

Typical Applications

Typical applications for the N-Series motors are:

- Machine tools
- Material handling
- Web processing
- Robotics
- Packaging machinery

Characteristics

- High performance stepper replacement
- NEMA mounting provides excellent mechanical interface
- Environmentally rugged

Selecting a Drive/Motor Combination

The following drive/motor combinations are available for the N-Series motors:

Motor	ULTRA 100	ULTRA 200	ULTRA Plus
N-2302-1-F00AA	1398-DDM-005	1398-DDM-010	NA
N-2304-1-F00AA	1398-DDM-005	1398-DDM-010	NA
N-3406-2-H00AA	1398-DDM-009	1398-DDM-020	1398-PDM-20
N-3412-2-H00AA	1398-DDM-009	1398-DDM-020	1398-PDM-20
N-4214-2-H00AA	1398-DDM-009	1398-DDM-020	1398-PDM-20
N-4220-2-H00AA	1398-DDM-019	1398-DDM-030	1398-PDM-30
N-5630-2-H00AA	1398-DDM-019	1398-DDM-030	1398-PDM-30
N-5637-2-H00AA	1398-DDM-019	1398-DDM-030	1398-PDM-30
N-5647-2-H00AA	1398-DDM-019	1398-DDM-030	1398-PDM-30

N-Series Specifications

This section contains the mechanical, thermostat and winding specifications for the N-Series motor family, as well as the load force ratings and performance specifications for every combination of ULTRA series drives and N-Series motors. It also provides motor dimensions, connector pin and signal designations, and all motor and connector ordering information.

N-Series Mechanical Specifications

Specifications	Units	N-2302	N-2304	N-3406	N-3412	N-4214
Rotor moment of inertia	kg-m ² (lb-in.-s ²)	0.000009 (0.00008)	0.00002 (0.00016)	0.00008 (0.0007)	0.00015 (0.0013)	0.00024 (0.0021)
Rotor moment of inertia (brake motors)	kg-m ² (lb-in.-s ²)	0.000018 (0.00016)	0.000032 (0.00028)	0.000122 (0.00108)	0.000202 (0.00179)	0.000210 (0.00186)
Motor net weight	kg (lb)	1.0 (2.3)	1.5 (3.4)	2.6 (5.7)	3.5 (7.6)	4.7 (10.4)
Brake motor net weight	kg (lb)	1.3 (2.9)	2.0 (4.3)	3.4 (7.5)	4.3 (9.5)	5.1 (11.2)
Damping	N-m/kRPM (lb-in./kRPM)	0.0015 (0.013)	0.0021 (0.019)	0.0078 (0.069)	0.012 (0.106)	0.013 (0.113)
Friction torque	N-m (lb-in.)	0.012 (0.11)	0.014 (0.13)	0.021 (0.19)	0.035 (0.31)	0.043 (0.38)
Maximum Operating Speed	rpm	6000	6000	6000	6000	6000

Specifications	Units	N-4220	N-5630	N-5637	N-5647
Rotor moment of inertia	kg-m ² (lb-in.-s ²)	0.00035 (0.0031)	0.0009 (0.008)	0.0011 (0.01)	0.0015 (0.013)
Rotor moment of inertia (brake motors)	kg-m ² (lb-in.-s ²)	0.000320 (0.00283)	0.000651 (0.00576)	0.000778 (0.00689)	0.000893 (0.00791)
Motor net weight	kg (lb)	5.9 (13.0)	9.1 (20.0)	11.0 (24.2)	13.0 (28.7)
Brake motor net weight	kg (lb)	6.9 (15.2)	10.9 (24.0)	13.2 (29.0)	15.9 (35.0)
Damping	N-m/kRPM (lb-in./kRPM)	0.012 (0.106)	0.022 (0.194)	0.02 (0.175)	0.028 (0.25)
Friction torque	N-m (lb-in.)	0.048 (0.406)	0.078 (0.688)	0.1 (0.875)	0.11 (0.938)
Maximum Operating Speed	rpm	5000	4000	4000	3000

N-Series Thermostat Specifications

Specifications	
Rated voltage	0 - 250V DC or 50/60 Hz AC ¹
Rated current	3.0A at power factor of 1.0 2.0A at power factor of 0.6
Maximum switching current	5 A
Contact resistance	Less than 0.040 Ohms maximum
Contacts	Normally closed
Insulation dielectric	Mylar Nomex capable of withstanding 1500V AC RMS 50/60 Hz for 1 minute
Opening temperature (±5°C)	135°C

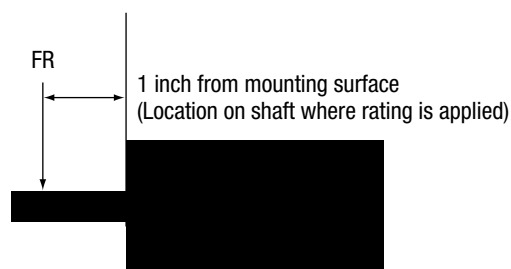
¹ The thermostat is normally used as a switch for a 15V DC logic signal (recommended).

N-Series Winding Specifications

Specifications	Units	N-2302	N-2304	N-3406	N-3412	N-4214
Sine wave K_T torque Constant at 25°C ¹	N-m/A (lb-in./A)	0.08 (0.73)	0.18 (1.6)	0.17 (1.5)	0.34 (3.0)	0.41 (3.6)
Square wave K_T torque Constant at 25°C ²	N-m/A (lb-in./A)	0.09 (0.80)	0.20 (1.8)	0.18 (1.6)	0.37 (3.3)	0.45 (4.0)
K_E voltage constant ³	V/kRPM	10	22	21	41	49
Winding resistance Phase to phase at 25°C	Ohm	3.2	4.9	2.2	2.7	2.8
Winding inductance Phase to phase	mH	4.1	8.1	6.1	8.6	11.0
Thermal resistance ⁴	°C/Watt	3.0	2.2	1.6	1.2	1.1
Poles		4	4	4	4	4

N-Series Motors Shaft Load Specifications

Motor	Shaft Radial Load (FR)
N-2300	2.26 kg (5 lb)
N-3406	13.6 kg (30 lb)
N-3412	15.9 kg (35 lb)
N-4214	20.4 kg (45 lb)



ULTRA 100 Series Specifications for N-Series Motors¹

Specifications		N-2302	N-2304	N-3406	N-3412	N-4214
Drive	1398-DDM-	005	005/009	009	009	009
Maximum continuous operating speed ²	RPM	6000	6000	6000	5500	4500
Continuous stall torque ²	N-m (lb-in.)	0.2 (1.6)	0.4/0.5 (3.5/4.4)	0.8 (6.8)	1.6 (13.8)	2.0 (15.5)
Peak torque ³	N-m (lb-in.)	0.5 (4.6)	1.1/1.4 (10.0/13.0)	2.1 (18.5)	4.1 (36.0)	5.7 (45.0)

Specifications		N-4220	N-5630	N-5637	N-5647
Drive	1398-DDM-	019	019	019	019
Maximum continuous operating speed ²	RPM	5000	4000	4000	3000
Continuous stall torque ²	N-m (lb-in.)	2.5 (22.0)	3.4 (30.0)	4.5 (40.0)	5.9 (52.0)
Peak torque ³	N-m (lb-in.)	7.1 (63.0)	10.7 (95.0)	13.0 (120)	17.0 (150)

¹ Ambient temperature is 0°C to 40°C for motors and 0°C to 50°C for drives.

² With 230V AC line voltage input, except for N-2302 and N-2304, which are used with 115V AC line voltage input.

³ System limit.

ULTRA 200 Series Specifications for N-Series Motors¹

Specifications		N-2302	N-2304	N-3406	N-3412	N-4214
Drive	1398-DDM-	010	010	020	020	020
Maximum continuous operating speed ²	RPM	6000	6000	6000	5500	4500
Continuous stall torque ²	N-m (lb-in.)	0.2 (1.7)	0.5 (4.4)	0.8 (6.8)	1.6 (13.8)	2 (18)
Peak torque ³	N-m (lb-in.)	0.5 (4.7)	1.4 (13.0)	2.1 (18.5)	4.1 (36)	5.7 (50)

Specifications		N-4220	N-5630	N-5637	N-5647
Drive	1398-DDM-	030	030	030	030
Maximum continuous operating speed ²	RPM	5000	4000	4000	3000
Continuous stall torque ²	N-m (lb-in.)	2.9 (26.0)	3.8 (34.0)	5.2 (46.0)	6.0 (53.0)
Peak torque ³	N-m (lb-in.)	7.1 (63.0)	10.7 (95.0)	13.0 (120)	17.0 (150)

¹ Ambient temperature is 0°C to 40°C for motors and 0°C to 50°C for drives.

² With 230V AC line voltage input, except for N-2302 and N-2304, which are used with 115V AC line voltage input.

³ System limit.

ULTRA Plus Specifications for N-Series Motors¹

Specifications		N-2302	N-2304	N-3406	N-3412	N-4214
Drive	1398-PDM-	NA	NA	20	20	20
Maximum continuous operating speed ²	RPM	NA	NA	6000	6000	5000
Continuous stall torque ²	N-m (lb-in.)	NA	NA	0.8 (6.8)	1.6 (13.8)	2 (18)
Peak torque ³	N-m (lb-in.)	NA	NA	2.1 (18.5)	4.1 (36)	5.7 (50)

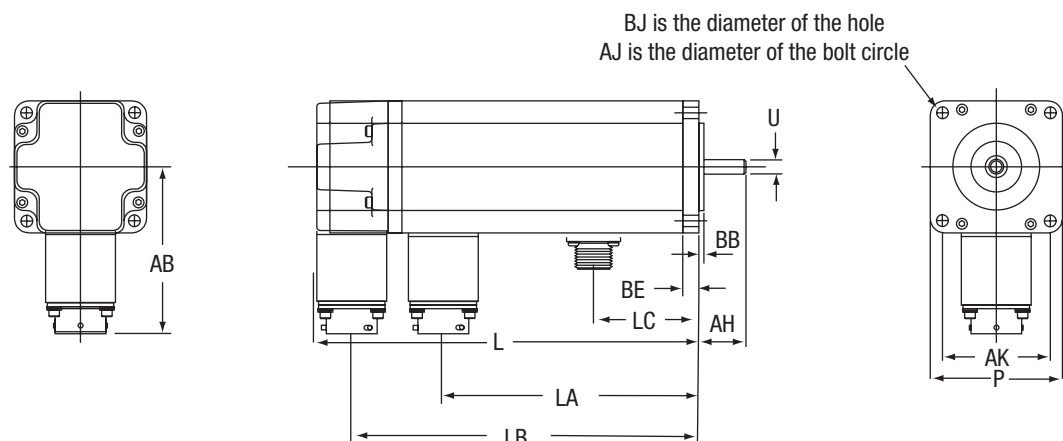
Specifications		N-4220	N-5630	N-5637	N-5647
Drive	1398-PDM-	30	30	30	30
Maximum continuous operating speed ²	RPM	5000	4000	4000	3000
Continuous stall torque ²	N-m (lb-in.)	2.9 (26.0)	3.8 (34.0)	5.2 (46.0)	6.0 (53.0)
Peak torque ³	N-m (lb-in.)	7.1 (63.0)	10.7 (95.0)	13.0 (120)	17.0 (150)

¹ Ambient temperature is 0°C to 40°C for motors and 0°C to 50°C for drives.

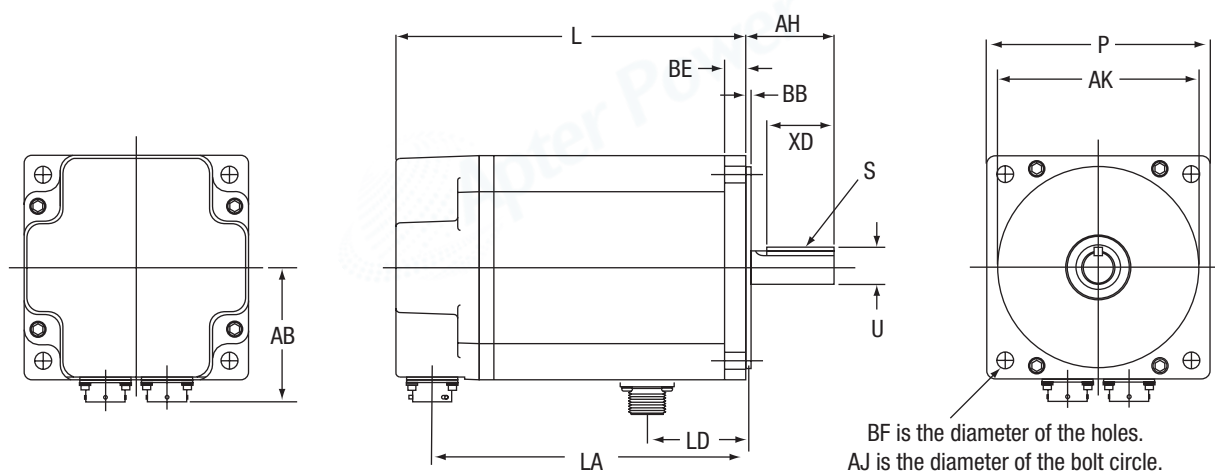
² With 230V AC line voltage input.

³ System limit.

N-2300 Motors Dimensions (see page 62 for dimension values)



N-3400, -4200, and -5600 Motors Dimensions (see page 62 for dimension values)



Dimensions	AB	AH ¹	AJ	AK	BB	BE	BF	L	L with brake	LA	LB	P	S (width x depth) ⁵	U ³	XD ⁶
Motor Models	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm x mm (in. x in.)	mm (in.)	mm (in.)
N-2302	69 (2.71)	21 (0.81)	67 (2.625)	38 ² (1.50)	2 (0.09)	7 (0.275)	5 (0.205)	118 (4.64)	161 (6.35)	62 (2.43)	106 (4.05)	58 (2.27)	NA	6 (0.25)	NA
N-2304	69 (2.71)	21 (0.81)	67 (2.625)	38 ² (1.50)	2 (0.09)	7 (0.275)	5 (0.205)	156 (6.14)	199 (7.85)	100 (3.93)	141 (5.55)	58 (2.27)	NA	6 (0.25)	NA
N-3406	64 (2.53)	30 (1.19)	98 (3.875)	73 ⁴ (2.878)	3 (0.12)	8 (0.315)	6 (0.220)	147 (5.8)	193 (7.59)	124 (4.87)	NA	88 (3.48)	3 x 2 (0.127 x 0.085)	13 (0.50)	20 (0.79)
N-3412	64 (2.53)	30 (1.19)	98 (3.875)	73 ⁴ (2.878)	3 (0.12)	8 (0.315)	6 (0.220)	173 (6.8)	218 (8.59)	149 (5.87)	NA	88 (3.48)	3 x 2 (0.127 x 0.085)	13 (0.50)	20 (0.79)
N-4214	63 (2.48)	35 (1.38)	126 (4.95)	56 ⁷ (2.187)	3 (0.12)	10 (0.394)	7 (0.280)	174 (6.8)	221 (8.69)	152 (5.99)	NA	102 (4.00)	5 x 3 (0.189 x 0.108)	16 (0.625)	25 (1.00)
N-4220	63 (2.48)	35 (1.38)	126 (4.95)	56 ⁷ (2.187)	3 (0.12)	10 (0.394)	7 (0.280)	200 (7.87)	246 (9.69)	178 (6.99)	NA	102 (4.00)	5 x 3 (0.189 x 0.108)	16 (0.625)	25 (1.00)
N-5630	76 (2.99)	50 (1.97)	149 (5.875)	114 ⁸ (4.50)	3 (0.12)	12 (0.472)	9.5 (0.375) in UNC	199 (7.845)	256 (10.06)	178 (7.0)	NA	127 (5.00)	5 x 3 (0.189 x 0.121)	19 (0.75)	40 (1.57)
N-5637	76 (2.99)	50 (1.97)	149 (5.875)	114 ⁸ (4.50)	3 (0.12)	12 (0.472)	9.5 (0.375) in UNC	225 (8.845)	281 (11.06)	203 (8.0)	NA	127 (5.00)	5 x 3 (0.189 x 0.121)	19 (0.75)	40 (1.57)
N-5647	76 (2.99)	50 (1.97)	149 (5.875)	114 ⁸ (4.50)	3 (0.12)	12 (0.472)	9.5 (0.375) in UNC	250 (9.845)	306 (12.06)	229 (9.0)	NA	127 (5.00)	5 x 3 (0.189 x 0.121)	19 (0.75)	40 (1.57)

¹ Tolerance is ±0.03 in. (±0.76 mm).

² Tolerance is -0.002 in. (-0.05 mm).

³ Tolerance is -0.005 in. (-0.13 mm) diameter.

⁴ Tolerance is -0.006 in. (-0.15 mm).

⁵ Tolerance is -0.002 in. (-0.05 mm) width, -0.015 in. (-0.38 mm) depth.

⁶ Tolerance is +0.06 in. (+1.5 mm).

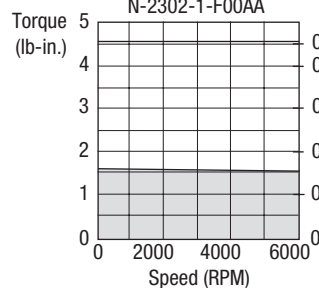
⁷ Tolerance is -0.001 in. (-0.025 mm) diameter.

⁸ Tolerance is -0.003 in. (-0.076 mm) diameter.

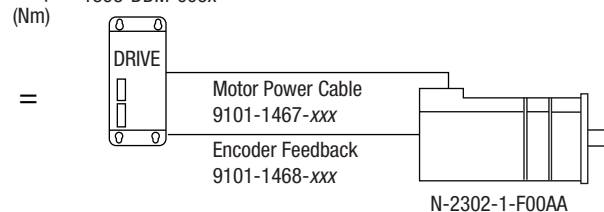
Note: NEMA motors are manufactured to inch dimensions. Millimeter dimensions are approximate conversions from inches. Engineering specifications showing motor detail are available upon request.

ULTRA Servo Drives with N-Series Motors

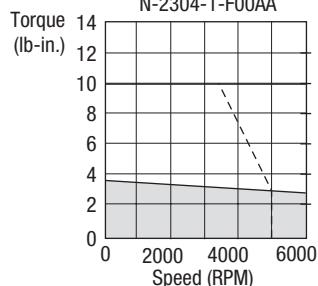
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N-2302-1-F00AA



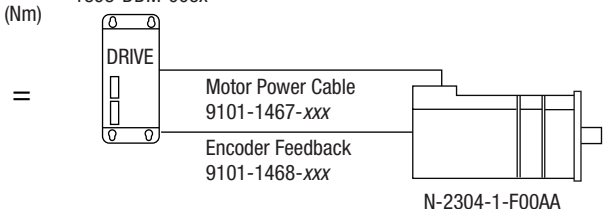
1398-DDM-005
1398-DDM-005x



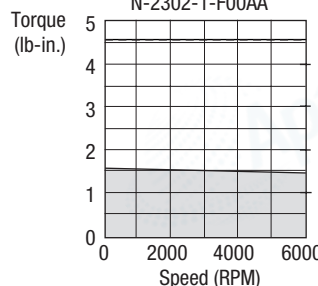
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N-2304-1-F00AA



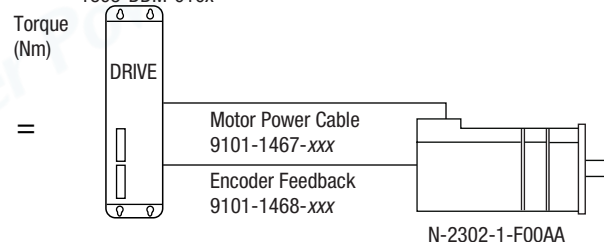
1398-DDM-005
1398-DDM-005x



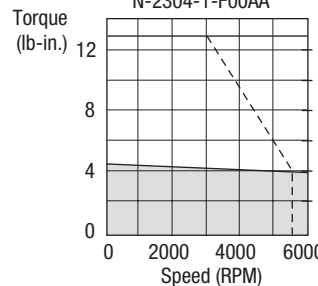
1398-DDM-010,-010x and
N-2302-1-F00AA



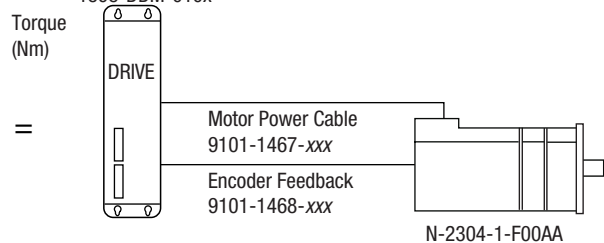
1398-DDM-010
1398-DDM-010x



1398-DDM-010,-010x and
N-2304-1-F00AA



1398-DDM-010
1398-DDM-010x



System speed-torque characteristics

Drive module input voltage = 230V AC RMS

* Last three digits select standard cable lengths of:

10 ft (3.0 m)-010; 25 ft (7.7 m)-025; 50 ft (15.0 m)-050; 75 ft (23.0 m)-075; 100 ft (31.0 m)-100

Note: Serial interface cables for use with the ULTRA 100 drives cannot exceed 50 ft.

- = Intermittent operating region
- = Continuous operating region
- = Drive operation with 115V AC RMS input voltage