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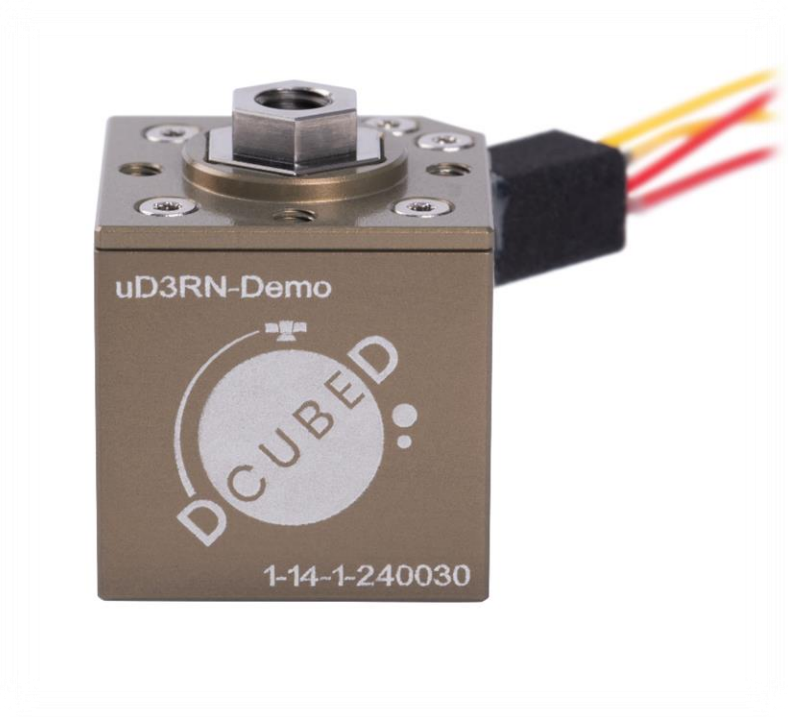


# Datasheet

## Micro Release Nut (uD3RN)

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**Last updated on:**
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# Description

The DCUBED Micro Release Nut Aluminum (uD3RN) is a Shape Memory Alloy (SMA) based release actuator which secures sensitive equipment during launch and safely releases it on orbit. It is one of the smallest, yet powerful HDRM solutions on the market. Moreover, it is easily resettable (on-ground, in-space), easy-to-use and readily available as a COTS part.
A video showing the simple actuation and the easy reset can be found here.

| **Specifications/Configuration** | Aluminum-Titanium (1-14-1) |
|---|---|
| Body Size (L x W x H) | 25 x 25 x 25 mm |
| Mass | <40 grams |
| Material | **Body**: Hard anodized Aluminum 7075-T7351<br>**Nut**: Titanium grade 5 |
| Operating Temperature Range | -65°C to +75°C |
| Nut Dimensions | Ø10 mm x 19.5 mm Length |
| Minimum preload | 250N |
| Max Preload (Axial) | 2,500 N |
| Minimum lever arm<br>(under an axial preload with 250N) | 200 mm (100 mm with pull-back spring) |
| Max Misalignment Angle | ±5° (10° with pull-back spring) Cone |
| Max Nut Push-out Force | 20 N |
| Rapid Resetability | Yes (on-ground depending on preload) |
| Redundancy | Redundant Wiring and Redundant SMA |
| Release Shock | <50g (Ultra-Low-Shock) |
| Reset Cycles | >40 |
| TRL | 8 (9 in 2024) |

# Interfaces

## Mechanical Interface

The standard mechanical mounting configuration for the uD3RN is comprised of four threaded M2.5 holes with Helicoils inserts as shown in Figure 1. Moreover, the titanium release nut is equipped with an M5 thread at the top.

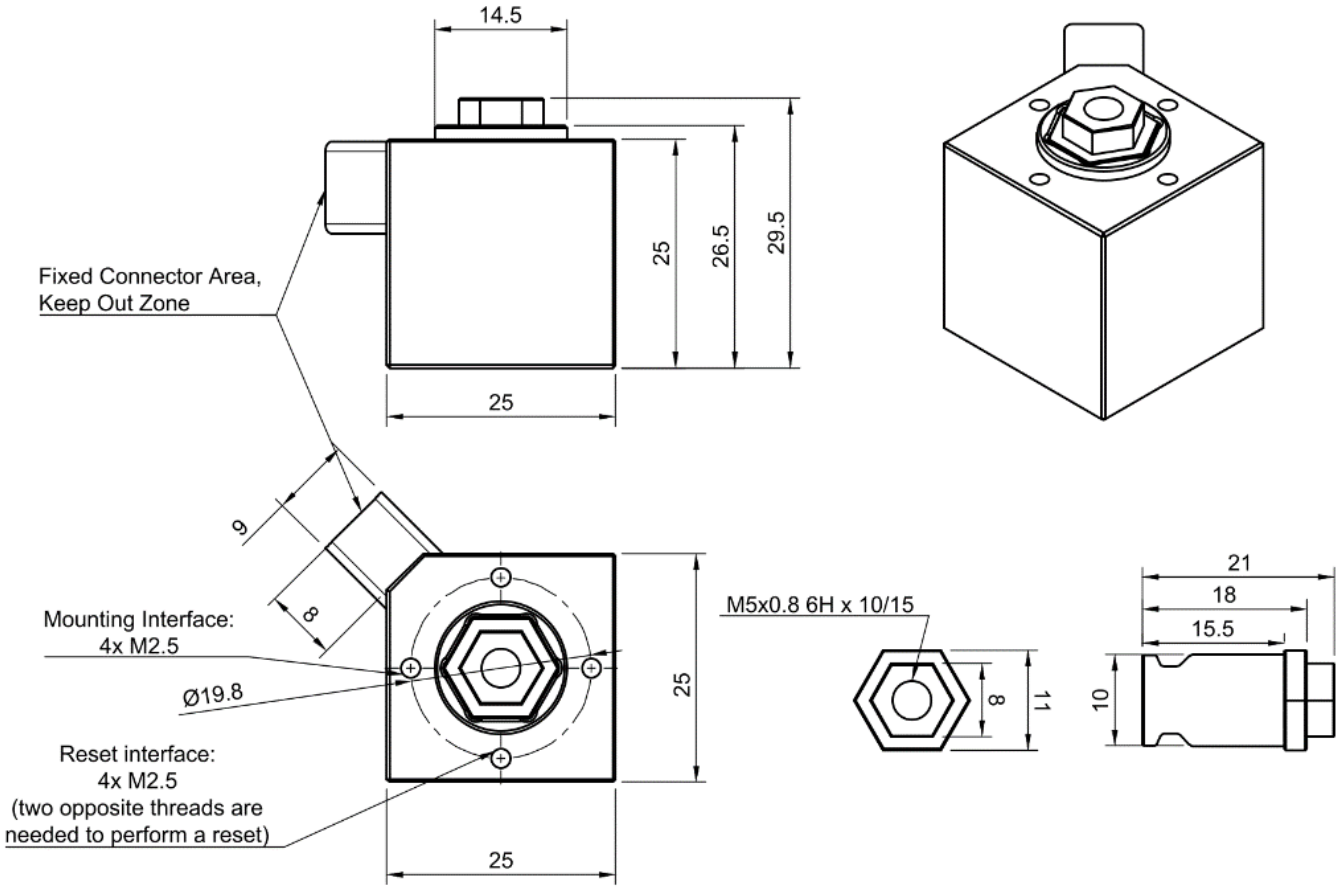


*Figure 1: Dimensions and standard mechanical interfaces.*

Besides the standard four-point mount, custom interface plates are available to achieve any custom interface mounting (e.g. 3-point, 4-point).

The minimum lever arm (see specifications above) of the uD3RN is defined as shown in Figure 2 and needs to be above 200mm.

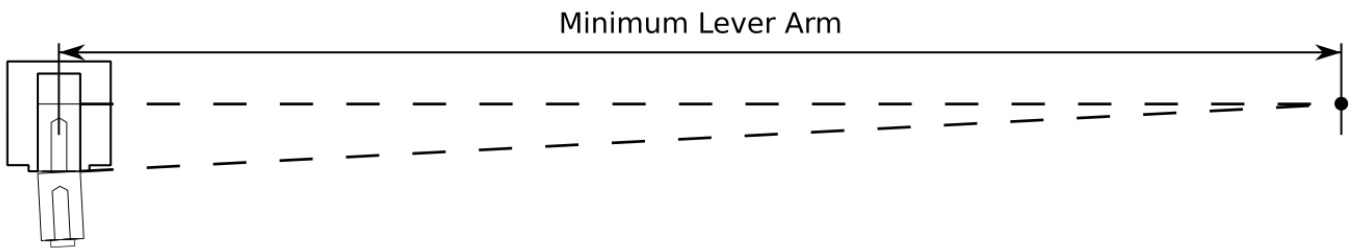


*Figure 2: Illustration of lever arm.*

# Electrical Interface

The standard electrical interface of the uD3RN is shown in Figure 3.

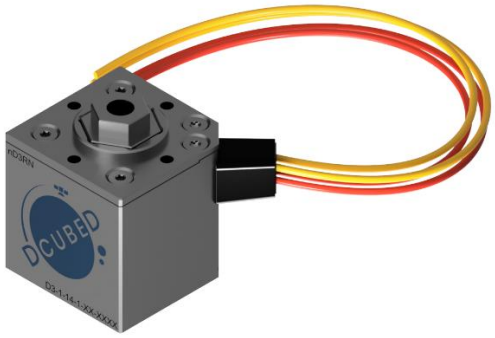

*Figure 3: Electrical wiring of the uD3RN.*

To trigger the release nut, a current must be applied across one of its actuation lines. The actuation lines are color-coded as red and yellow wire pairs (red-red, yellow-yellow). The actuation line behaves like a simple resistor (see the table below), with no specific polarity.

| **Electrical Details** | | |
|---|---|---|
| Actuation Leads | | 2 x 2 (1 Primary Pair, 1 Redundant Pair) |
| Wire Length | | >200 mm |
| Material | | Silver-plated Copper, PTFE<br>fulfils MIL-W-16878/4 (Type E) |
| Actuation Wire Gauge | | 22 AWG |
| Actuation Current | | 4A (DC) |
| Resistance (Ω) | | 0.6 ± 0.2 Ω (@ Room Temperature) |
| Max current allowed after actuation | | < 200 mA |
| Estimated trigger time*<br>(at 4.0 A and 2kN preload in vacuum) | -45°C | 4.0 sec |
| | 0°C | 3.3 sec |
| | 20°C | 2.6 sec |
| | 55°C | 1.8 sec |

*More detailed specifications regarding temperature and current dependent trigger times can be found in the DCUBED user manual. It will be made available upon order placement.

# Loads

The uD3RN is designed to survive the following mechanical loads.

| **Details** | Load Level | Note |
|---|---|---|
| Random Vibration (X, Y, Z) | 30 GRMS (PSD) | 1st Eigenfrequency: >2kHz |
| Sinusoidal Vibration (X, Y, Z) | 20 g | 20-130 Hz |
| Shock (X, Y, Z) | 100 Hz: 50 g<br>1,000 Hz-10,000 Hz: 1500 g | SRS |
| Release Load | 2,500 N (axial) | Maximum preload under which the nut releases |
| Max Nut Push-out Force | 20 N (axial) | Maximum axial force the nut is pushed out with |
| Ultimate Load Rating | 4,000 N Pull-out | Maximum loads which the nut can survive but not actuate under |

# Disclaimer

Please note, this is **not** the user manual. The more elaborate, user manual will be made available by DCUBED upon placement of an order. The specifications contained herein are all nominal which represent our current production. The products described may be subject to change. The images shown are for illustration purposes only and may not be an exact representation of the product.

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