Precision Z Stage

Compact Multi-Axis Combinations with Linear and Rotation Stages

L-310

- Travel range 26 mm (1")
- High-resolution encoder
- DC, BLDC, and stepper motors
- Zero-play ball screw
- Load capacity to 10 kg
- Variants suitable for vacuum available

Precision-class Z stage
High guiding accuracy and stiffness due to ball screws and crossed roller guides. Stress-relieved aluminum base for high stability. Vacuum-compatible product variants on request. Noncontact limit and reference switches (Hall effect). Reference switch with direction sensing in the middle of the travel range.

Drive types
- .xxSD variant: 2-phase stepper motor for high torque even at low velocities and high resolution.
- .023xxx variant: DC servo motor
- .025xxx variant: Brushless DC motor (BLDC) for high rotational velocity. Smooth running and low wear, therefore longer lifetime.

Position measuring
- Versions with DC motor: Rotary encoder
- Optional: Integrated linear encoder, installed centrically.

Highly accurate position measuring with incremental linear encoder
Noncontact optical linear encoders measure the position directly at the platform with the greatest accuracy. Nonlinearity, mechanical play or elastic deformation have no influence on the measurement.

Minimum incremental motion and slow motion
In conjunction with an ACS controller (e.g., ECMsm-4B44T-NNNNN), versions with stepper motor and integrated linear encoder (L-310.xASD) achieve repeatable minimum incremental motion in the range of the sensor resolution. The same configuration achieves constant low velocities of a few sensor increments per second.

Application fields
Precision positioning in industry and research, high duty cycles.

Motion	Unit	Tolerance	L-310.023211	L-310.023212	L-310.023232	L-310.025212	L-310.025232	L-310.20SD	L-310.2ASD
Active axes			Z	Z	Z	Z	Z	Z	Z
Travel range in Z	mm		26	26	26	26	26	26	26
Maximum velocity in Z, unloaded	mm/s		50	50	50	50	50	15	15
Straightness error in X	µm	Typ.	±3	±3	±3	±3	±3	±3	±3
Straightness error in Y	µm	Typ.	±3	±3	±3	±3	±3	±3	±3
Angular error around X	µrad	Typ.	±150	±150	±150	±150	±150	±150	±150
Angular error around Y	µrad	Typ.	±150	±150	±150	±150	±150	±150	±150
Angular error around Z	µrad	Typ.	±150	±150	±150	±150	±150	±150	±150

Positioning	Unit	Tolerance	L-310.023211	L-310.023212	L-310.023232	L-310.025212	L-310.025232	L-310.20SD	L-310.2ASD
Minimum incremental motion in Z	µm	Typ.	0.2	0.2	0.3	0.2	0.3	0.3	0.05
Unidirectional repeatability in Z	µm	Typ.	±0.1	±0.1	±0.15	±0.1	±0.15	±0.15	±0.05
Bidirectional repeatability in Z	µm	Typ.	0.4	0.4	4	0.4	4	4	0.4
Reference switch			Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN
Reference switch repeatability	µm		2	2	2	2	2	2	2
Limit switches			Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN	Hall effect, N/C contact, 5 V, NPN
Integrated sensor			Incremental linear encoder	Incremental linear encoder	Incremental rotary encoder	Incremental linear encoder	Incremental rotary encoder	—	Incremental linear encoder
Sensor signal			Sin/cos, 1 V peak-peak	A/B quadrature, RS-422	A/B quadrature, RS-422	A/B quadrature, RS-422	A/B quadrature, RS-422	—	Sin/cos, 1 V peak-peak
Sensor signal period	µm		20	—	—	—	—	—	20
Sensor resolution	nm		—	50	—	50	—	—	—
Sensor resolution	Cts./rev.		—	—	16384	20000	20000	—	—

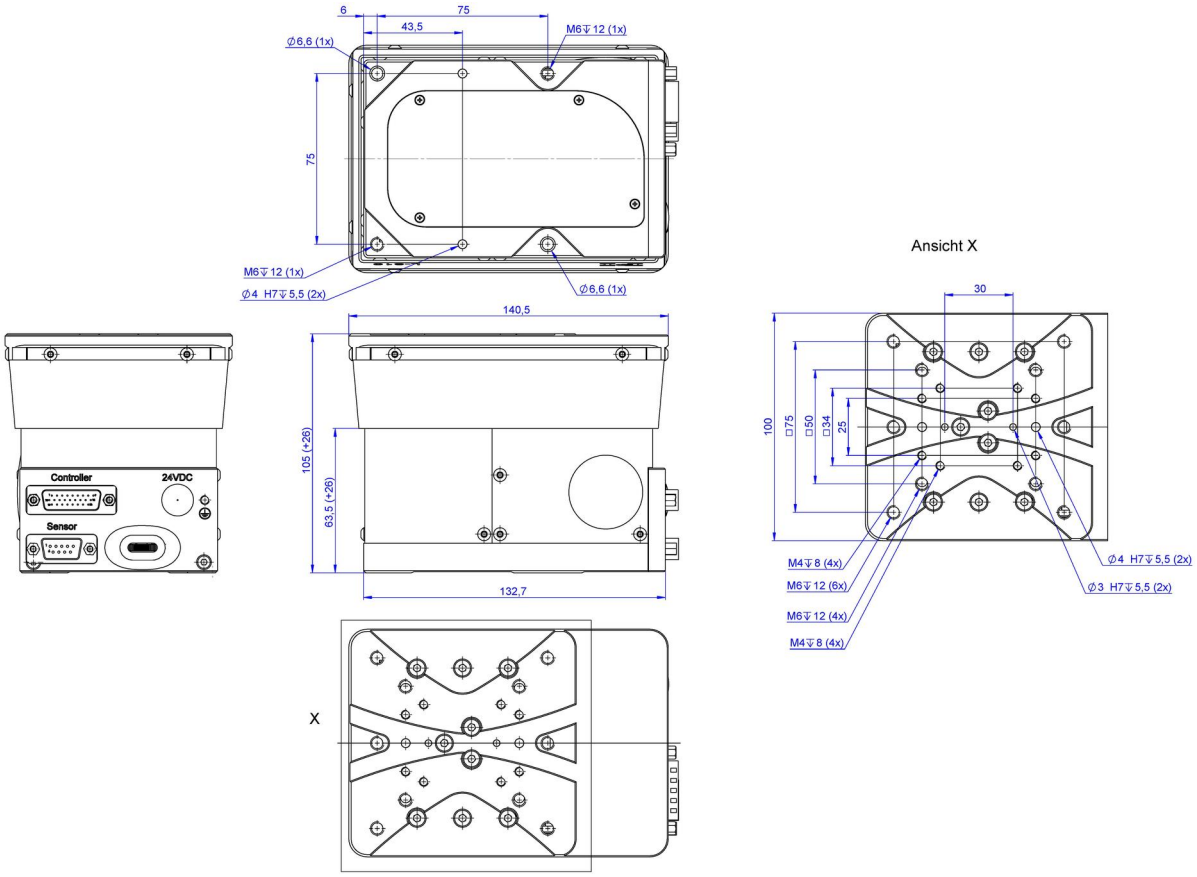
Drive Properties	Unit	Tolerance	L-310.023211	L-310.023212	L-310.023232	L-310.025212	L-310.025232	L-310.20SD	L-310.2ASD
Drive type			DC motor	DC motor	DC motor	Brushless DC motor	Brushless DC motor	2-phase stepper motor	2-phase stepper motor
Nominal voltage	V		24	24	24	24	24	24	24
Motor resolution	Full steps/rev.		—	—	—	—	—	200	200
Drive force in positive direction of motion in Z	N	Typ.	100	100	100	100	100	55	55
Drive force in negative direction of motion in Z	N	Typ.	100	100	100	100	100	55	55

Mechanical Properties	Unit	Tolerance	L-310.023211	L-310.023212	L-310.023232	L-310.025212	L-310.025232	L-310.20SD	L-310.2ASD
Permissible push force in Y	N	Max.	100	100	100	100	100	100	100
Permissible push force in Z	N	Max.	100	100	100	100	100	55	55
Permissible torque in θX	N·m	Max.	40	40	40	40	40	40	40
Permissible torque in θY	N·m	Max.	80	80	80	80	80	80	80
Permissible torque in θZ	N·m	Max.	80	80	80	80	80	80	80
Holding force in Z, passive	N		—	—	—	—	—	50	50
Moved mass in Z, unloaded	g		900	900	900	900	900	900	900
Drive screw type			Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw	Ball screw
Drive screw pitch	mm		1	1	1	1	1	1	1
Guide			Crossed roller guide	Crossed roller guide	Crossed roller guide	Crossed roller guide	Crossed roller guide	Crossed roller guide	Crossed roller guide
Overall mass	g		2700	2700	2700	2700	2700	2700	2800
Material			Anodized aluminum	Anodized aluminum	Anodized aluminum	Anodized aluminum	Anodized aluminum	Anodized aluminum	Anodized aluminum

Miscellaneous	Unit		L-310.023211	L-310.023212	L-310.023232	L-310.025212	L-310.025232	L-310.20SD	L-310.2ASD
Operating temperature range	°C		5 to 40	5 to 40	5 to 40	5 to 40	5 to 40	5 to 40	5 to 40
Connector			HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)
Sensor connector			D-sub 9 (m)	—	—	—	—	—	D-sub 9 (m)
Recommended controllers/drivers			C-863 C-885 with C-863.20C885 C-884 G-901 G-910 ACS modular controller	C-863 C-885 with C-863.20C885 C-884 G-901 G-910 ACS modular controller	C-863 C-885 with C-863.20C885 C-884 G-901 G-910 ACS modular controller	G-901 G-910 ACS modular controller	G-901 G-910 ACS modular controller	C-663.12 C-885 with C-663.12C885 G-901 G-910 ACS modular controller	C-663.12 C-885 with C-663.12C885 G-901 G-910 ACS modular controller

At PI, technical data is specified at 22 ±3 °C. Unless otherwise stated, the values are for unloaded conditions. Some properties are interdependent. The designation "typ." indicates a statistical average for a property; it does not indicate a guaranteed value for every product supplied. During the final inspection of a product, only selected properties are analyzed, not all. Please note that some product characteristics may deteriorate with increasing operating time.

Drawings / Images



L-310, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.

Order Information

L-310.023211
Precision Z stage; DC motor; 26 mm travel range; 100 N load capacity; 50 mm/s maximum velocity; ball screw; incremental linear encoder, 20 µm sensor signal period, sin/cos, 1 V peak-peak

L-310.023212
Precision Z stage; DC motor; 26 mm travel range; 100 N load capacity; 50 mm/s maximum velocity; ball screw; incremental linear encoder, 50 nm sensor resolution, A/B quadrature, RS-422

Order Information

L-310.023232
Precision Z stage; DC motor; 26 mm travel range; 100 N load capacity; 50 mm/s maximum velocity; ball screw; incremental rotary encoder, 16384 counts/rev sensor resolution, A/B quadrature, RS-422

L-310.025212
Precision Z stage; brushless DC motor; 26 mm travel range; 100 N load capacity; 50 mm/s maximum velocity; ball screw; incremental linear encoder, 50 nm sensor resolution, A/B quadrature, RS-422

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

L-310.20SD
Precision Z stage; 2-phase stepper motor; 26 mm travel range; 55 N load capacity; 15 mm/s maximum velocity; ball screw

L-310.2ASD
Precision Z stage; 2-phase stepper motor; 26 mm travel range; 55 N load capacity; 15 mm/s maximum velocity; ball screw; incremental linear encoder, 20 µm sensor signal period, sin/cos, 1 V peak-peak