

# Three Phase Modifiable NEMA®† Horizontal Motors Accessories and Modifications

## 19. UL®† Listed Fire Pump (continued)

- Suitable for the following starting methods:
  - Across-the-Line Start (All Frame Sizes)
  - Also suitable for Wye-Start/Delta-Run (250 Frame and larger)
  - Dual Voltage motors are suitable for Part Winding Start on Low Voltage (250 Frame & Larger)
  - Single Voltage motors also suitable for Part Winding Start (100 HP or larger)
- Depicting UL®† File Number Fire Pump Tags

UL Listed Fire Pump NEMA frame motors (ODP & TEFC) can be supplied as Energy Efficient, since they are exempt from EISA - 2007 / IHP HP Motor Final Rule 2016 (NEMA Premium), unless the customer requests Premium Efficiency.

## 20. Foot Flatness, Special

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	N/A	N/A	75	75	75	225	225	225	450	450	450	450

0.005" Foot Flatness from mounting hole to mounting hole. Available on Cast Iron Frame Hazardous Location motors, 180 Frame and larger. Standard (no charge) on 841 PLUS® motors.

## 21. Footless (Round Frame)

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	150	150	150	150	150	225	225	300	375	450	450	N/A

Footless motors require either a C-Face or D-Flange. Refer to the "Endshield, C-Face/D-Flange" option. Refer to the "Drip Cover (Canopy Cap) option and Lifting Provisions options. Mounting orientation (Horizontal, Vertical Shaft Down or Vertical Shaft Up) must be specified at order entry. Footless not available on 449 Frame. ODP Energy or Premium Efficiency motors in 360-400 Frames are not available as Horizontal Footless motors. They must be built as Vertical Motors (for Vertical Motors, see Catalog PB500).

## 22. Frequency, 50 Hertz

### A. 50 Hertz, Open Drip Proof (ODP)

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

See Option B for TEFC and Hazardous Location 50 Hertz adder, and for notes.

### B. 50 Hertz, Totally Enclosed Fan Cooled (TEFC) & Hazardous Location

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

Adder is percent of Base List Price. The Frequency adder includes 50 Hz, 1.0 Service Factor. If higher Service Factor is required, the Service Factor adder must also be used. The Frequency adder is used when the primary rating is 50 Hertz. Some motors can be built with a Dual Rating (60 Hertz primary rating and 50 Hertz secondary rating). If 50 Hertz is specified as the secondary rating, this adder is not required.

Unless specified otherwise at order entry, the following motors have a 50 Hertz secondary rating as standard:

- Energy Efficient ODP and TEFC with 60 Hertz, 230/460 or 208-230/460 volts Primary Rating have a 50 Hertz, 190/380 Volts Secondary Rating
- Energy Efficient ODP and TEFC with 60 Hertz, 460 Volt Primary Rating have a 50 Hertz 380 Volt Secondary Rating
- The secondary rating is always 1.0 Service Factor.

## 23. Grease Fittings

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	173	173	173	173	173	173	173	173	173	173	173	173

Grease Fittings are available in a variety of options:

- Grease Fitting on Fill, with Pressure Drains
- Grease Fitting on Fill, with Plug on Drain
- Plug on Fill and Drain

Grease Fitting on Fill with Plug on Drain is standard (no charge) as follows:

- All motors (except UNIMOUNT®) 250 Frame and larger, both ends
- CORRO-DUTY® 180-210 Frame, both ends
- 56-140 Frames have sealed bearings and no grease fittings
- UNIMOUNT® 180-280 Frame, pulley end only
- Hazardous Location, 180-210 Frame, both ends
- 180 Frame Hostile Duty not available

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## 24. Grounding

### A. Grounding Lug or Servit Post in Conduit Box

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	120	120	120	120	120	120	120	120	120	120	120	120

All motors have provisions for grounding (stud in the main conduit box). Use this adder for a Ground Lug or in the main conduit box. Ground Lug in main conduit box is standard (no charge) on CORRO-DUTY®, 841 PLUS® and Hazardous Location motors. Also use this adder for a Ground Lug or Servit Post in an accessory conduit box. Refer to the "Conduit Box, Accessory" option for availability of accessory boxes.

### B. Grounding Terminal in Conduit Box

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	53	53	53	53	53	53	53	53	53	53	53	53

All motors have provisions for grounding (stud in the main conduit box). Use this adder for a Ground Terminal in the main conduit box. Also use this adder for a Ground Terminal in an accessory conduit box. Refer to the "Conduit Box, Accessory" option for availability of accessory boxes.

### C. Grounding on Frame

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)

Refer to Quick Pick Chart for List Price adders. There are several options available for grounding on the frame:

- Tapped Hole on Foot (Q1 or Q2) – not available on ODP 56-320 Frame motors or Footless Motors
- Ground Terminal on Frame (Q1 or Q2) – not available on ODP 56-320 Frame motors or Hazardous Location motors
- Ground Pad (Q1 or Q2) – not available on 56-400 Frame or Hazardous Location motors

Double the adder for quantity two. Frame Grounding is always in addition to, not in lieu of, Conduit Box Grounding.

The Conduit Box Ground is the "primary ground."

### D. Shaft Ground Ring

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)

Not Available On UL Listed Hazardous Location Motors. Inpro/Seal®† XP MGS®† is only available on TEFC 440 frame, if Self Certified (Non-Listed) Division 2 and CSA®† Certified Division 2.

A shaft grounding ring is included in the Inverter Duty Base List Price on all Inverter Duty offerings (Excluding Hazardous Location and Cooling Tower Duty). If a specific device is required, please advise at time of order (subject to additional adder).

## 25. Hardware, Stainless Steel

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	225	225	225	225	225	225	420	420	420	420	420	435

All motors are built with Corrosion Resistant Hardware. When Stainless Steel Hardware is specified, all hardware required for Endshields, Fan Cover, Bearing Caps (if applicable), Conduit Box and Fan are changed to 316 Stainless Steel.

## 26. High Inertia Load

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

Adder is percent of Base List Price. Refer to Appendix for standard Load Inertia values. Use this adder for values higher than listed in the table. Application details, including load inertia reflected to the motor shaft, must be reviewed prior to entering an order. When this is required, contact your Nidec Motor Corporation Technical Representative for assistance.

## 27. Horsepower, Non-Standard

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)

(4) It is best to use a Standard NEMA®† horsepower rating whenever possible, however non-standard horsepower ratings can be designed. Use the Base List Price of the next higher standard horsepower of the same motor type and speed.

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# Three Phase Modifiable NEMA<sup>®†</sup> Horizontal Motors Accessories and Modifications

## 28. Insulation Class

### A. Class F

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD

Insulation systems are divided into classes according to the thermal endurance of the system for temperature rating purposes. Four classes are used in motors and generators, namely Classes A, B, F and H. Two of these classes are used by Nidec Motor Corporation: Class F and Class H. Class F is the standard Nidec Motor Corporation Insulation System.

- Class F Insulation System is one which by experience or accepted test can be shown to have suitable thermal endurance when operating at the limiting Class F temperature specified in the temperature rise standard for the machine under consideration.
- All products described in this catalog are manufactured with copper magnet and lead wire. Aluminum wire is not available.
- All production-modified products are supplied with Class F insulation as standard.
- Inverter-duty products are supplied with a special insulation system that is described in item 08 of this section.
- Class H insulation is an available option for special ambient conditions, inverter duty applications, insulation life requirements, etc.
- Temperature-rise considerations are described in item 49 of this modification section.

### INSULATION CLASS

Common designations include Class B, F, and H. These indicate the maximum thermal capability of each system based on providing a life expectancy in accordance with IEEE guidelines and industry standards. The following table illustrates the various elements and their contribution to the insulation systems.

INSULATION CLASS	A <sup>1</sup>	B	F	H
Ambient temperature (for options see item 2 of this modification section)	40°C	40°C	40°C	40°C
Temperature rise at nameplate H.P. (for options see item 44 of this modification section)	60°C	80°C	105°C	125°C <sup>2</sup>
Hot spot or service factor allowance (for service factor see item 44 of this modification section)	10°C	10°C	10°C	15°C
Thermal limit of insulation system <sup>3</sup>	105°C	130°C	155°C	180°C
NOTES:				
<sup>1</sup> Class A insulation system shown for reference only and is not commercially available from Nidec Motor Corporation.				
<sup>2</sup> Class H insulation is offered for special ambient conditions, life requirements, etc. Class H temperature rise is not available or used by Nidec Motor Corporation.				
<sup>3</sup> Each insulation class provides the same winding design life when operated at its thermal limit.				

Any deviation from insulation class standards stated on individual price book pages requires the appropriate modification adder and may impact frame size and performance characteristics.

### B. Class H

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	114	114	159	192	252	420	552	708	1023	1218	1686	1686

Insulation systems are divided into classes according to the thermal endurance of the system for temperature rating purposes. Four classes are used in motors and generators, namely Classes A, B, F and H. Two of these classes are used by Nidec Motor Corporation: Class F and Class H.

- Class H(180°C) Insulation System is one which by experience or accepted test can be shown to have suitable thermal endurance when operating at the limiting Class H temperature specified in the temperature rise standard for the machine under consideration. Refer to office for ambients above 60°C.

## 29. Insulation System

### A. Insulife 1000

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD	STD

Standard treatment for frame sizes up through 440. Insulife 1000 utilizes 100% solid polyester resins completely impregnating slot end turns. The standard process is Non-Hygroscopic Class F (155°C), suitable for ODP motors in a relatively dry environment or for TEFC motors with moderate exposure to moisture. One dip and bake in polyester resin.

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# Three Phase Modifiable NEMA<sup>®†</sup> Horizontal Motors Accessories and Modifications

## 29. Insulation System (continued)

### B. Insulife 2000

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	50	50	65	102	131	218	278	342	461	597	780	780

Insulife 2000, an additional treatment of polyester varnish ideal for applications with high moisture content. Two dips and bakes. Standard on CORRO-DUTY<sup>®</sup> and Inverter Duty motors.

### C. VPI 1000

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	N/A	N/A	N/A	N/A	N/A	600	750	900	1050	1350	1575	1575

VPI 1000: One cycle of vacuum impregnation of 100% solid epoxy resins. Available on 280 Frame - Cast Iron only, and all 320-440 Frames.

### D. VPI 2000

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	N/A	N/A	N/A	N/A	N/A	750	957	1124	1584	1881	2321	2321

VPI 2000: Two cycles of vacuum impregnation of 100% solid epoxy resins. Meets NEMA definition for moisture-resistant winding per NEMA MG1 - 1.27.1. Available on 280 Frame - Cast Iron only, and all 320-440 Frames.

### E. Abrasion Resistant Coating

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	51	51	51	81	104	173	221	272	365	474	474	474

Optional overcoat treatment available with any Nidec Motor Corporation insulation systems. Abrasion Resistant Coating protects against environments contaminated with abrasive dust such as fly-ash, cement dust, etc.

### F. Tropical Protection

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)

(5) For Tropical Protection, add for Insulife 2000 Insulation System and screens (on ODP motors).

## 30. Inverter Duty (Automotive Duty)

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

Adder is percent of Base List Price. This adder is for Inverter Duty Automotive Duty motors – 10:1 Variable Torque Speed Range or 5:1 Constant Torque Speed Range. For 10:1 Constant Torque Speed Range, use Base List Price of the next higher horsepower plus this adder. Non-Automotive Duty Inverter Duty motors have their own Base List Prices. Refer to the Base List Price section.

## 31. Kiln Duty

<b>Frame:</b>	56	140	180	210	250	280	320	360	400	444-445	447	449
<b>Adder:</b>	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%

Adder is percent of Base List Price. Kiln Duty motors are specifically designed for Kiln Applications. Each application is different, and the customer's specific requirements must be reviewed. Typical product features include:

- Totally Enclosed Air-Over (TEAO) Enclosure
- High Ambient Temperature
- Class H Insulation
- High Temperature Grease
- Special Grease Fitting arrangements
- Sealed (Potted) Leads
- Longer than Standard Motor Leads

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## Three Phase Modifiable NEMA<sup>®†</sup> Horizontal Motors Accessories and Modifications

### 32. Leads

#### A. Longer Than Standard (Q1 to 5), Adder Per Foot

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	113	113	113	113	113	113	113	113	113	113	113	113

#### B. Longer Than Standard (Q6 +), Adder Per Foot

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	68	68	68	68	68	68	68	68	68	68	68	68

#### C. Sealed (Potted)

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	413	413	413	413	443	450	549	609	620	780	800	800

Sealing compound applied around the leads at the lead outlet opening to separate leads, and to seal outlet to prevent contamination from entering the motor. Standard (no charge) on Hazardous Location motors. Not available on Open Drip Proof (ODP) motors.

#### D. Special Terminations

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)

### 33. Lifting Provisions (Both Horizontal & Vertical)

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	N/A	N/A	90	90	128	128	173	173	218	240	240	240

Either Horizontal or Vertical Lifting Provisions, based on the Assembly Position, are supplied as standard (no charge) on the following:

- Open Drip Proof motors 210 Frame and larger
  - Totally Enclosed motors 180 Frame and larger
- Use the Lifting Provisions adder for motors requiring both Horizontal and Vertical Lifting Provisions.

### 34. Lubrication

#### A. High Temperature Grease

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	150	150	150	150	150	250	320	390	525	685	890	890

#### B. Low Temperature Grease

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	150	150	150	150	150	250	320	390	525	685	890	890

Mobil<sup>®</sup> 28 (or equal) grease for temperatures below -30°C. Low Temp Grease is standard (no charge) if Arctic Duty is selected. Cannot have Low Temp Grease with Double Sealed Bearings.

#### C. Washdown Duty Grease

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	75	75	75	75	75	125	160	195	265	340	445	445

Keystone Nevastane<sup>®†</sup> (or equal) grease, standard on Washdown Duty motors.

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# Three Phase Modifiable NEMA® Horizontal Motors Accessories and Modifications

## 34. Lubrication *(continued)*

### D. Oil Mist Provisions (Ball Bearing Motors Only)

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	375	375	375	375	375	570	570	975	1650	1650	2025	2025

Includes providing the Motor with provisions to accommodate Oil Mist Lubrication. An Oil Mist Lubrication System (supplied by others) is a centralized system in which the energy of compressed gas, usually air taken from the plant supply, is used to atomize oil. The oil is then conveyed by air in a low pressure distribution system to application fittings on the Motor mist fittings which meter oil to bearing housings). Available on Enclosed Motors only.

## 35. Marine Duty

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

Marine Duty is available per IEEE-45 Specifications for either Above Deck or Below Deck operation. IEEE-45 requires that motors exposed to the weather, seas, splashing or other severe moisture conditions either be water tight or protected by watertight enclosures.

Since electric motors breathe during operation, they cannot be constructed as watertight. Above Deck motors must be protected by suitable watertight enclosures. Below Deck motors should be located to avoid splashing bilge water. Above Deck also requires CORRO-DUTY®. Open Drip Proof (ODP) motors can only be used Below Deck.

NOTE: IEEE 45 requires that motors exposed to the weather, seas, splashing or other severe moisture conditions either be watertight or protected by watertight enclosures. Since electric motors "breathe" during operation, they cannot be constructed as watertight. Above-deck motors must be protected by suitable watertight enclosures.

## 36. Multi-Speed Motors

Frame:	56	140	180	210	250	280	320	360	400	444-445	447	449
Adder:	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)

Refer to Quick Pick Chart for pricing.

Base List Price:

- Variable & Constant Torque - use base list price of High Speed HP & Poles
- Constant Horsepower - use base list of High Speed HP & Low Speed Poles

This adder includes Multi-Speed with 1.0 Service Factor. If higher Service Factor is required, the Service Factor adder must also be used. The following charts show typical Frame Size adjustments for Multi-Speed (over the standard Single Speed Base Frame Size):

Poles	Speed (RPM)	Variable Torque		Constant Torque		Constant Horsepower	
		1-Wdg	2-Wdg	1-Wdg	2-Wdg	1-Wdg	2-Wdg
2/4	3600/1800	Base	N/A	+1	N/A	+1	N/A
4/6	1800/1200	N/A	+2	N/A	+2	N/A	+1
4/8	1800/900	SEE HP TABLE BELOW					
4/12	1800/600	N/A	+2	N/A	+2	N/A	+1
6/8	1200/900	N/A	+2	N/A	+2	N/A	+1
6/12	1200/600	Base	+2	+1	+2	+1	+1

HP	Speed (RPM)	Variable Torque		Constant Torque		Constant Horsepower	
		1-Wdg	2-Wdg	1-Wdg	2-Wdg	1-Wdg	2-Wdg
1/3-2	1800/900	Base	+2	+1	+2	+1	+1
3-20	1800/900	Base	+2	+2	+3	+1	+1
25-60	1800/900	+1	+2	+2	+3	+1	+1
75+	1800/900	+1	+2	+1	+2	+1	+1

