BD2510B
Tachogenerator

0.1v or 0.2v/rpm

2706E

BROOK CROMPTON

Introduction

The BD2510B Tachogenerator is famous for its robust construction and for its high accuracy and consistent voltage proportional to speed. Brook Crompton (previously GEC) have been continuously manufacturing the same design of tachogenerator for over 40 years, taking care to preserve the special materials and design features which provide its unique performance. With this wealth of experience and knowledge applied, our tachogenerators are renowned throughout the world.

Specification for standard tachogenerator

	BD2510B/1	BD2510B/2	See Note
Volts per 1000 r/min	100 ±5%	200 ±5%	1
Speed range	0-4000 r/min	0-2000 r/min	
Maximum Emergency Overspeed	5000 r/min	2500 r/min	2
Armature Resistance at 20ºC	25 ±10% ohms	65 ±10% ohms	
Armature Inductance	0.218 Henries	0.566 Henries	
Drive torque at 1500 r/min with minimum load impedance	0.197Nm	0.266Nm	
	(28 oz/in)	(32 oz/in)	
	BD2510B/1 and BD2510B/2		
Direction of Rotation	Reversible		3
Maximum Output	0.1A at 400V		
Maximum load impedance	4000 ohms		
Maximum temperature rise	40K		4
Insulation class	Class B		4
Maximum ambient temperature	65ºC (MG-18-632)		4
High voltage test	2000V, 50Hz for one minute		
Insulation resistance (as tested)	Exceeding 100 megohms		
Armature moment of Inertia (mr2)	0.0021 kg m2 (7.2lb in2)		
Frame	Rolled steel		
Degree of protection and cooling form	IP44 and IC0041 6		
Brushes and brush dimensions	2 per arm 3/8" wide x 1/4" thick x 1" long		
Brush grade	Silver graphite 0.1A		
Commutator	Monel metal, 54 segments		
Armature	18 slots, skewed		
Field Magnets	Alcomax 4		
Bearings	Pre-loaded ball bearings		
Connections	Brought to terminal box		
Approximate overall dimensions	Ø165mm (6.5") x 291mm (11 15/32") long		
Total weight (flange mounted)	12.8 kg (28.25 lb)		

Notes

1. The actual output voltage for any individual tachogenerator lies between 95% and 105% of the nominal rated value. The performance figures appearing in the table (page *) are then applicable to the individual voltage.
2. Overspeeds are likely to cause bad commutation which may temporarily affect the characteristics of the tachogenerator.
3. These tachogenerators are supplied for reversible rotation only.
4. Class B insulation is used throughout although temperature rise in normal operation is well within the normal Class A limits. This ensures extended life expectation and alternatively allows operation in ambients up to 80ºC without harmful effects to the machine..

Standard features and alternatives

	Standard Features	Alternatives
Voltage	100V, 200V per 1000 r/min	None
Maximum output	0.1A at 400V	
Mounting	Flange as standard dimension sheet	B56 flange to BS2048
		NEMA 'C' flange
		Detachable feet
Ripple	Standard	Reduced ripple
Degree of protection	IP44	
Cooling form	IC0041	
Shaft extension	Standard at drive end	Special at drive end
	Stub shaft at non-drive end	Special at both ends
Cable entry	CM20	1/2" Briggs
		PG11
Rotation	Reversible	None

NEMA Specification MG1-18, 626-940, 'DC permanent tachometer generators for control systems'

The BD2510B tachogenerator complies with the test and performance requirements of this specification with the added advantage of an insulation system superior to that specified. The manufacturing requirements of this specification may also be satisfied if requested at the time of ordering.

Applications and Performance data

Applications

Applications exist for the tachogenerator wherever a d.c. voltage proportional to speed is required. It provides a highly accurate and consistent feed-back voltage suitable for feeding high impedance electronic circuit, it may also be used for supplying instruments and for other loads where greater weights are required, but where the same degree of accuracy is not essential.

An indication of some applications are controlling paper mill/steel mill drives, controlling the heat treatment of steel rods used in reinforced concrete and in colliery equipment.

Performance data

A testing programme to determine the characteristics and accuracy of the BD2510B tachogenerator was undertaken by the University of Aston in Birmingham, England, whose laboratories have established reputation for independent investigations.

Tachogenerators taken at random from stock were tested by University staff using IEE Specification No. 251 'Proposed test procedure for direct current tachometer generators' as a guide. The figures shown in the table were derived from these tests according to the specification in collaboration with the University. The certified accuracy of the apparatus used enabled the University to offer the following limits of accuracy in their readings at 1500 r/min.

Speed measurement	±0.0021%
Voltage measurement	±0.0165%
mV per r/min calculated from above	±0.0186%

ie performance figures are derived from readings whose accuracy is certified better than ±2 in 10^4 or ±0.02mV per r/min or ±200 parts per million.

Standard Reversible Tachogenerator Performance Figures at 1500 r/min

Maximum deviation from linearity	±0.2%
Maximum reversing error	±0.2%
Maximum voltage regulation	0.9%
Maximum ripple voltage	0.5%
Maximum amb. temp. factor	±0.003% V per C
Maximum short term instability	0.03%
Maximum long term instability	0.02%V per hour

These derivation of these figures is defined in IEEE Specification No. 251 and summarised as follows:

Deviation from linearity

The tachogenerator is connected to a non-inductive resistance to give rated output and at least seven voltage readings are taken, evenly spaced throughout the rated speed range. An average volts per 1000 r/min is obtained by dividing the sum of the output voltages by the sum of the corresponding speeds in thousands of r/min. At any speed the difference between the voltage per 1000 r/min output at that speed and the average, expressed as a percentage of the average, is defined as the deviation from linearity

The procedure is repeated at no-load and also in reverse rotation.

Reversing error

Using the same arrangement as for linearity, voltage output readings are token in both rotations after a series of reversals. The reversing error is the difference between the output voltage in each rotation, expressed as a percentage of the average of those two voltages.

Voltage regulation

This is not normally of very great importance in a tachogenerator, which usually has a load of constant impedance. It is calculated from the linearity readings as the difference between the no-load and rated load average volts per 1000 r/min expressed as a percentage of the rated load value.

Ripple voltage

The total ripple is measured by a direct reading valve voltmeter and the rms value expressed as a percentage of the d c. output voltage as read on a high accuracy digital voltmeter at rated load

Note: the inherent a.c ripple in output voltage of a d.c generator has two main, components.

(1) low frequency variation which occurs at 1 and 2 cycles per revolution and is minimised in the B2510B tachogenerator by careful component design coupled with accuracy in machining and assembly. This ripple can however, be adversely affected by poorly designed drive arrangements, as mentioned under 'Installation'

(2) High frequency variation, caused by the armature slots, occurring at 18 cycles per revolution. To minimised this the armature slots are skewed and the stator poles specially shaped and offset circumferentially.

Ambient temperature factor

the tachogenerator is run in a temperature controlled enclosure. Voltage output readings at rated load are taken at temperatures approximately 25°C apart and the difference between them expressed as the percentage change per degree Centigrade from the reading at the lower temperature to that at the higher temperature. The procedure is repeated for another pair of temperatures in a different part of the specified ambient range.

Note: Temperature effects are reduced to a minimum in the BD2510B tachogenerator by the use of temperature compensating magnetic shunts attached to the stator pole pieces.

Short term instability

The tachogenerator is run at rated load for 3 hours to allow conditions to stabilise and then continued for a further 5 hours during which the-largest peak-to-peak voltage variation in any one hour is recorded. This variation is expressed as a percentage of the average voltage over that hour.

Long term instability

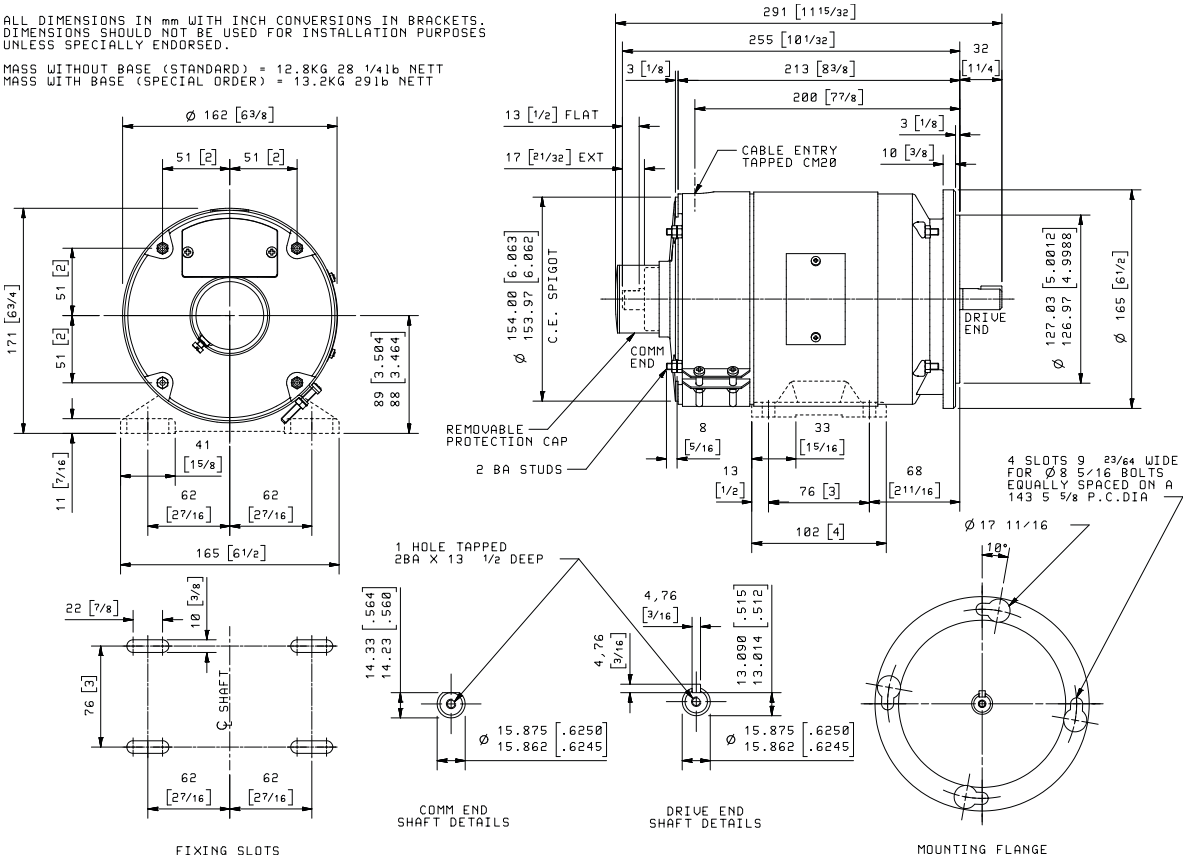
Continuing the above run over 24 hours, hourly readings are taken and the maximum percentage change in voltage per hour is recorded.

Installation and maintenance

A separate document is available detailing the safety measures that must be observed when installing the machine and maintenance considerations for machines that are in operation. It is important that electrical installation is conducted in accordance with relevant local regulations and that bearing replacement, when necessary, is achieved without removing the armature (to maintain accurate performance of the tachogenerator). Machines may be returned to the factory for servicing and remagnetisation.

see back page for a BD2510 outline dimensions

BD2510 Tachogenerator Dimensions



Note:
Can also be supplied with dimensions which conform to NEMA standards, details available on request.

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