

# Electric Rotary Actuators (motors)

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- DC motors
- AC motors
  - stepper (2-phase synchronous)
  - brushless (3-phase synchronous)
  - induction

# Step Motors

Figure 2. "One phase on" stepping sequence for two phase motor.

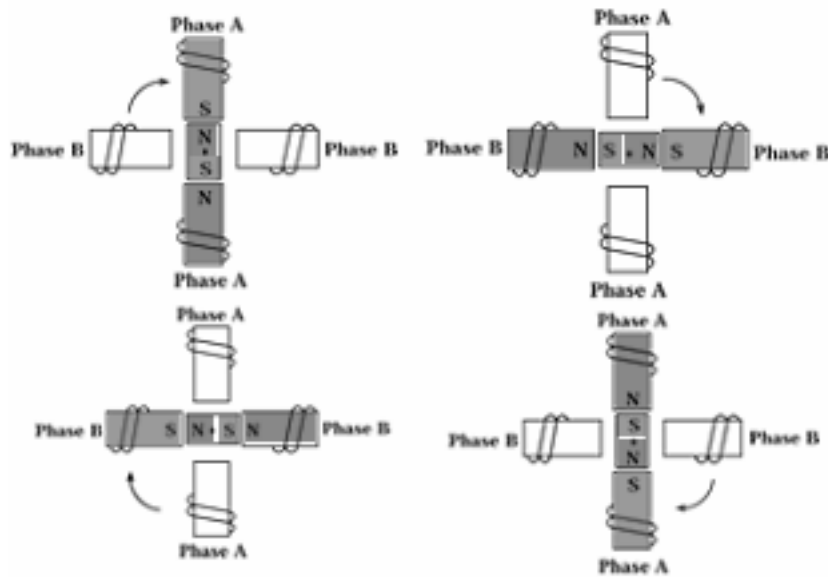
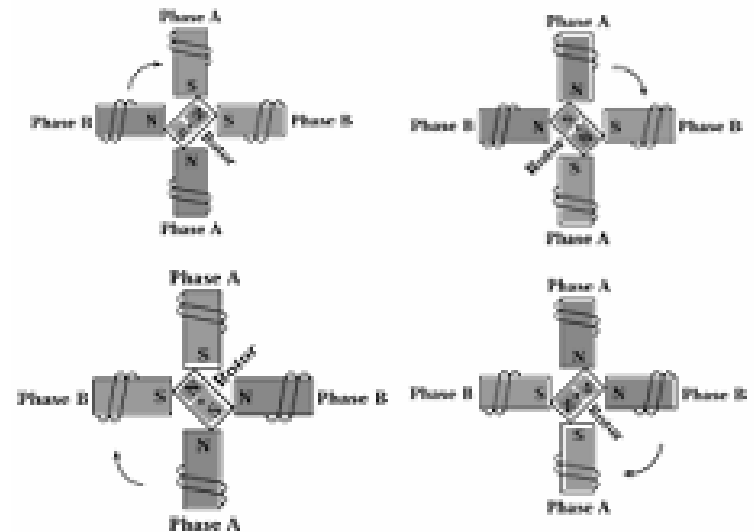


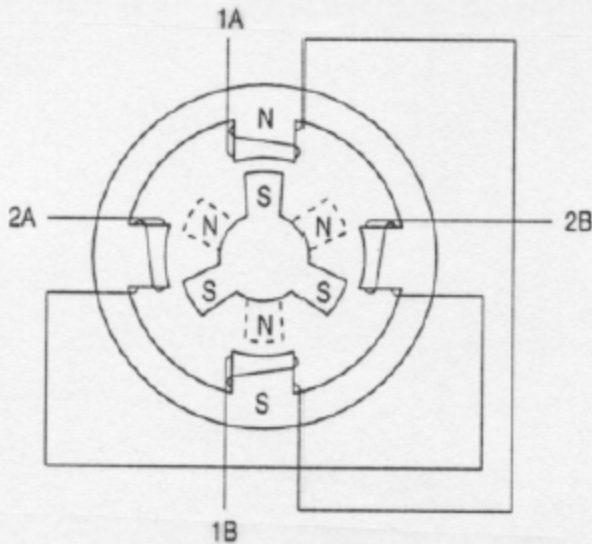
Figure 3. "Two phase on" stepping sequence for two phase motor.



# Step Motors

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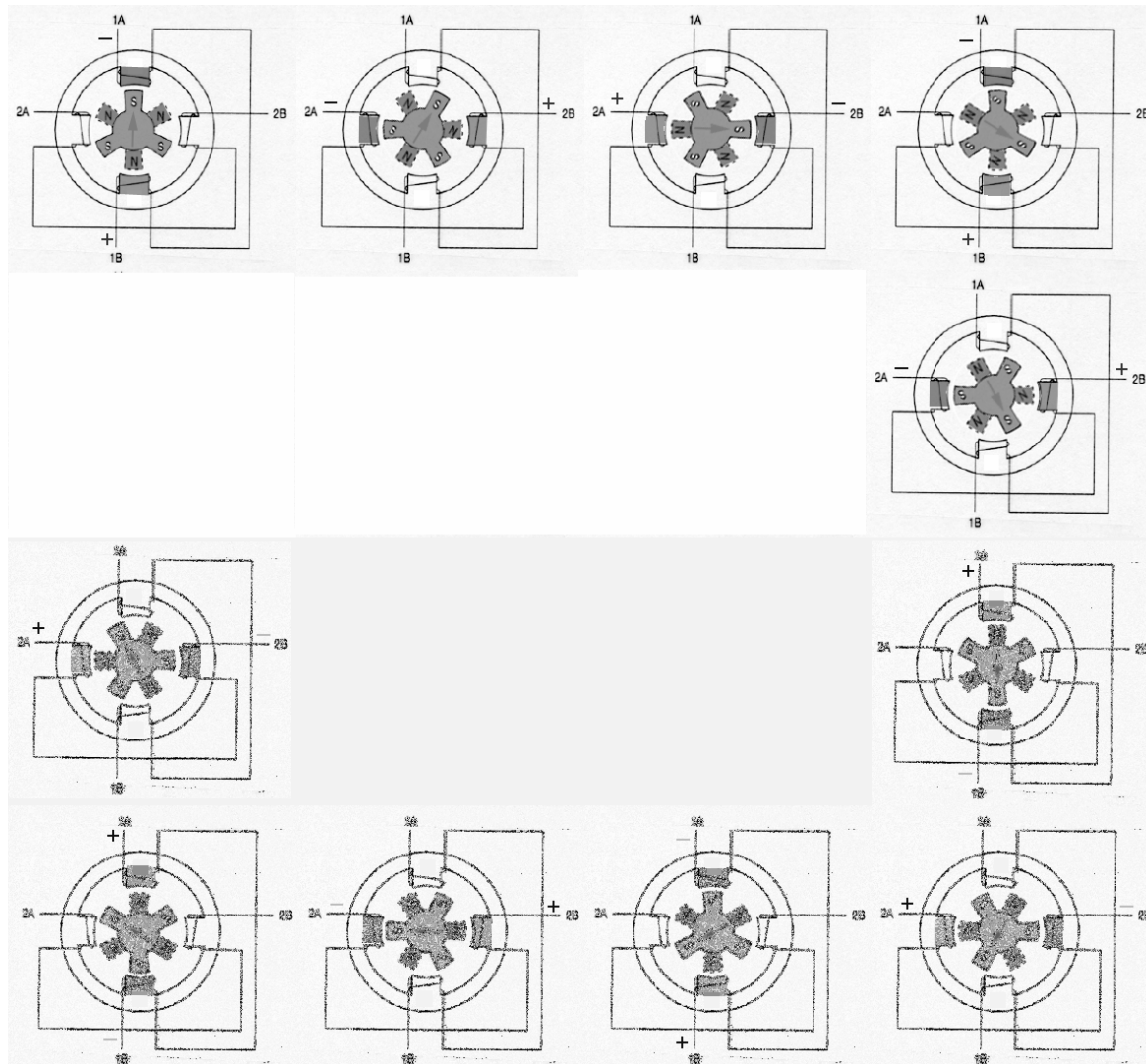
*Fig. 1.4 Simple 12 step/rev hybrid motor*



# Step Motor

## 12 step/rev, 1 phase on

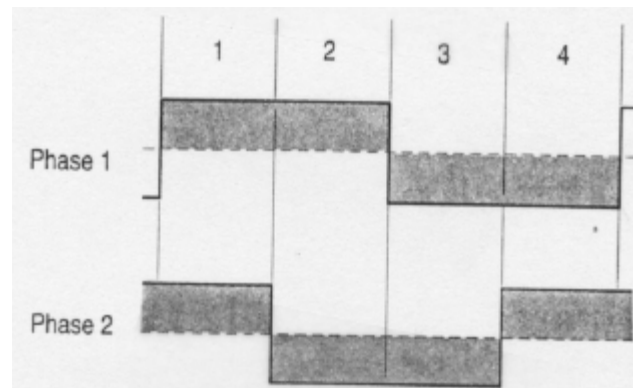
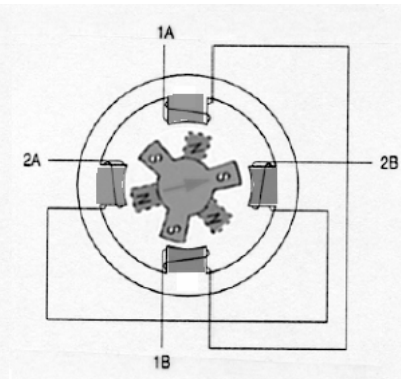
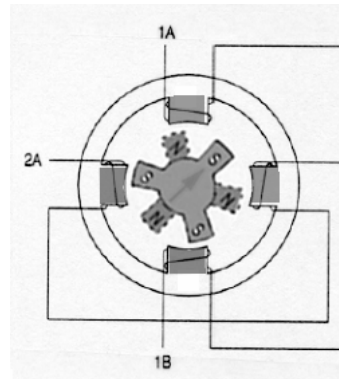
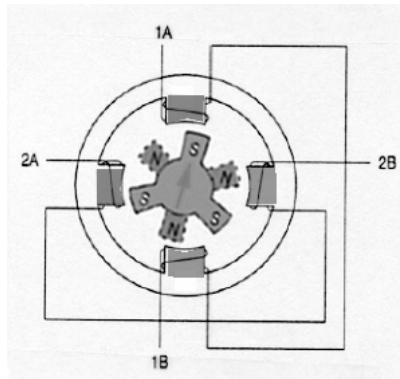
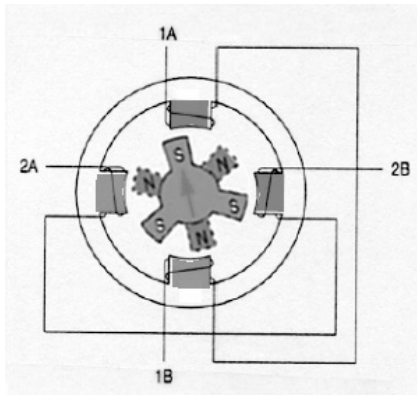
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# Step Motor

## 12 step/rev, 2 phase on

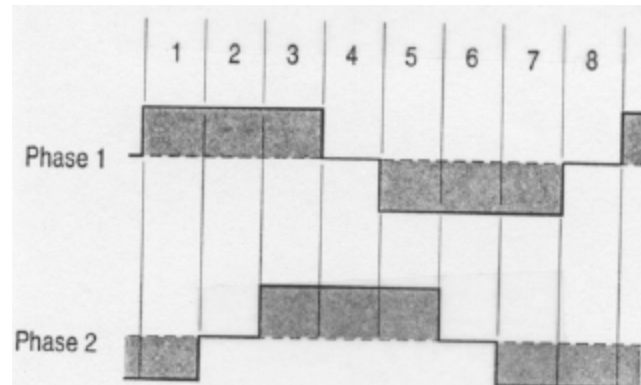
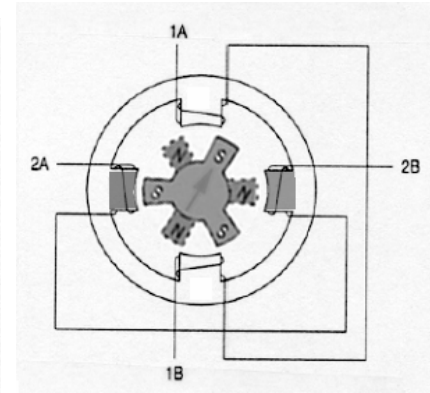
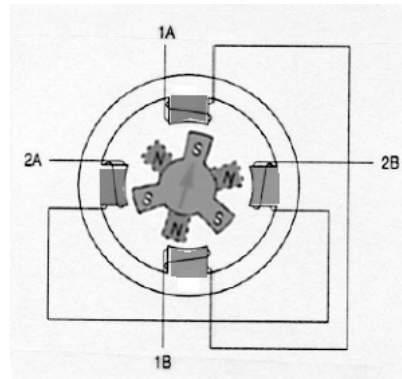
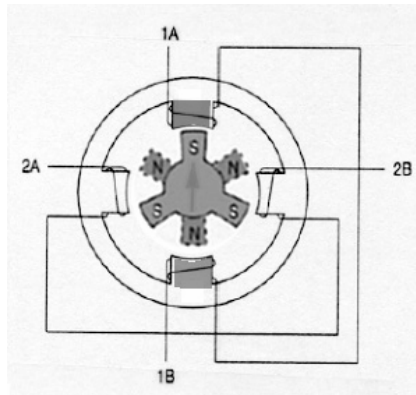
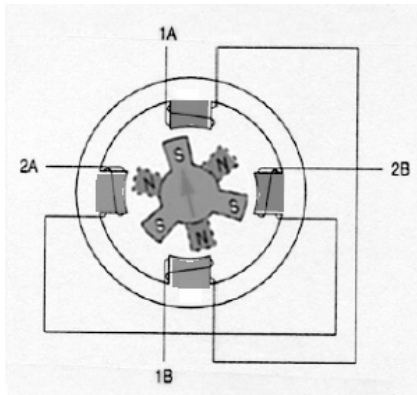
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# Step Motor

## 12 step/rev, half-stepping

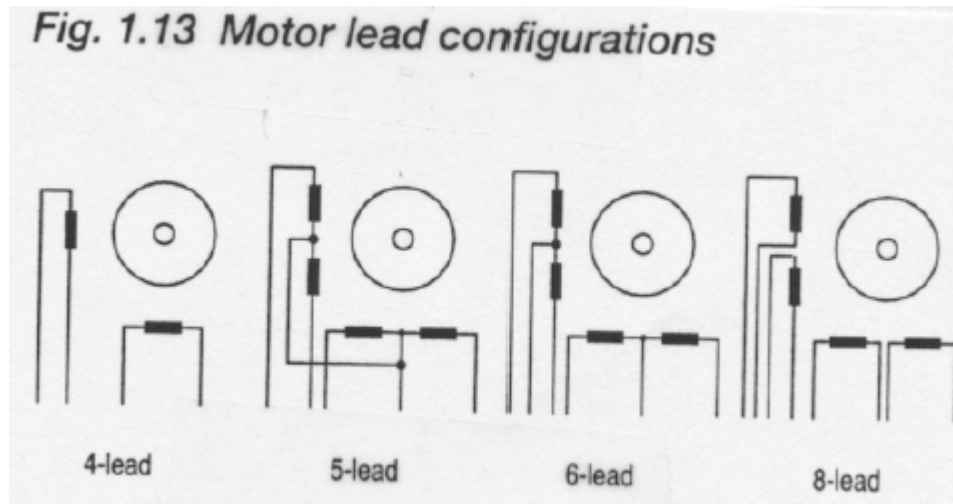
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# Step Motors

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*Fig. 1.13 Motor lead configurations*



# Selecting Step Motors

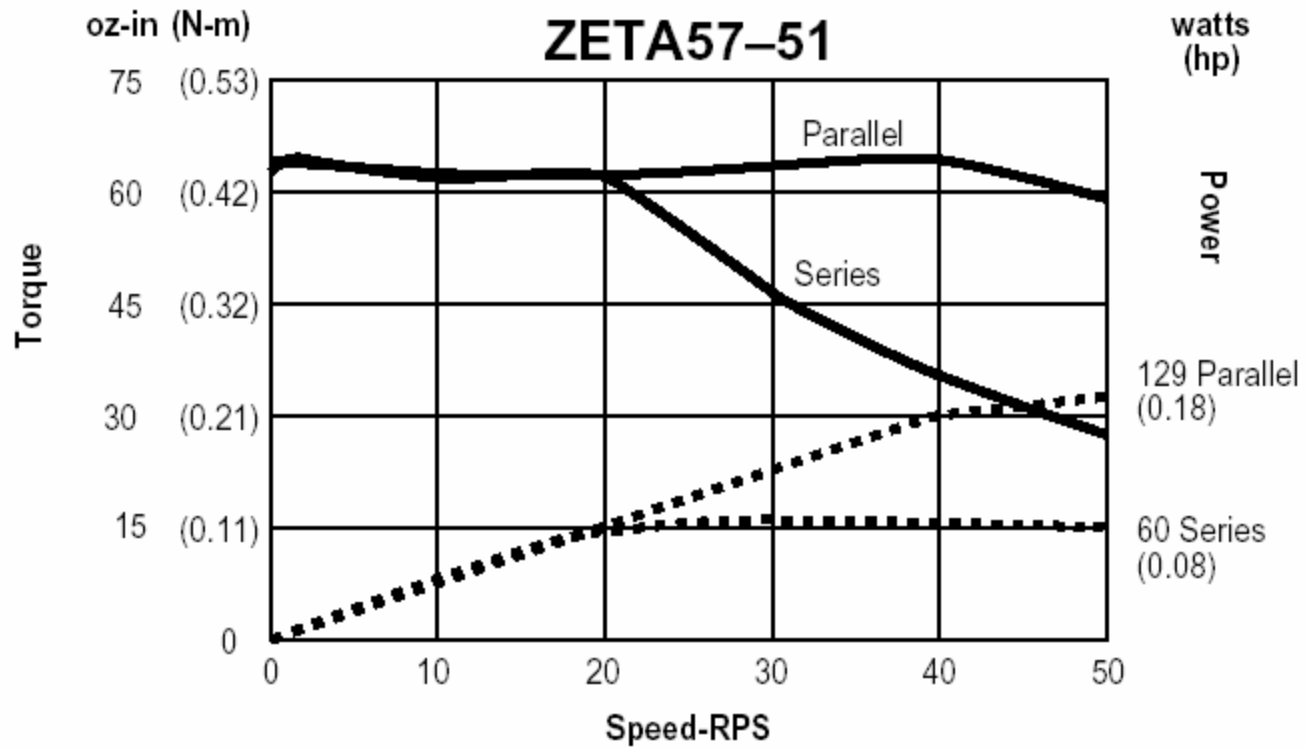
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- Torque
- Speed
- Current
- Lead configuration



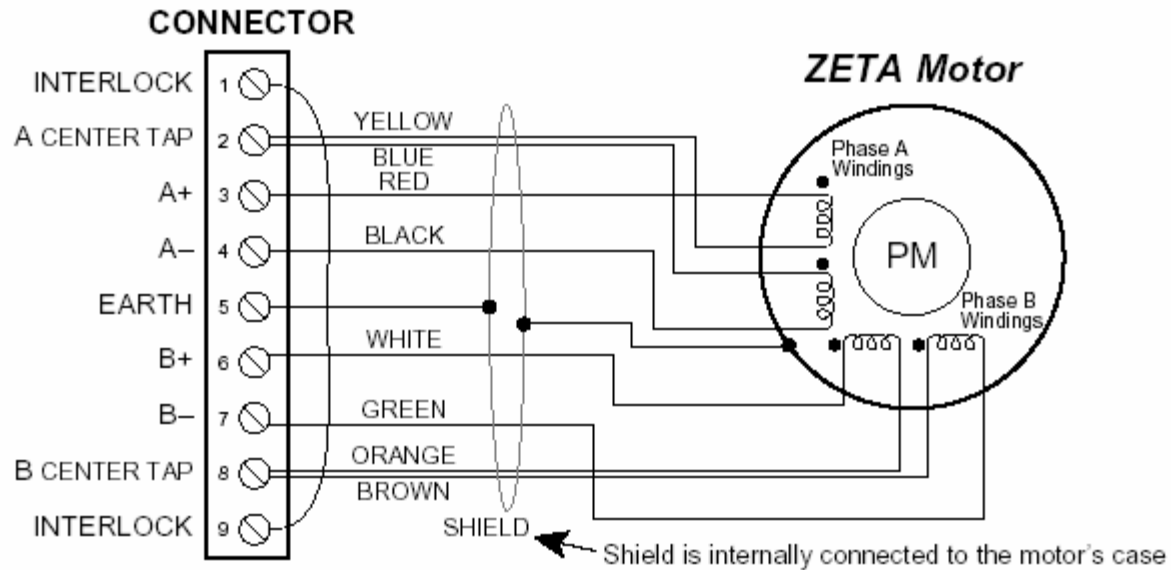
# Torque/Speed

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# Series/Parallel Wiring

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# Step Motor Drives

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- Resolution (full, half, microstepping)
- Current Limit (resistor or digital)
- AC powered or DC powered
- Pulse/Direction or Indexing

# Resolution

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- Full step/Half step
- Microstepping
  - x2,x4,x5,x8,x10,x16,x25,x32,x50,x64,x125,x128,x250,x256 common choices
- Max step frequency
  - PLC: 7kHz pulse rate => 2100 RPM at x1, 8.2RPM at x256 (1.8deg motor)
  - Compumotor 6104: 2MHz pulse rate => 2300RPM at x256
- Resonance problems