

AutomationDirect AC Motors Selection Overview

EPAct, High and Premium Efficiency What does it all mean?

EPAct (1992)

In 1992, the U.S. Congress passed legislation requiring that general purpose Design A & B motors meet minimum efficiency requirements, and this legislation was called the Energy Policy Act of 1992. Previously, there had been no U.S. standards set forth for motor energy efficiency. Since 1997 (when EPAct '92 was first enforced), two-, four-, and six-pole general purpose Design A & B motors had to meet EPAct guidelines. Since then, most general purpose motors manufactured and/or sold in the U.S. have met these requirements.

Premium Efficiency (EISA 2007)

In December 2010, a new level of energy efficiency mandate went into effect. The Energy Independence and Security Act of 2007 mandated that all AC industrial motors as described below must meet Premium Efficiency standards. The NEMA trade group was instrumental in getting this legislation passed, so many people refer to the high efficiency motors by their nickname – NEMA Premium®. All applicable motors manufactured or imported into the U.S. after December 2010 must meet the Premium Efficiency guidelines.

Motors Covered Under EISA 2007 (Premium Efficiency Mandate)	
Included – must meet the new Premium Efficiency standards – Industrial AC electric squirrel-cage general-purpose motors as follows:	
Single speed; Polyphase; 1–200 hp with 3-digit frame sizes; 2, 4, & 6 pole (3600, 1800, & 1200 rpm); NEMA design A & B (including IEC equivalent); Continuous rated	
Not Included in Premium Efficiency standards, but must now meet EPAct standards:	
JM; JP; Round body (footless); 201–500 hp; Fire pump; U-frame; Design C; 8-pole	
Certain motors (Inverter/Vector Duty, NEMA design D, etc.) are not covered by EISA 2007.	
For full text, visit www.energy.senate.gov and click "ENERGY INDEPENDENCE & SECURITY ACT OF 2007".	

Nominal Full-Load Efficiency Standards Comparisons (%)						
Enclosed Electric Motors, Random Wound, 60 Hz, 600V or Less						
Motor HP	1200 rpm [6-pole]		1800 rpm [4-pole]		3600 rpm [2-pole]	
	EPAct	Premium Efficiency	EPAct	Premium Efficiency	EPAct	Premium Efficiency
1	80.0	82.5	82.5	85.5	75.5	77.0
1.5	85.5	87.5	84.0	86.5	82.5	84.0
2	86.5	88.5	84.0	86.5	84.0	85.5
3	87.5	89.5	87.5	89.5	85.5	86.5
5	87.5	89.5	87.5	89.5	87.5	88.5
7.5	89.5	91.0	89.5	91.7	88.5	89.5
10	89.5	91.0	89.5	91.7	89.5	90.2
15	90.2	91.7	91.0	92.4	90.2	91.0
20	90.2	91.7	91.0	93.0	90.2	91.0
25	91.7	93.0	92.4	93.6	91.0	91.7
30	91.7	93.0	92.4	93.6	91.0	91.7
40	93.0	94.1	93.0	94.1	91.7	92.4
50	93.0	94.1	93.0	94.5	92.4	93.0
60	93.6	94.5	93.6	95.0	93.0	93.6
75	93.6	94.5	94.1	95.4	93.0	93.6
100	94.1	95.0	94.5	95.4	93.6	94.1
125	94.1	95.0	94.5	95.4	94.5	95.0
150	95.0	95.8	95.0	95.8	94.5	95.0
200	95.0	95.8	95.0	96.2	95.0	95.4

AutomationDirect AC Motors Selection Overview

General-purpose or inverter-duty motor?

How to choose a general purpose motor vs. an inverter-duty motor

General purpose motors have been around for many years. They are the workhorse of almost every industry. An inverter-duty motor is a much newer concept that was necessary as general purpose motors began to be driven by VFDs (inverters or AC drives). An inverter duty motor can withstand the higher voltage spikes produced by all VFDs (amplified at longer cable lengths) and can run at very slow speeds without overheating. This performance comes at a cost: inverter-duty motors can be much more expensive than general purpose motors. Guidelines for choosing an IronHorse general purpose motor vs. an inverter-duty motor are given below. If your application falls within the guidelines below, there is no need to apply an inverter-duty motor.

NOTE: Marathon inverter-duty motors have limitations as well. Please see the Marathon section for more details.

Background: For many years, AC motors were driven by across-the-line contactors and starters. The electricity sent to the motor was a very clean sine wave at 60Hz. Noise and voltage peaks were relatively small. However, there were drawbacks: they only ran electrically at one speed (speed reduction was usually handled by gearboxes or some other, usually inefficient, mechanical means) and they had an inrush of electrical current (when the motor was first turned on) that was usually 5 to 6 times the normal current that the motor would consume. The speed reduction apparatus was expensive and bulky, and the inrush would wreak havoc with power systems and loading (imagine an air conditioning system in an old house - when the compressor would kick on, the lights would dim; now imagine the same circumstances with a motor the size of a small car).

Note: The following discussion applies only to 3-phase motors.

Enter the VFDs (variable frequency drives):

Drives were introduced to allow the speed of these motors to be changed while running and to lessen the inrush current when the drive first starts up. To do this, the drive takes the incoming 60Hz AC power and rectifies it to a DC voltage (every drive has a DC bus that is around 1.414 (sqrt of 2) * incoming AC Line Voltage).

This DC voltage is then “chopped” by power transistors at very high frequencies to simulate a sine wave that is sent to the motor [see Figure 1]. By converting the incoming power to DC and then reconvert it to AC, the drive can vary its output voltage and output frequency, thus varying the speed of a motor. Everything sounds great, right? We get to control the frequency and voltage going out to the motor, thus controlling its speed.

Some things to watch out for: A VFD-driven general purpose motor can overheat if it is run too slowly. (Motors can get hot if they're run slower than their rated speed.) Since most general purpose motors

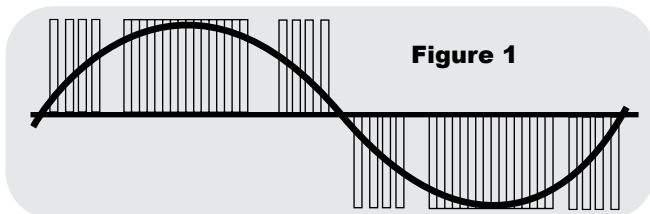


Figure 1

cool themselves with shaft-mounted fans, if the motor overheats, bearing and insulation life will be reduced. Therefore there are minimum speed requirements for all motors.

The voltage “chopping” that occurs in the drive actually sends high-voltage spikes (at the DC bus level) down the wire to the motor. If the system contains long cabling, there are actually instances where a reflected wave occurs at the motor. The reflected wave can effectively double the voltage on the wire. This can lead to premature failure of the motor insulation. Long cable lengths between the motor and drive increase the harmful effects of the reflected wave, as do high chopping frequencies (listed in drive manuals as carrier frequencies). Line reactors, 1:1 transformers placed at the output of the drive, can help reduce the voltage spikes going from the drive to the motor. Line reactors are used in many instances when the motor is located far from the drive [see Figure 2].

In summary, general purpose motors can be run with drives in many applications; however inverter-duty motors are designed to handle much lower speeds without overheating and they are capable of withstanding higher voltage spikes without their insulation failing. With the increased performance comes an increase in cost. This additional cost can be worth it if you need greater performance.

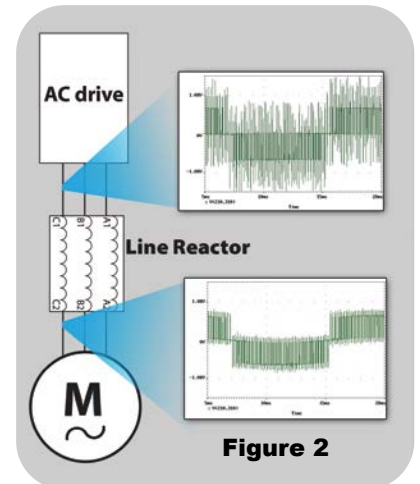


Figure 2

The considerations for applying IronHorse motors are given below.

Heat considerations

	IronHorse speed ratio	For an 1800 RPM motor, minimum IronHorse speed is:
Variable Torque applications (fans, centrifugal pumps, etc.)	5:1 (EPAct motors) 10:1 (PE motors)	1800/5 = 360RPM 1800/5 = 180RPM
Constant Torque Applications (conveyors, extruders, etc.)	2:1 (EPAct motors) 4:1 (PE motors)	1800/2 = 900RPM 1800/4 = 450RPM

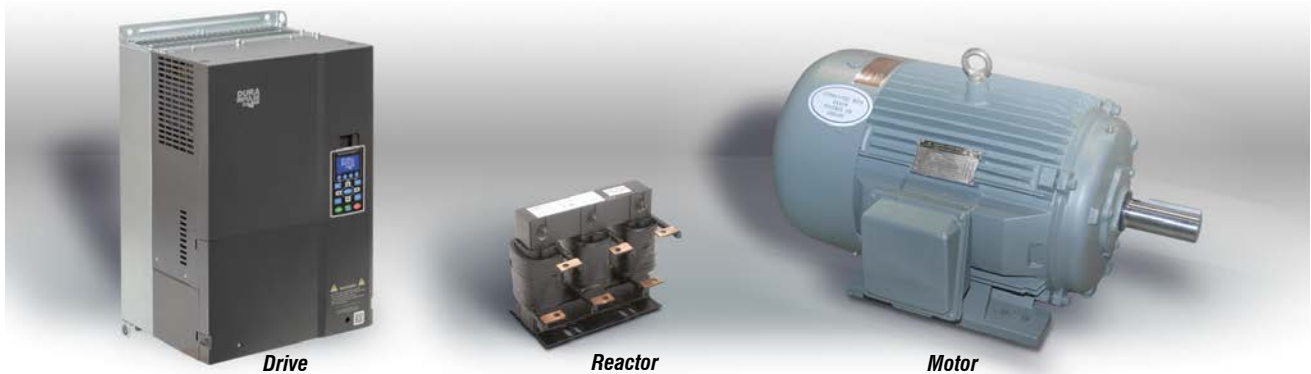
Voltage Spike considerations

	Max cable distance from drive to IronHorse motor	Max cable distance with a 3% line reactor between drive and IronHorse motor
For use with 230V and 460V VFDs*	125 ft	250 ft

* Up to 6kHz carrier frequency

IronHorse® General-Purpose AC Motors

Using IronHorse General-Purpose Motors with AC Drives



AC drive motor control vs. across-the-line motor control

General purpose AC induction motors are typically controlled by across-the-line starters, i.e. contactors, manual motor starters, etc. However, three-phase general purpose motors can also be controlled by AC drives under certain conditions. (Single-phase AC motors cannot be controlled by typical three-phase AC drives.)

Across-the-line control applies full voltage to the motor at startup, and has several disadvantages.

- High inrush current - startup inrush current is typically 5-6 times the normal motor full load current, and can significantly increase utility bills.
- Inability to change speeds - the motor runs only at its rated speed.
- Inefficiency in some applications - fan and pump applications require ON/OFF control or valves/dampers to control flow.
- Contact maintenance - arcing caused by high inrush and breaking currents significantly reduce the motor starter's life span.

Many applications can use AC drive control for three-phase AC induction motors, which has several advantages:

- Lower inrush current at motor startup
- Ability to change motor speed
- Greater efficiency in some applications. - fan and pump applications can use the AC drive to provide both motor control and flow control. The drive can control the flow by varying the motor speed, and therefore eliminate the need for inefficient valves/dampers.
- Solid state power delivery; minimal maintenance.

NOTE: AC drive (VFD) control is applicable only for three-phase AC motors (three-phase AC drives cannot be used to control single-phase motors)

General purpose AC induction motors are not designed specifically for use with AC drives, so there are three major considerations for AC drive control of three-phase general purpose motors:

1. Heat considerations for AC drive control

Fan-cooled motors are designed to provide sufficient insulation cooling when the motors run at rated speed. The cooling ability of fans is reduced when motors run at lower speeds, and the insulation in general purpose motors is not designed for this condition. Therefore, there are limitations on how slowly general purpose motors can be continuously run without prematurely causing motor insulation failure.

• Constant Torque (CT) Applications

PE motors: 4:1 (1/4 rated speed)

EPAct motors: 2:1 (1/2 rated speed)

The CT minimum continuous speed for an IronHorse general purpose motor is either one quarter or one half of its rated speed, as shown in the motor Performance Data tables. (Constant torque loads require the same amount of torque from the motor regardless of speed; e.g., conveyors, cranes, machine tools.)

• Variable Torque (VT) Applications

PE motors: 10:1 (1/10 rated speed)

EPAct motors: 5:1 (1/5 rated speed)

The VT minimum continuous speed for an IronHorse general purpose motor is either one tenth or one fifth of its rated speed, as shown in the motor Performance Data tables. (Variable torque loads require less torque at lower speeds, resulting in less heat generated by the motor; e.g., fans, centrifugal pumps.)

If your application requires motors to run at speeds below those described above, use our Marathon inverter duty motors. Inverter duty motors can run fully loaded at very low speeds without being damaged by overheating.

2. Voltage spike considerations for AC drive control

All AC drives cause large voltage spikes between the drive and the motor, and long cable distances increase these spikes even more. Therefore, there are maximum cable lengths that can be run between the drive and the motor. Line (load) reactors can be installed near the drive output to reduce the voltage spikes.

- 230V and 460V **Without Reactor** – 125 ft maximum cable length between drive and motor

- 230V and 460V **With Reactor** – 250 ft maximum cable length between drive and motor

If your application requires cable lengths longer than those described above, please use our Marathon inverter-duty motors.

3. Carrier frequency limitation for AC drive control

The AC Drive carrier frequency should be set to 6kHz or less.

AC Motor Selection – IronHorse[®] General Purpose Motors



IRONHORSE[®]
AUTOMATIONDIRECT

IronHorse [®] General Purpose Motor Selection					
Characteristics	1-Phase		3-Phase		
	56C/56HC Frame Rolled Steel***	T-Frame Farm Duty	56C/56HC Frame Rolled Steel***	56C Frame Stainless Steel	Cast Iron and Rolled Steel T & TC Frames
Electrical Characteristics					
Horsepower range	1/3 – 2	2 - 10	1/3 – 3	1/3 – 3/4	1-300(T); 1-30(TC)
Base speed (# Poles)	1800 (4), 3600 (2)	1800 (4)	1800 (4), 3600 (2)		1200 (6); 1800 (4); 3600 (2)
Standard Voltage	115/208-230, 115/230	208-230	208-230/460		208-230/460, 460
Phase / Base Frequency (Hz)	1 / 60		3 / 60		
Service Factor	1.15		1.15 (line) ; 1.0 (drive)		1.25 (TEFC, Line); 1.15 (ODP, Line); 1.00 (drive)
Design Code (NEMA)	L, N	L	B		
Insulation Class	F				
Insulation System	dip & bake twice	Double VPI	dip & bake	double dip & bake	TEFC : VI (Vacuum Impregnation); ODP: Double VPI
Duty Cycle	continuous				
Thermal protection	none	yes	none		
Mechanical Characteristics					
Frame size (mounting)	56C or 56HC	182T – 215T	56C or 56HC		143T/TC - 449T
Enclosure	TEFC				TEFC / ODP (MTCP2 / MTDP)
Frame material	rolled steel			304 stainless steel	Cast Iron / Rolled Steel
End bracket material	aluminum	aluminum	aluminum	304 stainless steel	Cast Iron / Aluminum 143T-256T, Cast Iron 284T-326T (TEFC / ODP)
Junction box material	steel	Base: Aluminum, Cover: Steel	steel	304 stainless steel	Cast Iron / Steel
Fan guard material	steel	steel	steel	304 stainless steel	Steel / N/A for ODP
Fan material	polypropylene plastic	plastic	plastic	heat-resistant polyethylene	Plastic / N/A for ODP
Lead termination	junction box				
Standard mounting	C-Face with Removable Rigid Base	Rigid Base	C-Face with Removable Rigid Base	C-Face with Rigid Base C-Face with Round Body	Rigid Base, C-Face with Rigid Base (1-100 hp)
Drive end shaft slinger	yes	no	yes		Yes / No 143T-256T, Yes 284T-326T
Paint	black	green	black	n/a	Grey / Blue
Bearings	ball				1-300HP - 2P, 1-75 HP - 4P & 6P: Ball; 100-300 HP - 4P & 6P: Roller
Grease	Mobil Polyrex EM	NS7 ENS	Mobil Polyrex EM	Korschun lithium-based	Mobil Polyrex EM / NS7 ENS (TEFC / ODP)
Standard junction box assembly position	F1				F1 (Some sizes reversible to F2)
Performance Characteristics					
Constant Torque speed range	n/a	n/a	2:1 (MTR2, MTSS); 4:1 (MTRP, MTR2)		10:1
Variable Torque speed range	n/a	n/a	5:1 (MTR, MTSS); 10:1 (MTRP, MTR2)		20:1
Constant Horsepower speed range	n/a	n/a	1.5:1		1.5:1
Temperature rise	F	B			
Encoder provisions	none				
Other Characteristics					
Warranty*	2 years			1 year	2 Years
Agency Approvals **	CE, cCSA _{US}	CE, cUR _{US}	cCSA _{US}		CE, cCSA _{US} / CE, cUR _{US}

* See Terms and Conditions for motor warranty explanation.

1) For warranty on IronHorse motors below 50 hp, warranty service can be arranged through AutomationDirect.

2) For warranty on IronHorse motors 50 hp and above, motors must be inspected by a local EASA motor repair or service center; (see AutomationDirect Terms & Conditions).

** To obtain the most current agency approval information, see the Agency Approval Checklist on the specific part number's web page.

*** 56HC motors are capable of 56C C-face mounting, and are also compatible with 56, 143T, and 145T foot mounting dimensions.

IronHorse® General-Purpose AC Motors

MTF2, MTDP, MTR2, MTCP2, & MTSS

Model Overview

IronHorse motors are manufactured by leading motor suppliers with over 20 years experience delivering high-quality motors to the demanding U.S. market. Our suppliers produce motors in ISO9001 facilities, and test the motors during production and after final assembly. This is how we can stand behind our IronHorse motors with a two-year warranty (one year for Stainless Steel).



**Single-Phase
Farm Duty T-Frame**



**Single-Phase
Rolled Steel 56C Frame**



**Three-Phase
Rolled Steel 56C Frame**



**Three-Phase Premium Efficiency
Rolled Steel Open Drip-Proof**



**Three-Phase
Stainless Steel 56C – Round Body**



**Three-Phase
Stainless Steel 56C – Rigid Base**



**Three-Phase Premium Efficiency
Cast Iron T-Frame**



**Three-Phase Premium Efficiency
Cast Iron TC Frame**

The IronHorse line of motors includes:

- **MTR2 Series:** TEFC 56(H)C-frame **single-phase** AC motors with rolled-steel frames; flange mount and removable mounting feet; 0.33–2 hp
- **MTF2 Series:** TEFC T-frame **single-phase** Farm-Duty AC motors with rolled-steel frames and mounting feet; 2–10 hp
- **MTR2 Series:** TEFC 56C-frame **three-phase** AC motors with rolled-steel frames; flange mount and removable mounting feet; 0.33–0.75 hp
- **MTRP Series:** TEFC 56C/HC-frame **three-phase** AC motors with rolled-steel frames; removable base and C-face mount; 1–3 hp
- **MTSS Series:** TEFC 56C-frame **three-phase** AC motors with stainless-steel frames; flange mount and round bodies or rigid mounting feet; 0.33–0.75 hp
- **MTCP2 Series:** TEFC T-frame **three-phase** Premium Efficiency AC motors with cast-iron frames and mounting feet; 1–300 hp (TC-frame [C-face] 1–30 hp)
- **MTDP Series:** Open Drip-Proof **three-phase** Premium Efficiency AC motors with rigid base mount; motor rating range - 1 to 50 hp.
- Replacement switches, junction boxes, and start and run capacitors available for IronHorse single-phase motors
- Replacement bases, fans, and fan shrouds available for many IronHorse motors
- Accessory C-flange kits available for flange mounting of IronHorse three-phase cast iron and rolled steel T-frame Premium Efficiency motors
- STABLE motor slide bases for adjustable mounting of NEMA motors from 56 to 449T (adjustable stainless steel bases not available)

IronHorse® Farm-Duty AC Motors – 1-Phase

T-Frame TEFC Motors – Single-Phase 2 to 10 hp

Features

- 208-230VAC 1-phase
- Totally Enclosed Fan Cooled (TEFC) enclosure
- IP55 environmental rating
- NEMA T-frame
- Rolled-steel housing
- Rigid mounting base
- Can be mounted in horizontal or vertical orientation
- Steel fan cover
- Class-10 manual-reset locked-rotor thermal protector (motor thermal overload must be provided separately)
- Large easy-to-wire junction box with rubber gasket
- Heavy duty oversized ball bearings
- High tensile strength steel shaft
- Mylar nameplate with easy-to-read wiring diagram
- Electrically reversible
- NEMA design L
- Class F winding insulation
- VPI (Vacuum and Pressure Impregnation) insulation process
- Service Factor: 1.15 @ 230VAC; 1.0 @ 208VAC
- Two year warranty
- cUR US certified, CE

Accessories Available

- Start capacitors (replacement/spare)
- Run capacitors (replacement/spare)
- Centrifugal switches (replacement/spare)
- Stationary switches (replacement/spare)
- Locked rotor thermal overload switches (replacement/spare)
- Junction boxes (replacement/spare)
- Fans (replacement/spare)
- Fan shrouds (replacement/spare)
- C-face kits

Applications

- Conveyors
- Fans
- Pumps
- Air compressors
- Other farm equipment



Motor Specifications – Single-Phase Farm-Duty Motors

Part Number	Price	HP	Base RPM	Voltage	Housing	NEMA Frame	Service Factor	FL Amps @ 208/230VAC	Approx Weight (lb)	Drawing Link
MTF2-002-1B18-182	\$485.00	2 hp	1800rpm	208-230 VAC	TEFC IP55	182T	1.15 @ 230 VAC, 1.0 @ 208 VAC	9.3 / 8.5	67	PDF
MTF2-003-1B18	\$559.00	3 hp				184T		13.5 / 12.5	76	PDF
MTF2-005-1B18	\$748.00	5 hp				184T		22.2 / 20.2	100	PDF
MTF2-7P5-1B18-215	\$1,060.00	7 1/2 hp				215T		31.5 / 28.7	134	PDF
MTF2-010-1B18	\$1,171.00	10 hp				215T		45.2 / 38.8	149	PDF

Notes:

- 1) Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
- 2) Certain heavy and oversized items can be shipped only via LTL. Check our web site for current shipping method constraints by part number.
- 3) Operate on 230VAC +/- 10% (1.15 @ 230VAC; 1.0 S.F. @ 208V), single-phase power only.

Performance Data – Single-Phase Farm-Duty Motors

Part Number	HP	NEMA Design	FL RPM	Current @ 230V (Amps)			Torque (lb-ft)			FL Efficiency (%)	FL Power Factor	Rotor Inertia (lb-ft ²)
				230V No Load	Full Load	Locked Rotor	Full Load	Locked Rotor	Break-down			
MTF2-002-1B18-182	2 hp	215T	1764	3.0	8.5	78.6	6.01	21.8	22.1	84.0	0.92	0.27
MTF2-003-1B18	3 hp		1769	4.2	12.5	89.2	8.76	24.9	24.4	84.4	0.91	0.34
MTF2-005-1B18	5 hp		1769	6.3	20.2	170.7	14.7	57.2	57.3	86.4	0.92	0.49
MTF2-7P5-1B18-215	7 1/2 hp		1767	8.2	28.7	238.5	21.91	82.8	82.2	86.6	0.96	0.74
MTF2-010-1B18	10 hp		1765	11.79	38.8	365.8	29.93	119.7	122.7	87.5	0.96	0.85

IronHorse[®] Rolled-Steel AC Motors – 1-Phase

56C/56HC Frame TEFC Motors – Single-Phase 0.33 to 2 hp

Features

- Totally Enclosed Fan Cooled (TEFC) enclosure
- IP43 environmental rating
- NEMA 56C or 56HC flange mount (varies by model)
- Rolled steel shell frame / cast aluminum end bell
- Removable base / bolt-on/bolt-off mounting feet
- No mounting orientation restrictions
- Steel fan cover
- Large all-metal capacitor cover with rubber gasket and oversized capacitors
- Large easy-to-wire junction box with rubber gasket
- Heavy duty oversized ball bearings
- High tensile strength steel shaft

- Large Mylar nameplate with easy-to-read wiring diagram
- Electrically reversible
- NEMA design L or N (varies by model)
- Class F winding insulation
- Service Factor: 1.15
- Two year warranty
- cCSA_{US} certified, CE

Accessories Available

- Start capacitors (replacement/spare)
- Run capacitors (replacement/spare)
- Centrifugal switches (replacement/spare)
- Stationary switches (replacement/spare)
- Junction boxes (replacement/spare)
- Fans (replacement/spare)
- Fan shrouds (replacement/spare)
- Motor bases (replacement/spare)

Applications

- Conveyors
- Fans
- Gear reducers
- Pumps



MTR Series 1-phase motor
(model with run capacitor shown)



MTR2 Series 1-phase motor
(model without run capacitor shown)

Motor Specifications – Single-Phase 56C/56HC Frame Motors

Part Number	Price	HP		Base RPM		1-phase Voltage		Housing	NEMA Frame	Service Factor		F.L. Amps		Approx Weight (lb)
		60 Hz	50 Hz	60 Hz	50 Hz	60Hz	50Hz			60Hz	50Hz	115V/230V 60Hz	110/220V 50Hz	
MTR2-P33-1AB18	\$171.00	1/3	1/4	1800	1500	115/230	110/220	TEFC rolled steel frame with cast aluminum end bell F1 conduit box location	56C flange mount	1.15	1	5.2 / 2.6	5.4 / 2.7	22
MTR2-P50-1AB18	\$188.00	1/2	1/3									7.2 / 3.6	7.2 / 3.6	25
MTR2-P75-1AB18	\$204.00	3/4	1/2									10.0 / 5.0	9.6 / 4.8	29
MTR2-001-1AB18	\$209.00	1	3/4									13.0 / 6.5	12.4 / 6.2	36
MTR2-1P5-1AB18	\$248.00	1-1/2	1									14.5 / 7.3	14.0 / 7.0	37
MTR2-002-1AB18	\$287.00	2	1-1/2									19.6 / 9.8	23.4 / 11.7	44
MTR2-P33-1AB36	\$171.00	1/3	1/4	3600	3000	115/230	110/220	TEFC rolled steel frame with cast aluminum end bell F1 conduit box location	56C	1.15	1	5.4 / 2.7	5.4 / 2.7	21
MTR2-P50-1AB36	\$177.00	1/2	1/3									6.5 / 3.3	6.4 / 3.2	23
MTR2-P75-1AB36	\$196.00	3/4	1/2									9.2 / 4.6	9.2 / 4.6	27
MTR2-001-1AB36	\$207.00	1	3/4									11.5 / 5.8	10.2 / 5.1	30
MTR2-1P5-1AB36	\$227.00	1-1/2	1									13.0 / 6.5	11.4 / 5.7	31
MTR2-002-1AB36	\$266.00	2	1-1/2									17.0 / 8.5	14.6 / 7.3	37

Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.

IronHorse® Open Drip-Proof AC Motors – 3-Phase

T-Frame ODP Motors – Three-Phase – 1 to 50hp



MTDP Series 3-Phase Motor

IronHorse® MTDP, open drip-proof motors range in size from 1hp to 50hp at 1800 rpm and 3hp, 5hp, and 7.5 hp at 3600 rpm. Frame sizes are available from 143T to 326T. All models have a rolled steel frame; frame sizes up to 256T have cast aluminum end bells, while frame sizes of 284T or larger have cast iron end bells. All frame sizes have a fixed base.

Features

- Open drip-proof enclosure
- Rolled steel shell frame / cast aluminum or cast iron end bells
- Large easy-to-wire junction box with rubber gasket
- Heavy duty oversized ball bearings
- High tensile strength steel shaft
- Electrically reversible
- Inverter capable (3-phase only)
- NEMA design B
- Class F winding insulation
- Service Factor: 1.15 across-the-line (1.0 for 3-phase with AC drive)
- Two year warranty
- cUR_{US} certified, CE

Accessories Available

- Junction boxes (replacement/spare)
- C-face kits
- Drive end endbell
- Opposite drive end endbell
- Current diverter rings (CDRs)

Applications

- Conveyors
- Fans
- Gear reducers
- Pumps

IronHorse® Open Drip-Proof AC Motors – 3-Phase

T-Frame ODP Motors – Three-Phase – 1 to 50 hp

Motor Specifications – Three-Phase T-Frame ODP Motors – 1800 & 3600 RPM										
Part Number	Price	HP	Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps @ 208/230V/460V 60Hz	Approx Weight (lb)	Drawing Links	
1800 RPM										
<u>MTDP-001-3BD18</u>	\$257.00	1 hp	208-230/460 VAC	ODP IP23	143T	1.15 (sine), 1.0 (drive)	2.9 / 2.6 / 1.3	33.1	PDF	
							3.1 / 2.8 / 1.4			
<u>MTDP-1P5-3BD18</u>	\$319.00	1 1/2 hp					145T	4.6 / 4.2 / 2.1	34.2	PDF
<u>MTDP-002-3BD18</u>	\$339.00	2 hp					145T	5.9 / 5.4 / 2.7	38.6	PDF
<u>MTDP-003-3BD18</u>	\$411.00	3 hp					182T	8.4 / 7.6 / 3.8	68.3	PDF
								8.7 / 7.8 / 3.9		
<u>MTDP-005-3BD18</u>	\$485.00	5 hp					184T	13.6 / 12.4 / 6.2	91.5	PDF
								13.7 / 12.4 / 6.2		
<u>MTDP-7P5-3BD18</u>	\$662.00	7 1/2 hp					213T	20.7 / 18.8 / 9.4	140.2	PDF
								21.7 / 19.6 / 9.8		
<u>MTDP-010-3BD18</u>	\$789.00	10 hp					215T	28.3 / 25.6 / 12.8	156.0	PDF
<u>MTDP-015-3BD18</u>	\$1,081.00	15 hp					254T	37.6 / 34.2 / 17.1	214.9	PDF
								38.5 / 34.8 / 17.4		
<u>MTDP-020-3BD18</u>	\$1,325.00	20 hp					256T	49.5 / 45.0 / 22.5	260.1	PDF
								51.5 / 46.6 / 23.3		
<u>MTDP-025-3BD18</u>	\$1,612.00	25 hp	284T	66.3 / 60.0 / 30.0	300.0	PDF				
<u>MTDP-030-3BD18</u>	\$1,836.00	30 hp	286T	79.4 / 71.8 / 35.9	330.0	PDF				
				77.6 / 70.2 / 35.1						
<u>MTDP-040-3BD18</u>	\$2,398.00	40 hp	324T	105.6 / 95.8 / 47.9	440.0	PDF				
<u>MTDP-050-3BD18</u>	\$2,763.00	50 hp	326T	130.3 / 117.4 / 58.7	470.0	PDF				
				131.2 / 118.6 / 59.3						
3600 RPM										
<u>MTDP-003-3BD36</u>	\$408.00	3 hp	208-230/460 VAC	ODP IP23	145T	1.15 (sine), 1.0 (drive)	7.9 / 7.2 / 3.6	39.7	PDF	
							8.2 / 7.4 / 3.7			
<u>MTDP-005-3BD36</u>	\$468.00	5 hp					182T	12.3 / 11.8 / 5.9	64.9	PDF
<u>MTDP-7P5-3BD36</u>	\$664.00	7 1/2 hp	184T	18.9 / 17.2 / 8.6	78.1	PDF				
				19.2 / 17.4 / 8.7						
Specifications in GREEN apply to motors manufactured after September 2020 Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product. IronHorse Motors with product numbers ending in P are Premium Efficiency motors and meet or exceed all current efficiency guidelines.										

IronHorse® Rolled-Steel AC Motors – 3-Phase

56C/56HC-Frame TEFC Motors – Three-Phase – 0.33 to 3 hp

Features

- Totally Enclosed Fan Cooled (TEFC) enclosure
- NEMA 56C or 56HC flange mount (56HC are suitable for 56, 143T, or 145T frame mounting dimensions)
- Rolled steel shell frame / cast aluminum end bell
- Removable base / bolt-on/bolt-off mounting feet
- Steel fan cover
- Large easy-to-wire junction box with rubber gasket
- Heavy duty oversized ball bearings
- High tensile strength steel shaft
- Electrically reversible
- Inverter capable (3-phase only)
- NEMA design B
- Class F winding insulation
- Service Factor: 1.15 across-the-line (1.0 for 3-phase with AC drive)
- Two year warranty
- cCSA_{US} certified, CE

Accessories Available

- Junction boxes (replacement/spare)
- Fans (replacement/spare)
- Fan shrouds (replacement/spare)
- Motor bases (replacement/spare)
- Adjustable mounting slide bases

Applications

- Conveyors
- Fans
- Gear reducers
- Pumps



MTR Series 3-phase motor



MTRP Series 3-phase motor



MTR2 Series 3-phase motor

IronHorse® Rolled-Steel AC Motors – 3-Phase

56C/56HC-Frame TEFC Motors – Three-Phase – 0.33 to 3 hp

Motor Specifications – Three-Phase 56C/56HC-Frame Motors – 1800 & 3600 RPM										
Part Number	Price	HP	Base RPM	Phase	Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps @ 230V/460V	Approx Weight (lb)
<u>MTR2-P33-3BD18</u>	\$153.00	1/3	1800	3	230/460	TEFC	56C flange mount (MTRP = 56HC)*	1.15	1.4 / 0.7	18
<u>MTR2-P33-3BD36</u>	\$135.00		3600						1.3 / 0.65	18
<u>MTR2-P50-3BD18</u>	\$160.00	1/2	1800						1.9 / 0.95	19
<u>MTR2-P50-3BD36</u>	\$141.00		3600						1.7 / 0.85	19
<u>MTR2-P75-3BD18</u>	\$175.00	3/4	1800						2.6 / 1.3	22
<u>MTR2-P75-3BD36</u>	\$150.00		3600						2.4 / 1.2	21
<u>MTRP-001-3BD18</u>	\$220.00	1	1800		F1 conduit box location	3.2 / 1.6			35	
<u>MTRP-001-3BD36</u>	\$180.00		3600						23	
<u>MTRP-1P5-3BD18</u>	\$253.00	1-1/2	1800						4.5 / 2.25	43
<u>MTRP-1P5-3BD36</u>	\$203.00		3600						4.0 / 2.0	31
<u>MTRP-002-3BD18</u>	\$296.00	2	1800						6.0 / 3.0	49
<u>MTRP-002-3BD36</u>	\$220.00		3600						5.2 / 2.6	33
<u>MTRP-003-3BD36</u>	\$287.00	3	3600	7.4 / 3.7	39					

Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
 IronHorse Motors with product numbers ending in P are Premium Efficiency motors and meet or exceed all current efficiency guidelines.
 *56HC motors are capable of 56C C-face mounting, and are also compatible with 56, 143T, and 145T foot mounting dimensions.

IronHorse® MTSS Stainless-Steel Three-Phase General-Purpose AC Motors

MTSS Stainless Steel TEFC Motors – Three Phase – 0.33 to 0.75 hp



MTSS-xxx-3BDxxR
3-Phase Stainless Steel 56C Frame without Feet

Features

- Totally Enclosed Fan Cooled (TEFC) enclosure
- NEMA 56C flange mount
- 304 stainless steel shell frame
- Stainless steel shaft
- Large easy-to-wire junction box with fluorinated silicone rubber gasket
- Nickel-plated brass cable gland included
- IP56 environmental rating
- Available with or without mounting feet
- Heavy-duty permanently-sealed oversized ball bearings
- Nameplate information with wiring diagram etched into frame
- Electrically reversible
- NEMA design B
- Class F winding insulation
- Service Factor: 1.15 across-the-line (1.0 with AC drive)
- One year warranty
- cCSA_{us} certified

Accessories & Spare Parts Available

- Nickel-plated brass cable gland (spare/replacement)

Applications

- Conveyors
- Fans
- Gear reducers
- Pumps
- Inverter capable
- Washdown environments



MTSS-xxx-3BDxx
3-Phase Stainless Steel 56C Frame with Feet



MTAS-CG-M22
Spare/Replacement Nickel-plated Brass Cable Gland

IronHorse® MTSS Stainless-Steel Three-Phase General-Purpose AC Motors

56C Frame Stainless Steel TEFC Motors – Three Phase – 0.33 to 0.75 hp

Motor Specifications – 3-phase 56C Frame Stainless Steel Motors – 1800 & 3600 RPM											
Part Number	Price	HP	Base RPM	Phase	Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps @ 208-230V/460V	Approx Weight (lb)	
MTSS-P33-3BD18R	\$439.00	1/3	1800	3	208-230/460	TEFC	56C flange mount	1.15	1.5-1.4 / 0.7	27	
MTSS-P50-3BD18R	\$447.00	1/2				stainless steel frame with round body			1.55-1.5 / 0.75	27	
MTSS-P75-3BD18R	\$460.00	3/4				F1 conduit box location			2.6-2.4 / 1.2	29	
MTSS-P33-3BD18	\$458.00	1/3				TEFC			1.5-1.4 / 0.7	28	
MTSS-P50-3BD18	\$466.00	1/2				1800			stainless steel frame with rigid base	1.55-1.5 / 0.75	28
MTSS-P50-3BD36	\$454.00					3600			1.99-1.8 / 0.9	29	
MTSS-P75-3BD18	\$480.00	3/4				1800			F1 conduit box location	2.6-2.4 / 1.2	30
MTSS-P75-3BD36	\$460.00					3600			2.4-2.3 / 1.15	31	

Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.

Motor Accessory (Optional) – 3-phase 56C Frame Stainless Steel Motors – 1800 & 3600 RPM			
Part Number	Price	Description	Approx Weight (lb)
MTAS-CG-M22	\$38.00	Cable gland; M22 x 1.5 mm thread; (1) silicone rubber gasket accommodates a cable diameter range of 0.393 to 0.512 in (10 to 13 mm); IP66 protection level; nickel-plated brass housing. <i>This is a SPARE part for IronHorse MTSS motors - one cable gland is pre-installed on each MTSS motor.</i>	0.2

Performance Data – 3-phase 56C Frame Stainless Steel Motors (460V data except as indicated) – 1800 & 3600 RPM																
Part Number	HP	NEMA Design	FL RPM	Minimum Speed (rpm)			Current @ 460V (Amps)		Torque (lb-ft)			Maximum Speed (rpm)		FL Efficiency (%)	FL Power Factor	Rotor Inertia (lb-ft ²)
				CT (2:1)	VT (5:1)	No Load	Locked Rotor	Full Load	Locked Rotor	Break-down	CHP*	Safe				
MTSS-P33-3BD18(R)	1/3	B	1725	900	360	0.29	4.2	1.0	2.9	3.9	2250	4500	82.5	0.71	0.078	
MTSS-P50-3BD18(R)	1/2		1725	900	360	0.30	4.6	1.5	3.8	5.2	2250		82.5	0.76	0.078	
MTSS-P50-3BD36			3460	1800	720	0.36	6.0	0.7	1.9	2.5	4500	77.0	0.88	0.077		
MTSS-P75-3BD18(R)	3/4		1725	900	360	0.44	7.3	2.2	5.0	7.0	2250	82.5	0.78	0.081		
MTSS-P75-3BD36			3470	1800	720	0.43	7.6	1.1	2.7	3.3	4500	73.0	0.84	0.100		

* Maximum Coupled HP speed is for direct-coupled loads.

IronHorse[®] MTCP2 Premium-Efficiency Cast-Iron Three-Phase AC Motors

T-Frame TEFC Motors – Three-Phase Industrial Duty – 1 to 300 hp

TC-Frame (C-Face) TEFC Motors – Three-Phase Industrial Duty – 1 to 30 hp



Premium Efficiency
Three-Phase Cast Iron T-Frame



Premium Efficiency
Three-Phase Cast Iron TC-Frame

Features

- Available in 1200, 1800, & 3600 rpm
- Totally Enclosed Fan Cooled (TEFC) enclosure
- NEMA TC-frame (C-face) and T-frame motors
- Cast iron frame with ribbed design for maximum cooling
- Solid full frame length cast iron mounting feet
- Steel fan cover
- Cast iron junction box with rubber gasket and rubber dust cover
- NSK/NTN/SKF brand premium quality ball (1-75 hp) or roller bearings (100-300 hp)
- Maintenance free bearings (10 hp and below)
- V-ring shaft seals on drive end and on opposite drive end
- Electrically reversible
- Class F winding insulation
- Service Factor: 1.25 (1-200 hp), 1.15 (250-300 hp), 1.0 with AC drive (ALL)
- Meets or exceeds Premium Efficiency standards
- Class I, Div 2 hazardous locations
- Inverter ratings: 20:1 (variable torque); 10:1 (constant torque)
- Two year warranty
- cCSA_{us} certified, ISO9001, CE

Accessories & Spare Parts Available

- STABLE motor slide bases for adjustable mounting
- C-flange kits (for converting T-frame motors to TC-frame)
- Replacement junction boxes
- Replacement fans
- Replacement fan shrouds

Applications

- Fans
- Conveyors
- Pumps
- Material Handling
- Metal Processing
- Textile Processing
- Test Stands

IronHorse[®] MTCP2 Premium-Efficiency Cast-Iron Three-Phase AC Motors

T-Frame TEFC Motors – 3-Phase Industrial Duty – 1–300 hp – 1800 rpm

TC-Frame (C-Face) TEFC Motors – 3-Phase Industrial Duty – 1–30 hp – 1800 rpm

Motor Specifications – Premium-Efficiency T & TC Frame Three-Phase Motors – 1800 rpm														
Part Number ⁽¹⁾	Price	HP ⁽²⁾	Base RPM @60Hz (50Hz)	Phase	Voltage	Housing	NEMA Frame	Mounting ⁽³⁾	Holes / Foot	Service Factor ⁽⁶⁾ (@50Hz)	F.L. Amps @208-230V/460V	Approx Product Weight (lb) ⁽⁴⁾		
MTCP2-001-3BD18	\$248.00	1	1800 (1500)	3	208-230/460V	TEFC cast iron	143T	F1(F2)	2	1.25 (1.0)	3.61-3.27 / 1.63	41		
MTCP2-001-3BD18C	\$278.00						143TC							
MTCP2-1P5-3BD18	\$293.00	1.5					145T		4			4.92-4.45 / 2.22	56	
MTCP2-1P5-3BD18C	\$299.00						145TC							
MTCP2-002-3BD18	\$334.00	2					145T		4			6.56-5.93 / 2.97	58.5	
MTCP2-002-3BD18C	\$366.00						145TC							
MTCP2-003-3BD18	\$602.00	3					182T		2			9.01-8.16 / 4.08	86	
MTCP2-003-3BD18C	\$639.00						182TC							
MTCP2-005-3BD18	\$575.00	5					184T		F1			4	13.9-12.6 / 6.3	104
MTCP2-005-3BD18C	\$662.00						184TC							
MTCP2-7P5-3BD18	\$883.00	7.5					213T	F1(F2)	2			20.4-18.5 / 9.23	172	
MTCP2-7P5-3BD18C	\$921.00						213TC							
MTCP2-010-3BD18	\$991.00	10					215T	F1(F2)	4			26.9-24.3 / 12.2	193	
MTCP2-010-3BD18C	\$1,131.00						215TC							
MTCP2-015-3BD18	\$1,354.00	15					254T	F1(F2)	2			40.0-36.2 / 18.1	265	
MTCP2-015-3BD18C	\$1,502.00						254TC							
MTCP2-020-3BD18	\$1,614.00	20					256T	F1(F2)	4			52.4-47.4 / 23.7	304	
MTCP2-020-3BD18C	\$1,796.00						256TC							
MTCP2-025-3BD18	\$2,223.00	25					284T	F1(F2)	2			65.1-58.8 / 29.4	385	
MTCP2-025-3BD18C	\$2,154.00						284TC							
MTCP2-030-3BD18	\$2,291.00	30					286T	F1(F2)	4			78.1-70.6 / 35.3	430	
MTCP2-030-3BD18C	\$2,299.00						286TC							
MTCP2-040-3BD18	\$2,840.00	40					324T	F1	2			104-93.7 / 46.8	531	
MTCP2-050-3BD18	\$2,954.00	50					326T		4			127-115 / 57.6	578	
MTCP2-060-3BD18	\$4,228.00	60					364T	F1	2			158-142 / 71.2	769	
MTCP2-075-3BD18	\$4,494.00	75					365T		4			196-177 / 88.7	858	
MTCP2-100-3BD18	\$5,449.00	100					405T	F1(F2)	4			252-228 / 114	1131	
MTCP2-125-3BD18	\$6,294.00	125					444T		2			323-292 / 146	1429	
MTCP2-150-3BD18	\$8,029.00	150			445T	F1(F2)	4	386-349 / 175	1625					
MTCP2-200-3BD18	\$9,393.00	200			445/7T		4	506-458 / 229	2033					
MTCP2-250-3D18	\$13,759.00	250	449T	F1	2	280 ⁵	2508							
MTCP2-300-3D18	\$17,849.00	300	449T		2	336 ⁵	2728							

- 1) Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
- 2) For warranty on motors 50 hp and above, motors must be inspected by an EASA motor repair or service center.
- 3) F1(F2) indicates F1 conduit box mounting location, field convertible to F2 (as shown on dimensional diagram).
- 4) Certain heavy and oversized items can be shipped only via LTL. Check our web site for current shipping method constraints by part number.
- 5) F.L. Amps @ 460V only.
- 6) The service factor changes from 1.25 to 1.0 under the following conditions:
 - When running the motor at 208VAC @ 60Hz
 - When running the motor at 200/400VAC @ 50Hz
 - When used with a VFD

IronHorse[®] MTCP2 Premium-Efficiency Cast-Iron Three-Phase AC Motors

T-Frame TEFC Motors – Three-Phase Industrial Duty – 1–20 hp – 1200 & 3600 rpm

Motor Specifications – Premium-Efficiency T-Frame Three-Phase Motors – 1200 rpm												
Part Number ⁽¹⁾	Price	HP	Base RPM @60Hz (50Hz)	Phase	Voltage	Housing	NEMA Frame	Mounting ⁽²⁾	Holes / Foot	Service Factor ⁽⁴⁾ (@50Hz)	F.L. Amps @208-230V/460V	Approx Product Weight (lb) ⁽³⁾
MTCP2-001-3BD12	\$331.00	1	1200 (1000)	3	208-230/460V	TEFC cast iron	145T	F1(F2)	4	1.25 (1.0)	3.86-3.49 / 1.75	53
MTCP2-1P5-3BD12	\$466.00	1.5					182T		2		5.22-4.72 / 2.36	91.5
MTCP2-002-3BD12	\$527.00	2					184T		4		6.59-5.96 / 2.98	100
MTCP2-003-3BD12	\$692.00	3					213T		2		9.92-8.97 / 4.48	166
MTCP2-005-3BD12	\$777.00	5					215T		4		16.1-14.5 / 7.27	179
MTCP2-7P5-3BD12	\$1,224.00	7.5					254T		2		20.8-18.8 / 9.41	247
MTCP2-010-3BD12	\$1,460.00	10					256T		4		27.8-25.1 / 12.5	258
MTCP2-015-3BD12	\$1,770.00	15					284T		2		42.9-38.8 / 19.4	366
MTCP2-020-3BD12	\$1,952.00	20					286T		4		56.5-51.1 / 25.5	419

1) Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
 2) F1(F2) indicates F1 conduit box mounting location, field convertible to F2 (as shown on dimensional diagram).
 3) Certain heavy and oversized items can be shipped only via LTL. Check our web site for current shipping method constraints by part number.
 4) The service factor changes from 1.25 to 1.0 under the following conditions:

- When running the motor at 208VAC @ 60Hz
- When running the motor at 200/400VAC @ 50Hz
- When used with a VFD

Motor Specifications – Premium-Efficiency T-Frame Three-Phase Motors – 3600 rpm												
Part Number ⁽¹⁾	Price	HP	Base RPM @60Hz (50Hz)	Phase	Voltage	Housing	NEMA Frame	Mounting ⁽²⁾	Holes / Foot	Service Factor ⁽⁴⁾ (@50Hz)	F.L. Amps @208-230V/460V	Approx Product Weight (lb) ⁽³⁾
MTCP2-1P5-3BD36	\$260.00	1.5	3600 (3000)	3	208-230/460V	TEFC cast iron	143T	F1(F2)	2	1.25 (1.0)	4.62-4.18 / 2.09	45.2
MTCP2-002-3BD36	\$299.00	2					145T		4		6.05-5.48 / 2.74	50.7
MTCP2-003-3BD36	\$423.00	3					182T	F1	2		6.45-7.64 / 3.82	80.5
MTCP2-005-3BD36	\$489.00	5					184T		4		13.3-12.0 / 6.01	96
MTCP2-7P5-3BD36	\$720.00	7.5					213T	F1(F2)	2		20.9-18.9 / 9.45	160
MTCP2-010-3BD36	\$767.00	10					215T		4		27.0-24.4 / 12.2	180
MTCP2-015-3BD36	\$1,386.00	15					254T		2		38.8-35.1 / 17.5	261
MTCP2-020-3BD36	\$1,621.00	20					256T	4	51.1-46.2 / 23.1		297	

1) Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
 2) F1(F2) indicates F1 conduit box mounting location, field convertible to F2 (as shown on dimensional diagram).
 3) Certain heavy and oversized items can be shipped only via LTL. Check our web site for current shipping method constraints by part number.
 4) The service factor changes from 1.25 to 1.0 under the following conditions:

- When running the motor at 208VAC @ 60Hz
- When running the motor at 200/400VAC @ 50Hz
- When used with a VFD