



# Z3TM+ COMBINED MODULE

ASME-NNNN-04-364-0004-1

with AccurET VHP

Data sheet

Version 1.0

**ETEL**

AXIS DESIGNATION			
Number of controlled axes	4		
Axes name	Fine Z	Tip-Tilt	Theta
Thrust transmitter: DD (direct drive) or ID (indirect drive)	DD	DD	DD

TESTING CONDITIONS	UNIT			
Position controller	-	VHP 48 (5/10A)		VHP 100 (7/15A)
Motion controller	-	ULTIMET		
Rated payload (1)	kg	2		
Rated inertia (1)	kg.m <sup>2</sup>	-	-	0,018
Rated input voltage	VDC	48		96
Tool point position	mm	20 mm above Z3TM+ chuck interface		
Ambient temperature	°C	22 ± 1		
Isolation system	-	QUIET		

DIMENSIONAL DATA	UNIT			
Width	mm	284		
Length	mm	308		
Height	mm	90		
Total stroke	mm or °	±2	±0.08°	364°
Moving mass (without payload)	kg	5	-	3
Total mass (without payload)	kg	9,4		
Rotor inertia (without payload)	kg.m <sup>2</sup>	-	-	0,004

FORCE / TORQUE CAPABILITIES (2)	UNIT			
Peak force / torque	N or Nm	65,3	-	7,36
Continuous force / torque	N or Nm	15,7	-	0,831
Standstill force / torque	N or Nm	-	-	0,669
Max. detent force / torque (average to peak)	N or Nm	-	-	0
Static friction (maximal value)	N or Nm	-	-	0,2
Dynamic friction (maximal value)	N/(m/s) or Nm/(rad/s)	-	-	0,2

LOAD CAPACITIES	UNIT			
Maximum axial load	N	-	-	25

DYNAMIC PERFORMANCE	UNIT			
Duty cycle	%	-	-	6
Maximum speed	m/s or rad/s	0,1	-	10
Maximum acceleration	m/s <sup>2</sup> or rad/s <sup>2</sup>	3	-	180
Typical position stability at 2kHz	nm or arcsec	±3	-	±0.025

ACCURACY	UNIT			
Bidirectional repeatability	µm or arcsec	±0.03	-	±2
Horizontal straightness / radial runout	µm	-	-	±3.5
Total axial error at 0 [mm] radius	µm	-	-	±3
XY displacement while moving in Z (3)	µm	±0.1	-	-

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

## WORKING ENVIRONMENT

Clean room compatibility (4)	-	ISO1
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## ELECTRICAL SPECIFICATIONS (2)

	UNIT	Fine Z	Tip-tilt	Theta
Motor type	-	Electro-Magnet		Ironless
Motor model	-	EMF-14.5-058-1NA-219		SLICE0109-015
Number of phases	-	3 x single-phase		3
<b>Kt</b> Force constant	Nm/Arms or N/A <sub>DC</sub>	19,6		0,646
<b>Ku</b> Back EMF constant (5)	V <sub>rms</sub> (rad/s) or V <sub>DC</sub> (m/s)	19,6		0,372
<b>Km</b> Motor constant	Nm/√W	8,34		0,309
<b>R20</b> Electrical resistance at 20°C (5)	Ohm	5,5		2,92
<b>L1</b> Electrical inductance (5)	mH	13,5		5,52
<b>I<sub>p</sub></b> Peak current	Arms or A <sub>DC</sub>	3,38		11,8
<b>I<sub>c</sub></b> Continuous current	Arms or A <sub>DC</sub>	0,8		1,33
<b>I<sub>s</sub></b> Standstill current	Arms or A <sub>DC</sub>	-		1,01
<b>U<sub>m</sub></b> Max. input voltage	VDC	48		100
<b>P<sub>c</sub></b> Max. cont. power dissipation	W	3,88		8,75
<b>2p</b> Number of poles	-	-		32

## VACUUM CHARACTERISTICS (6)

	UNIT			
<b>Vacuum supply for wafer chuck</b>				
Vacuum at interface output	bar		-0,6	
<b>Vacuum supply for axis cleanliness</b>				
Vacuum flow	l/min	-	-	5

## TYPICAL MOVE AND SETTLE TIMES

	UNIT			
Move 1: 100µm within ±50 nm	ms	60	-	-
Move 2: 1mm within ±50 nm	ms	100	-	-
Move 1: 1° within ±40 µdeg	ms	-	-	70
Move 1: 90° within ±40 µdeg	ms	-	-	260
Move 2: 180° within ±40 µdeg	ms	-	-	450
Move 3: 360° within ±40 µdeg	ms	-	-	750

## GUIDING ELEMENTS

Type	-	Flexures	Ball bearing
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## MATERIAL AND FINISH

Baseplate	-	Anodized aluminum	-
Carriage	-	Anodized aluminum	Stainless steel

## OPTIONS / ACCESSORIES / FEATURES

	UNIT			
Gravity compensation	N	Yes	-	-

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) Tolerances on electrical parameters are available on request.
- (3) Maximum displacement measured over a 100 µm sliding window, wherever the position on the fine Z stroke.
- (4) Measured at the chuck interface level under horizontal laminar flow at 0.4 m/s without activating the Theta hard-stop.
- (5) Terminal to terminal.
- (6) Clean dry air : maximum size of particule 1 µm, maximum condensing point +3 °C, maximum concentration of oil 0.1 mg/m<sup>3</sup>.