

# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 43. Starting Method *(continued)*

#### C. Reduced Voltage Starting

Standard motors are capable of accelerating  $Wk^2$  loads per the published table as long as the motor terminal voltage does not drop below 80% for NEMA®† or 90% for TITAN® of the nominal motor voltage. For starting at lower than stated guidelines, make the following percentage additions:

Starting Voltage Percent	Price Addition
69%-65% TAP	12%
80%-70% TAP	7.5%

If the load inertia is 1/2 of the NEMA®† normal and load torque during acceleration does not exceed 60% of the motor rated torque, no price addition is required down to 75% voltage. Engineering verification of the motor capability is required prior to quotation. If the load inertia is greater than NEMA®†, both the inertia adder and the low voltage adder must be made.

NOTE: Motors designed for low-voltage starting may have higher than the standard in-rush current at full voltage.

### 44. Surge Protection

- Available as motor mounted.
- Do not use this accessory on applications where motor is driven by an inverter. Serious damage to the VFD will result. Consult your drive supplier.
- Suitable oversized main conduit box is included in price adders shown.

Surge capacitors and lightning arrestors protect the motor winding from transient voltage spikes and from the incoming distribution system. Distribution system conditions likely to cause turn-to-turn or turn-to-ground winding damage include lightning strikes, capacitor switching, and opening or closing of the system circuit breaker, among others. Should the magnitude of stresses imposed on the winding from system voltage transients exceed the surge limits the motor can withstand, the insulation system will fail.

Lightning arrestors limit the magnitude of the transient voltage spike. This is achieved by the arrestor conducting to ground when the voltage reaches a given value. Surge capacitors limit the rate of rise of the voltage. This is achieved by the capacitor momentarily absorbing the steep wave front.

Surge protection is most effective when it is mounted directly from the main conduit box at the motor leads. Increasing this distance beyond 3 feet significantly reduces its effectiveness. Fusing the capacitors or arrestors is not recommended due to the difficulty in determining if or when the fuse is blown.

Motor Voltage	Surge Capacitors and Lightning Arrestors
600V & Below	\$4,280
601-2400V	\$10,920
2401-4800V	\$14,160
4801-6900V	\$20,285

### 45. Temperature Rise, Standard And Optional

- This option may not be available on the maximum HP rating in a given frame size. Consult your Nidec Motor Corporation Technical Representative for availability.
- This option may change motor frame size and performance characteristics. Consult your Nidec Motor Corporation Technical Representative for confirmed data.
- Combined with other design altering modifications (high ambient, high altitude, VFD use, etc.), this option will significantly change listed product performance described in this catalog. Consult your Nidec Motor Corporation Technical Representative for confirmed frame size, performance data, etc.
- The description of this product feature assumes the motor is applied to sine wave power and in accordance with NEMA®† standards (standard ambient, altitude, balanced voltage, etc.).

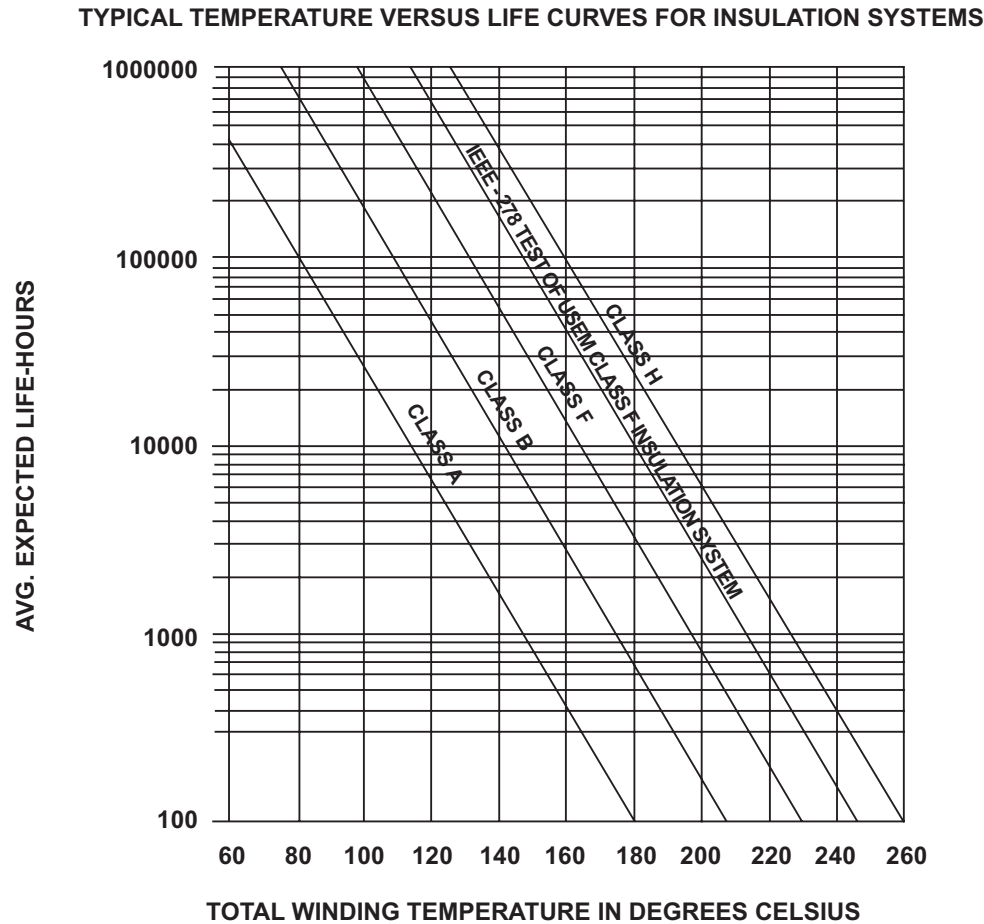
The standard insulation system supplied on all Nidec Motor Corporation products described in this catalog is Class F. When our Class F system is subjected to insulation life testing as described in IEEE-275™, it significantly exceeds the thermal capabilities required to classify it as capable of providing 20,000 hours of design life when operated at the Class F thermal limit of 155°C. Chart 44-1 indicates the thermal capabilities of our standard insulation system, which is shown as the diagonal line slightly below Class H.



**Modifiable TITAN® Horizontal Motors**  
**Accessories and Modifications**

**45. Temperature Rise** *(continued)*

**CHART 45-1**



Most products described in this catalog are designed to operate at Class B temperature rise (80°C measured by resistance) when loaded to nameplate HP in a 40°C ambient under sine wave power. When the motor is run up to the 1.15 SF load point, standard temperature rise is Class F. Generally, products that deviate from this basic design philosophy are so noted on their perspective pricebook pages. This information is stated in general terms due to the wide variety of products and modifications listed in this catalog.

IEEE standards assume winding design life doubles with a 10°C decrease in temperature rise and is halved with a 10°C increase. An insulation system operating at its thermal limit has a design life of 20,000 hours (about 2.3 years). Considering the standard thermal limits for Class F for 155°C and our design practice of 130°C total temperature rise under load, Nidec Motor Corporation provides about 100,000 hours -- 5 times the industry standard -- of winding life. This is one reason there are so many old U.S. MOTORS® horizontal motors still in operation today.

† All marks shown within this document are properties of their respective owners.



# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 45. Temperature Rise *(continued)*

INSULATION CLASS	A <sup>(1)</sup>	B	F	H
<b>Ambient temperature</b> (for options, see item 2 on page M-11)	40°C	40°C	40°C	40°C
<b>Temperature rise at nameplate H.P.</b> (for options, see item 45 on page M-29)	60°C	80°C	105°C	125°C <sup>(2)</sup>
<b>Hot spot or service factor allowance</b> (for service factor, see item 39 on page M-29)	10°C	10°C	10°C	15°C
<b>Thermal limit of insulation system <sup>(3)</sup></b>	105°C	130°C	155°C	180°C
<b>NOTES:</b> <sup>(1)</sup> Class A insulation is 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 pricebook pages requires the appropriate modification adder and may impact frame size and performance characteristics.

#### A. Class "B" Rise at 1.0 S.F.

<b>Frame:</b>	<b>449</b>	<b>5000</b>	<b>5800</b>	<b>6800</b>	<b>8000</b>	<b>9600</b>
<b>Adder:</b>	STD	STD	STD	STD	STD	STD

- Class "B" Rise at 1.0 Service Factor (Full Load) is considered the Standard Temperature Rise.

#### B. Class "B" Rise at 1.15 S.F.

<b>Frame:</b>	<b>449</b>	<b>5000</b>	<b>5800</b>	<b>6800</b>	<b>8000</b>	<b>9600</b>
<b>Adder:</b>	12%	12%	12%	12%	12%	12%

- Adder is percent of Base List Price.
- Make this adder for Class "B" Rise at 1.15 Make this adder for Class "B" Rise at 1.15 service factor. This includes the following options based on a 40°C ambient:
  - "B" Rise at 1.15 Service Factor (By Resistance Method)
  - "B" Rise at 1.15 Service Factor (By Embedded Detector)
  - 90°C Rise at 1.15 Service Factor (By Resistance Method)
- CAUTION: Temperature Rise Below Normal may require a larger frame size. Confirm frame size prior to quoting.

#### C. Class "A" Rise at 1.0 S.F.

<b>Frame:</b>	<b>449</b>	<b>5000</b>	<b>5800</b>	<b>6800</b>	<b>8000</b>	<b>9600</b>
<b>Adder:</b>	25%	25%	25%	25%	25%	25%

- Adder is percent of Base List Price.
- Make this adder for Class "A" Rise at 1.0 service factor. This includes the following options based on a 40°C ambient:
  - "A" Rise at 1.0 Service Factor (By Resistance Method)
  - 60°C Rise at 1.0 Service Factor (By Resistance Method)
- CAUTION: Temperature Rise Below Normal may require a larger frame size. Confirm frame size prior to quoting.



# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 46. Tests (List Pricing)

All completely assembled motors receive a production test prior to shipment from the factory. This test confirms conformance to Nidec Motor Corporation design and no specific values are recorded. The exact nature of this test varies by motor type, but as a minimum, the motor is run at no load and visually inspected. There is no extra charge for a production test, and this test requirement does not need to be noted at order entry. Other testing is available as follows:

- Short Commercial Test (meets NEMA® MG1-12.55 or Part 20 for TITAN® motors) -- This test consists of no-load current, locked rotor current, winding resistance, and high potential.
- Short Commercial Test Witnessed -- A short commercial test, as described above, performed in the presence of a witness.
- Complete Initial Test -- Nidec Motor Corporation tests per IEEE Standard 112™, method B, dynamometer test. This test consists of full-load heat run, percent slip, no-load current, full-load current, locked rotor current, lock rotor torque, breakdown torque (calculated), efficiency and power factor at 100%, 75%, and 50% full load, insulation resistance per IEEE Standard 43™, winding resistance and high potential. (For 460V ratings, testing limited to 700 HP and less.)
- Calibrated Test -- Same as complete initial but curves are provided to customer.
- Sound Test -- This is a no-load test performed in accordance with ANSI S12.51 and NEMA® MG-1. For details on how this is performed, refer to Product Facts.
- Sound Test Witnessed -- A sound test, as described above, performed in the presence of a witness.
- Vibration and Special Testing -- Refer to the Nidec Motor Corporation Technical Representative for details and capabilities.
- Polarization Index -- In accordance with IEEE Standard 43™. Dielectric absorption ratio.
- Spray test -- Form wound stator with EVERSEAL®† Insulation System.
- Immersion Test -- Form wound stator with EVERSEAL®† Insulation System.
- Inverter with motor -- Refer to the Inquiry Group for engineering and plant approval.

Description Tests (List Pricing Per Motor):	449	5000	5800	6800	8000	9600
Short Commercial Test, Un-Witnessed	\$145	\$145	\$145	\$145	\$145	\$145
Short Commercial Test, Witnessed	\$450	\$450	\$675	\$900	\$900	\$900
Complete Initial Test, Un-Witnessed (8)	\$5,575	\$5,575	\$5,575	\$7,800	\$7,800	\$7,800
Complete Initial Test, Witnessed (8)	\$11,250	\$11,250	\$11,250	\$15,600	\$15,600	\$15,600
Calibration Test, Un-Witnessed (8)	\$6,740	\$6,740	\$12,935	\$14,905	\$14,905	\$15,655
Calibration Test, Witnessed (8)	\$10,045	\$10,045	\$18,855	\$22,550	\$22,550	\$22,550
Sound Test, Un-Witnessed (8)	\$1,355	\$1,355	\$2,225	\$2,465	\$2,465	\$2,960
Sound Test, Witnessed (8)	\$2,035	\$2,035	\$3,698	\$3,698	\$3,698	\$4,605
Vibration Test, Un-Witnessed	\$2,075	\$2,075	\$2,075	\$2,075	\$2,305	\$2,305
Vibration Test, Witnessed	\$3,455	\$3,455	\$3,455	\$3,455	\$4,605	\$4,605
Polarization Test, Un-Witnessed	\$1,355	\$1,355	\$1,355	\$1,355	\$1,355	\$1,355
Polarization Test, Witnessed	\$2,035	\$2,035	\$2,035	\$2,035	\$2,035	\$2,035
Spray Test, Un-Witnessed *	\$4,545	\$4,545	\$5,848	\$7,525	\$7,525	\$7,525
Spray Test, Witnessed *	\$6,818	\$6,818	\$8,772	\$11,288	\$11,288	\$11,288
Immersion Test, Un-Witnessed *	\$6,623	\$6,623	\$6,623	\$6,623	\$6,623	\$6,623
Immersion Test, Witnessed *	\$9,935	\$9,935	\$9,935	\$9,935	\$9,935	\$9,935

• NOTE: (8) Multiply net test charge by 1.50 multi-speed motors tested at both speeds.

\* Form wound motors with EVERSEAL®† Insulation System only.



# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 47. Thermal Protection

Selection of an accessory designed to provide thermal protection of bearings or windings depends upon the desired function the device is to perform. The table below provides a comparison of their various characteristics.

	SWITCH (RELAY)	INDICATOR SWITCH	THERMOMETER	THERMOSTATS	RTD	THERMOCOUPLE	THERMISTOR
				KLIXON®†			
BRAND REF.	1	2	3	4	5	6	7
WHERE USED	BRG	BRG	BRG	WDG	BOTH	BOTH	WDG
ALARM	YES	YES	NO	YES	YES <sup>2</sup>	YES <sup>2</sup>	YES
SHUT DOWN	YES <sup>a</sup>	YES <sup>a</sup>	NO	YES <sup>a</sup>	YES <sup>b</sup>	YES <sup>b</sup>	YES <sup>a</sup>
AUTO RESET	YES	YES	NO	YES	NO	NO	NO
TEMPERATURE INDICATING	NO	YES	YES	NO	YES <sup>b</sup>	YES <sup>b</sup>	NO
RANDOM WOUND	-	-	-	YES	YES <sup>c</sup>	YES	YES
FORM WOUND	-	-	-	YES	YES	YES	LIMITED EFFECTIVENESS
OPERATE AUXILIARY EQUIPMENT	YES	YES	YES	YES	YES <sup>b</sup>	YES <sup>b</sup>	YES <sup>b</sup>
TYPE OF PROTECTION	I	I	I	B-G	A-H	A-H	A-H

• NOTE: Brand reference - typical factory choice as follows:

- 1 - BARKSDALE™ MT1H or equal  
(Applicable to oil lubricated bearings only)
- 2 - UNITED ELECTRIC CONTROLS™ Series 800 or equal  
(Applicable to oil lubricated bearings only)
- 3 - ROCHESTER™ gauges - 3 inches stainless-steel dial or equal  
(Applicable to oil lubricated bearings only)
- 4 - TEXAS INSTRUMENTS™ or equal
- 5 - MINCO™, The RTD Co.™ or equal
- 6 - MINCO™, The RTD Co.™ or equal
- 7 - USEM THERMA SENTRY®

#### QUALIFICATION FOOTNOTES:

- a. Requires connection to motor control relay
- b. Requires auxiliary monitor or controller not (normally) supplied with motor
- c. Limited availability

#### • TYPE OF PROTECTION PROVIDED

##### A. Locked Rotor

This type of protection is only available for random wound motors and is dependent on two variables. 1) The response time of the circuits beyond our detectors (or in the case of THERMA SENTRY®, beyond our controller), and 2) The particular motor design.

##### B. Running Overload (thermal considerations only)

##### C. Abnormally High Ambient

##### D. Voltage Unbalance

##### E. High or Low Voltage

##### F. Ventilation Failure

##### G. Single Phasing

##### H. Starting Overload

##### I. Alarm or Shutdown to Prevent Catastrophic Failure



# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 47. Thermal Protection *(continued)*

#### Bearing Thermal Protection

##### THERMOWELLS

Thermowells are not an available option on NEMA®† or TITAN® motors. Thermowells are specifically designed to protect probes from pressure, flow and corrosion when the probe is submerged in this environment. None of these conditions exist in their application to TITAN® motors.

#### A. Arrange-To-Accommodate BTDs (Not Available On UL®† Listed Hazardous Location Motors)

Frame:	449	5000	5800	6800	8000	9600
Adder:	365	365	365	365	365	365

- Adder is per bearing.
- Arrange Motor to accommodate Customer supplied & jobsite installed Bearing Temperature Detectors.
  - ATA Arrange-To-Accommodate BTDs (Must specify details at order entry)

#### B. Bearing RTDs, 10 Ohm (Copper) or 120 Ohm (Nickel)

Frame:	449	5000	5800	6800	8000	9600
Adder:	895	895	895	895	895	895

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a know temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### C. Bearing RTDs, 100 Ohm (Platinum) TCR Rating of .00392

Frame:	449	5000	5800	6800	8000	9600
Adder:	1435	1435	1435	1435	1435	1435

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a know temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### D. Bearing RTDs, 100 Ohm Precision (Platinum) TCR Rating of .00385 (DIN)

Frame:	449	5000	5800	6800	8000	9600
Adder:	1950	1950	1950	1950	1950	1950

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a know temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### E. Bearing RTDs, 10 Ohm Dual Element (Copper) or 120 Ohm Dual Element (Nickel)

Frame:	449	5000	5800	6800	8000	9600
Adder:	1345	1345	1345	1345	1345	1345

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a know temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### F. Bearing RTDs, 100 Ohm Dual Element (Platinum) TCR Rating of .00392

Frame:	449	5000	5800	6800	8000	9600
Adder:	2155	2155	2155	2155	2155	2155

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a know temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

† All marks shown within this document are properties of their respective owners.

# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 47. Thermal Protection *(continued)*

#### G. Bearing RTDs, 100 Ohm Dual Element Precision (Platinum) TCR Rating of .00385 (DIN)

Frame:	449	5000	5800	6800	8000	9600
Adder:	2920	2920	2920	2920	2920	2920

- Adder is per bearing.
- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
  - RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### H. Bearing Thermocouples

Frame:	449	5000	5800	6800	8000	9600
Adder:	395	395	395	395	395	395

- Adder is per bearing. Not available on UL®† Listed Hazardous Location Motors.
- Thermocouple: A pair of dissimilar conductors so joined at one point that an electromotive force is developed by the thermoelectric effects.
  - Control monitor supplied by others, not Nidec Motor Corporation.
- The following options are available:
  - Copper-Constantan (Type T)
  - Iron-Constantan (Type J)
  - Chromel-Constantan (Type E)
  - Chromel-Alumel (Type K)
- Standard bearing temperature detector condulets are cast iron. For Stainless Steel RTD Condulets, please add additional \$1500 per bearing.

#### I. Bearing Temperature Relay (For Use With Oil Lubricated Bearings Only)

Frame:	449	5000	5800	6800	8000	9600
Adder:	520	520	520	520	520	520

- Adder is per bearing. Not available on UL®† Listed Hazardous Location Motors.
- Temperature Relay: Standard offering is BARKSDALE™ Model MT1H Bearing Temperature Switch (Standard Enclosure).

#### J. Bearing Temperature Indicator & Switch (For Use With Oil Lubricated Bearings Only)

Frame:	449	5000	5800	6800	8000	9600
Adder:	1040	1040	1040	1040	1040	1040

- Adder is per bearing. Not available on UL®† Listed Hazardous Location Motors.
- Temperature Indicator & Switch: Standard offering is UE dial type with or without alarm contacts (Standard Enclosure).

#### K. Stem Type Thermometer (For Use With Oil Lubricated Bearings Only)

Frame:	449	5000	5800	6800	8000	9600
Adder:	1040	1040	1040	1040	1040	1040

- Adder is per bearing. Not available on UL®† Listed Hazardous Location Motors.

### Winding Thermal Protection

- For two winding multispeed motors, double list price adder shown below.

#### A. Winding Thermostats

Frame:	449	5000	5800	6800	8000	9600
Adder:	320	320	320	320	320	320

- All UL®† Listed Hazardous Location Motors must be supplied with Thermostats. On self-certified Division 2 motors, apply the Hermetically Sealed Thermostat Adder.
- Snap action, bimetallic, temperature actuated switches installed in the connection end-turns of the motor winding. Their purpose is to activate a warning device (N.O.) or shut down the motor (N.C.) upon excessive winding temperatures. Leads are normally brought out to the main conduit box on 460 volt motors. They are available with normally closed contacts for automatic reset. Overheat protectors with normally open contacts, for use in alarm or warning circuits, are available when specified at time of order.
  - Standard arrangement is Qty. 1 per phase. Double adder for Qty. 2 per phase.
- Normally Closed Thermostats are supplied as standard (no charge) on the following motors:
  - Inverter Duty Motors.
  - UL®† Listed Hazardous Location

† All marks shown within this document are properties of their respective owners.

# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 47. Thermal Protection *(continued)*

#### B. Winding Thermostats, Hermetically Sealed

Frame:	449	5000	5800	6800	8000	9600
Adder:	640	640	640	640	640	640

- Hermetically sealed, snap action, bimetallic, temperature actuated switches installed in the connection end-turns of the motor winding. Their purpose is to activate a warning device (N.O.) or shut down the motor (N.C.) upon excessive winding temperatures. Leads are normally brought out to the main conduit box on 460 volt motors. They are available with normally closed contacts for automatic reset. Overheat protectors with normally open contacts, for use in alarm or warning circuits, are available when specified at time of order.
- Standard arrangement is Qty. 1 per phase. Double adder for Qty. 2 per phase.

#### C. Winding Thermistors (Embedded in Winding)

Frame:	449	5000	5800	6800	8000	9600
Adder:	865	865	865	865	865	865

- Winding thermistors are a nonlinear resistance temperature detector made of semiconductor material and embedded in the end turns of the motor winding, one per phase. Nidec Motor Corporation offers only SIEMENS®† PTC type (Positive Temperature Coefficient) thermistors. NTC type thermistors are not available.
- This accessory will not work without a control module. Our standard thermistors are SIEMENS®† type B59155. Three thermistors are installed in the winding with 6 leads brought to the main conduit box. With this adder, the control module is supplied by others, not Nidec Motor Corporation.
- To prevent nuisance tripping when this accessory is applied to reduced voltage starters, a timer in the control circuit should be added in the control circuit and set for 1-2 seconds. This will allow the motor to start when the auto signal is received (see diagram under THERMA SENTRY® description).
- This accessory provides NEMA®† Type 2 (winding - running over temperature) protection.
- Thermistors are embedded in the winding end turns during manufacturing and cannot be easily added through conversion.

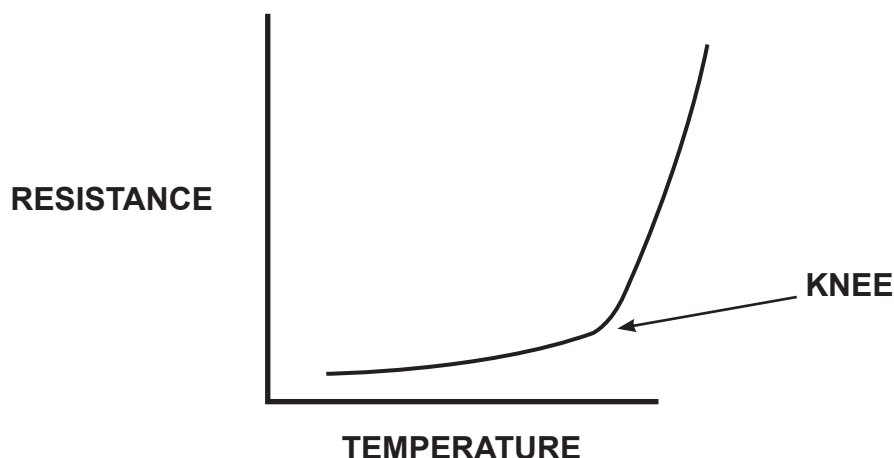
#### D. THERMA SENTRY® System (Separately Mounted / Separately Excited)

Frame:	449	5000	5800	6800	8000	9600
Adder:	1460	1460	1460	1460	1460	1460

- Refer to notes listed under thermistors above (Note: THERMA SENTRY® includes control module)

##### THERMA SENTRY® Mode of Operation

The temperature sensor in the THERMA SENTRY® is a PTC thermistor. Its resistance increases non-linearly with temperature. When the motor winding reaches the critical shutdown point (knee of curve), there is a sharp rise in resistance.



† All marks shown within this document are properties of their respective owners.



# Modifiable TITAN® Horizontal Motors

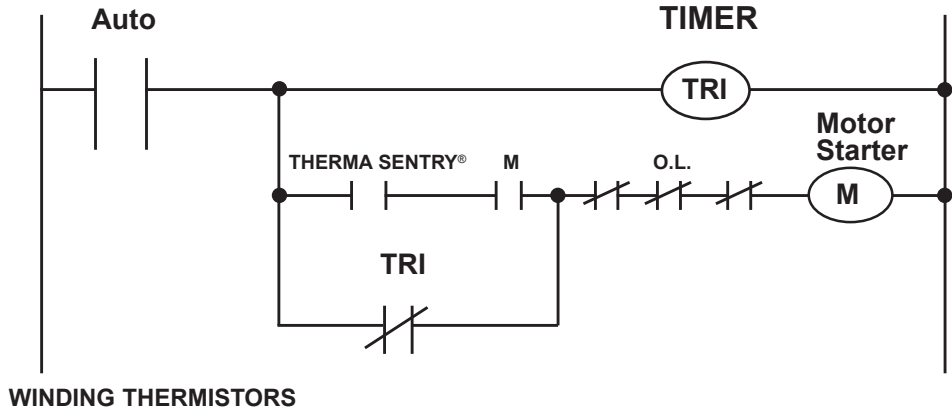
## Accessories and Modifications

### 47. Thermal Protection (continued)

The THERMA SENTRY® winding protection consists of three Positive Temperature Coefficient (PTC) thermistors, one per phase, embedded in the end turns with six leads brought to the motor conduit box and a control for remote mounting by the customer. It protects against the most common causes of motor failure, including: high or low supply voltage, unbalanced line voltage, single phase conditions, abnormally high ambient temperatures, blocked ventilation, starting overload, and running overloads. The control module is supplied with one normally open and normally closed contact (N/C). The control module must be separately excited by a 24 to 240 AC/DC voltage source. The THERMA SENTRY® control module on this option is remote mounted in the customer's control panel.

- Time-out circuit for THERMA SENTRY® used with reduced voltage starting.

There are many possible ways to provide a time-out scheme to the starting circuit. One simple, inexpensive option is shown below:



### E. THERMA SENTRY® System (Motor Mounted / Separately Excited)

Frame:	449	5000	5800	6800	8000	9600
Adder:	2425	2425	2425	2425	2425	2425

- Refer to notes listed under thermistors above (Note: THERMA SENTRY® includes control module).
- The THERMA SENTRY® control module on this option is motor mounted. Other winding accessory leads, with exception to stator RTD leads, can be directed to the THERMA SENTRY® accessory conduit box.
- Not Available on Hazardous Location Motors.

### F. Winding Thermocouples

Frame:	449	5000	5800	6800	8000	9600
Adder:	2190	2190	2190	2190	2190	2190

- Thermocouple: A pair of two dissimilar conductors welded together into a junction. This is inserted into the motor winding - 2 per phase / 6 per motor. Thermocouple leads are brought out to terminal strip connections in an accessory conduit box, which is included in its price. These accessory signal wires leads are connected to an input instrument (supplied by others) to form a reference junction. Heating of the thermocouple imbedded in the winding generates a thermo-electric potential (EMF) proportional to the temperature difference between the two points, indicating the temperature of the embedded thermocouple.
  - Control monitor supplied by others, not Nidec Motor Corporation.
- The following options are available:
  - Copper-Constantan (Type T)
  - Iron-Constantan (Type J)
  - Chromel-Constantan (Type E)
  - Chromel-Alumel (Type K)

# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 47. Thermal Protection *(continued)*

#### Winding Resistance Temperature Detectors (RTDs)

An RTD is a sensing element consisting of a precision wound wire coil of pure metal. Recognized for their accuracy, the RTD's resistance increases with temperature rise in a known and highly repeatable manner. Two RTDs per phase/6 per motor are our standard offering. Accessory lead (signal) wires are connected to terminal strip connectors in an accessory conduit box. When connected to an input instrument or monitor, RTD temperature can be monitored. A variety of RTDs are offered to industry standard curves as shown below. Must be specified at time of order entry.

RTD Element	No. of Wires	Resistance
Nickel (1)	2	120 Ohm @ 0°C
Copper	3	10 Ohm @ 25°C
Platinum	3	100 Ohm @ 0°C
Precision Platinum	3	100 Ohm @ 0°C

(1) Nidec Motor Corporation standard supply, if not specified at time of order entry.

#### G. Winding RTDs, 10 Ohm (Copper) or 120 Ohm (Nickel)

Frame:	449	5000	5800	6800	8000	9600
Adder:	2190	2190	2190	2190	2190	2190

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

#### H. Winding RTDs, 100 Ohm (Platinum) TCR Rating of .00392

Frame:	449	5000	5800	6800	8000	9600
Adder:	3288	3288	3288	3288	3288	3288

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

#### I. Winding RTDs, 100 Ohm Precision (Platinum) TCR Rating of .00385 (DIN)

Frame:	449	5000	5800	6800	8000	9600
Adder:	4460	4460	4460	4460	4460	4460

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

#### J. Winding RTDs, 10 Ohm Dual Element (Copper) or 120 Ohm Dual Element (Nickel)

Frame:	449	5000	5800	6800	8000	9600
Adder:	3225	3225	3225	3225	3225	3225

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

#### K. Winding RTDs, 100 Ohm Dual Element (Platinum) TCR Rating of .00392

Frame:	449	5000	5800	6800	8000	9600
Adder:	4935	4935	4935	4935	4935	4935

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

#### L. Winding RTDs, 100 Ohm Dual Element Precision (Platinum) TCR Rating of .00385 (DIN)

Frame:	449	5000	5800	6800	8000	9600
Adder:	6690	6690	6690	6690	6690	6690

- Resistance Temperature Detector (RTD): Precision, wire-wound resistors with a known temperature-resistance characteristic.
- RTD transmitters and monitor supplied by others, not Nidec Motor Corporation.

# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

### 48. Torque

#### Special Locked Rotor or Breakdown Torque

Frame:	449	5000	5800	6800	8000	9600
Adder:	15%	15%	15%	15%	15%	15%

- Adder is a percent of Base List Price.
- Make the High Torque Adder for higher than standard Locked Rotor Torque or Breakdown Torque, or for Design "C" characteristics (Design "C" characteristics are not available on all ratings. Confirm offering prior to quoting).
  - Refer to Appendix "C" for standard Locked Rotor & Breakdown Torque values.
  - Contact your Nidec Motor Corporation Technical Representative to confirm availability & Frame size.
- High Torque is included as standard (no charge) with Crusher Duty.

### 49. Vibration Detectors

#### (QP) Refer to Quick Pick Chart For Pricing

Frame:	449	5000	5800	6800	8000	9600
Adder:	(QP)	(QP)	(QP)	(QP)	(QP)	(QP)

- Nidec Motor Corporation offers a wide variety of vibration switches and transducers. However, we do not offer the corresponding monitoring equipment. The engineer or end user normally has well-defined monitoring system requirements that are the province of custom panel shops, not Nidec Motor Corporation.
- Monitors and control units, cables, etc., are not included in prices. These are not supplied by Nidec Motor Corporation.
- Nidec Motor Corporation's standard vibration detector for non-classified areas is the ROBERTSHAW® Model RS366.
- Nidec Motor Corporation's standard vibration detector for Hazardous Location ratings is the METRIX™ Model M5550.
- Nidec Motor Corporation can also arrange to accommodate
- If the "Arrange-To-Accommodate" option is selected, the Manufacturer, Manufacturer's Part Number and Type must be specified at order entry.

### 50. Proximity Probes (Sleeve Bearing Motors Only)

#### A. Arrange-To-Accommodate Proximity Probes

Frame:	449	5000	5800	6800	8000	9600
Adder:	N/A	1735	1735	2078	2078	2078

- When requesting "Arrange-To-Accommodate", Customer must specify the series and size. Provision will include a drilled and tapped hole (mounting studs are not included).
- If customer supplied proximity probes are calibrated for "4140" shaft material, please also apply the Shaft Material, High Tensile Steel Adder.

#### B. BENTLY-NEVADA® 3300 Series 8mm Proximity Probes

Frame:	449	5000	5800	6800	8000	9600
Adder:	N/A	25135	25135	25135	25135	25135

- BENTLY-NEVADA® 3300 Series 8mm Proximity Probes are used for monitoring shaft position on a Sleeve Bearing Motor. Two probes are required per bearing. The price adder includes "4140" high tensile steel shaft, probes, proximeters, mounting studs and cables wired to a dedicated accessory conduit box.

#### C. BENTLY-NEVADA® 3300 Series 8mm Proximity Probes With Qty. 1 Keyphaser

Frame:	449	5000	5800	6800	8000	9600
Adder:	N/A	31955	31955	31955	31955	31955

- BENTLY-NEVADA® 3300 Series 8mm Proximity Probes are used for monitoring shaft position on a Sleeve Bearing Motor. Two probes are required per bearing. The price adder includes "4140" high tensile steel shaft, probes, proximeters, mounting studs and cables wired to a dedicated accessory conduit box.
- Includes Qty. 1 Keyphaser



# Modifiable TITAN® Horizontal Motors

## Accessories and Modifications

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### 51. Voltage, Standard And Special

Frame:	449	5000	5800	6800	8000	9600
Adder:	5%	5%	5%	5%	5%	5%

- Motors will operate successfully, but not necessarily in accordance with all NEMA®† MG1 performance standards, at voltages 10% above or below nameplate stamping at maintained frequency.
- The Voltage Adder should be made for voltages other than those listed below:

Hertz	Standard Voltages						
60 Hz	460	575	2300	2400	4000	4160	6600
50 Hz	380	400	415	3300	6000	6900	

- For Special Voltages, use the following Base List Prices:
  - Up To 600 Volt Use 460V Base List
  - 601 To 3299 Volt Use 2300V Base List
  - 3300 To 4999 Volt Use 4000V Base List
  - 5000 To 6900 Volt Use 6600V Base List
- Voltages above 6900V are not available.
- 2300/4000V motors are not available on ratings below 150 H.P.

