

# ServoTek

PRODUCTS INC.

## Product Selection Guide



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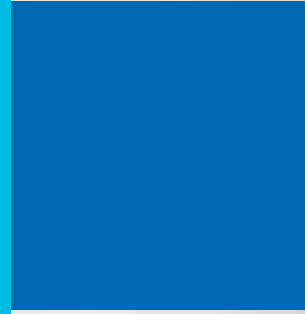
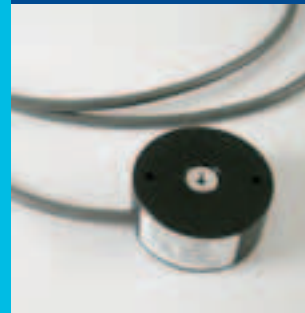
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## ServoTek Products

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Becoming a member of the Bellofram Group of Companies in 2011, ServoTek Products Inc., is a world renowned manufacturer of Instrument-grade DC tachometers, low cost encoders, and tachsyn transducers, serving OEM customers involved in aerospace, automotive, industrial machinery control, robotics, lift and process monitoring related applications.

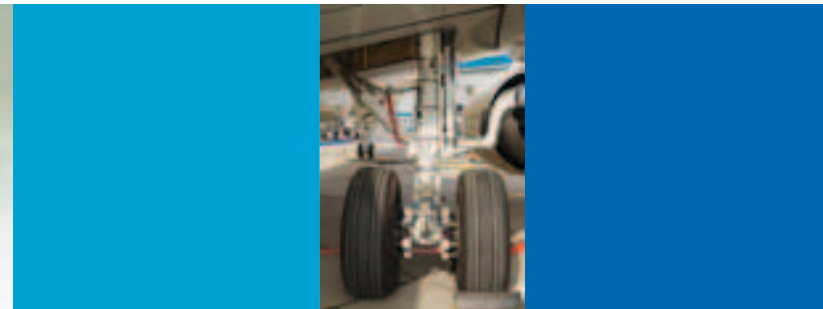
ServoTek Products are known for their rugged designs, high-reliability performance in challenging environments, and proven pedigree across thousands of successful field installations.

Our Tachsyn tach/commutator is a unique transducer that can be used as a brushless dc tachometer and/or as a brushless dc motor commutator. The Tachsyn transducer is a magnetic sensing device in which the output windings, field winding, and permanent magnet are all located in the stator, thus maximizing reliability.

ServoTek Tachometer/Pulser delivers both the linear analog output from a tachometer and a digital pulse train to provide speed/position control feedback from a rotating devices such as motors or conveyor rollers. The pulser produce from four to twelve well-defined square-wave pulses per revolution.

Our tachometer generators provide a convenient and economical means of converting rotational speed into an isolated analog voltage signal. ServoTek tachometers offers better than 0.1% linearity output, and the ripple is less than 3% of the DC value. We also offer tachometers with lower ripple of 1.5% of the dc value.

ServoTek Incremental Encoders offers a low cost solution for measuring shaft speed/position. The encoders can be used to supply digital feedback for motor speed control and speed indication. ServoTek offers both the hollow shaft design, and the screw mount design for applications where space is limited.



# DC Tachometer Generators

# Mounting Dimensions

### Technical Data

ServoTek Products DC Tachometer generators provide a convenient and economical means of converting rotational speed into an isolated analog voltage signal suitable for remote indication and control. While the following contain information on our most popular models, we also manufacture countless specials. The data presented here is true of all models outlined in this web page.

### Construction

ServoTek Tachometer generators are housed in aluminum casings protected in accordance with MIL-C-5541 or MIL-A-8625. Alnico permanent magnets are used. Armature shafts are stainless-steel, and rotate on fully-shielded stainless-steel ball bearings. Commutators are made from alloy containing 95% silver. Armature laminations are wound with Isomid insulated wire, over Teflon slot insulation. The entire armature is impregnated and baked, resulting in a NEMA Class H insulation system.

### Brush Life

Brushes and commutators (in generators) are rated for a minimum of 100,000 hours operation at 3,600 RPM (equivalent to 10 years continuous operation) at 1 mA output. (50,000 hours on Series E.)

### Linearity

Linearity at any speed is better than 0.1% of the output at the rpm.

### Ripple

The ripple rms value will not exceed 3% of the DC value at any speed in excess of 40 rpm on standard units; 1.5% on low-ripple models.

### Bidirectional Operation

All ServoTek generators operate in either rotational direction. That direction can be determined by output voltage polarity. Output (in either direction) is held to a tolerance of 0.25% of the average output.

### Stability

Optimum brush and commutators combination gives 0.1% stability. Highly stable output gives no evidence of long-term drift.

### Breakdown Voltage

ServoTek tachometer generators are factory tested with an ac potential of 1,250 volts rms applied for one second between (either) terminal and the shaft. (Series E—500 volts.)

### Temperature Range

Tachometers are designed for continuous operation in ambient temperatures ranging from -55°C to 100°C (-67°F to +212°F). Voltage output at 25°C will not deviate by more than 0.01% per degree of change within the range of -20°C to +75°C. All units are temperature compensated, with the exception of Series D and E.

### Six Armature / Winding specifications

ServoTek Tachometer Generators are grouped in six series, each identified by a letter immediately following the digit string in the middle of the model number. This series designator identifies armature length and characteristics.

The groupings breakdown this way:

- A—single-length armature
- B—2 x A-length armature
- D—4 x A-length armature
- E—Subminiature armature
- F—single-length armature specially wound for extra-low ripple output voltage
- H—B-length armature wound for extra-low ripple output

As the dimensions of the armature (with commutator) change, so do the outline dimensions of the permanent magnet and the housing that encloses it. The larger the desired output voltage, the longer the armature winding. When the existing space is exhausted, the armature is made longer to increase voltage output (e.g. moving from armature A to B). Note that the Series designator refers to the armature length, not the housing length. The housing length will change with the level of ruggedization or other special construction requirements of a given application.

Standard housings, except for the E series (subminiature), are 1.135" in diameter. Ruggedized housings have larger diameters, as required by the application.

All dimensions are in inches.

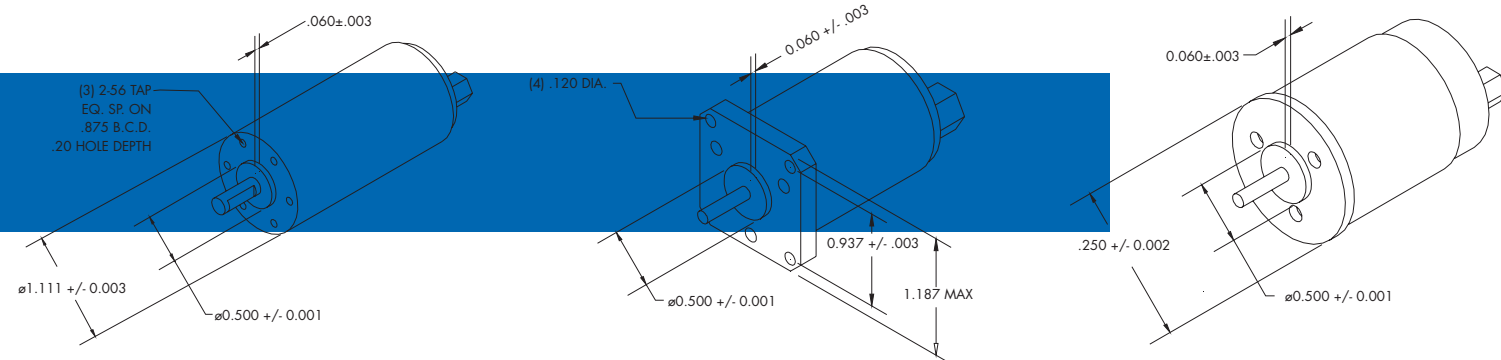


Fig. 1  
SA Face Mount

Fig. 2  
SB Flange Mount

Fig. 3  
SD Clamp Mount

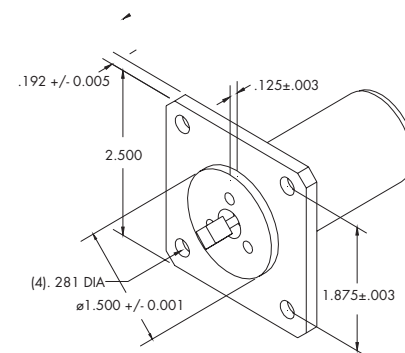


Fig. 4  
SM Aircraft Mount

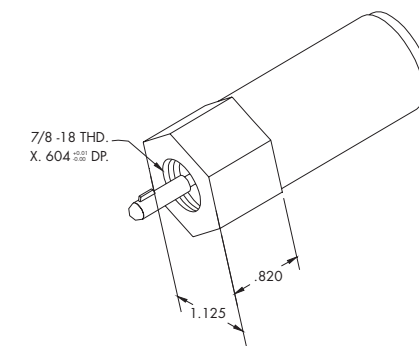


Fig. 5  
SN Automotive

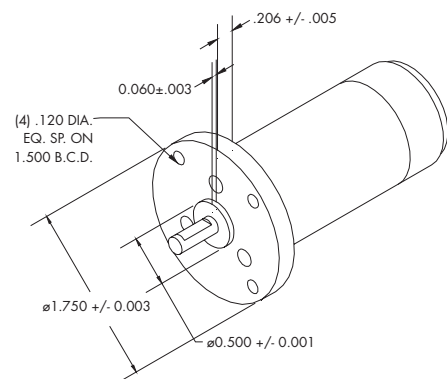


Fig. 6  
SU Large Flange

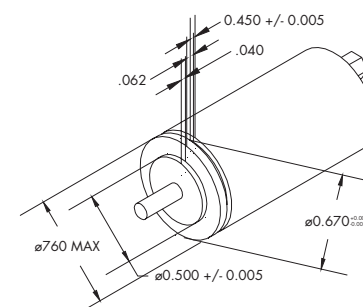


Fig. 7  
SS Syncro Mount

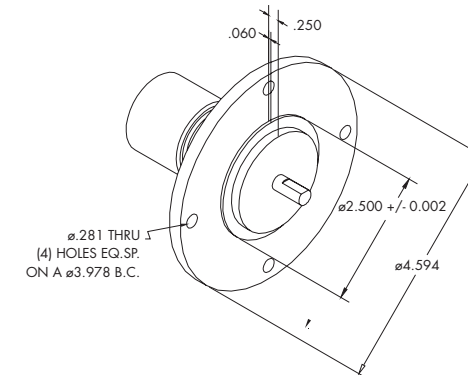


Fig. 8  
DA Mount

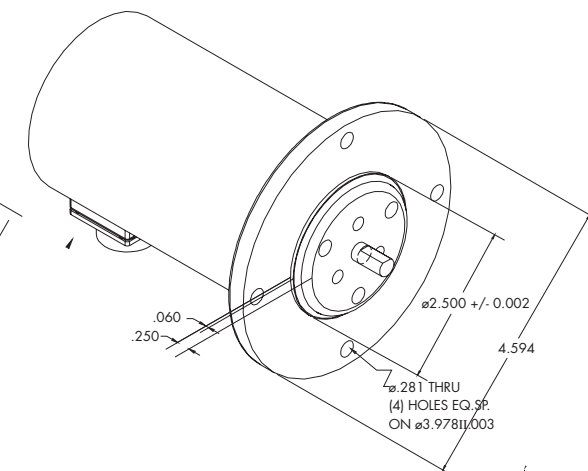


Fig. 9  
Rugged Mount

## Tachometers with 1–10VDC Outputs

### A-Series—DC Tachometers

DC Tachometers with output signal between 1 and 10 volts/1000 RPM

A-Series tachometers are designed for use in applications requiring an output signal between 1 and 10 volts/1000 RPM. The units come in three basic configurations, instrument, industrial, and automotive.



Model#	Mounting (page 5)	V/1000RPM	RPM Max.	Sealed	Shaft Size
SA-740A-7	Face (Fig. 1)	2.6VDC±3%	12000	No	0.120"
SB-740A-7	Flange (Fig. 2)	2.6VDC±3%	12000	No	0.120"
SB-7427A-7	Flange (Fig. 2)	2.6VDC±3%	12000	No	0.120"
SA-7103A-5E	Face (Fig. 1)	3VDC±3%	12000	No	0.187"
SA-740A-5E	Face (Fig. 1)	3VDC±3%	12000	No	0.120"
SA-7103A-3	Face (Fig. 1)	5VDC±3%	12000	No	0.187"
SB-740A-1L	Flange (Fig. 2)	5VDC±1%	12000	No	0.120"
SA-757A-3A	Face (Fig. 1)	5.5VDC±3%	12000	No	0.187"
DA-7533A-2	PY Mount (Fig. 8)	7.0VDC±3%	12000	No	0.3125"
SA-7103A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.187"
SA-7125A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.2495"
SA-740A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.120"
SA-7534A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.120"
SA-757A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.187"
SA-796A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.187"
SB-740A-2	Flange (Fig. 2)	7.0VDC±3%	12000	No	0.120"
SB-7491A-2	Flange (Fig. 2)	7.0VDC±3%	12000	No	0.187"
SB-757A-2	Flange (Fig. 2)	7.0VDC±3%	12000	No	0.187"
SD-7146A-2	Clamp (Fig. 3)	7.0VDC±3%	12000	No	0.120"
SD-740A-2	Clamp (Fig. 3)	7.0VDC±3%	12000	No	0.120"
SN-763A-2	Automotive (Fig. 5)	7.0VDC±3%	12000	No	0.187"
ST-7336A-2	Face (Fig. 1)	7.0VDC±3%	12000	Yes w/Boot	0.120"
ST-7468A-2	Face (Fig. 1)	7.0VDC±3%	12000	No	0.187"
ST-7553A-2	Face (Fig. 1)	7.0VDC±3%	12000	Yes w/Boot	0.187"
SU-780A-2	Large Flange (Fig. 6)	7.0VDC±3%	12000	No	0.187"
SA-7103A-2C	Face (Fig. 1)	7.21VDC±1.75%	12000	No	0.187"
SA-740A-1	Face (Fig. 1)	10VDC±2%	12000	No	0.120"
SB-757A-1	Flange (Fig. 2)	10VDC±2%	12000	No	0.187"

## Tachometers with 7–24VDC Outputs

### B-Series—Tachometers Generators

7-24 volts/1000 RPM

B-Series tach generators are designed for applications requiring output voltages between 7 and 24 VDC/1000 RPM. The models listed are representative of the line, although we also offer specials (not shown). As the case with the A-Series generators, the B-Series comes in instrument, industrial, and automotive configurations. Instrument models have a 0.120" shaft; industrial, a 0.187" shaft; and automotive, SAE mounting. General technical data applies to the B-Series also.



Item	Mounting (page 5)	V/1000RPM	RPM Max.	Sealed	Shaft Size
CN-7480B-6A	Flange (Fig. 2)	7.0VDC±3%	8000	No	0.3125"
SA-7103B-1	Face (Fig. 1)	20.8VDC±5%	8000	No	0.187"
SA-740B-1	Face (Fig. 1)	20.8VDC±5%	8000	No	0.120"
SA-7499B-1	Face (Fig. 1)	20.8VDC±5%	8000	No	0.187"
SA-757B-1	Face (Fig. 1)	20.8VDC±5%	8000	No	0.187"
ST-7337B-1	Face (Fig. 1)	20.8VDC±5%	8000	Yes w/Boot	0.187"
ST-7453B-1	Syncro (Fig. 7)	20.8VDC±5%	8000	No	0.187"
BA-7107B-1	Large Flange (Fig. 6)	20.8VDC±5%	8000	No	0.187"
SB-7123B-1	Flange (Fig. 2)	20.8VDC±5%	8000	No	0.187"
SB-740B-1	Flange (Fig. 2)	20.8VDC±5%	8000	No	0.120"
SB-757B-1	Flange (Fig. 2)	20.8VDC±5%	8000	No	0.187"
SU-7114BW-1	Large Flange (Fig. 6)	20.8VDC±5%	8000	No	0.187"
SU-7346B-1	Large Flange (Fig. 6)	20.8VDC±5%	8000	Yes w/Boot	0.187"
SU-757B-1	Large Flange (Fig. 6)	20.8VDC±5%	8000	No	0.187"
SD-740B-1	Clamp (Fig. 3)	20.8VDC±5%	8000	No	0.120"
SN-763B-1	Automotive (Fig. 5)	20.8VDC±5%	8000	No	0.187"
DA-7533B-1	DA Mount (Fig. 8)	20.8VDC±5%	8000	No	0.3125"

## Tachometers with 25–50VDC Outputs

### D-Series—Tachometer Generators

25–50 volts DC/1000 RPM

With rugged construction and high output voltages, D-Series tachometer generators are ideally suited to a variety of industrial applications.

The flange mounting provides a convenient assembly method, and the sturdy 0.187" diameter shaft permits the heavier loading frequently encountered where pulleys or belt drives are employed. The output bearing is fitted with a seal to help prevent the contamination that can occur in industrial applications. With output up to 50 VDC/1000 RPM, D-Series generators are ideal for applications where high output voltages are required. Typically, these are slow-speed applications.



Item	Mounting (page 5)	V/1000RPM	RPM Max.	Sealed	Shaft Size
SU-780D-2	Large Flange (Fig. 6)	33VDC±5%	5000	No	0.187"
DA-7533D-1	DA Mount (Fig. 8)	45VDC±5%	5000	No	0.3125"
BA-7107D-1	Large Flange (Fig. 6)	45VDC±5%	5000	No	0.187"
CN-7480D-1	Large Flange (Fig. 6)	45VDC±5%	5000	No	0.3125"
CN-7546D-1	Large Flange (Fig. 6)	45VDC±5%	5000	No	0.3125"
SU-780D-1	Large Flange (Fig. 6)	45VDC±5%	5000	No	0.187"
ST-7346D-1J	Face (Fig. 1)	50VDC±5%	5000	Yes w/boot	0.187"
SU-780D-1J	Large Flange (Fig. 6)	50VDC±5%	5000	No	0.187"

## Subminiature Tachometers with 3VDC Outputs

### E-Series—Tachometers Generators

Subminiature Tachometer 3 VDC/1000 RPM

The E-Series generator is the smallest tachometer among those offering similar technical characteristics. Many outstanding features make it particularly suitable for use in all types of servo systems. Although the diameter is only 0.760", the E-Series provides a 3 VDC/1000 RPM output and linearity better than 0.1% at 3600 RPM. With driving torque of only 0.25 oz-in., and inertia of just  $0.25 \times 10^{-4}$  oz-in.-sec<sup>2</sup>. E-Series gives design advantages not available with competitive units.



Item	Mounting (page 5)	V/1000RPM	RPM Max.	Sealed	Shaft Size
SS-779E-1	Synchro (Fig. 7)	3.0VDC±5%	12000	No	0.120"

## Low Ripple Tachometers 3VDC to 16VDC

### F- and H-Series—Low Ripple Tachometer Generators

1–16 VDC/1000 RPM

ServoTek low-ripple tachometer generators satisfy the need for a low-cost, very low-ripple tachometer. In addition to being the first economical of their type, Series F and H tachometers incorporate all the desirable features of the ServoTek generator line—temperature compensation, long brush life, excellent linearity, etc.



Item	Mounting (page 5)	V/1000RPM	RPM Max.	Shaft Size
CS-7514F-51C	Face (Fig. 1)	3VDC±3%	12000	0.2495"
CS-7561F-51C	Face (Fig. 1)	3VDC±3%	12000	0.2495"
SA-7356F-1	Face (Fig. 1)	7VDC±3%	12000	0.120"
SA-7388F-1	Face (Fig. 1)	7VDC±3%	12000	0.187"
SB-7483H-1	Flange (Fig. 2)	16VDC±3%	8000	0.187"

# Ruggedized Tachometers

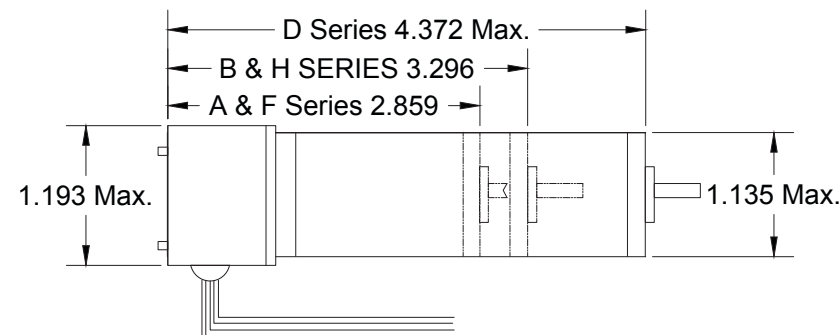
Model#	Mounting (page 5)	V/1000RPM	RPM Max.	Shaft Size
ST-12970-1	Tach. Assembly (Fig. 9)	20.8VDC	8000	0.120"
ST-12970-12	Tach. Assembly (Fig. 9)	20.8VDC	8000	0.187"
ST-12970-19	Tach. Assembly (Fig. 9)	7.0VDC	12000	0.187"
ST-12970-22	Tach. Assembly (Fig. 9)	7.0VDC	12000	0.120"
ST-13212-1	Tach. Assembly (Fig. 9)	45.0VDC	5000	0.3125"
ST-13212-2	Tach. Assembly (Fig. 9)	20.8VDC	8000	0.3125"
ST-13212-9	Tach. Assembly (Fig. 9)	50.0VDC	5000	0.3125"

# Tachometer/Pulser Units

## ServoTek Pulser Option

The Pulser Option delivers a single digital pulse train to provide speed/position-control feedback from rotating tachometers. The ServoTek pulser operates from an external supplied 4.5 to 15 VDC supply. The pulser option is available in four or twelve well defined square-wave pulses per revolution. The output is separate from the standard tachometer outputs, and fits on the back of all ServoTek tachometers with 1.135" diameter housing.

**Pulser Option Dimensions** (inches)



# ServoTek Incremental Encoders

## PM Series—Encoders, Rotary Shaft

Low Cost Rotary Shaft Incremental Encoders to 100 ppr.

When mounted to any rotating shaft, the PM Series Encoder provides a single channel square wave output to speed/position control. The Encoder can be used to supply digital feedback for motor speed control and speed indication. The small size of the PM Series Encoder makes it easy to use where space is limited. The Screw Mount design has a 10-32 threaded shaft that is easy to mount. Special mounting brackets and couplings are not required. The Face Mount design has three tapped mounting holes and a syncro groove.



### Features:

- Rotary Shaft Design
- Screw Mount design has a 10-32 threaded shaft
- Can be used to supply a digital tachometer signal for motor speed control and speed indication
- Provides a single or dual channel digital signal up to 100 ppr.
- +5, +12, +15, or +24V varieties
- Operating temperatures from -40°C to +80°C
- Maximum speed of 12000 RPM

### Complete Model Number: PMXX-YY-ZZ

PM	X	X	YY	ZZ
Series	Mounting	Shaft Size	Pulses	Voltage
	A= Screw	1= 10-32	1, 2, 10, 12,	+5VDC (standard)
	B= Face	2= .187	30, 60, 100	+12, +15, +24VDC Available
		3= .125		

## PT Series—Encoders, Hollow Shaft

Low Cost Modular Incremental Encoders to 200 ppr.

A completely new Optical Encoder is now available from ServoTek Products. OEM's and Motor Manufactures now have a simple, Low Cost Solution to their digital feedback requirements. The new Encoder can replace a variety of more expensive digital devices, as well as sensitive magnetic pickups that are difficult to mount.

### Features:

- Hollow shaft design
- Incorporates the housing and hub into one assembly
- Eliminates the need for a coupling or complicated mounting procedure
- Can be used to supply a digital tachometer signal for motor speed control and speed indication
- The small size, 2.0" dia., .900" long, makes it easy to use where space is limited
- Provides a single/dual channel digital signal up to 200 pulses per revolution
- Standard mounting hole centers are 1.500" and 1.812"
- Operating temperatures up to +80°C
- Maximum speed of 20,000 RPM
- Hub bore can accommodate mounting shaft diameters up to .251"



### Complete Model Number: PTXX-YY-ZZ

PT	X	X	YY	ZZ
Series	Mounting Centers	Bore Size	Pulses	Voltage
	A= 1.812" #4-40	1= .251	1, 2, 10, 12,	+5VDC (standard)
	B= 1.500" #6-32	2= .188	30, 60, 100	+12, +24VDC Available

# ServoTek Incremental Encoders

# ServoTek Tachsyn Transducer

Model#	Description
PMA1-02-05	ENCODER, 2 PULSE, 5 VOLT, 10-32 SCREW MOUNT
PMA1-100-05	ENCODER, 100 PULSE, 5 VOLT, 10-32 SCREW THD. MTD
PMA1-100-24	ENCODER, 100 PULSE, 24 VOLT, 10-32 SCREW MOUNT
PMA1-30-05-2	ENCODER, DUAL CHANNEL, 30 PULSE, 5 VOLT
PMA1-30-24-2	ENCODER, DUAL CHANNEL, 30 PULSE, 24 VOLT
PMA1-60-05	ENCODER, 60 PULSE, 5 VOLT, 10-32 SCREW MOUNT
PMB2-60-05	ENCODER, 60 PULSE, 5 VOLT, .187 SHAFT
PMB3-100-05-A	ENCODER, 100 PULSE, 5 VOLT, .125 DIA SHAFT, WITH 4 PIN MOLEX CONNECTOR
PTA1-30-24	ENCODER, 30 PULSE, 24 VOLT
PTB1-100-05	ENCODER, 100 PULSE, 5 VOLT
PTB12-02-05	ENCODER, 2 PULSE, 5 VOLT, PUSH ON SHAFT
PTB12-100-24-D	ENCODER, 2 CHANNEL, 100 PULSE, 24 VOLT, MTD 1.5 6-32
PTB12-30-05	ENCODER, 30 PULSE, 5 VOLT
PTB12-30-12	ENCODER, 30 PULSE, 12 VOLT
PTB2-02-05	ENCODER, 2 PULSE, 5 VOLT, MTD. 1.5 6-32
PTB2-30-05	ENCODER, 30 PULSE, 5 VOLT
PTB2-100-05	ENCODER, 100 PULSE, 5 VOLT
PTB2-12-05	ENCODER, 12 PULSE, 5 VOLT
PTB2-30-05-12	ENCODER, 2 CHANNEL, 30 PULSE, 5 VOLT, WITH 18" CABLE
PTB2-30-05-1B	ENCODER, 2 CHANNEL, 30 PULSE, 5 VOLT, WITH 12" CABLE AND MOLEX CONNECTOR
PTB2-30-05-A	ENCODER, 30 PULSE, 5 VOLT, WITH STUB SHAFT
PTB2-30-15-7	ENCODER, 30 PULSE, 15 VOLT
PTB2-30-24	ENCODER, 30 PULSE, 24 VOLT
PTB2-60-24-4	ENCODER, 2 CHANNEL, 60 PULSE, 24 VOLT

### Tachsyn Series—DC Tachometers

Brushless DC Tachometer/Commutator



The Tachsyn tachometer/commutator are a unique transducer that can be used as a brushless dc tachometer and/or as a brushless dc motor commutator. The Tachsyn transducer is a magnetic sensing device in which the output windings, field winding, and permanent magnet are all located in the stator, thus maximizing reliability. The very-low-inertia rotor has no windings, but is, instead, contoured with high- and low- reluctance poles.

Tachsyn transducers are available in models to commutate 4-, 6-, 8-pole brushless dc motors. Any size may be used when a simple tach signal is all that is required. Pancake-shaped Tachsyn transducers are easily mounted, cantilever-style, to the back of a motor or other device, with synchro-type adjustment for phasing. The Tachsyn tach/commutators offer an economical solution to many velocity-loop problems, whether brushless or standard servo.

#### Features:

- Can be used as a brushless dc tachometer and/or as a brushless dc motor commutator
- Very-low-inertia rotor has no windings, but is, instead, contoured with high- and low-reluctance poles
- The CT4 circuit board completes the Tachsyn signal conditioning and may be housed up to 100 feet from the hot-running motor, leaving only the non-electronic transducer to take the heat
- The CT4 circuit provides ac field excitation for the transducer, as well as condition for its output signals
- Output signals include a linear, low-ripple dc tachometer voltage and either hall-equivalent or sine wave commutation signals
- Tachsyn transducers are available in models to commutate 4-, 6-, 8-pole brushless dc motors
- Tachsyn tach/commutators offer an economical solution to many velocity-loop problems, whether brushless or standard servo

#### General Information:

Each Tachsyn Transducer requires one CT4 Series circuit board, or customer-built equivalent, connecting cable with double barreled shield. Standard configurations are normally in stock.

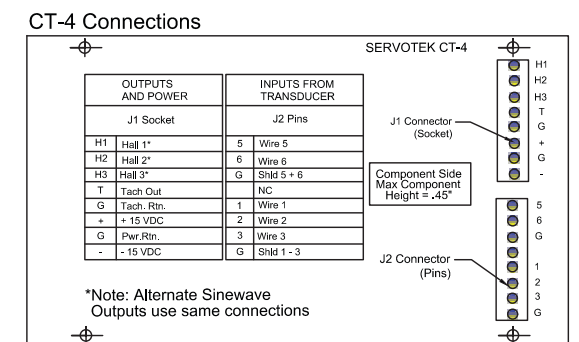
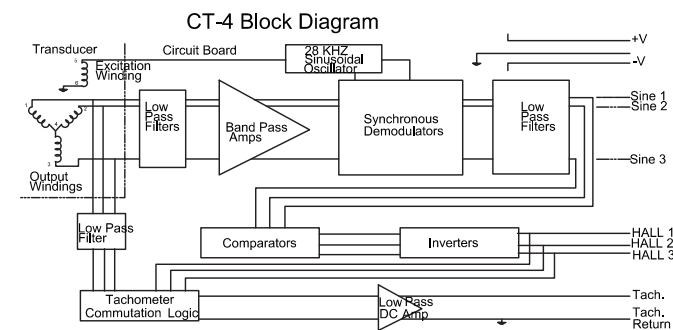
#### How to determine which circuit board is best for your application:

First determine the Tach output as follows

(Figure in multiplier Column, page 14):

$X$  (Your Speed in Thousands of RPM)  $X$  (Volts/1000 RPM from TACHSYN, below)

If, at the top speed, the calculated voltage exceeds bus-1 VDC, then select a lower output multiplier in the right column and recalculate. For the best signal-to-ambient-noise ratio in slow speed applications, select the maximum multiplier which will not exceed bus-1 VDC.

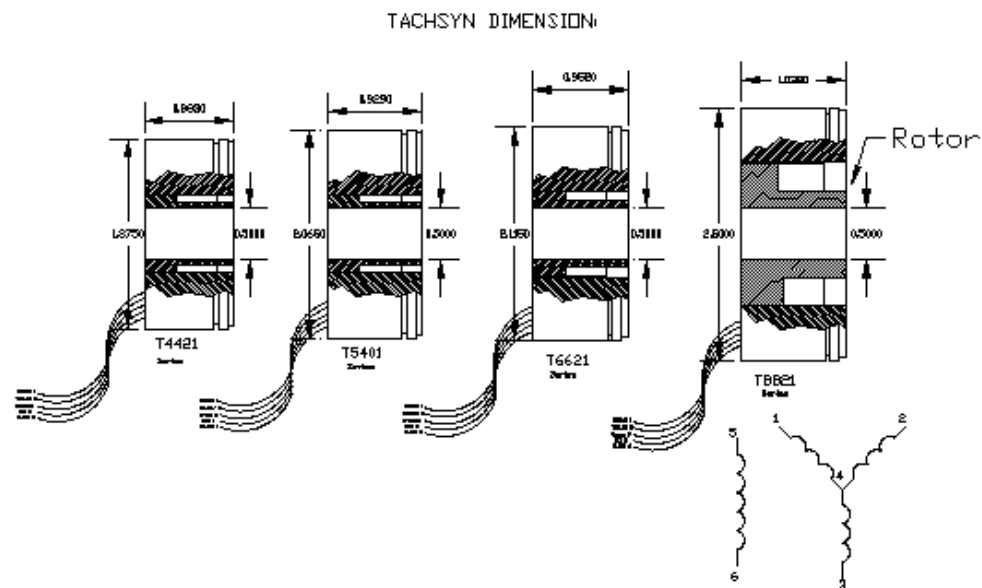


# Output Waveforms

SIGNAL CONDITIONING BOARDS:			
Hall-equivalent Output	Output Multiplier	Sinusoidal Output	Output Multiplier
CT-405	0.5	CT-405S	0.5
CT-410	1.0	CT-410S	1.0
CT-415	1.5	CT-415S	1.5
CT-425	2.5	CT-425S	2.5
CT-440	4.0	CT-440S	4.0

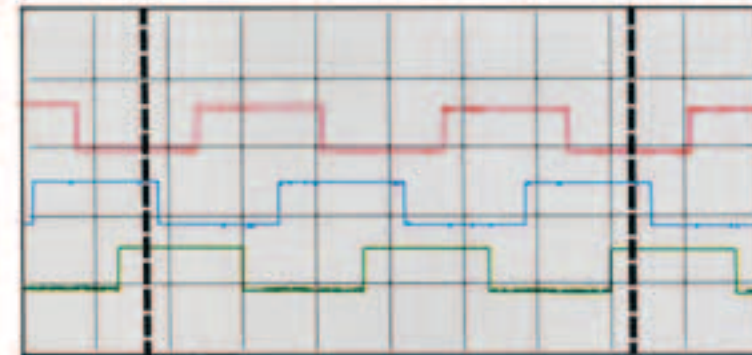
Model#	Poles	Gain	Volts/1000 RPM
T4421WAB (For CT3 boards only)	4	1.15	1.0VDC±10%
T4421WAC	4	1.00	1.0VDC±10%
T5400WAC	4	1.00	1.0VDC±10%
T5400WAC-R with rotor	4	1.00	1.0VDC±10%
T6621WAC	6	1.00	1.5VDC±10%

Note: ADD "R" to part number to include rotor



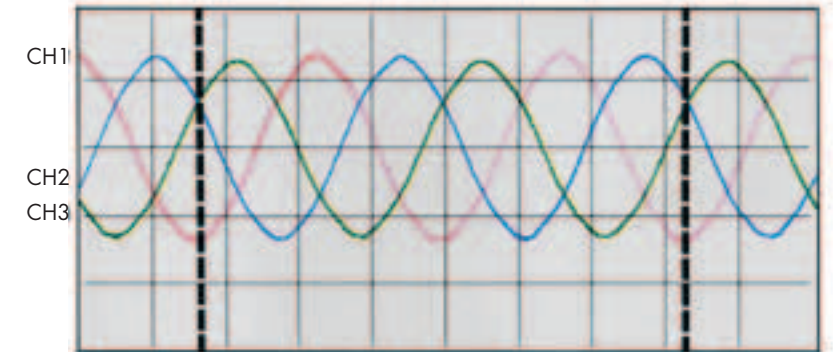
Series T4421 Tachsyn Transducer with CT-440, at 1800 RPM. One revolution shown between bold vertical lines.

20.00 V/DIV 5.00ms/DIV



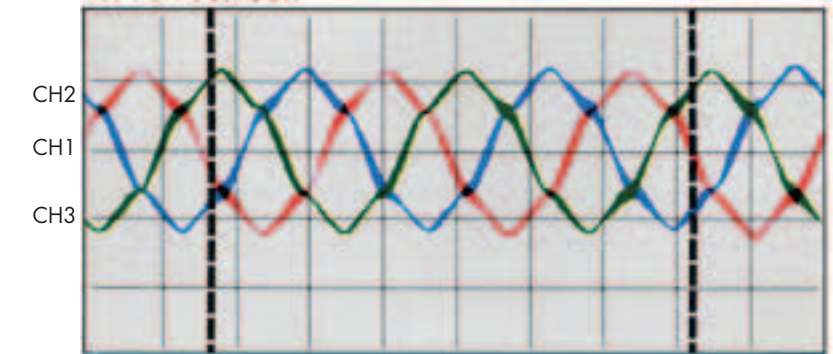
Three-phase Hall-equivalent output from CT-440.

2.00 V/DIV 5.00ms/DIV



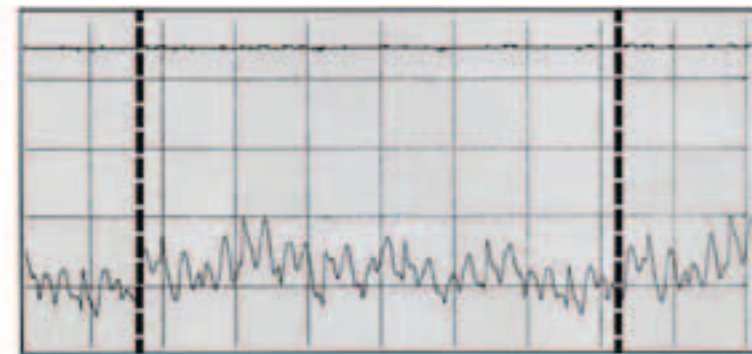
Three-phase sine wave output from CT-440.

1.00 V/DIV 5.00ms/DIV



Raw three-phase Tachsyn Transducer output with PM field and ac excitation.

5.00ms/DIV



DC tach output from CT-440 relative to zero volts. Scope is dc coupled. 5 V/DIV

Tach output from CT-440. Shown with scope ac coupled to amplify the ripple. 200m V/DIV



## Rubber Couplings

Part#	Description
ST-9502-1	SILICON RUBBER COUPLING
ST-9502-2	RUBBER COUPLING



## Shaft Couplings

Part#	Description
ST-9776-1	RUBBER COUPLING .120 X .120
ST-9776-2	RUBBER COUPLING .1875 X .1875
ST-9776-3	RUBBER COUPLING .250 DIA. 1/4"
ST-9776-4	RUBBER COUPLING .312 DIA.
ST-9776-5	COUPLING .120 X .1875 DIA.
ST-9776-6	COUPLING .120 X .250 DIA.
ST-9776-7	COUPLING .120 X .312 DIA.
ST-9776-8	COUPLING .1875 X .250 DIA.
ST-9776-9	COUPLING .1875 X .312. DIA.
ST-9776-10	RUBBER COUPLING .250 X .312
ST-9776-11	RUBBER COUPLING 8MM X .187
ST-9776-12	RUBBER COUPLING .375 X .187
ST-9776-13	COUPLING .120 X .375
ST-9776-14	COUPLING .250 X .375
ST-9776-15	COUPLING .120 X .355



## Common Parts

Part#	Description
ST-13063-1	RUBBER BOOT
ST-13063-2	BOOT-SILICONE RUBBER, GRAY
ST-13927-1	ASSY-BRUSH

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