

# DPT-E DIGITAL PIEZO TRANSLATORS

## Actuators / Translators

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 of up to 110  $\mu\text{m}$ .

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. Dimensions are identical with travel ranges increased by at least 25% and dynamic performance is enhanced.



## Key features

- Closed-loop travel ranges from 20  $\mu\text{m}$  to 110  $\mu\text{m}$
- 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
- NanoScan NPC-D-6110 Single channel and NPC-D-6330 Multi-channel Closed Loop Controllers

Designed specifically to control Queensgate's Nanometer Precision Mechanisms incorporating capacitive sensors. They give precise positional feedback delivering high resolution and linearity of movement.

Market-leading update rates (20  $\mu\text{sec}$ ) 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 eeprom which allows controllers (plug and play) to be interchanged with minimal performance changes.

## Technical specifications

Parameter	Value						Units	Comments
State physical								
Variant	DPT-E-020	DPT-E-050	DPT-E-110	DPT-E-020-UHV	DPT-E-050-UHV	DPT-E-110-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	
Stage mass	126	126	126	126	126	126	g	Note 2
Air cable length	2	2	2	1	1	1		To be ordered separately.
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 3
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 4
Max pull force	200	200	200	200	200	200	N	Note 9
Stiffness	120	48	21	120	48	21	N/µm	Typical
Response (settle) time	2	2.5	3	2	2.5	3	ms	Typical, Note 5
Dynamic physical								
Position resolution	0.09	0.12	0.15	0.2	0.35	0.4	nm	Note 6
Storage temperature	-50 to +100	-50 to +100	-50 to +100	-50 to +100	-50 to +100	-50 to +100	°C	
Operating pressure	1 Atm	1 Atm	1 Atm	10 <sup>-3</sup> to 10 <sup>-10</sup> Torr	10 <sup>-3</sup> to 10 <sup>-10</sup> Torr	10 <sup>-3</sup> to 10 <sup>-10</sup> Torr		
Error terms (typical)								
Linearity Error (peak to peak)	<0.03	<0.03	<0.03	<0.08	<0.08	<0.08	%	Note 7
Repeatability (rms)	0.5	0.6	0.8	0.8	1	1.2	nm	Typical

### Notes

- Housing (out of the thermal expansion loop) in Stainless Steel 316 or 316L on UHV models.
- Excludes cable and connector mass
- Typical value for actuators operated in open loop.
- Full closed loop range forces greater than this may lead temporarily to range reduction.
- 0.5 µm step, unloaded with a fast PID setting and using a digital controller.
- 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 may differ from that listed.
- Percent error over the full range of motion using a digital controller.
- Measured at the centre of the actuator displacement.
- 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.

## Ultra High Vacuum (UHV)

The DPT-E is available as ultra-high vacuum compatible as standard: these special actuators are made from very low outgassing materials and can be baked out at up to 90°C.

Vacuum compatible systems can be supplied with a feedthrough to suit customer requirements. SMA connectors are fitted as standard. Systems are calibrated with the feedthrough 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 feedthrough to the controller. Note that cable material and length influence position noise performance.

## Customized solutions

Please contact us for any specific requirements not shown on this datasheet. Customised version for the following environments are available on request.

## High temperature

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

Super Invar parts are replaced with nonmagnetic Stainless Steel.

## Radiation hard

Uses materials which degrade less when exposed to radiation (available on UHV models only).

## Ordering information

Product Ref	Description
QGDPT-E-020-2M	DPT Actuator - 20 µm travel range (closed-loop), preloaded, capacitive sensor, 2m cable
QGDPT-E-050-2M	DPT Actuator - 50 µm travel range (closed-loop), preloaded, capacitive sensor, 2m cable
QGDPT-E-110-2M	DPT Actuator - 110 µm travel range (closed-loop), preloaded, capacitive sensor, 2m cable
QGDPT-E-020-UHV-1M	DPT Actuator - Ultra-high vacuum (UHV), 20 µm travel range (closed-loop), preloaded, capacitive sensor, 1m cable
QGDPT-E-050-UHV-1M	DPT Actuator - Ultra-high vacuum (UHV), 50 µm travel range (closed-loop), preloaded, capacitive sensor, 1m cable
QGDPT-E-110-UHV-1M	DPT Actuator - Ultra-high vacuum (UHV), 110 µm travel range (closed-loop), preloaded, capacitive sensor, 1m cable
QG242-SMADF50-C40-4	UHV feedthrough 4 x floating SMA DN-40CF (1 channel stage/DPT or 2 channel sensor) RAD HARD
QG4SMA-17W-1	1m air side stage/actuator cable 4 x SMA to 17 way D-type (built in full calibration)
QG4SMA-17W-2	2m air side stage/actuator cable 4 x SMA to 17 way D-type (built in full calibration)
QG4SMA-17W-3	3m air side stage/actuator cable 4 x SMA to 17 way D-type (built in full calibration)
	<b>Accessories<sup>1</sup></b>
QGVPE3	V-groove end piece
QGFS25	25mm diameter mirror holder
QGFS12	12.5mm diameter mirror holder
QGBEP5	Spherical end piece
QGPPEP	PEP: plain end piece
QGMPEP	MEP: magnetic end piece
QGMBI-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
	<b>Alternative products</b>
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

### Notes

1. Refer to Installation and Handling Instructions for more information.

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