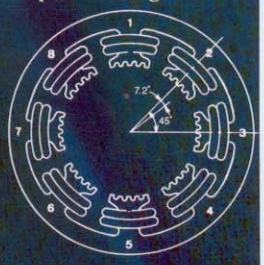
Hybrid Stepper Motors

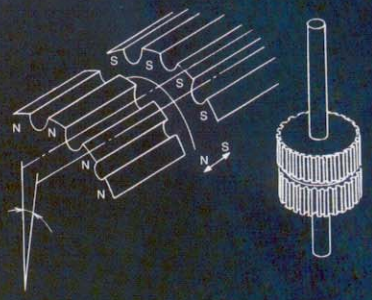
Astrosyn is a major supplier of dc and stepper motors, drives and controls. In addition to this product guide, detailed specifications are available on each device and we are happy to discuss any applications or requirements that you may have.

Introduction to Hybrid Steppers

Hybrid Stepper motors convert a pulsed digital input into shaft rotation. The shaft speed and angular rotation are directly proportional to the input frequency and number of pulses. This mode of operation is achieved as a result of the toothed structure of both stator and rotor stack. A full step is the angle through which an unloaded motor shaft will turn when a single pulse is applied to the stator windings. The relative numbers of stator and rotor teeth defines the size of the step angle.



Hybrid steppers offer high precision, open loop position control with



excellent acceleration performance. Typical applications include office equipment, medical instrumentation, factory automation, vending and ticketing equipment. This Product Guide lists the dimensions and average performance characteristics of our standard range.

Motor Sizes

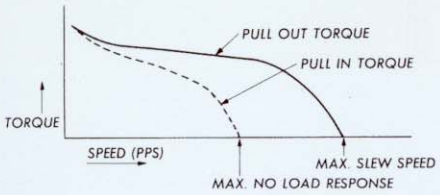
Stepper motors are classified according to the diameter of the motor body in inches, e.g. size 23 has a diameter approximately 2.3 inches. Within each size range there are many different rotor stack lengths depending on the output torque requirement.

ASTROSYN

ADVANCING THE DRIVE TOWARDS MOTOR EFFICIENCY

Performance Characteristics

The characteristic stepper motor performance curves are shown in the diagram below.



- Pull In Torque is the dynamic torque that the motor can start, stop and reverse in synchronism with the input pulse rate.
- Pull Out Torque is the dynamic torque that the motor can sustain in the same direction with integrity.
- No Load Response is the maximum pulse rate at which an unloaded motor can start, stop and reverse.
- Slew Speed is the pulse rate at which a motor can run in the same direction with integrity.
- Holding Torque is the torque generated when the stator is energised at rated current.
- Detent Torque is the torque required to turn the rotor without power applied to the stator.

Drive Electronics

The performance of a stepper motor is strongly influenced by the type of drive used.

Unipolar

A unipolar drive causes current to flow in one direction only through each section of winding, in sequence, to create a rotating field. Stepper motors having 5,6 or 8 leads (four individual phases) can be driven from a unipolar drive. Stepper motors having 5 leads can only be driven from a unipolar drive.

Bipolar

From a bipolar drive, current flows in either direction through each winding in sequence. To operate from a bipolar drive, a stepper motor needs to have two effective windings, and therefore only requires 4 leads. Motors with 6 or 8 leads can be converted to 4 leads by making simple modifications.

Custom Requirements

Lead Wires & Connectors

Motors can be supplied fitted with a wide range of colour coded UL-approved lead wires and connectors. The leads are fitted to custom length, with sheathing, heatshrink or harnesses. Astrosyn can also supply EMC-compliant braided cabling.

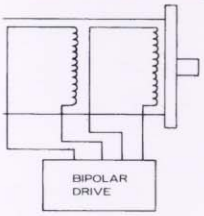
Motor Output Shaft

To avoid damage, drive shaft attachments must be fitted with care. Astrosyn can supply motors fitted with pulleys, gears, gearboxes and custom shafts (e.g., flats, holes, threads, keyways).

Hybrid Stepper Motor Range

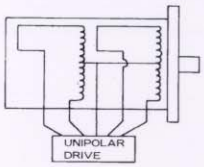
Astrosyn hybrid stepper motor connections are normally to the following conventions.

4 Lead wire stepper motors



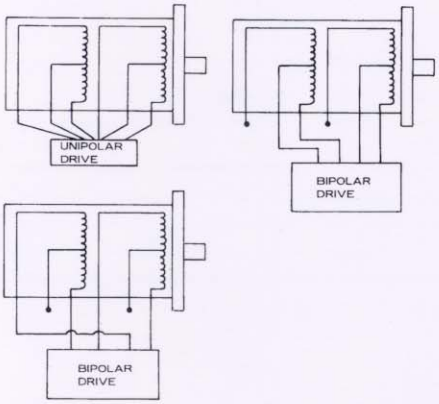
Can only be driven from a bipolar drive.
Bipolar drives require 4 motor wires and energise the 2 phases sequentially with alternate polarity.

5 Lead wire stepper motors



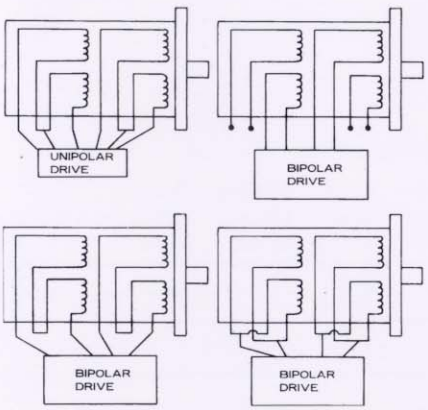
Can only be driven from a unipolar drive.
Unipolar drives require 5 or 6 lead wires and each of the 4 phases are energised in sequence with no change in polarity.

6 Lead wire stepper motors



Can be driven from unipolar or bipolar drives.

8 Lead wire stepper motors



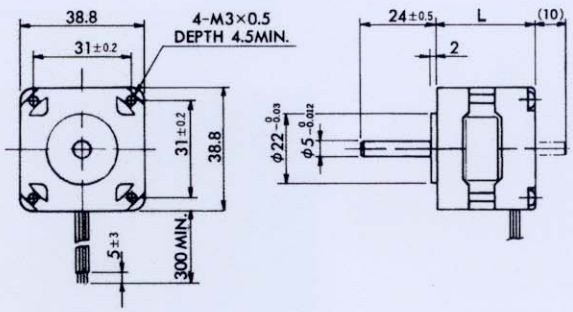
Can be driven from unipolar or bipolar drives.

Size 16 Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0001	0.9	4.0	0.80	5.0	1.4	0.65	17	6	0.17	31
SST0002	0.9	6.0	0.60	10.0	3.0	0.70	17	6	0.17	31
SST0003	0.9	11.0	0.30	37.5	11.0	0.70	17	6	0.17	31
SST0004	0.9	4.0	0.80	5.0	5.0	1.15	17	6	0.17	31
SST0005	0.9	9.6	0.40	24.0	26.0	1.20	17	6	0.17	31
SST0006	0.9	11.2	0.30	37.5	37.7	1.25	17	6	0.17	31
SST0007	0.9	6.0	0.80	7.5	11.0	1.85	27	6	0.2	37
SST0008	0.9	8.6	0.56	15.0	23.0	1.79	27	6	0.2	37
SST0009	0.9	12.0	0.40	30.0	44.0	1.67	27	6	0.2	37
SST0010	1.8	4.3	0.85	5.0	5.0	1.48	17	6	0.17	31
SST0011	1.8	9.6	0.40	24.0	21.0	1.38	17	6	0.17	31
SST0012	1.8	8.3	0.22	37.5	30.0	0.98	17	6	0.17	31
SST0013	1.8	12.0	0.16	75.0	60.0	1.00	17	6	0.17	31
SST0014	1.8	4.0	0.95	4.2	4.0	1.10	17	6	0.17	31
SST0015	1.8	6.0	0.80	7.5	7.5	2.20	27	6	0.20	37
SST0016	1.8	8.5	0.56	15.0	16.5	2.40	27	6	0.20	37
SST0017	1.8	12.0	0.40	30.0	30.0	2.40	27	6	0.20	37

Note: All of these motors are available in single or double shaft versions

Dimensions (mm)



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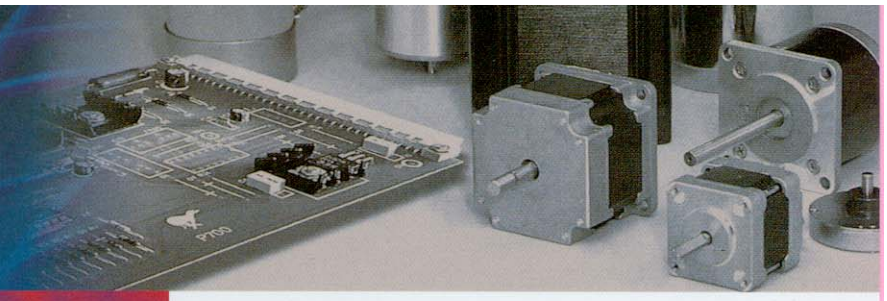
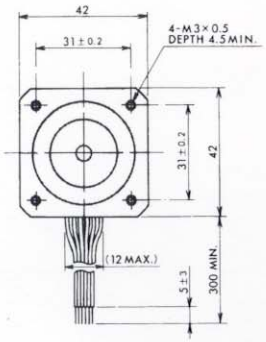
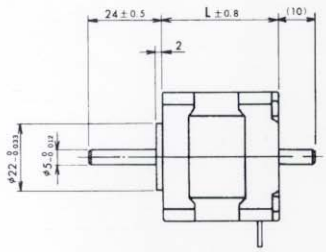
Standard Range



Dimensions (mm)

Size 17



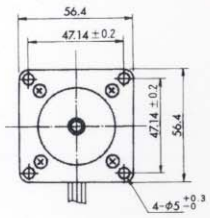


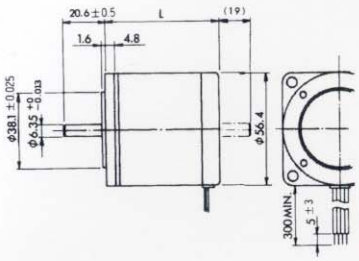
Size 17 Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0018	1.8	3.7	0.95	3.9	3.6	1.9	27	6	0.18	31
SST0019	1.8	5.3	0.70	7.6	6.8	1.9	27	6	0.18	31
SST0020	1.8	10.5	0.35	30.0	21.7	1.7	27	6	0.18	31
SST0021	1.8	16.5	0.22	75.0	53.0	1.7	27	6	0.18	31
SST0022	1.8	3.7	1.20	3.1	4.2	3.2	48	6	0.27	38
SST0023	1.8	5.1	0.90	5.7	6.8	3.2	48	6	0.27	38
SST0024	1.8	6.7	0.70	9.5	11.8	3.2	48	6	0.27	38
SST0025	1.8	12.0	0.40	30.0	34.3	3.2	48	6	0.27	38
SST0026	1.8	18.8	0.25	75.0	72.8	3.0	48	6	0.27	38

Note: All of these motors are available in single or double shaft versions

Size 17





Size 23 Models and Specifications

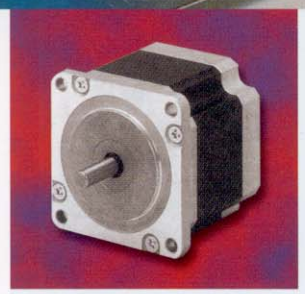
Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0027	1.8	2.6	1.7	1.5	1.9	3.0	70	6	0.38	38
SST0028	1.8	4.0	1.1	3.6	4.8	3.0	70	6	0.38	38
SST0029	1.8	12.0	0.4	30.0	37.5	2.9	70	6	0.38	38
SST0030	1.8	24.0	0.2	120.0	92.0	2.6	70	6	0.38	38
SST0031	1.8	1.6	3.2	0.5	0.6	4.4	110	6	0.51	49.5
SST0032	1.8	5.0	1.0	5.0	9.0	5.0	110	6	0.51	49.5
SST0033	1.8	9.0	0.6	16.0	24.0	4.7	110	6	0.51	49.5
SST0034	1.8	24.0	0.2	110.0	120.0	4.5	110	6	0.51	49.5
SST0035	1.8	3.3	2.2	1.5	2.8	6.8	160	6	0.61	55.5
SST0036	1.8	6.0	1.2	5.0	10.6	6.7	160	6	0.61	55.5
SST0037	1.8	12.0	0.6	20.0	39.0	6.8	160	6	0.61	55.5
SST0038	1.8	24.0	0.3	80.0	91.0	6.2	160	6	0.61	55.5
SST0039	1.8	5.1	1.4	3.6	5.4	7.3	200	6	0.77	66.5
SST0040	1.8	4.0	2.0	2.0	3.5	9.6	220	6	0.94	76.5
SST0041	1.8	5.0	1.5	3.3	5.9	9.4	220	6	0.94	76.5

Note: All of these motors are available in single or double shaft versions

Models SST0027 to SST0041 have been discontinued.

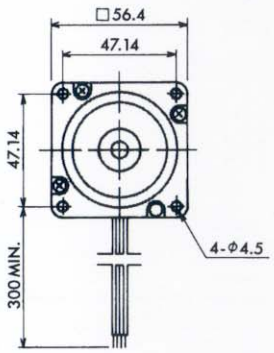
Please contact Astrosyn for advice on alternatives.

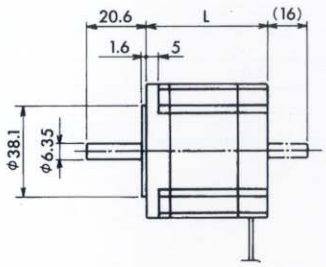
Standard Range



Dimensions (mm)

Size 23 High Torque





Six Lead Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0042	1.8	3.8	1.2	3.2	3.8	3.8	135	6	0.49	42
SST0043	1.8	2.4	2.0	1.2	13.0	3.8	135	6	0.49	42
SST0044	1.8	1.5	3.0	0.5	0.5	3.8	135	6	0.49	42
SST0045	1.8	5.0	1.2	4.2	6.7	6.5	230	6	0.60	49
SST0046	1.8	3.0	2.0	1.5	2.6	6.5	230	6	0.60	49
SST0047	1.8	2.2	3.0	0.7	1.1	6.5	230	6	0.60	49
SST0048	1.8	6.0	1.2	5.0	10.0	7.4	290	6	0.71	54
SST0049	1.8	3.4	2.0	1.7	3.6	7.4	290	6	0.71	54
SST0050	1.8	2.1	3.0	0.7	1.3	7.4	290	6	0.71	54
SST0051	1.8	6.2	1.2	5.2	8.2	9.4	330	6	0.86	65
SST0052	1.8	3.6	2.0	1.8	3.0	9.4	330	6	0.86	65
SST0053	1.8	2.4	3.0	0.8	1.3	9.4	330	6	0.86	65
SST0054	1.8	8.4	1.2	7.0	14.0	12.0	430	6	1.10	77
SST0055	1.8	4.8	2.0	2.4	5.1	12.0	430	6	1.10	77
SST0056	1.8	3.0	3.0	1.0	2.2	12.0	430	6	1.10	77

Note: All of these motors are available in single or double shaft versions

Eight Lead Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0057	1.8	5.0	1.0	5.0	5.4	3.8	135	8	0.49	42
SST0058	1.8	2.4	2.0	1.2	1.3	3.8	135	8	0.49	42
SST0059	1.8	1.5	3.0	0.5	0.5	3.8	135	8	0.49	42
SST0060	1.8	6.2	1.0	6.2	9.7	6.5	230	8	0.60	49
SST0061	1.8	3.0	2.0	1.5	2.6	6.5	230	8	0.60	49
SST0062	1.8	2.2	3.0	0.7	1.1	6.5	230	8	0.60	49
SST0063	1.8	6.9	1.0	6.9	14.0	7.4	290	8	0.71	54
SST0064	1.8	3.4	2.0	1.7	3.6	7.4	290	8	0.71	54
SST0065	1.8	2.1	3.0	0.7	1.3	7.4	290	8	0.71	54
SST0066	1.8	7.2	1.0	7.2	12.0	9.4	330	8	0.86	65
SST0067	1.8	3.6	2.0	1.8	3.0	9.4	330	8	0.86	65
SST0068	1.8	2.4	3.0	0.8	1.3	9.4	330	8	0.86	65
SST0069	1.8	8.8	1.0	8.8	19.0	12.0	430	8	1.10	77
SST0070	1.8	4.8	2.0	2.4	5.1	12.0	430	8	1.10	77
SST0071	1.8	3.0	3.0	1.0	2.2	12.0	430	8	1.10	77

Note: All of these motors are available in single or double shaft versions

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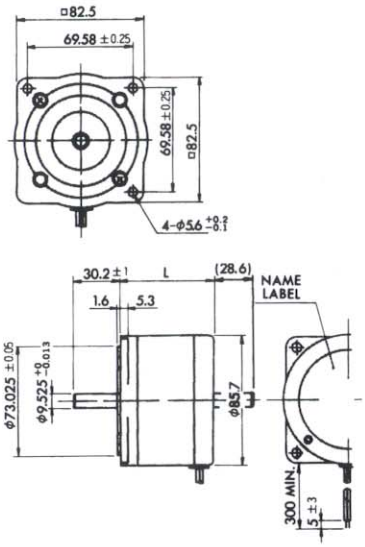
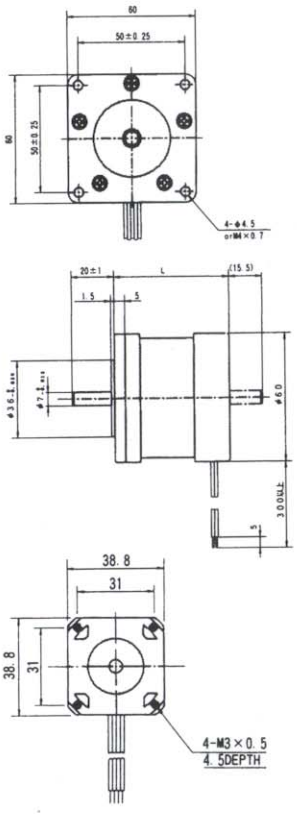
Standard Range

Dimensions (mm)

Size 34



5 Phase



Size 34 Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0072	1.8	1.8	4.5	0.4	0.9	16.0	570	6	1.4	62
SST0073	1.8	2.8	2.8	1.0	2.6	16.0	570	6	1.4	62
SST0074	1.8	5.5	1.2	4.4	15.0	17.0	570	6	1.4	6
SST0075	1.8	3.0	4.0	0.7	2.4	31.0	1100	6	2.5	9
SST0076	1.8	6.0	2.0	3.0	13.0	36.0	1100	6	2.5	93.5
SST0077	1.8	4.2	3.5	1.2	4.7	42.0	1800	6	3.5	128.5

Note: All of these motors are available in single or double shaft versions

5 Phase Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0078	0.72	1.9	1.0	1.9	2.2	2.5	70	10	0.35	38.5
SST0079	0.72	1.9	0.7	2.5	3.5	2.5	70	10	0.35	3
SST0080	0.72	1.8	1.3	1.4	3.0	4.0	160	10	0.56	5
SST0081	0.72	3.1	0.8	4.0	8.0	4.0	160	10	0.56	53.5

Note: All of these motors are available in single or double shaft versions

5 Phase Models and Specifications

Model	Step angle Deg	Voltage V	Current A/Ø	Resistance Ω/Ø	Inductance mH/Ø	Holding torque Kg-cm	Rotor inertia g-cm²	Leads	Mass Kg	Dim. L
SST0082	0.36	2.0	0.75	2.6	2.8	0.8	17	10	0.17	31
SST0083	0.36	6.9	0.21	33.0	26.0	0.8	17	10	0.17	3
SST0084	0.36	2.1	0.75	2.8	3.8	1.2	27	10	0.20	3
SST0085	0.36	2.7	0.54	5.0	7.0	1.2	27	10	0.20	37

Note: All of these motors are available in single or double shaft versions