EXOpod 12U/16U

CubeSat Deployment System

Brochure

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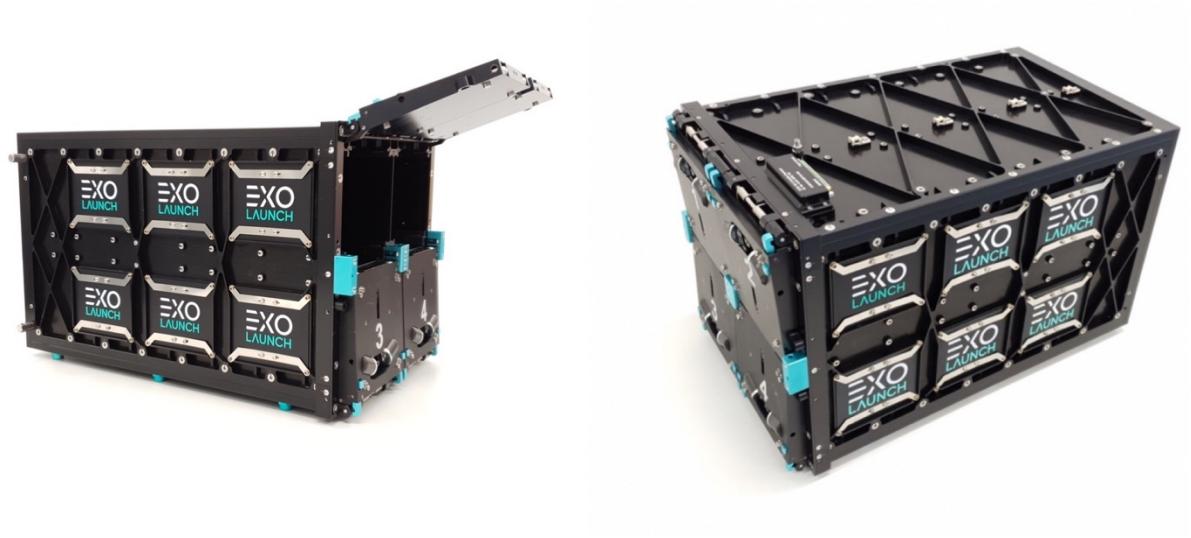
1. EXOLAUNCH Cubesat Deployers

Cubesats have been extremely successful in facilitating access to space. Since the California Polytechnic State University (CalPoly) and Stanford University developed and introduced the Cubesat Design Specification in 1999, hundreds of Cubesats have been launched. Due to their small size and mass, as well as standardized separation systems, Cubesats are compatible with a multitude of launch vehicles which makes them ideal to be launched as piggyback payloads. The separation systems in form of containers minimize the risks for the primary payload and for the launch vehicle.

EXOLAUNCH has developed its EXOpod Cubesat Deployers in this context. They are the most advanced separation systems on the market, offering a combination of the highest reliability and user-friendliness, as well as a number of features that expand the limits of the Cubesat Design Specification. The EXOpod Deployer has substantial flight heritage and has successfully deployed 80 satellites since 2017.



EXOpods are designed to ensure easy integration, safe transportation and reliable separation of Cubesat spacecraft. In its basic configuration, the 12U EXOpod can feature up to four separation slots, each the size of a 3U Cubesat. This way one deployer can carry up to four Cubesats. Special adapters can be used to load 1U and 2U Cubesats into a 3U slot. Individual slots can be connected allowing a 12U EXOpod to carry two 6U or one 12U Cubesat. The 16U version of the EXOpod can accommodate either two 6U XL, two 8U or one 16U Cubesat respectively.

1.1 Overview of Components and Features

The main components of the 12U and 16U EXOpods are shown in Figure 1. The unique feature are listed below.

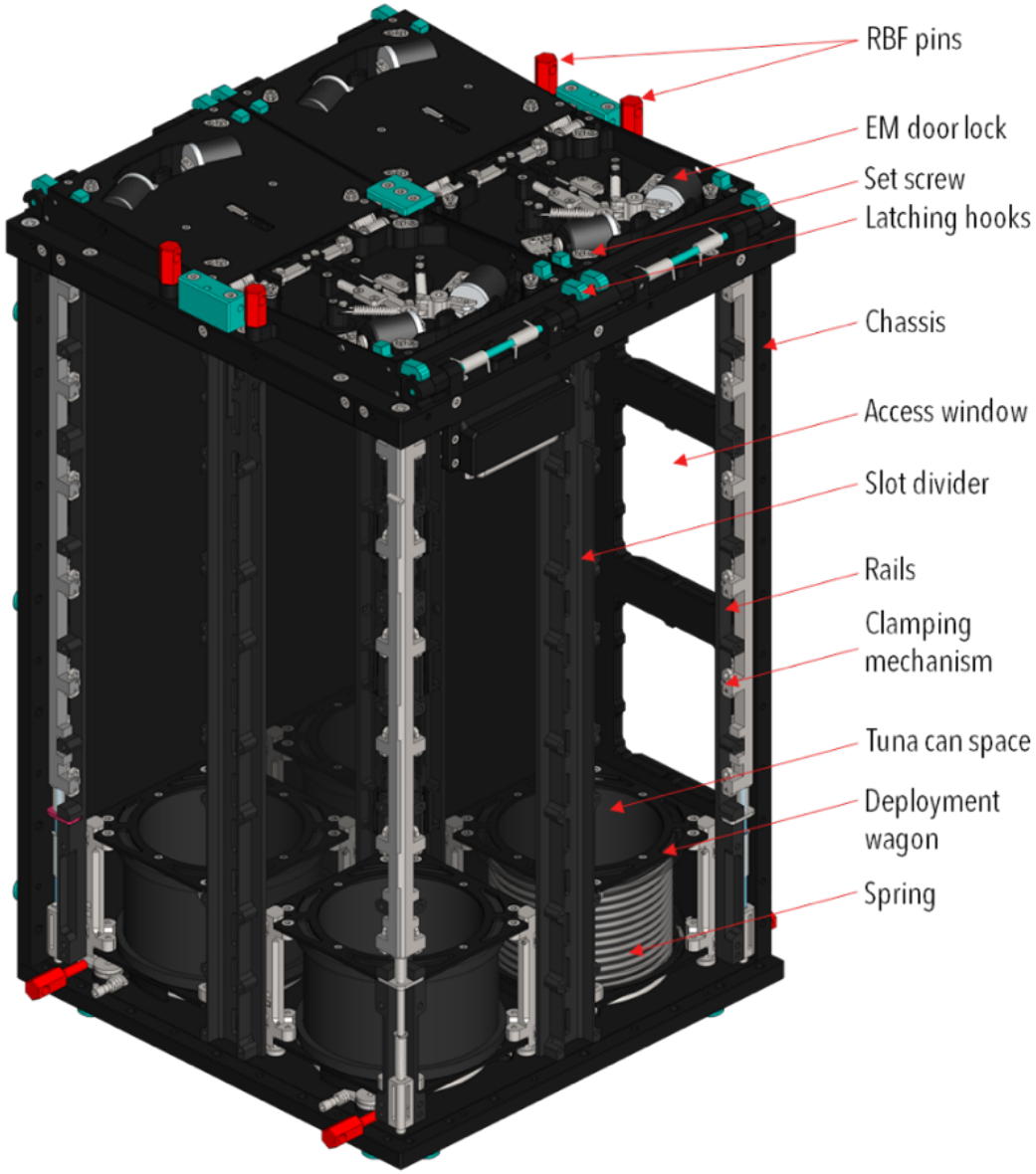


Figure 1: Main components of the EXOpod.

Door Locks

A unique magnetic door lock system allows opening and closing of the doors within seconds at any time before, during or after integration. A second lock provides redundancy.

Deployment Wagon

The deployment wagon, which is situated in between the spring and Cubesat, serves to keep the spring in the correct orientation ensuring that the spring force is transferred uniformly to the Cubesat. It can also be locked in place using an RBF pin to prevent unwanted deployment of the satellite during integration.

Cable Guides

Cable guides on the top and back faces of the deployer are used to securely fasten the main cable to the chassis. Zip ties are used to fasten the cable to the cable guides. The cable guides are made from PEEK, a strong engineering plastic with low outgassing properties.

Access Windows

Access windows on two sides of the EXOpod allow inspection of the satellite even after integration, allowing charging, programming or removing RBF elements if they are located on the side facing the window. The access window covers are anodized aluminum and fixed to the chassis with four M3 screws. A steel bracket keeps the screws in place facilitating removal and handling.

Clamping Mechanism

A clamping mechanism pushes an array of clamping feet distributed along the guidance rails inwards when the deployer's doors are closed. This compensates for the tolerance gaps between the deployer and the satellite in the lateral axes. The Cubesat is held in place safely and impacts from vibrations during transportation and launch are significantly reduced. In addition, loose tolerances in the deployment axis are compensated by a set of adjustable set screws.

Remove Before Flight Pins

EXOpods feature two sets of RBF pins to ensure safety during integration, transportation and handling. One pin secures each slot door; a second pin locks the deployment wagon in place. This prevents premature spring release and facilitates the integration procedure.

Chassis

The chassis is stiff enough so that it doesn't rely on Cubesats to be integrated for structural support and can launch with an empty slot without any problems. Grounding straps are not required as the EXOpod is grounded to the launch vehicle through the mounting bolts and mounting surfaces.

2. Dimensions

The outer dimensions of the 12U and 16U EXOpods are shown below.

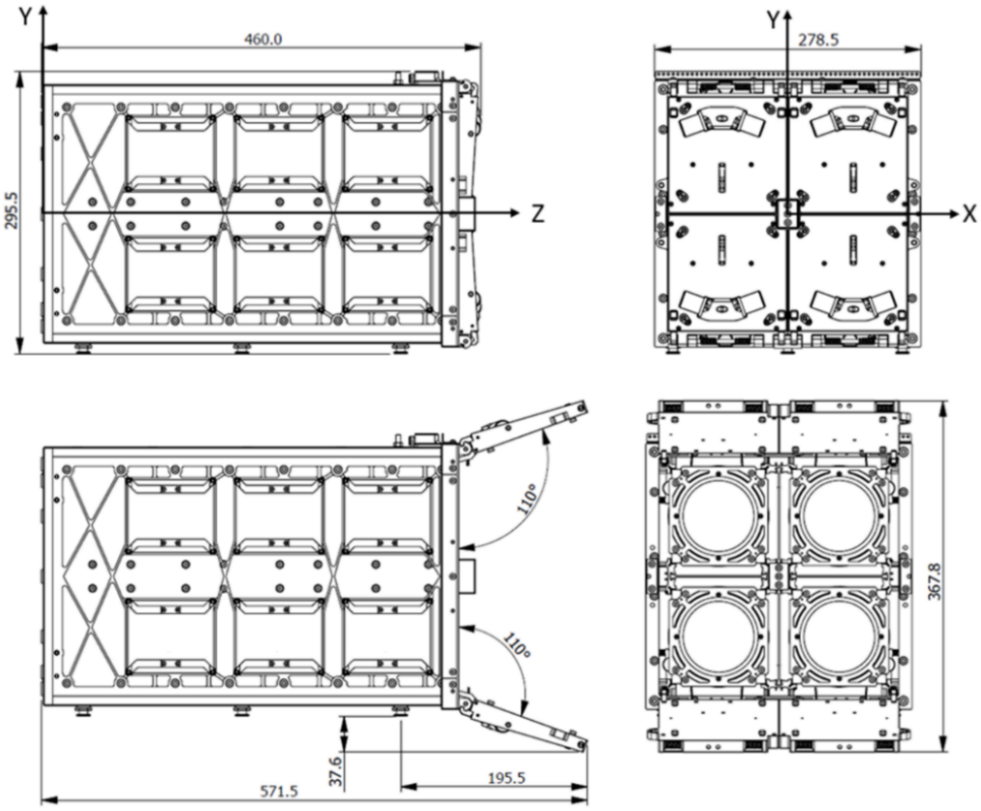


Figure 2: Outer dimensions of the opened and closed configurations of the 12U EXOpod.

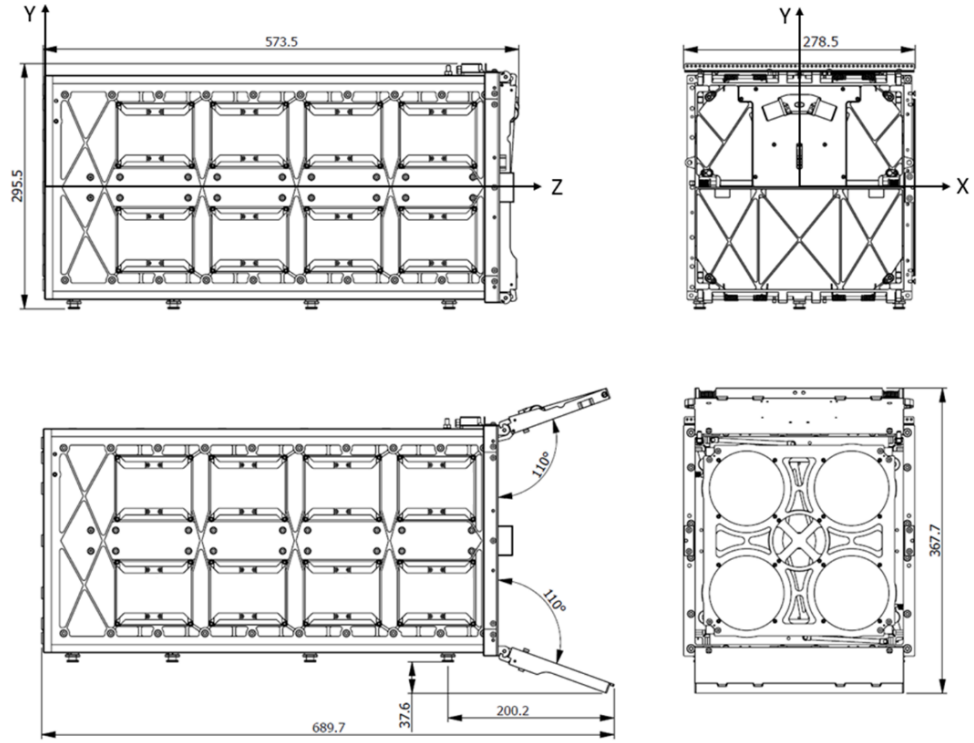


Figure 3: Outer dimensions of the opened and closed configurations of the 16U EXOpod.

3. Satellite Interfaces

The EXOpod has been developed to follow the Cubesat Design Specification (CDS). However, changes have been implemented which allow it to carry and deploy Cubesats that exceed some dimensions defined in the CDS, while still accommodating fully CDS-compliant Cubesats.

The maximum volume for Cubesats from 3U to 16U is shown in the Figure 4. and Table 1. below. The red areas mark the rails, the primary interfaces with the EXOpod. These dimensions must be followed for the Cubesat to fit within the deployer. The grey areas denote the volume that can be used by the Customer. The yellow area represents the so-called Tuna Can, and may also be used by the Customer. The red surfaces (rails) comply with the CDS and have a tolerance of ±0.1 mm. Features can be any size within the envelope, but no part can extend beyond the envelope. The rails must additionally be hard anodized (Type III hard anodizing).

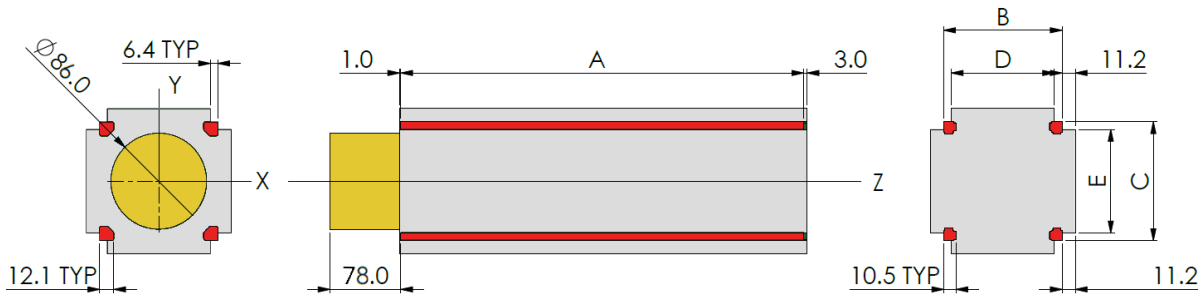


Figure 4: Maximum allowed outer dimensions for Cubesats launched in an EXOpod. Contact areas with the deployer are marked red.

Table 1: Maximum Cubesat Dimensions

Description	Letter	3U	6U	6U XL	8U	12U	16U
Cubesat Rail Length (Z) [mm]	A	340.5	340.5	365.9	454	340.5	454
Cubesat Rail Width (X) [mm]	B	100	226.3	226.3	226.3	226.3	226.3
Cubesat Rail Height (Y) [mm]	C	100	100	100	100	226.3	226.3
Maximum Space Between Rails (X) [mm]	D	87.2	213.5	213.5	213.5	213.5	213.5
Maximum Space Between Rails (Y) [mm]	E	87.2	87.2	87.2	87.2	213.5	213.5
Number of Tuna Cans	-	1	2	2	2	5*	5*
Distance Between Tuna Cans [mm]	-	-	126.3	126.3	126.3	126.3	126.3
Maximum Mass [kg]	-	5.5	11	12	15	22	24
Maximum Distance Between CoG and Geometric Center [mm]	-	20					
Rail Parallelism [mm]	-	0.05					
Surface Roughness [µm]	-	1.6					

*The fifth tuna can is located at the center of the deployment wagon.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