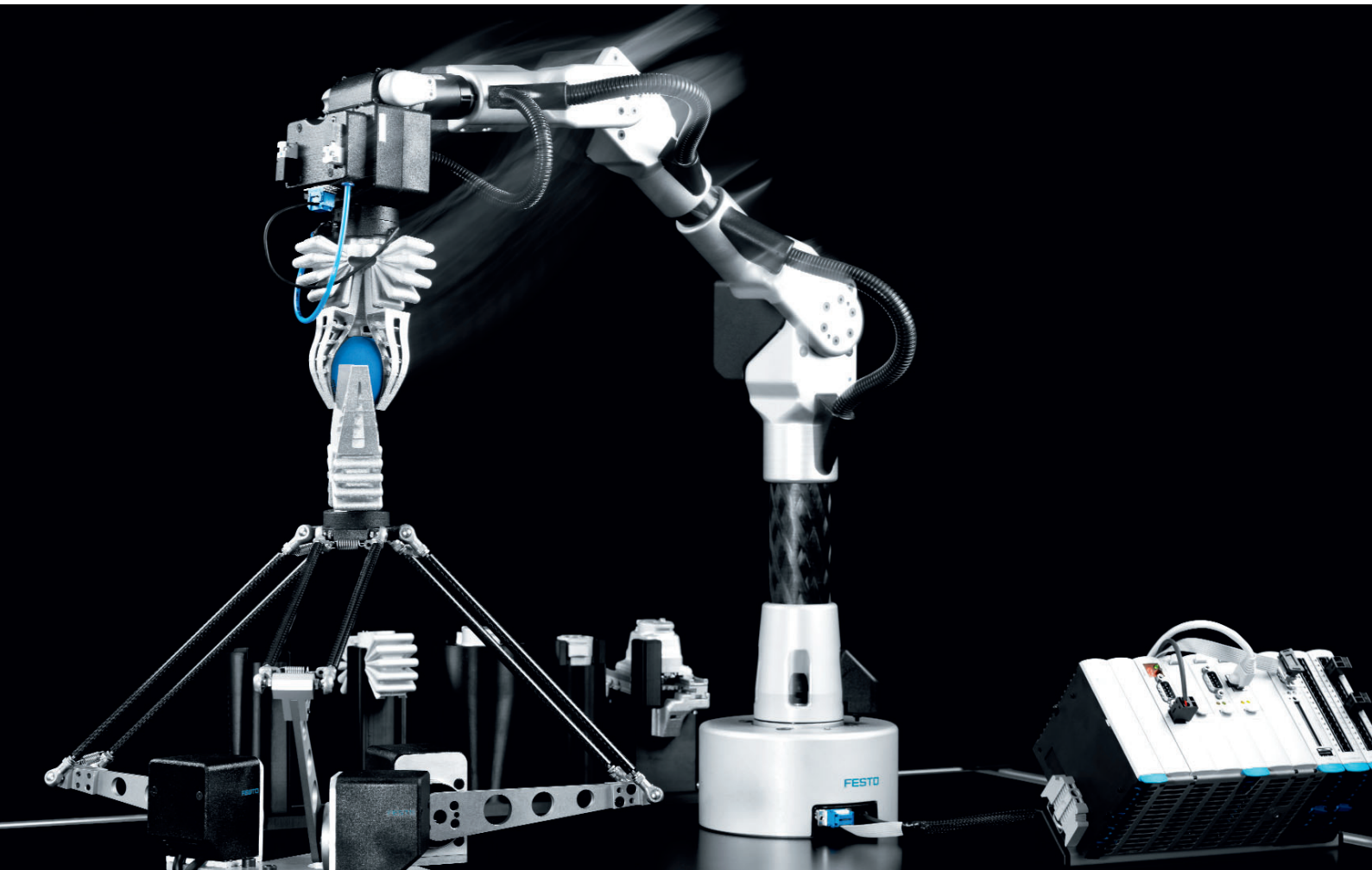


# Modular Lightweight Handling

**FESTO**



Handling from  
a construction kit

Info

## The handling construction kit for basic and further training

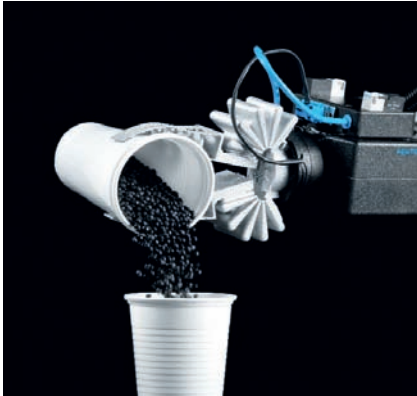


As a learning system, Modular Lightweight Handling will extend the scope of the multiple-axis construction kit system from Festo; it is the latest addition to a series of kinematic systems based on CMXR robot control from the range of Festo products. In combination with Modular Lightweight Handling, the versatile, systematically coordinated product range of Festo provides for developments ranging from an angle picker, via a tripod, up to six-axis articulated-arm kinematics. Schools can configure their own kinematic systems in a variable manner to suit their individual budgets. School and university students and trainees can learn with the aid of real industrial components from practical application, as has been daily routine for over 40 years at Festo Didactic, the world market leader in basic and further industrial training. With Modular Lightweight Handling an articulated-arm kinematic system can be built up with full robotic functionality.

With a net weight of only 4 kg, a payload of up to 800 grams and six degrees of freedom, Modular Lightweight Handling is ideally suited as an educational robot. It is suitable for use in many fields

of basic and advanced industrial training. Thanks to its simple, cost-efficient design, it can be used in pick-and-place applications, in the automation of laboratory processes or as an assistant in the field of service robotics. With its versatile range of uses, Modular Lightweight Handling provides insights into the future of a lightweight modular learning system. Its low weight allows the use of kinematics without a protective cage, thus paving the way for interactive human-machine collaboration.

As a “third hand”, Modular Lightweight Handling can also facilitate work processes and for example autonomously pick up workpieces, hold them in position for processing by a human operator and then deposit them in a different place. The kinematics can also be manually controlled to define specific positions in a “teach-in” process. These positions can then be addressed by Modular Lightweight Handling at any desired speed and in any order. The kinematics can thus be easily and rapidly programmed, and the system can be operated by untrained personnel.



Gripping modules for a large number of diverse workpieces

Through the use of actuators with precision gearing, Modular Lightweight Handling can position objects precisely within a range of  $\pm 0.1$  mm. Thanks to decentralised control units in the joints, all the motors operate at low voltage, and the CMXR robot control from Festo is addressed by a serial bus (CAN) system.

This approach allows the kinematics to be reconfigured at any time. From single-axis to six-axis kinematics, all variants can be modified or even subsequently retrofitted with a minimum of effort. The gears can be selected with three different ratios, and the carbon composite tube connections between the joints are variable in length. Thanks to these parameters, many different configurations are possible to suit individual applications.

The combination of a mobile robot platform with a light four-axis Modular Lightweight Handling variant, for example, is ideal for use in service robotics. For simple pick-and-place applications one-to four-axle kinematics can also be used, depending on requirements, and optimized for scope of operation, payload and speed.

This principle of a modular, lightweight construction kit is continued at the front end, for example with the gripping tool interface.

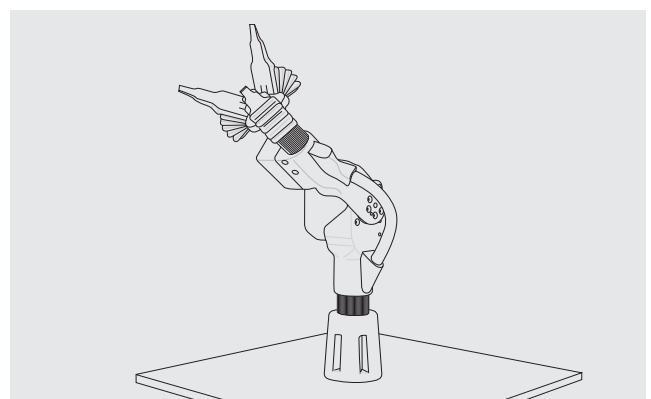
An interface, complete with bayonet lock and sockets for compressed air and signal lines, can be fitted with highly diverse types of gripper. Modular Lightweight Handling autonomously selects two- and three-finger grippers, parallel and angle grippers, suction cups and Bernoulli grippers from a storage unit. The Bernoulli gripper, a product of Festo, is specially designed for handling wafers, for example in the photovoltaics industry.

With this gripper kit, Modular Lightweight Handling can manipulate workpieces with a variety of different geometries. Adaptive gripper fingers based on the Fin Ray Effect<sup>®</sup> also allow complex, irregularly shaped products to be grasped.

A small valve unit with sensor electronics makes for decentralized force control. In this case, the gripping force is registered by sensors and the air pressure in the sensory gripper is adjusted proportionally. Soft and delicate products can be reliably handled by this means.



Learning with industrial components from practical application



Use as a pick-and-place unit



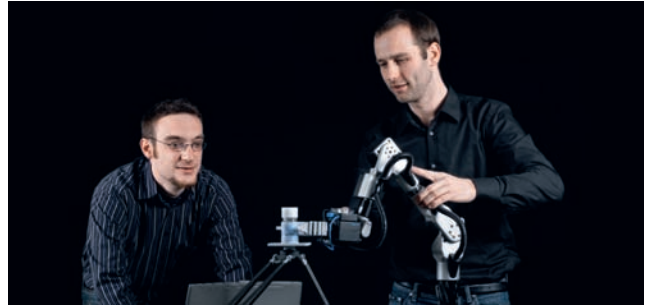
#### 6-axis kinematics – technical data:

Payload: max. 600 g  
Net weight: 4,200 g  
Scope of operation: max. 600 mm  
Degrees of freedom: 6  
Repeatability:  $\pm 0.2$  mm  
Control: CMXR

#### Tripod – technical data:

Payload: max. 1.2 kg  
Net weight: 1.5 kg  
Scope of operation (diameter): 300 mm  
Degrees of freedom: 3  
Repeatability:  $\pm 0.1$  mm  
Control: CMXR  
Speed: 1.5 m/s

Brands: Fin Ray Effect® is a trademark of EvoLogics GmbH, Berlin, Germany



#### Project participants:

Project initiator:  
Dr. Wilfried Stoll, Chairman of the Supervisory Board, Festo AG

Concept:  
Dr. Rüdiger Neumann, Dipl.-Ing. (FH) Markus Fischer,  
Dipl.-Des. Elias Knubben, Festo AG & Co. KG

Design and construction:  
Dipl.-Des. Elias Knubben, Festo AG & Co. KG

Programming:  
Dipl.-Ing. Armin Hartmann, Festo AG & Co. KG

Control:  
Dipl.-Ing. Matthias Doll, Festo AG & Co. KG

Photos:  
Axel Waldecker, Murr, Germany

#### Festo AG & Co. KG

Corporate Design  
Rüter Strasse 82  
73734 Esslingen  
Germany  
[www.festo.com/bionic](http://www.festo.com/bionic)  
Phone ++49 711 347-38 80  
Telefax ++49 711 347-38 99  
[fish@de.festo.com](mailto:fish@de.festo.com)