IronHorse® Permanent-Magnet DC Motors (SCR Rated) Model Overview

MTPM-P10-1JK43

MTPM-P25-1JK44

MTPM-P33-1L18

MTPM-P75-1L18

MTPM-1P5-1M18

IronHorse motors are manufactured by leading motor suppliers with decades of experience delivering high-quality motors to the demanding U.S. market. Our suppliers test the motors during production and after final assembly. This is how we can stand behind our IronHorse motors with a two-year warranty (motors 1/3hp and above only; motors 1/4hp and less have a one-year warranty).

IronHorse DC motors are designed for use on unfiltered SCR (Thyristor) type and PWM (pulse width modulated) type DC adjustable speed drives, and on across-the-line DC controls.

The IronHorse line of DC motors features:

- Replacement brush sets
- Simple two-lead connection
- Class F insulation

Features for Small-Frame Motors 1/4hp and Under

- Available models accommodate 12 VDC, 24 VDC, 90 VDC (110 VAC DC drive), and 180 VDC (230 VAC DC drive)
- Rated for SCR drives
- TENV enclosure
- IP40 environmental rating
- Class F insulation
- High energy ceramic magnets
- Double shielded ball bearings
- Dynamically-balanced armature
- Electrically-reversible
- 18in leads, or junction boxes with 8-inch leads
- Externally replaceable brushes
- Can be mounted in any orientation
- Not intended for DC power generation
- UL recognized (E365956), CSA certified (259724), RoHS

Features for Motors 1/3hp and Above

- Input power of 115 or 230 volts rectified AC can be used with an appropriate SCR drive
- Linear speed/torque characteristics over entire speed range
- High starting torque for heavy load applications
- Capable of dynamic braking for faster stops
- Available in TENV or TEFC housings, depending on model
- NEMA 56C flange mount
- Rolled steel shell frame / cast aluminum end bell
- Removable base (0.33–2hp)
- STABLE motor slide bases for adjustable mounting of NEMA motors from 56–449T
- Space-saving design
- Large, replaceable brushes for longer brush life
- Easy access to DC motor brushes (DC motors ship with one set of brushes installed and one set of spare brushes in the box)
- Large easy-to-wire junction box with rubber gasket and six-inch leads
- Heavy duty oversized ball bearings
- High tensile strength steel shaft
- Large, easy to read nameplate
- Electrically reversible
- Not intended for DC power generation
- Service Factor: 1.0
- Two year warranty
- $_{C}CSA_{US}$ certified (247070), CE, RoHS

Applications

- Conveyors
- Turntables
- Where adjustable speed and constant torque are required
- When dynamic braking and reversing capabilities are needed

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IronHorse® DC Motors

MTPM Small-Frame Permanent Magnet DC Motors – 1/31 to 1/4hp

MTPM-P10-1JK43
with flying leads

MTPM-P25-1JK44
with junction box

Motor Specifications – MTPM Series Small-Frame Permanent Magnet DC Motors

Part Number	Price	Voltage (VDC)	HP	Speed (rpm)	F/L Torque (oz-in)	F/L Current (A)	Shaft Dia (in)	Pilot Shaft (in)	Overhung Load (lb)	Axial/ Thrust Load (lb)	Wiring Type	Replacement Brush	Weight (lb)	Drawing Links
MTPM-P10-1JK43	$147.01	12/24	1/20 1/10	1746 4252	28	4.8	5/16	1.00	85	70	Flying Leads	MTPM-BRUSH-5	2.8	PDF
MTPM-P13-1JK42	$158.81		1/17 1/8	1825 4224	32	5.4							3.3	PDF
MTPM-P17-1JK43	$211.39		1/13 1/6	1841 4290	42	7.5	1/2	2.02	130	150	Junction Box	MTPM-BRUSH-4	5.3	PDF
MTPM-P25-1JK40	$219.97		1/6 1/4	1732 3996	96 80	14.3 12.2							7.8	PDF
MTPM-P25-1JK44	$219.97		1/5 1/4	1854 4375	113 70	18.1 11.9							9	PDF
MTPM-P03-1L18	$153.44	90	1/31	1797	18	0.4	5/16	1.00	85	70	Flying Leads	MTPM-BRUSH-7	2.8	PDF
MTPM-P04-1L17	$162.03		1/26	1749	22	0.5							3.3	PDF
MTPM-P05-1L19	$211.39		1/19	1917	28	0.7	1/2	2.02	130	150	Junction Box	MTPM-BRUSH-6	5.3	PDF
MTPM-P13-1L19	$209.24		1/8	1917	73	1.4							7.8	PDF
MTPM-P14-1L19	$227.48		1/7	1740	86	1.6							9	PDF
MTPM-P07-1M24	$188.85	180	1/15	2440	28	0.4							5.3	PDF
MTPM-P13-1M19	$227.48		1/8	1865	73	0.7							7.8	PDF
MTPM-P14-1M18	$227.48		1/7	1828	84	0.8							9	PDF

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IronHorse® DC Motors

56C Frame TEFC/TENV Motors – DC – 1/3 to 2hp

Motor Specifications – DC 56C Frame Motors – 1800rpm										
Part Number	Price	HP	Base RPM	Armature Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps	Weight (lb)	Drawing Links
MTPM-P33-1L18	$274.00	1/3	1800	90 VDC	TENV	56C flange mount	1.0	3.5	17.70	PDF
MTPM-P50-1L18	$353.00	1/2						5.2	20.74	PDF
MTPM-P75-1L18	$399.00	3/4			TEFC			7.8	25.30	PDF
MTPM-001-1L18	$445.00	1						10.4	28.36	PDF
MTPM-1P5-1L18	$479.00	1-1/2						15.4	34.97	PDF
MTPM-P33-1M18	$270.00	1/3		180 VDC	TENV			1.75	17.60	PDF
MTPM-P50-1M18	$350.00	1/2						2.6	20.74	PDF
MTPM-P75-1M18	$399.00	3/4			TEFC			3.9	25.58	PDF
MTPM-001-1M18	$442.00	1						5.2	28.32	PDF
MTPM-1P5-1M18	$479.00	1-1/2						7.7	35.70	PDF
MTPM-002-1M18	$762.00	2						9.8	61.95	PDF

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

Performance Data – DC 56C Frame Motors – 1800rpm																
Part Number	HP	Armature Voltage	Torque (lb·ft)	Form Factor *	Ambient Temp.	Insulation Class	Ball Bearings		Mounting	Wire / Housing	Shaft	Constant Torque Speed Range	Overall Speed Range	Base / Type	Paint Color	Rotor Inertia ($kg \cdot m^2$)	Efficiency (%)
			Full Load				DE Bearing	ODE Bearing									
MTPM-P33-1L18	1/3	90 VDC	0.97	1.35	40°C (104°F)	F	6203	6203	Top Mounted	Junction Box	Keyed	90-1800rpm	0-2000rpm	Rigid Removable	Gray	0.01956	79
MTPM-P50-1L18	1/2		1.46													0.02365	80
MTPM-P75-1L18	3/4		2.19													0.02795	
MTPM-001-1L18	1		2.92													0.03225	
MTPM-1P5-1L18	1-1/2		4.38													0.04945	81
MTPM-P33-1M18	1/3	180 VDC	0.97													0.01956	79
MTPM-P50-1M18	1/2		1.46													0.02365	80
MTPM-P75-1M18	3/4		2.19													0.02795	
MTPM-001-1M18	1		2.92													0.03225	
MTPM-1P5-1M18	1-1/2		4.38													0.04945	81
MTPM-002-1M18	2		5.84													0.09675	85

*** See additional information in Form Factor Table.**

Form Factor

The voltage used to power a permanent magnet (PM) DC motor is not pure DC; it is derived by rectifying a supplied AC voltage. The resulting DC voltage has a ripple that is related to the frequency of the AC input.

Form factor is the ratio of I_{rms} to I_{dc}, and it indicates how close the driving voltage is to pure DC. The form factor for a DC battery is 1.0. The higher the form factor is above 1.0, the more it deviates from pure DC. The Form Factor Table shows examples of commonly used voltages.

Form factor should not exceed 1.40 for continuous operation. Half wave rectification is not recommended, as it drastically increases form factor.

Operating Ironhorse PMDC motors with DC voltages with form factors higher than 1.40 can result in premature brush failure and excessive motor heating.

Form Factor Table	
Form Factor	DC Voltage Source
1.0	Battery (pure DC)
1.05 *	Pulse width modulation (PWM)
1.40 **	Full wave rectification (1-phase)
1.9 ***	Half wave rectification (1-phase) **

*** All DC-input IronHorse GSD series DC drives are 1.05. IronHorse AC-input GSD5 DC drive is 1.05.**

**** 1-phase full wave rectification is the most common form of DC drive in 0.33–2hp range. All IronHorse GSD series DC drives are 1.40 or better.**

***** Not Recommended.**

IronHorse® VP1 DC Gearmotors

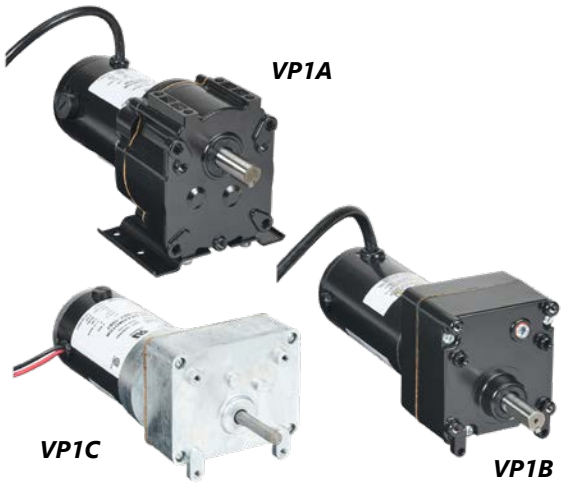
Series VP1 Parallel Shaft Gearmotors – 90 VDC

Torque range to 280 in-lbs and Speed range to 165rpm

Model Overview

IronHorse DC gearmotors are manufactured in the U.S.A. by a leading motor supplier with over 75 years experience delivering high-quality motors and gearmotors to the demanding U.S. market. VP1 series gearmotors provide 90 VDC motor voltage with new industry standard torque and speed ranges. Our supplier does 100% dynamic testing of the gearmotors before shipment.

IronHorse DC gearmotors are designed for use with adjustable SCR controls and drives or with PWM (pulse width modulated) adjustable speed drives. The motors can also be started "across-the-line" with a DC power source, but the system may see a sudden high current surge.



Gearmotor Features

- Available in 90 VDC
- Torque ranges from 13 – 280 in-lbs
- Speed ranges from 7 – 165rpm
- TENV enclosure
- Metal gears for long service life
- Reduced noise design
- IP40 environmental rating
- Class F insulation
- SCR rated
- Rugged diecast aluminum design
- VP1A, VP1VB - 36" Jacketed power cord; VP1C - 18in flying leads
- Externally replaceable DC brushes; available for purchase
- Double-shielded bearings
- Dynamically balanced armature
- Electrically reversible
- Orientation restrictions vary depending on model
- Not intended for DC power generation
- UL recognized (E365956), CSA certified (259724), RoHS

Applications

- Conveyors
- Turntables
- Pick and place
- Indexers
- Small machinery
- Where reduced speed and/or increased torque are required

IronHorse® MTG DC Gearmotors

Series MTG Gearmotors – 1/19 to 1/5hp

Model Overview

IronHorse DC gearmotors are manufactured in the U.S.A. by a leading motor supplier with over 75 years experience delivering high-quality motors and gearmotors to the demanding U.S. market. MTG series provides a variety of parallel shaft and right angle shaft gearmotors in voltage ranges from 12 - 180 VDC. Our supplier does 100% dynamic testing of the gearmotors before shipment.

IronHorse DC gearmotors are designed for use on unfiltered SCR (Thyristor) type rectified AC input. They may also be used with PWM (pulse width modulated) type DC adjustable speed drives, and in across-the-line applications.

Applications

- Conveyors
- Turntables
- Pick and place
- Indexers
- Small machinery
- Where reduced speed and/or increased torque are required

General Features

- Available in 12, 24, and 90 VDC
- Available from 1/19 to 1/5hp
- Available with parallel or right-angle gear shafts

Gearmotor Features

- TENV enclosure
- IP40 environmental rating
- Class F insulation
- SCR rated
- Externally-replaceable brushes
- Double-shielded bearings
- Dynamically-balanced armature
- Electrically-reversible
- 18-inch leads, or junction box with 8-inch Leads
- Replacement components are available
- Orientation restrictions vary depending on model. See illustrations for details
- Not intended for DC power generation
- UL recognized (E365956), CSA certified (259724), RoHS

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AC Motor Selection – IronHorse® General Purpose Motors

IronHorse® 1-Phase Motor Selection			
Motor Series	***MTR2***	***MTRJ***	***MTF2***
Paint Color	***Black***	***Black***	***Green***
Main Characteristics	***General Purpose Rolled Steel***	***Jet Pump***	***Farm Duty Rolled Steel***
Electrical Characteristics			
Horsepower range	1/3 - 2	1/3 - 2	2 - 10
Base speed	1800; 3600	3600	1800
Standard Voltage	115/208–230 VAC; 115/230 VAC	115/230 VAC	208–230 VAC
Phase / Base Frequency	1-phase / 60 Hz		
Service Factor	1.15		
Design Code (NEMA)	L or N (by model)	L or N (by model)	L
Insulation Class	Class F		
Insulation System	Dip and Bake Twice		Double VPI
Duty Cycle	Continuous		
Thermal protection	None	Automatic	Manual
Hazard Classification	None		
Mechanical Characteristics			
Frame size	56C or HC	56J	182T - 215T
Enclosure	TEFC	TEFC	TEFC
Enclosure Rating	IP43		IP55
Frame material	Rolled Steel		
End bracket material	Aluminum		
Junction box material	Steel		
Fan guard material	Steel		
Fan material	Polypropylene Plastic	Plastic	
Lead termination	Junction Box		
Standard mounting	C-Face with Removable Rigid Base		Rigid Base
Drive end shaft slinger	Yes		V-ring seal
Bearings	Ball		
Grease	Mobil Polyrex EM		NS7 ENS
Standard junction box assembly position	F1		
Performance Characteristics			
Constant Torque speed range	N/A		
Variable Torque speed range	N/A		
Constant Horsepower speed range	N/A		
Temperature rise	B		
Encoder provisions	None		
Other Characteristics			
Warranty*	2 Years		
Agency Approvals **	CSA, CE		CE, UR

*** See Terms and Conditions for motor warranty explanation.**
1) For warranty on IronHorse motors below 50hp, warranty service can be arranged through AutomationDirect.
2) For warranty on IronHorse motors 50hp 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.**

AC Motor Selection – IronHorse® General Purpose Motors

IronHorse® 3-Phase Motor Selection					
Motor Series	**MTR2/MTRP**	**MTRJ/MTRJP**	**MTDP**	**MTSP/MTSN**	**MTCP2**
Paint Color	**Black**	**Black**	**Blue**	**Stainless**	**Gray**
Main Characteristics	**General Purpose Rolled Steel**	**Jet Pump**	**Rolled Steel Open Drip Proof**	**Stainless Steel Premium Efficiency IP69K**	**Cast-Iron Hazardous Duty**
Electrical Characteristics					
Horsepower range	1/3 - 3	1/3 - 3	1 - 50	1 - 20	1 - 300(T) 1 - 30(TC)
Base speed	1800; 3600	3600	1800; 3600	1200; 1800; 3600	1200; 1800; 3600
Standard Voltage	208–230/460 VAC; 230/460 VAC	208–230/460 VAC; 230/460 VAC	208–230/460 VAC	208–230/460 VAC	208-230/460 VAC; 460VAC
Phase / Base Frequency (Hz)	3-phase / 60 Hz				
Service Factor	1.15	1.15	1.15 (sine), 1.0 (drive)		1.25 (1-200) 1.15 (250-300) 1.0 (all w/ drive)
Design Code (NEMA)	B				
Insulation Class	Class F				
Insulation System	Dip and Bake	Dip and Bake Twice	VPI	Dip and Bake	Vacuum Impregnation
Duty Cycle	Continuous				
Thermal protection	None				
Hazard Classification	None			Class 1 / Div 2	
Mechanical Characteristics					
Frame size	56C or HC - 326T	56J	56C - 326T	56C - 256TC	143T/TC - 449T
Enclosure	ODP / TEFC	TEFC	ODP / TEFC	TEFC / TENV	TEFC
Enclosure Rating	IP43		IP23	IP69K	IP55
Frame material	Rolled steel		Rolled steel	304 Stainless steel	Cast iron
End bracket material	Aluminum	Aluminum	≤256 frame- Aluminum >256- Cast iron	304 Stainless steel	Cast iron
Junction box material	Steel	Steel	Steel	304 Stainless steel	Cast iron
Fan guard material	Steel	Steel	N/a	304 Stainless steel	Steel
Fan material	Polypropylene plastic	Plastic	N/a	Heat-Resistant Polyethelene	Plastic
Lead termination	Junction Box				
standard mounting	C-face with removable rigid base		Rigid base	C-face round body and C-face with rigid base	Rigid base, c-face with rigid base (1-100 hp)
Drive end shaft slinger	Yes	Yes	None	Yes	Yes
Bearings	Ball				1-300 hp - 2p, 1-75 hp - 4p & 6p: Ball 100-300 hp - 4p & 6p: Roller
Grease	Mobil Polyrex EM		NS7 ENS	Mobil Polyrex EM	
Standard junction box assembly position	F1				F1 (field convertible F2)
Performance Characteristics					
Constant Torque speed range	4:1	4:1	10:1	10:1	10:1
Variable Torque speed range	10:1	10:1	20:1	20:1	20:1
Constant Horsepower speed range	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1
Temperature rise	B				
Encoder provisions	None				
Other Characteristics					
Warranty*	2 years	2 years	2 years	1 year	2 years
Agency Approvals **	CSA, CE	CSA,CE	CSA	NEMA, CSA, UR, CE, BISCC	CSA, ISO9001, CE

*** See Terms and Conditions for motor warranty explanation.**
1) For warranty on IronHorse motors below 50hp, warranty service can be arranged through AutomationDirect.
2) For warranty on IronHorse motors 50hp 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® AC Motors

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 IS09001 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).

MTF2 1-phase Farm Duty T-Frame

MTR2 / MTRJ 1-phase General Purpose or Jet Pump Rolled Steel 56C Frame

The IronHorse® line of motors includes:

1 - Phase

- **MTR2 Series:** TEFC 56(H)C-frame AC motors with rolled-steel frames; flange mount and removable mounting feet; 0.33–2 hp
- **MTF2 Series:** TEFC T-frame Farm-Duty AC motors with rolled-steel frames and mounting feet; 2–10 hp
- **MTRJ Series:** TEFC 56J frame. Jet Pump AC Motors. Flange mount and removable mounting feet. 1/3hp - 2hp

3 - Phase

- **MTR2 Series:** TEFC 56C-frame AC motors with rolled-steel frames; flange mount and removable mounting feet; 0.33–0.75 hp
- **MTRP Series:** TEFC 56C/HC-frame AC motors with rolled-steel frames; removable base and C-face mount; 1–3 hp
- **MTRJ Series:** TEFC 56J frame. Jet Pump AC Motors. Flange mount and removeable mounting feet. 1/3hp - 3hp
- **MTSS Series:** TEFC 56C-frame AC motors with stainless-steel frames; IP56; flange mount and round bodies or rigid mounting feet; 0.33–0.75 hp
- **MTSP/MTSN Series:** TEFC/TENV 56C-284t frame AC motors with stainless steel frames; IP69K; flange mount and round bodies or flange mount with rigid mounting feet; 0.33–20 hp
- **MTCP2 Series:** TEFC T-frame 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 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 1-phase motors
- Replacement bases, fans, and fan shrouds available for many IronHorse motors
- Accessory C-flange kits available for flange mounting of IronHorse 3-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)

MTR2 / MTRP / MTRJ 3-phase General Purpose or Jet Pump Rolled Steel 56C Frame

MTSP / MTSN 3-phase Stainless Steel 56C – Rigid Base or Round Body

MTDP 3-phase Premium Efficiency Rolled Steel Open Drip-Proof

MTSS 3-phase Stainless Steel 56C – Rigid Base or Round Body

MTCP2 3-phase Premium Efficiency Cast-iron TC & T Frame

MTF2 Series Farm-Duty AC Motors – 1-Phase

T-Frame TEFC Motors – 1-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
- $_{C}$UR $_{US}$ 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 – 1-phase Farm-Duty Motors

Part Number	Price	HP	Base RPM	Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps @ 208/230VAC	Approx Weight (lb)	Drawing Link
MTF2-002-1B18-182	$459.00	2	1800	208–230 VAC	TEFC IP55	182T	1.15 @ 230 VAC, 1.0 @ 208 VAC	9.3 / 8.5	67	PDF
MTF2-003-1B18	$528.00	3				184T		13.5 / 12.5	76	PDF
MTF2-005-1B18	$695.00	5				184T		22.2 / 20.2	100	PDF
MTF2-7P5-1B18-215	$989.00	7 1/2				215T		31.5 / 28.7	134	PDF
MTF2-010-1B18	$1,045.00	10				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), 1-phase power only.

Performance Data – 1-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	215T	1764	3.0	8.5	78.6	6.01	21.8	22.1	84.0	0.92	0.27
MTF2-003-1B18	3		1769	4.2	12.5	89.2	8.76	24.9	24.4	84.4	0.91	0.34
MTF2-005-1B18	5		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		1767	8.2	28.7	238.5	21.91	82.8	82.2	86.6	0.96	0.74
MTF2-010-1B18	10		1765	11.79	38.8	365.8	29.93	119.7	122.7	87.5	0.96	0.85

Independently tested for quality at www.advancedenergy.org

Advanced Energy is North America's leading independent motor test lab and also the first motor lab to receive NVLAP (National Voluntary Laboratory Accreditation Program) compliance for motor efficiency testing through NIST. We commissioned them to put all IronHorse motors through rigorous mechanical and electrical tests to confirm our quality requirements. We were very satisfied with the results, and we're sure you will be too!

Rolled Steel 56C Frame Motors 0.33 to 3 hp

1-phase - 115/208-230 Volt, 56C Frame - TEFC Enclosure, 1800 & 3600 RPM

- 0.33 to 2 hp
- Electrically reversible
- Capacitor start
- Removable bolt-on / bolt-off base
- Industrial gauge steel motor, frame and base

3-phase - 208-230/460 Volt, 56C Frame - TEFC Enclosure, 1800 & 3600 RPM

- 0.33 to 3 hp
- Electrically reversible
- Removable bolt-on / bolt-off base
- Industrial gauge steel motor, frame and base

MTR2 Series Rolled-Steel AC Motors – 1-Phase

56C/56HC Frame TEFC Motors – 1-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
- CCSAUS 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

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

Motor Specifications – 1-phase MTR2 Series

Part Number	Price	HP	Base RPM	1-phase Voltage	Housing	NEMA Frame	Service Factor	F.L. Amps 115V/230V	Approx Weight (lb)	Drawing Links
MTR2-P33-1AB18	$233.00	1/3	1800	115/230	TEFC rolled steel frame with cast aluminum end bell, F1 conduit box location	56C flange mount	1.15	5.2 / 2.6	22	PDF
MTR2-P50-1AB18	$257.00	1/2						7.2 / 3.6	25	PDF
MTR2-P75-1AB18	$278.00	3/4						10.0 / 5.0	29	PDF
MTR2-001-1AB18	$287.00	1				56HC		13.0 / 6.5	36	PDF
MTR2-1P5-1AB18	$339.00	1-1/2						14.5 / 7.3	37	PDF
MTR2-002-1AB18[1]	$391.00	2						19.6 / 9.8	44	PDF
MTR2-P33-1AB36	$235.00	1/3	3600	115/230	TEFC rolled steel frame with cast aluminum end bell, F1 conduit box location	56C	1.15	5.4 / 2.7	21	PDF
MTR2-P50-1AB36	$243.00	1/2						6.5 / 3.3	23	PDF
MTR2-P75-1AB36	$263.00	3/4						9.2 / 4.6	27	PDF
MTR2-001-1AB36	$278.00	1						11.5 / 5.8	30	PDF
MTR2-1P5-1AB36	$307.00	1-1/2		115/230				13.0 / 6.5	31	PDF
MTR2-002-1AB36	$359.00	2				56HC		17.0 / 8.5	37	PDF

Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
1) If using this motor with 115V, a 30A feed service breaker will be required. The FLA will trip a standard 20A breaker.

MTDP Series Open Drip-Proof AC Motors – 3-Phase

T-Frame ODP Motors – 3-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
- No mounting orientation restrictions
- 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
- CURUS 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

MTR2 & MTRP Series Rolled-Steel AC Motors – 3-Phase

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

Features

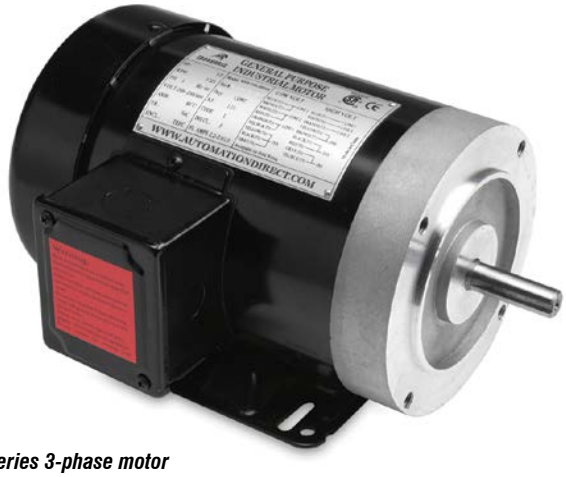
- Totally Enclosed Fan Cooled (TEFC) enclosure
- NEMA 56C or 56HC flange mount (56HC are suitable for 56, 143T, or 145T frame mounting dimensions)
- Rolled steel shell frame / cast aluminum end bell
- No mounting orientation restrictions
- Removable base / bolt-on/bolt-off mounting feet
- Steel fan cover
- 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
- CCSAUS certified, CE

Accessories Available

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

MTR2 & MTRP Series Rolled-Steel AC Motors – 3-Phase

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

Motor Specifications – 3-phase MTR2 & MTRP Series 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)***
MTR2-P33-3BD18	$208.00	1/3	1800	3	230/460	TEFC rolled steel frame with cast aluminum end bell F1 conduit box location	56C flange mount (MTRP = 56HC)*	1.15	1.4 / 0.7	18
MTR2-P33-3BD36	$185.00		3600						1.3 / 0.65	18
MTR2-P50-3BD18	$221.00	1/2	1800						1.9 / 0.95	19
MTR2-P50-3BD36	$195.00		3600						1.7 / 0.85	19
MTR2-P75-3BD18	$240.00	3/4	1800						2.6 / 1.3	22
MTR2-P75-3BD36	$205.00		3600						2.4 / 1.2	21
MTRP-001-3BD18	$299.00	1	1800						3.2 / 1.6	35
MTRP-001-3BD36	$247.00		3600						3.0 / 1.50	23
MTRP-1P5-3BD18	$329.00	1-1/2	1800						4.5 / 2.25	43
MTRP-1P5-3BD36	$279.00		3600						4.0 / 2.0	31
MTRP-002-3BD18	$387.00	2	1800						6.0 / 3.0	49
MTRP-002-3BD36	$298.00		3600						5.2 / 2.6	33
MTRP-003-3BD36	$389.00	3	3600						7.4 / 3.7	39

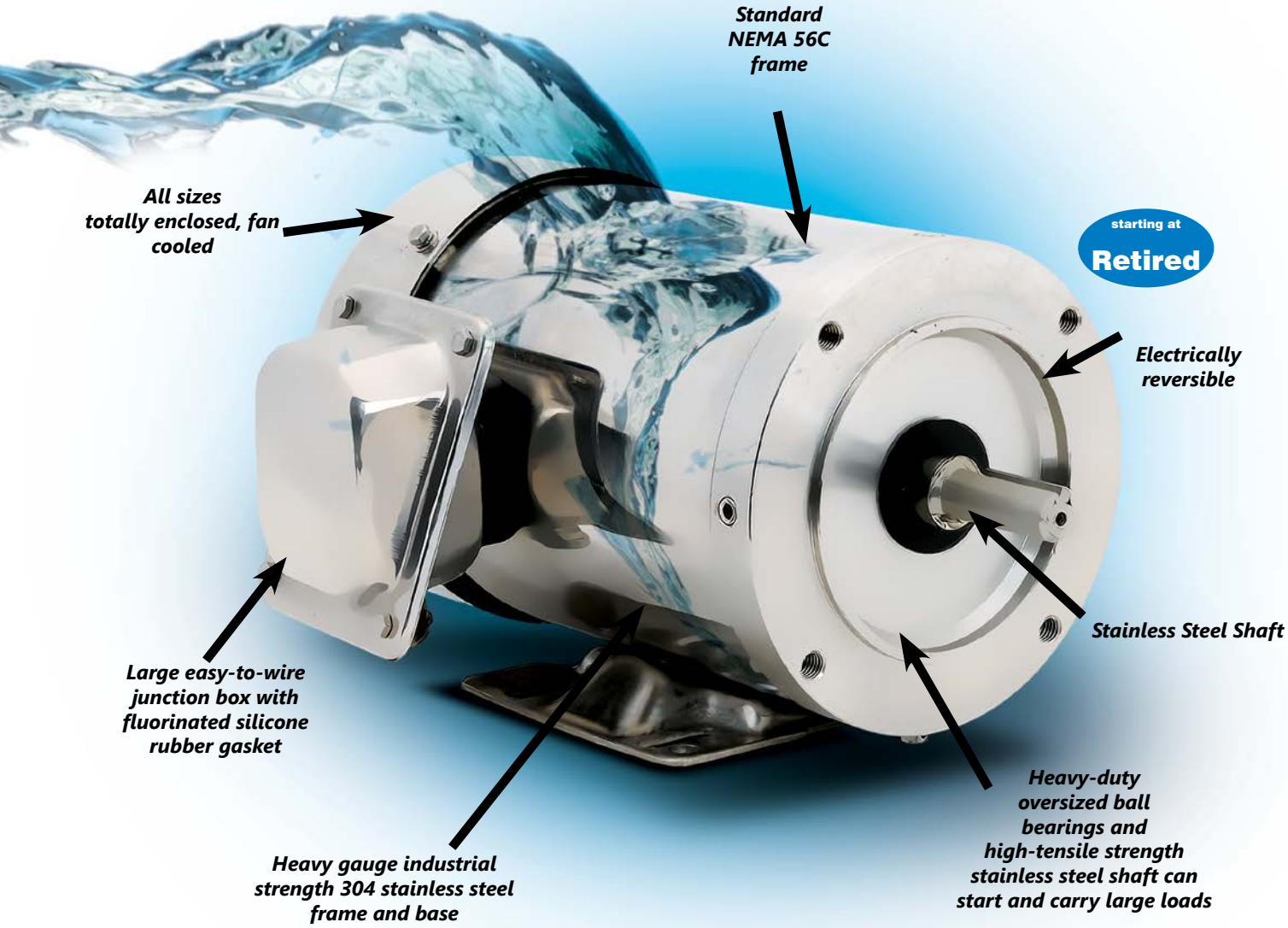
Note: Please review the AutomationDirect Terms & Conditions for warranty and service on this product.
IronHorse Motors with product numbers ending in P are Premium Efficiency motors and meet or exceed all current efficiency guidelines.
***56HC motors are capable of 56C C-face mounting, and are also compatible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

IronHorse is ready for washdowns and harsh environments!

IRONHORSE®
AUTOMATIONDIRECT

IP56 environmental rating

MTSS Stainless Steel 56C Frame Motors 0.33 to 0.75 hp



Three-phase - 208-230/460 Volt, 56C Frame - TEFC Enclosure, 1800 & 3600 RPM

- 0.33 to 0.75 hp
- Electrically reversible
- Round body motors (no base) also available
- Heavy gauge stainless steel shaft, frame and base
- Available with or without mounting feet
- Includes pre-installed IP66 cord grip

MTSS Series Stainless-Steel 3-phase General-Purpose AC Motors

MTSS Stainless Steel TEFC Motors – 3-phase – 0.33 to 0.75 hp

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

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

Features

- Totally Enclosed Fan Cooled (TEFC) enclosure
- NEMA 56C flange mount
- 304 stainless steel shell frame
- No mountin orientation restrictions
- 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
- $_{c}CSA_{us}$ certified

Accessories & Spare Parts Available

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

Applications

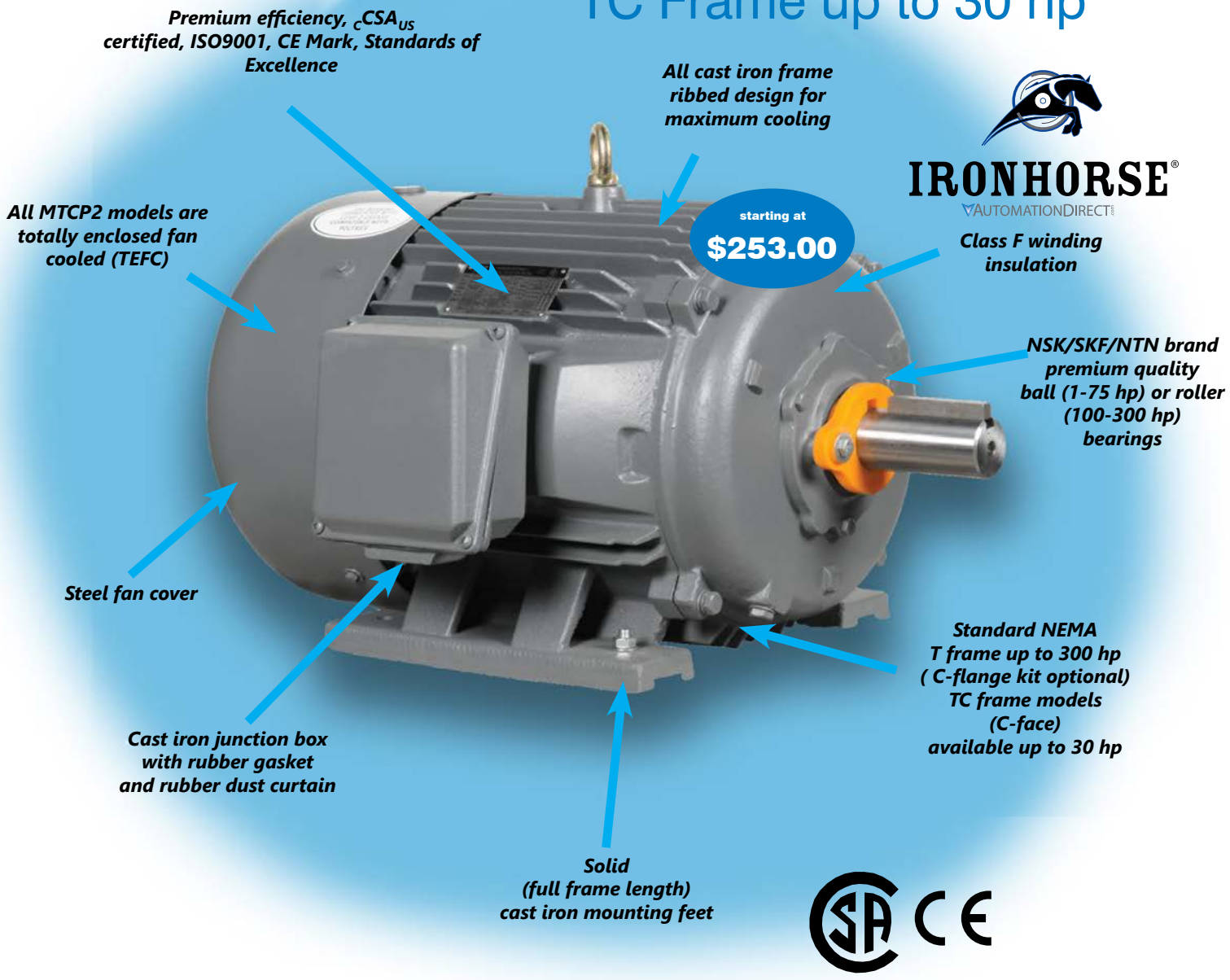
- Conveyors
- Fans
- Gear reducers
- Pumps
- Inverter capable
- Washdown environments

Premium efficiency motors for energy conservation

IronHorse© Premium Efficiency AC electric motors meet the requirements of the Energy Independence and Security Act of 2007. The MTCP2 Series gives you a low cost of entry so you get a quicker payback on your investment. All our Ironhorse motors are in stock and ready for same-day shipment; if your order is over $49, you get free shipping too!

Cast Iron T Frame Motors 1 to 300 hp

TC Frame up to 30 hp



Three-phase - 208-230/460 Volt, T Frame - TEFC Enclosure, 1200,1800, 3600 RPM

- Premium Efficiency
- Premium grade quality
- All cast iron frames
- Drive-end ball bearings (1-75 hp) or roller bearings (100-300 hp) are installed in all MTCP2 motors
- Electrically reversible
- C-flange kits for C-face mounting are available
- C-face models available up to 30 hp

MTCP2 Premium-Efficiency Cast-Iron 3-phase AC Motors

T-Frame TEFC Motors – 3-phase Industrial Duty – 1 to 300 hp

TC-Frame (C-Face) TEFC Motors – 3-phase Industrial Duty – 1 to 30 hp

Premium Efficiency
3-phase Cast-iron T-Frame

Premium Efficiency
3-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
- Horizontal or Vertical shaft down orientation
- 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
- $_{c}CSA_{us}$ 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

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. As the use of VFDs (inverters or AC drives) has become commonplace in industry, the construction of general purpose motors was improved to handle many applications. All ADC General purpose 3 phase motors are inverter rated and can withstand the higher voltage spikes produced by all VFDs (amplified at longer cable lengths).

If an application requires precise speed control or high loads at lower speed, a high performance inverter duty motor may be required. These motors are designed run at very slow speeds without overheating. This performance comes at a cost: high performance inverter-duty motors can be much more expensive than general purpose inverter rated motors. Guidelines for choosing an IronHorse general purpose motor vs. a high performance inverter duty motor are given below. If your application falls within the guidelines below, there is no need to apply a high performance inverter-duty motor.

NOTE: Marathon high performance, 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.

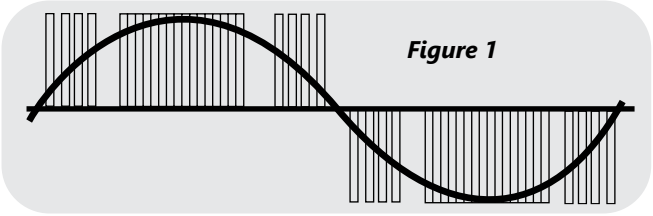


Figure 1

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].

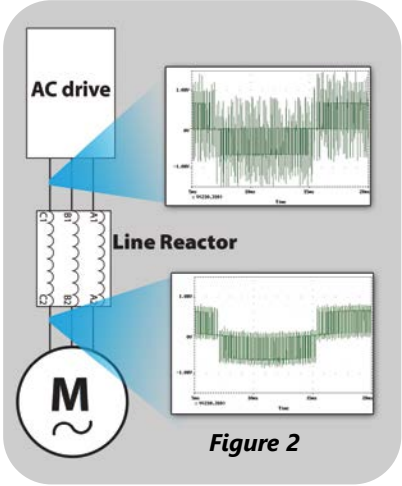


Figure 2

In summary, all ADC general purpose motors are inverter rated and can be run with drives in many applications; however high performance, 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) 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

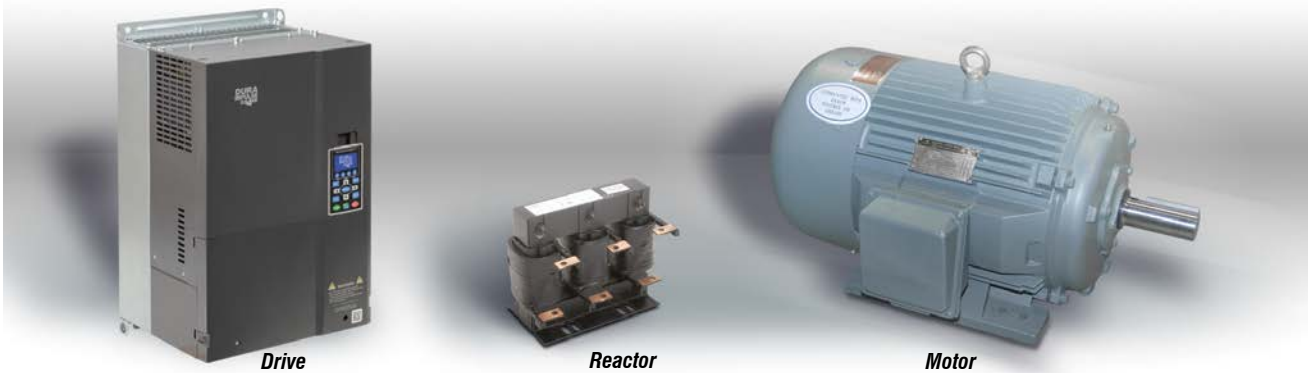
Voltage Spike considerations

	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, 3-phase general purpose motors can also be controlled by AC drives under certain conditions. (1-phase AC motors cannot be controlled by typical 3-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 3-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 3-phase AC motors (3-phase AC drives cannot be used to control 1-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 3-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 high performance, inverter-duty motors.

3. Carrier frequency limitation for AC drive control

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