NEMA Premium® Efficiency XRI® Series Inverter Duty Motors

marathon® Motors

Features

- Meets or exceeds NEMA Premium efficiencies
- Inverter duty
- Suitable for use with ALS (across-the-line starting) or IGBT (AC drive)
- 10:1 variable torque and constant torque on VFD with 1.0 service factor
- 1.15 service factor on sinewave; 1.0 service factor on IGBT power
- Class F insulation
- Continuous duty at 40° C ambient
- Rolled steel construction with C-face rigid base mounting
- F3 conduit box location
- Utilizes ball bearings
- Electrically reversible
- UL Recognized, CSA Certified, and CE Mark
- Three-year warranty (through Marathon Electric)

Applications

- Typical uses include gear reducers, pumps, machine tools, and other direct-coupled equipment installed in damp, dusty, or dirty environments where long life and ultra-high efficiency is desired.

Motor Shipping Schedule *		
*Same or one day **	*Up to 7 days*	*Up to 10 days*

Color indicates shipping lead time in business days. Check stock status online.
** Certain heavy and oversized items can be shipped only via LTL.*
Check our website for current shipping method constraints by part number.

208–230/460V Motor Specifications

Part Number*	Price	HP	Base RPM	Volts	Enclosure	NEMA Frame	Model No.	F.L. Amps	Weight (lb)*
E2000		1	3600	208–230 / 460	TEFC	56C	056T34F5940	3.0–2.8 / 1.4	28
E2001A			1800			143TC	143TTFR16053	3.3–3.3 / 1.65	48
E2002			1200			145TC	145TTFR6078	3.8–3.8 / 1.9	42
E2003		1-1/2	3600			143TC	143TTFR5582	4.4–4.0 / 2.0	39
E2004A			1800			145TC	145TTFR16331	4.7–4.6 / 2.3	50
E2005 †			1200			182TC	182TTFW6076	5.6–5.2 / 2.6	77
E2007A		2	1800			145TC	145TTFR16329	6.2–6.0 / 3.0	65
E2008 †			1200			184TC	184TTFW6076	7.35–6.4 / 3.2	94
E2009 †		3	3600			182TC	182TTFW6001	8.4–7.8 / 3.9	63
E2010 †			1800				182TTFW6026	8.4–7.8 / 3.9	87
E2011A			1200			213TC	213TTFWD6076	9.2–8.8 / 4.4	117

** Refer to the Motor Shipping Schedule table for shipping information.*
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† These specifications are for the Marathon motor currently being sold. Marathon manufactured a previous version of this Part Number (that had a different model #), and that version had some different specifications. For detailed information on the previous motor, please refer to the "Previous Marathon Model Numbers" table on the next page, or click on the

Notes: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
Warranty service can be arranged through numerous Marathon Electric service centers.
See list of service centers on our Web site at .

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NEMA Premium® Efficiency
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208–230/460V Motor Specifications

Part Number*	Price	HP	Base RPM	Volts	Enclosure	NEMA Frame	Model No.	F.L. Amps	Weight (lb)*
E2012 †		5	3600	208-230 / 460	TEFC	184TC	184TTFW6001	12 / 6	86
E2013 †			1800				184TTFW6026	12.6 / 6.3	87
E2014A			1200			215TC	215TTFWD6076	14.8-17 / 7	150
E2015A		7-1/2	3600	208-230 / 460		213TC	213TTFWD6001	19.7-18.6 / 9.3	103
E2016B			1800				213TTFWD16039	20.8-19.6 / 9.8	124
E2018A		10	3600	230 / 460		215TC	215TTFWD6001	23.6 / 11.8	133
E2019B			1800	208-230 / 460			215TTFWD16047	14-26.4 / 13.2	170

** Refer to the Motor Shipping Schedule table for shipping information.*
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NEMA Premium® Efficiency XRI® Series Inverter Duty Motors

Performance Data

Performance Data (460 Volt)															
Part Number	HP	NEMA Design	F.L. RPM	Min RPM	Current (Amps)			Torque (lb·ft)			Max CHP RPM*	Max Safe RPM	F.L. Effic. (%)	F.L. Power Factor	Rotor Inertia (lb·ft²)
					No Load	Full Load	Locked Rotor	Full Load	Locked Rotor	Break -down					
E2000	1	B	3490	349	0.7	1.4	10	1.5	3.6	5.1	5235	7200	80	84	0.04
E2001A		A	1765	177	1.2	1.7	17	3.0	13.7	16.8	1765	4000	85.5	68	0.12
E2002		B	1170	117	1.3	1.9	10	4.5	13.5	15.8	1755	5400	82.5	60	0.14
E2003	1-1/2		3490	349	1.0	2.0	21	2.3	8.5	11.2	5235	7200	84.0	82	0.06
E2004A			1755	176	1.5	2.3	24	4.5	21.2	26	1755	4000	86.5	71	0.14
E2005 †			1175	118	1.3	2.6	17	6.8	13.4	24.4	1762.5	5400	87.5	71.5	0.38
E2007A	2		1760	176	1.9	3.0	30.5	6.0	24.5	33.2	1760	4000	86.5	71	0.14
E2008 †			1170	117	1.9	3.2	20.5	9.0	16.8	30.2	1755	4000	88.5	67	0.162
E2009 †	3		3510	351	1.8	3.9	33	4.5	11.0	18.2	5265	7200	86.5	83	0.23
E2010 †			1760	176	1.9	3.9	33.5	8.9	22.5	36	2640	4000	89.5	80.5	0.38
E2011			1170	117	2.5	4.4	32	13.5	34	47.5	1755	4200	89.5	70	0.80
E2012 †	5		3495	350	1.7	6.0	46	7.5	16	26	5243	5400	88.5	89.5	0.30
E2013 †			1760	176	2.4	6.3	49	15.0	30.1	50.2	2640	4000	89.5	83	0.49
E2014A			1170	117	3.7	7.0	46	22.5	45.6	68.2	1755	4000	89.5	75	1.00
E2015	7-1/2		3540	354	3.0	8.9	64	11.1	24	38	5310	5400	90.2	87	0.55
E2016A			1765	177	4.7	9.7	63.5	22.0	52	72	1765	4000	91.7	80	0.85
E2016B			1765	177	4.9	9.8	67.5	22.3	52.9	75	1765	4000	91.7	78.3	0.85
E2018	10		3535	354	3.5	11.8	80	14.9	30	46	5302.5	5400	91.7	87	0.65
R2018A			3525	353	4.4	11.8	79.5	14.9	27.7	47.1	4000	4000	90.2	87.9	0.55
E2019B			1760	176	7.2	13.2	81	29.9	76	90	1760	4000	91.7	77.5	1.1

** Maximum Constant HP RPM is for direct coupled loads.*

† These specifications are for the Marathon motor currently being sold. Marathon manufactured a previous version of this Part Number (that had a different model #), and that version had some different specifications. For detailed information on the previous motor, please refer to the "Previous Marathon Model Numbers" table below, or click on the previous motor's specifi-

NEMA Premium® Efficiency XRI® Series Inverter Duty Motors

Previous Marathon Model Numbers

Previous Marathon Model Numbers				
Part Number	***HP***	***Previous Model #***	***Current Model #***	***Date of Change-over***
E2001	1	143TTFR5642	n/a	09/2014
E2004	1-1/2	145TTFR6033	n/a	09/2014
E2005	1-1/2	182TTFR6076	182TTFW6076	09/2011
E2007	2	145TTFR6035	n/a	09/2014
E2008	2	184TTFR6076	184TTFW6076AA	09/2011
E2009	3	182TTFR6001	182TTFW6001AA	09/2011
E2010	3	182TTFW6026	182TTFW6026AA	09/2011
E2012	5	184TTFW6001	184TTFW6001AA	09/2011
E2013	5	184TTFW6026	184TTFW6026AA	09/2011
E2016	7-1/2	213TTFW6026	n/a	09/2014
E2019	10	215TTFW6026	n/a	09/2014

(The model # appears on the motor nameplate.)

NEMA Premium® Efficiency XRI® Series Inverter Duty Motors

Dimensions (units = inches)

Figure 1 - Frame 56C – Part #: E2000

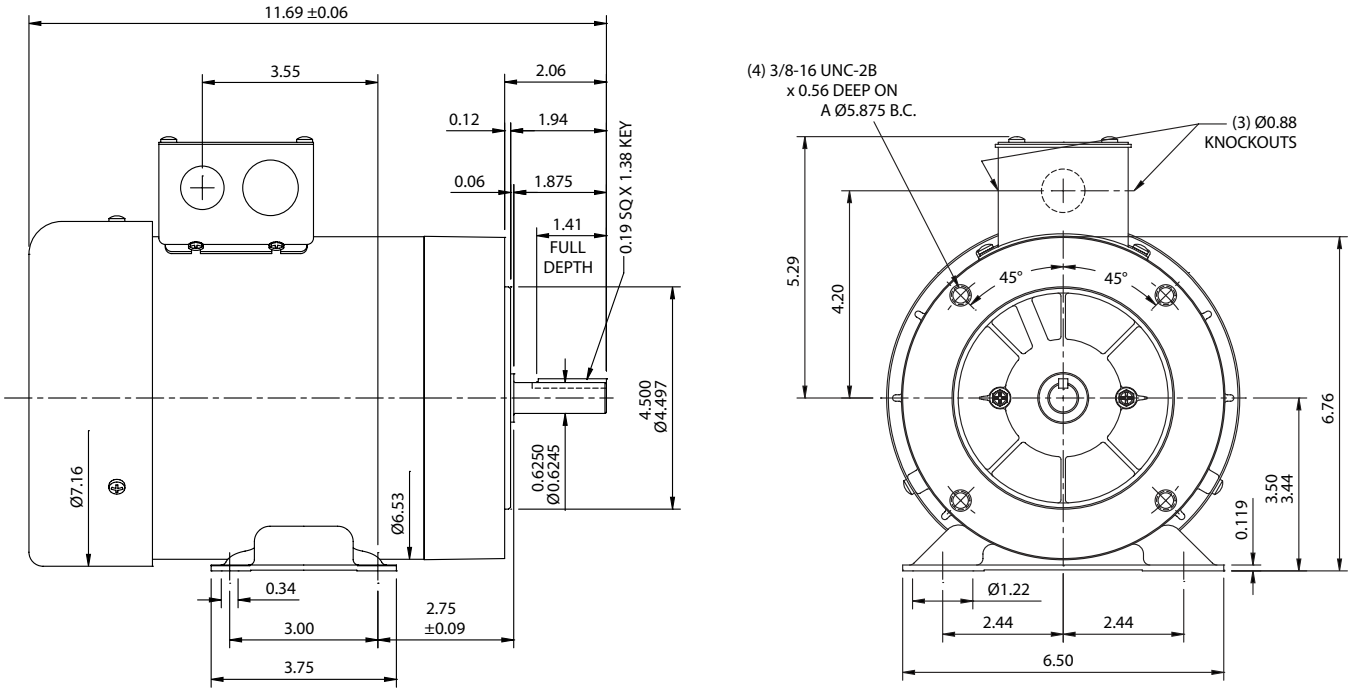
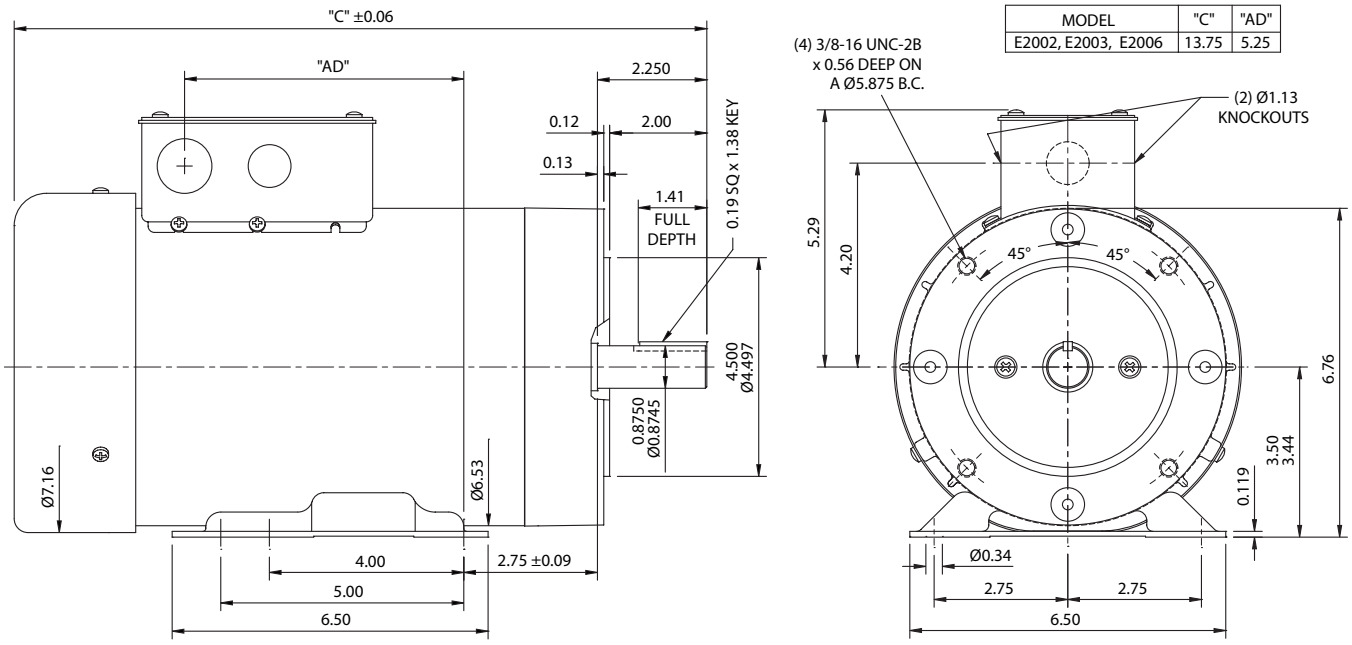


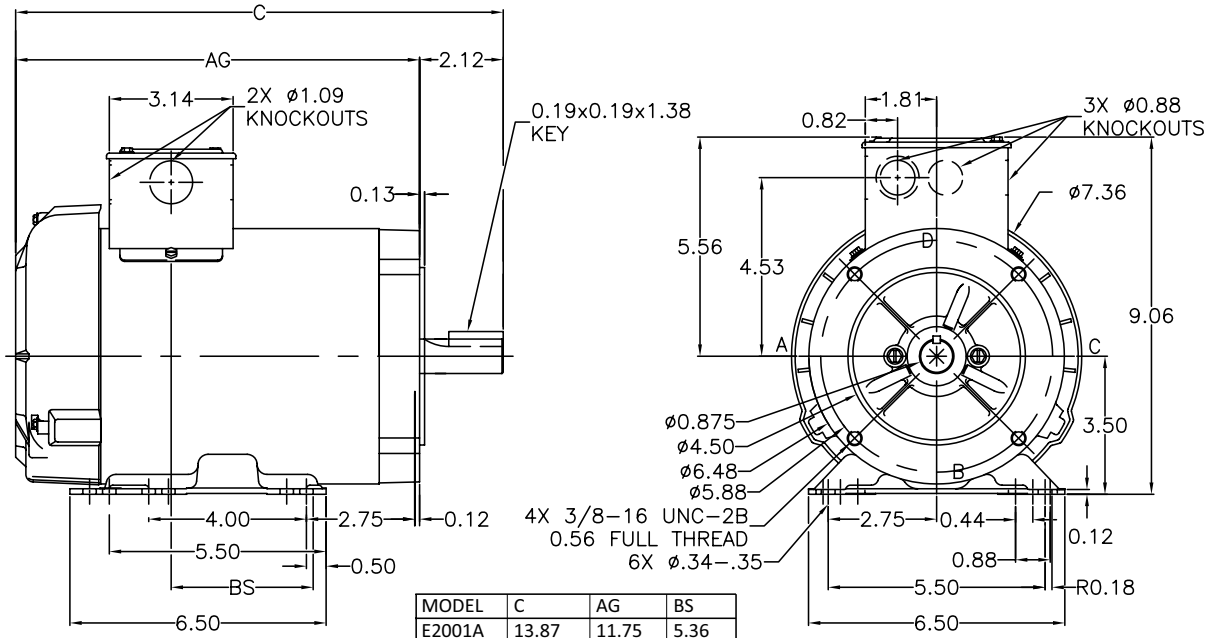
Figure 2 - Frame 143/5TC – Part #: E2002, E2003



NEMA Premium® Efficiency XRI® Series Inverter Duty Motors

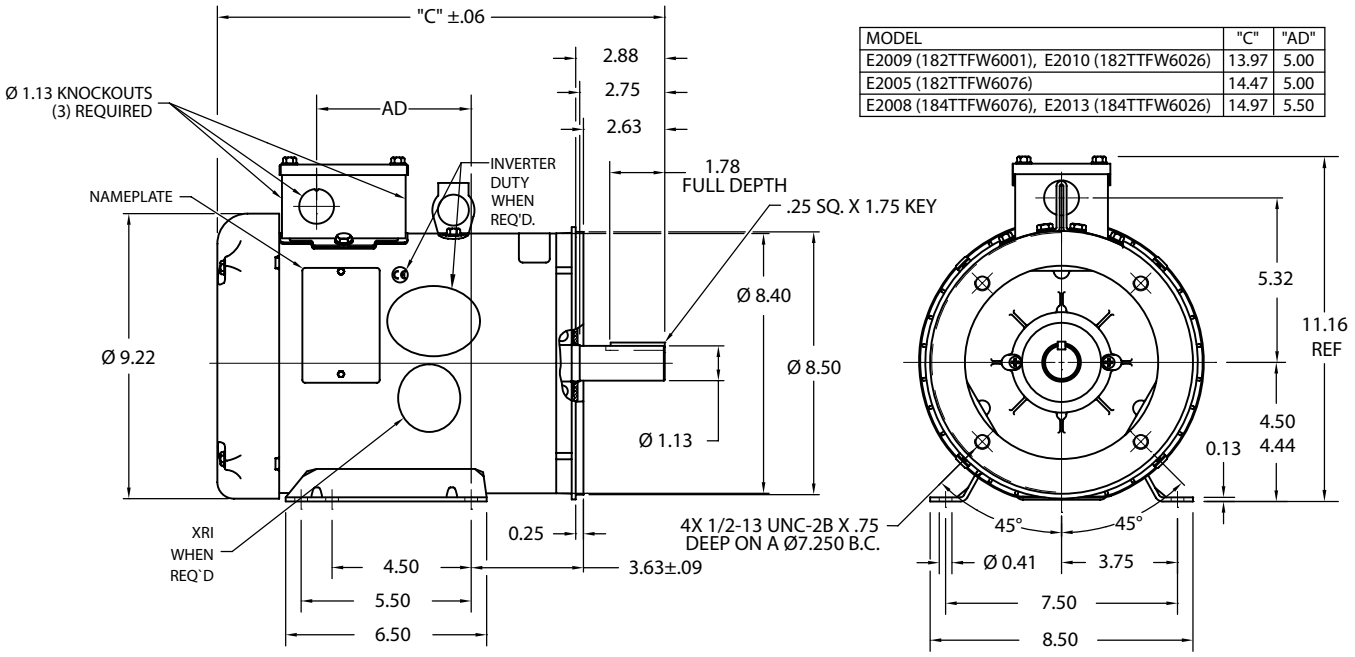
Dimensions (units = inches)

Figure 3 - Frame 143/5TC – Part #: E2001A, E2004A, E2007A



MODEL	C	AG	BS
E2001A	13.87	11.75	5.36
E2004A	14.37	12.25	5.86
E2007A	14.87	12.75	6.36

Figure 4 - Frame 182/4TC – Part #: E2005, E2008, E2009, E2010, E2013



MODEL	"C"	"AD"
E2009 (182TTFW6001), E2010 (182TTFW6026)	13.97	5.00
E2005 (182TTFW6076)	14.47	5.00
E2008 (184TTFW6076), E2013 (184TTFW6026)	14.97	5.50

NEMA Premium® Efficiency
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Dimensions (units = inches)

Figure 5 - Frame 184TC – Part #: E2012

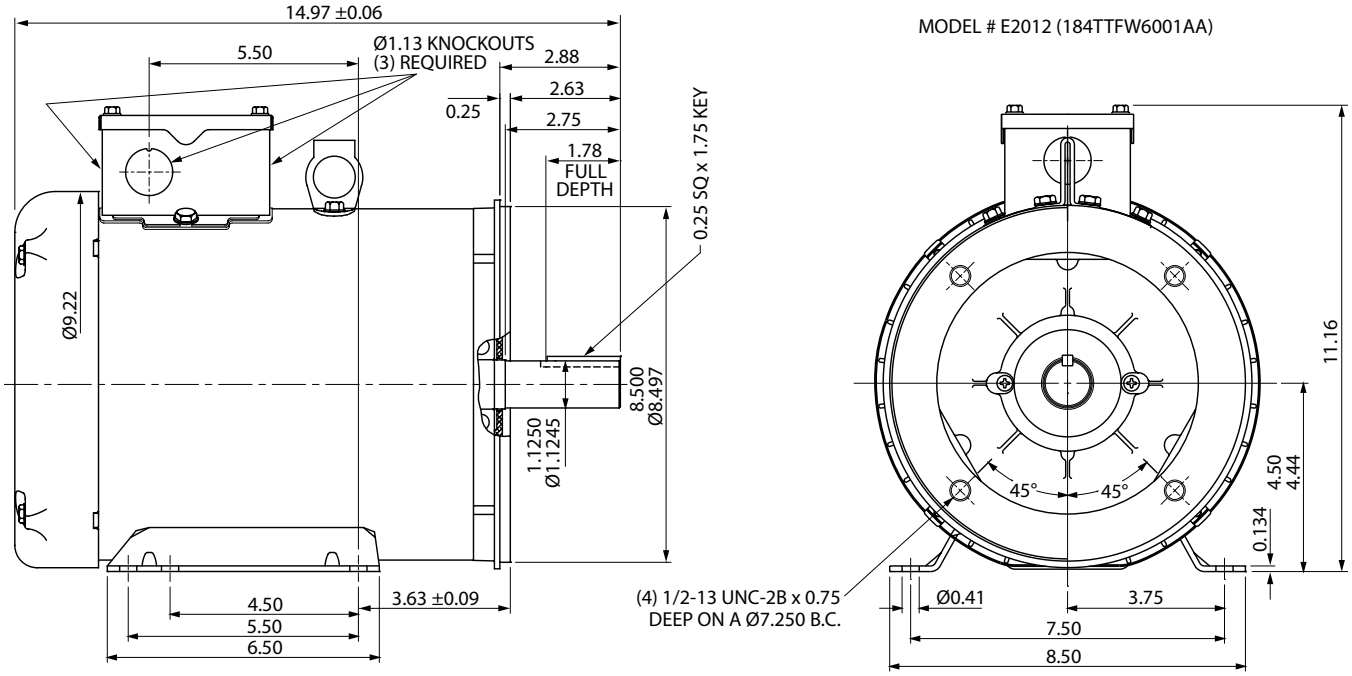
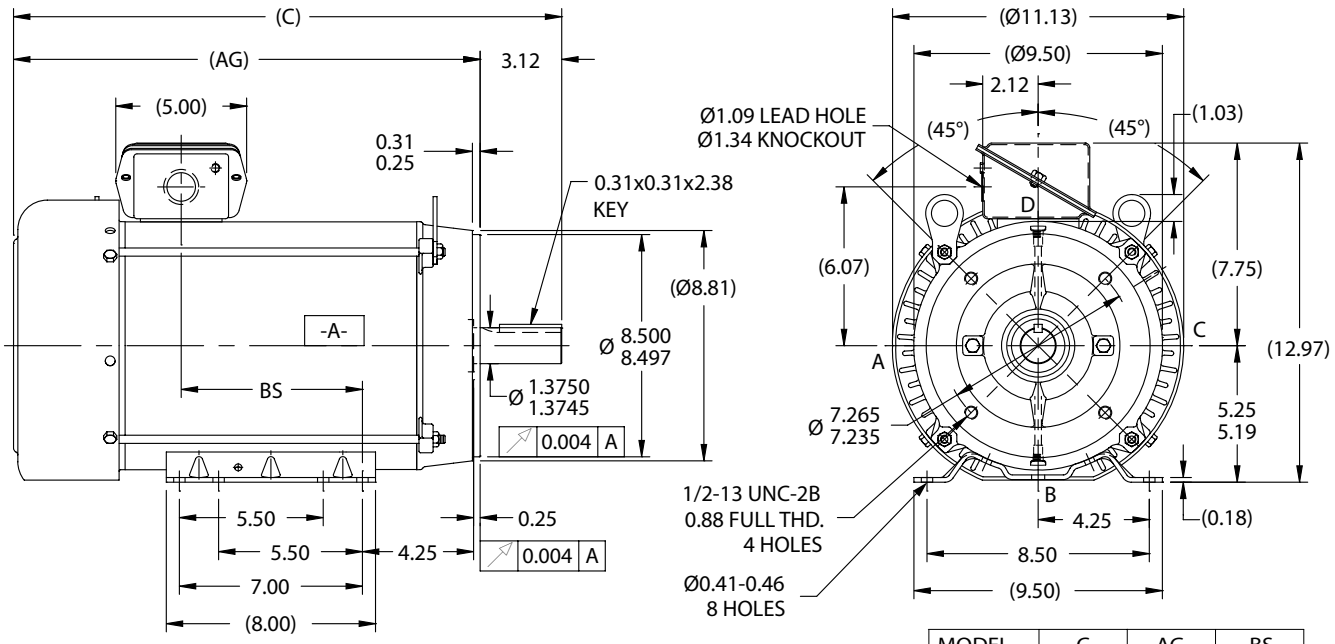


Figure 6 - Frame 213/5TC – Part #: E2011, E2015, E2016A, E2018



MODEL	C	AG	BS
E2014	20.97	17.85	6.93
E2019A	22.22	19.10	8.18

STABLE™ Motor Slide Bases

Mounting Slide Bases for 56 to 449T NEMA Motors Features

- Allows adjustment of motor mounting position
- Slide direction is perpendicular to motor shaft
- Double adjusting screws for frames 182T–449T
- Manufactured to precise dimensional standards
- Dimensionally interchangeable with existing major makes
- Heavy-duty steel construction
- Painted with oven-baked primer for better adhesion of customer's paint
- All "D" bolts (motor mounting bolts) are fixed to the exact motor foot pattern
- All "D" bolts are welded into position to prevent spinning and dropping from slots
- • Nuts and washers are provided for securing the motor to the slide base

STABLE Motor Slide Bases for 3-Phase Motors

Part Number	Price	Fits Frame Type	Product Wt. (lb)	Fits Motor						
				IronHorse	Marathon					
					micro -MAX ---- Max+	Black Max 230/460V ---- Black Max 575V	Blue Max	XRI GP & NEMA Premium	Powerwash SXT & Jet Pump	Blue Chip XRI 230/ 460V ---- Blue Chip XRI 575V
MTA-BASE-W56 *		56*	2.8	MTPM-P3x-1x18 MTPM-P5x-1x18 MTPM-P7x-1x18 MTPM-0xx-1x18 MTPM-1xx-1x18 MTR(2)(P)-xxx-xxxxx*	Y500 Y502 Y360 Y362 Y364 Y280 Y281 Y282	Y592(-A772) Y534(-A772) Y535(-A772) Y555(-A772) Y556(-A772)	–	E2000 D390 G580 K703 D391 G581 K705 D392 G582 K707 D393A K708A G583A K709A D394A K721A G584A K722A D395A G585A K724A D396A K725A	N410 J066A	–
MTA-BASE-W143T		143T/TC	4.6	MTCP2-001-3BD18(C) MTCP2-1P5-3BD36	–	Y536(-A772)	–	E2001A E2003		–
MTA-BASE-W145T		145T/TC	5.1	MTCP2-001-3BD12 MTCP2-1P5-3BD18(C) MTCP2-002-3BD18(C) MTCP2-002-3BD36	Y366 Y368 Y284 Y285	Y537(-A772) Y538(-A772) Y551(-A772) Y557(-A772)	–	E2002 E2004A E2007A		–
MTA-BASE-W182T		182T/TC	9.2	MTCP2-1P5-3BD12 MTCP2-003-3BD18(C) MTCP2-003-3BD36 MTF-002-1C18-182	Y1999 Y286A	Y541A(-A772) Y558A(-A772)	–	E2005 E2009 E2010	G590A C382B C383B	–

** IronHorse MTR2 56HC motors have double-punched bases to fit on slide base MTA-BASE-W56.*
*** Motors MTC-250-3D18 and MTC-300-3D18 are obsolete, and no longer available.*

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STABLE™ Motor Slide Bases

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STABLE Motor Slide Bases for 3-Phase Motors

Part Number	Price	Fits Frame Type	Product Wt. (lb)	Fits Motor						
					Marathon					
				IronHorse	micro -MAX ---- Max+	Black Max 230/460V ---- Black Max 575V	Blue Max	XRI GP & NEMA Premium	Powerwash SXT & Jet Pump	Blue Chip XRI 230/460V ---- Blue Chip XRI 575V
MTA-BASE-W184T		184T/TC	10	MTCP2-002-3BD12 MTCP2-005-3BD18(C) MTCP2-005-3BD36 MTF-00x-1C18	Y1372 Y287A	Y540(-A772) Y543A(-A772) Y559A(-A772)	–	E2008 E2012 E2013	C387B	–
MTA-BASE-W213T		213T/TC	13	MTCP2-003-3BD12 MTCP2-7P5-3BD18(C) MTCP2-7P5-3BD36	Y994	Y542(-A772) Y545(-A772) Y560(-A772)	–	E2011 E2015 E2016A	C389B C390B C391B E2011A E2015A E2016B	–
MTA-BASE-W215T		215T/TC	15	MTCP2-005-3BD12 MTCP2-010-3BD18(C) MTCP2-010-3BD36	Y996	Y544(-A772) Y547(-A772) Y561(-A772	–	E2018	C392B E2014A E2018A E2019B	–
MTA-BASE-W254T		254T/TC	18	MTCP2-7P5-3BD12 MTCP2-015-3BD18(C) MTCP2-015-3BD36	–	Y546(-A772) Y549(-A772) Y562(-A772)	–	–	–	E307
MTA-BASE-W256T		256T/TC	19	MTCP2-010-3BD12 MTCP2-020-3BD18(C) MTCP2-20-3BD36	–	Y548(-A772) Y552(-A772) Y563(-A772)	–	–	–	E308
MTA-BASE-W284T		284T/TC	20	MTCP2-015-3BD12 MTCP2-025-3BD18(C)	–	Y553(-A772)	–	–	–	E207 E309
MTA-BASE-W286T		286T/TC	21	MTCP2-20-3BD12 MTCP2-030-3BD18(C)	–	Y393(-A772)	–	–	–	E208 E310
MTA-BASE-W324T		324T/TC	30	MTCP2-040-3BD18(C)	–	–	Y571(-A774) Y513(-A775)	–	–	E209 E311
MTA-BASE-W326T		326T/TC	31	MTCP2-050-3BD18(C)	–	–	Y572(-A774) Y514(-A775)	–	–	E210
MTA-BASE-W364T		364T/TC	43	MTCP2-060-3BD18(C)	–	–	Y573(-A774) Y515(-A775)	–	–	E313
MTA-BASE-W365T		365T/TC	43	MTCP2-075-3BD18(C)	–	–	Y574(-A774) Y516(-A775)	–	–	E212 E315
MTA-BASE-W404T		404T/TC	58	–	–	–	–	–	–	–
MTA-BASE-W405T		405T/TC	60	MTCP2-100-3BD18(C)	–	–	Y575(-A774) Y517(-A775)	–	–	E314
MTA-BASE-W444T		444T	63	MTCP2-125-3BD18	–	–	–	–	–	–
MTA-BASE-W445T		445T	65	MTCP2-150-3BD18	–	–	–	–	–	–
MTA-BASE-W447T		447T	89	MTCP2-200-3BD18	–	–	–	–	–	–
MTA-BASE-W449T		449T	94	MTCP2-250-3D18 MTCP2-300-3D18	–	–	–	–	–	–

** IronHorse MTR2 56HC motors have double-punched bases to fit on slide base MTA-BASE-W56.*

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 reconverting 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.

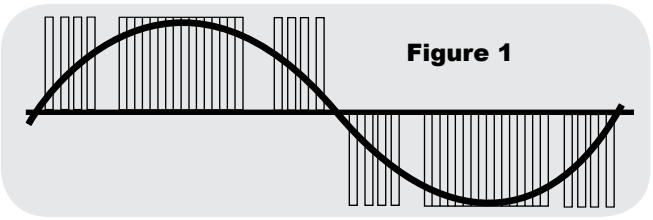

Figure 1

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 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].

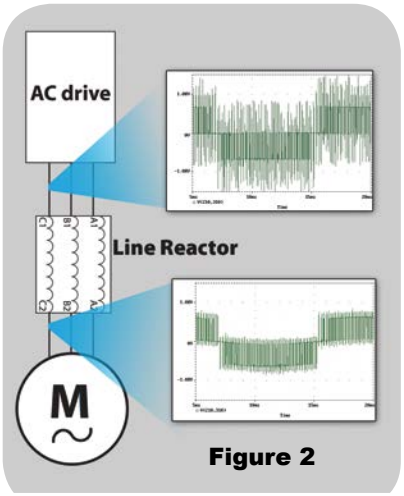

Figure 2

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.

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)	1800/5 = 360RPM
	10:1 (PE motors)	1800/5 = 180RPM
Constant Torque Applications (conveyors, extruders, etc.)	2:1 (EPAct motors)	1800/2 = 900RPM
	4:1 (PE motors)	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*