

1 ISELLA 2 in Fraunhofer IPA laboratory
2 Two degrees of freedom in one module
actuated with two QuadHelix-Drives

»ISELLA 2« LIGHTWEIGHT ROBOTIC ARM WITH QUADHELIX-DRIVES

DoHelix – The basic idea

The DoHelix-Muscle has characteristics similar to a human muscle. By winding up a flexible yet tensile-strength-guaranteeing cord it contracts and induces a force at its ends. The cord is coiled up from two sides onto a thin motor shaft following a double helix shape. The diametrical distribution orthogonal to the shaft allows a thin shaft diameter, because shaft bending forces are low that way. The omission of heavy mechanical transmission elements reduces the actuator weight. With the integrated reduction higher actuation forces within the cords are possible.

QuadHelix-Drive

The QuadHelix-Drive powering ISELLA 2 uses two DoHelix cords, which alternately occupy the same shaft segment, but in opposite directions. Now a rotational or a

linear axis is drivable in both directions by only one motor. For that purpose the rotation of the motor shaft is translated into a linear movement of the motor unit by a gear rod and a worm gear or a spindle nut. The worm gear / spindle nut module is hereby adapted to the shaft and cord diameter and with that, at all times a smooth coiling is guaranteed.

Advantages of this concept compared to other drive solutions are a lower dead load of the drive unit combined with high energy efficiency and a high output torque. Its advantage compared to the DoHelix-Muscle is an increase in dead-load-to-payload ratio through the usage of only one motor unit for a bidirectional movement around one degree-of-freedom (DoF) instead of the usage of two motor units as done in ISELLA 1.

Fraunhofer-Institute for Manufacturing Engineering and Automation IPA

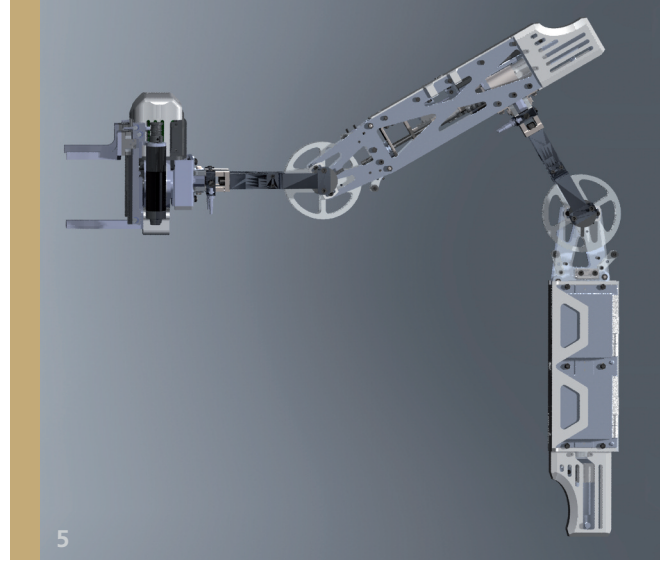
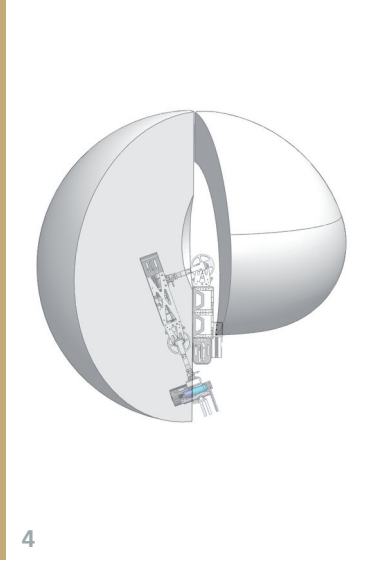
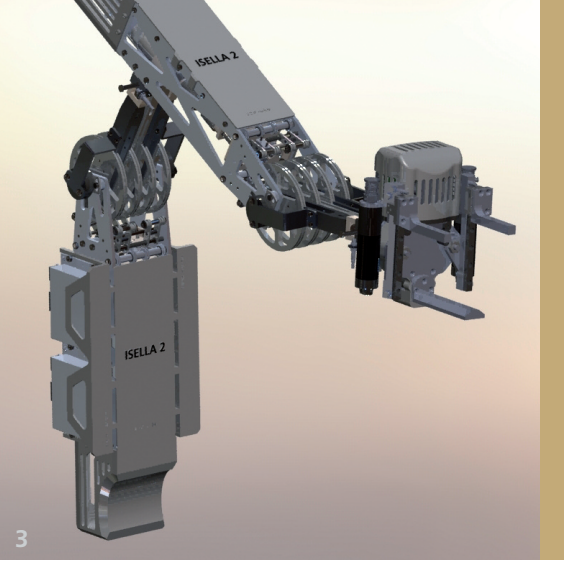
Nobelstrasse 12
70569 Stuttgart

Contact

Dipl.-Ing. Kai Pfeiffer
Phone +49 711 970-1226
kai.pfeiffer@ipa.fraunhofer.de

Dipl.-Ing. Maik Siee
Phone +49 711 970-1603
maik.siee@ipa.fraunhofer.de

www.ipa.fraunhofer.de



Technical Data

A 2-Degrees-of-Freedom-Unit with two QuadHelix-Drives has:

- 2 Motors à 100 or 200 Watts
- 2 DoF per Module with:
 - Axis 1:0 to 220°
 - Axis 2:0 to 130°
- 2 Sensors for axis angles
- 2 Limit switches per axis
- Dead load 100 W-Modul: 4 kg
- Dead load 200 W-Modul: 4.5 kg

ISELLA 2 – Lightweight robotic arm

The modular ISELLA 2 lightweight robotic arm is built with two 2-DoF-Units plus a gripper, which was developed at Fraunhofer IPA. It has 4 degrees-of-freedom within its arm and 3 degrees-of-freedom within its gripper. Each DoF is powered by one QuadHelix-Drive. The motor controllers are integrated into two modules, which are attached to the left and the right side of the basic arm structure. The arm has a dead load of 11 kilograms including the gripper with its 2.5 kilograms.

Our Services

- You are looking for a drive solution and you consider using the QuadHelix-Drive? We will engineer it exactly to your needs.
- You want to add the QuadHelix-Drive to your products? We will support you with technical consulting, engineering and know-how.
- You are looking for an energy-efficient handling solution? We will develop it with QuadHelix-Drives.

- 3** Lightweight robotic arm, built with two modules and an IPA gripper
- 4** Workspace of ISELLA 2 including gripper
- 5** ISELLA 2 side view