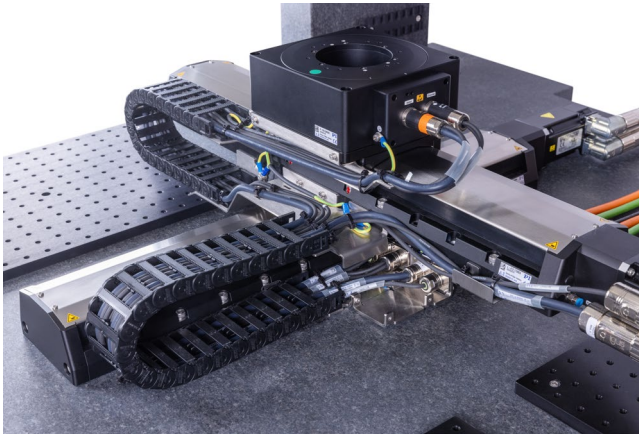


Integrated Multi-Axis System

XY Positioning System • Additional Options • Freely Configurable



X-417

- XY system made of high-load linear stages, travel ranges from 102 mm to 407 mm
- Additional axis: precision Z stage
- Z axis: high-load linear stage, several mounting options
- Matching G-901 ACS controller, software support available
- Base plate, mounting bracket, accessories
- Delivery includes extensive test reports

Integrated multi-axis system - IMAS

The X-417 multi-axis system is a solution for industrial applications with high demands on dynamics and precision. The X-417 can be freely configured and can thus be optimally adapted to the most diverse needs.

Systems in three performance classes with suitable ACS high-performance controller from PI are available. They are based on an XY system consisting of high-load linear stages, which can be expanded by a Z stage as 3rd axis as well as a Z axis. Base plates made of granite, axis brackets made of aluminum or granite, and additional accessories like a base frame with vibration absorber complement the offer. Your configured system will be delivered with suitable cables and an appropriate cable management.

Application fields

Laser machining: Laser ablation. Laser welding. Ultrashort pulse laser machining. Laser micromachining. Laser drilling. Galvo integration. Ceramics and diamond cutting. Test & inspection. Electronics manufacturing.

System selection

Not every combination of the individual system components is possible. The selection of components that you make on the ordering information page thus only represents a preselection for your desired system. Together with a PI sales representative, the details can be worked out.

Components

Below you will find a list of the main components of X-417 systems (positioners and controllers) which are available in several performance classes.

Performance classes describe the performance of systems in terms of precision and throughput of their main components (X and Y axes). For X-417 systems, you can choose from three performance classes: 1 - low, 2 - medium, 3 - high

Performance class 1

X and Y axes with servo motor and ball screw for inexpensive solutions

X and Y Axes

- L-812.xx9453 high-load linear stage, travel ranges: 102 mm, 204 mm, 407 mm

Additional Axis

- L-310.025232 precision Z stage, travel range: 26 mm

Z Axis

- L-812.xx9453B high-load linear stage with holding brake, travel ranges: 102 mm, 204 mm
- L-812.xx9453BF high-load linear stage with holding brake and folded drive, travel ranges: 102 mm, 204 mm
- L-412.xx9054B high-load linear stage with safety brake, travel ranges: 102 mm, 204 mm

Controller

- G-901.R4199 ACS controller, suitable for XY[Z] systems with Z stage
- G-901.R5199 ACS controller, suitable for XY[Z] systems

Performance class 2

X and Y axes with servo motor and ball screw for high precision

X and Y Axes

- L-412.xx9054 high-load linear stage, travel ranges: 102 mm, 204 mm, 305 mm, 407 mm

Additional Axis

- L-310.025232 precision Z stage, travel range: 26 mm

Z Axis

- L-812.xx9453B high-load linear stage with holding brake, travel ranges: 102 mm, 204 mm
- L-812.xx9453BF high-load linear stage with holding brake and folded drive, travel ranges: 102 mm, 204 mm
- L-412.xx9054B high-load linear stage with safety brake, travel ranges: 102 mm, 204 mm

Controller

- G-901.R4199 ACS controller, suitable for XY[Z] systems with Z stage
- G-901.R5199 ACS controller, suitable for XY[Z] systems

Performance class 3

X and Y axes with linear motor for solutions that require maximum precision with very high throughput

X and Y Axes

- V-417.xx6025E0 high-load linear stage, travel ranges: 204 mm, 305 mm, 407 mm

Additional Axis

- L-310.025232 precision Z stage, travel range: 26 mm

Z Axis

- L-812.xx9453B high-load linear stage with holding brake, travel ranges: 102 mm, 204 mm
- L-812.xx9453BF high-load linear stage with holding brake and folded drive, travel ranges: 102 mm, 204 mm
- L-412.xx9054B high-load linear stage with safety brake, travel ranges: 102 mm, 204 mm

Controller

- G-901.R4199 ACS controller, suitable for XY systems with Z stage
- G-901.R5199 ACS controller, suitable for XY systems

Specifications

XY System of Performance Class 1: L-812				
Travel range (single axes)	102 mm	204 mm	407 mm	
Max. payload on Y axis	15 kg	15 kg	15 kg	
Max. acceleration, unloaded	10 m/s ²	10 m/s ²	10 m/s ²	
Max. velocity, unloaded	100 mm/s	100 mm/s	100 mm/s	
1-D positioning accuracy (X / Y) ⁽¹⁾	≤12 μm / ≤11 μm		≤13 μm / ≤13 μm	
Orthogonality (X / Y) ⁽²⁾	with travel range X × Y: 102 mm × 102 mm: ≤35 μrad / 7" 204 mm × 102 mm: ≤30 μrad / 6" 204 mm × 204 mm: ≤30 μrad / 6"		with travel range X × Y: 407 mm × 102 mm: ≤30 μrad / 6" 407 mm × 204 mm: ≤25 μrad / 5" 407 mm × 407 mm: ≤20 μrad / 4"	

XY System of Performance Class 2: L-412				
Travel range (single axes)	102 mm	204 mm	305 mm	407 mm
Max. payload on Y axis	15 kg	15 kg	15 kg	15 kg
Max. acceleration, unloaded	10 m/s ²	10 m/s ²	10 m/s ²	10 m/s ²
Max. velocity, unloaded	175 mm/s	175 mm/s	175 mm/s	175 mm/s
1-D positioning accuracy (X / Y) ⁽¹⁾	≤8 μm / ≤7 μm	≤8 μm / ≤7 μm	≤8 μm / ≤8 μm	≤9 μm / ≤9 μm
Orthogonality (X / Y) ⁽²⁾	with travel range X × Y: 102 mm × 102 mm: ≤35 μrad / 7" 204 mm × 102 mm: ≤30 μrad / 6" 204 mm × 204 mm: ≤30 μrad / 6" 305 mm × 102 mm: ≤30 μrad / 6" 305 mm × 204 mm: ≤30 μrad / 6" 305 mm × 305 mm: ≤30 μrad / 6"		with travel range X × Y: 407 mm × 102 mm: ≤30 μrad / 6" 407 mm × 204 mm: ≤25 μrad / 5" 407 mm × 305 mm: ≤25 μrad / 5" 407 mm × 407 mm: ≤20 μrad / 4"	

XY System of Performance Class 3: V-417			
Travel range (single axes)	204 mm	305 mm	407 mm
Max. payload on Y axis	15 kg	15 kg	15 kg
Max. acceleration, unloaded	X: 10 m/s ² Y: 15 m/s ²	X: 10 m/s ² Y: 15 m/s ²	X: 10 m/s ² Y: 15 m/s ²
Max. velocity, unloaded	400 mm/s	500 mm/s	1000 mm/s
1-D positioning accuracy (X / Y) ⁽¹⁾	≤3 μm / ≤2 μm	≤3 μm / ≤3 μm	≤4 μm / ≤4 μm
Orthogonality (X / Y) ⁽²⁾	with travel range X × Y: 204 mm × 204 mm: ≤30 μrad / 6" 305 mm × 204 mm: ≤30 μrad / 6" 305 mm × 305 mm: ≤25 μrad / 5"		with travel range X × Y: 407 mm × 204 mm: ≤25 μrad / 5" 407 mm × 305 mm: ≤20 μrad / 4" 407 mm × 407 mm: ≤20 μrad / 4"

Additional Axis	L-310.025232
Positioner type	Z stage
Travel range	26 mm
Max. payload on additional axis	10 kg
Max. velocity, unloaded	50 mm/s

Z Axis	L-812.xx9453B	L-812.xx9453BF	L-412.xx9054B
Travel range	102 mm / 204 mm	102 mm / 204 mm	102 mm / 204 mm
Max. payload on Z axis	15 kg	15 kg	15 kg
Holding brake ⁽³⁾	Electromagnetic	Electromagnetic	Electromagnetic
Bidirectional repeatability	5 μm	5 μm	6 μm

⁽¹⁾ Value valid with "1D Mapping" option

The positioning accuracy specification does not refer to the entire travel range, but to the next smaller hundreds value. For a 102 mm travel range, the calibrated range is therefore 100 mm, for a 204 mm travel range it is 200 mm and so on.

Recommended ambient conditions for 1-D positioning accuracy: 21 °C ± 1 °C at 50 to 60 % relative humidity.

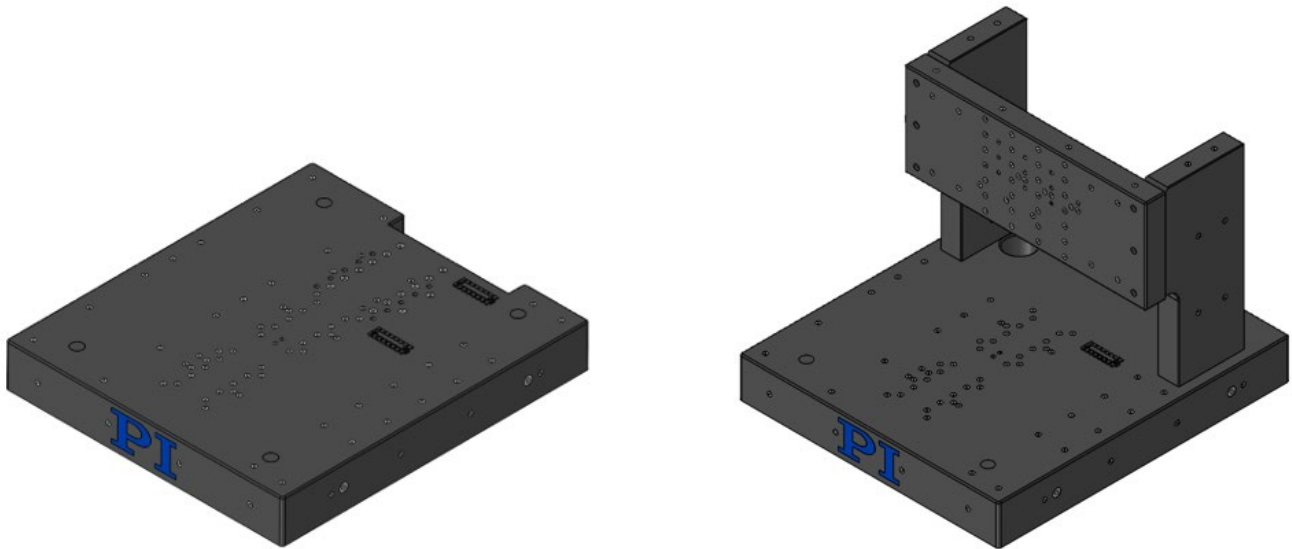
⁽²⁾ Value valid with "Orthogonal Alignment" option

⁽³⁾ Safety coefficients for the holding brake are available on request

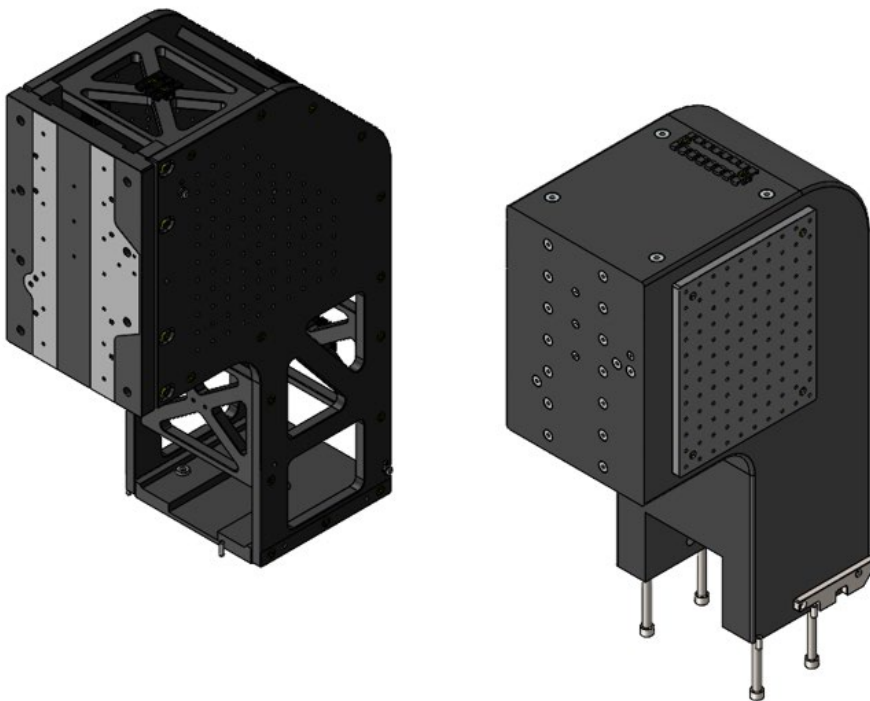
Drawings / Images



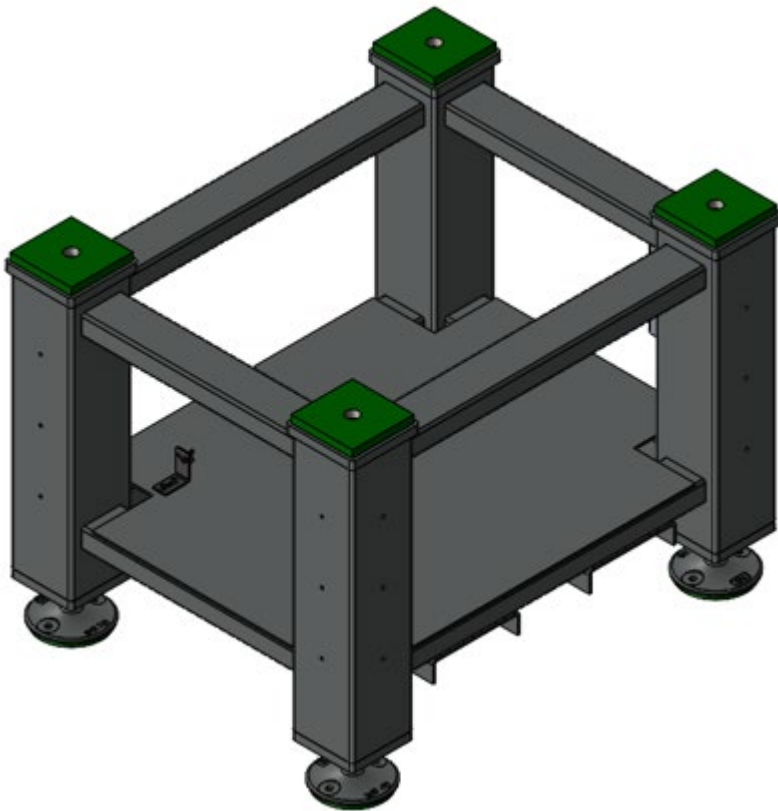
X-417 XY system with additional and Z axes on granite plate with portal, with breadboard set and G-901 controller in base frame



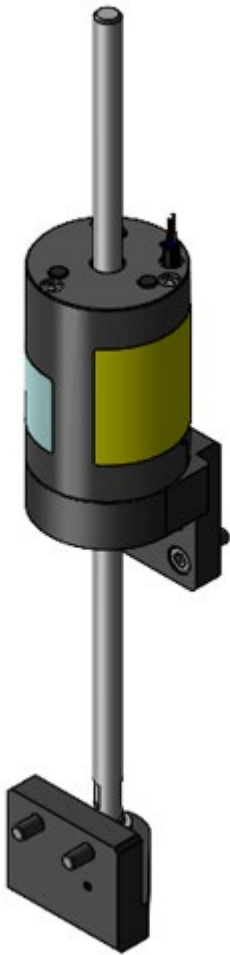
Base plate for X-417 (left), base plate for X-417 with portal (right); material: granite



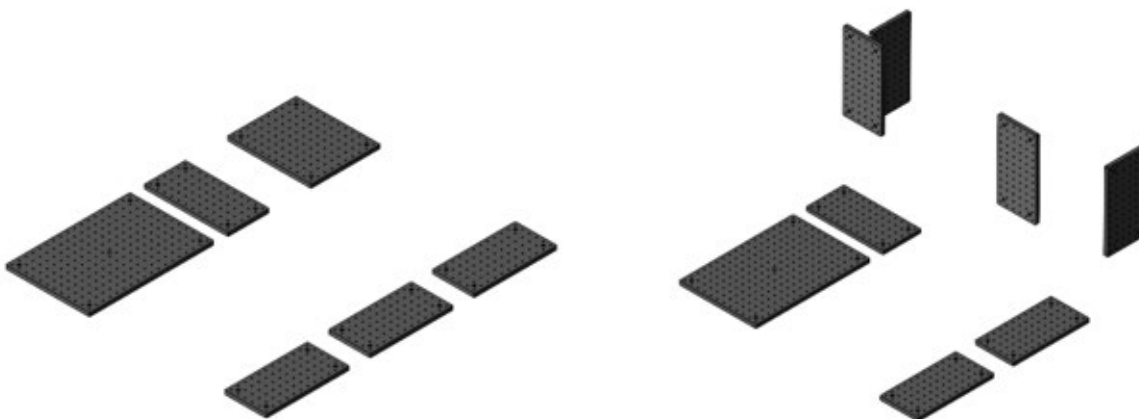
Mounting bracket for Z axis: aluminum (left) or granite (right)



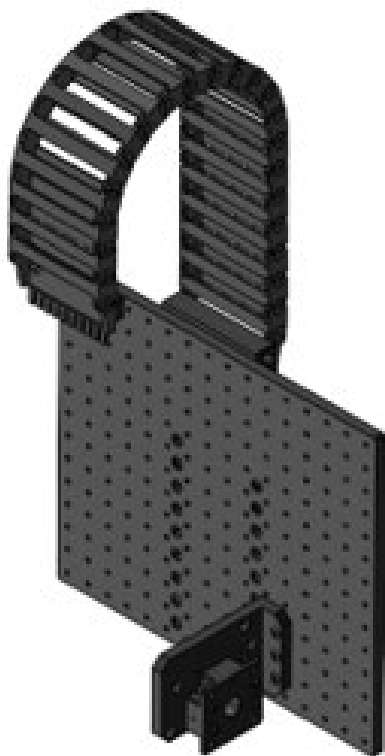
X-417.Z001: base frame



X-417.Z002: safety brake



X-417.Z003: Breadboard set (left), X-417.Z004: breadboard set for base plate with portal (right)



X-417.Z005: bracket for galvanoscanner

Ordering Information

X and Y Axes

L-812.059453

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 102 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn

L-812.099453

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 204 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn

L-812.179453

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 407 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn

L-412.059054

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 102 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev. sensor resolution, EnDat 2.1; 116 mm width

L-412.099054

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 204 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev. sensor resolution, EnDat 2.1; 116 mm width

L-412.139054

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 305 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev. sensor resolution, EnDat 2.1; 116 mm width

L-412.179054

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 407 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev. sensor resolution, EnDat 2.1; 116 mm width

V-417.096025E0

High-load linear stage of performance class 3; ironless 3-phase linear motor; 204 mm travel range; 450 N load capacity; 2000 mm/s maximum velocity; absolute linear encoder, 1 nm sensor resolution, EnDat 2.2; 166 mm width

V-417.136025E0

High-load linear stage of performance class 3; ironless 3-phase linear motor; 305 mm travel range; 450 N load capacity; 2000 mm/s maximum velocity; absolute linear encoder, 1 nm sensor resolution, EnDat 2.2; 166 mm width

V-417.176025E0

High-load linear stage of performance class 3; ironless 3-phase linear motor; 407 mm travel range; 450 N load capacity; 2000 mm/s maximum velocity; absolute linear encoder, 1 nm sensor resolution, EnDat 2.2; 166 mm width

Additional Axis**L-310.025232**

Precision Z stage; brushless DC motor; 26 mm travel range; 100 N load capacity; 50 mm/s maximum velocity; ball screw; incremental rotary encoder, 20000 counts/rev sensor resolution, A/B quadrature, RS-422

Z Axis**L-812.059453B**

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 102 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn; electromagnetic safety brake

L-812.099453B

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 204 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn; electromagnetic safety brake

L-812.059453BF

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 102 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn; electromagnetic holding brake; folded drivetrain

L-812.099453BF

High-load linear stage of performance class 1; synchronous servo motor to 310 V; 204 mm travel range; 500 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn; electromagnetic holding brake; folded drivetrain

L-412.059054B

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 102 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev sensor resolution, EnDat 2.1; electromagnetic safety brake; 116 mm width

L-412.099054B

High-load linear stage of performance class 2; synchronous servo motor to 320 V; 204 mm travel range; 400 N load capacity; 300 mm/s maximum velocity; ball screw; absolute rotary encoder, multiturn, 8192 counts/rev sensor resolution, EnDat 2.1; electromagnetic safety brake; 116 mm width

Controller

G-901.R4199

ACS controller with ACS driver module, 4 axes, intermediate circuit voltages 96 V / 2000 W and 48 V / 480 W, 19-inch housing, integrated ACS SP+EC-08080832NNNDNDNN motion controller + EtherCAT master, integrated ACS UDMcb2BB2U2CBAN and UDMcb2BA2U2CBAN driver modules, integrated STO module (safe torque off), EtherCAT, Ethernet, RS-232 interfaces
Suitable for XY[Z] systems with additional axis.

G-901.R5199

ACS controller with ACS driver module, 4 axes, intermediate circuit voltage 96 V / 2000 W, 19-inch housing, integrated ACS SP+EC-08080832NNNDNDNN motion controller + EtherCAT master, two integrated ACS UDMcb2BB2U2CBAN driver modules, integrated STO module (safe torque off), EtherCAT, Ethernet, RS-232 interfaces
Suitable for XY[Z] systems.

Base Plate

Granite plate

Base plate; material: granite; flatness: 5 µm; dimensions: 1100 × 980 × 150 mm; mass: 460 kg

Granite plate with portal

Base plate with portal for fixing the Z axis; material: granite; flatness: 5 µm; dimensions: 1100 × 980 × 821 mm; mass: 620 kg

Holding Bracket for Z Axis

Mounting bracket for Z axis, aluminum

Mounting bracket for Z axis; material: aluminum; dimensions: 413 × 223 × 666 mm; mass: 25.5 kg

Mounting bracket for Z axis, granite

Mounting bracket for Z axis; material: granite; dimensions: 413 × 275 × 666 mm; mass: 127 kg; for applications that require high rigidity and vibration damping

Accessories

X-417.Z001

Base frame for X-417 Integrated multi-axis system; 105 × 85 × 80 cm; vibration absorbers (passive); connector for protective earth conductor; space for two 19-inch racks

X-417.Z002

Safety brake for X-417 Integrated multi-axis system

X-417.Z003

Breadboard set for X-417 Integrated multi-axis system, consisting of 6 plates of different sizes for mounting on a base plate; hole pattern for M6 thread

X-417.Z004

Breadboard set for X-417 Integrated multi-axis system, consisting of 8 plates of different sizes for mounting on a base plate with portal; hole pattern for M6 thread

X-417.Z005

Bracket for galvanoscanner for X-417 Integrated multi-axis system