

Tekniska specifikationer

RS Lagernummer	440-420	440-436	440-442	440-458	440-464	440-470
Märkspänning (V)	5	12	5	12	3	2.5
Märkström (I)	0.5	0.16	1	0.6	2	4.5
Motstånd (Ω)	10	75	5	20	1.5	0.56
Induktans (mH)	6	36	9	32	4.5	2.8
Spärrmoment (mNm)	5	4	30	30	40	100
Hållmoment (mNm)	70	70	500	500	1274	2450
Noggrannhet stegvinkel (%)	5	5	5	5	5	5
Stegvinkel	1.8	1.8	1.8	1.8	1.8	1.8
Isoleringsklass	B	B	B	B	B	B
NEMA-.ramstorlek	17	17	23	23	40	40
Bakre axel	Nej	ja	Nej	ja	ja	Nej

RS Lagernummer	191-8299	191-8306	191-8328	191-8334	191-8340	191-8356	191-8362	191-8378	191-8384
Märkspänning	12	15	5	12	12	12	5,4	3,4	6
Märkström	0,4	0,4	1	0,4	0,48	0,6	1,4	2,85	1,8
Motstånd	30	37,5	5	30	25	20	3,6	1,3	3,4
Induktans	15	22	5,7	30	40	35	7,0	2,5	8
Spärrmoment	3,5	3,5	14,8	14,8	29,6	29,6	56,5	77,6	77,6
Hållmoment	100	100	260	260	500	500	882	1200	1200
Noggrannhet stegvinkel	5	5	5	5	5	5	5	5	5
Stegvinkel	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8
soleringsklass	B	B	B	B	B	B	B	B	B
NEMA-.ramstorlek	17	17	23	23	23	23	23	23	23
Bakre axel	Nej	Nej	Nej	Nej	Nej	Nej	Nej	Nej	Nej

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Instruction Leaflet  
Bedienungsanleitung  
Hojas de instrucciones  
Feuille d'instructions  
Foglio d'istruzioni  
Betjeningsvejledning  
Instructies  
Instruktionsfolder

- Hybrid Stepping Motors (GB)
- Hybrid-Schrittmotoren (D)
- Motores híbridos paso a paso (E)
- Moteurs pas à pas hybrides (F)
- Motori ibridi passo-passo (I)
- Hybride stepmotorer (DK)
- Hybride stappmotor (NL)
- Hybridstegmotorer (SE)

Figures / Abbildung / Figura / Figuren / Afbeeldingen

1

(GB) Connection diagrams
(E) Esquemas de conexión
(I) Schemi di inserzione
(NL) Aansluitdiagrammen

(D) Anschluß der Schrittmotoren
(F) Diagrammes de raccordement
(DK) Koblingsdiagram
(SE) Kopplingschema

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2

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3

**F** Code commande RS.  
440-420 - 440-470  
191-8299 - 191-8384

Étape	A	B	A'	B'
1	Activé	Activé		
2		Activé	Activé	
3			Activé	Activé
4	Activé			Activé

**Moteurs 6 fils (voir figure 1)**

Code commande RS	Position					
	A	B	C	D	E	F
440-420	Blanc	Marron	Rouge	Jaune	Marron	Bleu
440-436	Blanc	Marron	Rouge	Jaune	Marron	Bleu
191-8299	Blanc	Marron	Rouge	Jaune	Marron	Bleu
191-8306	Blanc	Marron	Rouge	Jaune	Marron	Bleu

**Couleur des fils**

**Moteurs 8 fils (Voir les figures 2 et 3)**

Code commande RS	Position							
	A	B	C	D	E	F	G	H
440-442	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
440-458	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
440-464	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
440-470	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8328	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8334	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8340	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8356	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8362	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8378	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert
191-8384	Rouge	Rouge/Blanc	Noir/Blanc	Noir	Jaune	Jaune/Blanc	Vert/Blanc	Vert

**Couleur des fils**

**Caractéristiques techniques**

Code commande RS	440-420	440-436	440-442	440-458	440-464	440-470
Tension nominale (V)	5	12	5	12	3	2,5
Courant nominal (I)	0,5	0,16	1	0,6	2	4,5
Résistance (Ω)	10	75	5	20	1,5	0,56
Inductance (mH)	6	36	9	32	4,5	2,8
Couple de détente (mNm)	5	4	30	30	40	100
Couple de maintien (mNm)	70	70	500	500	1274	2450
Précision angulaire (%)	5	5	5	5	5	5
Angle de pas	1,8	1,8	1,8	1,8	1,8	1,8
Classe d'isolement	B	B	B	B	B	B
Dimension du cadre NEMA	17	17	23	23	40	40
Axe arrière	Non	Oui	Non	Oui	Oui	Non

**Caractéristiques techniques**

Code commande RS	191-8299	191-8306	191-8328	191-8334	191-8340	191-8356	191-8362	191-8378	191-8384
Tension nominale	12	15	5	12	12	12	5,4	3,4	6
Courant nominal	0,4	0,4	1	0,4	0,48	0,6	1,4	2,85	1,8
Résistance	30	37,5	5	30	25	20	3,6	1,3	3,4
Inductance	15	22	5,7	30	40	35	7,0	2,5	8
Couple de détente	3,5	3,5	14,8	14,8	29,6	29,6	56,5	77,6	77,6
Couple de maintien	100	100	260	260	500	500	882	1200	1200
Précision de l'angle de pas (%)	5	5	5	5	5	5	5	5	5
Angle de pas	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8	1,8
Class d'isolement	B	B	B	B	B	B	B	B	B
Dimension du cadre NEMA	17	17	23	23	23	23	23	23	23
Axe arrière	Non	Non	Non	Non	Non	Non	Non	Non	Non

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**I** RS Codici.  
440-420 - 440-470  
191-8299 - 191-8384

Fase	A	B	A'	B'
1	on	on		
2		on	on	
3			on	on
4	on			on

**Motors a 6 fili (fare riferimento alla figura 1)**

RS Codici	Posizione					
	A	B	C	D	E	F
440-420	Bianco	Marrone	Rosso	Giallo	Marrone	Blu
440-436	Bianco	Marrone	Rosso	Giallo	Marrone	Blu
191-8299	Bianco	Marrone	Rosso	Giallo	Marrone	Blu
191-8306	Bianco	Marrone	Rosso	Giallo	Marrone	Blu

**Colori fili**

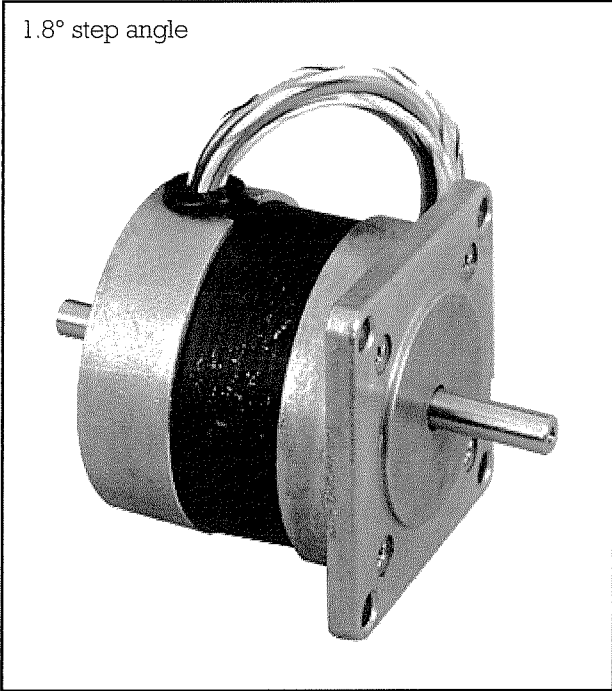
**Motors a 8 fili (fare riferimento alle figure 2 e 3)**

RS Codici	Posizione							
	A	B	C	D	E	F	G	H
440-442	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
440-458	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
440-464	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
440-470	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8328	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8334	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8340	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8356	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8362	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8378	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde
191-8384	Rosso	Rosso/Bianco	Nero/Bianco	Nero	Giallo	Giallo/Bianco	Verde/Bianco	Verde

**Colori fili**

# Datasheet

Size	Rear shaft	No. of wires	RS stock no.
17	No	6	440-420
	Yes		440-436
	No		191-8299
	No		191-8306
23	No	8	440-442
	Yes	8	440-458
	No	8	191-8328
	No	8	191-8334
	No	8	191-8340
	No	8	191-8356
	No	8	191-8362
	No	8	191-8378
34	Yes	8	440-464
	No	8	440-470

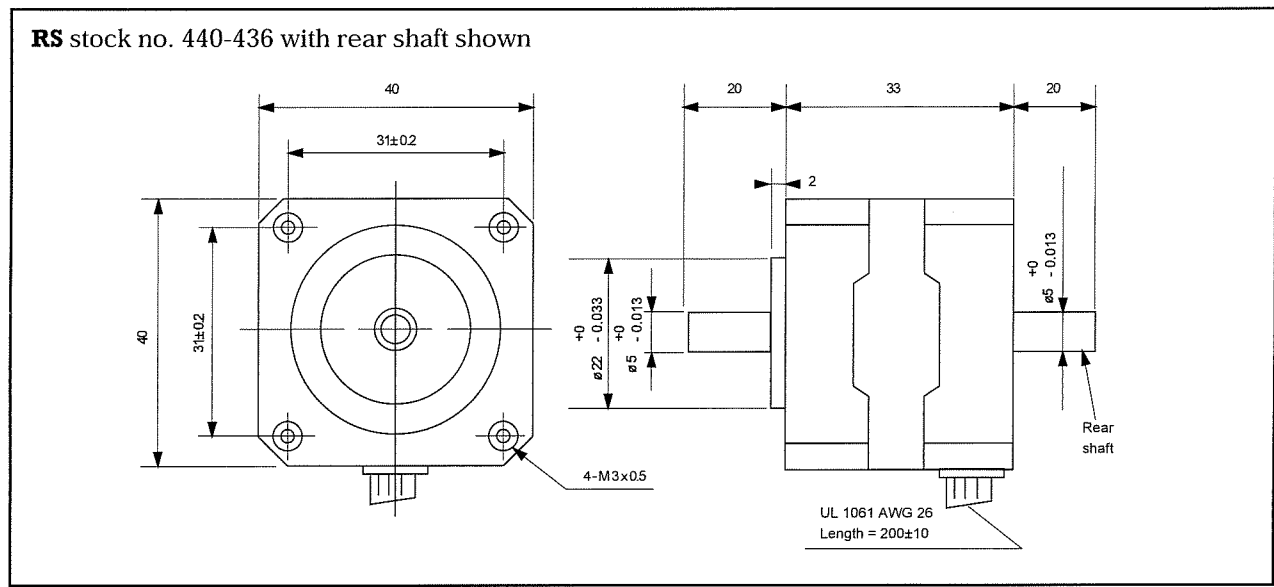


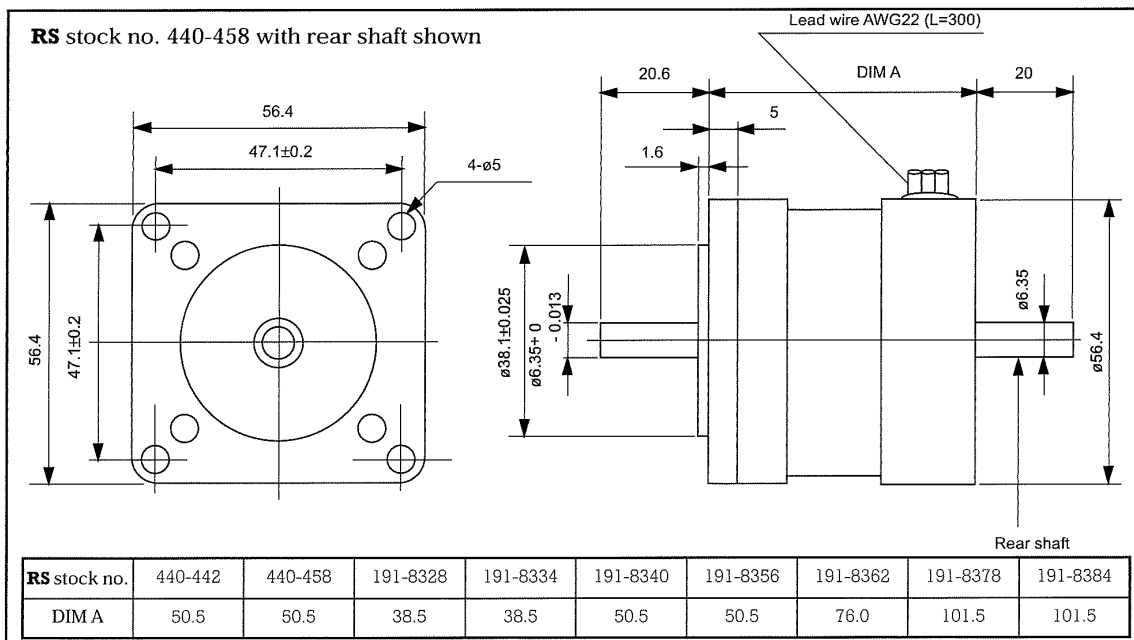
These 4 phase hybrid stepper motors are capable of delivering much higher working torques and stepping rates than permanent magnet (7.5° and 15°) types. Whilst at the same time maintaining a high detent torque even when not energised. This feature is particularly important for positional integrity. Many of the motors are directly compatible with the RS stepper motor drive boards (RS stock nos. 332-098, 342-051 and 440-240).

Size 34 motors and a number of size 23 motors are supplied in 8-lead configuration which allows the maximum flexibility when connecting to the drive boards.

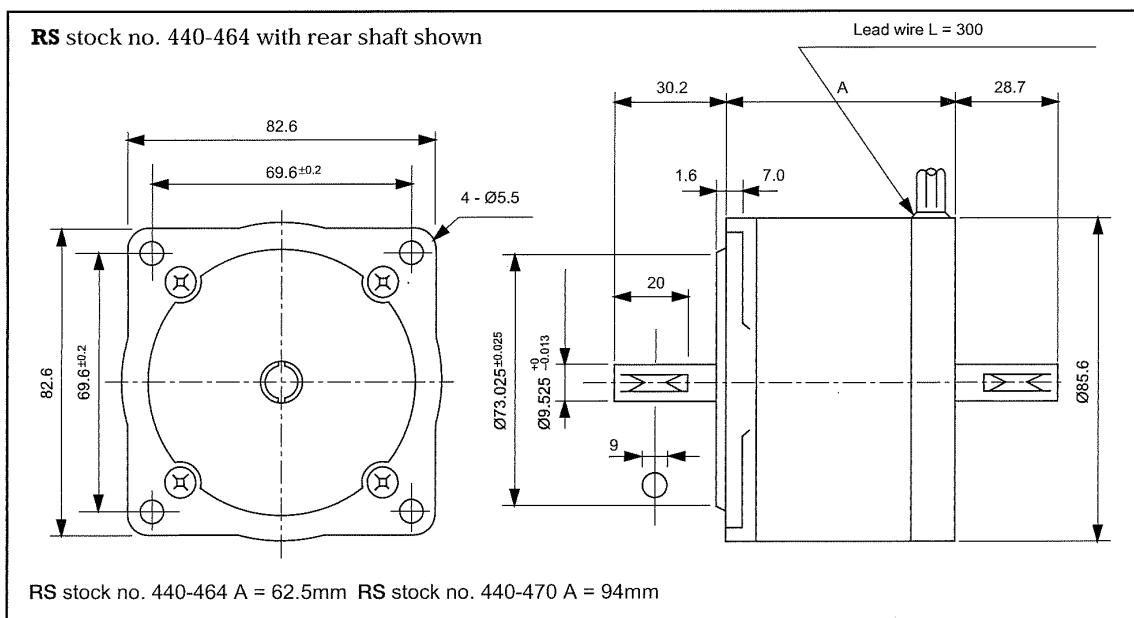
Rear extension shafts are provided on three of the motors to enable connection of other drive requirements and feedback devices.

## Size 17

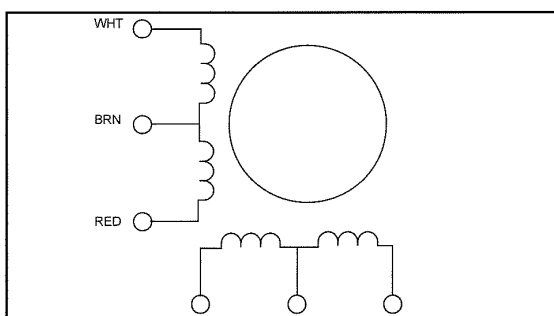




Size 34

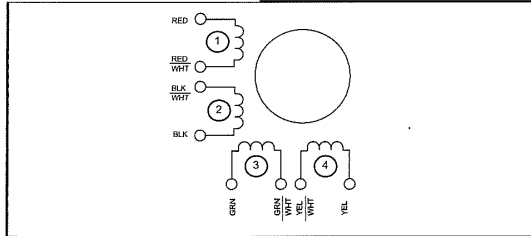


6 Wire configuration



Exciting sequence and direction of rotation when facing mounting flange end.

Step	White	Blue	Red	Yellow	Brown	CW
1	On	On			+dcV	↓
2		On	On			
3			On	On		
4	On			On		



Exciting sequence and direction of rotation when facing mounting flange end.

Step	Red	Green	Black	Yellow	Com	CW
1	On	On			+dcV	↓
2		On	On			
3			On	On		
4	On			On		

**Technical specification**

RS stock no.	440-420	440-436	440-442	440-458	440-464	440-470
Rated voltage (V)	5	12	5	12	3	2.5
Rated current (I)	0.5	0.16	1	0.6	2	4.5
Resistance ( $\Omega$ )	10	75	5	20	1.5	0.56
Inductance (mH)	6	36	9	32	4.5	2.8
Detent torque (mHm)	5	4	30	30	40	100
Holding torque (mNm)	70	70	500	500	1200	2200
Step angle accuracy (%)	5	5	5	5	5	5
Step angle	1.8	1.8	1.8	1.8	1.8	1.8
Insulation class	B	B	B	B	B	B

RS stock no.	191-8299	191-8306	191-8328	191-8334	191-8340	191-8356	191-8362	191-8378	191-8384
Rated voltage (V)	12	15	5	12	12	12	5.4	3.4	6
Rated current (I)	0.4	0.4	1	0.4	0.48	0.6	1.4	2.85	1.8
Resistance ( $\Omega$ )	30	45	5	40	25	20	3.8	1.2	3.5
Inductance (mH)	14	22	5.7	40	33	32	6.8	1.5	7.3
Detent torque (mHm)	3.5	3.5	14.8	14.8	29.6	29.6	56.5	77.6	77.6
Holding torque (mNm)	100	100	260	260	494	494	882	1200	1200
Step angle accuracy (%)	5	5	5	5	5	5	5	5	5
Step angle	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Insulation class	B	B	B	B	B	B	B	B	B

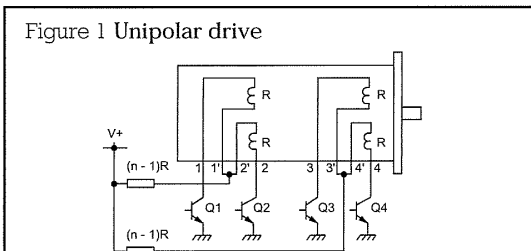
**Resonance**

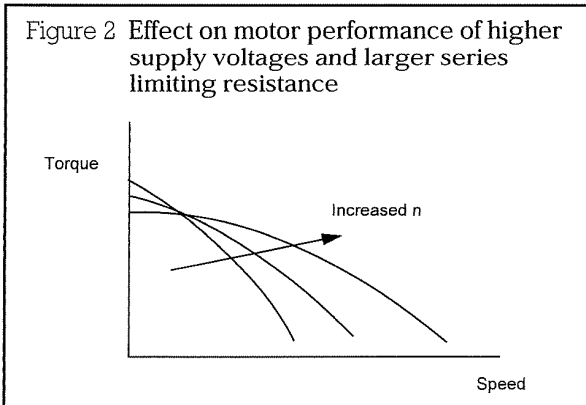
Certain operating frequencies cause resonance and the motor loses track of the drive input. Audible vibration may accompany resonance conditions. These frequencies should be avoided if possible. Driving the motor on the half step mode (see motor drive methods) greatly reduces the effect of resonance. Alternatively extra load inertia and external damping may be added to shift resonance regions away from the operating frequency.

**Motor drive methods**

The normal way of driving a 4-phase stepper motor is shown in Figure 1.

This is commonly known as the 'Unipolar L/nr drive'. Here the current in each winding, when energised, flows in one direction only 'n', value is  $\geq 1$  (but not necessarily an integer) and nR is the sum of the external resistance plus the winding resistance (R). By selecting a higher value for n (ie. larger external resistance) and using a higher dc supply to maintain the rated voltage and current for each winding, improved torque speed characteristics can be obtained. Thus a 6V, 6 $\Omega$  motor (1A per phase) can be driven from a 6Vdc supply without any series resistor, in the L/R mode. Alternatively it can be driven from a 24Vdc supply using 18 $\Omega$  series resistance in the L/4R mode with much improved performance.





**Table 1 Full step mode**

Step No.	Q1	Q2	Q3	Q4
Start position (arbitrary)	ON	OFF	OFF	ON
1	ON	OFF	ON	OFF
2	OFF	ON	ON	OFF
3	OFF	ON	OFF	ON
4	ON	OFF	OFF	ON
Above sequence repeating	ON	OFF	ON	OFF

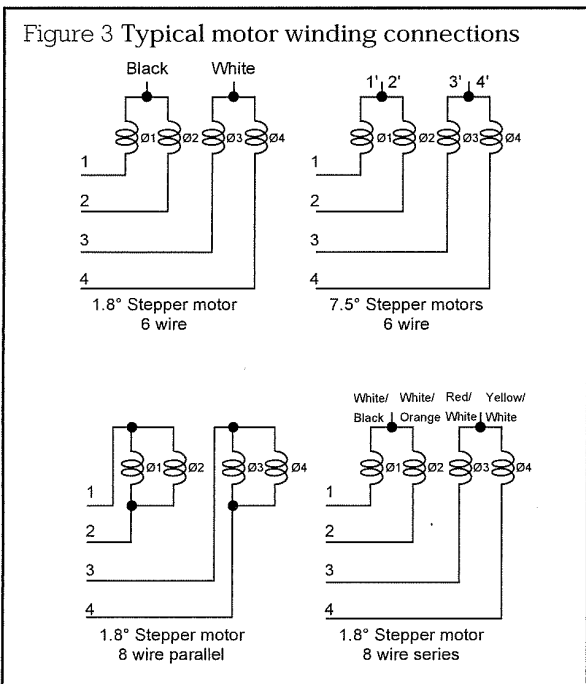
↑ Anti-clockwise  
↓ Clockwise

**Connection to RS bipolar stepper motor board**  
When the windings of the RS stepper motors are assigned (Ø1-Ø4) as shown in Figure 3, they can be connected to the board according to Figure 1.

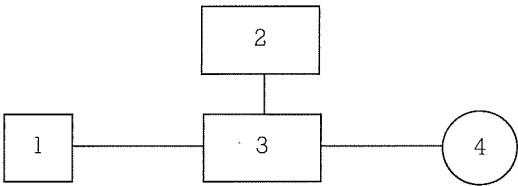
**Table 2 Half step mode**

Step No.	Q1	Q2	Q3	Q4
Start position	ON	OFF	ON	OFF
1	ON	OFF	OFF	OFF
2	ON	OFF	OFF	ON
3	OFF	OFF	OFF	ON
4	OFF	ON	OFF	ON
5	OFF	ON	OFF	OFF
6	OFF	ON	ON	OFF
7	OFF	OFF	ON	OFF
8	ON	OFF	ON	OFF
Above sequence repeating				

↑ Anti-clockwise  
↓ Clockwise



**Typical stepper motor control system**  
The operation of a stepper motor requires the presence of the following elements:



When using 8 lead motors with coils in parallel the motor current should be set no greater than:

$$I \text{ per phase} \times \sqrt{2}$$

When using 6 lead or 8 lead motors with coils in series the motor current should be set no greater than:

$$I \text{ per phase} \times \sqrt{\frac{1}{2}}$$

Motors with 4 leads have a bipolar rating and can be used according to manufacturer's specification.

To step a motor in a particular direction a specific switching sequence for the drive transistors Q1-Q4 needs to be followed. If this sequence is in Table 1 (known as the unipolar full step mode) it results in the rotor advancing through one complete step at a time.

1. **A control unit.** Usually a microprocessor based unit which gives step and direction signals to the drive card. RS stepper motor control board (RS stock no. 440-098) is ideally suited for this function.
2. **Power supply.** Giving the required voltage and current for the drive card using a linear power supply.
3. **Drive card.** This converts the signals from the control unit in to the required stepper motor sequence. RS stock nos. 332-098, 342-051 and 440-240 are designed for the function.
4. **Stepper motor.**

### Stepper motor drive boards

For control of stepper motors RS has three types of stepper drive board which are suitable to drive stepper motors of various current ranges.

Drive board	RS stock nos.	Suitable stepper motors	Suggested wiring configuration
Unipolar 2A (RS stock no. 332-098) This drive is only suitable for applications where low speeds and low torques are required	440-420	Size 17	N/A
	440-436	Size 17	
	191-8299	Size 17	
	191-8306	Size 17	
	440-442	Size 23	
	440-458	Size 23	
	191-8328	Size 23	
	191-8334	Size 23	
	191-8340	Size 23	
	191-8356	Size 23	
Bipolar 3.5A (RS stock no. 342-051) Suitable for medium current, medium torque applications	440-442	Size 23	Series or parallel Parallel connection Series Series Series or parallel Series or parallel Series or parallel connection Series or parallel connection
	440-455	Size 23	
	191-8328	Size 23	
	191-8362	Size 23	
	191-8378	Size 23	
	191-8384	Size 23	
	440-464	Size 34	
Bipolar 6A (RS stock no. 440-240). Suitable for high current, high torque applications	191-8378	Size 23	Series or parallel Parallel Parallel connection Series or parallel connection
	191-8384	Size 23	
	440-464	Size 34	
	440-470	Size 34	

Note: Connecting a stepper motor in series will give a good low speed high torque performance.  
Connecting a stepper motor in parallel will give a good high speed lower torque performance.

### Drive board connections

