



National Aeronautics and
Space Administration



TECHNOLOGY SOLUTION

Robotics, Automation and Control

Robot-Driven Blind Mate Interface

A mechanism capable of simultaneously making electrical, fluid, and structural connections in a single motion

Many robot operations require connecting modules, tools, or other types of hardware to accomplish assembly or servicing tasks. When working in harsh environments, robots must be enabled to make these kinds of connections without human intervention. These robotic operations must be capable of surviving all kinds of harsh environments, from outer space to the deep sea. Additionally, robot operations must be suitable for many different structures and assemblies. As a result, there is a need for a reliable robot-friendly mechanism that allows structural, electrical, and fluid connections to be made. The Robot-Driven Blind Mate Interface is capable of providing connection mechanisms for a variety of couplings and can operate in harsh environments as well.

BENEFITS

- Enables use for a variety of coupling types
- Operable in harsh environments



THE TECHNOLOGY

The Robot-Driven Blind Mate Interface is a specialized interface utilizing a robot-driven, blind mate mechanism that allows structural, electrical, and fluid connections to be reliably made in a single motion. The interface is composed of a removable side and a fixed side. The removable side consists of the robot grasp point, a drive bolt, one side of a blind mate fluid, electrical couplings, and one side of the interface alignment features. The fixed side consists of corresponding alignment features and the mechanisms carriage. The carriage houses the corresponding fluid and electrical couplings and over-travel protection for the couplings. The robot system used dictates the specific type of robot grasp point, any required targets, and mechanism status indicators.

The mate and de-mate forces of the interface are balanced throughout the mechanism so it can be actuated with one motion, such as turning a single drive bolt. The point at which the different connectors seat is carefully controlled the spring forces distributed throughout the mechanism. For example, the electrical connectors can make contact before the fluid couplings, if desirable, to accommodate the long length of high voltage and current pins. The springs that compress to provide over-travel protection on the electrical connectors allow for preload to be developed between the removable side and fixed side of the interface to create a sound structural connection while not over-stressing the connectors. Overtravel protection can be applied to fluid couplings as needed depending on the specific coupling used. The interface is versatile and can be tailored to a wide range of fluid and electrical couplings.

APPLICATIONS

The technology has several potential applications:

- Space robotic repairs
- Deep sea robotic repairs
- Hydraulic machinery

PUBLICATIONS

Patent No: 10958014

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