A Fully-Modular Coupling Kit Enabling OMAR and Beyond:

The intelligent Space System Interface **iSSI® by iBOSS**

ESA 2021 Clean Space Industrial Days 2021

Session: Debris Removal and Servicing: IOS Enabling Technologies OMAR

23 September 2021 – Virtual Event

Thomas A. Schervan (iBOSS GmbH)

Joerg Kreisel (JKIC + iBOSS GmbH)

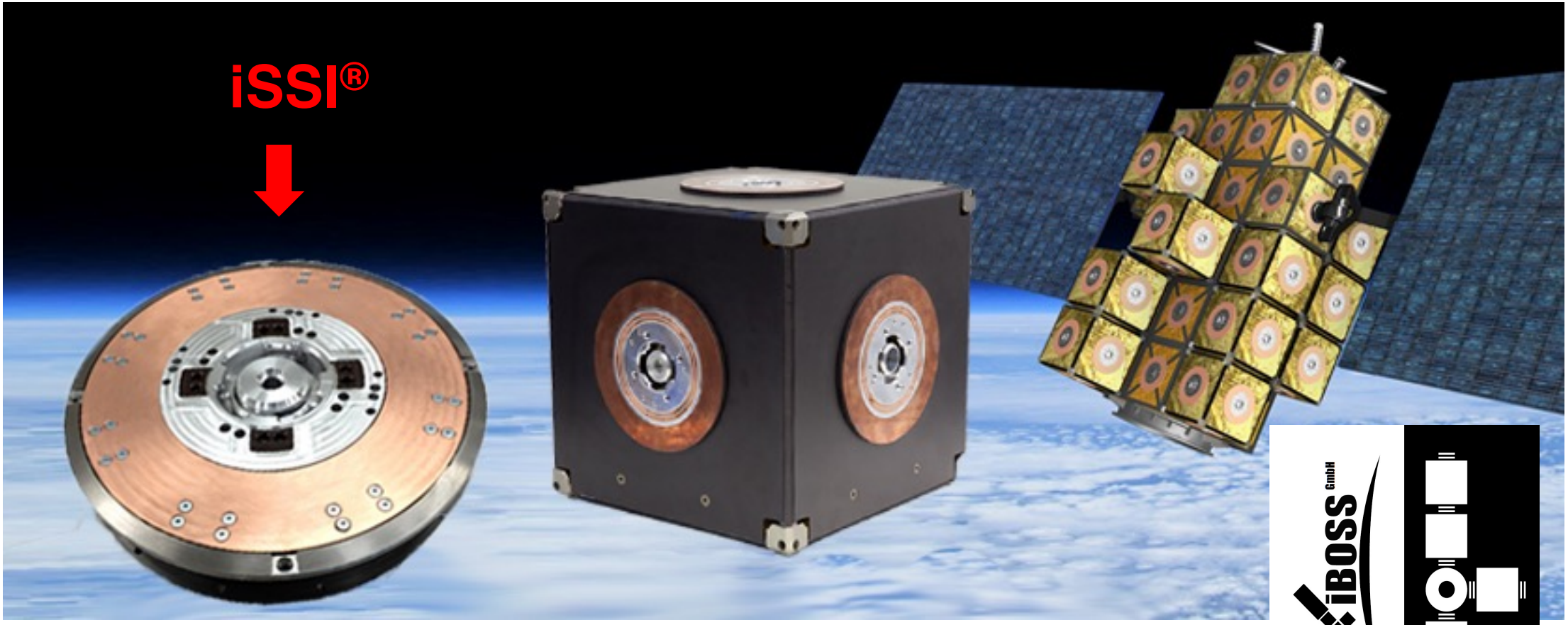
Dennis Ray Wingo (Skycorp)

Dave Barnhart (Arkisys)

Space Ventures
Business Partners
Equity Finance
Global Links

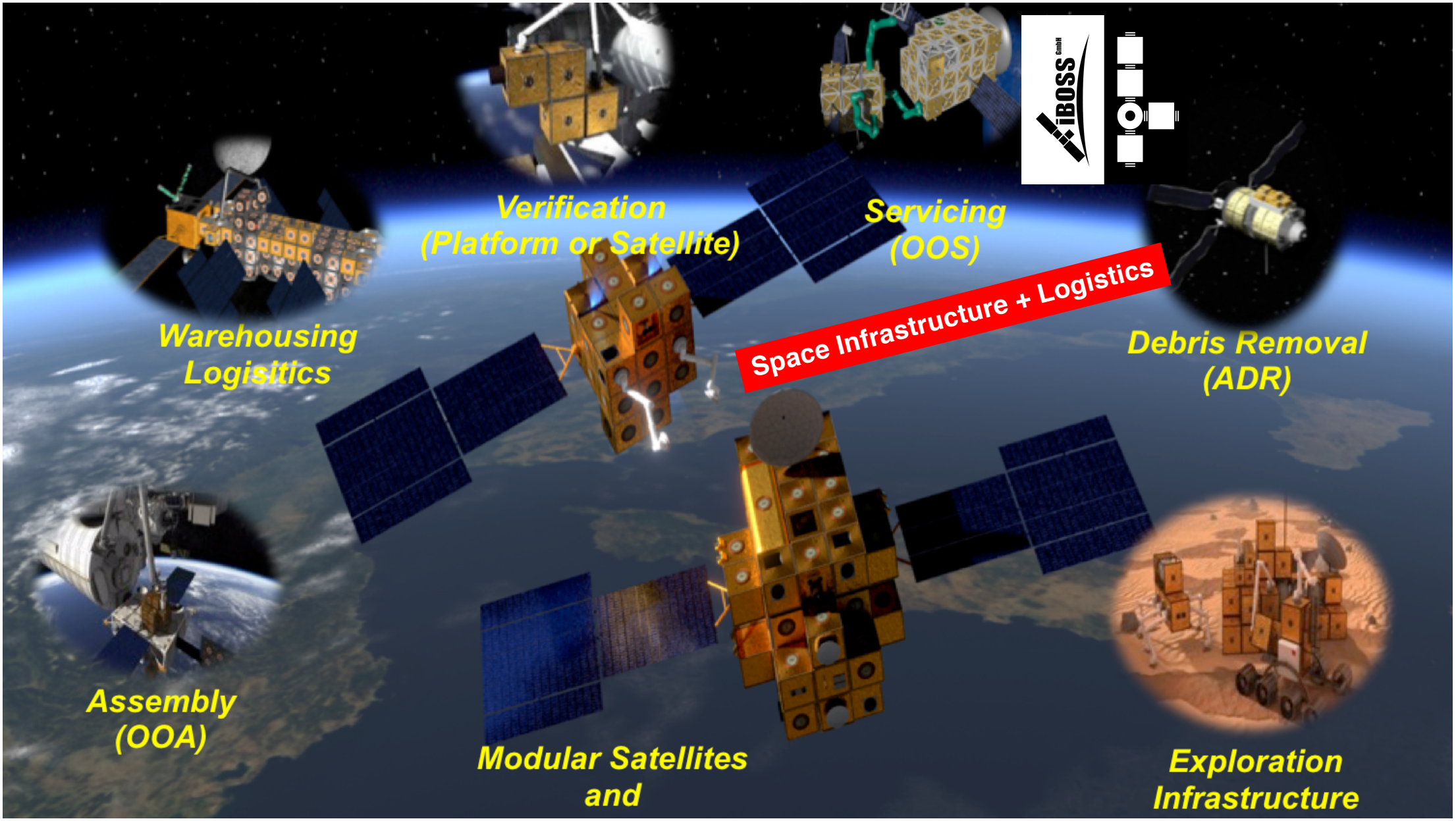
JOERG KREISEL
International Consultant

iBOSS GmbH - Game-Changing Technology Platform Company



Standards ENABLING YOUR Business

MADE IN GERMANY

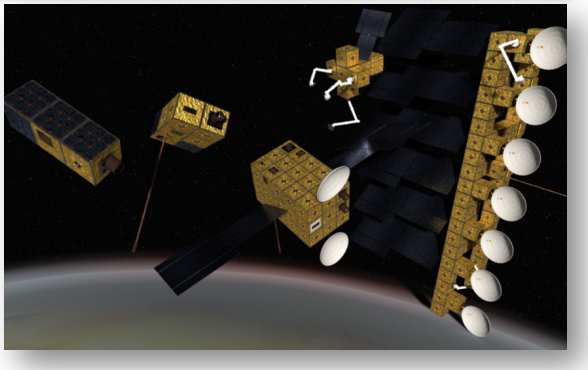

iBOSS GmbH
Verification
(Platform or Satellite)
Servicing
(OOS)
Space Infrastructure + Logistics
Warehousing
Logisitics
Debris Removal
(ADR)
Assembly
(OOA)
Modular Satellites
and
Exploration
Infrastructure

Mission Statement

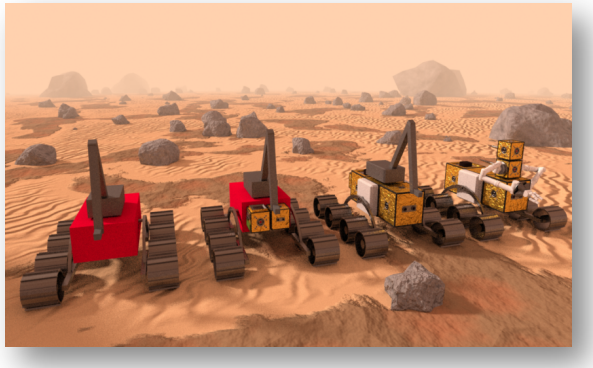
The USB for Space

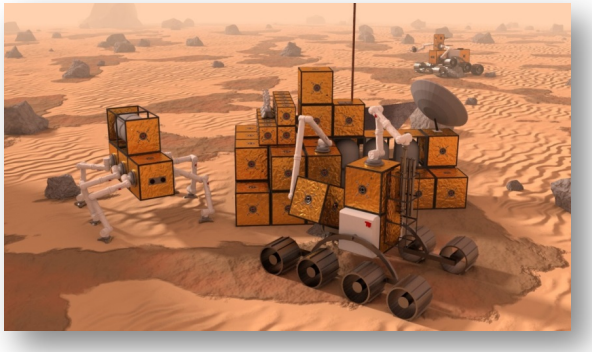
MADE IN GERMANY

Orbital Systems



Planetary Systems

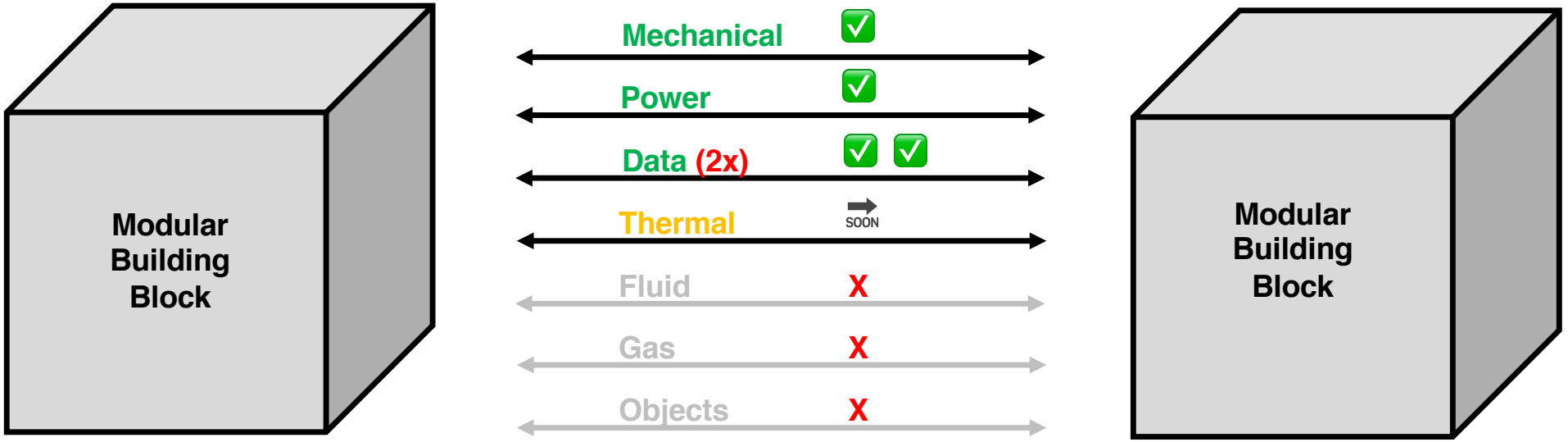


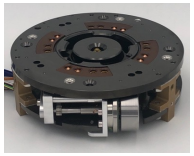


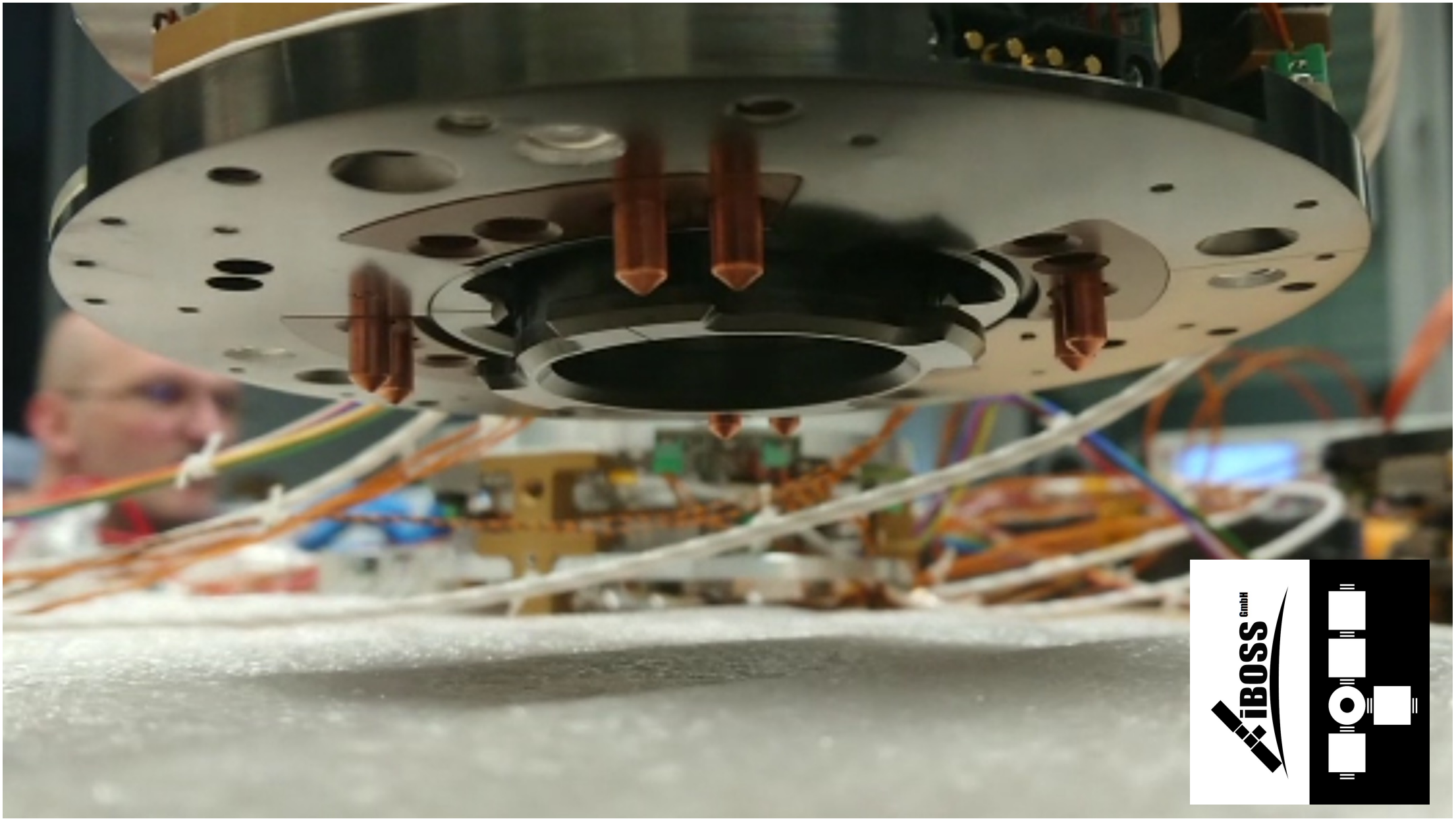
Enabling LEGO in Space

Integration Problem + Connection Challenge

Generic Scope Interfacing + Modular iSSI® Functionalities



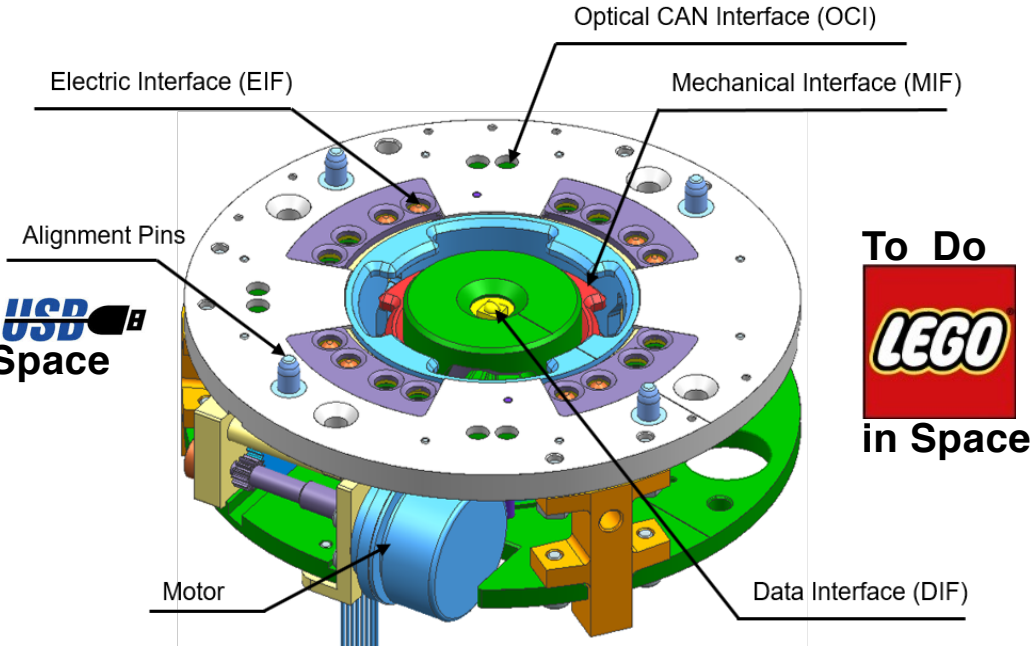



iBOSS
GmbH

The Product ”iSSI®”

Solving the Integration Problem!

- **iSSI®** – intelligent Space System Interface
- Enabling Ultimate Plug-and-Play (OSAM)



The USB for Space

To Do LEGO in Space

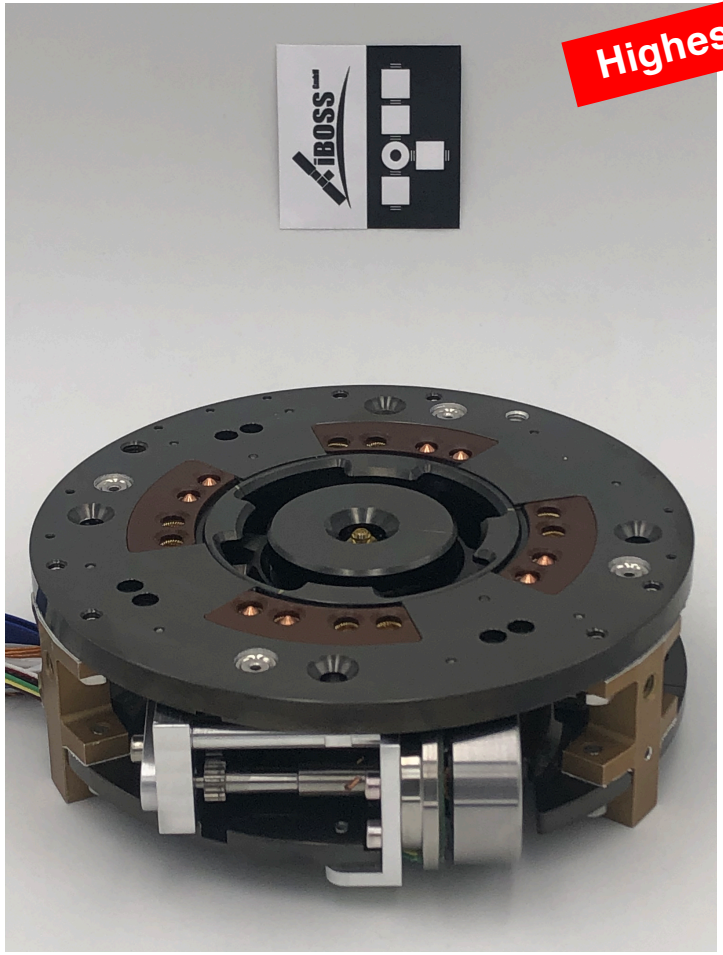
Key Features

- **Multi-Functionality**
  Mechanical - Power - Data - Thermal
- **Full Modularity** of Functionalities
- **Scalability** in Size + per Functionality
- Androgynous Design - No Male-Female
- Fast Coupling with Adjustable Speed
- Fail-Safe System for De-Coupling
- 90°-Degree Rotational Symmetry
- **Flat Surface** - Unrivaled
- **Multi-Mounting Option**
- **Lubricant-Free**
- **Compactness**
- **Lightweight**
- **Patented** - internationally

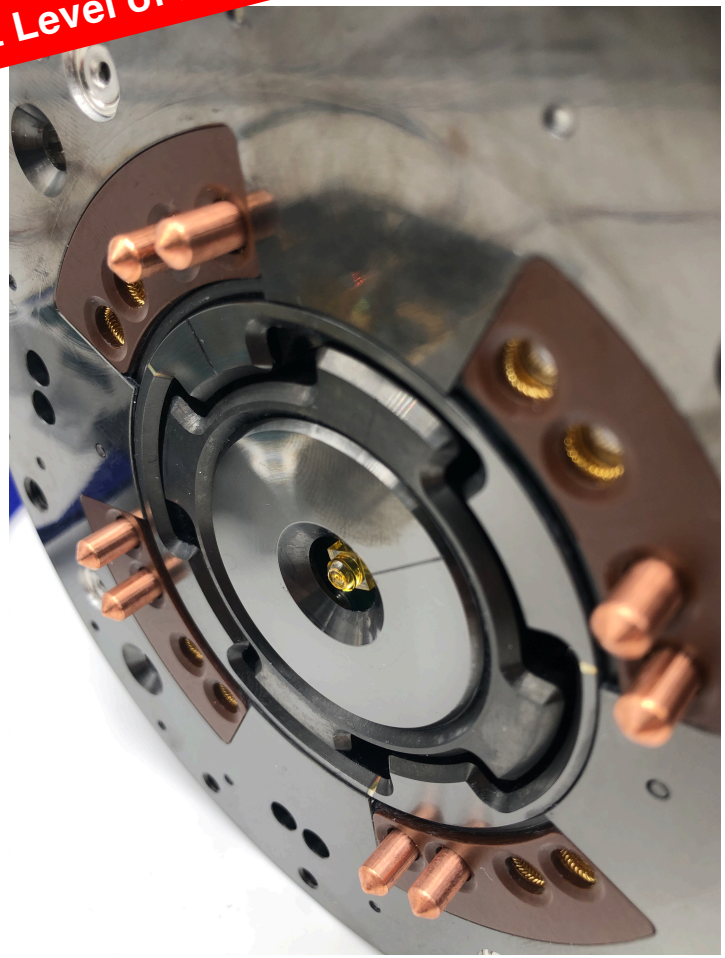
For Building Blocks + Robotics

iSSI® in Brief

- **Multi-Functionality**
  - M+P+D+T
- **Full Modularity**
  - All Functionalities
- **Compactness**
  - Ø138mm (5.4inch)
- **Lightweight**
  - 1kg-Range (2.2lbs)
- **Scalability**
  - Size + Functionalities
- **Speed**
  - Fast Coupling < 10sec

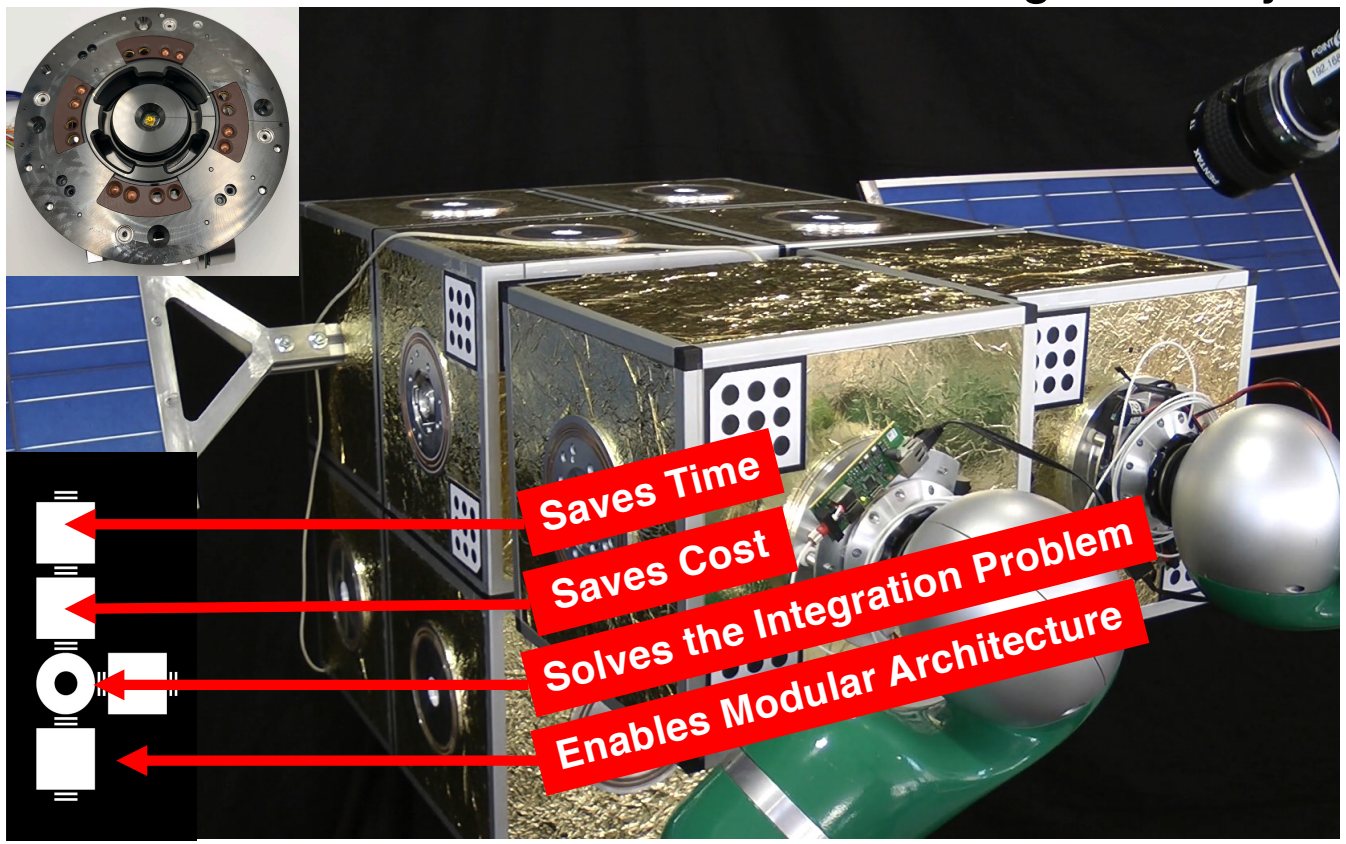


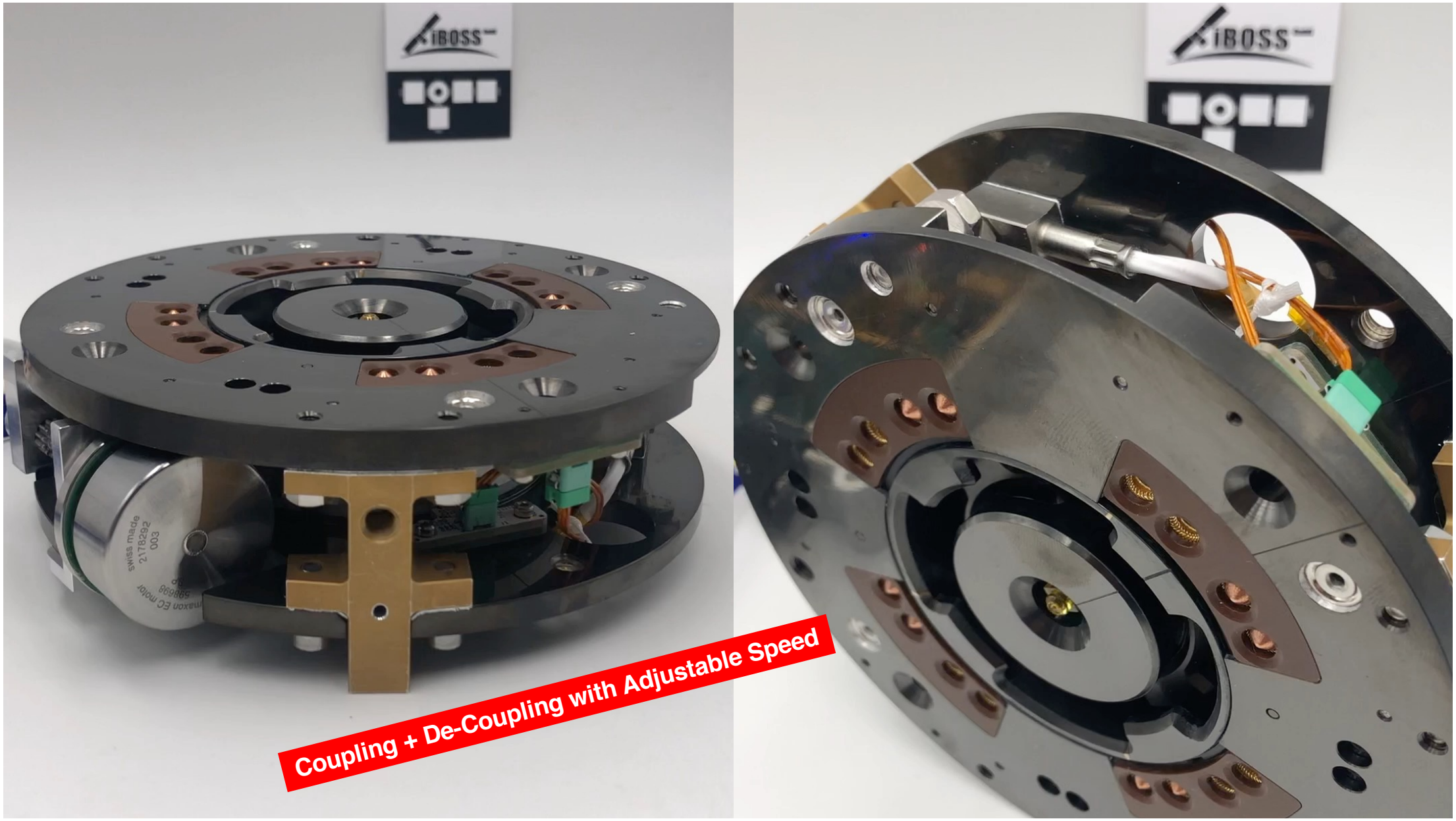
Highest Level of Flexibility



Product Summary

- The **iSSI®** = a Standardized Multi-Functional Interface for Ultimate Plug-and-Play
- Flexibility
- Modularity
- Lightweight
- Compactness
- Top Tech Capabilities
- Manufacturing Process
- Scalability
- Patent
- IOD
- Potential Standard

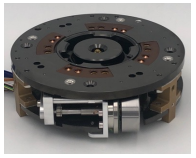


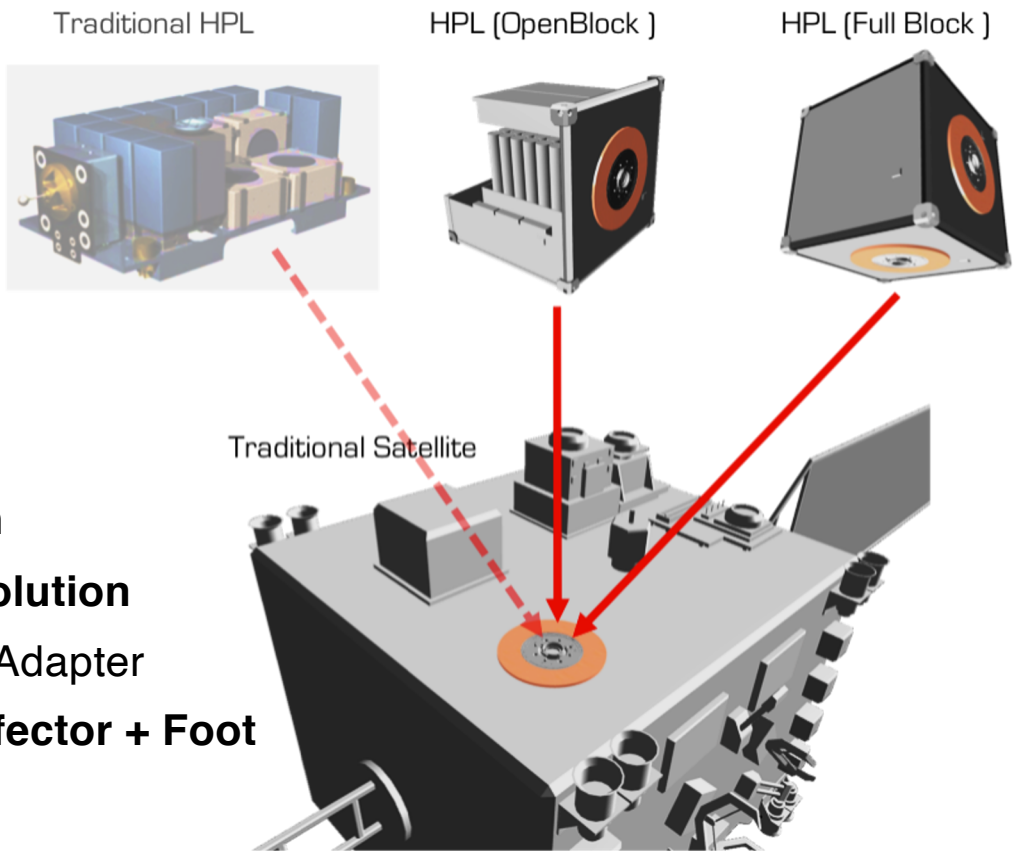

iBOSS
iBOSS
Coupling + De-Coupling with Adjustable Speed

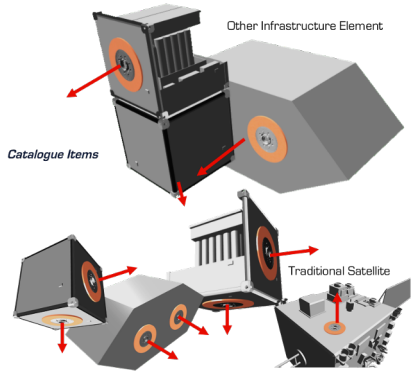
iSSI® - Use Cases

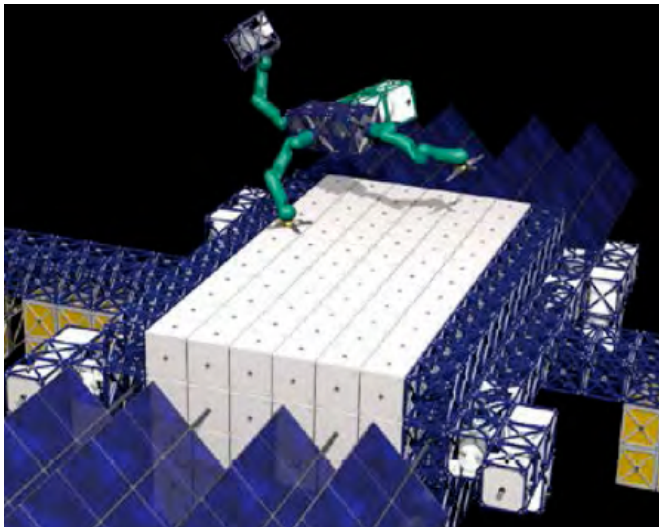
Multi-Purpose (Standard) Connector

- **Coupling**
- De-Coupling
- **Extension**
- **Servicing**
- **Upgrading**
- **Re-Purposing**
- **Configuration**
- Re-Configuration
- **Late Loading Solution**
- Hosted Payload Adapter
- **Robotic-End-Effector + Foot**
- **...**

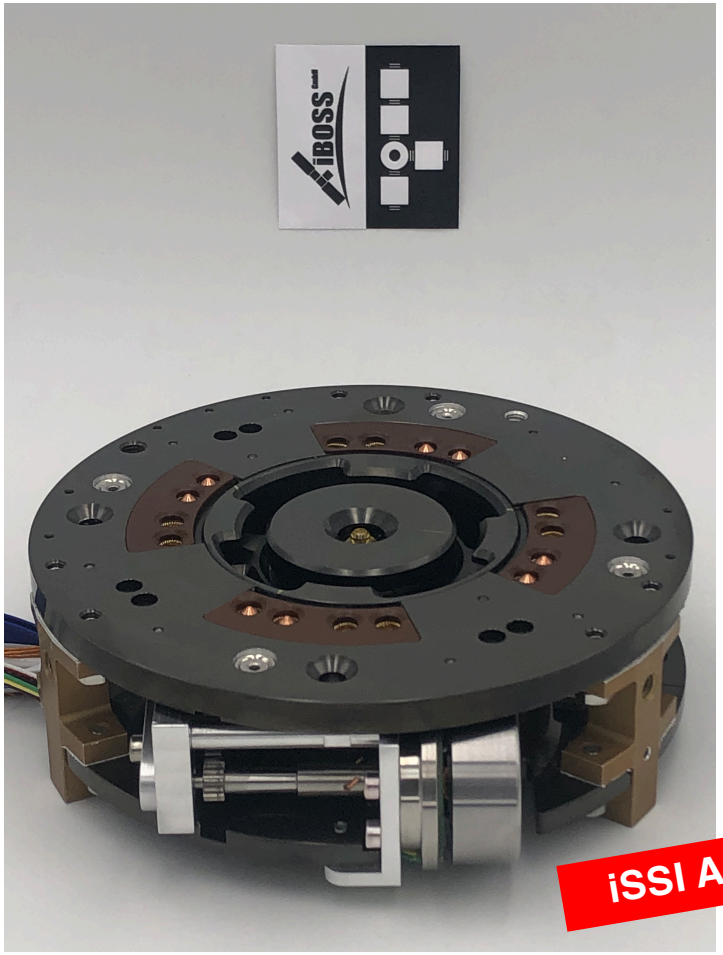


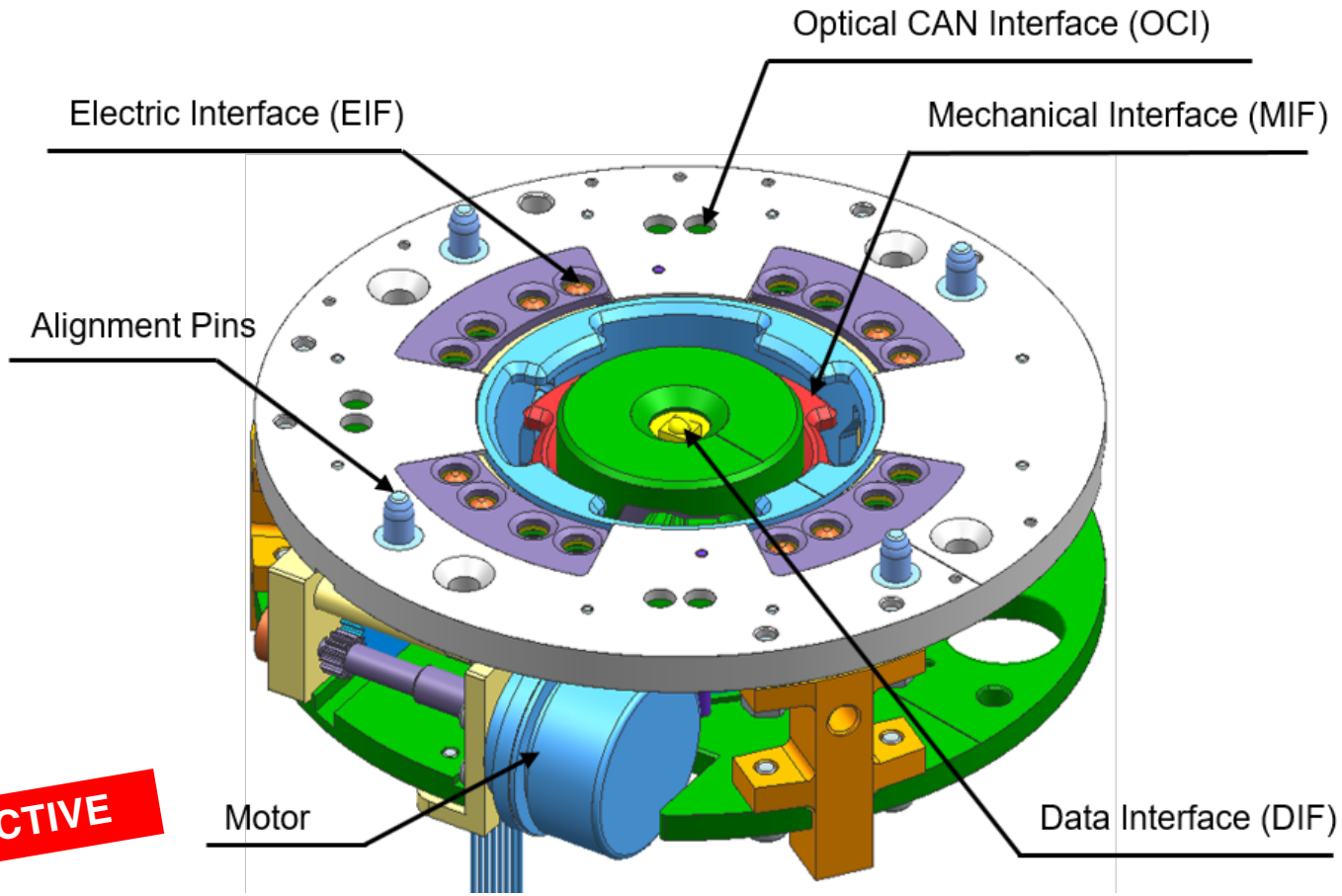






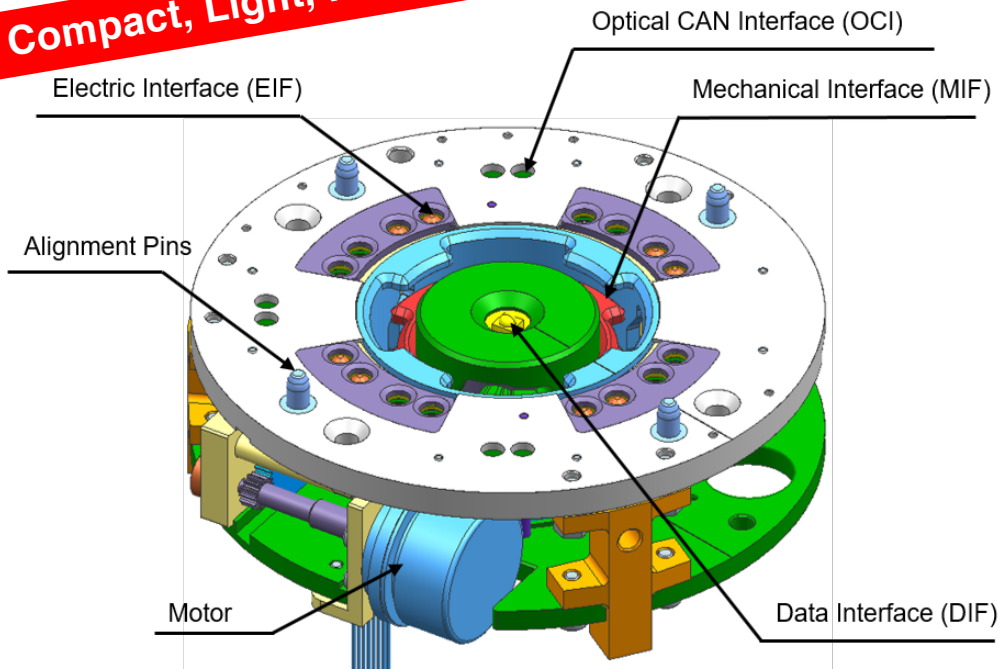
iSSI® - Functionalities (3-in-1 Baseline)

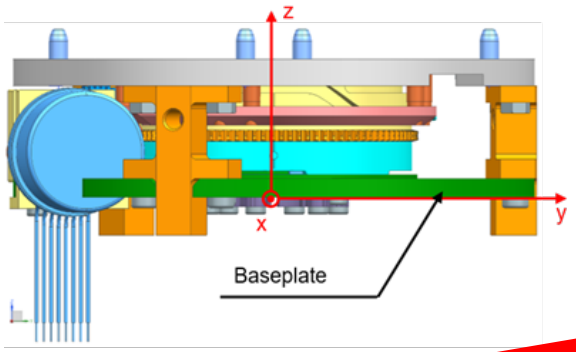




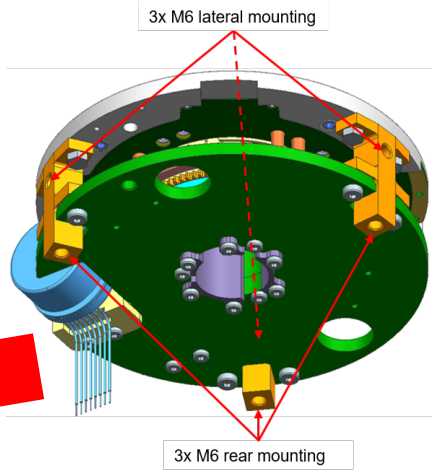
iSSI® - Views (3-in-1 Baseline)

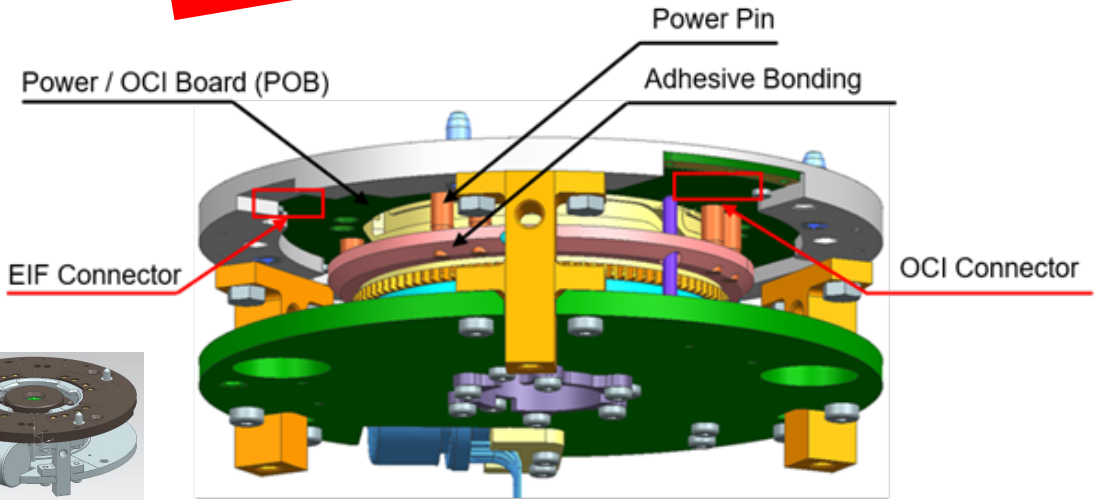
Compact, Light, Fast, Multi-Mounting + Counting ...

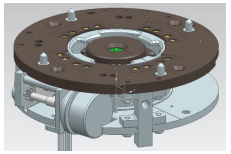




Multi-Mounting Options





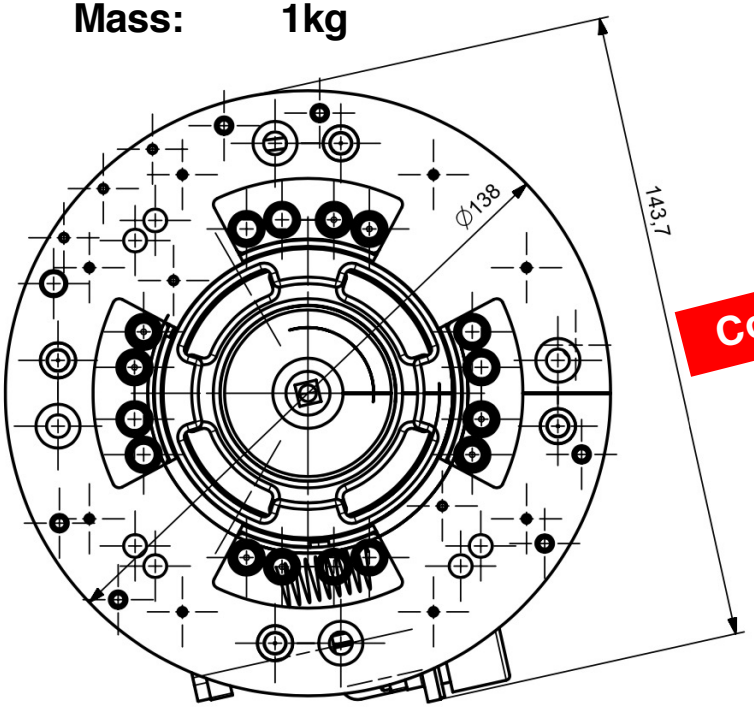


iSSI® - Compactness + Lightweight

Diameter: **138.00mm** (143.70mm)

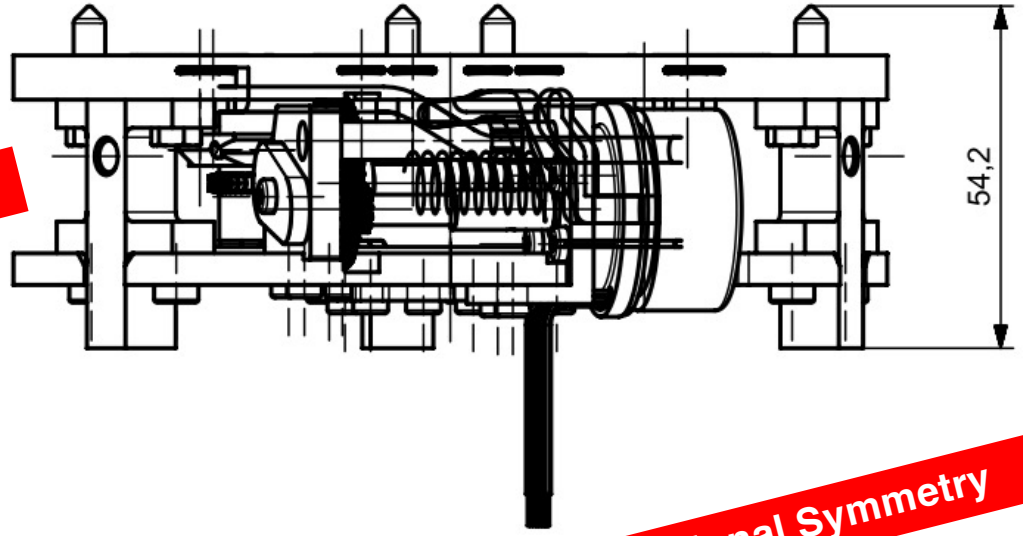
Height: **47.00mm** (54.20mm)

Mass: **1kg**



Androgynous Design

Core Unit

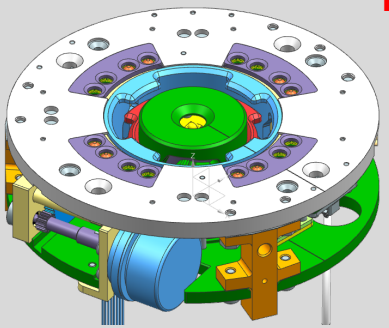


90° Rotational Symmetry

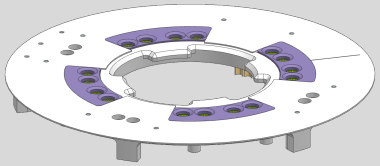
iSSI® - Full Modularity + Add-Ons

Customization Made Easy

Baseline

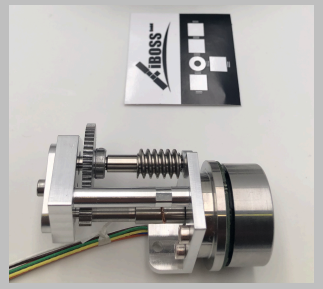


iSSI® (ACTIVE)



iSSI® (PASSIVE)

Baseline Modules

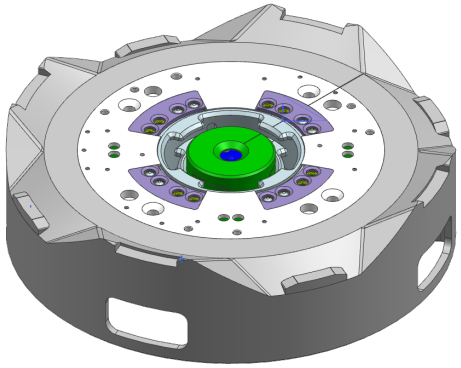


Motor Unit

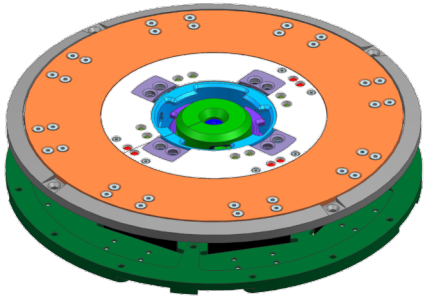
Alignment Pins

Data Interface

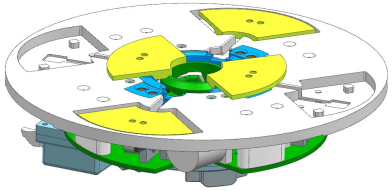
Add-On Modules



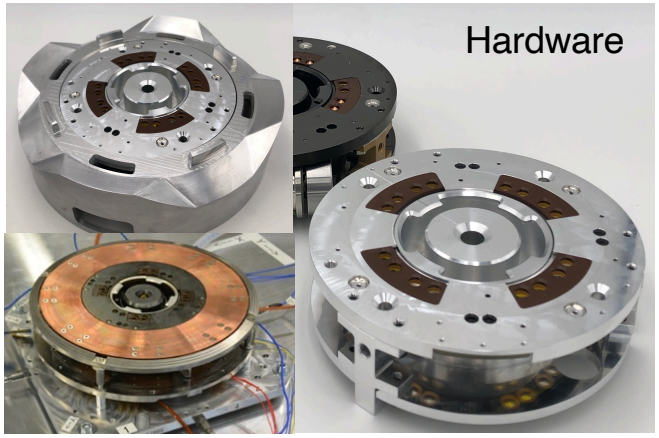
Form Fit



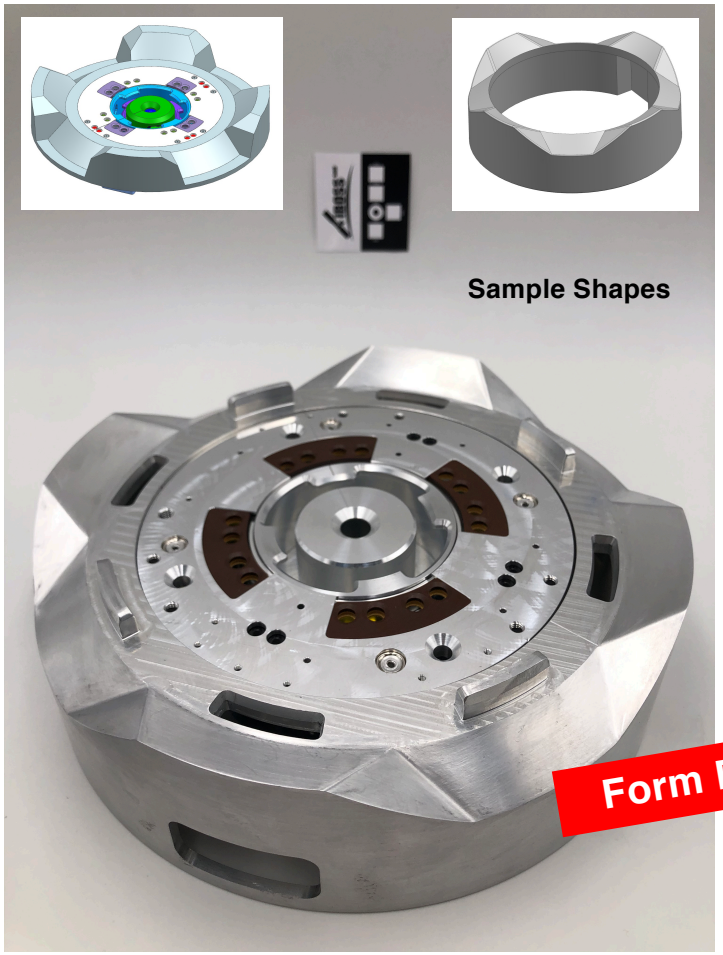
Thermal Interface



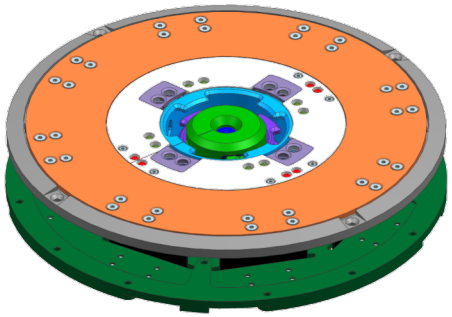
Dust Cover



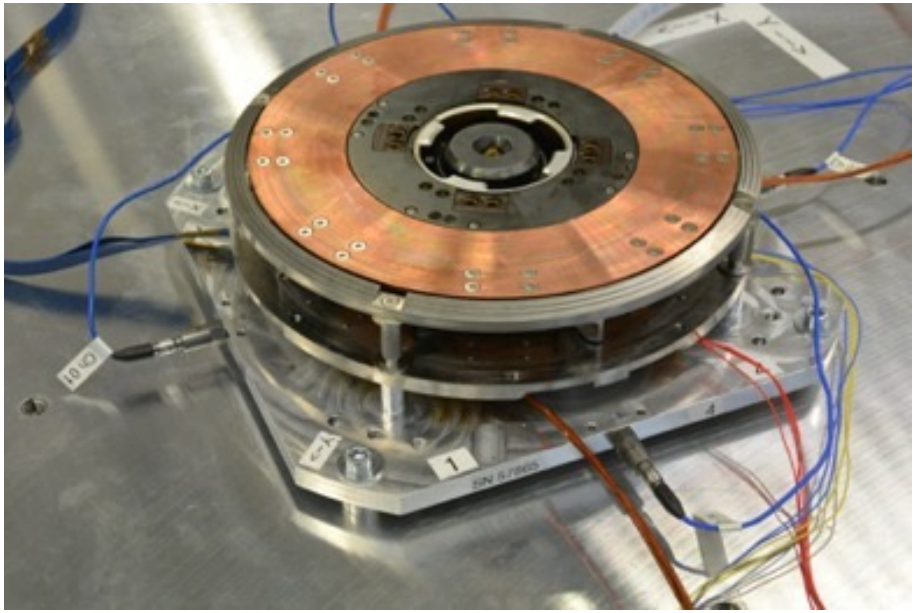
iSSI® - Add-On-Modules

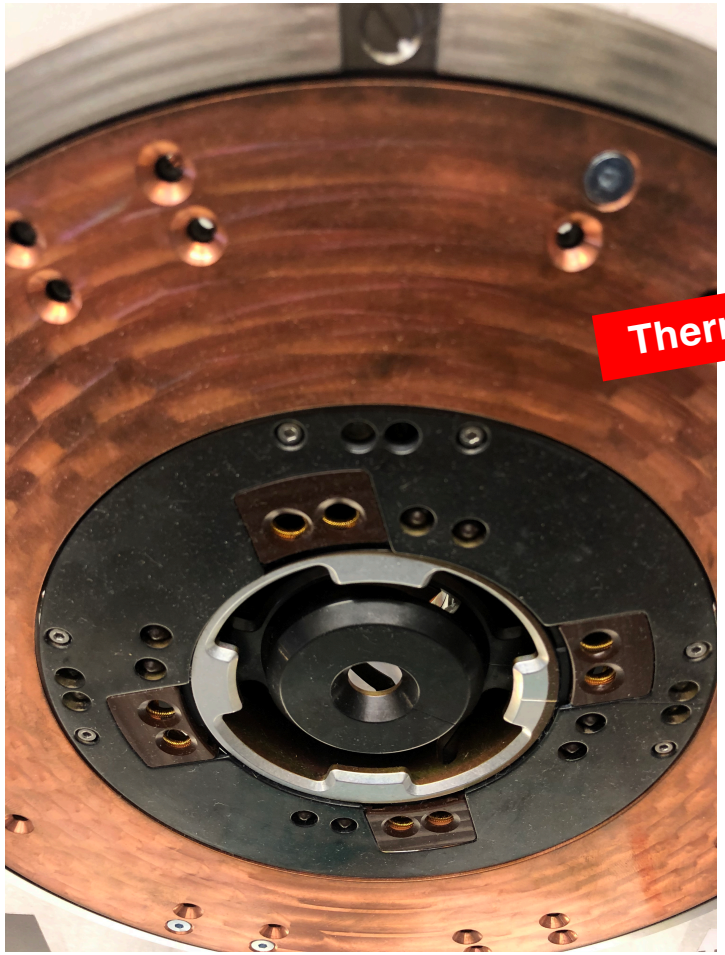


iSSI® - Add-On Modules Cont'd



New Nano-Tube Material

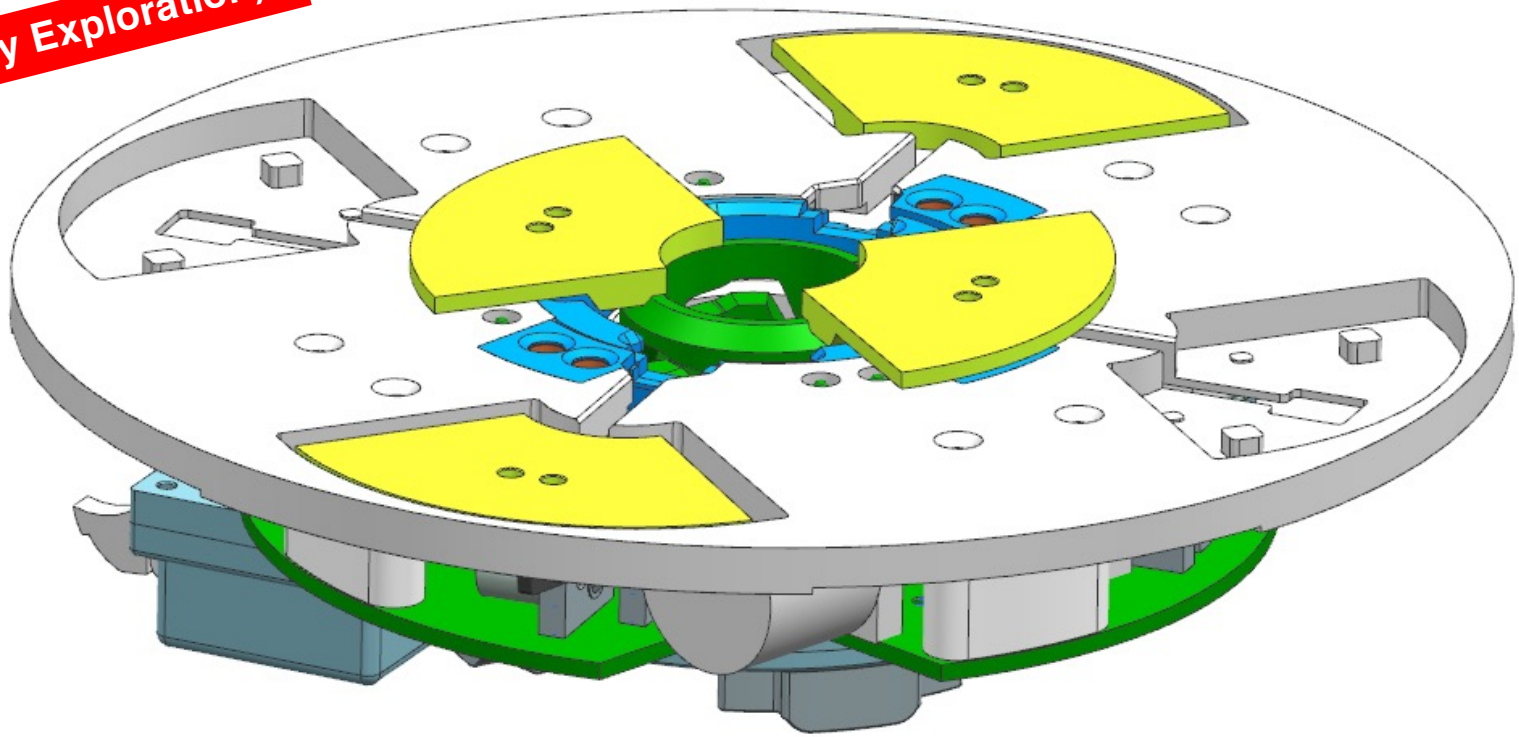




Thermal Interface

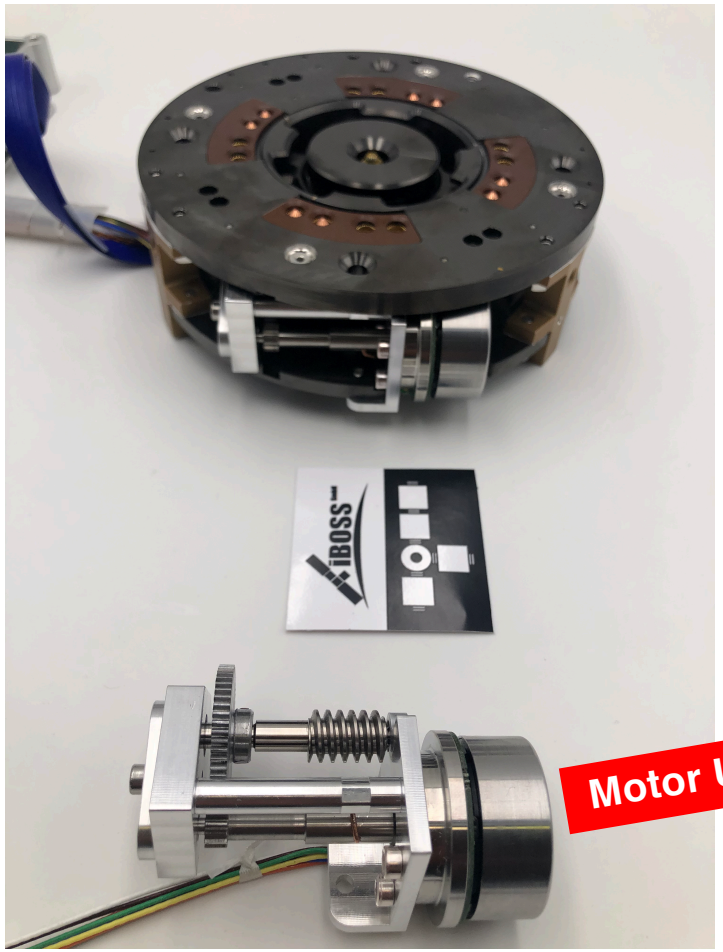
iSSI® - Add-On Module Coming Up Next ...

Dust Cover (4 Planetary Exploration)



Preliminary Design

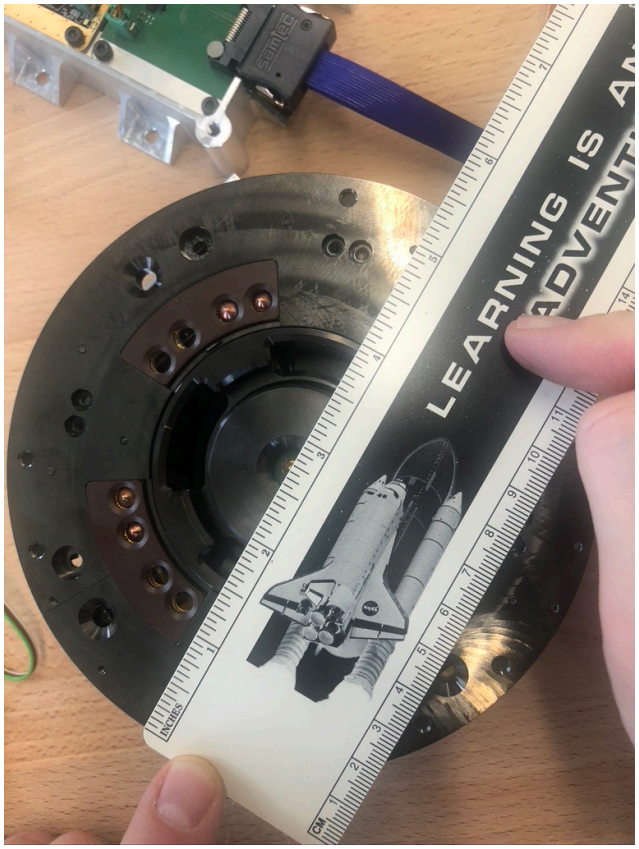
iSSI® - More Modules ...

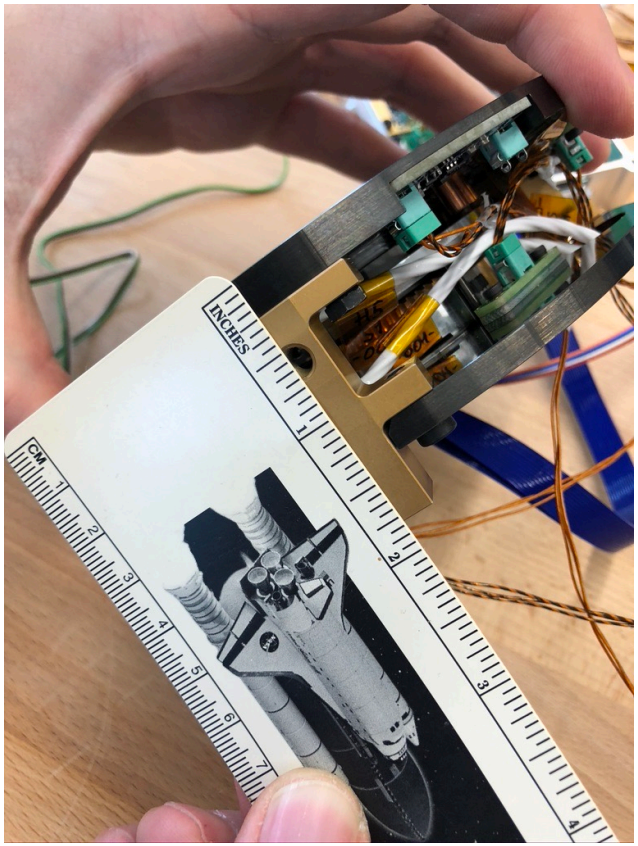


Motor Unit

Optical Data Interface Front End

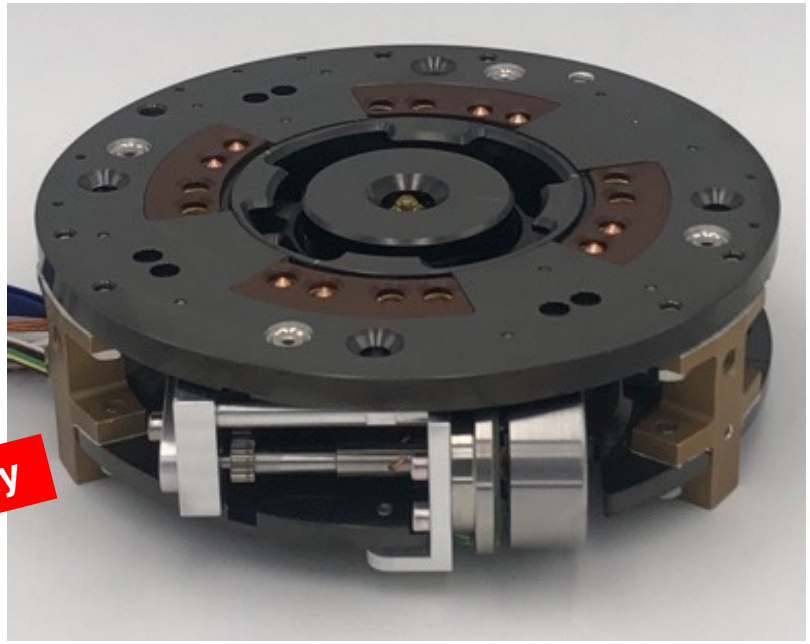
iSSI® - Get an Idea of Its Size





iSSI® - Scope

- **Multi-Functionality**
  - Mechanical: 6,000N Axial, 400N Lateral, 100Nm Bending/Torque + Increase by Modules
  - Power: 5/100 kW/V
  - Data (2x Optical): CAN Bus 0.5Gbit/s, Fast Ethernet 1Gbit/sec-10Gbit/sec (or other Protocols)
  - Thermal: 5W/K
- **Full Modularity**
  - wrt All Functionalities + Motor Unit
- **Compactness**
- **Lightweight**
- **Scalablility**
  - Customization
  - Per Functionality
- **Speed**



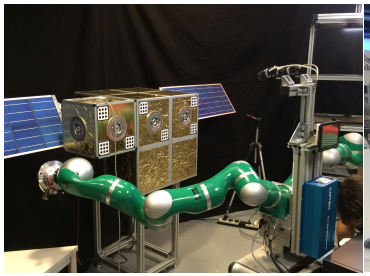
Highest Level of Flexibility

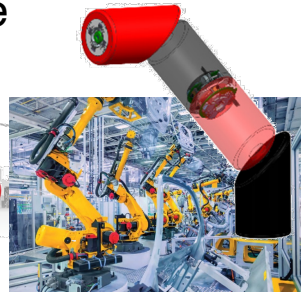
Past Performance of Technology + Company

- **Tech** (TRL 6)
- End-to-End Robotic Demonstration on Ground
- Flight Experiment Ground Testing for IOD (ISS)
- European Standard Interface Benchmarking
- Baselined for the Port by Arkisys + MoonFibre
- Terrestrial Industry Projects in

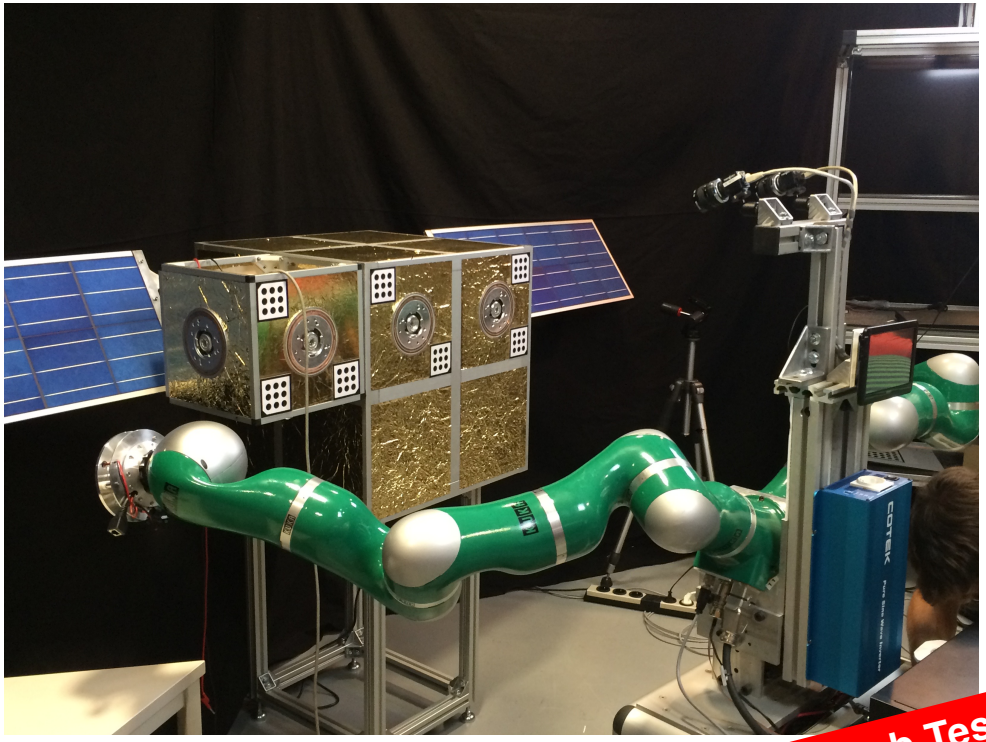
  Robotics, Automotive, Logistics, Inter-Modal Transport, E-Mobility

- **Company** (Established 2017)
- Patent WIPO
- Customers
- Early Revenues
- 100+ Units Produced
- Terrestrial Applications
- International Recognition
- Industry Partnerships + Sustaining Member CONFERS FOSTERING THE SATELLITE SERVICING INDUSTRY
- Manufacturing Process in Place





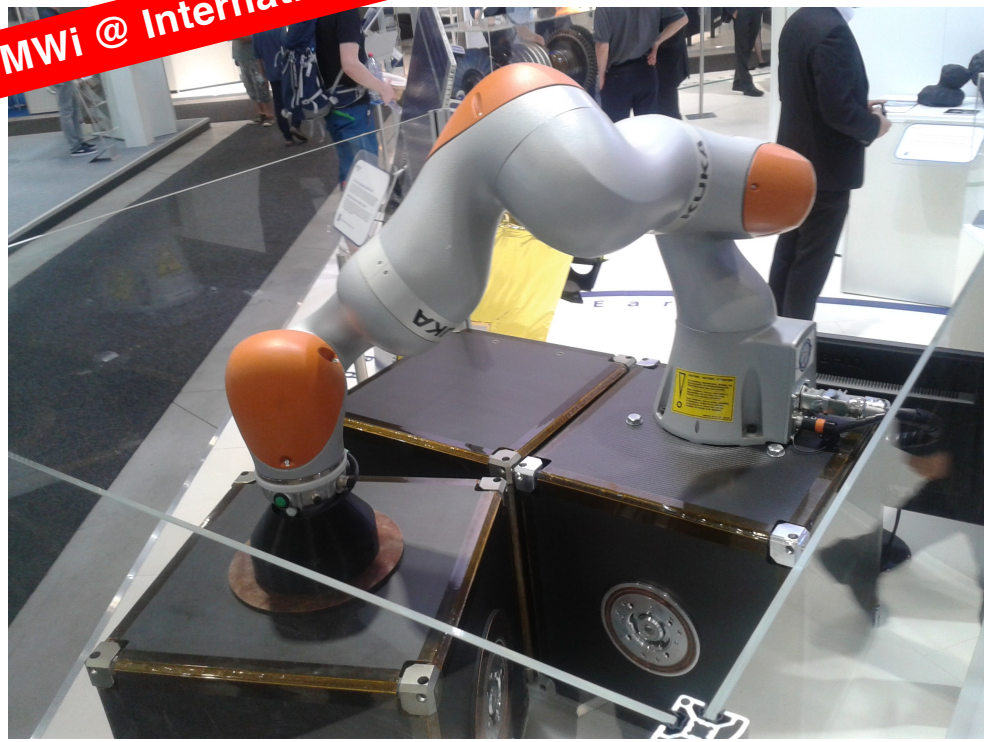
iBOSS Heritage - Robotic Concept Demonstration (2015)



End-to-End Lab Tests + Verification

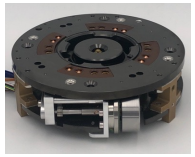
iBOSS - Full Robotic Servicing - ILA Berlin Air Show (2016)

+ Showcased by BMWi @ International Level



Click Here to Watch the Video

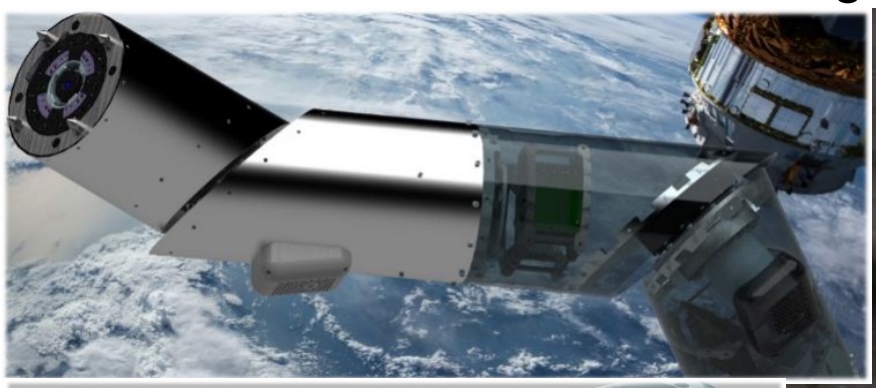
https://youtu.be/87Wv3xgJAQM

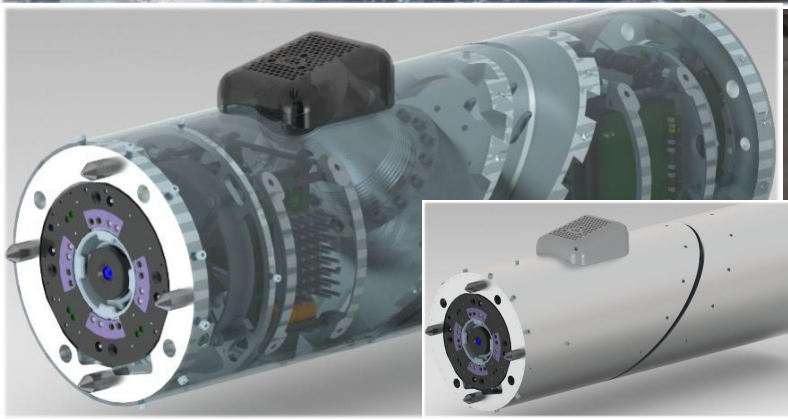


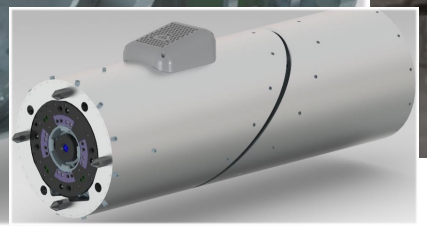

iBOSS
HEGGEMANN
360°
from Engineering
to Production
iBOSS GmbH
Industry 4.0 Series Manufacturing Process

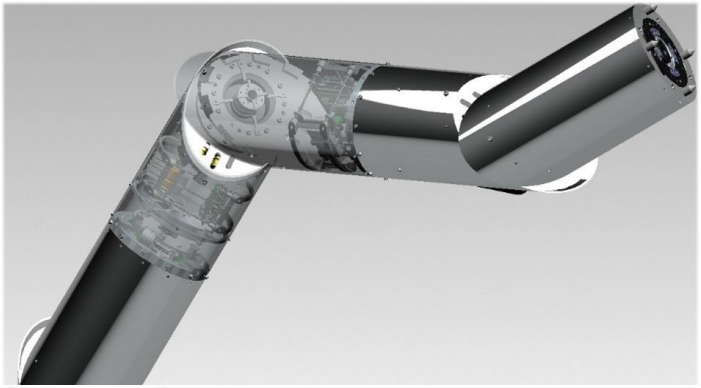
iSSI®-Enabled Modular Robotic Arm Architecture (HOMER)

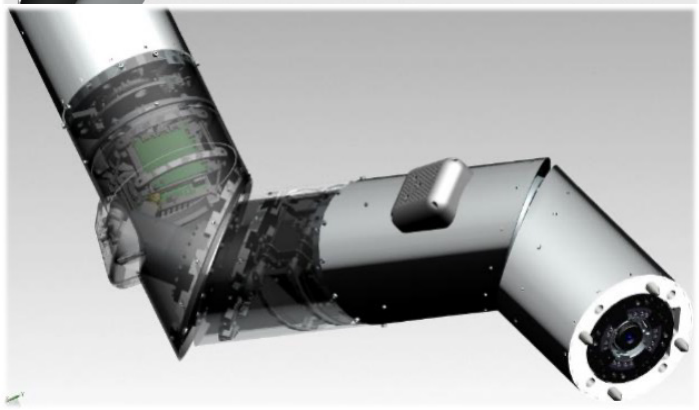
- Highly-Redundant Modular Robotic Systems for Flexible Use in Space and Automotive Manufacturing **(HOMER)**





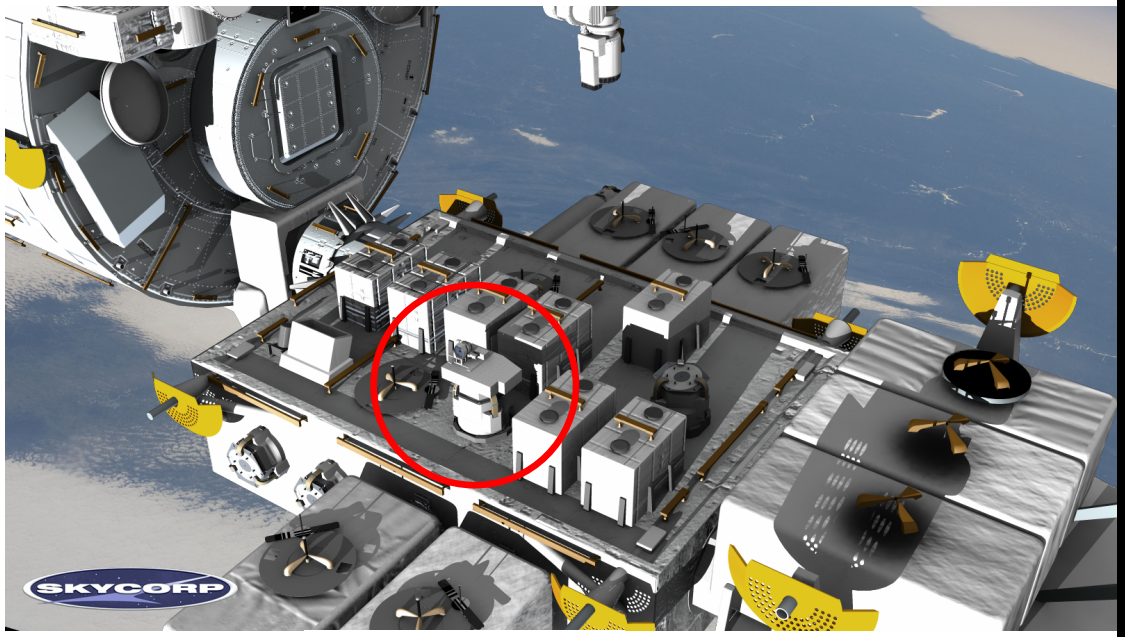


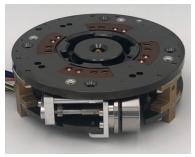


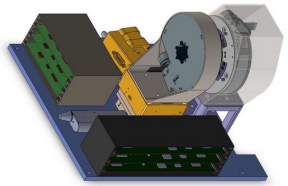


INNOspace Technische Universität Braunschweig Institut für Raumfahrtsysteme | Institute of Structural Mechanics and Lightweight Design | RWTH AACHEN UNIVERSITY

iSSI® - Flight Qualification Experiment (iSSI FQE - 2021)



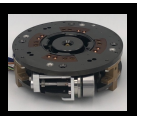




Experiment Apparatus

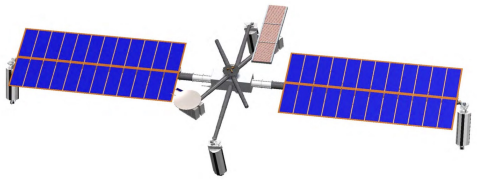
OSAM Partner Projects + Counting

Pioneering Stuff



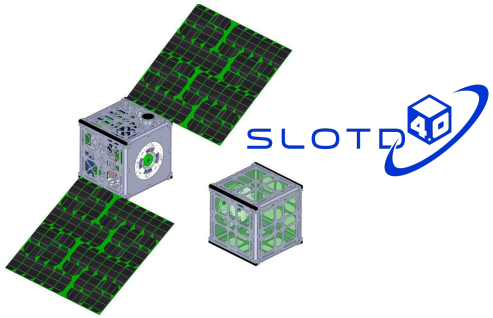
iBOSS GmbH

Orbital Logistics Vehicle (OLV)



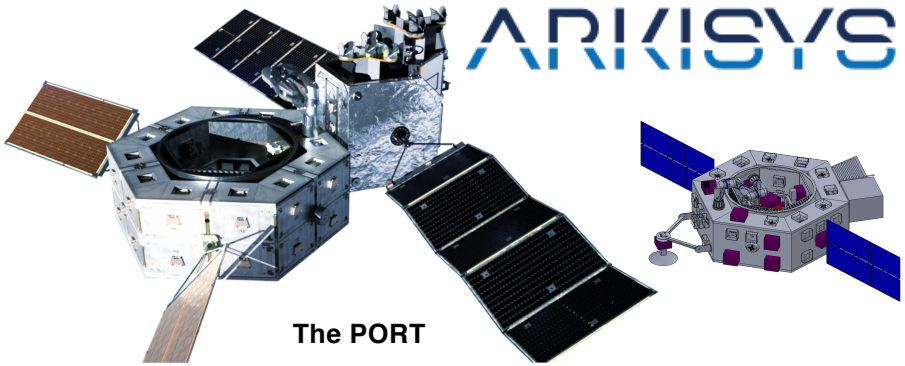
SKYCORP

Standard Payload Module



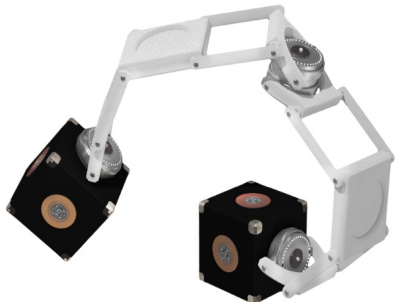
SLOTD

ARKISYS



The PORT

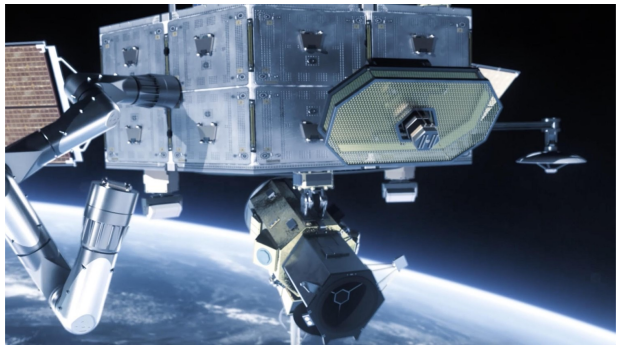
ReConBot



FZI

AIRBUS DEFENCE & SPACE

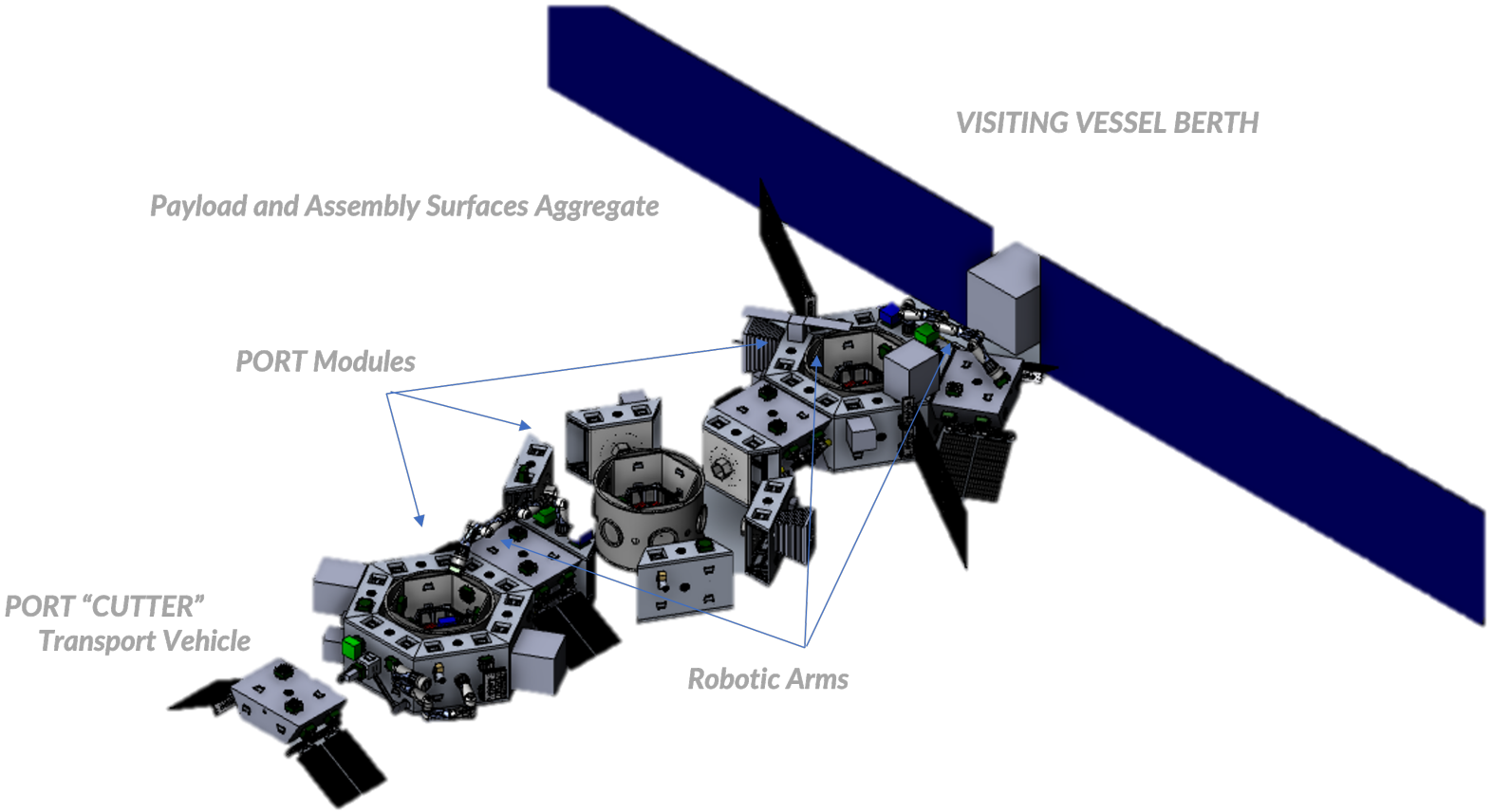
MANTOS



Click Here to Watch the Video

https://vimeo.com/478216598

The Port by Arkisys - A Project with iSSI® Inside



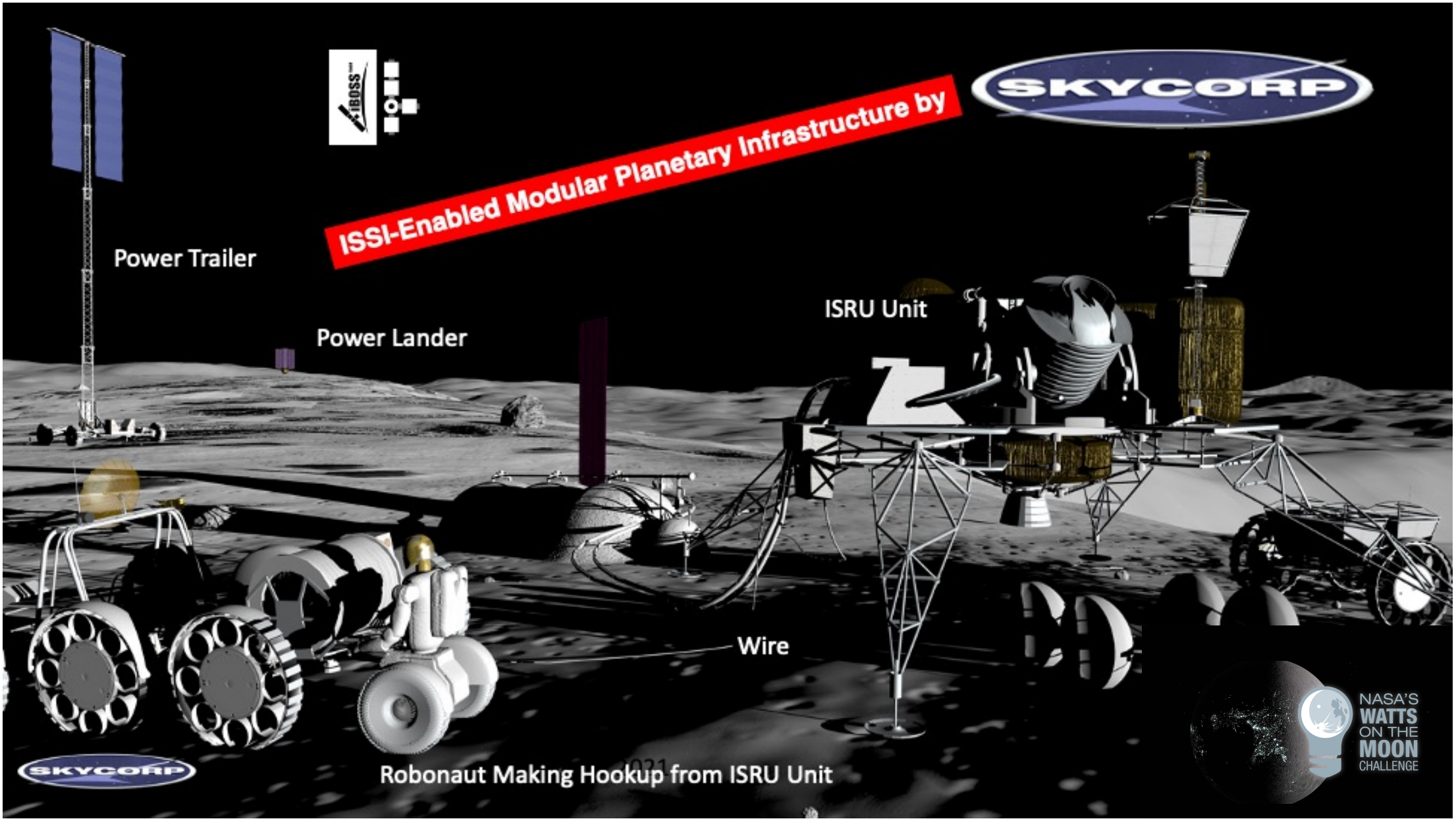
Interfaces

iSSI® by

UDA by NovaWurks

ARKISYS

https://www.youtube.com/watch?v=_-N1YDMsbx0

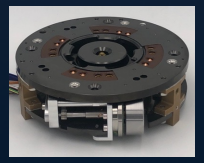

ISSI-Enabled Modular Planetary Infrastructure by
SKYCORP
Power Trailer
Power Lander
ISRU Unit
Wire
Robonaut Making Hookup from ISRU Unit
SKYCORP
NASA'S WATTS ON THE MOON CHALLENGE

iBOSS GmbH - Wanted Card

- **The Company**
  - Comercialization of Products + Services Based on iBOSS Technologies
    - Standards for Next-Gen Space Systems
    - Member of CONFERS www.satelliteconfers.org
  - Global Business Development + Partnerships
  - IP-Pooling, Management + Licensing
  - Technology Transfer in Growth Markets on Earth
  - A German NewSpace Company
- **Website**
  - www.iboss.space
- **Address**
  - iBOSS GmbH, Dennewartstrasse 25-27, 52072 Aachen, Germany
- **Contact** (General: info@iboss.space)
  - Thomas A. Schervan thomas@iboss.space CEO + Co-Founder (Tech + Admin)
  - Joerg Kreisel joerg@iboss.space Chairman + Co-Founder (BizDev + Strategy + Partnerships)
  - Kai-Uwe Schroeder kai-uwe@iboss.space VP Institutional Affairs + Co-Founder (Tech + Gov)

Thank You!

Supporting Slides



iBOSS GmbH

iBOSS - Tech Project Heritage to Commmercial Exploitation

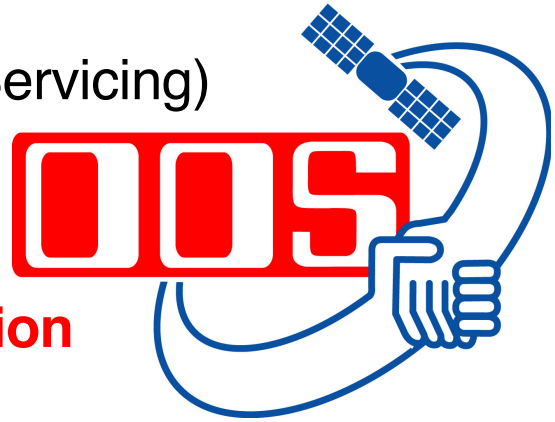
- German Aerospace Center DLR - Space Administration
  - Collaborative R&D Program iBOSS (2010-2018)

Supported by Federal Ministry of Economics and Technology
This project receives funding from the Federal Ministry for Economic affairs and energy under grant agreement no.:
Grant No. 50 RA 1501
Grant No. 50 RA 1502
Grant No. 50 RA 1503
Grant No. 50 RA 1504
Grant No. 50 RA 1505

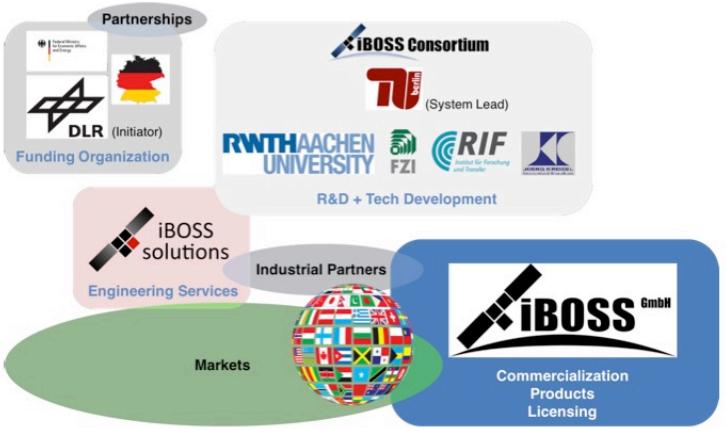
- **iBOSS**
  - Intelligent Building Blocks for On-Orbit Satellite Servicing + Assembly

Project

- OOS (On-Orbit Servicing)



- **Commercialization**



Company

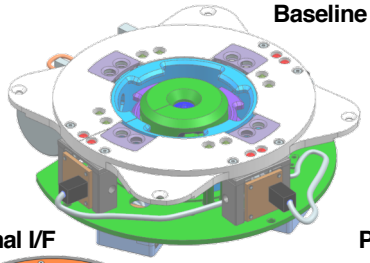
iBOSS Building Set Philosophy

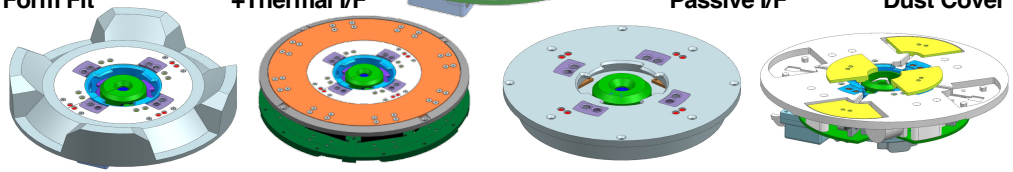
iBOSS Project

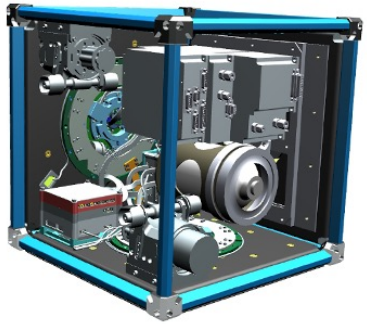
iBOSS Concept Elements

Modularity + Scalability

Enabling Ultimate Plug-and-Play







iSSI®

intelligent Space System Interface

iBLOCK

Intelligent Functional Building Blocks

iSSI® - Initial Requirements + Evolution Since 2010

- Design to Robotic Manipulation
- 20-Year Lifetime in GEO
- Multi-Functionality
- Maximum Flexibility
- Multi-Redundancy
- Compactness
- Robustness
- Lightweight
- Scalability
- Easy Integration
- Standardization
- Series Production
- Cost Efficiency