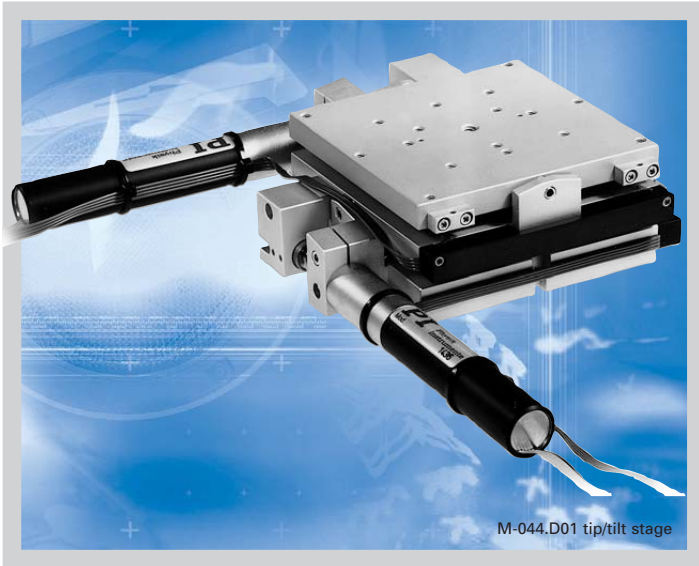


# M-041 • M-044

## Tip/Tilt Stages



- One- & Two-Axis Tilt Stages
- Zero Backlash
- Sub- $\mu$ rad Resolution
- Manual and DC-Motor Drives
- Compatible with Leading Industrial Motion Controllers
- Optional Piezo Drives for Tracking and Scanning

M-041 through M-044 are one- and two-axis ( $\theta_x$ ,  $\theta_y$ ) tip/tilt stages for small loads. They are spring preloaded for elimination of backlash and feature resolution and repeatability superior to that of goniometric cradles. Versions with piezo translators allow ultra-high-resolution dynamic scanning and tracking. See the "Active Optics" section for fast, ultra-high-resolution, tip/tilt platforms p. 3-8.

The two basic versions (with part number extension .00) are equipped with manual micrometer drives providing 65 and 80  $\mu$ rad minimum incremental motion, respectively. The versions with extension .D01 are equipped with closed-loop, DC-servo-motor drives (model M-227.10, see page 7-76 for fur-

ther details and recommended motor controllers) providing 15 and 12  $\mu$ rad minimum incremental motion, respectively. Sets of limit switches eliminate the possibility of overtravel.

### High-Resolution Piezo Option

For sub- $\mu$ rad resolution and dynamic tracking or scanning, optional open-loop/closed-loop piezo drive upgrade kits are available. See the P-840 and P-841 see page 1-34 in the "Piezo Actuators" section for further details and recommended controllers. The piezo drives can also be ordered subsequently to upgrade manual or motorized systems.

### Notes

See "Accessories", page 7-92 ff. for adapters, brackets, etc.

### Ordering Information

#### M-041.00

Small Tilt Stage, Manual Micrometer Drive

#### M-041.D01

Small Tilt Stage, DC-Motor Drive

#### M-042.00

Small Tip/Tilt Stage, Manual Micrometer Drive

#### M-042.D01

Small Tip/Tilt Stage, DC-Motor Drive

#### M-043.00

Tilt Stage, Manual Micrometer Drive

#### M-043.D01

Tilt Stage, DC-Motor Drive

#### M-044.00

Tip/Tilt Stage, Manual Micrometer Drive

#### M-044.D01

Tip/Tilt Stage, DC-Motor Drive

### Upgrades

#### M-041.U0

Open-Loop Piezo Drive Upgrade Kit for M-041 Tilt Stages

#### M-041.US

Closed-Loop Piezo Drive Upgrade Kit for M-041 Tilt Stages

#### M-042.U0

Open-Loop Piezo Drive Upgrade Kit for M-042 Tip/Tilt Stages

#### M-042.US

Closed-Loop Piezo Drive Upgrade Kit for M-042 Tip/Tilt Stages

#### M-043.U0

Open-Loop Piezo Drive Upgrade Kit for M-043 Tilt Stages

#### M-043.US

Closed-Loop Piezo Drive Upgrade Kit for M-043 Tilt Stages

#### M-044.U0

Open-Loop Piezo Drive Upgrade Kit for M-044 Tip/Tilt Stages

#### M-044.US

Closed-Loop Piezo Drive Upgrade Kit for M-044 Tip/Tilt Stages

**Ask about custom designs!**

Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

**Hexapods / Micropositioning**

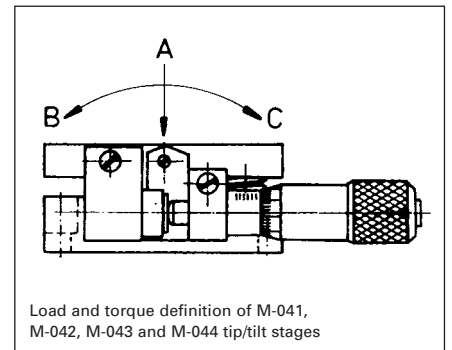
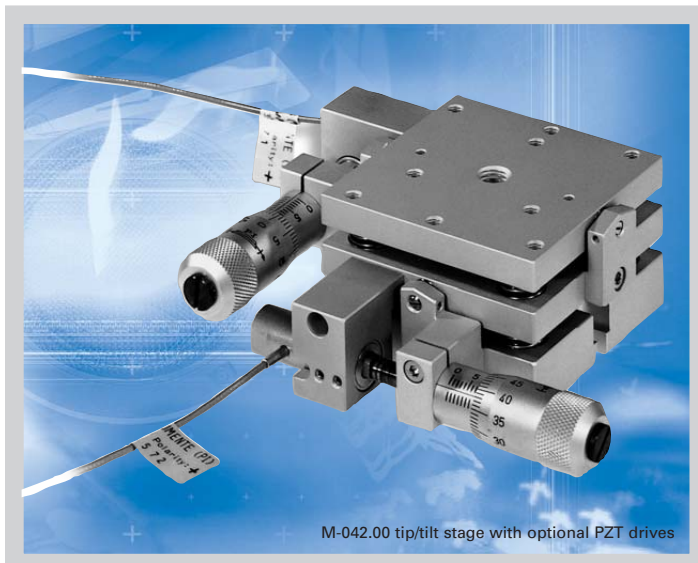
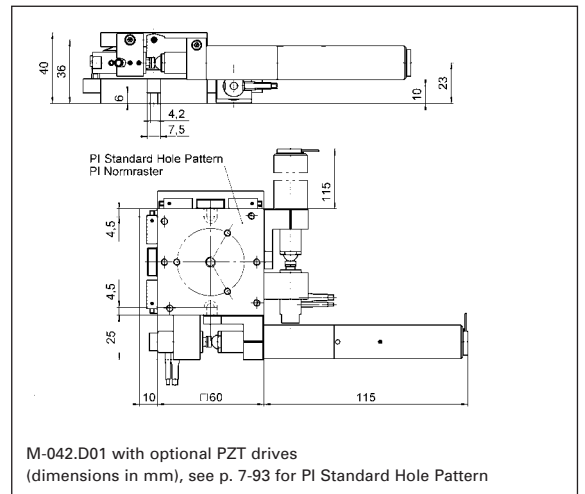
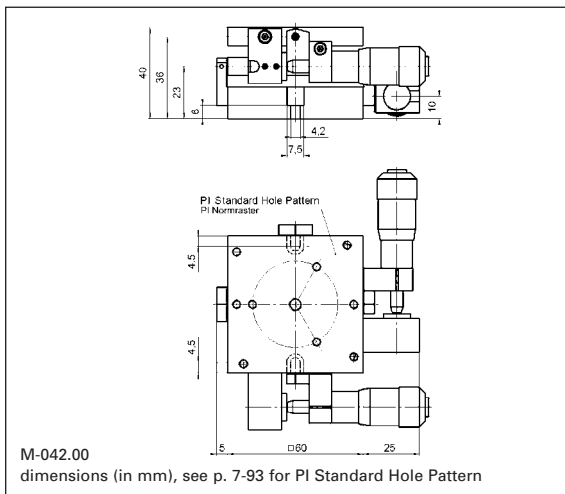
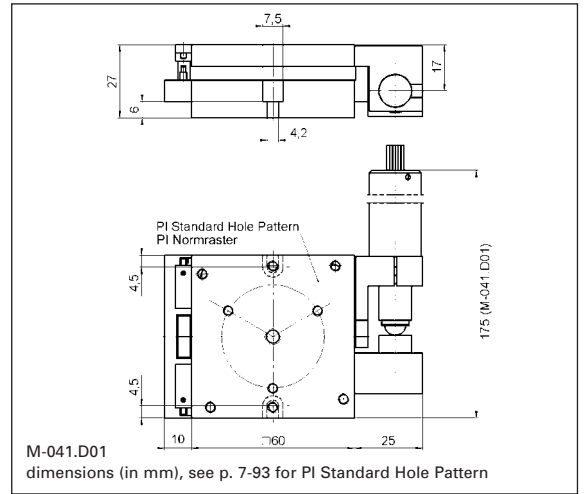
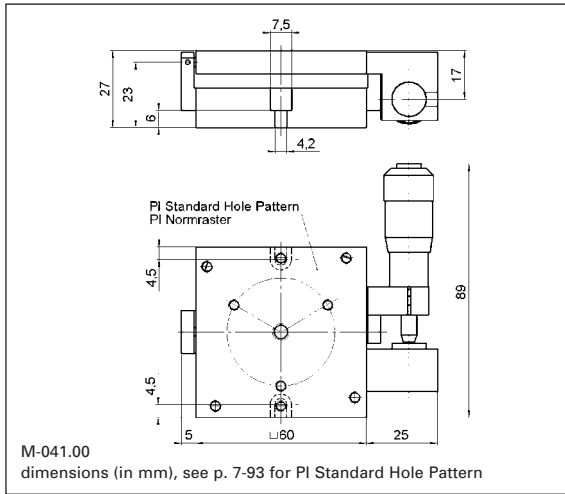
Photonics Alignment Solutions

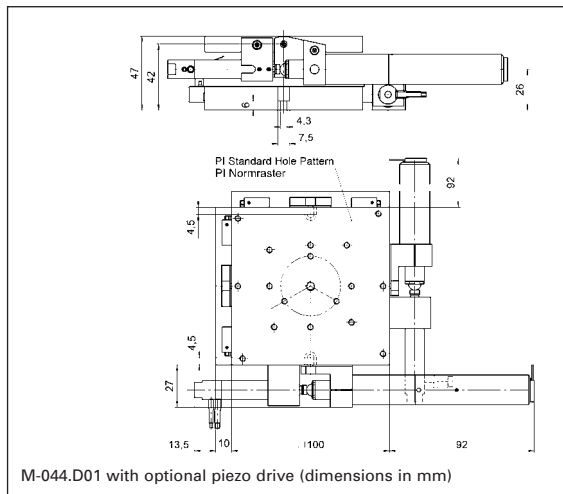
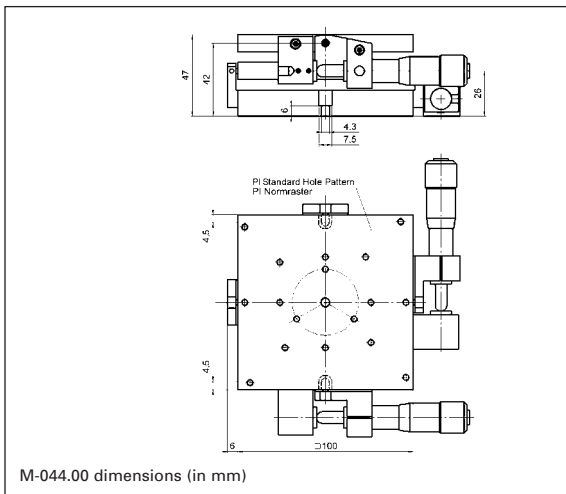
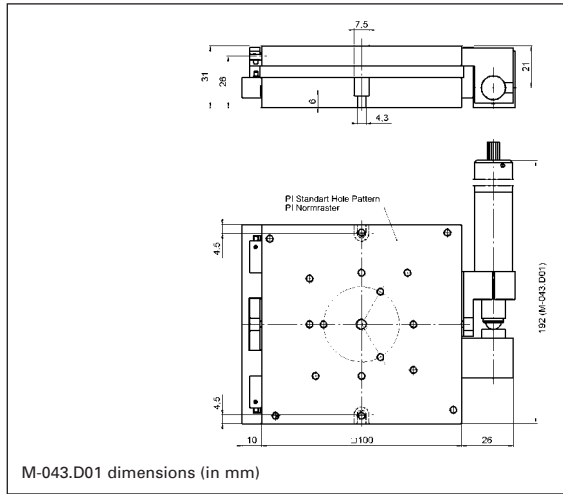
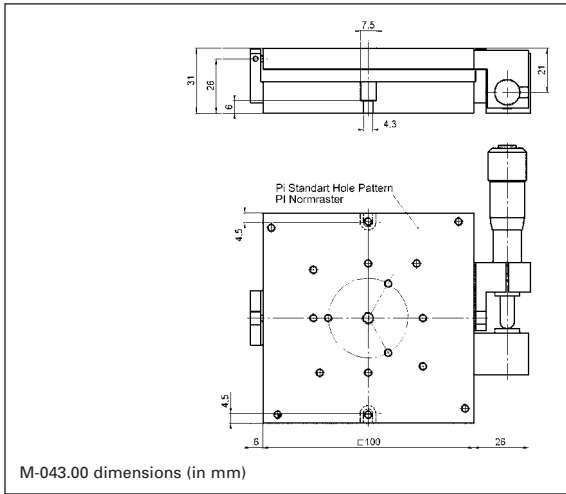
Motion Controllers

Ceramic Linear Motors & Stages

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## Tip/Tilt Stages (cont.)





**Technical Data**

Models	M-041.00	M-042.00	M-043.00	M-044.00	M-041.D01	M-042.D01	M-043.D01	M-044.D01	Units	Notes
Tilt Axes	$\theta_x$	$\theta_x, \theta_y$	$\theta_x$	$\theta_x, \theta_y$	$\theta_x$	$\theta_x, \theta_y$	$\theta_x$	$\theta_x, \theta_y$		
Tilt Range	$\pm 9$	$\pm 9$	$\pm 7$	$\pm 7$	$\pm 9$	$\pm 9$	$\pm 7$	$\pm 7$	$^\circ$ (axis)	
Fine Range (piezo option)	$\pm 1.2$	$\pm 0.6$	$\pm 1.4$	$\pm 1.4$	$\pm 1.2$	$\pm 0.6$	$\pm 1.4$	$\pm 1.4$	mrad (axis)	
Design resolution	-	-	-	-	0.28	0.28	0.23	0.23	$\mu$ rad	A3
Min. incremental motion	80	80	65	65	5	5	5	5	$\mu$ rad	A4
Min. incremental motion (piezo option)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	$\mu$ rad	A4
Rotation / linear input	80	80	65	65	80	80	65	65	$\mu$ rad/ $\mu$ m	A5
Unidirectional repeatability	-	-	-	-	20	20	15	15	$\mu$ rad	
Backlash	-	-	-	-	200	200	175	175	$\mu$ rad	
Max. velocity (motor)	-	-	-	-	4.5	4.5	3.6	3.6	$^\circ$ /s	
Max. load (A)	4	4	5	5	4	4	5	5	kg	
Max torque (B, C)	450, 150	450, 150	750, 250	750, 250	450, 150	450, 150	750, 250	750, 250	mNm	
Drive	M-622 Micrometer	M-622 Micrometer	M-624 Micrometer	M-624 Micrometer	M-227.10 DC-Mike	M-227.10 DC-Mike	M-227.10 DC-Mike	M-227.10 DC-Mike		
Piezo drive (optional) M-04x.U0 / M-04x.US	P-840.20 / P-841.20	P-840.10 / P-841.10	P-840.30 / P-841.30	P-840.30 / P-841.30	P-840.20 / P-841.20	P-840.10 / P-841.10	P-840.30 / P-841.30	P-840.30 / P-841.30		D1
Weight	0.4	0.6	0.8	1.2	0.5	0.7	0.9	1.5	kg	
Body material	Al	Al	Al	Al	Al	Al	Al	Al		L

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