

SERIES: NEMA23-AMT112S | **DESCRIPTION:** STEPPER SERVO MOTOR**FEATURES**

- CUI Devices AMT112S encoder + LIN Engineering stepper motor
- stepper motor with encoder for closed-loop mode when paired with a controller
- small, compact NEMA 23 frame size
- up to 270 oz-in (1.90 N-m) holding torque
- patented capacitive encoder ASIC technology
- incremental resolutions up to 4096 PPR
- resolutions programmable with AMT Viewpoint™ PC software
- digitally set zero position



IN PARTNERSHIP WITH
 **LIN ENGINEERING**
 The Step Motor Specialists
 BACKED BY **MOONS'**

MODEL

| | step angle | current/phase | resistance/phase typ ($\Omega \pm 10\%$) | inductance/phase typ (mH $\pm 20\%$) | max holding torque | max optimal speed | body length max (inch) |
|------------------------|------------|---------------|---|--|--------------------|-------------------|---------------------------|
| | (°) | (A) | | | (oz-in) | (RPS) | |
| NEMA23-17-15SD-AMT112S | 1.8 | 2.10 | 1.2 | 2.18 | 85.0 | 13 | 1.74 |
| NEMA23-17-15PD-AMT112S | 1.8 | 4.20 | 0.3 | 0.39 | 85.0 | 24 | 1.74 |
| NEMA23-17-01SD-AMT112S | 1.8 | 1.40 | 2.8 | 4.1 | 85.0 | 6 | 1.74 |
| NEMA23-17-01PD-AMT112S | 1.8 | 2.80 | 0.7 | 1.15 | 85.0 | 11 | 1.74 |
| NEMA23-22-02SD-AMT112S | 1.8 | 2.10 | 1.8 | 4.8 | 170.0 | 3 | 2.22 |
| NEMA23-22-02PD-AMT112S | 1.8 | 4.20 | 0.5 | 1.2 | 170.0 | 9 | 2.22 |
| NEMA23-31-01SD-AMT112S | 1.8 | 1.40 | 4.5 | 12.76 | 270.0 | 2 | 3.1 |
| NEMA23-31-01PD-AMT112S | 1.8 | 2.80 | 1.1 | 3.82 | 270.0 | 5 | 3.1 |

AMT112S ENCODER ELECTRICAL

| parameter | conditions/description | min | typ | max | units |
|------------------------------|------------------------|---------|-----|-----|-------|
| power supply | VDD | 4.5 | 5 | 5.5 | V |
| start up time | | | 200 | | ms |
| current consumption | with unloaded output | | 16 | | mA |
| output high level | | VDD-0.1 | | | V |
| output low level | | | | 0.1 | V |
| output current (per channel) | | | | 15 | mA |
| rise/fall time | | | 8 | | ns |

INCREMENTAL CHARACTERISTICS

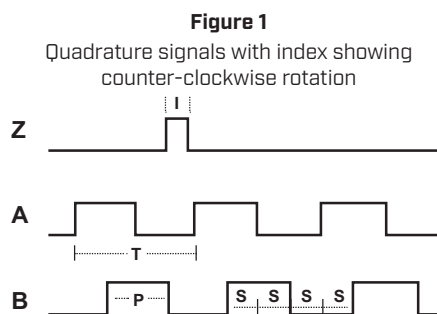
| parameter | conditions/description | min | typ | max | units |
|-------------------------------------|---|-----|-----|-----|---------|
| channels | CMOS Voltage: A, B, Z | | | | |
| waveform | CMOS voltage square wave | | | | |
| phase difference | A leads B for CCW rotation (viewed from front) | | | | |
| quadrature resolutions ¹ | 48, 96, 100, 125, 192, 200, 250, 256, 360, 384, 400, 500, 512, 768, 800, 1000, 1024, 1600, 2000, 2048, 2500, 4096 | | | | PPR |
| index ² | one pulse per 360 degree rotation | | | | |
| accuracy | | | 0.2 | | degrees |
| quadrature duty cycle | | | 50 | | % |

Notes: 1. Resolution programmed with AMT Viewpoint™ PC software. Default resolution set to 400 PPR.
2. Zero position alignment set with AMT One Touch Zero™ module, AMT Viewpoint™ PC software, or serial commands

MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------------------------------|---|-----|------|------|-------|
| weight | | | 15.7 | | g |
| rotational speed (at each resolution) | 48, 96, 100, 125, 192, 200, 250, 256, 384, 400, 500, 512, 800, 1000, 1024, 2048 | | | 8000 | RPM |
| | 360, 768, 1600, 2000, 4096 | | | 4000 | RPM |
| | 2500 | | | 2500 | RPM |

ENCODER WAVEFORMS




The following parameters are defined by the resolution selected for each encoder, where R = resolution.

| Parameter | Description | Expression | Units |
|-----------|-----------------|------------|--------------------|
| T | period | $360/R$ | mechanical degrees |
| P | pulse width | $T/2$ | mechanical degrees |
| I | index width | $P/2$ | mechanical degrees |
| S | A/B state width | $P/2$ | mechanical degrees |

STEPPER MOTOR SPECIFICATIONS

| parameter | conditions/description | min | typ | max | units |
|---------------------|--|-----|-------|-------|--------------------|
| motor frame size | NEMA Size 23 | | | | |
| step angle | | | 1.8 | | ° |
| rated current/phase | see page 1 for details | | | | |
| rated voltage | | | 24-80 | | Vdc |
| resistance/phase | see page 1 for details | | | | |
| inductance/phase | see page 1 for details | | | | |
| connection type | bipolar | | | | |
| rotor inertia | NEMA23-22-02SD-AMT112S, NEMA23-22-02PD-AMT112S | | 1.5 | | oz-in ² |
| | NEMA23-31-01SD-AMT112S | | 2.60 | | oz-in ² |
| | NEMA23-31-01PD-AMT112S | | 3.60 | | oz-in ² |
| | all other models | | 0.70 | | oz-in ² |
| max holding torque | see page 1 for details | | | | |
| bearing type | ABEC3 | | | | |
| front shaft OD | | | 6.35 | | mm |
| front shaft length | | | 0.81 | | inch |
| max optimal speed | see page 1 for details | | | | |
| max axial load | | | | 15 | lb |
| radial play | at 1 lb load | | | 0.001 | inch |
| end play | at 2 lbs load | | | 0.003 | inch |
| shaft run out | | | 0.002 | | inch TIR |
| dielectric strength | | | 500 | | V |
| EMI/EMC | EN 55014-1:2007 | | | | |

SWITCHING SEQUENCE

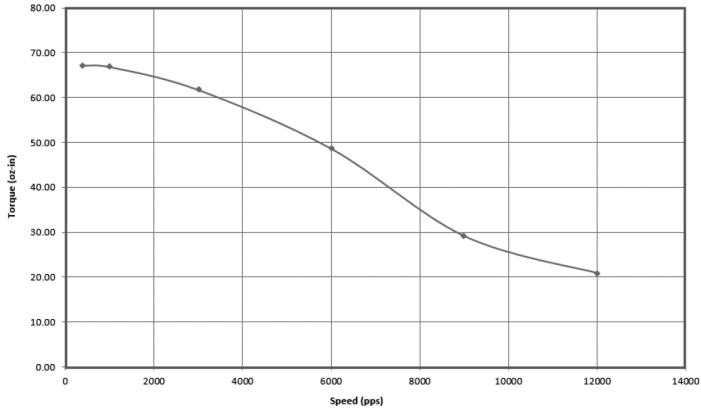
| SWITCHING SEQUENCE | | | | | |
|---|------|---|---|---|---|
| CCW | STEP | A | A | B | B |
|  | 1 | + | - | + | - |
| | 2 | + | - | - | + |
| | 3 | - | + | - | + |
| | 4 | - | + | + | - |
| | 1 | + | - | + | - |
| Motor Rotation Viewed from Front Shaft End | | | | | |

ENVIRONMENTAL

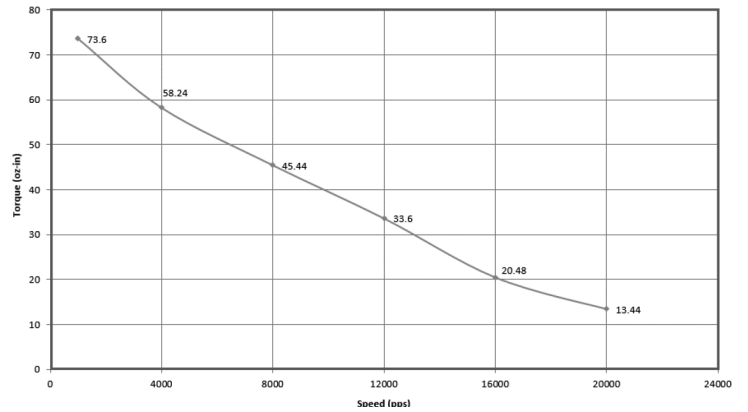
| parameter | conditions/description | min | typ | max | units |
|-----------------------|--|-----|-----|-----|-------|
| operating temperature | | -20 | | 50 | °C |
| storage temperature | | -20 | | 100 | °C |
| humidity | non-condensing | | | 85 | % |
| vibration | 10-500 Hz, 5 minute sweep, 2 hours on each XYZ | | | 5 | G |
| shock | 3 pulses, 6 ms, 3 on each XYZ | | | 200 | G |
| RoHS | yes | | | | |

TORQUE CURVES

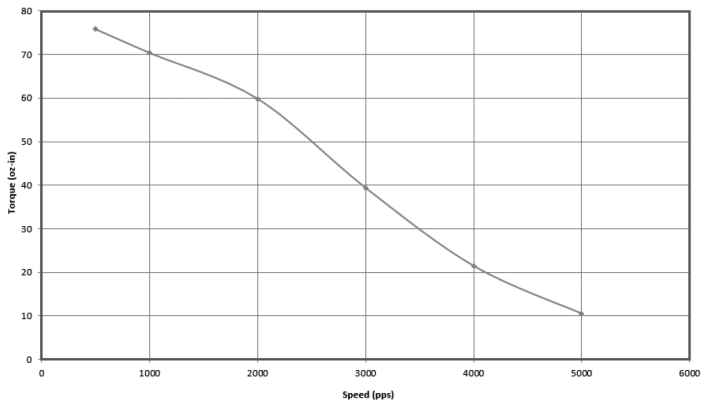
CUI Devices P/N NEMA23-17-15SD-AMT112S
Lin Engineering P/N WO-5718X-15S (1.8 Step Motor)
24 Vdc, 2.10 Amp/Phase, R356, 1/2 Stepping



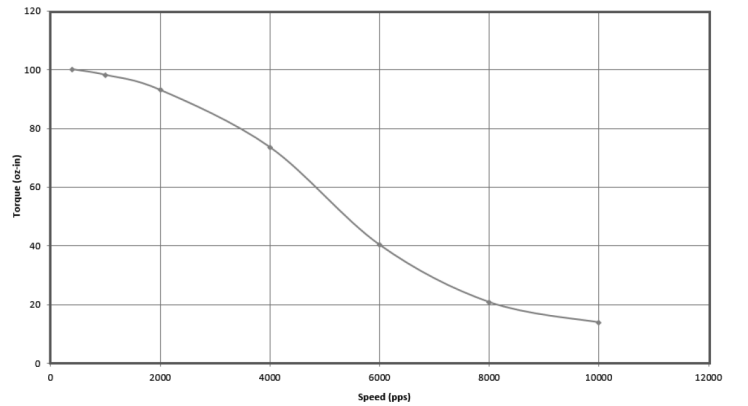
CUI Devices P/N NEMA23-17-15PD-AMT112S
Lin Engineering P/N WO-5718X-15P (1.8 Step Motor)
24 Vdc, 4.2 Amp/Phase, Bipolar, 1/2 Stepping



CUI Devices P/N NEMA23-17-01SD-AMT112S
Lin Engineering P/N WO-5718X-01S (1.8 Step Motor)
24 Vdc, 1.4 Amp/Phase, Bipolar, 1/2 Stepping

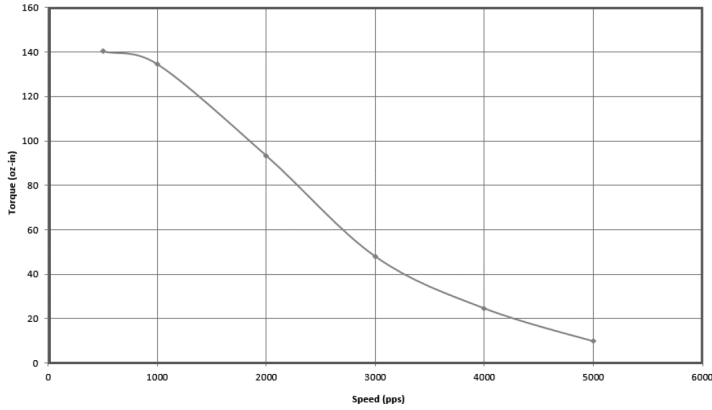


CUI Devices P/N NEMA23-17-01PD-AMT112S
Lin Engineering P/N WO-5718X-01P (1.8 Step Motor)
24 Vdc, 2.8 Amp/Phase, IB463, 1/2 Stepping

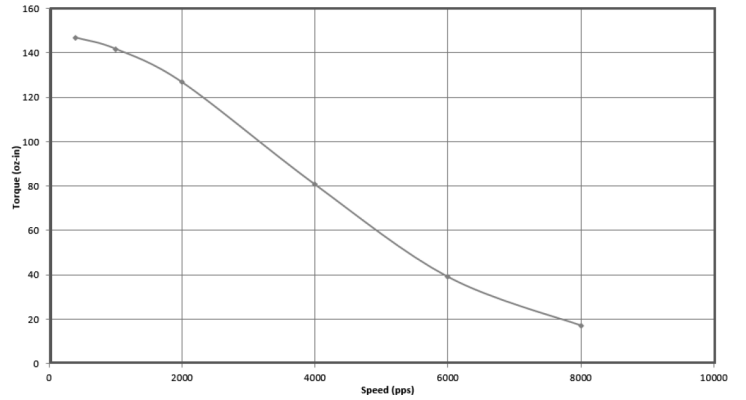


TORQUE CURVES (CONTINUED)

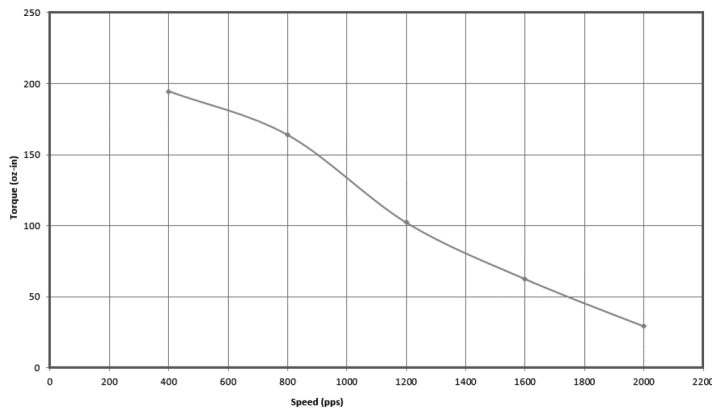
CUI Devices P/N NEMA23-22-02SD-AMT112S
 Lin Engineering P/N WD-5718M-02S (1.8 Step Motor)
 24 Vdc, 2.1 Amp/Phase, Bipolar, 1/2 Stepping



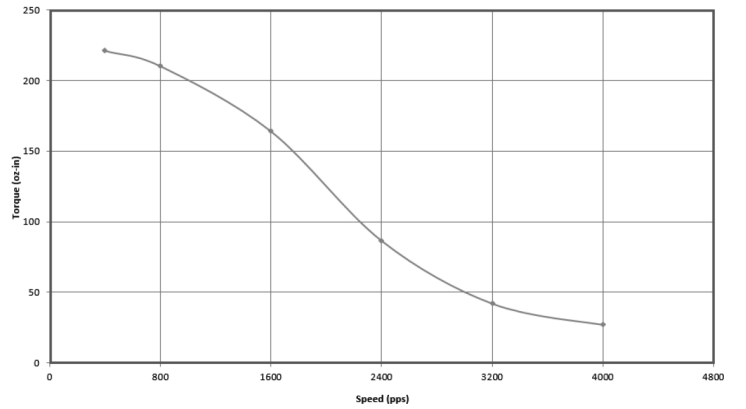
CUI Devices P/N NEMA23-22-02PD-AMT112S
 Lin Engineering P/N WD-5718M-02P (1.8 Step Motor)
 24 Vdc, 4.2 Amp/Phase, IB1010, 1/2 Stepping



CUI Devices P/N NEMA23-31-01SD-AMT112S
 Lin Engineering P/N WD-5718L-01S (1.8 Step Motor)
 24 Vdc, 1.4 Amp/Phase, Bipolar, 1/2 Stepping

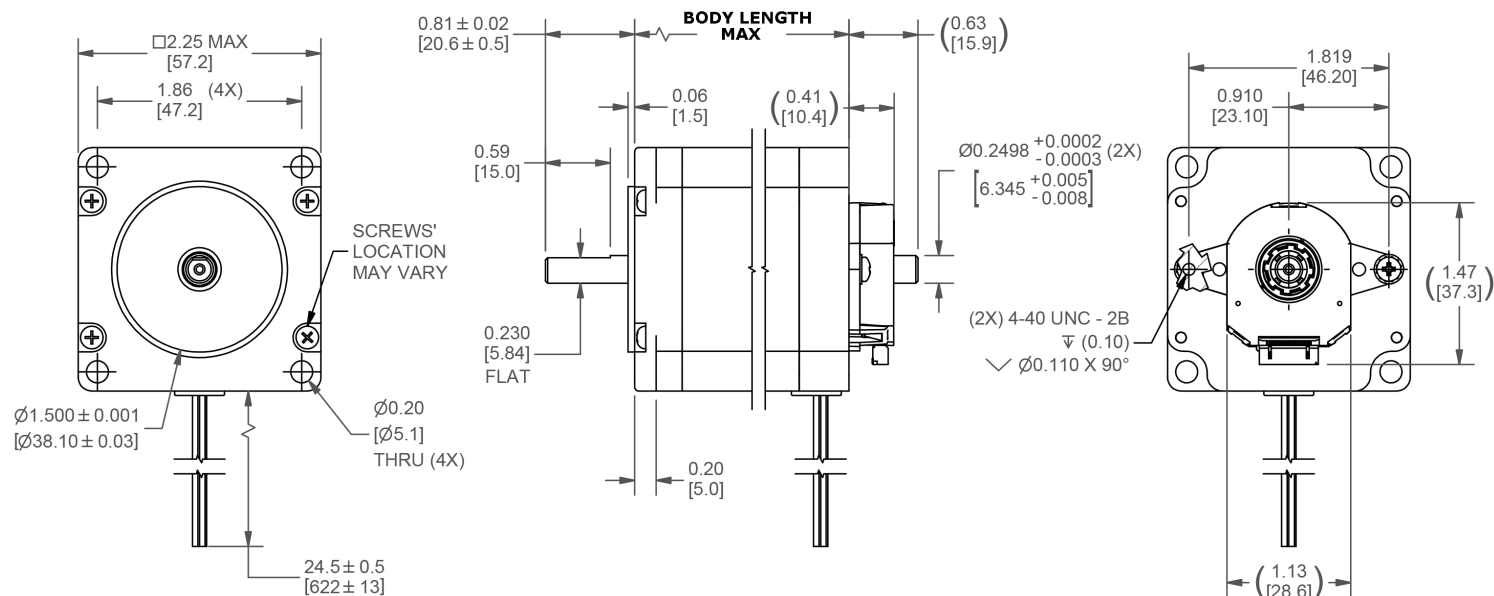


CUI Devices P/N NEMA23-31-01PD-AMT112S
 Lin Engineering P/N WD-5718L-01P (1.8 Step Motor)
 24 Vdc, 2.8 Amp/Phase, IB463, 1/2 Stepping

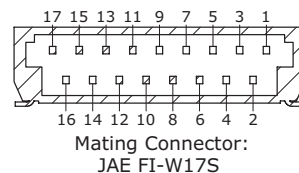


MECHANICAL DRAWING

units: inch [mm]
 tolerance:
 X.XX ±0.01 [±0.25]
 X.XXX ±0.005 [±0.13]
 X.XXXX ±0.0005 [±0.013]



| MOTOR WIRE CONNECTIONS | |
|------------------------|-----------|
| Color | Function |
| red | A |
| blue | \bar{A} |
| green | B |
| black | \bar{B} |
| 22 AWG, PVC | |



| MODEL NO. | BODY LENGTH (inch) | WEIGHT (lb) |
|------------------------|--------------------|-------------|
| NEMA23-17-15SD-AMT112S | 1.74 | 1.05 |
| NEMA23-17-15PD-AMT112S | 1.74 | 1.05 |
| NEMA23-17-01SD-AMT112S | 1.74 | 1.05 |
| NEMA23-17-01PD-AMT112S | 1.74 | 1.05 |
| NEMA23-22-02SD-AMT112S | 2.22 | 1.50 |
| NEMA23-22-02PD-AMT112S | 2.22 | 1.50 |
| NEMA23-31-01SD-AMT112S | 3.10 | 2.35 |
| NEMA23-31-01PD-AMT112S | 3.10 | 2.35 |

| ENCODER CONNECTIONS | |
|---------------------|----------|
| # | Function |
| 1 | TX_ENC+ |
| 2 | RX_ENC+ |
| 3 | N/A |
| 4 | GND |
| 5 | N/A |
| 6 | +5 V |
| 7 | N/A |
| 8 | B+ |
| 9 | N/A |
| 10 | A+ |
| 11 | N/A |
| 12 | Z+ |
| 13 | N/A |
| 14 | MCLRB |
| 15 | N/A |
| 16 | N/A |
| 17 | N/A |

REVISION HISTORY

| rev. | description | date |
|------|------------------------------|------------|
| 1.0 | initial release | 06/26/2018 |
| 1.01 | brand update | 02/20/2020 |
| 1.02 | logo, datasheet style update | 08/05/2022 |

The revision history provided is for informational purposes only and is believed to be accurate.



CUI Devices offers a one (1) year limited warranty. Complete warranty information is listed on our website.

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