

# Appendix A

## Load Inertia Tables, Squirrel-Cage Induction Motors - Refer to the "High Inertia Load" Option

### Load Wk<sup>2</sup> (Exclusive of Motor Wk<sup>2</sup>), Lb-Ft<sup>2</sup>

Horsepower	Synchronous Speed, RPM @ 60 Hertz						
	3600	1800	1200	900	720	600	514
150	133	640	1719	3456	5940	9230	13410
200	172	831	2238	4508	7750	12060	17530
250	210	1017	2744	5540	9530	14830	21560
300	246	1197	3239	6540	11270	17550	25530
350	281	1373	3723	7530	12980	20230	29430
400	315	1546	4199	8500	14670	22870	33280
450	349	1714	4666	9460	16320	25470	37090
500	381	1880	5130	10400	17970	28050	40850
600	443	2202	6030	12250	21190	33110	48260
700	503	2514	6900	14060	24340	38080	55500
800	560	2815	7760	15830	27440	42950	62700
900	615	3108	8590	17560	30480	47740	69700
1000	668	3393	9410	19260	33470	52500	76600
1250	790	4073	11380	23390	40740	64000	93600
1500	902	4712	13260	27350	47750	75100	110000
1750	1004	5310	15060	31170	54500	85900	126000
2000	1096	5880	16780	34860	61100	96500	141600
2250	1180	6420	18440	38430	67600	106800	156900
2500	1256	6930	20030	41900	73800	116800	171800
2750	1325	7408	21563	45259	79875	126586	186424
3000	1387	7860	23040	48520	85800	136200	200700
3250	1442	8295	24469	51696	91600	145563	214799
3500	1491	8700	25850	54800	97300	154800	228600

Horsepower	Synchronous Speed, RPM @ 50 Hertz						
	3000	1500	1000	750	600	500	429
150	208	998	2676	5378	9233	14352	20833
200	270	1298	3489	7021	12064	18764	27250
250	329	1590	4282	8626	14834	23086	33541
300	387	1874	5058	10200	17554	27333	39728
350	443	2152	5819	11748	20231	31517	45826
400	497	2425	6567	13272	22870	35644	51846
450	550	2692	7303	14774	25474	39722	57795
500	602	2955	8029	16257	28048	43753	63682
600	703	3467	9451	19170	33111	51693	75283
700	800	3964	10839	22020	38075	59486	86682
800	893	4447	12195	24814	42949	67150	97901
900	982	4918	13523	27557	47743	74696	108959
1000	1069	5377	14825	30254	52463	82134	119869
1250	1273	6478	17975	36811	63975	100311	146567
1500	1461	7520	20995	43135	75120	117959	172539
1750	1635	8509	23899	49253	85945	135143	197877
2000	1796	9451	26697	55187	96482	151911	222646
2250	1945	10349	29399	60951	106754	168299	246899
2500	2083	11206	32012	66558	116784	184338	270675
2750	2211	12025	34541	72019	126586	200051	294008
3000	2328	12808	36992	77343	136175	215458	316927
3250	2437	13556	39368	82536	145563	230577	339454
3500	2536	14272	41673	87605	154759	245423	361610

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



# Appendix B

## UL<sup>®†</sup> Class, Group & Temperature Codes

### Hazardous Location Definitions \*

<b>HAZARDOUS LOCATION</b>	An area where the possibility of explosion and fire is created by the presence of flammable gases, vapors, dusts, fibers or flyings.
<b>DIVISION 1</b>	Division 1 in the normal situation; the hazard would be expected to be present in everyday production operations or during frequent repair and maintenance activity.
<b>DIVISION 2</b>	Division 2 in the abnormal situation; material is expected to be confined within closed containers or closed systems and will be present only through accidental rupture, breakage or unusual faulty operation.
<b>CLASS I</b>	Those areas in which flammable gases or vapors may be present in the air in sufficient quantities to be explosive or ignitable.
<b>CLASS II</b>	Those areas made hazardous by the presence of combustible dust.
<b>CLASS III</b>	Those areas in which there are easily ignitable fibers or flyings present, due to type of material being handled, stored or processed.

<b>GROUPS</b>	The gases and vapors of Class I locations are broken into four groups by the codes A, B, C and D. These materials are grouped according to the ignition temperature of the substance, its explosion pressure and other flammable characteristics.	Group A	Acetylene
		Group B	Hydrogen
		Group C	Ethyl-Ether, Ethylene, Cycle Propane
		Group D	Gasoline, Hexane, Naphtha, Benzene, Butane, Propane, Alcohol, Lacquer Solvent, Vapors, Natural Gas
	Class II - dust locations - Groups E, F & G. These groups are classified according to the ignition temperature and the conductivity of the hazardous substance.	Group E	Metal Dust
		Group F	Carbon Black, Coal, Coke Dust
		Group G	Flour, Starch, Grain Dust

	Maximum Temperature		Temperature Code	Notes
	Degrees C	Degrees F		
<b>OPERATING TEMP. CODES</b>	450	842	T1	1) T1, T2 & T6 not offered by USEM. 2) T1 through T2D not applicable to Class II locations. 3) T2A through T2D, Class I Group D only.
	300	572	T2	
	280	536	T2A	
	260	500	T2B	
	230	446	T2C	
	215	419	T2D	
	200	392	T3	
	180	356	T3A	
	165	329	T3B	
	160	320	T3C	
	135	275	T4	
	120	248	T4A	
	100	212	T5	
	85	185	T6	

- NOTES**
- 1) USEM offers Class I and Class II only. USEM does not offer Group A or B.
  - 2) Group C available on 5800 Frame.
  - 3) Refer to Base List Price Section for available ratings.
  - 4) Orders for UL<sup>®†</sup> Listed Hazardous Location Motors must specify Division, Class, Group and Temperature Code.

\* These are simplified definitions - refer to NATIONAL ELECTRICAL CODE<sup>®†</sup> (NEC<sup>®†</sup>), Article 500 for complete definitions.

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## Appendix C

### Standard Locked Rotor & Breakdown Torque - For Pricing Purposes; Refer to the "Torque, High" Option

Horsepower	Standard Locked Rotor Torque (% Of Full Load Torque)						
	3600	1800	1200	900	720	600	514
50	120	140	135	125	120	115	110
60	120	140	135	125	120	115	110
75	105	140	135	125	120	115	110
100	105	125	125	125	120	115	110
125	100	110	125	120	115	115	110
150	100	110	120	120	115	115	60
200	100	100	120	120	115	60	60
250	70	80	100	100	60	60	60
300	70	80	100	60	60	60	60
350	70	80	100	60	60	60	60
400	70	80	60	60	60	60	60
450	70	80	60	60	60	60	60
500	70	80	60	60	60	60	60
600	60	60	60	60	60	60	60
700	60	60	60	60	60	60	60
800	60	60	60	60	60	60	60
900	60	60	60	60	60	60	60
1000	60	60	60	60	60	60	60
1250	60	60	60	60	60	60	60
1500	60	60	60	60	60	60	60
1750	60	60	60	60	60	60	60
2000	60	60	60	60	60	60	60
2250 & Up	60	60	60	60	60	60	60

Horsepower	Standard Breakdown Torque (% Of Full Load Torque)						
	3600	1800	1200	900	720	600	514
50	200	200	200	200	200	200	200
60	200	200	200	200	200	200	200
75	200	200	200	200	200	200	200
100	200	200	200	200	200	200	200
125	200	200	200	200	200	200	200
150	200	200	200	200	200	200	175
200	200	200	200	200	200	175	175
250	175	175	175	175	175	175	175
300	175	175	175	175	175	175	175
350	175	175	175	175	175	175	175
400	175	175	175	175	175	175	175
450	175	175	175	175	175	175	175
500	175	175	175	175	175	175	175
600	175	175	175	175	175	175	175
700	175	175	175	175	175	175	175
800	175	175	175	175	175	175	175
900	175	175	175	175	175	175	175
1000	175	175	175	175	175	175	175
1250	175	175	175	175	175	175	175
1500	175	175	175	175	175	175	175
1750	175	175	175	175	175	175	175
2000	175	175	175	175	175	175	175
2250 & Up	175	175	175	175	175	175	175

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



# Appendix D Space Heater Wattage, 60Hz 460/575V Nominal Efficiency Table & Shaft Extensions

## Space Heater Wattage

Typical Space Heater Wattage				
Frame	ODP, WPI, WPIL	TEFC	Div. 1 Hazardous Location	TEAAC, TEWAC
449	192 Watts	288 Watts	--	--
5000	384 Watts	384 Watts	288 Watts	--
5800	384 Watts	384 Watts	384 Watts	384 Watts
6800	480 Watts	480 Watts	--	480 Watts
8000	700 Watts	--	--	700 Watts
9600	900 Watts	--	--	900 Watts

## Nominal Full Load Efficiencies of Premium Efficient 60Hz 460/575V Motors

HP	OPEN MOTORS				ENCLOSED MOTORS			
	2 POLE	4 POLE	6 POLE	8 POLE	2 POLE	4 POLE	6 POLE	8 POLE
150	94.1	95.8	95.4	94.1	95.0	95.8	95.8	94.1
200	95.0	95.8	95.4	94.1	95.4	96.2	95.8	94.5
250	95.0	95.8	95.8	95.0	95.8	96.2	95.8	95.0
300	95.4	95.8	95.8	--	95.8	96.2	95.8	--
350	95.4	95.8	95.8	--	95.8	96.2	95.8	--
400	95.8	95.8	--	--	95.8	96.2	--	--
450	96.2	96.2	--	--	95.8	96.2	--	--
500	96.2	96.2	--	--	95.8	96.2	--	--

## Shaft Extensions

TITAN® Horizontal Shaft Extensions					
Enclosure	Frame	2-Pole (Standard)	4-Pole & Slower (Standard)	4-Pole & Slower (Optional)	Notes
TEFC	449	TS	T	TM, TL	
	5000	S	S	ML	
	5800	SS	S	ML, L	"L" extension is only applicable to 5810 & 5812
	6800	--	S	--	
Div. 1 Hazardous Location	5000	SS	S	G	"G" is GM Automotive Extension
	5800	SS	S	ML	Applicable to 5807, 5809 & 5811
TEAAC	5800	S	M	L	
TEWAC	8000	SS	S	--	
	9600	--	S	--	
ODP WPI WPIL	449	TS	TS	TM	
	5000	SS, S	S	MS, L	Must use "S" on 2-Pole above 800 HP, Cannot use "L" with Sleeve Bearings
	5800	S	M	L	Cannot use "L" with Sleeve Bearings
	6800	SS	S	MS, No Suffix	Cannot use "No Suffix" with Sleeve Bearings
	8000	SS	S	--	
	9600	--	S	--	

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# Appendix E

## Typical Sound Levels & Motor Weights

Typical Motor Sound Levels (Sound Pressure in dBA @ 1 Meter)							
Frame	RPM	ODP / WPI	WPII	TEFC	Div. 1 Hazardous Location	TEAAC	TEWAC
449	3600	84	--	92	--	--	--
	1800	73	--	91	--	--	--
	1200 & Slower	70	--	87	--	--	--
5000	3600	90	88	90	93	--	--
	1800	88	86	86	89	--	--
	1200 & Slower	82	80	79	82	--	--
5800	3600	91	90	90	96	90	92
	1800	90	88	85	92	90	87
	1200 & Slower	82	80	78	91	88	82
6800	3600	--	--	--	--	--	--
	1800	90	82	88	--	--	--
	1200 & Slower	86	80	82	--	--	--
8000	3600	94	90	--	--	92	--
	1800	90	88	88	--	90	87
	1200 & Slower	86	82	--	--	90	85
9600	3600	--	--	--	--	--	--
	1800	95	92	--	--	92	90
	1200 & Slower	92	87	--	--	90	87

Note: Sound abatement options available on most ratings. See Accessories and Modifications section.

Typical Motor Shipping Weights (lbs.)							
Frame	ODP/WPI	WPII	TEFC	Div. 1 Hazardous Location	TEAAC	TEWAC	
449	2000	--	2400	--	--	--	
5004	--	--	2700	--	--	--	
5008	4115	4550	4000	3000	--	--	
5010	4900	5250	4800	--	--	--	
5012	5425	5775	6000	--	--	--	
5807	--	--	--	4600	--	--	
5809	--	--	--	5200	--	--	
5810	5000	5900	7700	--	7800	7900	
5811	5900	6800	--	5700	8800	8900	
5812	7100	8000	9300	--	10000	10000	
5813	8200	9100	--	--	11200	11200	
6808	--	--	12200	--	--	--	
6809	6400	6800	13300	--	8900	9000	
6810	6850	7750	--	--	9400	9900	
6811	7350	8000	16000	--	10600	10500	
8005	9500	11600	--	--	--	--	
8006	9500	11600	--	--	--	--	
8007	9500	11600	--	--	12600	13800	
8008	10000	12000	--	--	13750	14500	
8009	10900	13000	--	--	14800	15300	
8010	12000	14200	--	--	15900	16200	
8011	13300	15500	--	--	17200	17600	
9603	14300	16800	--	--	--	--	
9604	14300	16800	--	--	18800	18800	
9605	15250	18100	--	--	20200	20200	
9606	16500	19400	--	--	21500	21500	
9607	17700	20700	--	--	22600	22600	
9608	19000	21900	--	--	24000	24000	
9609	19000	23300	--	--	25400	25400	
9610	19000	24600	--	--	26900	26900	

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# Appendix F

## Type Designations, Dual Drilled Frames & C-Face / D-Flange Availability

**U.S. MOTORS® type codes for horizontal motors do have meaning - the first letter designates the enclosure:**

R = TITAN® ODP, WPI, WP11	J = TITAN® TEFC	E = TITAN® Hazardous Location UL® Listed Division 1
H = TITAN® ODP, WPI, WP11	JT = TITAN® TEAAC	N = TITAN® Hazardous Location UL® Listed Division 2
JW = TITAN® TEWAC	JAD = Standard Efficient Auto Duty	JDE = Premium Efficient Auto Duty

**The next letter(s) designate special features, such as:**

E = Premium Efficient (NEMA®)	I = VFD/Inverter Duty	C = CORRO-DUTY®
S = Sleeve Bearings	N = Non-Ventilated	X = Vector Duty

### Dual Mounting Holes (Standard Frame & One Frame Below)

Motor Types	Standard Frames	Enclosure	Dual Drilled Standard (Yes / No)
R	447 / 449	ODP/WPI	No
R/RS	5008 / 5010 / 5012	ODP/WPI	Yes*
R/RS	5008 / 5010 / 5012	WP11	Yes*
R/RS	5810 / 5811 / 5812 / 5813	ODP / WPI / WP11	Yes
H/HS	6809 / 6810 / 6811	ODP / WPI / WP11	No
R/RS	8005 / 8006 / 8007 / 8008 / 8009 / 8010 / 8011	ODP / WPI / WP11	No
R/RS	9603 / 9604 / 9605 / 9606 / 9607 / 9608 / 9609 / 9610	ODP / WPI / WP11	Yes
J	449	TEFC	Yes
J/JS	5008 / 5010 / 5012	TEFC	Yes
J/JS	5810 / 5812	TEFC	Yes
J/JS	6808 / 6809 / 6811 / 450MLA / 450LAB / 450BCD / 7007 / 7008 / 7010	TEFC	Yes*
E/JAD/JDE	5004 / 5008	Div. 1 Hazardous Location / TEFC	No
E/J	5807 / 5809 / 5811	Div. 1 Hazardous Location / TEFC	Yes
JT	5810 / 5811 / 5812 / 5813	TEAAC	Yes
JT/JTS	8005 / 8006 / 8007 / 8008 / 8009 / 8010 / 8011	TEAAC	No
JT/JTS	9603 / 9604 / 9605 / 9606 / 9607 / 9608 / 9609 / 9610	TEAAC	Yes

\* Tri-Drilled Frame (Standard Frame & Two Frame Below)

### C-Face / D-Flange Availability

Frame	Feature	ODP & WPI		TEFC	
		"C"	"D"	"C"	"D"
449	Flange on Drive End	Yes (cast)	Yes (cast)	Yes (cast)	Yes (cast)
	Flange on both ends	No	No	No	No
	Footless ("round frame")	Yes – shaft down only	Yes – shaft down only	Yes – shaft down only	Yes – shaft down only
5000	Flange on drive end	Yes (cast)	Yes (cast)	Yes (cast)	Yes (cast)
	Flange on both ends	Yes (cast)	Yes (cast)	No	No
	Footless ("round frame")*	Yes (Fab. Steel)	No	No	No
5800	Flange on drive end	No	No	No	Yes (Fab. Steel)
	Flange on both ends	No	No	No	No
	Footless ("round frame")*	No	No	No	Yes (Fab. Steel)
6800 & Larger	Flange on drive end	No	No	No	No
	Flange on both ends	No	No	No	No
	Footless ("round frame")*	No	No	No	No

\* Price footless as normal thrust vertical motor from PB500 catalog.



# Appendix G

## Encoder Selection Guide

Also known as tachometer, a rotary encoder is a feedback device that translates mechanical motion into an electrical signal. There are multiple mounting styles for all types, but Titan II motors offer hollow shaft encoder mounting as a standard.

### Type of Encoding:

Optical encoders are usually less expensive, but are much more vulnerable to shock, vibration, and contamination from dusty, dirty, wet, or chemical environments. For these tough environments, Nidec recommends magnetic encoders.

### Encoder Wiring

Encoders may be connected with MS military style connectors (solder connections with threaded housing), built-in cable (pigtail), or EPIC industrial connectors (screw terminal). Not all models are available with all connectors; consult encoder pages for options.

### Durability/Duty


Encoders are available for Titan II motors in a broad range of prices and performance specifications. Often the lowest-priced encoder is not the best for tough applications, nor is "IP rating" a good indicator of encoder durability. Instead, Nidec groups encoders by duty: light duty, mill duty, heavy mill duty and severe mill duty:

Recommended Type	Typical Applications*								
	Conveying	Converting	Films	Food <sup>s</sup>	Paper	Steel	Hoist	Marine <sup>s</sup>	Oil Drilling <sup>E</sup>
Light									
Standard / Mill									
Heavy									
Severe									

\* Darker = better suited for application  
<sup>s</sup> Stainless Option Recommended  
<sup>E</sup> Explosion Protected Recommended

\* Nidec Motor Corporation makes no warranty as to suitability of purpose; recommendations are based on industry standard applications and are subject to warranty terms and conditions of sale.

See the quick pick chart on page M-1 for more details of the encoders below:

	Type of Encoder	Mounting	Encoder (Grouped by Type)
	Optical Light Duty	Hollow Shaft	AVTRON HS35A Dynapar HS35R EPC 776
	Magnetic Mill Duty	Hollow Shaft	AVTRON HS35M
	Magnetic Heavy Duty	Hollow Shaft	AVTRON HS45 NORTHSTAR HS56
	Magnetic Severe Duty	Hollow Shaft	AVTRON AV685 NORTHSTAR HS85

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