



The Trusted Source for Innovative Control Solutions

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	Sensors						
		PROXIMITY	SENSORS				
	HESS	HESS PSA SERIES PSAC		PSAFP SERIES			
				QQ			
Description	Round Proximity	Round Threaded Proximity	Round Amplified Proximity	Space Saving Flat Pack Proximity			
Dimensions (Height)x(Width)	64 mm (H) x 10 mm (W)	Model Dependent	114 mm (H) x 19 mm (W)	Model Dependent			
Recommended Installation	Counters/Rate Meters	Counters/Rate Meters	Counters/Rate Meters	Counters/Rate Meters			
Max. Operating Frequency	5 KHz	Model Dependent 5 KHz		Model Dependent			
Output	NPN O. C.	NPN Loaded Collector, 1 mA to 3 mA Swing	NPN O. C.	NPN O. C.			
Max. Sensing Distance	.040" (1 mm)	.059" (1.5 mm) to .394" (10 mm) Model Dependent	.040" (1 mm)	.078" (2 mm) .393" (10 mm)			
Operating Power	8 to 30 VDC	Model Dependent	10 to 30 VDC	10 to 30 VDC			
Options	N/A	Mounting Brackets	Mounting Brackets, Quick Disconnect Cables	Mounting Bracket and Spacer			
Construction	Stainless Steel Case with 10 Foot Cable	Model Dependent	Stainless Steel Case	High Impact Plastic Case			
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	Sensors						
	MAGNETIC PICK-UPS						
	MP SERIES	LMP SERIES	ARC RINGS				
Description	Threaded Magnetic Pick-ups	Amplified Magnetic Pick-ups	"C" Face-Mounted Motor Adapter Kits				
Dimensions (Height) x (Width)	Model Dependent	102 mm (H) x 19 mm (W)	Refer to Drawing				
Recommended Installation	Rate Meters, 100 RPM Min.	Rate Meters, 25 RPM Min.	Magnetic: Rate Meters Proximity: Counters/Rate Meters				
Max. Operating Frequency	Greater than 50 KHz Typical	10 KHz	Magnetic: Greater than 50 KHz Typical Proximity: 5 KHz				
Output	AC Voltage Signal	NPN OC (LMPC) 5 VDC Signal (LMPEC)	Magnetic: A/C Voltage Signal Proximity: NPN O. C.				
Max. Sensing Distance	Model Dependent	0.125" w/24 DP Gear	Sensor Pregapped in Ring Kits				
Operating Power	Self Powered Two Wires	9 to 30 VDC	Magnetic: Self Powered Proximity: 8 to 10 VDC				
Options	In-Line Amplifier (ASTC) Explosion-Proof Version (MP75TX)	Mounting Brackets, Quick Disconnect Cables	N/A				
Construction	Threaded Stainless Steel Case	Stainless Steel Case	Cast Aluminum w/ Junction Box				
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	Sensors					
	MOTOR F	EEDBACK	ROTARY PULSE	GENERATORS		
	MOTOR MOUNT	MOTOR MOUNT	LOW PROFILE	LOW PROFILE		
Description	Motor Mount Configurations	C-Face Encoders	Small Thru-Bore and Shaft Encoders	Large Thru-Bore Encoders		
Dimensions (Height)x(Width)	Refer to Drawing	Refer to Drawing	Refer to Drawing	Refer to Drawing		
Recommended Installation	Motor Feedback Systems	Motor Feedback Systems	Counters/Rate Meters	Counters/Rate Meters		
Max. Operating Frequency	250 KHz	200 KHz	200 KHz	200 KHz		
Output	Line Driver	Line Driver	Standard: Quadrature Open Collector, Others Include Line Driver, Push Pull	Standard: Quadrature Open Collector, Others Include Line Driver, Push Pull		
Max. Sensing Distance	N/A	N/A	N/A	N/A		
Operating Power	5 to 28 VDC	5 to 28 VDC	5 to 28 VDC	5 to 28 VDC		
Options	Protective Cover Kit, Various Bore Sleeves	N/A	Precision Shaft Couplings	Flex Mount Kits, Bore Insert Kits, Magnetic Coupling Kit		
Construction	Nylon Composite	Metal	Aluminum	Aluminum		
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	Sensors					
	ROTARY PULSE GENERATORS					
	INDUSTRIAL DUTY INDUSTRIAL DUTY		INDUSTRIAL AND HEAVY DUTY	HEAVY DUTY ENCODER		
	P.					
Description	Shaft Encoders	Large Thru-Bore Encoders	Industrial and Heavy Duty Encoder	Size 20 and 25 Flange Encoders		
Dimensions (Height) x (Width)	Refer to Drawing	Refer to Drawing	Refer to Drawing	Refer to Drawing		
Recommended Installation	Counters/Rate Meters	Counters/Rate Meters	Counters/Rate Meters	Counters/Rate Meters		
Max. Operating Frequency	10 KHz	1 MHz 20 KHz		1 MHz		
Output	Single Channel or Quadrature, NPN O.C.	Standard: Quadrature Open Collector, Others Include Line Driver, Push Pull	Single Channel or Quadrature, Current Sinking.	Standard: Quadrature Open Collector, Others Include Line Driver, Push Pull		
Max. Sensing Distance	N/A	N/A	N/A	N/A		
Operating Power	8 to 35 VDC (ZCG) 8 to 28 VDC (ZCH)	5 to 28 VDC	5 to 28 VDC	5 to 28 VDC		
Options	Precision Shaft Couplings	Tether Arm Kits, Bore Insert Kits, Magnetic Coupling Kit	Precision Shaft Couplings	Precision Shaft Couplings		
Construction	Cast Aluminum	Nylon Composite	Aluminum	Aluminum		
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	Sensors					
	LENGTH	SENSORS	LINEAR	рното ече		
	MINIATURE LENGTH SENSORS	LENGTH SENSORS	LINEAR ENCODER	PHOTO EYES		
Description	Length Measurement Sensor	Length Measurement Sensor	Length Measurement Sensor	Photo Electric Sensors		
Dimensions (Height) x (Width)	Refer to Drawing	Refer to Drawing	Refer to Drawing	Model Dependent		
Recommended Installation	Counters/Rate Meters	Counters/Rate Meters	Counters/Rate Meters	Counters/Timers		
Max. Operating Frequency	200 KHz	10 KHz 125 KHz		1 KHz		
Output	Quadrature Open Collector	Single Channel or Quadrature, Current Sinking.	Quadrature, Open Collector	NPN O. C., PNP O. C.		
Max. Sensing Distance	N/A	N/A	N/A	15 Foot (Reflective) 12 Inch (Proximity) 10 Foot (Opposed Beam)		
Operating Power	5 to 28 VDC	8 to 35 VDC (ZFG) 8 to 28 VDC (ZFH)	5 to 28 VDC	10 to 30 VDC		
Options	Mounting Bracket, Various Measuring Wheels	Single or Dual Shaft, Mounting Bracket, Various Measuring Wheels	Mounting Bracket	Mounting Brackets, Reflectors		
Construction	Nylon Composite	Cast Aluminum	Aluminum	Plastic		
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	Sensors					
	PRESSURE	TEMPERATU	RE SENSORS	C U R R E N T T R A N S D U C E R S		
	PT SERIES	THERMOCOUPLES	RTDS	CURRENT TRANSFORMERS		
Description	Pressure Sensors	Various Thermocouple Sensors	Various RTD Sensors	Current Transformers		
Dimensions (Height) x (Width)	68 mm (H) x 23 mm (W)	Model Dependent	Model Dependent	Model Dependent		
Recommended Installation	Digital Panel Meters/Process Meters	Temperature Meters/Controllers	Temperature Meters/Controllers	Digital Panel Meters/Process Meters		
Max. Operating Frequency	N/A	N/A	N/A	Model Dependent		
Output	4 to 20 mA	mV	mV	0.1, 1, and 5 Amp		
Max. Sensing Distance	N/A	N/A	N/A	N/A		
Operating Power	8 to 33 VDC	Model Dependent	Model Dependent	N/A		
Options	Adapter Fittings	Field Cuttable, Quick Disconnects, Handheld, Compression, Surface, Pipe Plug	Field Cuttable, Quick Disconnects, Handheld, Compression, Surface, Pipe Plug	N/A		
Construction	Stainless Steel Case	Model Dependent	Model Dependent	Plastic		
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	Sensors				
	CURRENT TR	RANSDUCERS			
	CURRENT TRANSDUCERS	CURRENT SWITCH			
	And				
Description	Current Transducers	Current Switch			
Dimensions (Height)x(Width)	Model Dependent	Model Dependent			
Recommended Installation	Digital Panel Meters/Process Meters	Stand Alone			
Max. Operating Frequency	Model Dependent	60 to 100 Hz			
Output	4 to 20 mA or 0 to 10 VDC Model Dependent	Solid State Switch			
Max. Sensing Distance	N/A	N/A			
Operating Power	N/A	Self Powered			
Options	Fixed or Split Core, Model Dependent	Fixed or Split Core, Model Dependent			
Construction	Thermoplastic	Thermoplastic			
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MODEL HESS - HALL EFFECT SPEED SENSOR



DETECTS STEEL SENSING GEARS OR OTHER FERROUS TARGETS

NPN OPEN COLLECTOR OUTPUT

OPERATES FROM 0 TO 10 KHz

3/8" DIAMETER STAINLESS STEEL CASE

EPOXY ENCAPSULATED FOR OIL, DIRT & MOISTURE RESISTANCE

IDEAL FOR TACHOMETRIC INPUTS

DESCRIPTION

The Hall Effect speed sensor (HESS) is ideal for sensing steel gears or other ferrous targets from 0 to 10 KHz. This sensor does not have a minimum threshold speed as does a magnetic pickup sensor. However, when the sensor is first powered up, the output state is indeterminate (*Hi or Lo*) when the sensor is not detecting metal. The unit operates from a +8 to +30 VDC power supply and is reverse polarity protected. The sensor face can be mounted flush into metal panels. The case is stainless steel and is supplied with 10 feet (3 M) of cable. The stranded shield wire is not connected to the sensor circuit or case.

SPECIFICATIONS

- 1. POWER SUPPLY: +8 to +30 VDC @ 30 mA max.; reverse polarity protected.
- 2. MAXIMUM SENSING DISTANCE: 0.040" (1 mm).
- 3. **OUTPUT:** NPN O.C. transistor; $V_{MAX} = 30$ VDC; $V_{SAT} = 1 V_{MAX}$ @ 30 mA max. load.
- 4. **OPERATING TEMPERATURE RANGE:** -25°C to 70°C (-14°F to 158°F).
- 5. CABLE LENGTH: 10 feet (3.05 M).
- 6. OPERATING FREQUENCY: 0 to 10 KHz.
- 7. WIRE: 3 wire, 22 AWG with stranded shield wire and 100% foil coverage; grey PVC jacket.
- Color Code: Red (+VDC), Black (Comm.), White (Output). 8. CABLE STRAIN RELIEF: 10 lbs. (4.5 Kg.) for 1 minute.
- Note: DO <u>NOT</u> adjust sensor air gap while target (gear) is moving.

TYPICAL COUNTER DIP SWITCH SET-UP HESS +VDC (RED) \land +12VDC MAG. SRC. LO FRQ. \cap O.C. OUTPUT (WHITE) COUNT \cap (BLACK) COMMON COMMON -OGIC SNK. HI ()SHIELD WIRE N/C DEPENDENT

TARGET SIZE

The HESS can detect gears as small as 24 D.P. or other ferrous targets with equal or greater dimensions. The sensor is compatible with all Red Lion Controls Sensing Gears.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
HESS	NPN O.C. Hall Effect Speed Sensor	HESS0000



Do not dispose of unit in trash - Recycle



1-717-767-6511

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MODEL PSAH - HALL EFFECT SPEED SENSOR



- DETECTS STEEL SENSING GEARS OR OTHER FERROUS TARGETS
- NPN OPEN COLLECTOR OUTPUT
- OPERATES FROM 0 TO 10 KHz
- IDEAL FOR RATE APPLICATIONS

DESCRIPTION

The Hall Effect speed sensor (PSAH) is ideal for sensing steel gears or other ferrous targets from 0 to 10 KHz. This sensor does not have a minimum threshold speed as does a magnetic pickup sensor. However, when the sensor is first powered up, the output state is indeterminate (*Hi or Lo*) when the sensor is not detecting metal. The unit operates from a +8 to +30 VDC power supply and is reverse polarity protected. The sensor face can be mounted flush into metal panels. The case is stainless steel and is supplied with 10 feet (3 M) of cable. The stranded shield wire is not connected to the sensor circuit or case.

SPECIFICATIONS

- 1. **POWER SUPPLY:** +8 to +30 VDC @ 30 mA max.; reverse polarity protected.
- 2. MAXIMUM SENSING DISTANCE: 0.040" (1 mm).
- 3. **OUTPUT:** NPN O.C. transistor; $V_{MAX} = 30$ VDC; $V_{SAT} = 1 V_{MAX}$ @ 30 mA max. load.
- 4. OPERATING FREQUENCY: 0 to 10 KHz.
- 5. OPERATING TEMPERATURE RANGE: -25°C to 70°C (-14 °F to 158 °F).
- OUTPUT CABLE: Integrally potted 10 ft PVC jacketed, 3 wire, 22 AWG conductors, with stranded shield wire and 100% foil coverage; grey PVC jacket.
- Color Code: Red (+VDC), Black (Comm.), White (NPN OC Output).
- 7. **CONSTRUCTION**: Epoxy encapsulated 0.297 sensor in 0.75" ±0.005" dia. #304 stainless steel case.





TARGET SIZE

The PSAH can detect gears as small as 24 D.P. or other ferrous targets with equal or greater dimensions. The sensor is compatible with all Red Lion Controls Sensing Gears.

3/4" DIAMETER CYLINDRICAL SENSOR MOUNTING

The PSAH and other Red Lion Controls 3/4" dia. cylindrical pickups may be easily mounted using Model 5400100 **Block Mount** (*see diagram below*). This

machined block of solid aluminum provides for rigid mounting using the two included #8-32 x 1/2" screws. The single screw split-clamp design allows for easy adjustment of the airgap and locks the unit securely without deforming the case.



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PSAH	NPN O.C. Hall Effect Sensor	PSAH0000
BM	Block Mount	5400100



Do not dispose of unit in trash - Recycle

INDUCTIVE PROXIMITY SENSORS

- SENSE FERROUS & NON-FERROUS METAL OBJECTS TO "ZERO SPEED"
- 2-WIRE CURRENT SOURCE (NAMUR) & 3-WIRE NPN TRUE OPEN COLLECTOR OUTPUTS
- 5 SIZES & 3 SENSING DISTANCES FOR APPLICATION VERSATILITY
- L.E.D. TARGET INDICATOR (PSA 2B, 6B, 7B, & 8B)



DESCRIPTION & OPERATION

Inductive Proximity Sensors detect the presence of metal objects which come within range of their oscillating field and provide target detection to "zero speed". Internally, an oscillator creates a high frequency electromagnetic field (RF) which is radiated from the coil and out from the sensor face (See Figure 1). When a metal object enters this field, eddy currents are induced into the object.

As the metal moves closer to the sensor, these eddy currents increase and result in an absorption of energy from the coil which dampens the oscillator amplitude until it finally stops.





MODELS PSA-1B & 2B

The 2-wire Models PSA-1B and 2B contain only the coil and oscillator circuit *(See Figure 2)*. With no metal object being sensed, the circuit oscillates and draws greater than 2.2 mA of supply current. As a metal object of sufficient size is brought into the sensing field, the oscillator amplitude dampens and finally stops, resulting in less than 1 mA of circuit current being drawn. This greater than 2.2 mA to less than 1 mA change in circuit current between oscillating and non-oscillating conditions is converted into a usable voltage signal (V_S) by placing a resistor (R_S) in series with the sensor leads.



PSA-1B & PSA-2B SPECIFICATIONS

1 Dowor Supply	PSA-1B PSA-2B		
1. Fower Supply.	+5 to +30 VDC		
2. Maximum Switching Frequency:	5 KHz	500 Hz	
3. Output:	Less than 1 mA Target Sensed; Great than 2.2 mA No Target.		
4. Maximum Sensing Distance:	0.059" (1.5 mm)	0.394" (10 mm)	
5. Wire Color Code:	Brown = +VDC; Blue = Count		
6. Operating Temperature:	-25°C to +70°C (-13°F to +158°F)		
7. Construction:	NEMA 1, 3, 4, 6, 13, and IEC IP 67.		



In addition to the coil and oscillator circuit, the 3-wire Models PSA-6B, 7B, and 8B each contain a Detector Circuit and NPN Transistor Output *(See Figure 3)*. In these units, the Detector Circuit senses when the oscillator stops, and turns on the Output Transistor which controls the load. The Detector Circuit also turns on an integrally case mounted L.E.D., visually indicating when a metal object is sensed.



PSA-6B, 7B, & 8B

These Inductive Proximity Sensors have a maximum sensing distance of 0.059" (1.5 mm), 0.197" (5 mm) and 0.394" (10 mm) respectively, and operate over a wide power supply range *(See Specifications Below)*. They are each housed in threaded metal cases and are supplied with 2 metal jam nuts for mounting. The NPN transistor outputs are true open collector and are compatible with most RLC counter and rate input circuits. Maximum sensing frequencies are \leq 3 KHz, 1 KHz, and 500 Hz respectively. In addition, the outputs are overload and short circuit protected. These sensors are shielded for flush mounting in metal applications.

PSA-6B, 7B, & 8B SPECIFICATIONS

	PSA-6B	PSA-7B	PSA-8B		
1. Power Supply:		+10 to +30 VDC @ 10 mA max.	•		
	REVERSE	POLARITY PRO	TECTION		
2. Maximum Switching Frequency:	≤ 3 KHz 1 KHz 500 Hz				
3. Output:	NPN Open Collector Output, Overload and Short Circuit protected.				
	V _{SAT} = 1.8 V @ V _{SAT} = 1.8 V @ 150 mA max. load 200 mA max. load				
4. Maximum Sensing Distance:	0.059" (1.5 mm)	0.059" (1.5 mm) 0.197" (5 mm) 0.394" (10 m			
5. Wire Color Code:	Brown = +VDC; Blue = Common; Black = Output				
6. Operating Temperature:	-25°C to +70°C (-13°F to +158°F)				
7. Construction:	NEMA 1, 3, 4, 6, 13 and IEC IP 67				



SELECTION & APPLICATION OF PROXIMITY SENSORS

Selection of the proper proximity sensor depends on the size, material, and spacing of the target being sensed and the sensing distance that can be maintained. The maximum sensing distance is defined as the distance in which the sensor is just close enough to detect a ferrous target whose diameter is equal to or greater than the sensor diameter. In actual application, the sensing distance should be between 50 to 80% of the maximum sensing range to assure reliable detection. For target sizes smaller than the sensor diameter, the maximum sensing distance can be estimated from the curve (See Figure 4). A further reduction factor must also be applied if the target material is non-ferrous metal (See Figure 5). Ideally, spacing between adjacent targets should be at least one sensor diameter so that the first target completely leaves the sensors field before the next target appears. Individual targets can still be resolved as separate objects if this spacing is reduced to 70 or 75% of the sensor diameter, however, this can introduce a minimum limit on sensing distance that makes adjustment more critical. All Proximity sensors are internally shielded which allows the sensor face to be flush mounted in metal applications without reducing sensing distance. In applications where proximity sensors must be placed next to each other, a distance of at least 1 sensor diameter should separate sensors to eliminate any frequency interference (See Figure 6).

MAXIMUM SENSING DISTANCE REDUCTION FACTORS





PSA-6B, 7B, or 8B may be used as an input to more than 1 indicator or control only if the respective power supplies of each unit are *"unregulated"* and can load share. It is recommended to use only one power supply for sensor power. An indicator or control with a regulated power supply may not be paralleled.





APPLICATION SELECTION CHART

	PSA-1B	PSA-2B	PSA-6B	PSA-7B	PSA-8B
MAX. SENSING DISTANCE	0.059" (1.5 mm)	0.394" (10 mm)	0.059" (1.5 mm)	0.197" (5 mm)	0.394" (10 mm)
MAX. SWITCHING FREQ.	5 KHz	500 Hz	≤ 3 KHz	1 KHz	500 Hz
POWER SUPPLY	5-30 VDC	5-30 VDC	10-30 VDC	10-30 VDC	10-30 VDC
OUTPUT	<1 mA> 2.2 mA	<1 mA> 2.2 mA	NPN C	pen Collector Tra	nsistor
L.E.D. TARGET INDICATOR	No	Yes	Yes	Yes	Yes

DIMENSIONS

J

30°

F

– H –

С

G

MODELS MB4B & 5B MOUNTING BRACKETS



The Models MB4B and 5B are stainless steel right angle mounting brackets, designed to provide easy mounting and adjustment of PSA-7B and 8B respectively, using the 2 hex jam nuts provided with each sensor.

DIMENSIONS In inches (mm)

BRACKET MODEL NO.	SENSOR					DIME	INSIONS				
	MODEL	Α	В	С	D	E	F	G	н	J	SLOT
MB4B	PSA7B	1.63 (41.5)	1.00 (25.4)	2.5 (63.5)	1.25 (31.8)	0.62 (15.7)	0.31 (7.9)	1.88 (47.8)	0.75 (19.1)	0.06 (1.5)	0.22 X 0.75 (5.6 X 19.1)
MB5B	PSA8B	2.62 (66.5)	1.75 (44.5)	4.25 (108.0)	1.75 (44.5)	0.88 (22.4)	0.37 (9.5)	3.50 (88.9)	1.19 (30.2)	0.07 (1.8)	0.28 X 1.25 (7.1 X 31.8)

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PSA1B	2-Wire Cylindrical Proximity Sensor	PSA1B000
PSA2B	2-Wire, 30 mm Threaded Proximity Sensor	PSA2B000
PSA6B	8mm Threaded Proximity Sensor	PSA6B000
PSA7B	18mm Threaded Proximity Sensor	PSA7B000
PSA8B	30mm Threaded Proximity Sensor	PSA8B000
MB4B	Mounting Bracket for PSA7B	MB4B0000
MB5B	Mounting Bracket for PSA8B	MB5B0000

Do not dispose of unit in trash - Recycle

1-717-767-6511

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MODEL PSAC - 3-WIRE INDUCTIVE PROXIMITY SENSOR WITH CURRENT SINK OUTPUT



- SENSE FERROUS AND NON-FERROUS METAL OBJECTS
- OPERATES FROM ZERO TO 5 KHZ PULSE OUTPUT RATE
- SENSES TARGETS AS SMALL AS 12 D.P. GEAR TEETH
- IDEAL FOR TACHOMETER, COUNTER AND CONTROL INPUT

DESCRIPTION

The PSAC offers a NPN Open Collector output that is compatible with most Red Lion Controls' Motion Monitors, Counters, and Controls. This sensor has a maximum sensing distance of 0.059" (1.5 mm) and can detect ferrous and non-ferrous metal targets from zero speed to 5 KHz.

The 0.25" diameter pole piece is epoxy encapsulated in a stainless steel case measuring 0.75" Dia. x 3.5" L and is supplied with a 10, 25 or 50 ft., 3-wire, cable. Overall dimensions, including the neoprene strain-relief boot are 0.90" Dia. x 4.5" L. Operating temperature range is -25 ° to +70 °C.

SPECIFICATIONS

- 1. SUPPLY VOLTAGE: +10 30 VDC @ 20 mA max.; Unit is not Reverse Polarity Protected.
- 2. MAXIMUM SWITCHING FREQUENCY: 5 KHz
- 3. OUTPUT: NPN Open Collector Transistor;
- $V_{OH} = 30$ VDC max.; $V_{OL} = 1$ V max @ 150 mA.
- 4. MAXIMUM SENSING DISTANCE: 0.059" (1.5 mm)
- 5. **OUTPUT CABLE:** Integrally potted 10, 25, or 50 feet ± 6 inches; PUR jacketed 3-wire 24 AWG conductors.
- **BROWN** = +VDC, **BLUE** = Common, **BLACK** = NPN O.C. Output 6. **OPERATING TEMPERATURE RANGE:** -25 °C to +70 °C (-13 °F to
- +158 °F)
- 7. **CONSTRUCTION:** Epoxy Encapsulated 0.25" dia. sensor in 0.750" ±0.005" dia. #304 stainless steel case.



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
	NPN O.C. Proximity Sensor, 10 ft. Cable	PSAC0000
PSAC	NPN O.C. Proximity Sensor, 25 ft. Cable	PSAC0025
	NPN O.C. Proximity Sensor, 50 ft. Cable	PSAC0050
	Block Mount for 3/4" Cylindrical Sensors	5400100
	Steel Plug Mount	5403701
	Stainless Steel Plug Mount	5403702

PSAC APPLICATION

PSAC application depends on the size, material, and spacing of the targets being sensed and the sensing distance that can be maintained. The maximum sensing distance is defined as that distance where the sensor is just close enough to detect a ferrous target whose diameter is equal to or greater than the sensor diameter. For the PSAC, the internally potted sensor diameter is 0.25". In an actual application the sensing distance should be between 50-70% of the maximum to assure reliable detection. For target sizes smaller than the 0.25" sensor diameter, the maximum sensing distance can be estimated from the curve in Fig. 2. A further reduction factor must also be applied if the target material is a non-ferrous metal as shown in Fig. 3.

Ideally, spacing between adjacent targets should be at least 0.25" so that the first target completely leaves the sensors' viewing field before the next target appears. Individual targets can still be resolved as separate objects if this spacing is reduced to 70 or 75% of the sensor diameter, however this can introduce a minimum limit on sensing distance that makes adjustment a bit more critical

The PSAC is internally shielded which allows the sensor face to be flush mounted in metal applications without reducing sensing distance.





3/4" DIAMETER CYLINDRICAL SENSOR MOUNTING

BLOCK MOUNT

The PSAC and other Red Lion Controls 3/4" diameter cylindrical pickups may be easily mounted using Model 5400100 **BLOCK MOUNT** (see diagram below). This machined block of solid aluminum provides for rigid mounting using the two included #8-32 x 1/2" screws. The one screw split-clamp design allows for easy adjustment of airgap and locks the unit securely without deforming the case.



PLUG MOUNT

The **PLUG MOUNT** (see diagram below) allows 3/4" dia. cylindrical sensors to be mounted in "thru-wall" applications. The Plug Mounts 3/4-14 NPT thread is installed into a threaded wall or casing. The sensor is then installed through the plug mount. The sensor-to-target airgap is adjusted and the sensor is tightened into position by two #8-32 set screws. Tightening the ferrule nut compresses a teflon ferrule around the sensor providing an oil tight seal. Plug Mounts are available in both steel and stainless steel (see ordering information).



"FLAT PACK" RECTANGULAR INDUCTIVE PROXIMITY SENSORS

- IDEAL FOR LIMITED SPACE APPLICATIONS
- SENSE FERROUS & NON-FERROUS METAL OBJECTS TO "ZERO SPEED"
- 3-WIRE NPN TRUE OPEN COLLECTOR OUTPUTS
- 2 SIZES & SENSING DISTANCES FOR APPLICATION VERSATILITY
- L.E.D. TARGET INDICATOR



DESCRIPTION & OPERATION

Inductive Proximity Sensors detect the presence of metal objects that come within range of their oscillating field and provide target detection to *"zero speed"*. Internally, an oscillator creates a high frequency electromagnetic field (RF) that is radiated from the coil and out from the sensor face *(See Figure 1)*. When a metal object enters this field, eddy currents are induced into the object.

As the metal moves closer to the sensor, these eddy currents increase and result in an absorption of energy from the coil that dampens the oscillator amplitude until it finally stops.





MODELS PSAFP1 & PSAFP2

In addition to the coil and oscillator circuit, the 3-wire Models PSAFP1 and PSAFP2 each contain a Detector Circuit and NPN Transistor Output *(See Figure 2).* In these units, the Detector Circuit senses when the oscillator stops, and turns on the Output Transistor that controls the load. The Detector Circuit also turns on an integrally case mounted L.E.D., visually indicating when a metal object is sensed.



LED STATES

LED ON (GREEN) POWER ON LED ON (YELLOW) OUTPUT ENERGIZED

LED ON (FLASHING GREEN) SHORT CIRCUIT WARNING

These Inductive Proximity Sensors have a maximum sensing distance of 0.078" (2 mm) and 0.393" (10 mm) respectively, and operate over a wide power supply range (*See Specifications Below*). They are each housed in plastic with a top active face. The NPN transistor outputs are true open collector and are compatible with most Red Lion counter and rate meter input circuits. Maximum sensing frequencies are 2 KHz and 500 Hz respectively. In addition, the outputs are overload and short circuit protected. These sensors are shielded for flush mounting in metal applications.

PSAFP1 AND PSAFP2 SPECIFICATIONS

	PSAFP100	PSAFP200	
1. Power Supply:	+10 to +30 VDC @ 15 mA max.		
	REVERSE POLAR	ITY PROTECTION	
2. Maximum Switching Frequency:	2 KHz 500 Hz		
3. Output:	NPN Open Collector Output, Overload and Short Circuit protected.		
	V _{SAT} = 1.8 V @ V _{SAT} = 1.8 V @ 150 mA max. load 200 mA max. loa		
4. Maximum Sensing Distance:	0.078" (2 mm) 0.393" (10 mm		
5. Wire Color Code:	Brown = +VDC; Blue = Common; Black = Output		
6. Operating Temperature:	-25° to +85°C -25° to +70 (-14° to +185°F) (-14° to +15		
7. Construction:	NEMA 1, 3, 4, 6, 13 and IEC IP 67		
8. Trigger Current for Overload Protection:	220 mA		

TYPICAL HOOKUP



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PSAFP100 and PSAFP200 outputs are NPN open collector outputs. A PSAFP100 and PSAFP200 may be used as an input to more than 1 indicator or control only if the respective power supplies of each unit are "unregulated" and can load share. It is recommended to use only one power supply for sensor power. An indicator or control with a regulated power supply may not be paralleled.



SELECTION & APPLICATION OF PROXIMITY SENSORS

Selection of the proper proximity sensor depends on the size, material, and spacing of the target being sensed and the sensing distance that can be maintained. The maximum sensing distance is defined as the distance when the sensor is just close enough to detect a ferrous target whose diameter is equal to or greater than the sensor diameter. In actual application, the sensing distance should be between 50 to 80% of the maximum sensing range to assure reliable detection. For target sizes smaller than the sensor diameter, the maximum sensing distance can be estimated from the curve (See Figure 3). A further reduction factor must also be applied if the target material is non-ferrous metal (See Figure 4). Ideally, spacing between adjacent targets should be at least one sensor diameter so that the first target completely leaves the sensors field before the next target appears. Individual targets can still be resolved as separate objects if this spacing is reduced to 70 or 75% of the sensor diameter, however, this can introduce a minimum limit on sensing distance that makes adjustment more critical. All proximity sensors are internally shielded which allows the sensor face to be flush mounted in metal applications without reducing sensing distance. In applications where proximity sensors must be placed next to each other, a distance of at least 1 sensor diameter should separate sensors to eliminate any frequency interference (See Mounting below).



PSAFP200 MOUNTING



А	В	С	D	E
30.00 mm	45.00 mm	30.00 mm	30.00 mm	60.00 mm

MODELS MB7 & MB8 MOUNTING ACCESSORIES FOR PSAFP200



The Model MB7 and MB8 mounting accessories are designed to provide easy mounting and adjustment of the PSAFP200.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PSAFP1	2 mm Flat Pack Rectangular Proximity Sensor	PSAFP100
PSAFP2	10 mm Flat Pack Rectangular Proximity Sensor	PSAFP200
MB7	Spacer for PSAFP200	MB700000
MB8	Mounting Bracket for PSAFP200	MB800000



Do not dispose of unit in trash - Recycle

MAGNETIC PICKUPS & IN-LINE PREAMPLIFIER SIMPLE, RELIABLE & ECONOMICAL PULSE GENERATORS FOR:



SPEED SWITCHES DIGITAL TACHOMETERS FREQUENCY TO D.C. CONVERTERS

FEATURES INCLUDE

- SELF-GENERATING, NO EXT. POWER NEEDED
- WIDE OPERATING TEMPERATURE RANGE
- EPOXY ENCAPSULATED, MECHANICALLY RUGGED
- IMPERVIOUS TO DIRT, OIL & WATER
- NO MAINTENANCE REQUIRED
- LOW COST
- M12 CONNECTOR (MODEL SPECIFIC)

DESCRIPTION OF OPERATION

A Magnetic Pickup consists of a permanent magnet, a pole-piece, and a sensing coil all encapsulated in a cylindrical case. An object *(target)* of iron, steel, or other magnetic material, passing closely by its pole-piece causes distortion of the magnetic flux field passing through the sensing coil and pole-piece, which in turn generates a signal voltage. The magnitude of the signal voltage depends on the relative size of the magnetic target, its speed of approach, and how close it approaches. The polarity of the signal depends on whether the target is moving toward or away from the pole-piece.

Magnetic Pickups are most frequently used to sense passing teeth on a gear, sprocket, or timing belt wheel, to bolt-heads, key-ways, or other moving machine mounted targets. Typical targets and resulting signal wave forms are shown below in Fig. 1.

SELECTING A MAGNETIC PICKUP

Selecting a magnetic pickup is a matter of matching a pickup to a gear (*or other target*), to provide enough input signal to a tachometer, speed-switch, or other device for operation at the required minimum speed. The open-circuit output from a magnetic pickup is directly proportional to speed, and once the minimum operating speed conditions have been met, excess signal will always be available at higher speeds.

The "1-Volt Threshold Speed" column in the Application and Ordering Table (next pg.) provides a convenient guide for estimating minimum operating speeds. This value is the linear surface-speed of a reference gear required to generate a 1-Volt peak, open-circuit output at an air-gap of 0.005". The reference gear listed for each pickup is near the optimum size for that pickup, as defined by the criteria in Fig. 1B. The RPM listed is for a reference gear with 60 teeth running at that surface-speed. Gears with larger teeth provide about the same or somewhat more output at the same surface-speed, while gears with smaller teeth or fewer number of teeth yield lower outputs. Figures 1C - 1F need a very high surface speed to generate a 1-Volt peak. The "Minimum Gear Size" column lists the Diametral Pitch size at which the output drops to 40-60% of the output when the reference gear is used. Gears with very small teeth in relation to the pole-piece diameter, deliver greatly reduced outputs, as shown in Fig. 1A. Threshold outputs when using targets other than gear teeth. For more information

on gears, definitions and relationships, see the Sensing Gears Bulletin.

The 1-Volt Threshold Speeds are based on a 0.005" air-gap. In applications where this air-gap cannot be maintained or where the air-gap can vary due to eccentricity of the sensing gear, a correction factor can be applied from the curve in Fig 2. The effect of electrical loading is usually minimal at low speeds and low output frequencies, however, output voltage drop due to loading at high frequency or with low impedance inputs can be estimated based on the Output Impedance data.

Note: Magnetic Pickups are used primarily for tachometer and other speed related functions. They are not normally used for counting since loss of counts will occur at low speeds. Therefore, counters are not designed to accept outputs directly from conventional magnetic pickups. In special applications where counting occurs only at running speed or where lowspeed count loss is acceptable, a Model ASTC can be used, or a different type of sensor can be used as a substitute.

TYPICAL APPLICATION EXAMPLE

A Digital Tachometer, with an input sensitivity of 0.25 V is to be used with a Magnetic Pickup and gear to indicate speed down to 75 RPM. What are the alternative choices?

Since the input voltage required by the tachometer is only 0.25 V, the surface speeds and reference gear RPM's required would only be 2 of the 1-Volt Threshold Speeds listed. The MP-25TA with a 60-tooth, 24 D.P. reference gear would obviously fall short since this combination will not develop 0.25 V until the reference gear speed reaches 250 RPM.

The MP-37CA with the 60-tooth, 20 D.P. reference gear would both prove suitable since they would deliver the required 0.25 V at 50 and 45 RPM respectively. They would also provide some additional margin for air-gap variation. The curve of Fig. 2 shows a typical output drop of about 25% when the air-gap is increased from 0.005" to 0.0075". Since the minimum operating speed in this application is 75 RPM, the additional sensitivity can be traded for a wider air-gap allowance.

The MP-62TA and MP-75TX with their respective reference gears would allow operation at even lower speeds. With both of these pickups it would be possible to drop to a smaller gear pitch for this application.



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MAGNETIC PICKUP APPLICATION & ORDERING INFORMATION



NOTES:

- Surface speed of listed reference gear to produce 0.8 volt peak min., opencircuit output @ 0.005" air-gap.
- 2) Gear pitch where output will drop to 40-60% of that generated by the reference gear size, at the same surface speed.
- 3) UL Listed CSA Certified, Class I Group A, B, C and D; Class II Group E, F and G. (AI-TEK Instruments) PN#AIRPAX/70085-1010-005, UL File #E40545 (N), CSA File #042648.
- Polarity, all pickups: white output lead goes positive with respect to black when target approaches pole.
- 5) 2-Wire shielded cable is recommended for all magnetic pickup outputs. Connect the shield to the "COMMON" or "GROUND" terminal of the instrument being used and leave the shield un-connected at the pickup.

Magnetic Pickup signal leads should never be run in conduit, troughs, or bundles with other power or control voltage lines.

- 6) Lead length of magnetic pickup should not be extended. An in-line preamplifier (ASTC) can be placed on the end of the provided length which would allow longer length after the in-line pre-amplifier.
- 7) M12 unit color codes for 1 meter cable is:



ORDERING INFORMATION

The following cables are for use with magnetic pickups MP37TAC1 and MP62TAC1, which have M12 connectors.

MODEL NO.	DESCRIPTION	PART NUMBERS
CCM	Mating Cable With M12 Connector, 1 Meter In Length	CCM12S01

Do not dispose of unit in trash - Recycle

LOGIC MAGNETIC PICKUPS - SUPER-SENSITIVE MAGNETIC PICKUPS WITH CURRENT SINKING OUTPUT OR CURRENT SOURCING OUTPUT



- DETECTS STEEL SENSING GEARS OR OTHER MOVING FERROUS TARGETS
- BUILT-IN PULSE SHAPING AMPLIFIER PROVIDES ULTRA-LOW-SPEED OPERATION WITH LARGE AIR GAPS
- TWO OUTPUT SIGNAL VERSIONS
- 3/4" DIAMETER STAINLESS STEEL CASE
- EPOXY ENCAPSULATED SENSOR FOR OIL, DIRT & MOISTURE RESISTANCE

DESCRIPTION

LOGIC MAGNETIC PICKUPS (LMP's) provide sensing sensitivities several orders of magnitude greater than standard magnetic pickups when detecting moving ferrous targets. By locating a high gain pre-amplifier & signal processing circuit "inside" the mag pickup housing, larger airgaps and slower target surface speeds can be achieved thereby greatly expanding application versatility as compared with conventional mag pickups. In addition, these units have excellent noise immunity and a frequency response to 10 KHz. The stainless steel sensing pole is mounted flush to the plastic sensing face allowing greater ease of setting airgaps and eliminating snagging the pole with a moving target.

Two output types are available (see ordering information). The NPN Open Collector Transistor Output unit provides a negative going current sinking output with the approach of a ferrous target and is current limited to 40 mA. The Transistor Emitter-Follower Output unit provides positive going 5 V pulses with the approach of a ferrous target and can source 20 mA of load current. The Open Collector units are available with either an integrally potted 10, 25 or 50 foot 3-wire shielded cable with neoprene strain relief boot or a polarized 3-pin 5/8"-24 threaded connector for quick change versatility (see following page for mating extension cable). The Emitter-Follower output unit is available in the 3-pin connector version only.



SPECIFICATIONS

- 1. SUPPLY VOLTAGE (all versions): +9 to +30 VDC @ 25 mA max.
- NPN OPEN COLLECTOR OUTPUT (LMPC & LMPCC): V_{OH} = 30 VDC max.; V_{OL} = 1 Vmax. @ 30 mA, output current is limited to 40 mA.
- 3. EMITTER-FOLLOWER OUTPUT (LMPEC): +5 V signal level @ 20 mA max. current sourcing.
- 4. OPERATING FREQUENCY (all versions): 10 KHz max.
- 5. **OPERATING TEMPERATURE:** -18°C to +60°C (0°F to +140°F)
- CONSTRUCTION: Epoxy encapsulated in 0.750" ±0.005" dia. #304 stainless steel case. Plastic sensing face with stainless steel sensing pole.
- OUTPUT CABLE (LMPC only): Integrally potted 10, 25 or 50 ft. PVC jacketed, 3-wire 22 AWG conductors, with stranded shield and 100% foil shield coverage.
 - **RED** = +VDC, **BLK** = COMMON, **WHT** = NPN O.C. OUTPUT
- OUTPUT CONNECTOR (LMPCC & LMPEC): Polarized 5/8"-24 thread 3-pin connector.

A = +VDC, B = COMMON, C = SIGNAL OUTPUT





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3-PIN CONNECTOR EXTENSION CABLE (LMPCC & LMPEC)

This cable and connector assembly *(see diagram below)* is composed of PVC jacketed, 3-wire 22 AWG conductors with stranded shield and 100% foil shield coverage for noise immunity and is oil and water resistant. Connector/cable junctions are silicone sealed. The 5/8"-24 threaded ring is fitted with an O-ring to make a moisture proof connection. Cable is available in 10, 25, or 50 foot lengths.



3-PIN CONNECTOR EXTENSION CABLE

PVC jacketed, 3-wire, 22 AWG conductors with stranded shield and 100% foil shield coverage. There is no connection of stranded shield wire to 3-pin connector. Shield may be connected to instrument common for increased noise immunity.

3/4" DIAMETER CYLINDRICAL SENSOR MOUNTING

Logic Magnetic Pickups and other Red Lion Controls 3/4" dia. cylindrical pickups may be easily mounted using Model 5400100 **BLOCK MOUNT** (*see diagram below*). This machined block of solid aluminum provides for rigid mounting using the two included #8-32 x 1/2" screws. The one screw splitclamp design allows for easy adjustment of airgap and locks the unit securely without deforming the case.

The **PLUG MOUNT** (see diagram below) allows 3/4" dia. cylindrical sensors to be mounted in "thru-wall" applications. The Plug Mounts 3/4-14 NPT thread is installed into a threaded wall or casing. The sensor is then installed through the plug mount. The sensor-to-target airgap is adjusted and the sensor is tightened into position by two #8-32 set screws. Tightening the ferrule nut compresses a teflon ferrule around the sensor providing an oil tight seal. Plug Mounts are available in both steel and stainless steel (see ordering information).



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
	Logic Magnetic Pickup, NPN O.C., 10 ft. Cable	LMPC0000
LMPC	Logic Magnetic Pickup, NPN O.C., 25 ft. Cable	LMPC0025
	Logic Magnetic Pickup, NPN O.C., 50 ft. Cable	LMPC0050
LMPCC	Logic Magnetic Pickup, NPN O.C., 3-Pin Connector	LMPCC000
LMPEC	Logic Magnetic Pickup, Emitter Follower, 3-Pin Connector	LMPEC000
	Block Mount for 3/4" Cylindrical Sensors	5400100
	Steel Plug Mount	5403701
	Stainless Steel Plug Mount	5403702
	3-Pin Connector without Cable	2500030
0040	3-Pin Connector with 10 ft. Cable	CCA3PC00
CCAS	3-Pin Connector with 25 ft. Cable	CCA3PC25
	3-Pin Connector with 50 ft. Cable	CCA3PC50



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MODEL ARCJ - NEMA "C" FACE-MOUNTED MOTOR ADAPTER KITS FOR CONVENIENT ADAPTATION OF SENSORS & SENSING GEARS TO GEAR CASE OR FOOT-MOUNTED NEMA "C" FACE MOTORS

DESCRIPTION

ARCJ Ring Adapters can be quickly and easily installed on foot-mounted motors with NEMA type "C" face mount end bells, or between motor and gear case flange.

The ARCJ ring, with integral junction box, is cast aluminum with precision machined mounting surfaces. Kits are supplied complete with a 60-tooth sensing gear, factory installed magnetic pickup or HESS sensor, and mounting hardware. The maximum recommended gear speed for all kits is 5,000 RPM. Two ARCJ ring sizes and five gear bores cover the range of motor frame sizes as listed in the Ordering Information.

Wiring connections to the sensor are made by removing the gasketed junction box cover. Two threaded female ($\frac{1}{2}$ " NPT) conduit connections are provided for right or left conduit entry (as shown in the Dimension drawing). A threaded plug is supplied with each kit for sealing the un-used conduit entry.

The 60-tooth steel sensing gear (kit supplied) results in direct RPM indication when used with a 1 second time-base rate indicator (tachometer).

Red Lion Controls rate indicators can be configured to provide a complete speed sensing and indication system. The following two sensor options (next page) are available with the ARCJ kits in order to meet a wide variety of applications.



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MAGNETIC PICKUP SENSOR

The ARCJ kits with this sensor option use the Red Lion Controls MP-37CA Magnetic Pickup. This sensor does not require external power.

The Magnetic Pickup is factory installed in the ring to provide a nominal sensor/gear air gap of 0.007" (0.18 mm) to 0.010" (0.25 mm). This provides adequate output from the sensor for most applications. However, if output must be maximized, the air gap can be easily user-adjusted to 0.005" (0.13 mm) minimum, once the particular gear being used is mounted on the motor shaft. (Refer to Magnetic Pickup literature for more details, enclosed in ARCJ kits.)

HALL EFFECT SPEED SENSOR (HESS)

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The ARCJ kits with the HESS sensor requires an external +8 to +30 VDC power source. This sensor does **NOT** have a minimum threshold speed as does a magnetic pickup sensor. However, when the sensor is first powered up, the output state is indeterminate when the sensor is not detecting metal. The sensor face can be mounted flush into metal panels. The case is stainless steel and is supplied with 10 feet (3 M) of cable. The stranded shield wire is not connected to the sensor circuit or the case.

The sensor to gear air gap is factory set to a nominal gap of 0.015" (0.38 mm). The air gap can be adjusted by the user from 0.005" (0.13 mm) to 0.040" (1.02 mm), which allows 0.005" (0.13 mm) maximum total gear runout.

SPECIFICATIONS (HESS Sensor)

- 1. **POWER SUPPLY:** +8 to +30 VDC @ 30 mA max; Reverse Polarity Protected.
- 2. MAXIMUM SENSING DISTANCE: 0.040" (1 mm).
- 3. **OUTPUT:** NPN O.C. transistor; $V_{SAT} = 1 V \max @ 30 mA \max$. load.
- 4. OPERATING TEMPERATURE RANGE: -25°C to 70°C
- (-14°F to 158°F)
- 5. CABLE LENGTH: 10 feet (3.05 M)
- 6. **OPERATING FREQUENCY:** 0 to 10 KHz
- 7. WIRE COLOR CODE: 3-wire, 22 AWG with stranded drain wire and 100% foil coverage; grey PVC jacket.
- 8. CABLE STRAIN RELIEF: 10 lbs (4.5 Kg) for 1 minute. Note: Do **NOT** adjust sensor air gap while target (gear) is moving.





ORDERING INFORMATION

MOTOR ERAME SIZE	SHAFT DIA.	RING	GEAR P/N	SEN	COMPLETE KIT	
MOTOR FRAME SIZE	(Gear Bore)	MODEL NO.	(Ref.)	MAG. PICKUP	HESS	PART NO.
560	E/0"		0060625	Х		ARCJ1A00
560	0/0	ARCJ-1	0960625		Х	ARCJ1AZ0
142TC 14ETC 192C 194C	7/0"	ARCJ-1	0960875	Х		ARCJ1B00
14310, 14510, 1820, 1840	//0				Х	ARCJ1BZ0
182TC 184TC 212C 215C 254C	1 1/8"	ARCJ-2	0941125	Х		ARCJ2A00
18210, 18410, 2130, 2150, 2540					Х	ARCJ2AZ0
212TO 215TO 254110 256110	4.0/0"	ARCJ-2	0941375	Х		ARCJ2B00
21310, 21310, 25400, 25600	1 3/0				Х	ARCJ2BZ0
25410 25610	1 5/0"	ARCJ-2	0044005	Х		ARCJ2C00
25410, 25610	1 5/6		0941025		Х	ARCJ2CZ0

MODEL NO.	DESCRIPTION	PART NUMBER
HESS	Replacement Sensor for HESS Option	HESS0000
MP-37CA	Replacement Sensor for Magnetic Pickup Option	MP37CA00



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MODEL ZR - C-FACE ENCODER WITH LINE DRIVER OUTPUT FOR MOTOR FEEDBACK



- THRU-SHAFT DESIGN FOR EASY MOUNTING
- EXCELLENT CHOICE FOR VECTOR MOTOR DRIVE CONTROL
- DESIGNED FOR INDUSTRIAL ENVIRONMENTS
- GASKET KIT INCLUDED
- QUADRATURE LINE DRIVER OUTPUT
- POSITIVE INDEX PULSE

DESCRIPTION

The Model ZR C-face encoder for motor feedback is a rugged, high resolution, high temperature (100°C) encoder designed to mount directly on NEMA C-face motors. The ZR contains a precision bearing and internal coupling that virtually eliminates inaccuracies induced by motor shaft runout. This encoder is ideal for applications using high performance AC vector motors.

The thru-shaft design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C, 143TC, 145TC, 182C, 184C). The tough anodized aluminum housing with thru-shaft design resists the vibration and hazards of an industrial environment.

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. SUPPLY: 4.75 to 28 VDC, 40 mA current draw typical, 100 mA maximum
- 2. OUTPUT: Quadrature Line driver, 20 mA max per channel (meets RS-422 at 5 VDC supply). Incremental - two square waves in quadrature with A leading B for clockwise shaft rotation. Positive pulse index.

Note: Line driver outputs are intended for motion controllers that have line driver receivers.

3. CYCLES PER REVOLUTION: 1024 or 2048



- 4. MAX. FREQUENCY: 200 KHz
- 5. NOISE IMMUNITY: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022; BS EN61000-6-2; BS EN50081-2
- 6. SYMMETRY: 180° (±18°) electrical
- 7. **OUAD PHASING**: 90° (±22.5) electrical
- 8. MIN EDGE SEP: 67.5° electrical
- 9. RISE TIME: Less than 1 microsecond

MECHANICAL SPECIFICATIONS

- 1. MAX MECHANICAL SPEED: 6000 RPM
- 2. BORE DIAMETER: 0.625" or 1.0"
- 3. BORE TOLERANCE: +0.0015"/-0.000"
- 4. MOMENT OF INERTIA: 3.3×10^{-3} oz-in-sec² typical
- 5. USER SHAFT TOLERANCES:
- Radial Runout:0.005"
- Axial Endplay: ±0.015"
- 6. ELECTRICAL CONNECTION: 10-pin MS type connector or 36" (914.4 mm) cable. 24 AWG foil and braid shield.

FUNCTION	PIN	CABLE WIRE COLOR
+VDC	D	RED
COM	F	BLACK
DATA A	А	WHITE
DATA A'	Н	BROWN
DATA B	В	BLUE
DATA B'	I	VIOLET
DATA Z	С	ORANGE
DATA Z'	J	YELLOW
SHIELD	_	BARE

- 7. HOUSING: All metal construction
- 8. MOUNTING: NEMA 56C to 184C when proper bore size is selected
- 9. WEIGHT: 2.60 lb. (1.18 Kg) typical

ENVIRONMENTAL CONDITIONS

1. OPERATING TEMPERATURE:0 to +100°C @ 4.75 to 24 VDC

- 0 to +70°C @ 4.75 to 28 VDC
- 2. STORAGE TEMPERATURE: -25 to +100°C 3. HUMIDITY: 98% RH non-condensing
- 4. VIBRATION: 10 g @ 58 to 500 Hz 5. SHOCK: 50 g @ 11 msec duration
- 6. SEALING: IP65 with included shaft cover and gaskets installed.

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MOUNTING INSTRUCTIONS

Mounting Kit Items Included:

- 4 ea. 3/8" 16 x 1.0" Length Socket Head Cap Screws, Black Alloy.
- 4 ea. 3/8" High Collar Spring Lock washer, Steel Zinc.
- 1 ea. 3/32" Hex Allen Wrench, Long arm.

Note: The ZR encoder can mount to many types of C face devices. In these mounting instructions, we will refer to the device as a motor.

Step 1

After carefully unpacking the unit, inspect to insure the motor shaft is the correct size and free of all burrs or aberrations. Slide the ZR Encoder over the motor shaft. DO NOT USE EXCESSIVE FORCE: There is a rubber O-ring in the Encoder locking collar that will provide a small amount of resistance as it engages the shaft. If the encoder does not slide easily See Note 1 below.

Step 2

Install the four 3/8" 16 x 1.0" socket head cap screws with lock washers through the holes in the Encoder C face and tighten securely to the motor.

Step 3

Insure the shaft locking collar is flush with the Encoder cover plate. Prevent the motor shaft from turning (See Note 2 for additional information) and tighten the four 4-40 Allen head cap screws in the locking collar evenly in a crossing pattern. See Figure 1. Make sure the screws are securely tightened and the front of the locking collar remains flush with the encoder cover plate. If the collar does not turn true when the motor shaft is rotated, loosen the four screws and repeat the procedure.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	BORE SIZE	CONNECTION	PART NUMBER
	NEMA C Face Encoder 56C to 184C (Must select proper bore size)	1024	0.625	MS 10-Pin	ZRJ1024Z
		2048	0.625	MS 10-Pin	ZRJ2048Z
ZRJ		1024	0.625	36" Pigtail	ZRJ1024R
		2048	0.625	36" Pigtail	ZRJ2048R
ZRL		1024	1.0	MS 10-Pin	ZRL1024Z
		2048	1.0	MS 10-Pin	ZRL2048Z
		1024	1.0	36" Pigtail	ZRL1024R
		2048	1.0	36" Pigtail	ZRL2048R

Only factory stocked part numbers are listed. Consult Factory for part number and availability of other PPR and output configurations.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
CCBRPG	10-Pin MS Connector	CCBRPG04
	10-Pin MS Connector with 10 ft 24 AWG 5 Conductor Cable w/drain	CCBRPG05
	10-Pin MS Connector with 20 ft 24 AWG 5 Conductor Cable w/drain	CCBRPG06



In Case of Difficulty:

- Note 1: Make sure the four 4-40 Allen head cap screws in the front of the Encoder locking collar are loose and the collar is not cocked or jammed. Clean the shaft of any burrs using fine crocus cloth. The O- ring in the Encoder locking collar may need a small amount of additional lubrication.
- **Note 2**: When tightening the screws in the locking collar avoid holding the motor shaft with anything that may scar or burr the shaft.

MACHINED STEEL SENSING GEARS FOR EXCITING SENSORS



Sensing Gears are available in a variety of sizes to cover most applications where a sensor is to be used, but a suitable existing machine gear is not available. Split-type gears are convenient for use on machine drive shafts where a shaft-end is not available to mount a standard gear. Hubless gears are ideal for mounting in tight locations or when only a short shaft stub is available. Hubtype, Split, and Hubless gears can be supplied with special bores (See notes below Ordering Information & Dimensions table).

Caution: RLC's machined steel sensing gears are **NOT** to be used as driving or driven gears in a power transmission system.

HUB TYPE GEARS



LOCK WASHER (2) FLAT WASHER (2) FLAT

SPLIT GEARS

HUBLESS GEARS



ORDERING INFORMATION & DIMENSIONS

ТҮРЕ	NO. OF TEETH & DIAMETRAL PITCH	STOCK BORE +0.003" -0.000"	MAX. SPL. BORE +0.003" -0.000"	O.D. ±0.003"	HUB			RECOMMENDED	RECOMMENDED	
					± DIA "D" 0.010"	PROJ "P" ±0.020"	±0.010"	SET & CAP SCREWS	MAXIMUM GEAR SPEEDS	PART NUMBER
	30 T. 16 D.P.	0.500"	1.375"	2.000"	1.625"	0.500"	0.500"	25 in. lbs.	5000 RPM	0950500
HUB TYPE	60 T. 20 D.P.	0.375"	1.750"	3.100"	2.000"	0.500"	0.375"	25 in. lbs.	5000 RPM	0970375
	60 T. 10 D.P.	0.875"	2.250"	6.200"	2.500"	0.875"	1.000"	55 in. lbs.	5000 RPM	0910875
	30 T. 10 D.P.	0.750"	1.875"	3.200"			*1.000"	182 in. lbs.	3000 RPM	0920750
SPLIT GEAR	60 T. 10 D.P.	0.875"	4.250"	6.200"			*1.000"	182 in. lbs.	1500 RPM	0930875
	60 T. 20 D.P.	0.625"	0.870"	3.100"			0.375"	25 in. lbs.	5000 RPM	0960625
	60 T. 20 D.P.	0.875"	0.875"	3.100"			0.375"	25 in. lbs.	5000 RPM	0960875
HUBLESS	60 T. 12 D.P.	1.125"	1.370"	5.160"			0.656"	40 in. lbs.	5000 RPM	0941125
	60 T. 12 D.P.	1.375"	1.620"	5.160"			0.656"	40 in. lbs.	5000 RPM	0941375
	60 T. 12 D.P.	1.625"	1.625"	5.160"			0.656"	40 in. lbs.	5000 RPM	0941625

* A portion of the teeth near the cap screws are milled away. However, at least ¼" of the teeth face width is available, allowing sensing of all teeth.

SPECIAL BORES: Hub-Type, Split, and Hubless gears can be supplied with special bore sizes between the Stock Bore and Max. Special Bore sizes listed above. To order Special Bores, substitute 9999 for the last 4 digits of the part number and specify special bore size required.

ASSEMBLY NOTE FOR SPLIT GEARS: When tightening the split gear halves on a shaft, it is recommended that the flat washer spacers be used to help keep the gap between halves equal.

Run-out should be checked after installation is complete. Always use the supplied lock washers when tightening the socket head cap screws. Torque these screws to 182 in. lbs.

STANDARD SPUR GEAR DEFINITIONS, RELATIONSHIPS & FORMULA

Gear parameters are fundamentally related to their use as power transmission elements. Although these parameters are not the most convenient when using gears to excite magnetic pickups, they can be easily converted to more useful form, once the basic definitions are understood.

- **PITCH DIAMETER (P.D.)** The diameter of the circle described by the toothto-tooth contact point when running in mesh with the teeth of another gear. This point is roughly half way between the root (bottom) and the tip of the gear tooth. The Pitch Diameter is slightly smaller than the outside diameter of the gear.
- **DIAMETRAL PITCH (D.P.)** The number of teeth/inch of Pitch Diameter. Thus a 20 D.P. gear has 20 teeth for each inch of Pitch Diameter. A 60-tooth, 20 D.P. gear would have a pitch diameter of 3', a 60T, 10 D.P. gear has a Pitch Diameter of 6'.
 - **PRESSURE ANGLE -** Pressure angle relates to tooth shape and strength. It has no significant effect on the operation of the gear for exciting magnetic pickups, and pickups can be used with gears of any pressure angle.
 - **OUTSIDE DIAMETER (O.D.)** The outside diameter is the overall diameter of the gear to the tops of the teeth, and is used for calculating surface speed when the gear is used to excite a magnetic sensor. The O.D. can be determined from the following formula:

$$O.D. = \frac{RPM \times Nt}{60}$$

Example: A 60T, 16 D.P. Gear has an O.D. of:

O.D. =
$$\frac{10 \times 60}{3.1 \times \pi}$$
 = 3.875 inches

SURFACE SPEED - The output of a magnetic pickup depends on the linear surface speed of the tops of the passing gear teeth. Surface speed is normally expressed in inches/sec. and can be calculated for a given gear as follows:

Surface Speed in inches /sec. = $\frac{50 \times 3.1 \times \pi}{60}$

or; RPM =
$$\frac{60+2}{20}$$

Example: What is the surface speed of the 60T, 20 D.P. Gear when running at 50 RPM? At what RPM will the 1-Volt Threshold Speed (10 inches/sec.) for the MP-62TA be realized?

Gear O.D. = $\frac{\text{Surface Speed x 60}}{\text{O.D. x }\pi}$ = 3.1" (From O.D. formula above)

Surface Speed = $\frac{\text{RPM x O.D. x }\pi}{60}$ = 8.115 inches /sec.

1-Volt Threshold RPM (@ 10 in/sec.) = $\frac{60+2}{16}$ = 61.61 RPM

OUTPUT SIGNAL FREQUENCY - The frequency generated by passing gear teeth is related to gear RPM and the number of gear teeth (Nt) by the following:

Output frequency (Hz or teeth/sec.) = $\frac{Nt(No. of teeth) + 2}{D.P. (Diametral Pitch)}$

MODELS ZUJ AND ZUL - LARGE THRU-BORE Rotary pulse generators FOR MOTOR FEEDBACK



SPECIFICATIONS **ELECTRICAL SPECIFICATIONS**

- 1. SUPPLY VOLTAGE: 4.75 to 28 VDC @ 100 mA max. -20°C to 85°C; 4.75 to 24 VDC @ 100 mA max. -20°C to 105°C
- 2. OUTPUTS: Line driver, V_{OH} = 40 VDC max.; 20 mA max. current. Incremental - two square waves with A leading B for clockwise rotation. B leads output A for the reverse phased.
- Note: Line driver outputs are intended for motion controllers that have line driver receivers.
- 3. MAX. PULSE RATE: 250 KHz
- 4. INDEX: NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Once per revolution centered over output Channel A. Index is a positive going pulse.
- 5. MINIMUM EDGE SEPARATION: 45° electrical min, 63° electrical or better typical
- 6. RISE TIME: Less than 1 microsecond
- 7. ACCURACY: Within 0.1° mechanical from one cycle to any other cycle, or 6 arc minutes.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 4000 RPM
- 2. BORE SIZE: 0.625" or 1.0" (15.875 or 25.4 mm)
- 3. BORE TOLERANCES: -0.0000"/+0.0008"
- 4. USER SHAFT TOLERANCES: Radial Runout: 0.005" max Axial Endplay: +/- 0.050" max
- 5. MAXIMUM ACCELERATION: 1X10⁵ rad/sec²
- 6. STARTING TORQUE: 4.0 oz-in typical (28.24 N-mm)

GENERAL DESCRIPTION

The ZUJ and ZUL are high performance units that are ideal for fast revving motor mount applications. The injection molded housing is grooved with "cooling fins", and can take the extreme heat of the motion control industry.

The unit comes equipped with a 3.5" to 5.90" B.C. tether arm to mount to a 4.5" motor face.

This revolutionary encoder can also be adapted to various standard and metric sized motor shafts by using individual sleeves (Sold separately).

Electrically the unit offers line driver outputs, limited to 20 mA per channel. The outputs are standard quadrature with index and are also available with reverse phasing for the typical motor drive controller application. The separation is 90° with output A leading output B for clockwise rotation. Output B leads output A for the reverse phased output, for clockwise rotation.

7. MOMENT OF INERTIA:

7.6 x 10⁻⁴ oz-in-sec²

8. ELECTRICAL CONNECTOR: 10-pin MS type connector

FUNCTION	PIN	CABLE WIRE COLOR
+VDC	D	RED
COM	F	BLACK
DATA A	А	WHITE
DATA A'	Н	BROWN
DATA B	В	BLUE
DATA B'	I	VIOLET
DATA Z	С	ORANGE
DATA Z'	J	YELLOW
SHIELD	-	BARE
N/A	G	GREEN

9. HOUSING: Proprietary nylon composite

- 10. MOUNTING: 3.5" to 5.90" B.C. (4.5" C-Face) tether arm kit
- 11. WEIGHT: 8 oz. (226.7 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. **OPERATING TEMPERATURE**: -20°C to 105°C (See Supply Voltage)
- 2. STORAGE TEMPERATURE: -20°C to 85°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. VIBRATION: 20 g @ 5 to 2000 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP66



1-717-767-6511

Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
ZUJ	0.625" Thru-Bore Rotary Pulse	1024	ZUJ1024Z
	Generators For Motor Feedback	2048	ZUJ2048Z
ZUL	1" Thru-Bore Rotary Pulse	1024	ZUL1024Z
	Generators For Motor Feedback	2048	ZUL2048Z

Only factory stocked part numbers are listed. Consult Factory for part number and availability of other PPR and output configurations.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
CCBRPG	10-Pin MS Connector	CCBRPG04
	10-Pin MS Connector with 10 ft 24 AWG 9 Conductor Cable w/drain	CCBRPG05
	10-Pin MS Connector with 20 ft 24 AWG 9 Conductor Cable w/drain	CCBRPG06
	0.500 Inch Bore Sleeve	RPGBSI00
DDCDCI	0.625 Inch Bore Sleeve	RPGBSI01
RPGBSI	0.750 Inch Bore Sleeve	RPGBSI02
	0.875 Inch Bore Sleeve	RPGBSI03
	19 mm Bore Sleeve	RPGBSM00
DDCDCM	20 mm Bore Sleeve	RPGBSM01
RPGBSM	24 mm Bore Sleeve	RPGBSM02
	25 mm Bore Sleeve	RPGBSM03
PROMK	Standard Tether Arm Kit 4.5 Inch	RPGMK002
RPGMK	Elongated Tether Arm Kit 8.5 Inch	RPGMK003
RPGMB *	Magnetic Coupling Kit (0.625 inch shaft)	RPGMB001
RPGPC	56C Protective Cover	RPGPC000

* ZUL encoders require 0.625 " bore sleeve to accomodate magnetic coupling.



MODEL ZR - C-FACE ENCODER WITH NPN OPEN COLLECTOR OUTPUT



- THRU-SHAFT DESIGN FOR EASY MOUNTING
- EXCELLENT CHOICE FOR VECTOR MOTOR DRIVE CONTROL
- DESIGNED FOR INDUSTRIAL ENVIRONMENTS
- QUADRATURE OUTPUT
- POSITIVE INDEX PULSE
- C-FACE GASKET KIT INCLUDED

DESCRIPTION

The Model ZR C-face encoder is a rugged, high resolution, high temperature (100°C) encoder designed to mount directly on NEMA C-face motors. The ZR contains a precision bearing and internal coupling that virtually eliminates inaccuracies induced by motor shaft runout. This encoder is ideal for applications using high performance AC vector motors.

The thru-shaft design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C, 143TC, 145TC, 182C, 184C). The tough anodized aluminum housing with thru-shaft design resists the vibration and hazards of an industrial environment. In addition, a C-face gasket kit is included free for motor shaft protection and enclosure.

Open Collector Output Wiring

The ZR series of sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (40 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.



SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- SUPPLY: 4.75 to 28 VDC, 40 mA current draw typical, 100 mA maximum.
 OUTPUT: NPN Open Collector transistor, V_{OH} = 40 VDC max.; 100 mA max. current. Incremental two square waves in quadrature with A leading B for clockwise rotation. Positive pulse index.
- 3. CYCLES PER REVOLUTION: 256 or 1024
- Note: Review the max. input rate of the RLC counter being used. The high output rate of the 1024 version will quickly reach the max. input capability of RLC quadrature counters. At 1024 PPR, high pulse rates are reached at low RPM.
- 4. MAX. FREQUENCY: 200 KHz
- 5. NOISE IMMUNITY: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022; BS EN61000-6-2; BS EN50081-2
- 6. **SYMMETRY**: 180° (±18°) electrical
- 7. QUAD PHASING: 90° (+22.5) electrical
- 8. MIN EDGE SEP: 67.5° electrical
- 9. RISE TIME: Less than 1 microsecond

MECHANICAL SPECIFICATIONS

- 1. MAX MECHANICAL SPEED: 6000 RPM
- 2. BORE DIAMETER: 0.625" or 1.0"
- 3. BORE TOLERANCE: +0.0015"/-0.000"
- 4. **MOMENT OF INERTIA:** 3.3×10^{-3} oz-in-sec² typical
- 5. USER SHAFT TOLERANCES
 - Radial Runout:0.005"

Axial Endplay: ±0.015"

6. ELECTRICAL CONNECTION: 36" (914.4 mm) cable. 24 AWG foil and braid shield.

FUNCTION	WIRE COLOR
+ VDC	RED
COMMON	BLACK
DATA A	WHITE
DATA B	GREEN
INDEX Z	ORANGE

- 7. HOUSING: All metal construction.
- 8. MOUNTING: NEMA 56C to 184C when proper bore size is selected
- 9. WEIGHT: 2.60 lb. (1.18 Kg) typical

ENVIRONMENTAL CONDITIONS

- 1. OPERATING TEMPERATURE: 0 to +100°C @ 4.75 to 24 VDC
 - 0 to +70°C @ 4.75 to 28 VDC
- 2. **STORAGE TEMPERATURE**: -25 to +100°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. **VIBRATION**: 10 g @ 58 to 500 Hz
- 5. SHOCK: 50 g @ 11 msec duration
- 6. SEALING: IP65 with included shaft cover and gaskets installed.

1-717-767-6511

MOUNTING INSTRUCTIONS

Mounting Kit Items Included:

- 4 ea. 3/8" 16 x 1.0" Length Socket Head Cap Screws, Black Alloy.
- 4 ea. 3/8" High Collar Spring Lock washer, Steel Zinc. 1 ea. 3/32" Hex Allen Wrench, Long arm.

Note: The ZR encoder can mount to many types of C face devices. In these mounting instructions, we will refer to the device as a motor:

Step 1

After carefully unpacking the unit, inspect to insure the motor shaft is the correct size and free of all burrs or aberrations. Slide the ZR Encoder over the motor shaft. DO NOT USE EXCESSIVE FORCE: There is a rubber O-ring in the Encoder locking collar that will provide a small amount of resistance as it engages the shaft. If the encoder does not slide easily See Note 1 below.

Step 2

Install the four 3/8" 16 x 1.0" socket head cap screws with lock washers through the holes in the Encoder C face and tighten securely to the motor.

Step 3

Insure the shaft locking collar is flush with the Encoder cover plate. Prevent the motor shaft from turning (See Note 2 for additional information) and tighten the four 4-40 Allen head cap screws in the locking collar evenly in a crossing pattern. See Figure 1. Make sure the screws are securely tightened and the front of the locking collar remains flush with the encoder cover plate. If the collar does not turn true when the motor shaft is rotated, loosen the four screws and repeat the procedure.



In Case of Difficulty:

Note 1: Make sure the four 4-40 Allen head cap screws in the front of the Encoder locking collar are loose and the collar is not cocked or jammed. Clean the shaft of any burrs using fine crocus cloth. The O- ring in the Encoder locking collar may need a small amount of additional lubrication.

Note 2: When tightening the screws in the locking collar avoid holding the motor shaft with anything that may scar or burr the shaft.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	BORE SIZE	PART NUMBER
ZR	NEMA C Face Encoder 56C to 184C (Must select proper bore size)	256	0.625	ZRJ0256A
		1024	0.625	ZRJ1024A
		256	1.0	ZRL0256A
		1024	1.0	ZRL1024A
		256	0.875	ZRI0256A *
		1024	0.875	ZRI1024A *

* Replaces ARC1. Available by special order, consult factory.

www.redlion.net Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

MODEL ZSD - 0.25" SHAFT STANDARD SERVO MOUNT ROTARY PULSE GENERATOR



SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. **SUPPLY VOLTAGE**: 4.75 to 28 VDC, 100 mA max. with no output load 2. **OUTPUTS**: NPN Open Collector Transistor, $V_{OH} = 30$ VDC max.; 20 mA
- max. current. Incremental Two square waves in quadrature with Channel A leading Channel B for clockwise rotation.
- 3. MAX. FREQUENCY: 200 KHz
- 4. **INDEX**: NPN Open Collector Transistor, $V_{OH} = 30$ VDC max.; 20 mA
- max. current. Once per revolution centered over Output Channel A. Index is a positive going pulse.
- NOISE IMMUNITY: Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811
- 6. SYMMETRY: 180° (±18°) electrical
- 7. QUAD PHASING: 90° (±22.5°) electrical
- 8. MIN EDGE SEP: 67.5° electrical
- 9. ACCURACY: Within 0.017° mechanical or 1 arc minute from true position (for PPR>189)

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 8000 RPM
- 2. SHAFT SIZE: 0.25" (6.33 mm)
- 3. RADIAL SHAFT LOAD: 5 lbs. max. (2.25 kg)
- 4. AXIAL SHAFT LOAD: 5 lbs. max. (2.25 kg)
- 5. STARTING TORQUE: 0.4 oz-in. (2.82 N-mm)
- 6. MOMENT OF INERTIA: 6.7×10^{-5} oz-in-sec² (4.8 gm-cm²)
- 7. **ELECTRICAL CONNECTION**: 36" (914.4 mm) cable. 24 AWG foil and braid shield.

FUNCTION	WIRE COLOR
+VDC	Red
Common	Black
Data A	White
Data B	Green
Index Z	Orange

8. WEIGHT: 3 oz. (85.0 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. OPERATING TEMPERATURE: -20°C to 85°C
- 2. **STORAGE TEMPERATURE**: -25°C to +85°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. **VIBRATION**: 10 g @ 58 to 500 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP64

GENERAL DESCRIPTION

The Model ZSD encoder is ideal for applications requiring a miniature, high precision, low cost encoder, designed with all metal construction for years of trouble-free operation.

The NPN Open Collector outputs are each current limited to 20 mA. The outputs are standard quadrature with index, available in resolutions up to 2500 pulses per shaft revolution. The quadrature separation is typically 90 electrical degrees. Output A leads output B for clockwise rotation of the encoder shaft.

Open Collector Output Wiring

The ZSD sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages (30 VDC max.) different than the encoder supply voltage. NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
ZSD	0.25" Shaft Standard Servo Mount Rotary Pulse Generators	60	ZSD0060A
		100	ZSD0100A
		500	ZSD0500A
		600	ZSD0600A
		1000	ZSD1000A
		1200	ZSD1200A
		2000	ZSD2000A
		2500	ZSD2500A

Only factory stocked part numbers are listed. Consult the factory for part number and availability of other PPR and output configurations.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
RPGFC	Flexible Coupling (1" Length) 0.25" - 0.25"	RPGFC001
	Flexible Coupling (1" Length) 0.25" - 0.375"	RPGFC002
	Flexible Coupling (1" Length) 0.25" - 6 mm	RPGFC005

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MODELS ZOD AND ZOH - THRU-BORE Rotary pulse generators (ZOH Replaces the Model RPGO)

GENERAL DESCRIPTION

The Model ZOD and ZOH are Thru-Bore Encoders. The ZOD has a bore of 0.25" (6.35 mm) and the ZOH is a 0.375" (9.5 mm) bore. These units are ideal for applications requiring a miniature, high precision, low cost encoder, designed with all metal construction for years of trouble-free operation.

The encoders have a flexible butterfly mount and blind hollow shaft. These encoders use two set screws that are 90° apart to clamp the encoder's hub to the motor shaft. The NPN Open Collector outputs are each current limited to 100 mA. The outputs are standard quadrature with index, and are available in resolutions up to 2500 pulses per shaft revolution. The quadrature separation is typically 90 electrical degrees. Output A leads output B for clockwise rotation of the encoder shaft.

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 4.75 to 28 VDC, 100 mA max. with no output load
- 2. **OUTPUTS:** NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Incremental Two square waves in quadrature with A leading B for clockwise rotation.
- 3. MAX. FREQUENCY: 200 KHz
- 4. **INDEX:** NPN Open Collector Transistor, $V_{OH} = 30$ VDC max.; 20 mA max. current. Once per revolution centered over output Channel A. Index is a positive going pulse.
- NOISE IMMUNITY: Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN500811
- 6. **SYMMETRY**: 180° (±18°) electrical
- 7. QUAD PHASING: 90° (±22.5°) electrical
- 8. MIN EDGE SEP: 67.5° electrical
- 9. ACCURACY: Within 0.017° mechanical or 1 arc minute from true position (for PPR>189)

MECHANICAL SPECIFICATIONS

1. MAXIMUM MECHANICAL SPEED: 8000 RPM

2. BORE SIZE:

- ZOD: 0.25" (6.35 mm)
- ZOH: 0.375" (9.5 mm)
- 3. BORE TOLERANCE: -0.0000"/+0.0006"

4. USER SHAFT TOLERANCES:

- Radial Runout: 0.008" max
- Axial Endplay: +/- 0.030" max
- 5. STARTING TORQUE: 0.6 oz-in (4.24 N-mm)
- 6. MOMENT OF INERTIA:
- $6.7 \times 10^{-5} \text{ oz-in-sec}^2 (4.8 \text{ gm-cm}^2)$
- 7. ELECTRICAL CONNECTIONS:
- Cable is 36" (914.4 mm) in length with 24 AWG conductors w/shield.

FUNCTION	WIRE COLOR
+VDC	Red
Common	Black
Data A	White
Data B	Green
Index Z	Orange

8. **MOUNTING**: 1.811 (46 mm) slotted flex mount 9. **WEIGHT**: 3 oz. (85.0 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. OPERATING TEMPERATURE: -20°C to 85°C
- 2. **STORAGE TEMPERATURE**: -25°C to +85°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. **VIBRATION**: 10 g @ 58 to 500 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP64



Open Collector Output Wiring

The ZOD and ZOH encoders have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (30 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.



ORDERING INFORMATION

	DESCRIPTION	PPR	PART NUMBER		
WODEL NO.			0.25" Thru-Bore	0.375" Thru-Bore	
	Thru-Bore Rotary Pulse Generators	60	ZOD0060A	ZOH0060A	
		100	ZOD0100A	ZOH0100A	
		500	ZOD0500A	ZOH0500A	
ZOD & ZOH		600	ZOD0600A	ZOH0600A	
		1000	ZOD1000A	ZOH1000A	
		1200	ZOD1200A	ZOH1200A	
		2000	ZOD2000A	ZOH2000A	
		2500	ZOD2500A	ZOH2500A	

Only factory stocked part numbers are listed. Consult factory for part number and availability of other PPR and output configurations.

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MODEL ZCG - SINGLE CHANNEL OUTPUT ROTARY PULSE GENERATOR MODEL ZFG and ZGG - SINGLE CHANNEL OUTPUT LENGTH SENSORS (Replaces MODELS RPGC, LSCS and LSCD respectively)

- VARIOUS PULSE PER REVOLUTION (PPR) RATES Up to 200 PPR for fine, high-resolution counting or precision speed measurement from slow shaft speeds.
- UP TO 10 KHz OUTPUT FREQUENCY
- CURRENT SINK OUTPUT
- LENGTH SENSORS AVAILABLE WITH: Single or Dual Ended Shaft
- SEALED PRECISION BALL BEARINGS
- VARIOUS CABLE LENGTHS AVAILABLE



- RUGGED CAST ALUMINUM HOUSING
- 3/8" DIA. STAINLESS STEEL SHAFT
- WIDE INPUT SUPPLY VOLTAGE RANGE & LOW CURRENT OPERATION
- EASY INSTALLATION Eliminates air-gap, sensing distance, and beam alignment procedures of other types of sensing.
- IDEAL FOR DUSTY, DIRTY ENVIRONMENTS Where "Non Contact" sensing means are impractical.

DESCRIPTION

The units are rugged, incremental encoders that convert shaft rotation into a current sinking pulse train.

Internally, a single L.E.D. light source and a photologic sensor in conjunction with a shaft-mounted, durable, metal-etched encoder disc, provides signal accuracy and reliability to 10 KHz. The DC input power supply requirement is a versatile +8 to +35 VDC, and is reverse polarity protected. The NPN Open Collector Transistor Output is current limited to 40 mA and is compatible with most RLC counters, rate indicators, controllers and accessories.

All units are packaged in a rugged cast aluminum housing with a gasketed, rear aluminum cover. The 3/8" (9.53 mm) diameter heavy duty stainless steel shaft and sealed, lifetime-lubricated precision ball bearings are preloaded for minimum end play and rated for continuous use up to 6000 RPM. They are designed to meet NEMA 13/IP54 environmental requirements. All units are supplied with 10 feet (3M) of PVC jacketed 3-wire, 22 AWG cable with stranded shield wire and 100% foil shield coverage. Operating Temperature range is -18° C to $+60^{\circ}$ C.



ROTARY PULSE GENERATOR

The ZCG can be direct-coupled to a machine shaft by means of a flexible bellows, spring or rubber sleeve type coupler, etc., that allows for axial and radial misalignment. They can also be coupled with instrument timing belts and pulleys or gears. The housing may be rigidly face-mounted with the 4, #8-32 threaded holes. The 3-wire shielded cable exits through a cord connector.

LENGTH SENSOR

The length sensors are available in both Single Ended Shaft (*ZFG*) and Double Ended Shaft (*ZGG*) versions, both of which include a Stainless Steel Handle Tube for mounting and 10 feet (3.05 M) of 3-wire shielded cable. When mounted to a Length Sensor Hinge Clamp Assembly (*See Model LSAHC001*) and coupled with one or two Measuring Wheels (*See Measuring Wheels*), a low cost, versatile and highly accurate length measurement system can be configured.

LENGTH SENSOR MEASUREMENT ACCURACY

Factors which affect measurement accuracy include Measuring Wheel accuracy and wear, and material conditions. Ideally, materials which are hard, thin and strong provide good readings. Conversely, soft, thick and elastic materials can present problems in obtaining true readings. Count or Rate Indicators with *"input scaling"* can compensate for Measuring Wheel wear and material elasticity and compliance errors. In addition, English/Metric conversions may also be accomplished.

Open Collector Output Wiring

The ZCG, ZFG, and ZGG series of sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages (40 VDC max.) different than the encoder supply voltage. NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

LENGTH SENSOR MOUNTING CONSIDERATION

- 1. Length Sensors should be mounted so measuring wheel(s) contact ribbon, strip or web as it passes over a roller. As an alternative, wheel(s) can be driven by roller surface next to material being measured.
- 2. Note: The weight at the Length Sensor unit provides sufficient traction for accurate operation when mounted, with arm angle from horizontal not exceeding $\pm 30^{\circ}$.
- 3. Tension on signal cable can cause wheel(s) to lift. Make sure cable is clamped to machine frame near the unit and allow slack.

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ELECTRICAL SPECIFICATIONS

- 1. SUPPLY VOLTAGE: +8 to +35 VDC (including power supply ripple) @ 50 mA max. (30 mA typ.); Reverse polarity protected.
- 2. OUTPUTS: NPN Open Collector Transistor; $V_{OH} = 30$ VDC max., $V_{OL} = 1$ V max. @ 40 mA Output current is limited to 40 mA.
- 3. OUTPUT FREQUENCY: Up to 10 KHz
- 4. CABLE CONNECTIONS:
- RED = +VDC; BLACK = Common; WHITE = NPN O.C. Output.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 6000 RPM
- 2. RADIAL SHAFT LOAD: 15 lbs. max. (66.7N)
- 3. AXIAL SHAFT LOAD: 15 lbs. max. (66.7N)
- 4. STARTING TORQUE: 3 oz.-in. (21.2N-mm)
- 5. MOMENT OF INERTIA: Single Shaft = 2.82×10^{-4} oz. - in. - sec.² (1.99 x 10^{-3} N - mm - sec²) Dual Shaft = 3.09×10^{-4} oz. - in. - sec.² (2.19 x 10^{-3} N - mm - sec²)
- 6. OPERATING TEMPERATURE: -18°C to +60°C
- WEIGHT (LESS CABLE): 7.
 - Rotary Pulse Generator = 15 oz (0.42 Kg)Length Sensors = 22 oz (0.62 Kg)

WAVE OUTPUT DIAGRAM





ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	OUTPUT PULSE RATE CODE	PART NUMBER
ZCG	Rotary Pulse Generator (Replaces RPGC)	1		ZCG0001C
		10		ZCG0010C
		12		ZCG0012C
		60		ZCG0060C
		100		ZCG0100C
		*120		ZCG0120C
		*200		ZCG0200C
ZFG	Length Sensor Single Shaft (Replaces LSCS)	1	1/Foot	ZFG0001C
		10	10/Foot	ZFG0010C
		12	1/inch	ZFG0012C
		20	60/Mt or Yd	ZFG0020C
		60	60/Foot	ZFG0060C
		100	100/Foot	ZFG0100C
		*120	10/Inch	ZFG0120C
		*200	600/Mt or Yd	ZFG0200C
		.333	1/Mt or Yd	ZFG00/3C
		3.333	10/Mt or Yd	ZFG03/3C
		33.333	100/Mt or Yd	ZFG33/3C
ZGG	Length Sensor Double Shaft (Replaces LSCD)	1	1/Foot	ZGG0001C
		10	10/Foot	ZGG0010C
		12	1/inch	ZGG0012C
		20	60/Mt or Yd	ZGG0020C
		60	60/Foot	ZGG0060C
		100	100/Foot	ZGG0100C
		*120	10/Inch	ZGG0120C
		*200	600/Mt or Yd	ZGG0200C
		.333	1/Mt or Yd	ZGG00/3C
		3.333	10/Mt or Yd	ZGG03/3C
		33.333	100/Mt or Yd	ZGG33/3C
RPGFC	Flexible Coupling (1" Length) 0.250" - 0.375"			RPGFC002
	Flexible Coupling (1" Length) 0.375" - 0.375"			RPGFC003
	Flexible Coupling (1" Length) 0.375" - 0.500"			RPGFC004
	Flexible Coupling (1" Length) 0.375" - 6 mm			RPGFC006

* Rotary pulse generators and length sensors with 120 & 200 PPR outputs employ an internal doubling circuit and deliver a fixed 50 µsec ±20% output pulse at the leading and trailing edge of a passing slot. Additional doubling in external indicators or circuits may not be applicable. These outputs are derated to 7300 Hz due to internal x2 circuitry. (See Wave Output Diagram)

Notes.

1. For 25 foot cable, replace the last character of the part number ("C") with "D".

2. Wheels and mounting brackets are sold separately, see Length Sensor Accessories.

For 50 foot cable, replace the last character of the part number ("C") with "E"

www.redlion.net Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

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LENGTH SENSOR ACCESSORIES SEPARATE LENGTH MEASURING WHEELS - DIMENSIONS In Inches (mm)



SELECTING APPROPRIATE WHEEL SIZE & PPR (Pulses Per Rev.) OF ROTARY PULSE GENERATOR

When the desired output of a length sensor and wheel combination is either in inches, feet, yards, or meters selection of the proper combination is relatively straight forward. For example, with a 1-foot wheel circumference, a 1 PPR Rotary Pulse Generator will deliver 1 pulse/ft, 12 PPR would deliver 12 pulses/ ft (*1 pulse/inch*); 100 PPR would yield 100 pulses/ft; and 120 PPR would permit measuring to 1/10th of an *inch (1/120th of a foot)*.

WHEELS & REPLACEMENT TIRES FOR CODE OR WHEELS

ORDERING INFORMATION

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.40%	WF10000R
	1/3 meter	±0.40%	WM03330R
	4/10ths yard	±0.40%	WY0400OR
	4/10ths meter	±0.40%	WM04000R
	1 foot (1/3 yd)	±0.35%	WF10000F
<u>OF</u>	1/3 meter	±0.30%	WM03330F
	4/10ths yard	±0.30%	WY04000F
	4/10ths meter	±0.30%	WM04000F
<u>BF</u> (Balanced)	1 foot (1/3 yd)	±0.40%	WF1000BF

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.35%	WF1000OK
OK	1/3 meter	±0.30%	WM03330K
	4/10ths yard	±0.30%	WY04000K
	4/10ths meter	±0.30%	WM04000K
BK (Balanced)	1 foot (1/3 yd)	±0.35%	WF1000BK
	1 foot (1/3 yd)		TORF1000
Replacement Tires	1/3 meter		TORM0333
for <u>OR</u> Wheels	4/10ths yard		TORY0400
	4/10ths meter		TORM0400

Note: After installation of measuring wheels, ensure guards, shields or other devices are in place to protect personnel from rotating equipment.

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MODEL LSAHC - LENGTH SENSOR HINGE CLAMP ASSEMBLY

The Length Sensor Hinge Clamp Assembly provides an easy method for attachment and mounting of the Length Sensors and LSCB1 Conversion Bracket. The removable top on the solid zinc LSAHC mounting block allows quick installation of the Length Sensor handle tube and provides secure clamping retention. The mounting block pivots freely in zinc right angle brackets to allow mounting the assembly via clearance holes for 1/4" dia. bolts.

The lock washers must be used as indicated (between the bolt head and the top clamp piece). Assemble the top clamp piece as follows.

- 1. Tighten both bolts so that the top clamp half draws down evenly on the sensor tube.
- 2. Tighten the bolts until both lock washers are flat.



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CAUTION: Downward tension

on signal cable can cause

wheel(s) to lift. Make sure

encoder and allow slack.

cable is clamped to

machine frame near

NOTE: The weight at the

Length Sensor unit

provides sufficient traction

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MODEL ZCH - QUADRATURE OUTPUT ROTARY PULSE GENERATOR MODEL ZFH and ZGH - QUADRATURE OUTPUT LENGTH SENSORS (Replaces MODELS RPGQ, LSQS and LSQD respectively)

- 100, 200 & 500 PULSES PER REVOLUTION
- QUADRATURE CURRENT SINKING OUTPUTS TO 50 KHz For position measurement, bi-directional counting and systems with mechanical backlash
- SEALED PRECISION BALL BEARINGS
- RUGGED CAST ALUMINUM HOUSING
- 3/8" DIA. STAINLESS STEEL SHAFT
- WIDE INPUT SUPPLY VOLTAGE RANGE & LOW CURRENT OPERATION
- VARIOUS CABLE LENGTHS AVAILABLE



DESCRIPTION

The units are rugged, incremental encoders that convert shaft rotation into a current sinking pulse train.

Internally, a single L.E.D. light source and a photologic sensor in conjunction with a shaft-mounted, durable, metal-etched encoder disc, provides signal accuracy and reliability to 50 KHz. The DC input power supply requirement is a versatile +8 to +28 VDC, and is reverse polarity protected. The NPN Open Collector Transistor Output is current limited to 40 mA and is compatible with most RLC counters, rate indicators, controllers and accessories.

All units are packaged in a rugged cast aluminum housing with a gasketed, rear aluminum cover. The 3/8" (9.53 mm) diameter heavy duty stainless steel shaft and sealed, lifetime-lubricated precision ball bearings are preloaded for minimum end play and rated for continuous use up to 6000 RPM. They are designed to meet NEMA 13/IP54 environmental requirements. All units are supplied with 10 feet (3M) of PVC jacketed 3-wire, 22 AWG cable with stranded shield wire and 100% foil shield coverage.



ROTARY PULSE GENERATOR

The ZCH can be direct-coupled to a machine shaft by means of a flexible bellows, spring or rubber sleeve type coupler, etc., that allows for axial and radial misalignment. They can also be coupled with instrument timing belts and pulleys or gears. The housing may be rigidly face-mounted with the 4, #8-32 threaded holes. The 3-wire shielded cable exits through a cord connector.

LENGTH SENSOR

The length sensors are available in both Single Ended Shaft (ZFH) and Double Ended Shaft (ZGH) versions, both of which include a Stainless Steel Handle Tube for mounting and 10 feet (3.05 M) of 3-wire shielded cable. When mounted to a Length Sensor Hinge Clamp Assembly (See Model LSAHC001) and coupled with one or two Measuring Wheels (See Measuring Wheels), a low cost, versatile and highly accurate length measurement system can be configured.

LENGTH SENSOR MEASUREMENT ACCURACY

Factors which affect measurement accuracy include Measuring Wheel accuracy and wear, and material conditions. Ideally, materials which are hard, thin and strong provide good readings. Conversely, soft, thick and elastic materials can present problems in obtaining true readings. Count or Rate Indicators with *"input scaling"* can compensate for Measuring Wheel wear and material elasticity and compliance errors. In addition, English/Metric conversions may also be accomplished.

LENGTH SENSOR ACCESSORIES

The Length Sensor Hinge Clamp Assembly provides an easy method for attachment & mounting the Length Sensors and LSCB1 Conversion Bracket. The removable top on the solid aluminum LSAHC mounting block allows quick installation of the Length Sensor handle tube and provides secure clamping retention. The mounting block steel shaft pivots freely in oil impregnated sintered bronze bushings, and aluminum right angle brackets allow mounting the assembly via clearance holes for 1/4" (6.35 mm) dia. bolts (See LSAHC Dimensions & Mounting).

Open Collector Output Wiring

The ZCH, ZFH, and ZGH series of sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages (40 VDC max.) different than the encoder supply voltage . NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

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SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. **SUPPLY VOLTAGE:** +8 to +28 VDC (including power supply ripple) @ 50 mA max. (30 mA typ.); Reverse polarity protected.
- 2. **OUTPUTS:** NPN Open Collector Transistor, $V_{OH} = 30$ VDC max., $V_{OL} = 1$ V max @ 40 mA. Output current is limited to 40 mA. Incremental Two square waves in quadrature with Channel A leading B for clockwise rotation.
- 3. OUTPUT FREQUENCY: Up to 50 KHz
- 4. **OUTPUT DUTY CYCLE:** Channel A & B: 50/50 nominal. *(See Figure 1, Note 3)*
- 5. QUADRATURE OUTPUT PHASE: 90° ±15° (See Figure 1, Note 3)
- 6. CABLE CONNECTIONS: RED = +VDC; BLACK = Common;
- WHITE = Channel A Output; GREEN = Channel B Output.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 6000 RPM
- 2. RADIAL SHAFT LOAD: 15 lbs. max. (66.7N)
- 3. AXIAL SHAFT LOAD: 15 lbs. max. (66.7N)
- 4. STARTING TORQUE: 3 oz.-in. (21.2N-mm)
- 5. MOMENT OF INERTIA:
- Single Shaft = 1.03×10^{-4} oz. in. sec.² (7.30 x 10^{-4} N mm sec²) Dual Shaft = 1.30×10^{-4} oz. - in. - sec.² (9.21 x 10^{-4} N - mm - sec²)
- 6. OPERATING TEMPERATURE: 0°C to +70°C
- 7. WEIGHT (LESS CABLE): ZCH: 14.3 oz (406 g)
 - ZFH: 22.0 oz (623 g) ZGH: 22.7 oz (643 g)

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EQUIVALENT CIRCUIT & CONNECTIONS



NOTES:

- Channel A leads Channel B for clockwise shaft rotation when viewed from housing front. Conversely, Channel B leads Channel A for Counterclockwise shaft rotation.
- 2. The number of lines on the optical disc determines the Pulses Per Revolution (PPR).
- 3. Duty Cycle is the relationship of output "High" time, "a", to output "Low" time, "b", and is expressed as a High/Low percentage ratio, ie....% High time = a/(a+b) x 100; % Low time = b/(a+b) x 100.
- 4. Quadrature Phase "c" is specified as the lead or lag between Channel A & B in electrical degrees. Nominally 90° (*1/4 cycle*).

LENGTH SENSOR MOUNTING CONSIDERATION

- Length Sensors should be mounted so measuring wheel(s) contact ribbon, strip or web as it passes over a roller. As an alternative, wheel(s) can be driven by roller surface next to material being measured.
- Note: The weight at the Length Sensor unit provides sufficient traction for accurate operation when mounted, with arm angle from horizonal not exceeding ±30°.
- 3. Tension on signal cable can cause wheel(*s*) to lift. Make sure cable is clamped to machine frame near they unit and allow slack.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
		100	ZCH0100C
zсн	Rotary Pulse Generator (Replaces RPGQ)	200	ZCH0200C
		500	ZCH0500C
	Length Sensor	100	ZFH0100C
ZFH	Single Shaft	200	ZFH0200C
	(Replaces LSQS)	500	ZFH0500C
	Length Sensor Double Shaft	100	ZGH0100C
ZGH		200	ZGH0200C
	(Replaces LSQD)	500	ZGH0500C
	Flexible Coupling (1" Length) 0.250" - 0.375"		RPGFC002
RPGFC	Flexible Coupling (1" Length) 0.375" - 0.375"		RPGFC003
	Flexible Coupling (1" Length) 0.375" - 0.500"		RPGFC004
	Flexible Coupling (1" Length) 0.375" - 6 mm		RPGFC006

* 25 and 50 foot cable versions available. Consult factory for details.

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LENGTH SENSOR ACCESSORIES SEPARATE LENGTH MEASURING WHEELS - DIMENSIONS In Inches (mm)



APPROPRIATE WHEEL SIZE & PPR (Pulses Per Rev.) OF ROTARY PULSE GENERATOR

When the desired output of a length sensor and wheel combination is either in inches, feet, yards, or meters selection of the proper combination is relatively straight forward. For example, with a 1-foot wheel circumference, a 1 PPR Rotary Pulse Generator will deliver 1 pulse/ft, 12 PPR would deliver 12 pulses/ ft (*1 pulse/inch*); 100 PPR would yield 100 pulses/ft; and 120 PPR would permit measuring to 1/10th of an *inch (1/120th of a foot)*.

WHEELS & REPLACEMENT TIRES FOR CODE OR WHEELS

ORDERING INFORMATION

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.40%	WF10000R
OP	1/3 meter	±0.40%	WM03330R
	4/10ths yard	±0.40%	WY0400OR
	4/10ths meter	±0.40%	WM04000R
	1 foot (1/3 yd)	±0.35%	WF10000F
<u>OF</u>	1/3 meter	±0.30%	WM03330F
	4/10ths yard	±0.30%	WY04000F
	4/10ths meter	±0.30%	WM04000F
<u>BF</u> (Balanced)	1 foot (1/3 yd)	±0.40%	WF1000BF

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.35%	WF1000OK
OK	1/3 meter	±0.30%	WM03330K
	4/10ths yard	±0.30%	WY04000K
	4/10ths meter	±0.30%	WM04000K
BK (Balanced)	1 foot (1/3 yd)	±0.35%	WF1000BK
	1 foot (1/3 yd)		TORF1000
Replacement Tires	1/3 meter		TORM0333
for OR Wheels	4/10ths yard		TORY0400
	4/10ths meter		TORM0400

Note: After installation of measuring wheels, ensure guards, shields or other devices are in place to protect personnel from rotating equipment.

MODEL LSAHC - LENGTH SENSOR HINGE CLAMP ASSEMBLY

The Length Sensor Hinge Clamp Assembly provides an easy method for attachment and mounting of the length sensors and LSCB1 Conversion Bracket. The removable top on the solid zinc LSAHC mounting block allows quick installation of the Length Sensor handle tube and provides secure clamping retention. The mounting block pivots freely in zinc right angle brackets to allow mounting the assembly via clearance holes for 1/4" dia. bolts.

The lock washers must be used as indicated (between the bolt head and the top clamp piece). Assemble the top clamp piece as follows.

- 1. Tighten both bolts so that the top clamp half draws down evenly on the sensor tube.
- 2. Tighten the bolts until both lock washers are flat.



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CAUTION: Downward tension

on signal cable can cause

wheel(s) to lift. Make sure

encoder and allow slack.

cable is clamped to

machine frame near

NOTE: The weight at the

MODEL ZUK - LARGE THRU-BORE Rotary pulse generators



GENERAL DESCRIPTION

The ZUK is a high performance unit that is ideal for fast revving motor mount applications. This industrial strength model features the largest thru bore available in a 2.5" encoder, mounting directly on shafts as large as 1.125" (28 mm.) The injection molded housing is grooved with "cooling fins", and can take the extreme heat of the motion control industry.

The ZUK comes equipped with a 3 point Flex Mount adapting to both 2.25" and 2.75" motor faces. It is also available with an optional "tether arm" mounting kit for additional motor compatibility.

This revolutionary encoder can also be adapted to various standard and metric sized motor shafts by using an accessory sleeve kit, or individual sleeves (Sold separately).

Electrically the ZUK offers NPN open collector outputs, each limited to 100 mA. The outputs are standard quadrature with index and are also available with quadrature reverse phasing for the typical motor drive controller application. The quadrature separation is 90° with output A leading output B for clockwise rotation. Output B leads output A for the reverse phased output, for clockwise rotation.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 4.75 to 28 VDC, 100 mA max. (no load)
- 2. **OUTPUTS:** NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Incremental two square waves in quadrature with A leading B for clockwise rotation.
- 3. MAX. PULSE RATE: 250 KHz
- INDEX: NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Once per revolution centered over output Channel A. Index is a positive going pulse.
- 5. MIN EDGE SEP: 45° electrical min, 63° electrical or better typical
- 6. **RISE TIME**: Less than 1 microsecond
- ACCURACY: Within 0.1° mechanical from one cycle to any other cycle, or 6 arc minutes.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 4000 RPM
- 2. BORE SIZE: 1.125" (28.58 mm)
- 3. BORE TOLERANCES: -0.0000"/+0.0008"
- 4. USER SHAFT TOLERANCES: Radial Runout: 0.005" max
 - Axial Endplay: +/- 0.050" max
- 5. STARTING TORQUE: 4.0 oz-in typical (28.24 N-mm) IP66
- 6. MOMENT OF INERTIA:
- $7.6 \times 10^{-4} \text{ oz-in-sec}^2$
- 7. MAX ACCELERATION: 1 X 10⁵ rad/sec²
- 8. ELECTRICAL CONNECTOR: 7-pin MS type connector

		1 71
FUNCTION	PIN	CABLE WIRE COLOR
+VDC	А	Red
Common	В	Black
Data A	С	White
Data B	D	Green
Data Z	E	Orange
CASE	F	Bare

- 9. HOUSING: Nylon composite
- 10. MOUNTING: 2.25" to 2.75" B.C. 3-point flex mount
- 11. WEIGHT: 8 oz. (226.7 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. OPERATING TEMPERATURE: -20°C to 85°C
- 2. **STORAGE TEMPERATURE**: -20°C to 85°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. **VIBRATION**: 20 g @ 5 to 2000 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP66



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Open Collector Output Wiring

The ZUK series of sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (30 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

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ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
		60	ZUK0060H
		100	ZUK0100H
ZUK	1.125" Large Thru-Bore Rotary Pulse Generators	500	ZUK0500H
		600	ZUK0600H
		1000	ZUK1000H
		1200	ZUK1200H
		2000	ZUK2000H
		2500	ZUK2500H



Do not dispose of unit in trash - Recycle

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
	7-Pin MS Connector	CCBRPG00
CCBRPG	7-Pin MS Connector with 10 ft 24 AWG 5 Conductor Cable w/drain	CCBRPG02
	7-Pin MS Connector with 20 ft 24 AWG 5 Conductor Cable w/drain	CCBRPG03
PPCPI	Inch Bore Insert Kit (includes 0.5, 0.625, 0.875, and 1 inch sleeves)	RPGBII00
RFGBI	Large Metric Bore Insert Kit (includes 19, 20, 24, and 25 mm sleeves)	RPGBIM00
	0.500 Inch Bore Sleeve	RPGBSI00
	0.625 Inch Bore Sleeve	RPGBSI01
RPGBSI	0.750 Inch Bore Sleeve	RPGBSI02
	0.875 Inch Bore Sleeve	RPGBSI03
	1 Inch Bore Sleeve	RPGBSI04
	19 mm Bore Sleeve	RPGBSM00
PPGRSM	20 mm Bore Sleeve	RPGBSM01
KF GD SIM	24 mm Bore Sleeve	RPGBSM02
	25 mm Bore Sleeve	RPGBSM03
REGMK	Standard Tether Arm Kit 4.5 Inch	RPGMK002
KF GWIK	Elongated Tether Arm Kit 8.5 Inch	RPGMK003
RPGMB *	Magnetic Coupling Kit (0.625 inch shaft)	RPGMB001
RPGPC	56C Protective Cover	RPGPC000

* ZUK encoders require 0.625 " bore sleeve to accomodate magnetic coupling.

Only factory stocked part numbers are listed. Consult Factory for part number and availability of other PPR and output configurations.

MODELS ZPJ - LARGE THRU-BORE Rotary pulse generator



SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 4.75 to 28 VDC, 100 mA max.
- 2. OUTPUTS: NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Incremental - Two square waves in quadrature with A leading B for clockwise rotation.
- 3. MAX. FREQUENCY: 200 KHz
- 4. **INDEX:** NPN Open Collector Transistor, $V_{OH} = 30$ VDC max.; 20 mA max. current. Once per revolution centered over output Channel A. Index is a positive going pulse.
- 5. NOISE IMMUNITY: Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6; BS EN55011
- 6. SYMMETRY: 180° (±18°) electrical
- 7. QUAD PHASING: 90° (±22.5°) electrical
- 8. MIN EDGE SEP: 67.5° electrical
- 9. ACCURACY: Within 0.01° mechanical from one cycle to any other cycle, or 0.6 arc minutes.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 7500 RPM
- 2. BORE SIZE: 0.625" (15.875 mm)
- 3. BORE TOLERANCES: -0.0000"/+0.0006"
- 4. USER SHAFT TOLERANCES: Radial Runout: 0.007" max Axial Endplay: +/- 0.030" max
- 5. STARTING TORQUE: 2.5 oz-in (17.65 N-mm) IP64
- 6. MOMENT OF INERTIA:
- 3.9 x 10⁻⁴ oz-in-sec² (27.5 gm-cm²) 7. MAX ACCELERATION: 1 X 10⁵ rad/sec²
- 8. ELECTRICAL CONNECTION: 36" (914.4 mm) cable (foil and braid shield, 24 AWG conductors)

FUNCTION	WIRE COLOR
+VDC	Red
Common	Black
Data A	White
Data B	Green
Index Z	Orange

- 9. HOUSING: Black non-corosive finish
- 10. MOUNTING: Flex arm 1.06" to 1.81" radius mounting
- 11. WEIGHT: 3.5 oz. typical (99.2 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. OPERATING TEMPERATURE: 0°C to +70°C
- 2. STORAGE TEMPERATURE: -40°C to +100°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. VIBRATION: 10 g @ 58 to 500 Hz
- 5. SHOCK: 50 g @ 11 msec duration
- 6. SEALING: IP64

GENERAL DESCRIPTION

The Model ZPJ ia a thru-bore encoder with a bore of 0.625" (15.875 mm). Additional mounting kits are available to adapt it to both standard and metric shaft sizes. This unit is ideal for applications requiring a miniature, high precision, low cost encoder, designed with all metal construction for years of trouble-free operation.

The ZPJ encoder has a flexible arm mount and blind hollow shaft. It uses two set screws that are 90° apart to clamp the encoder's hub to the motor shaft. The NPN Open Collector outputs are each current limited to 20 mA. The outputs are standard quadrature with index, and are available in resolutions up to 2500 pulses per shaft revolution. The quadrature separation is typically 90 electrical degrees. Output A leads output B for clockwise rotation of the encoder shaft.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



Open Collector Output Wiring

The ZPJ encoder has open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (30 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.



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ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
	0.625" Thru-Bore Rotary Pulse Generators	60	ZPJ0060A
		100	ZPJ0100A
ZPJ		500	ZPJ0500A
		600	ZPJ0600A
		1000	ZPJ1000A
		1200	ZPJ1200A
		2000	ZPJ2000A
		2500	ZPJ2500A

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
PROMK	1.575" (40 mm) Bolt Circle Flex Mount Kit	RPGMK000
RPGMK	1.811" (46 mm) Bolt Circle Flex Mount Kit	RPGMK001
	Inch Std Bore Insert Kit (includes 0.25, 0.375, and 0.50 inch sleeves)	RPGBII01
RPGBI	Large Metric Bore Insert Kit (includes 11, 12, and 14 mm sleeves)	RPGBIM01
	Small Metric Bore Insert Kit (includes 6, 8, and 10 mm sleeves)	RPGBIM02
RPGMB	Mag Coupling Kit (0.625 inch shaft)	RPGMB001

Only factory stocked part numbers are listed. Consult Factory for part number and availability of other PPR and output configurations.

Do not dispose of unit in trash - Recycle

MODELS ZBG AND ZBH STANDARD DUTY ENCODER (Replaces MODEL RPGB) MODEL ZHG HEAVY DUTY ENCODER (Replaces MODEL RPGH)



- CURRENT SINK OUTPUTS
- HIGH PULSE PER REVOLUTION (PPR) RATES Up to 1200 PPR for fine, high-resolution counting or precision speed measurement from slow shaft speeds.
- QUADRATURE OUTPUT For position measurement, bi-directional counting and in systems with backlash counting requirements.
- AVAILABLE WITH MS AND M12 CONNECTORS

MODEL ZBG and ZBH - FOR GENERAL INDUSTRIAL SERVICE (Replaces Model RPGB)

The units contain an L.E.D. light source and a photo sensor that scans a shaftmounted, slotted disc. An internal pulse-shaping amplifier circuit delivers a rectangular pulse signal from the current sinking output in response to the passing slots as it rotates. They can be direct-coupled to a machine shaft by means of a flexible-bellows, spring, or rubber sleeve type coupling that allows for axial and radial misalignment. They can also be coupled with light instrument timing-belts. Timing-belt drives also allow convenient gear-up or gear-down speed ratio changes that can be useful for obtaining non-standard PPR rates.



MODEL ZHG - HEAVY-DUTY SEALED HOUSING (Replaces Model RPGH)

These heavy duty units feature a heavy cast aluminum housing with 1/4" thick aluminum cover plates and 0-ring seals. Heavy duty bearings are double-sealed and allow radial shaft loading of 40 lbs (18 Kg).

A 1/2" (12.7 mm) NPT Conduit entry permits signal wiring to be run via flexconduit to an internal terminal block. Electrical characteristics are identical to those for the Model ZBG. Terminal board markings correspond to the Pin-Out identification of the ZBG.



SPECIFICATIONS ELECTRICAL SPECIFICATIONS

1. SUPPLY VOLTAGE:

+4.75 to +28 VDC @ 80 mA max. from 0 °C to 85 °C +4.75 to +24 VDC @ 80 mA max. from 0 °C to 100 °C

2. **OUTPUT**: Current Sinking

ZBG and ZHG (Single Channel): 250 mA max.

ZBH (Quadrature): 250 mA max. current per output. Incremental - two square waves in quadrature with Channel A leading Channel B for clockwise rotation. (Quad. Phase relationship is $90^{\circ} \pm 22.5$ electrical degrees)

Note: NPN Transistor outputs have 1.5 K Ω load resistors returned to supply for internal feed back purposes. This does not interfere with the ability to use these outputs as conventional "Open-Collector" outputs as long as the supply voltage for the ZB is supplied by the indicator or control receiving its output signal. The ZB's internal load resistor also allows the output to be used as a current source, however, load current must be limited to 1 mA max.

3. MAXIMUM FREQUENCY:

Single Channel: 20 KHz

Quadrature: 20 KHz

PPR available up to 1270 for both single channel and quadrature.

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM SHAFT SPEED: 6000 RPM
- 2. SHAFT DIAMETER: 0.375" (9.5 mm)
- 3. RADIAL SHAFT LOAD: 40 lbs. operating (18 kg)
- 4. AXIAL SHAFT LOAD: 30 lbs operating (13.6 kg)
- 5. STARTING TORQUE: ZBG & ZBH: 0.38 oz-in (2.68 N-mm) ZHG: 3 oz-in (21.18 N-mm)
- 6. MOMENT OF INERTIA: 6.5 x 10⁻⁶ oz-in-sec²
- CONNECTIONS: 6-pin MS style or 8-Pin M12 connector. (Male) Mating connector and cable assembly sod separately. For wiring cofiguration, see Cable Connections. For Ordering Information, see Accessories.
- 8. HOUSING: Black non-corrosive finished 6063-T6 aluminum.
- 9. BEARINGS: ABEC3 double sealed ball bearings
- 10. WEIGHT:

ZBG & ZBH: 10 oz (283.5 g) **ZHG**: 3.8 lbs (1.72 Kg)

ENVIRONMENTAL SPECIFICATIONS

- 1. **OPERATING TEMPERATURE**: 0 ° to 100 °C (See supply voltage)
- 2. **STORAGE TEMPERATURE**: -25°C to +85°C
- 3. HUMIDITY: 98% RH non-condensing
- 4. VIBRATION: 10 g @ 58 to 500 Hz
- 5. SHOCK: 50 g @ 11 msec duration



Cable Connections

The tables below list the pin connections from the ZBG and ZHG single channel and ZBH quadrature encoder to the optional CCARPG or CCM cable.

FUNCTION	6-PIN MS CONN	M12 CONN	CABLE WIRE COLOR
+VDC	А	1	RED
COMMON	В	2	BLACK
DATA A	С	3	WHITE
DATA B if appl. (quad)	D	4	GREEN
NO CONNECTION	E	5	—

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR*	PART NUMBER
	Single Channel - Heavy Duty	600	ZHG06004
ZHG	Rotary Pulse Generator	1000	ZHG10004
	* For Dual Channel contact factory	1200	ZHG12004
		60	ZBG00602
	Single Channel	100	ZBG01002
	General Service	600	ZBG06002
ZBG	6-Pin MS Connector	1000	ZBG10002
		1200	ZBG12002
	Single Channel General Service M12 Connector	100	ZBG01003
		600	ZBG06003
	Dual Channel	10	ZBH00102
		12	ZBH00122
		100	ZBH01002
704	6-Pin MS Connector	120	ZBH01202
ZBH		500	ZBH05002
		600	ZBH06002
	Dual Channel General Service	100	ZBH01003
	M12 Connector	600	ZBH06003

Note: Only factory stocked part numbers are listed. Consult factory for part number and availability of other PPR and output configurations.



Do not dispose of unit in trash - Recycle

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
	Flexible Coupling (1" Length) 0.250"-0.375"	RPGFC002
PROFO	Flexible Coupling (1" Length) 0.375"-0.375"	RPGFC003
REGEC	Flexible Coupling (1" Length) 0.375"-0.500"	RPGFC004
	Flexible Coupling (1" Length) 0.375"-6 mm	RPGFC006
Mating 6-Pin	MS Connector	CCARPG00
6-Pin MS Co	nnector w/10 feet 22 AWG 4-conductor w/drain	CCARPG01
6-Pin MS Connector w/25 feet 22 AWG 4-conductor w/drain		CCARPG25
6-Pin MS Connector w/50 feet 22 AWG 4-conductor w/drain		CCARPG50
M12 Connector w/4 Meter 24 AWG 5-conductor w/drain		CCM12894
M12 Connector w/10 Meter 24 AWG 5-conductor w/drain		CCM12890

LENGTH SENSOR CONVERSION BRACKET WITH 6-PIN MS CONNECTOR ADAPTS APPROPRIATE ZBG and ZBH ROTARY PULSE GENERATOR TO LENGTH MEASUREMENT



The tubular arm length of this bracket, related to the wheel axis center-line of the encoder is 6.8" similar to the length sensors. The 10' long, 4-wire, shielded cable with 6-pin MS connector *(included with conversion bracket)* has the same color coding as described for the encoder cable P/N CCARPG01. Screws for mounting the conversion bracket are included.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
1000	Length Sensor Conversion Bracket	LSCB1000
LSCB	Length Sensor Conversion Bracket (Special Length)	LSCB1099
	Hinge Clamp Assembly for Length Sensors & Conversion Bracket (Above)	LSAHC001

DESCRIPTION

This conversion bracket allows the customer to assemble a custom length sensor by purchasing the following items separately.

1. Length Sensor Conversion Bracket (P/N LSCB1000)

2. An encoder with appropriate connector, PPR and output type.

3. One or two measuring wheels. Install OF & OK measuring wheels with set screw hub facing encoder shaft *(as shown)*. Apply thread locking material to wheel set screw threads during installation to the encoder shaft. 4. Hinge Clamp Assembly (P/N LSAHC001)

Note: To complete installation, insure guards, shields or other devices are in place to protect personnel from rotating equipment.

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LENGTH SENSOR MEASUREMENT ACCURACY

Factors which affect measurement accuracy include Measuring Wheel accuracy and wear, and material conditions. Ideally, materials which are hard, thin and strong provide good readings, conversely, soft, thick and elastic materials can present problems in obtaining true readings. The great majority of these situations, where this effect is consistant, can be compensated for by applying a multiplier to the quadrature output pulse train so as to obtain a corrected measurement. Counter or Rate Indicators with "input scaling" can compensate for Measuring Wheel wear and material elastic and compliance errors. In addition, English/Metric conversions may also be accomplished (*See RLC catalog for more information*).

LENGTH SENSOR ACCESSORIES SEPARATE LENGTH MEASURING WHEELS - DIMENSIONS In Inches (mm)



SELECTING APPROPRIATE WHEEL SIZE & PPR (Pulses Per Rev.) OF ROTARY PULSE GENERATOR

When the desired output of a length sensor and wheel combination is either in feet or inch units, selection of the proper combination is relatively straight forward. For example, with a 1-foot wheel circumference, a 1 PPR Rotary Pulse Generator will deliver 1 pulse/ft, 12 PPR would deliver 12 pulses/ft (*1 pulse/inch*); 100 PPR would yield 100 pulses/ft; and 120 PPR would permit measuring to 1/10th of an *inch (1/120th of a foot)*.

WHEELS & REPLACEMENT TIRES FOR CODE OR WHEELS

ORDERING INFORMATION

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.40%	WF1000OR
OP	1/3 meter	±0.40%	WM03330R
	4/10ths yard	±0.40%	WY0400OR
	4/10ths meter	±0.40%	WM04000R
OF	1 foot (1/3 yd)	±0.35%	WF10000F
	1/3 meter	±0.30%	WM03330F
	4/10ths yard	±0.30%	WY04000F
	4/10ths meter	±0.30%	WM04000F
BF (Balanced)	1 foot (1/3 yd)	±0.40%	WF1000BF

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.35%	WF10000K
OK	1/3 meter	±0.30%	WM03330K
	4/10ths yard	±0.30%	WY0400OK
	4/10ths meter	±0.30%	WM04000K
BK (Balanced)	1 foot (1/3 yd)	±0.35%	WF1000BK
Replacement Tires	1 foot (1/3 yd)		TORF1000
	1/3 meter		TORM0333
for OR Wheels	4/10ths yard		TORY0400
	4/10ths meter		TORM0400

Note: After installation of measuring wheels, ensure guards, shields or other devices are in place to protect personnel from rotating equipment.

MODEL LSAHC - LENGTH SENSOR HINGE CLAMP ASSEMBLY

The Length Sensor Hinge Clamp Assembly provides an easy method for attachment and mounting of the Length Sensors and LSCB1 Conversion Bracket. The removable top on the solid zinc LSAHC mounting block allows quick installation of the Length Sensor handle tube and provides secure clamping retention. The mounting block pivots freely in zinc right angle brackets to allow mounting the assembly via clearance holes for 1/4" dia. bolts.

The lock washers must be used as indicated (between the bolt head and the top clamp piece). Assemble the top clamp piece as follows.

- 1. Tighten both bolts so that the top clamp half draws down evenly on the sensor tube.
- 2. Tighten the bolts until both lock washers are flat.
- 3. Then turn each bolt an additional $\frac{1}{2}$ to $\frac{3}{4}$ turn.



MODEL NO. DESCRIPTION PART NUMBER LSAHC Length Sensor Hinge Clamp Assembly LSAHC001

892



MODEL ZMH - HEAVY DUTY LENGTH SENSOR

- HEAVY DUTY INDUSTRIAL CONSTRUCTION
- QUADRATURE OUTPUT
- BUILT-IN SPRING TENSIONING
- VERTICAL, HORIZONTAL, OR UPSIDE-DOWN MOUNTING
- EASY INSTALLATION
- VARIOUS MEASURING WHEELS AVAILABLE
- VARIOUS MOUNTING CONFIGURATIONS

DESCRIPTION

Designed for heavy duty sensing applications, the Heavy Duty Length Sensor, Model ZMH, is versatile and easy-to-use.

It features a built-in spring-loaded torsion arm that provides a simple-toadjust torsion load, allowing the unit to be mounted in almost any orientation, including upside down. Using a properly selected wheel, the ZMH can be used on almost any surface, while operating at speeds up to 3000 feet per minute. Whether you need to measure speed, position, or distances, the Model ZMH is the ideal solution.

Open Collector Output Wiring

The ZMH sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (30 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
		250	ZMH0250B
			ZMH0500B
ZMH *	Heavy Duty Length Sensor with Quadrature Output	1000	ZMH1000B
		2000	ZMH2000B
		2500	ZMH2500B
MDZM	Mounting Bracket and Shaft	N/A	MBZM0001
	Double Wheel Pivot Mount and Shaft	N/A	MBZM0002

* Mounting shaft not included.

DIMENSIONS In inches (mm)



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LENGTH SENSOR MEASUREMENT ACCURACY

Factors which affect measurement accuracy include Measuring Wheel accuracy and wear, and material conditions. Ideally, materials which are hard, thin and strong provide good readings, conversely, soft, thick and elastic materials can present problems in obtaining true readings. Where this effect is consistant, Counter or Rate Indicators with "input scaling" can compensate for Measuring Wheel wear and material elastic and compliance errors. In addition, English/Metric conversions may also be accomplished.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



SPECIFICATIONS

- **ELECTRICAL SPECIFICATIONS**
- 1. INPUT VOLTAGE: 4.75 to 28 VDC.
- 2. INPUT CURRENT: 100 mA max (65 mA typical) with no output load
- 3. **OUTPUTS**: NPN Open Collector Transistor, $V_{OH} = 30$ VDC max.; 20 mA max. current. Incremental Two square waves in quadrature with A leading B for clockwise rotation, as viewed from the wheel side.
- 4. MAX FREQUENCY: 200 KHz
- NOISE IMMUNITY: Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811
- 6. SYMMETRY: 180° (±18°) electrical



Note: All dimensions are in inches with a tolerance of +0.01" unless otherwise specified.

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7. QUAD. PHASING: 90° (±22.5°) electrical

- 8. MIN. EDGE SEP: 67.5° electrical
- ACCURACY: Within 0.017° mechanical or 1 arc-minute from true position. (for PPR>189)

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 3000 RPM
- 2. SHAFT MATERIAL: Stainless Steel
- 3. SHAFT SIZE: 0.375"
- 4. RADIAL SHAFT LOAD: 10 lb. max. controlled by spring torsion.
- 5. STARTING TORQUE: 1.0 oz-in typical
- 6. **ELECTRICAL CONNECTION**: 2 meter Cable, (foil and braid shield, 24 AWG conductors).

FUNCTION	CABLE WIRE COLOR
+VDC	Red
Com	Black
A	White
В	Green
Shield	Bare

- 7. MOUNTING: 5/8" diameter thru hole with clamp
- 8. **HOUSING**: powder coated aluminum.
- 9. WEIGHT:

ZMH: 2.15 lb. (0.975 Kg) MBZM0001: 1.5 lb. (0.68 Kg) MBZM0002: 0.15 lb.. (68.04 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. OPERATING TEMPERATURE: -20°C to 85°C
- 2. **STORAGE TEMPERATURE**: -25°C to +85°C
- 3. **HUMIDITY**: 98% RH non-condensing
- 4. VIBRATION: 10 g @ 58 to 500 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP50

DOUBLE WHEEL PIVOT MOUNT - MBZM0002

This accessory allows the unit to rotate freely to maintain equal pressure on both wheels, accomodating uneven/angled surfaces and mounting misalignment. Pivot mounting shaft included with MBZM0002. For installation of unit, use the mounting bracket and shaft included with MBZM0001.



MOUNTING BRACKET - MBZM0001

This accessory angle mounting bracket allows for a variety of mounting positions and makes installation of the ZMH even easier. Mounting shaft included with mounting bracket.



LENGTH SENSOR ACCESSORIES SEPARATE LENGTH MEASURING WHEELS - DIMENSIONS In Inches (mm)



SELECTING APPROPRIATE WHEEL SIZE & PPR (Pulses Per Rev.) OF ROTARY PULSE GENERATOR

When the desired output of a length sensor and wheel combination is either in feet or inch units, selection of the proper combination is relatively straight forward. For example, with a 1-foot wheel circumference, a 1 PPR Rotary Pulse Generator will deliver 1 pulse/ft, 12 PPR would deliver 12 pulses/ft (1 pulse/inch); 100 PPR would yield 100 pulses/ft; and 120 PPR would permit measuring to 1/10th of an inch (1/120th of a foot).

WHEELS & REPLACEMENT TIRES FOR CODE OR WHEELS

ORDERING INFORMATION

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.40%	WF1000OR
OB	1/3 meter	±0.40%	WM0333OR
	4/10ths yard	±0.40%	WY0400OR
	4/10ths meter	±0.40%	WM04000R
OF	1 foot (1/3 yd)	±0.35%	WF10000F
	1/3 meter	±0.30%	WM03330F
	4/10ths yard	±0.30%	WY04000F
	4/10ths meter	±0.30%	WM04000F
BF (Balanced)	1 foot (1/3 yd)	±0.40%	WF1000BF

WHEEL CODE	CIRCUMFERENCE	TOLERANCE	PART NUMBER
	1 foot (1/3 yd)	±0.35%	WF1000OK
OK	1/3 meter	±0.30%	WM03330K
	4/10ths yard	±0.30%	WY0400OK
	4/10ths meter	±0.30%	WM04000K
BK (Balanced)	1 foot (1/3 yd)	±0.35%	WF1000BK
	1 foot (1/3 yd)		TORF1000
Replacement Tires	1/3 meter		TORM0333
for <u>OR</u> Wheels	4/10ths yard		TORY0400
	4/10ths meter		TORM0400

Note: After installation of measuring wheels, ensure guards, shields or other devices are in place to protect personnel from rotating equipment.

ZMH INSTALLATION

INSTALLATION:

- 1. Slide ZMH over a fixed Ø5/8" (Ø0.625 +0/-0.005") shaft. The optional ZMH Mounting Bracket (MBZM0001) is shown in the picture.
- 2. While rotating the ZMH clamp to apply a spring load, securely tighten the two clamp bolts with a 5/32" (supplied) or 4 mm hex "L" key.
- Note 1: A 1/2 20 bolt can be threaded into the end of the clamp to aid in loading the spring as shown. If a 1/2 - 20 bolt is not handy, then a $\emptyset 0.45$ " or smaller rod, bolt, screw driver etc. works as well.
- Note 2: The spring should not be preloaded too much or it may come in contact with the spring limit pins and the ZMH will not have sufficient travel to accommodate variations in the surface height of the material being measured. For most applications, the spring setting in its mid-range (5-6 lbs.) is sufficient.



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DOUBLE WHEEL PIVOT INSTALLATION (MBZM0002):

- Note: It is recommended that double wheel ZMH's be installed with the optional Double Wheel Pivot. The pivot allows the unit to rotate freely to maintain equal pressure on both wheels, accommodating uneven/angled surfaces and mounting misalignment.
- 1. Thread the pivot clamp into the end of the ZMH's clamp by hand until the threads just bottom out then back out approximately 1 revolution to allow for rotation after installation.
- 2. Slide the pivot clamp over a fixed Ø5/8" (Ø0.625 +0/-0.005") shaft. The optional ZMH Mounting Bracket (MBZM0001) is shown in the picture.
- 3. While applying a load to the spring, securely tighten the two clamp bolts with a 5/32" (supplied) or 4mm hex "L" key.



CONNECTOR EXIT ORIENTATION ADJUSTMENT:

- 1. Slide the ZMH over a Ø5/8" (Ø0.625 +0/-0.005") shaft and tighten the clamp bolts with the supplied 5/32" hex "L" key.
- 2. Remove the measuring wheel(s) using the supplied 3/32" hex "L" wrench to loosen the set screws.
- 3. Remove 6 screws (3 on each side) from the side plates using the supplied 7/64" hex "L" key.
- 4. Rotate body of encoder to desired orientation, aligning bolt pattern with one of six unique positions (see inset drawing).
- 5. Replace side plate screws and measuring wheel(s), making sure to tighten screws securely.



MODEL ZDH - 2" FLANGE MOUNT ROTARY PULSE GENERATOR MODEL ZNH - 2.5" FLANGE MOUNT ROTARY PULSE GENERATOR (Replaces the Model RPGD and RPGN respectively)



GENERAL DESCRIPTION

The ZDH and ZNH series of sensors are heavy duty, extremely rugged, reliable, yet compact encoders designed for harsh factory and plant floor environments. Both models are flange mount and conform to NEMA 4, 13 and IP66 standards. Typical applications include motion control feedback, machine control, process control, elevator controls, conveyors, textile equipment, robotics and food processing.

Open Collector Output Wiring

The ZDH and ZNH series of sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (40 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the opencollector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

REPLACEMENT

Note: The RPGD connections are made by a 24 inch cable. The ZDH uses a 7-Pin MS connector.

DIMENSIONS In inches (mm) ZDH 6-32 UNC-2B Ø0.156 (3.96) THRU 0.25 (6.35) DEEP 4X 90° Ø2.00 (50.8) B.C. 4X 90° ø2.475 (62.87) B.C. 0.50 0.12 (3.05) (12.7) 0.75 (19.05) 0.625 (15.875) [•]о 0.05 -(1.27)ø2.'00 (50.8)0.3748-0.0004 $(9.52^{+0.000}_{-0.010})$ 0.30 (7.62) (35.92)Ø1.249+.000 _2.06_ (52.32) $(\emptyset 31.72^{+.000}_{-.0508})$ 2.00 (50.8)

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 4.75 to 28 VDC, 100 mA max. with no output load 2. **OUTPUTS**: NPN Open Collector Transistor, $V_{OH} = 40$ VDC max.; 100 mA max. current. incremental - two square waves in quadrature with A leading B for clockwise shaft rotation.
- 3. MAX. FREQUENCY: Up to 1 MHz
- 4. INDEX: NPN Open Collector Transistor, V_{OH} = 40 VDC max.; 100 mA max. current. Once per revolution centered over Output Channel A. Index is a positive pulse.
- 5. INPUT RIPPLE: 100 mV peak to peak at 0 to 100 KHz.
- 6. NOISE IMMUNITY: Tested to BS EN61000-4-2; IEC801-3; BS EN61000-4-4; DDENV 50141; DDENV 50204; BS EN55022; BS EN61000-6-2; BS EN50081-2
- 7. SYMMETRY:
- 1 to 6000 CPR: 180° (±18°) electrical at 100 KHz output
- 6001 to 20,480 CPR: 180° (±36°) electrical
- 8. OUAD PHASING:
- 1 to 6000 CPR: 90° (±22.5°) electrical 6001 to 20,480 CPR: 90° (±36°) electrical
- 9. MIN EDGE SEP:
- 1 to 6000 CPR: 67.5° electrical at 100 KHz output 6001 to 20.480 CPR: 54° electrical
- >20,480 CPR: 50° electrical
- 10. RISE TIME: Less than 1 microsecond
- 11 ACCURACY
 - Instrument and Quadrature Error: From one cycle to any other cycle. 200 to 1999 CPR: 0.017° mechanical (1.0 arc minutes) 2000 to 3000 CPR: 0.01° mechanical (0.6 arc minutes)
- Interpolation error (units >3000 CPR only) within 0.005° mechanical. (Total Optical Encoder Error = Instrument + Quadrature + Interpolation)

MECHANICAL SPECIFICATIONS

- 1. MAXIMUM MECHANICAL SPEED: 8000 RPM
- 2. SHAFT DIAMETER:
- ZDH: 0.375" (9.5 mm)
- **ZNH**: 0.375" (9.5 mm)
- 3. RADIAL SHAFT LOAD: 80 lbs. max. Rated load of 20 to 40 lbs. for bearing life of 1.5 X 10⁹ revolutions.
- 4. AXIAL SHAFT LOAD: 80 lbs. max. Rated load of 20 to 40 lbs. for bearing life of 1.5 X 10⁹ revolutions.
- 5. STARTING TORQUE: 3.0 oz-in. (21.18 N-mm)



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6. MOMENT OF INERTIA: $5.2 \times 10^{-4} \text{ oz-in-sec}^2 (3.66 \times 10^{-3} \text{ N-mm-sec}^2)$

7. CONNECTOR TYPE: 7-Pin MS type connector

FUNCTION	PIN	WIRE COLOR
+VDC	А	RED
COMMON	В	BLACK
DATA A	С	WHITE
DATA B	D	GREEN
INDEX Z	E	ORANGE
CASE GROUND	F	BARE WIRE

8. HOUSING: Black non-corrosive finish

9. MOUNTING:

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ZDH: 2.0" Flange Mount

ZNH: 2.5" Flange Mount

10. WEIGHT: 11 oz. (311.8 g)

ENVIRONMENTAL CONDITIONS

- 1. OPERATING TEMPERATURE: 0 to +70 °C
- 2. STORAGE TEMPERATURE: -25 to +85 °C

3. HUMIDITY: 98% RH non-condensing

4. SHOCK: 75 g @ 11 msec duration

5. SEALING: NEMA 4, 13 and IP66 with shaft seal

ORDERING INFORMATION

	DESCRIPTION		PART NUMBER	
MODEL NO.		PPR	2" Flange Mount	2.5" Flange Mount
		60	ZDH0060H	ZNH0060H
		100	ZDH0100H	ZNH0100H
ZDH & ZNH	Rotary Pulse Generators	500	ZDH0500H	ZNH0500H
		600	ZDH0600H	ZNH0600H
		1000	ZDH1000H	ZNH1000H
		1200	ZDH1200H	ZNH1200H
		2000	ZDH2000H	ZNH2000H
		2500	ZDH2500H	ZNH2500H

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
	7-Pin MS Connector	CCBRPG00
CCBRPG	7-Pin MS Connector w/10 ft 24 AWG 5 Conductor w/drain	CCBRPG02
	7-Pin MS Connector w/20 ft 24 AWG 5 Conductor w/drain	CCBRPG03
	Flexible Coupling (1" Length) 0.25" - 0.375"	RPGFC002
PROFO	Flexible Coupling (1" Length) 0.375" - 0.375"	RPGFC003
RPGFC	Flexible Coupling (1.5" Length) 0.375" - 0.5"	RPGFC004
	Flexible Coupling (1" Length) 0.375" - 6 mm	RPGFC006

Note: Only Factory Stocked part numbers are listed. Consult Factory for part number and availability of other PPR and Output Configurations.

MODEL ZMD – MINIATURE LENGTH SENSOR (Replaces MODEL LSM)

- COMPACT SIZE
- QUADRATURE OUTPUT
- BUILT-IN SPRING TENSIONING
- VERTICAL, HORIZONTAL, OR UPSIDE-DOWN MOUNTING
- REDUCES INSTALLATION TIME
- VARIOUS MEASURING WHEELS AVAILABLE



DESCRIPTION

Designed for light to medium duty sensing applications, the Miniature Length Sensor, Model ZMD, is compact in size and easy-to-use.

It features a built-in spring-loaded torsion arm that provides a simple-toadjust torsion load, allowing the unit to be mounted in almost any orientation, including upside down. Using a 6" or 200 mm wheel, the ZMD can be used on almost any surface, while operating at speeds up to 3000 feet per minute. The housing is a durable, conductive composite material that will eliminate static build up. Whether you need to measure speed, position, or distances, the Model ZMD is the ideal solution. For other pulse rates and/or wiring configurations, contact the factory for further details.

Open Collector Output Wiring

The ZMD sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages different than the encoder supply voltage (30 VDC maximum). NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



DIMENSIONS In inches (mm)

SPECIFICATIONS

CE

ELECTRICAL SPECIFICATIONS

- INPUT VOLTAGE: 4.75 to 28 VDC max for temperatures up to 85°C; 4.75 to 24 VDC for temperatures between 85°C to 100°C, reverse polarity protected.
- 2. INPUT CURRENT: 100 mA max (65 mA typical) with no output load
- OUTPUTS: NPN Open Collector Transistor, V_{OH} = 30 VDC max.; 20 mA max. current. Incremental - Two square waves in quadrature with A leading B for clockwise rotation, as viewed from the wheel side.
- 4. MAX FREQUENCY: 200 KHz standard
- 5. **NOISE IMMUNITY**: Tested to BS EN61000-6-2; BS EN50081-2; BS EN61000-4-2; BS EN61000-4-3; BS EN61000-4-6, BS EN500811 (Tested with 2 meter cable)
- 6. SYMMETRY: 180° (±18°) electrical
- 7. QUAD. PHASING: 90° (±22.5°) electrical
- 8. MIN. EDGE SEP: 67.5° electrical
- 9. ACCURACY: Within 0.017° mechanical or 1 arc-minute from true position. (for PPR>189)

MECHANICAL SPECIFICATIONS

- 1. **MAXIMUM MECHANICAL SPEED**: 6000 RPM. Higher speeds may be achievable, contact the factory.
- 2. SHAFT MATERIAL: Stainless Steel
- 3. SHAFT TOLERANCE: +0.0000/-0.0004" (+0.000/-0.010 mm)
- 4. **RADIAL SHAFT LOAD**: 5 lb. max. Rated load of 2 to 3 lb for bearing life of 1.2×10^{-10} revolutions
- 5. AXIAL SHAFT LOAD: 5 lb. max. Rated load of 2 to 3 lb for bearing life of 1.2×10^{-10} revolutions
- 6. STARTING TORQUE: 0.05 oz-in
- 7. **ELECTRICAL CONNECTION**: 2 meter Cable, (foil and braid shield, 24 AWG conductors). Drain wire internally connected to case.

FUNCTION	CABLE WIRE COLOR
+VDC	Red
Com	Black
A	White
В	Green
Shield	Bare



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- 8. **MOUNTING**: Pivot Shaft can be mounted from either side of the housing and is field reversible.
- 9. **HOUSING**: Stainless steel fibers in a high temperature nylon composite 10. **WEIGHT**: 5 oz typical

- ENVIRONMENTAL SPECIFICATIONS
- 1. **OPERATING TEMPERATURE**: -20°C to 85°C 2. **STORAGE TEMPERATURE**: -25°C to +85°C
- 2. STORAGE TEMPERATURE: -25°C to +85°C
- 3. **HUMIDITY**: 98% RH non-condensing
- 4. **VIBRATION**: 10 g @ 58 to 500 Hz
- 5. SHOCK: 80 g @ 11 msec duration
- 6. SEALING: IP50

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ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PPR	PART NUMBER
ZMD		250	ZMD0250B
	Miniature Length Sensor with Quadrature Output	500	ZMD0500B
		1000	ZMD1000B
		2000	ZMD2000B
		2500	ZMD2500B

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Do not dispose of unit in trash - Recycle

ACCESSORIES

DESCRIPTION	PART NUMBER
Mounting Bracket	RPGMB002
Urethane (6" Circumference) Wheel	WI0006OF
Knurled (6" Circumference) Wheel	WI0006OK
Urethane (200 mm Circumference) Wheel	WM02000F
Knurled (200 mm Circumference) Wheel	WM02000K

Only factory stocked part numbers are listed. Consult the factory for part number and availability of other PPR and output configurations.

MOUNTING BRACKET

This accessory angle mounting bracket allows for a variety of mounting positions and makes installation of the ZMD even easier.

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DIMENSIONS In inches (mm)



MODEL ZLZ - LINEAR CABLE ENCODER (Replaces MODEL LES)

- LOW COST LINEAR SOLUTION
- 50 OR 500 PULSES PER INCH
- STAINLESS STEEL CABLE
- 0 TO 50 INCHES OF CABLE MEASUREMENT
- VARIOUS CABLE ASSEMBLIES AVAILABLE



DESCRIPTION

The Linear Cable Encoder can provide an accurate, yet low cost solution for Linear Measurement applications. Common applications include robotics, extrusion presses, valve positioning, textile machinery, and gate control positioning, just to name a few. The ZLZ has some unique advantages over other sensing solutions. Using a stainless steel cable, perfect parallel alignment is no longer required and with a 50 inch cable reach, it can easily be mounted away from harsh environments. The ZLZ is available in a quadrature output, allowing the sensor to operate in positioning applications.

Additional cable exit configurations, pulses per inch, and mating connectors are available on special request. Contact the factory for details.

Open Collector Output Wiring

DIMENSIONS In inches (mm)

The ZLZ sensors have open collector outputs. An open collector output brings the uncommitted collector of the encoder switching device to the external world. Because the collector element is not associated with the sensor supply voltage, the sensor output collector may be "pulled up" to external voltages (40 VDC max.) different than the encoder supply voltage . NPN open collector outputs are current sinking devices. An output signal will not be generated unless a pull-up resistor is connected from the open-collector to the positive side of an external supply. The same supply can be used for powering the unit and for the pull-up resistor.

SPECIFICATIONS

- **ELECTRICAL SPECIFICATIONS**
- 1. INPUT VOLTAGE: 4.75 to 28 VDC
- 2. INPUT CURRENT: 80 mA maximum with no output load
- 3. INPUT RIPPLE: 100 mV peak-to-peak at 0 to 100 KHz
- 4. **OUTPUT**: NPN open collector; 250 mA max per channel; Incremental square wave with channel A leading B during linear extension.
- 5. INDEX: Once per 5" cable extension or retraction
- 6. MAX FREQUENCY: 0 to 125 KHz 7. SYMMETRY: 180° (±18°) electrical
- 8. QUAD PHASING: 90° (±22.5°) electrical
- 9. **RISE TIME**: Less than 1 µsec

- MECHANICAL SPECIFICATIONS 1. FULL STROKE LENGTH (FSL): 50" standard.
- 2. **FINISH**: Black powder coated aluminum
- 3. ACCURACY: ±0.10% FSL
- 4. **REPEATABILITY**: ±0.015% FSL
- 5. LINEAR RESOLUTION: Up to 500 cycles per inch (0.002" per cycle)
- 6. CABLE MATERIAL: 0.034" nylon coated stainless steel rope
- 7. CABLE TENSION: 20 oz maximum typical
- 8. LIFE (CYCLES): 1,000,000 predicted at zero angle cable exit
- 9. CONNECTOR TYPE: 6-Pin MS type connector
- 10. WEIGHT: 19 oz (538.64 g)

ENVIRONMENTAL SPECIFICATIONS

- 1. **OPERATING TEMPERATURE**: 0 °C to 85 °C
- 2. SEALING: IP65 standard
- 2. SEALING. II 05 standard



MOUNTING BRACKET



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I ZLZ WIRING SPECIFICATIONS

FUNCTION	LE PIN	CCARPG WIRE COLOR
+VDC	А	RED
COMMON	В	BLACK
DATA A	С	WHITE
DATA B	D	GREEN
NO CONNECTION	E	

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
71 7	Quadrature output, 50 PPI, Standard Housing	ZLZ0050G
ZLZ	Quadrature output, 500 PPI, Standard Housing	ZLZ0500G

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBER
	ZLZ Mounting Bracket	LEMTBR00
CCARPG	Mating 6-Pin MS Connector	CCARPG00
	10' 6-Pin 4-Wire Cable/Connector	CCARPG01
	25' 6-Pin 4-Wire Cable/Connector	CCARPG25
	50' 6-Pin 4-Wire Cable/Connector	CCARPG50

COMPACT DC POWERED PHOTO-ELECTRIC SENSORS

- RETROREFLECTIVE, PROXIMITY (DIFFUSE) & OPPOSED BEAM PAIRS
- MODULATED LED LIGHT BEAMS FOR IMMUNITY TO AMBIENT LIGHT
- +10 to +30 VDC OPERATION WITH REVERSE POLARITY PROTECTION
- NPN & PNP (CURRENT SINKING AND SOURCING) OUTPUTS
- RUGGED VALOX HOUSING MEETS NEMA 1, 2, 3, 3S, 4, 4X, 12, & 13 STANDARDS
- LED SIGNAL STRENGTH INDICATOR MAKES ALIGNMENT EASY
 & PROVIDES INDICATION OF LIGHT SIGNAL DETERIORATION



DESCRIPTION

These compact self-contained and powerful Retroreflective, Proximity (Diffuse) and Opposed Beam Pair Photo-electric Sensors provide application flexibility in counting, positioning and object detection. All units are interchangeable with conventional 18 mm threaded barrel-type photo-electrics and inductive proximity sensors. Their small $2-1/8" \times 1-1/4" \times 1/2"$ size, in addition to various mounting options, greatly increases alignment ease and application possibilities.

All units can be powered from +10 to +30 VDC and are reverse polarity protected. Current sinking NPN and current sourcing PNP Open Collector Transistors are protected from continuous overload and inductive load transients and are rated to 150 mA, with low saturation voltage and less than 1 μ A offstate leakage current. In addition, no false outputs are generated at power-up. A 6 foot long 4 conductor PVC jacketed cable with strain relief provides supply input and transistor outputs.

A gasketed removable back cover provides access to the LIGHT/DARK Operate Mode Selector. When in the "Light Operate" (LO) position, outputs turn on when light <u>is</u> received by the detector. When in the "Dark Operate" (DO) position, the outputs are turned on when sensor light is <u>not</u> detected. Also accessible is a 15-turn screwdriver adjustable GAIN potentiometer that enables precise adjustment of system sensitivity. A rear mounted LED Signal Strength Indicator "lights" whenever the sensor sees a light condition and "blinks" at a rate proportional to the received signals strength (the stronger the signal, the faster the rate). This LED allows for easy alignment and monitoring of signal strength deterioration due to dirty optics or changes in alignment.

SPECIFICATIONS

- 1. **POWER REQUIREMENTS:** +10 to +30 VDC, 10% Ripple Max., Reverse Polarity Protected, 25 mA max. (Model EMDC = 20 mA max.)
- OUTPUTS: Current Sinking NPN and Current Sourcing PNP Open Collector Transistors; Short Circuit Protected to +30 VDC, Internal Zener Diode Protected;

 I_{SNK} = 150 mA each; V_{OH} = 30 VDC max.

NPN $V_{SAT} = 0.2 \text{ V}$ (a) 10 mA load; 1 V max. (a) 150 mA max. load

PNP V_{SAT} = Less than 1 V @ 10 mA load; less than 2 V @ 150 mA max. load

Offstate Leakage Current = Less than 1 μ A

- RESPONSE TIME: Responds to a "light" or "dark" signal duration of 1 msec. or greater.
- 4. OPERATING TEMPERATURE: -4° to+158°F (-20° to +70°C)
- 5. WEIGHT: 3.5 oz (99.2 g)

MOUNTING

Various mounting methods have been designed to simplify alignment and provide versatility in any industrial environment. The integral 18 mm threaded lense can be interchanged with existing threaded entries common to 18 mm barrel sensors and inductive proximity switches. The threaded lense can also be installed into panel thicknesses of 5/16" through a 0.71" diameter hole and tightened into place with the supplied mounting nut. Two #4 screw clearance through-holes on 0.95" centers are available for side mounting or side nesting of multiple units on 1/2" centers for scanning large areas or for code reading applications. Units may also be mounted using the stainless steel Bottom-Mount or Side-Mount Bracket Kits (Models MB2 or MB3). These brackets allow 2 axes of movement & greatly simplify alignment.

MODEL RRDC - RETROREFLECTIVE SENSOR

The Model RRDC is a compact, DC powered, retroreflective photo-electric sensor with maximum detection range of 15 feet (with 3" dia. reflector Model RT2). The "visible" LED light beam allows for easy alignment and is modulated, providing immunity to ambient light. The small beam size of 1/2" at 1 foot from the lense, makes it a good choice for detecting relatively small objects.

In operation, the visible LED light beam is directed at a prismatic photo transistor, amplified and demodulated. An object which then breaks this beam will trigger the outputs.



ALIGNMENT

Apply DC power to the RRDC and direct its visible light beam at a reflective target (Models RT1 or RT2) while observing the Signal Strength LED on the back of the unit. Optimum alignment occurs when the sensor is receiving the maximum amount of reflected light and the GAIN (sensitivity) potentiometer is adjusted for the highest pulse rate on the Signal Strength LED. Note that glass, metallic objects, and other highly reflective surfaces may not be detected. In these applications, mount the sensor and reflector at any angle to the object to minimize direct reflections.

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MODEL PRDC - PROXIMITY SENSOR

The Model PRDC is a compact, DC powered, Proximity (Diffuse) photoelectric sensor with a 12" maximum detecting distance (as measured with a 90% reflective white test card). This sensor requires no special reflectors or reflective tapes and the limited 12" sensing range reduces detection of background reflections. It is ideally suited for detection of transparent or translucent objects, parts ejected from presses, and rotating targets such as pulley spokes. A modulated "infrared" LED light beam provides immunity to ambient light.

In operation, the modulated light beam is reflected by the object to be detected. Actual sensing range is determined by the surface area and the amount of reflectivity of the object. This reflected light is sensed by a photo-transistor, amplified, demodulated and then energizes the outputs.



ALIGNMENT

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With the PRDC in its sensing position, apply DC Power and direct the infrared light beam at the object to be detected. While observing the Signal Strength LED, adjust the GAIN (sensitivity) potentiometer for the highest LED pulse rate. Now remove the sensed object. If the LED goes out, no further adjustment is necessary. If the LED remains lit, the sensor is "seeing" reflected light from the background. Reduce the GAIN by steps until the sensor "sees" the object but not the background. Then turn the pot counter clockwise 2 more full turns. If the background is still being sensed, it will be necessary to reduce its reflectivity by either moving it back or painting it flat black.

MODELS EMDC & RCDC - OPPOSED BEAM EMITTER/ RECEIVER SENSOR PAIR

The Models EMDC (Emitter) and the RCDC (Receiver) are compact, DC powered, Opposed Beam photo-electric sensor pairs with a 10 foot sensing range. The Emitter contains a high power modulated "infrared" LED. The Receiver contains a sensitive photo-transistor, amplifier-demodulator and output transistors. In operation, these outputs will be triggered when the Receiver detects that an object begins to break the Emitter beam. Due to their high gain, they are ideally suited for detecting opaque objects in dirty and dusty areas or when condensation or oil film environments are present. The small 1/8" well defined beam size allows for sensing small parts accurately and provides repeatable edge sensing of opaque objects to better than 0.01" for accurate positioning applications. Greater accuracies can be achieved by aperturing the Emitter, Receiver or both. However, aperturing will result in reduced sensing distances. While the beam size is small, the Receiver has a wide field of view which allows easy "line-of-sight" alignment.



ALIGNMENT

Temporarily mount the Emitter-Receiver Pair opposite, and in line-of-sight, to each other. Apply DC power to both and aim the Emitter at the Receiver. Move the Receiver up-down-left-right until the Signal Strength LED lights. Optimum alignment occurs when the Signal Strength LED flashes at the highest rate obtainable with the GAIN (Sensitivity) potentiometer adjusted to the lowest setting needed to light the LED. Mount the units in place. Opposed Beam Pairs should be used at their highest possible gain. Therefore, have the object to be detected in "sensing position" and adjust the GAIN potentiometer fully clockwise (maximum gain). If the Signal Strength LED comes on, "burn-through" is occurring, and will require that the GAIN pot be backed off (counter clockwise) until the LED goes out and then backed off 2 more full turns. Note that Opposed Beam Pairs must be aligned properly and mounted securely. Excessive movement or vibration can cause loss of alignment and intermittent or false operation.

MB2 BOTTOM MOUNT BRACKET KIT INSTALLATION

- 1. Remove lense mounting nut on sensor and bottom lense screw.
- 2. Align mounting foot (A) under lense as shown with threaded insert facing
- down and attach to lense with long kit supplied screw B
- 3. Place sensor mounting peg into bracket hole.
- 4. Install screw, with washers, into long slotted bracket hole and into mounting foot threaded insert.



MB3 SIDE MOUNT BRACKET KIT INSTALLATION

- 1. Remove lense mounting nut from sensor.
- Install screws with flat washers, through side clearance holes in sensor and through top hole and slot of bracket.
- 3. Install lockwashers and tighten hex nuts.

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ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBERS
RRDC	Retroreflective DC Photo-Electric Sensor	RRDC0000
PRDC	Proximity (Diffuse) DC Photo-Electric Sensor	PRDC0000
EMDC	DC Emitter (Opposed Beam Pair)	EMDC0000
RCDC	DC Receiver (Opposed Beam Pair)	RCDC0000
MB2	Bottom Mount Bracket Kit	MB200000
MB3	Side Mount Bracket Kit	MB300000
RT1	1-1/2" Dia. Prismatic Reflector (Model RRDC)	RT100000
RT2	3" Dia. Prismatic Reflector (Model RRDC)	RT200000



Do not dispose of unit in trash - Recycle

MODELS PRM & RRM – MINIATURE DC POWERED PHOTO-ELECTRIC SENSOR



- RETROREFLECTIVE, PROXIMITY (DIFFUSE) & OPPOSED BEAM PAIRS
- +10 to +30 VDC OPERATION WITH REVERSE POLARITY PROTECTION
- COMPLEMENTARY NPN (CURRENT SINKING) OUTPUTS
- DURABLE BLACK POLYCARBONATE/ABS ALLOY HOUSING MEETS NEMA 6 AND IP65 STANDARDS
- LED's DISPLAY OPERATING STATUS
- PUSH BUTTON DIGITAL GAIN ADJUSTMENT

GENERAL DESCRIPTION

These miniature self-contained and powerful Retroreflective, Proximity (Diffuse) and Opposed Beam Pair Photo-electric Sensors provide application flexibility in counting, positioning and object detection. All units are interchangeable with conventional 12 mm threaded barrel-type photo-electrics and inductive proximity sensors. Their small size, in addition to various mounting options, greatly increases alignment ease and application possibilities.

All units can be powered by supplies ranging from +10 to +30 VDC and are reverse polarity protected. The complementary NPN open collector (Current Sinking) outputs are protected from continuous overload and inductive load transients and are rated to 150 mA, with low saturation voltage and less than 10 μ A off-state leakage current. In addition, no false outputs are generated at power-up. Two versions of the sensor are available, a 6 foot (1.83 M) long 4 conductor PVC jacketed cable or 6 inch long quick disconnect Pico-style connector provides supply input and transistor output.

These miniature sensors offer a digital gain adjustment that uses a single sealed push button to streamline installation and setup. The user simply holds the button in to achieve maximum sensitivity, and then can click the button for seven decremental settings to fine tune for your application. They also feature smart new status indicators. Green and amber LED's display operating status from three directions, indicate "power on" and "light sensed" and flash to signal "maximum gain," "gain reduced one increment" and "minimum gain" conditions. You can tell operating status of your sensors at a glance.

MODEL RRMDC - RETROREFLECTIVE SENSOR

The Model RRMDC is a miniature, DC powered, retroreflective photoelectric sensor with maximum detection range of 6.5 feet [1.98 M] (with 3" dia. reflector Model RT2). The "visible" LED light beam allows for easy alignment and is modulated, providing immunity to ambient light. The small beam size makes it a good choice for detecting relatively small objects.

In operation, the visible LED light beam is directed at a photo transistor, amplified and demodulated. An object which then breaks this beam will trigger the output.



MODEL PRMDC - PROXIMITY SENSOR

The Model PRMDC is a miniature, DC powered, Proximity (Diffuse) photoelectric sensor with a 8" maximum detecting distance. This sensor requires no special reflectors or reflective tapes and the limited 8" sensing range reduces detection of background reflections. It is ideally suited for detection of transparent or translucent objects, parts ejected from presses, and rotating targets such as pulley spokes. A modulated "infrared" LED light beam provides immunity to ambient light.

In operation, the modulated light beam is reflected by the object to be detected. Actual sensing range is determined by the surface area and the amount of reflectivity of the object. This reflected light is sensed by a photo-transistor, amplified, demodulated and then energizes the outputs.



MODELS EMMDC & RCMDC - OPPOSED BEAM EMITTER/ RECEIVER SENSOR PAIR

The Models EMMDC (Emitter) and the RCMDC (Receiver) are miniature, DC powered, Opposed Beam photo-electric sensor pairs with a 13 foot sensing range. The Emitter contains a high power modulated "infrared" LED. The Receiver contains a sensitive photo-transistor, amplifier-demodulator and output transistor. In operation, this output will be triggered when the Receiver detects that an object begins to break the Emitter beam. Due to their high gain, they are ideally suited for detecting opaque objects in dirty and dusty areas or when condensation or oil film environments are present.



SPECIFICATIONS

- 1. **POWER REQUIREMENTS**: +10 to +30 VDC (10% Ripple Max.) Current Draw: 25 mA max. (exclusive of load) Reverse Polarity Protected
- 2. **REPEATABILITY**: Opposed Mode: 1 msec, All others: 175 µsec.
- 3. **OUTPUTS**: Current Sinking Complementary NPN Open Collector Transistor; Short Circuit Protected I_{SNK} : 150 mA max. each; $V_{OH} = 30$ VDC max.
- V_{SAT}: 1 V @ 10 mA load
- Offstate Leakage Current : Less than 10 μ A @ 30 VDC
- 4. OUTPUT RESPONSE TIME: Opposed Mode: 8 msec ON, 4 msec OFF, All others 1.5 msec
- 5. OPERATING TEMPERATURE: -4° to+131°F (-20° to +55°C)
- 6. WEIGHT: 0.4 oz. (1.13 g)

DIMENSIONS In inches (mm) **FRONT VIEW REAR VIEW** .31 (8.0) -.31 (8.0) 79 PUSHBUTTON 79 (20.0) 00 (20.0)LEDS SIDE VIEW -1.38 (35.0) -.07 (1.8) .87 (22.0) - .17 (4.2) .12 (3.0) PVC-COVERED CABLE (+)(SEE WIRE OPTIONS) (18.0)(+)MOUNTING NUT (SUPPLIED) .55 (14.0) M12 X 1 MOUNTING HOLES (2), THREAD Ø.13 (Ø3.2), FOR SIDE MOUNTING

SET-UP AND INSTALLATION USING THE PHOTOELECTRIC LED INDICATORS

The photoelectric has two bright LEDs; both are visible from the back, and each is visible from one side of the sensor. They indicate the following:

Green steady: Power ON

Amber steady: Light sensed

Green flashing rapidly 5 times: Maximum gain

Single green flash: Push button "click" registered, gain reduced by one increment

Amber/Green alternating: Minimum gain (can not reduce further)

SETTING SENSITIVITY

The unit features an extremely simple method for setting sensitivity (gain). Simply hold the push button until the LED flashes rapidly, 5 times. The sensor is automatically set to maximum gain.

Reduce gain by pressing the push button briefly ("clicking" it) up to 7 times; gain will reduce in single increments with each click. Amber and green LEDs alternate after the lowest setting is reached.

If the gain is accidentally set too low, hold the push button until gain increases to the maximum level, then click the push button down to the approrpriate level. Gain may be readjusted in this way at any time.



ORDERING INFORMATION

	DESCRIPTION	PART NUMBERS		
MODEL NO.	DESCRIPTION	w/ 2 Meter Cable	w/ Pico Connector	
RRMDC	Retroreflective DC Photo-Electric Sensor	RRMDC000	RRMDC001	
PRMDC	Proximity (Diffuse) DC Photo-Electric Sensor	PRMDC000	PRMDC001	
EMMDC	DC Emitter (Opposed Beam Pair)	EMMDC000	EMMDC001	
RCMDC	DC Receiver (Opposed Beam Pair)	RCMDC000 RCMDC001		
MB2	Bottom Mount Bracket Kit	MBM20000		
MB3	Side Mount Bracket Kit	MBM30000		
RT1	1-1/2" Dia. Prismatic Reflector (Model RRMDC)	RT100000		
RT2	3" Dia. Prismatic Reflector (Model RRMDC)	RT200000		
CCMPE	Pico-Style Quick Disconnect Connector & Cable, 2 meters	CCMPE000		

Do not dispose of unit in trash - Recycle





MOUNTING

Various mounting methods have been designed to simplify alignment and provide versatility in any industrial environment. The integral 12 mm threaded lense can be interchanged with existing threaded entries common to 12 mm barrel sensors and inductive proximity switches. The threaded lense can also be installed into panel thicknesses of 3/16" through a 0.51" diameter hole and tightened into place with the supplied mounting nut. Two #4 screw clearance through-holes on 0.55" centers are available for side mounting or side nesting of multiple units on 1/2" centers for scanning large areas or for code reading applications. Units may also be mounted using the stainless steel Bottom-Mount or Side-Mount Bracket Kits (Models MBM2 or MBM3). These brackets allow 2 axes of movement & greatly simplify alignment.





WIRING DIAGRAM





MODEL PT - PRESSURE TRANSMITTER



- COMPACT STAINLESS STEEL HOUSING
- M12 QUICK DISCONNECT
- EXCELLENT EMC RESISTANCE
- SHORT CIRCUIT AND REVERSE POLARITY PROTECTION
- **IP67 PROTECTION RATING**
- CERAMIC TECHNOLOGY THAT PROVIDES LONG TERM **RELIABLE OPERATION**

DESCRIPTION

The PT Series Pressure Transmitters are designed to provide accurate and dependable pressure measurement, even in the most demanding applications. The reliability of solid-state design and the durability of the stainless steel case are the cornerstone of their design.

Proven ceramic component technology allows long-term stability and high tolerance to overpressure conditions. The 4 to 20 mA output can easily be connect to any Red Lion process meter for monitoring and/or control. Short circuit and reverse polarity protection are built-in to the circuitry, further enhancing this pressure transmitters.

The transmitter housing is constructed of stainless steel and provides an IP 67 level of protection. The fluid connection is a standard G 1/4 thread, while the electrical connection is a M12 connector.

Additional pressure ranges and accessories are available on special request, contact the factory for more details.

SAFETY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



DIMENSIONS In inches (mm)



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	BAR	PSI	PART NUMBER
PT	2 Wire Relative Pressure Transmitter	0 - 1	0 - 14.5	PT00001R
		0 - 1.6	0 - 23.2	PT00002R
		0 - 10	0 - 145	PT00010R
		0 - 250	0 - 3625	PT00250R
ССМ	4 Wire 22 AWG unshielded 2 meter cable/ connector			CCM12U02



Do not dispose of unit in trash - Recycle

SPECIFICATIONS

- 1. ACCURACY: ≤0.3% Full Scale
- 2. MEDIUM TEMPERATURE: -40°F to + 302°F (-40°C to +150°C)
- 3. OPERATING VOLTAGE: 8 to 33 VDC
- 4. OUTPUT: 4 to 20 mA
- 5. CURRENT CONSUMPTION: ≤20 mA
- 6. DYNAMIC RESPONSE: < 2 msec
- 7. SHORT CIRCUIT PROTECTION: Yes
- 8. REVERSE POLARITY PROTECTION: Yes
- 9. DEGREE OF PROTECTION: IP 67
- 10. HOUSING MATERIAL: SST 1.4305 (AISI 303)
- 11. ELECTRICAL CONNECTION: M12x1
- 12. FLUID CONNECTION: G 1/4
- 13. SHOCK RESISTANCE: 75 G, 11 msec per IEC 68-2-27
- 14. VIBRATION RESISTANCE: 20 G, 15 mm per IEC 68-2-6

WIRING PINOUT AND SPECIFICATIONS



PT PIN	FUNCTION	WIRE COLOR
1	+VDC	BROWN
3	4-20 mA OUT	BLUE
4	N/C	_







MODEL TMP - FIELD CUTTABLE TEMPERATURE SENSOR PROBES and ACCESSORIES

- THERMOCOUPLE OR RTD
- 24" PROBE CUTTABLE TO 3.5"
- MEASURE TEMPERATURES UP TO 704 °C/1300 °F
- MOUNTING AND WIRING ACCESSORIES

GENERAL DESCRIPTION

Model TMP Thermocouple and RTD Temperature Probes are field cuttable to the desired length. The probes can be trimmed to within 3.5" (88.9 mm) of the probe tip allowing for greater application flexibility. Accessory hardware is available to wire and mount the probes in the user's existing thermowell.

Optional spring loaded fittings (sold separately) slide along the probe sheath to proper immersion depth as determined by the user. These fittings allow for strong contact between the probe and the thermowell to improve response.

SPECIFICATIONS

- 1. THERMOCOUPLE: Ungrounded J, K, T and E calibration available.
- 2. **RTD**: 3 Wire, 100Ω, Class "A" DIN Platinum per IEC751 (385 ALPHA) 3. **PROBE SHEATH**: 0.25" (6.35 mm)
- 5. PROBE SHEATH: 0.25" (0.55 mm
- 4. **PROBE LENGTH**: 24" (0.6 M) as supplied, can be field cut down to 3.5" (88.9 mm).
- 5. LEAD WIRE: 6" (152.4 mm) 24 gauge
- 6. **WIRE INSULATION**: Neoflon PFA, Fiberglass or High Temperature Glass. As specified by part number.

CUTTING THE TUBING

The thermocouple and RTD probes have a crimp mark located 3" (76.2 mm) from the tip. This indicates the end of the internal seal. Damage to the probe will occur if trimmed within 3.5" (88.9 mm) of the tip.

- 1. Determine the desired probe length and mark it with a pen or marker. Secure the probe within a tube vice being careful not to deform or flatten the probe.
- "Score" the tubing with a tubing cutter. Make one or two revolutions with the cutter. Do not cut completely through the tubing to prevent burrs or a sharp lip on the inside of the tubing.
- 3. Use a pair of pliers to grasp the excess tubing to be removed.



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- 4. Use a narrow range of motion to slowly work the excess tubing from side to side until it separates from the probe. Using a wide range of motion will deform the tube and prevent installation of the tube sleeve.
- 5. Remove the excess tubing and trim the leads to the desired length.
- 6. Install the tube sleeve in the open end of the tube to protect the leads from any sharp edges on the inside of the tube.



TMPXXXXX TMPACC01 (One tube sleeve is included with each probe.)

INSTALLATION

- 1. Orient the probe and the spring loaded fitting as shown above.
- 2. Screw the spring loaded fitting one complete turn into the thermowell (not included).
- 3. Push the probe into the fitting until it touches the bottom of the thermowell.
- 4. Hold the probe to the bottom of the thermowell and tighten the fitting. This
- ensures good contact between the probe and the bottom of the thermowell.
- 5. Completely tighten the fitting into the thermowell.
- *Note: The probe must be inserted only as shown above to prevent damage to the fitting.*

If it becomes necessary to separate the probe and the fitting, first disconnect the wires and then unscrew the fitting completely from the thermowell. Pull the probe through the fitting from the end that was screwed into the thermowell. The fitting will present resistance to the probe removal if you attempt to go in the wrong direction.

MODEL NO.	DESCRIPTION	TYPE	WIRE COLOR	WIRE INSULATION	TEMPERATURE RANGE	PART NUMBER
		J	White (+)	Neoflon PFA	0 to 260 °C / 32 to 500 °F	TMPJ2SU1
				Fiberglass	0 to 370 °C / 32 to 700 °F	TMPJ2SU2
				High Temp Glass	0 to 370 °C / 32 to 700 °F	TMPJ2SU3
				Neoflon PFA	-200 to 260 °C / -328 to 500 °F	TMPK2SU1
TMP		к	Yellow (+) Red (-)	Fiberglass	-200 to 482 °C / -328 to 900 °F	TMPK2SU2
	TC Probe			High Temp Glass	-200 to 704 °C / -328 to 1300 °F	TMPK2SU3
		Т	Blue (+) Red (-)	Neoflon PFA	-200 to 200 °C / -328 to 400 °F	TMPT2SU1
			Violet (+) Red (-)	Neoflon PFA	-200 to 260 °C / -328 to 500 °F	TMPE2SU1
		E		Fiberglass	-200 to 430 °C / -328 to 800 °F	TMPE2SU2
				High Temp Glass	-200 to 430 °C / -328 to 800 °F	TMPE2SU3
	RTD Probe	Proha 205 tt Neoflon PFA -200 to 260 °C	-200 to 260 °C / -328 to 500 °F	TMPA2S01		
		RID Probe	365		Fiberglass	-200 to 600 °C / -328 to 1112 °F

** RTDs do not have color standard. Excitation and Signal+ are the same color. Signal common is the odd color.

ORDERING INFORMATION

1-717-767-6511

ACCESSORIES (sold separately)

Weatherproof Heads:

Cast Aluminum Protects against dust, rain, splashing, and hose directed water Weatherproof gasket Stainless steel chain



Terminal Blocks

2-Terminal for use with TCs



4-Terminal for use with RTDs



Spring Loaded Fittings: Connects probe to thermowell and attaches

to weatherhead 1/2" NPT X 1/2" NPT Stainless Steel.



Tube Sleeve

Tube sleeve to protect probe leads from burrs after cutting probe.

	Ц	
Т	1	MPACC03

ACCESSORIES (All accessories are sold separately)

MODEL NO.	DESCRIPTION	PART NUMBER
TMPACC	Spring Loaded Fitting	TMPACC01
	Cast Aluminum Weatherproof Head	TMPACC02
	Spare Tube Sleeve	TMPACC03
	2-Terminal Block (for TCs)	TMPACC04
	4-Terminal Block (for RTDs)	TMPACC05

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MODELS TMPC, TMPU, & TMPB THERMOCOUPLES



MODEL TMPC - HIGH TEMPERATURE THERMOCOUPLE

GENERAL DESCRIPTION

The model TMPC thermocouple is double-protected with abrasion resistant Inconel overbraid with high temperature ceramic fiber insulation. A temperature rating of up to 980 °C (1796 °F) continuous service and 1090 °C (1994 °F) shortterm service makes these probes ideal for many high temperature measurement applications. Ideal applications include profiling ovens and furnaces.



- Flexible and Abrasion Resistant
- Smooth, rounded tip on "hot" side
- Male high temperature standard size ceramic connector on "cold" side

SPECIFICATIONS

- 1. WIRE: 20 AWG, 10 feet in length; standard limits of error
- 2. INSULATION: Nextel[®] ceramic fiber. (Not to be exported) *
- 3. **TEMPERATURE**: 980 °C (1796 °F) continuous 1090 °C (1994 °F) short-term service depending on TC type
- 4. **CONNECTOR**: High temperature ceramic standard size style connector -29 to 650 °C (-20 to 1202 °F)
- 5. **PROBE**: Grounded TC junction with Inconel overbraid welded to form a smooth, round tip

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER	
TMPC	Type K OVERBRAIDED CERAMIC TC	TMPKCF01	

* Nextel can not be exported. Consult factory for available options.



Do not dispose of unit in trash - Recycle

1-717-767-6511



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MODEL TMPU - UTILITY THERMOCOUPLES

GENERAL DESCRIPTION

Utility thermocouple probes are basic products for temperature measurement. They are typically connected to a hand held thermometer. The unit features a rugged handle that is permanently molded to a probe sheath. A retractable cable is connected with strain relief to the handle end, and termination is provided by a miniature male connector.



* For connector information see the TMPCNM01 bulletin.

- RETRACTABLE CABLE WITH SUPERIOR MEMORY
- MINIATURE CONNECTOR FOR USE WITH HAND HELD THERMOMETERS
- MOLDED HANDLE RATED TO 220 °C (428 °F)
- MEETS OR EXCEEDS SLE AND EN 60584-2: TOLERANCE CLASS 1

SPECIFICATIONS

- 1. HANDLE TEMPERATURE RATING: 220 °C (428 °F)
- 2. THERMOCOUPLE JUNCTION: Grounded
- 3. CABLE LENGTH: 1 foot, expands to 5 feet
- 4. **PROBE LENGTH**: 12 inches
- 5. MAX PROBE TEMPERATURE: 304SS: 900 °C (1652 °F) Inconel: 1150 °C (2102 °F)

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION	TC ANSI TYPE	SHEATH MATERIAL	SHEATH DIAMETER	CABLE LENGTH	TC JUNCTION	PART NUMBER
TMPU -	TC HANDLE PROBE	к	304 SS	.125	1' EXPANDS TO 5'	GROUNDED	TMPKUT01
	TC HANDLE PROBE	к	INCONEL 600	.125	1' EXPANDS TO 5'	GROUNDED	TMPKUT02



Do not dispose of unit in trash - Recycle

MODEL TMPB - SPRING LOADED COMPRESSION FITTING THERMOCOUPLES

GENERAL DESCRIPTION

The spring-loaded compression fitting thermocouple is ideally suited for measuring plastic processing machinery temperatures at the crosshead, die or barrel. It has a 5 foot stainless steel cable, with a 3/16" sheath diameter and a brass compression fitting with 1/8" NPT.



- IDEAL FOR EXTRUDERS/MOLDING AND MACHINE PROCESS TEMPERATURE
- COLD END TERMINATION IS HIGH TEMPERATURE NICKEL ZINC FERRITE CORE STANDARD MALE CONNECTOR
- STANDARD MALE CONNECTOR IS DESIGNED FOR SUPPRESSION OF ELECTROMAGNETIC INTERFERENCE

SPECIFICATIONS

- 1. THERMOCOUPLE JUNCTION: Type K, grounded
- 2. CABLE: 5 feet, 0.188 dia. stainless steel
- CONNECTOR SPECIFICATIONS: Extra heavy duty solid male pin male connector

Case Material: High temperature liquid crystal polymer (LCP) Temperature ratings:

- Ferrite core effectiveness: 120° C (248° F)
- LCP Material: 260° C (500° F)
- Impedance: (±20%): 35 ohms @ 25 MHz 70 ohms @ 100 MHz

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION	PART NUMBER
ТМРВ	COMPRESSION TC ASSEMBLY	TMPKBT01

- 1

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Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com
QUICK DISCONNECT TEMPERATURE PROBES AND ACCESSORIES

MODEL TMP - QUICK DISCONNECT TEMPERATURE PROBES



GENERAL DESCRIPTION

Model TMP Quick Disconnect Thermocouples are available with both miniature and standard size connector termination. These rugged probes feature a variety of calibration types, sheath materials and diameters, and are available with an ungrounded junction. A high temperature probe is also available that can be mated with a standard female universal connector. All temperature probes are rated at the tolerance standard SLE, (Special Limits Of Error), which is ± 2 °C degrees of error.

SPECIFICATIONS

- 1. **SHEATH**: Constructed of 304 stainless steel, Inconel 600, or XL (High Temperature Probe only)
- 2. SHEATH DIAMETER: 1/16" or 1/8"
- 3. PROBE LENGTH: 12" Ungrounded junction.
- 4. CONNECTOR BODY: Glass Filled Nylon, rated to 220 °C.
- 5. WIRE: Sold separately, see accessory details



ORDERING INFORMATION

DESCRIPTION	ANSI TYPE TC	SHEATH MATERIAL	SHEATH DIAMETER INCHES	PART NUMBER
	J	304SS	1/16	TMPJQD01
MINI QUICK DISCONNNECT TC PROBE W/ MOLDED	к	304SS	1/16	TMPKQD01
	Т	304SS	1/16	TMPTQD01
	E	304SS	1/16	TMPEQD01
	J	INCONEL 600	1/16	TMPJQD02
CONN	К	INCONEL 600	1/16	TMPKQD02
	Т	INCONEL 600	1/16	TMPTQD02
	E	INCONEL 600	1/16	TMPEQD02
	J	304SS	1/8	TMPJQD03
	К	304SS	1/8	TMPKQD03
	T 304SS	1/8	TMPTQD03	
QUICK	Е	304SS	1/8	TMPEQD03
DISCONNNECT TC PROBE	J	INCONEL 600	1/8	TMPJQD04
W/ MOLDED CONN	К	INCONEL 600	1/8	TMPKQD04
	Т	INCONEL 600	1/8	TMPTQD04
	Е	INCONEL 600	1/8	TMPEQD04
	К	XL	1/8	*TMPKQD05

• MATING FEMALE CONNECTOR (with "write on label") AND PLCM

 * XL probes have a very low drift and are for use in high temperature applications up to 1335 °C.



Do not dispose of unit in trash - Recycle

WIRING

MODEL TMWS - THERMOCOUPLE WIRE

GENERAL DESCRIPTION

Thermocouple wire is for use with the Mini and Standard Quick Disconnect Temperature Probes. It is available in a variety of insulation and calibration types, and spool lengths.

SPECIFICATIONS

Ι

- 1. WIRE LENGTH: 25 or 100 Foot Spools
- 2. INSULATION: Duplex Insulated
- 3. TYPE: 24 AWG Solid Wire
- 4. COLOR CODE: ANSI color codes

ANSI TYPE	POSITIVE	NEGATIVE	JACKET
J	WHITE	WHITE RED	
К	YELLOW	RED	BROWN
Т	BLUE	RED	BROWN
E	PURPLE	RED	BROWN



ORDERING INFORMATION

DESCRIPTION	ANSI TYPE	MAX TEMP		INSULATION TYPE	NOMINAL SIZE (IN.)	PART NUMBER
		°C	°F			
	J	260	500	NEOFLON PFA	.056 X .093	TMWSJ100
	К	260	500	NEOFLON PFA	.056 X .093	TMWSK100
WIRE 100' SPL	Т	200	400	NEOFLON PFA	.056 X .092	TMWST100
	E	260	500	NEOFLON PFA	.056 X .092	TMWSE100
	J	370	700	GLASS BRAID	.050 X .085	TMWGJ100
	К	482	900	GLASS BRAID	.050 X .080	TMWGK100
	Т	200	400	GLASS BRAID	.050 X .080	TMWGT100
	Е	430	800	GLASS BRAID	.050 X .080	TMWGE100
	J	260	500	NEOFLON PFA	.056 X .093	TMWSJ025
	К	260	500	NEOFLON PFA	.056 X .093	TMWSK025
	Т	200	400	NEOFLON PFA	.056 X .092	TMWST025
WIRE	E	260	500	NEOFLON PFA	.056 X .092	TMWSE025
25' SPL	J	370	700	GLASS BRAID	.050 X .085	TMWGJ025
	К	482	900	GLASS BRAID	.050 X .080	TMWGK025
	Т	200	400	GLASS BRAID	.050 X .080	TMWGT025
	E	430	800	GLASS BRAID	.050 X .080	TMWGE025

Do not dispose of unit in trash - Recycle

MODEL TMPCB - RETRACTABLE SENSOR CABLES

GENERAL DESCRIPTION

The retractable sensor cables are color coded and for use with thermocouples. The cables have a superior jacket construction, employing the latest in jacketing material: TPE (thermoplastic elastomer), a unique family of thermoplastics which exhibits characteristics previously found only in rubber compounds. TPE is extremely tough and flexible, and has excellent abrasion resistance. This special construction technique yields an expansion rate of up to 500%. These retractable cables are for use with electronic type indicators, either panel, handheld or bench type models.

ORDERING INFORMATION

DESCRIPTION	TYPE	JACKET	+WIRE	-WIRE	PART NUMBER
2 FT RETRACT CABLE	J	BLACK	WHITE	RED	TMPCBS01
	к	YELLOW	YELLOW	RED	TMPCBS02
	Т	BLUE	BLUE	RED	TMPCBS03
	E	PURPLE	PURPLE	RED	TMPCBS04



Do not dispose of unit in trash - Recycle

- COMPATIBLE WITH J, K, T AND E THERMOCOUPLE CALIBRATIONS
- EXPANSION RATIO UP TO 500% 1 Ft (300 mm) OF CABLE STRETCHES TO 5 Ft (1500 mm)
- IDEAL FOR USE WITH HANDHELD AND BENCH STAND ELECTRONIC INDICATORS
- BARE WIRE ENDS

SPECIFICATIONS

- 1. INSULATION: TPE Thermoplastic Elastomer outer jacket
- 2. INNER CONDUCTORS: Neoflon PFA
- 3. CALIBRATIONS: J, K, T, E
- THERMOCOUPLE WIRE CONFORMITY: SLE Standard limit of error per ANSI MC 96.1 (1975)
- 5. TEMPERATURE RATING: -30 to 105 °C (-22 to 220 °F)
- 6. CONSTRUCTION: 28 AWG stranded wire (7 strand x 36 gauge)
- 7. LENGTH: 2 feet (600 mm)

ACCESSORIES

MODEL TMPCN - QUICK DISCONNECT STANDARD CONNECTORS

GENERAL DESCRIPTION

Standard Connectors are for use with the Standard Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification. The female standard connector is a universal connector, meaning it can be used to terminate male versions of both the standard and miniature connector.



SPECIFICATIONS

- 1. CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220 °C (-20 to 428 °F).
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 14 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws

ORDERING INFORMATION

DESCRIPTION	TYPE	TERMINATION	PART NUMBER
STANDARD	K	MALE	TMPCNS01
	ĸ	FEMALE	TMPCNS02
	т	MALE	TMPCNS03
	1	FEMALE	TMPCNS04
CONNECTOR	_	MALE	TMPCNS05
	E	FEMALE	TMPCNS06
		MALE	TMPCNS07
	J	FEMALE	TMPCNS08

Covered by US and Foreign Patents.



Do not dispose of unit in trash - Recycle

MODEL TMPCN - QUICK DISCONNECT MINIATURE CONNECTORS

0.194 (4.9) WIRE HOLE

1.00 (25.4)

FEMALE

 \bigcirc

0.28 (7.1)

0.03 (0.8)

0.13 (3.3)

0.31 (7.9)

GENERAL DESCRIPTION

8

0.10

0.19 (4.8)

(2.5) DIA.

0.09 (2.3)

0.13 (3.3) 0.31 (7.9) ſ®

֥

_0.66

MALE

DIMENSIONS In inches (mm)

0.81 (20.6)

0.50 (12.7)

Miniature Connectors are for use with the Miniature Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification.



- 1. CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220 °C (-20 to 428 °F).
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 20 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws

ORDERING INFORMATION

DESCRIPTION	TYPE	TERMINATION	PART NUMBER
	K	MALE	TMPCNM01
	ĸ	FEMALE	TMPCNM02
	т	MALE	TMPCNM03
MINIATURE	I	FEMALE	TMPCNM04
CONNECTOR	_	MALE	TMPCNM05
		FEMALE	TMPCNM06
		MALE	TMPCNM07
	J	FEMALE	TMPCNM08

Covered by US and Foreign Patents.



1-717-767-6511

TRANSITION JOINT PROBES AND ACCESSORIES

MODEL TMP - TRANSITION JOINT PROBES

- CHOICE OF 304 SS, INCONEL 600 OR XL SHEATH
- STRIPPED BARE WIRE ENDS
- XL HIGH TEMPERATURE PROBE AVAILABLE
- EASILY ATTACHES TO STANDARD AND MINI STYLE CONNECTORS (SEE ACCESSORIES)
- MEETS OR EXCEEDS SLE AND EN 60584-2: TOLERANCE CLASS 1

GENERAL DESCRIPTION

Model TMPTJ transition joint probes are rugged temperature probes that feature a spring strain relief at the "cold" end of the probe that prevents pinching of the thermocouple wire that can occur in certain applications. These versatile probes come in a variety of sheath diameters and materials. The probes are standard 12" long transitioning to 40" of wire with exposed leads.

SPECIFICATIONS

- 1. **SHEATH**: Constructed of 304 stainless steel, Inconel 600, or XL (High Temperature Probe)
- 2. SHEATH DIAMETER: 1/16" or 1/8"
- 3. PROBE LENGTH: 12" Ungrounded junction.
- 4. CONNECTOR BODY: Glass Filled Nylon, rated to 260 °C.
- 5. WIRE INSULATION: Neoflon PFA
- 6. LEAD LENGTH: 40" (1 meter) with stripped ends



Note: Probe supplied with 1M (40") cable

ORDERING INFORMATION

DESCRIPTION	ANSI TYPE TC	SHEATH MATERIAL	SHEATH DIAMETER INCHES	UPPER TEMP GUIDELINES °C (°F) TC JUNCTION	PART NUMBER
	к	INCONEL 600	1/16	921 (1690)	TMPKTJ01
	к	INCONEL 600	1/8	1071 (1960)	TMPKTJ02
TRANSITION JOINT PROBES	к	304 SS	1/16	899 (1650)	TMPKTJ03
	к	304 SS	1/8	899 (1650)	TMPKTJ04
	к	XL	1/8	1038 (1900)	TMPKTJ05
	к	XL	1/16	1149 (2100)	TMPKTJ06

 * XL probes have a very low drift and are for use in high temperature applications up to 1335 °C.



Do not dispose of unit in trash - Recycle

ACCESSORIES

MODEL TMPCN - QUICK DISCONNECT STANDARD CONNECTORS

GENERAL DESCRIPTION

Standard Connectors are for use with the Standard Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification. The female standard connector is a universal connector, meaning it can be used to terminate male versions of both the standard and miniature connector.



SPECIFICATIONS

- 1. **CONNECTOR BODY MATERIAL**: Glass Filled Nylon, for temperature ranges of -29 to 220° C. (-20 to 428 °F)
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 14 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws

ORDERING INFORMATION

V V	MALE	TMPCNS01
ĸ	FEMALE	TMPCNS02
Ŧ	MALE	TMPCNS03
I	FEMALE	TMPCNS04
_	MALE	TMPCNS05
E	FEMALE	TMPCNS06
	MALE	TMPCNS07
J	FEMALE	TMPCNS08
	K T E J	K FEMALE T MALE FEMALE E MALE FEMALE J MALE FEMALE

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MODEL TMPCN - QUICK DISCONNECT MINIATURE CONNECTORS

GENERAL DESCRIPTION

Miniature Connectors are for use with the Miniature Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification.

SPECIFICATIONS

- CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220° C. (-20 to 428 °F)
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 20 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws



ORDERING INFORMATION

DESCRIPTION	TYPE	TERMINATION	PART NUMBER
	K	MALE	TMPCNM01
	ĸ	FEMALE	TMPCNM02
	т	MALE	TMPCNM03
MINIATURE CONNECTOR	I	FEMALE	TMPCNM04
	F	MALE	TMPCNM05
		FEMALE	TMPCNM06
	J	MALE	TMPCNM07
		FEMALE	TMPCNM08

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MODEL TMPRT - SURFACE MOUNT AND PIPE PLUG RTD SENSORS



MODEL TMPRT - ADVANCED DESIGN SURFACE MOUNT RTD SENSOR

GENERAL DESCRIPTION

Model TMPRT "stick-on" style RTD temperature sensor mounts on flat surfaces and provides Class B accuracy for critical monitoring applications. Based on a bare 2 X 2 X 0.08 mm thin film platinum RTD, the unit is supplied in a Neoflon PFA insulated configuration and can be easily applied using its self-adhesive backing. Some of the applications of this versatile RTD sensor include monitoring chip, heat sink, and environmental temperatures in electronic devices; checking piping or ducting temperatures; monitoring motor and transformer core heat; testing insulation capabilities, as well as checking other applications in which surface and/or gradient temperatures need to be monitored and controlled.

SPECIFICATIONS

- 1. MINIMUM/MAXIMUM TEMPERATURE:
- -73 °C (-100 °F) to 260 °C (500 °F) continuous
- 2. SENSING ELEMENT: 100Ω at 0 °C (32 °F)
- Temperature coefficient of 0.00385 $\Omega/\Omega/^{\circ}C$ (IEC60751)
- 3. ACCURACY: ± 0.12% at 0 °C (DIN Class B)
- 4. **RESPONSE TIME**: Less than 0.9 sec (63% response time in water flowing at 3 feet per second), less than 2 sec response time on a hot plate.
- 5. **LEAD WIRE**:10 foot 26 AWG stranded nickel plated copper, Neoflon PFAinsulated and jacket cable
- 6. ADHESIVE PAD DIMENSIONS: 1 x 3/4 " (25 X 19 mm)

- 100 Ω DIN CLASS B (± 0.12 % AT 0 °C) ACCURACY STANDARD
- EASY-INSTALLATION SILICONE BASED, SELF BACKING RATED TO 260 °C (500 °F)
- SENSOR CAN BE REAPPLIED
- STRIPPED 3 WIRE LEADS (CONNECTORS SOLD SEPARATELY)
- 10 FOOT LEAD LENGTH
- IDEAL FOR FLAT OR CURVED SURFACES



MODEL NO.	DESCRIPTION	INSULATION TYPE	TERMINATION (COLD SIDE)	CABLE LENGTH (IN FEET)	PART NUMBER
TMPRT	SMT RTD	NEOFLON PFA	Stripped Wire Bare Ends	10	TMPRT001

MODEL TMPRT - PIPE PLUG RTD SENSOR

GENERAL DESCRIPTION

The pipe plug RTD sensor is a unit specially designed for use in pressure vessel applications. Its 3 wire construction provides connectivity to most hand held instruments with Red/Red/White per IE/ASTM-E-1137. The unit features a high accuracy 100 Ω Class A DIN platinum element and steel braided, Neoflon PFA insulated wires for the necessary durability and protection demanded by harsher environments.

SPECIFICATIONS

- 1. WIRE: 6' long 26 AWG insulated Neoflon PFA
- 2. MAX TEMPERATURE: 230 °C (450 °F)
- 3. TERMINATION: Stripped bare wire ends
- 4. OVERBRAID: Stainless Steel
- 5. THREADS: 1/4" NPT
- 6. SENSING ELEMENT END DIAMETER: 0.24" (6mm)



ORDERING INFORMATION

BAR (2500 PSI) MAXIMUM

(ALPHA = 0.00385) • STRAIN RELIEF SPRING

• 6 MM (0.24") DIAMETER, SST PROBE

MODEL NO.	DESCRIPTION	CABLE LENGTH (IN FEET)	TERMINATION (COLD SIDE)	PART NUMBER
TMPRT	Pipe Plug RTD Sensor	6'	Stripped Bare Wire Ends	TMPRT002

IDEAL FOR USE IN PRESSURE VESSEL APPLICATIONS, 172

STEEL BRAIDED, NEOFLON PFA INSULATED LEAD WIRES

HIGH ACCURACY 100 Ω CLASS A DIN PLATINUM ELEMENT

MODEL TMPCN - RTD PROBE CONNECTORS

GENERAL DESCRIPTION

RTD Mini Connectors are for use with RTD probes. They are miniature size, and are available in both male and female termination.

SPECIFICATIONS

- CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220 °C.
- 2. CONNECTOR BODY COLOR: White
- 3. WIRE GAGE: Accepts stranded or solid wire up to 20 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws
- 5. CONNECTOR ENDS: Copper



MODEL NO.	DESCRIPTION		TERMINATION	PART NUMBER
TMDCN	RTD Miniature Male Connector	U	Male	TMPCNM09
IMPCN	RTD Miniature Female Connector	U	Female	TMPCNM10

MODELS TMPT AND TMPTR - THERMOCOUPLE OR RTD CONNECTOR WITH BUILT IN 4-20 mA TEMPERATURE TRANSMITTER



• HIGH ACCURACY, REPEATABILITY AND STABILITY

- CONNECTOR DESIGN CONVERTS INPUT SIGNAL TO A STANDARD 2-WIRE, 4-20 mA OUTPUT
- PROVIDES "OPEN SENSOR WIRE" SIGNAL INDICATION
- ENCAPSULATED HOUSING
- COMPENSATES FOR LONG LEAD WIRES
- FACTORY CALIBRATED, NO ADJUSTMENTS REQUIRED
- MODELS FOR J, K, T (UNGROUNDED) THERMOCOUPLES AND 100 OHM, 0.00385 3-WIRE RTD'S

GENERAL DESCRIPTION

The model TMPT's internal circuitry conditions the non-linear millivolt output of a thermocouple, across a specified temperature range, and retransmits it as a standard 2-wire 4–20 mA analog output. The TMPTR also provides a 2-wire 4–20 mA output by conditioning the resistive change of a 100 Ω , 0.00385 RTD sensor and transmitting it as a 4–20 mA output.

SPECIFICATIONS

TMPT SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 9 to 24 VDC @ 30 mA
- 2. OUTPUT: 4 to 20 mA
- 3. TEMPERATURE RANGE: See Ordering Information
- 4. ACCURACY: \pm 0.5% of full scale millivolt input @ 23° C plus the nonlinearity of the thermocouple type (note that the TMPT does not compensate for thermocouple non-linearity)
- 5. TEMPERATURE COEFFICIENT: ± 0.002 mA/°C
- 6. MAX LOOP LOAD: $(\Omega) = (V \text{ supply 9 } V)/0.02 \text{ A}$
- 7. TRANSMITTER OPERATING TEMPERATURE: -40° to 85°C
- 8. AGENCY APPROVAL: CE
- 9. **RESPONSE TIME**: 120 msec (0 to 63% FS)
- 10. THERMOCOUPLE JUNCTION: Ungrounded
- 11. **INPUT CONNECTION:** Standard size female connector mates with both standard and miniature male connectors.
- 12. CABLE CONNECTIONS: 10 foot 2-wire shielded cable

WIRE COLOR CODE	FUNCTION
RED	+VDC
BLACK	OUTPUT
WHITE	SHIELD

* Max cable run is determined by max loop load and wire resistance (≈1000ft).



TMPTR SPECIFICATIONS

- 1. SUPPLY VOLTAGE: 9 to 24 VDC @ 30 mA
- 2. OUTPUT: 4 to 20 mA
- 3. TEMPERATURE RANGE: 2 569° C (36 1056° F)
- 4. **INPUT**: 3 wire, PT100 ($\alpha = 0.00385$)
- 5. OPEN SENSOR WIRE INDICATION:
 - Leg 1: Open = 27 mA
 - Leg 2: Open = 2.2 mA
 - Leg 3: Open = 2.2 mA
- INPUT CONNECTION: 3 prong minature connector mates with TMPCNM09
- 7. CABLE CONNECTIONS: 10 foot 2-wire shielded cable

WIRE COLOR CODE	FUNCTION
RED	+VDC
BLACK	OUTPUT
WHITE	SHIELD

* Max cable run is determined by max loop load and wire resistance (≈1000ft).



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WIRING CONNECTION



ORDERING INFORMATION

MODEL NO.	DESCRIPTION	TC ANSI TYPE	TEMPERATURE RANGE	PART NUMBER
	TC TRANSMITTER WITH FEMALE CONNECTOR	К	-18 to 1093 °C (0 to 2000 °F)	TMPTRN01
		К	-18 to 538 °C (0 to 1000 °F)	TMPTRN02
тирт		Т	-18 to 121 °C (0 to 250 °F)	TMPTRN03
		Т	-18 to 399 °C (0 to 750 °F)	TMPTRN04
		J	-18 to 121 °C (0 to 250 °F)	TMPTRN05
		J	-18 to 538 °C (0 to 1000 °F)	TMPTRN06
TMPTR	RTD TRANSMITTER WITH FEMALE CONNECTOR	-	2 to 569 °C (36 to 1056 °F)	TMPTRN07

Covered by US and Foreign Patents.

ACCESSORIES

MODEL TMPCN - QUICK DISCONNECT STANDARD CONNECTORS

GENERAL DESCRIPTION

Standard Connectors are for use with the Standard Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification. The female standard connector is a universal connector, meaning it can be used to terminate male versions of both the standard and miniature connector.



SPECIFICATIONS

- 1. CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220° C. (-20 to 428 °F)
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 14 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws

ORDERING INFORMATION

DESCRIPTION	TYPE	TERMINATION	PART NUMBER
	K	MALE	TMPCNS01
	ĸ	FEMALE	TMPCNS02
	т	MALE	TMPCNS03
STANDARD	I	FEMALE	TMPCNS04
CONNECTOR	E	MALE	TMPCNS05
		FEMALE	TMPCNS06
		MALE	TMPCNS07
	J	FEMALE	TMPCNS08

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MODEL TMPCN - QUICK DISCONNECT MINIATURE CONNECTORS

GENERAL DESCRIPTION

Miniature Connectors are for use with the Miniature Quick Disconnect TC Probes. They are available in both male and female termination, and include a "write on label" for easy identification.

SPECIFICATIONS

- 1. CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220° C. (-20 to 428 °F)
- 2. CONNECTOR BODY COLOR: ANSI color coded
- 3. WIRE GAGE: Accepts stranded or solid wire up to 20 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws



ORDERING INFORMATION

DESCRIPTION	TYPE	TERMINATION	PART NUMBER
	K	MALE	TMPCNM01
	ĸ	FEMALE	TMPCNM02
MINIATURE	Ŧ	MALE	TMPCNM03
	I	FEMALE	TMPCNM04
CONNECTOR	_	MALE	TMPCNM05
	E	FEMALE	TMPCNM06
	J	MALE	TMPCNM07
		FEMALE	TMPCNM08

MODEL TMPCN - RTD PROBE CONNECTORS

GENERAL DESCRIPTION

RTD Mini Connectors are for use with RTD probes. They are miniature size, and are available in both male and female termination.

SPECIFICATIONS

- CONNECTOR BODY MATERIAL: Glass Filled Nylon, for temperature ranges of -29 to 220 °C.
- 2. CONNECTOR BODY COLOR: White
- 3. WIRE GAGE: Accepts stranded or solid wire up to 20 AWG
- 4. WIRE TERMINATION: Combination Phillips/Slot Screws
- 5. CONNECTOR ENDS: Copper



MODEL NO.	O. DESCRIPTION		TERMINATION	PART NUMBER
TMDON	RTD Miniature Male Connector	U	Male	TMPCNM09
TIMECIN	RTD Miniature Female Connector	U	Female	TMPCNM10

MODEL CT - CURRENT TRANSFORMER



conductor passing once through the transformer opening. The ratio is reduced in multiples by looping the conductor through the opening. A transformer having a ratio 200:5 changes to a ratio of 100:5 if two loops are made through the transformer with the primary conductor. The ratio of the transformer will be 50:5 if four loops are made with the primary conductor, etc.

ORDERING INFORMATION

2.40

(61.0)

CURRENT	ACCURACY	VA 60 Hz	MAXIMUM OUTPUT WIRE DISTANCE BETWEEN CT AND METER				PART NUMBERS
RATIO	@ 60 Hz	BURDEN	18 AWG	16 AWG	14 AWG	12 AWG	
50:0.1	±5.0%	2.5	Wire distant current flow	ce is not an i . Wires may	ssue due to t be as long a	the low s needed.	CT005001
50:5	±3.0%	2.0	5.0 ft.	7.5 ft.	12 ft.	18 ft.	CT005050
200:5	±1.0%	4.0	10 ft.	17.5 ft.	28 ft.	43 ft.	CT020050

Do not dispose of unit in trash - Recycle



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MODEL CT004 - CURRENT TRANSFORMER



DESCRIPTION

The CT004 is intended for use with temperature controllers for monitoring heater current. The CT004 is suitable for general purpose AC current monitoring applications up to 40 Amps.

SPECIFICATIONS

- 1. CURRENT RATIO: 40:0.1A
- 2. MAX HEATER CURRENT: 50 A.
- 3. DIELECTRIC STRENGTH: 1000 VAC (For 1 minute)
- 4. VIBRATION RESISTANCE: 50 Hz (Approx. 10 G)
- 5. TERMINALS: Solder type
- 6. WINDOW DIAMETER: 0.228" (5.8 mm).
- 7. WEIGHT: 0.406 oz (11.5 g).
- Notes: Refer to the instruction manual of the temperature controller for connection information and max. heater current allowable by the temperature controller.

DIMENSIONS In inches (mm) -- 0.59 0.11 (2.8) (15) 0.029 (0.5) 0.29 (7.5) RED LION CONTROLS Ø0.23 (5.8) RATIO 40:0.1A 0.98 (25) ´+ 0.41 (10.5) ł 0.83 0.12 (3) (21) 2X Ø0.14 (3.5) 0.39 (10) (+)(+)- 1.18 (30) 1.57 (40)

ORDERING INFORMATION

MODEL NO.	CURRENT RATIO	PART NUMBER
CT004	40 : 0.1 A	CT004001



Do not dispose of unit in trash - Recycle

MODEL APSCM - DC CURRENT SHUNT



- 10 AND 100 AMP DC CURRENT SHUNTS
- CONVERTS DC CURRENT to DC MILLIVOLTS
- PROVIDES A 0 to 100 MILLIVOLT OUTPUT

DESCRIPTION

The APSCM current shunts accept signals over 2 Amp VDC and convert the output to a millivolt signal compatible with most standard DC meters. Two models are available; a 0 to 10 Amp and a 0 to 100 Amp version. Both models provide a 100 mVDC output proportional to the DC current input.



SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding literature, or on equipment, must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



SPECIFICATIONS

- **1. INPUT**: 10 or 100 Amps
- MAX CURRENT: 110% of rating, not recommetneed for continuous use at Maximum Amp rating.
- 3. TERMINALS:
 - Bolt Connections for Curent Input
- Screw Connections for Millivolt Output
- 4. WEIGHT: 1 lbs. (0.45 Kg)

ORDERING INFORMATION

DC RATIO	DESCRIPTION	PART NUMBER
10 A : 100 mV	10 Amp Current Shunt	APSCM010
100 A : 100 mV	100 Amp Current Shunt	APSCM100

927

MODEL CTD - DC CURRENT TRANSDUCER

- THREE JUMPER SELECTABLE INPUT RANGES
- OUTPUT IS MAGNETICALLY ISOLATED FROM THE INPUT
- INTERNAL POWER REGULATION

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SPLIT-CORE CASE FOR EASY INSTALLATION



GENERAL DESCRIPTION

CTD transducer combines a Hall Effect sensor and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space. The CTD has jumper selectable current input ranges and industry standard 4-20 mA output with a split-core case.





SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

SPECIFICATIONS

- 1. OUTPUT SIGNAL: 4-20 mA
- 2. OUTPUT LIMIT: 23 mA
- 3. ACCURACY: 1.0% FS
- 4. REPEATABILITY: 1.0% FS
- 5. RESPONSE TIME: to 90% of step change 100 msec
- 6. FREQUENCY RANGE: DC
- 7. POWER SUPPLY: 22 26 VAC/VDC
- Power input and output signal are not isolated.
- 8. POWER CONSUMPTION: 2 VA
- 9. LOADING: 650Ω max.
- 10. ISOLATION VOLTAGE: 3 kV (monitored line to output)
- 11. LINEARITY: 0.75% FS
- 12. **CURRENT RANGES**: Three selectable Ranges: 0 50 A

0 - 75 A0 - 100 A

- 13. CASE: UL 94V-0 Flammability rated thermoplastic
- 14. ENVIRONMENTAL: -4 to 122 °F (-20 to 50 °C) 0-95% RH, non-condensing

INSTALLATION

Run wire to be monitored through opening in the sensor. Be sure the monitored current flows in the same direction as the arrow on the sensor. The arrow is just above the hinge, with the "+" symbol on the left, the "-" symbol on the right. The CTD transducers work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures. They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch (25.4 mm) distance between sensor and other magnetic devices.

Split-Core Versions

Press the tab in the direction as shown to open the sensor. After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.



KEEP SPLIT-CORE SENSORS CLEAN.

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.

OUTPUT WIRING

Connect control or monitoring wires to the sensor. Use up to 14 AWG copper wire and tighten terminals to 4 inch-pounds torque.

4-20mA:

The current loop is powered by the CTD Transducer. Maximum loop impedance is $650 \ \Omega$.



RANGE SELECT

CTD transducers feature field selectable ranges. The ranges are factory calibrated, eliminating time consuming and inaccurate field setting of zero or span.

- 1. Determine the normal operating amperage of your monitored circuit.
- Select the range that is equal to or slightly higher than the normal operating amperage.
- 3. Place the range jumper in the appropriate position.

TROUBLE SHOOTING

1. Output Signal Too Low

- A. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
- B. Power supply is inadequate. Check power supply. Make sure it is of sufficient voltage with all loads at maximum. CTD Series draw 2.0 VA.
 C. Output load too high. Check output load, be sure it is no more than 650 Ω.
- 2. Output Signal is always at maximum
- A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.

3. Sensor has no output

- A. Polarity is not properly matched. Check and correct wiring polarity
- B. Monitored load is not DC or is not on. Check that the monitored load is DC and that it is actually on.
- C.Split Core models: The core contact area may be dirty. Open the sensor and clean the contact area.

MODEL NO.	DESCRIPTION	PART NUMBERS
CTD	DC/DC, Split Case	CTD00000

MODEL CTL - AVERAGE RESPONDING AC CURRENT TRANSDUCERS

- AVERAGE RESPONDING OUTPUT: 0-10 VDC or 4-20 mA
- JUMPER SELECTABLE RANGES
- OUTPUT IS MAGNETICALLY ISOLATED FROM THE INPUT
- SPLIT-CORE AND FIXED-CORE CASES



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GENERAL DESCRIPTION

CTL Series transducers combine a current transformer and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space.

The CTL Series transducers have jumper selected current input ranges and industry standard 0-10 VDC or 4-20 mA outputs. The CTL Series is designed for application on "linear" or sinusoidal AC loads. Available in a split-core or solidcore case. Select the CTL Series for constant speed loads or On/Off loads.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.







SPECIFICATIONS

	0-10 VDC	4-20 mA
1. OUTPUT SIGNAL:	0-10 VDC	4-20 mA
2. OUTPUT LIMIT:	15 VDC	40 mA
3. FREQUENCY RANGE:	50-60 Hz	20-100 Hz
4. RESPONSE TIME:	100 msec	300 msec
5. ACCURACY:	1.0% FS	0.5% FS
6. POWER SUPPLY:	Self-powered	24 VDC Nominal, 40 VDC max.

6. POWER SUPPLY:

7. INPUT RANGES: (Jumper Selectable)

MODEL	PANCE	MAXIMUM			
WODEL	KANGE	Continuous	6 sec	1 sec	
	2 A	80 A	125 A	250 A	
CILUUS	5 A	100 A	125 A	250 A	
	10 A	80 A	125 A	250 A	
CTL050	20 A	110 A	150 A	300 A	
	50 A	175 A	215 A	400 A	
	100 A	200 A	300 A	600 A	
CTL200	150 A	300 A	450 A	800 A	
	200 A	400 A	500 A	1000 A	

8. ISOLATION VOLTAGE: 3 kV

9. CASE: UL 94V-0 Flammability rated thermoplastic

10. ENVIRONMENTAL: -4 to 122 °F (-20 to 50 °C)

0-95% RH. non-condensing

- 11. TORQUE RATINGS: 7 in-lbs on Fixed-core models; 9 in-lbs on Split-core models.
- 12. LISTING: UL 508 Industrial Control Equipment, CSA C22.2 No. 14-M95, and CE Certified.



www.redlion.net

Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

INSTALLATION

Run wire to be monitored through opening in the sensor. The CTL Series transducers work in the same environment as motors, contactors, heaters, pullboxes, and other electrical enclosures. They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch (25.4 mm) distance between sensor and other magnetic devices.

Split-Core Versions

Press the tab in the direction as shown to open the sensor. After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.



KEEP SPLIT-CORE SENSORS CLEAN.

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.

OUTPUT WIRING

Connect control or monitoring wires to the sensor. Use up to 14 AWG copper wire and tighten terminals to 7 inch-pounds torque for solid-core models and 9 inch-pounds torque for split-core models. Be sure the output load or loop power requirements are met (see diagram).

POWER SUPPLY





RANGE SELECT

CTL series transducers feature field selectable ranges. The ranges are factory calibrated, eliminating time consuming and inaccurate field setting of zero or span.

- Determine the normal operating amperage of your monitored circuit
 Select the range that is equal to or slightly higher than the normal operating
- amperage.
- 3. Place the range jumper in the appropriate position.

TROUBLE SHOOTING

0-10 VDC OUTPUT MODELS

1. Sensor Has No Output

- A. Polarity is not properly matched. Check and correct wiring polarity.
- B. Monitored load is not AC or is not on. Check that the monitored load is AC and that it is actually on.
- C. Split Core models: The core contact area may be dirty. Open the sensor and clean the contact area.

2. Output Signal Too Low

- A. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
- B. Output load too low. Check output load, be sure that it is at least 100K Ω and preferably 1 M Ω .
- C. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum. Sensed Amps = (Actual Amps) x (Number of Loops). Count loops on the inside of the aperture.

3. Output Signal Is Always At Maximum

A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.

4-20 mA OUTPUT MODELS

1. Sensor Has No Output

- A. Power supply is not properly sized. Check power supply voltage and current rating.
- B. Polarity is not properly matched. Check and correct wiring polarity
- C. Split Core models: The core contact area may be dirty. Open the sensor and clean the contact area.

2. Output Signal Too Low

- A. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
- B. The load current is not sinusoidal.
- C. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum. Sensed Amps = (Actual Amps) x (Number of Loops). Count loops on the inside of the aperture.

3. Sensor Is Always At 4 mA

A. Monitored load is not AC or is not on. Check that the monitored load is AC and that it is actually on.

4. Output Signal Is Always At 20 mA

A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.

MODEL NO.	DESCRIPTION	PART NUMBER
CTL005	2-5A / 4-20 mA, Split Case	CTL0052S
	10A-50 A / 10 VDC, Fixed Case	CTL0501F
CTL050	10A-50 A / 4-20 mA, Fixed Case	CTL0502F
	10A-50 A / 4-20 mA, Split Case	CTL0502S
	100A-200 A / 10 VDC, Fixed Case	CTL2001F
CTL200	100A-200 A / 4-20 mA, Fixed Case	CTL2002F
	100A-200 A / 4-20 mA, Split Case	CTL2002S

MODEL CTR - TRUE RMS AC CURRENT TRANSDUCER

CE

TRUE RMS OUTPUT

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- JUMPER SELECTABLE RANGES
- OUTPUT IS MAGNETICALLY ISOLATED FROM THE INPUT
- SPLIT-CORE CASE



GENERAL DESCRIPTION

CTR Series transducers combine a current transformer and a signal conditioner into a single package. This provides higher accuracy, lower wiring costs, easier installation and saves valuable panel space.

The CTR Series transducers are available in 4-20 mA output only. The CTR Series provides a "True RMS" output on distorted waveforms found on VFD or SCR outputs, and on linear loads in "noisy" power environments. Select the CTR Series for variable speed or SCR controlled loads.

The current waveform of a typical linear load is a pure sine wave. In VFD and SCR applications, however, output waveforms are rough approximations of a sine wave. There are numerous spikes and dips in each cycle. CTR transducers use a mathematical algorithm called "True RMS", that integrates the actual waveform over time. The output is the amperage component of the true power (heating value) of the AC current waveform. True RMS is the only way to accurately measure distorted AC waveforms.





SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.



SPECIFICATIONS

- 1. OUTPUT SIGNAL: 4 to 20 mA DC, loop-powered, True RMS
- 2. OUTPUT LIMIT: 23 mA
- 3. FREQUENCY RANGE: 10-400 Hz (All Waveforms)
- 4. **RESPONSE TIME**: to 90% of step change 600 msec
- 5. ACCURACY: 0.8% FS
- 6. POWER SUPPLY: 24 VDC Nominal, 40 VDC Max.
- 7. **INPUT RANGES**: (Jumper Selectable)

MODEL	RANGE	MAXIMUM		
		Continuous	6 sec	1 sec
CTR05	10 A	80 A	125 A	250 A
	20 A	110 A	150 A	300 A
	50 A	175 A	215 A	400 A
CTR2	100 A	200 A	300 A	600 A
	150 A	300 A	450 A	800 A
	200 A	400 A	500 A	1000 A

8. ISOLATION VOLTAGE: 3 kV

- 9. CASE: UL 94V-0 Flammability rated thermoplastic
- 10. ENVIRONMENTAL: -4 to 122 °F (-20 to 50 °C)
- 0-95% RH, non-condensing
- 11. TORQUE RATINGS: 9 in-lbs
- LISTING: UL 508 Industrial Control Equipment, CSA C22.2 No. 14-M95, and CE Certified.

INSTALLATION

Run wire to be monitored through opening in the sensor. Be sure the monitored current flows in the same direction as the arrow on the sensor. The CTR Series transducers work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures. They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch (25.4 mm) distance between sensor and other magnetic devices.

Split-Core Versions

Press the tab in the direction as shown to open the sensor. After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.



KEEP SPLIT-CORE SENSORS CLEAN.

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.

OUTPUT WIRING

Connect control or monitoring wires to the sensor. Use up to 14 AWG copper wire and tighten terminals to 9 inch-pounds torque. Be sure the output load or loop power requirements are met (see diagram).

METER

Connection Notes:

- Captive screw terminals.
- 14-22 AWG solid or stranded.
- Observe Polarity
- See label for ranges & jumper positions



RANGE SELECT

CTR series transducers feature field selectable ranges. The ranges are factory calibrated, eliminating time consuming and inaccurate field setting of zero or span.

- 1. Determine the normal operating amperage of your monitored circuit
- 2. Select the range that is equal to or slightly higher than the normal operating amperage.
- 3. Place the range jumper in the appropriate position.

TROUBLE SHOOTING

1. Sensor Has No Output

- A. Power supply is not properly sized. Check power supply voltage and current rating.
- B. Polarity is not properly matched. Check and correct wiring polarity.
- C. Split Core models: The core contact area may be dirty. Open the sensor and clean the contact area.

2. Output Signal Too Low

- A. The jumper may be set in a range that is too high for current being monitored. Move jumper to the correct range.
- B. Output load too high. Check output load, be sure that $V_{\rm L}$ does not exceed 40 VDC.
- C. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum. Sensed Amps = (Actual Amps) x (Number of Loops). Count loops on the inside of the aperture.

3. Output Signal Is Always At 4mA

A. Monitored load is not AC or is not on. Check that the monitored load is AC and that it is actually on.

4. Output Signal Is Always At 20mA

A. The jumper may be set in a range that is too low for current being monitored. Move jumper to the correct range.

MODEL NO.	DESCRIPTION	PART NUMBERS
CTR	50 A/4-20 mA, Split Case	CTR05000
	200 A/4-20 mA, Split Case	CTR20000

MODEL CTS - AC CURRENT OPERATED SWITCH

CE

- UNIVERSAL OUTPUT
- SELF-POWERED

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- EASILY ADJUSTABLE SETPOINT
- FIXED OR SPLIT-CORE CASE



GENERAL DESCRIPTION

CTS Series Transducers are self-powered, solid-state current-operated switches that trigger when the current level sensed through the aperature exceeds the adjusted setpoint. The solid state output contacts can switch AC or DC; this "universal" output makes them well suited for application in automation systems.

CTS Series Current Operated Switches combine a current transformer, signal conditioner and limit alarm into a single package for use in status monitoring or proof of operation applications. Offering an extended setpoint range of 1-150 A and universal, solid-state outputs, the self-powered CTS can be tailored to provide accurate and dependable digital indication of over-current conditions across a broad range of applications. Available in solid-core enclosure styles or in a split-core case to maximize ease of installation.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.







SPECIFICATIONS

- 1. POWER SUPPLY: None self powered
- 2. OUTPUT: Magnetically isolated normally open solid-state switch
- 3. OUTPUT RATING: 0.15A, 240 VAC/VDC
- 4. OFF STATE LEAKAGE: <10 µA
- 5. RESPONSE TIME: 120 msec
- 6. HYSTERESIS: Approx 5% of Setpoint
- 7. SETPOINT RANGES AND MAXIMUM AMPS:

MODEL	SETPOINT RANGE	MAXIMUM INPUT AMPS		
		Continuous	6 sec	1 sec
CTSF	Fixed-Core: 1 - 150 A	150 A	400 A	1000 A
CTSS	Split-Core: 1.75 - 150 A	150 A	400 A	1000 A
CTSG	Fixed-Core Go/No Go: 0.75 A max	250 A	400 A	1000 A

- 8. SETPOINT ADJUST: 4 Turn potentiometer (CTSS) 15 Turn Potentiometer (CTSF)
- 9. FREQUENCY RANGE: 6-100 Hz
- 10. ISOLATION VOLTAGE: UL Listed to 1,270 VAC. Tested to 5,000 VAC
- 11. CASE: UL 94V-0 Flammability rated thermoplastic
- 12. ENVIRONMENTAL: -58 to 149 °F (-50 to 65 °C)
- 0-95% RH, non-condensing
- 13. TORQUE RATINGS: 5 in-lbs
- LISTING: UL 508 Industrial Control Equipment, CSA C22.2 No. 14-M95, and CE Certified.



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Courtesy of Steven Engineering, Inc. - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

INSTALLATION

Run wire to be monitored through opening in the sensor. The CTS Series transducers work in the same environment as motors, contactors, heaters, pullboxes, and other electrical enclosures. They can be mounted in any position or hung directly on wires with a wire tie. Just leave at least one inch (25.4 mm) distance between sensor and other magnetic devices.

Split-Core Versions

Press the tab in the direction as shown to open the sensor. After placing the wire in the opening, press the hinged portion firmly downward until a definite click is heard and the tab pops out fully.



KEEP SPLIT-CORE SENSORS CLEAN.

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.

OUTPUT WIRING

Connect control or monitoring wires to the sensor. Use up to 14 AWG copper wire and tighten terminals to 5 inch-pounds torque. Be sure the output load does not exceed the switch rating.

CAUTION: Incandescent lamps can have "Cold Filament Inrush" current of up to 10 times their rated amperage. Use caution when switching lamps.



SETPOINT ADJUSTMENT

CTS Series SETPOINT is adjusted with a 4-turn potentiometer (CTSS) or a 15-turn potentiometer (CTSF). The pot is shipped factory set to the lowest setpoint, fully clockwise (CW). Turning the pot counter-clockwise (CCW) will increase the setpoint. The pot has a slip-clutch to prevent damage at either end of its rotation. To determine where the adjustment is, turn the pot all the way CW. This will return it to the minimum setpoint.

Adjustment Notes:

- 1. Output contacts are solid-state. Check output status by applying voltage to the contacts and reading the voltage drop across the contacts. An Ohmmeter set on "Continuity" will give misleading results.
- 2. It is recommended that the setpoint be adjusted to allow for voltage variations of 10-15%.

Typical Adjustment

- 1. Turn the pot to minimum setpoint (4 or 15 turns CW).
- 2. Have normal operating current running through the sensor. The output should be tripped since the pot is at its minimum setpoint. For units with LED, it should be flashing fast (2 to 3 times per second).
- 3. Turn the pot CCW until the unit un-trips. This is indicated by the slow flashing of the LED (once every 2 to 3 seconds), or by the changing of the output switch status.
- 4. Now turn the pot CW slowly until the unit trips again. It is now set at the current level being monitored.
- A. To Set UNDERLOAD Turn the pot about 1/8 turn further CW.
- B. To Set OVERLOAD Turn the pot about 1/8 turn further CCW.

MONITORED AMPS	OUTPUT	SMART-LED
None or <min.< td=""><td>OPEN</td><td>OFF</td></min.<>	OPEN	OFF
Below Trip Level	OPEN	SLOW (2 sec)
Above Trip Level	CLOSED	FAST (0.5 sec)

TROUBLE SHOOTING

- 1. Sensor Is Always Tripped
 - A. The setpoint may be too low. Turn pot CCW to increase setpoint.
 - B. Switch has been overloaded and contacts are burned out. Check the output load, remembering to include inrush on inductive loads (coils, motors, ballasts).

2. Sensor Will Not Trip

- A. The setpoint may be too high. Turn pot CW to decrease setpoint.
- B. Split Core models: The core contact area may be dirty. Open the sensor and clean the contact area.
- C. Monitored current is below minimum required. Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum. Sensed Amps = (Actual Amps) x (Number of Loops). Count loops on the inside of the aperture.
- D. Switch has been overloaded and contacts are burned out. Check the output load, remembering to include inrush on inductive loads (coils, motors, ballasts).

MODEL NO.	DESCRIPTION	PART NUMBERS
CTS	1.75-150 A Split-Core Current Switch, Adjustable	CTSS0000
	1-150 A Fixed-Core Current Switch, Adjustable	CTSF0000
	.75 A Fixed-Core Current Switch, Go-No Go	CTSG0000

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