



DANA

WARNER ELECTRIC®



**SLO-SYN® GEARMOTORS,
AC SYNCHRONOUS MOTORS**

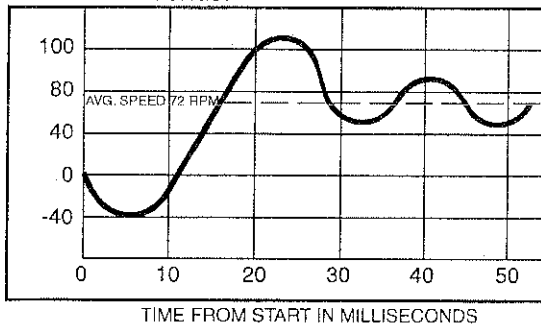
AC - Synchronous®

People Finding A Better Way®

Characteristics of SLO-SYN Synchronous Motors

Starting and Stopping Characteristics

Rapid starting, stopping and reversing characteristics are among the principal advantages of a SLO-SYN AC motor. The motors will start within 1-1/2 cycles of the applied frequency and will stop within 5° for a 72 rpm motor or 14° for a 200 rpm motor. As shown in the typical starting curve, a 72 rpm motor will start and reach its full synchronous speed within 5 to 25 milliseconds.



TYPICAL STARTING CHARACTERISTICS FOR A 72 RPM MOTOR

Phase-Shifting Network

A SLO-SYN motor can be operated directly from a two-phase or a three-phase power supply, depending on the specific motor used. When operating from a single-phase power source, however, a phase-shifting network is required.

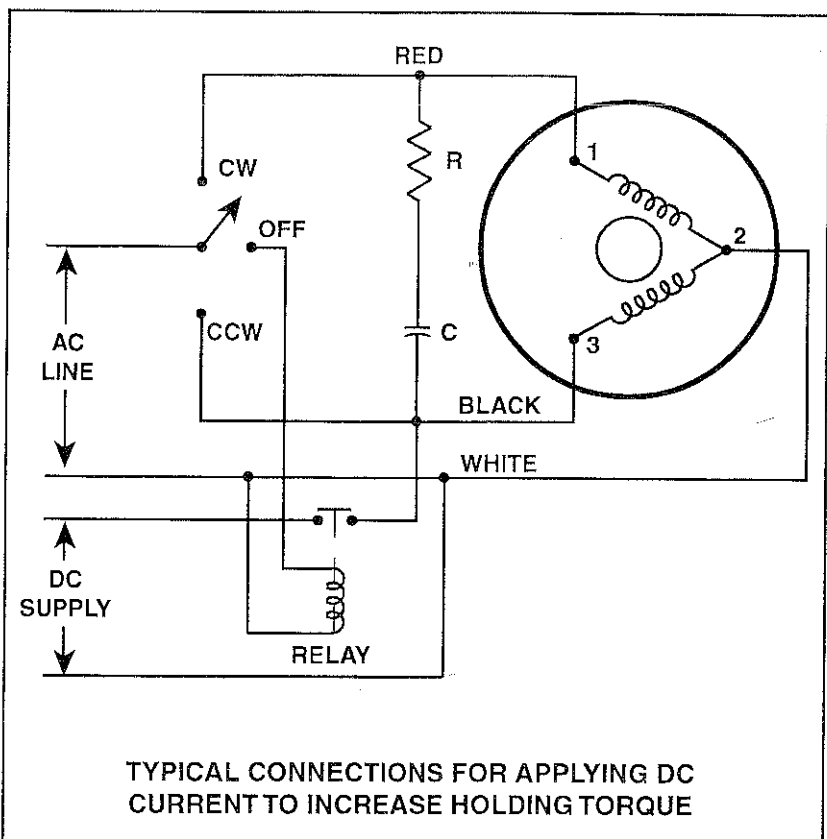
The phase-shifting network for a two-phase motor consists of a resistor and a capacitor, while a three-phase motor needs only a capacitor. Ratings and part numbers for the phase-shifting components are given in the Ratings sections of this catalog. Be sure to select the correct components of the frequency of the AC power source, since the components needed for 50 hertz operation may be different from those required for operation at 60 hertz.

Temperature

All SLO-SYN AC Synchronous Motors are rated for continuous duty at a maximum ambient temperature of 40°C (104°F). **Motor shell temperature must not be allowed to exceed 100°C (212°F) measured with a thermocouple.** The minimum ambient temperature at which the motors may be operated is -40°C (-40°F). **All standard types have Class B insulation.** Higher temperature windings are available as an option.

Holding Torque

The permanent magnet construction of a SLO-SYN motor provides a small residual torque which helps hold the motor shaft in position when the motor is de-energized. When additional holding torque is required, dc current can be applied to one winding when the ac input is removed. DC current can also be applied to both windings if more holding torque is needed. The diagrams show typical connections for applying dc current to increase holding torque.



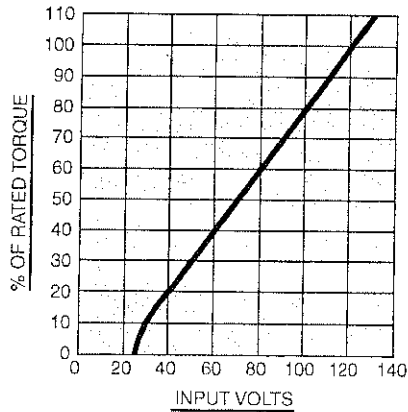
TYPICAL CONNECTIONS FOR APPLYING DC CURRENT TO INCREASE HOLDING TORQUE

Starting and Running Current

When a SLO-SYN motor is energized, ac current flows only through the windings. Current does not flow through the rotor, since the motor is of brushless construction. **Therefore, it is not necessary to consider high inrush currents when designing a control system for a SLO-SYN motor, since starting and operating current are, for all practical purposes, identical.**

Stalling

If a SLO-SYN motor becomes stalled, it will not overheat and will continue only that current required to energize the windings. However, if a SLO-SYN motor is stalled by running up against a stop, the motor will vibrate against the stop. Operating the motor continuously in this manner will eventually cause bearing failure.



**TYPICAL TORQUE VERSUS VOLTAGE
FOR A SLO-SYN MOTOR**

Torque Versus Voltage

As indicated in the curve, the torque output of a SLO-SYN motor is approximately proportional to the applied input voltage. For intermittent operation, this characteristic can be used to provide increased torque by increasing the voltage. For example, assume that an application has a torque requirement of 200 ounce-inches (141 Ncm). Normally, a 220 ounce-in (155 Ncm) SLO-SYN motor would be adequate, but this application is subject to wide voltage fluctuations and, therefore, the 20

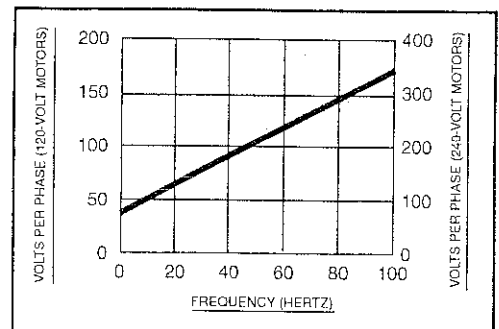
ounce-inch (14.1 Ncm) safety margin may be insufficient. The Recommended practice is to use a motor having a higher torque rating. However, a larger motor may not fit in the available space. In this case, a step-up transformer could be used to increase the voltage to the 220 ounce-inch motor by approximately 10%. Because operation at a higher voltage will cause a greater temperature rise, care must be taken to assure motor shell temperature does not exceed 100°C (212°F).

Speed Versus Frequency

The speed of a SLO-SYN motor is directly proportional to the applied frequency, as shown in the Speed vs. Frequency chart. However, because the winding impedance is also a function of frequency it is necessary to adjust the voltage to provide a constant torque at different excitation frequencies. The voltage required at a specific frequency can be obtained from the Voltage vs. Frequency curve. When a two-phase SLO-SYN motor is operated from a two-phase source or a three-phase SLO-SYN motor is operated from a three-phase source, it is only necessary to change the voltage and frequency to obtain the desired synchronous speed. When operating from a single-phase source however, it will be necessary to change the values of the phase shifting components at each new frequency to provide the necessary phase shift.

SPEED VS. FREQUENCY

FREQUENCY (HERTZ)	SPEED	
	72 RPM AT 60 HERTZ MODELS	200 RPM AT 60 HERTZ MODELS
10	12	33-1/3
20	24	66-2/3
30	36	100
40	48	133-1/3
50	60	166-2/3
60	72	200
70	84	233-1/3
80	96	266-2/3
90	108	300
100	120	333-1/3



**TYPICAL VOLTAGE VERSUS
FREQUENCY FOR
A SLO-SYN MOTOR**

RATINGS

Motor Type	HP	Minimum Running Torque Oz-in (Ncm)		Maximum Load Inertia Lb-in (kg-cm)						Input				Connection Diagram*	Shaft Speed (RPM)	
				1-Phase Rigidly Attached		3-Phase Rigidly Attached		1-Phase 5 Flex Coupling		Voltage		Frequency (Hertz)	Current (Amps)		60 Hertz	50 Hertz
		1-Phase	3-Phase	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	1-Phase	3-Phase				60 Hertz	50 Hertz
SS25	0.0015	25 (17.7)	-	0.44 (1.3)	-	-	-	-	-	120	-	50/60	0.1	A	72	60
SS50	-	50 (35.3)	-	1.5 (4.4)	1.5 (4.4)	-	-	-	-	120	-	50/60	0.3	A	72	60
SS52	-	50 (35.3)	-	1.5 (4.4)	1.5 (4.4)	-	-	-	-	240	-	50/60	0.2	A	72	60
SS80	0.0048	80 (56.6)	-	0.5 (1.47)	0.5 (1.47)	-	-	-	-	120	-	50/60	0.3	A	72	60
SS82	0.0048	80 (56.6)	-	0.5 (1.47)	0.5 (1.47)	-	-	-	-	240	-	50/60	0.2	A	72	60
SS91	0.0054	90 (64)	-	1.6 (4.7)	0.5 (1.47)	-	-	11 (32.2)	4 (11.7)	120	-	50/60	0.25	A	72	60
SS92	0.0054	90 (64)	-	1.6 (4.7)	0.8 (2.3)	-	-	11 (32.2)	4 (11.7)	240	-	50/60	0.15	A	72	60
SS131	0.0077	130 (92)	-	1.8 (5.3)	0.8 (2.3)	-	-	13 (38)	6 (17.6)	120	-	50/60	0.3	A	72	60
SS132	0.0077	130 (92)	-	1.8 (5.3)	0.8 (2.3)	-	-	13 (38)	6 (17.6)	240	-	50/60	0.15	A	72	60
SS150B	0.0089	150 (106)	-	1.5 (4.4)	1.5 (4.4)	-	-	-	-	120	-	50/60	0.45	A	72	60
SS152B	0.0089	150 (106)	-	1.5 (4.4)	1.5 (4.4)	-	-	-	-	240	-	50/60	0.2	A	72	60
SS241	0.013	240 (169)	-	2.5 (7.3)	0.5 (1.47)	-	-	18 (53)	3.5 (10.2)	120	-	50/60	0.4	B	72	60
SS242	0.013	240 (169)	250 (177)	2.5 (7.3)	1 (2.9)	2.5 (7.3)	4 (12)	18 (53)	7 (21)	240	208	50/60	0.2	B	72	60
SS250B	0.015	250 (177)	-	3 (8.8)	3 (8.8)	-	-	-	-	120	-	50/60	0.6	A	72	60
SS252B	0.014	250 (177)	-	3 (8.8)	3 (8.8)	-	-	-	-	240	-	50/60	0.4	A	72	60
X250	0.014	250 (177)	-	3 (8.8)	-	-	-	21 (61)	-	120	-	50/60	0.6	A	72	60
X252	0.014	250 (177)	-	3 (8.8)	-	-	-	21 (61)	-	240	-	50/60	0.4	A	72	60
XD250	0.014	250 (177)	-	3 (8.8)	-	-	-	21 (61)	-	120	-	50/60	0.6	A	72	60
SS400B	-	400 (282)	-	4.5 (13.2)	13 (38)	-	-	-	-	120	-	50/60	0.6	A	72	60
SS402B	-	400 (282)	-	4.5 (13.2)	13 (38)	-	-	-	-	240	-	50/60	0.4	A	72	60
SS451	0.025	450 (318)	-	5.5 (16)	1.3 (3.8)	-	-	38 (111)	9.1 (27)	120	-	50/60	0.8	B	72	60
SS452	0.025	450 (318)	475 (335)	7.5 (22)	2.0 (5.9)	4.5 (13.2)	4.5 (13.2)	52 (152)	14 (41)	240	208	50/60	0.3	B	72	60
SS700	0.042	700 (494)	-	10.2 (30)	-	-	-	71 (208)	-	120	-	50/60	1.1	A	72	60
SS702	0.042	700 (494)	-	10.2 (30)	-	-	-	71 (208)	-	240	-	50/60	0.55	A	72	60
X1100	0.065	1100 (777)	-	9 (26.4)	-	-	-	63 (184)	-	120	-	50/60	3	A	72	60
X1102	0.065	1100 (777)	-	9 (26.4)	-	-	-	63 (184)	-	240	-	50/60	1.5	A	72	60
X1500	0.089	1500 (1059)	-	12 (35.2)	-	-	-	84 (246)	-	120	-	50/60	3	A	72	60
X1502	0.089	1500 (1059)	-	12 (35.2)	-	-	-	84 (246)	-	240	-	50/60	1.5	A	72	60
SS1800	0.107	1800 (1271)	-	47 (138)	-	-	-	-	-	120	-	50/60	4	A	72	60
SS1802	0.107	1800 (1271)	-	47 (138)	-	-	-	-	-	240	-	50/60	2.5	A	72	60
TS25	0.0013	22 (15.5)	-	0.12 (0.35)	-	-	-	0.84 (2.5)	-	120	-	50/60	0.2	A	200	167
TS50	0.003	50 (35.3)	-	0.25 (0.73)	-	-	-	1.75 (5.1)	-	120	-	50/60	0.3	A	200	167
TS52	0.003	50 (35.3)	-	0.25 (0.73)	-	-	-	1.75 (5.1)	-	240	-	50/60	0.2	A	200	167

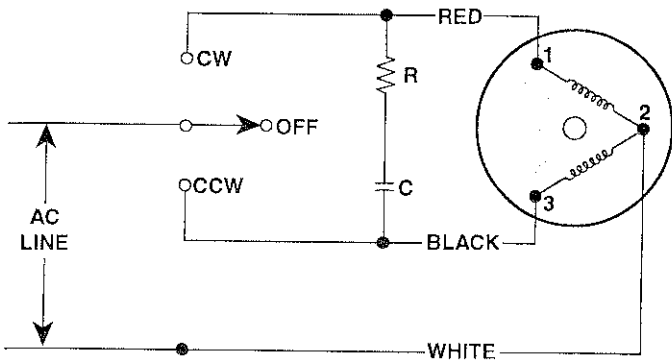
* Motors that use Connection Diagram A are two-phase motors; Motors using Connection Diagram B are three-phase.

SLO-SYN® AC Synchronous Motors

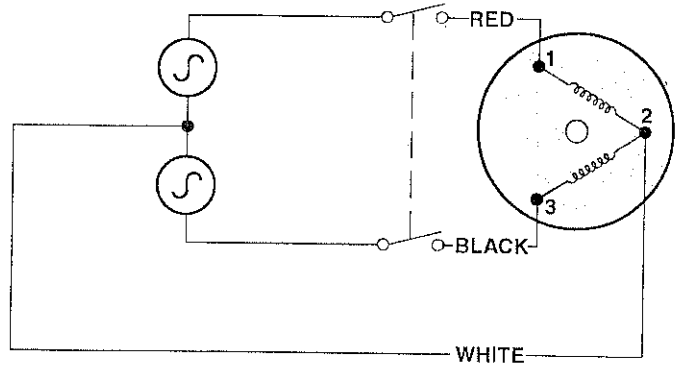
SPECIFICATIONS

MOTOR TYPE	MINIMUM HOLDING TORQUE				TYPICAL RESIDUAL TORQUE OZ-IN (Ncm)	MAX. RADIAL FORCE LB (N)	MAX. AXIAL FORCE LB (N)	NEMA FRAME SIZE	NET WEIGHT	
	ONE WINDING ON OZ-IN (Ncm)	TWO WINDINGS ON OZ-IN (Ncm)	CURRENT PER WINDING (AMPERES)	DC VOLTS PER WINDING					LB	kg
SS25	30 (21.2)	40 (28.2)	0.07	80	1 (0.7)	15 (67)	25 (111)	23D	1.3	0.6
SS50	50 (35.3)	80 (56.3)	0.15	50	1.5 (1.1)	15 (6.7)	15 (111)	34D	3	1.4
SS52	50 (35.3)	80 (56.3)	0.08	100	1.5 (1.1)	15 (67)	25 (111)	34D	3	1.4
SS80	80 (56.5)	120 (85)	0.15	50	2.0 (1.4)	15 (67)	10 (44.5)	34D	3.5	1.6
SS82	80 (56.5)	120 (85)	0.08	100	2.0 (1.4)	15 (67)	25 (111)	34D	3.5	1.6
SS91	100 (70.6)	150 (106)	0.18	43	5 (3.5)	15 (67)	25 (111)	23D	2	0.9
SS92	100 (70.6)	150 (106)	0.09	86	5 (3.5)	15 (67)	25 (111)	23D	2	0.9
SS131	120 (85)	180 (127)	0.2	42	6 (4.2)	15 (67)	25 (111)	23D	2.75	1.25
SS132	120 (85)	180 (127)	0.1	84	6 (4.2)	15 (67)	25 (111)	23D	2.75	1.25
SS150B	200 (141)	300 (212)	0.51	35	4.0 (2.8)	25 (111)	50 (222)	42C	8	3.6
SS152B	200 (141)	300 (212)	0.26	70	4.0 (2.8)	25 (111)	50 (222)	42C	8	3.6
SS241	350 (247)	-	0.5	85	15 (10.6)	25 (111)	50 (222)	34D	4.1	1.9
SS242	350 (247)	-	0.25	170	15 (10.6)	25 (111)	50 (222)	34D	4.1	1.9
SS250B	280 (198)	450 (318)	0.7	32	6.5 (4.9)	25 (111)	50 (222)	42C	8	3.6
SS252B	280 (198)	450 (318)	0.35	70	6.5 (4.9)	25 (111)	50 (222)	42C	8	3.6
X250	280 (198)	450 (318)	0.5	32	6.5 (4.9)	25 (111)	50 (222)	42D	9	4.1
X252	280 (198)	450 (318)	1	64	6.5 (4.9)	25 (111)	50 (222)	42D	9	4.1
XD250	280 (198)	450 (318)	0.5	32	6.5 (4.9)	25 (111)	50 (222)	42D	9	4.1
SS400B	500 (353)	700 (494)	0.3	64	35 (24.7)	25 (111)	50 (222)	42C	12.3	5.6
SS402B	500 (353)	700 (494)	0.6	30	35 (24.7)	25 (111)	50 (222)	42C	12.3	5.6
SS451	550 (388)	-	0.9	75	25 (17.7)	25 (111)	50 (222)	34D	6.5	3
SS452	550 (388)	-	0.45	150	25 (17.7)	25 (111)	50 (222)	34D	6.5	3
SS700	1000 (706)	1400 (989)	1	20	9 (6.4)	25 (111)	50 (222)	42C	15.5	7
SS702	1000 (706)	1400 (989)	0.5	40	9 (6.4)	25 (111)	50 (222)	42C	15.5	7
X1100	1600 (1130)	2400 (1695)	2.6	14	15 (10.6)	50 (222)	100 (445)	66	36	16
X1102	1600 (1130)	2400 (1695)	1.3	28	15 (10.6)	50 (222)	100 (445)	66	36	16
X1500	2000 (1412)	3000 (2118)	2.2	10	25 (17.7)	50 (222)	100 (445)	66	42	19
X1502	2000 (1412)	3000 (2118)	1.1	20	25 (17.7)	50 (222)	100 (445)	66	42	19
SS1800	2200 (1554)	3000 (2118)	2.4	9.5	20 (14.1)	50 (222)	100 (445)	66	45	20
SS1802	2200 (1554)	3000 (2118)	2.4	19	20 (14.1)	50 (222)	100 (445)	66	45	20
TS25	30 (21.2)	40 (28.2)	0.13	60	1 (0.7)	8 (35.6)	10 (44.5)	23D	2.5	1.1
TS50	55 (38.8)	85 (60)	0.13	50	1.5 (1.1)	15 (67)	25 (111)	34D	5.8	2.6
TS52	55 (38.8)	85 (60)	0.07	100	1.5 (1.1)	15 (67)	25 (111)	34D	5.8	2.6

2000

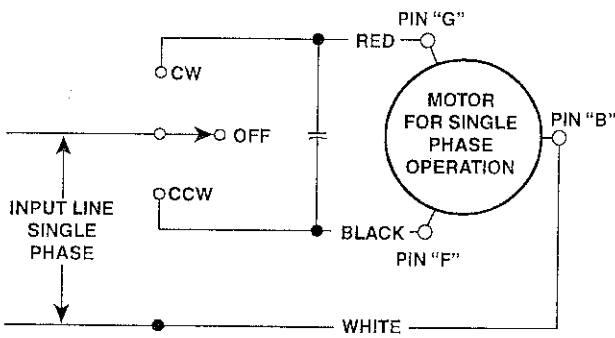


SINGLE-PHASE OPERATION



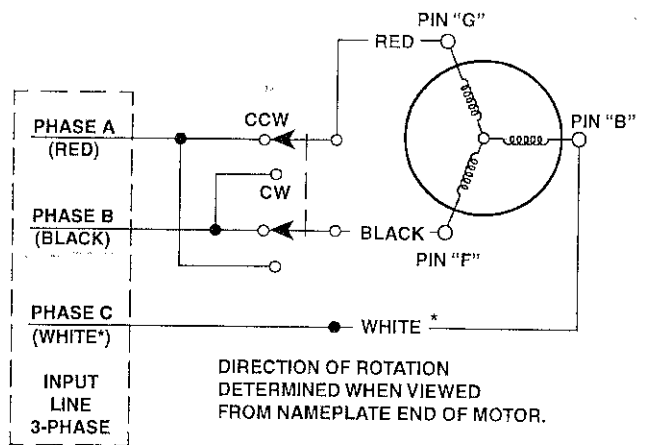
TWO-PHASE OPERATION

CONNECTION DIAGRAM A (2-PHASE MOTORS)



DIRECTION OF ROTATION
DETERMINED WHEN VIEWED
FROM NAMEPLATE END OF MOTOR.

SINGLE-PHASE OPERATION



DIRECTION OF ROTATION
DETERMINED WHEN VIEWED
FROM NAMEPLATE END OF MOTOR.

* — WHITE IS NOT "NEUTRAL".

THREE-PHASE OPERATION

CONNECTION DIAGRAM B (3-PHASE MOTORS)

CONNECTION POINTS

LEAD COLOR	MOTOR CONNECTOR	CABLE CONNECTOR	TERMINAL
RED	G	7	1
BLACK	F	6	3
WHITE	B	2	2

PHASE SHIFTING COMPONENTS

RESISTOR RATING CHART

MOTOR	FREQUENCY (Hz)	120 VOLT OPERATION		240 VOLT OPERATION	
		PART NUMBER	RATING ($\pm 5\%$)	PART NUMBER	RATING ($\pm 5\%$)
SS25	50	201052-002	200 ohm, 5 watt	-	-
SS25	60	201052-001	500 ohm, 5 watt	-	-
SS50	50	201052-007	250 ohm, 25 watt	-	-
SS50	60	201052-006	400 ohm, 25 watt	-	-
SS52	50	-	-	201052-004	1000 ohm, 10 watt
SS52	60	-	-	201052-029	1500 ohm, 10 watt
SS80	50	201052-007	250 ohm, 25 watt	-	-
SS80	60	201052-006	400 ohm, 25 watt	-	-
SS82	50	-	-	201052-004	1000 ohm, 10 watt
SS82	60	-	-	201052-029	1500 ohm, 10 watt
SS91	50/60	201052-031	500 ohm, 25 watt	-	-
SS92	50/60	-	-	201052-032	2000 ohm, 25 watt
SS131	50/60	201052-007	250 ohm, 25 watt	-	-
SS132	50/60	-	-	A201052-030	1000 ohm, 25 watt
SS150B	50/60	201052-007	250 ohm, 25 watt	-	-
SS152B	50/60	-	-	201052-030	1000 ohm, 25 watt
SS250B	50/60	201052-013	150 ohm, 50 watt	-	-
SS252B	50/60	-	-	201052-015	500 ohm, 50 watt
SS400B	50/60	201052-013	150 ohm, 50 watt	-	-
SS402B	50/60	-	-	201052-015	500 ohm, 50 watt
X250	50/60	201052-013	150 ohm, 50 watt	-	-
X252	50/60	-	-	201052-015	500 ohm, 50 watt
XD250	50/60	201052-013	150 ohm, 50 watt	-	-
SS700	50/60	201052-027	150 ohm, 100 watt	-	-
SS702	50/60	-	-	201052-028	500 ohm, 100 watt
X1100	50/60	201052-025	100 ohm, 160 watt	-	-
X1102	50/60	-	-	201052-026	400 ohm, 160 watt
X1500	50	201052-016	65 ohm, 160 watt	-	-
X1500	60	201052-020	55 ohm, 375 watt	-	-
X1502	50/60	-	-	201052-018	250 ohm, 200 watt
SS1800	50/60	201052-022	40 ohm, 375 watt	-	-
SS1802	50/60	-	-	201052-023	130 ohm, 375 watt
TS25	50	201052-003	125 ohm, 10 watt	-	-
TS25	60	201052-002	200 ohm, 5 watt	-	-
TS50	50/60	201052-010	300 ohm, 25 watt	-	-
TS52	50/60	-	-	201052-012	1200 ohm, 25 watt

2000

CAPACITOR RATING CHART

Motor	Frequency (Hz)	120 Volts		220 Volts		240 Volts	
		Part Number	Rating ($\pm 6\%$)	Part Number	Rating ($\pm 6\%$)	Part Number	Rating ($\pm 6\%$)
SS25	50	201053-023	1 μ fd, 300 Vac	-	-	-	-
SS25	60	201053-022	0.75 μ fd, 330 Vac	-	-	-	-
SS50	50	201053-002	3.3 μ fd, 330 Vac	-	-	-	-
SS50	60	201053-025	2.25 μ fd, 330 Vac	-	-	-	-
SS52	50	-	-	-	-	201053-008	0.8 μ fd, 660 Vac
SS52	60	-	-	-	-	201053-007	0.67 μ fd, 660 Vac
SS80	50	201053-002	3.3 μ fd, 330 Vac	-	-	-	-
SS80	60	201053-025	2.25 μ fd, 330 Vac	-	-	-	-
SS82	50	-	-	-	-	201053-008	0.8 μ fd, 660 Vac
SS82	60	-	-	-	-	201053-007	0.67 μ fd, 660 Vac
SS91	50	201053-044	3 μ fd, 330 Vac	-	-	-	-
SS91	60	201053-041	2.5 μ fd, 330 Vac	-	-	-	-
SS92	50	-	-	201053-008	0.8 μ fd, 370 Vac	201053-008	0.8 μ fd, 370 Vac
SS92	60	-	-	201053-007	0.67 μ fd, 370 Vac	201053-007	0.67 μ fd, 370 Vac
SS131	50	201053-062	3.75 μ fd, 250 Vac	-	-	-	-
SS131	60	201053-044	3 μ fd, 250 Vac	-	-	-	-
SS132	50	-	-	201053-023	1 μ fd, 370 Vac	201053-023	1 μ fd, 370 Vac
SS132	60	-	-	201053-023	0.75 μ fd, 370 Vac	201053-063	0.75 μ fd, 370 Vac
SS150B	50/60	201053-005	3.75 μ fd, 330 Vac	-	-	-	-
SS152B	50	-	-	-	-	201053-034	1.5 μ fd, 660 Vac
SS152B	60	-	-	-	-	201053-023	1.0 μ fd, 660 Vac
SS241	50	201053-066	10 μ fd, 250 Vac	-	-	-	-
SS241	60	201053-037	7.5 μ fd, 250 Vac	-	-	-	-
SS242	50	-	-	201053-041	2.5 μ fd, 250 Vac	201053-038	2 μ fd, 250 Vac
SS242	60	-	-	201053-038	2 μ fd, 250 Vac	201053-038	2 μ fd, 250 Vac
SS250B	50/60	201053-010	6.5 μ fd, 330 Vac	-	-	-	-
SS252B	50	-	-	-	-	201053-030	3.0 μ fd, 660 Vac
SS252B	60	-	-	-	-	201053-036	2.0 μ fd, 660 Vac
X250	50/60	201053-010	6.5 μ fd, 330 Vac	-	-	-	-
X252	50/60	-	-	-	-	201053-012	1.75 μ fd, 660 Vac
XD250	50/60	201053-010	6.5 μ fd, 330 Vac	-	-	-	-
SS400B	50	201053-033	10 μ fd, 330 Vac	-	-	-	-
SS400B	60	201053-010	6.5 μ fd, 330 Vac	-	-	-	-
SS402B	50	-	-	-	-	201053-035	2.5 μ fd, 660 Vac
SS402B	60	-	-	-	-	201053-012	1.75 μ fd, 660 Vac
SS451	50/60	201053-042	14 μ fd, 250 Vac	-	-	-	-
SS452	50	-	-	201053-061	4 μ fd, 250 Vac	201053-061	4 μ fd, 250 Vac
SS452	60	-	-	201053-044	3 μ fd, 250 Vac	201053-044	3 μ fd, 250 Vac
SS700	50	201053-031	15 μ fd, 370 Vac	-	-	-	-
SS700	60	201053-032	12.5 μ fd, 330 Vac	-	-	-	-
SS702	50	-	-	-	-	201053-028	4 μ fd, 660 Vac
SS702	60	-	-	-	-	201053-030	3 μ fd, 660 Vac
X1100	50	201053-027	25 μ fd, 330 Vac	-	-	-	-
X1100	60	201053-026	17.5 μ fd, 330 Vac	-	-	-	-
X1102	50	-	-	-	-	201053-029	6 μ fd, 660 Vac
X1102	60	-	-	-	-	201053-028	-
X1500	50	201053-018	35 μ fd, 440 Vac	-	-	-	-
X1500	60	201053-014	30 μ fd, 330 Vac	-	-	-	-
X1502	50	-	-	-	-	201053-019	9 μ fd, 660 Vac
X1502	60	-	-	-	-	201053-016	8 μ fd, 660 Vac
SS1800	50/60	201053-020	60 μ fd, 330 Vac	-	-	-	-
SS1802	50/60	-	-	-	-	201053-021	15 μ fd, 660 Vac
TS25	50	201053-065	3.0 μ fd, 330 Vac	-	-	-	-
TS25	60	201053-064	2.5 μ fd, 330 Vac	-	-	-	-
TS50	50/60	201053-005	3.75 μ fd, 330 Vac	-	-	-	-
TS52	50/60	-	-	-	-	201053-023	1 μ fd, 660 Vac

PHASE SHIFTING COMPONENT DIMENSIONS

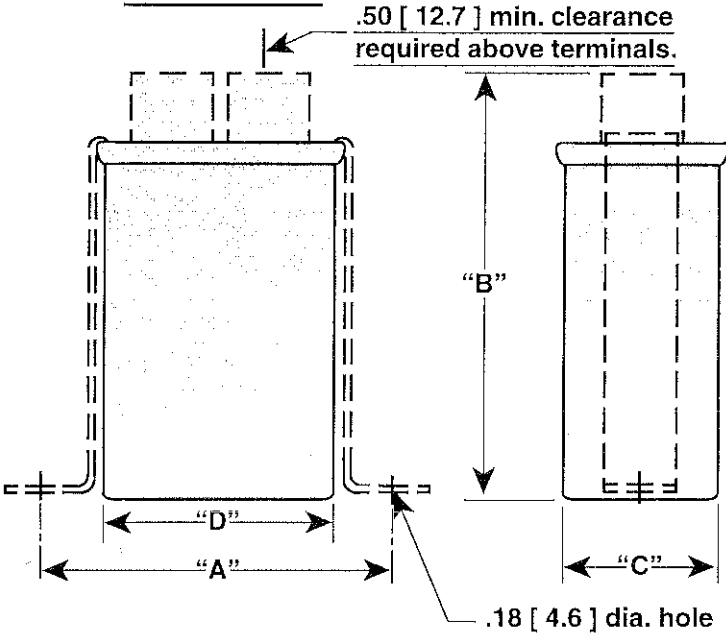


FIGURE C1

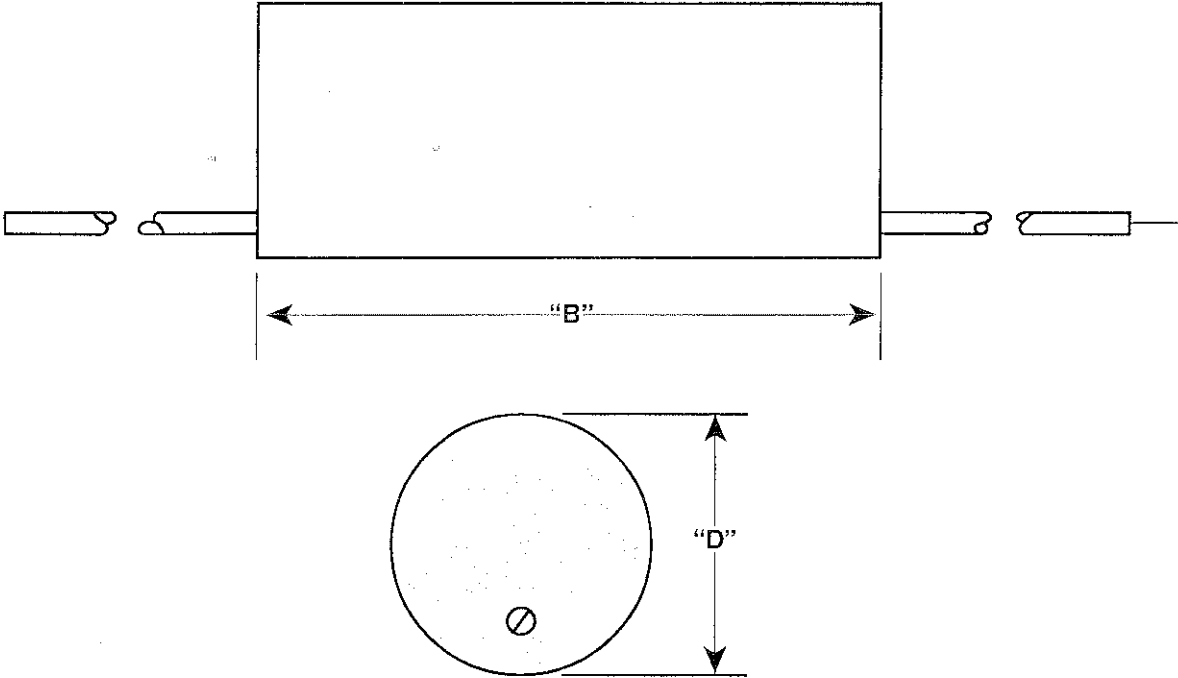


FIGURE C2

Please see dimensions chart on page AC11

CAPACITOR DIMENSIONS

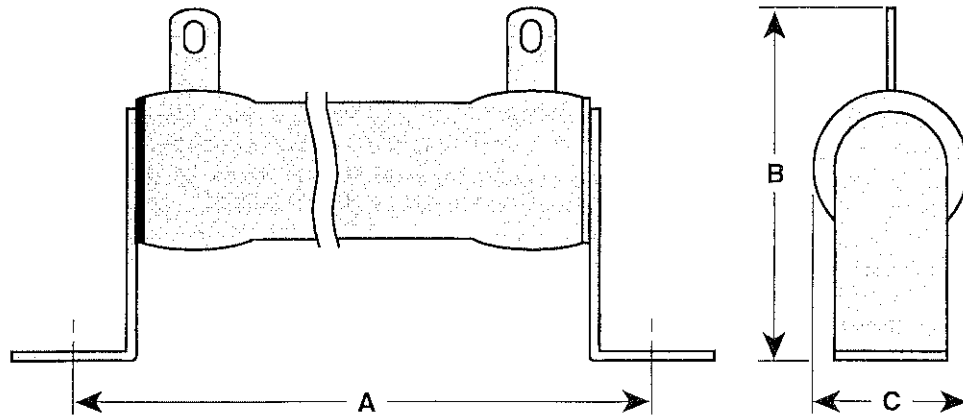
CAPACITOR DIMENSIONS

CAPACITOR PART NUMBER A201053-	DIMENSIONS, inches (mm)			
	A	B	C	D
002§	-	2.77 (70)	1.31 (33.3)	2.16 (55)
005§	-	3.27 (83)	1.31 (33.3)	2.16 (55)
007§	-	3.27 (83)	1.31 (33.3)	2.16 (55)
008§	-	3.27 (83)	1.31 (33.3)	2.16 (55)
010§	2.66 (67.6)	4.64 (118)	1.31 (33.3)	2.66 (67.6)
012§	2.66 (67.6)	4.27 (109)	1.31 (33.3)	2.16 (55)
013§	2.66 (67.6)	3.27 (83)	1.31 (33.3)	2.16 (55)
014§	3.41 (86.6)	8.06 (205)	1.91 (48.5)	2.91 (74)
016§	3.41 (86.6)	6.31 (160)	1.91 (48.5)	2.91 (74)
018§	4.16 (105.7)	9.81 (249)	1.97 (50)	3.66 (93)
019§	4.16 (105.7)	6.31 (160)	1.97 (50)	3.66 (93)
020*	3.41 (86.6)	8.06 (205)	1.91 (48.5)	2.91 (74)
021§	4.16 (105.7)	7.6 (193)	1.97 (50)	3.66 (93)
022§	2.66 (67.6)	3.27 (83)	1.31 (33.3)	2.16 (55)
023§	-	3.27 (83)	1.31 (33.3)	2.16 (55)
024§	2.66 (67.6)	3.27 (83)	1.31 (33.3)	2.16 (55)
025§	-	3.27 (83)	1.31 (33.3)	2.16 (55)
026§	3.41 (86.6)	4.82 (123)	1.91 (48.5)	2.91 (74)
027§	3.41 (86.6)	6.19 (158)	1.91 (48.5)	2.91 (74)
028§	2.66 (67.6)	3.92 (100)	1.31 (33.3)	2.16 (55)
029§	2.66 (67.6)	4.92 (125)	1.31 (33.3)	2.16 (55)
030§	2.66 (67.6)	4.08 (104)	1.31 (33.3)	2.16 (55)
031§	3.41 (86.6)	4.44 (113)	1.91 (48.5)	2.91 (74)
032§	2.66 (67.6)	6.58 (167)	1.31 (33.3)	2.16 (55)
034§	-	3.56 (90)	1.31 (33.3)	2.16 (55)
036§	2.66 (67.6)	3.7 (94)	1.31 (33.3)	2.16 (55)
037†	-	1.75 (44.5)	-	1.095 (27.8)
038†	-	1.75 (44.5)	-	0.661 (16.8)
041†	-	1.75 (44.5)	-	0.672 (17.1)
042†	-	2.5 (63.5)	-	1.146 (29.1)
044†	-	1.75 (44.5)	-	0.678 (17.2)
061†	-	1.75 (44.5)	-	0.81 (20.6)
062†	-	1.75 (44.5)	-	0.78 (19.8)
063	2.66 (67.6)	3.27 (83)	1.31 (33.3)	2.16 (55)
064	2.66 (67.6)	2.2 (55.9)	1.25 (31.8)	2.16 (55)
065	2.66 (67.6)	2.7 (68.6)	1.25 (31.8)	2.16 (55)

* Consists of two capacitors. Dimensions shown are for one capacitor.

§ See Figure C1.

† See Figure C2.



RESISTOR DIMENSIONS

RESISTOR PART NUMBER A201052-	DIMENSIONS, inches (mm)		
	A	B	C
001	1.75 (44.5)	1.375 (35)	0.31 (7.9)
002	1.75 (44.5)	1.375 (35)	0.31 (7.9)
003	2.5 (64)	1.625 (41.3)	0.59 (15)
004	2.5 (64)	1.625 (41.3)	0.59 (15)
006	3 (76)	1.94 (50)	0.75 (19)
007	3 (76)	1.94 (50)	0.75 (19)
010	3 (76)	1.94 (50)	0.75 (19)
012	3 (76)	1.94 (50)	0.75 (19)
013	4.88 (124)	1.44 (37)	1.0 (25.4)
015	4.88 (124)	1.44 (37)	1.0 (25.4)
016	9.38 (238)	2.5 (64)	1.13 (28.7)
018	11.5 (292)	2.75 (70)	1.13 (28.7)
020	11.5 (292)	2.56 (65)	1.25 (31.8)
022	11.5 (292)	2.69 (68.3)	1.13 (28.7)
023	9.38 (238)	2.5 (64)	1.13 (28.7)
025	9.38 (238)	2.5 (64)	1.13 (28.7)
026	9.38 (238)	2.5 (64)	1.13 (28.7)
027	5.88 (150)	2.76 (70)	1.38 (35)
028	5.88 (150)	2.76 (70)	1.38 (35)
029	9.38 (238)	2.5 (64)	1.13 (28.7)
030	3 (76)	1.94 (50)	0.75 (19)
031	3 (76)	1.94 (50)	0.75 (19)
032	3 (76)	1.94 (50)	0.75 (19)

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Gears and Pulleys

When the load is driven through gears or pulleys, the torque should be decreased or increased by the overall ratio.

For example, if the load is 90 ounce-inches (63.6 Ncm) and the step-down ratio is 3:1, the required torque would be 30 ounce-inches (21.2 Ncm).

Load inertia should be decreased or increased by the square of the ratio. For example, with a load inertia of 4 pound-inches²

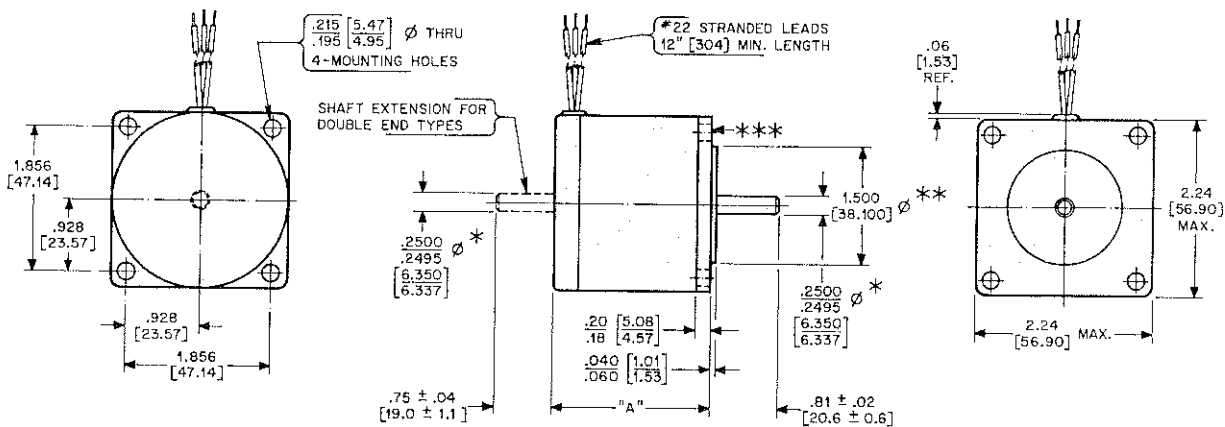
(11.71 kg-cm²) and a 2:1 step-down ratio, the effective inertia would be 1 pound-inch² (2.93 kg-cm²) plus the inertia of the first gear or pulley.

4. Motor Selection

Once all the requirements of the application including input voltage and frequency are known, refer to the Ratings charts and select the motor which best suits these requirements.

If additional information or technical assistance is needed, contact the nearest office of Superior Electric listed on the back cover. A representative will be pleased to help you select the best motor for your application.

DIMENSIONS



BASIC MOTOR TYPE	"A" MAX.
SS25	2.27 [57.66]
TS25	3.27 [83.06]

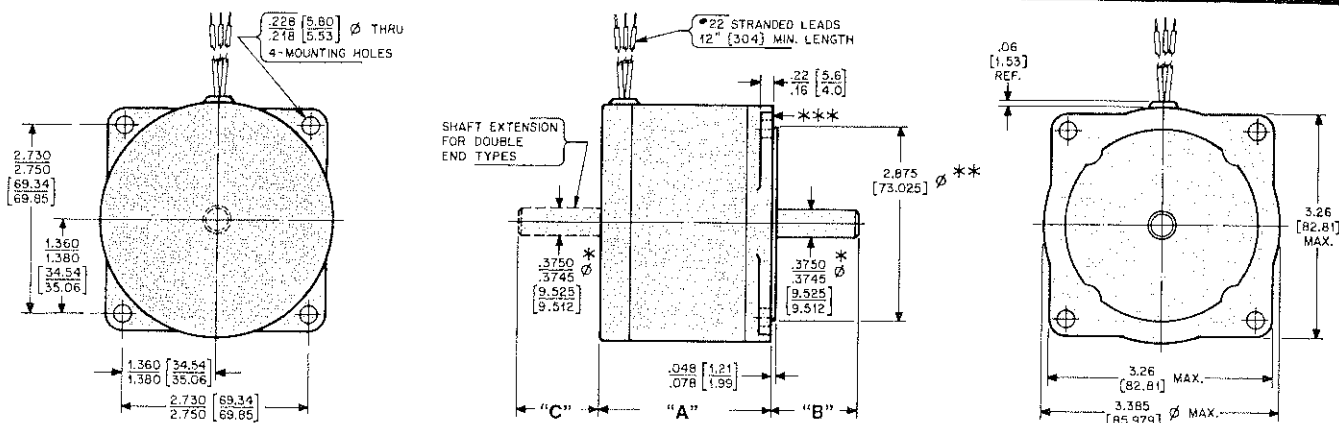
- * SHAFT RUNOUT .002 [0.051] MAX.
- ** DIAMETER TOLERANCE ±.002 [0.051]
- ** DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.P.
- *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

NOTES --

- 1- Dimensions in brackets are millimeters.
- 2- Tolerance on decimals ---
- 3- .XXX = ± 0.005 [0.13] unless otherwise specified.
- 3- Dimensions shown apply before painting or plating.
- 4- This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

SS25, SS25E, TS25 and TS25E Motors

SLO-SYN® AC Synchronous Motors



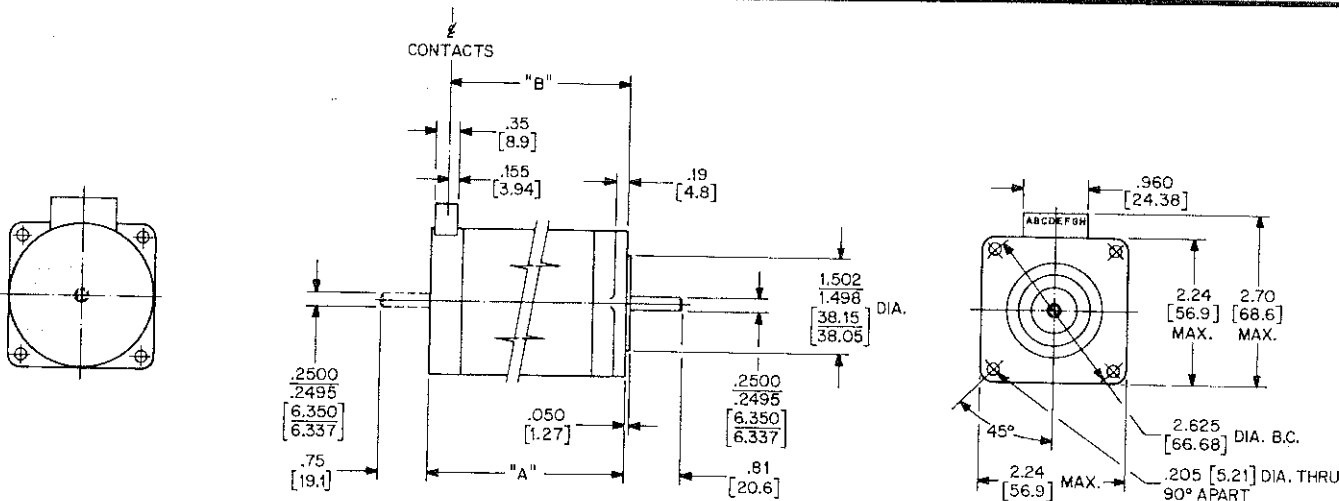
NOTES: - -

- 1 - Dimensions in brackets are millimeters
- 2 - Tolerance on decimals - - -
XXX = ±0.005 [0.13] unless otherwise specified.
- 3 - Dimensions shown apply before painting or plating.
- 4 - This drawing shows only those features which are pertinent to the form, fit and function of the motor.

- * SHAFT RUNOUT .002 [0.051] MAX.
- ** DIAMETER TOLERANCE ±.002 [0.051]
DIAMETER CONCENTRIC TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.
- *** SURFACE SQUARE TO SHAFT DIAMETER WITHIN .003 [0.077] T.I.R.

MOTOR TYPE	"A" MAX.	"B"	"C"
TS50/TS50E/ TS52/TS52E	3.72 [94.49]	1.25 [31.8]	1.25 [31.8]
SS50/SS52/ SS80/SS80E/ SS82/SS82E	2.47 [62.74]	1.19 [30.2]	1.12 [28.4]

TS50, TS50E, TS52, TS52E, SS50, SS52, SS80, SS80E, SS82 and SS82E Motors

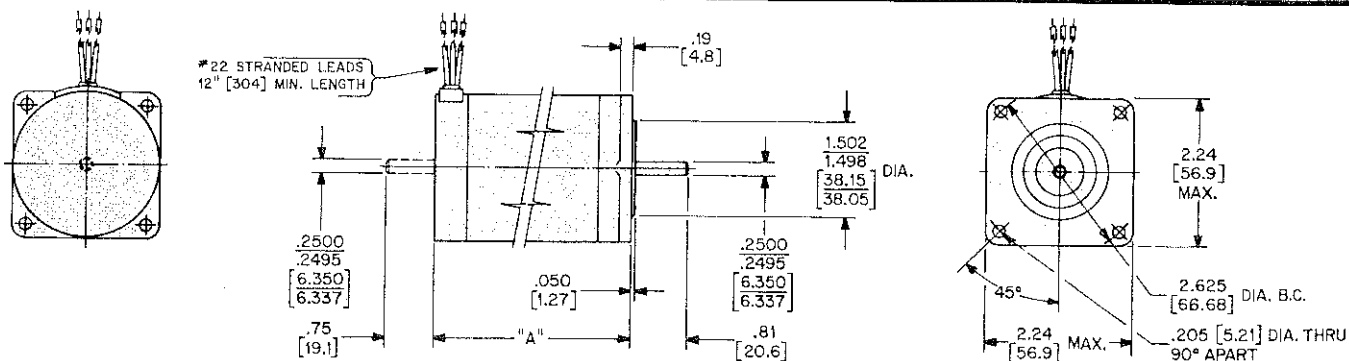


NOTES: - -

1. All dimensions apply before painting /plating.
2. Dimensions in brackets are millimeters.

MOTOR TYPE	"A" MAX.	"B"
SS91/SS91E SS92/SS92E	3.02 [76.7]	2.64 [67.1]
SS131/SS131E SS132/SS132E	4.02 [102.1]	3.64 [92.5]

SS91, SS91E, SS92, SS92E, SS131, SS131E, SS132 and SS132E Motors



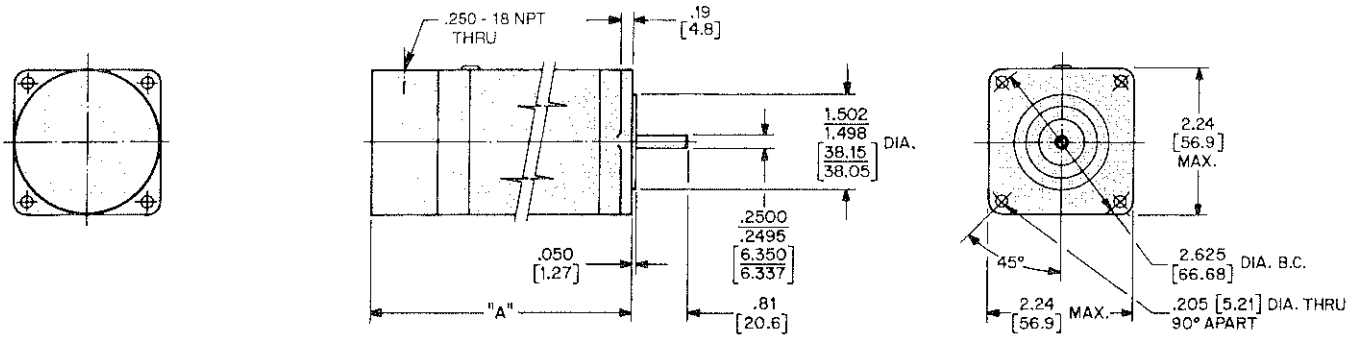
NOTES: - -

1. All dimensions apply before painting /plating.
2. Dimensions in brackets are millimeters.

MOTOR TYPE	"A" MAX.
SS91/SS91E SS92/SS92E	3.02 [76.7]
SS131/SS131E SS132/SS132E	4.02 [102.1]

SS91L, SS91LE, SS92L, SS92LE, SS131L, SS131LE, SS132L and SS132LE Motors

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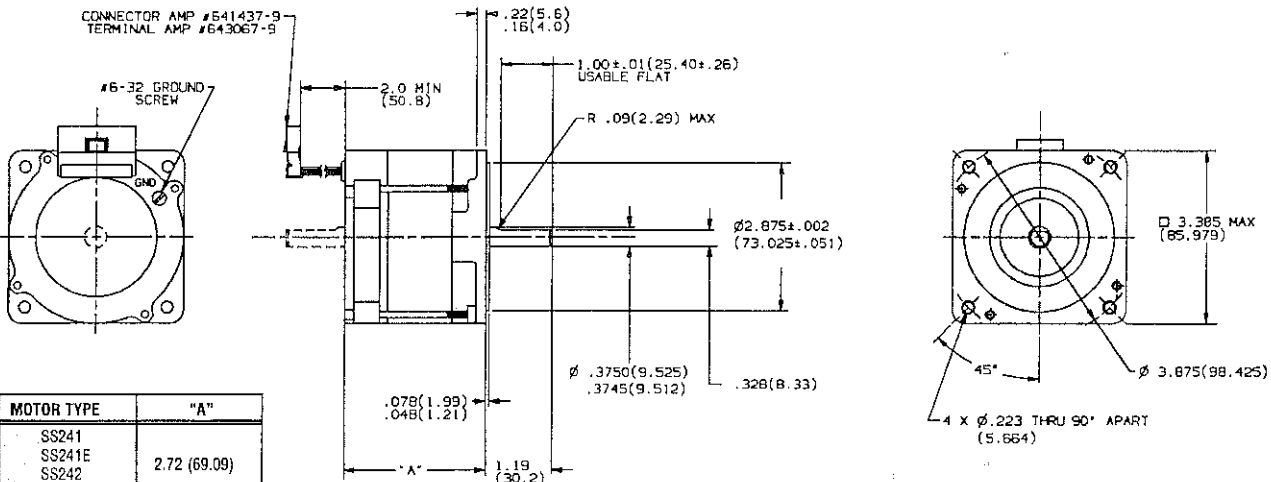


MOTOR TYPE	"A" MAX.
SS91T / SS92T	4.02 [102.1]
SS131T / SS132T	5.02 [137.5]

NOTES:--

1. All dimensions apply before painting / plating.
2. Dimensions in brackets are millimeters.

SS91T, SS92T, SS131T, SS132T Motors

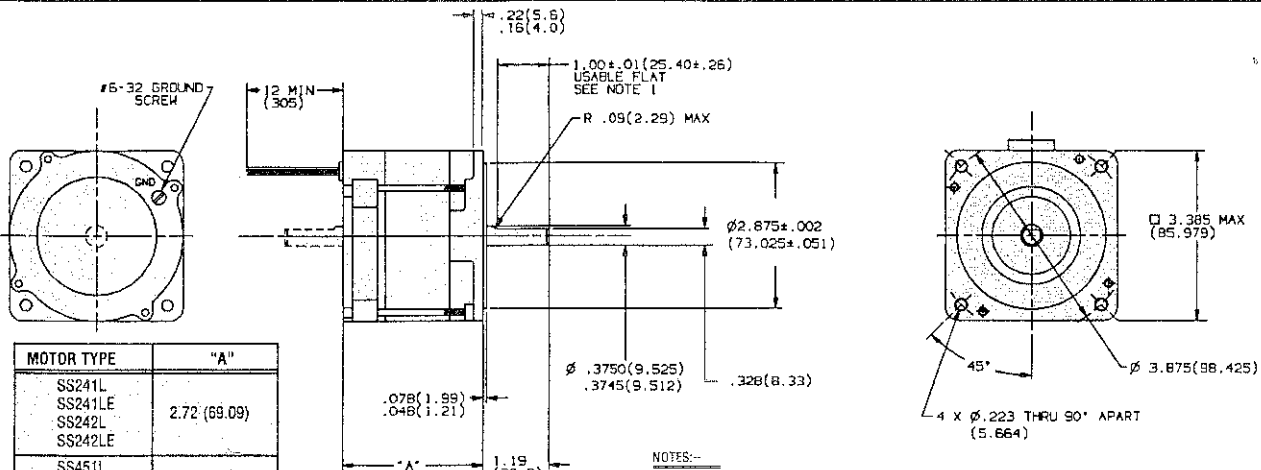


MOTOR TYPE	"A"
SS241 SS241E SS242 SS242E	2.72 (69.09)
SS451 SS451E SS452 SS452E	4.32 (109.73)

NOTES:--

1. Flat dimensions are typical both ends on double ended ("E") motors.
2. All dimensions apply before painting/plating.
3. Dimensions in brackets are millimeters.
4. Mating connector supplied

SS241, SS241E, SS242, SS242E, SS451, SS451E, SS452 and SS452E Motors



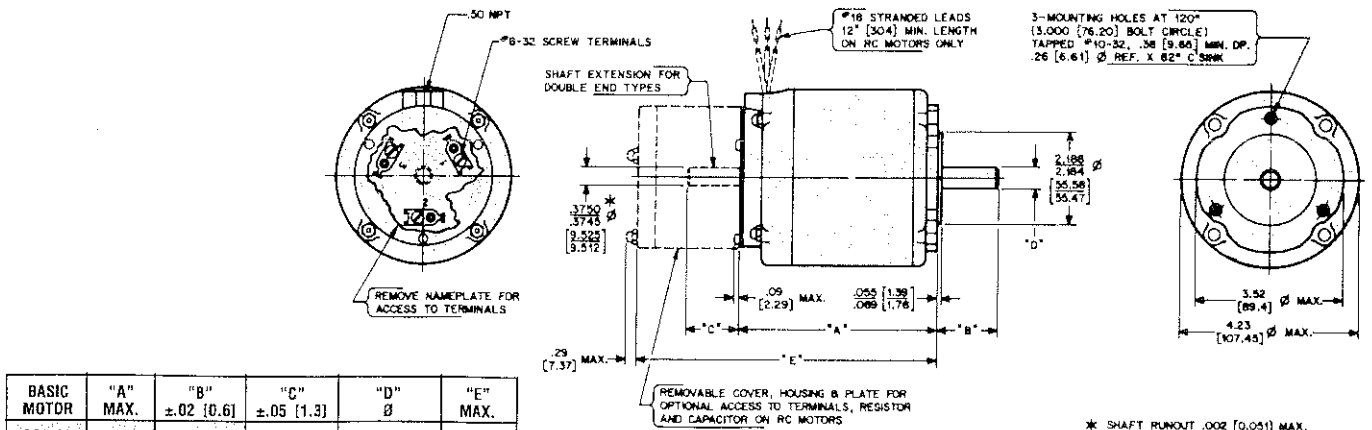
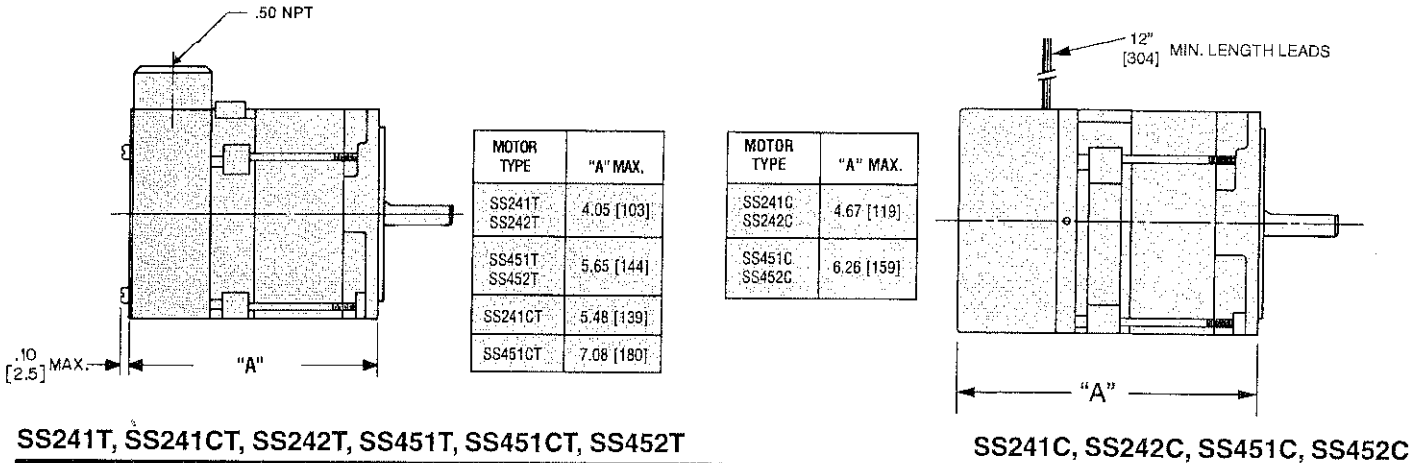
MOTOR TYPE	"A"
SS241L SS241LE SS242L SS242LE	2.72 (69.09)
SS451L SS451LE SS452L SS452LE	4.32 (109.73)

NOTES:--

1. Flat dimensions are typical both ends on double ended ("E") motors.
2. All dimensions apply before painting/plating.
3. Dimensions in brackets are millimeters.

SS241L, SS241LE, SS242L, SS242LE, SS451L, SS451LE, SS452L, SS452LE Motors

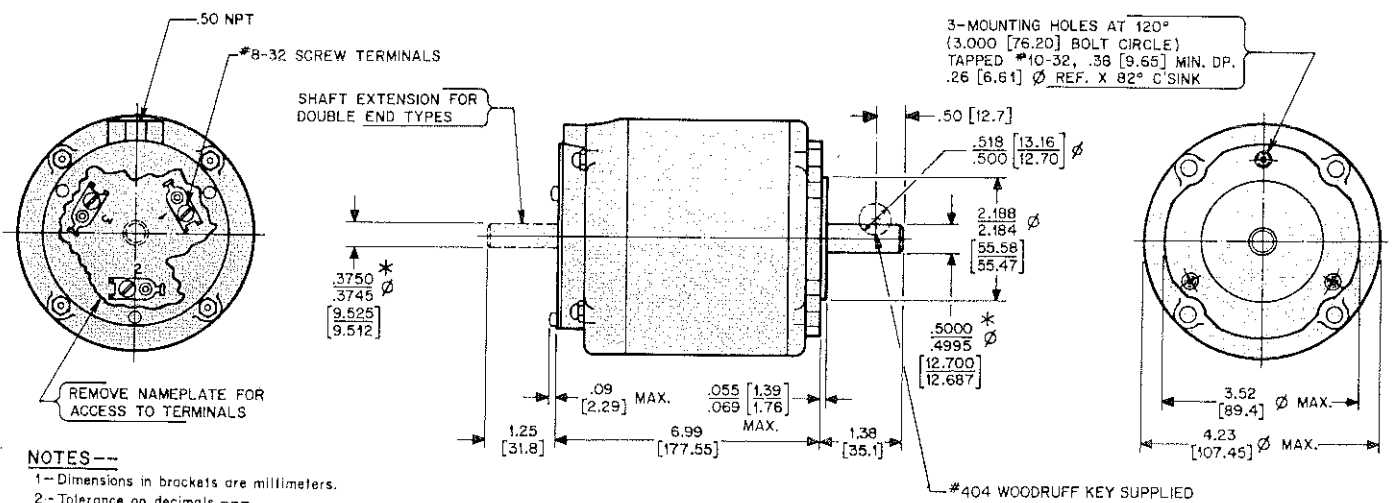
SLO-SYN® AC Synchronous Motors



BASIC MOTOR	"A" MAX.	"B" ±.02 [0.6]	"C" ±.05 [1.3]	"D" Ø	"E" MAX.
SS150B SS150BE SS152B SS152BE	4.74 [120.40]	1.25 [31.8]	1.25 [31.8]	.3750 [9.512] .3745 [8.512]	7.27 [184.66]
SS250B SS250BE SS252B SS252BE	4.74 [120.40]	1.25 [31.8]	1.25 [31.8]	.3750 [9.512] .3745 [8.512]	7.27 [184.66]
SS400B SS402B	6.61 [167.9]	1.38 [35.1]		.500 [12.700] .4995 [12.687]	

- NOTES: --
- 1 - Dimensions in brackets are millimeters
 - 2 - Tolerance on decimals ---
.XXX = ±0.005 [0.13] unless otherwise specified.
 - 3 - Dimensions shown apply before painting or plating.
 - 4 - This drawing shows only those features which are pertinent to the form, fit and function of the motor.

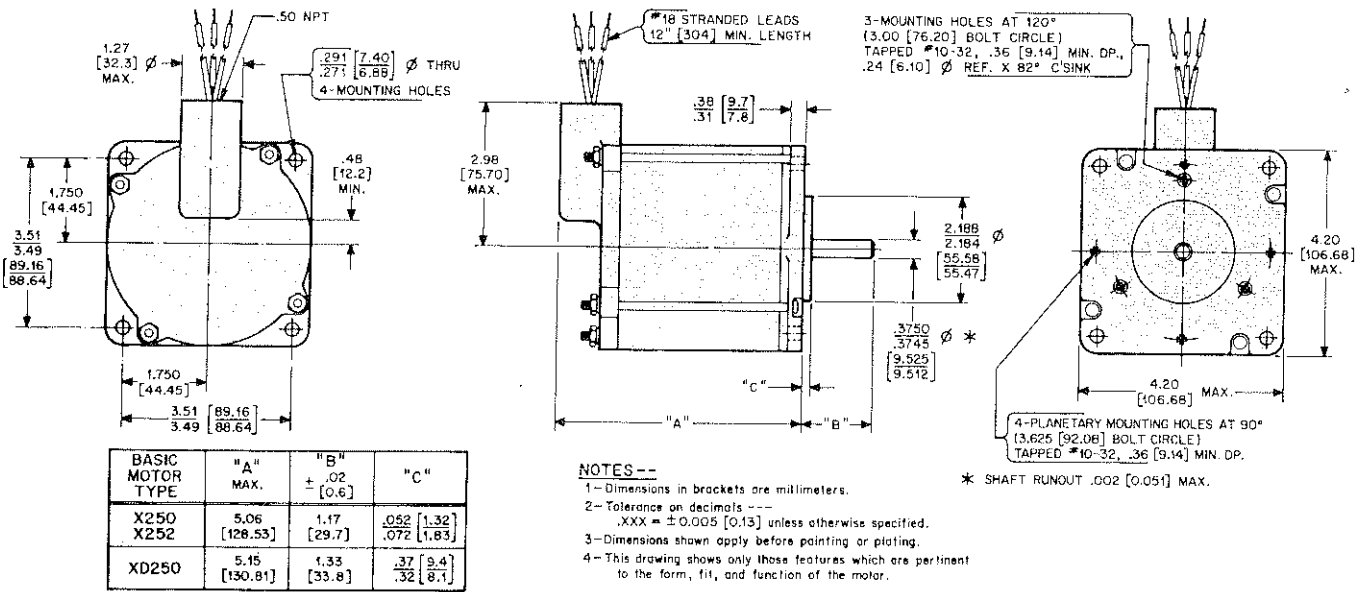
SS150B, SS150BE, SS152B, SS152BE, SS250B, SS250BE, SS252B, SS252BE, SS400B, SS402B Motors



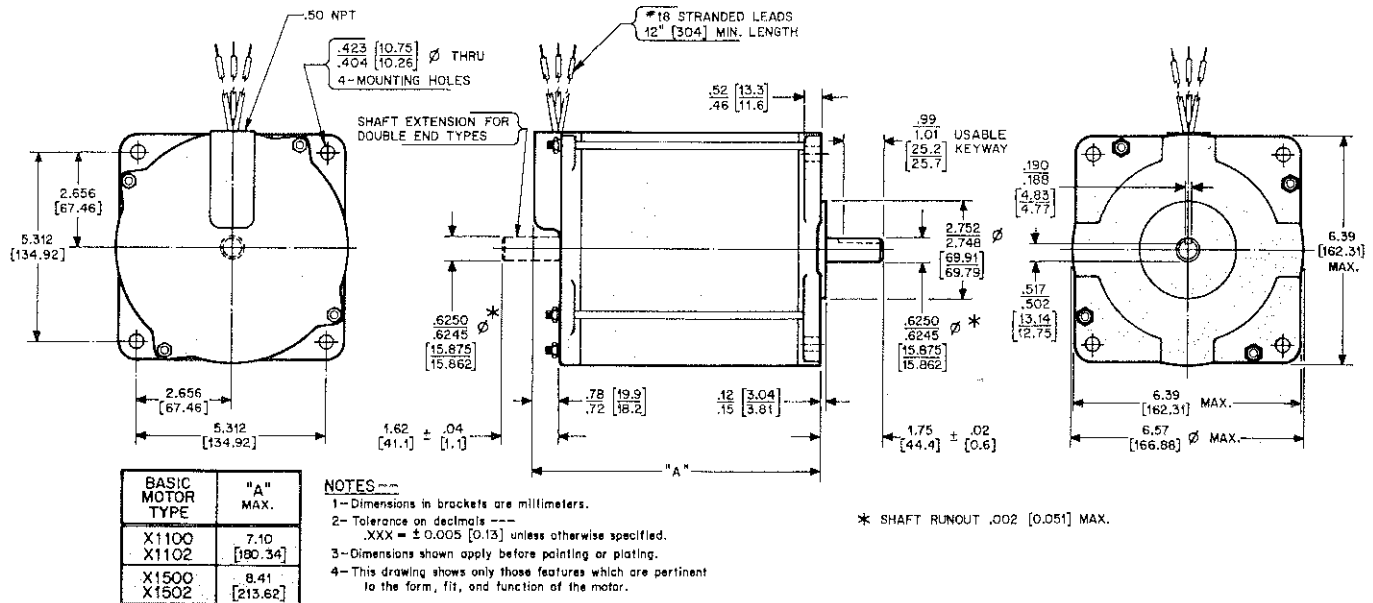
- NOTES --
- 1 - Dimensions in brackets are millimeters.
 - 2 - Tolerance on decimals ---
.XXX = ±0.005 [0.13] unless otherwise specified.
 - 3 - Dimensions shown apply before painting or plating.
 - 4 - This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

SS700, SS700E, SS702 and SS702E Motors

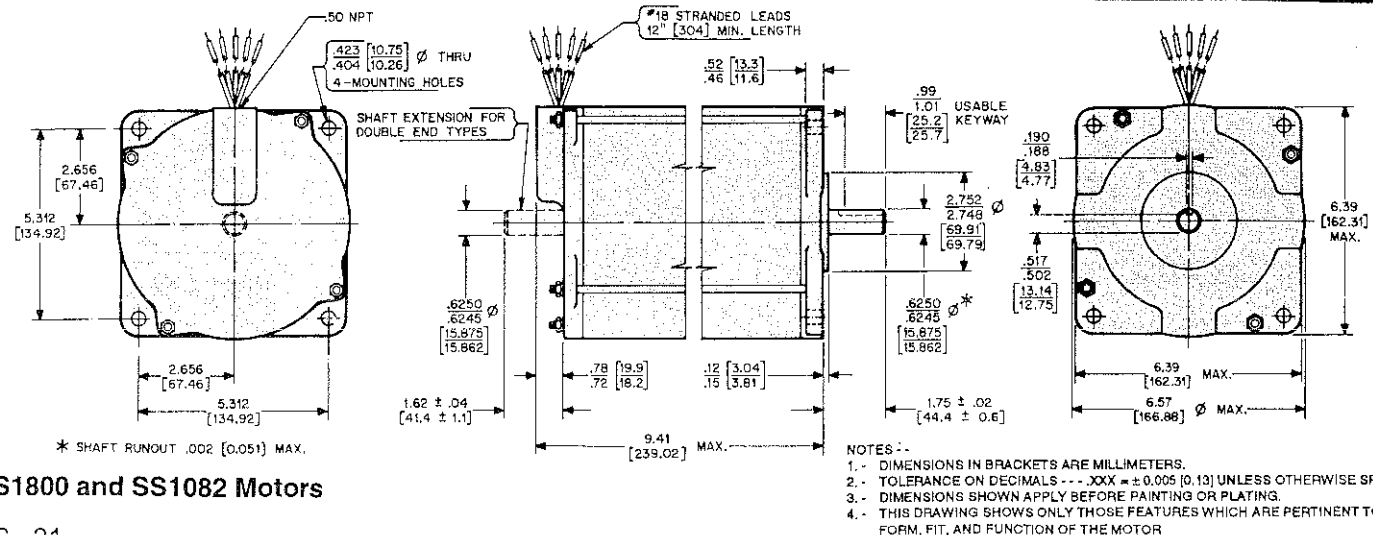
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X250, X252 and XD250 Motors



X1100, X1102, X1500 and X1502 Motors



SS1800 and SS1082 Motors

Gearbox Specifications

GEARBOX "G" RATIO	PART NUMBER	NOMINAL BODY LENGTH INCHES (mm)	TYPICAL INPUT SHAFT LOST MOTION	TYPICAL OUTPUT SHAFT BACKLASH	REFLECTED MOMENT OF INERTIA LB-IN ² (kg-cm ²)
3:1	220763-003	1.19 (30.2)	6°	2°	0.105 (3.09 x 10 ⁻⁵)
4:1	220763-004	1.19 (30.2)	7°	2°	0.035 (1.02 x 10 ⁻⁵)
5:1	220763-005	1.19 (30.2)	8°	2°	0.021 (6.2 x 10 ⁻⁶)
9:1	220763-009	1.81 (46)	43°	2°	0.115 (3.37 x 10 ⁻⁵)
12:1	220763-012	1.81 (46)	61°	2°	0.041 (1.19 x 10 ⁻⁵)
15:1	220763-015	1.81 (46)	81°	2°	0.024 (7.1 x 10 ⁻⁶)
16:1	220763-016	1.81 (46)	58°	2°	0.037 (1.08 x 10 ⁻⁵)
20:1	220763-020	1.81 (46)	65°	2°	0.023 (6.6 x 10 ⁻⁶)
25:1	220763-025	1.81 (46)	73°	2°	0.022 (6.4 x 10 ⁻⁶)
27:1	220763-027	2.38 (60.5)	109°	2°	0.114 (3.35 x 10 ⁻⁵)
36:1	220763-036	2.38 (60.5)	110°	2°	0.041 (1.19 x 10 ⁻⁵)
45:1	220763-045	2.38 (60.5)	112°	2°	0.024 (7.1 x 10 ⁻⁶)
48:1	220763-048	2.38 (60.5)	113°	2°	0.037 (1.08 x 10 ⁻⁵)
60:1	220763-060	2.38 (60.5)	115°	2°	0.023 (6.6 x 10 ⁻⁶)
64:1	220763-064	2.38 (60.5)	116°	2°	0.037 (1.80 x 10 ⁻⁵)
75:1	220763-075	2.38 (60.5)	118°	2°	0.022 (6.4 x 10 ⁻⁶)
80:1	220763-080	2.38 (60.5)	119°	2°	0.023 (6.6 x 10 ⁻⁶)
100:1	220763-100	2.38 (60.5)	124°	2°	0.022 (6.4 x 10 ⁻⁶)
125:1	220763-125	2.38 (60.5)	130°	2°	0.022 (6.4 x 10 ⁻⁶)

Holding Torque Ratings

Holding torque ratings for SLO-SYN AC motors without gearboxes are given in the section which describes these motors. To calculate the holding torque rating for a gearmotor, multiply the holding torque rating for the corresponding AC motor by the gear ratio and multiply that result by the efficiency of the gearbox. Efficiency ratings for the gearboxes are as follows:

Ratio	Efficiency
G3 - G5	88%
G9 - G25	77%
G27 - G125	68%

For example, holding torque for the SS221 motor with one winding energized is 350 oz-in (247 Ncm). Holding torque for an SS221-G5 gearmotor can be calculated as follows:

Holding Torque = Motor Holding x Gear Ratio x Efficiency
 = 350 x 5 x 88% = 1540 oz-in (1088 Ncm)

Current and voltage ratings for applying DC power to a gearmotor are the same as those listed for the corresponding motor without the gearbox.

Adapter Plate

The SS220 and SS420 Series gearmotors have different mounting configurations than previous SS150B, SS250B and SS400B planetary motors. If an SS220 or SS420 gearmotor is to be used in place of one of these older planetary motors, **an Adapter plate must also be ordered.** The Adapter Plate fastens to the mounting surface of the gearmotor and has the same mounting hole locations as the previous planetary motor models. **The shaft extension, however, will be approximately 1/4" (6.4mm) shorter than the planetary motor due to the thickness of the Adapter Plate.** A gearmotor with a special shaft extension can be ordered, if necessary, to provide the same shaft extension as with the older planetaries (see charts below).

RATIO	SHAFT EXTENSION	GEARBOX KIT NUMBER
3:1	standard	220763-003
3:1	extended	220764-003
4:1	standard	220763-004
4:1	extended	220764-004
5:1	standard	220763-005
5:1	extended	220764-005
9:1	standard	220763-009
12:1	standard	220763-012
15:1	standard	220763-015
16:1	standard	220763-016
20:1	standard	220763-020
20:1	extended	220764-020
25:1	standard	220763-025
27:1	standard	220763-027
36:1	standard	220763-036
45:1	standard	220763-045

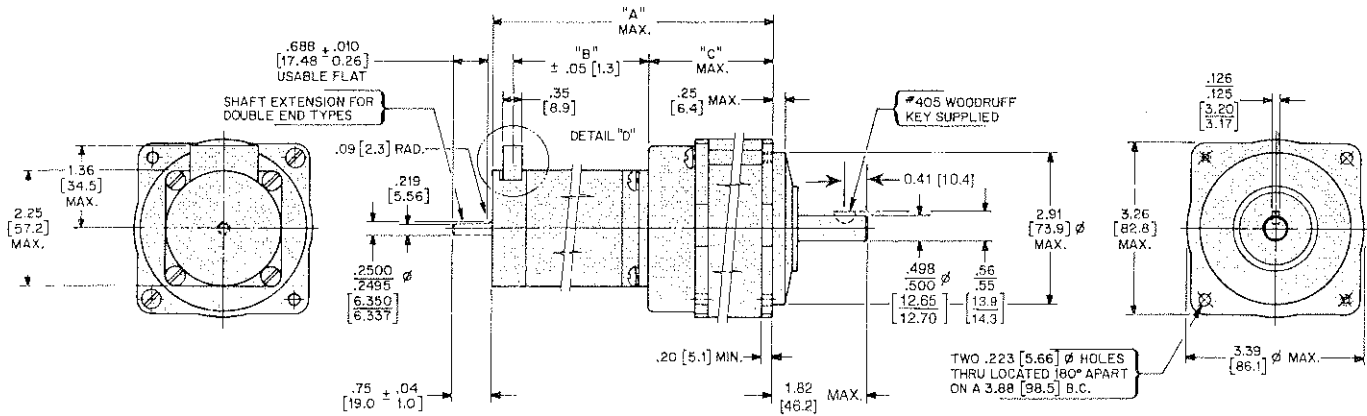
RATIO	SHAFT EXTENSION	GEARBOX KIT NUMBER
48:1	standard	220763-048
60:1	standard	220763-060
64:1	standard	220763-064
75:1	standard	220763-075
80:1	standard	220763-080
100:1	standard	220763-100
100:1	extended	220764-100
125:1	standard	220763-125

**Adapter Plates
 (For Mounting AC Gearmotor In Place Of Planetary Motor)**

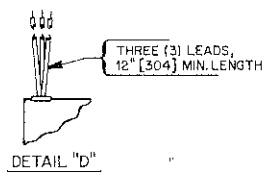
Motor To Be Replaced	Adapter Plate Kit
SS150B, SS250B, SS400, M111 G3, G4, G5	A216015G1
G9, G12, G15, G20, G25	A216015G2
G27, G36, G45, G48, G60, G64, G75, G80, G100, G125	A216015G3
SS91, SS92, SS131, SS132, TS25 All Ratios	A215730G1
X250, XD250 G3, G4, G5,	A216015G4
G9, G12, G15, G16, G20, G25	A216015G5
G27, G36, G45, G48, G60, G64, G75, G80, G100, G125	A216015G6
SS150, SS250 to SS221, SS421 All Ratios	B215772G1

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Dimensions

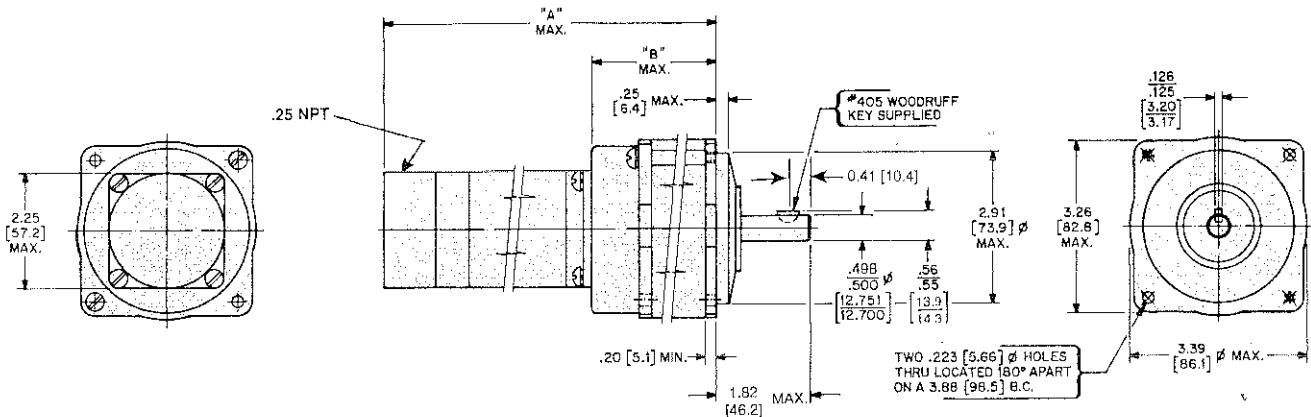


MOTOR TYPE	GEAR RATIO	"A"	"B"	"C"
SS91 / SS92 E, L/E	3:1, 4:1, 5:1	5.35 [135.9]	2.64 [67.1]	2.33 [59.2]
	9:1, 12:1, 15:1 16:1, 20:1, 25:1	5.97 [151.6]	2.64 [67.1]	2.95 [74.9]
	27:1, 36:1, 45:1 48:1, 60:1, 64:1 75:1, 80:1, 100:1 125:1	6.54 [166.1]	2.64 [67.1]	3.52 [89.4]
	3:1, 4:1, 5:1	6.35 [161.3]	3.64 [92.5]	2.33 [59.2]
	9:1, 12:1, 15:1 16:1, 20:1, 25:1	6.97 [177.0]	3.64 [92.5]	2.95 [74.9]
SS131 / SS132 E, L/E	27:1, 36:1, 45:1 48:1, 60:1, 64:1 75:1, 80:1, 100:1 125:1	7.54 [191.5]	3.64 [92.5]	3.52 [89.4]



- NOTES:---
- All dimensions apply before painting/plating.
 - Dimensions in brackets are millimeters.

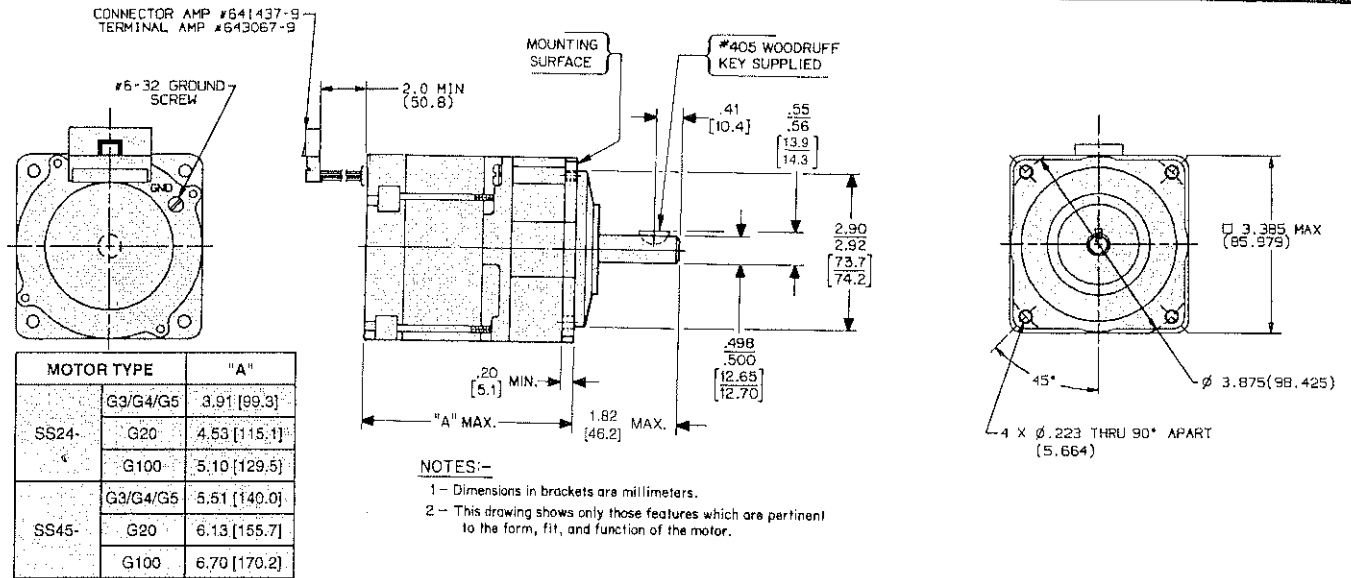
SS91, SS92, SS131, SS132 Series With Connectors or Leads, Standard or Double End Shaft



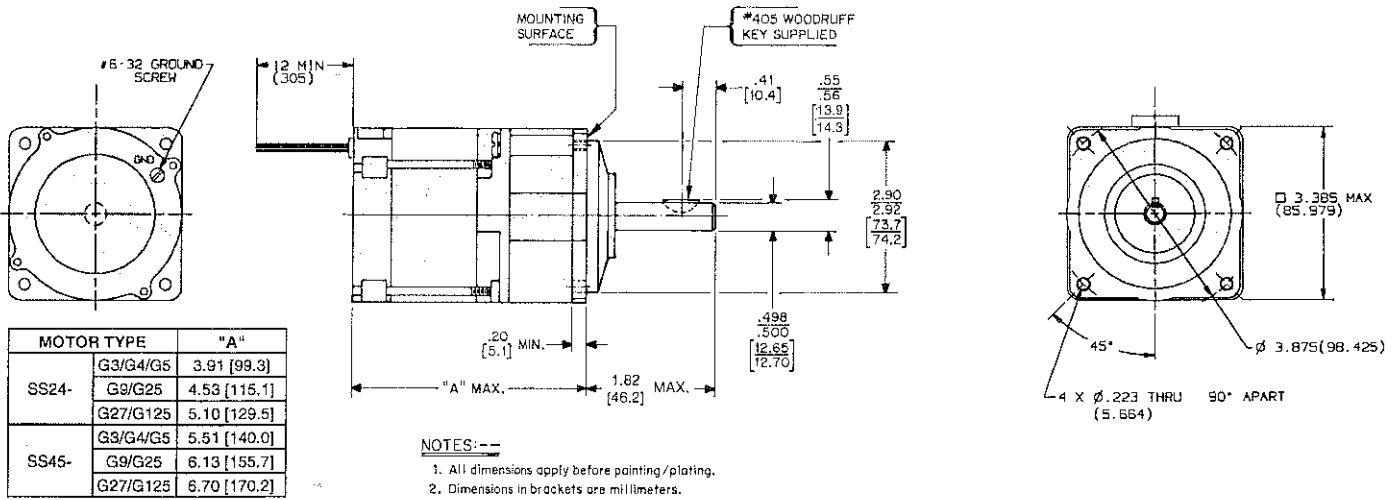
MOTOR TYPE	GEAR RATIO	"A"	"B"
SS91 / SS92 T	3:1, 4:1, 5:1	6.35 [161.3]	2.33 [59.2]
	9:1, 12:1, 15:1 16:1, 20:1, 25:1	6.97 [177.0]	2.95 [74.9]
	27:1, 36:1, 45:1 48:1, 60:1, 64:1 75:1, 80:1, 100:1 125:1	7.54 [191.5]	3.52 [89.4]
	3:1, 4:1, 5:1	7.35 [186.7]	2.33 [59.2]
	9:1, 12:1, 15:1 16:1, 20:1, 25:1	7.97 [202.4]	2.95 [74.9]
SS131 / SS132 T	27:1, 36:1, 45:1 48:1, 60:1, 64:1 75:1, 80:1, 100:1 125:1	8.54 [216.9]	3.52 [89.4]

- NOTES:---
- All dimensions apply before painting/plating.
 - Dimensions in brackets are millimeters.

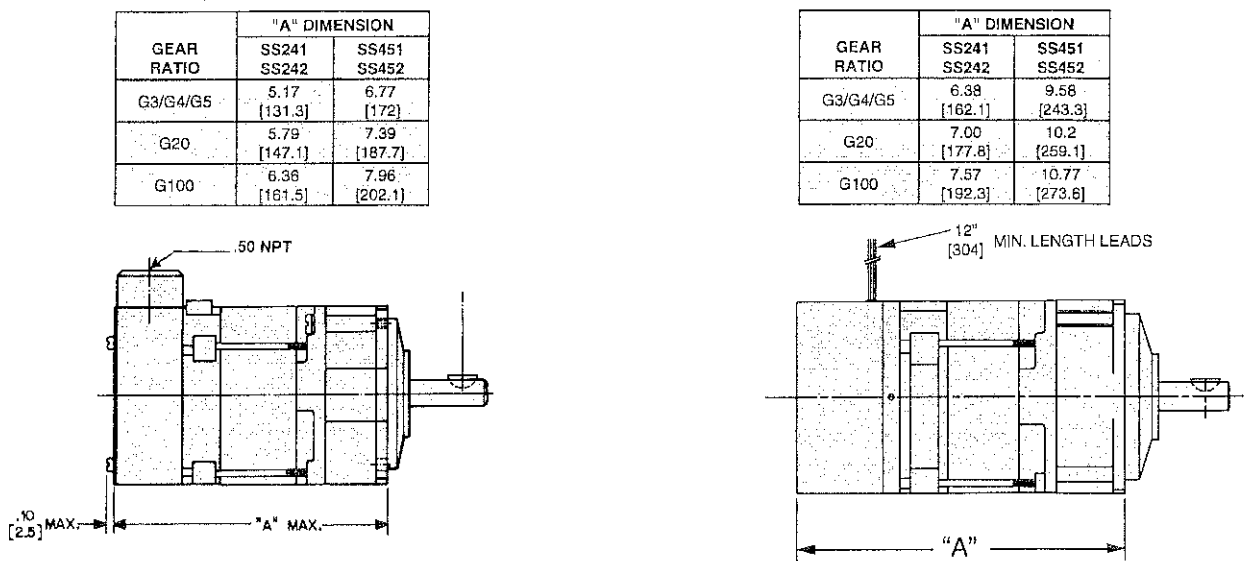
SS91, SS92, SS131, SS132 Series With Cast Terminal Enclosure



SS241, SS242, SS451, SS452 Series With Connectors



SS241L, SS242L, SS451L, SS452L Series With Leads

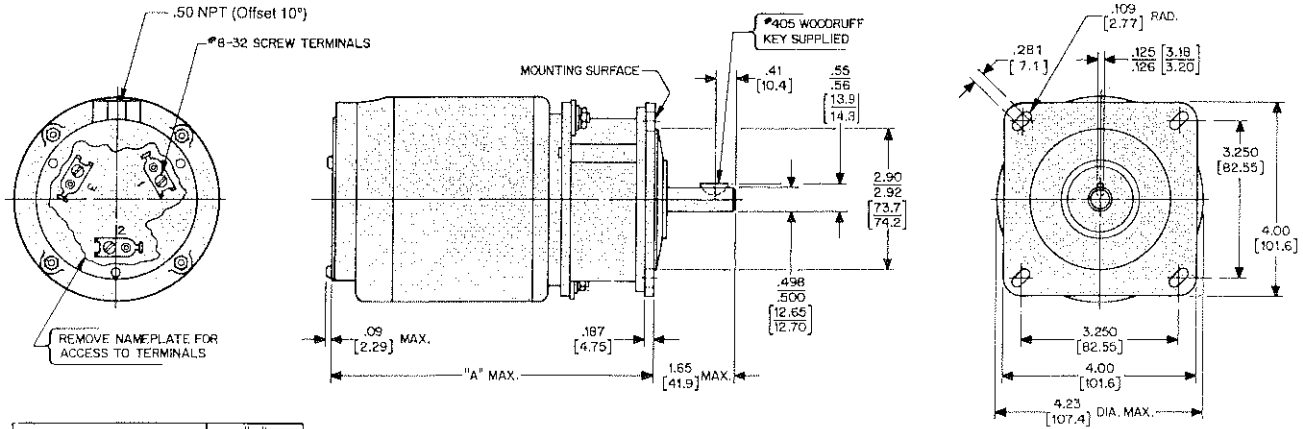


SS241, SS242, SS451, SS452 Series With Cast Terminal Enclosure

SS241, SS242, SS451, SS452 Series With Enclosed Capacitor

2000

Dimensions

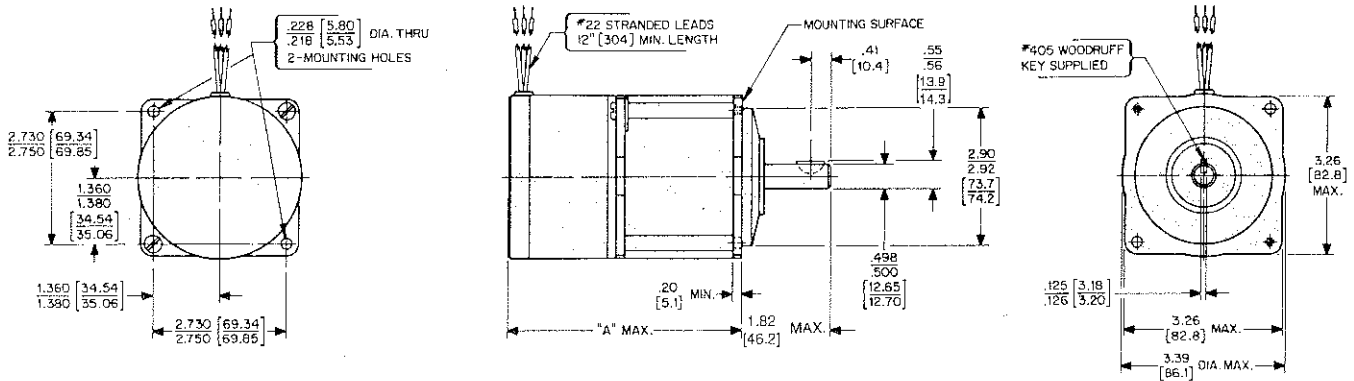


MOTOR TYPE	"A"
SS700/702	G3/G4/G5 8.50 [215.9]
	G20 9.12 [231.6]

NOTES:-

- 1 - Dimensions in brackets are millimeters.
- 2 - This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

SS700, SS702 Series



MOTOR TYPE	"A"
TS50/52	G3/G4/G5 4.91 [124.7]
	G20 5.53 [140.5]
	G100 6.10 [154.9]

NOTES:-

- 1 - Dimensions in brackets are millimeters.
- 2 - This drawing shows only those features which are pertinent to the form, fit, and function of the motor.

TS50 AND TS52 SERIES

TS50, TS52 Series