

AXIS DESIGNATION						
Number of controlled axes	8					
Axes name	X1-X2	Y (top axis)	Fine Z	Tip-Tilt	Theta	Coarse Z
Thrust transmitter: DD (direct drive) or ID (indirect drive)	DD	DD	DD	DD	DD	DD

TESTING CONDITIONS	UNIT					
Position controller	-	VHP 100 10/30A	VHP 100 10/30A	VHP48		VHP100
Motion controller	-	ULTIMET ADVANCED				
Rated payload (1)	kg	2				0.25
Rated inertia (1)	kg.m ²	-	-	-	0.018	-
Rated input voltage	VDC	96	96	48		96
Tool point position	mm	324 mm above bottom surface				
Ambient temperature	°C	22 ± 1				
Isolation system	-	QUIET 6DOF Sandwich				

DIMENSIONAL DATA	UNIT					
Width	mm	1010				
Length	mm	777				
Height	mm	1094				
Total stroke	mm or °	365	355	±2	±0.08	364 12
Moving mass (without payload)	kg	39.3	17.3	5	-	3 0.6
Total mass (without payload)	kg	900				
Rotor inertia (without payload)	kg.m ²	NA	NA	NA	NA	0.004 NA

FORCE / TORQUE CAPABILITIES	UNIT					
Peak force / torque	N or Nm	1970	594	65.3	-	7.36 34.4
Continuous force / torque	N or Nm	458	162	15.7	-	0.831 11.3
Standstill force / torque	N or Nm	346	122	-	-	0.669 -
Max. detent force / torque (average to peak)	N or Nm	34	12	-	-	0 -
Static friction (maximal value)	N or Nm	10.7	11.8	-	-	0.2 5
Dynamic friction (maximal value)	N/(m/s) or Nm/(rad/s)	23.5	28.7	-	-	0.2 3

LOAD CAPACITIES	UNIT					
Maximum axial load	N	-	-	-	-	25 4

DYNAMIC PERFORMANCE	UNIT					
Duty cycle	%	20		-	-	6 70
Maximum speed	m/s or rad/s	1	1.2	0.1	-	10 0.25
Maximum acceleration	m/s ² or rad/s ²	25	25	3	-	180 8
Typical position stability at 2 kHz	nm or arcsec	±2	±2	±3	-	±0.025 ±50

ENCODER CHARACTERISTICS	UNIT						
Encoder and signal type	-	Optical incremental	Optical incremental	Optical Incremental		Optical incremental	Optical absolute
Output signal	-	1 Vpp	1 Vpp	1 Vpp		1 Vpp	EnDat 2.2
Signal period or line count	µm or period/turn	4	4	4		18'000	10
Reference mark	-	One	One	One centered in Z		One	Absolute
Power supply	V	5	5	5		5	5

WORKING ENVIRONMENT						
Clean room compatibility (2)	ISO2					

GUIDING ELEMENTS							
Type	-	Ball bearing	Ball bearing	Flexures		Ball bearing	Ball bearing

OPTIONS / ACCESSORIES / FEATURES	UNIT						
Gravity compensation	N	N/A	N/A	Yes	-	-	Yes

ACCURACY	UNIT	X1-X2	Y (top axis)	Fine Z	Tip-Tilt	Theta	Coarse Z
Positioning accuracy (without mapping)	µm or arcsec	±10	±30	-	-	±30	-
Positioning accuracy (with mapping)	µm or arcsec	±1	±1	-	-	-	-
Unidirectional repeatability	µm or arcsec	-	-	-	-	-	±10 (4) / ±5 (5)
Bidirectional repeatability	µm or arcsec	±0.4 (3)	±0.4 (3)	±0.03	-	±2	±15 (4) / ±7.5 (5)
Horizontal straightness / radial runout	µm	±1.5	±3.5	-	-	±3.5	-
Vertical straightness / total axial error at tool point	µm	±3	±5	-	-	±3	-
XY displacement while moving in Z (6)	µm	N/A	N/A	±0.1	-	-	±15
Orthogonality	arcsec	±15	-	-	-	-	-
Rx (with mapping)	arcsec	±20	±25	-	±20	-	-
Ry (with mapping)	arcsec	±20	±60	-	±20	-	-
Rz	arcsec	±1.5	±10	-	-	-	-

ELECTRICAL SPECIFICATIONS (7)	UNIT					
Motor type	-	Ironcore	Ironcore	Electro-Magnet	Ironless	Electro-Magnet
Motor model	-	LMG10-070-3SB-H01	LMG10-050-3TB-209	EMF-14.5-058-1NA-219	SLICE0109-15	EMG012-075
Number of phases	-	3	3	3 x single-phase	3	1
Kt Force constant	N/Arms or Nm/Arms	41.7	23.4	19.6	0.646	10.7
Ku Back EMF constant (8)	Vrms/(m/s) or Vrms/(rad/s)	25.2	14.2	19.6	0.372	10.9
Km Motor constant	N/√W or Nm/√W	30.4	24.6	8.34	0.309	6.11
R20 Electrical resistance at 20°C (8)	Ohm	1.25	0.605	5.5	2.92	3.06
L1 Electrical inductance (8)	mH	8.89	3.77	13.5	5.52	8.97
Ip Peak current	Arms	46.5	30	3.38	11.8	3.49
Ic Continuous current	Arms	5.69	7.22	0.8	1.33	1.05
Is Standstill current	Arms	4.32	5.47	-	1.01	-
ns Standstill speed	m/s or rad/s	0.14	0.14	-	-	-
Um Max. input voltage	VDC	100	100	48	100	100
Pc Max. cont. power dissipation	W	76.9	62.5	3.88	8.75	3.93
2τp Magnetic period	mm	32	32	-	-	-
2p Number of poles	-	-	-	-	32	-

VACUUM CHARACTERISTICS	UNIT						
Vacuum supply for wafer chuck	bar	-0.6					
Vacuum flow for axis cleanliness	l/min	20	20	-	-	5	5

TYPICAL MOVE AND SETTLE TIMES	UNIT						
Move 1: 10 µm within ±100 nm window	ms	40	40	-	-	-	-
Move 2: 25 mm within ±10 nm window	ms	125	125	-	-	-	-
Move 3: 80 mm within ±10 nm window	ms	170	185	-	-	-	-
Move 4: 100 µm within ±50 nm window	ms	-	-	60	-	-	-
Move 5: 1 mm within ±50 nm window	ms	-	-	100	-	-	-
Move 6: 10 mm within ±500 nm window	ms	-	-	-	-	-	180
Move 7: 1 deg within ±40 µdeg window	ms	-	-	-	-	70	-
Move 8: 180 deg within ±40 µdeg window	ms	-	-	-	-	450	-

MATERIAL AND FINISH						
Baseplate	-	Granite	Aluminium & silicon alloy	Anodized aluminum	-	Stainless steel
Carriage	-	Aluminium & silicon alloy	Stainless steel	Anodized aluminum	Stainless steel	Stainless steel

According to the Machinery Directive 2006/42/EC, the system presently described falls into the "partly completed machinery" category and fully complies with it as long as the system is operated according to the working conditions described in the corresponding manual. Customer is responsible for setting safeties/limitations that will keep the motor in its safe operating area. ETEL cannot be held responsible if the system is used in an improper way.

- Notes:** The specifications given may be mutually exclusive. Unless stated otherwise, all measurements are made within the testing conditions.
- (1) Payload can be assimilated to a cylinder of diameter 270 mm, 19 mm thick, weighting 2 kg. Inertia is expressed with respect to the center of gravity of the payload, Z being the axis of rotation.
 - (2) Under horizontal laminar flow conditions at 0.45 m/s along X axis. Measured at 12 mm above customer mobile interface. Contact ETEL for more details.
 - (3) Acceleration used is 20 m/s²
 - (4) Measured at a radius of 150 mm over full stroke.
 - (5) Measured at a radius of 150 mm over a limited stroke of 0 to +3 mm.
 - (6) Maximum displacement measured on a 100 µm sliding window, wherever the position on the fine Z stroke.
 - (7) Tolerances on electrical parameters are available upon request.
 - (8) Terminal to terminal.