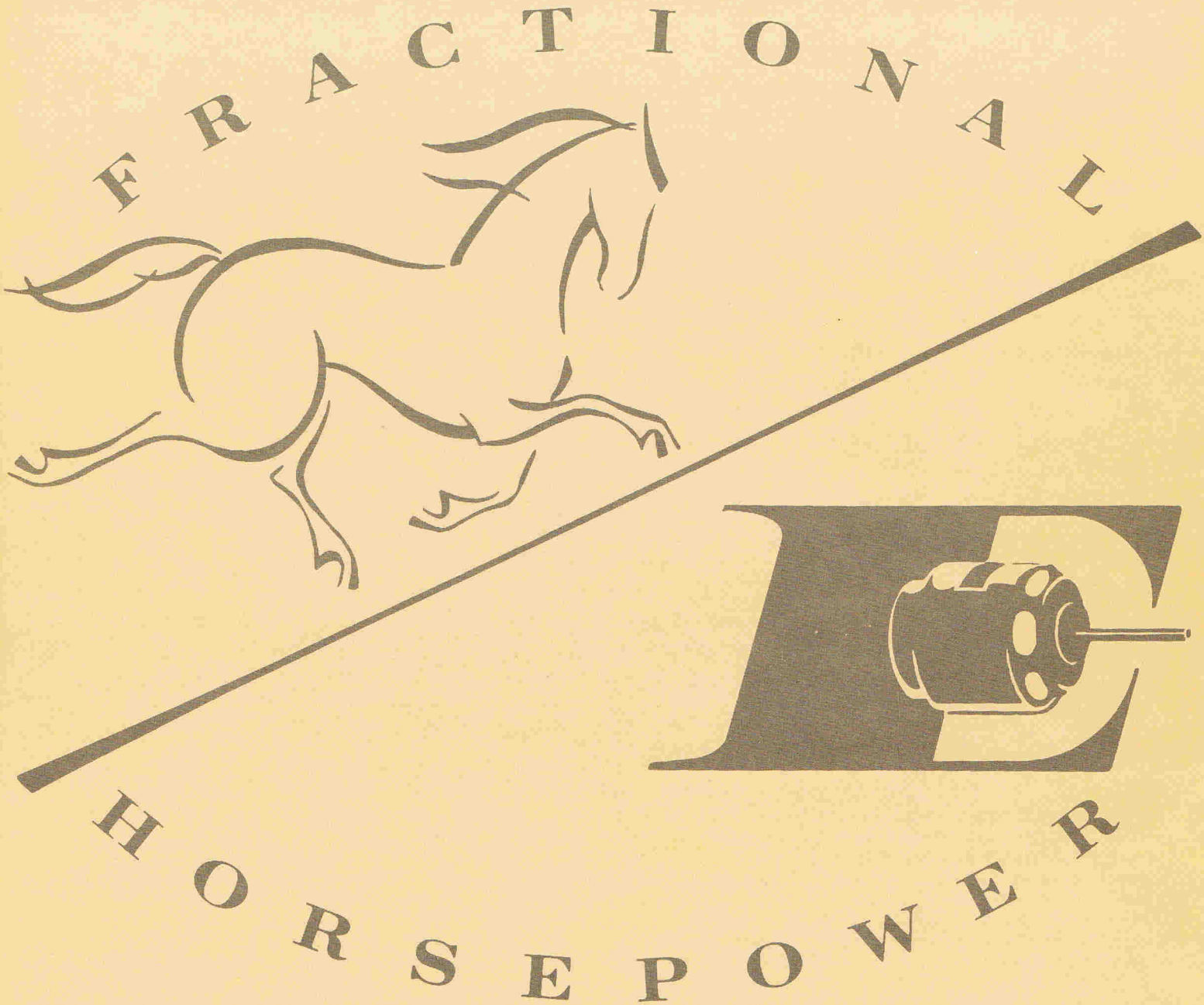
# SYNCHRONOUS MOTORS

## HYSTERESIS MOTORS AND SALIENT POLE INDUCTION MOTORS




# ELINCO

# ELINCO

# Electric Indicator Company

This catalog provides complete electrical and physical configurations available on 309 Elinco Synchronous Motors. These units have been selected as standards with wide applications. For example, dual speed motors shown have mostly equal torque at both speeds. Elinco has several hundred special designs available. For instance, it might be desired to have more torque at one speed than the other. In other words, one might want 55 in. oz. at 1,200 RPM and only 15 in. oz. at 3,600 RPM. Also available are derated motors where a low temperature rise is desired, or high torque motors where temperature rise or intermittent duty is not critical.

Elinco's engineering staff has worked for 40 years with leading engineers to custom tailor motors to their needs, whether this be special electrical or mechanical design. We have solved many tough fabrication and assembly problems and we can solve problems of heat, vacuum, humidity, shock, vibration and weight.

**Delivery:** A large inventory of standard parts is maintained, but the great variety of units offered precludes carrying an inventory of complete motors. Standard catalog items require a reasonable time for assembly and testing therefore units of special design will take proportionately longer.

**Prices:** Elinco motors are custom crafted and the prices depend on quantity ordered. Standard price break quantities are (1-9), (10-24), (25-49), (50-99), (100-249), etc. Elinco will supply quotes to your electrical and mechanical specifications.

Motors thus marked (*) indicate special internal construction to achieve higher torques in a small package. The prices on these run about 15% more than the preceding motors. This is pointed out so that the higher torque motor will not be selected if the torque is not required, since a premium price must be paid for the higher torque when required.

**GUARANTEES:** The general guarantees recommended by N.E.M.A., by which this Company has always abided, are as follows:

"The manufacturer agrees to correct, and shall have the right to correct, by repair or replacement, at his own expense, at his option, F.O.B., his works, any defects in said apparatus which may develop under normal and proper use within twelve months after date of shipment, when inspection proves the claim; providing the purchaser gives the manufacturer immediate written notice of such defects, and provided further that during said period apparatus is properly cared for, operated under normal conditions and with competent supervision. The correction of such defects by repair or replacement by the manufacturer shall constitute a fulfillment of all his obligations to the purchaser.

"The manufacturer shall not be responsible for any damage resulting from improper storage or handling prior to placing the apparatus in service, and the manufacturer shall not assume any expense or liability for repairs made outside his works, without his written consent.

"The manufacturer shall not be liable for consequential damage in case of any failure to meet the conditions of any guarantee."

Electric Indicator Company, Inc., 272 Main Ave., Norwalk, Conn. 06851, Phone (203) 847-5861

CAT. EI-4E REVISED 2-77

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**OMIT "H" IN ABOVE FRAME TYPES FOR SALIENT POLE INDUCTION SYNCHRONOUS MOTOR (PAGE 18 & 19)**

# THEORY OF THE HYSTERESIS MOTOR

**The hysteresis synchronous motor is so named because it utilizes the phenomenon of hysteresis to produce mechanical torque. In its simplest form, the rotor of a hysteresis motor is a smooth cylindrical tube of high hysteresis loss permanent magnet material without windings or slots. It is placed within a slotted stator carrying distributed windings designed to produce, as nearly as possible, a sinusoidal space distribution of flux. In single phase motors, the stator windings usually are the permanent-split-capacitor type. The capacitor value is selected to result in approximately balanced 2 phase conditions within the motor windings. The stator then produces a rotating field, approximately constant in space wave form and rotating at synchronous speed.**

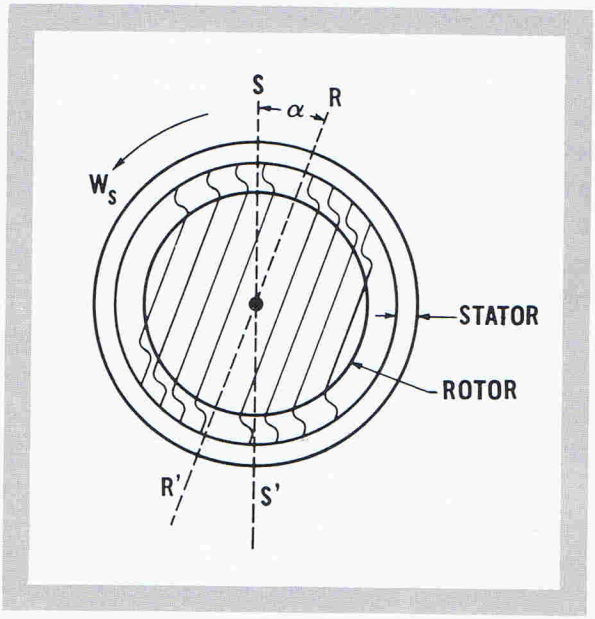



figure 1

Instantaneous magnetic conditions in the air gap are indicated in Figure 1 for a 2 pole stator. The axis SS′ of the stator m.m.f. wave revolves at synchronous speed, because of hysteresis the magnetization of the rotor lags behind the inducing m.m.f. wave, and therefore the axis RR′ of the rotor flux wave lags behind the axis of the stator m.m.f. wave by the hysteresis lag angle "$\alpha$". If the rotor is stationary, starting torque is produced proportional to the product of the fundamental components of the stator m.m.f. and rotor flux and the sine of the torque angle "$\alpha$". The rotor then accelerates if the counter torque of the load is less than the developed torque of the motor. When the rotor is turning at less than synchronous speed, each particle of the rotor is subjected to a repetitive hysteresis cycle at slip frequency. While the rotor is accelerating, the lag angle "$\alpha$" remains constant if the flux is constant, since the angle "$\alpha$" depends merely on the hysteresis loop of the rotor and is independent of the rate at which the loop is traversed.

The motor therefore develops constant torque right up to synchronous speed, as shown in the ideal speed torque, Figure 2. This feature is one of the advantages of the hysteresis motor in contrast to a reluctance motor which must snap its load into synchronism from the induction motor torque speed characteristic. Hysteresis motors can synchronize any load they can accelerate, regardless of the inertia. After reaching synchronism the motors continue to run at synchronous speed and adjust their torque angle to develop torques required by the loads.

There are deviations from the ideal speed torque curves for several reasons. In a single phase capacitor motor, a true two phase condition occurs only at one load point. It is not always possible to obtain a true sinusoidal winding distribution tooth pulsation loss in the rotor etc., so that speed torque curves A and B can be obtained. Therefore there is some flexibility in design possible to obtain curves A or B; curve A, when starting torque is not required; curve B, when a high starting torque is required.

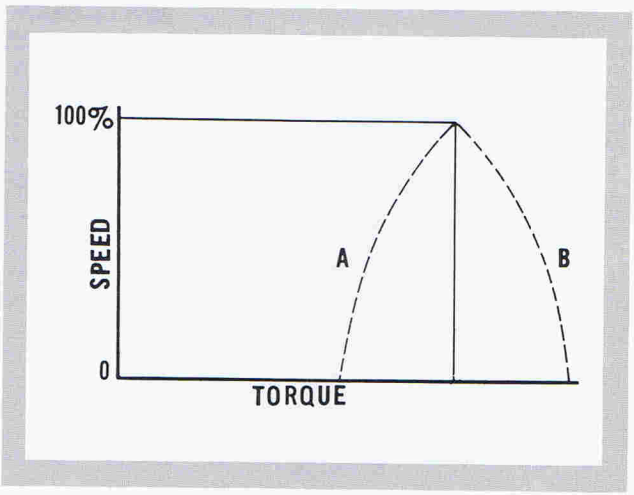
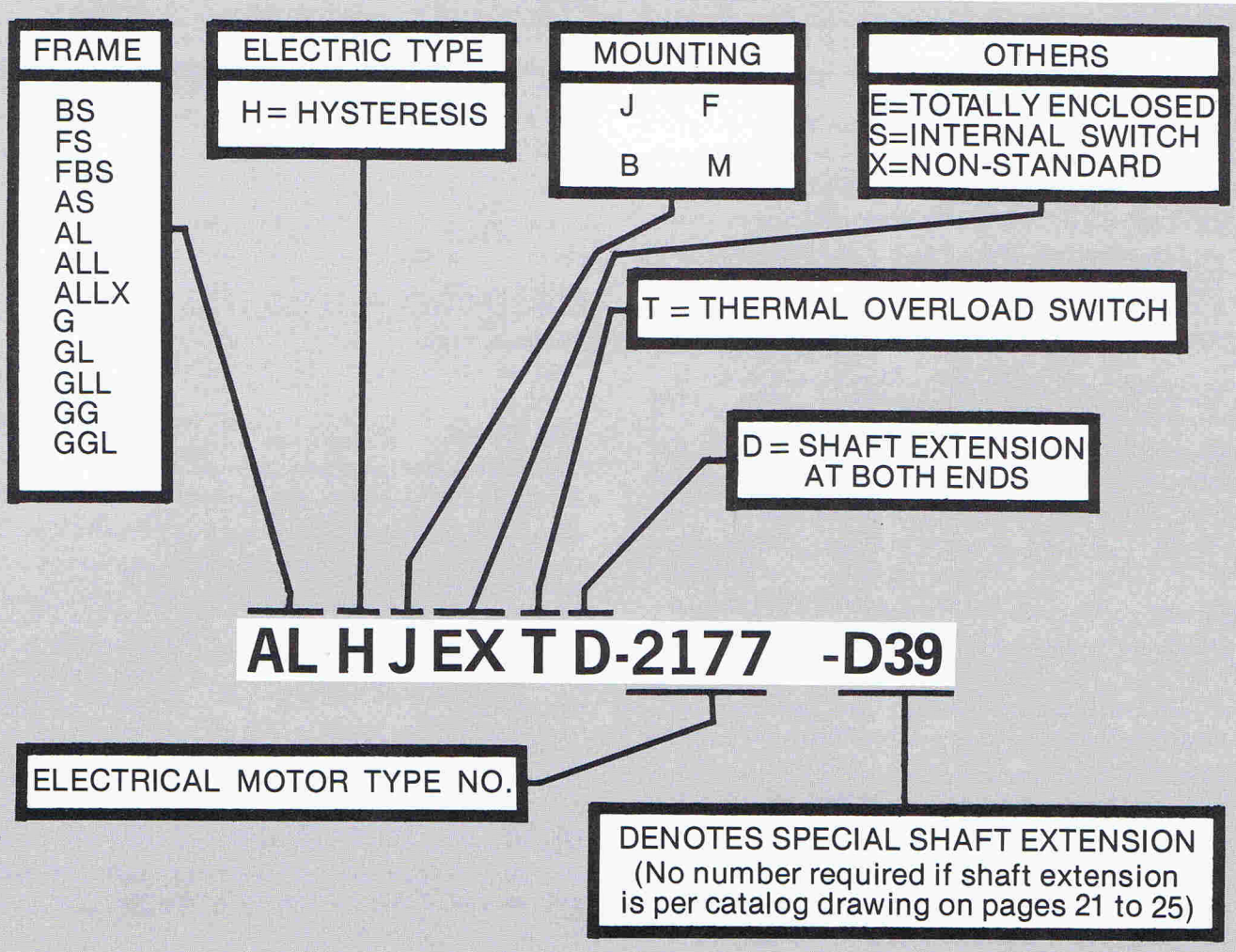



figure 2

# ELINCO DESIGNATION SYSTEM




**SHAFTS** are made of stainless steel to dimensions shown on the frame outline drawings in the catalog. Other dimensions or materials and special features such as flats, slots, splines, threads, double extensions, etc. can be furnished if requested.

**BALL BEARINGS** with seals and/or shields are lubricated for the life of the bearings. Chrome or stainless steel material is used depending on the requirements.

**FRAME MATERIAL** is cast aluminum. A blue-grey mottletone baked enamel is furnished on all non-mounting exterior surfaces. Other colors can be provided if requested.

**VENTILATION,** utilizing an internal fan, is provided on all A and G frames. These frames can also be supplied as totally enclosed units with a reduced horsepower rating. The BS, FS, BSJ, and FBS frame are normally supplied totally enclosed.

**SPECIAL TREATMENT** can be provided to meet extreme conditions of humidity, fungus environment, vibration, shock, high and low temperature and other requirements of military specifications.

**SPECIAL MOUNTING** or mechanical configuration can be supplied when requested. Various units from this and other Elinco catalogs can be combined into a single frame to meet special electrical requirements.

# ELECTRICAL CHARACTERISTICS
## FOR HYSTERESIS AND SALIENT POLE SYNCHRONOUS MOTORS

### VOLTAGE:
All frames, both in hysteresis and salient pole can be wound for voltages up to 440 volts.

### SPEED:
The synchronous speed for the hysteresis and salient pole motors is determined by the formula:

$$\text{Synchronous RPM} = \frac{120 \times \text{Line Frequency}}{\text{Number of Poles}}$$

The following speeds are available by frames:

| Hysteresis Motors: | 50 Hertz RPM | 60 Hertz RPM | 400 Hertz RPM | Poles |
|---|---|---|---|---|
| "BS", "FS" or "FBS" | 1000 | 1200 | 8000 | 6 |
| | 1500 | 1800 | 12000 | 4 |
| | 3000 | 3600 | 24000 | 2 |
| "AS" "AL" "G" "GL" | 500 | 600 | 4000 | 12 |
| | 750 | 900 | 6000 | 8 |
| | 1000 | 1200 | 8000 | 6 |
| | 1500 | 1800 | 12000 | 4 |
| | 3000 | 3600 | 24000 | 2 |

| Salient Pole Motors: | 60 Hertz RPM | Poles |
|---|---|---|
| "BS", "FS" or "FBS" | 1800 | 4 |
| | 3600 | 2 |
| "AS", "AL" "G" "GL" | 1200 | 6 |
| | 1800 | 4 |
| | 3600 | 2 |

**NOTE:**
Synchronous speeds will vary directly with frequency. Dual speed hysteresis 60 or 400 hertz motors can be supplied in any combination of the above single speeds. Three and five speed motors are listed on pages 14 and 15.

### FREQUENCY:
Hysteresis synchronous motors are available or can be developed, in each frame, in any desired frequency from 15 hertz to 1200 hertz. Salient pole synchronous motors are available or can be developed, in each frame, in any desired frequency from 15 hertz to 240 hertz.

### WINDINGS:
Motors can be wound for one, two or three phase operation, with class (H) insulation and other special features. Many units for special application are not shown in the catalog. If the motor you require is not shown, send us your specifications.

### INSULATION:
The following classes of insulation are safe for the following continuous duty at the listed temperatures. The listed temperatures are the absolute value of temperature which consists of the temperature rise of the motor and the ambient temperature.

| | | |
|---|---|---|
| **Class A** | **105°C** | **221°F** |
| **Class F** | **155°C** | **311°F** |
| **Class H** | **180°C** | **356°F** |

### HORSEPOWER RATINGS AT RATED TORQUE:

| **Hysteresis Motor:** | |
|---|---|
| "BS" or "FS" frame | 1/500 to 1/200 HP |
| "FBS" frame | 1/250 to 1/100 HP |
| "AS" frame | 1/300 to 1/50 HP |
| "AL" frame | 1/250 to 1/25 HP |
| "G" frame | 1/75 to 1/10 HP |
| "GL" frame | 1/50 to 1/6 HP |

| **Salient Pole Motors:** | |
|---|---|
| "BS" or "FS" frame | 1/500 to 1/250 HP |
| "FBS" frame | 1/250 to 1/125 HP |
| "AS" frame | 1/300 to 1/75 HP |
| "AL" frame | 1/250 to 1/50 HP |
| "G" frame | 1/75 to 1/15 HP |
| "GL" frame | 1/50 to 1/10 HP |

### DEFINITION OF CATALOGUE TERMS
All motors will meet rated torque at rated voltage, frequency and capacitor. All other data given is nominal.

**Starting Torque**

The starting torque of a motor is the torque which the motor will develop at rest at any angular position of the rotor.

**Pull Out Torque**

The pull out torque is the maximum torque which the motor will develop at synchronous speed.

**Pull In Torque**

The pull in torque is the maximum torque under which the motor will pull into synchronous speed as the rotor approaches synchronous speed.

**Pull Up Torque**

The pull up torque is the minimum torque developed by the motor during the period of acceleration from zero speed to pull in torque.

# SYNCHRONOUS MOTORS

## CHARACTERISTICS OF THE HYSTERESIS TYPE

**The two most popular fractional horsepower Synchronous motors used in precision and semi-precision design are the Hysteresis and the Salient pole or Reluctance types.**

### NOISE AND VIBRATION

The Hysteresis Synchronous motor consists of a wound stator and a rotor of uniform high permeable material. Having a smooth rotor of homogenous material, the noise and vibration produced is inherently low. Since there are no pole faces or saliencies, the magnetic path is of constant permeability, thus eliminating the magnetic pulsations which are the major cause of noise in the salient pole type.

### TORQUE

The torque of the motor is uniform due to the homogenous rotor and constant permeability. There is no variation in torque throughout a revolution. The availability of new materials and designs have increased the torque and horsepower values into the one horsepower range.

### SPEED

The speed of the Hysteresis Synchronous motor is determined by poles and line frequency as given in the formula on page 4. This speed is constant regardless of load variations within the rating of the motor. With a variation of load, however, the rotor will assume a new load angle dependent on the load variation.

Where large load variations or fluctation of line voltage occur, the stabilized Hysteresis motor can be used to reduce hunting. This motor type is described on page 16.

The rotor of the Hysteresis motor, not requiring pole saliencies allows for the design of low speed motors as well as multi-speed motors using the same rotor. Five speed motors and low speeds of 600 rpm, are standard items. Variations to the number of speeds and lower speeds are available in special designs.

### LOAD INERTIA

The Hysteresis Synchronous motor is capable of synchronizing high inertia loads, being unaffected by load inertia, it need only be powerful enough to drive the frictional component of load. The Hysteresis Synchronous motor can pull into synchronism high inertia loads that would require a salient pole motor several times its horsepower rating.

### STARTING TORQUE

In the Hysteresis Synchronous motor, the starting torque is constant throughout 360° of rotor position. Where uniform starting torque or constant tension is required, Hysteresis Synchronous motors, due to the absence of cogging, have been used successfully as torque motors.

### PHASING

The rotor of the Hysteresis Synchronous motor, having no pole saliencies, will lock in phase in any of the 360° of rotor rotation.

In applications where definite phasing is required, the polarized Hysteresis motor is recommended. This type of motor has one-half the "lock-in" points of the salient pole Induction motor. The description of this motor type is on page 16.

### SUMMARY

The Hysteresis Synchronous motor characteristics are:

- Low noise and vibration
- Constant speed regardless of load and voltage variation within motor rating
- Capability of synchronizing high inertia loads
- Uniform starting torque
- Can be wound for lower speed and greater number of poles than is practical with salient pole Induction type motors
- Can be provided as multi-speed motor
- Will lock in at any position with respect to line voltage

## MOTOR WEIGHT AND ROTOR MOMENT OF INERTIA

| FRAME | WEIGHT (Approx.) | MOMENT OF INERTIA (Oz. In.$^2$) |
|---|---|---|
| BS-FS-BSJ | 19 Oz. | 0.6 to 0.7 |
| FBS | 30 Oz. | 1.1 to 1.2 |
| AS | 3¼ Lbs. | 2.4 to 3.8 |
| AL | 4½ Lbs. | 3.0 to 4.7 |
| ALL | 5 Lbs. | 4.6 to 7.1 |
| ALLX | 6 Lbs. | 5.3 to 8.4 |
| G | 7¼ Lbs. | 13.2 to 18.6 |
| GL | 10½ Lbs. | 16.4 to 31.4 |
| GG | 13½ Lbs. | 26.4 to 37.2 |

# SINGLE SPEED MOTORS

## SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 830 | 1200 | 1/500 | 14 | 1.6 | 2.0 | 1.8 | 1.8 | 1 | 220 | figs. 1, 2, 3 page 21 |
| BS | 698 | 1800 | 1/350 | 16 | 1.6 | 2.0 | 1.4 | 1.8 | 1 | 220 | |
| BS | 1217 | 3600 | 1/200 | 16 | 1.4 | 1.6 | 1.6 | 1.5 | 2 | 220 | |
| FBS | 831 | 1200 | 1/250 | 27 | 3.2 | 4.0 | 4.0 | 3.6 | 2 | 220 | fig. 4 page 21 |
| FBS | 583 | 1800 | 1/125 | 30 | 4.4 | 6.0 | 4.8 | 5.4 | 2 | 220 | |
| FBS | 586 | 3600 | 1/100 | 27 | 2.8 | 4.3 | 3.3 | 3.6 | 2 | 220 | |
| AS | 2474 | 600 | 1/300 | 40 | 5.6 | 6.0 | 9.0 | 5.8 | 2 | 220 | figs. 1-4 pages 22 & 23 |
| AS | 2297 | 900 | 1/250 | 30 | 4.5 | 6.2 | 11.2 | 5.8 | 2 | 330 | |
| AS | 2476 | 1200 | 1/75 | 40 | 11.2 | 13.5 | 15.0 | 13.0 | 2 | 330 | |
| AS | 2464 | 1800 | 1/50 | 50 | 11.0 | 12.8 | 16.0 | 12.1 | 3 | 330 | |
| AS | 762 | 3600 | 1/50 | 41 | 5.6 | 7.5 | 8.5 | 7.0 | 3 | 220 | |
| AL | 2475 | 600 | 1/200 | 45 | 8.0 | 11.0 | 12.2 | 10.1 | 3 | 220 | |
| AL | 2462 | 900 | 1/125 | 48 | 9.0 | 10.1 | 21.5 | 9.7 | 3 | 220 | |
| AL | 2457 | 1200 | 1/75 | 40 | 11.2 | 13.7 | 16.0 | 13.1 | 2 | 330 | |
| AL | 724 | 1800 | 1/45 | 52 | 12.0 | 16.0 | 14.0 | 14.0 | 3 | 220 | |
| AL | 693 | 3600 | 1/30 | 60 | 9.6 | 10.7 | 12.0 | 9.9 | 5 | 220 | |
| ALL | 1493* | 600 | 1/150 | 60 | 11.2 | 15.0 | 11.5 | 14.0 | 5 | 220 | |
| ALL | 1683* | 900 | 1/50 | 93 | 22.4 | 27.2 | 32.0 | 24.8 | 5 | 330 | |
| ALL | 2573 | 1800 | 1/25 | 78 | 22.4 | 29.0 | 26.0 | 28.0 | 3 | 330 | |
| ALL | 2307 | 3600 | 1/20 | 81 | 14.0 | 19.2 | 19.2 | 18.4 | 5 | 330 | |
| G | 353 | 600 | 1/150 | 57 | 11.2 | 13.7 | 20.0 | 12.0 | 4 | 330 | figs. 1-4 pages 24 & 25 |
| G | 2472 | 900 | 1/50 | 76 | 22.5 | 26.0 | 35.0 | 24.5 | 3 | 330 | |
| G | 2502 | 1200 | 1/30 | 82 | 28.0 | 32.0 | 38.0 | 30.0 | 3 | 330 | |
| G | 1586 | 1800 | 1/15 | 102 | 37.0 | 46.5 | 48.0 | 43.0 | 6 | 330 | |
| G | 2440 | 3600 | 1/12 | 157 | 23.3 | 30.0 | 36.5 | 28.8 | 6 | 330 | |
| GL | 2486 | 600 | 1/60 | 94 | 28.0 | 32.0 | 33.6 | 30.4 | 4 | 330 | |
| GL | 2506* | 600 | 1/45 | 111 | 37.0 | 44.0 | 56.6 | 41.6 | 4 | 440 | |
| GL | 1613 | 900 | 1/25 | 115 | 45.0 | 59.0 | 64.0 | 54.0 | 5 | 330 | |
| GL | 2441* | 900 | 1/20 | 115 | 60.0 | 70.5 | 65.6 | 67.3 | 4 | 440 | |
| GL | 2221* | 1200 | 1/10 | 170 | 84.0 | 110.0 | 101.0 | 105.8 | 8 | 330 | |
| GL | 2428 | 1800 | 1/10 | 129 | 56.0 | 65.8 | 59.2 | 59.5 | 6 | 330 | |
| GL | 1128 | 1800 | 1/8 | 172 | 70.0 | 86.0 | 86.0 | 73.0 | 10 | 330 | |
| GL | 1921* | 1800 | 1/5 | 277 | 112.0 | 130.0 | 126.0 | 120.0 | 12 | 330 | |
| GL | 2137 | 3600 | 1/6 | 250 | 44.0 | 54.5 | 70.0 | 48.0 | 10 | 330 | |

*See inside front cover

## SINGLE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AL | 2110 | 70 | 3600 | 1/30 | 55 | 9.0 | 12.2 | 12.2 | 11.7 | 7 | 220 | figs pages 22 & 23 |
| ALL | 2092 | 230 | 1800 | 1/40 | 65 | 14.0 | 20.8 | 35.2 | 17.6 | 5 | 330 | |
| ALL | 2173 | 220 | 1800 | 1/25 | 78 | 22.5 | 27.0 | 32.0 | 26.0 | 4 | 330 | |
| GL | 2011* | 230 | 1800 | 1/10 | 190 | 56.0 | 72.0 | 56.0 | 64.0 | 3 | 550 | figs. pages 24 & 25 |
| GL | 1046 | 230 | 3600 | 1/7 | 207 | 40.0 | 48.0 | 72.8 | 44.0 | 4 | 550 | |

*See inside front cover

## TWO PHASE, ODD FREQUENCY, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | Hertz | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FBS | 1121 | 28 | 450 | 22½ | 1/1500 | 16 | 1.5 | 3.5 | 1.5 | 1.8 | fig. 4 page 21 |
| AL | 1047 | 115 | 7200 | 240 | 1/25 | 55 | 5.6 | 6.9 | 12.0 | 6.6 | figs. 1-4 pages 22 & 23 |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# SINGLE SPEED MOTORS

## TWO PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| BS | 1877 | 22 | 1800 | 1/250 | 26 | 2.2 | 2.8 | 2.6 | 2.6 | figs. 1, 2, 3 page 21 |
| AS | 2493 | 115 | 1200 | 1/75 | 48 | 11.2 | 12.5 | 19.2 | 12.1 | figs. 1-4 pages 22 & 23 |
| AL | 425 | 55 | 900 | 1/150 | 27 | 7.4 | 11.0 | 14.7 | 9.6 | |
| AL | 450 | 27.5 | 900 | 1/150 | 50 | 7.4 | 10.2 | 12.8 | 9.6 | |
| AL | 906 | 115 | 1800 | 1/50 | 45 | 11.2 | 16.0 | 22.0 | 14.0 | |
| GL | 2537 | 115 | 600 | 1/120 | 49 | 14.0 | 20.8 | 32.8 | 18.9 | figs. 1-4 pages 24 & 25 |
| GL | 2273* | 27.5 | 900 | 1/25 | 115 | 43.0 | 46.4 | 86.5 | 44.8 | |

*See inside front cover

## THREE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| BS | 610 | 30 | 1800 | 1/750 | 8 | .7 | .84 | .60 | .76 | figs. 1, 2, 3 page 21 |
| FBS | 2097 | 115 | 1800 | 1/100 | 35 | 5.6 | 7.3 | 10.4 | 6.8 | fig. 4 page 21 |
| AS | 2554 | 115 | 900 | 1/100 | 40 | 11.2 | 13.0 | 24.0 | 12.5 | figs. 1-4 pages 22 & 23 |
| AS | 1920 | 208 | 1800 | 1/40 | 60 | 14.0 | 18.4 | 32.0 | 17.6 | |
| AL | 1666 | 100 | 900 | 1/75 | 45 | 14.0 | 17.6 | 22.4 | 15.2 | |
| AL | 1882 | 115 | 1200 | 1/75 | 49 | 11.0 | 12.3 | 18.8 | 11.6 | |
| AL | 2234 | 240 | 1800 | 1/50 | 65 | 11.2 | 16.5 | 26.2 | 15.7 | |
| AS | 2219 | 208 | 3600 | 1/40 | 50 | 7.0 | 10.7 | 22.4 | 10.6 | |
| ALL | 1912 | 115 | 1800 | 1/25 | 82 | 22.5 | 25.5 | 38.5 | 24.0 | |
| ALL | 2040 | 208 | 1800 | 1/25 | 75 | 22.5 | 27.2 | 41.0 | 26.4 | |
| ALLX | 1429 | 208 | 3600 | 1/15 | 108 | 18.4 | 26.0 | 48.0 | 25.3 | |
| G | 2286 | 120 | 1800 | 1/15 | 132 | 38.2 | 42.4 | 80.0 | 41.5 | figs. 1-4 pages 24 & 25 |
| GL | 1823* | 208 | 600 | 1/40 | 107 | 42.0 | 44.0 | 44.0 | 43.0 | |
| GL | 1848* | 208 | 900 | 1/25 | 125 | 45.0 | 53.1 | 68.8 | 52.8 | |
| GL | 2417* | 208 | 1200 | 1/12 | 134 | 65.0 | 74.5 | 158.5 | 72.8 | |
| GL | 2167 | 208 | 1800 | 1/15 | 107 | 40.0 | 47.2 | 93.0 | 45.6 | |
| GL | 1960* | 220 | 1800 | 1/5 | 270 | 112.0 | 120.0 | 127.0 | 117.0 | |
| GL | 2125 | 220 | 3600 | 1/10 | 122 | 28.0 | 32.0 | 78.0 | 30.0 | |
| GL | 2360* | 115 | 3600 | 1/4 | 297 | 70.0 | 83.0 | 182.0 | 80.8 | |

*See inside front cover

**The magnetizing current on a three phase motor is normally high, so that the Volt-Amperes required are normally about 3 times the actual watts taken by the motor. In cases such as an electronic amplifier where the Volt-Amperes from the power supply are limited, the current taken by the motor can be reduced to approximately 1/3 its value by using capacitors across the lines for power factor correction.**

# DUAL VOLTAGE CONNECTION

## THREE PHASE, 60 HERTZ

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| ALLX | 1569 | 208 | 3600 | 1/15 | 105 | 18.6 | 24.0 | 44.8 | 23.4 | figs. 1-4 pages 22 & 23 |
| | | 230 | 3600 | 1/15 | 105 | 18.6 | 26.0 | 46.4 | 25.0 | |
| ALLX | 1326* | 208 | 3600 | 1/10 | 136 | 28.0 | 32.0 | 54.4 | 31.2 | |
| | | 230 | 3600 | 1/10 | 136 | 28.0 | 34.4 | 54.4 | 32.8 | |
| GL | 1787* | 208 | 1800 | 1/10 | 134 | 56.0 | 78.5 | 123.0 | 76.8 | figs. 1-4 pages 24 & 25 |
| | | 230 | 1800 | 1/10 | 123 | 56.0 | 81.6 | 126.0 | 78.4 | |
| GL | 1798* | 208 | 3600 | 1/6 | 222 | 47.0 | 56.8 | 100.0 | 54.5 | |
| | | 230 | 3600 | 1/6 | 217 | 47.0 | 54.4 | 94.5 | 52.8 | |

*See inside front cover

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# SINGLE SPEED MOTORS

## SINGLE PHASE, 50 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 961 | 115 | 1500 | 1/350 | 15 | 1.9 | 2.1 | 1.1 | 2.0 | 1 | 220 | figs. 1, 2, 3 page 21 |
| FBS | 897 | 115 | 1000 | 1/300 | 30 | 3.4 | 4.0 | 4.1 | 3.6 | 3 | 220 | |
| FBS | 2473 | 115 | 1500 | 1/150 | 30 | 4.5 | 5.9 | 4.8 | 5.6 | 3 | 220 | fig. 4 page 21 |
| FBS | 1318 | 220 | 3000 | 1/75 | 38 | 4.0 | 4.8 | 6.0 | 4.4 | 1 | 440 | |
| AS | 2079 | 115 | 500 | 1/400 | 30 | 5.0 | 5.6 | 6.4 | 5.1 | 2 | 220 | |
| AS | 2344 | 115 | 1500 | 1/125 | 25 | 5.4 | 8.3 | 7.0 | 6.7 | 2.5 | 220 | |
| AL | 2552* | 115 | 500 | 1/250 | 45 | 8.0 | 9.9 | 9.1 | 8.8 | 5 | 220 | figs. 1-4 pages 22 & 23 |
| AL | 1676 | 115 | 1500 | 1/50 | 55 | 14.0 | 17.6 | 17.6 | 16.8 | 4 | 220 | |
| AL | 618 | 115 | 3000 | 1/35 | 50 | 9.5 | 11.7 | 13.5 | 11.4 | 6 | 220 | |
| AL | 2158 | 220 | 3000 | 1/35 | 60 | 9.5 | 12.8 | 12.3 | 10.4 | 5 | 220 | |
| ALL | 2085 | 230 | 1500 | 1/40 | 58 | 16.8 | 24.8 | 30.7 | 20.8 | 5 | 220 | |
| G | 2532 | 115 | 750 | 1/60 | 75 | 22.4 | 29.5 | 36.0 | 28.0 | 3 | 330 | |
| G | 1090 | 115 | 1500 | 1/15 | 128 | 45.0 | 48.6 | 61.0 | 46.2 | 8 | 330 | |
| G | 2333 | 115 | 3000 | 1/15 | 105 | 22.5 | 27.2 | 34.4 | 26.2 | 5 | 330 | figs. 1-4 pages 24 & 25 |
| GL | 2324 | 115 | 1500 | 1/8 | 235 | 84.0 | 94.4 | 118.0 | 90.4 | 10 | 330 | |
| GL | 2181 | 115 | 3000 | 1/7 | 246 | 48.0 | 55.2 | 76.0 | 52.8 | 10 | 330 | |
| GL | 2189* | 115 | 3000 | 1/5 | 312 | 68.0 | 72.0 | 81.6 | 69.6 | 10 | 440 | |

*See inside front cover.

## THREE PHASE, 50 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| AS | 2177 | 208 | 1500 | 1/40 | 60 | 16.0 | 18.9 | 30.6 | 18.2 | |
| ALL | 2103 | 220 | 1500 | 1/25 | 77 | 27.2 | 34.3 | 40.0 | 33.2 | figs. 1-4 pages 22 & 23 |
| ALLX | 1545* | 220 | 3000 | 1/15 | 111 | 22.4 | 28.0 | 50.5 | 25.6 | |
| | | 380 | 3000 | 1/15 | 120 | 22.4 | 32.0 | 47.3 | 29.1 | |
| GL | 2524* | 208 | 1000 | 1/18 | 133 | 55.0 | 63.2 | 126.8 | 60.8 | figs. 1-4 pages 24 & 25 |
| GL | 1786* | 220 | 3000 | 1/6 | 202 | 56.0 | 74.5 | 99.0 | 73.0 | |

*See inside front cover.

## SINGLE PHASE, 50/60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz.In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AS | 2079 | 500 | 1/400 | 30 | 5.0 | 5.6 | 6.4 | 5.1 | 2 | 220 | figs. 1-4 pages 22 & 23 |
| | | 600 | 1/350 | 34 | 4.8 | 5.7 | 8.1 | 5.4 | | | |
| G | 2492 | 500 | 1/100 | 89 | 21.0 | 24.8 | 24.0 | 23.2 | 6 | 330 | |
| | | 600 | 1/80 | 111 | 21.0 | 24.8 | 29.7 | 22.2 | | | |
| GL | 1959 | 1500 | 1/10 | 195 | 67.0 | 72.0 | 102.0 | 68.0 | 10 | 330 | figs. 1-4 pages 24 & 25 |
| | | 1800 | 1/10 | 149 | 56.0 | 78.5 | 76.8 | 60.0 | 7 | | |
| GL | 1979* | 3000 | 1/5 | 300 | 67.0 | 81.6 | 76.8 | 76.8 | 15 | 440 | |
| | | 3600 | 1/5 | 285 | 56.0 | 72.0 | 64.8 | 67.2 | 12 | | |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNI

*See inside front cover.

**NOTE: 50/60 HERTZ MOTORS ARE NOT AS EFFICIENT AS MOTORS DESIGNED SPECIFICALLY FOR 50 HERTZ OR 60 HERTZ**

# SINGLE SPEED MOTORS

## SINGLE PHASE, 400 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Full Load Amps | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 925 | 115 | 8000 | 1/200 | 25 | .44 | .6 | 1.15 | 1.0 | .7 | .15 | 330 | fig. 1, 2, 3 page 21 |
| BS | 898 | 115 | 12000 | 1/100 | 25 | .45 | .8 | 1.2 | 1.2 | .9 | .22 | 330 | |
| FBS | 801 | 115 | 12000 | 1/70 | 40 | .6 | 1.2 | 1.6 | 1.6 | 1.3 | .5 | 330 | fig. 4 page 21 |
| FBS | 2357 | 115 | 24000 | 1/40 | 50 | .5 | 1.0 | 2.2 | 1.6 | 1.2 | .5 | 330 | |
| AS | 900 | 115 | 4000 | 1/120 | 90 | 1.0 | 2.1 | 2.8 | 6.8 | 2.6 | .75 | 330 | |
| AS | 1308 | 115 | 6000 | 1/50 | 80 | 1.4 | 3.3 | 4.6 | 6.9 | 3.9 | 1.0 | 330 | |
| AS | 1222 | 115 | 8000 | 1/30 | 93 | 1.1 | 4.2 | 5.2 | 8.3 | 4.6 | 1.0 | 330 | |
| AL | 790 | 115 | 4000 | 1/75 | 84 | 1.6 | 3.4 | 5.4 | 4.9 | 5.0 | .75 | 330 | figs. 1-4 pages 22 & 23 |
| AL | 1001 | 208 | 4000 | 1/100 | 73 | .8 | 2.5 | 4.1 | 7.7 | 3.2 | .5 | 440 | |
| AL | 1147 | 115 | 8000 | 1/10 | 180 | 3.1 | 12.6 | 13.6 | 18.4 | 13.1 | 1.0 | 440 | |
| AL | 841 | 115 | 12000 | 1/15 | 150 | 2.2 | 5.6 | 7.2 | 7.6 | 6.5 | 1.0 | 330 | |
| ALL | 1194 | 115 | 4000 | 1/40 | 101 | 3.0 | 6.3 | 8.3 | 9.5 | 6.8 | 1.0 | 440 | |
| ALL | 1156 | 115 | 8000 | 1/8 | 228 | 4.7 | 15.7 | 24.0 | 12.0 | 23.2 | 1.0 | 440 | |
| G | 649 | 115 | 8000 | 1/10 | 210 | 3.5 | 12.8 | 24.8 | 27.2 | 13.1 | 1.5 | 440 | |
| G | 1653 | 115 | 12000 | 1/10 | 270 | 4.5 | 8.4 | 13.4 | 19.2 | 12.8 | 1.5 | 440 | |
| GL | 2497 | 115 | 4000 | 1/25 | 330 | 11.0 | 10.0 | 16.0 | 32.0 | 15.0 | 3.0 | 440 | figs. 1-4 pages 24 & 25 |
| GL | 1678 | 115 | 6000 | 1/10 | 400 | 7.5 | 16.0 | 19.2 | 48.0 | 17.6 | 5.0 | 330 | |
| GL | 1122* | 115 | 8000 | 1/6 | 382 | 8.0 | 21.0 | 35.2 | 41.5 | 28.8 | 3.0 | 440 | |
| GL | 1085 | 115 | 12000 | 1/5 | 425 | 7.7 | 16.8 | 23.2 | 25.0 | 20.8 | 6.0 | 220 | |

*See inside front cover

## THREE PHASE, 400 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Full Load Amps | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AS | 1365 | 208 | 6000 | 1/35 | 44 | .7 | 4.8 | 5.9 | 13.4 | 5.6 | |
| AS | 1207 | 115 | 6000 | 1/50 | 51 | 1.4 | 3.3 | 4.6 | 12.0 | 4.3 | |
| AS | 1705 | 115 | 12000 | 1/50 | 50 | .80 | 1.7 | 3.0 | 7.6 | 2.4 | |
| AL | 2491 | 115 | 24000 | 1/4 | 360 | 5.7 | 10.0 | 12.0 | 53.0 | 11.7 | figs. 1-4 pages 22 & 23 |
| AL | 1602 | 115 | 6000 | 1/50 | 68 | 2.1 | 5.6 | 7.5 | 16.0 | 7.0 | |
| AL | 2571 | 115 | 8000 | 1/25 | 210 | 3.5 | 5.0 | 6.7 | 42.2 | 6.2 | |
| AL | 1544 | 230 | 12000 | 1/15 | 110 | 1.0 | 5.6 | 7.3 | 22.0 | 7.0 | |
| ALL | 2298 | 440 | 12000 | 1/10 | 136 | .5 | 8.4 | 9.3 | 21.5 | 9.0 | |
| G | 2284 | 89 | 6000 | 1/10 | 277 | 9.4 | 16.8 | 21.6 | 101.0 | 20.8 | |
| G | 1148 | 208 | 12000 | 1/4 | 365 | 3.85 | 21.0 | 27.2 | 80.0 | 25.0 | figs. 1-4 pages 24 & 25 |
| GL | 1517 | 208 | 6000 | 1/25 | 135 | 1.8 | 6.7 | 8.5 | 42.0 | 8.4 | |
| GL | 2299* | 440 | 12000 | 1/5 | 326 | 1.3 | 16.8 | 19.2 | 62.5 | 17.9 | |

*See inside front cover

## SINGLE PHASE, ODD FREQUENCY, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | Hertz | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 915 | 180 | 4050 | 135 | 1/1000 | 8 | .25 | .35 | .5 | .3 | .2 | 330 | figs. 1, 2, 3 page 21 |
| AL | 1149 | 115 | 1500 | 100 | 1/75 | 45 | 9.0 | 11.0 | 12.0 | 10.5 | 1.0 | 440 | figs. 1-4 pages 22 & 23 |
| AL | 1180 | 115 | 7200 | 120 | 1/50 | 50 | 2.8 | 6.5 | 4.8 | 4.8 | 4.0 | 220 | |
| G | 434 | 115 | 7200 | 240 | 1/30 | 95 | 4.2 | 8.0 | 4.5 | 7.2 | 1.0 | 220 | figs. 1-4 pages 24 & 25 |

**SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS**

# DUAL SPEED MOTORS

## SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 388 | 1800 | 1/1200 | 14 | .50 | .75 | .56 | .56 | 1.5 | 220 | fig. 1, 2, 3 page 21 |
| | | 3600 | 1/600 | 14 | .50 | .65 | .30 | .55 | | | |
| AS | 2171 | 600 | 1/400 | 42 | 4.0 | 4.8 | 4.2 | 4.2 | 5 | 220 | |
| | | 1800 | 1/125 | 42 | 4.5 | 5.7 | 6.7 | 5.6 | | | |
| AS | 2196 | 900 | 1/350 | 38 | 3.2 | 4.0 | 5.0 | 3.5 | 3 | 220 | |
| | | 3600 | 1/90 | 42 | 3.0 | 5.1 | 3.9 | 4.1 | 4 | | |
| AL | 1269 | 600 | 1/300 | 52 | 5.6 | 6.4 | 4.8 | 6.0 | 5 | 220 | |
| | | 900 | 1/200 | 48 | 5.6 | 5.8 | 5.1 | 5.7 | | | |
| AL | 1363 | 600 | 1/400 | 48 | 4.2 | 6.2 | 4.6 | 5.6 | 4 | 220 | |
| | | 1200 | 1/200 | 50 | 4.2 | 8.0 | 5.3 | 6.5 | | | |
| AL | 2490 | 600 | 1/300 | 50 | 5.6 | 6.7 | 10.4 | 5.9 | 5 | 220 | |
| | | 1800 | 1/100 | 50 | 5.6 | 7.8 | 7.1 | 7.2 | | | |
| AL | 2080 | 600 | 1/375 | 59 | 4.5 | 5.6 | 5.3 | 5.2 | 6 | 220 | figs. 1-4 pages 22 & 23 |
| | | 3600 | 1/90 | 70 | 3.1 | 6.5 | 4.6 | 5.6 | | | |
| AL | 2482 | 900 | 1/200 | 41 | 5.6 | 7.0 | 8.0 | 6.5 | 4 | 220 | |
| | | 1800 | 1/100 | 50 | 5.6 | 8.8 | 6.9 | 8.5 | | | |
| AL | 2560 | 900 | 1/200 | 42 | 5.6 | 6.9 | 6.5 | 7.0 | 3 | 220 | |
| | | 3600 | 1/50 | 43 | 5.6 | 7.0 | 6.5 | 7.0 | | | |
| AL | 1932 | 1200 | 1/75 | 60 | 11.0 | 13.2 | 12.1 | 11.8 | 5 | 220 | |
| | | 1800 | 1/60 | 55 | 9.5 | 11.8 | 12.9 | 10.5 | | | |
| AL | 2468 | 1200 | 1/100 | 63 | 8.4 | 10.8 | 9.7 | 9.8 | 5 | 220 | |
| | | 3600 | 1/40 | 63 | 7.0 | 11.2 | 9.4 | 9.7 | | | |
| AL | 1038 | 1800 | 1/60 | 50 | 9.5 | 12.5 | 14.0 | 10.0 | 5 | 220 | |
| | | 3600 | 1/40 | 65 | 7.0 | 10.0 | 9.0 | 8.5 | | | |
| ALL | 937 | 900 | 1/100 | 75 | 11.0 | 13.0 | 12.0 | 11.0 | 6 | 220 | |
| | | 1800 | 1/50 | 80 | 11.0 | 19.0 | 12.0 | 17.0 | | | |
| ALL | 1271 | 900 | 1/120 | 80 | 9.4 | 12.5 | 14.1 | 11.7 | 7 | 220 | |
| | | 3600 | 1/30 | 100 | 9.4 | 12.5 | 10.7 | 11.2 | | | |
| ALL | 1624 | 1200 | 1/100 | 62 | 8.4 | 13.6 | 13.6 | 11.8 | 5 | 220 | |
| | | 3600 | 1/40 | 58 | 7.0 | 13.1 | 9.6 | 10.4 | | | |
| ALL | 1040 | 1800 | 1/50 | 60 | 11.0 | 20.0 | 14.0 | 13.0 | 5 | 220 | |
| | | 3600 | 1/30 | 80 | 9.0 | 12.0 | 10.0 | 10.0 | | | |
| ALLX | 1316 | 1800 | 1/40 | 80 | 14.0 | 19.5 | 28.8 | 16.0 | 7 | 330 | |
| | | 3600 | 1/20 | 100 | 14.0 | 17.6 | 18.4 | 14.7 | | | |
| G | 2528 | 600 | 1/200 | 57 | 8.0 | 9.9 | 9.5 | 8.8 | 4 | 330 | |
| | | 900 | 1/100 | 55 | 11.2 | 13.6 | 15.0 | 12.6 | | | |
| G | 366 | 600 | 1/225 | 64 | 7.4 | 8.3 | 7.0 | 7.6 | 6 | 220 | |
| | | 1200 | 1/75 | 80 | 11.0 | 19.2 | 12.1 | 16.8 | | | |
| G | 2509 | 600 | 1/200 | 70 | 8.4 | 10.2 | 9.2 | 9.3 | 4 | 330 | |
| | | 1800 | 1/40 | 73 | 14.0 | 20.8 | 18.2 | 18.4 | | | |
| G | 2523 | 600 | 1/200 | 74 | 8.4 | 11.2 | 7.9 | 10.2 | 6 | 220 | |
| | | 3600 | 1/40 | 90 | 6.9 | 12.0 | 9.0 | 9.0 | | | |
| G | 2581 | 900 | 1/70 | 73 | 16 | 19.2 | 28.2 | 17.6 | 4 | 330 | |
| | | 1800 | 1/35 | 92 | 16 | 24.0 | 19.2 | 22.4 | | | figs. 1-4 pages 24 & 25 |
| G | 2369 | 900 | 1/40 | 106 | 25 | 34.4 | 36.8 | 31.4 | 8 | 220 | |
| | | 1800 | 1/20 | 143 | 25 | 33.6 | 30.4 | 32.0 | | | |
| G | 519 | 1200 | 1/60 | 67 | 14.0 | 16.8 | 26.0 | 16.0 | 6 | 220 | |
| | | 1800 | 1/40 | 80 | 14.0 | 19.2 | 15.0 | 16.0 | 5 | | |
| G | 2538 | 1200 | 1/50 | 85 | 16.8 | 25.0 | 30.0 | 20.8 | 6 | 330 | |
| | | 3600 | 1/25 | 120 | 11.2 | 14.0 | 16.0 | 13.0 | | | |
| G | 2032 | 1800 | 1/30 | 115 | 18.0 | 24.8 | 26.2 | 23.2 | 6 | 330 | |
| | | 3600 | 1/15 | 114 | 18.0 | 23.5 | 23.4 | 22.4 | | | |
| GL | 2780 | 600 | 1/100 | 75 | 16.0 | 28.0 | 8.0 | 26.0 | 4 | 330 | |
| | | 1200 | 1/50 | 75 | 16.0 | 28.0 | 8.0 | 26.0 | | | |

CONTINUED ON PAGE 11

# DUAL SPEED MOTORS

CONTINUED FROM PAGE 10

## SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GL | 2518 | 600 | 1/80 | 122 | 22.0 | 27.2 | 30.4 | 25.2 | 6 | 330 | |
| | | 1800 | 1/25 | 138 | 22.0 | 29.6 | 24.0 | 27.2 | | | |
| GL | 1918 | 600 | 1/100 | 141 | 16.8 | 20.8 | 20.2 | 18.4 | 8 | 330 | |
| | | 3600 | 1/10 | 172 | 28.0 | 35.2 | 31.3 | 31.0 | | | |
| GL | 2253* | 600 | 1/60 | 150 | 28.0 | 33.6 | 35.2 | 32.0 | 10 | 330 | |
| | | 3600 | 1/10 | 270 | 28.0 | 31.4 | 37.9 | 31.2 | | | |
| GL | 991 | 900 | 1/40 | 134 | 28.0 | 32.8 | 58.2 | 30.4 | 8 | 330 | |
| | | 1800 | 1/15 | 116 | 38.0 | 52.8 | 47.0 | 46.4 | | | |
| GL | 2500* | 900 | 1/30 | 129 | 40.0 | 48.0 | 45.0 | 44.8 | 10 | 330 | |
| | | 1800 | 1/12 | 179 | 45.0 | 54.5 | 45.6 | 51.2 | | | |
| GL | 1371 | 900 | 1/40 | 156 | 28.0 | 33.0 | 61.0 | 30.4 | 10 | 330 | figs. 1-4 pages 24 & 25 |
| | | 3600 | 1/12 | 173 | 23.4 | 27.2 | 31.1 | 25.6 | | | |
| GL | 1990* | 900 | 1/30 | 145 | 35.0 | 48.0 | 51.2 | 42.4 | 10 | 330 | |
| | | 3600 | 1/6 | 335 | 45.0 | 54.4 | 43.5 | 49.6 | 15 | | |
| GL | 1267 | 1200 | 1/25 | 130 | 34.0 | 40.0 | 40.6 | 38.1 | 6 | 330 | |
| | | 1800 | 1/15 | 130 | 37.0 | 48.8 | 43.5 | 43.8 | | | |
| GL | 1623* | 1200 | 1/15 | 185 | 55.0 | 62.0 | 58.0 | 61.0 | 10 | 330 | |
| | | 3600 | 1/5 | 315 | 55.0 | 62.0 | 58.0 | 61.0 | | | |
| GL | 989 | 1800 | 1/12 | 175 | 45.0 | 60.0 | 60.0 | 57.2 | 8 | 330 | |
| | | 3600 | 1/8 | 270 | 35.0 | 42.5 | 50.0 | 40.8 | | | |
| GL | 1712* | 1800 | 1/10 | 195 | 55.0 | 64.0 | 64.0 | 62.0 | 10 | 330 | |
| | | 3600 | 1/5 | 315 | 55.0 | 62.0 | 58.0 | 61.0 | | | |

*See inside front cover

## SINGLE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALL | 2028 | 100 | 900 | 1/200 | 38 | 6.0 | 8.0 | 7.2 | 7.2 | 5 | 220 | |
| | | | 1800 | 1/100 | 38 | 6.0 | 10.5 | 5.3 | 8.1 | | | |
| ALL | 2157 | 230 | 900 | 1/100 | 70 | 11.0 | 13.6 | 12.5 | 12.8 | 4 | 330 | figs. 1-4 pages 22 & 23 |
| | | | 1800 | 1/40 | 90 | 14.0 | 20.0 | 17.6 | 18.4 | | | |
| ALLX | 1379 | 230 | 1800 | 1/40 | 83 | 14.0 | 26.4 | 27.6 | 19.2 | 2 | 440 | |
| | | | 3600 | 1/20 | 112 | 14.0 | 21.6 | 19.2 | 19.2 | | | |

## THREE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| ALLX | 1401 | 208 | 1800 | 1/40 | 75 | 14.0 | 25.6 | 35.2 | 24.0 | |
| | | | 3600 | 1/20 | 120 | 14.0 | 22.4 | 30.4 | 19.2 | figs. 1-4 pages 22 & 23 |
| G | 1865 | 208 | 1200 | 1/45 | 86 | 18.0 | 22.4 | 52.8 | 20.8 | |
| | | | 3600 | 1/15 | 135 | 18.0 | 22.4 | 43.2 | 20.8 | |
| GL | 2513 | 230 | 900 | 1/20 | 152 | 56.0 | 72.0 | 110.8 | 70.5 | |
| | | | 1800 | 1/10 | 205 | 56.0 | 77.0 | 120.0 | 75.0 | |
| GL | 1843* | 208 | 900 | 1/25 | 148 | 45.0 | 49.5 | 60.0 | 48.0 | |
| | | | 3600 | 1/6 | 270 | 45.0 | 52.0 | 85.0 | 50.4 | |
| GL | 1763* | 208 | 1200 | 1/20 | 106 | 40.0 | 53.6 | 83.2 | 51.2 | figs. 1-4 pages 24 & 25 |
| | | | 1800 | 1/15 | 150 | 40.0 | 51.2 | 70.0 | 49.6 | |
| GL | 2206* | 208 | 1200 | 1/20 | 133 | 42.0 | 54.4 | 102.0 | 52.7 | |
| | | | 3600 | 1/6 | 290 | 45.0 | 52.8 | 97.7 | 49.6 | |
| GL | 1905 | 208 | 1800 | 1/25 | 92 | 22.4 | 30.4 | 48.0 | 28.0 | |
| | | | 3600 | 1/10 | 160 | 28.0 | 32.0 | 56.0 | 30.4 | |

*See inside front cover

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# DUAL SPEED MOTORS

## SINGLE PHASE, 50 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AL | 2080 | 115 | 500 | 1/400 | 52 | 5.0 | 6.2 | 4.0 | 6.0 | 6 | 220 | |
| | | | 3000 | 1/75 | 70 | 4.5 | 6.2 | 4.6 | 5.6 | | | |
| AL | 2033 | 115 | 750 | 1/160 | 48 | 8.0 | 9.2 | 12.3 | 8.6 | 5 | 220 | |
| | | | 1500 | 1/80 | 50 | 8.0 | 10.4 | 11.6 | 9.9 | | | |
| AL | 1474 | 115 | 750 | 1/300 | 40 | 4.5 | 6.0 | 4.1 | 5.2 | 5 | 220 | |
| | | | 3000 | 1/50 | 60 | 6.5 | 8.5 | 6.0 | 7.5 | | | |
| AL | 2385 | 230 | 750 | 1/300 | 45 | 4.5 | 5.6 | 5.1 | 4.9 | 3 | 220 | figs. 1-4 pages 22 & 23 |
| | | | 3000 | 1/60 | 75 | 5.6 | 8.1 | 5.4 | 7.3 | | | |
| AL | 2034 | 115 | 1000 | 1/150 | 42 | 6.7 | 11.2 | 8.3 | 9.9 | 5 | 220 | |
| | | | 1500 | 1/100 | 50 | 6.7 | 8.3 | 7.7 | 8.2 | | | |
| AL | 1736 | 115 | 1000 | 1/150 | 47 | 6.7 | 8.5 | 8.5 | 8.1 | 5 | 220 | |
| | | | 3000 | 1/50 | 50 | 6.7 | 8.1 | 6.4 | 7.7 | | | |
| AL | 1952 | 115 | 1500 | 1/100 | 55 | 6.7 | 10.9 | 10.5 | 8.8 | 5 | 220 | |
| | | | 3000 | 1/50 | 70 | 6.7 | 8.6 | 7.5 | 7.5 | | | |
| ALL | 1089 | 115 | 750 | 1/150 | 65 | 9.0 | 12.0 | 11.0 | 11.2 | 6 | 220 | |
| | | | 1500 | 1/75 | 65 | 9.0 | 14.5 | 11.0 | 13.5 | | | |
| G | 2030 | 115 | 750 | 1/125 | 82 | 11.0 | 20.0 | 14.7 | 18.4 | 5 | 330 | |
| | | | 1500 | 1/50 | 94 | 14.0 | 24.8 | 14.7 | 20.8 | | | |
| G | 2037 | 115 | 1000 | 1/60 | 70 | 16.8 | 27.2 | 28.5 | 21.6 | 6 | 330 | |
| | | | 3000 | 1/30 | 120 | 11.2 | 16.8 | 18.4 | 15.7 | | | |
| GL | 1916 | 115 | 500 | 1/75 | 138 | 26.0 | 28.8 | 28.2 | 28.0 | 10 | 330 | |
| | | | 1500 | 1/20 | 150 | 33.0 | 41.0 | 56.8 | 38.5 | | | |
| GL | 2270* | 115 | 500 | 1/90 | 113 | 22.0 | 32.0 | 22.8 | 29.6 | 10 | 330 | |
| | | | 3000 | 1/15 | 210 | 22.0 | 25.0 | 26.4 | 24.0 | | | |
| GL | 2332* | 230 | 750 | 1/20 | 170 | 67.0 | 75.0 | 72.0 | 72.0 | 10 | 330 | |
| | | | 1500 | 1/10 | 200 | 67.0 | 89.6 | 67.0 | 83.2 | | | figs. 1-4 pages 24 & 25 |
| GL | 2013 | 115 | 1000 | 1/25 | 121 | 40.3 | 48.0 | 52.0 | 42.4 | 8 | 330 | |
| | | | 1500 | 1/25 | 105 | 26.8 | 40.0 | 27.4 | 34.4 | | | |
| GL | 2315 | 240 | 1000 | 1/20 | 130 | 50.0 | 56.0 | 60.8 | 52.7 | 8 | 330 | |
| | | | 3000 | 1/20 | 145 | 17.0 | 23.2 | 26.6 | 21.8 | | | |
| GL | 1886* | 115 | 1000 | 1/20 | 185 | 50.0 | 65.6 | 50.9 | 60.0 | 10 | 440 | |
| | | | 3000 | 1/7 | 330 | 48.0 | 52.6 | 51.0 | 55.2 | | | |
| GL | 1442 | 115 | 1500 | 1/15 | 190 | 45.0 | 52.7 | 67.3 | 47.2 | 10 | 330 | |
| | | | 3000 | 1/8 | 240 | 42.0 | 46.4 | 61.2 | 45.0 | | | |
| GL | 1884* | 115 | 1500 | 1/12 | 210 | 55.0 | 62.0 | 58.3 | 57.0 | 10 | 440 | |
| | | | 3000 | 1/8 | 260 | 42.0 | 51.2 | 52.5 | 48.0 | | | |

*See front inside cover.

## THREE PHASE, 50 HERTZ, ODD VOLT

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| GL | 2514 | 230 | 750 | 1/20 | 160 | 67.0 | 83.2 | 136.0 | 81.6 | |
| | | | 1500 | 1/10 | 200 | 67.0 | 80.0 | 112.0 | 78.4 | figs. 1-4 pages 24 & 25 |
| GL | 1834* | 208 | 1000 | 1/25 | 128 | 40.0 | 49.6 | 80.0 | 46.4 | |
| | | | 3000 | 1/8 | 217 | 42.0 | 60.0 | 80.0 | 54.5 | |

*See front inside cover.

## THREE PHASE, 400 HERTZ, 208 VOL

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Full Load Amps | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| AS | 2170 | 6000 | 1/35 | 75 | 1.1 | 4.8 | 5.9 | 16.0 | 5.7 | |
| | | 12000 | 1/25 | 90 | .75 | 3.3 | 3.7 | 13.0 | 3.4 | figs. 1-4 pages 22 & 2 |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL U

# DUAL SPEED MOTORS

## SINGLE PHASE, 50/60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Hertz | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AL | 1084 | 50 | 500 | 1/400 | 41 | 5.0 | 6.7 | 4.2 | 5.9 | 5 | 220 | figs. 1-4 pages 22 & 23 |
| | | | 1500 | 1/125 | 51 | 5.4 | 6.8 | 4.2 | 5.9 | | | |
| | | 60 | 600 | 1/350 | 46 | 4.8 | 6.3 | 5.6 | 5.6 | | | |
| | | | 1800 | 1/100 | 53 | 5.6 | 6.7 | 5.7 | 6.3 | | | |
| AL | 1766 | 50 | 1500 | 1/80 | 43 | 8.4 | 12.9 | 9.0 | 10.9 | 5 | 330 | |
| | | | 3000 | 1/40 | 69 | 8.4 | 10.7 | 7.5 | 9.4 | | | |
| | | 60 | 1800 | 1/80 | 46 | 7.0 | 9.6 | 14.4 | 8.0 | | | |
| | | | 3600 | 1/40 | 67 | 7.0 | 9.2 | 9.6 | 8.6 | | | |
| G | 2030 | 50 | 750 | 1/100 | 82 | 13.4 | 20.0 | 14.7 | 18.4 | 5 | 330 | |
| | | | 1500 | 1/50 | 94 | 13.4 | 24.8 | 14.7 | 20.8 | | | |
| | | 60 | 900 | 1/100 | 92 | 11.0 | 15.2 | 24.6 | 13.1 | | | |
| | | | 1800 | 1/50 | 99 | 11.0 | 21.6 | 19.7 | 18.4 | | | |
| G | 1854 | 50 | 1000 | 1/70 | 94 | 15.0 | 18.5 | 13.2 | 16.0 | 6 | 220 | |
| | | | 3000 | 1/20 | 90 | 15.0 | 20.0 | 20.8 | 18.3 | | | |
| | | 60 | 1200 | 1/60 | 95 | 15.0 | 20.8 | 17.6 | 18.4 | | | |
| | | | 3600 | 1/20 | 95 | 15.0 | 17.6 | 24.0 | 16.0 | | | |
| G | 2032 | 50 | 1500 | 1/40 | 122 | 18.0 | 28.0 | 27.5 | 24.8 | 6 | 330 | figs. 1-4 pages 24 & 25 |
| | | | 3000 | 1/20 | 133 | 18.0 | 21.6 | 20.2 | 20.8 | | | |
| | | 60 | 1800 | 1/30 | 120 | 18.0 | 23.6 | 33.3 | 22.4 | | | |
| | | | 3600 | 1/15 | 119 | 18.0 | 23.2 | 26.6 | 20.8 | | | |
| GL | 1505 | 50 | 750 | 1/60 | 80 | 22.4 | 28.8 | 34.4 | 26.4 | 8 | 330 | |
| | | | 1500 | 1/20 | 120 | 33.6 | 41.6 | 26.2 | 38.4 | | | |
| | | 60 | 900 | 1/60 | 95 | 18.6 | 29.6 | 57.0 | 28.0 | | | |
| | | | 1800 | 1/20 | 115 | 28.0 | 43.2 | 34.6 | 39.2 | | | |

**NOTE: 50/60 HERTZ MOTORS ARE NOT AS EFFICIENT AS MOTORS DESIGNED SPECIFICALLY FOR 50 HERTZ OR 60 HERTZ.**

## TWO PHASE, ODD FREQUENCY, 115 VOLTS

| Frame | Motor Type No. | Hertz | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| AL | 1101 | 467 | 4670 | 1/60 | 60 | 3.6 | 4.9 | 10.0 | 4.8 | figs. 1-4 pages 22 & 23 |
| | | | 14010 | 1/20 | 120 | 3.6 | 5.0 | 12.0 | 4.7 | |

## SINGLE PHASE, 400 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Full Load Amps | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AS | 2503 | 6000 | 1/80 | 48 | .55 | 2.1 | 4.0 | 2.8 | 2.8 | .40 | 550 | figs. 1-4 pages 22 & 23 |
| | | 8000 | 1/60 | 57 | .80 | 2.1 | 3.5 | 3.2 | 2.3 | .25 | | |
| AL | 671 | 4000 | 1/75 | 110 | 2.0 | 3.4 | 4.6 | 5.5 | 4.3 | .75 | 330 | |
| | | 12000 | 1/25 | 110 | 1.6 | 3.4 | 4.3 | 4.0 | 4.0 | .75 | | |
| AL | 1257 | 6000 | 1/60 | 100 | 2.0 | 2.8 | 3.7 | 8.5 | 3.2 | .75 | 440 | |
| | | 12000 | 1/20 | 138 | 2.4 | 4.2 | 6.1 | 6.7 | 5.1 | .75 | | |
| AL | 1803 | 8000 | 1/35 | 81 | 1.3 | 3.4 | 4.6 | 4.4 | 4.0 | .75 | 330 | |
| | | 12000 | 1/25 | 112 | 1.7 | 3.4 | 4.3 | 4.3 | 4.0 | .75 | | |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# MULTIPLE SPEED MOTORS

## SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| G | 938 | 600 | 1/250 | 78 | 6.7 | 8.6 | 6.9 | 7.7 | 6 | 220 | figs. 1-4 pages 24 & 25 |
| | | 1200 | 1/100 | 86 | 8.4 | 11.5 | 12.5 | 10.5 | 6 | | |
| | | 3600 | 1/50 | 122 | 5.6 | 10.7 | 6.9 | 9.3 | 6 | | |
| G | 371 | 900 | 1/200 | 60 | 5.6 | 6.7 | 9.1 | 6.1 | 5 | 220 | |
| | | 1800 | 1/60 | 75 | 9.3 | 14.9 | 10.4 | 13.7 | 5 | | |
| | | 3600 | 1/30 | 115 | 9.3 | 13.3 | 9.3 | 11.4 | 8 | | |
| G | 957 | 900 | 1/150 | 70 | 7.5 | 9.6 | 14.2 | 8.6 | 6 | 220 | |
| | | 1800 | 1/50 | 90 | 11.2 | 16.3 | 13.6 | 15.2 | 6 | | |
| | | 3600 | 1/40 | 110 | 7.2 | 12.6 | 8.0 | 12.0 | 6 | | |
| G | 1243 | 1200 | 1/75 | 80 | 11.2 | 14.2 | 12.8 | 12.2 | 10 | 220 | |
| | | 1800 | 1/60 | 95 | 9.5 | 21.6 | 13.8 | 16.0 | 10 | | |
| | | 3600 | 1/40 | 120 | 7.1 | 13.6 | 14.2 | 11.7 | 10 | | |
| GL | 992 | 600 | 1/200 | 75 | 8.4 | 12.2 | 7.4 | 10.6 | 8 | 220 | |
| | | 1800 | 1/50 | 85 | 11.2 | 20.0 | 16.0 | 17.4 | 8 | | |
| | | 3600 | 1/25 | 150 | 11.2 | 20.8 | 17.2 | 19.2 | 8 | | |
| GG | 492 | 900 | 1/90 | 125 | 12.0 | 15.0 | 15.5 | 13.3 | 10 | 220 | |
| | | 1800 | 1/30 | 175 | 18.6 | 35.0 | 18.2 | 25.5 | 10 | | |
| | | 3600 | 1/20 | 250 | 14.0 | 30.4 | 13.5 | 22.3 | 16 | | |
| GG | 1152 | 900 | 1/50 | 76 | 22.5 | 26.0 | 35.0 | 24.5 | 3 | 330 | |
| | | 1800 | 1/30 | 92 | 18.5 | 26.4 | 26.2 | 19.2 | 6 | | |
| | | 3600 | 1/20 | 117 | 14.0 | 19.5 | 23.2 | 18.5 | 6 | | |
| GGLX | 1939 | 900 | 1/50 | 76 | 22.5 | 26.0 | 35.0 | 24.5 | 3 | 330 | |
| | | 1800 | 1/15 | 146 | 37.0 | 49.6 | 45.5 | 40.0 | 8 | | |
| | | 3600 | 1/10 | 230 | 28.0 | 35.2 | 41.6 | 32.8 | 8 | | |
| GG | 2071 | 600 | 1/125 | 91 | 13.0 | 16.0 | 23.8 | 15.0 | 6 | 330 | |
| | | 900 | 1/75 | 92 | 15.0 | 19.2 | 22.7 | 17.6 | 6 | | |
| | | 1200 | 1/50 | 93 | 17.0 | 24.8 | 19.2 | 22.9 | 6 | | |
| | | 1800 | 1/40 | 94 | 14.0 | 18.4 | 20.0 | 16.8 | 6 | | |
| GG | 1013 | 600 | 1/200 | 88 | 8.4 | 11.2 | 12.8 | 10.4 | 6 | 330 | figs. 1 & 2 page 24 |
| | | 1200 | 1/50 | 91 | 16.8 | 23.2 | 20.2 | 21.1 | 6 | | |
| | | 1800 | 1/25 | 88 | 22.4 | 32.8 | 31.6 | 24.0 | 6 | | |
| | | 3600 | 1/25 | 112 | 11.2 | 15.2 | 19.5 | 13.9 | 6 | | |
| GG | 449 | 600 | 1/225 | 64 | 7.4 | 8.3 | 7.0 | 7.6 | 6 | 220 | |
| | | 900 | 1/200 | 60 | 5.6 | 6.7 | 9.1 | 6.1 | 5 | | |
| | | 1200 | 1/75 | 80 | 11.2 | 19.2 | 12.1 | 16.8 | 6 | | |
| | | 1800 | 1/60 | 75 | 9.5 | 14.9 | 10.4 | 13.7 | 5 | | |
| | | 3600 | 1/30 | 115 | 9.3 | 13.3 | 9.3 | 11.4 | 8 | | |
| GG | 1153 | 600 | 1/200 | 57 | 8.0 | 9.9 | 15.7 | 8.8 | 4 | 330 | |
| | | 900 | 1/100 | 55 | 11.2 | 13.6 | 15.0 | 12.6 | 4 | | |
| | | 1200 | 1/75 | 80 | 11.2 | 14.2 | 12.8 | 12.2 | 10 | | |
| | | 1800 | 1/60 | 95 | 9.5 | 21.6 | 13.8 | 16.0 | 10 | | |
| | | 3600 | 1/40 | 120 | 7.1 | 13.6 | 14.2 | 11.7 | 10 | | |

## SINGLE PHASE, 50 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GG | 2304 | 750 | 1/60 | 95 | 22.0 | 25.5 | 43.0 | 24.0 | 8 | 330 | figs. 1 & 2 page 24 |
| | | 1500 | 1/30 | 117 | 22.0 | 27.0 | 34.0 | 26.0 | 8 | | |
| | | 3000 | 1/25 | 105 | 13.0 | 18.0 | 25.0 | 16.0 | 8 | | |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# MULTIPLE SPEED MOTORS

## SINGLE PHASE, 50/60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Hertz | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G | 2367 | 60 | 900 | 1/60 | 136 | 18.0 | 28.0 | 49.5 | 25.6 | 10 | 330 | figs. 1-4 pages 24 & 25 |
| | | | 1800 | 1/30 | 140 | 18.0 | 22.7 | 24.3 | 21.5 | 10 | | |
| | | | 3600 | 1/15 | 150 | 18.0 | 22.4 | 26.2 | 21.0 | 10 | | |
| | | 50 | 750 | 1/72 | 118 | 18.0 | 23.3 | 33.6 | 21.1 | 10 | 330 | |
| | | | 1500 | 1/36 | 140 | 18.0 | 27.5 | 22.7 | 24.8 | 10 | | |
| | | | 3000 | 1/18 | 150 | 18.0 | 25.6 | 21.9 | 24.3 | 10 | | |
| GGL | 1943* | 60 | 600 | 1/100 | 111 | 17.0 | 24.8 | 29.6 | 22.2 | 6 | 330 | figs. 1& 2 page 24 |
| | | | 1800 | 1/20 | 178 | 28.0 | 58.5 | 45.4 | 43.2 | 12 | | |
| | | | 3600 | 1/10 | 230 | 28.0 | 43.2 | 34.2 | 36.0 | 12 | | |
| | | 50 | 500 | 1/100 | 90 | 21.0 | 24.8 | 24.0 | 23.2 | 6 | 330 | |
| | | | 1500 | 1/20 | 195 | 36.0 | 63.2 | 51.8 | 55.2 | 15 | | |
| | | | 3000 | 1/10 | 245 | 36.0 | 41.6 | 39.0 | 38.5 | 15 | | |

*See inside front cover

**NOTE: 50/60 HERTZ MOTORS ARE NOT AS EFFICIENT AS MOTORS DESIGNED SPECIFICALLY FOR 50 HERTZ OR 60 HERTZ.**

# VARIABLE SPEED MOTORS

## TWO OR THREE PHASE, VARIABLE FREQUENCY, VARIABLE VOLTS

| Frame | Motor Type No. | Phase | Volts/Hertz | Voltage Range | Poles | RPM Speed Range | Frequency Range | Rated Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|
| G | 1324 | 2 | .70 | 6.3-250 | 12 | 90-3600 | 9-360 | 10.0 | figs. 1-4 pages 24 & 25 |
| AL | 425 | 2 | .92 | 8.2-330 | 8 | 135-5400 | 9-360 | 4.0 | figs. 1-4 pages 22 & 23 |
| AL | 450 | 2 | .46 | 4.1-165 | 8 | 135-5400 | 9-360 | 4.0 | |
| GL | 1863 | 2 | 1.92 | 57.5-460 | 8 | 450-3600 | 30-240 | 20.0 | figs. 1-4 pages 24 & 25 |
| AL | 1789 | 2 | .29 | 26-121 | 6 | 1800-8400 | 90-420 | 6.0 | figs. 1-4 pages 22 & 23 |
| AL | 906 | 2 | 1.92 | 19.2-115 | 4 | 300-1800 | 10-60 | 7.0 | |
| AL | 1666 | 3 | 1.67 | 16.6-308 | 8 | 150-2775 | 10-185 | 8.0 | |
| GL | 2386 | 3 | 2.00 | 24-240 | 6 | 220-2400 | 11-120 | 25.0 | figs. 1-4 pages 24 & 25 |
| AL | 2234 | 3 | 4.00 | 40-260 | 4 | 300-1950 | 10-65 | 12.0 | figs. 1-4 pages 22 & 23 |
| GL | 2299 | 3 | 1.10 | 220-440 | 4 | 6000-12000 | 200-400 | 16.0 | figs. 1-4 pages 24 & 25 |
| AL | 2006 | 3 | 4.0 | 40-260 | 2 | 600-3900 | 10-65 | 14.0 | figs. 1-4 pages 22 & 23 |
| GL | 2125 | 3 | 3.67 | 66-403 | 2 | 1080-6600 | 18-110 | 20.0 | figs. 1-4 pages 24 & 25 |

# A. C. HYSTERESIS SYNCHRONOUS MOTORS

## USED IN CONJUNCTION WITH D.C. INVERTERS

## ONE OR TWO PHASE, ODD FREQUENCY, ODD VOLTS

| Frame | Type | Phase | Hertz | Volts D.C. | Speed RPM | Poles | HP | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Start Oz. In. | Pull In Torque Oz. In. | Cap. Value MFD | Cap. Voltage | Frame Fig. No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 2591 | 1 | 60 | 12 | 1800 | 4 | 1/200 | 3.0 | 3.3 | 4.0 | 3.1 | 100. | 25 | figs. 1, 2, 3 page 21 |
| AS | 2247 | 1 | 60 | 125 | 1200 | 6 | 1/90 | 9.3 | 13.3 | 8.5 | 13.1 | 1.0 | 330 | figs. 1-4 pages 22 & 23 |
| AS | 2389 | 1 | 60 | 125 | 1800 | 4 | 1/70 | 8.0 | 8.6 | 10.2 | 8.2 | 1.5 | 330 | |
| AS | 2443 | 1 | 150 | 125 | 3000 | 6 | 1/45 | 8.0 | 9.0 | 6.1 | 8.5 | 0.5 | 440 | |
| AL | 2413 | 1 | 60 | 125 | 900 | 8 | 1/140 | 8.0 | 8.8 | 11.3 | 8.2 | 1.5 | 330 | |
| G | 2277 | 1 | 30 | 125 | 300 | 12 | 1/425 | 8.0 | 14.4 | 16.8 | 12.8 | 2.5 | 330 | figs. 1-4 pages 24 & 25 |
| G | 2442 | 1 | 60 | 125 | 600 | 12 | 1/150 | 9.6 | 18.9 | 13.4 | 17.3 | 2.0 | 330 | |
| BS | 2460 | 2 | 240 | 28 | 7200 | 4 | 1/50 | 2.8 | 3.5 | 4.5 | 3.0 | — | — | figs. 1, 2, 3 page 21 |

**SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS**

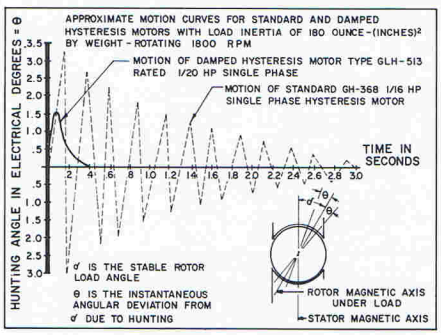
# POLARIZED SYNCHRONOUS MOTORS

In many applications, the motor shaft must synchronize in a particular position relative to line voltage. To overcome the disadvantage of the Hysteresis motor's lack of phasing, the Polarized Hysteresis unit has been developed. It is superior to the Reluctance motor in that the Polarized Hysteresis motor will lock in at one-half the points. In the two pole Reluctance motor there are two positions of lock-in 180° apart, but in the Polarized motor there is one point.

## SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Lock In Point | Accuracy | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 2038 | 1800 | 1/350 | 10 | 1.6 | 3.6 | 1.6 | 1.7 | 1 | 220 | 2@180° | ±2° | figs. 1, 2, 3 page 21 |
| BS | 2200 | 3600 | 1/250 | 10 | 1.1 | 1.3 | 1.6 | 1.3 | 1 | 220 | 1 | ±2° | |
| FBS | 1538 | 1800 | 1/250 | 28 | 2.2 | 8.8 | 5.0 | 5.9 | 3 | 220 | 2@180° | ±2° | fig. 4 page 21 |
| FBS | 1742 | 3600 | 1/250 | 27 | 1.1 | 5.9 | 1.6 | 1.8 | 2 | 220 | 1 | ±2° | |

# STABILIZED HYSTERESIS MOTORS FOR LARGE INERTIA LOADS




The early designs of the Hysteresis Synchronous motor, with low torques and soft couplings, showed little tendency to hunt. With the availability of new materials and advanced design techniques, the torque available from a given motor size increased tenfold (1/40 horsepower in 1947 to 1/4 horsepower in 1967). With the increase in torque, difficulties in hunting are proportionally greater.

In 1950, ELINCO announced a high torque Hysteresis motor with fully damped motion for large loads. Since then, the stabilized motor has become available in all frame sizes, with various speed and voltage variations, as well as multi-speed units.

This type of motor has application when an excellent degree of rotational stability is required. Its use permits higher basic motor speed for a given load inertia without increasing hunting and, therefore, greater power out for a fixed motor size. For the same frame size, the non-hunting feature reduces horsepower approximately 30%, mainly in the effect on pull in torque.

The curve at left shows the comparison between a standard 1/16 horsepower Hysteresis motor and the newer non-hunting unit. It may be seen that the non-hunting motor not only radically reduces the duration of any oscillation but cuts the magnitude of the initial swing about 50%.

The standard motor is capable of damping out after one oscillation a connected load inertia of approximately 9 oz. in.$^2$ by weight, as against a value of 180 oz. in.$^2$ for the motor with damped motion.

## SINGLE SPEED

### SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FBS | 1284 | 3600 | 1/225 | 24 | 1.2 | 1.5 | 3.2 | 1.4 | 1 | 330 | fig. 4 page 21 |
| AS | 1858 | 1800 | 1/115 | 45 | 5.0 | 5.2 | 15.2 | 5.1 | 3 | 330 | figs. 1-4 pages 22 & 23 |
| AL | 970 | 1800 | 1/50 | 52 | 11.0 | 12.0 | 19.0 | 11.5 | 3 | 220 | |
| AL | 2077 | 3600 | 1/50 | 53 | 5.6 | 8.1 | 9.2 | 7.5 | 3 | 330 | |
| GL | 2905 | 600 | 1/150 | 70 | 11.0 | 13.0 | 28.0 | 12.0 | 6 | 220 | figs. 1-4 pages 24 & 25 |
| GL | 2250* | 1800 | 1/15 | 105 | 37.3 | 64.0 | 44.0 | 51.2 | 6 | 330 | |
| GL | 2251* | 3600 | 1/10 | 200 | 28.0 | 46.6 | 48.0 | 33.6 | 8 | 330 | |
| GL | 2265* | 3600 | 1/6 | 250 | 46.6 | 51.2 | 52.8 | 48.0 | 10 | 330 | |

*See inside front cover.

## DUAL SPEED

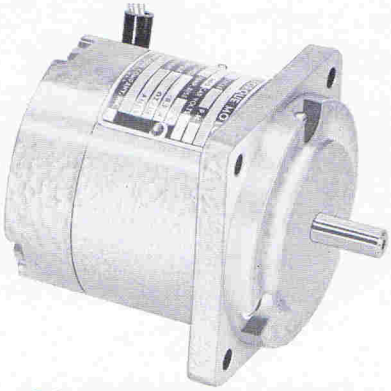
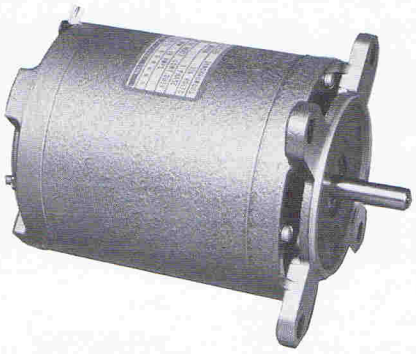
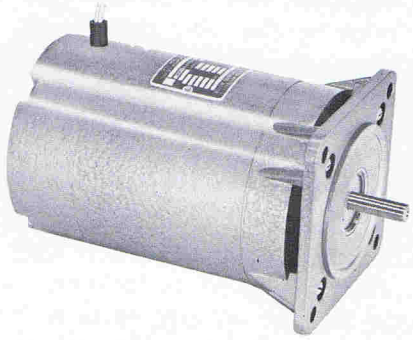
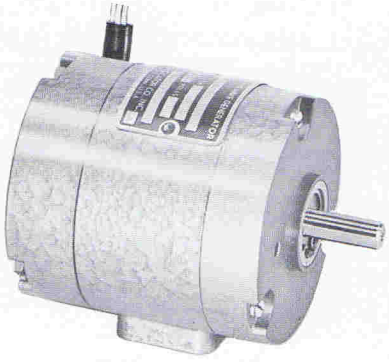
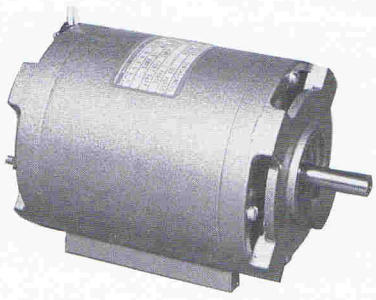
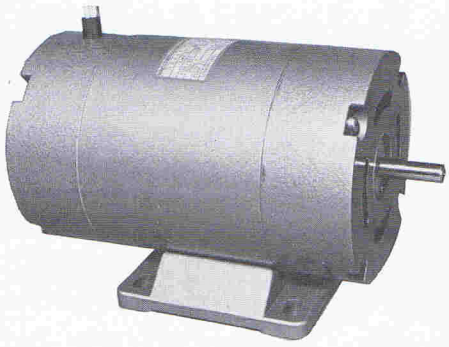
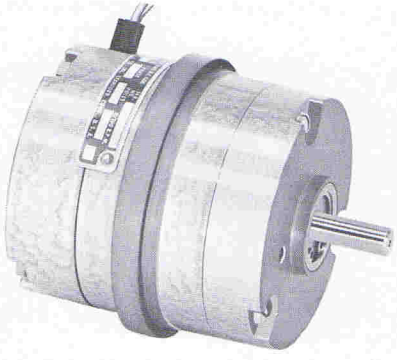
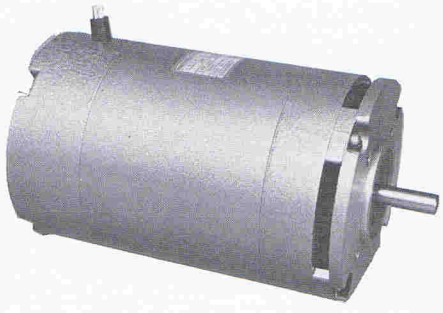
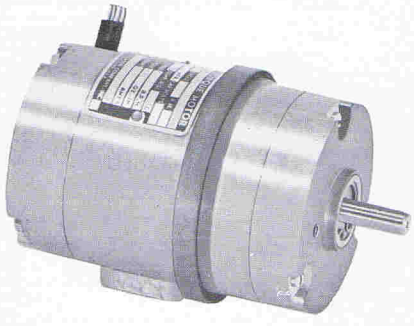
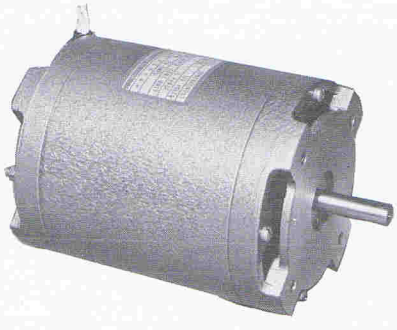
### SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Value Mfg. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALL | 2027 | 900 | 1/225 | 62 | 5.6 | 6.5 | 16.0 | 5.9 | 4 | 220 | figs. 1-4 pages 22 & 23 |
| | | 1800 | 1/90 | 71 | 7.2 | 7.8 | 13.1 | 7.3 | 4 | | |
| ALL | 2168 | 900 | 1/250 | 40 | 4.5 | 5.7 | 8.5 | 5.2 | 2 | 220 | |
| | | 1800 | 1/100 | 49 | 5.8 | 6.8 | 8.3 | 6.4 | 2 | | |
| ALL | 1974 | 900 | 1/200 | 57 | 5.6 | 7.2 | 10.2 | 6.7 | 5 | 220 | |
| | | 1800 | 1/75 | 66 | 7.5 | 9.6 | 11.2 | 8.8 | 5 | | |
| ALL | 1600 | 1800 | 1/60 | 61 | 9.6 | 11.8 | 16.1 | 9.8 | 5 | 220 | |
| | | 3600 | 1/40 | 80 | 7.0 | 8.5 | 8.5 | 7.0 | 5 | | |
| GL | 2356 | 600 | 1/150 | 90 | 11.2 | 15.2 | 25.6 | 14.1 | 5 | 330 | figs. 1-4 pages 24 & 25 |
| | | 1200 | 1/50 | 118 | 21.0 | 24.8 | 24.0 | 23.2 | 5 | | |
| GL | 2499 | 1800 | 1/25 | 110 | 22.2 | 29.8 | 30.4 | 27.8 | 5 | 440 | |
| | | 3600 | 1/15 | 160 | 18.7 | 29.2 | 27.2 | 27.5 | 5 | | |



SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# FRAME PICTURES

| 2-1/4 BASIC DIAMETER | 3-3/8 BASIC DIAMETER | 4-3/8 BASIC DIAMETER |
|---|---|---|
| MOUNTING FLANGE "J" | MOUNTING FLANGE "J" | MOUNTING FLANGE "J" |
|  |  |  |
| BSHJ FIGURE 3 PAGE 21 | ALHJ FIGURE 1 PAGE 22 | GLHJRN FIGURE 1 PAGE 24 |
| MOUNTING FACE OR BASE | MOUNTING BASE "B" | MOUNTING BASE "B" |
|  |  |  |
| BSH FIGURE 1 PAGE 21 | ALHB FIGURE 2 PAGE 22 | GLHNNB FIGURE 2 PAGE 24 |
| MOUNTING FACE OR RING | MOUNTING PILOT "F" | MOUNTING PILOT "F" |
|  |  |  |
| FSH FIGURE 2 PAGE 21 | ALHF FIGURE 3 PAGE 23 | GLHFRN FIGURE 3 PAGE 25 |
| MOUNTING FACE BASE RING | MOUNTING FACE NO PILOT "M" | MOUNTING FACE NO PILOT "M" |
|  |  |  |
| FBSH FIGURE 4 PAGE 21 | ALHM FIGURE 4 PAGE 23 | GLHMRN FIGURE 4 PAGE 25 |

OMIT "H" IN ABOVE FRAME TYPES FOR SALIENT POLE INDUCTION SYNCHRONOUS MOTORS (PAGE 18 & 19)

# SALIENT POLE INDUCTION SYNCHRONOUS MOTORS

**The Salient Pole Induction or Reluctance motor consists of a wound stator and a rotor similar to an Induction rotor. Pole saliencies are formed on the rotor by removing rotor teeth. This type of motor starts and accelerates through sub-synchronous speeds as an Induction motor, but runs at synchronous speed as a Reluctance motor.**

## CHARACTERISTICS OF THE SALIENT POLE TYPE

### SPEED

The angular velocity of this motor, once at synchronous speed, is constant and hunting, variations of angular velocity, is at a minimum. The relative rotor position or load angle will assume a new position with a load variation.

The number of poles and line frequency determine the rotor speed as in the Hysteresis Synchronous motor. The formula can be found on page 4. The maximum number of poles, however, is limited by the number of pole saliencies practical. The salient pole motor is available in two, four and, in the ELINCO "G" and "GL" frame, six poles. Due to pole saliencies required for each speed, this type of motor cannot be provided as a multi-speed unit.

### LOAD INERTIA

In the use of Salient Pole Induction motors, load inertia is an important factor. As the rotor approaches synchronous speed, there is a critical point at which the motor must accelerate the load and rotor inertia into synchronous operation. This transition must take place within the time the rotor rotates through one-half of a pole pitch. It is for this reason that a salient pole motor may start a load which it cannot pull into synchronism. With an inertia load, the size of the salient pole motor required may be much larger than a Hysteresis motor since the synchronous pull in torque must be selected to assure transition from sub-synchronous to synchronous speed.

### STARTING TORQUE

The starting torque, due to the pole saliencies, is subject to wide variations with rotor position.

### NOISE AND VIBRATION

The salient pole Induction motor operates at an inherently higher noise and vibration level than the Hysteresis Synchronous motor. The non-uniform magnetic path caused by the pole saliencies, accounts for this higher level. It should be remembered that this is a magnetic, rather than mechanical phenomena. ELINCO designs for minimum noise and vibration.

### PHASING

The salient pole Induction motor will phase into synchronous speed at fixed angular position. On two pole units, the rotor will phase in at two positions, 0° and 180° apart; a four pole motor will phase in at four positions 0°, 90°, 180° and 270° apart.

### SUMMARY

The inherent characteristics of the salient pole Induction motor are:

- Motor rotates at constant speed, regardless of load and voltage variations within the rating of the motor.
- Motor can phase in at definite positions with respect to shaft.
- Although the Hysteresis motor quickly damps the hunting to a minimum, there are applications where only minute hunting is permissible. On such applications, the salient pole motor should be used.
- Wide variations in starting torque, dependent on rotor position.
- Capable of synchronizing a limited load inertia.
- Inherent noise and vibration level higher than the Hysteresis Synchronous motor.
- Can be supplied as single speed motor only.

## SALIENT POLE INDUCTION SYNCHRONOUS MOTOR — SINGLE PHASE, 60 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Pull Out Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Cap Vaue Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FBS | 2022 | 1800 | 1/140 | 29 | 4.0 | 7.3 | 4.8 | 5.1 | 3 | 220 | fig. 4 page 21 |
| AS | 2228 | 1800 | 1/50 | 42 | 11.2 | 16.0 | 16.0 | 13.6 | 4 | 220 | figs. 1-4 pages 22 & 23 |
| ALL | 1762 | 1200 | 1/75 | 52 | 11.0 | 15.7 | 11.0 | 14.7 | 2 | 440 | |
| G | 1996 | 1800 | 1/25 | 108 | 22.4 | 46.4 | 19.4 | 36.0 | 10 | 330 | figs. 1-4 pages 24 & 25 |

## SPLIT PHASE — SINGLE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz.In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| GS | 248 | 230 | 1800 | 1/30 | 80 | 18.6 | 40.0 | 21.0 | 32.0 | figs. 1-4 pages 24 & 25 |
| GS | 197 | 115 | 1800 | 1/15 | 100 | 37.0 | 45.0 | 48.0 | 48.0 | |
| GS | 286 | 115 | 3600 | 1/20 | 140 | 14.4 | 42.0 | 18.5 | 18.5 | |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

# SALIENT POLE INDUCTION SYNCHRONOUS MOTOR

## DUAL CAPACITOR

### SINGLE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GS | 572 | 115 | 1200 | 1/15 | 120 | 56.0 | 70.0 | 66.0 | 70.0 | †5/10‡‡ | 220 | |
| GS | 295 | 115 | 1800 | 1/12 | 117 | 46.5 | 51.0 | 50.0 | 51.0 | 8/8 | 220 | |
| GS | 330 | 230 | 1800 | 1/25 | 52 | 22.0 | 45.0 | 28.0 | 41.0 | †1.5/3.5‡‡ | 330 | figs. 1-4 pages 24 & 25 |
| GS | 342 | 230 | 1800 | 1/12 | 130 | 46.0 | 93.0 | 51.0 | 55.0 | †2/4‡‡ | 220 | |
| GS | 333 | 115 | 3600 | 1/15 | 130 | 19.0 | 22.0 | 26.0 | 27.0 | †6/24‡‡ | 220 | |

†Running Capacitor. ‡‡Starting Capacitor.

### THREE PHASE, 60 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|
| AL | 267 | 115 | 1800 | 1/50 | 50 | 11.1 | 40 | 12.5 | 12.5 | figs. 1-4 pages 22 & 23 |
| AL | 201 | 220 | 1800 | 1/75 | 25 | 7.5 | 10 | 9.5 | 10.5 | |
| G | 234 | 220 | 1800 | 1/20 | 68 | 28.0 | 144 | 34.0 | 36.0 | figs. 1-4 pages 24 & 25 |

### SINGLE PHASE, 30 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 757 | 1800 | 1/500 | 9.5 | 1.1 | 2.4 | 1.3 | 2.2 | 2 | 220 | figs. 1, 2, 3 page 21 |

## SPLIT PHASE

### SINGLE PHASE, 50 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|
| GS | 647 | 1500 | 1/20 | 72 | 34 | 50 | 48 | 54 | figs. 1-4 pages 24 & 25 |

### SINGLE PHASE, 50 HERTZ, ODD VOLTS

| Frame | Motor Type No. | Volts | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Cap Value Mfd. | Cap Voltage | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS | 844 | 115 | 1500 | 1/350 | 15 | 2.0 | 2.3 | 2.3 | 2.5 | 1.00 | 220 | figs. 1, 2, 3 page 21 |
| AS | 328 | 230 | 1500 | 1/100 | 38 | 6.7 | 9.5 | 7.5 | 9.5 | 1.25 | 440 | figs. 1-4 pages 22 & 23 |

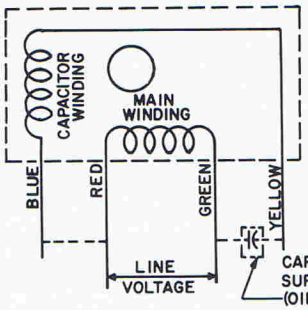
### TWO PHASE, 80 HERTZ, 115 VOLTS

| Frame | Motor Type No. | Speed RPM | HP | Full Load Watts | Rated Torque Oz. In. | Starting Torque Oz. In. | Pull In Torque Oz. In. | Pull Out Torque Oz. In. | Frame Figure No. Page No. |
|---|---|---|---|---|---|---|---|---|---|
| AS | 1023 | 4800 | 1/30 | 60 | 8.0 | 40 | 10 | 13 | figs. 1-4 pages 22 & 23 |
| AL | 1022 | 4800 | 1/20 | 65 | 11.2 | 60 | 13 | 16 | |

SEE PAGE 20 FOR WIRING DIAGRAMS ON ALL UNITS

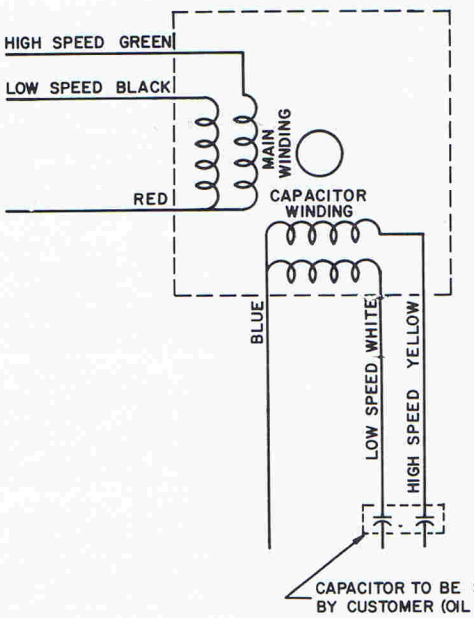
# STANDARD CONNECTION DIAGRAMS

## A
### SINGLE SPEED MOTOR
### FOUR LEAD, CAPACITOR TYPE CONNECTION
### REVERSIBLE ROTATION




NOTE
CONNECTION SHOWN FOR COUNTERCLOCKWISE ROTATION FACING LEAD END. TO REVERSE ROTATION INTERCHANGE RED AND GREEN LEADS.

## B
### DUAL SPEED MOTOR
### SIX LEAD, CAPACITOR TYPE CONNECTION
### REVERSIBLE ROTATION

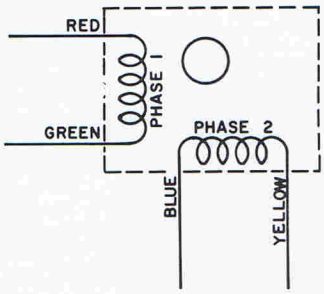



NOTE
COUNTERCLOCKWISE ROTATION FACING LEAD END.
CONNECT BLUE AND RED TO ONE SIDE OF LINE.

HIGH SPEED
CONNECT YELLOW TO CAPACITOR.
CONNECT GREEN AND CAPACITOR TO OTHER SIDE OF LINE.
TO REVERSE ROTATION INTERCHANGE RED AND GREEN LEADS.

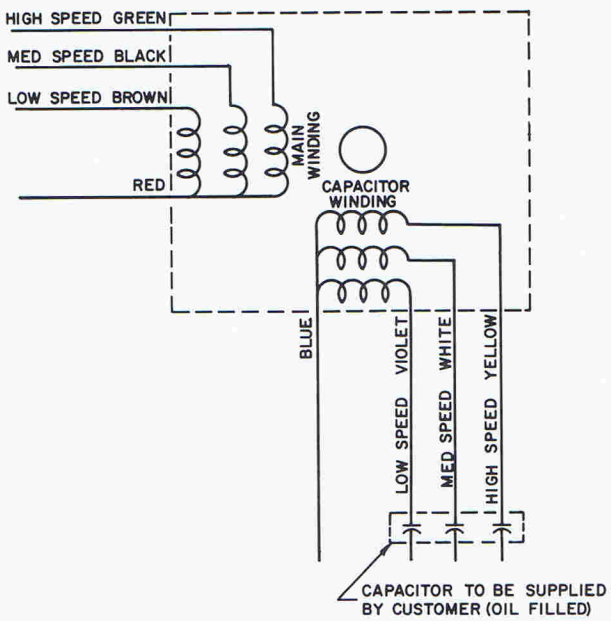
LOW SPEED
CONNECT WHITE TO CAPACITOR.
CONNECT BLACK AND CAPACITOR TO OTHER SIDE OF LINE.
TO REVERSE ROTATION INTERCHANGE RED AND BLACK LEADS.

## C
### SINGLE SPEED MOTOR
### FOUR LEAD, TWO PHASE CONNECTION
### REVERSIBLE ROTATION




NOTE
TO REVERSE ROTATION INTERCHANGE RED AND GREEN LEADS.

## D
### THREE SPEED MOTOR
### EIGHT LEAD, CAPACITOR TYPE CONNECTION
### REVERSIBLE ROTATION




NOTE
COUNTERCLOCKWISE ROTATION FACING LEAD END.
CONNECT BLUE AND RED TO ONE SIDE OF LINE.

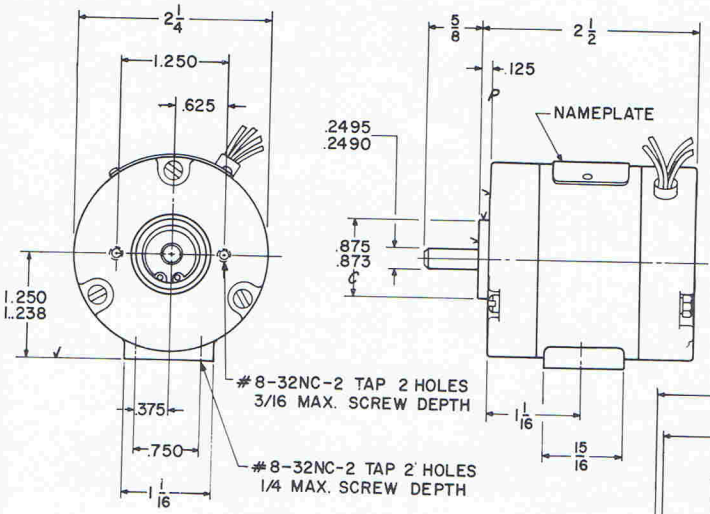
HIGH SPEED
CONNECT YELLOW TO CAPACITOR.
CONNECT GREEN AND CAPACITOR TO OTHER SIDE OF LINE.
TO REVERSE ROTATION INTERCHANGE RED AND GREEN LEADS.

MED SPEED
CONNECT WHITE TO CAPACITOR.
CONNECT BLACK AND CAPACITOR TO OTHER SIDE OF LINE.
TO REVERSE ROTATION INTERCHANGE RED AND BLACK LEADS.

LOW SPEED
CONNECT VIOLET TO CAPACITOR.
CONNECT BROWN AND CAPACITOR TO OTHER SIDE OF LINE.
TO REVERSE ROTATION INTERCHANGE RED AND BROWN LEADS.

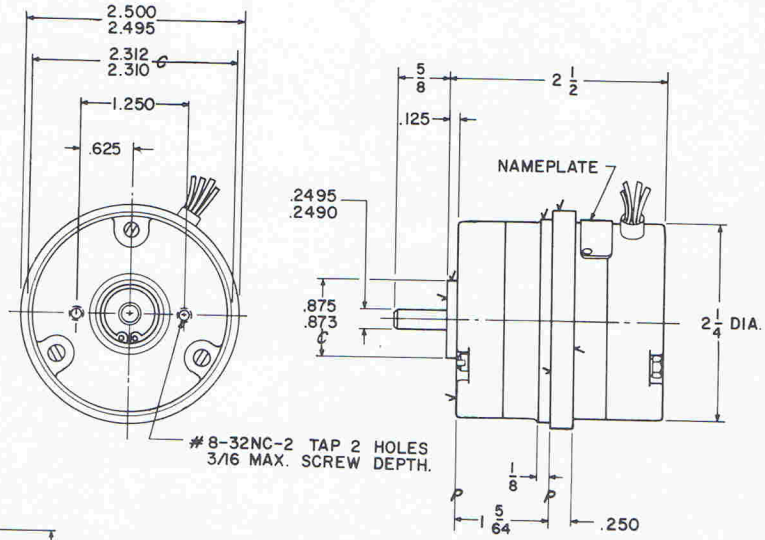
LEADS MAY BE IDENTIFIED BY TRACER OR SOLID COLORS

# "BS"-"FS"-"BSJ"-"FBS" FRAMES



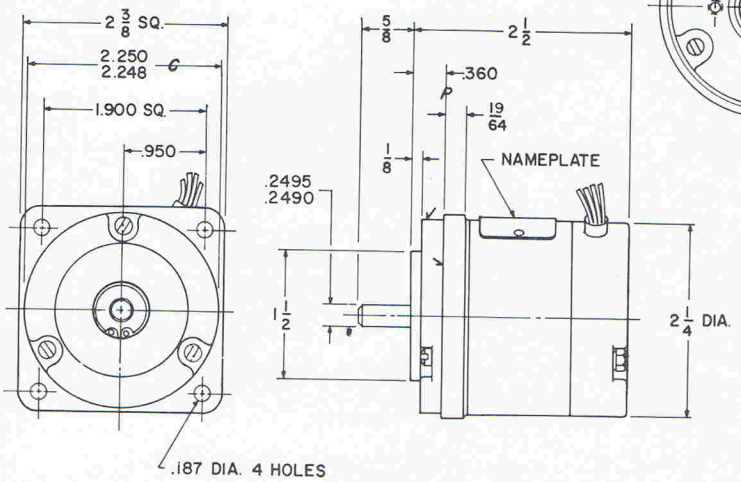

"BS" FRAME

◀ FIGURE ONE




"FS" FRAME

▲ FIGURE TWO

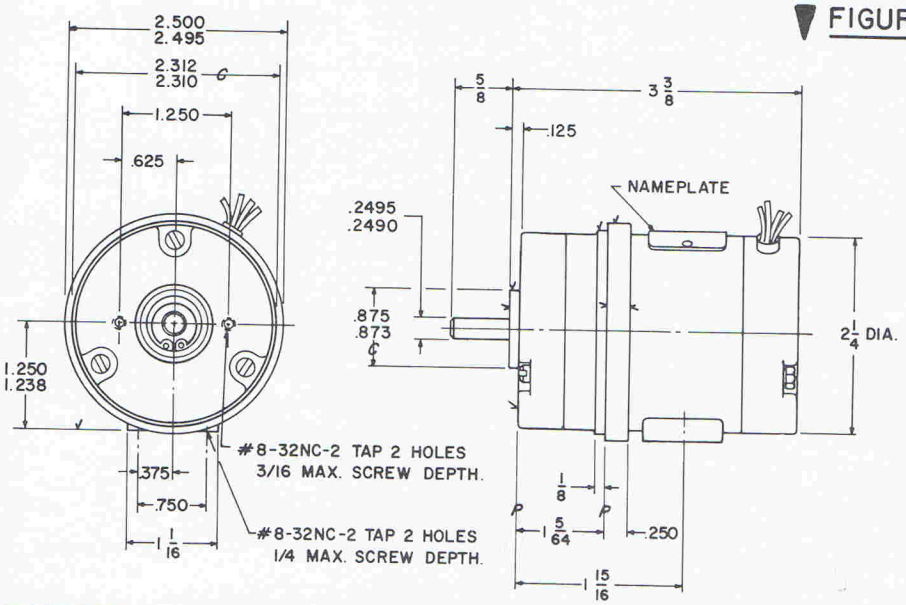



"BSJ" FRAME

◀ FIGURE THREE

"FBS" FRAME

▼ FIGURE FOUR

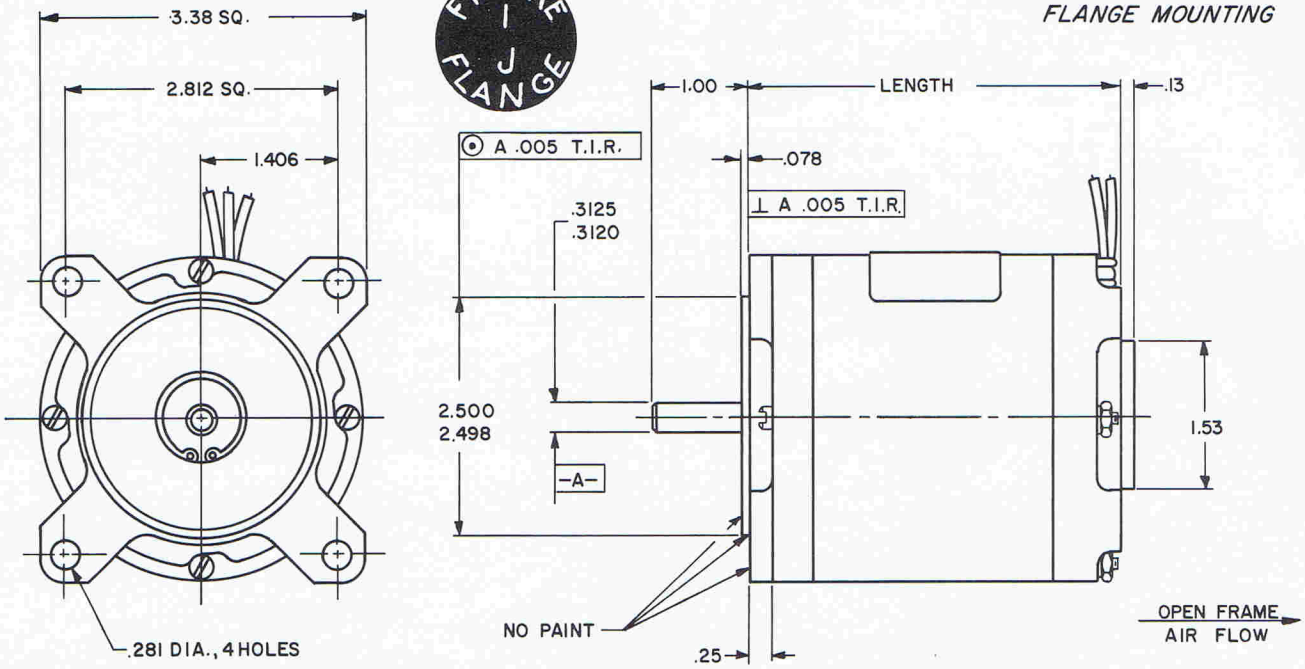



## NOTES PERTAINING TO DRAWINGS

Housing and End Caps are aluminum.
Shaft is stainless steel mounted on ball bearing.
Diameters marked "C" are concentric to shaft within .005 TIR.
Surfaces marked "P" are perpendicular to shaft within .005 TIR.
Surfaces "V" are not painted.
Decimal dimensions have a tolerance of ±.005 unless otherwise specified.
Fractional dimensions are for reference only.
Add suffix "D" to frame designation if double end shaft is required.
Flexible nylon jacketed leads will vary with type of unit.
Units have baked Blue Mottletone finish unless otherwise specified.
Design subject to minor modifications that do not affect mounting dimensions.

## ASJ - ALJ - ALLJ - ALLXJ
## ASJT - ALJT - ALLJT - ALLXJT
*FLANGE MOUNTING*

FIGURE 1 J FLANGE




| FRAME | | LENGTH | BASE LOCATION |
|---|---|---|---|
| ASJ | ASB | 3.81 | 1.50 |
| ALJ | ALB | 4.31 | 1.50 |
| ALLJ | ALLB | 5.18 | 1.75 |
| ALLXJ | ALLXB | 5.68 | 1.75 |
| ASJT | ASBT | 4.18 | 1.50 |
| ALJT | ALBT | 4.68 | 1.50 |
| ALLJT | ALLBT | 5.56 | 1.75 |
| ALLXJT | ALLXBT | 6.06 | 1.75 |

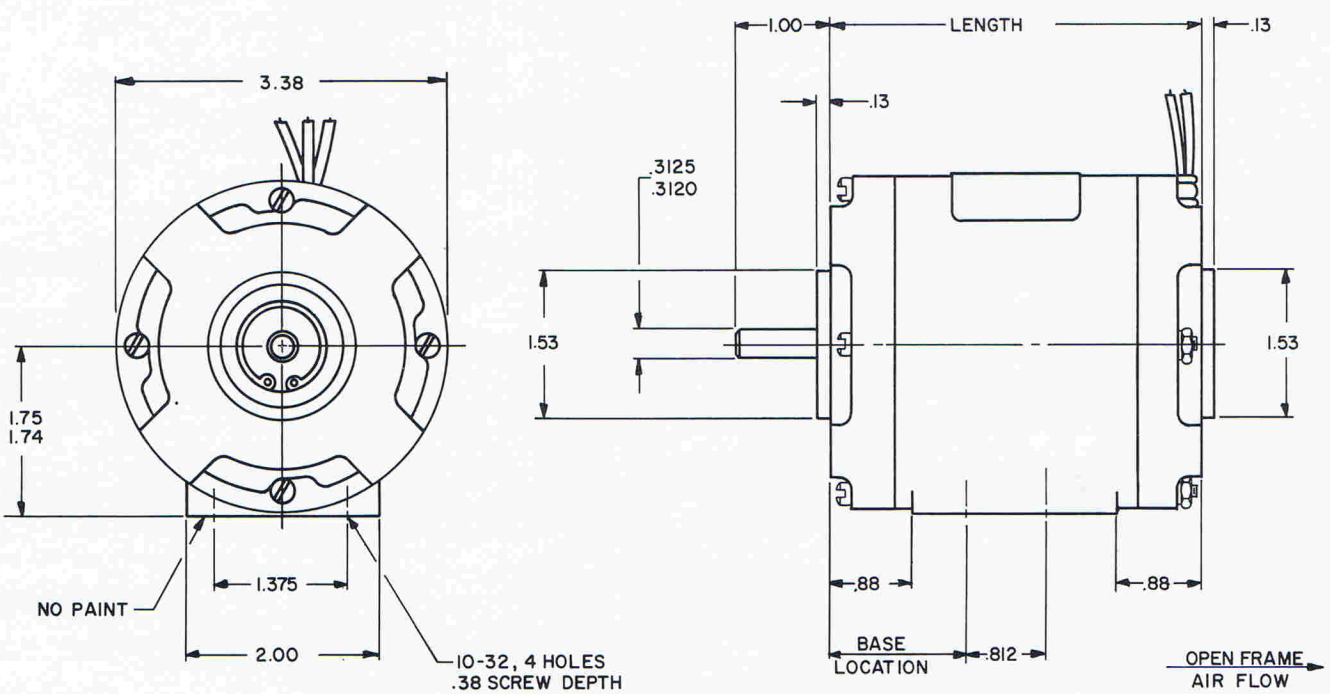
T = THERMAL PROTECTOR

TOLERANCES
.XX ±.03
.XXX ±.005

NOTE
1.-ALUMINUM FRAME
2.-STAINLESS STEEL SHAFT
3.-BALL BEARING CONSTRUCTION
4.-MOTOR LEADS 12" LONG
5.-FINISH-MOTTLETONE BLUE
6.-SHAFT RUNOUT, .001 T.I.R.

FIGURE 2 B BASE

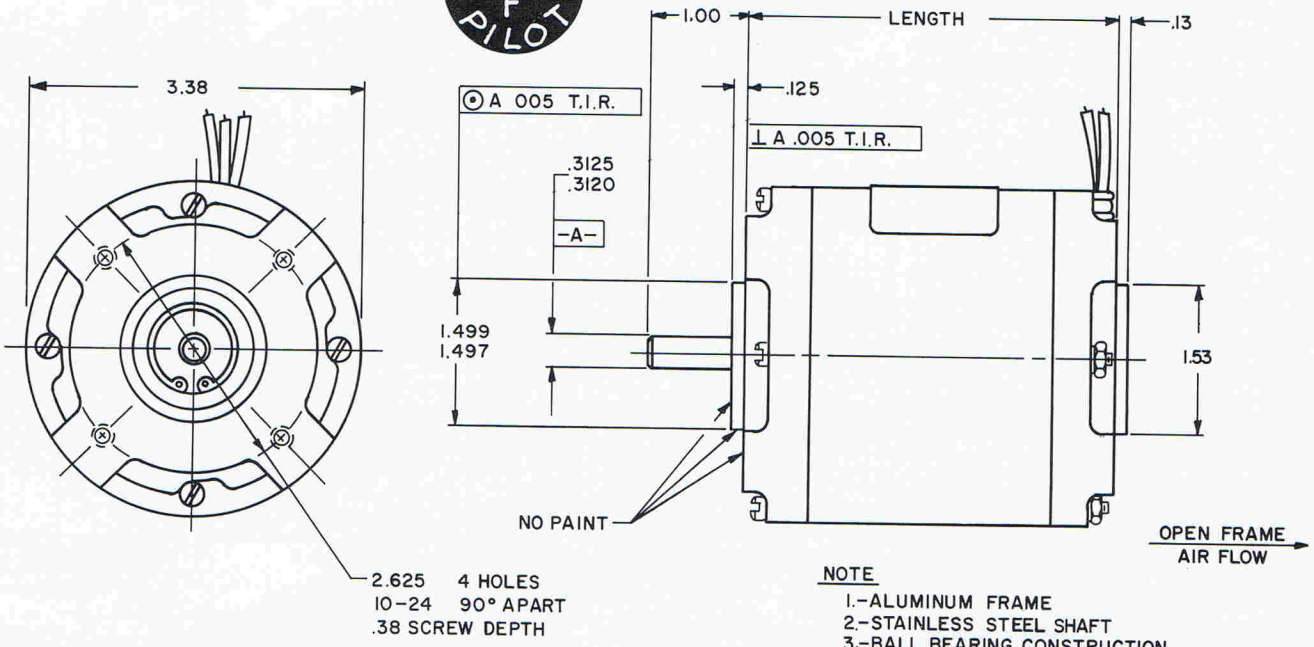
## ASB - ALB - ALLB - ALLXB
## ASBT - ALBT - ALLBT - ALLXBT
*BASE MOUNTING*



## ASF – ALF – ALLF – ALLXF
## ASFT – ALFT – ALLFT – ALLXFT

*FACE MOUNTING, WITH PILOT*

FIGURE 3 F PILOT




NOTE
1.–ALUMINUM FRAME
2.–STAINLESS STEEL SHAFT
3.–BALL BEARING CONSTRUCTION
4.–MOTOR LEADS 12" LONG
5.–FINISH–MOTTLETONE BLUE
6.–SHAFT RUNOUT, .001 T.I.R.

| FRAME | | LENGTH |
|---|---|---|
| ASF | ASM | 3.81 |
| ALF | ALM | 4.31 |
| ALLF | ALLM | 5.18 |
| ALLXF | ALLXM | 5.68 |
| ASFT | ASMT | 4.18 |
| ALFT | ALMT | 4.68 |
| ALLFT | ALLMT | 5.56 |
| ALLXFT | ALLXMT | 6.06 |

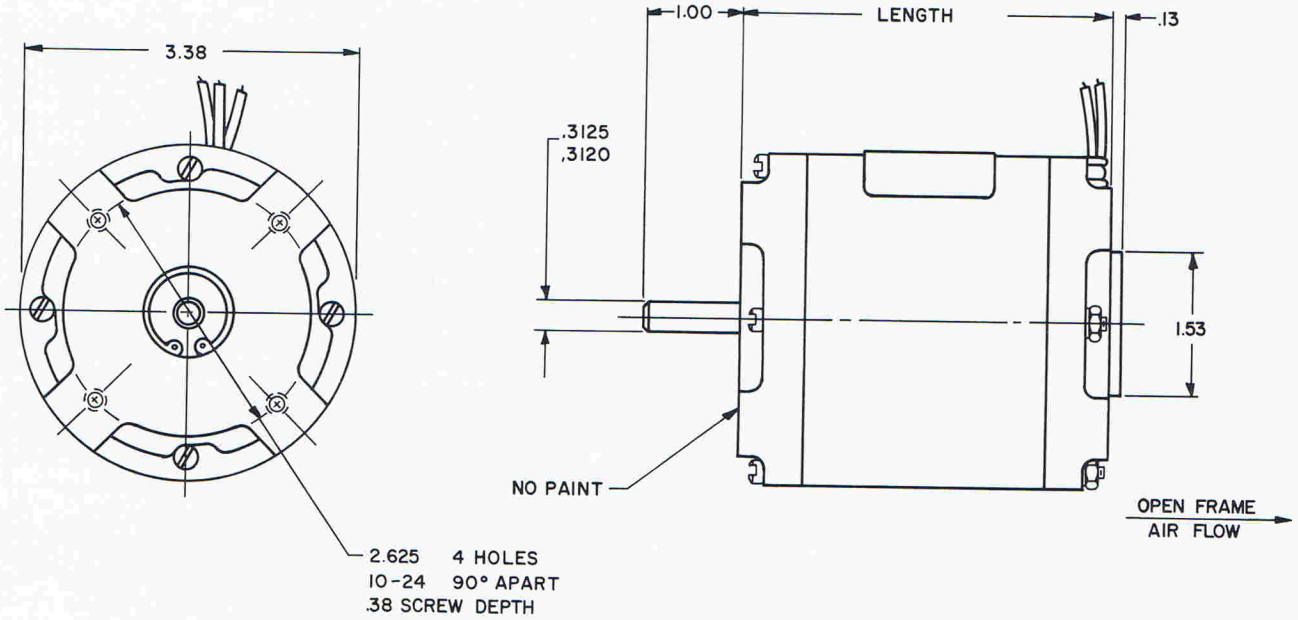
T = THERMAL PROTECTOR

TOLERANCES
.XX ± .03
.XXX ± .005

FIGURE 4 M FACE

## ASM – ALM – ALLM – ALLXM
## ASMT – ALMT – ALLMT – ALLXMT

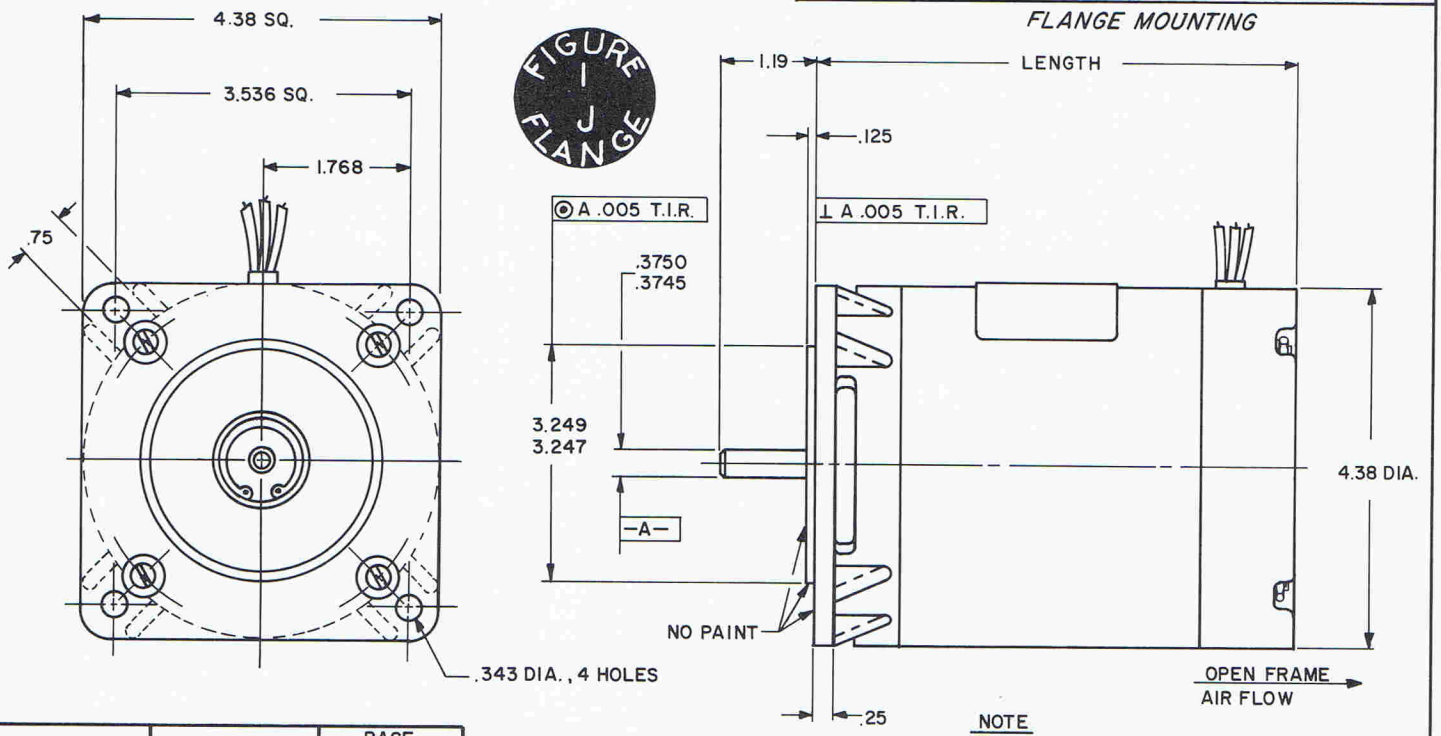
*FACE MOUNTING, NO PILOT*



# "G"–"GL"–"GLL"–"GG"–"GGL" FRAMES

## GJRN-GLJRN-GLLJRN-GGJRN-GGLJRN

*FLANGE MOUNTING*




| FRAME | LENGTH | BASE LOCATION |
|---|---|---|
| GJRN | 5.81 | |
| GLJRN | 6.81 | |
| GLLJRN | 8.38 | |
| GGJRN | 8.44 | |
| GGLJRN | 9.81 | |
| GNNB | 5.88 | 1.25 |
| GLNNB | 6.88 | 1.25 |
| GLLNNB | 8.44 | 2.50 |
| GGNNB | 8.50 | 2.68 |
| GGLNNB | 9.88 | 3.38 |

**TOLERANCES**

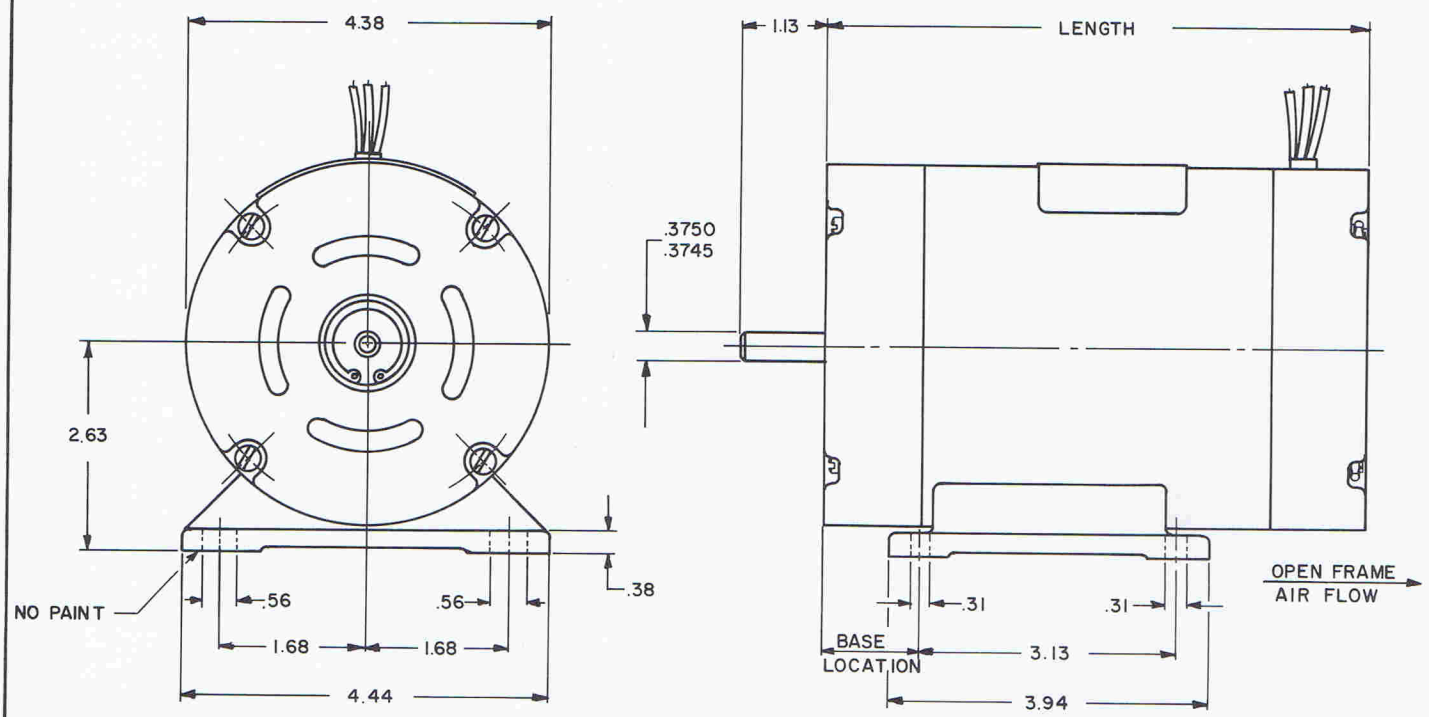
.XX ±.03
.XXX ±.005

**NOTE**

1.–ALUMINUM FRAME
2.–STAINLESS STEEL SHAFT
3.–BALL BEARING CONSTRUCTION
4.–MOTOR LEADS 12" LONG
5.–FINISH–MOTTLETONE BLUE
6.–SHAFT RUNOUT, .001 T.I.R.

## GNNB-GLNNB-GLLNNB-GGNNB-GGLNNB

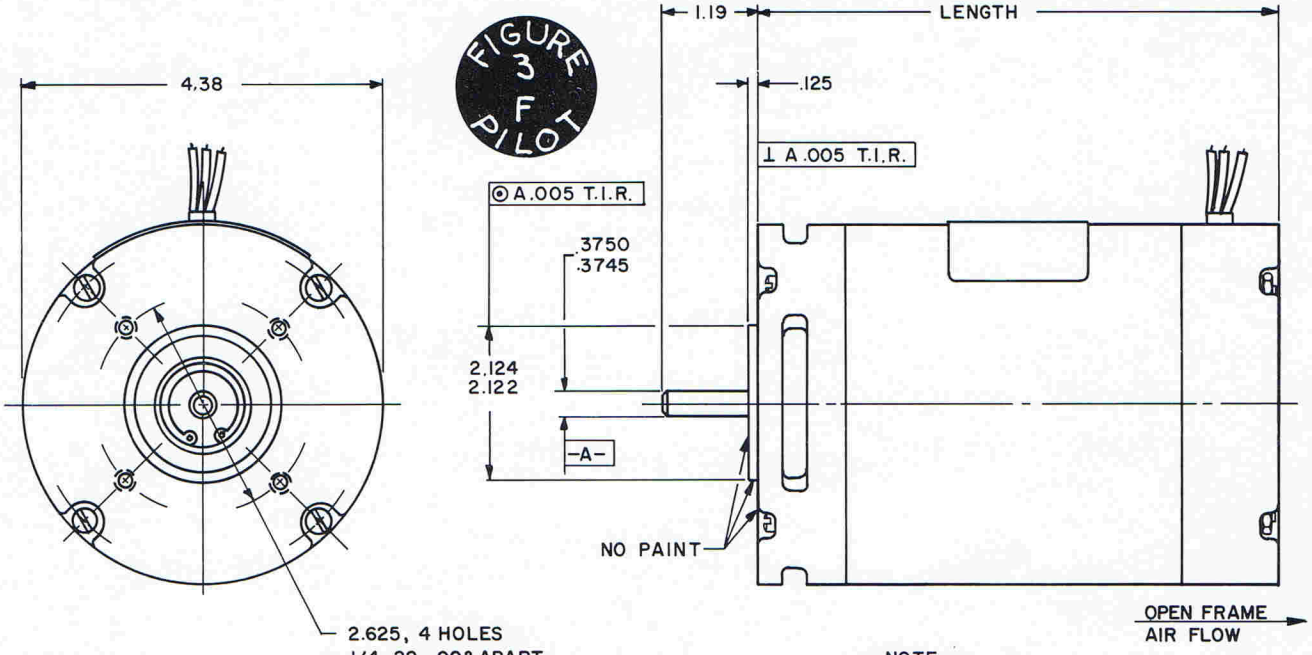
*BASE MOUNTING*



## GFRN-GLFRN-GLLFRN

*FACE MOUNTING, WITH PILOT*

FIGURE 3 F PILOT




| FRAME | LENGTH |
|---|---|
| GFRN | 5.81 |
| GLFRN | 6.81 |
| GLLFRN | 8.38 |
| GMRN | 5.88 |
| GLMRN | 6.88 |
| GLLMRN | 8.44 |

TOLERANCES

.XX ± .03
.XXX ± .005

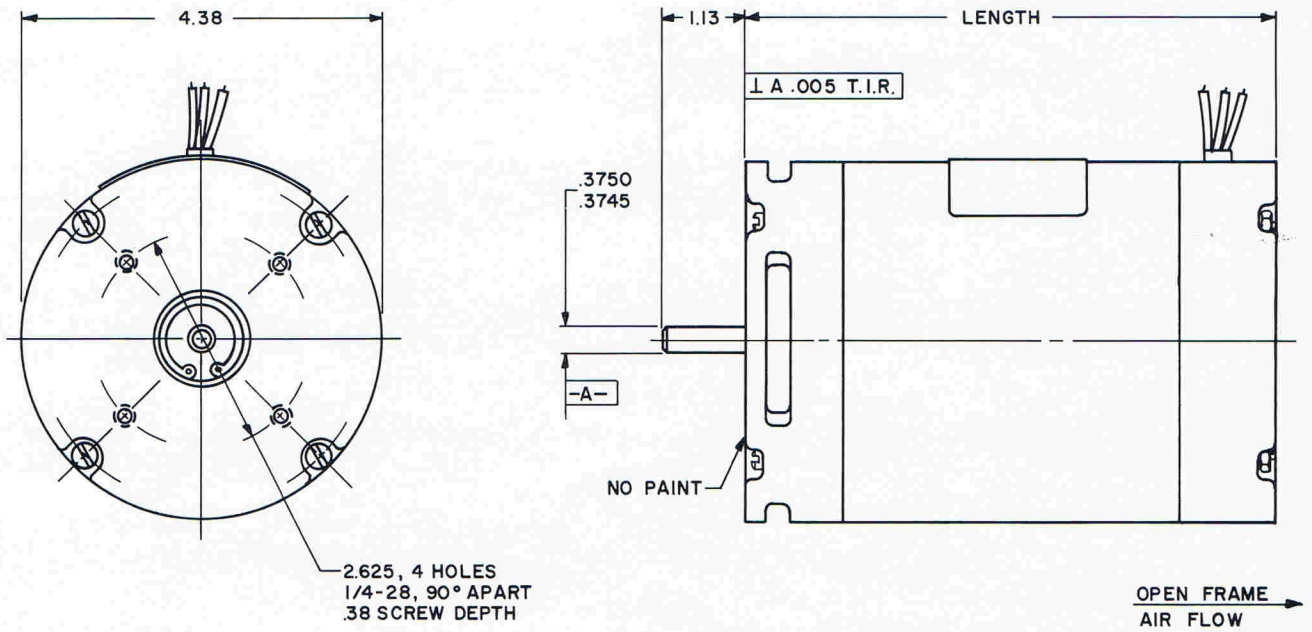
NOTE

1.–ALUMINUM FRAME
2.–STAINLESS STEEL SHAFT
3.–BALL BEARING CONSTRUCTION
4.–MOTOR LEADS 12" LONG
5.–FINISH–MOTTLETONE BLUE
6.–SHAFT RUNOUT, .001 T.I.R.

FIGURE 4 M FACE

## GMRN-GLMRN-GLLMRN

*FACE MOUNTING, NO PILOT*

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- D.C. Permanent Magnet Motors
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