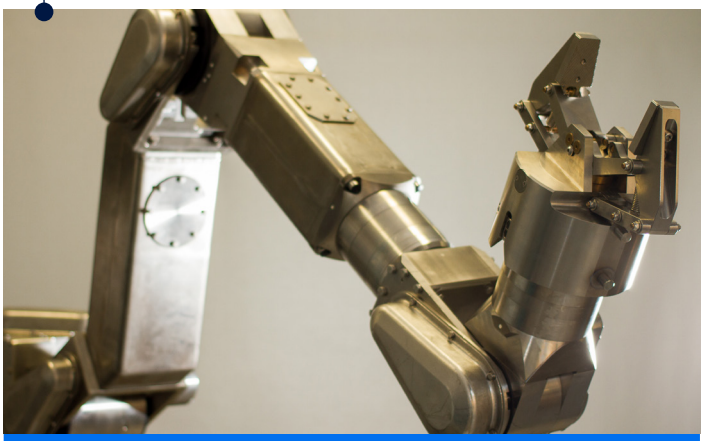
TECHNIP ENERGIES

# Maestro Arm

## Robotics manipulation arm for hostile environments



## Description

Maestro is a robotics manipulation system designed to perform complex dexterous operations in unstaffed areas and harsh environments. It can be either teleoperated by an operator for remote interventions or automatic for fully unmanned operations.

## Cartesian mode & force feedback

- The Maestro system is suitable for hostile environments such as hot cells (Nuclear Industry), deep waters (Offshore Industry) for dismantling, cleaning, carrying out maintenance and inspection or repair interventions.
- The Maestro is a dexterous arm with force feedback operating autonomously or in teleoperation.
- The cartesian mode allows easy, intuitive and safe operations in complex environments.

## Value for clients

**Remote, safe and live operations**
Maestro provides advanced operability capabilities to intervene safely in various areas (including confined space). It is also valuable for executing distant and real time operations, or, to automatically execute tasks when coupled to digital solutions such as a digital twin.

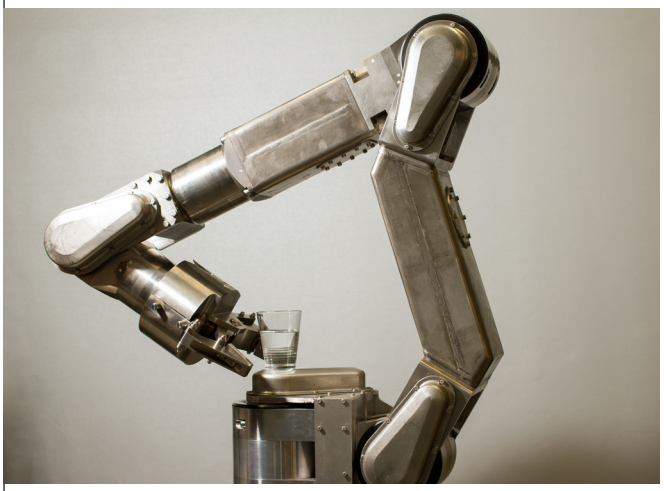
**Production increase**
Maestro is designed to perform complex manipulations normally handled by humans on a repeatable mode.

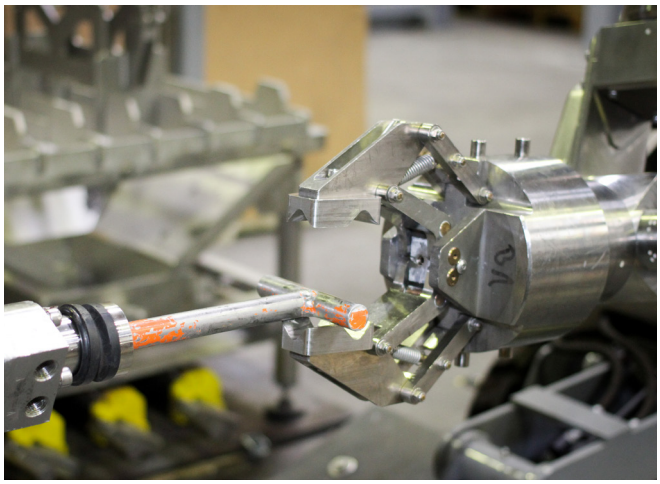
**OPEX Reduction**
Reduces costs, time and manhours for intervention during operations while reducing the risk of damaging equipment.

**HSE & Risks**
The arm has capabilities above human capabilities in term of load and dexterity making it the best option to replace human in hazardous areas. In addition, when piloting remotely, the ergonomic of the piloting station was designed to be comfortable for the pilot and reducing the physical effort of the pilot.

## Missions

- Dexterous Handling Interventions
- Dismantling
- Cleaning
- Maintenance
- Inspection
- Post accident interventions





## Main Characteristics

**The Maestro system is composed of:**

- 6-axis hydraulic slave arm with Force Feed Back (FFB)
- Slave arm hardness radiation > 104 Gy
- Master arm
- Control command (TAO 2000)
- CyxPro® in-house developed supervision software
- Modular components / tools
- Adaptable on various carriers (bridge,trolley, ...)

**Focus on the Slave Arm:**

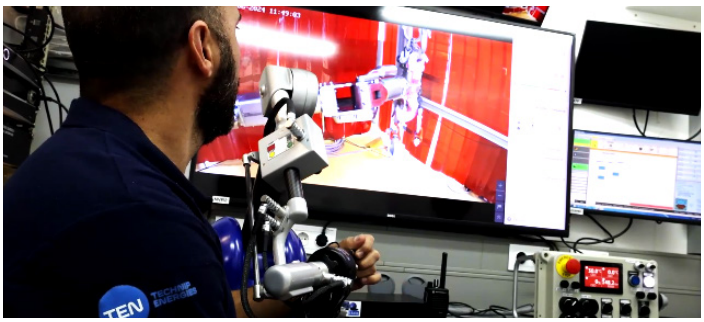
- Constructed primarily of Titanium (Nuclear Industry)
- Wrist equipped with tool changer
- High dexterity thanks to the arm morphology
- Large operating envelope (two versions available)
- High reliability (MTBF > 1500 h)
- 6 rotary actuators (minimize leakage and friction)

**Slave arm management (position/effort) and connection with the master arm:**

- Arm control loop in Cartesian or articular mode
- Force feedback management with different force ratios
- Slave arm movements with different displacement ratio
- Tools management (Turn on/ off, load compensation etc.)
- Virtual mechanisms to help the operator during the task
- Bilateral “slave-master” command
- Automatic trajectories thanks to the robot mode available
- Automatic video tracking

## Typical Deployment

- Offshore Projects / Operational Assets (FPSO, FSO, FLNG, TLP’s.. etc)
- Nuclear sites dismantling and maintenance
- Construction yard for commissioning tasks (max load = 100kg) and offshore/subsea (3000mwd*) operations
  *meter water depth



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