



Z3TH COMBINED MODULE

ASME-NNNN-06-0015-0004xx

Data sheet

Version 1.3

ETEL

AXIS DESIGNATION

Number of controlled axes	6			
Axes name	Fine Z	Tip-Tilt	Coarse Z	Theta
Thrust transmitter: DD (direct drive) or ID (indirect drive)	DD	DD	DD	DD

TESTING CONDITIONS

	UNIT				
Position controller	-	VHP48 1.5/3A	VHP48 1.5/3A	VHP48 5/10A	VHP48 5/10A
Motion controller	-	UltimET			
Rated payload	kg (lbs)	-	-	0.15 (0.33)	1 (2.2)
Rated inertia	kg.m ²	-	-	-	7.74E-03
Rated acceleration	m/s ² (in/s ²) or rad/s ²	1 (0.04)	-	-	55
Rated speed	m/s (in/s) or rad/s	0.05 (0.002)	-	0.1 (0.04)	10 (95.5 rpm)
Tool point position	mm	52 mm above ZT3H chuck interface			
Ambient temperature	°C	22 ±1			
Isolation system	-	QuiET			

DIMENSIONAL DATA (1)

	UNIT				
Stage width	mm (in)	353 (13.89)			
Stage length	mm (in)	314 (12.36)			
Stage height	mm (in)	127 (5)			
Total stroke	mm (in)	±2 (±0.078)	±0.1°	15 (0.59)	364°
Moving mass (without rated payload)	kg (lbs)	3.8 (8.37)	-	0.4 (0.08)	-
Total mass (without payload)	kg (lbs)	8.3 (18.3)			
Rotor inertia (without payload)	kg.m ²	-	0.013	-	0.0024

FORCE / TORQUE CAPABILITIES

	UNIT				
Fp/Tp Peak force / torque	N or Nm	189.6	8.91	18.1	2.89
Fc/Tc Continuous force / torque	N or Nm	30	1.41	6.2	0.504
Fs/Ts Stall force / torque	N or Nm	30	1.41	6.2	0.337
Static friction (maximal value)	N or Nm	-	-	3	0.25
Dynamic friction (maximal value)	N/(m/s) or Nm/(rad/s)	-	-	-	0.03

LOAD CAPACITIES

	UNIT				
Maximum payload	kg (lbs)	2 (4.4)			
Maximum inertia	kg.m ²	0.035			

DYNAMIC PERFORMANCE

	UNIT				
Maximum acceleration	rad/s ²	-	-	-	55
Maximum speed	rad/s	-	-	-	10 (95.5 rpm)
Typical position stability	nm or arcsec	±1.9	±0.0043	-	±0.0038
Typical speed stability (tracking error at 10% of rated speed)	arcsec	-	-	-	2

STAGE ACCURACY (2)

	UNIT				
Positioning accuracy (with mapping)	µm or arcsec	±0.020	-	-	±0.75
Unidirectional repeatability (3)	µm or arcsec	±0.010	-	±30	-
Bidirectional repeatability (3)	µm or arcsec	±0.010	-	-	±0.35
Horizontal straightness / radial runout	µm	-	-	-	±1
Vertical straightness / total axial error	µm	-	-	-	±1
XY displacement while moving in Z	µm	±0.7	-	±1.05	-
Yaw	arcsec	±0.5	-	-	-

ELECTRICAL SPECIFICATIONS		UNIT	Fine Z	Tip-Tilt	Coarse Z	Theta
Motor type	-		Electro-magnet		Electro-magnet	Toothless
Motor model	-		EMF-050-1LA		EMG016.-054-1NA-209	TTB0120-15-3NA
Number of phases	-		4x monophase		1	3
Kt Force constant (4)	Nm/Arms or N/A _{DC}		16.9		12.1	0.693
Ku Back EMF constant (4)(5)	V _{rms} /(rad/s) or V _{DC} /(m/s)		16.9		12.6	0.41
R20 Electrical resistance at 20°C (5)	Ohm		9.55		10.6	9.06
L1 Electrical inductance (5)	mH		21.3		43.3	2.49
I_p Peak current (4)	Arms or A _{DC}		3		1.5	4.24
I_c Continuous current (4)	Arms or A _{DC}		0.45		0.5	0.841
I_s Stall current (4)	Arms or A _{DC}		-		-	0.595
n_s Stall speed	rad/s		-		-	0.0029 (0.028 rpm)
U_{dc} Nominal input voltage	VDC		48		48	48
P_c Max. cont. power dissipation	W		2		3	10.4
2p Number of poles	-		-		-	20

WORKING ENVIRONMENT	
Clean room compatibility (6)	ISO 1

ENCODER CHARACTERISTICS		UNIT			
Encoder and signal type	-		Optical / sin-cos	Inductive / analog	Optical / sin-cos
Output signal	-		1 V _{pp}	0-10 VDC	1 V _{pp}
Signal period or line count	µm or period/turn		0.512	n.a.	360'000
Reference mark	-		one (center of Z stroke)	n.a.	no
Power supply	V		5	15-30	5

VACUUM CHARACTERISTICS		UNIT			
Vacuum supply for wafer chuck					
V_c Vacuum at interface output	bar		-0.6		
Vacuum supply for axis cleanliness					
Fv_c Vacuum flow	l/min		-	-	5

TYPICAL MOVE AND SETTLE TIMES		UNIT			
Move 1: 100µm within ±30 nm	ms		45	-	-
Move 2: 1 mm within ±30 nm	ms		90	-	-
Move 1: 15 mm	ms		-	-	250
Move 1: 90° within ±20 µ°	ms		-	-	360
Move 2: 180° within ±20 µ°	ms		-	-	525
Move 3: 360° within ±20 µ°	ms		-	-	850

GUIDING ELEMENTS					
Type		Flexure	Flexure	Plain bearing	Rotary bearing (2x)

MATERIAL AND FINISH				
Baseplate		Anodized aluminum	-	-
Carriage		Anodized aluminum (7)	Anodized aluminum	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. Hypothesis, tolerances and definition are in ETEL systems documentation.
(1) With bumpers compressed (except for total stroke) and without any additional customer part attached to the mobile interface.

(2) Values given at 3 sigmas.

(3) Repeatability measured with 10 m/s² acceleration

(4) Monophase motor have DC values rather than rms values

(5) Terminal to terminal.

(6) Under lateral laminar flow conditions at 0.25 m/s. Measured 12 mm above customer mobile interface. Contact ETEL for more details.

(7) Contact ETEL is you consider mounting payload on this axis

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