DPT-E Digital Piezo Translators

Actuators / Translators

Precision, accuracy and speed for the best in nano-positioning. The DPT-E range of actuators are designed with capacitive feedback control to give precise positioning.

DPT-E actuators are ideal for the most demanding applications. The actuators are capable of moving loads of up to 60 kg over their full travel range. Low electronic noise and high linearity, give confidence that the actuator is positioned with precision, speed and accuracy. The super invar construction provides high thermal stability and gives superior positional stability.

The DPT-E is a low voltage replacement for the high voltage DPT-C range of actuators. The dimensions are identical to the DPT-C range with travel ranges which have increased by at least 25% and dynamic performance is enhanced.

Key features

- Preloaded super-invar construction
- Capacitive sensor feedback control
- High blocking force
- Plug and play inter-changeability
- Friction free positioning providing sub nanometer repeatability
- UHV, radiation hard / cryogenic non-magnetic and high temperature variants

Typical applications

- Interferometry
- Beam alignment
- Mask wafer chuck alignment
- Cavity tuning
- Metrology

Suggested controllers

- NPC-D-5200 Digital Controller
- NPC-D-6330 Multi-channel Closed Loop Controller

Designed specifically to control Queensgate's Nanometer Precision Mechanisms incorporating capacitive sensors. They give precise positional feedback delvering high resolution and linearity of movement.
Market-leading update rates (20usec) and algorithms which control acceleration contribute to high speed positioning applications that require high speed movement of the stage.

The PC software facilitates user optimisation of all operating parameters, including PID and notch filter set up. There are eight programmable slots, three which are factory set to provide fast, medium and slow PID settings, the additional five slots are available for application specific settings.

The calibration and dynamic settings are held in the actuator eprom which allows controllers (plug and play) to be interchanged with minimal performance changes.

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Technical specification

Parameter	Value						Units	Comments
State physical								
Variant	DPT-E-20	DPT-E-50	DPT-E-110	DPT-E-20-UHV	DPT-E-50-UHV	DPT-E-1100-UHV		
Supersedes model	DPT-C-S	DPT-C-M	DPT-C-L	DPT-C-S-UVAC	DPT-C-M-UVAC	DPT-C-L-UVAC		
Material	Super Invar (0.35nm/K CTE)							Note 1
Length	44.2	76.7	127.8	42.2	76.7	127.8	mm	+/- 0.3
Diameter	20	20	20	20	20	20	mm	
Air cable length	2	2	2	1	1	1		Longer on request
UHV Kapton Cable Length	N/A	N/A	N/A	1	1	1		Longer on request
Closed loop range	20	50	110	20	50	110	µm	Note 2
Open loop range	26	66	145	26	66	145	µm	Typical
Max force generation	3500	3500	3500	3500	3500	3500	N	Typical
Full range push force	600	600	600	600	600	600	N	Note 3
Max pull force	200	200	200	200	200	200	N	Note 8
Stiffness	120	48	21	120	48	21	N/µm	Typical
Response (settle) time	<2	<2.5	<3	<2	<2.5	<3	ms	Note 4

Notes

1. Housing (out of the thermal expansion loop) in Stainless Steel 316 or 316L on UHV models.
2. Typical value for actuators operated in open loop.
3. Full closed loop range forces greater than this may lead temporarily to range reduction.
4. 0.5 µm step, unloaded with a fast PID setting and using a digital controller.
5. This is the maximum actual physical rms position noise of the actuator with slow PID setting and the digital controller using standard cable lengths. Longer cable lengths will increase position noise. For bespoke cable lengths linearity and resolution my differ from that listed.
6. Percent error over the full range of motion using a digital controller.
7. Measured at the centre of the actuator displacement.
8. Pulling in excess of this value can cause the actuator to require recalibration. Total Preload is 320N, for larger pulling forces add the external preload accessory.

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Dynamic physical								
Position resolution	0.09	0.12	0.15	0.2	0.35	0.4	nm	Note 5
Storage temperature	-50 to +100	-50 to +100	-50 to +100	-50 to +100	-50 to +100	-50 to +100	ºC	
Operating pressure	1 Atm	1 Atm	1 Atm	1 Atm	10^{-3} to 10^{-10} Torr	10^{-3} to 10^{-10} Torr		
Error terms (typical)								
Linearity Error (peak to peak)	<0.03	<0.03	<0.03	<0.08	<0.08	<0.08	%	Note 6
Repeatability (rms)	0.5	0.6	0.8	0.8	1	1.2	nm	Typical

Customized solutions:
Please contact us for any specific requirements not shown on this datasheet.

Vacuum compatible options are available with a variety of feed though options to suit your vacuum system. Systems are calibrated with the feed through connected. Flanges can be ordered with the actuator as a complete system. To guarantee inter-changeability please ensure airside cables are ordered to connect from the feed through to the controller. Note that cable material and length influence position noise performance.

Ultra High Vacuum (UHV) option:
The DPT-Es are available in vacuum compatible options: these special actuators are made from very low outgassing materials and can be baked out at up to 90°C. Please specify the suffix –UHV.

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High temperature option:
Operating up 110°C and can be baked out at 130°C. Range and pushing forces will reduce from standard models. These are also desirable for high frequency dynamic operations as self-heating is reduced.

Non magnetic option:
Super Invar parts are replaced with nonmagnetic Stainless Steel.

Radiation hard option:
Uses materials which degrade less when exposed to radiation, available on UHV models only.

Ordering information

Product Ref	Description
QGDTP-E-20	DPT-E-20 Digital Piezo Translator
QGDTP-E-50	DPT-E-50 Digital Piezo Translator
QGDTP-E-110	DPT-E-110 Digital Piezo Translator
QGDTP-E-20-UHV	DPT-E-20-UHV Digital Piezo Translator
QGDTP-E-50-UHV	DPT-E-50-UHV Digital Piezo Translator
QGDTP-E-110-UHV	DPT-E-110-UHV Digital Piezo Translator
	Accessories
QGVEP3	V-groove end piece
QGFS25-1”	25mm diameter mirror holder
QGFS12-½”	12.5mm diameter mirror holder
QGBEP5	Spherical end piece
QGPEP	PEP: plain end piece
QGMEP	MEP: magnetic end piece
QGCMI-D	CMI-D: mounting block
	Please contact us for additional external preload for larger pulling forces
	Please contact us for custom solutions to meet your needs
	Alternative products
QGNPS-Z-15B	NPS-Z-15B offers flexure guidance
QGNPS-Z-15L	NPS-Z-15L gives ten times the force for very large load applications
QGNPS-Z-500B	NPS-Z-500B offers a longer actuation range with reduced pushing force

Owing to continuous development, we reserve the right to introduce improvements and modify specifications without prior notice.

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