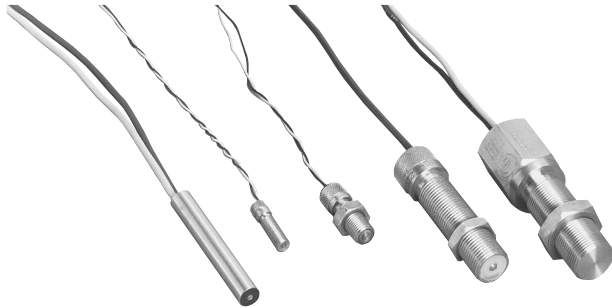


## MAGNETIC PICKUPS & IN-LINE PREAMPLIFIER SIMPLE, RELIABLE & ECONOMICAL PULSE GENERATORS FOR:



**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 can be estimated by their relative size with respect to the reference 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 low-speed 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.

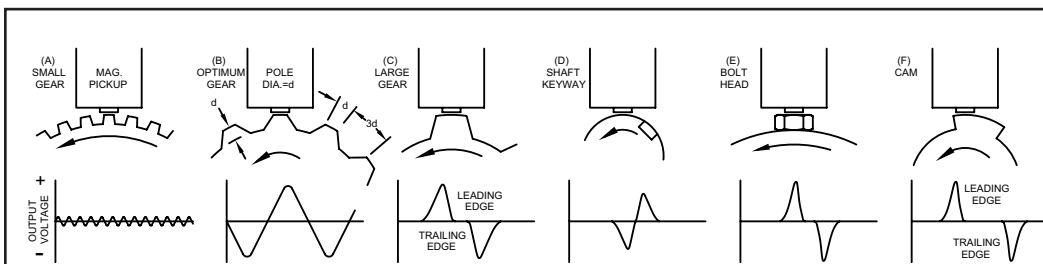


FIG. 1 OUTPUT WAVEFORMS WITH VARIOUS TARGET SHAPES & SIZES

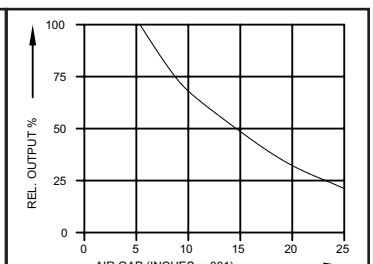


FIG. 2 TYPICAL OUTPUT/AIR-GAP

# MAGNETIC PICKUP APPLICATION & ORDERING INFORMATION

MODEL NO.	DIMENSIONS	1-VOLT THRESHOLD SPEED (1)	MINIMUM GEAR PITCH (2)	TEMP. RANGE °C	OUTPUT IMPEDANCE	PART NUMBER
MP-25TA		135 in/sec 1000 RPM 60T 24 D.P. Ref. Gear	48 D.P.	-40 to +107	130 Ω ±20% 15 mH	MP25TA00
MP-37TA		33 in/sec 200 RPM 60T 20 D.P. Ref. Gear	32 D.P.	-40 to +107	340 Ω ±20% 44 mH	MP37TA00
MP-37TAC1		33 in/sec 200 RPM 60T 20 D.P. Ref. Gear	32 D.P.	-40 to +107	340 Ω ±20% 44 mH	MP37TAC1 *
MP-37CA		30 in/sec 180 RPM 60T 20 D.P. Ref. Gear	32 D.P.	-40 to +107	300 Ω ±30% 65 mH	MP37CA00
MP-62TA		10 in/sec 50 RPM 60T 16 D.P. Ref. Gear	24 D.P.	-40 to +107	1200 Ω ±20% 400 mH	MP62TA00
MP-62TAC1		10 in/sec 50 RPM 60T 16 D.P. Ref. Gear	24 D.P.	-40 to +107	1200 Ω ±20% 400 mH	MP62TAC1 *
MP-62TB		20 in/sec 100 RPM 60T 16 D.P. Ref. Gear	24 D.P.	-40 to +107	1200 Ω ±20% 400 mH	MP62TB00
MP-75TX Explosion Proof (3)		30 in/sec 100 RPM 60T 10 D.P. Ref. Gear	12 D.P.	-73 to +93	230 Ω ±20% 100 mH	MP75TX00

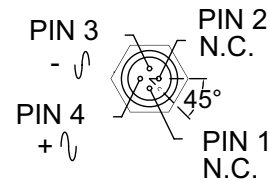
## NOTES:

- 1) Surface speed of listed reference gear to produce 0.8 volt peak min., open-circuit 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.
- 4) 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 pre-amplifier (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:

- PIN 3 - Blue (-)
- PIN 4 - Black (+)
- PIN 2 - NC
- PIN 1 - NC



## 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

Red Lion Controls  
Headquarters  
20 Willow Springs Circle  
York PA 17406  
Tel +1 (717) 767-6511  
Fax +1 (717) 764-0839

Red Lion Controls  
Europe  
Printerweg 10  
NL - 3821 AD Amersfoort  
Tel +31 (0) 334 723 225  
Fax +31 (0) 334 893 793

Red Lion Controls  
India  
54, Vishvas Tenement  
GST Road, New Ranip,  
Ahmedabad-382480 Gujarat, India  
Tel +91 987 954 0503  
Fax +91 79 275 31 350

Red Lion Controls  
China  
Unit 101, XinAn Plaza  
Building 13, No.99 Tianzhou Road  
Shanghai, P.R. China 200223  
Tel +86 21 6113-3688  
Fax +86 21 6113-3683