

# High-Resolution Linear Actuator

Suitable for High Cycle Numbers



## L-220

- Nonrotating tip: Avoidance of transfer of runout errors on contact point
- Highest precision: Minimal incremental steps of 100 nm, unidirectional repeatability  $\pm 0.25 \mu\text{m}$
- Direction-sensing reference switch: Reduction of time required for referencing move, possibility of application-dependent referencing to avoid collisions

### Reference-class linear drive

Combines high precision, high forces, and high dynamics. Models available for vacuum environments to  $10^{-9}$  hPa. Travel ranges 13 mm to 77 mm ( $\frac{1}{2}$ " to 3"), forces to 125 N, DC or stepper motor

### High-quality components

Ball screw for smooth feed. Nonrotating tip for uniform motion prevents wobble, torque, and wear at the point of contact. Incl. flat and spherical tip for decoupling forces. Noncontact limit switches protect the mechanics. A direction-sensing reference switch supports automation applications. Position-controlled variants with differential encoder driver in the connector for safe signal transfer over distances up to 10 m.

### Motor variants

- Position-controlled DC motors with a gearhead and high-resolution rotary encoders allow for incremental motion of just 100 nm
- High-performance and low-vibration 2-phase stepper motors with gear ratio allow precision positioning even without position control

### Application fields

Research. Automation. Optical alignment.

Motion	Unit		L-220.10DG	L-220.20DG	L-220.50DG	L-220.70DG	L-220.10SG	L-220.20SG	L-220.50SG	L-220.70SG
Active axes			X	X	X	X	X	X	X	X
Travel range in X	mm		13	26	52	77	13	26	52	77
Maximum velocity in X, unloaded	mm/s		3.5	3.5	3.5	3.5	0.8	0.8	0.8	0.8

Positioning	Unit	Tolerance	L-220.10DG	L-220.20DG	L-220.50DG	L-220.70DG	L-220.10SG	L-220.20SG	L-220.50SG	L-220.70SG
Minimum incremental motion in X	$\mu\text{m}$	Typ.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Unidirectional repeatability in X	$\mu\text{m}$	Typ.	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$	$\pm 0.25$
Bidirectional repeatability in X	$\mu\text{m}$	Typ.	2	2	2	2	2	2	2	2
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	Hall effect, N/C contact, 5 V, NPN
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	Hall effect, N/C contact, 5 V, NPN
Motor encoder			Incremental rotary encoder	Incremental rotary encoder	Incremental rotary encoder	Incremental rotary encoder	—	—	—	—
Motor encoder: Sensor signal			A/B quadrature, RS-422	A/B quadrature, RS-422	A/B quadrature, RS-422	A/B quadrature, RS-422	—	—	—	—
Resolution, motor encoder	Cts./rev.		512	512	512	512	—	—	—	—

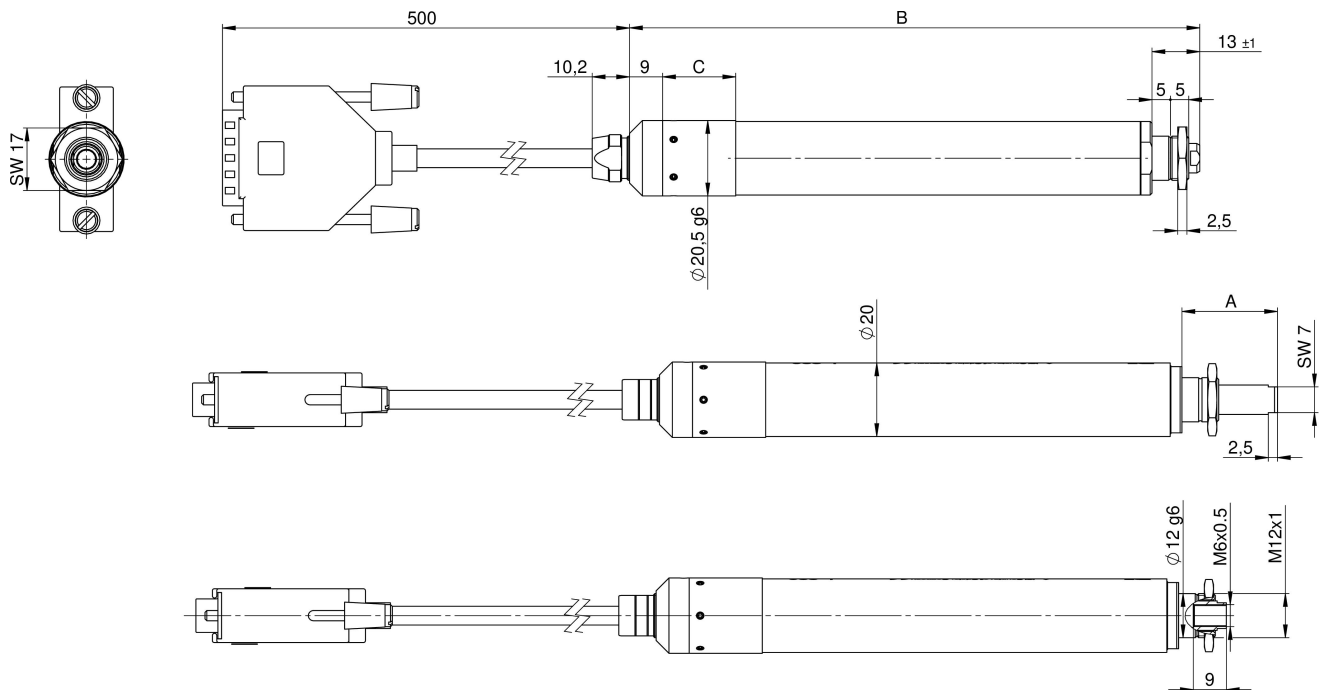
Drive Properties	Unit	Tolerance	L-220.10DG	L-220.20DG	L-220.50DG	L-220.70DG	L-220.10SG	L-220.20SG	L-220.50SG	L-220.70SG
Drive type			DC gear motor	DC gear motor	DC gear motor	DC gear motor	2-phase stepper motor with gearhead	2-phase stepper motor with gearhead	2-phase stepper motor with gearhead	2-phase stepper motor with gearhead
Nominal voltage	V		12	12	12	12	3.5	3.5	3.5	3.5
Nominal current, RMS	A	Typ.	0.28	0.28	0.28	0.28	0.25	0.25	0.25	0.25
Peak current, RMS	A	Typ.	0.56	0.56	0.56	0.56	—	—	—	—
Maximum power consumption	W		4	4	4	4	—	—	—	—
Motor resolution	Full steps/rev.		—	—	—	—	24	24	24	24
Drive force in positive direction of motion in X	N	Typ.	125	125	125	125	125	125	125	125
Drive force in negative direction of motion in X	N	Typ.	125	125	125	125	125	125	125	125
Torque constant	N·m/A	Typ.	0.0115	0.0115	0.0115	0.0115	—	—	—	—
Resistance phase-phase	Ω	Typ.	19.8	19.8	19.8	19.8	12.5	12.5	12.5	12.5
Inductance phase-phase	mH		0.42	0.42	0.42	0.42	6.3	6.3	6.3	6.3
Back EMF, phase-phase, rotational	V/kRPM	Max.	1.21	1.21	1.21	1.21	11	11	11	11
Number of pole pairs			1	1	1	1	—	—	—	—

Mechanical Properties	Unit	Tolerance	L-220.10DG	L-220.20DG	L-220.50DG	L-220.70DG	L-220.10SG	L-220.20SG	L-220.50SG	L-220.70SG
Permissible push force in Y	N	Max.	1	1	1	1	1	1	1	1
Holding force in X, passive	N		—	—	—	—	125	125	125	125
Moved mass in X, unloaded	g		20	20	25	30	20	20	25	30
Drive screw type			Ball screw	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	1
Gear ratio i			12493 : 567	12493 : 567	12493 : 567	12493 : 567	387283 : 5103	387283 : 5103	387283 : 5103	387283 : 5103
Overall mass	g		210	230	260	290	230	250	280	320
Material			Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze	Stainless steel, bronze

Miscellaneous	Unit		L-220.10DG	L-220.20DG	L-220.50DG	L-220.70DG	L-220.10SG	L-220.20SG	L-220.50SG	L-220.70SG
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	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)	HD D-sub 26 (m)
Cable length	m		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Recommended controllers/drivers			C-863 C-885 with C-863. 20C885 C-884 ACS modular controller	C-863 C-885 with C-863. 20C885 C-884 ACS modular controller	C-863 C-885 with C-863. 20C885 C-884 ACS modular controller	C-863 C-885 with C-863. 20C885 C-884 ACS modular controller	C-663.12 C-885 with C-663. 12C885 ACS modular controller	C-663.12 C-885 with C-663. 12C885 ACS modular controller	C-663.12 C-885 with C-663. 12C885 ACS modular controller	C-663.12 C-885 with C-663. 12C885 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



	Travel	A	B	C
L-220.10SG	13	26	148,3	13
L-220.10DG	13	26	155,2	19,9
L-220.20SG	26	39	161,5	13
L-220.20DG	26	39	168,4	19,9
L-220.50SG	52	65	186,6	13
L-220.50DG	52	65	193,5	19,9
L-220.70SG	77	90	211,6	13
L-220.70DG	77	90	218,5	19,9

L-220, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.



L-220 linear actuators are available in various length versions and with DC or stepper motor with gearhead

## Drawings / Images



L-220.70SG with stepper motor with gearhead

## Order Information

### **L-220.10DG**

High-resolution linear actuator, DC gear motor, 13 mm travel range, 125 N feed force; 3.5 mm/s maximum velocity; ball screw; incremental rotary encoder, 512 counts/rev. resolution, A/B quadrature, RS-422; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 m cable length

### **L-220.20DG**

High-resolution linear actuator, DC gear motor, 26 mm travel range, 125 N feed force; 3.5 mm/s maximum velocity; ball screw; incremental rotary encoder, 512 counts/rev. resolution, A/B quadrature, RS-422; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 m cable length

### **L-220.50DG**

High-resolution linear actuator, DC gear motor, 52 mm travel range, 125 N feed force; 3.5 mm/s maximum velocity; ball screw; incremental rotary encoder, 512 counts/rev. resolution, A/B quadrature, RS-422; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 m cable length

### **L-220.70DG**

High-resolution linear actuator, DC gear motor, 77 mm travel range, 125 N feed force; 3.5 mm/s maximum velocity; ball screw; incremental rotary encoder, 512 counts/rev. resolution, A/B quadrature, RS-422; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 m cable length

## Order Information

**L-220.10SG**

High-resolution linear actuator; 2-phase stepper motor with gearhead; 13 mm travel range; 125 N feed force; 0.8 mm/s maximum velocity; ball screw; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 cable length

**L-220.20SG**

High-resolution linear actuator; 2-phase stepper motor with gearhead; 26 mm travel range; 125 N feed force; 0.8 mm/s maximum velocity; ball screw; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 cable length

**L-220.50SG**

High-resolution linear actuator; 2-phase stepper motor with gearhead; 52 mm travel range; 125 N feed force; 0.8 mm/s maximum velocity; ball screw; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 cable length

**L-220.70SG**

High-resolution linear actuator; 2-phase stepper motor with gearhead; 77 mm travel range; 125 N feed force; 0.8 mm/s maximum velocity; ball screw; limit switch: Hall effect, N/C contact, 5 V, NPN; 0.5 m cable length