PLAN ETVAC SAMPLE CAPTURE AT MARE CRISIUM

SAMPLING EFFECTIVENESS ON THE LUNAR SURFACE

ZAK FITZGERALD – PLANETVAC LEAD

HONEYBEE ROBOTICS, A BLUE ORIGIN COMPANY
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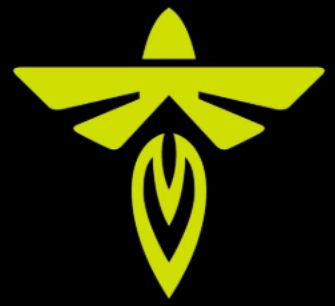
BLUE ORIGIN

HONEYBEE ROBOTICS
A BLUE ORIGIN COMPANY



BLUE GHOST MISSION 1

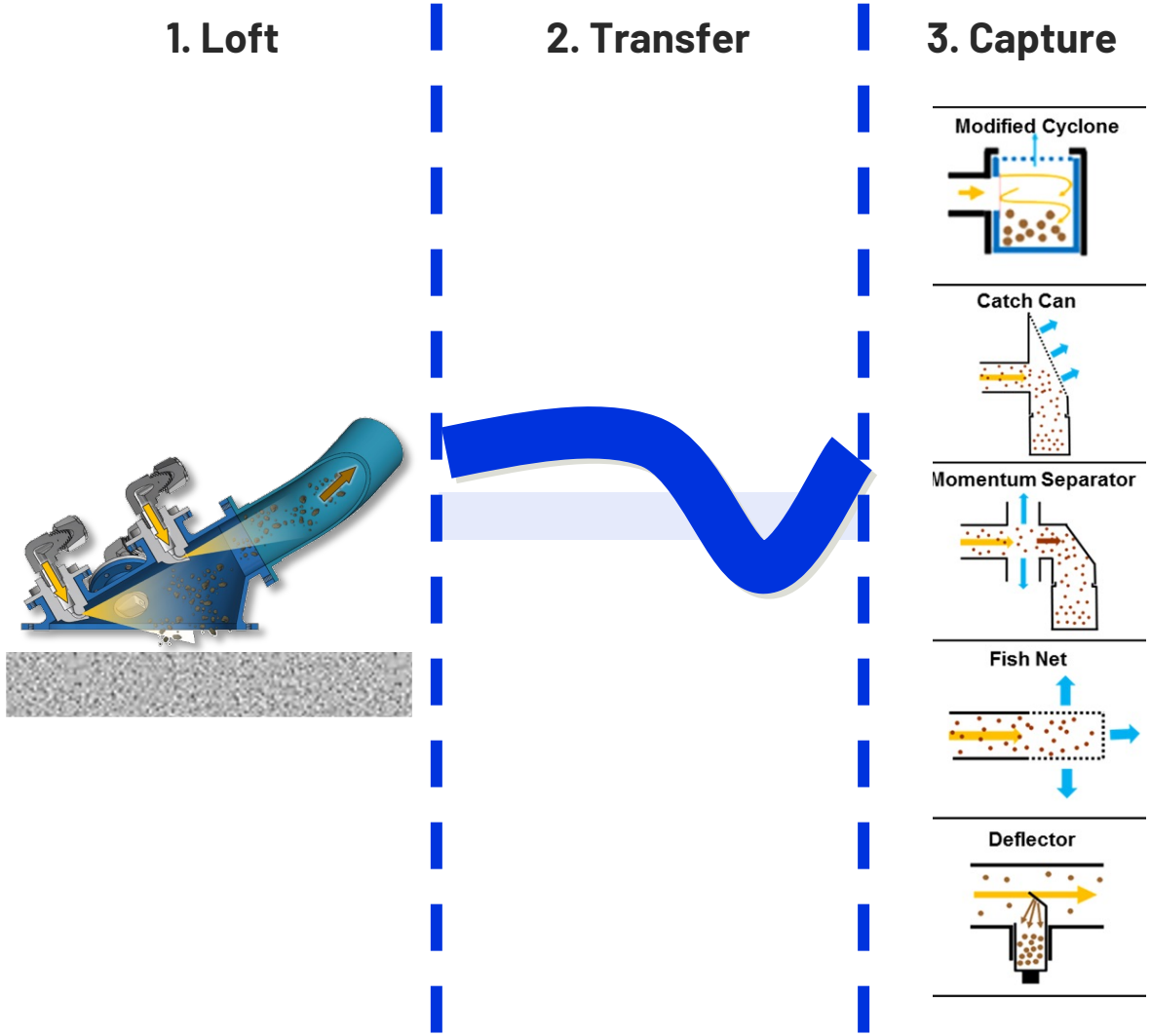
NASA's Lunar PlanetVac Surface Operations

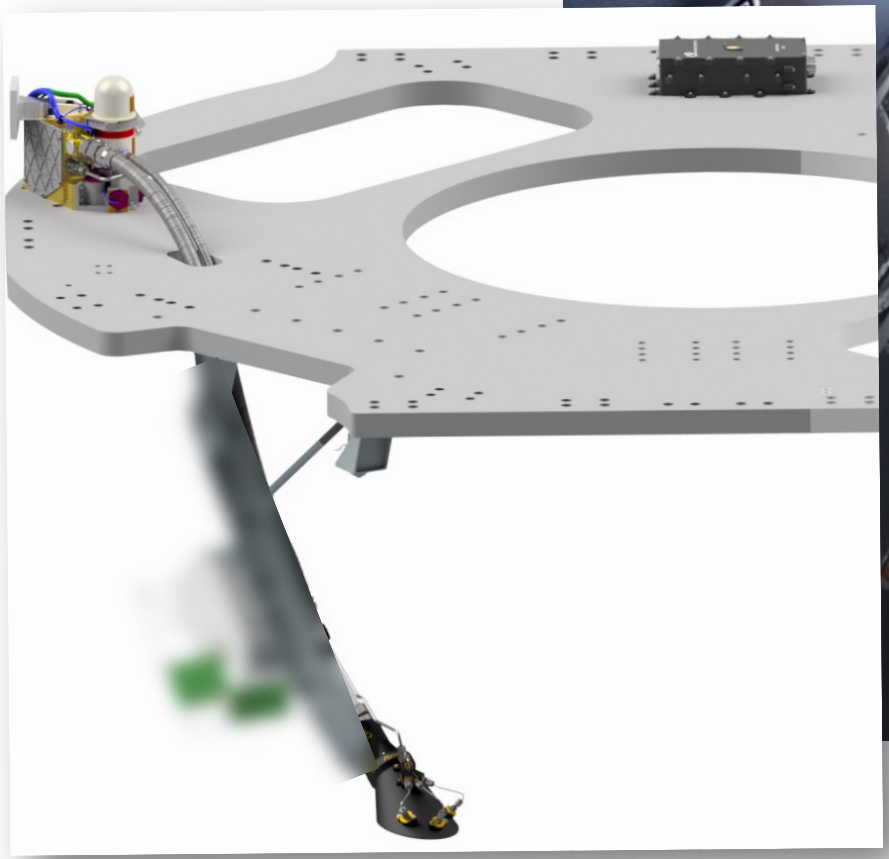
Lunar PlanetVac Objectives & Background

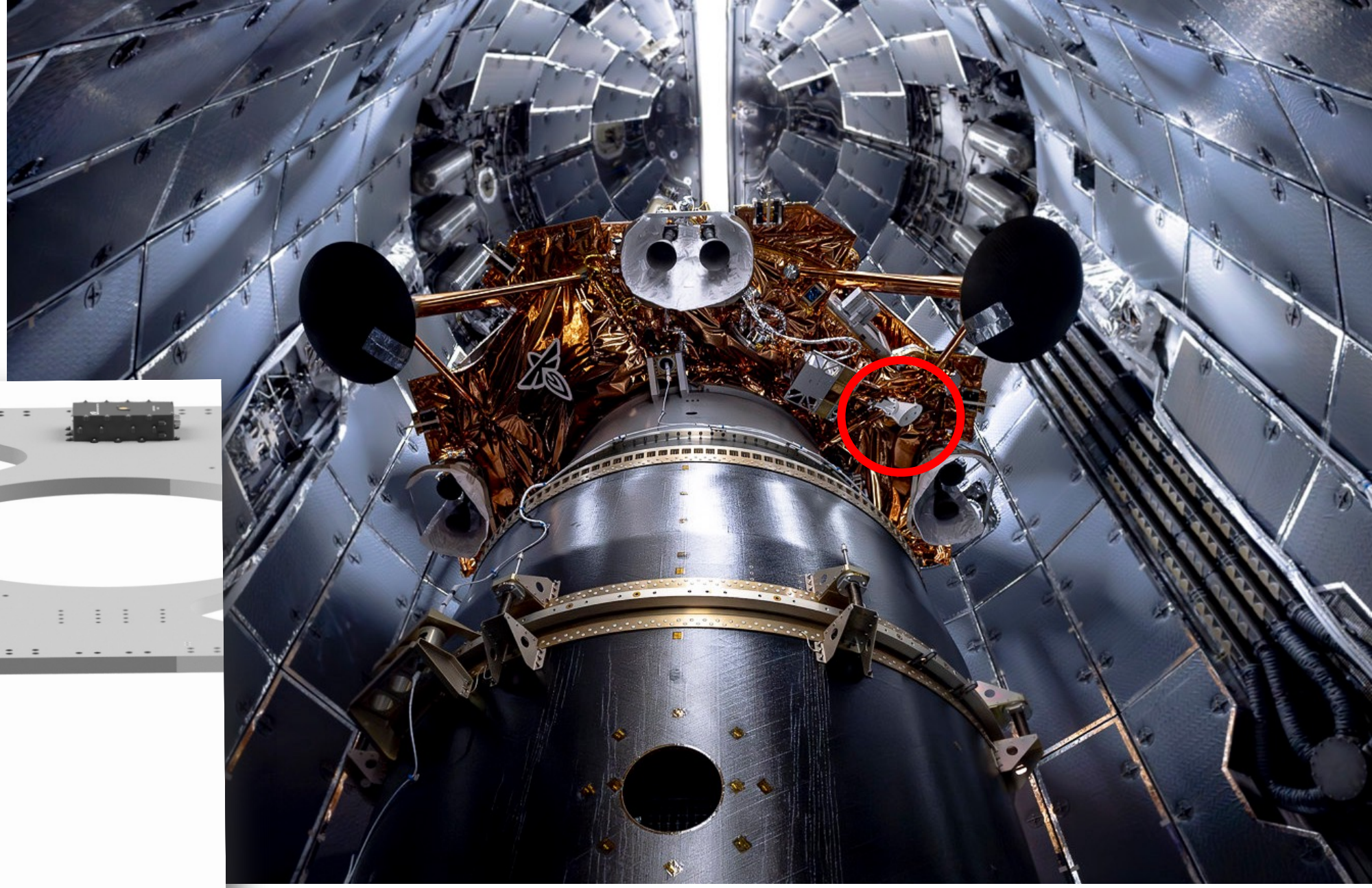
PlanetVac's goal is to **demonstrate a sampling capability on the Lunar surface, applicable to future spacecraft requiring sample for instruments or sample return.**

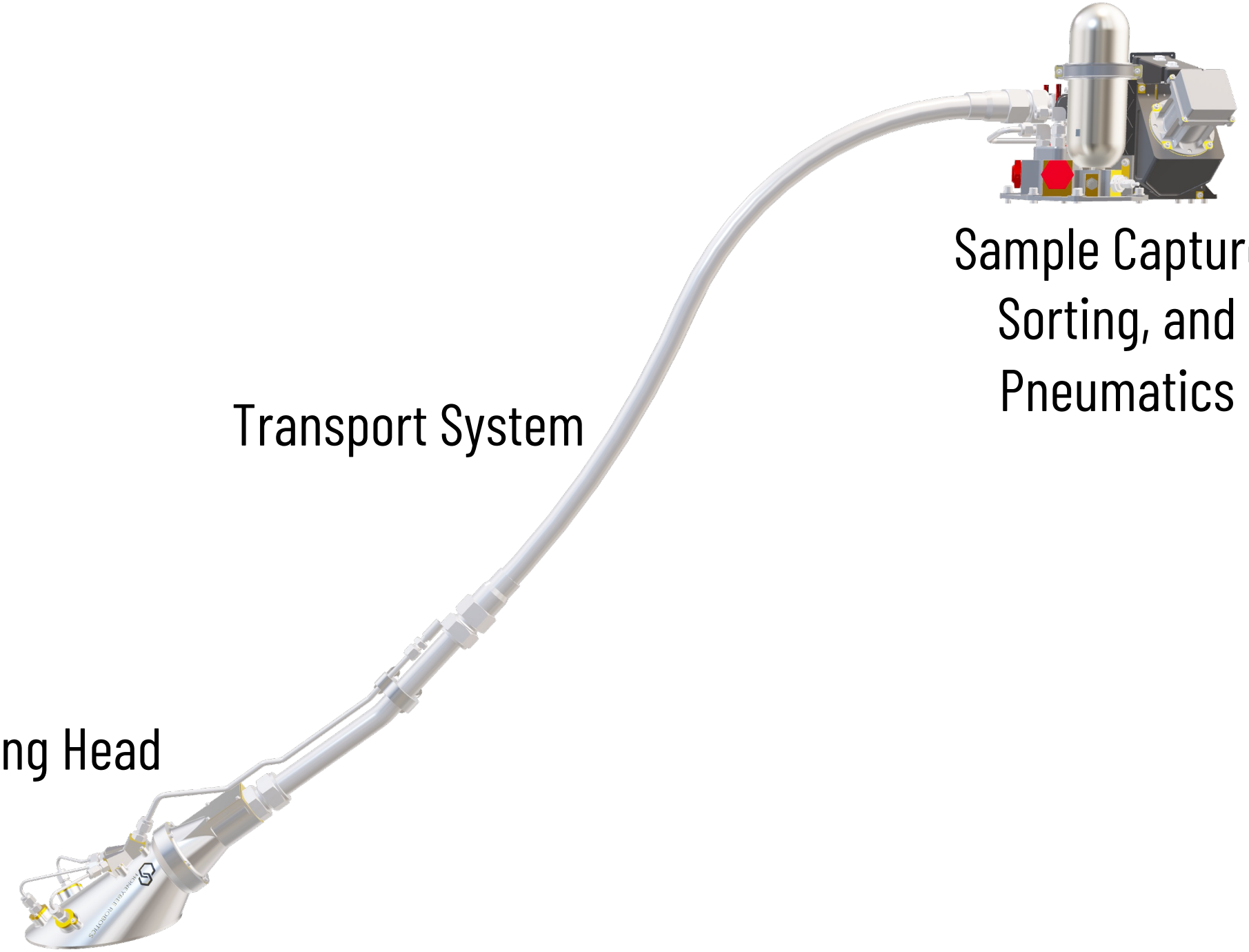
- PlanetVac is intended to serve as a reliable and less expensive alternative to conventional sample collection systems such as robotic arms.
- PlanetVac demonstrated capability of collecting both fine regolith material and rocklets; this serves the purpose of proving out capability to service both instruments such as XRD/XRF as well as provide science dense rocklets for sample return.
- PlanetVac-like concepts will be flown on various other missions, including the Pneumatic Sampler on the JAXA MMX vehicle.

In support of this goal, PlanetVac's mission objective is to **collect sample from the Lunar surface, separate fines from rocklets, and image the sample before and after it is processed.**







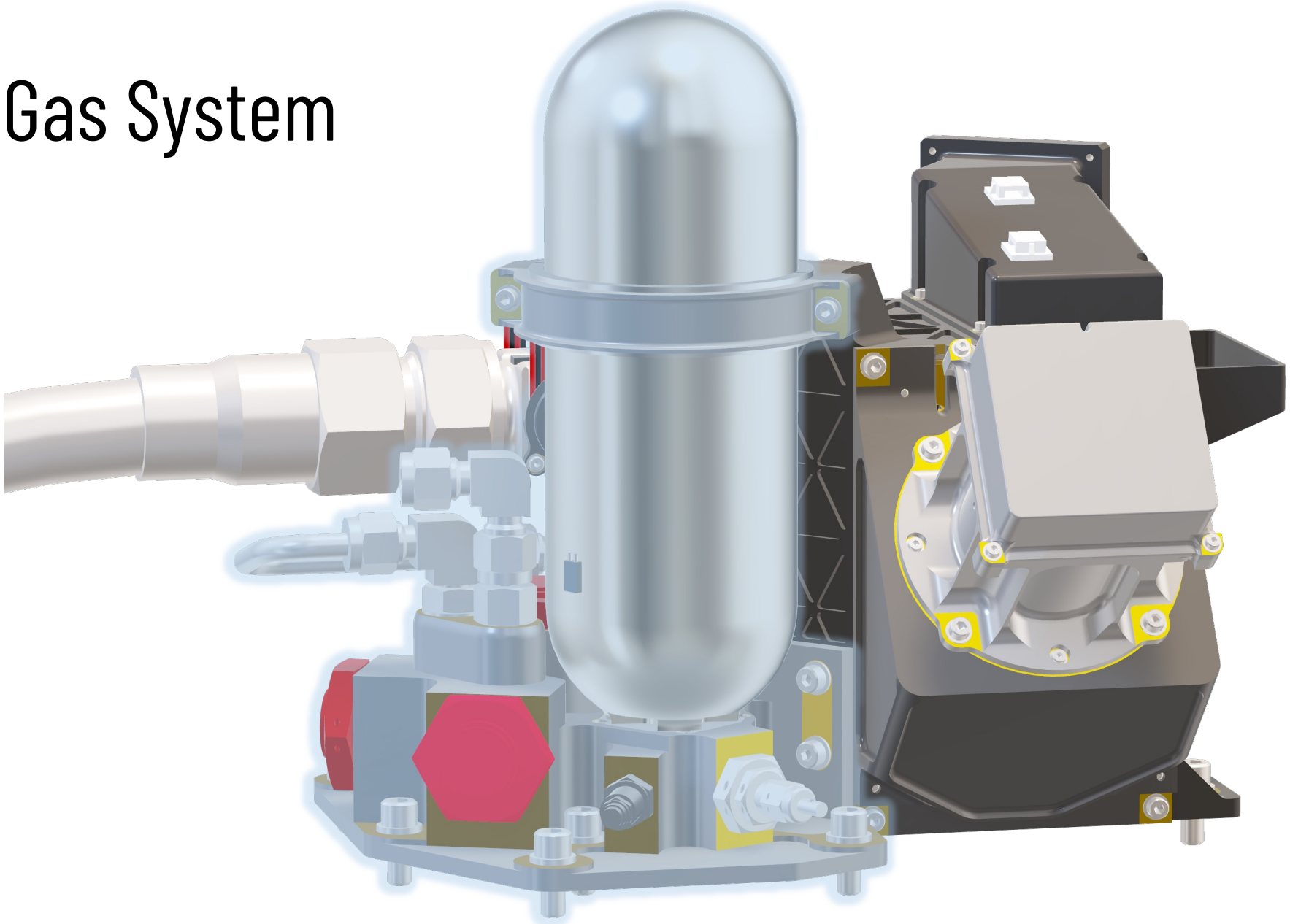


Sample Capture, Sorting, and Pneumatics

Transport System

Sampling Head

High-Pressure Gas System



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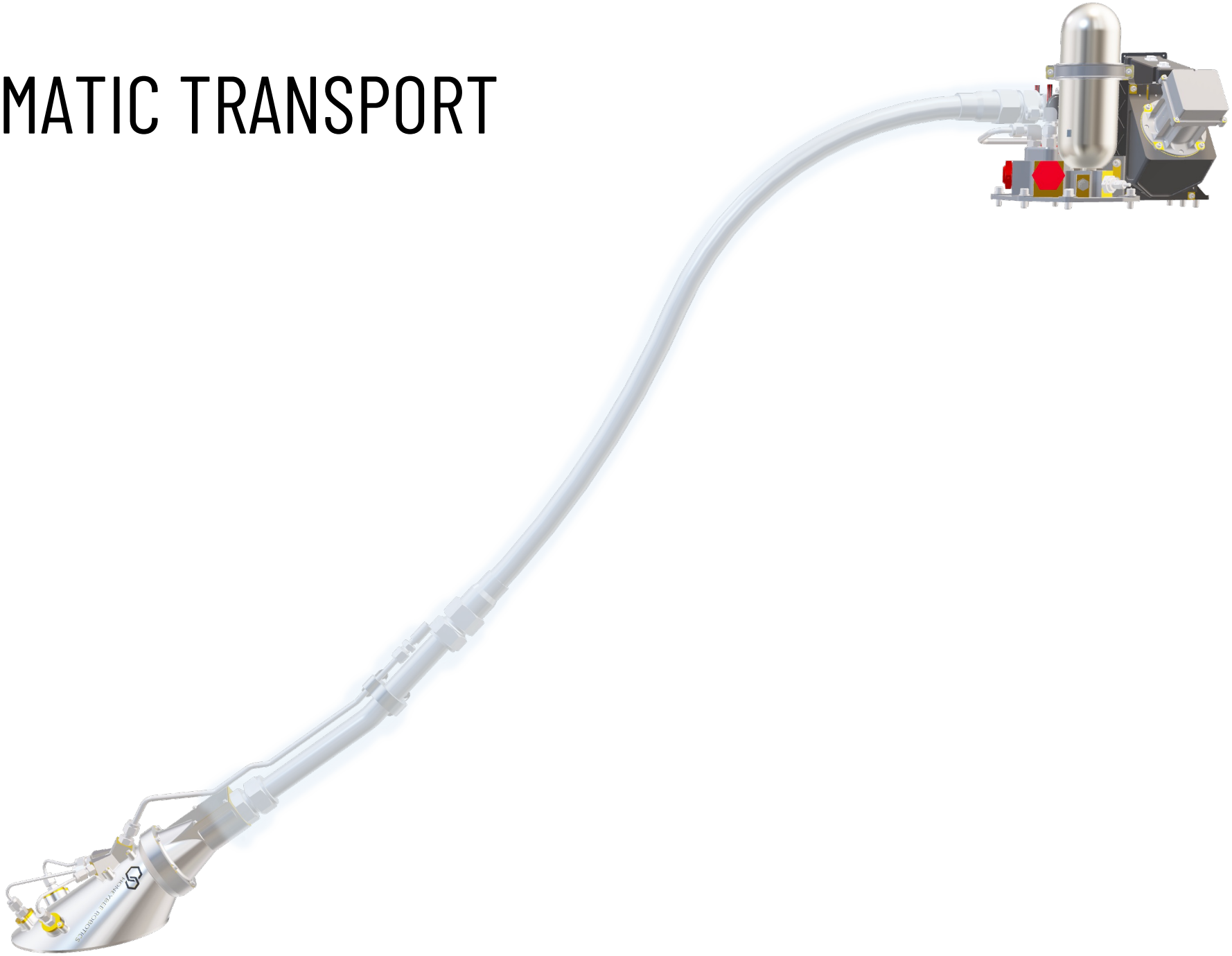

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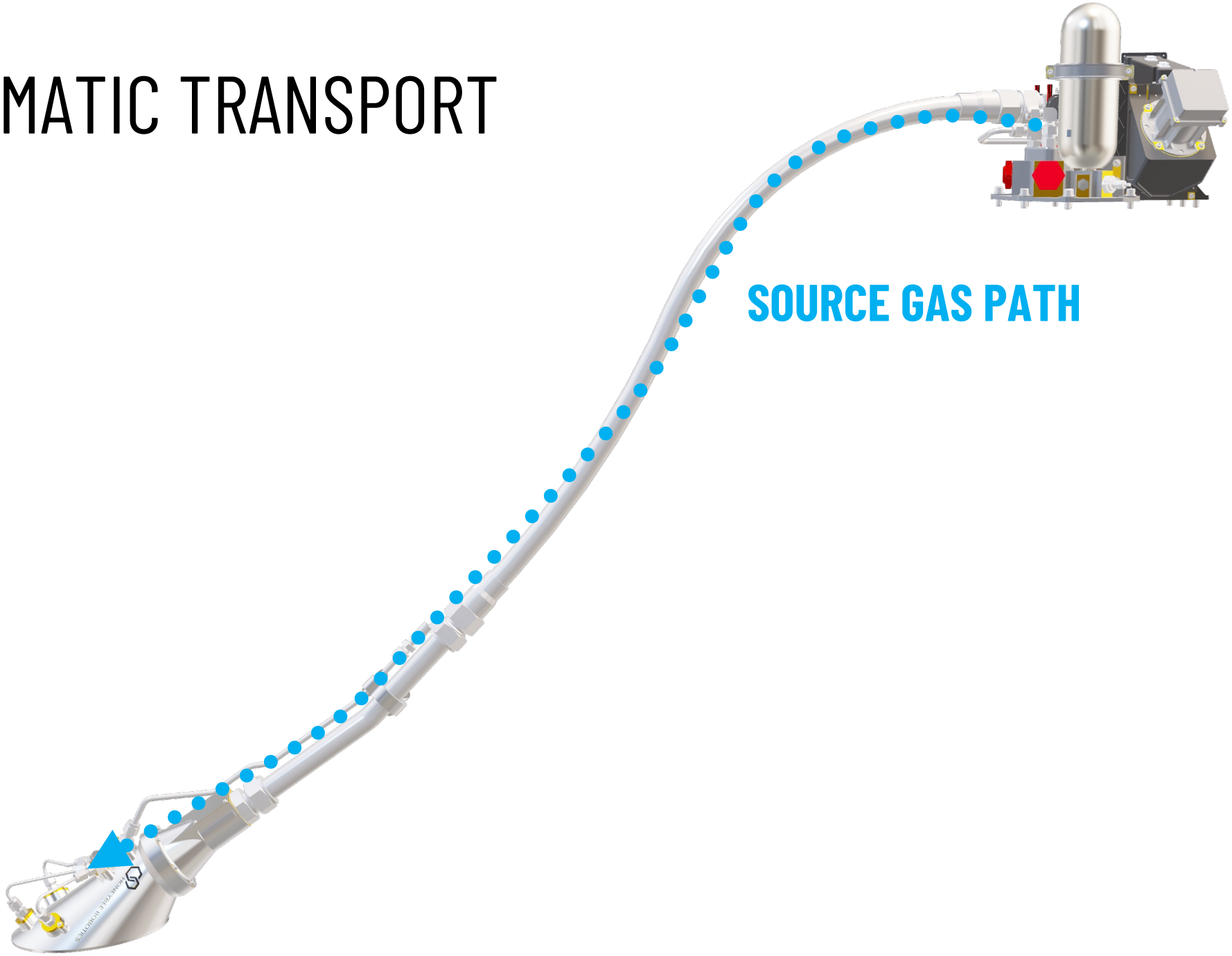
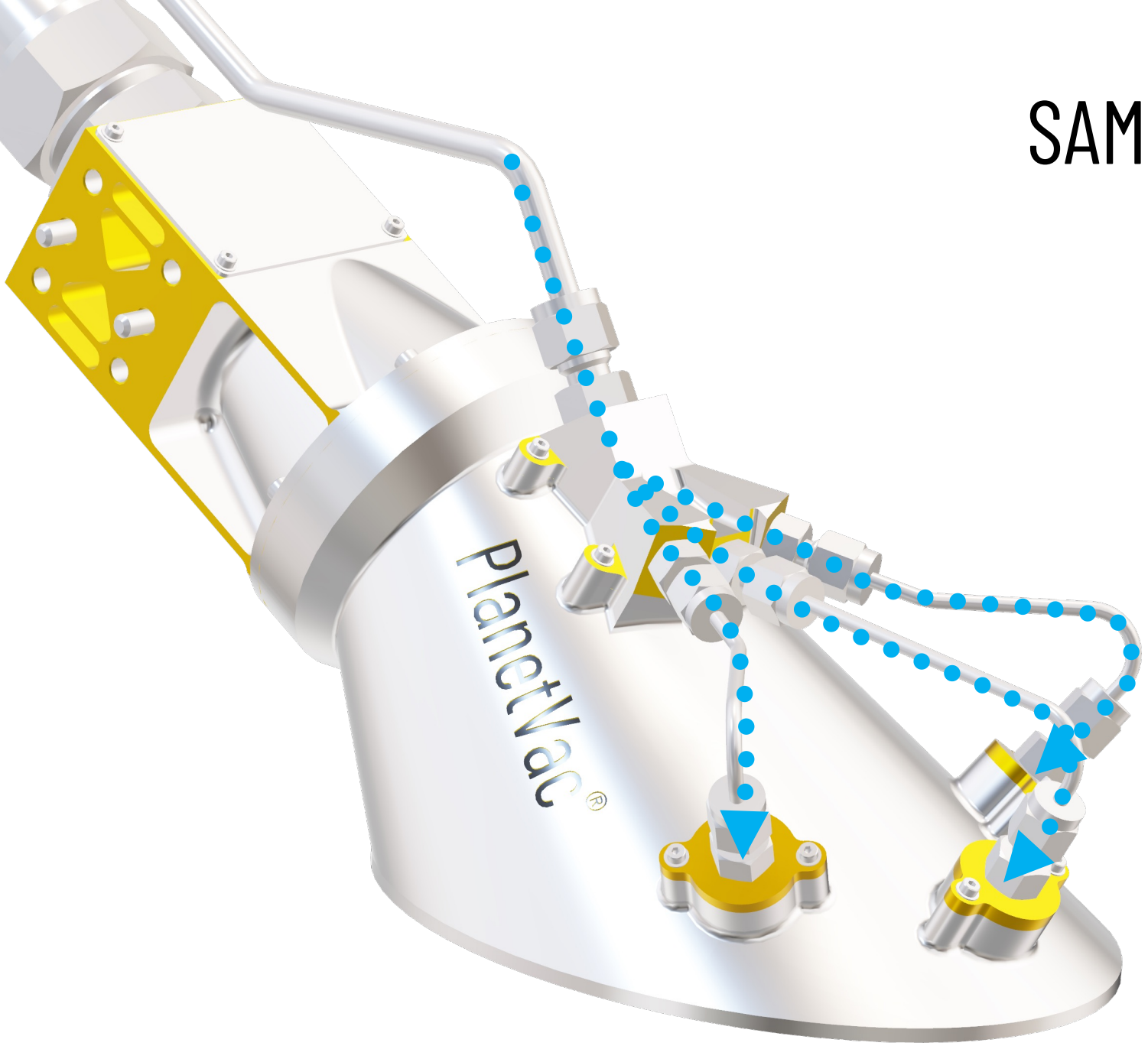


SAMPLING HEAD



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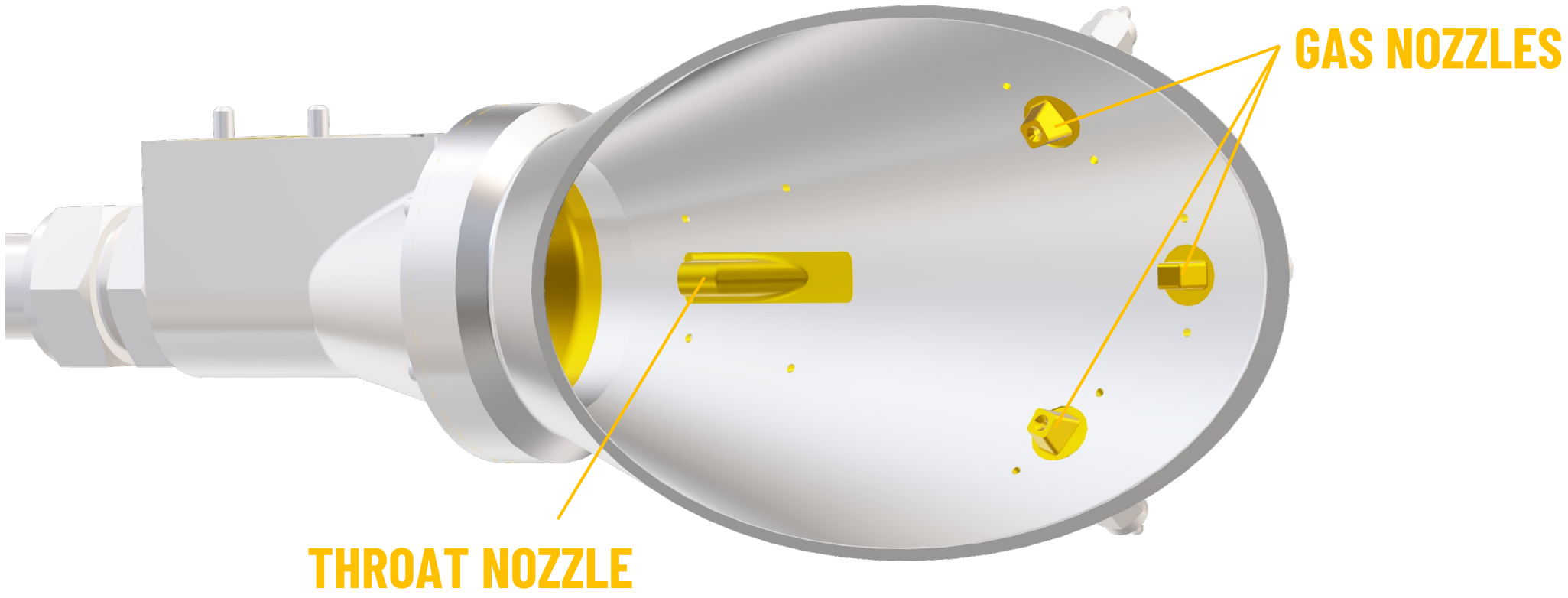

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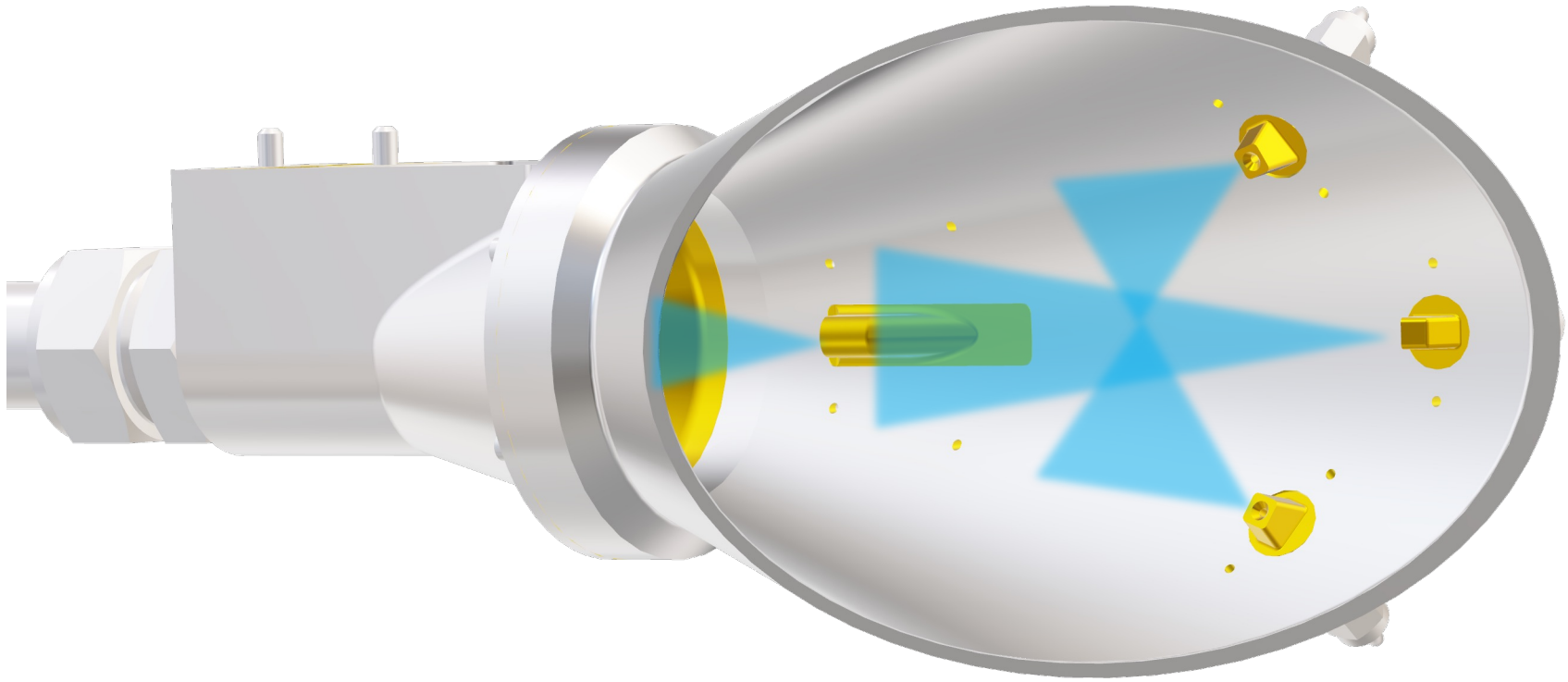

SAMPLING HEAD

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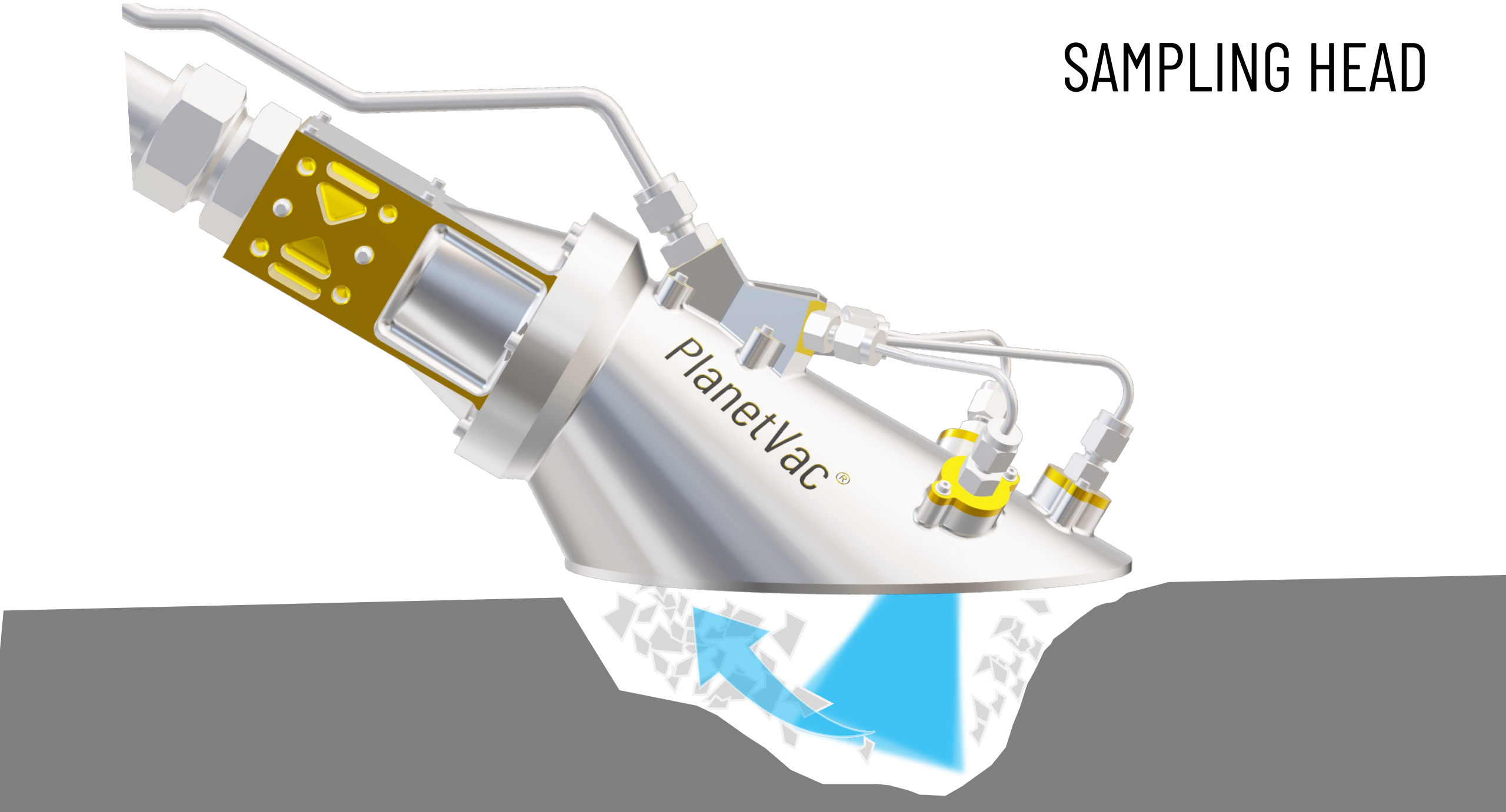
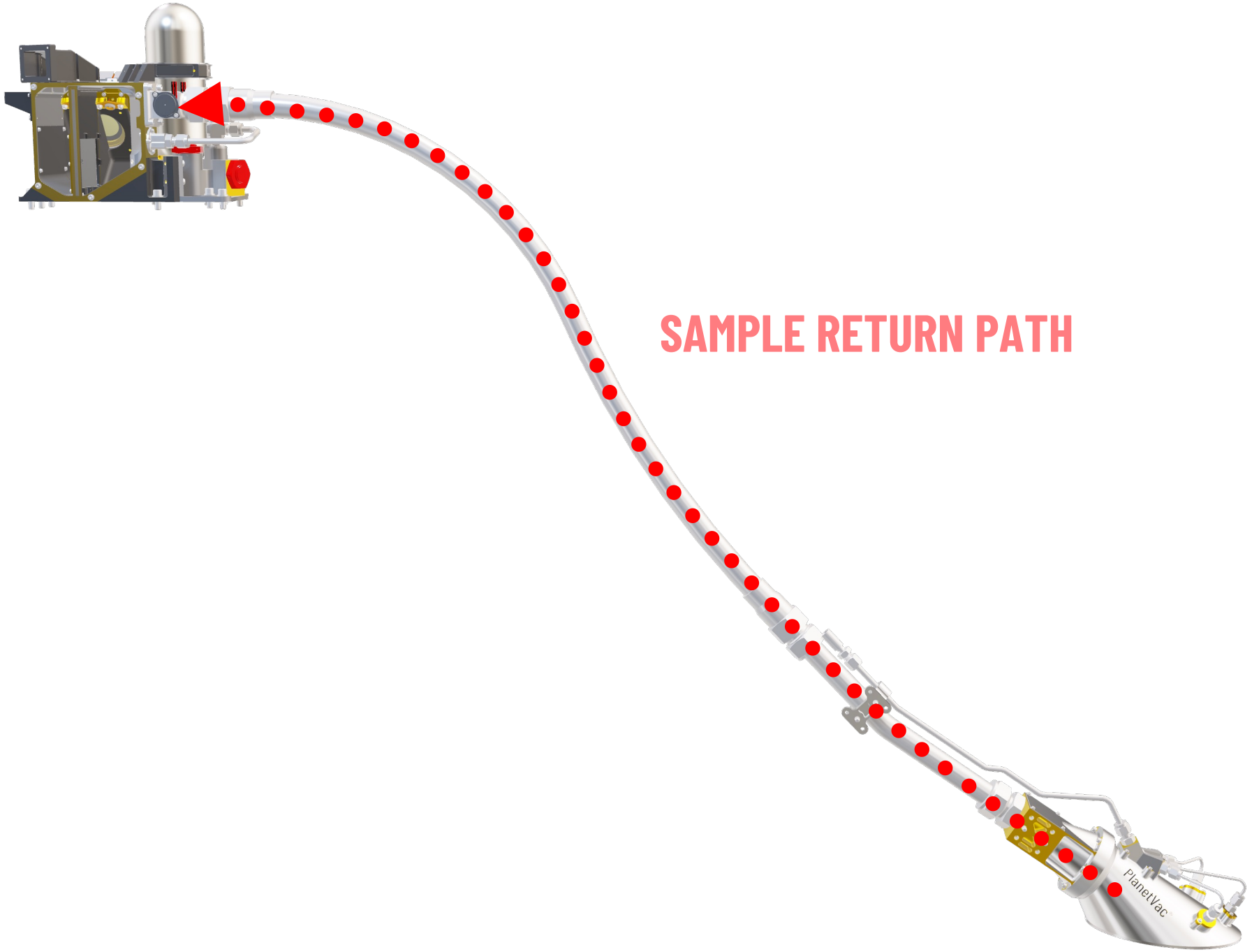
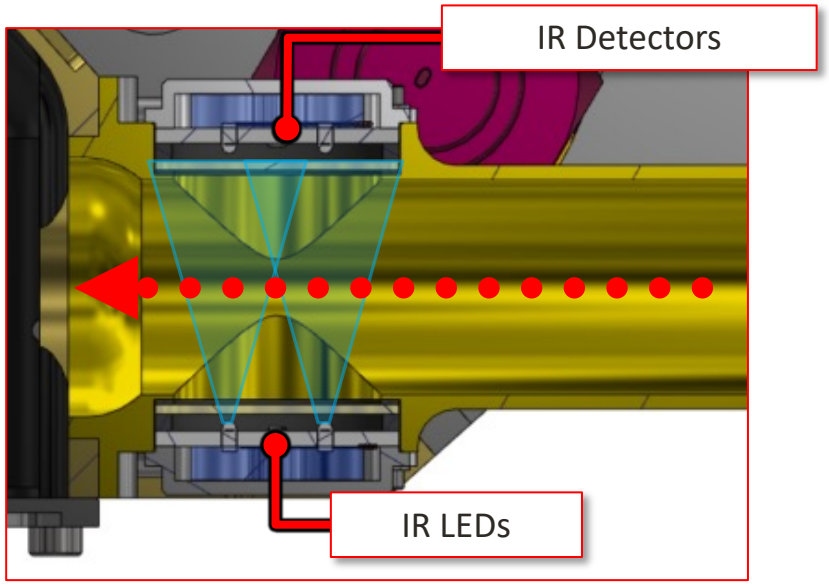
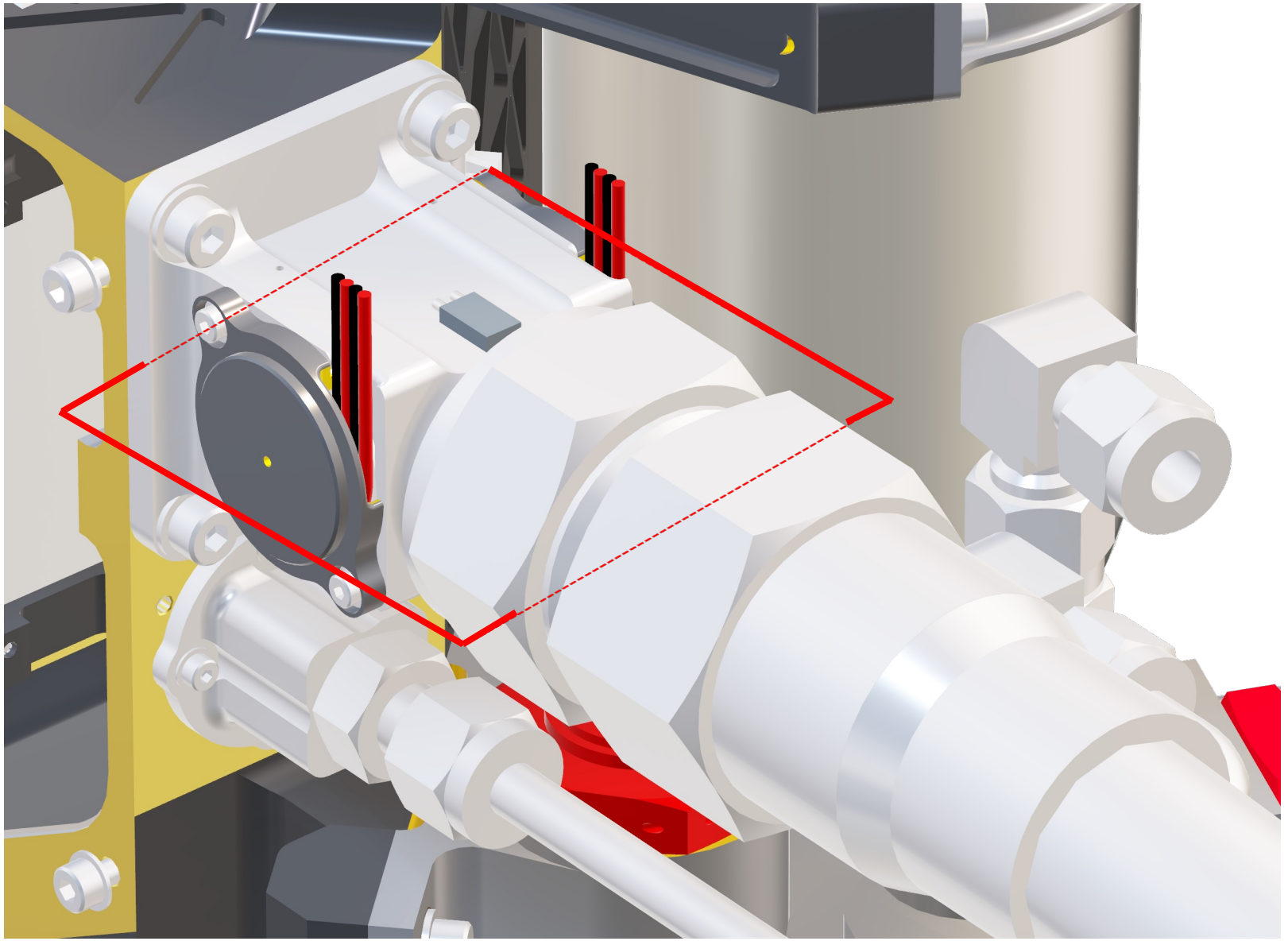


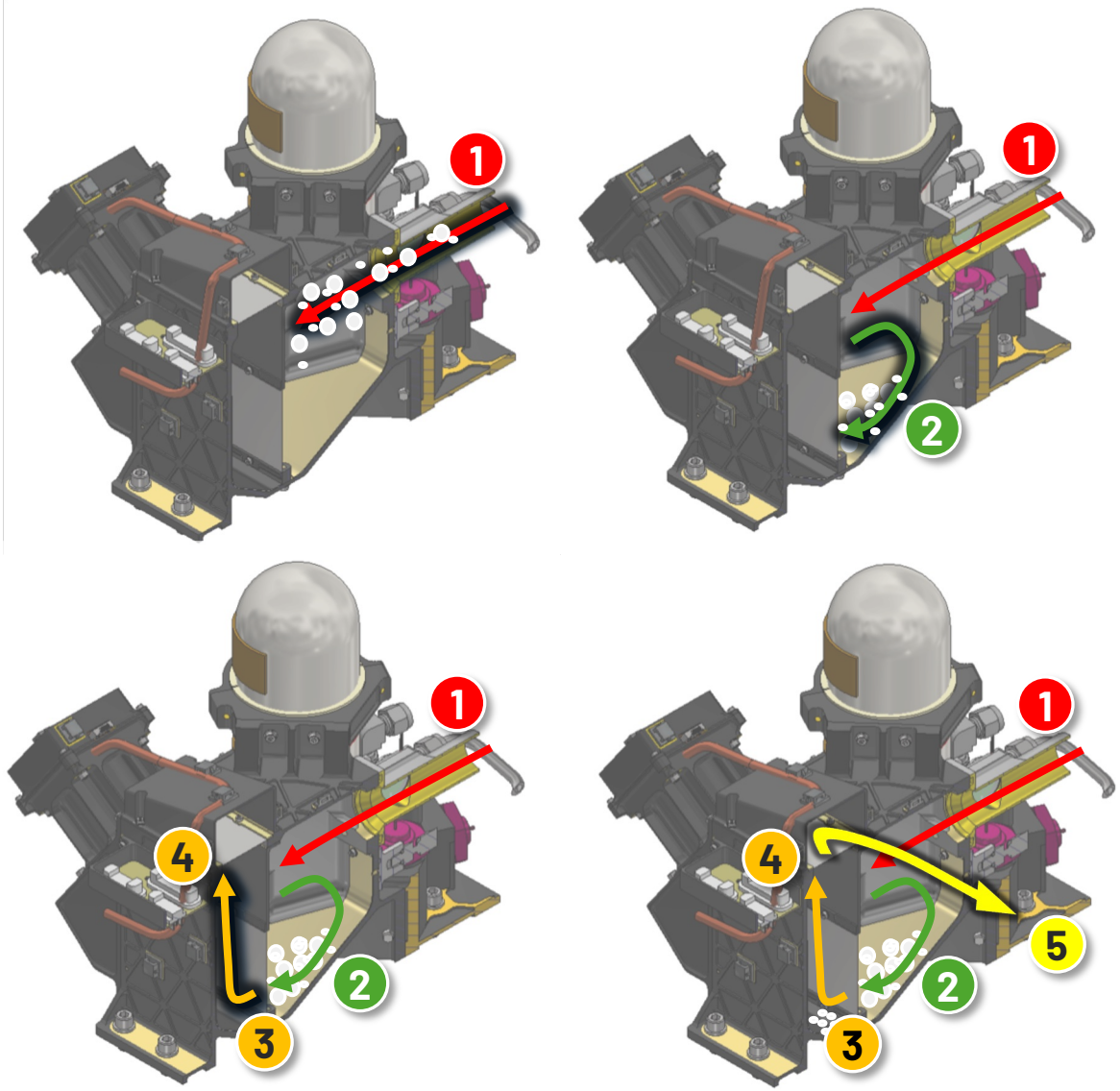

SAMPLE RETURN PATH
PlanetVac

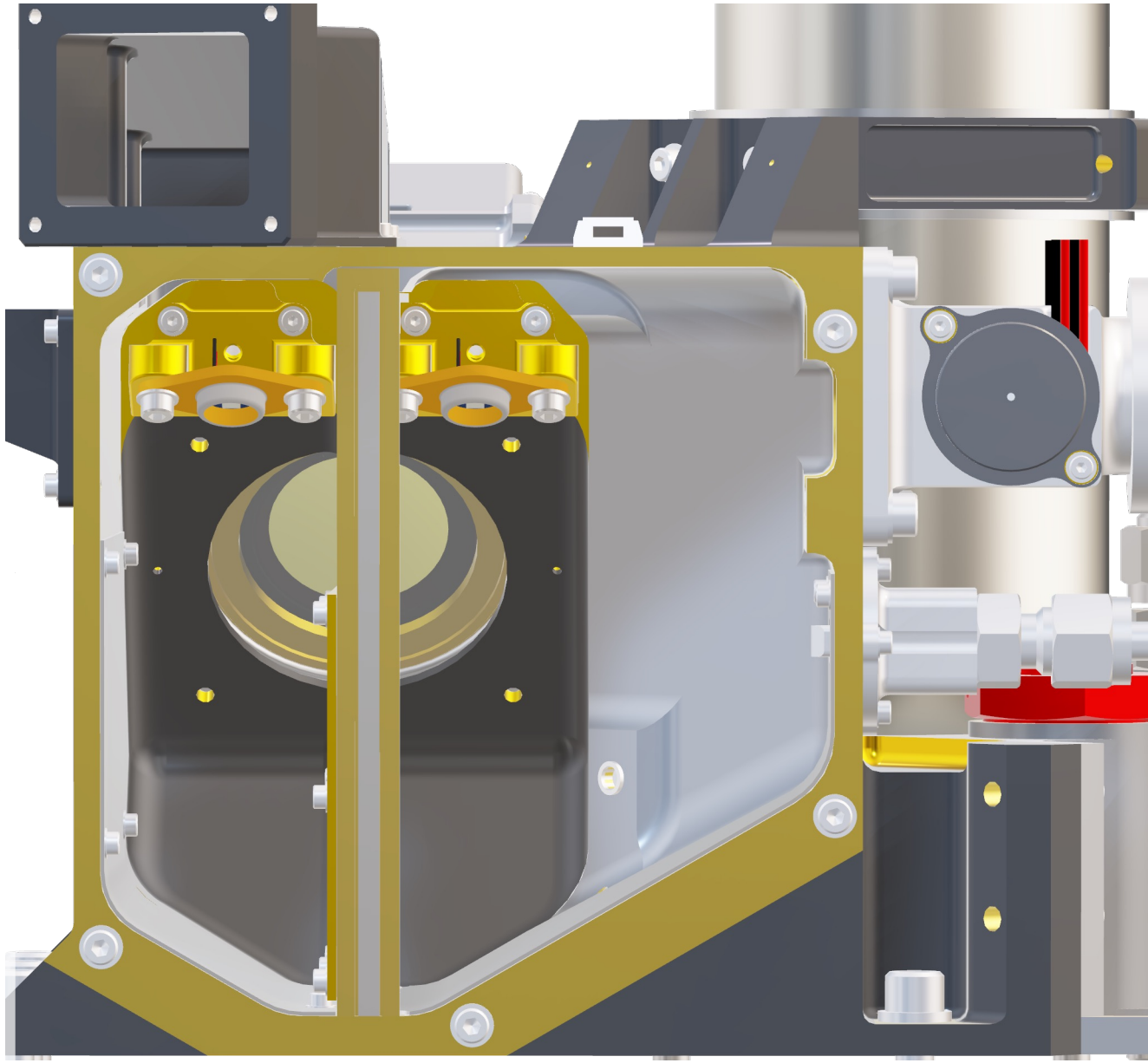
SAMPLE DETECTION





SAMPLE CAPTURE





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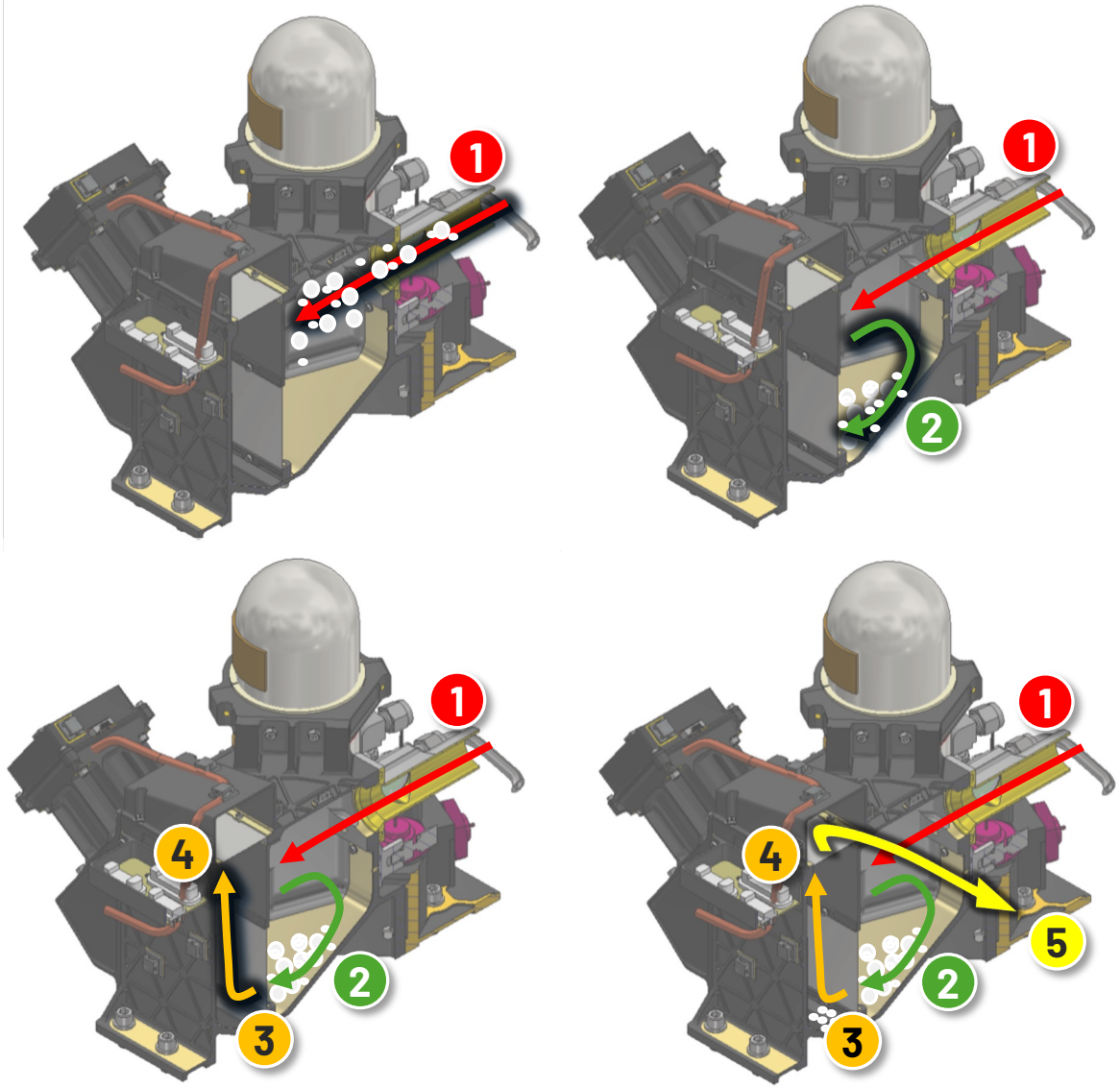

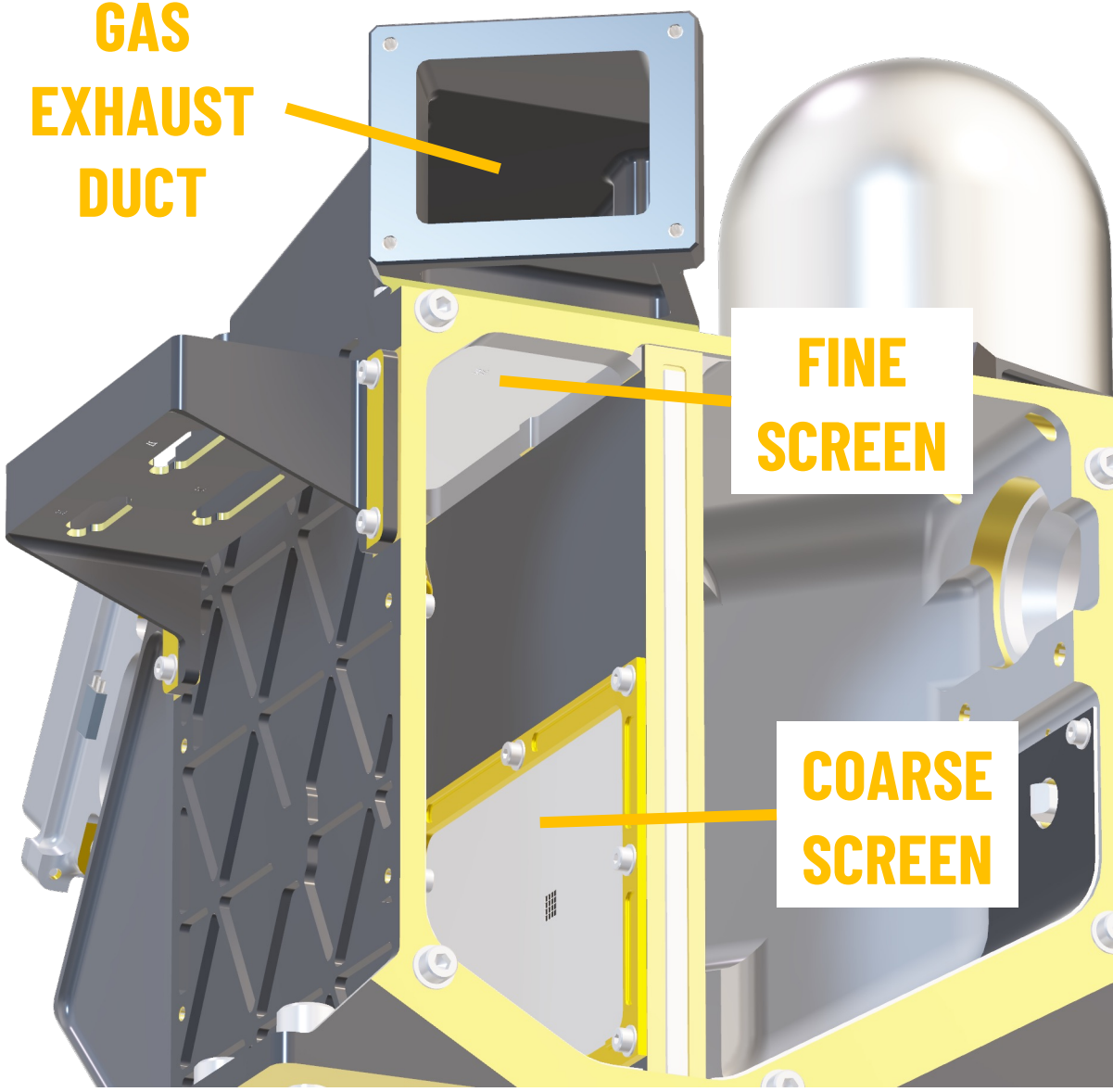

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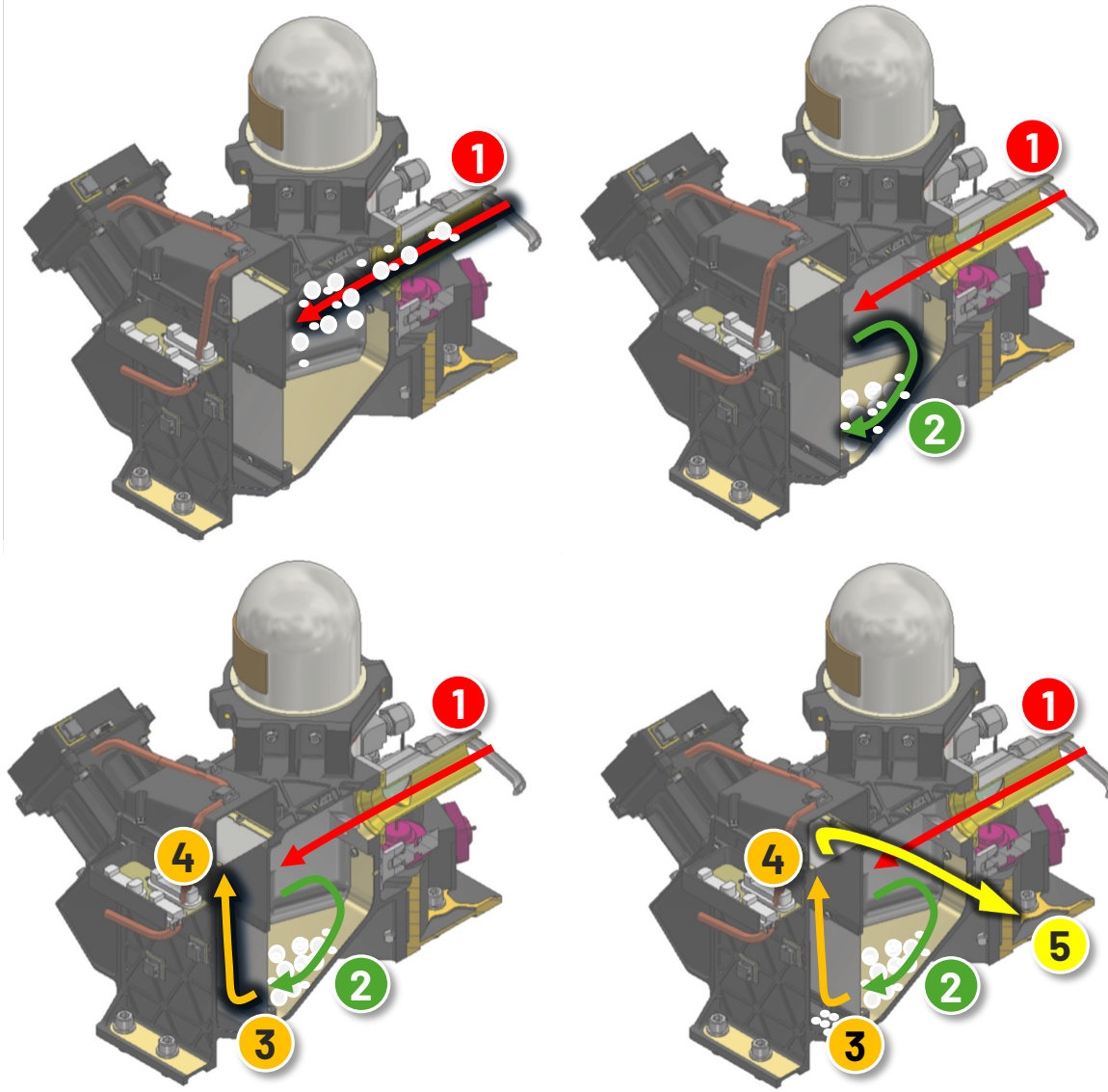
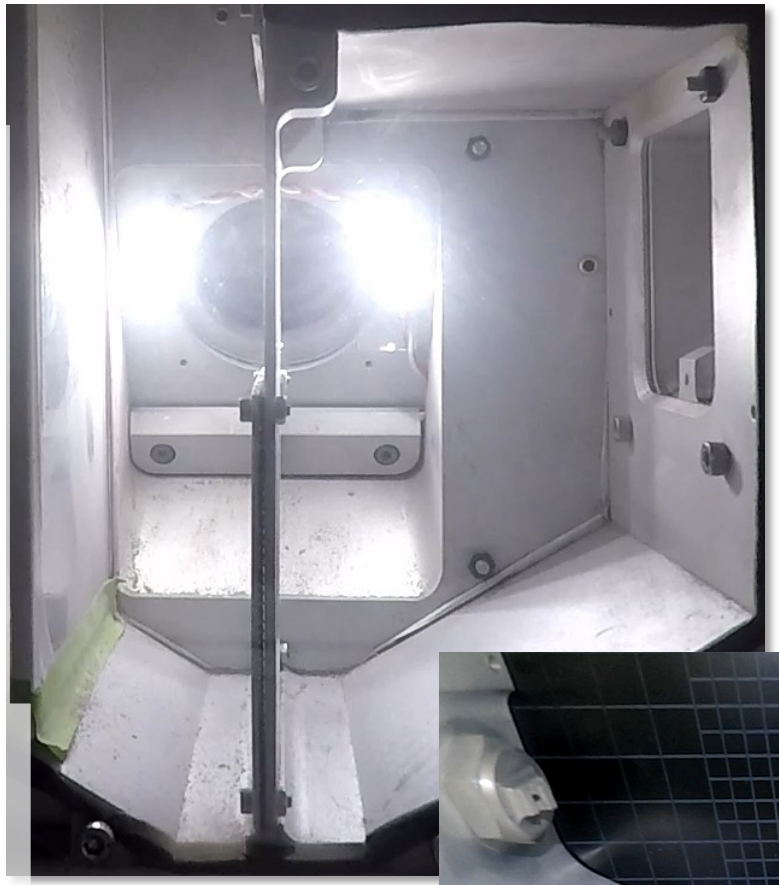
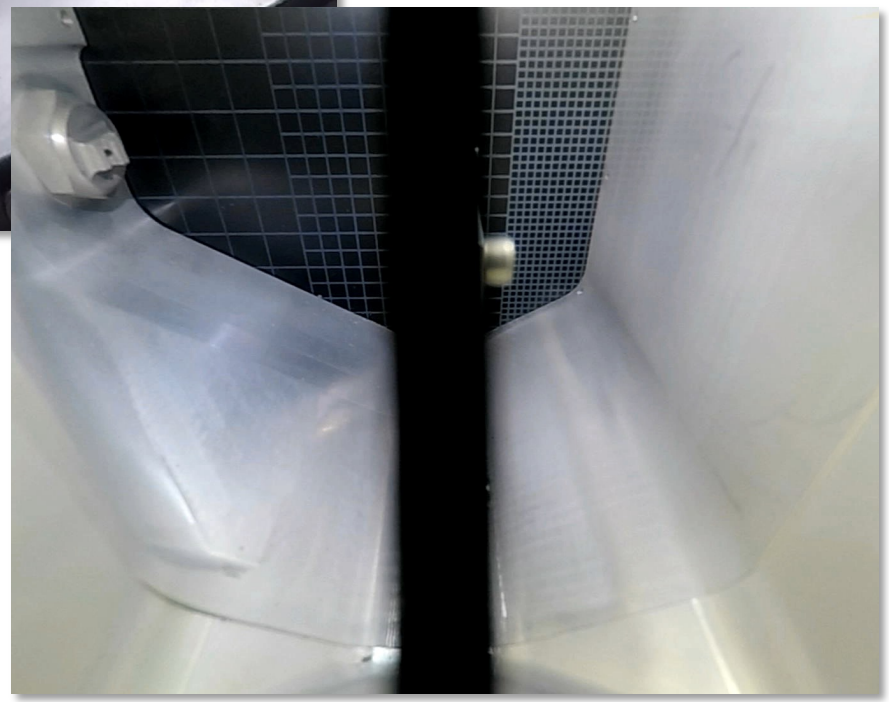
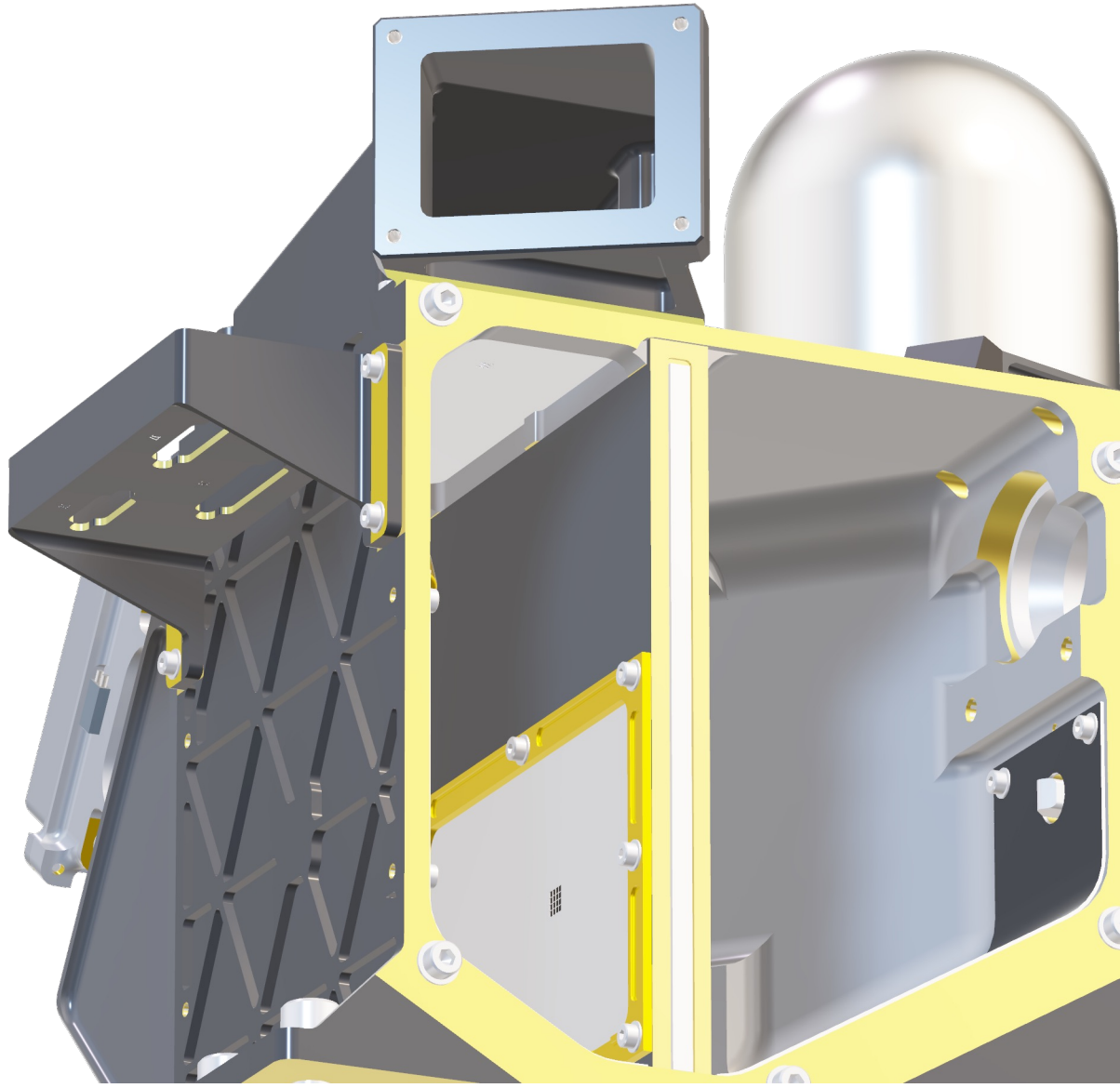




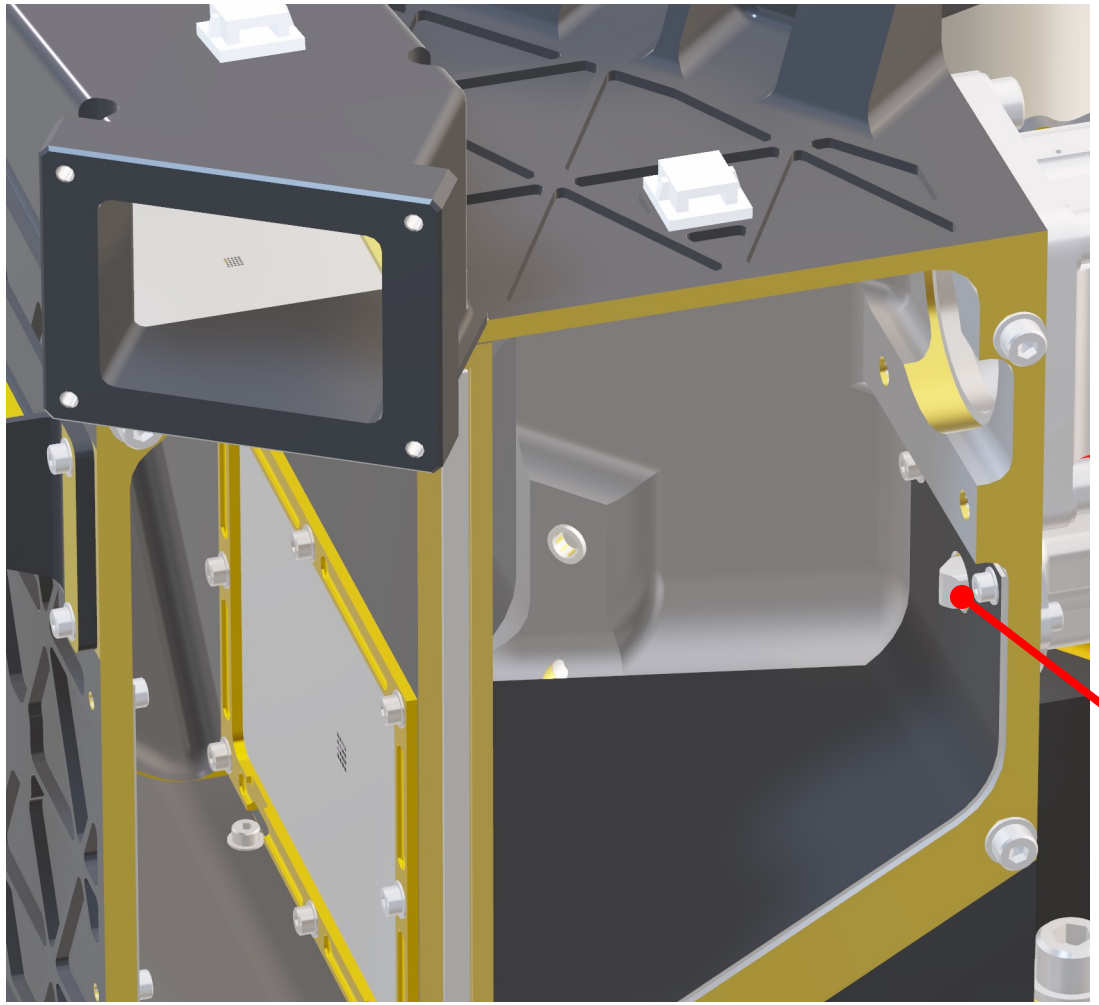


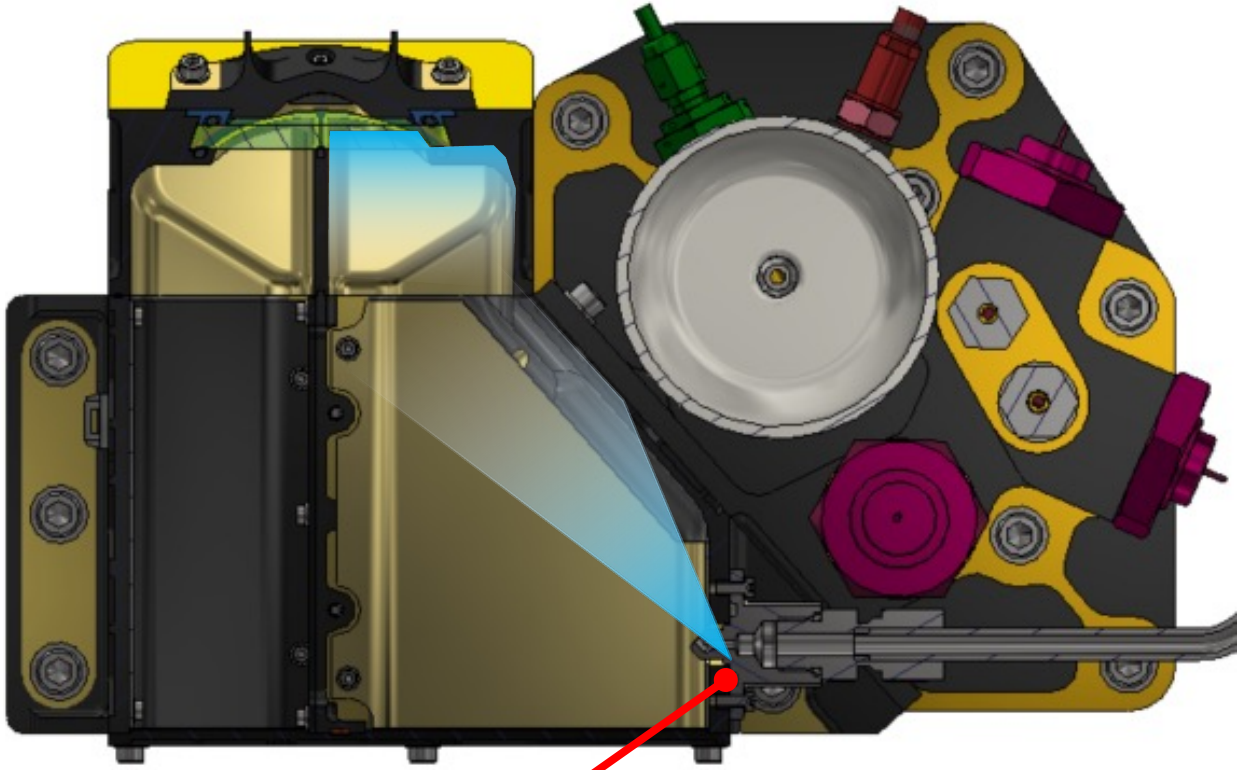
Sample Capture
(Footage from
developmental testing)

SAMPLE CAPTURE



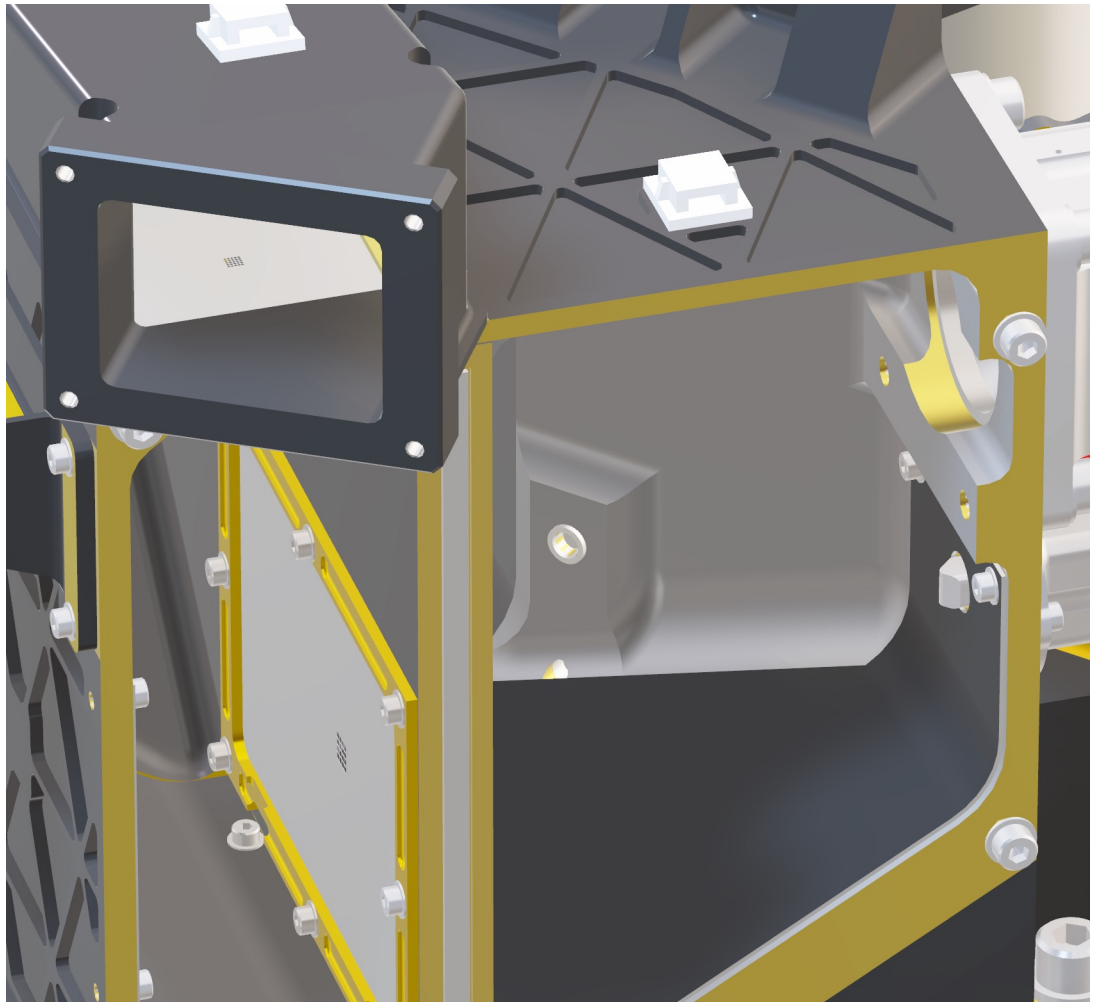
SIEVING (ROCKLET SEPARATION)





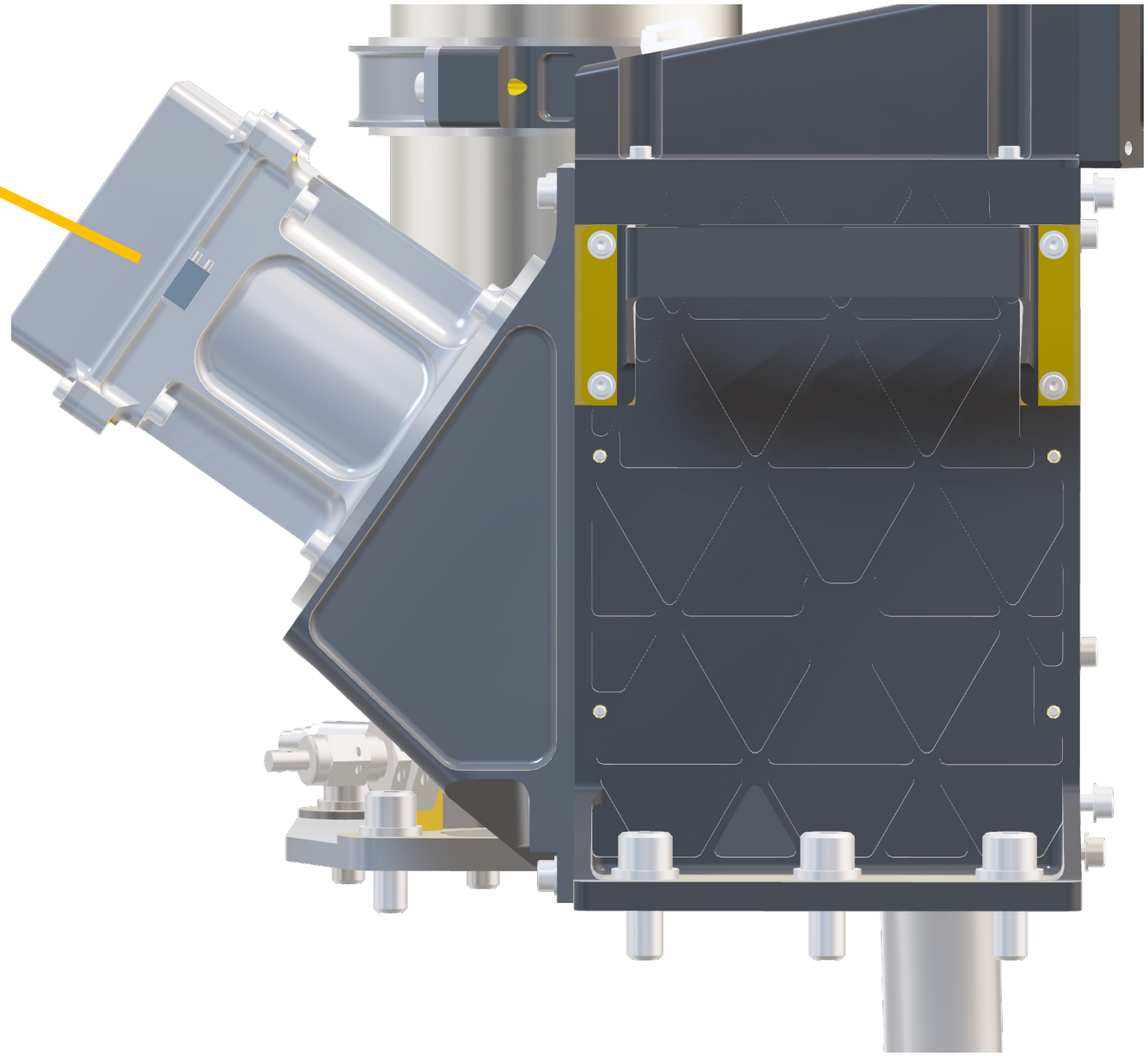
Sieving Nozzle

SIEVING (ROCKLET SEPARATION)



Sample Sieving
(Footage from developmental testing)

IMAGING



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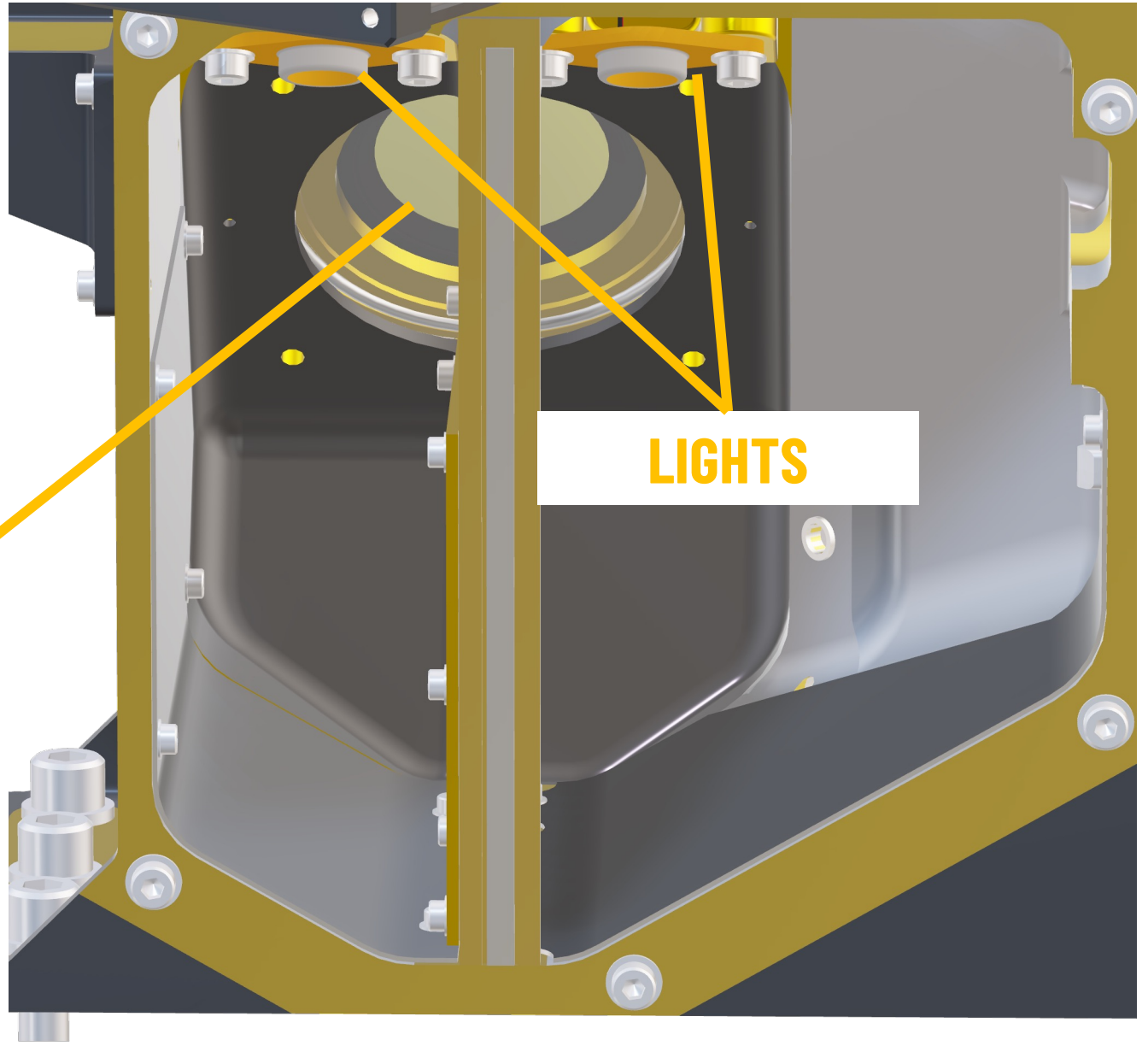
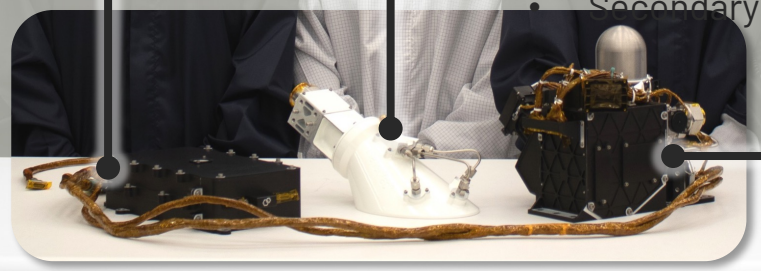


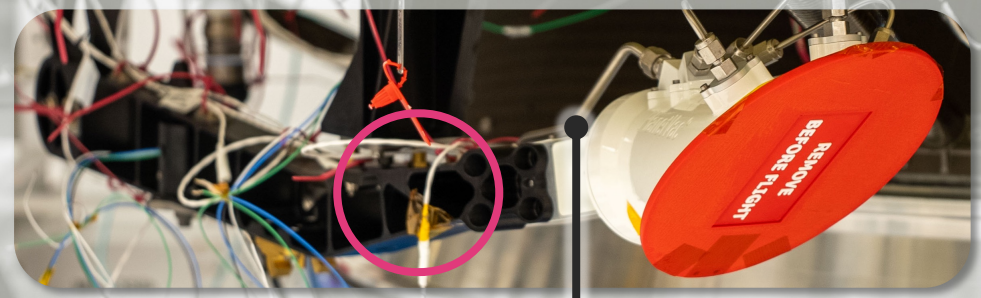
Lunar PlanetVac Overview

Avionics
- Temperature monitoring
- Power distribution management
- Command & Data Handling

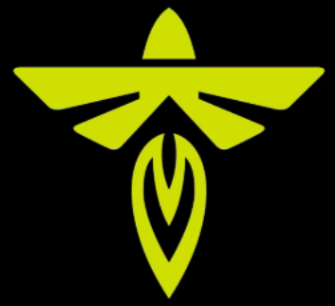
Sampling Head
- End-effector of sample collector.
- Accepts compressed gas downstream of high-pressure pneumatics
- Arrangement of nozzles to agitate and lift regolith



Sample Capture and Sorting
- Sample collection, imaging, and processing
- High-pressure pneumatics
- Secondary verification of sample receipt



Transport System
- Primary connection between Sampling Head and Sample Sorter.
- Gas line from pneumatics to surface nozzles.
- Transport line for regolith from surface to collection system.



BLUE GHOST MISSION 1

NASA's Lunar PlanetVac Surface Operations

Current ongoing data analysis of collected sample amount (mass, volume) based on geometric grid lines and lunar regolith mass properties yield between **7-10 cc**.
This is in-line with development test data from a very comprehensive test campaign encompassing a wide range of edge cases.