

SERIES: AMT10 | **DESCRIPTION:** MODULAR INCREMENTAL ENCODER

FEATURES

- patented capacitive ASIC technology
- low power consumption
- CMOS outputs
- 16 DIP switch selectable resolutions
- index pulse
- modular package design
- straight (radial) and right-angle (axial) versions
- 9 mounting hole options for radial version
- 8 mounting hole options for axial version
- -40~100°C operating temperature


ELECTRICAL

| parameter | conditions/description | min | typ | max | units |
|---------------------|------------------------------|---------|-----|-----|-------|
| power supply | VDD | 3.6 | 5 | 5.5 | V |
| current consumption | with unloaded output | | 6 | | mA |
| output high level | | VDD-0.8 | | | V |
| output low level | | | | 0.4 | V |
| output current | CMOS sink/source per channel | | | 2 | mA |
| rise/fall time | | | 30 | | ns |

INCREMENTAL CHARACTERISTICS

| parameter | conditions/description | min | typ | max | units |
|--|---|-----|------|-----|---------|
| channels | quadrature A, B, and X index | | | | |
| waveform | CMOS voltage square wave | | | | |
| phase difference | A leads B for CCW rotation (viewed from front) | | 90 | | degrees |
| quadrature resolutions ¹ | 48, 96, 100, 125, 192, 200, 250, 256, 385, 400, 500, 512, 800, 1000, 1024, 2048 | | | | PPR |
| index ² | one pulse per 360 degree rotation | | | | |
| accuracy | | | 0.25 | | degrees |
| quadrature duty cycle (at each resolution) | 256, 512, 1024, 2048 | 49 | 50 | 51 | % |
| | 48, 96, 100, 125, 192, 200, 250, 384, 400, 500 | 47 | 50 | 53 | % |
| | 800, 1000 | 43 | 50 | 56 | % |

Notes: 1. Resolution selected via adjustable DIP switch
 2. Some stepper motors may leak a magnetic field causing the AMT index pulse to not function properly (non-magnetic version available with 8 pulses per revolution).

MECHANICAL

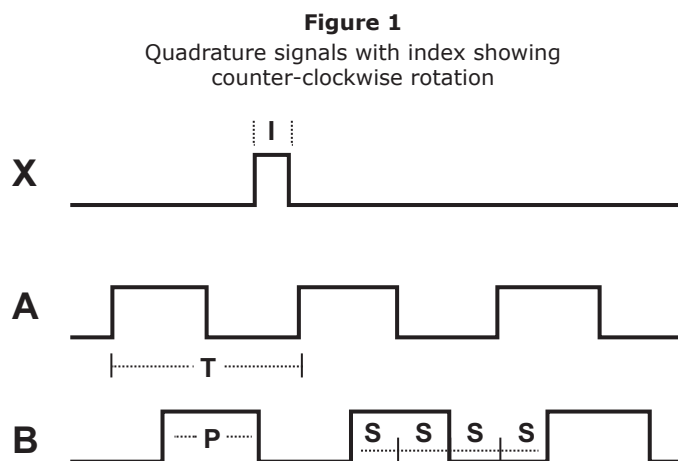
| parameter | conditions/description | min | typ | max | units |
|---------------------------------------|---|-----|------|-------|-------|
| motor shaft length | | 9 | | | mm |
| weight | AMT102 | | 20.5 | | g |
| | AMT103 | | 14.0 | | g |
| axial play | | | | ±0.3 | mm |
| rotational speed (at each resolution) | 192, 384, 400, 500, 800, 1000, 1024, 2048 | | | 7500 | RPM |
| | 48, 96, 100, 125, 200, 250, 256, 512 | | | 15000 | RPM |

ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|------------------------------------|-------------------------------|-----|-----|-----|-------|
| operating temperature ¹ | | -40 | | 100 | °C |
| humidity | non-condensing | | | 95 | % |
| vibration | 20~500 Hz, 1 hour on each XYZ | | | 10 | G |
| shock | 11 ms, ±XYZ direction | | | 50 | G |
| RoHS | 2011/65/EU | | | | |

Note: 1. Encoders with operating temperature of -40~125°C are available as a custom order

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 |

PART NUMBER KEY

For customers that prefer a specific AMT10 configuration, please reference the custom configuration key below.

AMT10X - X XXXX - X XXXX - X

Base Number

Orientation:

2 = Radial

3 = Axial

*See Mechanical Drawings

Resolution Option:

"blank" = fixed resolution

D = adjustable resolution

Resolution¹ (ppr):

0048 0384

0096 0400

0100 0500

0125 0512

0192 0800

0200 1000

0250 1024

0256 2048

Index Pulse:

I = single index pulse

per revolution

N = 8 index pulses

per revolution

Mounting Base:

S = Standard

W = Wide (AMT102 only)

Sleeve Bore Diameter:

2000 = 2 mm

3000 = 3 mm

3175 = 3.175 mm (1/8")

4000 = 4 mm

4760 = 4.76 mm (3/16")

5000 = 5 mm

6000 = 6 mm

6350 = 6.35 mm (1/4")

8000 = 8 mm

Note: 1. Fixed resolutions are permanently set at this value; adjustable resolutions are preset via DIP switch to this value upon shipment.

AMT10-V KITS

In order to provide maximum flexibility for our customers, the AMT10 series is provided in kit form standard. This allows the user to implement the encoder into a range of applications using one sku#, reducing engineering and inventory costs.

ORDERING GUIDE










AMT10X-V




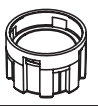




Orientation:

2 = Radial

3 = Axial

*See Mechanical Drawings

| SLEEVES | | | | | | | | |
|---|---|---|--|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |
| 8mm | 1/4 inch (6.35mm) | 6mm | 5mm | 3/16 inch (4.76mm) | 4mm | 1/8 inch (3.175mm) | 3mm | 2mm |
| Blue | Snow | Red | Green | Yellow | Gray | Purple | Orange | Light Sky Blue |

| | | | |
|--|---|---|---|
| 102 BASE  | 102 WIDE BASE  | 102 TOP COVER  | SHAFT ADAPTER  |
| 103 BASE  | 103 TOP COVER  | TOOL A  | TOOL B  |

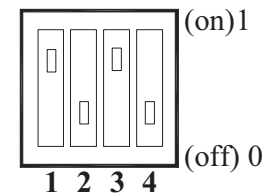
RESOLUTION SETTINGS

1 = On, 0 = Off

| Resolution (PPR) | Maximum RPM | 1 | 2 | 3 | 4 |
|------------------|-------------|---|---|---|---|
| 2048 | 7500 | 0 | 0 | 0 | 0 |
| 1024 | 7500 | 0 | 0 | 1 | 0 |
| 1000 | 7500 | 1 | 0 | 0 | 0 |
| 800 | 7500 | 0 | 1 | 0 | 0 |
| 512 | 15000 | 0 | 0 | 0 | 1 |
| 500 | 7500 | 1 | 0 | 1 | 0 |
| 400 | 7500 | 0 | 1 | 1 | 0 |
| 384 | 7500 | 1 | 1 | 0 | 0 |
| 256 | 15000 | 0 | 0 | 1 | 1 |
| 250 | 15000 | 1 | 0 | 0 | 1 |
| 200 | 15000 | 0 | 1 | 0 | 1 |
| 192 | 7500 | 1 | 1 | 1 | 0 |
| 125 | 15000 | 1 | 0 | 1 | 1 |
| 100 | 15000 | 0 | 1 | 1 | 1 |
| 96 | 15000 | 1 | 1 | 0 | 1 |
| 48 | 15000 | 1 | 1 | 1 | 1 |

DIP switch:

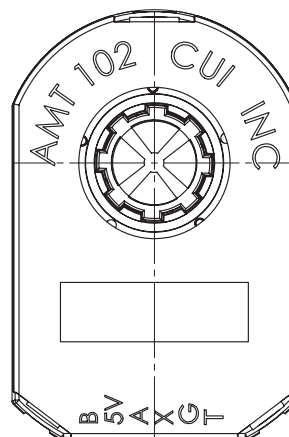
Example setting: 500 PPR



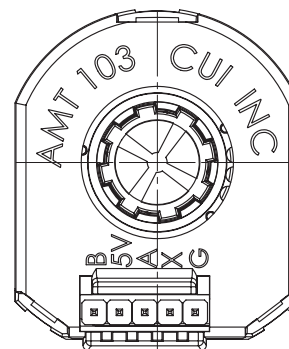
ENCODER INTERFACE

| PINOUT CONNECTOR | | |
|------------------|---------------|---------------|
| Function | | |
| # | AMT102 | AMT103 |
| B | B CHANNEL | B CHANNEL |
| 5V | +5 V | +5 V |
| A | A CHANNEL | A CHANNEL |
| X | INDEX CHANNEL | INDEX CHANNEL |
| G | GND | GND |
| T | UNUSED | N/A |

AMT102



AMT103



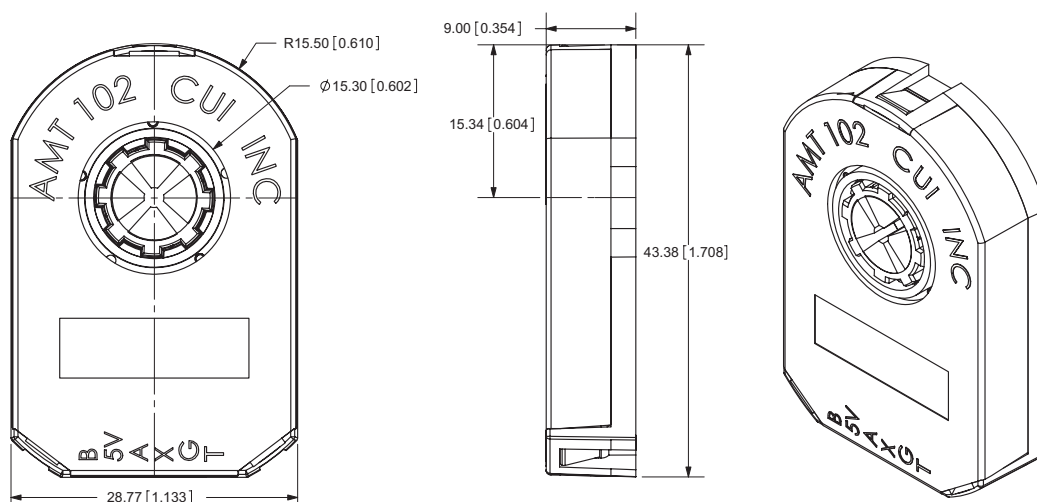
Mating Connector:
Molex 50-57-9405 Housing
Molex 16-02-0086 Terminals

Mating Connector:
AMP 3-640440-5 (tin)
AMP 3-641237-5 (gold)

MECHANICAL DRAWING

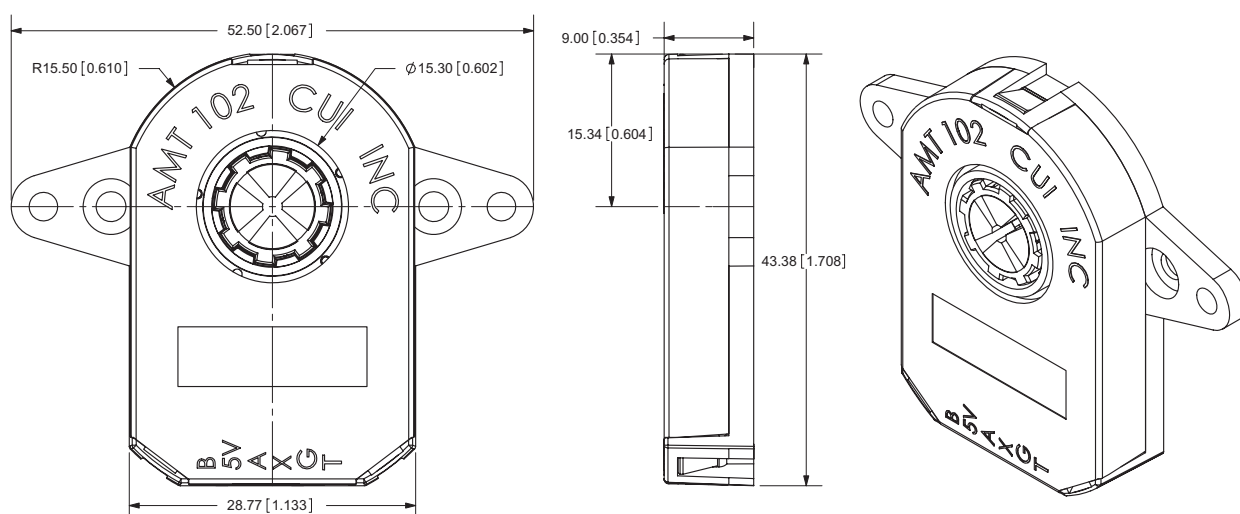
AMT102

units: mm[inch]

tolerance: $\pm 0.1\text{mm}$ 

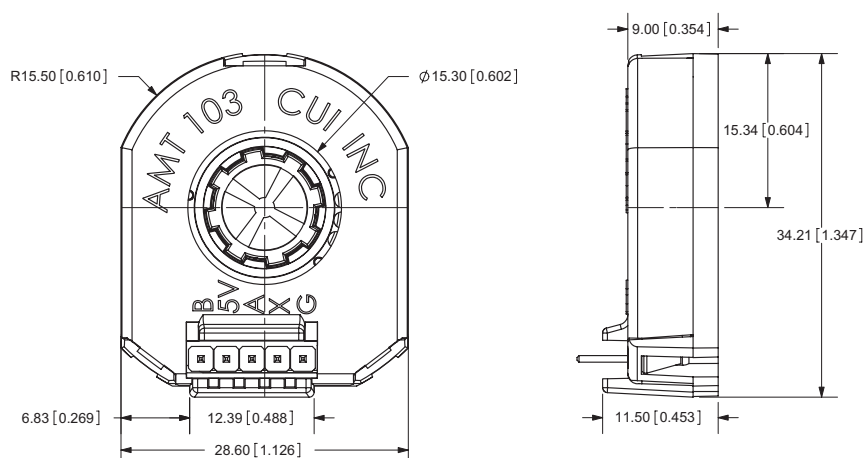
AMT102 WIDE BASE

units: mm[inch]

tolerance: $\pm 0.1\text{mm}$ 

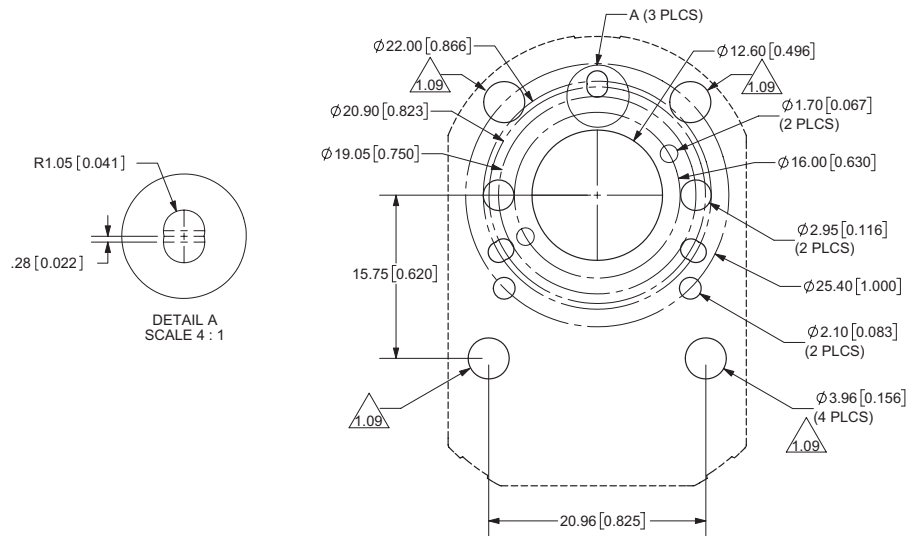
AMT103

units: mm[inch]

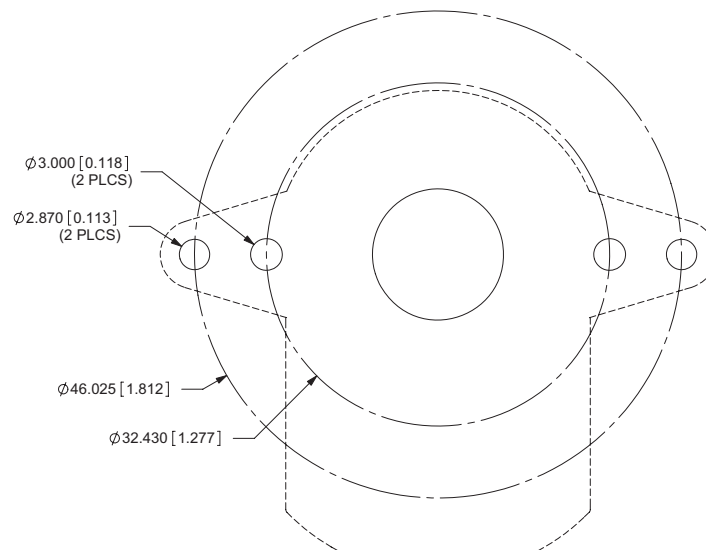
tolerance: $\pm 0.1\text{mm}$ 

MECHANICAL DRAWING (CONTINUED)**MOUNTING HOLE PATTERNS****AMT102**

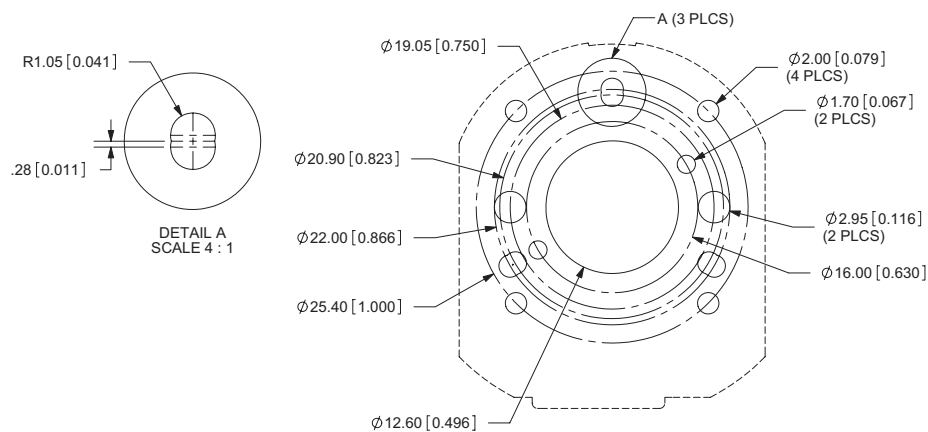
units: mm[inch]

tolerance: $\pm 0.1\text{mm}$ **AMT102 WIDE BASE**

units: mm[inch]

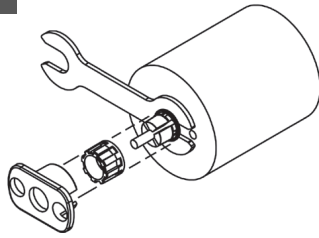
tolerance: $\pm 0.1\text{mm}$ **AMT103**

units: mm[inch]

tolerance: $\pm 0.1\text{mm}$ 

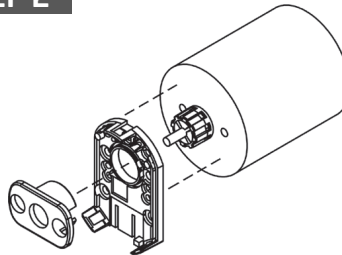
ASSEMBLY PROCEDURE

STEP 1



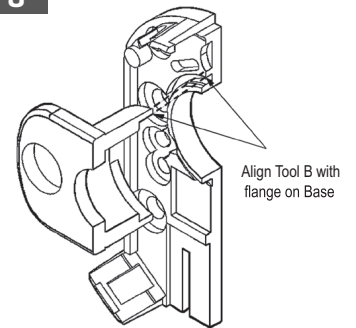
1. Insert Tool A as a spacer that defines the distance to the mounting surface.
2. Slide appropriate sized Sleeve over shaft all the way down to Tool A.
3. Slide Shaft Adaptor over Sleeve.
4. Use Tool B to press Shaft Adaptor over Sleeve until flush with Tool A.

STEP 2



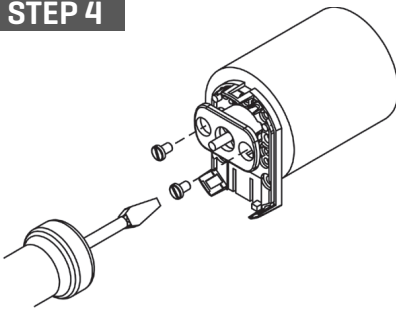
1. Remove Tools A and B.
2. Place Base on motor, with Tool B used as a centering tool.

STEP 3



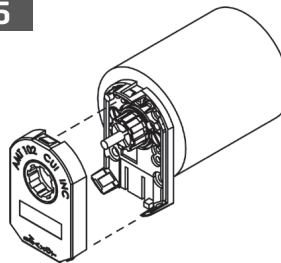
1. Align Tool B with flange on Base.
2. Slide Base and Tool B onto motor, centering onto the Shaft Adapter.

STEP 4



1. Fasten the Base on the motor.
2. Remove Tool B.

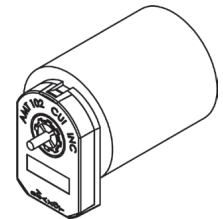
STEP 5



1. Slide the Top Cover onto the Base, carefully observing that the teeth of the Shaft Adaptor align with the grooves in the hub.*

* We recommend no more than three cycles of mounting and removal of the AMT top cover base. Multiple cycles of mounting and removing the top cover can cause base fatigue over time and affect encoder performance.

STEP 6



1. Make sure the snaps are fully engaged and the Top Cover is flush with the Base.
2. When assembly is finished, the Shaft Adaptor should be about flush with the front of the Encoder and the Motor Shaft should rotate freely.

REVISION HISTORY

| rev. | description | date |
|------|--|------------|
| 1.0 | initial release | 05/04/2011 |
| 1.01 | updated electrical specifications | 07/11/2011 |
| 1.02 | updated electrical specifications | 09/16/2011 |
| 1.03 | updated resolution table and electrical specifications | 10/18/2012 |
| 1.04 | updated part number key | 11/20/2012 |
| 1.05 | updated spec, updated DIP switch table | 07/26/2013 |
| 1.06 | updated spec | 01/03/2014 |
| 1.07 | updated part number key | 04/14/2014 |
| 1.08 | updated spec | 07/18/2014 |
| 1.09 | mounting holes increased to Ø3.96 mm through all, Ø5.79 x 1.02 mm counter-sink | 09/04/2015 |
| 1.10 | added high operating temperature range option | 12/18/2017 |

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



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