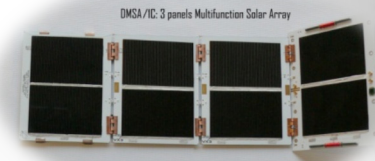
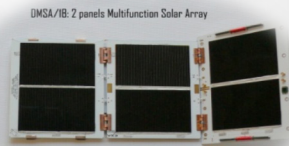




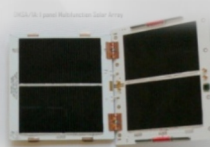
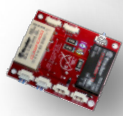
# DMSA: 1U DEPLOYABLE MULTIFUNCTION SOLAR ARRAYS WITH EMBEDDED ANTENNAS



DMSA/1C 3 panels Multifunction Solar Array



DMSA/1B 2 panels Multifunction Solar Array



DMSA/1A 1 panel Multifunction Solar Array



DMSA/1B 2 panels Multifunction Solar Array

The EXA DMSA/1 (Deployable Multifunction Solar Array for 1U) is the upgraded version of the latest DSA 1/A, it is our entry level product of a family of deployable solar arrays based on artificial muscles for 1U CubeSats. it includes deploy and release contact sensors and its own deploy control board.

Now, in a world's first, **it includes embedded antennas** that range from VHF to L band, no longer you need to buy and manage antenna systems, the DMSA has them embedded in its structure as 2 monopoles or 1 dipole and they deploy with the solar array, you just connect the cable to your radio.

It also has an embedded magnetorquer, sun and temperature sensors. You can configure your choice of solar cells like our low-cost solar cells to AzurSpace 3G-3D for very high-power missions; the maximum folded thickness is 6.25 mm for the 3-panel array

## FLIGHT HERITAGE (TRL9)

Our DMSA has **flight heritage since 2013** in 6 missions still in orbit and have been selected to fly in 10 more upcoming U.S. missions from 2019 to 2029. Almost 8 years now and our first DSA is still in service.

## SUPER THIN

Fully compatible with ISIS and Pumpkin structures, they fold into Amazing 4.5 mm thickness, the thinnest solar array available.

## POWERED BY ARTIFICIAL MUSCLES

Our unique **AMT** Artificial Muscle Technology allows for a gentle, safe and repeatable (unlike thermal knife systems) release and deploy both on ground (for testing) and in orbit.

## EMBEDDED ANTENNAS, MAGNETORQUERS AND SENSORS

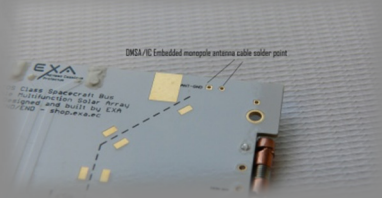
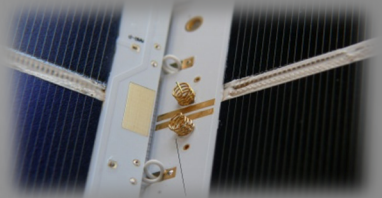
No longer you need to buy and deal with additional antenna systems in your cubesat, in the DMSA they come embedded in the solar arrays, you don't even need to worry about deployment, Same for the embedded magnetorquer and temperature and sun sensors.

## AUTOMATIC RELEASE/DEPLOY

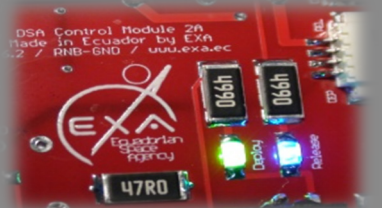
You only need to send the 3v3 or 5V deploy signal to our **included** DMSA control module and it will release and deploy your solar arrays to your pre-programmed final position. Includes a safety featured that will ensure release and deploy even if everything else fails!. No matter what, you will get powered in orbit.



DMSA/1B folded Multifunction Solar Array



DMSA/1C Embedded monopole antenna cable solder point



DSA Control Module 2A  
Made in Ecuador by EXA  
v2 / RH8-GH0 / www.exa.ec



# DMSA: TECHNICAL INFORMATION (I)

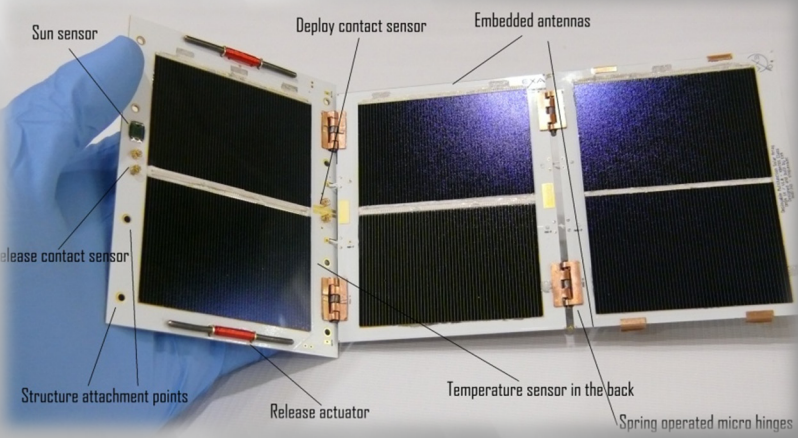
## FEATURES

- TRL9 system approved for NASA launches
- Heritage release with artificial muscles, spring operated deploy
- Release within 5 seconds, Deploys immediately
- Embedded antennas can be configured as 2 monopoles or 1 dipole, frequency range from VHF to L-band
- Includes Release control board and contact sensors
- Sun sensors and temperature sensors embedded
- Designed for LEO missions and requirements
- Manufactured according to space standards and custom mission design
- Functional, performance, thermal bake out and vibration tests provided with documentation.
- Very thin, 6.25mm folded, each panel is only 1.5mm thick
- Discounts for complete mission sets
- Compatible with ISIS and Pumpkin Structures
- Compliant to CubeSat Standard
- Compatible with QuadPack and ISIPOD Launch Adapters

## PROPERTIES

Mass (depends on configuration)	
1 Panel	46g
2 Panels	70g
3 Panels	92g

Folded Configuration Thickness	
1 Panel	2.0 mm
2 Panels	4.0 mm
3 Panels	6.2 mm



## PERFORMANCE

Supplied Voltage@Current and Power:  
Condition full sunlight in LEO

Low cost solar cells:			@BOL
Panels	Top	Bottom	Array Power
1	4.0V@0.5A	2.0V@0.5A	3.0W
2	6.0V@0.5A	4.0V@0.5A	5.0W
3	8.0V@0.5A	6.0V@0.5A	7.0W

High power AzurSpace 3G-30:			@BOL
Panels	Top side	Bottom side	Array Power
1	9.6V@0.5A	4.8V@0.5A	7.2W
2	14.4V@0.5A	9.6V@0.5A	12W
3	19.2V@0.5A	14.4V@0.5A	16.8W

Protection:  
2A@20V Schotky diodes integrated

Cell Efficiency:  
30% (High power) or 19% (low cost)

Release/Deploy:  
Release in 5 seconds using 52 joules  
Deploys immediately  
Contact sensors 24K gold plated

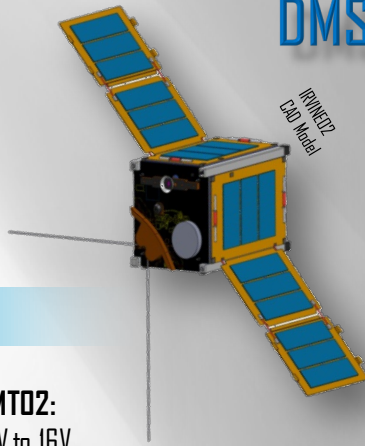
Deployable Panel Thickness: 1.5 mm

Operating Temperature: -80 to +130°C

Radiation Tolerance: 2 years minimum in LEO, 4 years minimum with NEMEA shielding



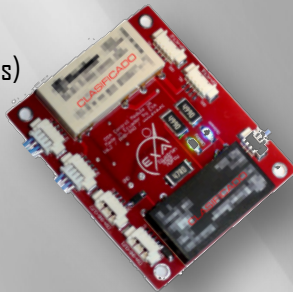
# DMSA: TECHNICAL INFORMATION (2)



## Embedded Devices

### Embedded Magnetorquers MT02:

- Working Voltage: From 1.25V to 16V
- Working Current: From 100mAh to 2000 mAh
- Nominal Magnetic moment:  $>0.14 \text{ Am}^2$
- Saturation Magnetic moment:  $>0.48 \text{ Am}^2$
- Linearity:  $\pm 4\%$  across operating design range
- Residual moment:  $<0.0075 \text{ Am}^2$
- Torque:  $3.66 \mu\text{Nm}$  @  $3.2 \text{ mTesla}$  (IU mass)
- Angular acceleration:  $1.75 \text{ Rad/sec}^2$  (IU mass)
- B-center =  $3.0 \text{ Gauss}$
- B-corners =  $3.1 \text{ Gauss}$
- Typical resistance:  $14.1$  to  $14.7 \text{ ohms}$  @  $25^\circ\text{C}$
- Random Vibration:  $16 \text{g rms}$



### Embedded Antennas:

- Band Range: VHF to L-band
- Gain:
- Monopole configuration =  $2.1 \text{ dB max}$
- Dipole configuration =  $3.1 \text{ dB max}$
- Extended Monopole =  $2.3 \text{ dB max}$
- Lambda: from  $1/4$  to full wave
- Connectors: User defined
- Cable: RG316 or User defined

### Sun Sensor:

- Analog, GPIO, 5 to 16V
- Linear response range from  $0.2 \text{ V}$  to  $5 \text{ V}$
- Working current  $50 \text{ mA}$
- Working FOV:  $65 \text{ degrees H/V}$

### Interfaces:

Custom choice, normally 3 Molex PicoBlade inline 4 pin connector with gold plated contacts. PTFE (Teflon) space grade cables, single strand, silver plated copper (AWG26, AWG24 and AWG30)

## TESTING and QUALITY

All panels are provided with tests reports regarding:

- Continuity isolation between cells and substrate
- No cracks warranty
- Thermal Bake out ( $10^{-7} \text{ mbar}$  @  $50^\circ\text{C}$  for 24 hours)
- Full vibration test for Dnepr, Falcon9, Soyuz. Electron and Long March 2D

TEST	QT	AT
Functional	✓	✓
Vibration	✗	✓
Thermal Cycling	✗	✓
Thermal Vacuum	✗	✓
Continuity Isolation	✓	✓
Solar cells Cracks	✓	✓
Flasher Test	✓	✓
Performance	✓	✓

### Temperature sensor:

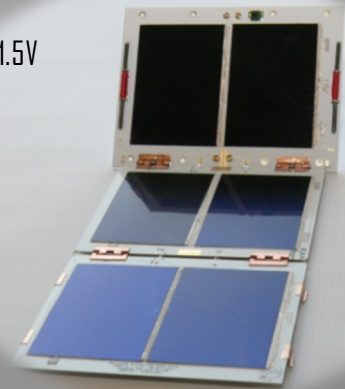
- Analog, GPIO, 4 to  $12 \text{ V}$
- Linear response range from  $0.3 \text{ V}$  to  $1.5 \text{ V}$
- Working current  $80 \text{ mA}$
- Working temperature:  $-65$  to  $135^\circ\text{C}$

### Actuators:

- Deploy: Spring operated
- Release: EXA MDR/RIC,  $50 \text{ grams}$  max torque artificial muscle strand

### Cell Interconnector:

- Invar Silver



## CUSTOMIZATION

Each DSA is tailored to the mission needs with customer's choice of connectors, harness, solar cells, shielding and panel count configuration. Detailed blueprints, 3D PDFs, STEP and SolidWorks files can be provided on demand.

## CONTACT US:

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