

Single voltage synchronous motors – reversible

Data Sheet



RS stock no.	Type
440-385	1
440-391	2
440-408	3
440-414	4

Suitable phasing capacitors:

RS stock no.	Type
210-538	1
210-500	2 and 3
210-522	4

These synchronous motors have two separately wound phases which when connected correctly with a suitable phasing capacitor will enable the motor to rotate at 250rpm. The phases are wound symmetrically around 12 pairs of poles in the motor such that given a constant supply frequency a rotating magnetic field will be developed which will drive the central permanent magnet rotor at a speed which is directly proportional to the frequency.

$$\text{ie. Speed} = \frac{60 f \text{ (in Hz)}}{p}$$

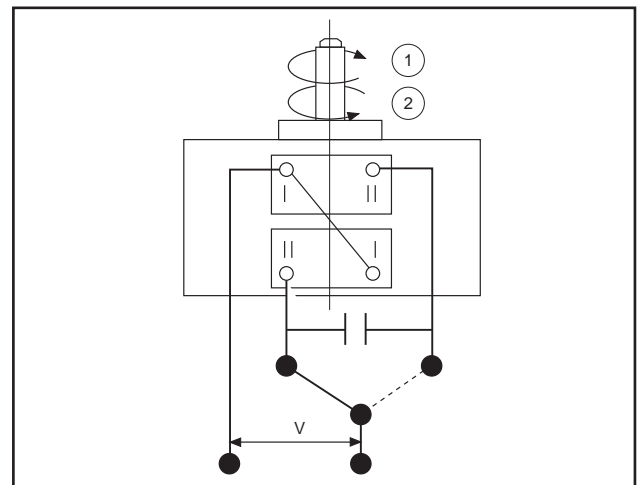
where p = pairs of poles.

Features

- Accurate output shaft speed
- High torque with small physical size
- Smooth running
- Quiet operation.

Connection diagrams

Parallel



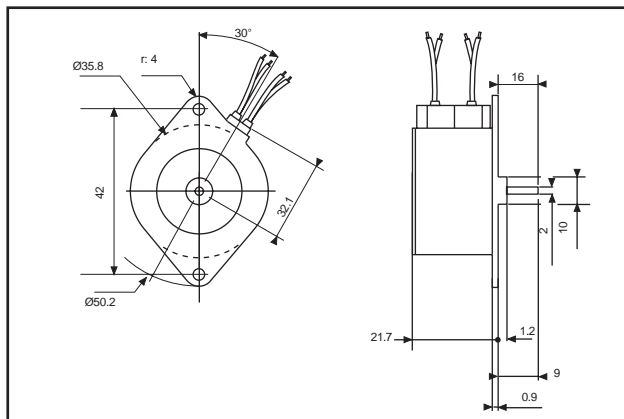
Can be used for motors type 1, 2, 3 and 4

1 – Clockwise

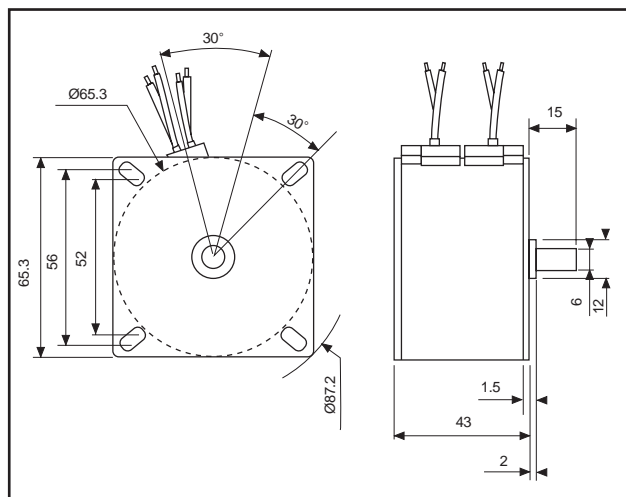
2 – Anti-clockwise

Motor dimensions

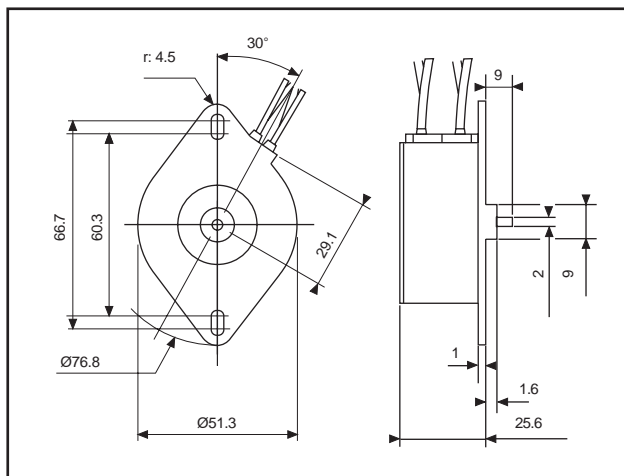
RS stock no. 440-385



RS stock no. 440-414



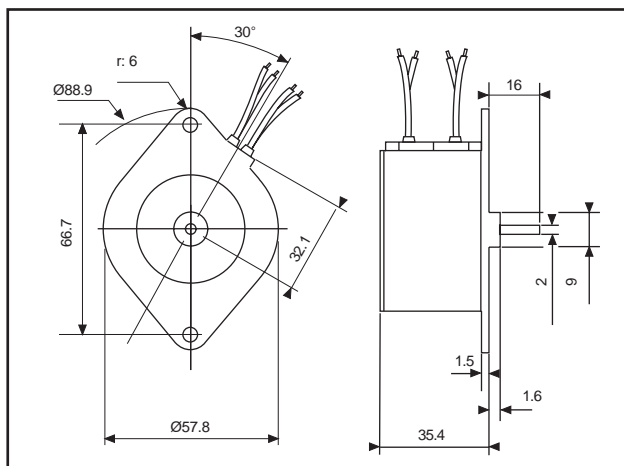
RS stock no. 440-391



Motor characteristics

RS stock no.	440-385	440-391	440-408	440-414
Voltage	220/240	220/240	220/240	220/240
Frequency	50	50	50	50
Base speed	250	250	250	250
Absorbed power (W)	2.7	3.5	3.6	7.2
Starting/Running torque (mNm)	12	37.5	55	106
Stall torque (mNm)	15	42	58	118
Torque developed at:				
1rpm (Nm)	3	9.37	13.75	26.5
Lead length (mm)	250	250	250	250
Pole pairs	12	12	12	12
Weight (g)	90	210	340	540
Disruptive voltage	2400	2400	2400	2400

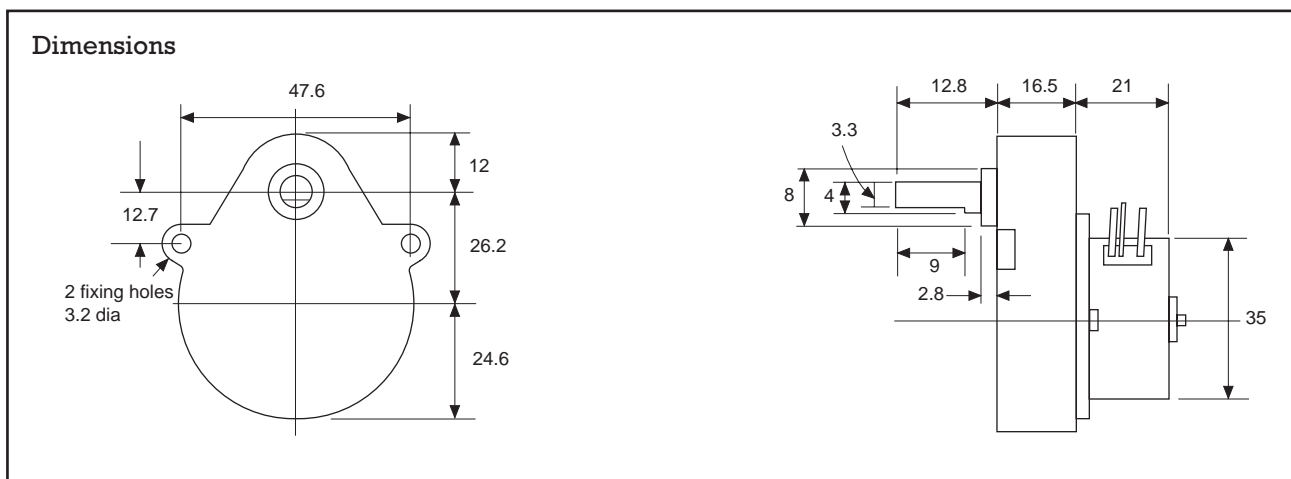
RS stock no. 440-408



Gearboxes

A range of ovoid shaped gearboxes, for use only with RS synchronous motor, RS stock no. 440-385, gears are fixed (reversible) ie. output shaft will **not** slip in either direction. Their rugged construction consists of cogs mounted between passivated steel side plates with beryllium copper intermediate support bearings and a self-lubricating bronze output bearing. The output shaft is stainless steel and incorporates a flat for ease of load coupling. The high material and constructional quality provides for a very efficient transmission of torque with speed reduction.

These advantages coupled with a gearhead fixture which is based on commonly-used ovoid standards renders this range suitable for reliable, long life performance in many industrial and instrument applications. The following diagram gives dimensional detail including a motor/gearbox assembly profile.



Gearbox parameters coupled with **RS** synchronous motor **RS** stock no. 440-385 at 50Hz

RS stock no.	332-868	336-450	336-444	336-438	336-422	336-416	336-400†
Synchronous output speed (50Hz)	60rpm	20rpm	10rpm	5rpm	2rpm	1rpm	1rph
Gear ratio	25:6	25:2	25:1	50:1	125:1	250:1	15,000:1
Maximum output torque* 240V i/p	21mNm	62mNm	121mNm	233mNm	560mNm	800mNm**	800mNm**
Maximum radial load	40N (8mm from mtg. face)						
Maximum axial load	20N						
Maximum shaft run out	± 0.13mm						
Maximum backlash	± 1°						
*@T amb = 25°C **Absolute maximum torque for any gearbox							
† Direction of rotation of aoutput shaft is clockwise when the motor rotation is anti-clockwise looking in the same direction.							

Assembly detail

Each gearbox is provided with a pinion which is the appropriate link between the motor and the first cog of the gearbox. With the aid of a spacer tool (also provided) and a little **RS** high strength adhesive retainer **RS** stock no. 851-016, the pinion may be securely fitted to the motor spindle. Detailed assembly instructions are supplied with each gearbox.

Load considerations

Torque

The gearbox should not be subjected to load torques in excess of the maximum output values stated. Should a mechanical stop be applied or the load system is inadvertently jammed, the motor is stall proof and will run with the output shaft locked. (Do not apply a stop to **RS** gearbox **RS** stock no. 336-400 as the mechanical advantage of the gear ratio far exceeds the maximum torque of 800mNm.) As with any gearbox these conditions are not recommended and where necessary loads should be controlled by overtravel cut out mechanisms linked to the motor supply or reversing switch.

Care should also be taken when increasing the output shaft synchronous speed, by means of additional pulleys and gears, as the maximum available output torque will be proportionally reduced by the ratio of the increased speed and the efficiency of the additional pulley/gear system.

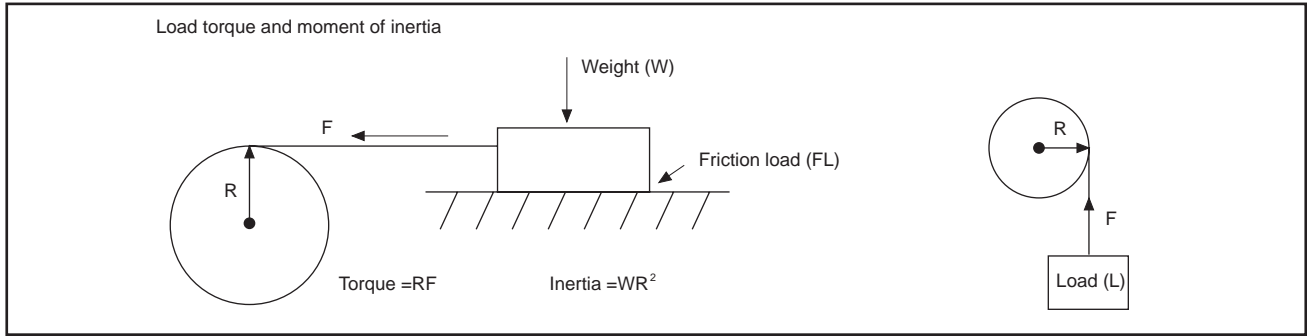
Example

Using **RS** gearbox **RS** stock no. 336-444 at 240V i/p with required final output speed of 15rpm and an additional gear efficiency of 80%.

Final available output torque

$$= \frac{121 \times 10 \times 0.8}{15} = 64.5\text{mNm}$$

It will also follow that available output torque will increase proportionally with a required reduction in output speed. But in all cases, available torque will decrease with gear efficiency.



orque is the force (F) applied at a radius (R) to lift a Load (L) or overcome Friction (FL). Inertia is the tendency of a body weight (W) to preserve its state of rest or uniform motion in a straight line.

This will ensure that load starting and stopping will not override the positional and timing control of the motor. A table of (J) is given for each gearbox fitted with motor **RS** stock no. 332-802.

In the case of **RS** synchronous motors and gearboxes, the motor equivalent moment of inertia (J) at the gearbox output should be equal to or greater than the equivalent load inertia at the same point.

Gearbox RS stock no.	332-868	336-450	336-444	336-438	336-422	336-416	336-400
J (kg cm ²)	0.022	0.2	0.8	3.2	20	80	114 x 10 ³

Depending on the state of the motor at rest (ie. the relative position between the rotor and the initiated magnetic field), under adverse conditions a starting time of up to 80mS should be allowed before synchronous speed is reached.