# TECO-WESTINGHOUSE MOTORS (CANADA) INC. MOTORS AND CONTROLS PRICE BOOK



amproelectric.com



MOTORS (CANADA) INC.

Your Authorized TECO-Wes	tinghouse Representative is:
Your Base Motor Multiplier is:	Your Base Controls Multiplier is: Date:







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For more information visit: **www.tecowestinghouse.ca** or call: **1-800-661-4023** 

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Induction Motor Reference Guide Index

# TAILORED DISCOUNT STRUCTURE

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	Optim <sup>®</sup> TEFC		
		Advantage Plus IEEE Ready	
		Advantage Plus IEEE 841	
		Optim <sup>®</sup> TEXP	
		Optim <sup>®</sup> Oilwell	
		MAX-HT	
		Stainless Steel Washdown	
_		THREE PHASE ODP	
		Rolled Steel ODP	
		Optim <sup>®</sup> ODP	
		MEDIUM VOLTAGE	
		Global XHP	
		Global ODP	
		SINGLE PHASE	
		Farm Duty	
		Single Phase TEFC	
		Single Phase ODP	
		PUMP MOTORS	
		Optim <sup>®</sup> JP	
		Optim <sup>®</sup> JM	
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Tailored Discount Structure

# TAILORED DISCOUNT STRUCTURE

TECO VFD Peripherals	
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VMX2 Low Voltage Soft Starters	
MVC MV Soft Starters	
MTE Reactors	
MTE dV/dT Filters	
MTE Sine Wave Filters	
MTE Matrix Harmonic Filters	
Programmable Logic Products	



## Definition

The term "Company" shall be deemed to include TECO-Westinghouse Motors (Canada) Inc. and its affiliates as the case may be.

#### Price Policy

## **List Prices and Discounts**

Prices and discounts are subject to change without notice prior to entry of order.

#### **Price Adjustment**

The contract price, excluding sales taxes and erection and service is subject to the following condition:

The contract price is firm for shipments made within 12 months from the date of quotation by the Company.

#### Taxes

Where prices include Government taxes, they are in accordance with the law and regulations in effect at the date of the proposal or quotation. Such prices are subject to increase or decrease to reflect changes in taxes levied by Governments made prior to delivery of the product.

Prices do not include Federal Sales Tax. Provincial and municipal taxes, where applicable will be added to the prices quoted.

## **Terms of Payment**

All payments shall be in Canadian dollars. Unless authorized differently on a specific negotiation, the Company's standard terms of payment will apply.

1. On orders under \$200,000 in value – 100% net 30 days. No cash discount.

2. On orders \$200,000 and over and/or with shipping schedule exceeding 6 months, progress payments will be required. The standard Company progress payments are:

a) 10% of the contract price on receipt of order.

- b) 10% of the contract price on submission of drawings.
- c) 40% on completion of major components (stator core, rotor core, motor frame).
- d) 30% due 45 days before contractual ship date.
- e) 10% due at final shipment.

In case partial shipments are made at different times, pro-rated payments shall be made therefore.

If shipments of the product specified, or any material part thereof, are delayed from any cause for which the Purchaser is directly or indirectly responsible, the date of completion of the product by the Company shall be regarded as the date of shipment in determining when payments for said products are to be made, and the Company shall be entitled to receive reasonable compensation for storing the completed product which shall be held at the purchaser's risk. Normally, the Company will inform the Purchaser in writing of the date of completion. The Purchaser agrees that should any of the payments not be made to the Company when due in accordance with these terms, the Purchaser shall pay the Company interest on such overdue payments at the rate of 18% per year.

## **Credit Approval**

Acceptance of a purchase order is subject to approval of the Purchaser's credit by the Company. Notwithstanding such acceptance and/or approval, if in the Company's judgment the purchaser's financial condition does not at any time warrant the continuation of production of shipment of the original terms, the Company reserves the right to request payment in advance or other surety.

## **Minimum Billing**

The minimum billing for any one order shall be \$150 net.

## Quotations

Unless specified in a proposal, written quotations automatically expire thirty calendar days from like date issued. Verbal quotations expire the same day they are made unless confirmed in writing, whereupon they expire thirty days from the date issued.

## **Shipping Policy**

#### **Factory Shipments**

Unless otherwise stated, CIF Ocean Port of entry in Canada. All other freight extra.

#### Warehouse Shipments / Normally Stocked Items

Shipping terms are F.O.B. point of shipment with freight prepaid and allowed to first Canadian destination serviced by a common carrier provided shipment is greater than \$5000. There will be one single Canadian destination per shipment prepaid. If shipment value is less than \$5000 freight charges will be collect.

#### Delivery

Unless otherwise expressly agreed in writing, delivery of the product will be made F.O.B. the Company's factory or warehouse. Delivery dates specified are subject to prior sale of manufacturing and engineering space and to the receipt of all information necessary to allow maintenance of the Company's engineering and manufacturing schedules.

## Loss or Damage in Transit

The Company does not hold itself responsible for any loss, damage or pilferage sustained in transit, having obtained "in good order" receipts from the carrier. Claims of such character should be made promptly against the carrier. If the Company is notified in writing of such claims, it will lend assistance to secure adjustment.

#### Shipment F.O.B. Destination

The Company agrees to deliver the product F.O.B. Destination, the Purchaser shall examine the product as soon as it is received and shall within ten days thereafter give notice to the Company and shall notify the carrier of any loss or damage sustained during transit, and further in the case of any damage, the Purchaser shall request an inspection of the Loss or Damage by a representative of the delivering carrier and a copy of the carrier's Inspection Report shall be sent to the Company. If such notice to the Company or to the delivering carrier is not given, the product shall be deemed to have been delivered in satisfactory condition and the price shall become due and payable in full as agreed between the Company and the Purchaser.

## Warranty

## Stock Motor Warranty

All TECO–Westinghouse brand stock motors sold by TECO–Westinghouse Motors (Canada) Inc. are warranted to be free of defects in material and workmanship for a period of thirty-six (36) months from the date of sale or in the case of Advantage Plus IEEE 841, five (5) years from date of sale. This warranty is conditioned upon the installation, operation, and maintenance of the motors in accordance with TECO- Westinghouse Motors (Canada) Inc. recommendations or standard industry practice and the motors have at all times been operating or used under normal operating conditions for which they were designed.

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TECO–Westinghouse Motors (Canada) Inc. shall, at its sole option and expense, either repair or replace, F.O.B.TWMI warehouse, any such motor or part which is defective within the warranty period.

In the event of a warranty claim, TECO–Westinghouse Motors (Canada) Inc. must be notified promptly following any motor failure. The motor shall be sent to a TECO–Westinghouse Motors (Canada) Inc. authorized service center for diagnosis on the cause of failure. If the failure is due to defective material and/or workmanship, TECO–Westinghouse Motors (Canada) Inc. will replace or repair the defective motor or part.

The repair or replacement of defective material and workmanship shall constitute complete fulfillment of TECO-Westinghouse Motors (Canada) Inc. warranty liability whether the warranty claims are based on contract, tort (including negligence and strict liability), or otherwise.

## **Controls Warranty**

TWMI warrants Control Products for the period of one year from the date of invoice to be of merchantable quality, free from defects in material, workmanship and design. Warranty is limited to the exchange or repair of products. Warranty does not apply to the application or installation of products, service, shipping or transportation costs associated with return or exchange of goods.

#### **Packaged Solutions Warranty**

TWMI warrants Control Products that are commissioned by an authorized TWMI Service Representative for the period of two years from the Commissioning Date to be of merchantable quality, free from defects in material, workmanship and design and that the products supplied are suitable for the intended application. Warranty is limited to the exchange or repair of products. Warranty does not apply to installation of products, shipping or transportation costs associated with return or exchange of goods or to any subsequent service costs.

Warranty is conditioned upon the installation, operation and maintenance of the Control Products in accordance with TECO-Westinghouse (Canada) Inc. recommendations or standard industry practices and the Controls at all times being operated or used under normal operating conditions for which they were designed.

TECO-Westinghouse Motors (Canada) Inc. shall, at its sole option and expense, either repair or replace, F.O.B.TWMI warehouse, any such Control Product or part there of which is defective within the warranty period.

In the event of a warranty claim, TECO-Westinghouse Motors (Canada) Inc. must be notified promptly following the Control Product failure. The Control Product shall be sent prepaid to TECO-Westinghouse Motors (Canada) Inc. authorized service center for diagnosis on the cause of failure. If the cause of failure is due to defective material, workmanship or design, TECO-Westinghouse Motors (Canada) Inc. will replace or repair the defective Control or Part.

(Continued ...)



Selling Policy

The repair or replacement of defective material and workmanship shall constitute complete fulfillment of TECO-Westinghouse Motors (Canada) Inc. warranty liability whether the warranty claims are based on contract, tort (including negligence and strict liability), or otherwise.

## **Engineered Motor Warranty**

Where the product sold by the Company is also manufactured by the Company, the Company warrants the product supplied hereunder to be of the kind designated or specified. Unless otherwise expressly agreed in writing, the company shall repair or replace any defective part or parts, F.O.B. the Company's plant, warehouse, or its designated service facility, which prove to be defective under normal and proper use within (one) 1 year from the date of installation or eighteen (18) months from date of shipment, whichever occurs earlier, provided that the Purchaser gives the Company immediate written notice of any such defect or defects. On expiration of the Warranty period, any liability of the Company shall terminate.

Where the product sold by the Company is not also manufactured by the Company, it is the product of a reputable manufacturer sold under that manufacturer's brand or trade name and the Company warrants that it will fulfill the same warranty obligations as it receives from the manufacturer.

### **Optional Warranties:**

## A. Deferred Warranty:

The standard warranty shall apply subject to the following modification:

The total warranty period will be a period of one year from date of initial operation but not in excess of the total warranty period selected.

For the total warranty period desired, make the addition from the table to the net price of each unit.

otal Wa	rranty Period (Months)	% Addition	
18	(12 operational)	0 (standard)	
30	(12 operational)	1%	
36	(12 operational)	2%	
42	(12 operational)	3%	
48	(12 operational)	4%	
54	(12 operational)	5%	
60	(12 operational)	6%	

The deferred warranty is valid only if the following conditions are complied with:

- That within thirty days prior to initial operation, a TWMI Service Engineer be hired by the customer to thoroughly inspect the apparatus to ascertain that the apparatus is in "as shipped" condition. This inspection will include but not be limited to:
  - a) Meggar test of winding insulation.
  - **b**) Internal inspection to determine that the winding has not been damaged and that the apparatus is clean and dry.
  - c) Inspection of the bearings to determine they have not been damaged and that there is no water in the oil reservoirs.
  - **d**) External inspection to determine that no damage has been done.
- Make any corrections which this inspection shows to be needed because the apparatus has been in storage or standing idle.

These corrections will be made at the customer's expense if corrections required are due to storage conditions.

3. That an affidavit certifying that the apparatus has successfully passed the inspection and is in "as shipped" condition be supplied to TWMI by the customer. Failure to provide TWMI with the affidavit certifying that the apparatus has passed inspection and is in "as shipped" condition will result in voiding the warranty.

### **B. Extending Operational Warranty:**

Extended Operational Warranties are available per the following:

Total Wa	rranty Period (Months)	% Addition	
18	(12 operational)	0 (standard)	
30	(24 operational)	3%	
42	(24 operational)	5%	
48	(36 operational)	7%	

Longer operational warranties are available, but must be negotiated with TWMI.

The applicable Warranty expressed in this paragraph constitutes the only Warranty of the Company and no other warrant or condition, statutory or otherwise, shall be implied.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING AND USAGE OF TRADE. UNDER NO CIRCUMSTANCES, SHALL TECO-WESTINGHOUSE MOTORS (CANADA) INC. BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING FREIGHT.

## Title

The title to the product or any part thereof shall pass from the Company as soon as all payments due have been fully made in cash, except as otherwise expressly stipulated herein. The said product shall be and remain personal property, notwithstanding its mode of attachment to realty or other property. If default is made in any of the payments herein, the Company may retain any partial payments which have been made, as liquidated damages and the Company shall be entitled to the immediate possession of the product and shall be free to enter the premises where the product may be located and remove it as the Company's property, without prejudice to the Company's right to recover any further expenses or damages the Company suffer by reason of such non-payment. Notwithstanding the terms hereof, risk will pass to the purchaser at point of delivery.

#### **Force Majeure**

The Company shall not be responsible or liable for any loss, damage, detention or delay caused by war, invasion, insurrection, riot, the order of any civil or military authority, or by fire, flood weather or to other acts of the elements, breakdown, lockouts, strikes or labor disputes, the failure of the Company's suppliers to meet their contractual obligations, or, without limitations of the foregoing, any other cause beyond the reasonable control of the Company and the receiving of the product by the Purchaser shall constitute a waiver of all claims for loss or damage due to delay.

### Patents

The Company's agrees that it will at its own expense defend all actions or proceedings instituted against the Purchaser and pay any award of damages assessed against the Purchaser in such actions or proceedings, Selling Policy TWMI 2500 (E) 03/19 Supersedes Selling Policy TWMI 2500 (E) 05/18

insofar as the same are based on any claim that the said product or any part thereof constitutes an infringement of any claim of a Canadian patent, other than a claim occurring a process or a product thereof, provided the Purchaser gives the Company immediate notice in writing of the institution of the actions or proceedings and permits the Company through its council to defend the same and give the Company all needed information, assistance and authority to enable the Company so to do. In case such product is in such action held to constitute infringement, and its use is enjoyed, the Company, within a reasonable time, will either secure for the Purchaser the right to continue using said product by suspension of the injunction, by procuring for the Purchaser a license or otherwise or will at its own expense, replace such product with non-infringing product or modify it so that it becomes non-infringing or remove the said enjoined product and refund the sums paid therefore.

## **Limitation of Liability**

Notwithstanding any other provision in this Agreement or any applicable statutory provisions, the Company shall not be liable to the Purchaser for any special or consequential or incidental or punitive damages including but not limited to loss of profits or revenues, loss off use of the equipment, loss of opportunities, loss of goodwill, interruption of business, or down time costs and in no event shall the aggregate liability of the Company exceed the unit price of the defective product, part or service on which the such liability is based. The provisions of this article, and of all other sections of the Agreement providing for limitation of or protection against liability of the Company, shall also protect its direct and indirect suppliers and its subcontractors and shall apply to the full extent permitted by law and shall survive the termination, cancellation or expiration of this Aareement.

In the event any product, part or service sold by the Company hereunder is the subject of a resale by the Purchaser, Purchaser agrees to bind his customer to provisions limiting the liability of Purchaser and its suppliers and subcontractors which are the same as the corresponding provisions of this Agreement and Purchaser shall indemnify and save harmless the Company from any claims, loss or damage arising directly or indirectly from the Purchaser's failure to do so.

#### **Returned Material**

The Company's permission must be obtained before returning any material whereupon it will furnish shipping instructions and tags. Any material returned without permission will be held at Purchaser's risk and is liable to non-acceptance or delay in approval of credit. Only standard stocked product may be returned for credit. When permission is granted for the return of material, credit will be allowed for the invoiced price less a restocking charge and less transportation charges. Any cost incurred in putting the material in salable condition shall be deducted from the allowed credit.

### **Cancellation or Changes**

Any order may be canceled or altered by the Purchaser only upon payment of reasonable charges based upon expenses already incurred and commitments made by the company with respect to the order.

### Installation

The product shall be installed by and at the expense of the Purchaser, unless otherwise expressly stipulated.

#### **Special Packing**

Catalogue prices include domestic packing only. Where special packing is required, refer to the Company.

## Special Testing

If witness or other tests are required, refer to the Company.



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Selling Policy

# STANDARD WARRANTY FOR STOCK MOTORS

All TECO–Westinghouse brand stock motors sold by TECO–Westinghouse Motors (Canada) Inc. are warranted to be free of defects in material and workmanship for a period of 36 months from the date of sale (Advantage Plus 5 Year Warranty - IEEE 841 only).

This warranty is conditioned upon the installation, operation, and maintenance of the motors in accordance with TECO–Westinghouse Motors (Canada) Inc. recommendations or standard industry practice and the motors have at all times been operating or used under normal operating conditions for which they were designed.

TECO–Westinghouse Motors (Canada) Inc. shall, at its sole option and expense, either repair or replace, F.O.B. TWMI warehouse, any such motor or part which is defective within the warranty period.

In the event of a warranty claim, TECO–Westinghouse Motors (Canada) Inc. must be notified promptly following any motor failure. The motor shall be sent to a TECO–Westinghouse Motors (Canada) Inc. authorized service center for diagnosis on the cause of failure. If the failure is due to defective material and/or workmanship, TECO–Westinghouse Motors (Canada) Inc. will replace or repair the defective motor or part.

The repair or replacement of defective material and workmanship shall constitute complete fulfillment of TECO–Westinghouse Motors (Canada) Inc. warranty liability whether the warranty claims are based on contract, tort (including negligence and strict liability), or otherwise.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING AND USAGE OF TRADE. UNDER NO CIRCUMSTANCES, SHALL TECO-WESTINGHOUSE MOTORS (CANADA) INC. BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING FREIGHT.

**ONLINE WARRANTY INSTRUCTIONS ARE AVAILABLE AT:** www.tecowestinghouse.ca/support/warranty



## WARRANTY CONTROL PRODUCTS

TWMI warrants Control Products for the period of one year from the date of invoice to be of merchantable quality, free from defects in material, workmanship and design. Warranty is limited to the exchange or repair of products. Warranty does not apply to the application or installation of products, service, shipping or transportation costs associated with return or exchange of goods.

## WARRANTY PACKAGED SOLUTIONS

TWMI warrants Control Products that are commissioned by an authorized TWMI Service Representative for the period of two years from the Commissioning Date to be of merchantable quality, free from defects in material, workmanship and design and that the products supplied are suitable for the intended application. Warranty is limited to the exchange or repair of products. Warranty does not apply to installation of products, shipping or transportation costs associated with return or exchange of goods or to any subsequent service costs.

Warranty is conditioned upon the installation, operation and maintenance of the Control Products in accordance with TECO-Westinghouse (Canada) Inc. recommendations or standard industry practices and the Controls at all times being operated or used under normal operating conditions for which they were designed.

TECO-Westinghouse Motors (Canada) Inc. shall, at its sole option and expense, either repair or replace, F.O.B. TWMI warehouse, any such Control Product or part there of which is defective within the warranty period.

In the event of a warranty claim, TECO-Westinghouse Motors (Canada) Inc. must be notified promptly following the Control Product failure. The Control Product shall be sent prepaid to TECO-Westinghouse Motors (Canada) Inc. authorized service center for diagnosis on the cause of failure. If the cause of failure is due to defective material, workmanship or design, TECO-Westinghouse Motors (Canada) Inc. will replace or repair the defective Control or Part.

The repair or replacement of defective material and workmanship shall constitute complete fulfillment of TECO-Westinghouse Motors (Canada) Inc. warranty liability whether the warranty claims are based on contract, tort (including negligence and strict liability), or otherwise.

THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING AND USAGE OF TRADE. UNDER NO CIRCUMSTANCES, SHALL TECO-WESTINGHOUSE MOTORS (CANADA) INC. BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING FREIGHT.

(CANADA)



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# **ROLLED STEEL TEFC**

# **FEATURES**

Totally Enclosed Fan Cooled IP44 Design

NEMA Premium Efficiency (T Frame)

• MEPS Efficiency (56 Frame)

Horizontal F1 Mount

• NEMA Design B 40°C Ambient

Max Elevation 3300 ft

CE NEMA 91

Effective 03-07-22

Supercedes All Previous



**MODEL:** ROLLED STEEL TEFC TYPE:

AEGH/AEGHPE

## **APPLICATIONS**

- Fans & Blowers
- Compressors

HVAC Equipment

• Pumps

## **PRODUCT OVERVIEW**

- 1/4-10 HP
- 56/56C Frame Available 1/4-3 HP
- 60Hz, 230/460V, or 575V
- · 3600, 1800 & 1200 RPM

## **DESIGN FEATURES**

- 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power
- Continuous Duty
- Class F Insulation

## **MECHANICAL FEATURES**

- Shielded Bearings
- Multemp SRL Grease
- Aluminum Rotor
- Rolled Steel Frame with Cast-Iron End Brackets
- Rolled Steel Conduit Box
- Number of Leads 230/460V: 9 Leads 1/4-5 HP; 12 Leads 7.5 and Larger; 575V: 3 Leads
- Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box
- Plastic Fan
- Paint System: Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Nameplate
- Rubber Flinger on DE
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- Phenolic Alkyd Resin Varnish
- Bi-Directional Rotation
- 230/460V Motors Usable on 208V (Sinusoidal Power Only)

## **OTHER FEATURES**

- CSA Certified, UL recognized and CE marked
- CSA Energy Efficiency Verification (EEV)
- \*Meets NEMA MG1 Part 31.4.4.2
- \*Speed Range 10:1 CT, and 20:1 VT
- Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.



Motor Products - ROLLED STEEL TEFC

# **ROLLED STEEL TEFC**

PREMIUM EFFICIENCY TEFC

# LIST PRICES

( E <u>NEMA</u> @ <u>@</u> .71



Effective 03-07-22 Supercedes All Previous

<b>CATALOGUE NUMBER</b>		110	0014	EDAME	F.L. <i>A</i>	MPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
RF0/22	RF0/225	0.25	3600	56	0.40	0.32	72.00	20	189
RF0/24	RF0/245	0.25	1800	56	0.45	0.36	72.00	21	193
RF0/26	RF0/265	0.25	1200	56	0.55	0.44	70.00	25	224
RF0/32	RF0/325	0.33	3600	56	0.54	0.43	71.50	20	199
RF0/34	RF0/345	0.33	1800	56	0.56	0.44	75.50	22	205
RF0/36	RF0/365	0.33	1200	56	0.71	0.57	72.00	26	243
RF0/52	RF0/525	0.50	3600	56	0.79	0.63	73.40	21	213
RF0/54	RF0/545	0.50	1800	56	0.74	0.59	78.20	25	220
RF0/56	RF0/565	0.50	1200	56	0.99	0.79	75.50	32	285
RF0/72	RF0/725	0.75	3600	56	1.15	0.92	76.80	23	224
RF0/74	RF0/745	0.75	1800	56	1.12	0.89	81.10	25	227
RF0/76	RF0/765	0.75	1200	56	1.28	1.02	81.70	33	332
RF0012-56	RF00125-56	1	3600	56	1.53	1.22	77.00	30	241
RF0012	RF00125	1	3600	143T	1.37	1.10	80.00	29	335
RF0014-56	RF00145-56	1	1800	56	1.56	1.24	83.50	32	288
RF0014	RF00145	1	1800	143T	1.45	1.16	85.50	36	345
RF0016-56	RF00165-56	1	1200	56	1.72	1.38	82.50	38	382
RF0016	RF00165	1	1200	145T	1.72	1.38	82.50	37	425
RF1/52-56	RF1/525-56	1.5	3600	56	1.98	1.58	85.50	30	299
RF1/52	RF1/525	1.5	3600	143T	1.98	1.58	85.50	29	358
RF1/54-56	RF1/545-56	1.5	1800	56	2.02	1.61	86.50	39	364
RF1/54	RF1/545	1.5	1800	145T	2.02	1.61	86.50	40	350
RF1/56	RF1/565	1.5	1200	182T	2.92	2.33	87.50	65	427
RF0022-56 RF0022 RF0024-56 RF0024 RF0026	RF00225-56 RF00225 RF00245-56 RF00245 RF00265	2 2 2 2 2 2	3600 3600 1800 1800 1200	56 145T 56 145T 184T	2.55 2.55 2.74 2.74 3.28	2.04 2.04 2.19 2.19 2.62	86.50 86.50 86.50 86.50 88.50	37 36 41 40 84	330 398 395 388 492
RF0032-56	RF00325-56	3	3600	56	3.65	2.92	86.50	39	377
RF0032	RF00325	3	3600	182T	3.67	2.94	87.50	73	437
RF0034	RF00345	3	1800	182T	4.24	3.39	89.50	60	437
RF0036	RF00365	3	1200	213T	4.62	3.69	89.50	126	731
RF0052	RF00525	5	3600	184T	5.81	4.65	89.50	84	531
RF0054	RF00545	5	1800	184T	6.54	5.23	89.50	82	506
RF0056	RF00565	5	1200	215T	7.06	5.65	90.20	164	878
RF7/52	RF7/525	7.5	3600	213T	9.21	7.37	90.20	123	725
RF7/54	RF7/545	7.5	1800	213T	9.23	7.38	91.70	117	726
RF0102	RF01025	10	3600	215T	11.96	9.57	91.00	162	859
RF0104	RF01045	10	1800	215T	12.01	9.61	91.70	159	874

**NOTE:** (1) Prices subject to change without notice.

(2) For VFD applcations please refer to page D-18.



<b>OPTIM</b> <sup>®</sup> TEFC	EEATUDES
<u> </u>	FEATURES
MODEL: OPTIM® TEFC TYPE: AEHH8N, AFHH	Effective 03-07-22 Supercedes All Previous
APPLICATIONS	
Fans & Blowers     Crushers	Mixers      • Pumps      • Compressor      • Conveyors
PRODUCT OVERVIEW	
• 1-800 HP	<ul> <li>Totally Enclosed Fan Cooled IP54 Design, IP55 for 5000 Frames and Larger</li> </ul>
• 60Hz, 230/460V, 460V or 575V	Horizontal F1 Mount
• 3600, 1800, 1200 & 900 RPM	NEMA Premium Efficiency
DESIGN FEATURES	
• 1.15 S.F. Sine Wave Power; 1.0 S.F. V	/FD Power • Class F Insulation • Max Elevation 3300ft
Continuous Duty	NEMA Design B or C
MECHANICAL FEATURES	
Shielded Bearings Frames 140T-280	0T and Open Bearings with Regreaseable Provisions Frames 280TS, 320T and Larger
• Polyrex EM Grease in all Regreaseal	ble Bearings, Multemp SRL Grease in Shielded Bearings
• Aluminum Rotor up to 5000 Frame	s; Copper/Copper Alloy 5800 and Larger
Cast-Iron Frame and End Brackets	
Cast-Iron Conduit Box up to 449T F	rames; Fabricated Steel Conduit Box 5000 Frames and Larger
Non-Sparking Plastic Fan up to 449	)T 4,6 & 8 Pole Motors; Bronze Fan 440TS 2 Pole Motors; Aluminum Fan 5000 Frames and Larger
Number of Leads 230/460V: 9 Lead	is 1-5 HP; 12 Leads 7.5-125 HP; 6 Leads 150 and Above
Number of Leads 575V: 3 Leads up	to 449T; 6 Leads 5000 Frames and Larger
Solderless Lug Terminals on All Lea	ids
Grounding Terminal Inside Main Te	rminal Box, Additional Grounding Terminal on Frame for 5000 Frames and Larger
Interchangeable F1 and F2 mountil	ng up to 4491, F3 Available 5000 Frames and Larger
Dual Drilled Feet for Longer Frames	s (i.e. 1451 also Drilled for 1431) 4491 and Below
Paint System: Phenolic Rust Proof E     Insulated NDE Rearing Standard fo	r 5000 Frames and Larger
<ul> <li>Rubber Flinger on DE up to 280T; B Inpro Seals 5000 Frames and Large</li> </ul>	r sooo Franies and Larger Grass Flinger on Both Ends 280TS to 449T; Steel Flinger on Both Ends Interchangeable with Gr
<ul> <li>*HPE<sup>™</sup> High Pulse Endurance Spike</li> </ul>	e Resistant Wire
• 2 Dips Phenolic Alkyd Resin Varnish	n 140T-440T, 2 Dips Epoxy Resin 5000 Frames and Larger; Spray Enamel Top Coat on all Frames
• Bi-Directional Rotation Except 3600	0RPM Motors 5000 Frames and Larger Which are CW From NDE
Winding RTD's, Space Heaters and	Provisions for Bearing RTD's Standard 5000 Frames and Larger
OTHER FEATURES	
• CSA Certified for Class I, Division 2,	Groups B, C & D (Class I, Zone 2, Groups IIB+H2, IIB and IIA)
CSA Certified Class II, Division 2 (Classes)	ass II, Zone 22) available for 440 Frames and larger upon request
• *Speed Ranges up to 10:1 CT, and 2	20:1 VT. Refer to data sheet for rating specific turn down ratios
• *Meets NEMA MG1 Part 31.4.4.2	

\* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.

# TECO Westinghouse

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Motor Products - OPTIM® TEFC

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PREMIUM EFFICIENCY TEFC SEVERE DUTY

# LIST PRICES

<u>Nema</u> () () ()



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER	110	DDM	FDAME	F.L. /	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
PDH0012	PDH00125	1	3600	143T	1.34	1.07	82.50	47	430
PDH0014	PDH00145	1	1800	143T	1.50	1.20	85.50	52	395
PDH0016	PDH00165	1	1200	145T	1.73	1.39	82.50	57	455
PDH0018	PDH00185	1	900	182T	2.08	1.66	77.00	92	722
PDH1/52	PDH1/525	1.5	3600	143T	2.00	1.60	84.00	49	447
PDH1/54	PDH1/545	1.5	1800	145T	2.08	1.67	86.50	61	437
PDH1/56	PDH1/565	1.5	1200	182T	2.53	2.02	87.50	85	533
PDH1/58	PDH1/585	1.5	900	184T	2.96	2.37	78.50	99	780
PDH0022	PDH00225	2	3600	145T	2.52	2.01	86.50	57	473
PDH0024	PDH00245	2	1800	145T	2.78	2.22	86.50	59	456
PDH0026	PDH00265	2	1200	184T	3.00	2.40	88.50	94	602
PDH0028	PDH00285	2	900	213T	3.22	2.58	85.50	140	885
PDH0032	PDH00325	3	3600	182T	3.53	2.82	88.50	92	546
PDH0034	PDH00345	3	1800	182T	3.85	3.08	89.50	96	541
PDH0036	PDH00365	3	1200	213T	4.02	3.22	89.50	140	814
PDH0038	PDH00385	3	900	215T	4.98	3.98	85.50	190	1,017
PDH0052	PDH00525	5	3600	184T	5.72	4.58	88.50	100	635
PDH0054	PDH00545	5	1800	184T	6.12	4.89	89.50	110	601
PDH0056	PDH00565	5	1200	215T	6.24	4.99	91.00	190	1,073
PDH0058	PDH00585	5	900	254T	7.43	5.95	87.50	255	1,460
PDH7/52	PDH7/525	7.5	3600	213T	8.67	6.94	91.00	160	901
PDH7/54	PDH7/545	7.5	1800	213T	9.23	7.38	91.70	165	892
PDH7/56	PDH7/565	7.5	1200	254T	9.59	7.67	91.00	255	1,441
PDH7/58	PDH7/585	7.5	900	256T	10.85	8.68	87.50	290	1,929
PDH0102	PDH01025	10	3600	215T	11.50	9.20	91.00	188	1,002
PDH0104	PDH01045	10	1800	215T	12.30	9.84	91.70	194	1,022
PDH0106	PDH01065	10	1200	256T	12.78	10.23	91.00	290	1,694
PDH0108	PDH01085	10	900	284T	14.12	11.30	90.20	391	2,472
PDH0152	PDH01525	15	3600	254T	16.61	13.29	92.40	255	1,400
PDH0154	PDH01545	15	1800	254T	17.27	13.82	92.40	288	1,457
PDH0156	PDH01565	15	1200	284T	18.20	14.56	92.40	391	2,364
PDH0158	PDH01585	15	900	286T	19.96	15.97	90.20	448	3,052
PDH0202	PDH02025	20	3600	256T	21.91	17.53	92.40	317	1,797
PDH0204	PDH02045	20	1800	256T	23.01	18.41	93.00	345	1,784
PDH0206	PDH02065	20	1200	286T	24.31	19.45	91.70	448	2,781
PDX0208	PDX02085	20	900	324T(X)	26.05	20.84	91.00	549	3,814
PDH0252	PDH02525	25	3600	284TS	27.84	22.27	92.40	417	2,251
PDH0254	PDH02545	25	1800	284T	29.08	23.26	93.60	453	2,264
PDX0256	PDX02565	25	1200	324T(X)	30.33	24.26	93.00	549	3,445
PDX0258	PDX02585	25	900	326T(X)	32.15	25.72	91.00	569	4,405
PDH0302	PDH03025	30	3600	286TS	33.19	26.55	93.00	428	2,620
PDH0304	PDH03045	30	1800	286T	35.31	28.25	93.60	494	2,493
PDX0306	PDX03065	30	1200	326T(X)	37.06	29.65	93.00	569	4,218
PDH0308	PDH03085	30	900	364T	38.72	30.98	93.00	871	5,645

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated (460V).

(3) For 50Hz, please contact a TWMI representative.

(4) For belt drive application, please contact a TWMI representative.

(5) For VFD applcations please refer to page D-18.





## LIST PRICES

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NEMA (F



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER		DDM	EDAME	F.L. <i>A</i>	MPS	F/L	APPROX.	LIST
230V/460V	575V	HP HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
PDX0402	PDX04025	40	3600	324TS(X)	44.06	35.25	92.40	566	3,479
PDX0404	PDX04045	40	1800	324T(X)	46.28	37.02	94.10	529	3,419
PDH0406	PDH04065	40	1200	364T	46.01	36.81	94.10	871	5,585
PDH0408	PDH04085	40	900	365T	51.63	41.31	93.00	895	7,093
PDX0502	PDX05025	50	3600	326TS(X)	54.72	43.77	93.00	638	4,545
PDX0504	PDX05045	50	1800	326T(X)	58.28	46.63	94.50	591	4,102
PDH0506	PDH05065	50	1200	365T	57.80	46.24	94.10	895	6,520
PDH0508	PDH05085	50	900	404T	62.15	49.72	93.00	1256	8,280
PDH0602	PDH06025	60	3600	364TS	64.20	51.36	94.10	759	6,025
PDH0604	PDH06045	60	1800	364T	68.37	54.69	95.00	777	5,445
PDH0606	PDH06065	60	1200	404T	68.33	54.67	94.50	1256	7,520
PDH0608	PDH06085	60	900	405T	74.58	59.66	93.00	1351	9,572
PDH0752 PDH0754 PDH0756 PDH0758	PDH07525 PDH07545 PDH07565 PDH07585	75 75 75 75 75	3600 1800 1200 900	365TS 365T 405T 444T	79.91 85.10 85.91 94.97	63.92 68.08 68.73 75.98	94.50 95.40 94.50 93.60	818 913 1351 1467	7,563 7,302 8,993 12,426
PDH1002	PDH10025	100	3600	405TS	106.68	85.35	95.40	1228	10,158
PDH1004	PDH10045	100	1800	405T	112.17	89.74	95.40	1296	9,427
PDH1006	PDH10065	100	1200	444T	119.47	95.58	95.00	1575	12,568
PDH1008	PDH10085	100	900	445T	126.63	101.30	93.60	1718	17,124
PDH1252	PDH12525	125	3600	444TS	143.26	114.61	95.00	1498	13,464
PDH1254	PDH12545	125	1800	444T	144.34	115.47	95.40	1619	12,086
PDH1256	PDH12565	125	1200	445T	148.44	118.75	95.00	1795	15,383
PDH1258	PDH12585	125	900	447T	155.48	124.38	94.10	2026	20,473
PDH1502	PDH15025	150	3600	445TS	169.93	135.95	95.00	1588	15,675
PDH1504	PDH15045	150	1800	445T	172.48	137.98	95.80	1703	13,627
PDH1506	PDH15065	150	1200	447T	175.58	140.46	95.80	2059	17,590
PDH1508	PDH15085	150	900	449T	186.57	149.26	94.10	2281	24,410
PDH2002	PDH20025	200	3600	447TS	220.56	176.45	95.40	1916	20,217
PDH2004	PDH20045	200	1800	447T	223.75	179.00	96.20	2004	17,075
PDH2006	PDH20065	200	1200	449T	232.71	186.17	95.80	2272	21,359
PDH2008	PDH20085	200	900	449T	247.71	198.17	94.50	2598	27,714
PDH2502	PDH25025	250	3600	449TS	272.10	217.68	95.80	2132	24,863
PDH2504	PDH25045	250	1800	449T	276.51	221.21	96.20	2312	21,402
PDH2506	PDH25065	250	1200	449T	289.17	231.33	95.80	2466	25,622
PF2508	PF25085	250	900	5009B	308.39	246.71	95.00	3900	39,220
PDH3002	PDH30025	300	3600	449TS	325.07	260.06	95.80	2312	30,284
PDH3004	PDH30045	300	1800	449T	331.82	265.45	96.20	2532	26,907
PDX3006	PDX30065	300	1200	449T(X)	347.00	277.60	95.80	3130	30,568
PF3008	PF30085	300	900	5009B	364.59	291.67	95.00	4100	40,769

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated (460V).

(3) For 50Hz, please contact a TWMI representative.

(4) For belt drive application, please contact a TWMI representative.

(5) For VFD applcations please refer to page D-18.



# **OPTIM**® TEFC

## PREMIUM EFFICIENCY TEFC SEVERE DUTY

# **LIST PRICES**

<u>Nema</u> () () ()



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER			504445	F.L. <i>F</i>	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
PDX3502	PDX35025	350	3600	449TS(X)	375.92	300.74	95.80	3000	35,146
PDX3504	PDX35045	350	1800	449T(X)	382.77	306.22	96.20	3186	30,558
PF3506	PF35065	350	1200	5009B	423.37	338.70	95.80	4100	43,382
PF3508	PF35085	350	900	5009B	424.84	339.87	95.00	4300	46,177
PDX4002	PDX40025	400	3600	449TS(X)	441.76	353.41	95.80	3045	32,283
PF4002	PF40025	400	3600	5009A	430.90	344.72	96.90	3700	41,434
PDX4004	PDX40045	400	1800	449T(X)	437.94	350.35	96.20	3342	32,477
PF4004	PF40045	400	1800	5009B	440.42	352.34	96.20	3900	41,890
PF4006	PF40065	400	1200	5011B	489.92	391.94	95.80	4600	47,668
PF4008	PF40085	400	900	5011B	486.82	389.46	95.10	4900	55,034
PF4502	PF45025	450	3600	5009A	487.68	390.14	96.00	3900	42,679
PF4504	PF45045	450	1800	5009B	493.80	395.04	96.20	4100	43,742
PF4506	PF45065	450	1200	5011B	539.76	431.81	95.90	4800	51,672
PF4508	PF45085	450	900	5011B	549.71	439.77	95.10	5100	58,337
PF5002	PF50025	500	3600	5011A	538.90	431.12	96.10	4300	50,353
PF5004	PF50045	500	1800	5011B	557.46	445.97	96.20	4500	47,573
PF5006	PF50065	500	1200	5011B	602.93	482.34	96.10	5000	55,023
PF5008	PF50085	500	900	5810B	595.37	476.30	95.20	6600	71,149
PF6002	PF60025	600	3600	5011A	643.13	514.50	96.10	4600	58,260
PF6004	PF60045	600	1800	5011B	657.71	526.17	96.30	4800	52,191
PF6006	PF60065	600	1200	5011B	689.68	551.74	96.40	5300	63,122
PF6008	PF60085	600	900	5810B	724.48	579.58	95.50	6700	81,009
PF7002	PF70025	700	3600	5011A	756.98	605.58	96.10	4900	64,968
PF7004	PF70045	700	1800	5011B	773.59	618.87	96.50	5200	64,716
PF7006	PF70065	700	1200	5810B	787.31	629.85	95.80	6300	74,295
PF7008	PF70085	700	900	5810B	841.23	672.98	95.60	7200	88,650
PF8002	PF80025	800	3600	5810A	849.23	679.38	96.40	6300	80,225
PF8004	PF80045	800	1800	5810B	884.67	707.74	96.00	6600	74,960
PF8006	PF80065	800	1200	5810B	897.91	718.33	96.00	6600	79,174
PF8008	PF80085	800	900	6808B	959.05	767.24	95.60	8800	94,761

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated (460V).

(3) For 50Hz, please contact a TWMI representative.

(4) For belt drive application, please contact a TWMI representative.

(5) For VFD applcations please refer to page D-18.

(5) RU logo for 449 Frames and Below.



Advantage					
Plus	EEE READY	ŀ	FEATU	RES	
		- <u>NEMA</u>	<u> </u>	<u></u>	
MODEL: ADVANTAG TYPE: AEHH8R	GE PLUS IEEE READY	Supe	Effective 0 ercedes All F	3-07-22 Previous	
APPLICATIONS					
Fans & Blowers	Compressors	Any Severe D	uty / Petro-(	Chemical / Pulp & P	aper Applications
• Pumps	Mixers	Class II Applie	cations Such	as Sawmills	
Crushers	Conveyors				
PRODUCT OVERVI	EW				
• 1-100 HP	• 3600, 1800,	1200 & 900 RPM	• H	orizontal F1 Mount	
• 60Hz, 460V or 575V	Totally Enclo	osed IP55 Design	• N	EMA Premium Effici	ency
DESIGN FEATURES					
• 1.15 S.F. Sine Wave Powe	er; 1.0 S.F. VFD Power • 40°C An	nbient			
Continuous Duty	• Max Ele	vation 3300ft			
Class F Insulation					
NEMA Design B or C					
MECHANICAL FEAT	TURES				
C3 Clearance Open Bear	ings with Regreaseable Provisions				
Polyrex EM Grease					
Aluminum Rotor					
Cast-Iron Frame and Enc	Brackets				
Cast-Iron Conduit Box					
Non-Sparking Plastic Far	า				
Number of Leads 460V/5	575V: 3 Leads; Solderless Lug Termi	nals on All Leads			
Grounding Terminal Insi	de Main Terminal Box and Provisio	ns for Grounding Termina	al on Motor	Frame	
<ul> <li>Interchangeable F1 and</li> </ul>	F2 mounting				
Dual Drilled Feet for Lon	ger Frames (i.e. 145T also Drilled fo	or 143T)			
Paint System: Zinc Chron	mate Epoxy Primer, Phenolic Rust P	roof Base with Lacquer T	op Coat		
Stainless Steel Hardware	e, Breather Drains and Nameplate				
• Rubber Flinger on DE up	o to 280T; Copper Flinger on Both E	nds 280TS and Larger			
• *HPE™ High Pulse Endur	ance Spike Resistant Wire				
• 2 Dips Phenolic Alkyd Re	esin Varnish with Moisture Resistan	t Varnish			
Bi-Directional Rotation					
OTHER FEATURES					
CSA Certified for Class I,	Division 2, Groups B, C & D (Class I,	Zone 2, Groups IIB+H2, I	IB and IIA)		
CSA Certified for Class II,	Division 2, Groups F & G (Zone 22,	Groups IIIA & IIIB)			

- \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to data sheet for rating specific turn down ratios
- \*Meets NEMA MG1 Part 31.4.4.2
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.



Motor Products - ADVANTAGE PLUS IEEE READY For more information visit: **www.tecowestinghouse.ca** or call: **1-800-661-4023** 



# LIST PRICES

<u>Nema</u> () () ()



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER		DDM	FDAAAF	F.L. /	AMPS	F/L	APPROX.	LIST
460V	575V	НР	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
APH0012	APH00125	1	3600	143T	1.34	1.07	82.50	46	464
APH0014	APH00145	1	1800	143T	1.50	1.20	85.50	46	445
APH0016	APH00165	1	1200	145T	1.73	1.39	82.50	62	522
APH0018	APH00185	1	900	182T	2.08	1.66	77.00	95	954
APH1/52	APH1/525	1.5	3600	143T	2.00	1.60	84.00	46	464
APH1/54	APH1/545	1.5	1800	145T	2.08	1.67	86.50	62	499
APH1/56	APH1/565	1.5	1200	182T	2.53	2.02	87.50	84	578
APH1/58	APH1/585	1.5	900	184T	3.01	2.41	77.00	114	1,066
APH0022	APH00225	2	3600	145T	2.52	2.01	86.50	62	498
APH0024	APH00245	2	1800	145T	2.78	2.22	86.50	62	534
APH0026	APH00265	2	1200	184T	3.00	2.40	88.50	101	664
APH0028	APH00285	2	900	213T	3.42	2.74	85.50	167	1,250
APH0032	APH00325	3	3600	182T	3.53	2.82	88.50	84	583
APH0034	APH00345	3	1800	182T	3.74	2.99	89.50	84	623
APH0036	APH00365	3	1200	213T	4.02	3.22	89.50	167	997
APH0038	APH00385	3	900	215T	4.98	3.98	85.50	189	1,636
APH0052	APH00525	5	3600	184T	5.72	4.58	88.50	101	766
APH0054	APH00545	5	1800	184T	6.12	4.89	89.50	101	720
APH0056	APH00565	5	1200	215T	6.24	4.99	91.00	194	1,183
APH0058	APH00585	5	900	254T	7.52	6.01	86.50	288	1,959
APH7/52	APH7/525	7.5	3600	213T	8.67	6.94	91.00	167	965
APH7/54	APH7/545	7.5	1800	213T	8.85	7.08	91.70	167	976
APH7/56	APH7/565	7.5	1200	254T	9.59	7.67	91.00	297	1,603
APH7/58	APH7/585	7.5	900	256T	11.49	9.19	85.50	332	2,818
APH0102	APH01025	10	3600	215T	11.50	9.20	91.00	194	1,147
APH0104	APH01045	10	1800	215T	11.60	9.28	91.70	194	1,177
APH0106	APH01065	10	1200	256T	12.78	10.23	91.00	337	1,915
APH0108	APH01085	10	900	284T	14.23	11.39	89.50	429	3,259
APH0152	APH01525	15	3600	254T	16.61	13.29	92.40	297	1,578
APH0154	APH01545	15	1800	254T	17.27	13.82	92.40	297	1,578
APH0156	APH01565	15	1200	284T	18.20	14.56	92.40	418	2,592
APH0158	APH01585	15	900	286T	20.12	16.10	89.50	475	4,433
APH0202	APH02025	20	3600	256T	21.91	17.53	92.40	337	1,937
APH0204	APH02045	20	1800	256T	23.01	18.41	93.00	337	1,915
APH0206	APH02065	20	1200	286T	24.31	19.45	91.70	475	3,198
APH0208	APH02085	20	900	324T	25.63	20.51	90.20	664	4,955
APH0252 APH0254 APH0256 APH0258	APH02525 APH02545 APH02565 APH02585	25 25 25 25 25	3600 1800 1200 900	284TS 284T 324T 326T	27.84 29.08 30.33 32.64	22.27 23.26 24.26 26.11	92.40 93.60 93.00 90.20	394 418 638 724	2,404 2,434 3,916 6,054
APH0302 APH0304 APH0306 APH0308	APH03025 APH03045 APH03065 APH03085	30 30 30 30 30	3600 1800 1200 900	286TS 286T 326T 364T	33.19 34.30 37.52 38.97	26.55 27.44 30.02 31.18	93.00 93.60 93.00 93.00	444 475 675 898	2,833 2,878 4,644 6,408

**NOTE:** (1) Prices subject to change without notice.

(2) For ratings meeting NEMA Design C, please contact a TWMI representative.

(3) For belt drive application, please contact a TWMI representative.

(4) For VFD applcations please refer to page D-18.





PREMIUM EFFICIENCY TEFC SEVERE DUTY

## **LIST PRICES**

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NEMA Premium € Ð



Effective 03-07-22 Supercedes All Previous

CATALOGU	E NUMBER		DDM	FDAME	F.L. A	MPS	F/L	APPROX.	LIST
460V	575V	HP HP	KPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
APH0402	APH04025	40	3600	324TS	44.22	35.38	94.10	616	3,725
APH0404	APH04045	40	1800	324T	46.28	37.02	94.10	638	3,707
APH0406	APH04065	40	1200	364T	46.01	36.81	94.10	834	6,222
APH0408	APH04085	40	900	365T	53.39	42.71	91.70	928	9,573
APH0502 APH0504 APH0506 APH0508 APH0602 APH0604	APH05025 APH05045 APH05065 APH05085 APH06025 APH06045	50 50 50 50 60 60	3600 1800 1200 900 3600 1800	326TS 326T 365T 404T 364TS 364T	54.67 56.94 57.85 62.54 64.20 68.37	43.74 45.56 46.28 50.03 51.36 54.69	94.10 94.50 93.00 94.10 93.00	638 675 913 1166 759 834	5,051 4,536 7,243 11,230 6,694 6,570
APH0606	APH06065	60	1200	404T	68.33	54.67	94.50	1166	8,356
APH0608	APH06085	60	900	405T	74.58	59.66	93.00	1298	12,318
APH0752	АРН07525	75	3600	365TS	79.91	63.92	94.50	818	8,404
APH0754	АРН07545	75	1800	365T	85.10	68.08	95.40	913	8,114
APH0756	АРН07565	75	1200	405T	85.91	68.73	94.50	1298	9,993
APH1002	APH10025	100	3600	405TS	106.68	85.35	95.40	1144	11,287
APH1004	APH10045	100	1800	405T	112.17	89.74	95.40	1298	10,474

**NOTE:** (1) Prices subject to change without notice.

(2) For ratings meeting NEMA Design C, please contact a TWMI representative.

(3) For belt drive application, please contact a TWMI representative.

(4) For VFD applcations please refer to page D-18.





# FEATURES

Effective 03-07-22 Supercedes All Previous



MODEL: ADVANTAGE PLUS IEEE 841 TYPE: AEHH8B

## APPLICATIONS

Fans & Blowers	Compressors	Conveyors
• Pumps	• Mixers	Crushers

Any Severe Duty / Petro-Chemical / Pulp & Paper Applications

## **PRODUCT OVERVIEW**

• 1-500 HP	- Horizontal E1 Mount	. 3600 1800 1200 8 000 PDM
• 1-500 FIF		• 5000, 1800, 1200 & 900 KFM
• 60Hz, 460V or 575V	NEMA Premium Efficiency	<ul> <li>Totally Enclosed Fan Cooled IP56 Design</li> </ul>
DESIGN FEATURES		
DESIGN FEATURES		
<ul><li>DESIGN FEATURES</li><li>1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Powe</li></ul>	r • NEMA Design B or C	Max Elevation 3300ft

## **MECHANICAL FEATURES**

- C3 Clearance Open Bearings with Regreaseable Provisions
- Polyrex EM Grease
- Aluminum Rotor up to 5000 Frames; Copper/Copper Alloy 5800 and Larger
- Routine Test Report Shipped with Motor
- Cast-Iron Frame and End Brackets
- Cast-Iron Conduit Box up to 449T Frames; Fabricated Steel Conduit Box 5000 Frames and Larger
- Non-Sparking Plastic Fan up to 449T 4,6 & 8 Pole Motors; Bronze Fan 440TS 2 Pole Motors and 5000 Frames and Larger
- Number of Leads 460V/575V: 3 Leads; Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box and Provisions for Grounding Terminal on Motor Frame
- Interchangeable F1 and F2 mounting up to 449T
- Dual Drilled Feet for Longer Frames (i.e. 145T also Drilled for 143T) 449T and Below
- Paint System: Zinc Chromate Epoxy Primer, Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Hardware, Breather Drains and Nameplate
- Inpro/Seal on DE and NDE
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- 2 Dips Phenolic Alkyd Resin Varnish with Moisture Resistant Varnish
- Bi-Directional Rotation Except 3600RPM Motors 5000 Frames and Larger; and 300 HP 3600RPM, Which are CW From NDE
- Winding RTD's, Space Heaters and Provisions for Bearing RTD's Standard 5000 Frames and Larger

## **OTHER FEATURES**

- CSA Certified for Class I, Division 2, Groups B, C & D (Class I, Zone 2, Groups IIB+H2, IIB and IIA)
- CSA Certified Class II, Division 2 (Class II, Zone 22) Available for 440 Frames and Larger Upon Request
- \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to Data Sheet for Rating Specific Turn Down Ratios
- Meets or Exceeds \*NEMA MG1 Part 31.4.4.2; IEEE 45 Marine Duty 1 125HP; IEEE Std 841<sup>™</sup>-2009
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.



For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023



PREMIUM EFFICIENCY IEEE 841 SEVERE DUTY

## **LIST PRICES**

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NEMA Premium Ð Œ



Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. /	AMPS	F/L	APPROX.	LIST
460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
APH0012-841	APH00125-841	1	3600	143T	1.34	1.07	82.50	51	804
APH0014-841	APH00145-841	1	1800	143T	1.50	1.20	85.50	55	761
APH0016-841	APH00165-841	1	1200	145T	1.73	1.39	82.50	59	922
APH0018-841	APH00185-841	1	900	182T	2.08	1.66	77.00	84	1,181
APH1/52-841	APH1/525-841	1.5	3600	143T	2.00	1.60	84.00	53	852
APH1/54-841	APH1/545-841	1.5	1800	145T	2.08	1.67	86.50	57	842
APH1/56-841	APH1/565-841	1.5	1200	182T	2.53	2.02	87.50	92	1,029
APH1/58-841	APH1/585-841	1.5	900	184T	3.01	2.41	77.00	92	1,288
APH0022-841	APH00225-841	2	3600	145T	2.52	2.01	86.50	57	906
APH0024-841	APH00245-841	2	1800	145T	2.78	2.22	86.50	59	890
APH0026-841	APH00265-841	2	1200	184T	3.00	2.40	88.50	108	1,153
APH0028-841	APH00285-841	2	900	213T	3.42	2.74	85.50	134	1,706
APH0032-841	APH00325-841	3	3600	182T	3.53	2.82	88.50	88	995
APH0034-841	APH00345-841	3	1800	182T	3.74	2.99	89.50	99	1,058
APH0036-841	APH00365-841	3	1200	213T	4.02	3.22	89.50	165	1,566
APH0038-841	APH00385-841	3	900	215T	4.98	3.98	85.50	161	1,894
APH0052-841	APH00525-841	5	3600	184T	5.72	4.58	88.50	107	1,135
APH0054-841	APH00545-841	5	1800	184T	6.12	4.89	89.50	110	1,174
APH0056-841	APH00565-841	5	1200	215T	6.24	4.99	91.00	196	1,813
APH0058-841	APH00585-841	5	900	254T	7.52	6.01	86.50	257	2,550
APH7/52-841	APH7/525-841	7.5	3600	213T	8.67	6.94	91.00	167	1,440
APH7/54-841	APH7/545-841	7.5	1800	213T	8.85	7.08	91.70	174	1,537
APH7/56-841	APH7/565-841	7.5	1200	254T	9.59	7.67	91.00	282	2,437
APH7/58-841	APH7/585-841	7.5	900	256T	11.49	9.19	85.50	293	3,183
APH0102-841	APH01025-841	10	3600	215T	11.50	9.20	91.00	185	1,594
APH0104-841	APH01045-841	10	1800	215T	11.60	9.28	91.70	200	1,708
APH0106-841	APH01065-841	10	1200	256T	12.78	10.23	91.00	337	2,750
APH0108-841	APH01085-841	10	900	284T	14.23	11.39	89.50	407	3,838
APH0152-841	APH01525-841	15	3600	254T	16.61	13.29	92.40	301	2,199
APH0154-841	APH01545-841	15	1800	254T	17.27	13.82	92.40	312	2,332
APH0156-841	APH01565-841	15	1200	284T	18.20	14.56	92.40	449	3,712
APH0158-841	APH01585-841	15	900	286T	20.12	16.10	89.50	449	4,884
APH0202-841	APH02025-841	20	3600	256T	21.91	17.53	92.40	345	2,877
APH0204-841	APH02045-841	20	1800	256T	23.01	18.41	93.00	374	2,957
APH0206-841	APH02065-841	20	1200	286T	24.31	19.45	91.70	510	4,500
APH0208-841	APH02085-841	20	900	324T	25.63	20.51	90.20	629	5,531
APH0252-841	APH02525-841	25	3600	284TS	27.84	22.27	92.40	440	3,443
APH0254-841	APH02545-841	25	1800	284T	29.08	23.26	93.60	464	3,192
APH0256-841	APH02565-841	25	1200	324T	30.33	24.26	93.00	656	4,940
APH0258-841	APH02585-841	25	900	326T	32.64	26.11	90.20	700	6,579
APH0302-841	APH03025-841	30	3600	286TS	33.19	26.55	93.00	482	3,840
APH0304-841	APH03045-841	30	1800	286T	34.30	27.44	93.60	517	3,533
APH0306-841	APH03065-841	30	1200	326T	37.52	30.02	93.00	695	5,421
APH0308-841	APH03085-841	30	900	364T	38.97	31.18	93.00	856	8,459

**NOTE:** (1) Prices subject to change without notice.

(2) For ratings meeting NEMA Design C, please contact a TWMI representative.

(3) For belt drive application, please contact a TWMI representative.

(4) For VFD applcations please refer to page D-18.





PREMIUM EFFICIENCY IEEE 841 SEVERE DUTY

# **LIST PRICES**

<u>Nema</u> () () ()



Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. <i>A</i>	AMPS	F/L	APPROX.	LIST
460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
APH0402-841	APH04025-841	40	3600	324TS	44.22	35.38	94.10	645	4,523
APH0404-841	APH04045-841	40	1800	324T	46.28	37.02	94.10	658	4,356
APH0406-841	APH04065-841	40	1200	364T	46.01	36.81	94.10	882	7,335
APH0408-841	APH04085-841	40	900	365T	53.39	42.71	91.70	922	10,620
APH0502-841	APH05025-841	50	3600	326TS	54.67	43.74	94.10	708	5,791
APH0504-841	APH05045-841	50	1800	326T	56.94	45.56	94.50	719	5,206
APH0506-841	APH05065-841	50	1200	365T	57.85	46.28	94.10	959	8,477
APH0508-841	APH05085-841	50	900	404T	62.54	50.03	93.00	1232	12,355
APH0602-841	APH06025-841	60	3600	364TS	64.20	51.36	94.10	748	7,871
APH0604-841	APH06045-841	60	1800	364T	68.37	54.69	95.00	873	7,615
APH0606-841	APH06065-841	60	1200	404T	68.33	54.67	94.50	1245	9,761
APH0608-841	APH06085-841	60	900	405T	74.58	59.66	93.00	1265	13,517
APH0752-841	APH07525-841	75	3600	365TS	79.91	63.92	94.50	937	9,132
APH0754-841	APH07545-841	75	1800	365T	85.10	68.08	95.40	972	8,817
APH0756-841	APH07565-841	75	1200	405T	85.91	68.73	94.50	1340	11,514
APH0758-841	APH07585-841	75	900	444T	95.58	76.47	93.00	1608	15,985
APH1002-841	APH10025-841	100	3600	405TS	106.68	85.35	95.40	1225	12,265
APH1004-841	APH10045-841	100	1800	405T	112.17	89.74	95.40	1300	11,381
APH1006-841	APH10065-841	100	1200	444T	119.47	95.58	95.00	1694	15,177
APH1008-841	APH10085-841	100	900	445T	127.45	101.96	93.00	1815	19,663
APH1252-841	APH12525-841	125	3600	444TS	143.26	114.61	95.00	1650	16,257
APH1254-841	APH12545-841	125	1800	444T	146.05	116.84	95.40	1716	14,595
APH1256-841	APH12565-841	125	1200	445T	148.44	118.75	95.00	1903	18,574
APH1258-841	APH12585-841	125	900	447T	156.31	125.05	93.60	2068	23,822
APH1502-841	APH15025-841	150	3600	445TS	169.93	135.95	95.00	1696	19,432
APH1504-841	APH15045-841	150	1800	445T	174.53	139.63	95.80	1811	16,809
APH1506-841	APH15065-841	150	1200	447T	175.58	140.46	95.80	2200	21,950
APH1508-841	APH15085-841	150	900	449T	187.57	150.05	93.60	2378	28,700
APH2002-841	APH20025-841	200	3600	447TS	225.63	180.50	95.40	2024	23,659
APH2004-841	APH20045-841	200	1800	447T	230.37	184.30	96.20	2123	20,450
APH2006-841	APH20065-841	200	1200	449T	232.71	186.17	95.80	2380	26,876
APH2008-841	APH20085-841	200	900	449T	248.76	199.01	94.10	2620	33,931
APH2502-841	APH25025-841	250	3600	449TS	277.67	222.13	95.80	2301	28,354
APH2504-841	APH25045-841	250	1800	449T	284.60	227.68	96.20	2442	25,409
APH2506-841	APH25065-841	250	1200	449T	289.17	231.33	95.80	2684	33,248
APH2508-841	APH25085-841	250	900	5009B	305.81	244.65	94.50	3784	51,951
APH3002-841	APH30025-841	300	3600	449TS	333.20	266.56	95.80	2493	36,895
APH3004-841	APH30045-841	300	1800	449T	341.52	273.21	96.20	2640	32,642
APH3006-841	APH30065-841	300	1200	449T	347.00	277.60	95.80	2816	41,116
APH3006L-841	APH30065L-841	300	1200	5009B	338.98	271.18	95.80	3916	54,116
APH3008-841	APH30085-841	300	900	5009B	366.98	293.58	94.50	4026	54,109
APH3502-841	APH35025-841	350	3600	449TS	379.25	303.40	95.80	2826	45,141
APH3502L-841	APH35025L-841	350	3600	5009A	373.46	298.77	95.80	3674	57,755
APH3504-841	APH35045-841	350	1800	449T	398.44	318.75	96.20	2959	42,145
APH3504L-841	APH35045L-841	350	1800	5009B	378.52	302.81	96.20	4026	51,953
APH3506-841	APH35065-841	350	1200	5011B	393.20	314.56	95.80	4246	58,634
APH3508-841	APH35085-841	350	900	5011B	428.14	342.51	94.50	4554	64,306

**NOTE:** (1) Prices subject to change without notice.

(2) For ratings meeting NEMA Design C, please contact a TWMI representative.

(3) For belt drive application, please contact a TWMI representative.

(4) For VFD applcations please refer to page D-18.

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PREMIUM EFFICIENCY IEEE 841 SEVERE DUTY

## **LIST PRICES**

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NEMA Premium Ð C



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER	НР	RPM	FRAME	F.L. AMPS		F/L	APPROX.	LIST
460V	575V	HP HP	KPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
APH4002-841	APH40025-841	400	3600	5009A	426.81	341.45	95.80	3850	58,196
APH4004-841	APH40045-841	400	1800	5009B	432.59	346.07	96.20	4114	56,216
APH4006-841	APH40065-841	400	1200	5011B	449.37	359.50	95.80	4510	65,260
APH4008-841	APH40085-841	400	900	5808B	480.40	384.32	94.50	5720	75,953
APH4502-841	APH45025-841	450	3600	5011A	479.63	383.71	95.80	4400	65,108
APH4504-841	APH45045-841	450	1800	5011B	486.66	389.33	96.20	4422	59,753
APH4506-841	APH45065-841	450	1200	5808B	499.80	399.84	95.80	5852	75,276
APH4508-841	APH45085-841	450	900	5808B	540.46	432.36	94.50	6006	82,945
APH5002-841	APH50025-841	500	3600	5011A	532.93	426.34	95.80	4510	71,709
APH5004-841	APH50045-841	500	1800	5011B	540.74	432.59	96.20	4840	64,960
APH5006-841	APH50065-841	500	1200	5808B	555.33	444.27	95.80	6050	83,071
APH5008-841	APH50085-841	500	900	5810B	600.51	480.40	94.50	6622	90,031

NOTE: (1) Prices subject to change without notice.(2) For ratings meeting NEMA Design C, please contact a TWMI representative.

(3) For belt drive application, please contact a TWMI representative.

(4) For VFD applcations please refer to page D-18.

(5) RU logo for 449 Frames and Below.





**MODEL:** OPTIM® TEXP

FEATURES

NEMA

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Effective 03-07-22



## AEHHXU, AEHHXF, AEHHXV TYPE: Supercedes All Previous **APPLICATIONS** Grain Elevators Applications Where Explosive Gases are Present Pumps · Applications Where Explosive Dusts / Grains are Present • Blowers **PRODUCT OVERVIEW** • 1-400 HP Horizontal F1 Mount · 60Hz, 230V/460V, 460V or 575V • 3600, 1800, 1200 & 900 RPM NEMA Premium Efficiency Totally Enclosed Fan Cooled - Explosion Proof Design **DESIGN FEATURES** 1.15 S.F. Sine Wave Power: 1.0 S.F. VFD Power Class F Insulation 40°C Ambient Continuous Duty NEMA Design B or C Max Elevation 3300ft **MECHANICAL FEATURES** Shielded Ball Bearings Frames 140T-280T and Open Bearings with Regreaseable Provisions Frames 280TS, 320T and Larger • Polyrex EM Grease in all Regreaseable Bearings, Multemp SRL Grease in Shielded Bearings Aluminum Rotor up to 449T Frames; Copper/Copper Alloy 5000 and Larger Cast-Iron Frame, Fan Cover and End Brackets • Frame Provided with Two Threaded Drain Holes and Stainless Steel Breather Drains Cast-Iron Frame, Fan Cover, Conduit Box and End Brackets Non-Sparking Plastic or Aluminum Fan • Number of Leads 230/460V: 9 Leads 1-5 HP; 12 Leads 7.5-125 HP; 6 Leads 150 HP and Larger Number of Leads 575V: 3 Leads Solderless Lug Terminals on All Leads • Grounding Terminal Inside Main Terminal Box • Interchangeable F1 and F2 Mounting up to 449T · Paint System: Phenolic Rust Proof Base with Lacquer Top Coat Stainless Steel Nameplate Brass Flinger on Both Ends • \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire Phenolic Alkyd Resin Varnish • Klixon 9700K Thermostats - 1 per phase **OTHER FEATURES** • CSA/UL Certified for Class I, Division 1, Groups \*\*C & D (Class I, Zone 1 Groups \*\*IIB & IIA); and Class II, Division 1, Groups E, F & G • \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to data sheet for rating specific turn down ratios • \*Meets NEMA MG1 Part 31.4.4.2

- Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.
- \*\* Up to 256T

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Motor Products - OPTIM® TEXP





# LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. <i>A</i>	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
XC0014	XC00145	1	1800	143T	1.61	1.29	85.50	62	634
XC0016	XC00165	1	1200	145T	1.72	1.38	82.50	70	708
XC0018	XC00185	1	900	182T	2.08	1.66	77.00	108	1,022
XC1/52	XC1/525	1.5	3600	143T	1.99	1.59	84.00	62	694
XC1/54	XC1/545	1.5	1800	145T	2.15	1.72	86.50	70	697
XC1/56	XC1/565	1.5	1200	182T	2.55	2.04	87.50	108	801
XC1/58	XC1/585	1.5	900	184T	2.96	2.37	78.50	120	1,155
XC0022	XC00225	2	3600	145T	2.52	2.01	85.50	70	737
XC0024	XC00245	2	1800	145T	2.78	2.22	86.50	70	715
XC0026	XC00265	2	1200	184T	3.07	2.45	88.50	120	910
XC0028	XC00285	2	900	213T	3.48	2.79	84.00	187	1,411
XC0032	XC00325	3	3600	182T	3.57	2.85	87.50	108	823
XC0034	XC00345	3	1800	182T	3.87	3.10	89.50	108	835
XC0036	XC00365	3	1200	213T	3.92	3.14	89.50	187	1,213
XC0038	XC00385	3	900	215T	4.98	3.98	85.50	211	1,786
XC0052	XC00525	5	3600	184T	5.81	4.65	88.50	120	956
XC0054	XC00545	5	1800	184T	6.23	4.98	89.50	120	960
XC0056	XC00565	5	1200	215T	6.41	5.13	90.20	211	1,491
XC0058	XC00585	5	900	254T	7.52	6.01	86.50	330	2,581
XC7/52	XC7/525	7.5	3600	213T	9.02	7.22	89.50	187	1,236
XC7/54	XC7/545	7.5	1800	213T	8.85	7.08	91.70	187	1,383
XC7/56	XC7/565	7.5	1200	254T	9.41	7.53	91.00	330	1,831
XH7/58	XC7/585	7.5	900	256T	11.35	9.08	86.50	376	3,551
XC0102	XC01025	10	3600	215T	11.93	9.55	90.20	211	1,458
XC0104	XC01045	10	1800	215T	11.67	9.34	91.70	211	1,612
XC0106	XC01065	10	1200	256T	12.63	10.10	91.00	376	2,245
XH0108	XH01085	10	900	284T	14.23	11.39	89.50	488	4,386
XC0152	XC01525	15	3600	254T	16.78	13.42	91.00	330	1,805
XC0154	XC01545	15	1800	254T	17.88	14.31	92.40	330	2,059
XH0156	XH01565	15	1200	284T	18.45	14.76	91.70	488	3,065
XH0158	XH01585	15	900	286T	20.12	16.10	89.50	530	4,650
XC0202	XC02025	20	3600	256T	22.37	17.89	91.00	376	2,395
XC0204	XC02045	20	1800	256T	23.55	18.84	93.00	376	2,465
XH0206	XH02065	20	1200	286T	24.31	19.45	91.70	530	3,642
XH0208	XH02085	20	900	324T	25.63	20.51	90.20	708	5,427
XH0252 XH0254 XH0256 XH0258	XH02525 XH02545 XH02565 XH02585	25 25 25 25 25	3600 1800 1200 900	284TS 284T 324T 326T	27.75 29.42 30.33 32.64	22.20 23.54 24.26 26.11	91.70 93.60 93.00 90.20	466 488 708 781	3,014 3,048 4,280 5,988
XH0302	XH03025	30	3600	286TS	33.04	26.44	92.40	502	3,482
XH0304	XH03045	30	1800	286T	35.10	28.08	93.60	530	3,543
XH0306	XH03065	30	1200	326T	36.39	29.11	93.00	781	5,176
XH0308	XH03085	30	900	364T	39.53	31.62	91.70	946	7,026

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated (460V).

(3) For 50Hz, please contact a TWMI representative.

(4) Group C/IIB applies to frames 256T and below.

(5) For belt drive application, please contact a TWMI representative.

(6) For VFD applcations please refer to page D-18.



# **OPTIM® TEXP** PREMIUM EFFICIENCY TEXP

# **LIST PRICES**

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Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER		2014		F.L. AMPS		F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
XH0402	XH04025	40	3600	324TS	44.26	35.40	93.00	691	4,685
XH0404	XH04045	40	1800	324T	46.55	37.24	94.10	708	4,714
XH0406	XH04065	40	1200	364T	46.28	37.02	94.10	946	6,598
XH0408	XH04085	40	900	365T	53.39	42.71	91.70	1019	8,398
XH0502	XH05025	50	3600	326TS	54.96	43.97	93.60	766	5,754
XH0504	XH05045	50	1800	326T	57.94	46.35	94.50	781	5,584
XH0506	XH05065	50	1200	365T	59.58	47.67	94.10	1019	7,494
XH0508	XH05085	50	900	404T	62.54	50.03	93.00	1287	11,928
XH0602	XH06025	60	3600	364TS	64.54	51.63	93.60	913	7,171
XH0604	XH06045	60	1800	364T	67.20	53.76	95.00	946	7,270
XH0606	XH06065	60	1200	404T	69.13	55.30	94.50	1287	9,209
XH0608	XH06085	60	900	405T	74.58	59.66	93.00	1408	12,912
XH0752	XH07525	75	3600	365TS	80.67	64.54	93.60	975	9,350
XH0754	XH07545	75	1800	365T	83.65	66.92	95.40	1019	8,713
XH0756	XH07565	75	1200	405T	85.91	68.73	94.50	1408	10,803
XH0758	XH07585	75	900	444T	94.97	75.98	93.60	1650	17,811
XH1002	XH10025	100	3600	405TS	107.70	86.16	94.50	1349	11,538
XH1004	XH10045	100	1800	405T	109.05	87.24	95.40	1408	10,240
XH1006R	XH10065R	100	1200	444T	118.75	95.00	95.00	1650	13,457
XH1008R	XH10085R	100	900	445T	126.63	101.30	93.60	1720	17,929
XH1252	XH12525	125	3600	444TS	136.89	109.51	95.00	1560	15,256
XH1254R	XH12545R	125	1800	444T	138.63	110.90	95.40	1600	14,164
XH1256R	XH12565R	125	1200	445T	146.67	117.34	95.00	1720	17,982
XH1258R	XH12585R	125	900	447T	150.76	120.61	94.10	2500	29,744
XH1502	XH15025	150	3600	445TS	164.00	131.20	95.00	1600	17,702
XH1504R	XH15045R	150	1800	445T	165.00	132.00	95.80	1780	17,211
XH1506R	XH15065R	150	1200	447T	173.50	138.80	95.80	2552	25,041
XH1508R	XH15085R	150	900	447T	180.91	144.73	94.10	2880	30,979
XH2002	XH20025	200	3600	447TS	220.55	176.44	95.40	2662	26,534
XH2004R	XH20045R	200	1800	447T	223.75	179.00	96.20	2660	27,023
XH2006R	XH20065R	200	1200	449T	229.97	183.97	95.80	2992	31,156
XH2008R	XH20085R	200	900	5007B	246.47	197.18	94.50	3920	45,403
XH2502	XH25025	250	3600	449TS	272.09	217.67	95.80	2816	27,749
XH2504R	XH25045R	250	1800	449T	279.68	223.75	96.20	3055	27,712
XH2506R	XH25065R	250	1200	5007B	280.85	224.68	95.80	4010	49,947
XH2508R	XH25085R	250	900	5009B	304.19	243.36	95.00	4360	49,883
XH3002	XH30025	300	3600	449TS	325.06	260.05	95.80	2882	32,957
XH3004R	XH30045R	300	1800	449T	335.62	268.50	96.20	3100	30,289
XH3006R	XH30065R	300	1200	5009B	335.86	268.69	95.80	4310	52,999
XH3502	XH35025	350	3600	5007A	388.72	310.98	95.80	4020	51,492
XH3504R	XH35045R	350	1800	5007B	388.43	310.74	96.20	4330	53,710
XH3506R	XH35065R	350	1200	5009B	391.39	313.11	95.80	4520	54,429
XH4002	XH40025	400	3600	5009A	442.75	354.20	95.80	4200	55,712
XH4004B	XH40045B	400	1800	5009B	443.92	355.14	96.20	4430	56,967

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated (460V).

(3) For 50Hz, please contact a TWMI representative.

(4) Group C/IIB applies to frames 256T and below.

(5) For belt drive application, please contact a TWMI representative.

(6) For VFD applcations please refer to page D-18.

(7) This rating must be de-rated when used with VFD, please contact a TWMI representative.



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ÓPTIM <sup>®</sup> C	DILWELL	FEATURE	<u>s</u>
MODEL: OPTIM® OILV TYPE: AEEAFP	VELL	Effective 03-07- Supercedes All Previo	© view of the second se
APPLICATIONS			
Any Applications Requiring	NEMA Design D Torques		
Oil Well Pumps			
PRODUCT OVERVIEW	V		
• 3.5-125 HP	• 1200 RPM	• Horizo	ntal F2 Mount
• 60Hz, 460V	Totally Enclos	ed, IP54 Design	
DESIGN FEATURES			
• 1.15 S.F.	Class F Insulation	• 40°C Ambient	Triple HP Ratings
Continuous Duty	NEMA Design D	Max Elevation 3300ft	
MECHANICAL FEATU	RES		
Shielded Bearings Frames	140T-280T and Open Bearings wit	h Regreaseable Provisions Frames 280TS	5, 320T and Larger
• Polyrex EM Grease in all Re	greaseable Bearings, Multemp SR	L Grease in Shielded Bearings	
Aluminum Rotor			
Cast-Iron Frame, Fan Cover	, Conduit Box and End Brackets		
Non-Sparking Plastic Fan			
• Number of Leads 460V: 12	Leads		
Solderless Lug Terminals or	n All Leads		
Grounding Terminal Inside	Main Terminal Box and on Frame		
Interchangeable F1 and F2	mounting		
• Paint System: Phenolic Rus	t Proof Base with Lacquer Top Coa	it	
Stainless Steel Nameplate			
• Rubber Flinger on DE up to	280T; Steel Flinger on Both Ends	320T and Larger	
Phenolic Alkyd Resin Varnis	sh with Red Varnish Coating		
• Klixon 9700K Thermostats	– 1 per phase		
OTHER FEATURES			
CSA Certified			



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Motor Products - OPTIM® OILWELL



# LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 460V	НР	RPM	FRAME	F.L. AMPS 460V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
TR7.56	3.5 5 7.5	1200	254T	10.0	83.5	276	1,880
TR0106	5 7.5 10	1200	256T	13.3	84.0	314	2,206
TR0156	7.5 10 15	1200	284T	18.7	85.5	420	3,138
TR0206	10 15 20	1200	286T	24.5	86.5	468	3,463
TR0256	15 20 25	1200	324T	30.5	87.0	635	4,557
TR0306	20 25 30	1200	326T	35.5	87.5	705	5,056
TR0406	25 30 40	1200	365T	47.5	88.5	906	7,649
TR0506	30 40 50	1200	404T	57.0	89.5	1166	9,005
TR0606	40 50 60	1200	405T	68.2	90.0	1212	10,444
TR0606LR	40 50 60	1200	444T	73.4	89.0	1400	11,562
TR0756R	50 60 75	1200	445T	91.2	89.5	1550	13,860
TR1006R	60 75 100	1200	445T	121	90.0	1600	15,997

**NOTE:** (1) Prices subject to change without notice.

Motor Products - OPTIM® OILWELL

(2) F.L. Amps & Efficiency values are for the larger HP per rating.



For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023

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MODEL: MAX-HT TYPE: AEEAGD, AEHHGD		Effective 03-07-22 Supercedes All Previous	
APPLICATIONS			
Crushers	Impactors	Chippers/ Shredde	ers
Ball Mills/ Rolling Mills	Any High Torque Application		
PRODUCT OVERVIEW			
• 1-600 HP	• 1800, 1200 & 900 RPM	Horizontal F1 Mou	int
• 60Hz, 230/460V, 460V or 575V	Totally Enclosed IP55 Design	NEMA Premium Ef	ficiency (1-500HP)
DESIGN FEATURES			
• 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power	Class F Insulation	• 40°C Ambient	
Continuous Duty	NEMA Design C or A	Max Elevation 3300ft	
MECHANICAL FEATURES			
Shielded Bearings Frames 140T-280T and Op	en Bearings with Regreaseable Pr	rovisions Frames 320T and Larger	

**FEATURES** 

Polyrex EM Grease in all Regreaseable Bearings, Multemp SRL Grease in Shielded Bearings

Aluminum Rotor

Cast-Iron Frame and End Brackets; Fabricated Steel Fan Cover

- Cast-Iron Conduit Box up to 449 Frames; Fabricated Steel Conduit Box 5000 Frames and Larger
- Non-Sparking Plastic Fan up to 449T; Aluminum Fan 5000 Frames and Larger but Cast Iron Fan for 4P
- Number of Leads 230/460V: 9 Leads 1-5 HP; 12 Leads 7.5-125 HP; 460V: 6 Leads; 575V: 6 Leads
- Solderless Lug Terminals on All Leads

Grounding Terminal Inside Main Terminal Box, Additional Grounding Terminal on Frame for 5000 Frames and Larger

- High Strength AISI 4140 Shaft Material with Radius Step-Down Shaft Shoulder
- Locknut and Washer on NDE for Vertical Shaft Down Applications 440 Frames and Larger
- Interchangeable F1 and F2 mounting up to 449T
- Dual Drilled Feet for Longer Frames (i.e. 145T also Drilled for 143T) 449T and Below
- Gamma Seal on DE up to 400T; Steel Flinger on Both Ends 440T and Larger
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- Epoxy Rust Proof Base Plus Polyurethane Top Coat
- Thermistors 1 per Phase, Terminated in Auxiliary Box up to 449T
- Winding RTD's, Space Heaters and Provisions for Bearing RTD's Standard 5000 Frames and Larger
- Bi-directional Rotation
- Stainless Steel Nameplate

## **OTHER FEATURES**

- \*\*CSA Certified for Class I, Division 2, Groups B, C & D (Class I, Zone 2, Groups IIB+H2, IIB and IIA)
- \*\*CSA Certified for Class II Div.2 Group F & G (Class II, Zone 22, Group IIIA, IIIB) 440 Frames and Larger
- \*Meets NEMA MG1 Part 31.4.4.2

Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.

\*\* AEHHGD Motors Only





# LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER		Цр	DDM	EDAME	F.L. AMPS		F/L	APPROX.	LIST
230V/460V	575V	HP HP	RPIN	FRAME	460V	575V	EFF.	WT. LBS	PRICE
HT0014	HT00145	1	1800	143T	1.50	1.20	85.50	55	818
HT0016	HT00165	1	1200	145T	1.73	1.39	82.50	61	992
HT0018	HT00185	1	900	182T	2.43	1.95	75.50	98	1,269
HT1/54	HT1/545	1.5	1800	145T	2.08	1.67	86.50	65	905
HT1/56	HT1/565	1.5	1200	182T	2.68	2.14	87.50	91	1,048
HT1/58	HT1/585	1.5	900	184T	3.44	2.75	78.50	102	1,385
HT0024	HT00245	2	1800	145T	2.78	2.22	86.50	63	956
HT0026	HT00265	2	1200	184T	3.53	2.82	88.50	102	1,174
HT0028	HT00285	2	900	213T	3.22	2.58	85.50	151	1,835
HT0034	HT00345	3	1800	182T	4.00	3.20	89.50	102	1,079
HT0036	HT00365	3	1200	213T	4.02	3.22	89.50	151	1,595
HT0038	HT00385	3	900	215T	4.98	3.98	85.50	204	2,036
HT0054	HT00545	5	1800	184T	6.38	5.10	89.50	118	1,196
HT0056	HT00565	5	1200	215T	6.60	5.28	91.00	204	1,949
HT0058	HT00585	5	900	254T	8.33	6.66	86.50	274	2,742
HT7/54	HT7/545	7.5	1800	213T	8.85	7.08	91.70	177	1,566
HT7/56	HT7/565	7.5	1200	254T	9.59	7.67	91.00	274	2,620
HT7/58	HT7/585	7.5	900	256T	10.85	8.68	87.50	310	3,421
HT0104	HT01045	10	1800	215T	11.60	9.28	91.70	208	1,740
HT0106	HT01065	10	1200	256T	12.78	10.23	91.00	310	2,956
HT0108	HT01085	10	900	284T	14.12	11.30	90.20	419	4,126
HT0154	HT01545	15	1800	254T	17.27	13.82	92.40	308	2,708
HT0156	HT01565	15	1200	284T	18.20	14.56	92.40	419	3,991
HT0158	HT01585	15	900	286T	19.96	15.97	90.20	478	5,251
HT0204	HT02045	20	1800	256T	23.41	18.73	93.00	339	3,013
HT0206	HT02065	20	1200	286T	24.31	19.45	91.70	510	4,838
HT0208	HT02085	20	900	324T	25.41	20.32	91.00	638	5,945
HT0254	HT02545	25	1800	284T	29.08	23.26	93.60	449	3,431
HT0256	HT02565	25	1200	324T	30.33	24.26	93.00	686	5,310
HT0258	HT02585	25	900	326T	32.15	25.72	91.00	695	7,073
HT0304	HT03045	30	1800	286T	34.30	27.44	93.60	550	3,798
HT0306	HT03065	30	1200	326T	37.52	30.02	93.00	695	5,828
HT0308	HT03085	30	900	364T	38.72	30.98	93.00	869	9,093
HT0404	HT04045	40	1800	324T	46.28	37.02	94.10	638	4,683
HT0406	HT04065	40	1200	364T	46.01	36.81	94.10	871	7,886
HT0408	HT04085	40	900	365T	51.63	41.31	93.00	913	11,417
HT0504	HT05045	50	1800	326T	56.94	45.56	94.50	737	5,596
HT0506	HT05065	50	1200	365T	57.80	46.24	94.10	895	9,113
HT0508	HT05085	50	900	404T	62.15	49.72	93.00	1208	13,282
HT0604	HT06045	60	1800	364T	68.37	54.69	95.00	845	7,541
HT0606	HT06065	60	1200	404T	68.33	54.67	94.50	1247	10,493
HT0608	HT06085	60	900	405T	74.58	59.66	93.00	1254	14,532
HT0754	HT07545	75	1800	365T	85.10	68.08	95.40	913	9,479
HT0756	HT07565	75	1200	405T	85.91	68.73	94.50	1344	12,377
HT0758	HT07585	75	900	444T	102.78	82.22	93.60	1628	17,183

**NOTE:** (1) Prices subject to change without notice.

(2) For VFD applcations please refer to page D-18.



# **LIST PRICES**

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER					F.L. <i>F</i>	MPS	F/L	APPROX.	LIST
230V/460V	575V	HP	KPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
HT1004	HT10045	100	1800	405T	112.17	89.74	95.40	1296	12,234
HT1006	HT10065	100	1200	444T	119.47	95.58	95.00	1676	16,315
H11008	H110085	100	900	4451	128.25	102.60	93.60	1815	21,137
HT1254	HT12545	125	1800	444T	144.34	115.47	95.40	1727	15,690
HT1256 HT1258	HT12585	125	900	4451 447T	148.44 155.48	124.38	95.00 94.10	2108	27,396
HT1504	HT15045	150	1800	445T	172.48	137.98	95.80	1804	18,069
HT1506	HT15065	150	1200	447T	175.58	140.46	95.80	2178	25,243
HT1508	HT15085	150	900	449T	186.57	149.26	94.10	2486	30,853
HT2004	HT20045	200	1800	447T	223.75	179.00	96.20	2134	23,518
HT2006	HT20065	200	1200	449T	232.71	186.17	95.80	2387	30,907
H12008	H120085	200	900	4491	240.20	192.16	94.50	2/8/	36,477
HT2504	HT25045	250	1800	449T	286.27	229.02	96.20	2482	31,495
HT2504LR	HT25045LR	250	1800	5007C	286.60	229.28	96.20	3320	42,184
HI2504LKZ	HI25045LKZ	250	1800	5050Z	286.60	229.28	96.20	2910	43,810
		250	1200	4491	311.27	249.02	95.80	2051	33,/12
		250	1200	500/C	308.12	240.50	95.80	3460	30,800
		250	1200	50000	301.05	241.52	95.60	4520	45,176
HT2508RZ	HT25085RZ	250	900	586/7UZ	309.29	231.73	95.00 95.80	4680	40,748
HT3004	HT30045	300	1800	ллот	347.62	278.09	96.20	2673	36.260
HT30041 R	HT30045LB	300	1800	5007C	344 73	275.09	96.20	3410	44 914
HT3004LR7	HT300451 B7	300	1800	586/7117	343 52	273.75	96.20	4580	45 247
HT3006R	HT30065R	300	1200	50090	356.27	285.01	95.80	4050	43 783
HT3008R	HT30085R	300	900	5806C	366.98	293 58	94 50	4850	44 103
HT3008RZ	HT30085RZ	300	900	586/7UZ	366.98	293.58	94.50	5000	45,341
HT3504R	HT35045R	350	1800	5009C	410.43	328.34	96.20	3840	48,532
HT3504RZ	HT35045RZ	350	1800	586/7UZ	395.19	316.15	96.20	4740	54,991
HT3506R	HT35065R	350	1200	5806C	416.15	332.92	95.80	5000	49,772
HT3506RZ	HT35065RZ	350	1200	586/7UZ	416.15	332.92	95.80	4980	50,703
HT3508R	HT35085R	350	900	5808C	427.00	341.60	94.50	5250	51,745
HT3508RZ	HT35085RZ	350	900	586/7UZ	433.49	346.79	94.50	5100	53,411
HT4004R	HT40045R	400	1800	5806C	463.47	370.78	96.20	4930	56,947
HT4004RZ	HT40045RZ	400	1800	586/7UZ	463.47	370.78	96.20	4860	60,648
HT4006R	HT40065R	400	1200	5808C	461.11	368.89	95.00	4800	56,100
HT4006RZ	HT40065RZ	400	1200	586/7UZ	461.11	368.89	95.00	4650	56,846
HT4008R	HT40085R	400	900	5808C	486.73	389.38	95.00	6400	70,903
HT4008RZ	HT40085RZ	400	900	586/7UZ	486.73	389.38	95.00	6400	72,115

NOTE: (1) Prices subject to change without notice.(2) For VFD applcations please refer to page D-18.




## LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER		DDM	EDAME	F.L. /	F.L. AMPS		APPROX.	LIST
230V/460V	575V	HP HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
HT4504R	HT45045R	450	1800	5808C	509.28	407.43	96.20	5340	59,871
HT4504RZ	HT45045RZ	450	1800	586/7UZ	509.28	407.43	96.20	5000	62,543
HT4506R	HT45065R	450	1200	5808C	516.57	413.26	95.40	5200	63,560
HT4506RZ	HT45065RZ	450	1200	586/7UZ	516.57	413.26	95.40	5000	64,929
HT5004R	HT50045R	500	1800	5808C	561.95	449.56	96.20	5560	71,478
HT5004RZ	HT50045RZ	500	1800	586/7UZ	561.95	449.56	96.20	5140	72,637
HT5006R	HT50065R	500	1200	5808C	573.97	459.18	95.40	5650	74,633
HT5006RZ	HT50065RZ	500	1200	586/7UZ	573.97	459.18	95.40	5450	76,532
HT6004R	HT60045R	600	1800	5808C	655.23	524.19	95.80	5800	77,493
HT6004RZ	HT60045RZ	600	1800	586/7UZ	655.23	524.19	95.80	5800	78,350
HT6006R	HT60065R	600	1200	5810C	688.76	551.01	95.40	6400	86,123

**NOTE:** (1) Prices subject to change without notice.

(2) For VFD applcations please refer to page D-18.





### STAINLESS STEEL WASHDOWN MOTOR

## FEATURES

Effective 03-07-22 Supercedes All Previous



### **MODEL:** STAINLESS STEEL WASHDOWN MOTOR **TYPE:** AEGP, AEGPCW

PE: AE

### **APPLICATIONS**

- Any Application Where the Motor Will be Subjected to High Pressure Spray Down
- Food Processing and Packaging
- Marine Duty

### **PRODUCT OVERVIEW**

- 1/2-10HP
- 60Hz, 230/460V or 575V
- 3600 & 1800 RPM

Horizontal F1 MountNEMA Premium Efficiency

Totally Enclosed Fan Cooled IP66 Design

### **DESIGN FEATURES**

- 1.15 S.F.
- Class B Temperature Rise
- Continuous Duty

Class F Insulation
NEMA Design B Torques

40°C Ambient

- MECHANICAL FEATURES
- Stainless Steel Frame, End Brackets and Hardware
- Grounding Terminal Inside Main Conduit Box
- Stainless Steel Oversized Main Conduit Box F3 Mounted (IM1001)
- Designed for 3300 ft. Elevation
- Bi-Directional Rotation
- SUS304 Stainless Steel Shaft
- Double Shielded Bearings Pre-Packed with MULTEMP SRL
- Contact Lip Type Seal on Both Ends
- Etched Nameplate on the Stainless Steel Frame
- New Dual Column Design Nameplate as Standard (60/50 Hz)
- Aluminum Die Cast Squirrel Cage Rotor Construction
- Suitable for Inverter Use per NEMA MG-1.4.4.2, Part 31
- Inverter Duty Speed Range: 10:1 Variable Torque, 4:1 Constant Torque
- 9 Leads
- Two Drain Holes on Bottom of Frame and one in the C-Flange
- Motors are U.L. Recognized, CSA Approved and CE Marked
- Department of Energy Efficiency Certificate # CC082A
- Encapsulated Windings as Option
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.



## STAINLESS STEEL WASHDOWN MOTOR TEFC COMMERCIAL DUTY

## **LIST PRICES**

NEMA Premium **SA** (E Œ



Effective 03-07-22 Supercedes All Previous

	FOOTED C-FACE										
CATALOGU	JE NUMBER		DDM	FDAME	F.L. <i>F</i>	MPS	F/L	APPROX.	LIST		
230V/460V	575V	HP	RPIN	FRAME	460V	575V	EFF.	WT. LBS	PRICE		
WFP0/52C	WFP0/525C	0.50	3600	A56C	0.80	0.64	72.00	-	427		
WFP0/54C	WFP0/545C	0.50	1800	A56C	0.88	0.70	74.00		418		
WFP0/72C	WFP0/725C	0.75	3600	A56C	1.14	0.91	75.50	-	517		
WFP0/74C	WFP0/745C	0.75	1800	A56C	1.26	1.00	75.50		470		
WFP0012C	WFP00125C	1	3600	A56C	1.42	1.13	77.00	-	547		
WFP0014C	WFP00145C	1	1800	B56C	1.35	1.08	85.50		547		
WFP1/52C	WFP1/525C	1.5	3600	B56C	1.88	1.50	84.00	-	592		
WFP1/54C	WFP1/545C	1.5	1800	C56C	2.01	1.60	86.50		611		
WFP0022C	WFP00225C	2	3600	C56C	2.45	1.96	85.50	-	641		
WFP0024C	WFP00245C	2	1800	C56C	2.63	2.10	86.50		675		
WP0012C	WP00125C	1	3600	143TC	1.42	1.13	77.00	-	693		
WP0014C	WP00145C	1	1800	143TC	1.35	1.08	85.50		626		
WP1/52C	WP1/525C	1.5	3600	143TC	1.88	1.50	84.00	-	727		
WP1/54C	WP1/545C	1.5	1800	145TC	2.01	1.60	86.50		706		
WP0022C	WP00225C	2	3600	145TC	2.45	1.96	85.50	-	834		
WP0024C	WP00245C	2	1800	145TC	2.63	2.10	86.50		770		
WP0032C	WP00325C	3	3600	182TC	3.69	2.95	86.50	-	1,448		
WP0034C	WP00345C	3	1800	182TC	4.08	3.26	89.50		1,448		
WP0052C	WP00525C	5	3600	184TC	5.95	4.76	88.50	-	1,622		
WP0054C	WP00545C	5	1800	184TC	6.55	5.24	89.50		1,588		
WP7/52C	WP7/525C	7.5	3600	213TC	9.25	7.40	89.50	-	2,116		
WP7/54C	WP7/545C	7.5	1800	213TC	9.25	7.40	91.70		2,116		
WP0102C	WP01025C	10	3600	215TC	12.05	9.64	90.20	-	2,397		
WP0104C	WP01045C	10	1800	215TC	12.15	9.72	91.70		2,363		

**NOTE:** (1) Prices subject to change without notice. (2) For VFD applcations please refer to page D-18.



## STAINLESS STEEL WASHDOWN MOTOR TEFC COMMERCIAL DUTY

## LIST PRICES

**91** (€ NEMA Premium Œ



Effective 03-07-22 Supercedes All Previous

ROUND BODY C-FACE										
CATALOGU	IE NUMBER		DDM	EDAME	F.L. <i>F</i>	MPS	F/L	APPROX.	LIST	
230V/460V	575V	HP HP	KPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE	
WFPV0/52C	WFPV0/525C	0.50	3600	A56C	0.80	0.64	72.00	-	418	
WFPV0/54C	WFPV0/545C	0.50	1800	A56C	0.88	0.70	74.00		406	
WFPV0/72C	WFPV0/725C	0.75	3600	A56C	1.14	0.91	75.50	-	517	
WFPV0/74C	WFPV0/745C	0.75	1800	A56C	1.26	1.00	75.50		464	
WFPV0012C	WFPV00125C	1	3600	A56C	1.42	1.13	77.00	-	547	
WFPV0014C	WFPV00145C	1	1800	B56C	1.35	1.08	85.50		547	
WFPV1/52C	WFPV1/525C	1.5	3600	B56C	1.88	1.50	84.00	-	592	
WFPV1/54C	WFPV1/545C	1.5	1800	C56C	2.01	1.60	86.50		611	
WFPV0022C	WFPV00225C	2	3600	C56C	2.45	1.96	85.50	-	641	
WFPV0024C	WFPV00245C	2	1800	C56C	2.63	2.10	86.50		675	
WPV0012C	WPV00125C	1	3600	143TC	1.42	1.13	77.00	-	611	
WPV0014C	WPV00145C	1	1800	143TC	1.35	1.08	85.50		626	
WPV1/52C	WPV1/525C	1.5	3600	143TC	1.88	1.50	84.00	-	675	
WPV1/54C	WPV1/545C	1.5	1800	145TC	2.01	1.60	86.50		696	
WPV0022C	WPV00225C	2	3600	145TC	2.45	1.96	85.50	-	764	
WPV0024C	WPV00245C	2	1800	145TC	2.63	2.10	86.50		770	
WPV0032C	WPV00325C	3	3600	182TC	3.69	2.95	86.50	-	1,395	
WPV0034C	WPV00345C	3	1800	182TC	4.08	3.26	89.50		1,416	
WPV0052C	WPV00525C	5	3600	184TC	5.95	4.76	88.50	-	1,594	
WPV0054C	WPV00545C	5	1800	184TC	6.55	5.24	89.50		1,558	
WPV7/52C	WPV7/525C	7.5	3600	213TC	9.25	7.40	89.50	-	2,085	
WPV7/54C	WPV7/545C	7.5	1800	213TC	9.25	7.40	91.70		2,064	
WPV0102C	WPV01025C	10	3600	215TC	12.05	9.64	90.20	-	2,348	
WPV0104C	WPV01045C	10	1800	215TC	12.15	9.72	91.70		2,311	

**NOTE:** (1) Prices subject to change without notice. (2) For VFD applcations please refer to page D-18.



## **ROLLED STEEL ODP**

## FEATURES

Supercedes All Previous

Effective 03-07-22

Open Drip Proof IP22 Design

MEPS Efficiency (56 Frame)

NEMA Premium Efficiency (T Frame)

Horizontal F1 Mount

MODEL: ROLLED STEEL ODP TYPE: ASGH/ASGHPE

### APPLICATIONS

- Fans & Blowers
- HVAC Equipment

Compressors

Pumps

### PRODUCT OVERVIEW

- 1/4-40 HP
- 56/56C Frame Available 1/4-3 HP
- 60Hz, 230V/460V, or 575V
- 3600, 1800 & 1200 RPM

### **DESIGN FEATURES**

- 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power
- Continuous Duty

Class F Insulation
NEMA Design B

• 40°C Ambient

Max Elevation 3300ft

### MECHANICAL FEATURES

- Shielded Bearings
- Multemp SRL Grease
- Aluminum Rotor
- Rolled Steel Frame with Cast-Iron End Brackets
- Rolled Steel Conduit Box
- Number of Leads 230/460V: 9 Leads 1/4-5 HP; 12 Leads 7.5 and Larger; 575V: 3 Leads
- Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box
- Paint System: Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Nameplate
- 230/460V Motors Usable on 208V (Sinusoidal Power Only)
- Rubber Flinger on DE
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- 56 Frame Available 1/4-3 HP
- Phenolic Alkyd Resin Varnish

### **OTHER FEATURES**

- \*Meets NEMA MG1 Part 31.4.4.2
- \*Speed Range 10:1 CT, and 20:1 VT
- CSA Certified, UL recognized and CE marked
- CSA Energy Efficiency Verification (EEV)
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.

## **ROLLED STEEL ODP**

PREMIUM EFFICIENCY ODP

### LIST PRICES

97



Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. /	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
RD0/22	RD0/225	0.25	3600	56	0.40	0.32	72.00	19	183
RD0/24	RD0/245	0.25	1800	56	0.45	0.36	72.00	20	187
RD0/26	RD0/265	0.25	1200	56	0.55	0.44	70.00	21	217
RD0/32	RD0/325	0.33	3600	56	0.53	0.42	72.00	19	193
RD0/34	RD0/345	0.33	1800	56	0.56	0.44	75.50	21	199
RD0/36	RD0/365	0.33	1200	56	0.71	0.57	72.00	25	236
RD0/52	RD0/525	0.50	3600	56	0.73	0.58	75.50	20	207
RD0/54	RD0/545	0.50	1800	56	0.83	0.66	77.00	23	213
RD0/56	RD0/565	0.50	1200	56	0.99	0.79	75.50	31	276
RD0/72	RD0/725	0.75	3600	56	1.11	0.89	78.50	22	217
RD0/74	RD0/745	0.75	1800	56	1.19	0.95	78.50	24	220
RD0/76	RD0/765	0.75	1200	56	1.24	0.99	78.50	32	323
RD0012-56	RD00125-56	1	3600	56	1.37	1.10	80.00	25	233
RD0012	RD00125	1	3600	143T	1.37	1.10	80.00	28	296
RD0014-56	RD00145-56	1	1800	56	1.45	1.16	85.50	35	280
RD0014	RD00145	1	1800	143T	1.45	1.16	85.50	35	287
RD0016-56	RD00165-56	1	1200	56	1.72	1.38	82.50	37	370
RD0016	RD00165	1	1200	145T	1.72	1.38	82.50	36	341
RD1/52-56 RD1/52 RD1/54-56 RD1/54 RD1/56-56 RD1/56	RD1/525-56 RD1/525 RD1/545-56 RD1/545 RD1/565-56 RD1/565	1.5 1.5 1.5 1.5 1.5 1.5 1.5	3600 3600 1800 1800 1200 1200	56 143T 56 145T 56 182T	1.98 1.91 0.00 2.00 0.00 3.01	1.58 1.53 0.00 1.60 0.00 2.41	85.50 85.50 86.50 86.50 86.50 86.50	35 35 35 35 35 35 35	289 319 354 316 467 445
RD0022-56 RD0022 RD0024-56 RD0024 RD0026	RD00225-56 RD00225 RD00245-56 RD00245 RD00265	2 2 2 2 2 2	3600 3600 1800 1800 1200	56 145T 56 145T 184T	2.55 2.46 2.74 2.61 3.75	2.04 1.97 2.19 2.09 3.00	86.50 86.50 86.50 86.50 87.50	35 35 35 35 35 35	320 352 383 341 479
RD0032-56	RD00325-56	3	3600	56	3.65	2.92	86.50	35	366
RD0032	RD00325	3	3600	145T	3.91	3.13	85.50	35	385
RD0034	RD00345	3	1800	182T	4.30	3.44	89.50	60	458
RD0036	RD00365	3	1200	213T	4.60	3.68	88.50	95	678

NOTE: (1) Prices subject to change without notice. (2) For VFD applcations please refer to page D-18.



## **ROLLED STEEL ODP**

PREMIUM EFFICIENCY ODP

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER		DDM	EDAME	F.L. <i>A</i>	MPS	F/L	APPROX.	LIST
230V/460V	575V	HP HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
RD0052	RD00525	5	3600	182T	6.08	4.86	87.50	67	472
RD0054	RD00545	5	1800	184T	6.79	5.43	89.50	77	479
RD0056	RD00565	5	1200	215T	7.17	5.73	89.50	123	811
RD7/52	RD7/525	7.5	3600	184T	8.82	7.05	88.50	77	576
RD7/54	RD7/545	7.5	1800	213T	9.53	7.62	91.00	115	678
RD7/56	RD7/565	7.5	1200	254T	10.11	8.09	90.20	197	1,073
RD0102	RD01025	10	3600	213T	12.14	9.71	90.20	123	734
RD0104	RD01045	10	1800	215T	12.16	9.72	91.70	143	811
RD0106	RD01065	10	1200	256T	12.84	10.28	91.70	234	1,309
RD0152	RD01525	15	3600	215T	17.74	14.19	91.00	152	965
RD0154	RD01545	15	1800	254T	18.20	14.56	93.00	213	1,191
RD0156	RD01565	15	1200	284T	19.15	15.32	91.70	305	1,692
RD0202	RD02025	20	3600	254T	22.69	18.15	91.70	202	1,248
RD0204	RD02045	20	1800	256T	24.26	19.41	93.00	234	1,309
RD0206	RD02065	20	1200	286T	24.71	19.77	92.40	364	2,023
RD0252	RD02525	25	3600	256T	28.05	22.44	91.70	202	1,502
RD0254	RD02545	25	1800	284T	29.42	23.54	93.60	295	1,910
RD0302	RD03025	30	3600	284TS	33.78	27.02	92.40	273	1,850
RD0304	RD03045	30	1800	286T	34.71	27.77	94.10	346	2,135
RD0402	RD04025	40	3600	286TS	44.79	35.83	92.40	322	2,283

**NOTE:** (1) Prices subject to change without notice.

(2) For VFD applcations please refer to page D-18.



Motor Products - ROLLED STEEL ODP



#### MODEL: OPTIM® ODP ASHH TYPE:

### **APPLICATIONS**

• Fans & Blowers

• Pumps

### **PRODUCT OVERVIEW**

- 1-500 HP
- 60Hz, 230V/460V, 460V or 575V
- · 3600, 1800 & 1200 RPM

### Horizontal F1 Mount

Open Drip Proof IP22 Design

NEMA Premium Efficiency

### **DESIGN FEATURES**

- 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power
- Class F Insulation • NEMA Design B
- 40°C Ambient Max Elevation 3300ft

FEATURES

Effective 03-07-22

Supercedes All Previous

CE

NEMA

**MECHANICAL FEATURES** 

- Shielded Bearings Frames 140T-280T and Open Bearings with Regreaseable Provisions Frames 280TS, 320T and Larger
- Polyrex EM Grease in all Regreaseable Bearings, Multemp SRL Grease in Shielded Bearings

Compressors

Aluminum Rotor

Continuous Duty

- Cast-Iron Frame and End Brackets
- Rolled Steel Conduit Box up to 400T Frames; Fabricated Steel Conduit Box 440T Frames and Larger
- Number of Leads 230/460V: 9 Leads 1-5 HP; 12 Leads 7.5-125 HP; 6 Leads 150 and Above
- Number of Leads 575V: 3 Leads up to 449T; 6 Leads 5000 Frames and Larger
- Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box
- Interchangeable F1 and F2 mounting up to 449T
- Paint System: Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Nameplate
- Usable on 208V Sinusoidal Power Only
- Rubber Flinger on DE up to 280T; Steel Flinger on DE 280TS and Larger
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- Phenolic Alkyd Resin Varnish 140T to 400T Frames; 2 Dips Phenolic Alkyd Resin Varnish and 1 Coat Spray Enamel 440T Frames and Larger
- Winding RTD's, Space Heaters and Provisions for Bearing RTD's Standard 5000 Frames and Larger

### **OTHER FEATURES**

- CSA Certified, UL Recognized and CE Marked
- UL Listed (UL 1004-5) for Fire Pump Applications (1-400HP) Available upon Request
- CSA Energy Efficiency Verification (EEV)
- \*Meets NEMA MG1 Part 31.4.4.2
- \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to data sheet for rating specific turn down ratios
- Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.

## TECC Westinghouse



# M° ODP

NEMA PREMIUM EFFICIENCY OPEN DRIP PROOF

## **LIST PRICES**

NEMA Premium CE Œ



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER			EDANAE	F.L. /	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
SDP0014	SDP00145	1	1800	143T	1.40	1.12	85.50	53	363
SDP0016	SDP00165	1	1200	145T	1.74	1.39	82.50	66	449
SDP1/52	SDP1/525	1.5	3600	143T	2.06	1.64	85.50	53	363
SDP1/54	SDP1/545	1.5	1800	145T	2.02	1.61	86.50	66	379
SDP1/56	SDP1/565	1.5	1200	182T	2.55	2.04	87.50	95	488
SDP0022	SDP00225	2	3600	145T	2.59	2.07	85.50	66	411
SDP0024	SDP00245	2	1800	145T	2.72	2.18	86.50	66	393
SDP0026	SDP00265	2	1200	184T	3.01	2.41	87.50	106	593
SDP0032	SDP00325	3	3600	145T	3.69	2.95	87.50	66	439
SDP0034	SDP00345	3	1800	182T	3.88	3.10	89.50	95	456
SDP0036	SDP00365	3	1200	213T	4.12	3.30	88.50	159	743
SDP0052	SDP00525	5	3600	182T	5.90	4.72	87.50	95	539
SDP0054	SDP00545	5	1800	184T	6.19	4.95	89.50	106	570
SDP0056	SDP00565	5	1200	215T	6.62	5.30	89.50	185	944
SDP7/52	SDP7/525	7.5	3600	184T	8.65	6.92	88.50	106	667
SDP7/54	SDP7/545	7.5	1800	213T	8.97	7.18	91.00	159	780
SDP7/56	SDP7/565	7.5	1200	254T	9.85	7.88	90.20	247	1,300
SDP0102	SDP01025	10	3600	213T	11.80	9.44	90.20	159	829
SDP0104	SDP01045	10	1800	215T	11.74	9.39	91.70	185	971
SDP0106	SDP01065	10	1200	256T	12.61	10.08	91.70	287	1,477
SDP0152	SDP01525	15	3600	215T	17.80	14.24	90.20	185	1,128
SDP0154	SDP01545	15	1800	254T	17.87	14.30	93.00	247	1,352
SDP0156	SDP01565	15	1200	284T	18.45	14.76	91.70	357	1,917
SDP0202	SDP02025	20	3600	254T	22.75	18.20	91.00	247	1,505
SDP0204	SDP02045	20	1800	256T	23.28	18.62	93.00	287	1,597
SDP0206	SDP02065	20	1200	286T	24.27	19.42	92.40	397	2,385
SDP0252	SDP02525	25	3600	256T	27.75	22.20	91.70	287	1,776
SDP0254	SDP02545	25	1800	284T	28.75	23.00	93.60	357	1,917
SDP0256	SDP02565	25	1200	324T	30.32	24.26	93.00	520	3,008
SDP0302	SDP03025	30	3600	284TS	33.60	26.88	92.40	370	2,251
SDP0304	SDP03045	30	1800	286T	34.31	27.45	94.10	397	2,259
SDP0306	SDP03065	30	1200	326T	35.94	28.75	93.60	595	3,367
SDP0402	SDP04025	40	3600	286TS	44.30	35.44	92.40	412	2,683
SDP0404	SDP04045	40	1800	324T	46.28	37.02	94.10	520	2,788
SDP0406	SDP04065	40	1200	364T	45.75	36.60	94.10	699	4,031
SDP0502	SDP05025	50	3600	324TS	58.50	46.80	93.00	518	3,369
SDP0504	SDP05045	50	1800	326T	58.28	46.63	94.50	595	3,147
SDP0506	SDP05065	50	1200	365T	57.85	46.28	94.10	772	4,696
SDP0602	SDP06025	60	3600	326TS	69.00	55.20	93.60	578	3,752
SDP0604	SDP06045	60	1800	364T	69.57	55.66	95.00	699	4,031
SDP0606	SDP06065	60	1200	404T	69.53	55.62	94.50	948	5,741
SDP0752	SDP07525	75	3600	364TS	82.50	66.00	94.10	666	4,805
SDP0754	SDP07545	75	1800	365T	85.95	68.76	95.00	772	4,798
SDP0756	SDP07565	75	1200	405T	86.00	68.80	94.50	1058	6,892

NOTE: (1) Prices subject to change without notice.(2) Ratings over 125HP are single voltage rated only (460V).





**LIST PRICES** 

NEMA €₽ CE



Effective 03-07-22 Supercedes All Previous

CATALOGU	IE NUMBER		0014	FDAME	F.L. <i>A</i>	MPS	F/L	APPROX.	LIST
230V/460V	575V	HP	KPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
SDP1002	SDP10025	100	3600	365TS	109.95	87.96	94.10	730	6,338
SDP1004	SDP10045	100	1800	404T	114.79	91.83	95.40	948	6,070
SDP1006	SDP10065	100	1200	444T	120.00	96.00	95.00	1170	11,847
SDP1252	SDP12525	125	3600	404TS	137.43	109.95	94.10	902	9,383
SDP1254	SDP12545	125	1800	405T	145.19	116.15	95.40	1058	8,155
SDP1256	SDP12565	125	1200	445T	150.00	120.00	95.00	1280	14,229
SDP1502	SDP15025	150	3600	405TS	164.22	131.38	94.50	981	11,180
SDP1504	SDP15045	150	1800	444T	170.00	136.00	95.80	1320	12,101
SDP1506	SDP15065	150	1200	445T	178.00	142.40	95.40	1370	15,305
SDP2002	SDP20025	200	3600	444TS	223.00	178.40	95.00	1150	14,551
SDP2004	SDP20045	200	1800	445T	226.00	180.80	95.80	1430	14,615
SDP2006	SDP20065	200	1200	447T	236.00	188.80	95.40	1810	18,885
SDP2502	SDP25025	250	3600	445TS	278.00	222.40	95.00	1280	17,215
SDP2504	SDP25045	250	1800	447T	281.00	224.80	95.80	1760	18,181
SDP2506	SDP25065	250	1200	449T	296.00	236.80	95.40	2160	23,951
SDP3002	SDP30025	300	3600	445TS	331.00	264.80	95.40	1320	22,157
SDP3004	SDP30045	300	1800	449T	335.00	268.00	95.80	1870	22,842
SDP3006	SDP30065	300	1200	449T	338.00	270.40	95.40	2615	29,028
SDP3502	SDP35025	350	3600	447TS	382.00	305.60	95.40	1590	25,055
SDP3504	SDP35045	350	1800	449T	391.00	312.80	95.80	2310	24,286
SDP3506	SDP35065	350	1200	5009B	404.00	323.20	95.40	3715	43,723
SDP4002	SDP40025	400	3600	449TS	434.00	347.20	95.80	1760	28,287
SDP4004	SDP40045	400	1800	449T	446.00	356.80	95.80	2445	29,415
SDP4006	SDP40065	400	1200	5009B	463.00	370.40	95.80	3835	49,072
SDP4502	SDP45025	450	3600	449TS	486.00	388.80	95.80	2125	30,670
SDP4504	SDP45045	450	1800	5009B	498.00	398.40	96.20	3620	42,597
SDP4506	SDP45065	450	1200	5009B	521.00	416.80	96.20	3960	50,678
SDP5002	SDP50025	500	3600	449TS	536.00	428.80	95.80	2225	32,349
SDP5004	SDP50045	500	1800	5009B	553.00	442.40	96.20	3790	45,640
SDP5006	SDP50065	500	1200	5009B	579.00	463.20	96.20	4075	52,116

**NOTE:** (1) Prices subject to change without notice. (2) Ratings over 125HP are single voltage rated only (460V).

(3) RU logo for 449 Frames and Below.





## **FEATURES**

NEMA Premium

Effective 03-07-22

Supercedes All Previous

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MODEL: GLOBAL XHP TYPE: AFHP

APPLICATIONS		
Fans & Blowers	Compressors	
• Pumps		
PRODUCT OVERVIEW		
• 200-2000 HP	Totally Enclose	ed IP55 Design
• 60Hz, 2300V/4000V	Horizontal F1	Mount
• 3600, 1800, 1200 & 900 RPM	NEMA Premiu	m Efficiency (250-500HP)
DESIGN FEATURES		
• 1.15 S.F. Sine Wave Power	<ul> <li>Class F Insulation</li> </ul>	• 40°C Ambient
Continuous Duty	NEMA Design B	Max Elevation 3300ft
MECHANICAL FEATURES		
<ul> <li>Anti-friction Bearings with Regr</li> </ul>	easeable Provisions	Stainless Steel Nameplate & Hardware
Insulated NDE Bearings		1045 Carbon Steel Shaft Material
Polyrex EM Grease		Labyrinth Type Steel Flinger on Both Ends
Copper/Copper Alloy or Alumin	um Rotor	<ul> <li>Form Wound Windings With Complete VPI Treatment</li> </ul>
<ul> <li>Cast-Iron Frame and End Bracket</li> </ul>	ets	Bi-Directional Rotation Except 3600RPM Motors
Fabricated Steel Conduit Box		<ul> <li>Winding RTD's, Space Heaters and Provisions for Bearing RTD's</li> </ul>
<ul> <li>Fabricated Steel Fan Cover</li> </ul>		<ul> <li>Grounding Terminal Inside Main Terminal Box and on Frame</li> </ul>
Class II Porous Drain Plugs		<ul> <li>Interchangeable F1 and F2 mounting, F3 Available</li> </ul>
Number of Leads: 6		
Steel Flinger on Both Ends Inter	changeable with Inpro Seals	
Paint System: Epoxy Resin Prime	er with Polyurethane Resin En	amel Top Coat
Aluminum Fan Except 2 Pole Mo	otors Which are Reinforced Pla	astic
<ul> <li>Vibration Sensor on Both Ends</li> </ul>		
Vibration Level per IEEE Std 841	(0.08 IPS or less)	
<ul> <li>Foot flatness per IEEE Std 841</li> </ul>		
Test Report Provided with Moto	r per IEEE Std 841	
Solderless Lug Terminals on All	Leads	
OTHER FEATURES		
CSA Certified for Class I, Division	n 2, Groups A, B, C & D (Class I,	, Zone 2, Groups IIB+H2, IIB & IIA)
CSA Certified for Class II, Divisio	n 2, Groups F & G (Class I, Zon	ie 2, Groups IIB+H2, IIB & IIA)
Suitable for Across the Line or R	educed Voltage Starting	
*Speed Ranges 3:1 CT, and 10:1	VT at SF 1.0	
<ul> <li>*Factory Certified for use on a V</li> </ul>	FD (Please Contact TWMI for S	Speed Ranges)
* Precautions should be taken to elim NEMA MG1, Part 31.4.4.	inate or reduce voltage spikes an	nd shaft currents that may be imposed on the motor by the VFD as stated per

A - 32 Motor Products - GLOBAL XHP



For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023



### PREMIUM EFFICIENCY TEFC SEVERE DUTY

### **LIST PRICES**

NEMA Premium

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 2300V/4000V	HP	RPM	FRAME	F.L. AMPS 4000V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
XHP2006	200	1200	5009B	29.93	95.20	3350	39,259
XHP2008	200	900	5009B	30.24	93.90	3610	42,114
XHP2502	250	3600	5009A	33.34	95.00	3220	37,965
XHP2504	250	1800	5009B	32.74	95.00	3450	39,594
XHP2506	250	1200	5009B	36.70	95.30	3560	41,362
XHP2508	250	900	5009B	37.25	94.10	3920	44,623
XHP3002	300	3600	5009A	39.13	95.00	3440	39,248
XHP3004	300	1800	5009B	39.03	95.00	3580	40,610
XHP3006	300	1200	5009B	43.07	95.40	3790	42,920
XHP3008	300	900	5011B	44.94	94.20	4630	48,491
XHP3502	350	3600	5009A	44.53	95.00	3660	40,945
XHP3504	350	1800	5009B	46.61	95.00	3700	42,438
XHP3506	350	1200	5009B	48.99	95.50	4010	45,021
XHP3508	350	900	5011B	51.66	94.40	5040	55,625
XHP4002	400	3600	5011A	50.66	95.00	4150	43,303
XHP4004	400	1800	5011B	52.28	95.00	3840	44,947
XHP4006	400	1200	5011B	57.04	95.60	4540	49,126
XHP4008	400	900	5011B	55.85	94.50	5170	63,559
XHP4502	450	3600	5011A	56.92	95.00	4390	51,522
XHP4504	450	1800	5011B	58.00	95.00	4210	47,441
XHP4506	450	1200	5011B	63.01	95.90	4820	54,795
XHP4508	450	900	5810B	67.47	94.60	6200	68,535
XHP5002	500	3600	5011A	62.62	95.00	4540	56,190
XHP5004	500	1800	5011B	64.38	95.00	4380	52,496
XHP5006	500	1200	5011B	68.68	96.00	5030	61,166
XHP5008	500	900	5810B	74.14	94.60	6400	78,150
XHP6002	600	3600	5011A	76.87	95.40	4770	60,862
XHP6004	600	1800	5011B	76.70	95.40	4690	65,466
XHP6006	600	1200	5810B	82.50	95.30	6400	72,507
XHP6008	600	900	5810B	88.58	94.60	6800	88,422
XHP7002	700	3600	5810A	89.07	95.40	6100	67,749
XHP7004	700	1800	5810B	92.00	95.40	6500	74,140
XHP7006	700	1200	5810B	94.69	95.40	6800	81,301
XHP7008	700	900	5810B	104.59	94.80	7400	91,687
XHP8002	800	3600	5810A	101.13	95.60	6400	87,376
XHP8004	800	1800	5810B	104.99	95.60	6800	80,395
XHP8006	800	1200	6808B	108.87	95.50	8600	102,261
XHP8008	800	900	6808B	120.05	95.00	9400	106,064

NOTE: (1) Prices subject to change without notice. (2) For other voltages please contact a TWMI representative.

(3) Contact TWMI for special design criteria, VFD duty & Hazloc Ratings.





## LIST PRICES

NEMA Premium €



Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 2300V/4000V	HP	RPM	FRAME	F.L. AMPS 4000V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
XHP9002	900	3600	5810A	114.74	95.60	6500	88,318
XHP9004	900	1800	5810B	117.86	95.60	6800	85,443
XHP9006	900	1200	6808B	122.86	95.70	9000	105,647
XHP9008	900	900	6808B	135.40	95.20	9900	111,082
XHP10004	1000	1800	5810B	131.39	95.60	7000	89,987
XHP10006	1000	1200	6812B	135.78	95.80	10500	113,655
XHP10008	1000	900	6812B	150.13	95.40	11600	120,042
XHP12504	1250	1800	6808B	166.91	96.00	9300	112,063
XHP12506	1250	1200	6812B	170.67	96.00	11600	126,470
XHP12508	1250	900	6812B	181.99	95.60	13000	135,442
XHP15004	1500	1800	6812B	197.50	96.10	11700	120,802
XHP15006	1500	1200	6812B	201.80	96.30	12900	136,841
XHP15008	1500	900	6812B	221.51	95.80	14100	145,948
XHP17504	1750	1800	6812B	230.75	96.30	12600	128,998
XHP17506	1750	1200	6812B	233.07	96.50	13800	148,028

\* Please contact your local TWMI sales representative for more information.

**NOTE:** (1) Prices subject to change without notice.

(2) For other voltages please contact a TWMI representative.

(3) Contact TWMI for special design criteria, VFD duty & Hazloc Ratings.







MODEL: GLOBAL ODP

AMHG

TYPE:

NEMA Premium

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Effective 03-07-22 Supercedes All Previous

APPLICATIONS				
<ul> <li>Fans &amp; Blowers</li> </ul>	Compressors			
• Pumps				
PRODUCT OVERVIEW				
• 100-2000 HP	WPI IPW23 ODP D	Design		
• 60Hz, 2300/4000V	Horizontal F1 Mor	unt		
• 3600, 1800, 1200 & 900 RPM				
DESIGN FEATURES				
• 1.15 S.F.	<ul> <li>Class F Insulation</li> </ul>	• 40°C Ambient		
Continuous Duty	NEMA Design B	Max Elevation 3300ft		
MECHANICAL FEATURES	5			
Anti-friction Bearings with Regi	reaseable Provisions			
<ul> <li>Polyrex EM Grease</li> </ul>				
Copper/Copper Alloy Rotor Bar	Except 447/449, 2 & 4; Which are	Die-Cast Aluminum		
Cast-Iron Frame and End Bracker	ets			
<ul> <li>Fabricated Steel Conduit Box</li> </ul>				
<ul> <li>Number of Leads: 6</li> </ul>				
<ul> <li>Solderless Lug Terminals on All</li> </ul>	Leads			
<ul> <li>Grounding Terminal Inside Main</li> </ul>	n Terminal Box and on Frame			
<ul> <li>Paint System: Phenolic Rust Pro</li> </ul>	oof Base with Polyurethane Top Co	bat		
<ul> <li>Stainless Steel Nameplate</li> </ul>				
<ul> <li>1045 Carbon Steel Shaft Materi</li> </ul>	al			
<ul> <li>Steel Flinger on Both Ends</li> </ul>				
<ul> <li>Form Wound Windings with Co</li> </ul>	mplete VPI Treatment			
Bi-Directional Rotation Except 3	3600 RPM Motors			
<ul> <li>Winding RTD's, Space Heaters a</li> </ul>	and Provisions for Bearing RTD's			
<ul> <li>Vibration Probe Mounting Prov</li> </ul>	isions			
OTHER FEATURES				

Suitable for Across the Line or Reduced Voltage Starting

CSA Certified

• Factory Certified for VFD Duty (Please Contact TWMI for Details)



**A -** 35

Motor Products - GLOBAL ODP



## **LIST PRICES**

NEMA Premium

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 2300V/4160V	НР	RPM	FRAME	F.L. AMPS 4160V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
MDP1002	100	3600	447TS	13.23	92.00	1760	27,639
MDP1004	100	1800	447T	13.80	93.70	2050	30,885
MDP1006	100	1200	447T	14.38	94.60	1920	36,638
MDP1008	100	900	447T	15.53	93.20	2310	36,784
MDP1252 MDP1254 MDP1256 MDP1258	125 125 125 125 125	3600 1800 1200 900	447TS 447T 449T 449T	16.10 17.83 17.83 18.98	93.10 94.20 94.70 93.30	1800 2100 2120 2530	28,021 31,415 38,938 39,529
MDP1502	150	3600	447TS	19.55	93.10	1870	28,403
MDP1504	150	1800	449T	20.13	94.80	2360	32,831
MDP1506	150	1200	449T	21.85	94.80	2180	39,910
MDP1508	150	900	449T	23.00	93.40	3260	40,500
MDP2002	200	3600	449TS	26.45	93.70	1900	30,352
MDP2004	200	1800	449T	27.60	94.90	2380	33,745
MDP2006	200	1200	449T	29.33	94.90	2270	41,118
MDP2008	200	900	5009B	31.63	93.50	3550	51,149
MDP2502	250	3600	449TS	31.63	94.50	2020	31,408
MDP2504	250	1800	449T	34.50	95.00	2490	35,983
MDP2506	250	1200	449T	36.23	95.00	2340	42,179
MDP2508	250	900	5009B	37.95	93.60	3990	55,159
MDP3002	300	3600	449TS	38.53	94.50	2100	32,323
MDP3004	300	1800	449T	40.83	95.00	2550	36,600
MDP3006	300	1200	449T	43.70	95.00	2490	43,386
MDP3008	300	900	5011B	45.43	93.70	4380	60,351
MDP3502	350	3600	5009A	45.43	94.50	3580	52,707
MDP3504	350	1800	5009B	47.15	95.00	3330	50,051
MDP3506	350	1200	5009B	51.75	95.00	3770	54,772
MDP3508	350	900	5011B	53.48	93.80	4710	63,330
MDP4002	400	3600	5009A	51.75	94.50	3700	53,323
MDP4004	400	1800	5009B	54.05	95.00	3420	51,259
MDP4006	400	1200	5009B	59.80	95.10	3850	55,388
MDP4008	400	900	5012B	62.68	93.90	4820	65,420
MDP4502	450	3600	5009A	58.65	94.50	3800	53,944
MDP4504	450	1800	5009B	60.38	95.00	3520	52,470
MDP4506	450	1200	5011B	67.85	95.20	3885	58,367
MDP4508	450	900	5810B	65.55	94.00	6160	75,186
MDP5002	500	3600	5011A	63.83	94.50	3900	58,545
MDP5004	500	1800	5009B	66.70	95.00	3720	54,562
MDP5006	500	1200	5011B	73.60	95.30	3920	61,050
MDP5008	500	900	5810B	73.60	94.10	6450	78,014

**NOTE:** (1) Prices subject to change without notice.

(2) For other voltages please contact a TWMI representative.(3) Not stocked in Canada. Please contact your TWMI representative for delivery.





### HIGH EFFICIENCY ODP SEVERE DUTY



NEMA Premium €₽



Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 2300V/4160V	HP	RPM	FRAME	F.L. AMPS 4160V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
MDP6002	600	3600	5011A	76.48	94.60	4000	60,222
MDP6004	600	1800	5011B	79.35	95.10	3770	59,485
MDP6006	600	1200	5011B	87.98	95.40	4250	64,205
MDP6008	600	900	5810B	87.98	94.20	6600	79,252
MDP7002	700	3600	5011A	88.55	94.70	4200	62,637
MDP7004	700	1800	5011B	92.58	95.20	4100	63,228
MDP7006	700	1200	5012B	102.35	95.50	4650	66,913
MDP7008	700	900	5811B	102.35	94.30	6880	87,272
MDP8002	800	3600	5011A	102.35	94.80	4400	63,871
MDP8004	800	1800	5012B	105.23	95.30	4300	67,415
MDP8006	800	1200	5810B	110.98	95.60	5940	74,197
MDP8008	800	900	5811B	115.58	94.40	7100	90,423
MDP9002	900	3600	5012A	113.28	94.90	4600	68,649
MDP9004	900	1800	5012B	119.03	95.40	4400	68,649
MDP9006	900	1200	5810B	124.20	95.70	6230	77,206
MDP9008	900	900	5812B	129.38	94.50	7700	97,266
MDP10002	1000	3600	5012A	128.23	95.00	4730	70,326
MDP10004	1000	1800	5810B	128.23	95.50	6890	87,734
MDP10006	1000	1200	5811B	136.85	95.80	6980	85,963
MDP12502	1250	3600	5810A	159.85	95.10	5740	83,592
MDP12504	1250	1800	5811B	163.30	95.60	7070	92,150
MDP12506	1250	1200	5812B	169.05	95.90	7660	95,983
MDP15004	1500	1800	5812B	194.93	95.70	7790	100,843
MDP17504	1750	1800	5813B	225.98	95.80	8390	108,798
MDP20004	2000	1800	5813B	259.90	95.90	8400	112,772

**NOTE:** (1) Prices subject to change without notice.

(2) For other voltages please contact a TWMI representative.

(3) Not stocked in Canada. Please contact your TWMI representative for delivery.





## FEATURES

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Effective 03-07-22 Supercedes All Previous



## APPLICATIONS

**MODEL:** FARM DUTY

• Fans & Blowers

TYPE:

• Farm Equipment

### PRODUCT OVERVIEW

- 1/3-10 HP
- 60Hz, 115/230V OR 230V; Single Phase

BEGCFD, BECCFD, BECSFD

• 1800 RPM

### **DESIGN FEATURES**

- 1.15 S.F.
- 40°C Ambient

Pumps

Machine Tools

Continuous Duty

• High Torque

- Max Elevation 3300ft
- Class B Insulation up to 3 HP; Class F Insulation 3-10 HP
- Class B Temperature Rise
- Capacitor Start, Induction Run .33-1.5 HP; Capacitor Start, Capacitor Run 2-10 HP

Totally Enclosed IP44 Design

Horizontal F1 Mount

Compressors

### **MECHANICAL FEATURES**

- Shielded Bearings
- Multemp SRL Grease
- Aluminum Rotor
- Cast-Iron Frame and End Brackets 1.5-10 HP, Rolled Steel for Others
- Rolled Steel Fan Cover and Terminal Box
- Plastic Fan
- Grounding Terminal Inside Main Terminal Box
- Paint System: Phenolic Rust Proof Base with Polyurethane Top Coat
- Rubber Flinger on DE
- Phenolic Alkyd Resin Varnish
- Manual Reset Overload

### **OTHER FEATURES**

CSA approved, UL Recognized







## **LIST PRICES**

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 115V/230V	HP	RPM	FRAME	F.L. AMPS 230V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
FD0/34	0.33	1800	56	4.40	53.00	32	348
FD0/54	0.50	1800	56	4.95	59.00	35	369
FD0/74	0.75	1800	56	6.10	66.00	38	392
FD0014	1	1800	56	7.00	67.00	48	422
FD1/54	1.5	1800	145T	11.00	70.00	70	497
FD0024	2	1800	182T	14.00	73.00	92	685
FD0034	3	1800	182T	21.00	74.00	92	771
FD0054	5	1800	184T	30.00	78.50	103	929
FD7/54	7.5	1800	213T	36.00	80.00	178	1,493
FD0104	10	1800	215T	48.00	78.50	181	1,599

**NOTE:** (1) Prices subject to change without notice. (2) 115/230V: 1/3-2HP; 230V: 3-10HP.



# **SINGLE PHASE TEFC**

**MODEL:** SINGLE PHASE TEFC

BEGS39/BEGS19

TYPE:

## **FEATURES**

NEMA Premium 71 €

Effective 03-07-22 Supercedes All Previous



APPLICATIONS			
Agricultural Industry	• Pumps		
HVAC Equipment	Compressors		
PRODUCT OVERVIEW			
• 1/4-10 HP	Horizontal F1 M	ount	
<ul> <li>Totally Enclosed IP44 Design</li> </ul>	• 60Hz, 115/230V	or 230V or 208V 1.0 S.F.; Single Phase	
• 3600, 1800 RPM			
DESIGN FEATURES			
• 1.15 S.F.	Class F Insulation	Designed for 3300 ft Elevation	
• 40°C Ambient	Class B Temperature Rise	Automatic Reset Overload	
Capacitor Start, Capacitor Run			
MIECHANICAL FEATURES			
Bi-Directional Rotation			
Rolled Steel Frame			
Cast Aluminum Terminal Box			
<ul> <li>1045 Carbon Steel Shaft</li> </ul>			
Aluminum Die Cast Squirrel Cag	e Rotor Construction		
Paint System: Phenolic Rust Proc	of Base Plus Lacquer Top Coat		
Paint Color: Blue – Munsell 5 PB	3/8		
Double Shielded Bearings Pre-Pa	acked with Lithium Base Grease		
No Terminals; Lead End Peel-Off	Insulation		
Grounding Terminal Inside Main	Box		
Stainless Steel Nameplate			
Motors are UL Recognized for U	nited States and Canada		





## **SINGLE PHASE TEFC**

### SINGLE PHASE TEFC

## LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 115V/230V	HP	RPM	FRAME	F.L. AMPS 230V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
BFR0/22	0.25	3600	48	1.28	68.00	21	262
BF0/22	0.25	3600	56	1.28	68.00	21	270
BFR0/24	0.25	1800	48	1.35	70.00	21	249
BF0/24	0.25	1800	56	1.35	70.00	22	257
BFR0/32 BF0/32 BFR0/34 BF0/34	0.33 0.33 0.33 0.33	3600 3600 1800 1800	48 56 48 56	1.68 1.68 1.77 1.77	72.00 72.00 74.00 74.00	22 22 22 22 23	266 279 266 274
BFR0/52	0.50	3600	48	2.42	74.00	25	297
BF0/52	0.50	3600	56	2.42	74.00	25	310
BFR0/54	0.50	1800	48	2.46	77.00	27	292
BF0/54	0.50	1800	56	2.46	77.00	27	301
BFR0/72	0.75	3600	48	3.38	77.00	29	323
BF0/72	0.75	3600	56	3.38	77.00	29	331
BFR0/74	0.75	1800	48	3.50	78.50	30	319
BF0/74	0.75	1800	56	3.50	78.50	30	331
BFR0012	1	3600	56H	4.51	78.50	36	397
BF0012	1	3600	143T	4.51	78.50	36	410
BFR0014	1	1800	56H	4.53	80.00	39	437
BF0014	1	1800	143T	4.53	80.00	40	449
BFR1/52	1.5	3600	56H	6.11	81.50	40	445
BF1/52	1.5	3600	143T	6.11	81.50	41	462
BFR1/54	1.5	1800	56H	6.38	81.50	45	493
BF1/54	1.5	1800	145T	6.38	81.50	46	506
BFR0022	2	3600	56H	8.23	82.50	43	483
BF0022	2	3600	145T	8.23	82.50	44	502
BFR0024	2	1800	56H	8.59	82.50	47	559
BF0024	2	1800	145T	8.59	82.50	48	576
BFR0032	3	3600	56H	11.70	84.00	54	519
BF0032	3	3600	145T	11.70	84.00	54	536
BFL0032	3	3600	182T	12.50	80.00	83	755
BF0034	3	1800	182T	12.60	82.50	88	829
BF0052	5	3600	184T	20.00	82.00	102	859
BF0054	5	1800	184T	20.40	84.00	106	990
BF7/52	7.5	3600	213T	28.90	84.50	149	1,334
BF7/54	7.5	1800	213T	31.10	82.00	176	1,696
BF0102	10.0	3600	215T	38.70	86.00	183	1,713
BF0104	10.0	1800	215T	41.60	83.50	202	2,089

**NOTE:** (1) Prices subject to change without notice.



# SINGLE PHASE ODP

• Pumps

Compressors

## FEATURES

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Effective 03-07-22 Supercedes All Previous



**MODEL:** SINGLE PHASE ODP **TYPE:** BSGS39

### APPLICATIONS

- Agricultural Industry
- HVAC Equipment

### PRODUCT OVERVIEW

- 1/4-3 HP
- Open Drip Proof Design

Horizontal F1 Mount
60Hz, 115/230V or 230V or 208V 1.0 S.F.; Single Phase

• 3600, 1800 RPM

### **DESIGN FEATURES**

• 1.15 S.F.

40°C Ambient

- Class F Insulation
- Class B Temperature Rise
- Designed for 3300 ft ElevationAutomatic Reset Overload

Capacitor Start, Capacitor Run

### **MECHANICAL FEATURES**

- Bi-Directional Rotation
- Rolled Steel Frame
- Cast Aluminum Terminal Box
- 1045 Carbon Steel Shaft
- Aluminum Die Cast Squirrel Cage Rotor Construction
- Paint System: Phenolic Rust Proof Base Plus Lacquer Top Coat
- Paint Color: Blue Munsell 5 PB 3/8
- Double Shielded Bearings Pre-Packed with Lithium Base Grease
- No Terminals; Lead End Peel-Off Insulation
- Grounding Terminal Inside Main Box
- Stainless Steel Nameplate
- Motors are UL Recognized for United States and Canada



## **SINGLE PHASE ODP**

### SINGLE PHASE ODP

## LIST PRICES

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Effective 03-07-22 Supercedes All Previous

CATALOGUE NUMBER 115V/230V	НР	RPM	FRAME	F.L. AMPS 230V	F/L EFF.	APPROX. WT. LBS	LIST PRICE
BDR0/22	0.25	3600	48	1.31	66.60	21	253
BD0/22	0.25	3600	56	1.31	66.60	21	262
BDR0/24	0.25	1800	48	1.41	68.50	22	240
BD0/24	0.25	1800	56	1.41	68.50	22	249
BDR0/32	0.33	3600	48	1.71	70.50	21	257
BD0/32	0.33	3600	56	1.71	70.50	22	270
BDR0/34	0.33	1800	48	1.85	72.40	23	257
BD0/34	0.33	1800	56	1.85	72.40	24	266
BDR0/52	0.50	3600	48	2.47	72.40	25	288
BD0/52	0.50	3600	56	2.47	72.40	25	296
BDR0/54	0.50	1800	48	2.54	76.20	26	283
BD0/54	0.50	1800	56	2.54	76.20	26	292
BDR0/72	0.75	3600	48	3.41	76.20	28	311
BD0/72	0.75	3600	56	3.41	76.20	28	319
BDR0/74	0.75	1800	56H	3.25	81.80	39	435
BDR0012	1	3600	56H	4.41	80.40	35	382
BD0012	1	3600	143T	4.41	80.40	35	395
BDR0014	1	1800	56H	4.39	82.60	45	491
BD0014	1	1800	143T	4.39	82.60	45	510
BDR1/52	1.5	3600	56H	6.11	81.50	40	429
BD1/52	1.5	3600	143T	6.11	81.50	40	444
BDR1/54	1.5	1800	56H	5.94	83.80	53	572
BD1/54	1.5	1800	145T	5.94	83.80	53	590
BDR0022	2	3600	56H	8.19	82.90	43	470
BD0022	2	3600	145T	8.19	82.90	43	483
BDR0024	2	1800	56H	8.04	84.50	59	639
BD0024	2	1800	145T	8.04	84.50	59	652
BDR0032 BD0032	3	3600 3600	56H 145T	11.60 11.60	84.10 84.10	53 53	

**NOTE:** (1) Prices subject to change without notice.





MODEL: OPTIM® JP TYPE: AEHH8N-JP

### APPLICATIONS

Pumps

### **PRODUCT OVERVIEW**

- 1-75 HP
- 60Hz, 230V/460V, or 575V
- 3600, 1800 & 1200 RPM

### **DESIGN FEATURES**

- 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power
- 40°C Ambient Max Elevation 3300ft

- Continuous Duty
- Class F Insulation
- NEMA Design B or C

### **MECHANICAL FEATURES**

- Shielded Bearings Frames 140JP (2, 4 & 6 Pole) 280JP (4 & 6 Pole) and Open Bearings with Regreaseable Provisions Frames 280JP (2 Pole), 320JP
- Polyrex EM Grease in all Regreaseable Bearings, Multemp SRL Grease in Shielded Bearings
- Aluminum Rotor
- Cast-Iron Frame and End Brackets
- Cast-Iron Fan Cover and Terminal Box
- Non-Sparking Plastic Fan
- Number of Leads 230/460V: 9 Leads 1-5 HP; 12 Leads 7.5 and Larger; 575V: 3 Leads
- Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box
- Interchangeable F1 and F2 mounting
- Paint System: Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Nameplate
- Rubber Flinger on DE Frames 140JP (2, 4 & 6 Pole) 280JP (4 & 6 Pole); Steel Flinger on Both Ends 280JP (2 Pole), 320JP (2, 4 & 6 Pole) and Larger
- Phenolic Alkyd Resin Varnish
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- JP Pump Shaft

### **OTHER FEATURES**

- CSA Certified for Class I, Division 2, Groups B, C & D (Class I, Zone 2, Groups IIB+H2, IIB and IIA)
- \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to data sheet for rating specific turn down ratios
- \*Meets NEMA MG1 Part 31.4.4.2
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.

A-44 Moto



Totally Enclosed IP54 Design

NEMA Premium Efficiency

Horizontal F1 Mount

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NEMA

FEATURES

Effective 03-07-22

Supercedes All Previous

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**LIST PRICES** 

NEMA Premium Œ œ



Effective 03-07-22 Supercedes All Previous

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CATALOGU	CATALOGUE NUMBER		0014	FDAME	F.L. AMPS		F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
CJP0012	CJP00125	1	3600	143JP	1.34	1.07	82.50	51	440
CJP0014	CJP00145	1	1800	143JP	1.50	1.20	85.50	55	507
CJP0016	CJP00165	1	1200	145JP	1.73	1.39	82.50	59	629
CJP1/52	CJP1/525	1.5	3600	143JP	2.00	1.60	84.00	53	574
CJP1/54	CJP1/545	1.5	1800	145JP	2.08	1.67	86.50	57	573
CJP1/56	CJP1/565	1.5	1200	182JP	2.53	2.02	87.50	92	687
CJP0022	CJP00225	2	3600	145JP	2.52	2.01	86.50	57	618
CJP0024	CJP00245	2	1800	145JP	2.78	2.22	86.50	59	613
CJP0026	CJP00265	2	1200	184JP	3.00	2.40	88.50	108	775
CJP0032	CJP00325	3	3600	182JP	3.53	2.82	88.50	88	697
CJP0034	CJP00345	3	1800	182JP	3.74	2.99	89.50	99	691
CJP0036	CJP00365	3	1200	213JP	4.02	3.22	89.50	165	1,088
CJP0052	CJP00525	5	3600	184JP	5.72	4.58	88.50	107	828
CJP0054	CJP00545	5	1800	184JP	6.12	4.89	89.50	110	779
CJP0056	CJP00565	5	1200	215JP	6.24	4.99	91.00	196	1,340
CJP7/52	CJP7/525	7.5	3600	213JP	8.67	6.94	91.00	167	1,106
CJP7/54	CJP7/545	7.5	1800	213JP	8.85	7.08	91.70	174	1,130
CJP7/56	CJP7/565	7.5	1200	254JP	9.59	7.67	91.00	282	1,881
CJP0102	CJP01025	10	3600	215JP	11.50	9.20	91.00	185	1,325
CJP0104	CJP01045	10	1800	215JP	11.60	9.28	91.70	200	1,375
CJP0106	CJP01065	10	1200	256JP	12.78	10.23	91.00	337	2,305
CJP0152	CJP01525	15	3600	254JP	16.61	13.29	92.40	301	1,813
CJP0154	CJP01545	15	1800	254JP	17.27	13.82	92.40	312	1,779
CJP0156	CJP01565	15	1200	284JP	18.20	14.56	92.40	449	3,002
CJP0202	CJP02025	20	3600	256JP	21.91	17.53	92.40	345	2,320
CJP0204	CJP02045	20	1800	256JP	23.01	18.41	93.00	374	2,309
CJP0206	CJP02065	20	1200	286JP	24.31	19.45	91.70	510	3,757
CJP0252	CJP02525	25	3600	284JP	27.84	22.27	92.40	440	2,924
CJP0254	CJP02545	25	1800	284JP	29.08	23.26	93.60	464	2,890
XJP0256	XJP02565	25	1200	324JP(X)	30.33	24.26	93.00	656	4,494
CJP0302	CJP03025	30	3600	286JP	33.19	26.55	93.00	482	3,402
CJP0304	CJP03045	30	1800	286JP	34.30	27.44	93.60	517	3,402
XJP0306	XJP03065	30	1200	326JP(X)	37.52	30.02	93.00	695	5,468
XJP0402	XJP04025	40	3600	324JP(X)	44.22	35.38	94.10	645	4,410
XJP0404	XJP04045	40	1800	324JP(X)	46.28	37.02	94.10	658	4,381
CJP0406	CJP04065	40	1200	364JP	46.01	36.81	94.10	882	7,022
XJP0502	XJP05025	50	3600	326JP(X)	54.67	43.74	94.10	708	5,604
XJP0504	XJP05045	50	1800	326JP(X)	56.94	45.56	94.50	719	5,527
CJP0506	CJP05065	50	1200	365JP	57.85	46.28	94.10	959	8,675
CJP0602	CJP06025	60	3600	364JP	64.20	51.36	94.10	748	7,222
CJP0604	CJP06045	60	1800	364JP	68.37	54.69	95.00	873	6,929
CJP0752	CJP07525	75	3600	365JP	79.91	63.92	94.50	937	9,050
CJP0754	CJP07545	75	1800	365JP	85.10	68.08	95.40	972	8,791

**NOTE:** (1) Prices subject to change without notice.

(2) Not stocked in Canada. Please contact your TWMI representative for delivery.
 (3) For VFD applcations please refer to page D-18.





MODEL: OPTIM®JM TYPE: AEHH8N-JM

### APPLICATIONS

Pumps

### **PRODUCT OVERVIEW**

- 1-50 HP
- 60Hz, 230V/460V, or 575V
- 3600, 1800 & 1200 RPM

### **DESIGN FEATURES**

- 1.15 S.F. Sine Wave Power; 1.0 S.F. VFD Power
- Continuous Duty

40°C Ambient Max Elevation 3300ft

- Class F Insulation
- NEMA Design B or C

### **MECHANICAL FEATURES**

- Shielded Bearings Frames 140JM (2, 4 & 6 Pole) 280JM (4 & 6 Pole) and Open Bearings with Regreaseable Provisions Frames 280JM (2 Pole), 320JM
- Polyrex EM Grease in all Regreaseable Bearings, Multemp SRL Grease in Shielded Bearings
- Aluminum Rotor
- Cast-Iron Frame and End Brackets
- Cast-Iron Fan Cover and Terminal Box
- Non-Sparking Plastic Fan
- Number of Leads 230/460V: 9 Leads 1-5 HP; 12 Leads 7.5 and Larger; 575V: 3 Leads
- Solderless Lug Terminals on All Leads
- Grounding Terminal Inside Main Terminal Box
- Interchangeable F1 and F2 mounting
- Paint System: Phenolic Rust Proof Base with Lacquer Top Coat
- Stainless Steel Nameplate
- Rubber Flinger on DE Frames 140JM (2, 4 & 6 Pole) 280JM (4 & 6 Pole); Steel Flinger on Both Ends 280JM (2 Pole), 320JM
- Phenolic Alkyd Resin Varnish
- \*HPE<sup>™</sup> High Pulse Endurance Spike Resistant Wire
- JM Pump Shaft

### **OTHER FEATURES**

- CSA Certified for Class I, Division 2, Groups B, C & D (Class I, Zone 2, Groups IIB+H2, IIB and IIA)
- \*Speed Ranges up to 10:1 CT, and 20:1 VT. Refer to data sheet for rating specific turn down ratios
- \*Meets NEMA MG1 Part 31.4.4.2
- \* Precautions should be taken to eliminate or reduce voltage spikes and shaft currents that may be imposed on the motor by the VFD as stated per NEMA MG1, Part 31.4.4.



Effective 03-07-22 Supercedes All Previous

NEMA

Totally Enclosed IP54 Design

NEMA Premium Efficiency

Horizontal F1 Mount







**LIST PRICES** 

NEMA Premium Œ œ



Effective 03-07-22 Supercedes All Previous

**R** 

CATALOGUE NUMBER			0014	EDAME	F.L. <i>F</i>	AMPS	F/L	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	WT. LBS	PRICE
CJM0012	CJM00125	1	3600	143JM	1.34	1.07	82.50	51	507
CJM0014	CJM00145	1	1800	143JM	1.50	1.20	85.50	55	507
CJM0016	CJM00165	1	1200	145JM	1.73	1.39	82.50	59	629
CJM1/52	CJM1/525	1.5	3600	143JM	2.00	1.60	84.00	53	574
CJM1/54	CJM1/545	1.5	1800	145JM	2.08	1.67	86.50	57	573
CJM1/56	CJM1/565	1.5	1200	182JM	2.53	2.02	87.50	92	687
CJM0022	CJM00225	2	3600	145JM	2.52	2.01	86.50	57	618
CJM0024	CJM00245	2	1800	145JM	2.78	2.22	86.50	59	613
CJM0026	CJM00265	2	1200	184JM	3.00	2.40	88.50	108	775
CJM0032	CJM00325	3	3600	182JM	3.53	2.82	88.50	88	697
CJM0034	CJM00345	3	1800	182JM	3.74	2.99	89.50	99	691
CJM0036	CJM00365	3	1200	213JM	4.02	3.22	89.50	165	1,088
CJM0052	CJM00525	5	3600	184JM	5.72	4.58	88.50	107	828
CJM0054	CJM00545	5	1800	184JM	6.12	4.89	89.50	110	779
CJM0056	CJM00565	5	1200	215JM	6.24	4.99	91.00	196	1,340
CJM7/52	CJM7/525	7.5	3600	213JM	8.67	6.94	91.00	167	1,106
CJM7/54	CJM7/545	7.5	1800	213JM	8.85	7.08	91.70	174	1,130
CJM7/56	CJM7/565	7.5	1200	254JM	9.59	7.67	91.00	282	1,881
CJM0102	CJM01025	10	3600	215JM	11.50	9.20	91.00	185	1,325
CJM0104	CJM01045	10	1800	215JM	11.60	9.28	91.70	200	1,375
CJM0106	CJM01065	10	1200	256JM	12.78	10.23	91.00	337	2,305
CJM0152	CJM01525	15	3600	254JM	16.61	13.29	92.40	301	1,813
CJM0154	CJM01545	15	1800	254JM	17.27	13.82	92.40	312	1,779
CJM0156	CJM01565	15	1200	284JM	18.20	14.56	92.40	449	3,002
CJM0202	CJM02025	20	3600	256JM	21.91	17.53	92.40	345	2,320
CJM0204	CJM02045	20	1800	256JM	23.01	18.41	93.00	374	2,309
CJM0206	CJM02065	20	1200	286JM	24.31	19.45	91.70	510	3,757
CJM0252	CJM02525	25	3600	284JM	27.84	22.27	92.40	440	2,924
CJM0254	CJM02545	25	1800	284JM	29.08	23.26	93.60	464	2,890
XJM0256	XJM02565	25	1200	324JM(X)	30.33	24.26	93.00	656	4,494
CJM0302	CJM03025	30	3600	286JM	33.19	26.55	93.00	482	3,402
CJM0304	CJM03045	30	1800	286JM	34.30	27.44	93.60	517	3,402
XJM0306	XJM03065	30	1200	326JM(X)	37.52	30.02	93.00	695	5,468
XJM0402	XJM04025	40	3600	324JM(X)	44.22	35.38	94.10	645	4,410
XJM0404	XJM04045	40	1800	324JM(X)	46.28	37.02	94.10	658	4,381
XJM0502	XJM05025	50	3600	326JM(X)	54.67	43.74	94.10	708	5,604
XJM0504	XJM05045	50	1800	326JM(X)	56.94	45.56	94.50	719	5,527

**NOTE:** (1) Prices subject to change without notice.

(2) For VFD applcations please refer to page D-18.





TYPE: AMRCNH

MODEL: OPTIM® VH VERTICAL HOLLOW SHAFT WPI

## FEATURES

> Effective 03-07-22 Supercedes All Previous



APPLICATIONS			
• Pumps	Irrigation		
PRODUCT OVERVIEW			
• 3-400 HP	• 3600*, 1800 & 1200 RP	M(*Up to 150 HP)	• WPI Enclosure / IP22 Design
• 60Hz, 230V/460V, 460V or 575V	High Thrust Vertical Ho	llow Shaft with P-Base	NEMA Premium Efficiency
DESIGN FEATURES			
• 1.15 S.F. Sine Wave Power; 1.0 S.F.	VFD Power • Class F Insulation	• Class B Temperature Ris	• Max Elevation 3300ft
Continuous Duty	NEMA Design B	• 40°C Ambient	
MECHANICAL FEATURES			
Aluminum Rotor		Optional Steady Bushing	
Cast Iron Frame, End Brackets, an	d Main Conduit Box	CCW Rotation when Viewed from	om Top
Fabricated Steel Drip Cover		• Space Heater Terminated in Ma	ain Terminal Box
• 1045 Carbon Steel Hollow Shaft		Coupling and Gib Key Included	l (See BX Table on Page 50)
Solderless Lug Terminals on All Le	eads	<ul> <li>*HPE<sup>™</sup> High Pulse Endurance S</li> </ul>	pike Resistant Wire
Number of Leads 575V: 6 Leads		Phenolic Alkyd Resin Varnish ar	nd Spray Enamel Coat
Shaft Grounding Ring Included 1	00HP and Larger		
Grounding Terminal Inside Main	Ferminal Box		
Paint System: Phenolic Rust Proof	Base with Lacquer Top Coat		
Number of Leads 230/460V: 9 Lea	ds 3-5 HP; 12 Leads 7.5-125 HP; 6 I	Leads 150 HP and Larger	
<ul> <li>Stainless Steel Nameplate and Ro</li> </ul>	dent Screens		
Metal Flinger at Flange Bracket Er	nd 320TP and Larger		
Standard Non-Reverse Ratchet w	ith Heavy Duty Stainless Steel Balls	5	
Guide Bearings: Shielded Bearing	s Frames 210TP-280TP and Open F	Bearings with Regreaseable Provis	ions Frames 320TP and Larger
Thrust Bearings: Re-Greasable An	gular Contact 210TP-280TP and O	il Lubricated Angular Contact with	n Site Glass 320TP and Larger
Polyrex EM Grease in all Regrease	able Bearings, Multemp SRL Greas	e in Shielded Bearings	
Thrust Bearing Oil Requirements: 320TP-400TP; 300 S.S.U. at 100°F f	Turbine Oil With a Viscosity of 150 for 440TP and Larger	S.S.U. at 100°F for 2P, 300 S.S.U. at	100°F for 4P & 6P Frames
OTHER FEATURES			
CSA Certified & UL listed		• *Meets NEMA MG1 Part 31.4.4.	2
• *Inverter Duty Speed Range: 450	RPM to Rated RPM, S.F.=1.0	• UL Listed (UL 1004-5) for Fire P	ump Applications
Precautions should be taken to elimir NEMA MG1, Part 31.4.4.	nate or reduce voltage spikes and shaft	currents that may be imposed on the	motor by the VFD as stated per

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For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023



PREMIUM EFFICIENCY WPI PUMP MOTOR HIGH THRUST VERTICAL HOLLOW SHAFT

## LIST PRICES

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CE NEMA ®



Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. <i>F</i>	MPS	F/L	DOWN	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	230/460V	575V	EFF.	THRUST LBS	WT. LBS	PRICE
VCN0036	VCN00365	3	1200	213TP	4.60	3.68	88.50	2950	197	3,567
VCN0056	VCN00565	5	1200	215TP	7.17	5.73	89.50	2950	209	3,770
VCN7/54	VCN7/545	8	1800	213TP	9.53	7.62	91.00	2600	197	3,596
VCN7/56	VCN7/565	8	1200	254TP	10.11	8.09	90.20	3850	303	4,620
VCN0102	VCN01025	10	3600	213TP	12.24	9.79	89.50	2000	197	3,652
VCN0104	VCN01045	10	1800	215TP	12.16	9.72	91.70	2600	209	3,811
VCN0106	VCN01065	10	1200	256TP	12.84	10.27	91.70	3850	324	4,951
VCN0152	VCN01525	15	3600	215TP	17.90	14.32	90.20	2000	209	3,914
VCN0154	VCN01545	15	1800	254TP	18.19	14.56	93.00	3350	303	4,578
VCN0156	VCN01565	15	1200	284TP	19.14	15.32	91.70	3850	417	6,009
VCN0202	VCN02025	20	3600	254TP	22.86	18.29	91.00	2700	303	4,520
VCN0204	VCN02045	20	1800	256TP	24.26	19.41	93.00	3350	324	4,947
VCN0206	VCN02065	20	1200	286TP	24.87	19.89	92.40	3850	456	6,187
VCN0252	VCN02525	25	3600	256TP	28.05	22.44	91.70	2700	324	4,922
VCN0254	VCN02545	25	1800	284TP	29.42	23.54	93.60	3350	417	6,090
VCN0256	VCN02565	25	1200	324TP	30.32	24.26	93.00	6000	622	9,031
VCN0302	VCN03025	30	3600	284TP	34.04	27.23	91.70	2700	417	5,860
VCN0304	VCN03045	30	1800	286TP	34.71	27.77	94.10	3350	456	6,284
VCN0306	VCN03065	30	1200	326TP	35.94	28.75	93.60	6000	675	9,321
VCN0402	VCN04025	40	3600	286TP	44.79	35.83	92.40	2700	456	6,227
VCN0404	VCN04045	40	1800	324TP	46.28	37.02	94.10	5700	622	9,145
VCN0406	VCN04065	40	1200	364TP	45.75	36.60	94.10	6600	775	11,533
VCN0502	VCN05025	50	3600	324TP	55.93	44.75	93.00	4600	622	9,563
VCN0504	VCN05045	50	1800	326TP	58.28	46.63	94.50	5700	675	9,673
VCN0506	VCN05065	50	1200	365TP	57.85	46.28	94.10	6600	860	11,831
VCN0602	VCN06025	60	3600	326TP	66.69	53.35	93.60	4600	675	9,991
VCN0604	VCN06045	60	1800	364TP	69.57	55.66	95.00	6000	775	11,646
VCN0606	VCN06065	60	1200	404TP	69.53	55.62	94.50	9000	1111	17,642
VCN0752	VCN07525	75	3600	364TP	82.90	66.32	93.60	5000	775	11,545
VCN0754	VCN07545	75	1800	365TP	85.95	68.76	95.00	6000	860	12,163
VCN0756	VCN07565	75	1200	405TP	85.91	68.73	94.50	9000	1215	18,080
VCN1002	VCN10025	100	3600	365TP	110.50	88.40	93.60	5000	860	12,389
VCN1004	VCN10045	100	1800	404TP	115.00	92.00	95.40	7900	1111	17,648
VCN1006	VCN10065	100	1200	444TP	120.00	96.00	95.00	12000	1800	33,209
VCN1252	VCN12525	125	3600	404TP	137.50	110.00	94.10	5000	1073	17,318
VCN1254	VCN12545	125	1800	405TP	145.00	116.00	95.40	7900	1215	18,483
VCN1256	VCN12565	125	1200	445TP	150.00	120.00	95.00	11900	1840	34,019

\* Please contact your local TWMI sales representative for more information.

**NOTE:** (1) Prices subject to change without notice.

(2) Ratings over 125HP are single voltage rated only (460V).

(3) For available accessories please refer to pages B-9 through B-11.

(4) For VFD applcations please refer to page D-18.



# OPTIM<sup>®</sup> VH

#### PREMIUM EFFICIENCY WPI PUMP MOTOR HIGH THRUST VERTICAL HOLLOW SHAFT

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

CATALOGU	JE NUMBER				F.L. A	MPS	F/L	DOWN	APPROX.	LIST
230V/460V	575V	HP	RPM	FRAME	460V	575V	EFF.	THRUST LBS	WT. LBS	PRICE
VCN1502	VCN15025	150	3600	405TP	165.00	132.00	94.10	5000	1135	17,930
VCN1504	VCN15045	150	1800	444TP	170.00	136.00	95.80	10700	1830	34,120
VCN1506	VCN15065	150	1200	445TP	178.00	142.40	95.40	11800	1970	35,114
VCN2004	VCN20045	200	1800	445TP	225.00	180.00	95.80	10700	1980	35,457
VCN2006	VCN20065	200	1200	447TP	236.00	188.80	95.40	14900	2660	40,995
VCN2504	VCN25045	250	1800	445TP20	283.00	226.40	95.80	13400	2440	39,634
VCN2506	VCN25065	250	1200	447TP	295.00	236.00	95.40	14700	2980	46,024
VCN3004	VCN30045	300	1800	447TP	335.00	268.00	95.80	13400	2670	41,823
VCN3006	VCN30065	300	1200	449TP	371.00	296.80	95.80	11200	3260	46,992
VCN3504	VCN35045	350	1800	447TP	388.00	310.40	95.80	13300	2800	43,444
VCN4004	VCN40045	400	1800	449TP	442.00	353.60	95.80	13200	3070	46,386

\* Please contact your local TWMI sales representative for more information.

#### **NOTE:** (1) Prices subject to change without notice.

- (2) Ratings over 125HP are single voltage rated only (460V).
- (3) For available accessories please refer to pages B-9 through B-11.
- (4) For VFD applcations please refer to page D-18.
- (5) 8P design also available with longer delivery.
- (6) 450-800HP also available with longer delivery.

COUPLING PRE-INSTALLED (BX DIMENSION AS LISTED BELOW):								
210TP – 280TP	BX = 1.001							
320TP – 360TP	BX = 1.188							
400TP – 445TP	BX = 1.501							
447TP	BX = 1.688							
449TP	BX = 1.938							



Effective 03-07-22 Supercedes All Previous

## **C-FLANGE KITS**

			TEFC - CAST-IRON			
EDANAE	OPTIM	* TEFC	ADVANTAGE PL	US IEEE READY	ADVANTAGE	PLUS IEEE 841
FRAME	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE
140T	CFE140T	126	CFHH140T	126	CFHB140T	153
180T	CFE180T	148	CFHH180T	148	CFHB180T	188
210T	CFE210T	209	CFHH210T	209	CFHB210T	209
250T	CFE250T	273	CFHH250T	273	CFHB250T	273
280TS	CFE280TS	461	-	-	-	-
280T	CFE280T	461	CFHH280	461	CFHB280	461
320T/TS	CFE320	545	CFHH320	545	CFHB320	545
320T(X)/TS(X)	CFE320X	545	-	-	-	-
360TS	CFE360TS	587	CFHH360TS	587	CFHB360TS	587
360T	CFE360T	587	CFHH360T	587	CFHB360T	587
400TS	CFE400TS	692	CFHH400TS	692	CFHB400TS	692
400T	CFE400T	692	CFHH400T	692	CFHB400T	692
440TS	CFE440TS	1,845	-	-	CFHB440TS	1,845
444/5T	CFE444/5T	1,845	-	-	CFHB444/5T	1,845
447/9T	CFE447/9T	1,845	-	-	CFHB447/9T	1,845
449T(X)	CFE449TX	1,845	-	-	-	-
449TS(X)	CFE449TSX	1,845	-	-	-	-
5007A	CFE5007A	2,454	-	-	-	-
5007B/C	CFE5007B/C	2,454	-	-	-	-
5009A	CFE5009A	2,454	-	-	-	-
5009B/C	CFE5009B/C	2,454	-	-	-	-
5011A	CFE5011A	2,454	-	-	-	-
5011B/C	CFE5011B/C	2,454	-	-	-	-
5806B/C	CFE5806B/C	3,986	-	-	-	-
5808A	CFE5808A	3,986	-	-	-	-
5808B/C	CFE5808B/C	3,986	-	-	-	-
5810A	CFE5810A	3,986	-	-	-	-
5810B/C	CFE5810B/C	3,986	-	-	-	-

**NOTE:** (1) Prices subject to change without notice.



Parts & Accessories

Effective 03-07-22 Supercedes All Previous

### **C-FLANGE KITS**

	TEXP	
EDAME	OPTIM	° TEXP
FRAME	CATALOGUE NUMBER	LIST PRICE
140T	CFXP140T	145
180T	CFXP180T	192
210T	CFXP210T	242
250T	CFXP250T	313
280TS	CFXP280TS	531
280T	CFXP280T	531
320T	CFXP320	742
360T	CFXP360T	1,018
400TS	CFXP400TS	1,325
400T	CFXP400T	1,325
440TS	CFXP440TS	2,123
444/5T	CFXP444/5T	2,123

#### **NOTE:** (1) Prices subject to change without notice.

(2) Must be installed by a hazardous locations CSA-Qualified Repair Facility.

	TEFC - ROLLED STEEL													
EDAME	ROLLED STEEL T	EFC	FARM DUTY											
FRAME	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE										
*56	CFG56	109	CFS56	111										
**56/140T	CFG5614	111	CFS140T	126										
180T	CFGP180T	148	CFS180T	148										
210T	CFGP210T	209	CFS210T	209										

\* Fits motors with P Dimension of 6.40".

\*\* Fits motors with P Dimension of 5.69".

**NOTE:** (1) Prices subject to change without notice.



Effective 03-07-22 Supercedes All Previous

## **C-FLANGE KITS**

	ODP - CAST-IRON	
EDAME	OPTIM® ODP	
FRAME	CATALOGUE NUMBER	LIST PRICE
250T	CFDH250T	273
280TS	CFDH280TS	461
280T	CFDH280T	461
320T/TS	CFDH320	545
360TS	CFDH360TS	587
360T	CFDH360T	587
400TS	CFDH400TS	785
400T	CFDH400T	785
444/5TS	CFDH444/5TS	1,845
444/5T	CFDH444/5T	1,845
447/9TS	CFDH447/9TS	1,845
447/9T	CFDH447/9T	1,845

**NOTE:** (1) Prices subject to change without notice.

	ODP - ROLLED STEEL					
EDAME	ROLLED S	TEEL ODP				
	CATALOGUE NUMBER	LIST PRICE				
*56	CFDT56	109				
**56/140T	CFDT5614	111				
180T	CFDT180T	148				
210T	CFDT210T	209				
250T	CFDT250T	273				
280T/TS	CFDT280	461				

\* Fits motors with P Dimension of 6.42".

\*\* Fits motors with P Dimension of 7.24".

**NOTE:** (1) Prices subject to change without notice.



Parts & Accessories

Effective 03-07-22 Supercedes All Previous

## SLIDE BASES

FRAME	CATALOGUE NUMBER	LIST PRICE	FRAME	CATALOGUE NUMBER	LIST PRICE
56	SBS56	50	324T	SB324T	340
143T	SB143T	104	326T	SB326T	340
145T	SB145T	104	364T	SB364T	435
182T	SB182T	129	365T	SB365T	435
184T	SB184T	129	404T	SB404T	639
213T	SB213T	165	405T	SB405T	639
215T	SB215T	165	444T	SB444T	792
254T	SB254T	232	445T	SB445T	792
256T	SB256T	232	447T	SB447T	1,089
284T	SB284T	255	449T	SB449T	1,119
286T	SB286T	255	-	-	-

### TRANSITION BASES

FRAME	CATALOGUE NUMBER	LIST PRICE	FRAME	CATALOGUE NUMBER	LIST PRICE
140T	TB1814T	86	320T	TB36U32T	372
180T	TB2118T	133	360T	TB40U36T	505
210T	TB25U21T	157	360TS	TB40US36TS	1,147
250T	TB28U25T	209	400T	TB44U40T	625
284TS	TB324S284TS	844	400TS	TB44US40TS	1,323
280TS	TB32S28TS	844	360TS	TB44US36TS	1,171
280T	TB32U28T	289	360T	TB44U36T	1,176
324TS	TB36US324TS	1,083	360T	TB44US36T	1,347
326TS	TB365US326TS	1,176	-	-	-

**NOTE:** (1) Prices subject to change without notice.



Parts & Accessories

Effective 03-07-22 Supercedes All Previous

### MOTOR MODIFICATIONS

MOD.	MODIFICATION						L	LIST PRICE						
CODE	SUMMARY	56	140	180	210	250	280	320	360	400	440	5000	5800	6800
C1A	C-FLANGE - ODP	127	181	215	251	297	502	600	740	853	2,312	2,514	-	-
C1B	C-FLANGE - TEFC	127	181	215	251	297	502	600	740	853	2,312	2,514	3,837	-
C2	C-FLANGE WITH INPRO/SEAL (ADV+)	-	181	215	251	297	502	600	740	853	2,312	2,514	3,837	-
C3A	D-FLANGE - ODP	-	-	-	-	416	575	896	984	1,195	2,362	-	-	-
C3B	D-FLANGE - TEFC	-	246	321	362	416	575	896	984	1,195	2,362	2,704	4,466	-
C4	D-FLANGE WITH INPRO/SEAL (ADV+)	-	192	229	267	315	540	645	796	915	2,511	2,715	4,164	-
C5A	INPRO/SEAL DE	217	278	333	394	444	520	735	837	1,471	1,751	2,527	3,009	3,075
C5B	INPRO/SEAL NDE	233	294	351	385	459	545	781	887	1,011	1,823	2,403	2,796	2,862
C5C	SPECIAL INPRO/SEAL DE (ADV+ 841)	-	359	421	473	591	690	991	1,120	1,558	1,848	2,271	2,960	-
C5D	SPECIAL INPRO/SEAL NDE (ADV+ 841)	-	368	428	455	600	681	1,016	1,145	1,231	1,886	2,125	2,682	-
C5E	HYBRID INPRO/SEAL DE (ADV+ 841)	-	574	674	756	966	1,129	1,627	1,821	2,613	3,057	3,665	4,979	-
C5F	HYBRID INPRO/SEAL NDE (ADV+ 841)	-	583	681	708	971	1,097	1,652	1,846	1,932	3,097	3,333	4,382	-
C6	F2 CONVERSION	-	122	149	185	215	251	283	353	455	640	4,227	4,416	4,606
C7	SPACE HEATERS (CSA CERTIFIED)	-	447	491	545	589	645	693	799	952	1,452	2,229	2,321	2,412
C8	THERMISTER 1/PH	-	395	444	495	543	595	645	729	853	1,075	1,801	1,893	1,984
С9	KLIXONS 1/PH	-	431	475	527	577	625	677	765	885	1,111	1,851	1,943	2,034
C10A	AUXILIARY BOX	-	891	905	923	939	957	677	713	765	860	-	-	-
C10B	AUXILIARY BOX F2 SIDE	-	807	835	871	935	971	1,021	1,093	1,210	1,452	2,114	2,206	2,297
C11A	INSULATED NDE BEARING	-	-	-	-	-	2,860	3,439	3,830	2,554	3,192	4,985	5,366	5,457
C11B	INSULATED DE & NDE BEARING	-	-	-	-	-	4,710	5,392	5,624	5,176	6,767	10,134	11,210	11,301
C12	STAINLESS STEEL HARDWARE	-	262	265	330	373	457	564	640	914	1,061	1,860	1,925	2,072
C13A	WINDING RTD 2/PH	-	2,282	2,310	2,346	2,428	2,464	2,611	2,846	2,950	3,140	3,813	3,905	3,996
C13B	WINDING RTD 1/PH	-	1,289	1,317	1,353	1,414	1,450	1,618	1,706	1,810	2,000	2,609	2,701	2,792
C14	BEARING RTD 1/BRG	-	-	-	-	2,573	2,645	2,715	2,819	2,961	3,188	3,747	3,839	3,930
C15A	RTD AUXILIARY BOX	-	884	898	916	932	950	966	1,170	1,222	1,317	-	-	-
C15B	RTD AUXILIARY BOX F2 SIDE	-	1,368	1,396	1,432	1,552	1,588	1,620	1,772	1,876	2,066	2,593	2,685	2,776
C15C	BTD BOX F2 SIDE	-	-	-	-	-	-	-	-	-	-	2,942	3,034	3,125
C16	REMOVE FEET	290	334	437	536	679	774	935	1,457	1,747	2,115	-	-	-
C17A	OVERSIZED TERMINAL BOX - STD	-	486	539	713	783	821	1,041	1,244	1,391	2,032	-	-	-
C17B	OVERSIZED TERMINAL BOX - TYPE II	-	-	-	-	-	-	-	-	-	4,457	4,704	4,769	4,835
C18	TERMINAL BLOCK MAIN TERMINAL BOX	-	430	464	498	679	697	810	946	1,118	1,280	-	-	-
C19	CONVERT BEARINGS: BALL TO ROLLER	-	-	-	-	-	-	1,618	1,855	2,701	3,964	6,476	8,301	8,392
C20	CONVERT BEARINGS: ROLLER TO BALL	-	-	-	-	-	-	1,123	1,276	1,794	2,812	5,896	7,642	7,733

**NOTE:** (1) Lead times vary depending on the modification requested.

(2) All prices to be based on "Stock Product Modification Procedures #TWMI-M1".

(3) Auxiliary Boxes are always to be priced as separate mods.

(4) Prices shown are TWMI's list prices, standard motor multiplier applies for the motor being modified.

(5) Please contact your TWMI representative for a discount when performing multiple modifications to one motor.

(6) Please contact your TWMI representative for pricing on mods not listed.

(7) Refer to Factory Modification Descriptions for more accurate details on each modification.

(8) All modifications are to be performed by authorized TECO-Westinghouse modification centers in accordance with "Stock Product Modification Procedures #TWMI-M1".



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Factory Modifications

Effective 03-07-22 Supercedes All Previous

### MOTOR MODIFICATIONS

MOD.	MODIFICATION						L	IST PRIC	Œ					
CODE	SUMMARY	56	140	180	210	250	280	320	360	400	440	5000	5800	6800
C21A	CUSTOM SHAFT - MODIFY EXISTING SHAFT	815	891	939	1,020	1,109	1,208	1,356	1,507	1,851	2,222	3,573	3,801	4,168
C21B	CUSTOM SHAFT - REPLACE EXISTING SHAFT	2,130	2,174	2,534	2,916	3,276	4,353	5,697	7,484	8,301	9,785	25,862	27,312	30,091
C21C	STUB SHAFT FOR SHAFT MOUNTED ENCODERS	577	621	649	742	826	934	1,034	1,215	1,387	1,645	3,023	3,253	3,618
C22	SPECIAL GREASE	304	379	459	495	659	695	858	995	1,099	1,289	1,865	1,957	2,048
C23	NAMEPLATE CHANGE	36	36	36	36	36	36	36	36	36	41	41	41	41
C24	ADDITIONAL NAMEPLATE - INFORMATION PLATE	36	36	36	36	36	36	36	36	36	36	36	36	36
C25	GROUNDING PROVISION	177	199	213	231	292	310	326	423	475	570	788	853	919
C26A	BREATHER DRAIN PLUGS	163	207	249	294	342	378	410	482	586	776	1,344	1,436	1,527
C26B	DRAIN HOLES DE (NO THREADS/BREATHER DRAINS)	75	97	111	129	145	163	179	215	267	362	532	597	663
C26C	DRAIN HOLES NDE (NO THREADS/ BREATHER DRAINS)	116	160	188	224	256	292	324	396	500	690	1,134	1,226	1,317
C26D	RELOCATE DRAINS FOR VERTICAL MOUNTING	141	185	226	271	319	355	387	459	563	753	1,322	1,414	1,505
C27	TROPICALIZATION- FUNGUS/CORROSION PROTECTION	141	198	292	328	426	462	559	631	803	993	1,503	1,595	1,686
C28	CHANGE ROTATION	-	-	-	-	-	-	-	-	-	-	1,100	1,165	1,231
C29	CHANGE COOLING FAN (FAN NOT INCL.)	79	101	136	167	201	233	267	337	437	581	835	900	966
C30	JACKING BOLTS	-	210	233	251	306	324	398	441	611	787	1,231	1,296	1,362
C31A	DRIP COVER	312	341	355	387	500	570	640	731	756	1,190	-	-	-
C31B	DRIP COVER C/W VERTICAL LIFTING LUGS	901	930	1,005	1,095	1,231	1,333	1,435	1,579	1,636	2,217	-	-	-
C32	SUN-SHIELD	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE	QUOTE						
C33A	ROUTINE COMMERCIAL TEST AS PER IEEE112	455	477	491	509	731	749	871	907	1,059	1,258	-	-	-
C33B	VIBRATION TEST & REPORT AS PER IEEE841	231	253	267	285	401	419	512	548	790	885	1,498	1,563	1,629
C34	BALANCE ROTOR TO IEEE841 STANDARDS	496	540	600	667	756	835	910	1,043	1,192	1,482	3,894	3,986	4,077
C35A	SHAFT GROUNDING BRUSH (CARBON TYPE)	303	325	339	357	530	548	647	683	-	-	-	-	-
C35B	SHAFT GROUND RING	362	384	441	493	616	726	894	1,020	1,305	1,636	2,199	2,649	2,715
C35C	SHAFT GROUND SEAL (ADV+)	-	608	670	835	1,188	1,441	1,640	1,839	2,303	2,611	3,222	3,581	-
C35D	SHAFT GROUND SEAL (OPTIM VH)	-	-	790	903	1,344	1,240	1,392	1,753	2,296	3,016	-	-	-
C36A	SPECIAL PAINT - COLOR (STANDARD PAINT)	-	312	360	407	521	620	715	833	1,045	1,464	1,926	1,991	-
C36B	SPECIAL PAINT - EPOXY	-	312	360	407	521	620	715	833	1,045	1,464	1,926	1,991	-
C37	CONVERT TO 3 LEAD MOTOR	281	325	387	486	582	686	781	919	1,086	1,342	2,109	2,201	2,292
C38	EXTEND MAIN LEADS	478	545	640	733	867	1,005	1,534	1,765	1,948	2,217	-	-	-

**NOTE:** (1) Lead times vary depending on the modification requested.

Factory Modifications

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(2) All prices to be based on "Stock Product Modification Procedures #TWMI-M1".

(3) Auxiliary Boxes are always to be priced as separate mods.

(4) Prices shown are TWMI's list prices, standard motor multiplier applies for the motor being modified.

(5) Please contact your TWMI representative for a discount when performing multiple modifications to one motor.

(6) Please contact your TWMI representative for pricing on mods not listed.

(7) Refer to Factory Modification Descriptions for more accurate details on each modification.

(8) All modifications are to be performed by authorized TECO-Westinghouse modification centers in accordance with "Stock Product Modification Procedures #TWMI-M1".



Effective 03-07-22 Supercedes All Previous

### MOTOR MODIFICATIONS

MOD.	MODIFICATION						L	IST PRIC	ĴE					
CODE	SUMMARY	56	140	180	210	250	280	320	360	400	440	5000	5800	6800
C39	CHANGE BEARINGS TO ZZ TYPE	-	269	342	409	564	767	831	964	1,471	2,237	-	-	-
C40	DE-RATE HP	36	36	36	36	36	36	36	36	36	36	36	36	36
C41	RE-RATE TO 50HZ	36	36	36	36	36	36	36	36	36	36	36	36	36
C42	LOW TEMP -50°C	-	735	828	885	1,059	1,118	1,292	1,464	1,618	2,120	3,028	3,120	3,211
C43A	CONVERT IEEE READY TO IEEE 841	-	726	821	900	1,104	1,253	1,769	1,941	2,828	3,833	5,464	6,273	-
C43B	CONVERT STANDARD TEFC TO IEEE 841	-	-	-	-	-	-	4,525	5,038	6,541	8,179	13,532	14,368	-
C44	LOCKED DE BRG	265	321	423	459	550	615	767	896	1,056	1,276	2,075	2,167	2,258
C45	REWIND MOTOR	2,057	2,495	2,901	3,147	3,451	4,803	7,910	10,174	15,371	21,525	-	-	-
C46	CONNECT MOTOR FOR WYE-DELTA STARTING	631	653	667	980	1,290	1,602	1,910	2,240	2,584	3,269	4,908	4,973	5,039
C47	VERTICAL LIFTING LUGS	631	653	729	803	851	896	941	1,038	1,118	1,360	-	-	-
C48	MODIFY TO IP66 (ADV+ 841 Motors)	-	212	306	391	482	575	735	921	1,118	1,360	-	-	-
C49	OIL MIST LUBRICATION	-	-	-	-	2,308	2,876	3,715	4,299	4,900	5,817	-	-	-
C50	VIBRATION SENSOR PROVISIONS	-	-	-	-	602	620	697	733	846	941	-	-	-
C51	AUX BLOWER	-	-	-	-	3,602	4,226	4,853	5,498	6,158	6,636	-	-	-
C52	NON STANDARD COUPLING	-	-	-	-	726	744	788	930	1,222	3,670	-	-	-

NOTE: (1) Lead times vary depending on the modification requested.

(2) All prices to be based on "Stock Product Modification Procedures #TWMI-M1".

(3) Auxiliary Boxes are always to be priced as separate mods.

(4) Prices shown are TWMI's list prices, standard motor multiplier applies for the motor being modified.

(5) Please contact your TWMI representative for a discount when performing multiple modifications to one motor.

(6) Please contact your TWMI representative for pricing on mods not listed.

(7) Refer to Factory Modification Descriptions for more accurate details on each modification.

(8) All modifications are to be performed by authorized TECO-Westinghouse modification centers in accordance with "Stock Product Modification Procedures #TWMI-M1".

### HAZARDOUS LOCATION MODIFICATIONS

MOD.	MODIFICATION	LIST PRICE												
CODE	SUMMARY	56	140	180	210	250	280	320	360	400	440	5000	5800	6800
H1	CSA CERTIFIED DIVISION 1 SPACE HEATERS	-	1,241	1,283	1,335	1,385	1,437	1,690	1,799	1,950	2,452	-	-	-
H2	F2 CONVERSION XP	-	292	317	353	450	484	613	686	835	980	-	-	-
H3	INSTALL C-FLANGE XP	-	368	457	475	713	903	1,208	1,609	1,952	2,106	-	-	-
H4	NAMEPLATE CHANGE HAZLOC	-	84	84	84	84	84	149	149	149	154	-	-	-
HA	EXPLOSION PROOF ADDER (WHEN APPROVED)	-	796	796	796	796	796	1,005	1,005	1,005	1,005	-	-	_

NOTE: (1) All modifications are to be performed by authorized TECO-Westinghouse modification centers in accordance with "Stock Product Modification Procedures #TWMI-M1".



Factory & Hazardous Location Modifications
Effective 03-07-22 Supercedes All Previous

#### MOTOR MODIFICATION DESCRIPTIONS

MOD. CODE	MODIFICATION SUMMARY	DESCRIPTION
C1A	C-FLANGE - ODP	Remove DE bracket and install C-Flange on ODP motor: modification price includes the C-Flange.
C1B	C-FLANGE - TEFC	Remove DE bracket and install C-Flange on TEFC motor: modification price includes the C-Flange.
C2	C-FLANGE WITH INPRO/SEAL (ADV+)	Remove DE bracket and Inpro/Seal; install C-Flange with Inpro/Seal on TEFC motor: modification price includes the C-Flange.
C3A	D-FLANGE - ODP	Remove DE bracket and install D-Flange on ODP motor: modification price includes the D-Flange.
C3B	D-FLANGE - TEFC	Remove DE bracket and install D-Flange on TEFC motor: modification price includes the D-Flange.
C4	D-FLANGE WITH INPRO/SEAL (ADV+)	Remove DE bracket and Inpro/Seal; install D-Flange with Inpro/Seal on TEFC motor: modification price includes the D-Flange.
C5A	INPRO/SEAL DE	Remove DE bracket, machine shaft opening and install Inpro/Seal: modification price includes Inpro/Seal.
C5B	INPRO/SEAL NDE	Remove NDE bracket, machine shaft opening and install Inpro/Seal: modification price includes Inpro/Seal.
C5C	SPECIAL INPRO/SEAL DE (ADV+ 841)	Remove DE Inpro/Seal and install new special purpose Inpro/Seal. Use for vertical seal or special seal: modification price includes Inpro/Seal.
C5D	SPECIAL INPRO/SEAL NDE (ADV+ 841)	Remove NDE Inpro/Seal and install new special purpose Inpro/Seal. Use for vertical seal or special seal: modification price includes Inpro/Seal.
C5E	HYBRID INPRO/SEAL DE (ADV+ 841)	Remove DE inpro/seal and install hybrid stainless/alumunim inpro/seal: modification price includes seal.
C5F	HYBRID INPRO/SEAL NDE (ADV+ 841)	Remove NDE inpro/seal and install hybrid stainless/alumunim inpro/seal: modification price includes seal.
C6	F2 CONVERSION	Convert terminal box location from standard F1 to F2, or F2 to F1, depending on the product line. on medium voltage motors, The auxiliary terminal boxes will be on the opposite side as the main terminal box as standard. If the requirement is to have all terminal boxes on either the F1 or F2 side, please specify.
С7	SPACE HEATERS (CSA CERTIFIED)	Install wire wound rubber space heater(s) with leads terminated in main terminal box; if auxiliary terminal box is required see mod C10. Standard voltage is 115V; however other voltages are available. Heaters are CSA certified for Class I, Division 2 areas.
C8	THERMISTER 1/PH	Install three PTC thermistors (155°c), one per phase, on the winding end turns with leads brought out to main terminal box; if auxiliary terminal box is required see mod C10.
С9	KLIXONS 1/PH	Install three normally closed thermostats (140°c), one per phase connected in series, on the winding end turns with leads brought out to the main terminal box; if auxiliary terminal box is required see mod C10.
C10A	AUXILIARY BOX	Mount auxiliary terminal box on NDE side of the main terminal box. Includes box and terminal strip with four terminals.
C10B	AUXILIARY BOX F2 SIDE	Mount auxiliary terminal box on F2 side of the motor. Includes box and terminal strip with four terminals.
C11A	INSULATED NDE BEARING	Remove standard NDE bearing and replace with an electrically insulating bearing to eliminate stray electric currents.
C11B	INSULATED DE & NDE BEARING	Remove standard DE & NDE bearings and replace with electrically insulating bearings to eliminate stray electric currents.
C12	STAINLESS STEEL HARDWARE	Remove existing plated hardware and replace with stainless steel.
C13A	WINDING RTD 2/PH	Install six $100\Omega$ platinum surface mount RTD's, two per phase, on the winding end turns with leads brought out to the main terminal box; if RTD auxiliary terminal box is required see mod C15.
C13B	WINDING RTD 1/PH	Install three $100\Omega$ platinum surface mount RTD's, one per phase, on the winding end turns with leads brought out to the main terminal box; if RTD auxiliary terminal box is required see mod C15.
C14	BEARING RTD 1/BRG	Install two 100Ω platinum bearing RTD's, one per bearing with leads brought out to the main terminal box; if RTD auxiliary terminal box is required see mod C15.



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### MOTOR MODIFICATION DESCRIPTIONS

MOD. CODE	MODIFICATION SUMMARY	DESCRIPTION
C15A	RTD AUXILIARY BOX	Mount RTD auxiliary terminal box on DE side of the main terminal box. Includes box and two terminal strips with 12 terminals each.
C15B	RTD AUXILIARY BOX F2 SIDE	Mount RTD auxiliary terminal box on F2 side of the motor. Includes box and two terminal strips with 12 terminals each.
C15C	BTD BOX F2 SIDE	Mount BTD auxiliary terminal box on F2 side of the motor. Includes box and one terminal strips with 12 terminals each.
C16	REMOVE FEET	Remove feet off horizontal mount T-Frame motor to create a round body type motor. Vertical lifting lugs can be added at additional cost.
C17A	OVERSIZED TERMINAL BOX - STD	Replace existing terminal box with an oversized main terminal box. Pricing is based on the terminal box that is standard for the next larger frame size. Price included box and adaptor plate.
C17B	OVERSIZED TERMINAL BOX - TYPE II	Replace existing terminal box with an oversized nema Type II main terminal box.
C18	TERMINAL BLOCK MAIN TERMINAL BOX	Install IEC style terminal block in the main terminal box and connect for requested voltage.
C19	CONVERT BEARINGS: BALL TO ROLLER	Convert standard bearing on DE from ball bearing to roller bearing. Lock the DE to contain DE Roller Bearing
C20	CONVERT BEARINGS: ROLLER TO BALL	Convert standard bearing on DE from roller bearing to ball bearing, machine work is required allow for thermal growth. Machine NDE to relieve NDE Bearing.
C21A	CUSTOM SHAFT - MODIFY EXISTING SHAFT	Modify existing shaft to meet customer requirements. A drawing must be submitted and approved by both TWMI and the customer. This mod includes TS shafts, shortened shafts, smaller diameter shafts etc.
C21B	CUSTOM SHAFT - REPLACE EXISTING SHAFT	Replace existing shaft to meet customer requirements. A drawing must be submitted and approved by both TWMI and the customer. This mod includes 4140 shafts, double shafts, JM shafts etc.
C21C	STUB SHAFT FOR SHAFT MOUNTED ENCODERS	Modify NDE with stub shaft and provisions to mount encoder. (Encoder not included, contact TWMI for pricing if required).
C22	SPECIAL GREASE	Remove standard grease from bearings, end brackets and inlet tubes. Purge and repack with specified grease type.
C23	NAMEPLATE CHANGE	Add new nameplate displaying approved data changes such as new voltage and frequency, revised HP and service factor, higher or lower ambient temperature, etc. Use this for adder for XP motors when modifications are being performed in addition to the nameplate change (H4).
C24	ADDITIONAL NAMEPLATE- INFORMATION PLATE	Add second data plate with customer part number, order number, or other data.
C25	GROUNDING PROVISION	Drill and tap the motor frame to accept ground lug. All motors have a grounding lug inside the main lead box as a standard. Lug not included in price.
C26A	BREATHER DRAIN PLUGS	Install stainless steel breather drain plugs where required.
C26B	DRAIN HOLES DE (NO THREADS/BREATHER DRAINS)	Drill drain holes in DE for vertical mounting. (No threads/breather drains)
C26C	DRAIN HOLES NDE (NO THREADS/BREATHER DRAINS)	Drill drain holes in NDE for vertical mounting. (No threads/breather drains)
C26D	RELOCATE DRAINS FOR VERTICAL MOUNTING	Relocate drain holes or breather drains for vertical mounting.
C27	TROPICALIZATION - FUNGUS/CORROSION PROTECTION	Spray the internal windings, rotor and end brackets with a fungus proof anti-corrosion coating.
C28	CHANGE ROTATION	Replace unidirectional cooling fan to achieve opposite direction of rotation.
C29	CHANGE COOLING FAN (FAN NOT INCLUDED)	Replace standard fan with non sparking fan, cast iron fan or other material requested to meet customer's requirements. Fan not included in price.
C30	JACKING BOLTS	Drill and tap two holes in the motor feet diagonally from one another to provide provisions for jacking bolts.



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Effective 03-07-22 Supercedes All Previous

### MOTOR MODIFICATION DESCRIPTIONS

MOD. CODE	MODIFICATION SUMMARY	DESCRIPTION
C31A	DRIP COVER	Install fabricated steel drip cover on NDE for vertical motors.
C31B	DRIP COVER C/W VERTICAL LIFTING LUGS	Install fabricated steel drip cover and lifting lugs on NDE for vertical motors.
C32	SUN-SHIELD	Install sun-shield over motor to protect from excessive heating caused by over exposure to the sun, typically for use in desert climates. Sun-shield will be priced per motor, contact your TWMI representative for more information.
C33A	ROUTINE COMMERCIAL TEST AS PER IEEE112	Perform Routine Commercial (unwitnessed) testing as per IEEE112 and provide report.
C33B	VIBRATION TEST & REPORT AS PER IEEE841	Perform vibration test and send report with motor as outlined in IEEE841 standard.
C34	BALANCE ROTOR TO IEEE841 STANDARDS	Balance rotor to IEEE841 specifications.
C35A	SHAFT GROUNDING BRUSH (CARBON TYPE)	Install carbon brush type shaft grounding device.
C35B	SHAFT GROUND RING	Install shaft grounding ring on DE to reduce or eliminate shaft currents.
C35C	SHAFT GROUND SEAL (ADV+)	Install shaft grounding seal on DE to reduce or eliminate shaft currents.
C35D	SHAFT GROUND SEAL (OPTIM VH)	Install shaft grounding seal inside motor to reduce or eliminate shaft currents.
C36A	SPECIAL PAINT - COLOUR (STANDARD PAINT)	Paint motor with standard type paint with customer specified color.
C36B	SPECIAL PAINT - EPOXY	Standard paint finish will be changed to Epoxy paint system (e.g. Advantage Plus Epoxy Paint).
C37	CONVERT TO 3 LEAD MOTOR	Re-connect motor to 3 leads.
C38	EXTEND MAIN LEADS	Extend existing leads to customer specified length. The splice will be made behind the terminal box so it is not seen.
C39	CHANGE BEARINGS TO ZZ TYPE	Remove bearings and install ZZ type double sheilded bearings.
C40	DE-RATE HP	De-rate motor HP to lower value, second data plate will be installed showing de-rated motor data.
C41	RE-RATE TO 50HZ	Re-rate motor to 50Hz operation, second data plate will be installed showing re-rated motor data.
C42	LOW TEMP -50°C	Modifiy motor for low temperature operation down to -50°C. Includes spaceheaters terminated in main box, low temp grease and new nameplate.
C43A	CONVERT IEEE READY TO IEEE 841	Convert Adv+ IEEE Ready motor to Adv+ IEEE 841 specs. Includes inpro seals, vibration test & report, new nameplate & labor.
C43B	CONVERT STANDARD TEFC TO IEEE 841	Convert standard TEFC motor to Adv+ IEEE 841 specs. Includes inpro seals, paint, hardware, vibration test & report, new nameplate & labor.
C44	LOCKED DE BRG	Lock DE bearing <.000" endplay.
C45	REWIND MOTOR	Rewing motor with class H insulation or special requirements. (Polyrex EM is rated for 170°C - no need to change grease for class H)
C46	CONNECT MOTOR FOR WYE-DELTA STARTING	Re-connect motor internally to allow for wye-delta starting. *Approval required
C47	VERTICAL LIFTING LUGS	Install vertical lifting lugs on horizontal motor.
C48	MODIFY TO IP66 (ADV+ 841 MOTORS)	Add epoxy potting to leads and silicon sealant on the endbells and connection box gaskets.
C49	OIL MIST LUBRICATION	Convert bearing grease system to oil mist lubrication system.
C50	VIBRATION SENSOR PROVISIONS	Add provisions for vibration monitors
C51	AUX BLOWER	Install auxilliary blower for use with VFD
C52	NON STANDARD COUPLING	Install a non standard sized coupling

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### HAZARDOUS LOCATION MODIFICATION DESCRIPTIONS

MOD. CODE	MODIFICATION SUMMARY	DESCRIPTION
H1	CSA CERTIFIED DIVISION 1 SPACE HEATERS	Install wire wound rubber space heater(s) that are CSA certified for division 1, with leads terminated in main terminal box. Standard voltage is 115V; however, other voltages are available. Please specify voltage when ordering. All heaters are single phase.
H2	F2 CONVERSION XP	Convert terminal box location from standard F1 to F2 on TEXP motor.
H3	INSTALL C-FLANGE XP	Remove DE bracket and install C-flange on TEXP motor: modification price includes the C-flange & a new nameplate.
H4	NAMEPLATE CHANGE HAZLOC	Add new nameplate displaying approved data changes such as new voltage and frequency, revised HP and service factor, higher or lower ambient temperature, etc. This adder is to be used when no other modifications are being done to the motor, otherwise use C23.
НА	EXPLOSION PROOF ADDER (WHEN APPROVED)	Additional cost to perform standard modifications to XP motors. Due to CSA regulations only certain modifications can be done on XP motors, contact your TWMI representative for more information.





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# L510

# **FEATURES**

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Effective 03-07-22

Supercedes All Previous

CE

#### **MODEL:** L510 MEDIUM DUTY MICRO AC DRIVE

**DESCRIPTION:** A compact, low cost and versatile AC Drive that is easy to program and ideal for OEM's.

#### **APPLICATIONS**

Mixing

AC Contactor Replacement

• Fans

- Pumps
- Small Conveyors

#### **FEATURES**

- Chassis Style Enclosure (IP 20)
- Sensorless Vector or V/Hz with Auto Torque Boost Feature
- 0.25 to 1HP, 115V, 50/60Hz, 1-Phase
- 0.25 to 3HP, 230V, 50/60Hz, 1-Phase
- 0.5 to 3HP, 230V, 50/60Hz, 3-Phase
- 1 to 3 HP, 460V, 50/60Hz, 3-Phase
- Extensive Diagnostic and Monitoring Capabilities
- Micro Drive with Din Rail Option
- PID Control
- 0 to 200Hz Speed Range
- 24VDC, 50mA External Sensor Supply Built-in
- 8 Preset Speeds
- Multi-function Analog Input/Output
- Built-in RS485 Modbus
- RJ45 Interface for PC and Copy Module
- cUL and CE Approved



L510 MEDIUM DUTY MICRO AC DRIVE

V/Hz and Sensorless Vector

L510

Open Chassis Micro AC Inverter

**PID Control** 

# LIST PRICES





Effective 03-07-22 Supercedes All Previous

VOLTAGE: 115V / 230V / 460V

115V 1-PHASE INPUT / 230V 3-PHASE OUTPUT											
	CONSTANT	CONSTANT	FRAME		DIMENSIONS	APPROX. WT.	LIST				
CATALOGUE NUMBER	TORQUE HP	TORQUE AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
L510-1P2-H1-U	.25	1.8	1	5.55	2.83	5.48	2	340			
L510-1P5-H1-U	.50	2.6	1	5.55	2.83	5.48	2	348			
L510-101-H1-U	1	4.3	2	5.67	4.65	5.80	3.5	376			

230V 1-PHASE INPUT / 230V 3-PHASE OUTPUT											
	CONSTANT	CONSTANT	FRAME	DIMENSIONS			APPROX. WT.	LIST			
CATALOGUE NUMBER	TORQUE HP	TORQUE AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
L510-2P2-H1-U	.25	1.8	1	5.55	2.83	5.48	2	320			
L510-2P5-H1-U	.50	2.6	1	5.55	2.83	5.48	2	336			
L510-201-H1-U	1	4.3	1	5.55	2.83	5.48	2	344			
L510-202-H1-U	2	7.5	2	5.67	4.65	5.80	3.5	473			
L510-203-H1-U	3	10.5	2	5.67	4.65	5.80	3.5	566			

230V 3-PHASE INPUT / 230V 3-PHASE OUTPUT											
CONSTANT CONSTANT FRAME DIMENSIONS	DIMENSIONS		APPROX. WT.	LIST							
CATALOGUE NUMBER	TORQUE HP	TORQUE AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
L510-2P5-H3-U	.50	2.6	1	5.55	2.83	5.48	2	336			
L510-201-H3-U	1	4.3	1	5.55	2.83	5.48	2	344			
L510-202-H3-U	2	7.5	2	5.67	4.65	5.80	3.5	465			
L510-203-H3-U	3	10.5	2	5.67	4.65	5.80	3.5	518			

460V 3-PHASE INPUT / 460V 3-PHASE OUTPUT									
	CONSTANT	CONSTANT	FRAME	DIMENSIONS			APPROX. WT.	LIST	
CATALOGUE NUMBER	TORQUE HP	TORQUE AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE	
L510-401-H3-U	1	2.3	2	5.67	4.65	5.80	3.5	477	
L510-402-H3-U	2	3.8	2	5.67	4.65	5.80	3.5	525	
L510-403-H3-U	3	5.2	2	5.67	4.65	5.80	3.5	634	

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



# L510 PERIPHERALS

V/Hz and Sensorless Vector

Open Chassis Micro AC Inverter

PID Control

L510 MEDIUM DUTY MICRO AC DRIVE

LIST PRICES



Effective 03-07-22 Supercedes All Previous

.(UL) =5

CE

VOLTAGE: 115V / 230V / 460V

L510 PERIPHERALS								
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE						
JN5-CM-USB	Programming Cable - Computer USB to Drive RJ45	137						
JN5-CU	Copy Module	209						
JN5-DIN-L01	DIN Rail Mounting Kit For Frame Size 1	23						
DINE2-201	DIN Rail Mounting Kit For Frame Size 2	15						
JN5-OP-L01	Remote Keypad	160						
JN5-CB-01M	1 Meter Extension Cable	42						
JN5-CB-02M	2 Meter Extension Cable	55						
JN5-CB-03M	3 Meter Extension Cable	82						
JN5-CB-05M	5 Meter Extension Cable	110						

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



# E510

# FEATURES

Effective 03-07-22 Supercedes All Previous



#### APPLICATIONS

Mixing

Conveyors

**MODEL:** 

**DESCRIPTION:** A versatile AC Drive that can control today's demanding

Machine Tools Fans

E510 MEDIUM DUTY COMPACT AC DRIVE

motor driven applications, this highly flexible drive has

multiple control modes and built-in PLC functionality.

- Packaging Machines
- Crushers/ Grinders
- Pumps (Centrifugal, Positive Displacement, Metering, etc.)
- Extrusion and Injection Molding
- Compressors

#### **FEATURES**

Control Modes for V/F, and Sensorless Vector

- Simple PLC Function Built-in
- .5 to 20 HP (CT), 230V, 50/ 60Hz, 3-Phase
- 1 to 25 HP (CT), 460V, 50/ 60Hz, 3-Phase
- Conformal Coating on PC Boards
- LED Keypad with 5 Digits
- Flexible Input/ Output Configurations that Accept Normally Open or Normally Closed Signals
- 0 to 599 Hz Speed Range
- PID Control

- Diagnostics Registers for Troubleshooting
- Built-in Modbus Protocol via (RJ45 Interface)
- UL, cUL, and CE Approved



#### E510 NEMA 4/4X WITH KEYPAD

V/Hz and Sensorless Vector

PID Control

E510 MEDIUM DUTY COMPACT AC DRIVE Conformal Coating

# LIST PRICES



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CE

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 230V / 460V

230V 3-PHASE INPUT / 230V 3-PHASE OUTPUT											
CATALOGUE NUMBER	HP CONSTANT TORQUE	DRIVE AMPS		DIMENSIONS	APPROX. WT.	LIST					
			HEIGHT	WIDTH	DEPTH	LBS	PRICE				
E510-205-H3N4-U	5	17.5	13.3	7.8	8.6	13.2	1,903				
E510-208-H3N4-U	7.5	26	18.4	8.8	9.8	28	2,165				
E510-210-H3N4-U	10	35	18.4	8.8	9.8	28	2,498				
E510-215-H3N4-U	15	48	18.4	8.8	9.8	28	3,109				
E510-220-H3N4-U	20	64	18.4	8.8	9.8	28	3,156				

460V 3-PHASE INPUT / 460V 3-PHASE OUTPUT										
	HP			DIMENSIONS		APPROX. WT.	LIST PRICE			
CATALOGUE NUMBER	CONSTANT TORQUE	DRIVE AMPS	HEIGHT	WIDTH	DEPTH	LBS				
E510-401-H3N4-U	1	2.3	9.8	6	7.2	6.4	1,045			
E510-402-H3N4-U	2	3.8	9.8	6	7.2	6.4	1,082			
E510-403-H3N4-U	3	5.2	13.3	7.8	8.6	13.2	1,447			
E510-405-H3N4-U	5	8.8	13.3	7.8	8.6	13.2	1,656			
E510-408-H3N4-U	7.5	13	18.4	8.8	9.8	28	2,133			
E510-410-H3N4-U	10	17.5	18.4	8.8	9.8	28	2,390			
E510-415-H3N4-U	15	24	18.4	8.8	9.8	28	2,621			
E510-420-H3N4-U	20	32	18.4	8.8	9.8	28	3,109			
E510-425-H3N4-U	25	40	18.4	8.8	9.8	28	3,269			

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) HP sizing based on Constant Torque applications.

(4) Indoor use only.

(5) Drive comes with Keypad only, no disconnect, no speed pot.



#### E510 NEMA 4/4X WITH KEYPAD AND SPEEDPOT E510 MEDIUM DUTY COMPACT AC DRIVE

# LIST PRICES



Conformal Coating V/Hz and Sensorless Vector PID Control

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 230V

230V 1-PHASE OR 3-PHASE INPUT / 230V 3-PHASE OUTPUT										
	НР			DIMENSIONS	APPROX. WT.	LIST				
CATALOGUE NOMBER	CONSTANT TORQUE	DRIVE AWIPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
E510-2P5-HN4R-U	0.5	2.6	9.8	6	7.9	6.4	911			
E510-201-HN4R-U	1	4.5	9.8	6	7.9	6.4	965			
E510-202-HN4R-U	2	7.5	13.3	7.8	9.3	13.2	1,179			
E510-203-HN4R-U	3	10.5	13.3	7.8	9.3	13.2	1,421			

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) HP sizing based on Constant Torque applications.

(4) Indoor use only.

(5) Drive comes with Keypad and speed pot, no disconnect.

E510 NEMA 4/4X with Keypad, Speedpot and Disconnect & Peripherals

## LIST PRICES

E510 MEDIUM DUTY COMPACT AC DRIVE & PERIPHERALS

Conformal Coating V/Hz and Sensorless Vector PID Control



Effective 03-07-22 Supercedes All Previous

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CE

VOLTAGE: 230V / 460V

230V 1-PHASE INPUT / 230V 3-PHASE OUTPUT											
	HP			DIMENSIONS	APPROX. WT.	LIST					
CAIALOGUE NUMBER	CONSTANT TORQUE	DRIVE AMPS	HEIGHT	WIDTH	DEPTH	EPTH LBS	PRICE				
E510-2P5-H1FN4S-U	0.5	2.6	9.8	6	7.9	6.4	956				
E510-201-H1FN4S-U	1	4.5	9.8	6	7.9	6.4	1,016				
E510-202-H1FN4S-U	2	7.5	13.3	7.8	9.3	13.2	1,341				
E510-203-H1FN4S-U	3	10.5	13.3	7.8	9.3	13.2	1,462				

460V 3-PHASE INPUT / 460V 3-PHASE OUTPUT											
	HP			DIMENSIONS	APPROX. WT.	LIST					
CATALOGUE NUMBER	CONSTANT TORQUE		HEIGHT	WIDTH	DEPTH	LBS	PRICE				
E510-401-H3FN4S-U	1	2.3	9.8	6	7.9	6.4	1,209				
E510-402-H3FN4S-U	2	3.8	9.8	6	7.9	6.4	1,374				
E510-403-H3FN4S-U	3	5.2	13.3	7.8	9.3	13.2	1,648				
E510-405-H3FN4S-U	5	8.8	13.3	7.8	9.3	13.2	1,813				
E510-408-H3FN4S-U	7.5	13	18.4	8.8	10.5	28	2,308				
E510-410-H3FN4S-U	10	17.5	18.4	8.8	10.5	28	2,527				
E510-415-H3FN4S-U	15	24	18.4	8.8	10.5	28	2,857				

E510 PERIPHERALS									
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE							
JN5-CM-USB	Programming Cable - Computer USB to Drive RJ45	137							
JN5-CU	Copy Module	209							

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) HP sizing based on Constant Torque applications.

(4) Indoor use only.

(5) Drive comes with Keypad, speed pot, disconnect.



# F510

# FEATURES

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Effective 03-07-22

Supercedes All Previous

#### **MODEL:** F510 FAN AND PUMP AC DRIVE

**DESCRIPTION:** A versatile AC Drive that is easily configured and handles almost any fan, blower or centrifugal pump application.

#### APPLICATIONS

• Fans

Centrifugal Pumps

• Blowers

HVAC Industries

Irrigation

- Water and Wastewater Industries
- FEATURES
- Control Modes for V/F, Sensorless Vector
- Application Macros for Quick Start-up. Macros Available for: Fans, Pumps, HVAC
- Built-in PLC as Standard
- LCD Keypad
- PID Control with advanced diagnostics and sleep mode
- 1 to 150HP (Variable Torque), 230V, 50/60Hz, 3-Phase
- 1 to 250HP (Variable Torque), 460V, 50/60Hz, 3-Phase
- Conformal Coating on PC Boards
- Diagnostics Registers for Troubleshooting
- Flexible Input/ Output Configurations that Incorporate Normally Open or Normally Closed Signals
- 0 to 400Hz Speed Range
- Built-in RS485 Communications (Modbus, BACNet and Metasys are Standard Protocols)
- Enhanced Design for Smoother and Quieter Motor Operation
- Pulse Output and Pulse Follower
- PTC Input Available for Direct Thermal Protection of the Motor
- Thermal Management on the Heat Sink for Overtemperature Fault Avoidance
- Select Between Closed Loop Speed and Torque Control in Vector Mode
- Built-in Brake Transistor on Models F510-2005-C3 thru F510-2030-C3 also F510-4005-C3 thru F510-4040-C3
- Built-in DC Link Reactor on Models F510-2060-C3 thru F510-2150-C3 also F510-4100-C3 thru F510-4250-C3
- cUL and CE Approved





#### F510 FAN & PUMP AC DRIVE A versatile AC Drive that is easily configured and handles almost any fan, blower or

centrifugal pump application.

# LIST PRICES



Effective 03-07-22 Supercedes All Previous

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CE

VOLTAGE: 230V / 460V

230V 1-PHASE OR 3-PHASE INPUT / 230V 3-PHASE OUTPUT											
	HP	DRIVE	FRAME		DIMENSIONS	APPROX. WT.	LIST				
CATALOGUE NUMBER	VARIABLE TORQUE	AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
F510-2001-C-UE	1	5	1	9.61	5.12	5.91	5.5	769			
F510-2002-C-UE	2	7.5	1	9.61	5.12	5.91	5.5	808			
F510-2003-C-UE	3	10.6	1	9.61	5.12	5.91	5.5	852			

230V 3-PHASE INPUT / 230V 3-PHASE OUTPUT											
	HP	DRIVE	FRAME		DIMENSIONS	APPROX. WT.	LIST				
CATALOGUE NUMBER	VARIABLE TORQUE	AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
F510-2005-C3-UE	5	14.5	2	12.4	5.51	6.97	8.4	1,026			
F510-2008-C3-UE	7.5	21	2	12.4	5.51	6.97	8.4	1,046			
F510-2010-C3-UE	10	30	2	12.4	5.51	6.97	13.6	1,487			
F510-2015-C3-UE	15	40	3	11.81	8.27	8.46	13.6	1,648			
F510-2020-C3-UE	20	56	4	14.17	10.43	8.86	22	2,068			
F510-2025-C3-UE	25	69	4	14.17	10.43	8.86	22	2,585			
F510-2030-C3-UE	30	79	4	14.17	10.43	8.86	22	3,062			
F510-2040-C3-UE	40	110	5	20.67	11.18	10.71	66.1	4,523			
F510-2050-C3-UE	50	138	5	20.67	11.18	10.71	66.1	5,299			
F510-2060-C3-UE*	60	169	6	22.83	13.54	11.81	89.3	7,544			
F510-2075-C3-UE*	75	200	6	22.83	13.54	11.81	89.3	8,288			
F510-2100-C3-UE*	100	250	7	31.10	18.08	12.78	162.8	10,856			
F510-2125-C3-UE*	125	312	7	31.10	18.08	12.78	162.8	13,569			
F510-2150-C3-UE*	150	400	8	39.37	27.16	16.14	405.0	27,138			

\* Models Are Open Chassis, NEMA 1 Kits Available.

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



Control Products - F510

## F510 & PERIPHERALS F510 FAN AND PUMP AC DRIVES & PERIPHERALS

A versatile AC Drive that is easily configured and handles almost any fan, blower or centrifugal pump application.

**LIST PRICES** 

.(UL)== CE



Effective 03-07-22 Supercedes All Previous

460V 3-PHASE INPUT / 460V 3-PHASE OUTPUT											
	HP	DRIVE	FRAME		DIMENSIONS	APPROX, WT.	LIST				
CATALOGUE NUMBER	VARIABLE TORQUE	AMPS	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
F510-4001-C3-UE	1	3.4	1	9.61	5.12	5.91	5.5	852			
F510-4002-C3-UE	2	4.1	1	9.61	5.12	5.91	5.5	890			
F510-4003-C3-UE	3	5.4	1	9.61	5.12	5.91	5.5	901			
F510-4005-C3-UE	5	9.2	2	12.40	5.51	6.97	8.8	1,002			
F510-4008-C3-UE	7.5	11.1	2	12.40	5.51	6.97	8.8	1,103			
F510-4010-C3-UE	10	17.5	2	12.40	5.51	6.97	8.8	1,615			
F510-4015-C3-UE	15	23	3	11.81	8.27	8.46	13.6	1,680			
F510-4020-C3-UE	20	31	3	11.81	8.27	8.46	13.6	2,218			
F510-4025-C3-UE	25	38	3	11.81	8.27	8.46	22.0	2,610			
F510-4030-C3-UE	30	44	4	14.17	10.43	8.86	22.0	3,244			
F510-4040-C3-UE	40	54	4	14.17	10.43	8.86	22.0	3,490			
F510-4050-C3-UE	50	72	5	20.67	11.18	10.71	66.1	4,451			
F510-4060-C3-UE	60	88	5	20.67	11.18	10.71	66.1	5,557			
F510-4075-C3-UE	75	103	5	20.67	11.18	10.71	66.1	6,107			
F510-4100-C3-UE	100	145	5	20.67	11.18	10.71	89.3	7,225			
F510-4125-C3-UE*	125	165	6	22.83	13.70	11.81	89.3	10,985			
F510-4150-C3-UE*	150	208	6	22.83	13.70	11.81	163.1	13,829			
F510-4215-C3-UE*	200	250	7	31.10	18.08	12.78	163.1	15,767			
F510-4250-C3-UE*	250	328	7	31.10	18.08	12.78	163.1	23,073			

	F510 PERIPHERALS										
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE									
JN5-CM-USB	Programming Cable - Computer USB to Drive RJ45	137									
JN5-CU	Copy Module	209									
JN5-IO-8DO	Output Card to Control up to 8 Starters	247									
JN5-CB-01M	1 Meter Extension Cable	42									
JN5-CB-02M	2 Meter Extension Cable	55									
JN5-CB-03M	3 Meter Extension Cable	82									
JN5-CB-05M	5 Meter Extension Cable	110									
JN5-NK-A06	NEMA 1 Kit For Frame 6 Drives	758									
JN5-NK-A07	NEMA 1 Kit For Frame 7 Drives	1,033									
JN5-NK-A08	NEMA 1 Kit For Frame 8 Drives	1,100									
JN5-OP-F03	LCD Keypad	110									

\* Models Are Open Chassis, NEMA 1 Kits Available.

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



# A510

# FEATURES

CE .(UL)...

Effective 03-07-22 Supercedes All Previous



#### **APPLICATIONS**

Mixing

**MODEL:** 

- Conveyors
- Packaging Machines
- Crushers / Grinders
- Machine Tools
- Fans

motor driven applications. This highly flexible drive has

A510 HEAVY DUTY AC DRIVE **DESCRIPTION:** A versatile AC Drive that can control todays demanding

multiple control modes and a built-in PLC.

- Compressors
- Crane / Hoist / Elevator
- Pumps (Centrifugal, Positive Displacement, Metering, etc.)
- · Extrusion and Injection Molding
- Winders / Unwinders

#### **FEATURES**

- Control Modes for V/F, V/F with PG Feedback, Sensorless Vector, and Closed Loop Vector
- Simple PLC Function Built-in
- Advanced Regenerative Load Handling Capability
- 1 to 100HP (CT), 230V, 50/60Hz, 3-Phase
- 1 to 200HP (CT), 460V, 50/60Hz, 3-Phase
- 1 to 200HP (CT) 575V, 50/60Hz, 3-Phase
- 15 to 250HP (CT) 690V, 50/60Hz, 3-Phase
- · Conformal Coating on PC Boards
- LCD Keypad That Can Be Remotely Mountable
- Flexible Input/Output Configurations That Accept Normally Open or Normally Closed Signals
- 0 to 400Hz Speed Range
- PID Control
- Diagnostics Registers for Troubleshooting
- Built-in RS485 Communications (Modbus)
- Enhanced Design for Smother and Quieter Motor Operation
- Pulse Output and Pulse Follower
- Select Between Closed Loop Speed and Torque Control in Vector Mode
- Built-in Brake Transistor on Models (A510-2001-C thru A510-2025-C3), (A510-4001-C3 thru A510-4040-C3) and (A510-5001-C3 thru A510-6040-C3)
- Built-in DC Link Reactor on Models (A510-2050-C3 thru A510-2100-C3), (A510-4075-C3 thru A510-4215-C3) and (A510-6100-C3 thru A510-6250-C3)
- cUL and CE Approved



Control Products - A510

# A510 A510 HEAVY DUTY AC DRIVE

# **LIST PRICES**

.(UL)== CE



A versatile AC Drive that can control todays demanding motor driven applications. This highly flexible drive has multiple control modes and a built-in PLC.

Effective 03-07-22 Supercedes All Previous

**VOLTAGE:** 230V

230V 1-PHASE OR 3-PHASE INPUT / 230V 3-PHASE OUTPUT											
	HP	DRIVE AMPS	FRAME		DIMENSIONS	APPROX. WT.	LIST				
CATALOGUE NUMBER	CONSTANT TORQUE	CONSTANT TORQUE	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
A510-2001-C-UE	1	5	1	9.61	5.12	5.91	6.0	755			
A510-2002-C-UE	2	8	1	9.61	5.12	5.91	6.0	791			
A510-2003-C-UE	3	11	2	12.40	5.51	6.97	9.0	974			

#### 230V 3-PHASE INPUT / 230V 3-PHASE OUTPUT

	HP	DRIVE AMPS	FRAME		DIMENSIONS	APPROX. WT.	LIST	
CATALOGUE NUMBER	CONSTANT TORQUE	CONSTANT TORQUE	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE
A510-2005-C3-UE	5	17.5	2	12.40	5.51	6.97	9.0	1,022
A510-2008-C3-UE	7.5	25	2	12.40	5.51	6.97	9.0	1,485
A510-2010-C3-UE	10	33	3	11.81	8.27	8.46	14.0	1,607
A510-2015-C3-UE	15	47	4	14.17	10.43	8.86	22.0	2,129
A510-2020-C3-UE	20	60	4	14.17	10.43	8.86	22.0	2,493
A510-2025-C3-UE	25	73	4	14.17	10.43	8.86	22.0	3,078
A510-2030-C3-UE	30	85	5	20.67	11.18	10.70	67.0	4,756
A510-2040-C3-UE	40	115	5	20.67	11.18	10.70	67.0	5,960
A510-2050-C3-UE*	50	145	6	22.83	13.54	11.81	103.0	7,542
A510-2060-C3-UE*	60	180	6	22.83	13.54	11.81	103.0	8,819
A510-2075-C3-UE*	75	215	7	31.10	18.08	12.78	194.0	10,704
A510-2100-C3-UE*	100	283	7	31.10	18.08	12.78	194.0	13,380

\* Models Are Open Chassis, NEMA 1 Kits Available.

NOTE: (1) Prices subject to change without notice.(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.





## LIST PRICES



A versatile AC Drive that can control todays demanding motor driven applications. This highly flexible drive has multiple control modes and a built-in PLC.

Effective 03-07-22 Supercedes All Previous VOLTAGE: 460V

	460V 3-PHASE INPUT / 460V 3-PHASE OUTPUT											
	HP	DRIVE AMPS	FRAME		DIMENSIONS		APPROX. WT.	LIST				
CATALOGUE NUMBER	TORQUE	TORQUE	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE				
A510-4001-C3-UE	1	3.4	1	9.61	5.12	5.91	6.0	779				
A510-4002-C3-UE	2	4.2	1	9.61	5.12	5.91	6.0	815				
A510-4003-C3-UE	3	5.5	1	9.61	5.12	5.91	6.0	986				
A510-4005-C3-UE	5	9.2	2	12.40	5.51	6.97	9.0	1,096				
A510-4008-C3-UE	7.5	14.8	2	12.40	5.51	6.97	9.0	1,593				
A510-4010-C3-UE	10	18	3	11.81	8.27	8.46	14.0	1,710				
A510-4015-C3-UE	15	24	3	11.81	8.27	8.46	14.0	2,190				
A510-4020-C3-UE	20	31	3	11.81	8.27	8.46	20.0	2,615				
A510-4025-C3-UE	25	39	4	14.17	10.43	8.86	22.0	3,260				
A510-4030-C3-UE	30	45	4	14.17	10.43	8.86	22.0	3,467				
A510-4040-C3-UE	40	60	5	20.67	11.18	10.70	67.0	4,598				
A510-4050-C3-UE	50	75	5	20.67	11.18	10.70	67.0	5,547				
A510-4060-C3-UE	60	91	5	20.67	11.18	10.70	67.0	6,325				
A510-4075-C3-UE	75	118	5	20.67	11.18	10.70	78.0	6,933				
A510-4100-C3-UE*	100	150	6	22.83	13.54	11.81	103.0	10,825				
A510-4125-C3-UE*	125	180	6	22.83	13.54	11.81	103.0	13,745				
A510-4150-C3-UE*	150	216	7	31.10	18.08	12.78	195.0	15,934				
A510-4215-C3-UE*	200	295	7	31.10	18.08	12.78	195.0	20,921				

\* Models Are Open Chassis, NEMA 1 Kits Available.

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



Control Products - A510

# A510 HEAVY DUTY AC DRIVE

# LIST PRICES



A versatile AC Drive that can control todays demanding motor driven applications. This highly flexible drive has multiple control modes and a built-in PLC.

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 575V

	575V 3-PHASE INPUT / 575V 3-PHASE OUTPUT											
	HP	DRIVE AMPS	FRAME		DIMENSIONS		APPROX. WT.	LIST				
CATALOGUE NUMBER	CONSTANT TORQUE	CONSTANT TORQUE	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE				
A510-5001-C3-UE	1	1.7	2	12.40	5.51	6.97	8.8	1,191				
A510-5002-C3-UE	2	3	2	12.40	5.51	6.97	8.8	1,292				
A510-5003-C3-UE	3	4.2	2	12.40	5.51	6.97	8.8	1,374				
A510-5005-C3-UE	5	6.6	3	11.81	8.27	8.46	13.6	1,454				
A510-5008-C3-UE	7.5	9.9	3	11.81	8.27	8.46	13.6	1,535				
A510-5010-C3-UE	10	11.4	3	11.81	8.27	8.46	13.6	1,615				
A510-6020-C3-UE	15	19	4	14.17	10.43	8.86	22.0	2,625				
A510-6025-C3-UE	20	22	4	14.17	10.43	8.86	22.0	3,373				
A510-6030-C3-UE	25	27	4	14.17	10.43	8.86	22.0	3,514				
A510-6040-C3-UE	30	34	4	14.17	10.43	8.86	22.0	4,443				
A510-6050-C3-UE	40	42	5	20.67	11.18	10.70	66.1	5,453				
A510-6060-C3-UE	50	54	5	20.67	11.18	10.70	66.1	6,664				
A510-6075-C3-UE	60	62	5	20.67	11.18	10.70	66.1	7,471				
A510-6100-C3-UE*	75	86	6	22.83	13.54	11.81	102.0	9,422				
A510-6125-C3-UE*	100	99	6	22.83	13.54	11.81	102.0	13,085				
A510-6150-C3-UE*	125	131	6	22.83	13.54	11.81	102.0	15,044				
A510-6215-C3-UE*	150	163	7	31.10	18.08	12.78	200.0	21,203				
A510-6250-C3-UE*	200	192	7	31.10	18.08	12.78	200.0	23,626				

\* Models Are Open Chassis, NEMA 1 Kits Available.

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.





## LIST PRICES



A versatile AC Drive that can control todays demanding motor driven applications. This highly flexible drive has multiple control modes and a built-in PLC.

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 690V

690V 3-PHASE INPUT / 690V 3-PHASE OUTPUT											
	HP	DRIVE AMPS	FRAME		DIMENSIONS		APPROX. WT.	LIST			
CATALOGUE NUMBER	CONSTANT TORQUE	CONSTANT TORQUE	SIZE	HEIGHT	WIDTH	DEPTH	LBS	PRICE			
A510-6015-C3-UE	15	15	4	14.17	10.43	8.86	22.0	2,343			
A510-6020-C3-UE	20	19	4	14.17	10.43	8.86	22.0	2,625			
A510-6025-C3-UE	25	22	4	14.17	10.43	8.86	22.0	3,373			
A510-6030-C3-UE	30	27	4	14.17	10.43	8.86	22.0	3,514			
A510-6040-C3-UE	40	34	4	14.17	10.43	8.86	22.0	4,443			
A510-6050-C3-UE	50	42	5	20.67	11.18	10.70	66.1	5,453			
A510-6060-C3-UE	60	54	5	20.67	11.18	10.70	66.1	6,664			
A510-6075-C3-UE	75	62	5	20.67	11.18	10.70	66.1	7,471			
A510-6100-C3-UE*	100	86	6	22.83	13.54	11.81	102.0	9,422			
A510-6125-C3-UE*	125	99	6	22.83	13.54	11.81	102.0	13,085			
A510-6150-C3-UE*	150	131	6	22.83	13.54	11.81	102.0	15,044			
A510-6215-C3-UE*	200	163	7	31.10	18.10	12.80	200.0	21,203			
A510-6250-C3-UE*	250	192	7	31.10	18.10	12.80	200.0	23,626			

\* Models Are Open Chassis, NEMA 1 Kits Available.

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



# A510 PERIPHERALS

#### A versatile AC Drive that can control todays demanding motor driven applications. This highly flexible drive has multiple control modes and a built-in PLC.

# LIST PRICES



Effective 03-07-22 Supercedes All Previous

A510 PERIPHERALS							
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE					
JN5-CM-USB	Programming Cable - Computer USB to Drive RJ45						
JN5-CU	Copy Module	209					
JN5-OP-A02	LCD Keypad	210					
JN5-CB-01M	1 Meter Extension Cable	42					
JN5-CB-02M	2 Meter Extension Cable	55					
JN5-CB-03M	3 Meter Extension Cable	82					
JN5-CB-05M	5 Meter Extension Cable	110					
JN5-NK-A06	NEMA 1 Kit For Frame 6 Drives	758					
JN5-NK-A07	NEMA 1 Kit For Frame 7 Drives	1,033					
JN5-PG-L	Encoder Card - Line Driver						
JN5-CMHI-EIP	Ethernet Communication Card	1,380					
JN5-CMH1-PDP	Profibus DP Communication Card	800					
JN5-CMHI-CAN	CANopen Communication Card	600					
JN5-CMHI-ECAT	EtherCAT Communication Card	800					
JN5-IO-2DO1AI	Digital And Analog Expansion Card	550					
JN5-PS-DC24V	24V DC Power Card	550					
JN5-MD-A01	Front Cover Spacer For Frame Size 1	300					
JN5-MD-A02	Front Cover Spacer For Frame Size 2	300					
JN5-MD-A03	Front Cover Spacer For Frame Size 3	300					
JN5-MD-A04	Front Cover Spacer For Frame Size 4	300					
JN5-OP-BTH	Bluetooth LCD Keypad	550					

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) Front Cover Spacer is required when adding any communication card.



# SP2000

# FEATURES



Effective 03-07-22 Supercedes All Previous

Mechanical Drive Upgrade / Replacement

• Pumps (Centrifugal, Positive Displacement, Metering etc.)



#### APPLICATIONS

- Mixing
- Fans
- . (
- ConveyorsProcess Lines
- Crushers
- Hammer Mill, Ball Mill

#### FEATURES

- Power Range; 5HP to 4000HP
- Wide Power Supply Voltage Range; 230-690Vac, 50/60Hz, 3-Phase
- Enclosure, IP00, IP20
- V/Hz, Sensorless Vector, Closed Loop Vector and Regenerative
- Complete Communications Offering
- 200% Torque Available
- 0-1000 Hz Speed Range
- 5 Languages; English, Italian, Spanish, Portuguese, German
- Start-Up Wizard Included
- Carrier Frequency 2.0 to 16Khz
- 4 Integrated Multi-Function Programmable Logic Blocks
- Programming and Monitoring Software Available
- 4 Separate Acceleration / Deceleration Ramps
- 3 Separate Analog Inputs
- 15 Multi-speed Setting
- PID with Sleep and Wake modes
- 3 Analog Outputs
- Built-In Timer Function
- Programmable Digital Outputs
- 3 Separate Motor Configurations
- 8 Digital Inputs
- Built-In Brake Chopper on Many Models
- 4 Line Display with 11 LED Indicators
- Fault History Log
- Keypad Copy Module
- Auto Tune Function
- S Curve Selection for Acceleration and Deceleration
- Skip Frequencies
- 3-Year Warranty
- cUL, CE, Gost, C-Tick Approved



# SP2000

#### SP2000 - OVERLOAD SELECTION CHART

SP2000 - OVERLOAD SELECTION CHART									
		OVER	RLOAD				OVER	LOAD	
APPLICATIONS	LGT	STD	HVY	STG	APPLICATIONS	LGT	STD	HVY	STG
Agitator		х			Hydraulic Power Jack (Inj. Mould Machines)			х	Х
Atomizer	X				Extruders		х		
Bottle Washer	х				Grinder		х		
Centrifuge		Х			Hydraulic Power Pack		Х		
Chipper		х			Mill			х	
Piston Compressor Loaded			X		Ball Mill			Х	
Piston Compressor Unloaded		х			Hammer Mill			х	
Screw Compressor Loaded		Х			Roller Mill			Х	
Screw Compressor Unloaded	Х				Mixer		Х		
Conveyor Belt			X		Palletiser		Х		
Conveyor Roller		x			Planer			х	
Conveyor Screw			X		Bore Pumps		Х		
Crusher (Cone)		x			Centrifugal Pumps	Х			
Crusher (Jaw)			X		Positive Displacement Pumps		Х		
Crusher (Rotary)		х			Slurry Pumps	Х	Х		
Crusher (Vertical Impact)		Х			Pulper			Х	
Debarker		х			Rotary Table		Х		
Dryer		x	X		Sander		Х		
Dust Collector	x				Bandsaw		Х		
Edger		x			Circular Saw		Х		
Damped Axial Fan	x				Separator		Х		
Undamped Axial Fan	X				Vibrating Screen			Х	
Centrifugal Damped Fan	x				Shredder		Х		
Undamped Centrifugal Fan	X				Slicer		Х		
High Pressure Fan	X				Tumbler		Х		
Elevators			X	X	Spinner		Х		
Hoists & Cranes			x		Industrial Washers		Х		
Screw Injection Moulding Machines		x	X		Looms			Х	
Mechanical Presses		х	Х		Axe Control			Х	Х
Drills			X	х	Shears		Х	Х	
Mills			Х		Winding / Unwinding Machines		Х	Х	
Forming Machines		х	Х		Drawplates		Х	Х	



# SP2000 SINUS PENTA

**SP2000 - SINUS PENTA** 

3 Year Warranty Flexible I/O **Heat Sink Segregation** Conformal Coating on all boards **Full Metal Casing** Wide Range of Communication Modules



CE



Effective 03-07-22 Supercedes All Previous

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**VOLTAGE:** 480V

480V 3-PHASE INPUT / 480V 3-PHASE OUTPUT										
CATALOGUE NUMBER	HP	AMPS	FRAME	I-NOM	I-MAX		DIMENSIONS (APPROX.)		APPROX.	LIST
			SIZE			HEIGHT	WIDTH	DEPTH	WI.LDJ	FRICE
SP2000-0014-4T-BA2K2	10	16.5	S05	16.5	25	13.5	7.0	7.0	16.0	3,020
SP2000-0020-4T-BA2K2	20	30	S12	30	36	16.0	8.5	9.0	28.0	3,562
SP2000-0025-4T-BA2K2	25	41	S12	41	48	16.0	8.5	9.0	28.0	4,047
SP2000-0036-4T-BA2K2	40	60	S12	60	72	16.0	8.5	9.0	28.0	4,943
SP2000-0049-4T-BA2K2	60	80	S15	80	96	18.5	9.0	13.0	50.0	6,455
SP2000-0067-4T-BA2K2	75	103	S20	103	118	24.0	11.0	13.0	80.0	7,802
SP2000-0086-4T-BA2K2	100	145	S20	145	155	24.0	11.0	13.0	80.0	9,269
SP2000-0129-4T-BA2K2	150	195	S30	195	215	29.5	12.0	16.5	112.0	16,010
SP2000-0162-4T-BA2K2	175	240	S30	240	290	29.5	12.0	16.5	112.0	16,315
SP2000-0202-4T-XA2K2	250	345	S41	345	420	35.0	20.0	16.2	267.0	23,405
SP2000-0260-4T-XA2K2	350	445	S41	445	560	35.0	20.0	16.2	267.0	26,785
SP2000-0313-4T-XA2K2	400	480	*S51	480	600	35.0	23.0	16.2	311.0	32,318
SP2000-0367-4T-XA2K2	450	550	*S51	550	680	35.0	23.0	16.2	311.0	36,832
SP2000-0402-4T-XA2K2	550	680	*S51	680	850	35.0	23.0	16.2	311.0	38,774
SP2000-0524-4T-XA2K2	650	800	*S60	800	960	52.0	35.0	21.0	573.0	64,784
SP2000-0598-4T-XA2K2	700	900	*S65	900	1100	55.2	39.0	22.0	970.0	101,807
SP2000-0748-4T-XA2K2	800	1000	*S65	1000	1300	55.2	39.0	22.0	970.0	111,444
SP2000-0831-4T-XA2K2	1000	1200	*S65	1200	1440	55.2	39.0	22.0	970.0	121,063

\* Input and Output reactors are required for these models.

I-NOM: Continuous rated current of the inverter

Maximum current produced by the inverter for 120 seconds every 20 minutes up to S30 and 60 seconds every 10 minutes for S41 and larger I-MAX:

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) All drives are open chassis.



Control Products - SP2000

# SP2000 SINUS PENTA

SP2000 - SINUS PENTA

3 Year Warranty Flexible I/O Heat Sink Segregation Conformal Coating on all boards Full Metal Casing Wide Range of Communication Modules

# LIST PRICES

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Effective 03-07-22 Supercedes All Previous VOLTAGE: 575V

575V 3-PHASE INPUT / 575V 3-PHASE OUTPUT										
CATALOGUE NUMBER	НР	AMPS	FRAME	FRAME I-NOM I-	I-MAX	DIMENSIONS (APPROX.)			APPROX.	LIST
			SIZE			HEIGHT	WIDTH	DEPTH	WI.LDS	PRICE
SP2000-0003-5T-XA2K2	5	7	S12	7	8.5	16.0	8.5	9.0	28.0	3,132
SP2000-0004-5T-XA2K2	7.5	9	S12	9	11	16.0	8.5	9.0	28.0	3,273
SP2000-0006-5T-XA2K2	10	11	S12	11	13.5	16.0	8.5	9.0	28.0	3,538
SP2000-0012-5T-XA2K2	10	13	S12	13	16	16.0	8.5	9.0	28.0	3,721
SP2000-0018-5T-XA2K2	15	17	S12	17	21	16.0	8.5	9.0	28.0	3,853
SP2000-0019-5T-BA2K2	15	21	S14	21	25	21.0	11.0	10.0	51.0	5,786
SP2000-0021-5T-BA2K2	20	25	S14	25	30	21.0	11.0	10.0	51.0	6,092
SP2000-0032-5T-BA2K2	50	52	S14	52	63	21.0	11.0	10.0	51.0	7,584
SP2000-0042-5T-BA2K2	60	60	S22	60	72	32.5	11.1	14.0	115.0	11,885
SP2000-0051-5T-BA2K2	75	80	S22	80	96	32.5	11.1	14.0	115.0	12,648
SP2000-0069-5T-BA2K2	100	105	S22	105	135	32.5	11.1	14.0	115.0	15,509
SP2000-0088-5T-BA2K2	150	150	S32	150	200	35.0	14.5	16.0	185.0	19,551
SP2000-0164-5T-BA2K2	200	230	S32	230	300	35.0	14.5	16.0	185.0	25,040
SP2000-0201-5T-XA2K2	300	330	S42	330	420	38.1	20.0	16.1	299.0	32,130
SP2000-0259-5T-XA2K2	400	400	S42	400	560	38.1	20.0	16.1	299.0	37,751
SP2000-0290-5T-XA2K2	450	450	S52	450	600	38.1	23.0	16.1	353.0	54,884
SP2000-0314-5T-XA2K2	500	500	S52	500	665	38.1	23.0	16.1	353.0	60,057
SP2000-0368-5T-XA2K2	550	560	S52	560	720	38.1	23.0	16.1	353.0	63,495
SP2000-0401-5T-XA2K2	600	640	S52	640	850	38.1	23.0	16.1	353.0	74,295
SP2000-0524-5T-XA2K2	800	800	*S65	800	960	55.1	39.0	22.0	970.0	123,244
SP2000-0748-5T-XA2K2	1000	1000	*S65	1000	1300	55.1	39.0	22.0	970.0	135,198

\* Input and Output reactors are required for these models.

I-NOM: Continuous rated current of the inverter

I-MAX: Maximum current produced by the inverter for 60 seconds every 10 minutes

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) All drives are open chassis.



**C -** 20

Control Products - SP2000

**SP2000** SINUS PENTA PERIPHERALS

#### **SP2000 - SINUS PENTA PERIPHERALS**

## LIST PRICES





#### Effective 03-07-22 Supercedes All Previous

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SP2000 - SINUS PENTA PERIPHERALS							
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE					
ZZ0095699	SINUS PENTA Remote Keypad Kit (Includes 3m Cable and Door Mounting)	135					
ZZ0095700	SINUS PENTA Remote Keypad Kit (Includes 5m Cable and Door Mounting)	150					
ZZ0101660	Spare SINUS PENTA LCD Keypad	220					
SPCBS05	Conduit Box NEMA 1 for SINUS PENTA S05	210					
SPCBS12	Conduit Box NEMA 1 for SINUS PENTA S12	210					
SPCBS14	Conduit Box NEMA 1 for SINUS PENTA S14	230					
SPCBS15	Conduit Box NEMA 1 for SINUS PENTA S15	230					
SPCBS20	Conduit Box NEMA 1 for SINUS PENTA S20	230					
SPCBS22	Conduit Box NEMA 1 for SINUS PENTA S22	300					
SPCBS30	Conduit Box NEMA 1 for SINUS PENTA S30	300					
SPCBS32	Conduit Box NEMA 1 for SINUS PENTA S32	330					
SPCBS42	Conduit Box NEMA 1 for SINUS PENTA S41 & S42	440					
SPCBS52	Conduit Box NEMA 1 for SINUS PENTA S52	660					
ZZ0095834	Encoder Card Multifunction ES836 for SINUS PENTA (Slot A)	200					
ZZ0101830	ES860 SINcos Card for SINUS PENTA (Slot A)	420					
ZZ0101860	ES861 Resolver/Encoder Board with Repeated Encoder, (3) Digital Input/Output (Slot C)	815					
ZZ0101814	ES847 (8) Digital Input, (6) Transistor Output, (4) PT100 Inputs up to 260°C, (1) Analog Voltage Input, (1) Analog Current Input 0-20mA, (Slot C)	745					
ZZ0101840	ES870 (8) Digital Input, (6) Output relays also for Multi-Pump Application (Slot C)	380					
PC1604662	Multi End Cable, Sinus Penta, D Connector to RS485 Three Wire (used with WW1420032)	270					
WW1420032	USB to RS485 Terminals, (used with PC1604662)	485					
ZZ0095850	ES822 Insulated Card RS232 and/or RS485 for SINUS PENTA (This Card Must Be Installed on the Inverter and it is Suggested for Modbus Networks) (Slot B)	150					

NOTE: (1) Prices subject to change without notice. (2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



**SP2000** SINUS PENTA PERIPHERALS

**SP2000 - SINUS PENTA PERIPHERALS** 

### LIST PRICES



Effective 03-07-22 Supercedes All Previous

SP2000 - SINUS PENTA COMMUNICATION PERIPHERALS							
CATALOGUE NUMBER	DESCRIPTION						
ZZ0101820	ES851 Data Logger - RS-232 (Slot B)	860					
ZZ4600013	KIT - "Remote Drive" for PC (Cables, Software, USB/485 Converter, Instruction Manual)	1,025					
ZZ4600030	KIT - "Anybus Communicator" Converting Card Modbus/Profibus DP/DeviceNet/Canbus for 32 Drives Connection, Complete with Cables & Programming Software	2,740					
ZZ4600045	Profibus DP Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	1,375					
ZZ4600042	PROFIdrive Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	1,960					
ZZ4600055	DeviceNet Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	1,885					
ZZ4600060	INTERBUS Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	1,940					
ZZ4600070	CANOpen Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	1,995					
ZZ4600080	ControlNet Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	2,750					
ZZ4600085	LonWorks Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	2,230					
ZZ4600100	Modbus TCP Card for SINUS PENTA (Kit Hardware and Software) (Slot B)	2,270					
ZZ0102402	BacNet RS485 + ES919 (Slot B)	1,140					
ZZ0102404	BacNet Ethernet + ES919 (Slot B)	1,140					
ZZ0102406	Metasys N2 + ES919 (Slot B)	820					
ZZR0988A0	120/240V Digital Input Card	1,925					
ZZ4600220	Modbus TCP (for use with the ES927 Control Board)	1,135					
ZZ4600221	Ethernet IP (for use with the ES927 Control Board)	1,135					
ZZ4600223	EtherCAT (for use with the ES927 Control Board)	1,135					

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



C - 22 Control Products - SP2000 - COMMUNICATION PERIPHERALS For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023

# VMX2-SERIES

# **FEATURES**

(UL) ,(UL) ... CE

Effective 03-07-22 Supercedes All Previous



#### **APPLICATIONS**

• Pumps

**MODEL:** 

Compressor

**DESCRIPTION:** VMX2 Series Low Voltage Soft Starters; The control and

- Conveyors
- Chillers

Blowers

VMX2-SERIES COMPACT SOFT STARTER

protection you expect in an innovative soft starter design.

• Fans

#### **FEATURES**

- Standard Duty (500% O/L for 20 Sec) & Heavy Duty (500% O/L for 60 sec) Ratings Available
- 9 to 1250A Current Ratings
- Chassis Style or Configured Style Available
- Multiple Ramps to Start Any Load
- Built-In Deceleration Control, Dual ramp, Kick Start and Jog Modes
- Start & Run Protection
- Real Time Thermal Modelling
- Phase Loss Protection
- Electronic Shear Pin
- Built-In Motor Protection
- Short Circuit Protection
- Phase Current Imbalance/Loss protection
- Complete with Bypass Contactor
- Pump Flex Deceleration
- 3 programmable Output Contacts
- Built in RS485 Communications
- Fault History
- Narrow width for MCC Mounting
- Remote Keypad Mounting Option Available
- Units operate on 230, 460 or 600 volts
- 1 Year Warranty
- UL, cUL and CE Approved



Control Products - VMX2-SERIES

### VMX2-SERIES VMX2-SERIES LOW VOLTAGE SOFT-STARTER

Current Ramp or Voltage Ramp, with Current Limit

# LIST PRICES

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CE

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Effective 03-07-22 Supercedes All Previous

VOLTAGE: 230V / 460V / 575V

Integral up to Speed Bypass Contactor 4-20mA Output RS-485 Modbus - RTU Communications 120 Volts AC Control 24V DC Dry Contact Inputs, No External DC Power Supply Required

24V DC Dry Contact Inputs, No External DC Power Supply Required Chassis Mount

Complete with Decel Control, Dual Ramp, Kick Start and Jog Modes

	ADJUSTABLE RANGE		230V / HP		460V / HP		/ / HP	LIST
CAIALOGUE NUMBER	(AMPS)	HD	SD	HD	SD	HD	SD	PRICE
VMX2-18-BP	9-18	5	5	10	10	10	15	3,412
VMX2-28-BP	14-28	7.5	7.5	15	20	20	25	3,412
VMX2-39-BP	19-39	10	10	25	25	30	30	3,582
VMX2-48-BP	24-48	15	15	30	30	30	40	3,582
VMX2-62-BP	31-62	20	20	40	40	50	50	3,626
VMX2-78-BP	39-78	25	25	50	60	60	60	3,775
VMX2-92-BP	46-92	30	30	60	60	75	75	4,473
VMX2-112-BP	56-112	30	40	75	75	75	100	4,929
VMX2-150-BP	75-150	50	50	100	100	75	125	6,489
VMX2-160-BP	80-160	50	60	100	125	75	150	6,934
VMX2-210-BP	105-210	60	75	150	150	150	200	10,011
VMX2-275-BP	138-275	75	100	150	200	150	200	11,890
VMX2-361-BP	181-361	125	125	250	300	300	350	12,824
VMX2-450-BP	225-450	150	150	300	350	300	450	14,390
VMX2-550-BP	275-550	200	200	400	450	500	500	18,170
VMX2-600-BP	300-600	200	200	450	500	600	600	18,500
VMX2-862-BP	431-862	300	300	500	600	600	700	26,302
VMX2-900-BP	450-900	300	350	600	700	600	900	29,049

SD - Standard Duty 500% - 20 seconds 1.0 S.F. with shunt rated bypass

HD - Heavy Duty 500% - 60 seconds 1.15 S.F. with fully rated bypass

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) Model VMX2-210-BP and above utilize an external by-pass contactor (included with softstarter)

DIMENSIONS AND SHIPPING WEIGHTS								
CATALOGUE NUMBER	HEIGHT INCHES (mm)	WIDTH INCHES (mm)	DEPTH INCHES (mm)	APPROX. WT. LBS (kg)				
VMX2-18-BP thru VMX2-48-BP	8.85 (225)			13 (5.9)				
VMX2-62-BP thru VMX2-112-BP	14 (355.6)	8 (203)	6.65 (169)	23 (10.4)				
VMX2-150-BP thru VMX2-160-BP	19 (482.6)			33 (15)				
VMX2-210-BP	20.1 (712.7)			130 (59)				
VMX2-275-BP	28.1 (713.7)	12 5 (217 5)	0.1 (221)	140 (63.5)				
VMX2-361-BP thru VMX2-450-BP	29.3 (744.2)	12.5 (317.5)	9.1 (231)	145 (65.8)				
VMX2-550-BP thru VMX2-600-BP	29.5 (749.3)			165 (74.8)				
VMX2-862-BP thru VMX2-900-BP	44.25 (1124)		11.86 (301.3)	325 (147)				
VMX2-1006-BP thru VMX2-1250-BP	50.77 (1289.6)	25.5 (647.7)	13.28 (337.3)	400 (181)				





# **VMX2-STARTERS**

# LIST PRICES

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Effective 03-07-22

Supercedes All Previous

CE

(UL)

#### VMX2 STARTERS COMPLETE IN NEMA 1

Panel does not include Control Transformer (120Vac Must be fed Externally). List pricing includes the VMX2 and the enclosure. Items on this page are not stocked in TECO-Westinghouse warehouses, however, are available for quick shipment from the factory. Please contact your TWMI representative for availability.



VOLTAGE: 230V / 460V / 575V

NEMA 1 ENCLOSURE							
	HEIGHT	WIDTH	DEPTH				
VMX2-18-BP-N	15	10	8	3,885			
VMX2-28-BP-N	15	10	8	3,885			
VMX2-39-BP-N	15	10	8	4,055			
VMX2-48-BP-N	15	10	8	4,055			
VMX2-62-BP-N	20	10	8	4,412			
VMX2-78-BP-N	20	10	8	4,560			
VMX2-92-BP-N	20	10	8	5,247			
VMX2-112-BP-N	20	10	8	5,698			
VMX2-150-BP-N	28	10	8	7,440			
VMX2-160-BP-N	28	10	8	7,879			
VMX2-210-BP-N	48	24	12	11,659			
VMX2-275-BP-N	48	24	12	13,593			
VMX2-361-BP-N	48	24	12	14,560			
VMX2-450-BP-N	60	24	12	16,385			
VMX2-550-BP-N	60	24	12	20,286			
VMX2-600-BP-N	60	24	12	20,621			

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

CABLE ASSEMBLY FOR REMOTE MOUNTING KEYPAD									
CATALOGUE NUMBER	DESCRIPTION	CABLE LENGTH	APPLICABLE MODEL	LIST PRICE					
VMX-KP12-KIT2-1	Remote Display Kit	1m Cable	VMX2-18 to VMX2-48	626					
VMX-KP12-KIT2-2	Remote Display Kit	2m Cable	VMX2-18 to VMX2-48	648					
VMX-KP12-KIT2-3	Remote Display Kit	3m Cable	VMX2-18 to VMX2-48	692					
VMX-KP12-KIT-1	Remote Display Kit	1m Cable	VMX2-62 and Above	714					
VMX-KP12-KIT-2	Remote Display Kit	2m Cable	VMX2-62 and Above	736					
VMX-KP12-KIT-3	Remote Display Kit	3m Cable	VMX2-62 and Above	758					



# **MVC-PLUS**

# FEATURES

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Effective 03-07-22 Supercedes All Previous



#### **MODEL:** MVC-PLUS MEDIUM VOLTAGE SOFT-STARTER

**DESCRIPTION:** Advanced Motor Control Protection and Monitoring in a Reliable Field Proven Soft Starter.

#### APPLICATIONS

- Pump Systems
- Gas Compression
- Conveyor Systems
- Aggregate Crushers
- No Load Motor Test Stands
- ID Fans & Blowers

#### FEATURES

- Available Voltage Class: 2300V, 3300V, 4160V, 6000/7200V, 11kV-15kV
- Units Available Up to 10,000 HP at 7.2kV (1500 amps)
- Units Available Up to 20,000 HP at 15kV (800 amps)
- 2,300V-7,200V (60kV BIL) / 11,000-15,000V (110kV BIL)
- Programmable Keypad/Operator with 2 Lines x 20 Character w, Backlit Display
- Up to 12 RTD Inputs Available
- Rugged Full Pulse Gate Firing Circuit
- Custom Packaged Systems Available Including Cascading
- Low Voltage Optically Isolated from Medium Voltage
- 500% current limit for 60 seconds
- Fully Rated Disconnect Switch
- Voltage Ramps with Current Limit
- Pump-Flex Feature Controls Water Hammer
- Built in RS-485 Communication
- Other Communication Protocols Available
- Free Software for Start up and Monitoring
- DV/DT Transient Voltage Protection
- Fully rated Line and Bypass Contactor
- Digital Control Unit on the Low Voltage Door
- Volts, Amps and Power reading for Measurement and Protection
- Motor and Starter Protection:
  - Phase Imbalance
- Phase Reversal
- Short Circuit Detection Over / Under Current - Over / Under Voltage - Shorted SCR
- Over / Under Voltage - Starter Over-Temp
- Coast Down Lockout
- Starts Per Hour Lockout
- Time Between Starts
- NEMA 12 Enclosure Standard (3R Enclosure Optional)
- 3 Year Warranty with Factory Start-Up
- UL, cUL and CE Approved

C-26 Contr



# **MVC-PLUS**

MVC-PLUS MEDIUM VOLTAGE SOFT-STARTER

Load-break Disconnect Switch with Door Safety Interlock Main Isolation Vacuum Contactor Fully Rated Bypass Contactor Heavy Duty SCR Stacks with Ring Transformer Isolation Fiber Optically Isolated Low Voltage Compartment 8 Programmable Relay Outputs for Control Flexibility 2 Programmable Analog Outputs (0-10vdc or 4-20ma) RS-485 Communications (Modbus RTU) NEMA 12 Gasketed Enclosure

LIST PRICES

Effective 03-07-22 Supercedes All Previous



VOLTAGE: 2300V / 4160V / 6600V / 11000V / 13800V

2300V								
CATALOGUE NUMBER	MAX AMPS	HP	LIST PRICE					
MVC4-23100-E-SWG	100	350	77,885					
MVC4-23200-E-SWG	200	700	82,335					
MVC4-23400-E-SWG	400	1400	85,676					
MVC4-23600-E-SWG	630	2700	144,643					

4160V								
CATALOGUE NUMBER	MAX AMPS	HP	LIST PRICE					
MVC4-41100-E-SWG	100	600	95,687					
MVC4-41200-E-SWG	200	1250	105,923					
MVC4-41400-E-SWG	400	2500	117,049					
MVC4-41600-E-SWG	630	4000	229,203					

6600V								
CATALOGUE NUMBER	MAX AMPS	HP	LIST PRICE					
MVC4-66100-E-SWG	100	1000	101,253					
MVC4-66200-E-SWG	200	2000	122,390					
MVC4-66400-E-SWG	400	4000	134,407					
MVC4-66600-E-SWG	630	7400	261,247					

11000V								
CATALOGUE NUMBER	MAX AMPS	HP	LIST PRICE					
MVC4-110200-E-SWG	200	3400	512,258					
MVC4-110400-E-SWG	400	6700	589,478					
MVC4-110600-E-SWG	630	10,600	712,088					

13800V								
CATALOGUE NUMBER	MAX AMPS	HP	LIST PRICE					
MVC4-138100-E-SWG	100	2100	513,819					
MVC4-138200-E-SWG	200	4200	594,819					
MVC4-138400-E-SWG	400	8500	698,736					
MVC4-138600-E-SWG	600	12500	1,068,132					
MVC4-1381000-E-SWG	1000	21000	1,513,187					

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(3) Size units based on motor amps including service factor.



### MV SOFT STARTER DIMENSIONS

#### **MV SOFT STARTER DIMENSIONS**

### LIST PRICES

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Effective 03-07-22 Supercedes All Previous

DIMENSIONS								
VOLTAGE	CATALOGUE NUMBER	HEIGHT	WIDTH	DEPTH				
	MVC4-23100-E-SWG							
2300	MVC4-23200-E-SWG	92	36	30				
2300	MVC4-23400-E-SWG							
	MVC4-23600-E-SWG	93	81	44				
	MVC4-41100-E-SWG							
	MVC4-41200-E-SWG	92	36	30				
4160	MVC4-41400-E-SWG							
	MVC4-41600-E-SWG	92	72	30				
	MVC4-411000-E-SWG	92	81	44				
	MVC4-66100-E-SWG							
6600	MVC4-66200-E-SWG	92	42	30				
0000	MVC4-66400-E-SWG							
	MVC4-66600-E-SWG	92	117	30				
	MVC4-110200-E-SWG							
11000V	MVC4-110400-E-SWG	95	126	44				
	MVC4-110600-E-SWG		92 72   92 81   92 42   92 117   95 126					
	MVC4-138100-E-SWG							
	MVC4-138200-E-SWG	95	126	44				
13800V	MVC4-138400-E-SWG							
	MVC4-138600-E-SWG	95	120	80				
	MVC4-1381000-E-SWG	23	120	00				

# **MV - ACROSS THE LINE STARTER**

MEDIUM VOLTAGE ACROSS THE LINE STARTER									
	VOITACE	AMDC	ЦБ	DIMENSIONS					
	VOLIAGE	AIVIPS	nr	HEIGHT	WIDTH	DEPTH			
MVC4-23200-E-DOL		200	700	02	24	30	42,857		
MVC4-23400-E-DOL	2300	400	1400	92			45,055		
MVC4-23600-E-DOL		600	2100	92	72	30	76,923		

MEDIUM VOLTAGE ACROSS THE LINE STARTER									
	VOLTAGE	41400	DIME		DIMENSIONS				
CATALOGUE NUMBER	VOLIAGE	AMPS	HP	HEIGHT	WIDTH	DEPTH			
MVC4-41200-E-DOL		200	1250	92	24	20	42,857		
MVC4-41400-E-DOL	4160	400	2500			30	45,055		
MVC4-41600-E-DOL		600	3800	92	72	30	76,923		

**NOTE:** (1) Max Amperage must be lower than Motor Full load current x Motor Service Factor.

(2) Motor Current and Service Factor must be supplied on order for Fuse and CT selection.

(3) Estimate assumes motor power factor = 0.8 or better, Motor Efficiency is 0.95 or better and S.F. = 1.15.

(4) Prices subject to change without notice.

Control Products - MV - ACROSS THE LINE STARTERS

(5) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



# **MTE REACTORS**

#### **MODEL:** MTE REACTORS

DESCRIPTION: RL Line/Load Reactors Solve Line and Load Power Quality Problems

#### **APPLICATIONS**

- Harmonic Compensation
- Output of Drive System
- Input of Drive System

#### **FEATURES**

- 1 to 1,500 Amp Current range
- 208V to 690V, 50/60Hz, 3-Phase
- Available for use on Single Phase Input
- Epoxy Impregnated
- High Saturation Current Rating
- For use on VFD Systems with Switching Frequencies up to 20kHz
- 150% O/L Rated
- Protects Motors from Long lead Lengths
- Reduce Output Voltage dV/dT
- Virtually Eliminate Nuisance Tripping
- Extended Semiconductor Life
- Transient Protection Options Available
- Reduce Motor Temperature
- Reduce Motor Audible Noise
- Available in Chassis Style, NEMA 1 and NEMA 3R
- UL, cUL, CSA and CE Approved





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**FEATURES** 

Effective 03-07-22 Supercedes All Previous

## 208V-3% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

### LIST PRICES



Effective 03-07-22 Supercedes All Previous

# VOLTAGE: 208V-3%

LIST PRICE

	OPTIONAL							
	HP		DIME	NSIONS (APP	ROX.)	APPROX. WT.	LIST	NEMA 1
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE
RL-00801	1	8	4.6	5.9	2.9	7	258	CAB-8B
RL-00801	1.5	8	4.6	5.9	2.9	7	258	CAB-8B
RL-00801	2	8	4.6	5.9	2.9	7	258	CAB-8B
RL-01801	3	18	5.1	5.9	3.2	9	393	CAB-8B
RL-02501	5	25	5.7	7.1	3.4	11	410	CAB-13VB
RL-03501	7.5	35	5.7	7.1	3.7	14	466	CAB-13VB
RL-05501	10	55	6.9	9	5.3	24	775	CAB-13VB
RL-05501	15	55	6.9	9	5.3	24	775	CAB-13VB
RL-08001	20	80	6.9	8.9	5.7	25	787	CAB-13VB
RL-10001	25	100	7	8.9	6	29	1,006	CAB-13VB
RL-10001	30	100	7	8.9	6	29	1,006	CAB-13VB
RL-13001	40	130	7.3	9.6	5.9	29	1,112	CAB-13VB
RL-16001	50	160	7.2	9.6	6	41	1,410	CAB-13VB
RL-20001B14	60	200	7.2	9.6	7.1	38	1,489	CAB-13VB
RL-25001B14	75	250	7	9.6	8.1	47	1,910	CAB-13VB
RL-32001B14	100	320	8.4	10.8	7.9	80	2,803	CAB-17V
RL-40001B14	125	400	8.4	11	8.6	84	3,056	CAB-17V
RL-50001B14	150	500	8.5	10.8	9.4	93	3,062	CAB-17V
RL-60001	200	600	11.1	14.3	8.8	120	4,893	CAB-26C2
RL-75001	250	750	11.2	14.3	10.4	140	6,270	CAB-26C2

**NOTE:** (1) Prices subject to change without notice.

Control Products - 208V-3% MTE REACTORS

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



## 208V-5% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

### LIST PRICES



Effective 03-07-22 Supercedes All Previous

VOLTAGE: 208V-5%

208V 3-PHASE 5% IMPEDANCE							OPTIONAL		
	HP	44406	DIME	NSIONS (APP	PROX.)	APPROX. WT.	LIST	NEMA 1	LIST
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE	PRICE
RL-00802	1	8	4.6	5.9	2.9	8	292	CAB-8B	220
RL-00802	1.5	8	4.6	5.9	2.9	8	292	CAB-8B	220
RL-01202	2	12	5	5.9	3.2	10	320	CAB-8B	220
RL-01802	3	18	5.1	5.9	3.5	12	399	CAB-8B	220
RL-02502	5	25	5.8	7.1	3.4	14	466	CAB-13VB	330
RL-03502	7.5	35	5.8	7.1	3.7	16	620	CAB-13VB	330
RL-05502	10	55	6.9	9	5.3	26	843	CAB-13VB	330
RL-04501	15	45	7.1	8.9	4.6	22	612	CAB-13VB	330
RL-05501	20	55	6.9	9	5.3	24	775	CAB-13VB	330
RL-08001	25	80	6.9	8.9	5.7	25	787	CAB-13VB	330
RL-13002	30	130	7.2	9.6	6	43	1,461	CAB-13VB	330
RL-16002	40	160	8.4	10.8	6.7	54	2,101	CAB-13VB	330
RL-20002B14	50	200	7.2	9.6	7.9	54	2,185	CAB-13VB	330
RL-20002B14	60	200	7.2	9.6	7.9	54	2,185	CAB-13VB	330
RL-25002B14	75	250	8.5	10.8	7.6	80	2,775	CAB-17V	1,215
RL-32002B14	100	320	8.4	10.8	8.9	102	3,208	CAB-17V	1,215
RL-40002B14	125	400	11.1	14.3	9.4	118	5,090	CAB-17V	1,215
RL-50002	150	500	11.1	14.3	10.6	160	5,674	CAB-26C2	3,495
RL-75002	200	750	11.1	14.3	11.5	190	7,899	CAB-26C2	3,495
RL-75002	250	750	11.1	14.3	11.5	190	7,899	CAB-26C2	3,495

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.


## 240V-3% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

## VOLTAGE: 240V-3%

list Price

	240V 3-PHASE 3% IMPEDANCE												
	HP		DIME	NSIONS (APP	PROX.)	APPROX. WT.	LIST	NEMA 1					
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE					
RL-00802	1	8	4.6	5.9	2.9	8	292	CAB-8B					
RL-00801	1.5	8	4.6	5.9	2.9	7	258	CAB-8B					
RL-00801	2	8	4.6	5.9	2.9	7	258	CAB-8B					
RL-01201	3	12	5	5.9	3.2	9	303	CAB-8B					
RL-01801	5	18	5.1	5.9	3.2	9	393	CAB-8B					
RL-02501	7.5	25	5.7	7.1	3.4	11	410	CAB-13VB					
RL-03501	10	35	5.7	7.1	3.7	14	466	CAB-13VB					
RL-04501	15	45	7.1	8.9	4.6	22	612	CAB-13VB					
RL-05501	20	55	6.9	9	5.3	24	775	CAB-13VB					
RL-08001	25	80	6.9	8.9	5.7	25	787	CAB-13VB					
RL-10001	30	100	7	8.9	6	29	1,006	CAB-13VB					
RL-13001	40	130	7.3	9.6	5.9	29	1,112	CAB-13VB					
RL-13001	50	130	7.3	9.6	5.9	29	1,112	CAB-13VB					
RL-16001	60	160	7.2	9.6	6	41	1,410	CAB-13VB					
RL-20001B14	75	200	7.2	9.6	7.1	38	1,489	CAB-13VB					
RL-25001B14	100	250	7	9.6	8.1	47	1,910	CAB-13VB					
RL-32001B14	125	320	8.4	10.8	7.9	80	2,803	CAB-17V					
RL-40001B14	150	400	8.4	11	8.6	84	3,056	CAB-17V					
RL-50001B14	200	500	8.5	10.8	9.4	93	3,062	CAB-17V					
RL-60001	250	600	11.1	14.3	8.8	120	4,893	CAB-26C2					

**NOTE:** (1) Prices subject to change without notice.

Control Products - 240V-3% MTE REACTORS

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



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## 240V-5% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

VOLTAGE: 240V-5%

			OPTIONAL						
	HP	44400	DIME	NSIONS (APF	PROX.)	APPROX. WT.	LIST	NEMA 1	LIST
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE	PRICE
RL-00803	1	8	4.7	5.9	3.3	11	348	CAB-8B	220
RL-00802	1.5	8	4.6	5.9	2.9	8	292	CAB-8B	220
RL-00802	2	8	4.6	5.9	2.9	8	292	CAB-8B	220
RL-01202	3	12	5	5.9	3.2	10	320	CAB-8B	220
RL-02502	5	25	5.8	7.1	3.4	14	466	CAB-13VB	330
RL-03502	7.5	35	5.8	7.1	3.7	16	620	CAB-13VB	330
RL-03502	10	35	5.8	7.1	3.7	16	620	CAB-13VB	330
RL-05502	15	55	6.9	9	5.3	26	843	CAB-13VB	330
RL-08002	20	80	7.1	8.9	5.7	33	1,101	CAB-13VB	330
RL-10001	25	100	7	8.9	6	29	1,006	CAB-13VB	330
RL-08001	30	80	6.9	8.9	5.7	25	787	CAB-13VB	330
RL-13002	40	130	7.2	9.6	6	43	1,461	CAB-13VB	330
RL-16002	50	160	8.4	10.8	6.7	54	2,101	CAB-13VB	330
RL-16002	60	160	8.4	10.8	6.7	54	2,101	CAB-13VB	330
RL-20002B14	75	200	7.2	9.6	7.9	54	2,185	CAB-13VB	330
RL-25002B14	100	250	8.5	10.8	7.6	80	2,775	CAB-17V	1,215
RL-40002B14	125	400	11.1	14.3	9.4	118	5,090	CAB-17V	1,215
RL-40002B14	150	400	11.1	14.3	9.4	118	5,090	CAB-17V	1,215
RL-60002	200	600	11.1	14.3	11	175	6,337	CAB-26C2	3,495
RL-75002	250	750	11.1	14.3	11.5	190	7,899	CAB-26C2	3,495

**NOTE:** (1) Prices subject to change without notice.



## 480V-3% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

### VOLTAGE: 480V-3%

			OPTIONAL						
	HP		DIME	NSIONS (APP	PROX.)	APPROX. WT.	LIST	NEMA 1	LIST
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE	PRICE
RL-00201	1	2	4	4.2	2.6	4	242	CAB-8B	220
RL-00402	1.5	4	4	4.2	2.6	4	253	CAB-8B	220
RL-00402	2	4	4	4.2	2.6	4	253	CAB-8B	220
RL-00803	3	8	4.7	5.9	3.3	11	348	CAB-8B	220
RL-00802	5	8	4.6	5.9	2.9	8	292	CAB-8B	220
RL-01202	7.5	12	5	5.9	3.2	10	320	CAB-8B	220
RL-01802	10	18	5.1	5.9	3.5	12	399	CAB-8B	220
RL-02502	15	25	5.8	7.1	3.4	14	466	CAB-13VB	330
RL-03502	20	35	5.8	7.1	3.7	16	620	CAB-13VB	330
RL-03502	25	35	5.8	7.1	3.7	16	620	CAB-13VB	330
RL-04502	30	45	7.2	8.9	4.6	26	730	CAB-13VB	330
RL-05502	40	55	6.9	9	5.3	26	843	CAB-13VB	330
RL-08002	50	80	7.1	8.9	5.7	33	1,101	CAB-13VB	330
RL-10002	60	100	7	8.9	6.6	37	1,124	CAB-13VB	330
RL-10002	75	100	7	8.9	6.6	37	1,124	CAB-13VB	330
RL-13002	100	130	7.2	9.6	6	43	1,461	CAB-13VB	330
RL-16002	125	160	8.4	10.8	6.7	54	2,101	CAB-13VB	330
RL-20002B14	150	200	7.2	9.6	7.9	54	2,185	CAB-13VB	330
RL-25002B14	200	250	8.5	10.8	7.6	80	2,775	CAB-17V	1,215
RL-32002B14	250	320	8.4	10.8	8.9	102	3,208	CAB-17V	1,215
RL-40002B14	300	400	11.1	14.3	9.4	118	5,090	CAB-17V	1,215
RL-50002	350	500	11.1	14.3	10.6	160	5,674	CAB-26C2	3,495
RL-50002	400	500	11.1	14.3	10.6	160	5,674	CAB-26C2	3,495
RL-60002	500	600	11.1	14.3	11	175	6,337	CAB-26C2	3,495
RL-75002	600	750	11.1	14.3	11.5	190	7,899	CAB-26C2	3,495

**NOTE:** (1) Prices subject to change without notice.



## 480V-5% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

VOLTAGE: **480V-5%** 

			OPTIONAL						
	HP	AMDC	DIME	NSIONS (APP	PROX.)	APPROX. WT.	LIST	NEMA 1	LIST
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE	PRICE
RL-00202	1	2	4	4.2	2.6	4	253	CAB-8B	220
RL-00404	1.5	4	4	4.2	3.3	6	298	CAB-8B	220
RL-00403	2	4	4	4.2	3	5	264	CAB-8B	220
RL-00804	3	8	4.7	5.9	3.3	13	399	CAB-8B	220
RL-00803	5	8	4.7	5.9	3.3	11	348	CAB-8B	220
RL-01203	7.5	12	5	5.9	3.8	18	461	CAB-8B	220
RL-01803	10	18	5.7	7.1	3.7	16	534	CAB-13VB	330
RL-02503	15	25	5.8	7.1	4.2	20	607	CAB-13VB	330
RL-03503	20	35	7.2	8.9	4.6	26	742	CAB-13VB	330
RL-03503	25	35	7.2	8.9	4.6	26	742	CAB-13VB	330
RL-05503	30	55	6.9	8.9	6.3	34	1,107	CAB-13VB	330
RL-05503	40	55	6.9	8.9	6.3	34	1,107	CAB-13VB	330
RL-08003	50	80	8.5	10.8	6.6	63	1,949	CAB-13VB	330
RL-10003	60	100	8.4	10.8	7.8	67	2,208	CAB-13VB	330
RL-10003	75	100	8.4	10.8	7.8	67	2,208	CAB-13VB	330
RL-13003	100	130	8.5	10.8	7.3	64	2,219	CAB-13VB	330
RL-16003	125	160	8.5	10.8	7.4	74	2,455	CAB-13VB	330
RL-20003B14	150	200	8.3	10.8	9.1	100	3,202	CAB-13VB	330
RL-25003B14	200	250	11.2	14.3	8.7	125	4,989	CAB-17V	1,215
RL-32003B14	250	320	11.1	14.3	9.4	160	5,393	CAB-17V	1,215
RL-40003B14	300	400	11.1	14.3	10.9	149	5,910	CAB-17V	1,215
RL-50003	350	500	11.1	14.3	13	210	6,719	CAB-26C2	3,495
RL-50003	400	500	11.1	14.3	13	210	6,719	CAB-26C2	3,495
RL-60003	500	600	11.1	14.3	13.5	270	8,551	CAB-26C2	3,495
RL-75003	600	750	14.1	14	13	265	11,039	CAB-26C2	3,495

**NOTE:** (1) Prices subject to change without notice.



## 600V-3% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## **LIST PRICES**



Effective 03-07-22 Supercedes All Previous

### VOLTAGE: 600V-3%

	600V 3-PHASE 3% IMPEDANCE										
	HP	AMDC	DIME	NSIONS (APP	PROX.)	APPROX. WT.	LIST	NEMA 1 LI			
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE	ENCLOSURE PR			
RL-00202	1	2	4	4.2	2.6	4	253	CAB-8B 22			
RL-00201	1.5	2	4	4.2	2.6	4	242	CAB-8B 22			
RL-00403	2	4	4	4.2	3	5	264	CAB-8B 22			
RL-00402	3	4	4	4.2	2.6	4	253	CAB-8B 22			
RL-00803	5	8	4.7	5.9	3.3	11	348	CAB-8B 22			
RL-01202	7.5	12	5	5.9	3.2	10	320	CAB-8B 22			
RL-01202	10	12	5	5.9	3.2	10	320	CAB-8B 22			
RL-01802	15	18	5.1	5.9	3.5	12	399	CAB-8B 22			
RL-02502	20	25	5.8	7.1	3.4	14	466	CAB-13VB 33			
RL-02502	25	25	5.8	7.1	3.4	14	466	CAB-13VB 33			
RL-03502	30	35	5.8	7.1	3.7	16	620	CAB-13VB 33			
RL-04502	40	45	7.2	8.9	4.6	26	730	CAB-13VB 33			
RL-05502	50	55	6.9	9	5.3	26	843	CAB-13VB 33			
RL-08002	60	80	7.1	8.9	5.7	33	1,101	CAB-13VB 33			
RL-08002	75	80	7.1	8.9	5.7	33	1,101	CAB-13VB 33			
RL-10002	100	100	7	8.9	6.6	37	1,124	CAB-13VB 33			
RL-13002	125	130	7.2	9.6	6	43	1,461	CAB-13VB 33			
RL-16002	150	160	8.4	10.8	6.7	54	2,101	CAB-13VB 33			
RL-20002B14	200	200	7.2	9.6	7.9	54	2,185	CAB-13VB 33			
RL-25002B14	250	250	8.5	10.8	7.6	80	2,775	CAB-17V 1,2			
RL-32002B14	300	320	8.4	10.8	8.9	102	3,208	CAB-17V 1,2			
RL-32002B14	350	320	8.4	10.8	8.9	102	3,208	CAB-17V 1,2			
RL-40002B14	400	400	11.1	14.3	9.4	118	5,090	CAB-17V 1,2			
RL-50002	500	500	11.1	14.3	10.6	160	5,674	CAB-26C2 3,4			
RL-60002	600	600	11.1	14.3	11	175	6,337	CAB-26C2 3,4			

**NOTE:** (1) Prices subject to change without notice.

(2) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.



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## 600V-5% MTE REACTORS

LINE & LOAD REACTORS: CHASSIS 3-PHASE

## LIST PRICES



Effective 03-07-22 Supercedes All Previous

VOLTAGE: 600V-5%

	600V 3-PHASE 5% IMPEDANCE										
	HP	ANADO	DIME	NSIONS (APF	PROX.)	APPROX. WT.	LIST		NEMA 1	LIST	
CATALOGUE NUMBER	RATING	AMPS	HEIGHT	WIDTH	DEPTH	LBS	PRICE		ENCLOSURE	PRICE	
RL-00203	1	2	4	4.2	2.6	4	292		CAB-8B	220	
RL-00202	1.5	2	4	4.2	2.6	4	253		CAB-8B	220	
RL-00404	2	4	4	4.2	3.3	6	298		CAB-8B	220	
RL-00404	3	4	4	4.2	3.3	6	298		CAB-8B	220	
RL-00804	5	8	4.7	5.9	3.3	13	399		CAB-8B	220	
RL-01203	7.5	12	5	5.9	3.8	18	461		CAB-8B	220	
RL-01203	10	12	5	5.9	3.8	18	461		CAB-8B	220	
RL-01803	15	18	5.7	7.1	3.7	16	534		CAB-13VB	330	
RL-02503	20	25	5.8	7.1	4.2	20	607		CAB-13VB	330	
RL-02503	25	25	5.8	7.1	4.2	20	607		CAB-13VB	330	
RL-03503	30	35	7.2	8.9	4.6	26	742		CAB-13VB	330	
RL-04503	40	45	7.3	8.9	5.1	34	933		CAB-13VB	330	
RL-05503	50	55	6.9	8.9	6.3	34	1,107		CAB-13VB	330	
RL-08003	60	80	8.5	10.8	6.6	63	1,949		CAB-13VB	330	
RL-08003	75	80	8.5	10.8	6.6	63	1,949		CAB-13VB	330	
RL-10003	100	100	8.4	10.8	7.8	67	2,208		CAB-13VB	330	
RL-13003	125	130	8.5	10.8	7.3	64	2,219		CAB-13VB	330	
RL-16003	150	160	8.5	10.8	7.4	74	2,455		CAB-13VB	330	
RL-20003B14	200	200	8.3	10.8	9.1	100	3,202		CAB-13VB	330	
RL-25003B14	250	250	11.2	14.3	8.7	125	4,989		CAB-17V	1,215	
RL-32003B14	300	320	11.1	14.3	9.4	160	5,393		CAB-17V	1,215	
RL-32003B14	350	320	11.1	14.3	9.4	160	5,393		CAB-17V	1,215	
RL-40003B14	400	400	11.1	14.3	10.9	149	5,910		CAB-17V	1,215	
RL-50003	500	500	11.1	14.3	13	210	6,719		CAB-26C2	3,495	
RL-60003	600	600	11.1	14.3	13.5	270	8,551		CAB-26C2	3,495	

**NOTE:** (1) Prices subject to change without notice.



# **MTE SERIES**

# **FEATURES**

,(UL) ... CE

Effective 03-07-22 Supercedes All Previous



#### **MODEL:** MTE SERIES D dV/dT FILTERS

**DESCRIPTION:** Designed to protect AC Motors from the destructive effects of peak voltages facilitated by long cable runs between the inverter and motor.

## **APPLICATIONS**

- Submersible Pumps
- Process Automation Lines
- HVAC Equipment

### **FEATURES**

- 3 to 600 Amp Range (0.5 to 600HP)
- 480V to 600V, 50/60 Hz, 3-Phase
- Max. Motor Peak Voltage Spec. (150% of DC Bus Voltage) at 1000 Feet
- For use on VFD Systems with Switching Frequencies 2kHz to 5kHz
- Protects Motors from Long lead Lengths and Standing Wave Phenomenon
- Reduce Output Voltage dV/dT
- Available in Chassis Style, NEMA 1 and NEMA 3R
- 1 Year Warranty
- cUL, CE Approved





# **MTE SERIES**

dV/dT FILTERS

## LIST PRICES

.(UL)==

CE

Protects Motors from Effects of Peak Voltages Caused by Long Cable Runs Select Filters Based on the Current Rating of the Motor



Effective 03-07-22 Supercedes All Previous

VOLTAGE: 480V

	SERIES A dV/dT FILTER, 480VAC, 60 Hz										
	AMDC	OPEN CHASS	IS	NEMA 1		NEMA	8R				
HP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE				
1 to 1.5	3	DVSP0003E	835	DVSG0003E	1,308	DVSW0003E	1,907				
2	4	DVSP0004E	846	DVSG0004E	1,330	DVSW0004E	1,918				
3	7	DVSP0007E	890	DVSG0007E	1,374	DVSW0007E	1,951				
5	9	DVSP0009E	929	DVSG0009E	1,418	DVSW0009E	2,000				
7.5	12	DVSP0012E	978	DVSG0012E	1,473	DVSW0012E	2,082				
10	17	DVSP0017E	1,066	DVSG0017E	1,571	DVSW0017E	2,126				
15	22	DVSP0022E	1,154	DVSG0022E	1,648	DVSW0022E	2,308				
20	27	DVSP0027E	1,236	DVSG0027E	1,736	DVSW0027E	2,445				
25	35	DVSP0035E	1,335	DVSG0035E	1,857	DVSW0035E	2,527				
30	45	DVSP0045E	1,473	DVSG0045E	2,005	DVSW0045E	2,610				
40	55	DVSP0055E	1,588	DVSG0055E	2,148	DVSW0055E	3,643				
50	65	DVSP0065E	1,736	DVSG0065E	2,313	DVSW0065E	3,709				
60	80	DVSP0080E	1,940	DVSG0080E	2,538	DVSW0080E	3,918				
75	110	DVSP0110E	2,418	DVSG0110E	3,082	DVSW0110E	4,681				
100	130	DVSP0130E	2,835	DVSG0130E	3,808	DVSW0130E	5,456				
125	160	DVSP0160E	3,154	DVSG0160E	4,198	DVSW0160E	5,566				
150	200	DVSP0200E	3,357	DVSG0200E	4,495	DVSW0200E	5,659				
200	250	DVSP0250E	3,758	DVSG0250E	4,951	DVSW0250E	5,918				
250	305	DVSP0305E	4,038	DVSG0305E	5,429	DVSW0305E	5,973				
300	365	DVSP0365E	4,522	DVSG0365E	6,055	DVSW0365E	7,599				
350	415	DVSP0415E	4,824	DVSG0415E	6,357	DVSW0415E	8,126				
450	515	DVSP0515E	5,753	DVSG0515E	7,495	DVSW0515E	8,412				
500	600	DVSP0600E	5,984	DVSG0600E	7,912	DVSW0600E	8,626				

NOTE: (1) Items on this page are not stocked in TECO-Westinghouse warehouses. Please contact your TWMI representative for availability. (2) Prices subject to change without notice.



MTE SERIES

## LIST PRICES



Protects Motors from Effects of Peak Voltages Caused by Long Cable Runs Select Filters Based on the Current Rating of the Motor

> Effective 03-07-22 Supercedes All Previous

VOLTAGE: 600V

SERIES A dV/dT FILTER, 600VAC, 60 Hz											
	ANADC	OPEN CHASS	SIS	NEMA 1		NEMA 3	BR				
ΠP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE				
1 to 2	3	DVSP0003E	835	DVSG0003E	1,308	DVSW0003E	1,907				
3	4	DVSP0004E	846	DVSG0004E	1,330	DVSW0004E	1,918				
5	7	DVSP0007E	890	DVSG0007E	1,374	DVSW0007E	1,951				
7.5	9	DVSP0009E	929	DVSG0009E	1,418	DVSW0009E	2,000				
10	12	DVSP0012E	978	DVSG0012E	1,473	DVSW0012E	2,082				
15	17	DVSP0017E	1,066	DVSG0017E	1,571	DVSW0017E	2,126				
20	22	DVSP0022E	1,154	DVSG0022E	1,648	DVSW0022E	2,308				
25	27	DVSP0027E	1,236	DVSG0027E	1,736	DVSW0027E	2,445				
30	35	DVSP0035E	1,335	DVSG0035E	1,857	DVSW0035E	2,527				
40	45	DVSP0045E	1,473	DVSG0045E	2,005	DVSW0045E	2,610				
50	55	DVSP0055E	1,588	DVSG0055E	2,148	DVSW0055E	3,643				
60	65	DVSP0065E	1,736	DVSG0065E	2,313	DVSW0065E	3,709				
75	80	DVSP0080E	1,940	DVSG0080E	2,538	DVSW0080E	3,918				
100	110	DVSP0110E	2,418	DVSG0110E	3,082	DVSW0110E	4,681				
125	130	DVSP0130E	2,835	DVSG0130E	3,808	DVSW0130E	5,456				
150	160	DVSP0160E	3,154	DVSG0160E	4,198	DVSW0160E	5,566				
200	200	DVSP0200E	3,357	DVSG0200E	4,495	DVSW0200E	5,659				
250	250	DVSP0250E	3,758	DVSG0250E	4,951	DVSW0250E	5,918				
300	305	DVSP0305E	4,038	DVSG0305E	5,429	DVSW0305E	5,973				
350	365	DVSP0365E	4,522	DVSG0365E	6,055	DVSW0365E	7,599				
450	415	DVSP0415E	4,824	DVSG0415E	6,357	DVSW0415E	8,126				
500	515	DVSP0515E	5,753	DVSG0515E	7,495	DVSW0515E	8,412				
600	600	DVSP0600E	5,984	DVSG0600E	7,912	DVSW0600E	8,626				

NOTE: (1) Items on this page are not stocked in TECO-Westinghouse warehouses. Please contact your TWMI representative for availability. (2) Prices subject to change without notice.



## **MTE SINE WAVE FILTERS**

#### **MODEL:** MTE SINE WAVE FILTERS

**DESCRIPTION:** MTE Sine Wave Filters transform the output of a Variable Frequency Drive to a near perfect sinusoidal wave form.

## **APPLICATIONS**

- Long Cable Runs
- VFD Feeding a Step Up Transformer
- Multi Motor Applications
- Reduced Motor Noise

## **FEATURES**

- 2 to 700 Amp Current Range
- 230, 480 & 600V, 50/60Hz, 3-Phase
- For Use on VFD Systems with Switching Frequencies from 2kHz to 8kHz
- 100% Rated RMS Current & Intermittent Current of 150% for 1 Minute
- Protects Motors from Long Lead Lengths
- Reduce Motor Temperature
- Reduce Motor Audible Noise
- Available in Chassis Style, NEMA 1 and NEMA 3R
- cUL and CE Approved



# **FEATURES**

,(UL) =s

CE

Effective 03-07-22 Supercedes All Previous



**TEC** Westinghouse мотокѕ (CANADA) INC.

**MTE SINE WAVE FILTERS** 

SINE WAVE FILTERS

## LIST PRICES

.(V). CE



Designed to provide a pure sine wave output when driven from a VFD Select filters based on the current rating of the motor

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 460V

SINE WAVE FILTERS 460VAC 60Hz											
		OPEN C	HASSIS	NEM	MA 1	NEM	IA 3R				
HP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE				
1.5	3	SWGM0003D	2,093	SWGG0003D	2,451	SWGW0003D	3,159				
3	5	SWGM0005D	2,170	SWGG0005D	2,538	SWGW0005D	3,264				
4	7	SWGM0007D	2,247	SWGG0007D	2,626	SWGW0007D	3,302				
5.5	9	SWGM0009D	2,319	SWGG0009D	2,714	SWGW0009D	3,478				
7.5	12	SWGM0012D	2,434	SWGG0012D	2,852	SWGW0012D	3,632				
10	17	SWGM0017D	2,626	SWGG0017D	3,071	SWGW0017D	3,901				
15	22	SWGM0022D	2,813	SWGG0022D	3,297	SWGW0022D	4,082				
20	27	SWGM0027D	3,060	SWGG0027D	3,516	SWGW0027D	4,429				
25	35	SWGM0035D	3,374	SWGG0035D	3,874	SWGW0035D	4,852				
30	45	SWGM0045D	3,687	SWGG0045D	4,313	SWGW0045D	5,280				
40	55	SWGM0055D	4,066	SWGG0055D	4,758	SWGW0055D	5,797				
50	65	SWGM0065D	4,445	SWGG0065D	5,203	SWGW0065D	6,313				
60	80	SWGM0080D	5,016	SWGG0080D	5,868	SWGW0080D	7,093				
75	110	SWGM0110D	6,522	SWGG0110D	8,692	SWGW0110D	9,275				
100	130	SWGM0130D	7,527	SWGG0130D	9,929	SWGW0130D	10,500				
125	160	SWGM0160D	9,038	SWGG0160D	11,775	SWGW0160D	12,335				
150	200	SWGM0200D	11,049	SWGG0200D	14,242	SWGW0200D	14,780				
200	250	SWGM0250D	13,560	SWGG0250D	17,319	SWGW0250D	17,835				
250	305	SWGM0305D	16,330	SWGG0305D	20,709	SWGW0305D	21,198				
300	365	SWGM0365D	19,346	SWGG0365D	24,407	SWGW0365D	24,868				
350	415	SWGM0415D	21,857	SWGG0415D	27,489	SWGW0415D	27,923				
450	515	SWGM0515D	26,890	SWGG0515D	33,648	SWGW0515D	34,033				
500	600	SWGM0600D	31,159	SWGG0600D	38,890	SWGW0600D	39,236				
600	720	SWGM0720D	37,198	SWGG0720D	46,286	SWGW0720D	46,571				

NOTE: (1) Items on this page are not stocked in TECO-Westinghouse warehouses. Please contact your TWMI representative for availability.

(2) Prices subject to change without notice.

Control Products - MTE SINE WAVE FILTERS



## **MTE SINE WAVE FILTERS**

## **LIST PRICES**

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CE

SINE WAVE FILTERS

Designed to provide a pure sine wave output when driven from a VFD Select filters based on the current rating of the motor



Effective 03-07-22 Supercedes All Previous

VOLTAGE: 600V

SINE WAVE FILTERS 600VAC 60Hz										
		OPEN C	HASSIS	NEM	MA 1	NEM	A 3R			
HP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE			
1	2	SWGM0002E	2,264	SWGG0002E	2,648	SWGW0002E	3,599			
2	3	SWGM0003E	2,302	SWGG0003E	2,698	SWGW0003E	3,665			
3	5	SWGM0005E	2,390	SWGG0005E	2,791	SWGW0005E	3,791			
5	7	SWGM0007E	2,467	SWGG0007E	2,890	SWGW0007E	3,835			
7.5	9	SWGM0009E	2,555	SWGG0009E	2,989	SWGW0009E	4,033			
10	12	SWGM0012E	2,681	SWGG0012E	3,137	SWGW0012E	4,214			
15	17	SWGM0017E	2,890	SWGG0017E	3,379	SWGW0017E	4,527			
20	22	SWGM0022E	3,093	SWGG0022E	3,621	SWGW0022E	4,736			
25	27	SWGM0027E	3,368	SWGG0027E	3,868	SWGW0027E	5,319			
30	35	SWGM0035E	3,709	SWGG0035E	4,258	SWGW0035E	5,626			
40	45	SWGM0045E	4,055	SWGG0045E	4,747	SWGW0045E	6,126			
50	55	SWGM0055E	4,473	SWGG0055E	5,236	SWGW0055E	6,725			
60	65	SWGM0065E	4,890	SWGG0065E	5,725	SWGW0065E	7,324			
75	80	SWGM0080E	5,516	SWGG0080E	6,456	SWGW0080E	8,231			
100	110	SWGM0110E	7,176	SWGG0110E	9,560	SWGW0110E	10,764			
125	130	SWGM0130E	8,280	SWGG0130E	10,918	SWGW0130E	12,181			
150	160	SWGM0160E	9,940	SWGG0160E	12,951	SWGW0160E	14,308			
200	200	SWGM0200E	12,154	SWGG0200E	15,665	SWGW0200E	17,143			
250	250	SWGM0250E	14,923	SWGG0250E	19,055	SWGW0250E	20,687			
300	305	SWGM0305E	17,967	SWGG0305E	22,780	SWGW0305E	24,593			
350	365	SWGM0365E	21,280	SWGG0365E	26,846	SWGW0365E	28,846			
400	415	SWGM0415E	24,049	SWGG0415E	30,242	SWGW0415E	32,390			
500	515	SWGM0515E	29,577	SWGG0515E	37,016	SWGW0515E	39,484			
600	600	SWGM0600E	34,275	SWGG0600E	42,780	SWGW0600E	45,511			
700	720	SWGM0720E	40,912	SWGG0720E	50,912	SWGW0720E	54,022			

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# **MTE MATRIX**

MTE MATRIX FILTERS **DESCRIPTION:** MTE Matrix Filters meet the most stringent IEEE-519

virtually any kind of six pulse rectifier.

requirements (5% THID) of removing current distortion on

## **FEATURES**

,(UL) ... CE

Effective 03-07-22 Supercedes All Previous



## **APPLICATIONS**

Any VFD Loads

**MODEL:** 

- Induction Heating Equipment
- Fans and Pumps
- Water Treatment Facilities
- · Hospitals and Critical Applications

### **FEATURES**

- 6 to 786 Amp Current Range
- 480 & 600V, 50/60Hz, 3-Phase
- Capacitor Options & More
- Epoxy Impregnated
- High Saturation Current Rating
- Performance Guarantee to Meet IEEE 519
- Generator Compatible
- Available in Open Style, NEMA 1 or NEMA 3R
- No System Analysis Required to Select and Apply Matrix Filters
- cUL and CE Approved

Control Products - MTE MATRIX FILTERS **C** - 44 For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023



# **MTE MATRIX**

**MTE MATRIX FILTERS** 

For use with 6 pulse Variable Frequency Drives to mitigate harmonics to less than 5% THID at full load current

## LIST PRICES



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Effective 03-07-22 Supercedes All Previous

VOLTAGE: 480V

MTE SERIES D MATRIX HARMONIC FILTERS 480VAC 60Hz											
		OPEN C	HASSIS	NEM	MA 1	NEM	A 3R				
HP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE				
5	8	MAPP0008D	2,665	MAPG0008D	4,368	MAPW0008D	4,912				
10	14	MAPP0014D	3,110	MAPG0014D	4,780	MAPW0014D	5,319				
15	21	MAPP0021D	3,621	MAPG0021D	5,379	MAPW0021D	5,934				
20	27	MAPP0027D	4,077	MAPG0027D	5,890	MAPW0027D	6,445				
25	34	MAPP0034D	4,527	MAPG0034D	6,390	MAPW0034D	6,962				
30	44	MAPP0044D	4,984	MAPG0044D	6,769	MAPW0044D	7,473				
40	52	MAPP0052D	5,775	MAPG0052D	7,758	MAPW0052D	8,335				
50	66	MAPP0066D	6,665	MAPG0066D	8,753	MAPW0066D	9,341				
60	83	MAPP0083D	7,549	MAPG0083D	9,747	MAPW0083D	10,346				
75	103	MAPP0103D	8,440	MAPG0103D	10,791	MAPW0103D	11,412				
100	128	MAPP0128D	11,104	MAPG0128D	13,720	MAPW0128D	14,368				
125	165	MAPP0165D	12,335	MAPG0165D	15,209	MAPW0165D	15,896				
150	208	MAPP0208D	13,324	MAPG0208D	16,462	MAPW0208D	17,176				
200	240	MAPP0240D	13,978	MAPG0240D	17,637	MAPW0240D	18,418				
250	320	MAPP0320D	19,846	MAPG0320D	26,115	MAPW0320D	26,901				
300	403	MAPP0403D	23,077	MAPG0403D	29,352	MAPW0403D	30,132				
400	482	MAPP0482D	26,742	MAPG0482D	33,016	MAPW0482D	33,797				
500	636	MAPP0636D	36,082	MAPG0636D	43,709	MAPW0636D	44,907				
600	786	MAPP0786D	42,615	MAPG0786D	51,434	MAPW0786D	52,764				
700	850	MAPP0850D	49,148	MAPG0850D	58,027	MAPW0850D	60,621				
900	1000	MAPP1000D	62,209	MAPG1000D	73,181	MAPW1000D	74,879				
1000	1200	MAPP1200D	68,742	MAPG1200D	80,758	MAPW1200D	82,588				

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(3) F.O.B. Appropriate TWMI Warehouse unless otherwise noted.

(4) Capacitor Contactor (-002) option is available, please contact your TWMI representative for a price and delivery.



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MTE MATRIX FILTERS

## LIST PRICES



For use with 6 pulse Variable Frequency Drives to mitigate harmonics to less than 5% THID at full load current

Effective 03-07-22 Supercedes All Previous

VOLTAGE: 600V

MTE SERIES D MATRIX HARMONIC FILTERS 600VAC 60Hz											
		OPEN C	HASSIS	NEM	MA 1	NEM	IA 3R				
HP	AMPS	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE	CATALOGUE NUMBER	LIST PRICE				
5	6	MAPP0006E	2,923	MAPG0006E	4,577	MAPW0006E	5,115				
10	11	MAPP0011E	3,374	MAPG0011E	5,143	MAPW0011E	5,577				
15	21	MAPP0021E	3,967	MAPG0021E	5,725	MAPW0021E	6,280				
25	27	MAPP0027E	4,698	MAPG0027E	6,560	MAPW0027E	7,132				
30	34	MAPP0034E	5,038	MAPG0034E	6,956	MAPW0034E	7,527				
40	44	MAPP0044E	6,154	MAPG0044E	8,022	MAPW0044E	8,764				
50	52	MAPP0052E	6,923	MAPG0052E	9,016	MAPW0052E	9,604				
60	66	MAPP0066E	7,813	MAPG0066E	10,005	MAPW0066E	10,610				
75	83	MAPP0083E	9,143	MAPG0083E	11,495	MAPW0083E	12,115				
100	103	MAPP0103E	11,368	MAPG0103E	13,978	MAPW0103E	14,632				
125	128	MAPP0128E	12,560	MAPG0128E	15,434	MAPW0128E	16,115				
150	165	MAPP0165E	14,126	MAPG0165E	17,258	MAPW0165E	17,978				
200	208	MAPP0208E	16,225	MAPG0208E	19,879	MAPW0208E	20,665				
250	240	MAPP0240E	19,780	MAPG0240E	23,962	MAPW0240E	26,835				
300	320	MAPP0320E	23,533	MAPG0320E	28,236	MAPW0320E	30,582				
400	403	MAPP0403E	28,907	MAPG0403E	34,654	MAPW0403E	35,962				
500	482	MAPP0482E	36,071	MAPG0482E	42,863	MAPW0482E	44,038				
600	636	MAPP0636E	42,341	MAPG0636E	51,154	MAPW0636E	52,484				
800	786	MAPP0786E	53,231	MAPG0786E	64,390	MAPW0786E	65,984				

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# SG2 PROGRAMMABLE LOGIC RELAYS

### **MODEL:** SG2 PROGRAMMABLE LOGIC RELAYS

**DESCRIPTION:** SG2 PLR offers a solid alternative to using mechanical relays and timers / OP10 HMI Can be used with SG2 as well as TECO VFD's.

## **APPLICATIONS**

- Panel Upgrades
- OEM Favorite

### **FEATURES**

- SG2 Available in Blind or with HMI Built-In
- 24VDC or 85 to 240Vac
- Built-In Modbus Available on Specific Models
- FREE Software Available
- Expansion Modules Available
- Software Allows Ladder Logic Programming or Function Block Programming
- Offline Simultation
- Online Monitoring
- HMI Can Be Used with SG2 and TECO VFD's
- HMI Offers 4.3 Monochrome Graphic Panel 192 x 64 Pixels
- UL, cUL, CE Approved





Effective 03-07-22

**FEATURES** 

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Effective 03-07-22 Supercedes All Previous

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# **SG2** PROGRAMMABLE LOGIC RELAYS

## LIST PRICES

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SG2 PROGRAMMABLE LOGIC RELAYS

Simple yet powerful, dependable yet affordable The SG2 PLR Includes the needed features at the industry's lowest price

> Effective 03-07-22 Supercedes All Previous

# VOLTAGE: 24V to 240V

SG2 PROGRAMMABLE LOGIC RELAYS										
CATALOGUE	CONTROL	DISCRETE / DIGITAL		ANALOG		COMME		KEVDAD		LIST
NUMBER	POWER	INPUTS	OUTPUTS	INPUTS	OUTPUTS	COMMIS	DISPLAT	KETPAD	INIAA I/O	PRICE
SG2-10HR-A	85-240 VAC	6	4	0	0	Prog RS232	4 x 12 Char.	8 key	34	192
SG2-12HR-D	24 VDC	6	4	2	0	Prog RS232	4 x 12 Char.	8 key	36	170
SG2-12KR-D	24 VDC	6	4	2	0	Prog RS232	-	-	36	145
SG2-20HR-A	85-240 VAC	12	8	0	0	Prog RS232	4 x 12 Char.	8 key	44	277
SG2-20VR-D	24 VDC	8+4	8	4	0	RS-232/RS-485	4 x 12 Char.	8 key	44	269
SG2-8ER-D	24 VDC	4	4	0	0	N/A	N/A	N/A	N/A	110
SG2-8ER-A	85-240 VAC	4	4	0	0	N/A	N/A	N/A	N/A	134
SG2-4AI	24 VDC	0	0	4	0	N/A	N/A	N/A	N/A	214
SG2-2AO	24 VDC	0	0	0	2	N/A	N/A	N/A	N/A	214
SG2-4PT	24 VDC	0	0	4-(PT100)	0	N/A	N/A	N/A	N/A	269
SG2-EN01	24 VDC	0	0	0	0	ETHERNET/232	N/A	N/A	N/A	808
SG2-MODBUS	24VDC	0	0	0	0	RS-485	N/A	N/A	N/A	269

SG2 OPTIONAL HARDWARE						
CATALOGUE NUMBER	DESCRIPTION	LIST PRICE				
SG2-PL01	SG2 Programming Cable, RS-232 to SG2-Programming Connector	44				
SG2-ULINK	SG2 Programming Cable, USB to SG2-Programming Connector	90				
SG2-PM05	SG2 Memory Cartridge.	22				
SG2-10PS-24	Power Supply 24 Volt Output	110				
OP10	HMI Screen RS232, RS485 MODBUS	277				
OP10-PL01	Programming cable for OP10 HMI	27				

**NOTE:** (1) Prices subject to change without notice.



## **CUSTOMER SERVICE** FIELD SERVICE AND START-UP ASSISTANCE

#### Effective 03-07-22 Supercedes All Previous

ΑCΤΙVΙΤΥ	RATE (CND \$)	DESCRIPTION
Basic Rate	\$120.00/Hr	Up to 8 hours a day, Monday - Friday, 7:00am - 6:00pm
<b>Standard Overtime:</b> Extended weekdays and Saturdays.	\$180.00/Hr	Weekday overtime and all hours prior to 7:00am or beyond 6:00pm and all Saturday time. Total time not to exceed 12 hours in any 24-hour period.
<i>Special Overtime:</i> Sundays, Holidays and in excess of 8 hours on Saturdays.	\$240.00/Hr	All Sunday and Holiday work and all time in excess of 8 hours on Saturdays. Total time not to exceed 12 hours in any 24- hour period.
Auto travel (round trip)	\$1.05/KM	Auto mileage charges cover the use of company or personal vehicles. Driving time is included in actual total time en-route from office to job site area.
Transportation and Living Expenses	Cost plus 15%	Transportation expense at cost based on round trip fares for personnel and equipment. Time involves actual total time enroute from office to the job site area.
Hold over and Standby time	Same as Service Time Rate	Holdover and standby time (waiting or on call) is considered service time and rendered at prevailing service rates. This rate will be charged to retain a technician in the service job site area in lieu of his/her incurring additional expense by returning to his/her headquarters.

If an authorized TECO-Westinghouse service representative performs a certified Controls start-up per the above field service rates, the 12 month standard warranty will be extended to 24 months from date of start-up, or 27 months from date of purchase, whichever is less.

- **NOTE:** (1) Prices subject to change without notice.
  - (2) Travel time will be rendered the same as Service Time Rates.
  - (3) Parts and materials supplied in connection with Field Service work will be priced in accordance with the Company's published Conditions of Sale and pricing policy.
  - (4) Any Equipment Rental in connection with Field Service work will be billed at cost.
  - (5) Any duties, visas or custom charges in connection with Field Service work will be billed at cost.

(6) Any credit for warranty materials will be identified on the TWMI Service Report Form, which should be acknowledged by the customer's signature each day.

(7) All rates are subject to appropriate taxes.





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## **ENCLOSURES**

There are two broad enclosure classifications:

**OPEN** and **TOTALLY ENCLOSED**. Each is divided into a number of specific types. The primary types are as follows:



Only those most frequently used will be discussed here.

## **Drip-proof Enclosures**

The NEMA definition for this type of enclosure is "a drip-proof machine is an open machine in which the ventilating openings are so constructed that successful operation is not interfered with when drops of liquid or solid particles strike or enter the enclosure at any angle from 0 to 15 degrees downward from the vertical." In the drip-proof motor, the cooling air is drawn into the motor from the outside and comes into direct contact with the winding, rotor, and all other internal parts of the motor. Therefore, the internal motor parts must be able to withstand any contaminants present in the atmosphere in which the motor is located.

The open drip-proof motor is designed to be an economical choice for most indoor applications where reasonably clean environments exist. As the name implies, this motor is adequately protected so that water dripping from overhead will not be drawn into the motor. The open drip-proof (ODP) should not, however, be used on applications where washdown with hoses is apt to occur or when driving rain, fog or snow will occur.

## **Totally Enclosed**

A totally enclosed motor is designed to prevent the free exchange of air between the inside and the outside of the motor housing, but not sufficiently tight to be termed airtight. When the motor is equipped with an integral fan that blows air over the exterior surface of the frame, the motor is classed as being TOTALLY ENCLOSED FAN-COOLED (TEFC). Without an externalcooling fan, the motor is classed as being TOTALLY ENCLOSED NON-VENTILATED (TENV).

## **Totally Enclosed Fan Cooled**

Cooling of TEFC motors takes place due to a continuous flow of air over the outside surface of the motor. The motor's surface is usually ribbed to obtain additional surface area for heat dissipation. The airflow is produced by a fan that is mounted on the shaft at the front of the motor. In order to provide power to drive this fan, the motor shaft is extended through the front of the motor and a suitable fan is mounted on this stub shaft. For protection and direction control of the airflow, a fan cover is installed over the fan. Fan covers are either fabricated with pressed steel or for severe duty applications constructed of cast-iron.



To prevent against damaging amounts of water, every standard TEFC motor is supplied with one or two drain holes in the lowest point of the motor frame. This hole can easily be closed with a tapped pipe plug. Advantage Plus and Optim® TEXP motors are supplied with automatic Breather/Drains as standard equipment. Such breathers allow the motor to drain any condensed moisture without allowing contaminants to be sucked into the motor during operation. Breather/Drains can be installed in any TECO-Westinghouse motor on frame sizes 140T or larger. Breather drains can also be installed or relocated to accommodate vertical mounting on any TECO-Westinghouse motor with the exception of Optim® TEXP due to restrictions with the certifications.

### **Space Heaters**

Space heaters can also be installed inside the motor enclosure to heat the inside air and maintain an internal temperature above the ambient dew point. This assures that cooling air will not condense and produce moisture inside the motor. Space heaters available for motors are the wrap-around type. Space heaters are rated for operation on 120V or 240V, 60 Hz, single phase power and are installed in the stator winding end-turns. Space heater leads can be terminated in the main conduit box or auxiliary box located off the main conduit box.

### **Rotating Shaft Seal**

Special protection is provided at the point where the motor shaft passes through the bearing housing in the form of an external flinger. This flinger keeps water, dust and other foreign matter out of the motor that might enter the motor along the shaft. All motors are furnished with a rotating neoprene flinger or machined metal labyrinth seal. INPRO/SEALS<sup>™</sup> are optional for Advantage Plus Motors. TEXP motors are furnished with shaft seals approved for hazardous locations as defined by CSA.

### Sealed Leads

Additional protection against moisture is provided by a neoprene seal through which each motor lead wire is brought out of the motor frame to the terminal box. This is a standard feature for all TECO-Westinghouse motors.



### **ENCLOSURES**

### **Explosion Proof Design**

The Standard explosion proof motor is to be used in all hazardous atmospheres listed under the following classifications:

**Class I**, **Group D**, gasoline, naptha, alcohols, acetone, lacquer solvent vapors and natural gas

**Class II**, **Group E**, metal dust including magnesium and aluminum or their commercial alloys

**Class II**, **Group F**, carbon black, coal or coke dust

**Class II**, **Group G**, flour, starch or grain dust

**Note:** Under Class 1 only, there are two divisions which allow some latitude on motor selection:

Generally, Class I, Division 1, locations are those in which the atmosphere is or may be hazardous under normal operating conditions. Included are the locations which can become hazardous during normal maintenance. An explosion-proof motor is mandatory for Division 1 locations.

Class I, Division 2, refers to locations where the atmosphere may become hazardous only under abnormal or unusual conditions (breaking of a pipe, for example). In general, motors in standard enclosures can be installed in Division 2 locations if the motor has no normally sparking parts. Thus, open or standard totally enclosed squirrel cage motors are acceptable, but motors with open slip rings or commutators (wound rotor, synchronous or DC) are not allowed unless the commutator or slip rings are in an explosion-proof enclosure. Optim<sup>®</sup> TEFC and Advantage Plus motors are approved for Class I, Division 2, Group B, C and D environments.

Explosion proof motors bear a label that is certified by Underwriters' Laboratories and CSA. This label can be applied only by a motor manufacturer, such as TECO-Westinghouse, whose facilities are under the constant supervision of Underwriters' Laboratories and CSA. Once a motor is disassembled in the field, the label no longer applies, unless the work is performed in a plant approved by Underwriters' Laboratories or CSA.

#### A Word of Caution

It is the user's responsibility to specify the atmosphere in the plant in which motors are to be applied. The user normally receives a classification from their insurance company as to the type of motor enclosure to be used where a hazardous atmosphere exists. If the user asks for recommendations, ask him to get a classification from his insurance company.

#### **Externally Ventilated Motors**

Occasionally, an external cooling system is used. This is necessary in case the motor's own fan will not provide sufficient cooling; such as on certain duty-cycle applications, planer drives, certain slow speed motors, etc. In other cases, the motor may be located in an extremely dirty atmosphere where it is desirable to connect the motor's air intake to a source of clean air by means of a duct. In either case, the air discharge can either be into the room directly from the motor, or it can be carried away from the motor through a pipe.

Motors with motor-mounted, separately driven blowers are usually called "force ventilated."

Motors ventilated from an external source are called "pipe ventilated." In this case, the air pressure can be supplied by an external blower, or an oversize fan can be used in the motor itself to draw air through the intake duct and force it through the motor.

### **Enclosures Summarized**

#### Drip-proof, for installation:

In non-hazardous atmospheres not containing abrasive or conducting dusts, high concentrations of chemical or oil vapors and/or where hosing down or severe splashing is not encountered.

#### Totally Enclosed Fan Cooled, for installation:

In non-hazardous atmospheres containing abrasive or conducting dusts, high concentrations of chemical or oil vapors and/or where hosing down or severe splashing is encountered.

#### Totally Enclosed Explosion Proof, for installation:

In hazardous atmospheres as defined by CANADIAN ELECTRICAL CODE (CEC) section 18.



**D -** 2

## ENCLOSURES

### **Frame Size**

Motor frame dimensions have been standardized with a uniform frame size numbering system developed by NEMA. The current standardized frames for integral horsepower induction motors range from 143T to 449T. These standards cover most motors in the range of 1 through 250 Horsepower.

The numbers used to designate frame sizes have specific meanings based on the physical size of the motor. The first two digits are related to the motor shaft height and the remaining digit or digits relate to the length of the motor.

The shaft height of horizontal motors can be calculated by dividing the first two digits of frame size by 4.

For example, a 256T frame motor would have a shaft height ("D") dimension of 25/4 = 6.25 inches. Similarly, a 444T frame motor would have a shaft height of 44/4 = 11 inches.

The third digit of the frame size is related to the length of the motor. There is no general rule of thumb that can be easily applied to determine the length of the motor.

It is important to note that when standard foot mounted motors have frame sizes that differ only in the third digit, the shaft diameters, shaft lengths and distance from the end of the shaft to the bolt holes in the feet on the shaft end of the motor will be the same. It is the motor length or distance from the drive end bolt-down holes to the "front" bolt-down holes that will vary.

## **Frame Suffix Letters**

When a motor is provided with special mounting dimensions, flanges or special shaft features, this is indicated by adding a suffix letter to its frame number.

#### FOR EXAMPLE:

A 254TS frame motor indicates that the motor has a shaft extension length and diameter different from that of a 254T frame motor.

The standard suffix letters and their meanings are as follows:

- D..... "D" flange mounting
- P & PH...... Vertical P or PH flange mounting
- T..... Standard shaft for belted service
- TS ...... Standard short shaft for coupled service
- Y..... Special mounting dimensions Z..... Special shaft extension

### **MECHANICAL CONSIDERATIONS**

#### **Motor Mounting**

#### **Installation Requirements**

The factors to consider in connection with the mounting requirements of the specific installation are:

#### First, how is the motor to be mounted?

There are two main categories:

- 1) Some type of base that will accommodate standard motor feet.
- 2) Installation in such a way that a special mounting flange is required on the motor.

#### Second, in what position is the motor to be mounted?

The possibilities include shaft: Horizontal Vertical At an angle

Third, is other equipment to be mounted on the motor?

This may include: Pumps Brakes Gears Zero-speed switches Tachometers

# Fourth, where is the conduit box to be located on the motor frame to best meet the needs of the installation's wiring arrangement?

Two points must be checked:

- 1) The position of the conduit box on the motor frame.
- 2) The position of the conduit opening.

#### **Conduit Box Location**

The standard location for the conduit box is on the right-hand side when facing the "front" of the motor.

#### **Definitions of "Front"**

There is still some confusion regarding which end of a motor is its "front." Since this is a frequently used term, it is important that everyone is consistent.

NEMA defines the "front" of a motor as the end opposite the shaft extension. ("When a motor has a flange, the flanged end is always considered to be the "rear").

The reason for this is that most motors are mounted with the shaft extension more or less hidden from view. Thus, the "front" is the end you normally see.



#### **Foot Mounting**

Most of the mounting problems encountered can be solved with one of the assembly combinations of a standard foot mounted motor. A thorough understanding of the basic components and how they can be positioned will result in a greater use of standard motors.

**The Frame** includes the mounting feet and forms the foundation for the complete assembly. It can be positioned with the feet in any plane . . . top, bottom or side.

The Conduit Box can be located on either side of the frame.

- F-1 = Conduit box on right-hand side of frame when facing "front" of motor.
- F-2 = Conduit box on left-hand side of frame when facing "front" of motor.

The conduit opening can be placed in any one of four positions by rotating the conduit box on its axis in 90° steps.

A standard motor can be adapted to any of these standard mounting methods. TECO-Westinghouse will provide motors configured as ordered, either F-1 or F-2. Price adders may apply.

#### **Angle Mounting**

Where the application requires the shaft to be at an angle to the horizontal, special attention must be paid to the motor bearings.

Grease-lubricated ball bearings are suitable for operation at any angle. However, motors equipped with sleeve bearings or slipring induction motors are limited to angle mounting that does not exceed 10° from the horizontal.

#### **Flange Mounting**

There are three basic types of flange mountings; each are designed to meet different installation requirements.

#### C-Flange

This type of flange is used with close-coupled pumps and similar applications where the mounting holes in the flange are threaded to receive bolts from the pump. Normally the "C" flange is used where a pump or similar item is to be overhung on the motor, which then must have feet.

#### D-Flange

When the motor is to be built-in as part of the machine, such as on machine tools, the "D" flange is usually selected. The mounting holes in this flange are not threaded. Bolts protrude through the flange from motor side. Normally, "D" flange motors are supplied without feet, since the "D" flange is generally used to mount the motor on the driven machine. The motor is lined up with the driven machine by tightening the bolts to press the machined surface and ring of the flange against corresponding surfaces.

#### P-Flange

The primary application of this flange is on such equipment as pumps and agitators where the motor is usually mounted in a vertical position on top of the equipment.

#### **Vertical Mounting**

When a horizontal motor is to be mounted in the vertical position special considerations must be made to ensure proper operation and motor life. The considerations are dependent on the motor shaft orientation.

#### 1. Shaft Down:

- Drain holes/breathers must be relocated to the lowest part of the motor and the original holes plugged. (Except TEXP Motors)
- Drip cover should be installed for outdoor applications, or if motor is exposed to overhead/spraying moisture
- \*NDE bearing must be locked with a shaft locknut 5000 frames and larger or if a Roller Bearing is installed on the DE.
- C-Flange motors to be mounted on a pump must have the DE BRG locked. The only axial movement will be the internal clearance of the bearing.
- \* Motor shall not be subject to additional axial loading from driven equipment.

#### 2. Shaft Up:

- Drain holes/breathers must be relocated to the lowest part of the motor and the original holes plugged. (Except TEXP Motors)
- If an inpro/seal is to be used it should be suitable for vertical use with no expulsion port.

## **Coupling Methods**

#### **Direct Drives**

Statistics show that only about one out of five machines operate at the same speed as its driving motor. When the motor is directly connected to the load, the application considerations are different than when some intermediate means is used to increase or decrease the speed.

Direct coupling of the motor to the load is practical if the load is to run at a standard motor speed. For these applications, specify "short shaft for coupled service."

#### **Belted Drives**

Gear-chain-drives and belt-drives are most commonly used to obtain speed reduction between motor and driven machine. In applying these drives to standard motors, two factors must be checked:

- 1. Effect on motor bearings.
- 2. Effect on motor shaft.

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Each of these drives will impose some strain on the bearings and shaft of the motor. The amount of strain in each case establishes the practical maximum values of horsepower and speed. The maximum values shown in Figure 7 have been established by NEMA to assure good bearing life and guard against excessive shaft stress in the application of V-belt drives to NEMA standardized frames.

Motor Frame	Synchronous Speed, RPM	Max. HP		
256T	3600	25		
445T	1800	200		
445T	1200	125		
445T	900	100		

Figure 7. Maximum Horsepower V-Belt Drives Recommended by NEMA for NEMA Standardized Frames

#### **Non-Standard Belt Applications**

A user may want to use a belt drive on a motor outside of the sizes listed in Figure 7. In such a situation, send all available information on the application to TECO-Westinghouse. This must include the following information:

- 1. Belt type (A, B, C, D, or E) and size
- 2. Number of belts
- 3. Sheave dimensions (pitch diameter, also face width and weight)
- 4. Direction of belt pull (whether up, down, or some other angle)
- 5. Centre Distance

There are several things that TWMI can do depending on the application:

- 1. In some cases, the standard motor may be suitable.
- 2. Engineers may be able to suggest some slight change in user's drive details to permit the use of a standard motor.

#### **Belt Tension**

All belt drives should include a means for adjusting belt tension. This may be a sliding base, slide rails or other device. The natural tendency of most operators is to run the belts too tight regardless of whether "V" belts or flat belts are being used. A good rule to remember is this – a belt that never slips is usually too tight. A properly applied belt will always slip slightly when starting under load. Tight belts shorten bearing life, and may cause vibration and shaft breakage.

Under certain conditions of excessive shaft stress, the shaft may rupture before the bearing fails.

This type of failure is usually encountered when a motor is applied to a belted load which exceeds the NEMA standard for its particular rating (See figure 7).

#### Bearings

#### **Ball Bearings**

All anti-friction bearings are rated on the basis of the fatigue life of the material. The "life" of a bearing is defined as the number of revolutions completed (or hours at some given speed) before the first evidence of fatigue develops.

This point is difficult to predict for an individual bearing. Therefore, statistical distribution is employed to predict bearing life on the basis of the performance of a group of bearings.

The "minimum" life of a group of identical ball bearings is defined as the number of revolutions (or hours) that 90% of the group of bearings will complete or exceed before the first evidence of fatigue develops. The "average" life is 5 times the minimum life.

Both of these factors are based on bearings running at their rated load. For loads above or below this point, bearing life varies inversely with the cube of the load:

$$\left(\frac{\text{Load}_{a}}{\text{Load}_{b}}\right)^{3} = \left(\frac{\text{Life}_{b}}{\text{Life}_{a}}\right)$$

Failure of ball bearings may be caused by:

- 1. Rough races caused by dirt ...one reason why doubleshielded sealed bearings are used is to minimize the possibility of introducing dirt into the bearings.
- 2. Metal flaking or cracking from balls or races ... caused by overloading.
- Worn or broken retainer ... caused by faulty lubrication or misalignment. We provide adequate lubrication and guard against misalignment by properly machining the parts.
- 4. Bearing jammed by hardened grease ... result of high temperature or contamination.

## **Using Speed-Torque Curves**

A great deal can be learned about torque from speed-torque curves. A typical speed-torque for an AC squirrel-cage motor is shown on the following page. Such a curve tells what kind of jobs a specific motor can handle.

This speed-torque curve is typical for a whole family of motors, but for this discussion assume it is for a 10HP, 1200 RPM AC squirrel-cage motor. Full-load torque is listed as 45 lb-ft (1).

In analyzing the solid-line motor curve, start at (2). This is the starting torque point which is one of the critical selection factors. The value is 150% of full-load torque, which of course, is 67-1/2 lb-ft for this specific motor.



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Now, moving up the curve, you see that the torque drops off a bit as the motor picks up speed, until about 20% synchronous speed is reached. At this point, the torque starts to increase and continues doing so until about 75% speed is reached (3). The motor has now reached the maximum, or breakdown, torque. The abscissa shows this point to be at 200% of full-load torque, which, when converted, equals 90 lb-ft. The speed is 900 RPM.

This is another critical selection factor, particularly where fluctuating loads are involved. No point in the duty cycle can exceed this torque value. If it does, it will stall the motor.

From here on, as the motor approaches synchronous speed, the torque decreases. At (4) the motor has reached full-load torque and is operating at full-load speed which is 1160 RPM. As would be expected, it is at this point that the rated horsepower is established.

The difference between the synchronous speed of the stator's rotating magnetic field and the speed of the rotor is termed "slip." With this motor, the slip is 40 RPM, or 3-1/3 percent.

It is fairly obvious that as long as the torque curve of the driven machine stays to the left of the motor speed-torque curve up to the full-load point, the motor will be able to handle the job. However, should any portion of the driven machine torque curve fall to the right of the motor speed-torque curve, then a different motor must be selected.

#### FOR EXAMPLE:

The dotted line, labeled (5), is the speed-torque curve for a loaded ball mill. The complete curve falls within the operating area of the motor.

The dash line, labeled (6), is the speed-torque curve for a loaded rolling mill. Here you see that the required starting torque falls beyond the capacity of this motor. Therefore, a different motor will have to be used.

The motor speed-torque curve shown here is that of a NEMA design B motor. As you know, there is a number of other NEMA designs for polyphase squirrel-cage motors, ... namely: A, C, D and F. Each design develops a different set of characteristics. Each design is intended for a different use.



## **SPEED-TORQUE CURVE - NEMA B**

#### Environment

The Environment Check List itemizes the problem areas. If the motor is exposed to any of these conditions, provisions must be made to protect the complete motor or its parts.

An understanding of the reasons for examining each of these problems will help determine which type of insulation is needed.

## **Environment Check List**

#### **Ambient Temperature**

Higher than 40°C (104° F) Lower than -40°C (-40° F)

Altitude

Above 3300 feet above sea level Mechanical Abuse Shock Vibration Contaminants Corrosive Agents Chemicals

Abrasive Agents Dust

Filings

Sand

**Blanketing Agents** 

Dust Lint

Snow

Moisture

High humidity Water

#### Form

Solid Liquid Gas

Method of Movement

Suspended in air Falling from above

Force directed

**High Ambient Temperature** primarily affects the insulation. It causes deterioration and accelerated aging. It also can reduce the viscosity of the greases in the bearings to the point where its lubrication value is impaired.

**Low Ambient Temperature** primarily affects lubrication. It can increase the viscosity of the grease in the bearings to the point where its lubrication value is impaired, especially during startup. Extreme low temperatures can cause materials to become brittle and prone to failure such as shaft breaks or cracked stator housings.

**High Altitude** where the thinner air has less cooling ability, causes excessive temperature rise in the motor.

**Shock and Vibration** mechanically abuse the complete motor causing breakage of mounting feet, frames, shafts and brackets, fatigue terminal connections, damage bearings and produce mechanical wear on insulation.

**Corrosive Agents** eat away at insulation and exposed metal parts (air-gap surfaces, bearings, and shaft)... eventually cause malfunction of these parts.

**Abrasive Agents** erode protective coatings as well as exposed surfaces, causing breakdown of insulation, score critical bearing surfaces.

**Blanketing Agents** deposit unwanted coatings on critical parts, clog air vents and passages and reduce heat dissipation. This points up the need for frequent inspection when the motor is located in contaminated atmospheres because current overload protection or ammeters on the control panel do not detect overheating of the motor caused by obstructed ventilation.

**Moisture** collects on critical parts, causes shorting of electrical components and corrodes exposed metal parts.

#### **High Ambient Temperature**

Since total temperature at the hottest spot and the insulation temperature capability are the governing factors, there are two approaches that can be taken.

 Use a higher class of insulation i.e. Class H in place of Class F. This would allow an extra 25°C to be utilized to offset the elevated ambient temperature. For example, a motor designed for a Class F insulation system but built with Class H insulation could theoretically operate satisfactorily in an ambient temperature of 65°C instead of 40°C. Consult your local TWMI representative for individual evaluation.

### PLEASE NOTE:

At elevated ambient temperatures, the type of bearings and the bearing lubricant would also have to be carefully analyzed.

2. Utilize the same insulation system but increase the motor frame size. This approach will lower the motors operating temperature rise thus making part of the temperature rise capability available to withstand the elevated ambient temperature. This is equivalent to oversizing the motor horsepower.

#### Low Ambient Temperature

1. -41°C to -50°C (-41°F to -58° F). Low temperature grease rated to minimum -50°C must be used to ensure adequate lubrication during startup and operation. Space Heaters are strongly recommended, especially for interment duty applications.

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2. Below -50°C (-58° F). Special consideration to the frame and shaft material must be made. Ductile cast iron will be used to increase tensile and yield strength, 4140 steel will be used for the shaft material. Appropriately rated low temperature grease must be used to ensure adequate lubrication during startup and operation. Space Heaters are strongly recommended, especially for interment duty applications. Consult your local TWMI representative for individual evaluation.

#### **Other Reasons for Using Higher Insulation Classes**

Occasionally it is desirable to use a higher class of insulation in order to put more horsepower into a particular frame size or to give the motor more capability to safely accelerate high inertia loads.

#### **High Elevation**

An additional factor that affects the motor's ability to dissipate heat is the density of the surrounding air. With higher air density, more heat can be transferred. Generally the density of air at a specific location is very constant, but air density does vary with elevation; thus, when motors are installed at locations where the elevation is substantially above sea level, consideration must be given to this factor.

Standard motors will operate successfully within their normal temperature rating at elevations up to 1000 meters (3300 ft) above sea level. When motors are to be operated above this altitude, the motor design should be checked for its suitability at the required elevation. Contact your local TWMI Representative for evaluation. When required, motor design can be modified to make them suitable for high elevation operation.

ALTITUDE (FEET)	HP DERATING FACTOR			
3,300 – 5,000	0.97			
5,001 – 6,600	0.94			
6,601 – 8,300	0.90			
8,301 – 9,900	0.86			
9,901 – 11,500	0.82			

## **MOTOR DESIGNS**

### **Horsepower Formula**

There are four conditions that define a motor's performance characteristics:

Horsepower Torque Speed Temperature Rise

## **MOTOR DESIGNS**

Each is a value unto itself, but each combines with the others to produce a total result. A basic understanding of these values, individually and collectively, is necessary before any real proficiency in the application of motors can be attained. Horsepower is the term used to define the rated size or power capability of the motor and is expressed:

HP = (Torque x RPM) / 5250

From this formula it is easy to see the relationship between Torque, Speed and Horsepower. Due to the fact that motors are rotating machines, the force the motor produces to do work is expressed as Torque (discussed in detail later). Keeping this Horsepower formula in mind, Torque can be expressed as:

#### Torque = (5250 x HP) /RPM

It is this relationship between Horsepower, Torque and Speed that must be understood before you can safely evaluate the proper motor for any given application. Most motor applications have very specific load requirements which require certain Torque, Horsepower and Speed. The sales engineer can evaluate what size motor or what Horsepower motor will produce the Torque required to drive the load at specified speeds. For example, using the same Horsepower formula, the motor's Speed (RPM) can be expressed as:

 $RPM = (5250 \times HP) / Torque$ 

If you need to know how much Torque a 200 Horsepower, 1784 RPM (4 Pole) motor can produce at full load (normal rated conditions) you would perform this calculation:

Torque = (5250 x 200HP) / 1784 RPM Torque = 588 lb-ft

To illustrate the relationship of Speed and Torque further, we will use the same 200HP rating but change the speed to 1185 RPM (6 Pole):

Torque = (5250 x 200HP) / 1185 RPM Torque = 886 lb-ft

In this example it is easy to see that a slower 6 Pole motor can produce significantly more torque that a faster 4 Pole motor of the same Horsepower rating.

Now lets consider a customer that requires a motor that can produce 875 Lb-ft of Torque but at a Speed of 3600 RPM (2 Pole). We know from the previous example that a 200HP motor running at 1200 RPM (6 Pole) speed can produce 886 Lb-ft of Torque but, what size or Horsepower motor will produce this Torque at the faster speed of 3600 RPM?

HP = (886 lb-ft x 3600 RPM) / 5250 HP = 607.5 HP

This is a substantially larger and more expensive motor than the 200HP motor.



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## **MOTOR DESIGNS**

### **Torque Terminology**

Torque and force are sort of blood brothers. The term "Force" is used when dealing in linear motion, and the term "Torque" when dealing in rotary motion.

Torque is a product of force (pounds) times radius (feet). Thus the value is expressed in "pound-feet" which indicates "X" the number of pounds at a one-foot radius (or any combination of radius and force whose product equals "X").

Torque is used two ways. In the case of a piece of machinery, torque indicates the rotational force required to drive the machine. In the case of a motor, torque indicates the rotational force that the motor can produce.

The typical AC induction motor speed-torque curve shown below illustrates some of the various types of torque with which you will be dealing.

"Starting Torque" is the torque developed at the instant the motor is started. In essence, the rotor is stationary, but only for a moment. The arrow at (1) shows starting torque. Starting torque is also called "locked-rotor torque" or "breakaway torque".

The next term, **"pull-up torque"** (also called **"minimum torque"**) is shown at (2). This is the minimum torque developed in the "cusp" area just above starting torque. It should be noted that many motors do not develop this cusp characteristic.

**"Breakdown torque"** is the maximum torque that the motor can develop without stalling. This is shown by the arrow at (3) as being the maximum value reached by the torque curve. This characteristic is sometimes called **"pull-out torque"**.

**"Full-load torque"** is the torque that the motor develops in producing rated horsepower at rated full-load speed, as shown at (4). You might think of this as **"rated torque"**.

"Accelerating torque" is the "plus" torque developed by the motor that is beyond the torque required by the load at any given speed. It is shown by the shaded area between the motor-torque curve and the load-torque curve at (5).



## TORQUE TERMINOLOGY

### **MOTOR DESIGNS**

### NEMA Designs A, B, C

It is important to understand the characteristics of each of these NEMA designs. In most cases you will use the standard NEMA B design. However, there will be times when an A, C, D or F design will handle the job better.

About the best way to become familiar with these characteristics is to analyze the speed-torque curves for each of the NEMA designs.

The graph shown below shows the speed-torque curves for NEMA designs A, B and C. Curve B is dotted because it was discussed on the previous page. Curve A is dotted because its characteristics are much like those of curve B. As you will note, design A has a slightly higher breakdown torque than design B.

Designs A and B are similar in basic characteristics. The difference lies in the fact that starting currents for design B motors are limited by NEMA standards. There is no limitation on starting current for design A.

As shown by the solid-line curve, a NEMA design C motor has a higher starting torque than either the A or B design. This torque is about 225% which, in the case of the 10HP example, is 101 lb-ft. Breakdown torque, on the other hand, is lower than that for either A or B. Although there is no definite point for breakdown torque, its value is established at about 190% (10HP example – 85 <sup>1</sup>/<sub>2</sub> lb-ft).

Full-load torque is the same as that for both A and B.

The curve (1) is the same loaded rolling mill speed-torque curve shown below . Here you see that a design C motor can handle this load because of its higher starting torque. In keeping with the basic speed-torque rule, all parts of the load curve fall to the left of the motor curve.

NEMA C motors have a double-deck rotor in which the upper deck consists of a small, high-resistance winding. This upper deck would be subject to severe heating during prolonged accelerations. For this reason, design C motors should not be used on applications requiring frequent accelerations or involving high inertia loads. The best feature of this design is its high starting and accelerating torque.



## **MOTOR DESIGNS**

### **NEMA Design D**

The solid-line curve in the following figure shows the characteristic of a NEMA design D motor. This design produces a very high starting torque (1) which is approximately 275% of full-load torque. However, it has no true breakdown torque, as evidenced by the fact that torque continues to decrease all the way up the speed ladder.

Another somewhat unusual characteristic of this motor is its high slip at full-load torque (2). The particular curve is that of a design D motor having a slip of 10%. However, design D motors with other values of slip are made. Two different designs have been standardized...one is the 5 to 8% slip motor, and the other is the 8 to 13% slip motor. Special designs can be made with slip values up to as much as 20%.

The characteristics of this design are useful in meeting the needs of two broad application categories. First, the high starting torque equips this motor to handle hard-to-start loads, particularly of the pulsating type. Second, the sloping speedtorque curve fits this motor for application where it is desirable to have the motor slow down during periods of peak load so that flywheel energy of the load can be released. Typical applications include press brakes and punch presses. As soon as the peak load has passed, the motor brings the flywheel back up to speed in preparation for the next peak.

#### FOR EXAMPLE:

A 120-ton, 6 inch stroke straight press is being used to punch <sup>1</sup>/<sub>2</sub> inch thick discs. The stroke length and the thickness of the metal being cut indicate that this press is doing the work only 17° of flywheel.

100 90 (2) ദ 80 SYNCHRONOUS SPEED - Percent ١ ۱ 70 1 60 50 Ċ Ò Ø 40 30 1 20 T L ١ 10 ۱ 1 0 25 50 75 100 125 150 175 200 225 250 300 275 0 **TORQUE - Percent of Full Load** 

### **SPEED-TORQUE CURVE - NEMA D**

In order to average out the load, a heavy flywheel is used to store energy from the motor during 343° of travel, and to give up this energy during the 17° working portion of the cycle.

Energy is removed from the flywheel by deceleration.... 10% slowdown is a typical value. In the example, the average horsepower required is 40. Consider what will happen in one case where a 40HP, NEMA B motor is used; and in the other case where a 40HP, NEMA D is used.

At point (3) on the accompanying graph, the NEMA B motor is running at 90% of synchronous speed (10% slowdown) and 165% of full-load torque (65% overload). However, note that the NEMA D motor is running at just about full load (at 10% slowdown).

Actually, a NEMA B motor would never let the flywheel slow down to 90% synchronous speed, because of the great increase in torque. The NEMA B motor will try to force the flywheel to run at a much higher speed, thus overloading the motor and preventing the flywheel from giving up a large portion of the usable kinetic energy it has stored.

The advantage then, of the high-slip NEMA D motor is its ability to "roll with the punches" on flywheel applications.



### **MOTOR DESIGNS**

## **NEMA Design F**

The speed-torque curve of a NEMA design F motor shows that this motor has a very low starting torque and only a moderate breakdown torque. However, this motor has one desirable characteristic...a low inrush current is required for starting. It is understandable why the applications of design F are limited. In general, these motors are used only for easy-to-start loads where low starting currents are required and low torque are acceptable. Because of its limited overload capacity, this motor must be matched to the load very carefully. Typical applications include fans and centrifugal pumps.

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### **SPEED-TORQUE CURVE - NEMA F**

## **POWER SUPPLY**

#### **Comparison of NEMA Design Characteristics**

The foregoing discussion of speed-torque curves emphasizes the fact that the five basic NEMA designs vary from one another to two important points...

STARTING TORQUE and BREAKDOWN TORQUE. An over-all picture of the relationship of these values is shown below.

#### How NEMA Speed-Torque Characteristics Are Classified

#### **NEMA DESIGN A**

Starting Torque NORMAL - Starting Current NORMAL Breakdown Torque HIGH - Full-load slip LOW

#### **NEMA DESIGN B**

Starting Torque NORMAL – Starting Current LOW Breakdown Torque MEDIUM – Full-load slip LOW

#### NEMA DESIGN C

Starting Torque HIGH – Starting Current LOW Breakdown Torque NORMAL – Full-Ioad Slip LOW

#### **NEMA DESIGN D**

Starting Torque VERY HIGH – Starting Current LOW Full-Load Slip HIGH

#### **NEMA DESIGN F**

Starting Torque LOW – Starting Current VERY LOW Breakdown Torque VERY LOW

### **Full Load Current**

As the torque on a motor increases, the line current (amperage) increases. The electrical wiring and controls providing power to the motor must be adequately sized to handle the maximum sustained current that the motor requires when it is fully loaded.

Thus, the electrician installing the motor must use the nameplate "Full Load Current" data to correctly size the power supply wiring and starter for the motor. In addition, once the motor has been put into service, line amperage can be utilized to determine if the motor is being overloaded. It is important to note that the motors line current and operating temperature will increase when it is subjected to either undervoltage or overvoltage.

### Voltage

In most industrial plants the power supply usually found for the average size polyphase motor is 460 or 575 volts, 3 phase, 60 Hz and the majority of T-Frame motors sold fall in this voltage and frequency class.

In many large cities where 120/208 volt networks are employed, commercial and small industrial loads are usually 200 volt, 3 phase, 60 Hz. All Optim<sup>®</sup> motors up to 125 Horsepower are usable on 208 volt networks however, motor torque, current and efficiencies will be greatly effected.

Motors for 2300V/4160V can be furnished on motor frames 444T and larger. Usually, because of the cost of starting equipment for this higher voltage, 2300V/4160V motors are rarely used below 150 Horsepower. Global Series motors rated for 2300V/4160V are available from 100 to 1250 Horsepower (Contact your local TECO-Westinghouse Representative for more information).

## Locked Rotor kVA Code Letter

When AC motors are started with full voltage applied (across-the-line starting), they draw line currents substantially greater than their full load running current. The magnitude of the "Inrush Current" is a function of motor Horsepower and the design characteristics of the motor. In order to define the inrush characteristics and present them in a simplified form, a series of code letters have been established. These code letters group motors depending on the range of inrush values and express the inrush current in terms of kVA (Kilovolt Amperes).

By using the kVA basis, a single letter can be used to define both the low voltage and high voltage inrush values on dual voltage motors.

The code letter designations and their values appear in the following table:

#### kVA/HORSEPOWER CODES

CODE	kVA/HP	MID-VALUE
А	0.00 – 3.14	1.6
В	3.15 – 3.54	3.3
C	3.55 – 3.99	3.8
D	4.00 - 4.49	4.3
E	4.50 – 4.99	4.7
F	5.00 – 5.59	5.3
G	5.60 - 6.29	5.9
Н	6.30 – 7.09	6.7
J	7.10 – 7.99	7.5
К	8.00 - 8.99	8.5
L	9.00 – 9.99	9.5
Μ	10.00 – 11.19	10.6
Ν	11.20 – 12.49	11.8
Р	12.50 – 13.99	13.2
R	14.00 – 15.99	15.0



## **POWER SUPPLY**

To determine the across the line starting inrush amperes from the code letter designation, the code letter value, horsepower, and rated operating voltage are inserted in the following equation.

Locked Rotor Amps =  $\frac{((\text{code letter value}) \times \text{HP} \times 577)}{\text{Rated Voltage}}$ 

The simplified equations will give approximate results.

200 Volts:	L R A = Code letter value x HP x 2.9
230 Volts:	L R A = Code letter value x HP x 2.5
460 Volts:	L R A = Code letter value x HP x 1.25
575 Volts:	L R A = Code letter value x HP x 1.00

The Performance data table gives the kVA/HP code letter for each rating. Generally, standard motors of 15HP or larger, will have code letters for G, or lower, 10HP and smaller will have code letters of H, or higher.

## **Rated Frequency and Number of Phases**

This indicates the frequency for which the motor is designed in Hertz (cycles per second). Hertz is normally abbreviated Hz. 60 Hertz power is utilized throughout the United States and Canada. 60 Hertz is also in a few foreign countries where there has been a strong American influence, however, 50 Hertz is the dominant system frequency in the majority of foreign countries. When motors are supplied for export shipments, it is vitally important to double check the required voltage and frequency.

In most industrial and commercial installations, the power systems, and consequently the induction motors, will either be single phase or three phase. The simplicity of the 3 phase induction motor makes it the natural choice for all requirements where 3 phase power is available. Single phase motors may be used on fractional horsepower requirements (less than 1HP) and in applications such as agricultural installations where 3 phase power is not available.

## **50 Cycle Motors**

While it is best to have a motor specifically designed for 50 Hz power systems, it is possible to use 60 Hz rated motors with 50 Hz power supply provided the following conditions are satisfied:

 In order for the motor to operate safely within thermal limits and generate sufficient output, it is important that balanced frequency and voltage power is supplied to the motor. Therefore, a motor designed for 460 volt, 60 Hz, is normally operated on the following voltage for 50 Hz power:

60 Hz / 460 V = 50 Hz / Preferred Voltage Preferred Voltage = (50 Hz x 460 V) / 60 Hz Preferred Voltage = 383 V or 380 volts

 The rated performance of a motor will change when operated on 50 Hz power. Horsepower output will be approximately 50 Hz / 60 Hz = 83% of its rated value at 60 Hz. Therefore, a motor rated 100HP at 60 Hz is normally rated for 83HP when operated on 50 Hz power. The conservative design of many TECO-Westinghouse motors allows for 50 Hz operation without HP de-rating. Contact your local TECO-Westinghouse representative for more details.

 Torque, current and efficiency values will also be different for motors when operated on 50 Hz power. Contact your local TECO-Westinghouse representative for these values when using a motor with 50 Hz power.

## **Service Factor**

A horsepower rating does not necessarily indicate a motor's *maximum* capacity. This is where "service factor" enters the picture. Service factor is a multiplier that indicates how much the motor may be safely overloaded.

The service factor is applied simply by multiplying it times the rated horsepower. The result is the maximum horsepower at which the motor may be operated.

It is important to remember that the value obtained by applying a service factor is valid only if usual service conditions, rated voltage and rated frequency are maintained. Also, it should be noted that the resultant overloaded state will increase the temperature rise and may affect the motor's efficiency, power factor and speed. The resulted increase in temperature rise can drastically reduce motor life, for every 10°C increase in motor temperature the expected life of the motor winding is cut in half.

Example of how service factor is applied:

SQUIRREL-CAGE, TEFC, 40°C

	10	rated horsepower
Х	1.15	service factor
	11.5	overloaded capacity (HP)

CHANGE IN TORQUE AND SPEED (1800 RPM Motor)

$$\frac{30.1 \times 1745}{5250} = 10 \text{ HP}$$
$$\frac{35 \times 1728}{5250} = 11^{1/2} \text{ HP}$$

Actually, a service factor is an indication of a motor's safe internal operating temperature. When a horsepower rating is established for a specific motor design and size, it is based on two factors: (1) the total power that the motor can produce, and (2) the amount of internal heat that the motor insulation can withstand.

The internal heat factor usually dictates a rating below the motor's momentary power output capacity. In addition, a margin of safety is often applied to the internal heat factor. It is this margin of safety that makes the service factor possible.



## **MOTOR EFFICIENCY**

### **Motor Efficiency**

A perfect motor would be a motor that could convert electrical power to mechanical power with 100% efficiency. Expressed mathematically, the perfect motor would convert 746 watts of electrical power to one horsepower of mechanical output power.

Real motors are not able to achieve this ideal goal, however, the larger a motor becomes, the closer it will come to approaching 100% efficiency. In most cases the efficiency of a motor is approximately constant, when operated at <sup>1</sup>/<sub>2</sub> or more of its full load torque rating.

The motor's losses or energy that is not converted into mechanical power turns into heat within the motor frame. This heat must be transferred out of the motor via the cooling medium (see the section on Enclosures for more detail).

A motor's efficiency is expressed as:

Efficiency = 
$$\frac{\text{Output KW}}{(\text{Output KW + Losses})}$$
  
Losses = Output x  $\left(\frac{1}{\text{Efficiency - 1}}\right)$ 

Premium Efficiency motors are specifically designed for low losses and to be highly efficient. This is important to industrial plants which operate large numbers of electrical motors which utilize great amounts of electrical power. Although Premium Efficiency motors are more expensive than the average motor, they pay for themselves over long periods of time with the money saved on utility bills. The following page provides an example of how TECO-Westinghouse Premium Efficiency Optim<sup>®</sup> TEFC motors can save the customer money.

## TECO-Westinghouse Motors (Canada) Inc. Energy Saving Example

This example compares two 100HP, 1800 RPM, 460 Volt, TEFC, 1.15 Service Factor Motors.

#### **Required Information:**

Efficiency of Competition's Motor	94.0%
Efficiency of TWMI's Motor	94.6%
Price of Competition's Motor	\$2,718.00
Price of TWMI's Optim® TEFC Motor	\$3,087.00
Energy Cost per Kilowatt (KW) Hour	\$0.06
Days of Motor Operation Per Year	340
Hours of Motor Operation per Day	24
Kilowatt (KW) Rating of Motors (0.746 x HP)	74.6

#### Payback Analysis

Competitor Motor's Yearly Energy Cost

\$38,855	=	<u>74.6 KW</u> 0.94 Eff. →	Х	24 Hours Day	х	340 Days Year	х	\$0.06 per KW Hour
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TWMI Motor's Yearly Energy Cost

\$38.609	=	74.6 KW 🗸	24 Hours	v	340 Days	v	\$0.06 per KW Hou
<i><b>J</b></i> <b>JU</b> ,007	-	0.946 Eff. ^	Day	^	Year	^	50.00 per KW Hour

#### Savings

	\$246.00	Por Voor	\$260
TWMI	-\$38,609	Yearly Energy Cost	-\$3,087 Motor Price
COMPETITOR	\$38,855	Yearly Energy Cost	\$2,718 Motor Price

#### **Pay Back Period**

In this example, a high quality, energy efficient Optim<sup>®</sup> motor that costs a full 12% more than the competition's is in the long run a much less expensive motor to own and operate.

### **STARTING METHODS**

## **Starting Methods for Squirrel Cage Motors**

All of our AC motors are designed and built to withstand full-voltage starting.

However, there may be conditions which would dictate the use of reduced voltage starting. They are:

- 1. kVA inrush limitations imposed by the power company
- 2. Mechanical shock to driven equipment
- 3. Excessive voltage drip and its effect on adjacent equipment

In many countries, the star-delta system of starting is employed. Here, the control first connects the motor windings in star for starting and after the motor is up to speed, connects the winding delta for running. By starting with the windings connected star, the inrush is reduced by 57% of what it would be had the motor been started delta connected. The starting torque and pullout torque are reduced to 34% of the normal values so that this method of starting is limited mostly to machines started unloaded.

When reduced voltage starting is desired for squirrel cage motors having normal windings, there are three types of controls:

- 1. Auto-transformer
- 2. Resistor
- 3. Reactor



(CANADA)

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## **STARTING METHODS**

## Auto-Transformer

An auto-transformer starter is essentially a transformer with a step-down tap plus a switching device that connects the motor to the transformer for starting and directly to the line for running. The transformer taps are normally supplied for values of 50%, 65% or 80% of the line voltage. Starting torque varies as the square of motor terminal voltage. The values for the three standard taps are as follows:

Auto-transformer Tap % Line Voltage	Starting Current % Normal	Starting Torque % Normal
50%	25%	25%
65%	42%	42%
80%	64%	64%

## Resistor

This method utilizes a resistor in series with each phase of the motor, to reduce line current for starting. The resistors are short-circuited when full speed is reached. If a high value resistor is short-circuited in increments, it is possible to increase the line current gradually until a value is reached that is adequate to start the load.

## Reactor

Reactor starting is not as common as resistor or autotransformer starting, but there are occasions when it can be used to good advantage. The method is very similar to the resistor method, except that series reactors are used instead of resistors. Short-circuiting the reactor for running is similar although step short-circuiting is not generally feasible. This method of starting is more commonly used with higher voltage motors 2300 volts and above.

Reactors are also used as inductive devices to filter unwanted harmonics and voltage spikes generated by variable frequency drives.

## **Effect of Reduced Voltage Starting**

The starting torques discussed so far are those values obtained when full voltage (across-the-line) starting is used. However, there are cases where the current required for full-voltage starting cannot be permitted, and thus reduced-voltage starting must be used to limit the starting current. In as much as torque varies as the square of the applied voltage, the values of starting torque will decrease when reduced-voltage starting is used. An indication of the result is shown on the following page. The table at the top lists typical values of voltage, current and torque obtained with some of the most common methods of reduced-voltage starting.

As indicated, the values shown in this table are the percent of the corresponding value that would be obtained if full-voltage starting were used. Take the case of the auto-transformer. If an 80% voltage starting current, and the starting torque would be 64% of the full-voltage starting torque.

For the moment, the main consideration is the last column.... percent of full-voltage torque. This shows that with resistor, reactor or auto-transformer starting, the starting torque varies as the square of the motor terminal voltage. With part-winding starting, the starting torque varies directly as the portion of the winding that is used for starting. With star-delta starting, the starting torque is always 33% of the full-voltage starting torque.

The resulting starting-torque values, based on the data in the table, are plotted on the speed-torque curve at the bottom of the page. The full-voltage curve is that of a NEMA design B motor. Other NEMA designs would, of course, produce other reduced-voltage curves. It should be remembered that the reduced-voltage curves apply only during the starting period. As soon as full voltage is applied, the motor characteristics then revert to the full-voltage values.



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## **STARTING METHODS**

## **REDUCED - VOLTAGE SPEED - TORQUE CURVES**

	PERCENTAGE OF FULL VOLTAGE		
	Voltage	Current	Torque
RESISTOR	80%	80%	64%
REACTOR	80%	80%	64%
PART WINDING	-	65%	100%
AUTO TRANSFORMER	80%	64%	64%
STAR-DELTA	57%	57%	33%



**TORQUE** - Percent of Full Load



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# VFD DRIVEN MOTOR APPLICATIONS

# **Variable Speed Applications**

A variable frequency drive allows a customer to change the motor's operating speed by changing the frequency (Hz) of the power supplied to the motor. While this is convenient for the customer, it causes several problems for the motor and special consideration must be given to the motor's ability to operate on various frequencies.

- Motors operated below their approved turn down ratio do not move enough air to adequately cool the motor. This will cause the motor to run hot and decrease the motor's life.
- Motors operated above 60Hz will experience decreased torque output. Additionally, care must be taken to ensure the motor, and all mechanical devices driven by the motor, are able to withstand these higher RPMs. Please contact your TECO-Westinghouse representative for the maximum safe operating RPM of your motor.

# **Effects of Harmonics on Induction Motors**

Power supplied by (PWM) variable frequency drives contain harmonic content in the electrical waveforms they generate at various frequencies. The harmonic content and non-sinusoidal waveforms generated by the drive can cause the following problems:

- High harmonics in the waveform increase the motor's "hot-spot" causing the motor to run hotter than it would under normal conditions.
- Voltage spikes at the motor terminals resulting from harmonics & reflective wave can exceed the rated peak voltage of the motor winding. The magnitude of the voltage spike and rise time is a function of the inverter switching speed (carrier frequency).
- Harmonic frequencies generated by the VFD could excite resonance in the motor frame resulting in increased noise and vibration levels.
- Corona effect causing partial discharge on the motor windings leading to insulation breakdown.
- Capacitive discharge from the motor shaft to ground causing pitting of the bearings leading to bearing failure.

# **Motor Insulation System & Supply Voltage**

The motor insulation system for VFD approved TECO-Westinghouse motors is based on and exceeds NEMA Standards. As defined in NEMA MG-1 Part 31.4.4.2 the insulation system must be capable of withstanding voltage spikes of 3.1 x rated line-to-line voltage for motors rated  $\leq 600V$  and 2.04 x rated line-to-line voltage for motors rated  $\geq 600V$  with a rise time of  $\geq 0.1 \mu s$ . TECO-Westinghouse motors rated  $\leq 600V$  have been designed to withstand voltage spikes up to 2000V with a rise time of  $\geq 0.1 \mu s$ .

Voltage spikes and rise time should be measured at the motor terminals and should not exceed the above given values.

# Cable Length & Type

Cable length and type connecting the motor and drive have a significant influence on the peak voltages occurring at the motor terminals.

#### Cable Length

The following conditions should be met when installing TECO-Westinghouse motors on an inverter:

VOLTAGE CLASS	NO FILTERS	LOAD REACTOR AT VFD RECOMMENDED	DV/DT FILTER RECOMMENDED	SINE-WAVE FILTER RECOMMENDED
≤480V (LV)	<100 ft.	100 - 1000 ft.	1001 - 2000 ft.	2001 - 3000 ft.
>480V - 690V (LV)	<35 ft.	36 - 300 ft.	301 - 2000 ft.	2001 - 3000 ft.

**Note:** Extended cable lengths and greater motor protection can also be realized through the use of solid state surge protection devices. Some configurations may yield a greater cable length protection then those specified.

Although filters may not be required at some cable lengths, they are always recommended to better protect both the motor and VFD.

Please contact TECO-Westinghouse for application specific recommendations.

#### Cable Type

VFD approved shielded cable is recommended to minimize the effects of reflected wave, provide a proper grounding path attributing to a balanced and low reference potential and reduce the commode mode voltage.



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# **VFD DRIVEN MOTOR APPLICATIONS**

# **Motor Shaft Voltages & Bearing Currents**

Shaft voltages and resulting circulating currents caused by magnetic dissymmetry's in the construction of larger motors, typically 5000 frames and larger, can be increased by the effects of high frequency components present in the voltage supplied by PWM inverters. The path of these induced currents is through the bearings and motor frame and can be prevented by insulating one of the bearings, preferably the non-drive end bearing, to avoid creating a loop through the driven equipment.

Common mode voltages imposed on the rotor by capacitive coupling between the rotor and stator can result in discharge through one or both bearings to ground; therefore insulating both bearings is required to prevent current flow. Shaft grounding brushes may also be used to divert current around the bearings and to prevent the current from damaging the driven equipment.

Electrical discharge through the bearings causes an electric discharge machining (EDM) effect, resulting in pitting of the bearing's rolling elements and raceways. Eventually this will lead to bearing failure and leaves a distinct pattern in the bearing race called "fluting".

The following conditions should be met when installing TECO-Westinghouse motors on a VFD:

FRAME SIZE	SHAFT GROUND BRUSH / RING	INSULATED NDE BEARING	INSULATED DE BEARING	
≤ 400T	Recommended	-	-	
440T	Recommended	Recommended	-	
≥ 5000	Recommended	Recommended	Recommended	

**Note:** It is not advisable to use shaft ground brushes on both ends as this will provide a path for circulating currents.

An alternate method of reducing damaging shaft currents is with the use of dV/dt or Sine-wave filters on the output of the VFD.

# **VFD Carrier Frequency Settings**

High switching frequencies increase the rate of current discharge through the bearings and increase the rate of insulation breakdown in the motor windings. The carrier frequency should be set between 2 kHz and 5 kHz.

# **VFD Application in Hazardous Locations**

Motors operated on VFD power in hazardous areas require special consideration; please contact TWMI for filtration and bearing protection options suitable for use in these applications.



## INSULATION

#### **Insulation Types and Temperature Rise**

#### **Functions of Motor Insulation**

Motor insulation has two basic functions:

- 1. It separates the various electrical components from one another.
- 2. It protects itself and the electrical components from attack of contaminants and other destructive forces.

To best perform these functions, five specialized elements are used, which together constitute the INSULATION SYSTEM. The following are typical in an AC motor:

- 1. TURN-TO-TURN INSULATION between separate wires in each coil. (Usually enamel on random-wound coils of smaller motors tape on "form-wound" coils or larger motors).
- 2. PHASE-TO-PHASE GROUND INSULATION between adjacent coils in different phase groups. (A separate sheet material on smaller motors not required on form-wound coils because the tape also performs this function).
- 3. PHASE-TO-GROUND INSULATION between windings as a whole and the "ground" or metal parts of the motor. (A sheet material, such as the liner used in stator slots, provides both dielectric and mechanical protection.)
- 4. SLOT WEDGE to hold conductors firmly in the slot.
- 5. IMPREGNATION to bind all other components together and fill in the air spaces. (A total impregnation, applied in a fluid form and hardened, provides protection against contaminants).

#### **CROSS SECTION OF STATOR COILS AND INSULATION**



#### 1. Turn-to-Turn Insulation:

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A coil consists of a number of turns of round copper magnet wire. These turns of wire are insulated from each other using a 200°C rated polyester enamel.

#### 2. Phase Insulation:

The various coils in a motor are connected together in the three phases. The coils in one phase must be insulated from the coils in another phase. TECO-Westinghouse uses a sheet of either Dacron Glass Cloth or DMD (Dacron Mylar Dacron) between the coils of the different phases.

#### 3. Ground Insulation:

The winding must be insulated from the stator iron in the motor. An insulation barrier (slot liner) of DMD (Dacron Mylar Dacron) is placed in the slot.

#### 4. Slot Wedges:

The wedges are made of DMD and hold the conductors firmly in the slot.

#### 5. Varnish:

The complete winding is given a non hydroscopic polyester varnish immersion and oven cure to bond the above materials together as well as the individual turns in the coil. This gives a good protective seal against moisture and contaminants. All motors receive two immersions and oven cure cycles. The bake-cycle is from 3 to 17 hours depending on the size.

#### **Insulation Types and Temperature Rise**

One of the most critical items relating to the life of any type of electrical equipment ranging from television sets to giant power generators is the maximum temperature that occurs at the hottest point within the unit and the length of time that the high temperature is allowed to exist.

To draw an analogy: The aging process in human beings is to a large extent determined by **years** and **stress**. Accidents, natural disasters, diseases and other illnesses can intervene to shorten an individual's life expectancy in the same way that lack of proper maintenance, overloads, moisture, chemical fumes, low and high voltages can shorten motor life.

Similarly, basic motor insulation life, when not complicated by these factors, is determined by *time* (age) and *temperature* (stress).

The *maximum allowable* safe operating temperature occurring at the hottest spot within a motor is determined by:

- 1. The temperature of the air surrounding the motor. This is the ambient temperature.
- 2. The heat created within the motor due to its operation at a fully loaded condition. This is the *temperature rise*.
- 3. The *thermal capability* of all the insulation materials used within the motor. For simplicity these materials have been broken into classes *A*, *B*, *F* and *H*.



### INSULATION

The four basic insulation classes and their IEEE ratings are as follows:

HOT-SPOT TEMPERATURES
105°C
130°C
155°C
180°C

These four classes have been standardized by NEMA.

Most AC motors now use Class F insulation, but in the past, Class B has been the most common. IEEE (Institute of Electrical and Engineering and Electronics Engineers) definitions for these four classes are as follows:

- CLASS A: Materials or combinations of materials such as cotton, silk and paper when suitably impregnated or coated, or when immersed in a dielectric liquid such as oil. Other materials or combinations of materials may be included in this class if by experience or accepted tests the total system can be shown to be capable of operation at 105°C.
- CLASS B: Materials or combinations of materials such as mica, glass fiber, polyesters and aramid laminates, etc., with suitable bonding substances. Other materials or combinations of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests the total system can be shown to be capable of operation at 130°C.
- CLASS F: Materials or combinations of materials such as mica, glass fiber, polyesters and aramid laminates, etc., with suitable bonding substances. Other materials or combinations of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests the total system can be shown to be capable of operation at 155°C. All TECO-Westinghouse motors use Class F insulationas standard.
- CLASS H: Materials or combinations of materials such as silicone elastomer, mica, glass fiber, polyester's and aramid laminates, etc., with suitable bonding substances such as appropriate silicone resins. Other materials or combinations of materials may be included in this class if by experience or accepted tests the total system can be shown to be capable of operation at 180°C.

#### **Service Factor**

Service Factor is a percentage multiplier applied to the nameplate horsepower to obtain the continuous overload capacity of the motor.

Thus, a standard TEFC 10HP, Class F insulated motor could carry continuously 1.15 x 10HP or 11.5HP.

It is important to remember that the value obtained by applying a service factor is valid only if usual service conditions, rated voltage, 40°C ambient, and rated frequency are maintained. Also, it should be noted that the resulting overload state will increase the temperature rise and may affect the motor's efficiency, power factor and speed.

Some motors are rated at their maximum temperature and therefore their service factor is given as 1.0.

CLASS	20,000 HR. LIFE TEMPERATURE
А	105°C
В	130°C
F	155°C
Н	180°C

#### WHERE DOES THIS TEMPERATURE COME FROM?

Basically the temperature build-up comes from two fundamental components and an allowance factor.

The three ingredients are:

- 1. The *ambient* or room temperature.
- 2. The *temperature rise* that occurs due to the heat generated by the mechanical and electrical losses within the motor.
- 3. Finally, due to the fact that the standardized motor temperature measurement method (change in winding resistance) measures the average temperature of the complete windings rather than the hottest spot (the point of highest thermal stress) an allowance factor called the *"hot spot allowance"* must be added.



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# INSULATION

With referece to Class B insulated, Class B temperature rise, T-frame, 1.0 Service Factor, totally enclosed motor operating at a rated horsepower and rated voltage, these ingredients work out as follows:

1. Ambient Temperature 2. Temperature Rise (maximum allowable) 3. Hot Spot Allowance	CLASS B 40°C (104°F) 80°C (176°F) 10°C (50°F)	CLASS F 40°C (104°F) 105°C (221°F) 10°C (50°F)
Total Temperature max (Hottest spot)	130°C (266°F)	155°C (311°F)

For service factored motors running at the service factor full load – i.e. 115% of rated load, the ingredients are as follows:

	140°C	
3. Hot Spot Allowance	10°C	
2. Maximum Temperature Rise	90°C	
1. Ambient Temperature	40°C	

Since 140°C is 10°C above the 130°C Class B rating, you could expect the motor's thermal life to be cut in half if it runs continuously at the 15% overload conditions.

However, TECO-Westinghouse motors have Class F insulation systems as illustrated above. Therefore, the hottest allowable temperature is 155°C, well above the 140°C temperature rise generated by the motor running at 1.15 service factor. A motor's service factor capability should only be used when short term overloads are expected or when the motor is to be used in an environment where the ambient temperature contribution to the total temperature is know to be less than 40°C.

If motors are operated at rated load rather than service factor load, the temperature rise will be less than 80°C so minimum normal life, or more, can be expected.

# **FIELD SERVICE**

#### Motor – Field Service

All TECO-Westinghouse Motors have been designed for long reliable service. However, any man-made product manufactured in such large quantities and installed under such a variety of conditions is likely to occasionally develop real or imaginary difficulties.

The more common user complaints can be combined under the following seven headings.

- A. Excessive vibration
- B. Noisy
- C. High Current
- D. Running Hot
- E. Bearing Failed
- F. Motor Burned Out

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# FIELD SERVICE

# **A. EXCESSIVE VIBRATION**

One of the most frequent complaints of motor troubles in the field is excessive vibration. The maximum vibration amplitudes often occur on the motor, and the user will conclude that the motor is the source of the trouble. Sometimes this is correct, but in the majority of such instances, the cure does not involve the motor.

Vibration is detrimental to all rotating equipment and should be minimized. In recognition of this requirement, NEMA has adopted standards for "maximum allowable" vibration (NEMA MG 1-1998, 7.8) and the conditions under which it should be determined. TECO-Westinghouse's commercial test limits for vibration will not exceed the maximum specified by NEMA.

It should be understood that a rotating motor or any rotating machinery always has some vibration. The best balancing methods can never attain perfect balance. An idle machine exhibits no vibration. When the motor is energized the vibration appears.

Before the motor is removed and sent to a repair shop the user should examine the entire machine and eliminate all possible external contributing factors.

When a motor is applied to an installation it becomes part of a system consisting of one or more drivers (motors), the driven equipment (one or more units), the foundations(s) and the mechanisms by which the components are interconnected, (coupling, belts, etc.). Any one of these components can be the cause of, or contribute to, excessive system vibration.

The most common causes of "excessive vibration" are:

- 1. "Resonant" foundation or structure
- 2. Poor alignment (cold and/or hot)
- 3. Loose "hold down bolts" securing the apparatus to its mounting
- 4. Unbalance in the motor, coupling(s), driven equipment (etc.)

In cases where excessive vibration is occurring, the recommended steps for isolating the trouble involves the study of both amplitude and frequency of vibration as follows:

#### **1 – RESONANT FOUNDATION**

- Step 1: During operation, measure the actual vibration amplitudes with suitable instrumentation (such as an IRD Vibration Analyzer, Davey Vibrometer, etc.) at the motor bearing housings in the vertical, horizontal, and axial directions.
- Step 2: Measure the vibration amplitude of the foundation structure during operation to determine background vibration (if the foundation is shaking due to a resonant condition, or to vibration being fed in from an external source, this vibration will affect the magnitude of vibration which appears on the motor.



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# **FIELD SERVICE**

If the vibration frequency of the foundation is low (less than 50%) compared to the operating speed of the motor the movement of the foundation will tend to be in phase with the movement of the motor. Therefore, the total vibration amplitude appearing on the motor will be the sum of the motor vibration plus foundation vibration.

If the vibration frequency of the foundation is high (more than 150%) of the operating speed the movement of the foundation will tend to be opposite (approaches 180°C out of phase) in direction to the movement of the motor, and the vibration amplitude which appears on the motors will be the difference between the motor and foundation vibrations alone. (This condition is extremely rare and is almost always due to a source external to the motor and supporting structure.)

If the foundation frequency lies within the range of 50% and 150% of operating frequency the phase relationship between motor and foundation amplitudes becomes complex and a meaningful determination requires the use of a vibration meter with a filter to measure the amplitude and phase of each frequency component. Such measurements and analysis are usually required only to identify an elusive source of external vibration.

Step 3: Determine the natural frequency of vibration of the rotating system at rest. Vibration at the natural frequency can usually be induced by "bumping" the motor at the same location and in the same plane where the maximum vibration was measured in Step 1.

If the natural frequency is close (in the range of 1/2 to 2/3) to the operating frequency of a multiple of operating frequency (called a harmonic) it must be changed to avoid resonance. This can best be accomplished by reinforcing and stiffening the system foundation.

Vibration may occur in the supporting structure if there is insufficient mass built into the foundation. The foundation structure is usually concrete or steel or a combination of the two.

A concrete structure may have its mass or weight increased by adding to its size or thickness by building a frame around and pouring in more concrete. If this is not desirable another remedy is to add to the mass and at the same time improve the resonance characteristics by pouring lead into a hole in the base. For instance, drill a hole in the concrete about 2" in diameter and 15" to 20" deep and fill with molten lead. The hold can be at a convenient location in the base and at an angle or vertical horizontal.

#### 2 - POOR ALIGNMENT

Step 4: Check and correct system alignment both cold and hot (at system operating temperatures). For machines with operating speeds below 2000 RPM parallelism and angularity of the component shafts and couplings should be within .002 inches for machines with operating speed of 2000 RPM or higher the parallelism and angularity should be within .001 inches.

#### **3 - LOOSE HOLD DOWN BOLTS**

Step 5: If the natural frequency is well above the operating frequency (150% of operating speed or more) and not a harmonic, look elsewhere – check the system components to make certain that they are properly shimmed, leveled and firmly tied down to the foundation structure.

#### 4 - UNBALANCE IN MOTOR

Step 6: While the motor coupling is broken, energize the motor and measure the vibration amplitude as in Step 1.

**NOTE:** Assuming that resonance is not present the uncoupled motor should exhibit vibration amplitudes within the limitation of NEMA standards. It is not uncommon for a motor to show a slight increase (less than 0.001 inch increase in vibration amplitude when it is sitting on a steel bedplate over what it demonstrated when it was checked for balance per NEMA Std. MG-1-12.07 because steel is not as "dead" as the flexible pads specified by NEMA. However, the presence of vibration amplitudes appreciably in excess (.001 inch or more) of these standards indicates an unbalance attributable to the motor and/or the coupling half.

Step 7: If the motor balance as demonstrated in Step 6 is satisfactory, the driven equipment and/or its supporting structure are most probably the source of system vibration.

# **B. EXCESSIVE NOISE**

Complaints of excessive noise in TECO-Westinghouse motors are rare. The important distinction which must be made is whether the reported noise indicates an abnormal condition requiring corrective action to preclude serious damage. The types of unusual noises which may indicate rapidly progressive damage are:

1. "Squeals" and associated noises which indicate a loss of clearance between rotating parts. Noises of this origin must be investigated and removed immediately. Typical causes are shifted blowers rubbing on air shields, shafts rubbing on bearing caps, etc.



## FIELD SERVICE

- 2. "Rumbles" and associated noises which indicate a bad anti-friction bearing. Continued operation may result in complete failure and drop the rotor onto the stator.
- 3. Heavy magnetic noises, which indicate misconnection, short circuit, single phasing, etc. Continued operation may result incomplete failure and drop the rotor onto the stator.

A difficult complaint to handle is one where an apparently perfectly good motor is unsatisfactory to one or more persons because of the noise produced. In such instances it is wise to keep the following facts in mind when deciding on a course of action:

- 1. NEMA Standard MG-1-1998 paragraph 14.3.5 recognized that "Operation where low noise levels are required" is an unusual service condition; requiring consultation with manufacturer during negotiations.
- 2. TECO-Westinghouse does not guarantee noise levels unless they are specifically negotiated and incorporated into the customer's purchase order and are accepted by the Company.
- 3. Noise apparently coming from a motor depends completely on the generated noise level present in the area from other sources. Consider how the kitchen refrigerator can be heard at night when the house is quiet, but is rarely noticed during the day when normal house noises mask it.
- 4. Noise associated with a motor may seem to emanate from the motor, but may really come from "sounding boards" which become excited by the forces which the motor and driven equipment place upon their foundations. Providing firmer foundations or isolation mounting devices often reduce noise from these sources.
- 5. Cavities of all kinds, such as ventilator ducts to or from the motor, small rooms, various shaped nooks and crannies, all may be excited like organ pipes by normal motor vibratory forces, and may amplify normal motor noise.

# **C. HIGH CURRENT**

Unusually high currents drawn by an alternating current motor normally come to the user's attention through the action of the overload protection associated with the starter. Commonly, this protection takes the form of calibrated "heaters" in the leads to the motor which respond to line amperes and operate bimetalic strips (when overheated) to open the line contactor and shut down the motor.

It is assumed that ambient conditions, heater ratings and horsepower demands of the driven equipment have all been reconfirmed and found to be satisfactory. Further investigation reveals that the motor is drawing current appreciable above the nameplate data at rated load as measured by a calibrated ammeter. Before condemning the motor make an accurate check of line voltage at the motor terminals.

Applied voltage higher than the nameplate rating will increase the current in the motor appreciable until saturation of the magnetic materials is reached at which point the current increases very rapidly and the motor will burn out. NEMA Standards state that induction motors "shall operate successfully" with a voltage variation of ±10% of nameplate voltage with rated frequency but that "operating performance within these voltage variations will not necessarily be in accordance with the standards established for operation at rated voltage". The saturation point must be above rated voltage plus 10% to provide acceptable performance. However, it is entirely possible to experience saturation with say a 440 volt motor being operated on a distribution system supplying say 500 volts at the motor terminals. The saturation point is a function of the amount of magnetic steel used, the electrical characteristics of the steel, and the winding design. Any and/or all of these can be altered to provide optimum performance for any specified voltage condition, but if the applied voltage is not precisely controlled, performance will vary from the motor. At the point where actual voltage exceeds  $\pm 10\%$  of rated voltage, performance will suffer markedly and very possible be entirely unsatisfactory.

To repeat, high current can be the direct result of high voltage. Nameplate full load current is stated for rated voltage conditions and will vary with applied voltage until the magnetic circuit becomes saturated, at which point current will increase tremendously. Nameplate voltage at the motor terminals provides optimum performance.

Higher than expected current may occur for another reason which is often overlooked. This is true with low speed motors such as are frequently used for direct connection to low speed pumps.

At the time when the system designer calculates the plant circuits, the motor starting equipment and the size of the wires to the motor he will often refer to standard tables to determine the full load amperes of the motor. These standard tables apply to motors of commonly used speeds down to 1200 RPM or possible 900 RPM. The tables overlook the fact that a motor with speeds below these values usually has a very low power factor which results in a considerably higher motor current. The true higher current figure will be stamped on the motor nameplate but by the time the motor is received by the user it is probable that the starter and its circuits will have been installed on the basis of the lower current shown in the standard tables.

Wherever a slow speed drive is concerned be sure to check the motor manufacturer for the accurate current value and ask for a reply in writing so there will be no misunderstanding.



# **FIELD SERVICE**

## **D. RUNNING HOT**

First determine that the machine is actually running over temperature. Just placing a hand on the machine is not sufficient to actually decide a machine is exceeding allowable temperature rise.

It should be remembered that modern standard motors for any given horsepower rating are smaller and they use Class F insulation. NEMA standards for Class F insulation allow a total temperature of 155°C. Thermometers can be placed on the frame for measuring the temperature.

The following checks can be made to determine the possible reasons for a machine running hot:

**Check 1** – Is the machine getting enough cool air? The amount of ventilation should be enough if;

- a. The shaft blower is present and clean.
- b. The external blower motor is operating (in the case of external forced air cooling)
- c. The shaft or external blower is rotating in the correct direction.
- d. There are no restrictions air is getting in and out of the machine.
- e. The air is not recirculating from the outlet into the inlet Check inlet temperature which should not be more than 5°C above ambient.
- f. The measurement of inlet and outlet temperature indicates the temperature rise is normal.
- g. The quantity of air is sufficient check for missing air shield or improperly fitted air shield. The air shield should be about 1/4" from the vanes and lined up with the vanes.
- h. The speed is incorrect check motor speed with nameplate rating at full load.

**Check 2** – Is the loading on the machine correct? To determine this:

- a. Check the duty cycle is it continuous or is it being started and stopped too frequently.
- b. Check supply voltage incorrect voltage causes excessive full load current and the losses go way up.
- c. Check supply frequency (NEMA allows ±5% from normal if normal voltage is maintained).
- d. Check for unbalanced phase-to-phase voltage.
- e. Check load voltage and current.

**Check 3** – Uncouple motor and take no load readings in each phase of the voltage, current and watts to determine if they are normal.

**Check 4** – (In places where a number of SCR drives are being used, check harmonic content of voltage source). SCR drives put harmonics back in the line and result in negative torques to the machine which cause heating.

**Check 5** – Check the bearings because defective bearings can increase the load on the motor and in small motors may become a large percentage of the load and result in overloading and increased temperature.

**CONCLUSION:** If all of the above check okay, the application could be wrong – too small a motor.

# **E. BEARING FAILURES**

One of the most frequent troubles which occurs on motors in the field is bearing malfunction or failure. Most bearing failures can be attributed to one of the following cases:

- 1. Inadequate, excessive or unsuitable lubrication
- 2. Misalignment
- 3. Overload
- 4. Incorrect of faulty fitting
- 5. Damage during installation
- 6. Vibration while the bearing is not rotating
- 7. Corrosion
- 8. Passage of electric current through the bearing
- 9. Defective or incorrect bearings

#### 1 – LUBRICATION

(See also - Lubrication Guidelines page D-29)

Perhaps the most common cause of bearing failures is improper lubrication. If the supply of lubricant is inadequate the bearing will run dry with consequent overheating and failure. If the bearing overheats to the point where is loses clearance it will fail almost immediately. The bearing is usually burned and severely damaged by this type of failure. If it does not lose clearance the material in the races and rollers will be damaged. After a short time particles of material will flake away causing the bearing to become rough and noisy.

Only a small amount of lubricant is required in a bearing at any one time, but a small amount of fresh lubricant must be fed into the bearing to replenish that which is depleted by working and by oxidation. This action takes place in our motors which are equipped with unshielded ball bearings. A clearance area around the edge of the inner bearing cap admits sufficient new grease while protecting the bearing against the addition of too much grease.

Too much lubricant can be as destructive as too little. As soon as a ball or roller bearing begins to rotate, any excess lubricant is pushed to the side of the ball or roller path. If the bearing cannot purge itself in this manner, it will churn the lubricant generating high temperature and pressure. Rapid overheating of the bearing will result, often causing it lose clearance and/or to reach temperature where the material loses its temper or the lubricant itself burns.

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# **FIELD SERVICE**

When re-lubricating ball bearings, it is recommended that the motor be stopped and the outlet plug be removed. Add lubricant with hand lever gun.

The use of the proper type of lubricant is also very important. In the case of oil it must be viscous enough so that the film of lubricant will not break down under load, but at the same time not viscous enough to produce high frictional loads. Grease must be still enough not to drain out of the bearing reservoir, but soft enough to settle against the bearing and be fed into it.

As a general rule it is not advisable to intermix different lubricants. The constituents of different lubricants may not be compatible and intermixing may cause them to quickly break down and lose their lubricating qualities.

There are many varieties of lubricants available, most of them intended for a particular use. There is no such thing as an all purpose lubricant. The motor manufacturer and/or lubricant manufacturer should be consulted whenever there is any question as to whether a lubricant is suitable for a particular application.

#### 2 - MISALIGNMENT

It is obvious that a misalignment between the motor shaft and the load shaft will bring about an early failure of the bearing. With each revolution this misalignment will impose heavy pressure followed by a relaxing of what pressure on many of the internal parts of the bearing. At operating speeds this change from plus to minus excessive pressure will occur so quickly and frequently as to act like a riveting hammer on the surface of the balls and races. This will either crack the balls or race or at least flake off pieces from the surface.

#### 3 - OVERLOAD

As a rule of thumb the life expectancy of a ball bearing is inversely proportional to the cube of the load. Therefore, an overall increase in load can cause a relatively large decrease in bearing life. The material in the bearing races is actually deformed when the ball or roller passes over it. Eventually the material will suffer fatigue failure, and pitting and flaking of material will occur in the ball track.

Heavy radial loads on a bearing may result from misalignment, or from a belted application where the belts are too tight. Severe thrust loads can usually be traced to the equipment which the motor is driving. On belted applications the smaller the diameter of the sheaves the greater will be the radial loads imposed on the motor shaft and bearings. If multiple belts (such as V-belts) are used, the fewer the number of belts, the more they must be tightened to transmit a given horsepower without slipping. There are specific recommendations published by NEMA and by most belt drive manufacturers for minimum sheave diameters, minimum number of belts of a given size and type, etc., required to transmit standard horsepower at various speeds. Also the belt drive manufacturers publish specific instruction on how to adjust their drives for proper belt tension.

To evaluate whether or not a particular belt drive is suitable for use with a given motor the following information is required:

- 1. Manufacturer of the belt drive.
- 2. Diameter of both drive and driven sheaves.
- 3. Center distance between sheaves.
- 4. Face width of the sheaves.
- Number and type of belts used (for standard V-belts, type A, B, C, D, or E; for super V-belts, 3V, 5V, 8V, etc).
- 6. Location of the drive sheave on the motor shaft.
- 7. Direction of belt pull, relative to the motor.
- 8. Nameplate data for the motor if this information is not already known.

It is usually not possible to tell whether the belts were too tight after a failure has occurred. However, if there are other motors with similar drives at the same site it might be worthwhile to check them. If the belts on the other motors are overly tight the chances are they were on the failed motor also.

#### 4 – FAULTY FITS

There are four important areas where the fit between the bearing and the other motor parts must be within prescribed limits to prevent faulty operation.

- 1. The fit of the bearing inner race on the shaft.
- 2. The fit of the bearing outer race on the shaft.
- 3. The internal clearances in the bearing itself between the balls and races.
- The overall fit of the rotating assembly made up of the rotor, shaft, and bearings in the stationary assembly made up of the frame and brackets.
- 1. The bearing race which rotates relative to the load has a tendency to spin if it is not restrained. The friction between the race and the shaft (or housing, as the case may be) can generate enough heat to cause the bearing to fail, some times in a matter of hours.

In the vast majority of motors the shaft rotates and the inner race of the bearing is assembled on the shaft with an interference fit. On smaller frame sizes this fit will vary from .001 inches to .0012 inches. On larger motors the fit can vary from .003 inches to .0015 inches. There are some special purpose motors where the fit may be as much as .0018 inches, but they will seldom be encountered.



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- 2. For ease of assembly the bearing race which is stationary relative to the load is assembled into its housing (or onto the shaft, as the case may be) with a loose fit. It should not be too loose however or this will tend to rotate at a slow rate in its housing. On smaller frame sizes the fit of the race in its housing can vary from .001 inches to .0013 inches. On some special purpose motors the fit may be as high as .0035 inches.
- 3. The internal clearance in a bearing is very important because the loss of this clearance will cause a bearing to bind and fail almost immediately. Usually the shaft and inner race of the bearing will attain a higher temperature than the outer race and therefore will expand more. The outer race, however, may be somewhat constrained by its housing, causing the clearances in the bearing to be reduced from their original value, when the motor reaches operating temperatures.

To reduce the possibility of a bearing losing internal clearance during operation the bearings used in TECO-Westinghouse industrial motors have larger internal clearances than do standard "off the shelf" bearing of the same type and size. Care should be exercised to insure that a bearing with the proper fit is used whenever a replacement is made in the field.

 Improper fits caused by incorrect dimensions, or out of round or distorted shaft and housing fits can all cause premature bearing failures.

#### **5 – INSTALLATION DAMAGE**

Damage during installation is usually the result of carelessness or ignorance. Such practices as pressing a bearing on a shaft by pushing on the outer race or allowing the bearing to take the thrust when a coupling is pressed on to a shaft can "brinell" the bearing races. Bearing and couplings are installed at the factory by preheating them and shrinking them into place, thereby reducing the possibility of installation damage. Preheating is usually done in a hot oil bath heated to a temperature somewhat below the flash point of oil.

#### **6 – VIBRATION BRINELLING**

If a motor equipped with ball or roller bearing is subjected to vibration over a prolonged period of time while it is not operating the movement can wear indention's in the races where the balls or rollers are touching. This type of damage has occurred where motors are transported over long distances and the rotating assembly has not been restrained to prevent movement. One of the reasons for installing a pre-loading spring in one end of a motor is to prevent this type of damage.

#### 7 – CORROSION

Corrosion resulting from moisture getting into the bearings, or from prolonged storage in an area of high humidity will cause a premature bearing failure. The rust will cause the balls and races to become rough and pitted. Most users will exercise care to prevent water from getting into bearings while a motor is in use. However, few of them take adequate measures to protect the bearings during prolongs storage of the motors. The motors should be kept warm and dry and the rotating element turned over periodically to maintain film of lubricant on the bearing surfaces.

#### 8 – ELECTRIC CURRENT

Bearing failures due to passage of electric current through the bearings or to defective or faulty material in the bearings are very rare. It will suffice to point out that such failures have occurred and the service of an experienced motor or bearing engineer are usually required to diagnose this type of trouble and to recommend remedial action.

#### CONCLUSION:

The foregoing discussion demonstrates the importance of having the correct bearing, properly fitted and installed, and correctly applied, to insure long trouble free operation. Each of the causes of bearing malfunction can leave distinctive marks and wear patterns which are quite revealing to the eye of the experienced bearing engineer. Unfortunately, when a failure does occur, the bearing is usually so badly damaged that these signs are obliterated. For this reason, examination of a bearing with incipient failure is usually much more revealing than examination of a bearing which has sustained severe damage.



# **FIELD SERVICE**

#### F. MOTOR BURNED OUT

A motor winding might burn out for many reasons each having a more or less typical appearance as follows.

- CASE 1: In a three phase motor a winding "burn out" due to a defect in workmanship or material would appear as a very localized burned spot in the failed winding and could be easily recognized. It might be a short circuit between the turns of wire in the coil or between the phases or even to the iron of the stator through ruptured insulation.
- CASE 2: On the other hand, when there is a complete "roast out" of the whole winding, all three phases of the winding would be blackened uniformly. This would not be due to a defect but it would be due to the failure of the control system to shut off the power to an overburdened motor. This overload might result from some material being caught in the machine.
- CASE 3: A single phase failure would be due to the loss of one phase from the power supply. This could be the result of:
  - One fuse opened.
  - One contactor of the starter opened (burned off or poor contact).
  - One line of the incoming power line opened.
  - One connection in the conduit box opened.

Assuming that the motor has started and is properly running under load from a three phase circuit – if one of the above situations occurs the motor will then operate on only one phase. This phase will pull more current in order to try to carry the entire three phase load and in doing so will exceed its capacity.

Normally the overload protection in the starter should disconnect the motor but if it does not then the motor will continue to run and the working phase will become hotter and hotter until eventually the winding burns out.

Examination of the incoming circuitry will usually prove that one of the four reasons listed above can be blamed for the open circuit which caused the single phase failure. Obviously the motor manufacturer is exonerated.

## USEFUL INFORMATION

- The front end of the motor is the end opposite the shaft extension.
- The location of the conduit box should always be referred to with reference to the front end of the motor.
- Direction of rotation, i.e., clockwise (CW) or counter clockwise (CCW) is always when facing the front end of the motor.
- Starting torque is the turning effort that the motor can exert at standstill with voltage applied. It is expressed in percent of full load strength.
- Inrush is a measure of current (or kVA) drawn from the line at standstill when voltage is applied. Also called starting current or kVA, it usually runs 5 to 6 times full load nameplate values for the conventional NEMA Design B or C motors when full voltage is applied.



# **RE-LUBRICATION GUIDELINES**

- 1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need re-lubrication, except on Advantage Plus products which have re-greasable features.
- 2. Frames 280TS, 320 and larger: Motors having grease fittings and grease discharge devices at brackets. It is necessary to re-lubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 1 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.
- \* Motors are shipped with grease for initial running however it is a good idea to add grease when the motor is first put into service, follow table 1 for the recommended amount.
- **GREASE TYPE:** Mobil Polyrex EM (unless otherwise specified).
- **GREASE QUANTITY:** The amount of grease to add per replenishment is dependent on the size of the bearing. The following table (Table 1) will provide two different quantities; "G" will provide the quantity required to re-lubricate the bearing sufficiently for the interval time found in Table 2; while the second quantity "Full Qty" is the amount required to completely fill the bearing with new grease forcing the old grease out the exit tube. Adding the "Full Qty" amount is time consuming and requires ideal conditions; old dried up grease can potentially block the exit tube leading to over greased bearings and other undesirable results. For general applications the "G" quantity is sufficient, less time consuming and has lower risk of over greased bearings. The "G" amount is based on the formula G=DxBx0.005 and is widely used in our industry.

2 SERIES					3 SERIES						
BEARING NUMBER	<b>d</b> (mm)	D (mm)	B (mm)	<b>G</b> (grams)	Full Quantity (grams)	BEARING NUMBER	<b>d</b> (mm)	D (mm)	B (mm)	<b>G</b> (grams)	Full Quantity (grams)
NU205/6205	25	52	15	4	15	NU305/6305	25	62	17	5	17
NU206/6206	30	62	16	5	15	NU306/6306	30	72	19	7	25
NU207/6207	35	72	17	6	15	NU307/6307	35	80	21	8	25
NU208/6208	40	80	18	7	20	NU308/6308	40	90	23	10	30
NU209/6209	45	85	19	8	25	NU309/6309	45	100	25	13	35
NU210/6210	50	90	20	9	30	NU310/6310	50	110	27	15	40
NU211/6211	55	100	21	11	35	NU311/6311	55	120	29	17	50
NU212/6212	60	110	22	12	40	NU312/6312	60	130	31	20	60
NU213/6213	65	120	23	14	50	NU313/6313	65	140	33	23	80
NU214/6214	70	125	24	15	50	NU314/6314	70	150	35	26	80
NU215/6215	75	130	25	16	60	NU315/6315	75	160	37	30	100
NU216/6216	80	140	26	18	60	NU316/6316	80	170	39	33	100
NU217/6217	85	150	28	21	80	NU317/6317	85	180	41	37	120
NU218/6218	90	160	30	24	80	NU318/6318	90	190	43	41	120
NU219/6219	95	170	32	27	90	NU319/6319	95	200	45	45	140
NU220/6220	100	180	34	31	100	NU320/6320	100	215	47	51	160
NU221/6221	105	190	36	34	110	NU321/6321	105	225	49	55	190
NU222/6222	110	200	38	38	120	NU322/6322	110	240	50	60	220
NU224/6224	120	215	40	43	120	NU324/6324	120	260	55	72	270
NU226/6226	130	230	40	46	140	NU326/6326	130	280	58	81	300

#### **PROCEDURE:**

Table 1

- Clean grease zerk and grease gun tip.
- Remove exit tube plug to allow old grease to drain.
- Add grease slowly with motor running, adding amount determined in Table 1.
- Allow one hour for old grease to run out, then reinstall exit tube plug.
- \* make sure grease gun is calibrated (one pump of gun should be approximately one gram of grease)

- **d** = Bore (mm)
- $\mathbf{D} = OD (mm)$

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- $\mathbf{B} = \text{Width (mm)}$
- **G** = Grease Quantity (g)

G = D \* B \* 0.005



# **RE-LUBRICATION GUIDELINES**

**INTERVALS:** Lubrication intervals are dependent on temperature, environment, rotational speed and load conditions; therefore it is difficult to be precise about replenishment intervals. However, for common applications the periods shown in Table 2 may be used as a guide. For smaller bearings not listed in Table 2 use the maximum interval shown for rated speed.

BEARNEXIMER       GOORPM       020 RPM       1200 RPM       1300 RPM       1300 RPM       3000 RPM <th< th=""><th>Table 2</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>	Table 2											
6000 7200 7200 7200 7200 7200 7200 7200	BEARING	<b>S NUMBER</b>	600 RPM	720 RPM	750 RPM	900 RPM	1000 RPM	1200 RPM	1500 RPM	1800 RPM	3000 RPM	3600 RPM
B3200       12       12       1000 Hours       1000 Hours         7300       14       1000 Hours       1000 Hours       1000 Hours         7300       16	62XX	6210		ý.								
73XX       13       13       1000 Hours       720 Hours         15       15       2000 Hours       2000 Hours       720 Hours         16       1000 Hours       1500 Hours       1500 Hours       720 Hours         180       1500 Hours       1500 Hours       1500 Hours       500 Hours         200       1500 Hours       1000 Hours       500 Hours       500 Hours         30       1500 Hours       1000 Hours       500 Hours       500 Hours         30       1000 Hours       1000 Hours       1000 Hours       500 Hours         30       1000 Hours       1000 Hours       1000 Hours       1000 Hours         100       100 Hours       1000 Hours       1000 Hours       1000 Hours         100       100 Hours       1000 Hours       1000 Hours       1000 Hours         100       100 Hours       1000 Hours       1000 Hours       1000 Hours         100       1000 Hours       1000 Hours       1000 Hours       1000 Hours         100       1000 Hours       1000 Hours       1000 Hours       1000 Hours         100       1000 Hours       1000 Hours       1000 Hours       1000 Hours         1000 Hours       1000 Hours       1000 Hours	63XX	12				•	-	-		-	2000	Hours
73X       14       Image: Contraction of the contraction of	72XX	13				•	-	-				
15	73XX	14				•	-	-		-	1000	Hours
16		15		-	-	-	-	-				
17       Image: Source in the second s		16		-	-	-	-	-			720	Hours
18       3000 Hours       1500 Hours         24       1500 Hours       1000 Hours         24       1000 Hours       1000 Hours         24       1000 Hours       1000 Hours         32       1000 Hours       500 Hours         32       1000 Hours       500 Hours         36       2000 Hours       1000 Hours         16       2000 Hours       1000 Hours         16       2000 Hours       1000 Hours         16       2000 Hours       1000 Hours         201       202       2000 Hours       1000 Hours         38       2000 Hours       1000 Hours       500 Hours         38       2000 Hours       1000 Hours       300 Hours         38       2000 Hours       300 Hours       300 Hours         38       2000 Hours       500 Hours       300 Hours         2220       300 Hours       300 Hours       300 Hours         38 </td <td></td> <td>17</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2000</td> <td>Hours</td> <td></td> <td></td>		17							2000	Hours		
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34         36         2000 Hours         1500 Hours           BEARING NUMBER         600 RPM         720 RPM         750 RPM         900 RPM         1000 RPM         1200 RPM         1800 RPM           NU2XX         NU214		32							500	lours		
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BEARING NUMBER         600 RPM         720 RPM         750 RPM         900 RPM         1000 RPM         1200 RPM         1500 RPM         1800 RPM           NU2XX         15		50		1					1		1	
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NU3XX       15       2000 Hours       2000 Hours         16	NU2XX	NU214			-			-			1	
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$ \begin{array}{c c c c c } \hline 26 & & & & & & \\ \hline 28 & & & & & & \\ \hline 30 & & & & & & \\ \hline 30 & & & & & & \\ \hline 32 & & & & & & \\ \hline 34 & & & & & & \\ \hline 34 & & & & & & \\ \hline 36 & & & & & & \\ \hline 36 & & & & & & \\ \hline 36 & & & & & & \\ \hline 40 & & & & & & \\ \hline 40 & & & & & & & \\ \hline 40 & & & & & & & \\ \hline 40 & & & & & & & \\ \hline 44 & & & & & & & \\ \hline 44 & & & & & & & \\ \hline 44 & & & & & & & \\ \hline 44 & & & & & & & \\ \hline 1000 \ Hours & & & & & & & \\ \hline \\ \hline \\ \hline \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ \hline \\ 8EARINC NMBER & & & & & & & \\ \hline \\ \hline \\ 8EARINC & & & & & & & \\ \hline \\ \hline \\ \hline \\ 8EARINC & & & & & & & \\ \hline \\ \hline \\ \hline \\ 8EARINC & & & & & & \\ \hline \\ \hline \\ \hline \\ \\ 8EARINC & & & & & & \\ \hline \\ \hline \\ \hline \\ \\ \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ \hline \\ \\ \\ \\ \\ \hline \\ \\ \\ \\ \hline \\ \\ \\ \\ \hline \\$		24			•	<b>.</b>	2000	Hours				
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$ \begin{array}{c c c c c } \hline 30 & & & & \\ \hline 32 & & & & \\ \hline 33 & & & & & \\ \hline 36 & & & & & \\ \hline 38 & 2000 \ \mbox{Hours} & 1000 \ \mbox{Hours} &$		28							500	lours		
$ \begin{array}{c c c c c c } \hline 32 & & & & & & & & & & & & & & & & & & $		30										
$ \begin{array}{c c c c c } \hline 34 & & & & & & & & & & & & & & & & & & $		32			2000	) Hours						
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$ \begin{array}{c c c c c } \hline 38 & 2000 \ \mbox{Hours} & 1000 \ \mbox{RPM} & 1000 \ \mbox{RPM} & 1000 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1800 \ \mbox{RPM} & 1200 \ \mbox{RPM} & 1500 \ \mbox{RPM} & 1800 \ \mbox$		36					-					
$  \begin{array}{c c c c c } \hline 40 & & & & & & & & & & & & & & & & & & $		38	2000	Hours			-					
$  \begin{array}{ c c c } \hline 44 \\ \hline 48 \\ \hline 48 \\ \hline 48 \\ \hline 48 \\ \hline \\ $		40			1000	) Hours						
48     1000 mm     1000 mm     1200 mm     1500 mm     1800 mm       222XX     2220     2220     300 Hours     300 Hours       223XX     22		44	1000	Hours								
BEARING NUMBER         600 RPM         720 RPM         750 RPM         900 RPM         1000 RPM         1200 RPM         1500 RPM         1800 RPM           222XX         222		48										
222XX     22220     300 Hours       223XX     22     300 Hours       24     1000 Hours     500 Hours       26     30     300 Hours       30     300 Hours     300 Hours       32     500 Hours     300 Hours       34     300 Hours     300 Hours       38     500 Hours     300 Hours       40     300 Hours     44       48     300 Hours     40	BEARING	<b>S NUMBER</b>	600 RPM	720 RPM	750 RPM	900 RPM	1000 RPM	1200 RPM	1500 RPM	1800 RPM		
223XX     22     500 Hours       24     1000 Hours     500 Hours       26     30     300 Hours       30     500 Hours     300 Hours       34     300 Hours     300 Hours       38     500 Hours     300 Hours       40     300 Hours     44       44     300 Hours     40	222XX	22220		·				·	300	lours		
24     1000 Hours       26       28       30       32       34       36       500 Hours       38       500 Hours       300 Hours	223XX	22		-	•	-	FOO	Laura				
26       28       30       32       34       36       500 Hours       38       300 Hours		24		1000	Hours	•	500	Hours				
28		26										
30         300 Hours           32         500 Hours           34         500 Hours           36         500 Hours           38         300 Hours           40         300 Hours           44         300 Hours		28							1			
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		48	300	Hours								



For more information visit: www.tecowestinghouse.ca or call: 1-800-661-4023

	U	SEFUL FORMULAS
kW	=	HP x .746
Torque in lb-ft	=	HP x 5250 RPM
Motor Synchronous Speed in RPM	=	120 x Hz Number of Poles
Three Phase Full-Load Amp	=	$\frac{\text{HP x .746}}{1.732 \text{ x E x } \frac{\text{Efficiency}}{100} \text{ x } \frac{\text{Power Factor}}{100}}{100}$
Rated Motor kVA	=	HP (.746) Efficiency x Power Factor
kW Loss	=	HP (.746) (1.0 – Efficiency) Efficiency
Wk <sup>2</sup> Referred to Motor Shaft Speed	=	$\left[ \text{Driven Machine Wk}^2 \left( \frac{\text{Driven Machine RPM}}{\text{Motor RPM}} \right)^2 \right] + \text{Gear Wk}^2$ at Motor Speed
Accelerating Time	=	.462 (Wk <sup>2</sup> of Motor and Load) RPM <sup>2</sup> Motor rated kW x 10 <sup>6</sup> x per-unit Effective Accelerating Torque
kVA Inrush	=	Percent Inrush x rate kVA
Approximate Voltage Drop (%)	=	Motor kVA Inrush x Transformer Impedance (normally 5% to 7%) Transformer kVA
Stored Kinetic Energy in kW-sec	=	2.31 x (total Wk <sup>2</sup> ) x RPM <sup>2</sup> x $10^{-7}$
Inertia Constant (H) in Seconds	=	Stored Kinetic Energy in kW Seconds HP (.746)
FL Amps	=	$\frac{\text{HP x 746}}{\text{Eff. x PF x }\sqrt{3} \text{ x E}} \qquad \text{for 3 Phase Motors}$
FL Amps	=	$\frac{\text{HP x 746}}{\text{Eff. x PF x E}}$ for Single Phase Motors
kVA Input	=	$\frac{E \times I \times \sqrt{3}}{1000}$ for 3 Phase Motors
kVA Input	=	$\frac{E \times I}{1000}$ for Single Phase Motors
kW Input	=	kVA Input x P.F.
HP Output	=	kW Input x Eff. 746
HP Output	=	Torque x RPM 5250
Power Factor	=	kW Input kVA Input

Note: E is voltage, I is current, PF is power factor, Eff. is efficiency





Blank

# **TWMI CANADA WIDE CONTACT INFORMATION**

Have a question or comment for us? Maybe you need some technical or sales assistance? Feel free to call the location nearest you.

LOCATION	CONTACT INFO	LOCATION	CONTACT INFO
CALGARY	TECO-Westinghouse Motors (Canada) Inc. Calgary, Alberta Phone: (403) 640 -2063 Fax: (403) 640-2075	EDMONTON	TECO-Westinghouse Motors (Canada) Inc. 18060 - 109 Avenue Edmonton, Alberta T5S 2K2 Phone: (780) 444-8933 Fax: (780) 486-4575 Toll Free Phone: 800-661-4023 Toll Free Fax: 888-873-8964 24 HR Emergency Phone: (780) 994-8964
CAMBRIDGE	TECO-Westinghouse Motors (Canada) Inc. 1165 Franklin Blvd., Unit A - C Cambridge, Ontario N1R 8E1 Phone: (519) 624-1616 Fax: (519) 624-1557 Toll Free Phone: 800-268-4770 24 HR Emergency Phone: (519) 841-6598	LACHINE	TECO-Westinghouse Motors (Canada) Inc. 2130 - 32e Avenue Lachine, Quebec H8T 3H7 Phone: (514) 636-8964 Toll Free Phone: 800-268-4770 Toll Free Fax: 866-309-8964 24 HR Emergency Phone: (514) 242-3179

# **TWMI CANADA AFTER HOURS EMERGENCY SERVICE**

Troubles happen at the worst of times. No worries, TWMI's highly trained staff is here to help you out. If you have an emergency, feel free to contact us and let us help you to get back up and running as quick as possible.

Our technicians are on call 24 hours a day to provide service and solutions to your technical needs.

LOCATION	EMERGENCY PAGING NUMBER
ALBERTA SERVICE	(780) 994-8964
ONTARIO SERVICE	(519) 841-6598
QUEBEC SERVICE	(514) 242-3179

- NOTE: (1) \$150 After Hour Charge Monday Sunday
  - (2) \$225 After Hour Charge All Statutory Holidays

(3) Rates are based upon 2 hour Call-out



Contact Information



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**WEST** 1-800-661-4023 **EAST** 1-800-268-4770



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