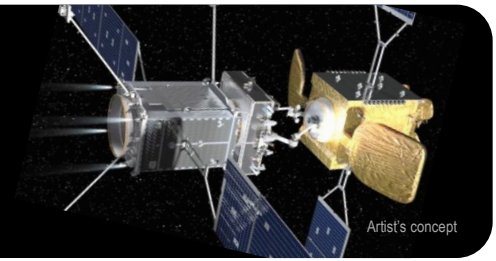


Robotic Servicing of Geosynchronous Satellites

INTERFACE FACT SHEET



Tool Changer & Receptacle (TCR)

Overview

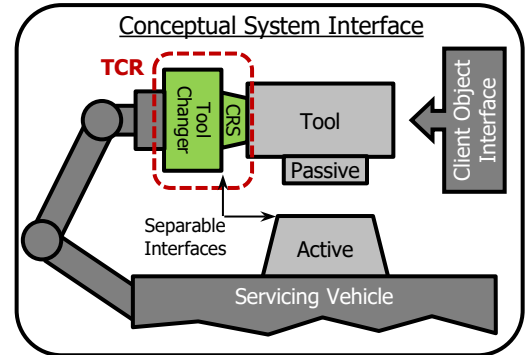
- The Tool Changer (TC) and Common Receptacle Subassembly (CRS) provide an electrical & mechanical interface for on-orbit attachment of tools and other separable items to the robotic arm.
- Interchangeable tools enable the RSGS robotic arm subsystem to perform a wide variety of servicing tasks.
- Provides a standardized robotic interface
 - Electrical power and data connections through the robotic arm
 - Torque delivery through the robotic arm tool drive (optional)
- Development Status: Tested and delivered

Tool Changer (TC)

- Mates to the robotic arm, serving as the active side of the interface
- Locking ball mechanism constrains axial movement of the CRS, providing a high-stiffness structural connection.
 - V-guides provide coarse rotational alignment during mating.
- 32 lines provide connectivity across the interface, capable of transferring up to 54W.
 - Connectors are arranged in 3 zones, for isolation of power, digital & analog signals.
- Axially-compliant socket transfers torque from the torque drive motor in the arm to the drive head in the CRS.

Common Receptacle Subassembly (CRS)

- Mates to the tool or separable item, serves as the passive side of the interface
- Provides structural and alignment features and electrical interface points
- Includes a pass-thru for the tool drive shaft, which is provided with an extended length to allow customization by the tool provider



SYSTEM FEATURES:

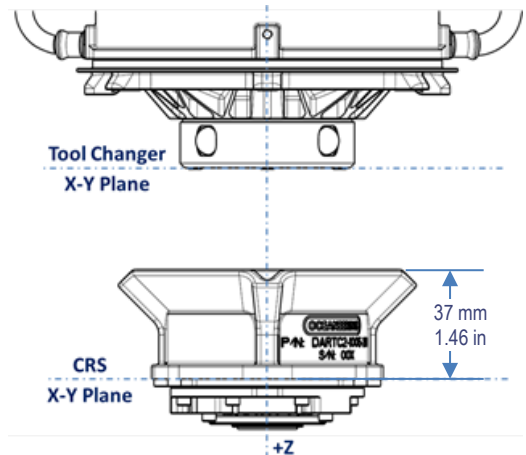
- Active (spacecraft side) and passive (tool side) components
- Independent mechanical, electrical, and tool drive mating, with telemetry feedback
- Mechanical alignment features provide misalignment tolerance
- Centerline tool drive
- Fault protection
- Designed for GEO radiation and low electromagnetic interference

Product Specifications

		U.S.	SI
Mechanical			
CRS Outer Diameter (mounting tab)		Ø3.64 in	Ø92.46 mm
CRS Mass (with plug)		1.00 lb	0.454 kg
Torque delivered through Tool Drive		17.7 ft-lb (±25%)	24 Nm (±25%)
Maximum Tool Drive Speed		100 RPM	
Misalignment Tolerances			
Capture Envelope	Radial	<0.45 in	<11.4 mm
	Angular	<7.0 deg	
	Rotational	<3.5 deg	
	Pin Engagement	<1.25 deg	
Locking Envelope	Radial	<0.02 in	<0.5 mm
	Angular	<4.0 deg	
	Rotational	<3.5 deg	
	Axial	<0.10 in	<2.5 mm
Thermal Tolerances			
TC Temp. Range		-13°F to 181°F	-25°C to 83°C
CRS Temp. Range		-76°F to 185°F	-60°C to 85°C

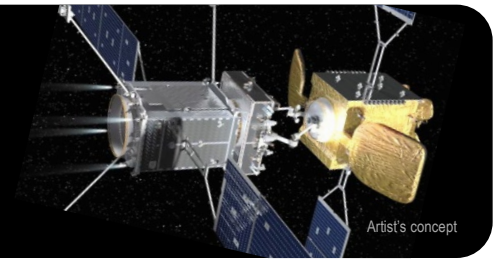
Information provided is current as of April 2021.

Interested parties should contact the manufacturer for up-to-date information.



Robotic Servicing of Geosynchronous Satellites

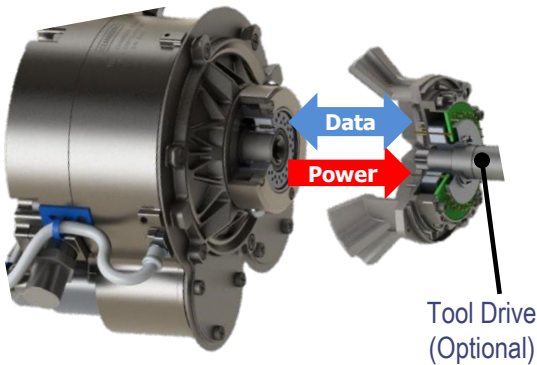
INTERFACE FACT SHEET



Tool Changer & Receptacle (TCR)

Tool Changer
(attached to robot arm)

CRS
(attached to tool)

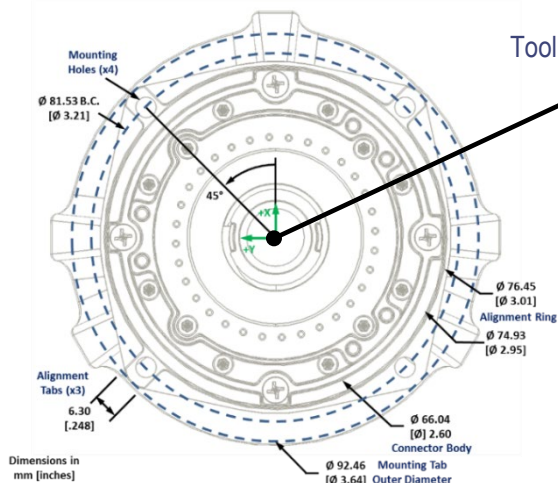


MANUFACTURER:

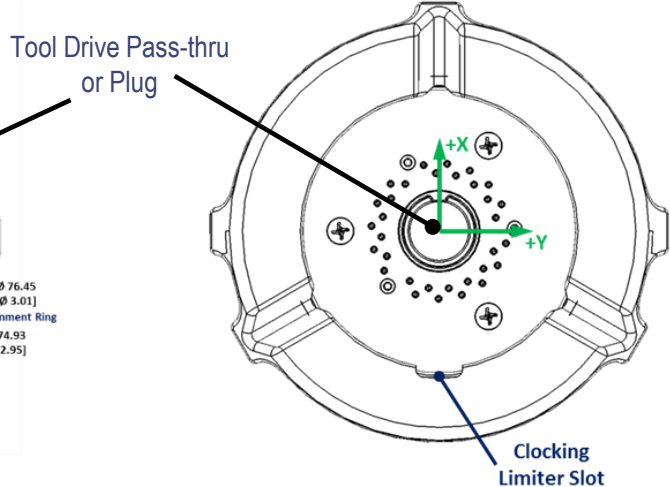
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CRS Bottom
(attached to a tool or separable item)



CRS Top
(mates to Tool Changer)

Product Specifications		
Maximum Interface Loads	CRS to Tool	
	U.S.	SI
X	± 7.5 lb	± 33.4 N
Y	± 10.7 lb	± 47.6 N
Z	± 20.1 lb	± 89.4 N
Mx	± 1225 in-lb	± 138.4 Nm
My	± 972 in-lb	± 109.8 Nm
Mz	± 651 in-lb	± 73.5 Nm

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This interface was developed with funding from the Defense Advanced Research Projects Agency (DARPA)
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