



*GE Industrial Systems*

---

# **Motor Selection Guide**

## **and Motor Application Matrix**



## Step 1: Motor Types

MOTOR TYPES	AC SINGLE PHASE					AC	DC
	SHADED POLE	PERM. SPLIT CAP	SPLIT PHASE	CAP. START	CAP. START CAP. RUN	THREE PHASE	PERM. MAG. COMPOUND SHUNT, SERIES
Starting Torque	VERY LOW	LOW	MOD-LOW	MOD-HIGH	MOD-HIGH	MOD-HIGH	MOD-VERY HIGH
GE Motor Types	KSP (1)	KCP (2)	KH (2)	KC (4)	KCR (5)	K (3)	BC, CD
Typical applications							BPB, BPA
Adjustable speed drives						A	A
Air moving (fans)							
Belt drive			A	A	B	A	A
Direct drive	A	A	A	B	B	A	A
Condenser	A	A	A	B	B	A	A
Evaporator	B	A	A	B	B	A	A
Farm/areation				A	A	A	
Farm/ventilating		A	A	A	A	A	
Industrial			A	A	A	A	A
Rooftop ventilator	B	B	A	B	B	A	
Checkout counters		B	A	A	A	A	
Centrifuges				A	A	A	
Compressors							
Air/small			A	B	B	A	A
Air/large				A	A	A	A
Paint sprayers			A	A	A	A	A
Refrigeration				A	A	A	
Concrete mixers			A	A	A	A	
Conveyors				A	A	A	A
Door operators		A	A	A	A	A	A
Exercise equipment			A	B	B	A	A
Farm equipment							
Barn cleaners				A	A	A	
Bunk feeders				A	A	A	
Dryers (grain)				A	A	A	
Elevators				A	A	A	
Grain augers				A	A	A	
Milking machines				A	A	A	
Silo unloaders				A	A	A	
Floor polishers			A	A	A		A
Food processing							
Blenders			A	B	B	A	
Grain mills				A	A	A	
Grinders				A	A	A	
Ice cream makers				A	A	A	
Ice makers			B	A	A	A	
Slicing machines			A	A	A	A	
Gear motors		B	A	A	A	A	A
Hospital							
Beds		B	A	B	B	A	
Suction pumps			A	B	B	A	
X-ray machines			A	B	B	A	A
Laundry equipment							
Dryers			A	A	A	A	
Extractors				A	A	A	
Washers				A	A	A	
Material handling							
Conveyors				A	A	A	A
Cranes				A	A	A	A
Elevators				A	A	A	A
Hoists				A	A	A	A
Oil burners			A	A			
Pumps							
Centrifugal			A	A	A	A	A
Contractor drainage			A	A	A	A	
Gasoline			B	A	A	A	
Hot Water Circulator			A	A	A	A	
Industrial			A	A	A	A	A
Jet			A	B	B	A	
Sump	B	A	A	B	B	A	
Sewage Extractor		B	A	A	A	A	
Swimming pool filter			A	B	B		
Submersible Sump	B	A	A	A	A	A	
Vacuum			A	A	A	A	
Water, high pressure			A	A	A	A	
Poultry processing				A	A	A	
Textile machinery				A	A	A	A
Tools, machine			A	A	A	A	A
Vending machines			A	B	B	A	A
Battery power							
Golf carts							A
Fork trucks							A
Lawn mowers							A
Motorized wheelchairs							A
Floor care equipment							A

## Step 2: Power Supply

AC Alternating Current

Single Phase<sup>(2)</sup>:Volts

115 230 115/230 60 Hz<sup>(1)</sup>

110 220 110/220 50 Hz<sup>(2)</sup>

Polyphase<sup>(1)</sup>: Volts

200 230/460 575 60 Hz<sup>(1)</sup>

220 380 220/380 50 Hz<sup>(2)</sup>

DC Direct Current<sup>(3)</sup>

Volts Battery: 12 - 24 - 36 - etc.

Generator: 115 - 230

Rectified: 90 - 180

## Step 3: Horsepower

Motor output

## Step 4: Speed-RPM

(Revolutions per minute)

3450<sup>(1)</sup> (2 pole)

Jet pumps, washer extractors, wood working tools.

1725<sup>(2)</sup> (4 pole)

General usage, fans, pumps, compressors, conveyors, feeders

1140<sup>(3)</sup> (6 pole)

Fans, gears, conveyors

850<sup>(4)</sup> (8 pole)

Direct drive fans

(other)

Lower RPM and multi-speed

## Step 5: Overload Protector

None<sup>(1)</sup>

No motor overload is necessary if motor is protected at the motor starter.

Automatic<sup>(2)</sup>

Designed to reset and restart motor after a cooling period. Typical uses are fans & pumps. CAUTION: DO NOT USE AUTOMATIC OVERLOAD WHERE UNEXPECTED RESTARTING WOULD BE HAZARDOUS TO EQUIPMENT OR PERSONS.

Manual<sup>(3)</sup>

Designed to prevent motor from becoming reenergized until reset by hand. Typical uses are shop tools & farm motors.

## Step 6: Enclosure

Open dripproof<sup>(1)</sup>

Use in clean, dry locations.

TENV-Air Over<sup>(2)</sup>

Use in shaft-mounted fan applications where foreign particles could get in motor.

TEFC & TENV<sup>(3)</sup>

Fan required to cool motor.

Use in dirty and low moisture areas. Suitable for most outdoor locations.

Severe duty<sup>(4)</sup>

For areas with corrosive agents in the air and high moisture locations.

Explosion proof<sup>(5)</sup>  
(hazardous duty)

Use in areas where explosive agents are in the atmosphere. Use when gases such as ether and gasoline or dusts such as coal, grain and metal are present.

## Step 7: Bearing

Sleeve<sup>(1)</sup>

Use where shaft is subject to moderate thrust in any direction. Must be oiled periodically.

Ball<sup>(2)</sup>

Use where high thrust is exerted on shaft and where low maintenance is required. Use in hard to relube locations.

**NOTES:** Superscripts (1), (2), (3), etc. denote relative cost with (1) being least cost.

A = Suggested

B = Alternate

### Step 8: Mounting

Extended thru bolts<sup>(1)</sup>

Base mounting<sup>(3)</sup>

C-face<sup>(4)</sup>

Use to mount motor or fan guard. Can be provided with or without base. Resilient cradle<sup>(3)</sup>. Rubber rings between motor and base to isolate vibration and reduce noise. Welded<sup>(2)</sup>. A solid base option for strong construction. Standard mount for some gears and pumps. Face has a machined rabbet.

### Step 9: Ambient

40°C (104°F)<sup>(1)</sup>

65°C (149°F)<sup>(2)</sup>

Temperature of air around an operating motor. Standard Optional, special for motors operating in high temperature areas.

### Step 10: Service Factor (S.F.)

S.F. of 1.15 to 1.4<sup>(2)</sup>

Standard on general purpose motors. These motors are designed to operate with additional load of 15% to 40% over nameplate Hp without overheating the motor.

S.F. of 1.0<sup>(1)</sup>

Standard on special service open and all standard totally enclosed motors. Not designed for over nameplate Hp.

### Step 11: Other Considerations

Rotation

Standard is CCW facing motor opposite shaft end. Motors are usually reconnectable for either rotation.

Duty cycle (running time from start to stop)

Continuous

Short time

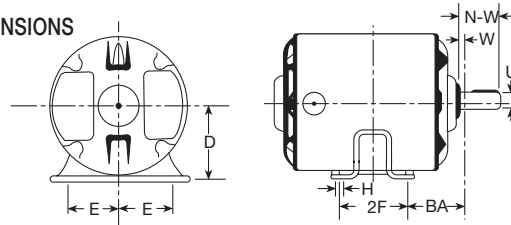
Motor runs for more than one hour. 1 hour, 30 min., 15 min., 5 min. Run this long without overheating. Then must cool.

Hp	RPM			
	3450	1725	1140	850
1/20	42	42		
	48	48	48	48
1/12	42	42		
	48	48	48	48
1/8	42	42		
	48	48	48	56
1/6	42			
	48	48	48	56
1/4	48	48	56	56
1/3	48	48		
		56	56	56
1/2	48	56	56	143T
3/4	56	56	56	145T
1	56	56	145T	182T
1-1/2	56	56	182T	184T
2	56	145T	184T	
3	145T	182T		
5	182T	184T		
7-1/2	184T			

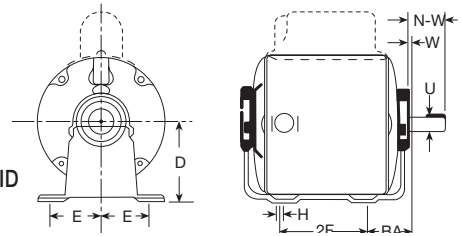
Frame sizes may vary with different motor types & enclosures.

### Step 12: NEMA Frame Sizes (Ref. single phase)

DIMENSIONS



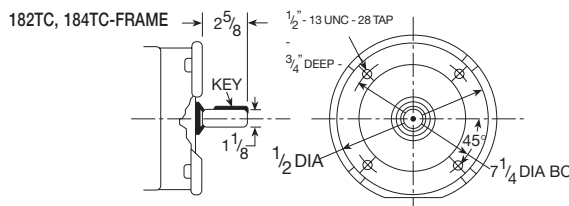
SOLID BASE



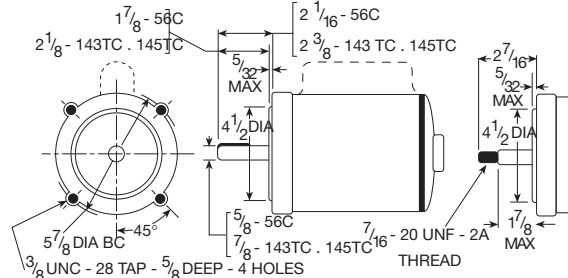
RESILIENT (OR SOLID CRADLE) BASE

NEMA Frame	All Dimensions							V	Key			
	D	2E	2F	BA	H	N-W	U		Min.	Wide	Thick	Long
42	2-5/8	3-1/2	1-11/16	2-1/16	9/32 slot	1-1/8	3/8	—	—	3/64 flat	—	
48	3	4-1/4	2-3/4	2-1/2	11/32 slot	1-1/2	1/2	—	—	3/64 flat	—	
56	3-1/2	4-7/8	3	2-3/4	11/32 slot	1-7/8	5/8	—	3/16	3/16	1-3/8	
56H	3-1/2	4-7/8	3 & 5	2-3/4	11/32 slot	1-7/8	5/8	—	3/16	3/16	1-3/8	
143T	3-1/2	5-1/2	4	2-1/4	11/32 dia.	2-1/4	7/8	2	3/16	3/16	1-3/8	
145T	3-1/2	5-1/2	5	2-1/4	11/32 dia.	2-1/4	7/8	2	3/16	3/16	1-3/8	
182T	4-1/2	7-1/2	4-1/2	2-3/4	13/32 dia.	2-3/4	1-1/8	2-1/2	1/4	1/4	1-3/4	
184T	4-1/2	7-1/2	5-1/2	2-3/4	13/32 dia.	2-3/4	1-1/8	2-1/2	1/4	1/4	1-3/4	

NEMA FACE MOUNT DIMENSIONS



56C, 143TC, 145TC-FRAME 56J-FRAME



### Step 13: NEMA Motor Frame Dimension Standards

GE Frame	NEMA Frame	Motor Types					
		KSP	KCP	KH	KC	KCR	K
29	42	1/35 - 1/3	1/30 - 1/3				
30	48	1/10 - 1/4	1/10 - 3/4	1/12 - 3/4	1/6 - 1/2		1/4 - 1/3
40	56		1/3 - 3/4	1/2 - 3/4	1/3 - 1 1/2	1/3 - 3	1/3 - 3
40	140				1 - 2	1 - 2	1 - 2
180	180				2 - 10	2 - 10	3 - 7 1/2

Hp range is listed for 4 pole motor. Hp will vary with motor speed

### Step 14: Hp Range Frame/Motor Types

### Step 15: See Motor Catalog for:

1. Installation
2. Maintenance
3. Safety Precautions
4. Terminology
5. Additional Application Information

NOTES: Superscripts (1), (2), (3), etc. denote relative cost with (1) being least cost.

A = Suggested

B = Alternate

## Motor Application Matrix

### AC

Motor Type	Hp Range	Speed Range	Starting Torque as a percent of full load torque	Characteristics	Typical uses
<b>Shaded Pole (KSP)</b>	1/80 - 1/4	variable 1050 1550 3000	very low 50 -100%	Light duty for small loads. Low in efficiency - usually air over required. Generally single voltage. Non-reversible.	Small fans & blowers Hair dryers Unit heaters Space heaters Humidifiers Seed cleaners Freezer blowers Small vent fans Small exhaust fans Window fans Floor fans Portable evap. coolers
<b>Permanent Split Capacitor (KCP)</b>	1/30 - 3/4	variable 825 1075 1625 3250	low 75 - 150%	Has a higher efficiency and power factor than shaded pole. Not recommended for belt drive. Normally single voltage and rotation. Adapts to solid state speed control.	Shaft mounted fans and blowers Room & central air conditioners -condenser fans -evaporator fans Furnace blowers Animal confinement fans Window fans Unit heaters Garage door openers
<b>Split Phase (KH)</b>	1/2 - 3/4	850 1140 1725 3450	moderate to low 130-170%	Use where low to medium starting torque suffices. Not adaptable to variable speed control. Usually single voltage, dual rotation.	Belted fans and blowers Air conditioning fans and blowers Office machines Centrifugal pumps Home appliances Oil burners Poultry feeders Attic fans Furnace blowers Small tools Lathes Door operators
<b>Capacitor Start (KC)</b>	1/6 - 5	850 1140 1725 3450	Moderate to high 200-400%	All purpose motors for high starting torque applications. Suitable for most heavy duty applications. Usually dual voltage, dual rotation. Capacitor is used to give high starting torque.	Compressors Conveyors Pumps Augers (grain, etc.) Cranes & hoists Machine tools Grain stirrers Ventilating fans Food equipment Vacuum pumps Manure pumps Milk coolers Elevators Cattle feeders Drying fans Aeration fans Gear motors
<b>Capacitor Start Capacitor Run (KCR)</b>	1/3 - 10	850 1140 1725 3450	Moderate to high 200-400%	The addition of a run capacitor improves efficiency, power factor and reduces load current. The run capacitor may be added just to improve efficiency, or to match motor losses with the cooling system.	Essentially all capacitor start motors above 1 Hp are capacitor start, capacitor run. Same typical uses as capacitor start. Barn cleaners Silo unloaders Feed mills Large bucket elevators
<b>Three Phase (K)</b>	1/4 - 250+	850 1140 1725 3450	Moderate to high 200-300%	For applications where three phase power is available. Relatively simple construction with no switch, centrifugal mechanism, capacitors, or start windings.	Same typical uses as capacitor start and capacitor start, capacitor run. May be used on AC variable speed drive applications with appropriate inverter control.

### DC

<b>Permanent Magnet</b>	1/20 - 3	variable 1140 1725 2500	Moderate 200-300%	Moderate starting torque and good running speed regulation. High efficiency since no field losses; therefore, good for battery and rectified power operation. Simple, reliable construction. Replacing shunt wound field motors to a great extent. Easy to reverse.	Adjustable speed drives -Industrial production equip. -Machine tools -Tape reel drives Machinery -Material handling -Medical equipment -Textile equipment -Agricultural equip. Fans Personnel carriers Wheelchairs EV power steering Elevator door Commercial door operators Electric vehicle accessories
<b>Shunt Wound</b>	1/12 - 250+	variable 1140 1725 2500	High 700-800%	High starting torque. Used where constant speed is needed at any control setting or where large speed range is required. Operated from adjustable voltage power supplies.	Business equipment Conveyors Machine tools Material handling Feed drives Textile machines Presses Packaging machines

NOTE: There are many other types of DC motors available, such as compound, compensated shunt, and series. Application of these may require factory help.



<http://www.ge.com>

GE Industrial Systems