Precision Linear Stage

High Velocity and Precision due to Magnetic Direct Drive

V-551

- Travel ranges to 230 mm
- Velocity up to 0.5 m/s
- Absolute encoder with 1 nm resolution
- Highest precision with PIOne linear encoder: Minimum incremental motion 0.5 nm
- High guiding accuracy
- Compact design with 160 mm width

Please note that at the moment only a limited selelction of variants of this product family is available.
If you require further information contact us via info@pi.ws.

Reference-class linear positioner
Thanks to the smooth-running precision linear guides with crossed roller bearings, the linear positioner is particularly suitable for scanning applications with constant velocity. The anti-creep system reliably prevents cage creep. The guides have high load capacity and high precision under all operating conditions.

Linear motors
Linear motors are electromagnetic direct drives. They dispense with mechanical components in the drivetrain and transfer the drive force directly and friction-free to the motion platform. The drives reach high velocities and accelerations. Ironless motors are particularly suitable for positioning tasks with the highest demands on precision because there is no undesirable interaction with the permanent magnets. This allows smooth running even at the lowest velocities and at the same time, there is no vibration at high velocities. Nonlinearity in control behavior is avoided and any position can be controlled easily. The drive force can be set freely.

Direct position measuring
Position measuring is performed with the highest accuracy directly at the motion platform so that nonlinearity, mechanical play or elastic deformation have no influence on position measuring.
The high-resolution PIOne encoder was developed by PI and, with corresponding processing of the measured values, allows a position resolution of much less than one nanometer. The optical and noncontact PIOne encoders are based on an interferometric measuring principle. Due to the short signal period and the high quality of the signals, the linearity error of PIOne encoders is less than 1 %. PIOne encoders support direction sensing when evaluating a reference signal.
Absolute encoders supply explicit position information that enables immediate determination of the position. This means that referencing is not required during switch-on, which increases efficiency and safety during operation.

Application fields
Industry and research. Automation. Metrology. Photonics and precision scanning in semiconductor or flat panel display manufacturing

Motion	Unit	Toleran-ce	V-551.2B	V-551.4B	V-551.7B
Active axes			X	X	X
Travel range in X	mm		60	130	230
Maximum velocity in X, unloaded	mm/s		500	500	500
Straightness (Linear crosstalk in Y with motion in X)	µm	Typ.	±1	±1	±2
Flatness (Linear crosstalk in Z with motion in X)	µm	Typ.	±2	±2	±2
Pitch (Rotational crosstalk in θY with motion in X)	µrad	Typ.	±50	±100	±100
Yaw (Rotational crosstalk in θZ with motion in X)	µrad	Typ.	±50	±50	±50

Positioning	Unit	Tolerance	V-551.2B	V-551.4B	V-551.7B
Minimum incremental motion in X	µm	Typ.	0.002	0.002	0.002
Bidirectional repeatability in X	µm	Typ.	0.05	0.05	0.05
Reference switch			–	–	–
Limit switches			Hall effect, N/O contact, 5 V, TTL	Hall effect, N/O contact, 5 V, TTL	Hall effect, N/O contact, 5 V, TTL
Integrated sensor			Absolute linear encoder	Absolute linear encoder	Absolute linear encoder
Sensor signal			BiSS-C	BiSS-C	BiSS-C
Sensor signal period	µm		–	–	–
Sensor resolution	nm		1	1	1

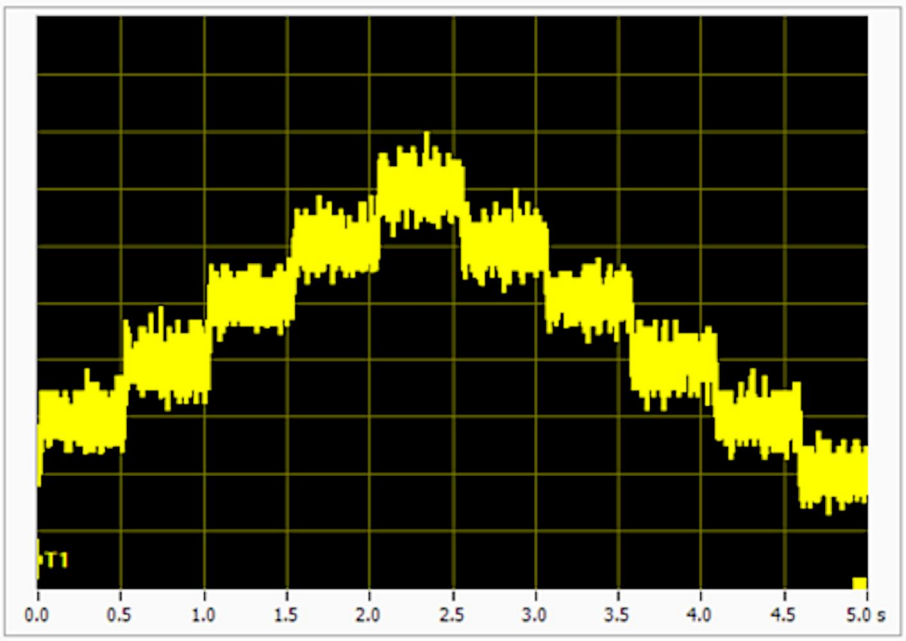
Drive Properties	Unit	Tolerance	V-551.2B	V-551.4B	V-551.7B
Drive type			Ironless 3-phase linear motor	Ironless 3-phase linear motor	Ironless 3-phase linear motor
Nominal voltage	V		48	48	48
Peak voltage	V		48	48	48
Nominal current, RMS	A	Typ.	1.5	1.5	1.5
Peak current, RMS	A	Typ.	10	10	10
Drive force in X	N	Typ.	27	27	27
Peak force in X	N		180	180	180
Force constant	N/A		18	18	18
Resistance phase-phase	Ω	Typ.	5.4	5.4	5.4
Inductance phase-phase	mH		1.8	1.8	1.8
Back EMF	V·s/m	Max.	16	16	16
Pole pitch N-N	mm		30	30	30

Mechanical Properties	Unit	Tolerance	V-551.2B	V-551.4B	V-551.7B
Permissible push force in Y	N	Max.	50	50	50
Permissible push force in Z	N	Max.	150	150	150
Moved mass in X, unloaded	g		2200	2700	4900
Guide			Crossed roller guide	Crossed roller guide	Crossed roller guide
Overall mass	g		4200	5500	9700
Material			Aluminum, black anodized	Aluminum, black anodized	Aluminum, black anodized

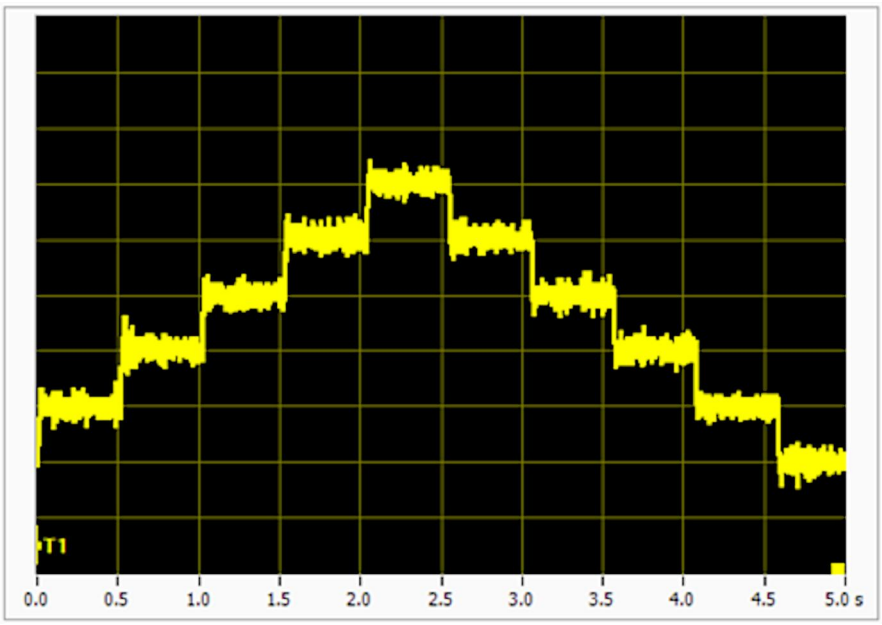
Miscellaneous	Unit		V-551.2B	V-551.4B	V-551.7B
Operating temperature range	°C		5 to 40	5 to 40	5 to 40
Connector			HD D-sub 26 (m)	HD D-sub 26 (m)	HD D-sub 26 (m)
Sensor connector			D-sub 15 (f)	D-sub 15 (f)	D-sub 15 (f)
Recommended controllers / drivers			C-891, C-885 with C-891.10C885, A-811.CE, G-901	C-891, C-885 with C-891.10C885, A-811.CE, G-901	C-891, C-885 with C-891.10C885, A-811.CE, G-901

Note on sensor resolution: interpolated
Note on minimum incremental motion: With ACS NanoPWM
Connecting cables are not included in the scope of delivery and must be ordered separately.

Drawings / Images

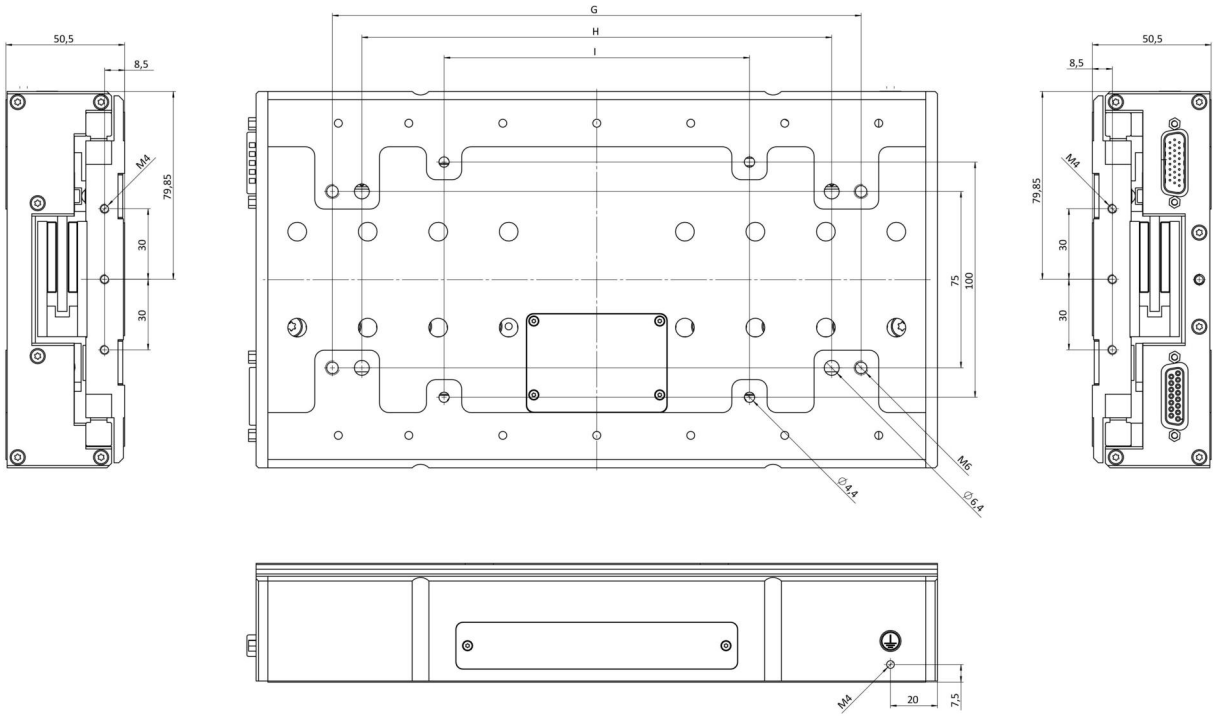


A V-551.4D with PIOne linear encoder performs a sequence of 0.5 nm steps.



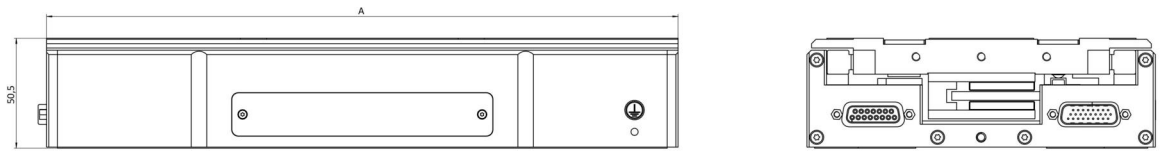
A V-551.4D with PIOne linear encoder performs a sequence of 1 nm steps.

Drawings / Images

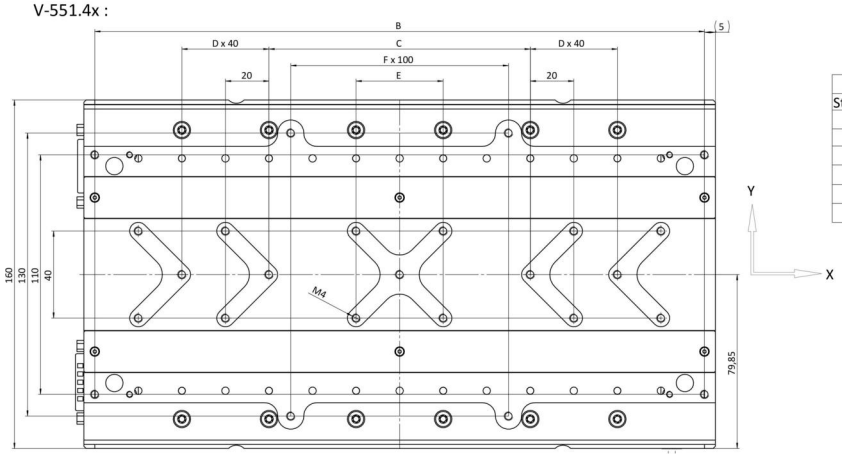


	V-551.2x	V-551.4x	V-551.7x
G	125	225	225
H	175	200	250
I	130	130	190

V-551, view from below and side views, dimensions in mm



V-551.4x :



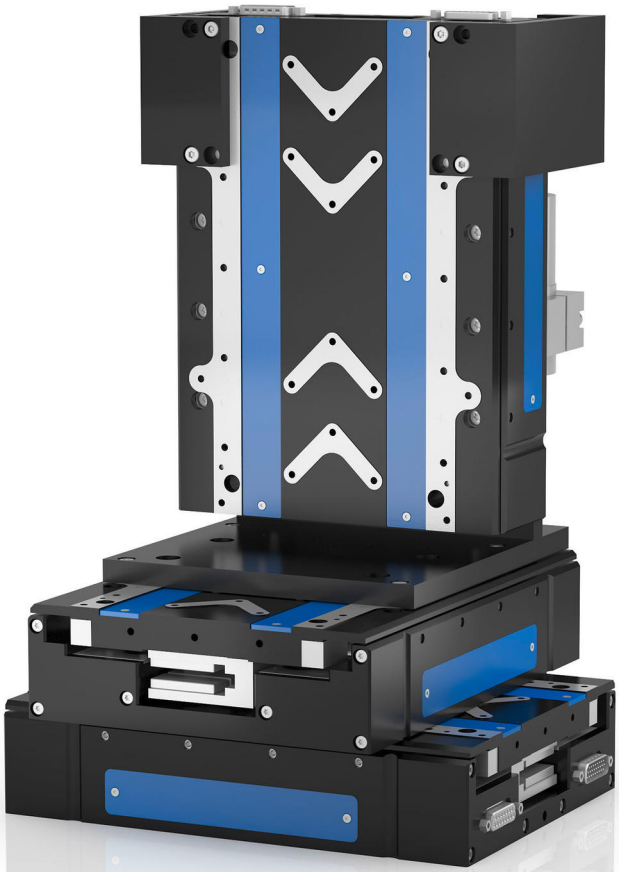
	V-551.2x	V-551.4x	V-551.7x
Stroke	60	130	230
A	220	290	450
B	210	280	440
C	60	120	120
D	1	1	3
E	-	40	40
F	1	1	3

V-551, view from above and side views, dimensions in mm

Drawings / Images

An XY setup of modified V-551.4D linear stages and an optional drag chain.

Drawings / Images



An XYZ assembly consisting of three V-551 linear stages each with 60 mm travel range. The Z axis was modified and has magnetic compensation of the weight force.

Order Information

V-551.2B
Precision linear stage, 160 mm width, 60 mm travel range, 150 N load capacity, absolute encoder, 1 nm sensor resolution, ironless 3-phase linear motor

V-551.4B
Precision linear stage, 160 mm width, 130 mm travel range, 150 N load capacity, absolute encoder, 1 nm sensor resolution, ironless 3-phase linear motor

V-551.7B
Precision linear stage, 160 mm width, 230 mm travel range, 150 N load capacity, absolute encoder, 1 nm sensor resolution, ironless 3-phase linear motor