GIMBAL PIEZOELECTRIC BASED 2 AXES POSITIONER

ABSTRACT

The DS describes the main features of the Gimbal piezoelectric based 2 axes positioner. It includes technical data and drawings.

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REVISION HISTORY

List of changes from original release to current revision.
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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1. Features

- Very high resolution
- Very low backlash
- High unpowered holding torque
- Absence of gears
- Absence of lubrication
- Redundant electrical connection in the piezoelectric elements
- Simple standard mechanical and electrical interfaces
- Space-qualified parts and materials
- Custom configurations available under request
- Full Gimbal system or individual motor available
- ITAR free

2. Applications

- Antenna pointing
- Solar arrays pointing
- Scientific instruments pointing
- Boom pointing

3. Description

Phi Drive developed the Gimbal piezoelectric based 2 axes positioner in a partnership with ARQUIMEA in the framework of the Pre2Pos project. The Pre2Pos project was part of the Horizon 2020 Innovation Programme from the European Union (Grant Agreement No. 733209).

The Gimbal is essentially a 2-DOFs (rotation in the roll and yaw axes) piezoelectric positioner developed for space applications. Its usage on satellites and probes can provide an extremely accurate way to point devices as required by several space applications. The Gimbal is formed by two motors driven by piezoelectric stacks with electric redundancy. It shows moderate torque capabilities, thus providing a very high accuracy and very low backlash to the user, therefore avoiding the use of additional gearboxes.

Several piezoelectric stacks separated in two phases operate with certain phase shift. This system provides individual rotative steps as small as 0.002° with a moderate speed. Adapting the working frequency, the output torque or the rotational speed can be adjusted according with the needs of the moment. The position is controlled by means of an optical encoder.

4. Dimensions

Fig. 1: Bottom view

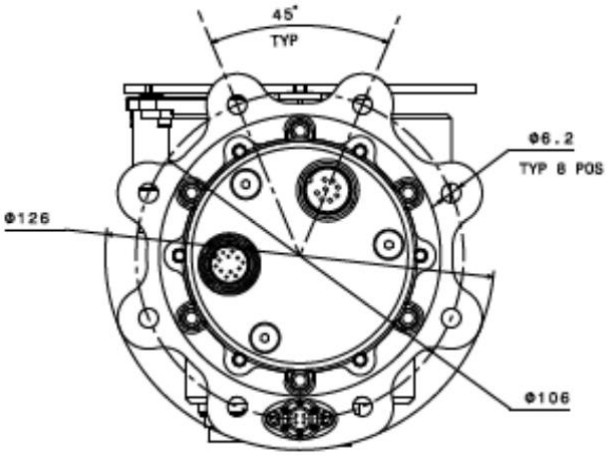
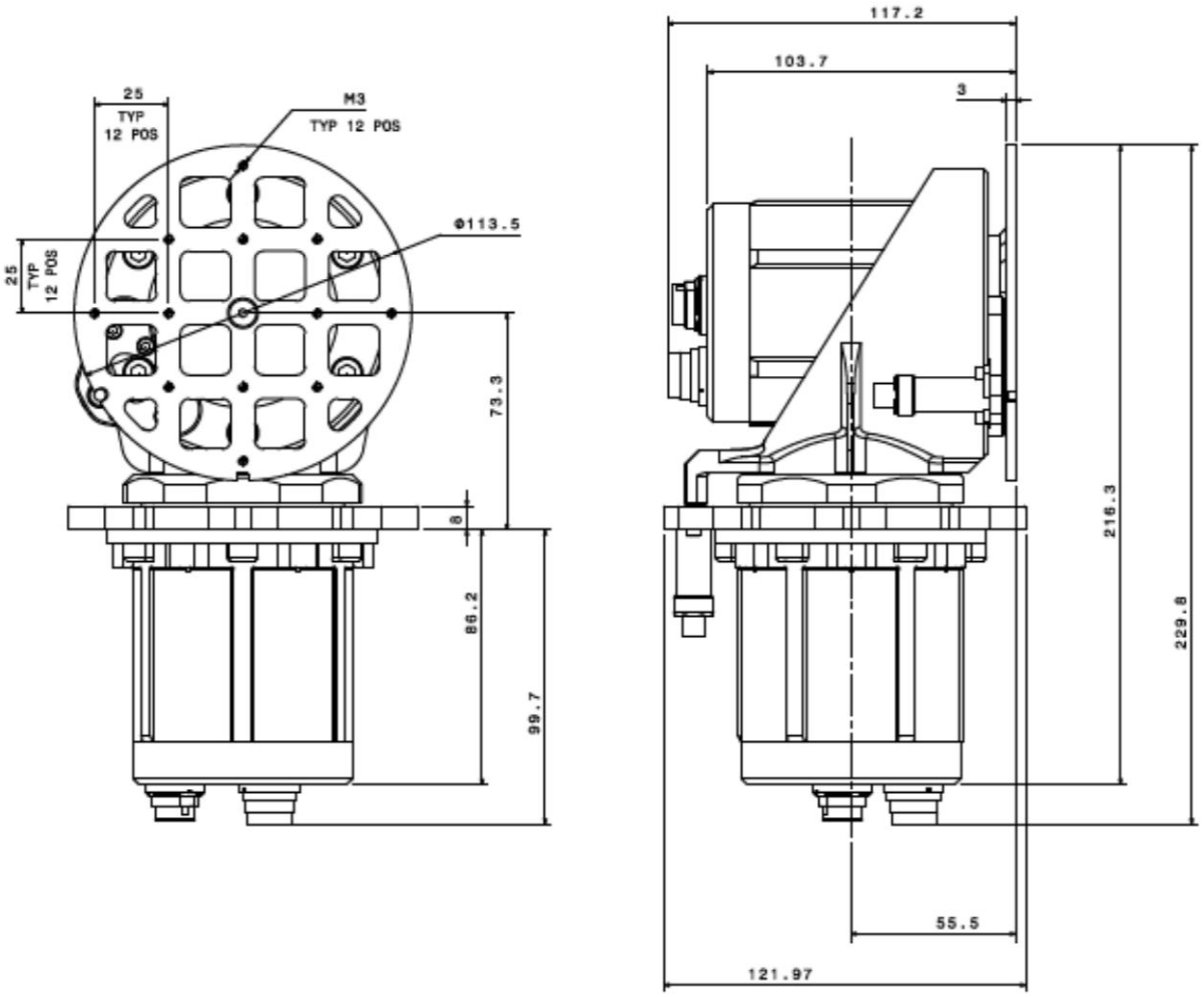


Fig. 2: Front (left) and left (right) view



5. Quality levels

Tab. 1: Quality levels

EM acceptance tests include	FM acceptance tests include EM tests plus
Physical measurements (envelop dimensions, mass)	Vibration (acceptance levels)
Electrical measurements (input capacitance, grounding, insulation)	Thermal vacuum cycling (actuation in extreme temperatures, voltage consumption and supplied current)
Actuation test (peak torque, maximum speed, voltage consumption and supplied current)	
Actuation test with redundant actuator (peak torque, maximum speed, voltage consumption and supplied current)	

6. Technical specifications

Tab. 2: Technical specifications

		Properties at standard operation temperature	Unit
Actuator technology		Piezo stacks	
Output torque		1	Nm
Powered holding torque		1	Nm
Unpowered holding torque		1	Nm
Angular range		360, yaw axis limited due to harness	deg
Speed		80	RPM
Output resolution		<0.002	deg
Measured angle resolution		0.002	deg
Mechanical interface	To Gimbal	8x M6x16 screws	
	To load	Array of threatened connections	
Electrical interface	With 2 channels	40	V
	Connector 1	Power, circular 8 pins	
	Connector 2	Encoder, circular 12 pins	
Operating temperature		-30 to +50	°C
Non-operation survival temperature		-50 to +70	°C
Life cycles (minimum)		1000	revolutions
Mass		2.1	kg
Part number		ARQ_16601_240000	

The Gimbal standard set includes:

- Gimbal device

The following accessories can be procured apart:

- Screws for connection to spacecraft or to load
- HDRM to hold the system during launch
- Aerial cables to connect the system to the spacecraft
- EGSEs and MGSEs for test

NOTES:

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