



Data Sheet

Multi-purpose gearbox (4Nm)

Ratio	RS stock no.	Ratio	RS stock no.
5:1	718-852	100:1	718-896
25:2	718-868	125:1	718-903
25:1	718-874	250:1	718-919
50:1	718-880	500:1	718-925

These gearboxes can be fitted to a range of **RS** motors with a particular adaptor kit.

Motors type	Motor RS stock no.	Adaptor kit	Adaptor kit RS stock no.	Mounting style
Hybrid stepper motor	440-420	A	718-931	2
	440-436	A	718-931	2
	440-442	C	718-953	1
	440-458	C	718-953	1
Tin can stepper motors	440-284	B	718-947	1A
	440-290	B	718-947	1A
	440-307	C	718-953	1A
	332-953	B	718-947	1A
Synchronous motors	440-391	B	718-947	1A
	440-408	B	718-947	1A
	440-414	C	718-953	1A

Adaptor	RS stock no.
A	718-931
B	718-947
C	718-953

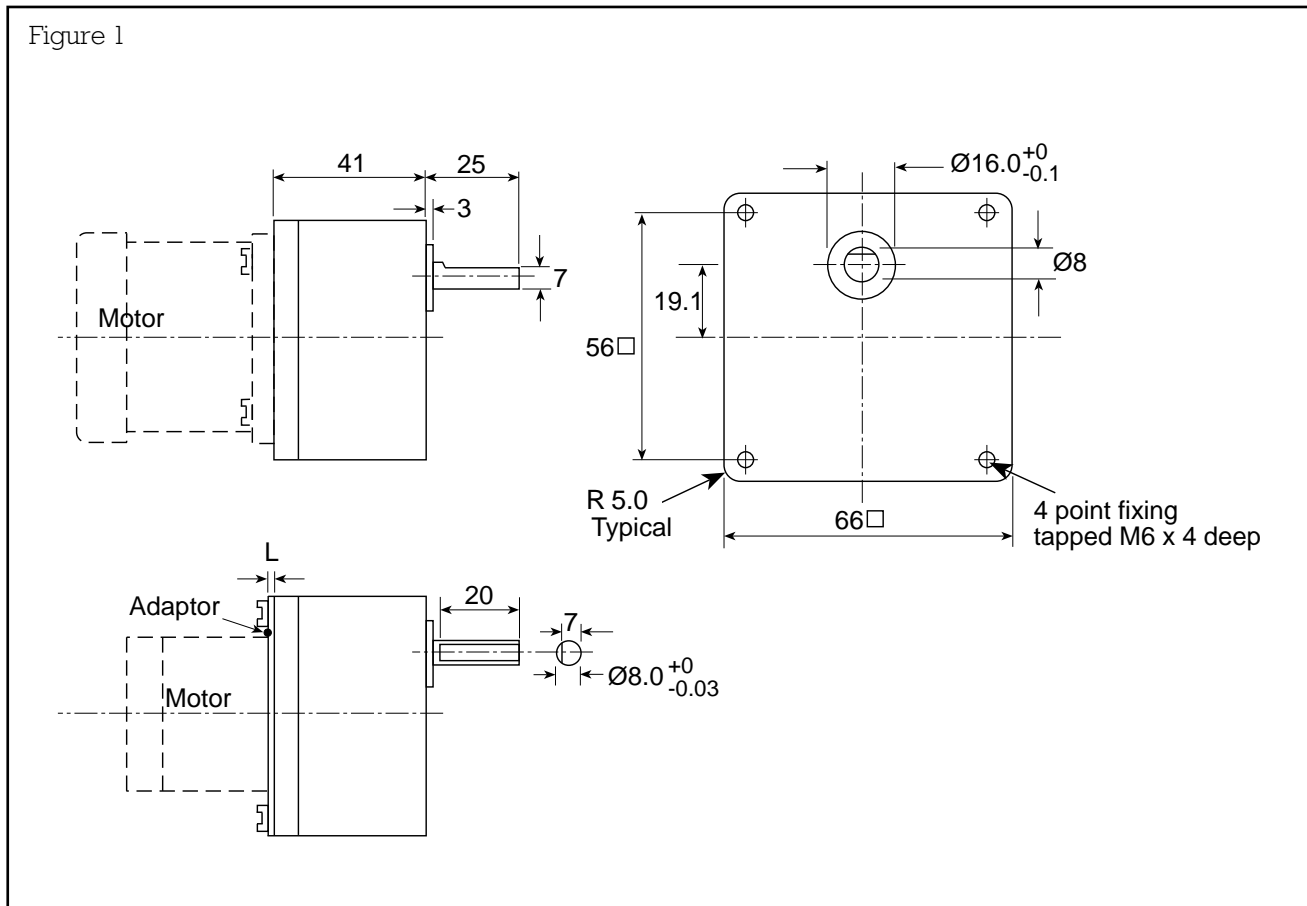
The multi-purpose design concept is based on being able to fit a wide variety of standard motors to the gear-head without special adapting or tooling. This approach has been achieved as a result of special attention to the mounting arrangement and careful consideration of the manner that fitting is carried out together with the adaptors necessary to maximise the number of motors that can be used.

The use of high strength metal spur gears throughout, coupled with a precision diecast housing ensures that the multi-purpose gearbox provides a robust high torque, state of the art, design ideally suited to a wide range of applications including:

- CCTV camera pan and tilt mechanisms
- Medical drives for sampling tables and peristaltic pumps
- Industrial water and hydraulic valve actuation
- Small component conveyor drives
- Special effects drives
- Research and development motion control systems.

Max. continuous output torque	4Nm
Max. continuous output power	15 Watts
Max. radial load on output shaft	25N
Max. axial load on output shaft	20N
Max. diameter of motor input shaft	6.35mm
Motor mounting	Via adaptor
Suitable motors	ac synchronous motors, stepper motors
Max. available gear ratio	500:1
Gear material	Metal throughout
Housing	Precision metal diecasting
Bearings	Sintered bronze
Dimensions	See following drawing

Figure 1



Gear ratio options

A wide choice of gear ratios is available as shown below.

In many cases 250rpm ac synchronous motors, 1.8 and 7.5 degree stepper motors may be used when the following speeds and steps/revolution will be obtained at the output of the gearhead:

Gear ratio	Output speed using 250rpm synchronous motor	Number of steps/rev using 7.5 degree 1.8 degree stepper motors	
		7.5 degree	1.8 degree
5:1	50rpm	240	1000
25:2	20rpm	600	2500
25:1	10rpm	1200	5000
50:1	5rpm	2400	10,000
100:1	2.5rpm	4800	20,000
125:1	2rpm	6000	25,000
250:1	1rpm	12,000	50,000
500:1	0.5rpm	24,000	100,000

Using hybrid stepper motors

The number of steps/rev quoted above assumes the motor is used in full step. In most cases, it is recommended to drive the hybrid motors in half step drive when the above resolution will be doubled for each gear ratio.

Direction of rotation and efficiency

While the direction of rotation at the output is reversible its relationship to that of the input (motor) together with the efficiency, will depend on the number of gear stages within the multi-purpose gearhead as shown below:

Also, because the maximum output torque will be dependent, not only on the peak capability of 4Nm, but also on the maximum power transmission capability (15 Watts), in practice, the maximum recommended torque will be dependent on the gear ratio employed as shown below:

Gear ratio	No. of stages	Direction of rotation with respect to input	Efficiency	Max. output torque
5:1	3	Opposite	72%	1.5Nm
25:2	3	Opposite	72%	2.5Nm
25:1	4	Same	65%	4.0Nm
50:1	4	Same	65%	4.0Nm
100:1	5	Opposite	58%	4.0Nm
125:1	5	Opposite	58%	4.0Nm
250:1	6	Same	52%	4.0Nm
500:1	6	Same	52%	4.0Nm

Calculating output torque of geared motor combination:

Example 1

Motor torque: 0.25Nm at 600rpm (2000 steps/sec)

Gear ratio: 5:1 Efficiency: 72%

$$\text{Gearhead output torque} = 0.25 \times \frac{5 \times 72}{100} = 0.9\text{Nm at } 120\text{rpm}$$

Example 2

Motor torque: 0.07Nm at 250rpm

Gear ratio: 125:1 Efficiency: 58%

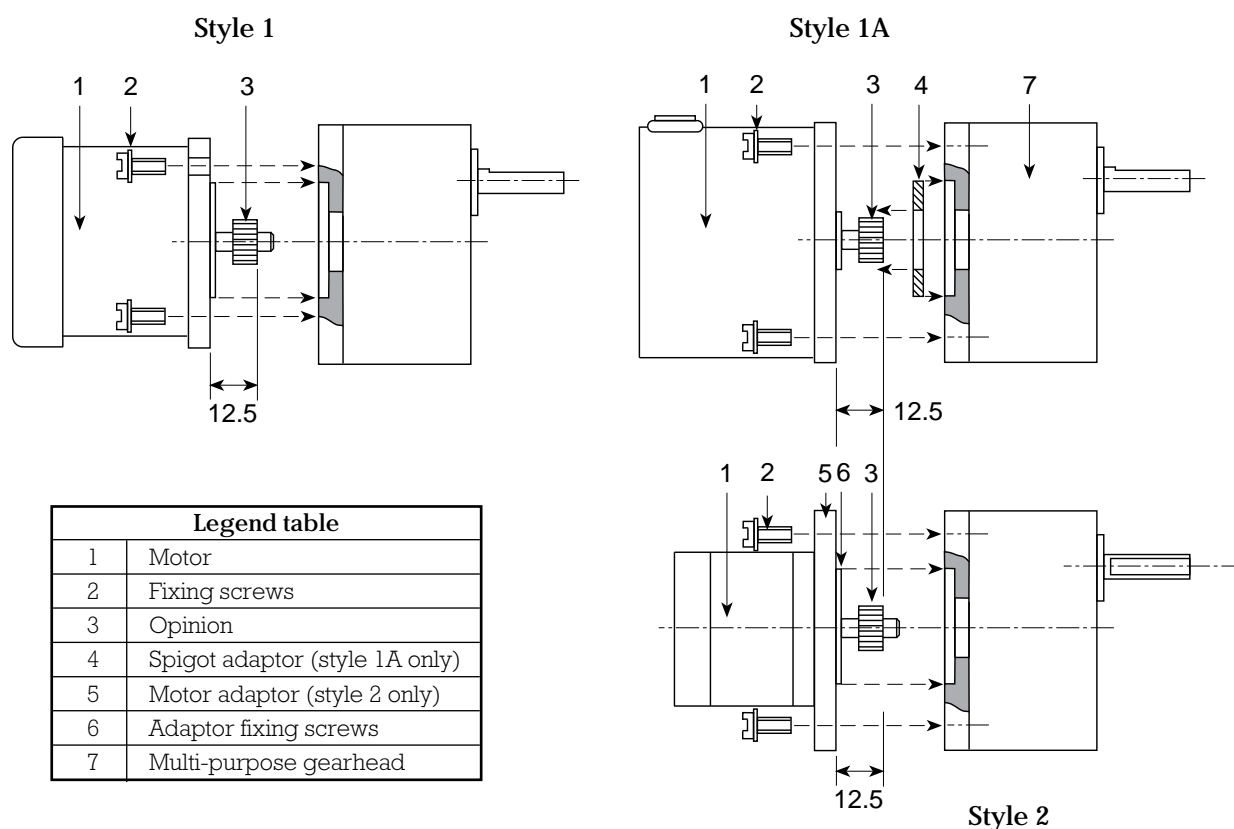
$$\text{Theoretical output torque} = 0.07 \times \frac{125 \times 58}{100} = 5.075\text{Nm}$$

Available output torque = 4.0Nm (see table on page 2).

Output torque using RS synchronous motors

Gear ratio	5:1	25:2	25:1	50:1	100:1	125:1	250:1	500:1
Output speed (rpm)	50	20	10	5	2.5	2	1	0.5
Typical torque (Nm) using motors:								
RS stock no.								
440-391	0.1	0.27	0.48	0.97	1.7	2.1	3.9	4.0
440-408	0.19	0.49	0.89	1.78	3.1	3.9	4.0	4.0
440-414	0.38	0.95	1.7	3.4	4.0	4.0	4.0	4.0

Figure 2



Motor fitting instructions

Motors are either fitted directly to the rear plate of the multi-purpose gearhead (Styles 1 and 1A) or by means of a motor mounting adaptor (Style 2) as shown in the above drawings.

The appropriate motor pinions, adaptors and fixing screws are provided in three mounting kits which should be selected according to the motor to be used detailed opposite:

Assembly kit consisting:

	Screws	Pinion bore	Suitable motors RS stock no.
A	2 pieces M3 × 6mm	} 5mm	440-420
	4 pieces M4 × 8mm		440-436
	4 pieces M4 washers		
B	2 pieces M4 × 6mm + washers	4mm	332-953
	2 pieces M3 × 4mm + washers	4mm	440-290
	2 pieces M3 × 4mm + washers	2mm	440-284
	2 pieces M3 × 4mm + washers	2mm	440-391
	2 pieces M3 × 4mm + washers	2mm	440-408
C	4 pieces M4 × 6mm + washers	6mm	440-307
	4 pieces M4 × 6mm + washers	6.35mm	440-414
	4 pieces M4 × 8mm + washers	} 6.35mm	332-082
			440-442
			440-458

General fitting instructions

The motor pinion is retained on the motor shaft using high strength retainer (**RS** stock no. 514-543). The application of the adhesive to the shaft should be done with care since it is important to ensure that a good bond is achieved.

Lightly rub the motor shaft with emery paper to provide a keyed surface and ensure that the shaft and the pinion bore is clean and free of grease. Apply high strength adhesive to the shaft and slide the pinion into position, rotating it on the shaft to ensure a good spread of adhesive in the shaft/pinion joint. Always carry out this operation with the motor shaft horizontal and observe the adhesive manufacturer's instructions. Ensure that:

1. No adhesive comes in contact with the motor bearings.
2. All excessive adhesive is removed prior to fitting motor.

Fitting instructions using assembly kit A

Mounting style	Motors RS stock no.
2	440-420 440-436

Using the fitting components shown in the table carry out the following procedure:

1. Fit the motor adaptor (Item 5 on attached drawing) to the motor using the two M3 screws provided, one screw being fitted to each corner of the motor.
2. Fit the pinion to the shaft using the high strength adhesive as described, positioning the pinion so that it is $12.5\text{mm}^{+0.25}_{-0.5}$ from the adaptor mounting face as shown in the attached drawing.
3. Fit the motor, adaptor assembly, directly to the back of the gearhead, taking care that the pinion slips freely back into mesh with the first gearwheel in the gearhead.

Note: The gearhead back plate is provided with two recesses in the casting to enable the heads of the motor retaining screws to be accommodated.

4. Secure using the four M4 screws as shown.

Fitting instructions using assembly kit B

Mounting style	Motors RS stock no.
1A	332-953 440-290 440-284 440-391

It should be noted that two adaptors are provided with the kit with bore sizes of either 9 or 12mm diameter to suit the alternative motor spigots provided. It is particularly important to ensure that, in the case of the motors which require the 9mm bore adaptor, that this is fitted as the first step in the motor fitting procedure.

2. Fit the pinion to the shaft using high strength adhesive as described, positioning the pinion so that it is $12.5\text{mm}^{+0.25}_{-0.5}$ from the motor mounting face as shown in the drawing.
3. Fit the motor directly to the back of the gearhead, taking care that the pinion slips freely into mesh with the first gearwheel in the gearhead.
4. Secure using the four screws as shown in the table.

Fitting instructions using assembly kit C

Mounting style	Motors RS stock no.
1	440-442 440-458

Using the fitting components shown in the table carry out the following procedure:

1. Fit the pinion to the shaft using high strength adhesive as described, positioning the opinion so that it is $12.5\text{mm}^{+0.25}_{-0.5}$ from the motor mounting face as shown in the drawing.
2. Fit the motor directly to the back of the gearhead, taking care that the pinion slips freely into mesh with the first gearwheel in the gearhead.
3. Secure using the four screws as shown in the table.

Mounting style	Motors RS stock no.
1A	440-307 440-414

Using the fitting components shown in the table carry out the following procedure:

1. Fit the circular motor spigot adaptor (Item 4 on attached drawing) to the motor.
2. Fit the pinion to the shaft using high strength adhesive as described, positioning the pinion so that it is $12.5\text{mm}^{+0.25}_{-0.5}$ from the motor mounting face as shown in the drawing.
3. Fit the motor directly to the back of the gearhead, taking care that the pinion slips freely into mesh with the first gearwheel in the gearhead.
4. Secure using the four screws as shown in the table.