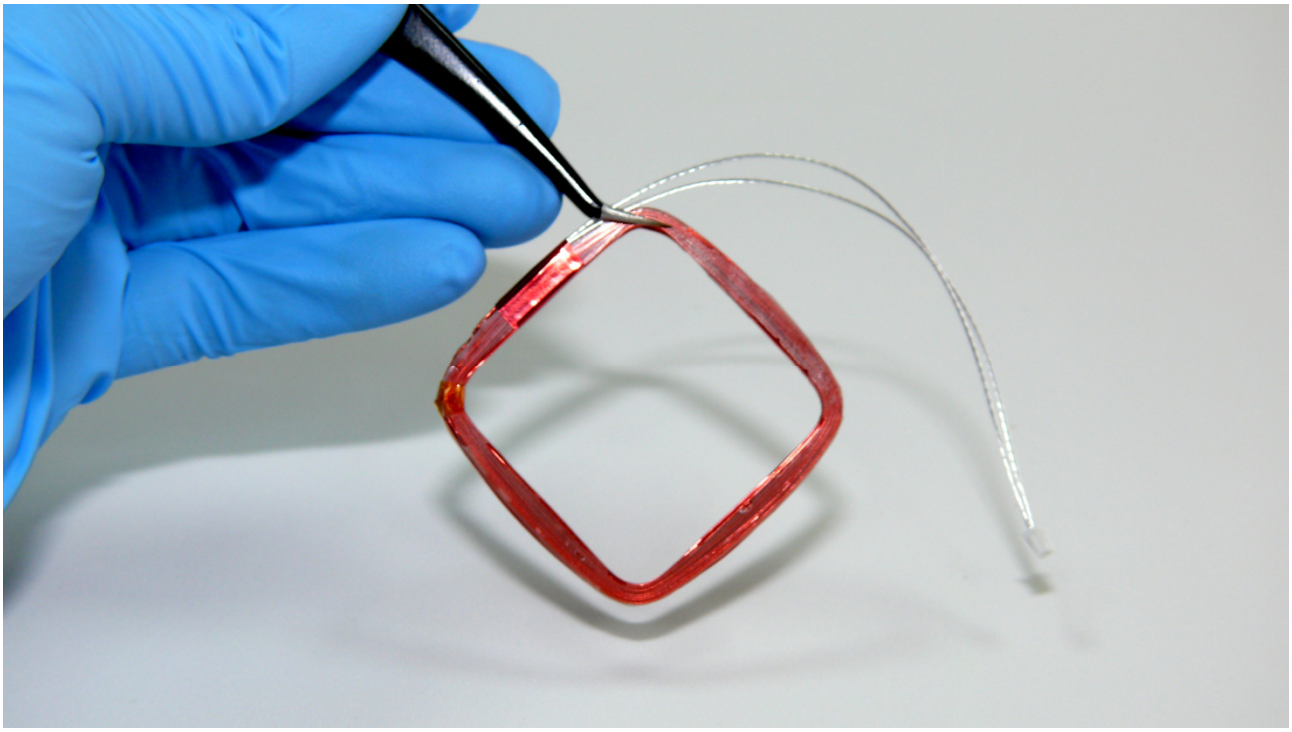
# MT01A

## Compact Magnetorquer
## Low voltage (1.25 ~ 5V)



## SUMMARY

With only 7.5 grams and 3.5 millimeters thickness, the MT01A Compact Magnetorquer is a vacuum core magnetic coil designed for ADCS control in cubesat mission from 1U to 3U that boast an impressive performance compared to its small footprint over the mass, power, and area budget of the spacecraft. Even with those small dimensions the MT01A is capable of greater magnetic moments, turn speeds and angular accelerations than comparable products on the market, yet the power usage is kept to a minimum: It can turn a 1U mass 90 degrees in 60 seconds using only 0.2 Watts at a LEO orbit of 500kms.

The greatest advantage of the MT01A is space saving: It can be easily affixed anywhere on your spacecraft using a minimal area and minimal thickness

PdR, Vía a Samborondon km 10.5 #9214
(593) 999 429106 Guayaquil – Ecuador

Facebook
LinkedIn

(593) 98 972 8887

info@exa.ec - www.exa.ec - @EXA_ec

Every coil is tested and qualified in our own facilities and shipped with full reports and packed with additional match connectors interfaces.

## FEATURES

- Low cost, proven standard.
- Very thin and Lightweight: only 3.5 mm thick at 7.5 grams
- Compact, power efficient, yet powerful magnetic dipole strength: Up to 0.79 Am2
- Fast 5.90 degrees per second turn speed (at max power, 1U mass) optimizes power usage.
- Space flight heritage from NEE-01 PEGASUS, NEE-02 KRYSAOR, IRVINE01, IRVINE02 and many other missions from 12 countries
- Manufactured with space grade materials according to space standards and custom mission design.
- Functional, performance, thermal bake out and vibration tests provided with documentation.
- Extensive documentation as 3D pdf, STEP files and blueprints
- Compatible with almost any structure and compliant to CubeSat Standard
- Custom Interface available

## PERFORMANCE

- **Working Voltage:** From 1.25V to 5V
- **Working Current:** From 70mAh to 1100 mAh
- **Nominal Magnetic moment:** >0.395 Am2 @ 3V3
- **Saturation Magnetic moment:** >0.790 Am2 @9V
- **Linearity:** +/- 4% across operating design range
- **Residual moment:** <0.0005 Am2
- **Torque:** 5.36 µNm @ 7.2-3 mTesla (1U mass)
- **Angular acceleration:** 3.2-3 Rad/sec-2 (1U mass)
- B-center = 18.9 Gauss @3v3
- B-corners = 54.5 Gauss @3v3
- **Supply Power:** From 50mW to 1500mW
- **Capacitance at 0V:** 44.31 pF

- **Inductance at 0V:** 892.9 pH
- **Thermal Performance:**

| | | |
|---|---|---|
| Operating Max temp @3.3V/0.66A | 53.70 | Centigrade |
| Operating Max temp @4V/0.76A | 68.90 | Centigrade |
| Operating Max temp @5V/0.90A | 85.10 | Centigrade |

- **Typical resistance:** 4.1 to 4.7 ohms @ 25°C
- **Random Vibration:** 16g rms
- **Lifetime:** >10 years

## PRODUCT PROPERTIES

- **Dimensions:**
  - External: 50×50 mm
  - Internal: 42×42 mm
  - Width: 4.3 mm
  - Height: 3.2 mm
- **Mass:** 7.5 grams
- **Operating Temperature:** -55 °C to +85 °C
- **Radiation Tolerance:** 12 years minimum in LEO

## MATERIALS

- Pre-evacuated enamel copper wire
- **Cohesion:** Space grade epoxy 3M
- **Interfaces:**
  - Custom choice, normally Molex PicoBlade/PicoSpox inline 2 pin connector with gold plated contacts
  - PTFE (Teflon) space grade cables, single strand, silver plated copper (AWG26 to AWG30)

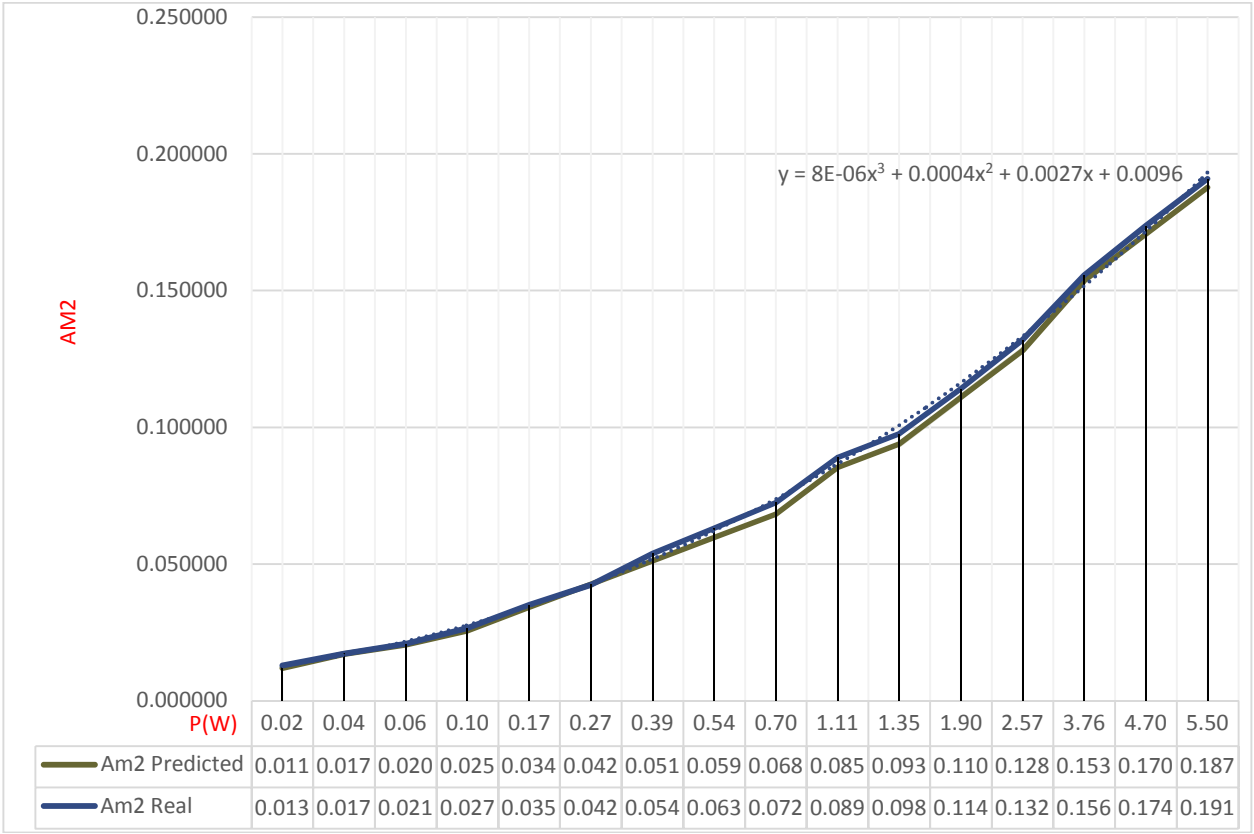
## TESTING

All platforms are provided with tests reports regarding the following tests:

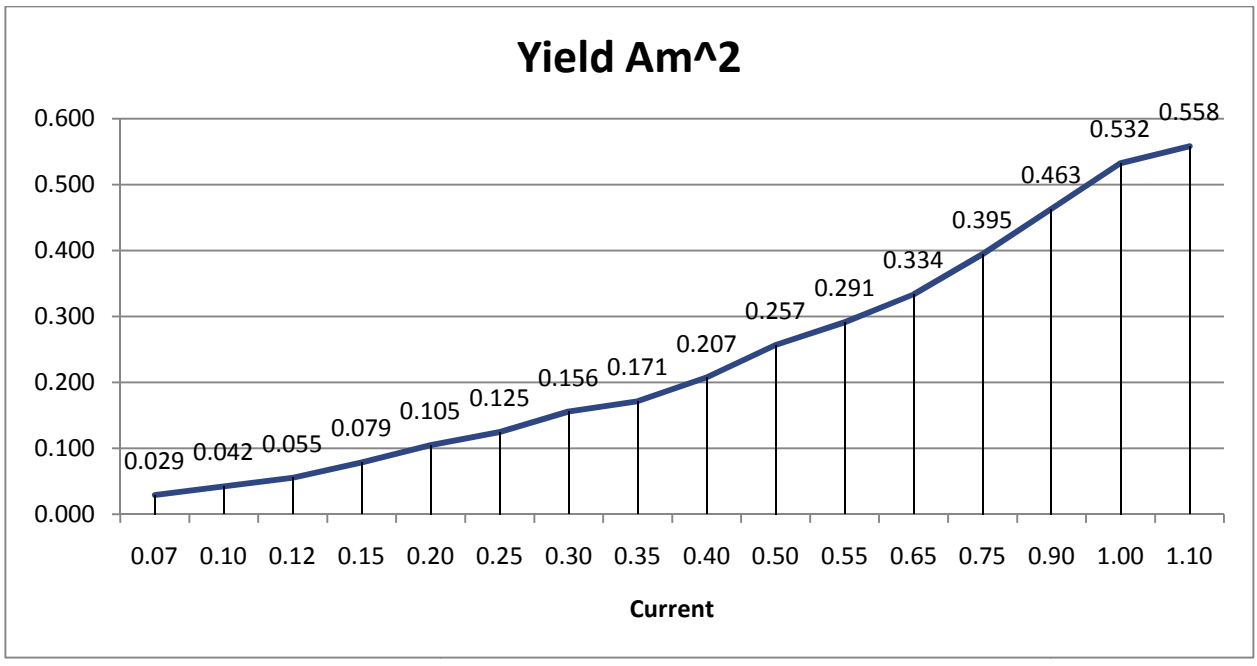
| Test | QT | AT |
|---|---|---|
| **Functional** | ✓ | ✓ |
| **Vibration** | — | ✓ |
| **Thermal Cycling** | — | ✓ |
| **Thermal Vacuum** | — | ✓ |
| **Cable / Connector Integrity** | ✓ | ✓ |
| **Continuity** | ✓ | ✓ |
| **Performance** | ✓ | ✓ |
| **Freezing / Overheating** | ✓ | ✓ |

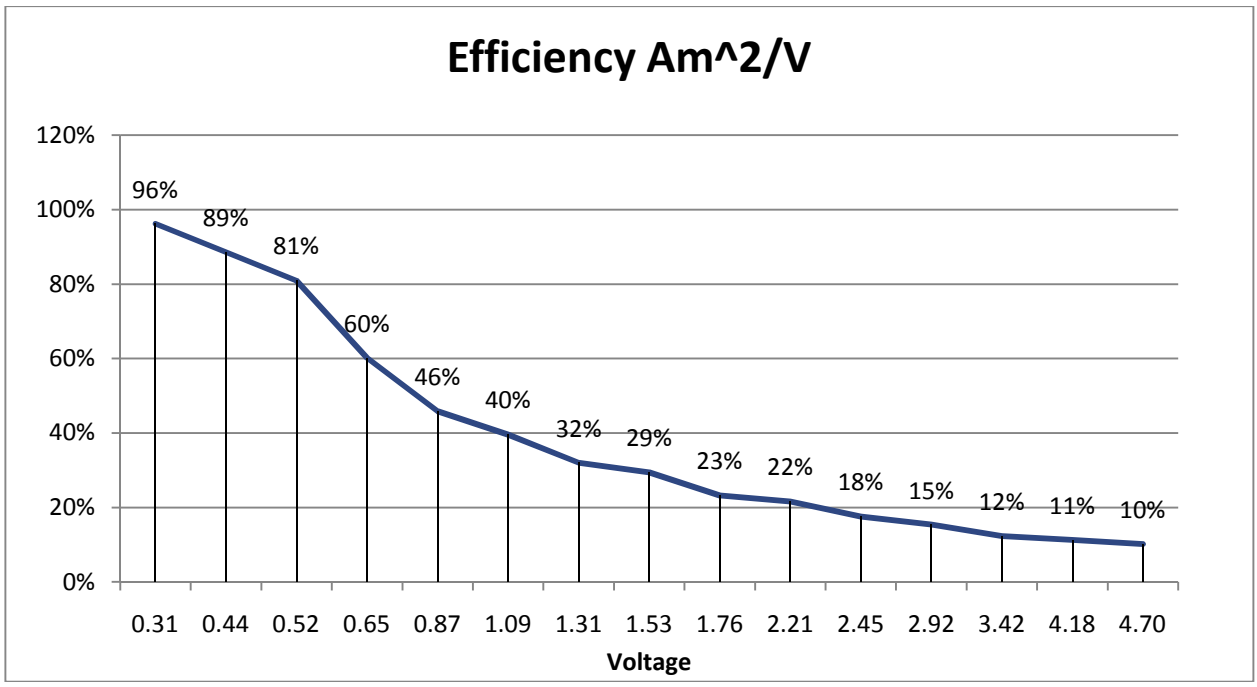
- Thermal Bake out (10E-7 mbar @ 50C for 24 hours)
- Full vibration test for Falcon9 and Soyuz vibration profiles, other LV profiles available upon request
- QT and AT is performed on the unit to be shipped at no charge.

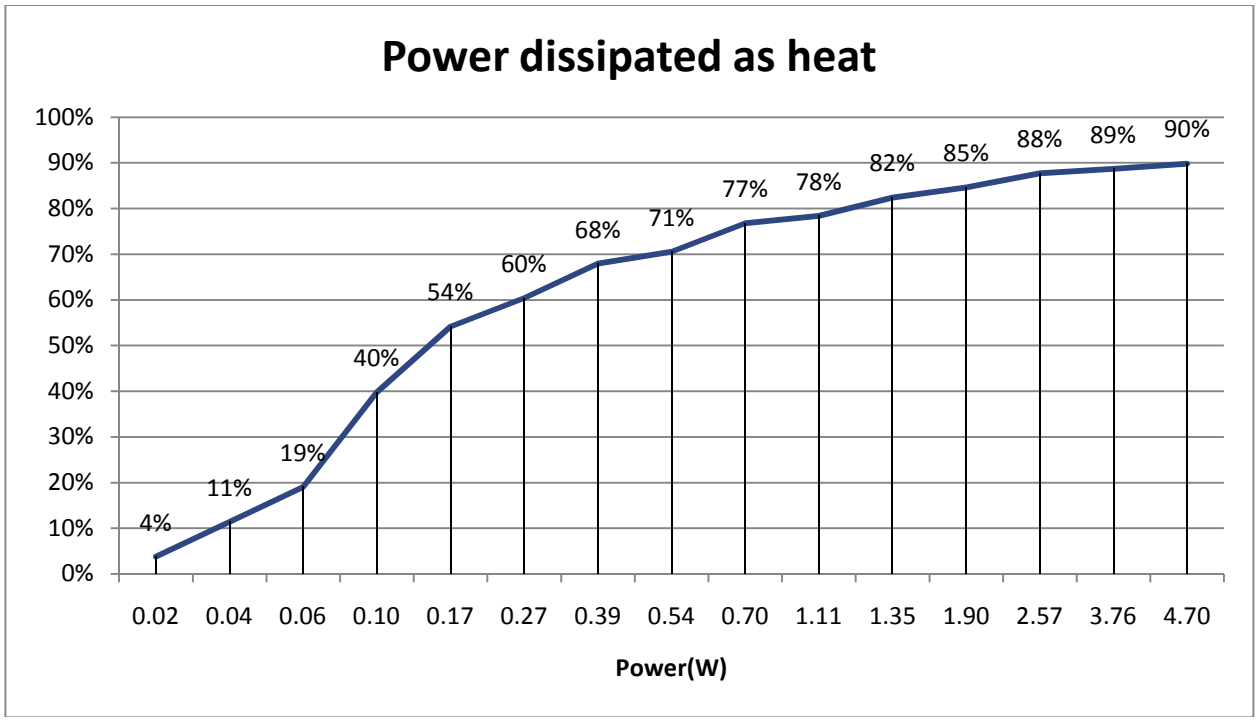
# TEST DATA




| P(W) | 0.02 | 0.04 | 0.06 | 0.10 | 0.17 | 0.27 | 0.39 | 0.54 | 0.70 | 1.11 | 1.35 | 1.90 | 2.57 | 3.76 | 4.70 | 5.50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Am2 Predicted | 0.011 | 0.017 | 0.020 | 0.025 | 0.034 | 0.042 | 0.051 | 0.059 | 0.068 | 0.085 | 0.093 | 0.110 | 0.128 | 0.153 | 0.170 | 0.187 |
| Am2 Real | 0.013 | 0.017 | 0.021 | 0.027 | 0.035 | 0.042 | 0.054 | 0.063 | 0.072 | 0.089 | 0.098 | 0.114 | 0.132 | 0.156 | 0.174 | 0.191 |




Efficiency Am^2/V
120%
100%
80%
60%
40%
20%
0%
96%
89%
81%
60%
46%
40%
32%
29%
23%
22%
18%
15%
12%
11%
10%
0.31
0.44
0.52
0.65
0.87
1.09
1.31
1.53
1.76
2.21
2.45
2.92
3.42
4.18
4.70
Voltage


Power dissipated as heat
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
4%
11%
19%
40%
54%
60%
68%
71%
77%
78%
82%
85%
88%
89%
90%
0.02
0.04
0.06
0.10
0.17
0.27
0.39
0.54
0.70
1.11
1.35
1.90
2.57
3.76
4.70
Power(W)