Modular Robotics

The modules of the PowerCube series provide the basis for flexible combinatorics in automation. Complex systems and multiple-axis robot structures with several degrees of freedom can be achieved with minimum time and expenditure spent on design and programming.

Your advantages and benefits

Modular

- Standardized interfaces for mechatronics and control for rapid and simple assembly without complicated designs
- Cube geometry with diverse possibilities for creating individual solutions from the modular system

Integrated

- The control and power electronics are fully integrated in the modules for minimal space requirements and interfering contours
- Single-cable technology combines data transmission and the power supply for minimal assembly and start-up costs

Intelligent

- Integrated high-end microcontroller for rapid data processing
- Decentralized control system for digital signal processing
- Universal communication interfaces for rapid incorporation in existing servo-controlled concepts

Module overview

The innovative technology of the PowerCube modules already forms the basis of numerous applications in the fields of measuring and testing systems, laboratory automation, service robotics and flexible robot technology.

PG
Servo-electric
2-Finger Parallel Gripper

PR
Servo-electric
Rotary Actuators

PW
Servo-electric
Rotary Pan Tilt Actuators

PSM
Servo-motors with
integrated position control

PDU
Servo-positioning motor
with precision gears

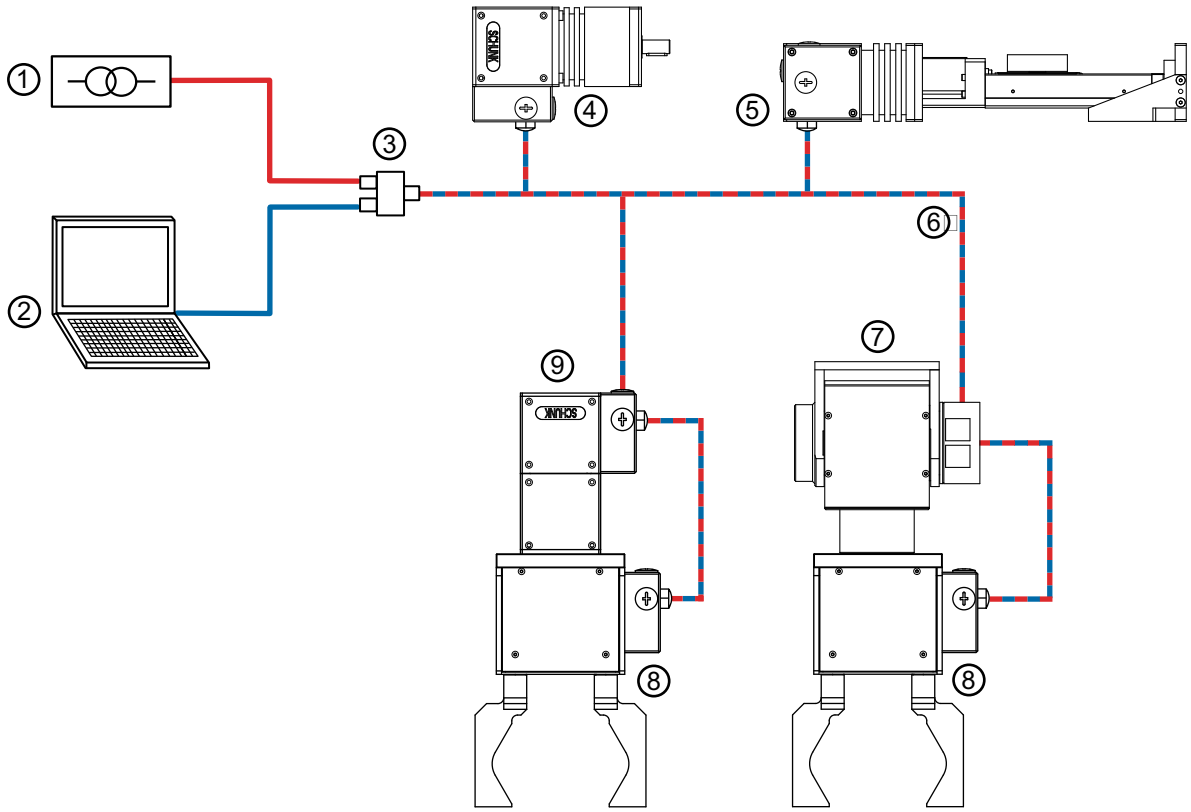
PLS
Servo-electric
Linear Axes with
ball-and-screw spindle drive

Method of actuation

The PowerCube modules work completely independently. The master control system is only required for generating the sequential program and sending it step by step to the connected modules. Therefore, only the current sequential command is ever stored in the modules, and the subsequent command is stored in the buffer. The current, rotational speed and positioning are controlled in the module itself. Likewise, functions such as temperature and limit monitoring are performed in the module itself. Real-time capability is not absolutely essential for the master control or bus system.

Control version	A	B			C
Hardware	Control with SPC (S7)	Control with PC			Control with PC
Interface	Profibus DP	CAN bus / RS-232			CANopen
Software	PowerCube standard software (gsd file, programming examples)	Windows operating system PowerCube standard software	LINUX operating system on request	Development platforms (LabView, Diadem) on request	on request (e.g. Eckelmann CNC 55)

ⓘ Included with the "PowerCube Standard Software" CD-ROM (ID 0307700): Assembly and operating manual with manufacturer's declaration, quick-step software, demo and diagnostic program plus various driver files.



1. 24 VDC / 48 VDC power supply provided by the customer
2. Control system provided by the customer (see control versions A, B and C)
3. PAE 130 TB terminal block for connecting the voltage supply, the communication and the hybrid cable
4. PDU servo-motor
5. Linear axis with PLS ball-and-screw spindle drive and PSM servo-motor
6. Hybrid cable (single-cable technology) for connecting the PowerCube modules (voltage supply and communication)
7. PW Servo-electric Rotary Pan Tilt Actuator
8. PG Servo-electric 2-Finger Parallel Gripper
9. PR Servo-electric Rotary Actuator

PW

Sizes
70 .. 90

Weight
1.8 kg .. 3.4 kg

Torque
Axis 1: 12 Nm .. 23 Nm
Axis 2: 2 Nm .. 12 Nm

Axial force
80 N .. 200 N

Bending moment
8 Nm .. 12 Nm

Application example

7-DOF light-weight arm and gripping hand for applications in research and development and in service robotics

1. SGH Servo-electric Gripping Hand
2. PW 70 Rotary Tilt Unit
3. LWA 2 Light-weight Arm

Pan Tilt Actuator

Servo-electric pan tilt actuator with two rotating axes for precise positioning

Area of application

Pan tilt actuator for cameras, laser scanners and other sensors for positioning during measuring and testing operations. Pan-tilt module and extension axes for service or standard robots and handling tasks in clean room environment

Your advantages and benefits

Two independently moving axes integrated in a single housing
for complete flexibility in the rotating movement, despite the compact design

High torques and speeds
for rapid acceleration and short cycle times

Fully integrated control and power electronics
for creating a decentralized control system

Versatile actuation options
for simple integration in existing servo-controlled concepts via Profibus DP, CAN bus or RS-232

Standard connecting elements and uniform control concept
for extensive combinatorics with other PowerCube modules (see explanation of the PowerCube system)

Single-cable technology for data transmission and voltage supply (plug & play)
for low assembly and start-up costs

POWERCUBE™

Information about the series

Working principle
with Harmonic Drive® gear driven by a brushless DC servo-motor

Housing material
Aluminum alloy, hard-anodized

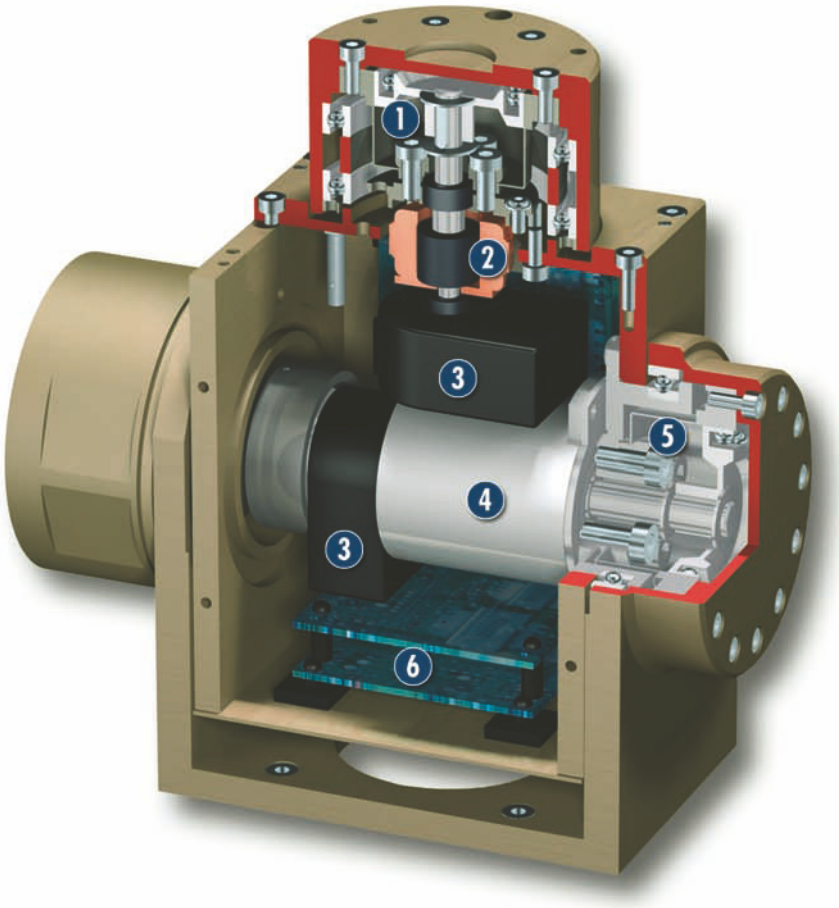
Actuation
servo-electric, with two brushless DC servo-motors and two incremental encoders for position and speed control

Warranty
24 months

Scope of delivery
"PowerCube Standard Software" CD-ROM, containing assembly and operating manual with manufacturer's declaration, quick-step software, demo and diagnostic programs and various driver files (see explanation of PowerCube system).

Further possible uses
Module suitable for use in clean room environment

Sectional diagram



1 **Axis 2**
for endless rotations

2 **Servo-motor axis 2**

3 **Encoder**
for position evaluation

4 **Servo-motor axis 1**
for maximum torques

5 **Axis 1**
for rotations up to +/– 120°

6 **Control electronics**
integrated control and power electronics

Function description

The pan tilt actuator accommodates two self-contained servo axes in an extremely compact housing. Both axes are actuated and moved by the separately integrated control electronics completely independent from one another.
Each axis features a Harmonic Drive® precision gear, which is driven directly by a brushless DC servo-motor.

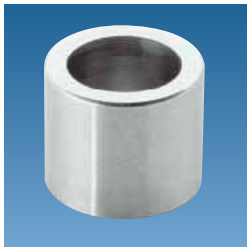
Electrical actuation

The PW pan tilt actuator is electrically actuated by the fully integrated control and power electronics. In this way, the module does not require any additional external control units.
A varied range of interfaces, such as Profibus DP, CAN-Bus or RS-232 are available as methods of communication. This enables you to create industrial bus networks, and ensures easy integration in control systems. You can make use of our hybrid cables for conveying the supply voltage and for communication.
If you wish to create combined systems (e.g. a rotary gripping module), various other modules from our PowerCube series are at your disposal.

Accessories

Accessories from SCHUNK – the suitable complement for the highest level of functionality, reliability and controlled production of all automation components.

Centering sleeves

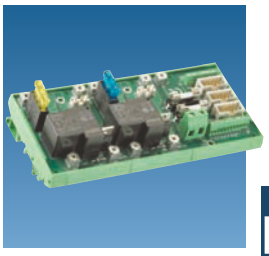


Interfaces

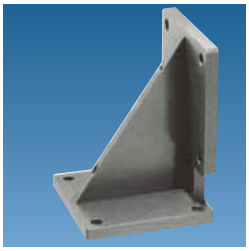
CAN-Bus	RS-232
Profibus-DP	

Hybrid cable

Electrical accessories PAE terminal block



PAM standard connecting elements



ⓘ For the exact size of the required accessories, availability of this size and the designation and ID, please refer to the additional views at the end of the size in question. You will find more detailed information on our accessory range in the „Accessories“ catalog section.

General information on the series

Repeat accuracy

Repeat accuracy is defined as the spread of the limit position after 100 consecutive swiveling cycles.

Axis positions

The position of the axes is always shown in the drawing in the zero position (0°). From here, it can be rotated clockwise and anti-clockwise in the “radius of action with end position switch“ – software end positions (basic position on delivery). If the basic parameters are changed (software end positions are deactivated), axis 2 of the module can be swiveled until the memory for the position value in the control electronics overflows.

Swiveling time

Swiveling times are purely the rotation times of the axes. Relay switching times or SPC reaction times are not included in the above times and must be taken into consideration when determining cycle times. Load-dependent rest periods may have to be included in the cycle time.

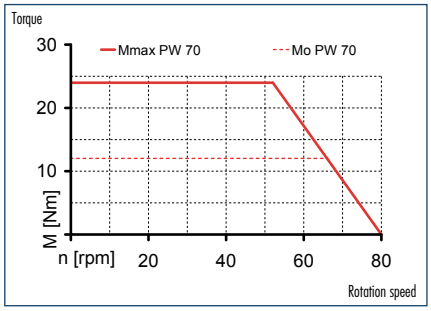
Mean attached load

The mean attached load should constitute a typical load. It is defined as the half of the max. possible moment of inertia that can be swiveled without bouncing or hitting, with a centric load and a vertical rotating axis.

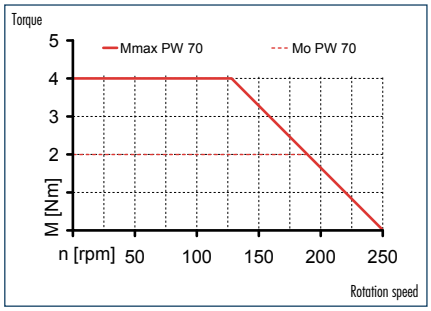
PW 70

Electrical · Rotary Actuators · Pan Tilt Actuator

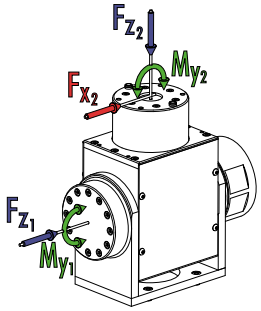
Torque characteristic axis 1



Torque characteristic axis 2



Forces and moments



		Axis 1	Axis 2
M_y	max.	8.0 Nm	8.0 Nm
F_z	max.	80.0 N	80.0 N
F_x	max.		120.0 N

ⓘ Moments and forces may occur simultaneously.

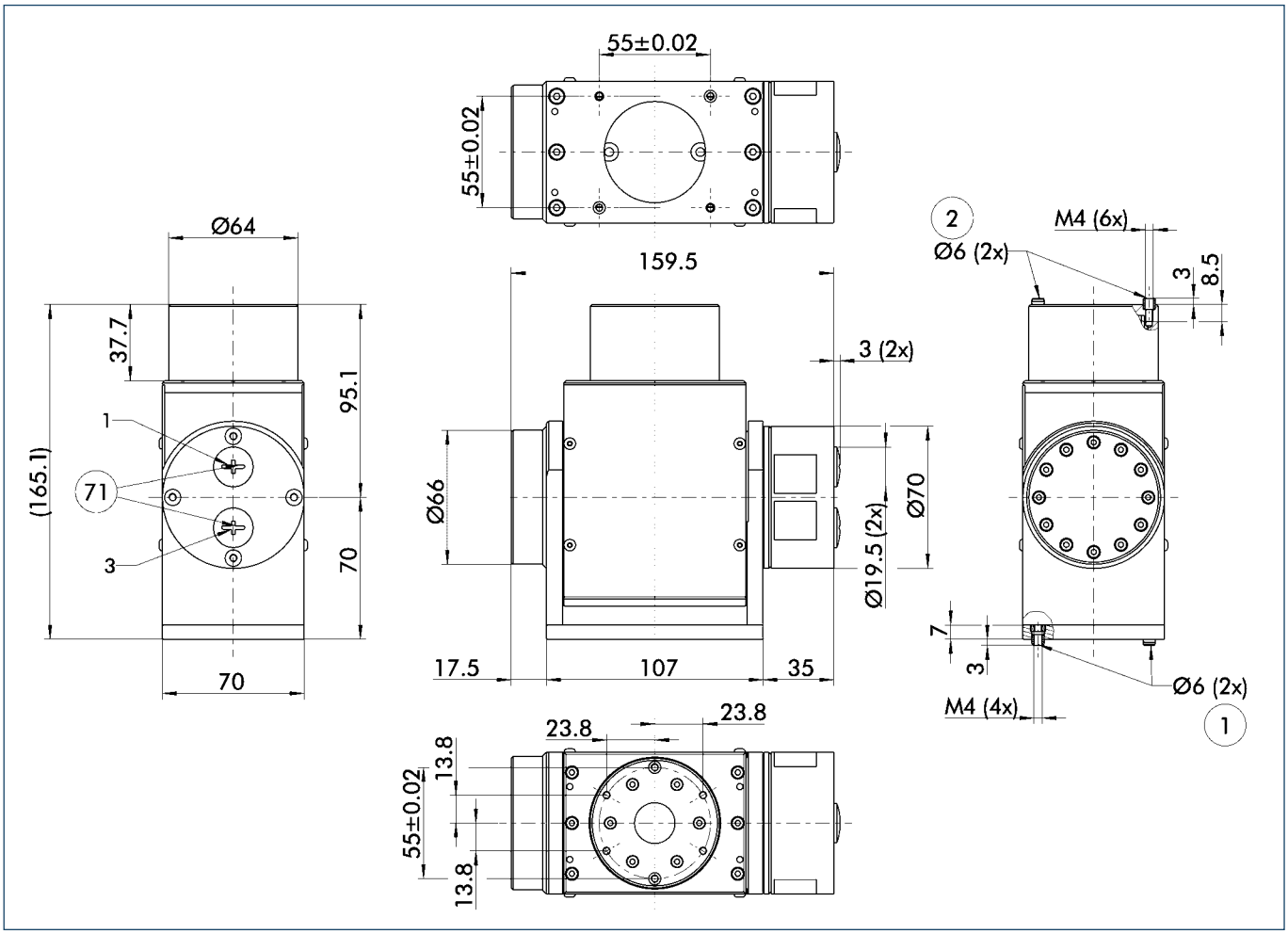
Technical data

Description			PW 70	
	ID		0306603	
IP class			54	
Weight	[kg]		1.8	
Min. ambient temperature	[°C]		5.0	
Max. ambient temperature	[°C]		55.0	
Mechanical operating data		**Axis 1**		**Axis 2**
Nominal torque	[Nm]	12.0		2.0
Peak torque	[Nm]	24.0		4.0
Angle of rotation (1:±/2:>)	[°]	120.0		360.0
Swiveling time (90°) with mean attached load	[s]	0.65		0.5
Repeat accuracy*	[°]	0.04		0.04
Max. angular velocity	[°/s]	240.0		360.0
Max. acceleration	[°/s²]	960.0		1440.0
Gear ratio		121:1		101:1
Magnetic brake		Yes		No
Resolution	[arcsec]	5.0		6.0
Electrical operating data				
Nominal voltage	[VDC]	24.0		24.0
Nominal power current	[A]	4.0		4.0
Max. current	[A]	8.0		
Control electronics				
Integrated electronics			Yes	
Voltage supply	[VDC]		24.0	
Nominal power current	[A]		0.5	
Sensor system			Encoder	
Interface			RS-232; Profibus-DP; CAN-Bus	

ⓘ The peak torques act as a temporary drive reserve on acceleration and braking.

* Higher accuracy on request

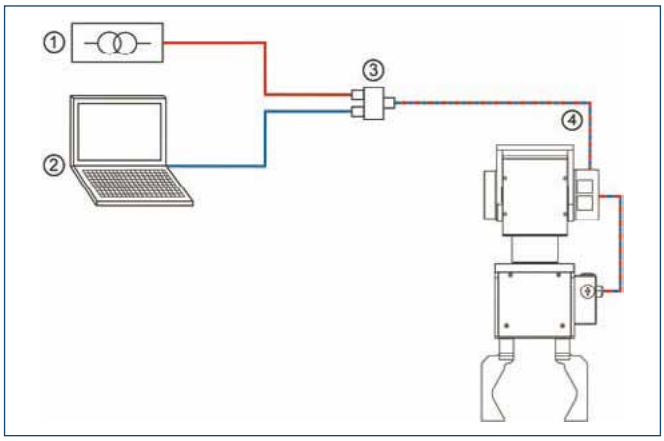
Main views



The drawing shows the rotary actuator with damp-proof cap in the basic version, the dimensions do not include the options described below.

① Connection of actuator
② Attachment connection
71 M16x1.5 for cable gland

Actuation



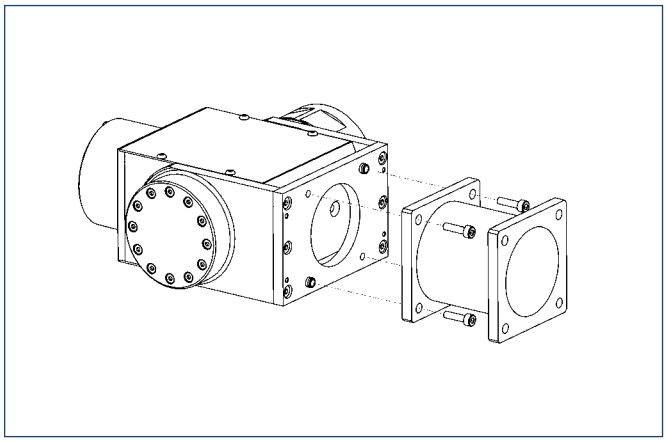
① 24 VDC voltage supply provided by customer
② Control (SPC, etc.) provided by customer
③ PAE 130 TB terminal block for connecting the voltage supply, the communication and the hybrid cable
④ Hybrid cable for connecting the PowerCube modules

Electrical accessories

Description	ID	Length
PowerCube Hybrid cable, coiled	0307753	0.3 m
PowerCube Hybrid cable, coiled	0307754	0.46 m
PowerCube Hybrid cable, straight (per meter)	9941120	
Terminal block PAE 130 TB	0307725	

You can find further cables in the „Accessories“ catalog section.

Mechanical accessories

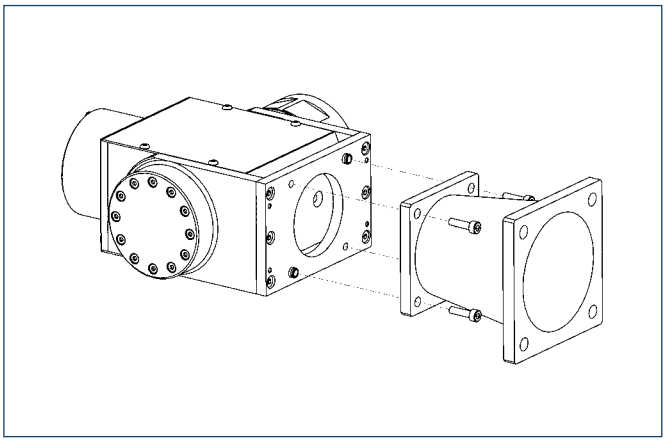


Straight connecting element

Straight standard element for connecting size 70 PowerCube modules with complete repeat accuracy

Description	ID	Dimensions
PAM 100	**0307800**	70x70/35/70x70 mm
PAM 101	**0307801**	70x70/70/70x70 mm

Special lengths on request

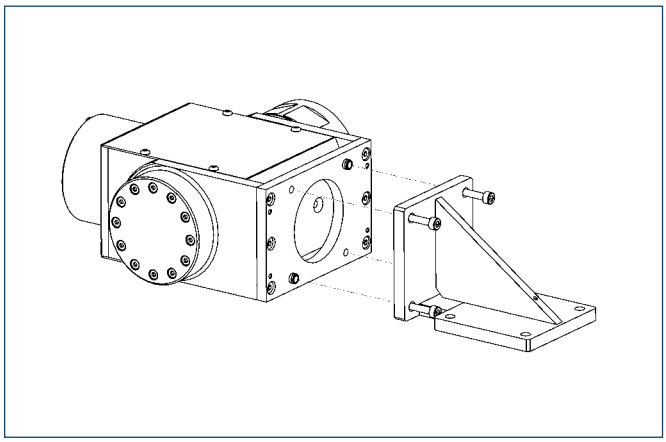


Conical connecting element

Conical standard element for connecting size 70 and 90 PowerCube modules with complete repeat accuracy

Description	ID	Dimensions
PAM 110	**0307810**	90x90/45/70x70 mm
PAM 111	**0307811**	90x90/90/70x70 mm

Special lengths on request



Right-angle connecting element

Right-angle standard element for connecting size 70 PowerCube modules with complete repeat accuracy

Description	ID	Dimensions
PAM 120	**0307820**	90°/70.5x98

You can find more detailed information and individual parts of the above-mentioned accessories in the „Accessories“ catalog section.