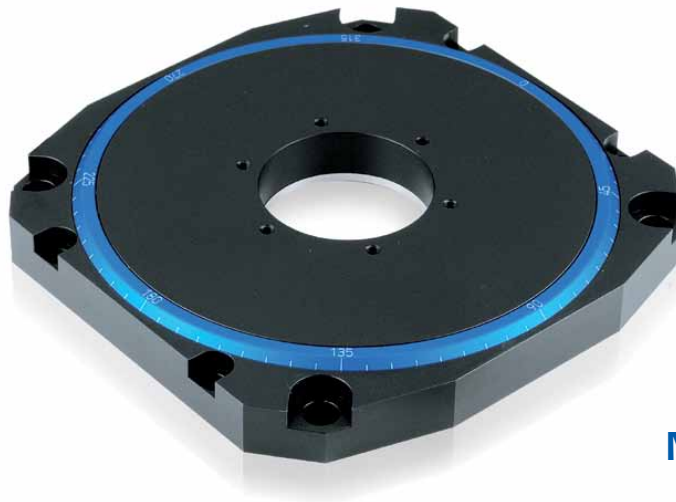


## Fast Rotation Stages with Ultrasonic Motors



M-660



U-628



U-624



U-622

# Miniaturized Rotation Stage

20 MM SIDE LENGTH, INTEGRATED ENCODER



## U-622

- Only 20 mm edge length, height 10 mm
- Integrated, direct-measuring incremental encoder
- Rotation range  $>360^\circ$
- High velocity 720  $^\circ/\text{s}$
- Drive torque 5 mNm

### Precision-class miniature rotation stage

Integrated, direct-measuring incremental encoder.  
Rotation range  $>360^\circ$ . Optical reference point switch

### PILine® ultrasonic piezo motor

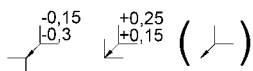
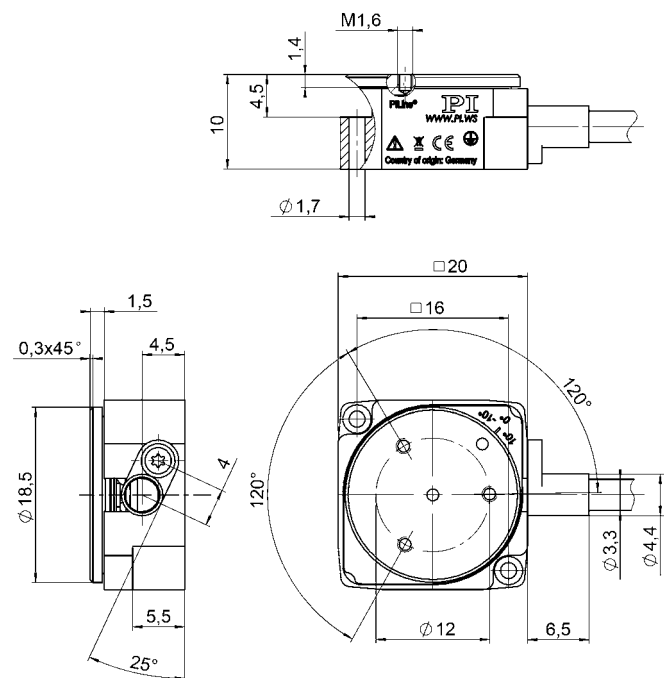
The piezoceramic ring-shaped motor acts directly on the rotating platform. Self-locking at rest, therefore no heat

generation. No drive noises. High velocity to 720  $^\circ/\text{s}$ . Holding torque 5 mNm

### Fields of application

Sample handling and positioning in research and industry for installations limited in space. Vacuum version for  $10^{-6}$  hPa optional

	U-622.03	Unit	Tolerance
Active axes	$\theta_z$		
<b>Motion and Positioning</b>			
Rotation range	>360	°	
Integrated sensor	Incremental encoder		
Design resolution	175	$\mu\text{rad}$	
Min. incremental motion	525	$\mu\text{rad}$	typ.
Bidirectional repeatability	$\pm 1050$	$\mu\text{rad}$	
Velocity	720	°/s	max.
<b>Mechanical Properties</b>			
Load capacity / axial force	0.3	N	max.
Holding torque	0.005	Nm	max.
Torque cw / ccw ( $\theta_z$ )	0.005	Nm	max.
<b>Drive Properties</b>			
Motor Type	PILine® ultrasonic piezomotor, performance class 1		
Reference point switch	Optical		
<b>Miscellaneous</b>			
Operating temperature range	0 to 40	°C	
Material	Al (black anodized)		
Mass	120	g	$\pm 5\%$
Cable length	1.5	m	$\pm 10\text{ mm}$
Connector	Sub-D connector, 15-pin (m)		
Recommended controller/driver	C-877.1U11: 1 channel, affordable compact device C-877.2U12: 2 channels, affordable bench-top C-867.1U: 1 channel C-867.2U: 2 channels		



U-622, dimensions in mm

# Fast Miniature Rotation Stage

WITH ULTRASONIC PIEZOMOTOR



## U-624

- Only 30 mm edge length, height 12 mm
- Integrated, direct-measuring incremental encoder
- Rotation range >360°
- High velocity 720 °/s
- Drive torque 10 mNm

### Small, precision-class rotation stage

Integrated, direct-measuring incremental encoder.  
Rotation range >360°. Optical reference point switch

### PILine® ultrasonic piezo motor

The piezoceramic ring-shaped motor acts directly on the rotating platform. Self-locking at rest, therefore no heat

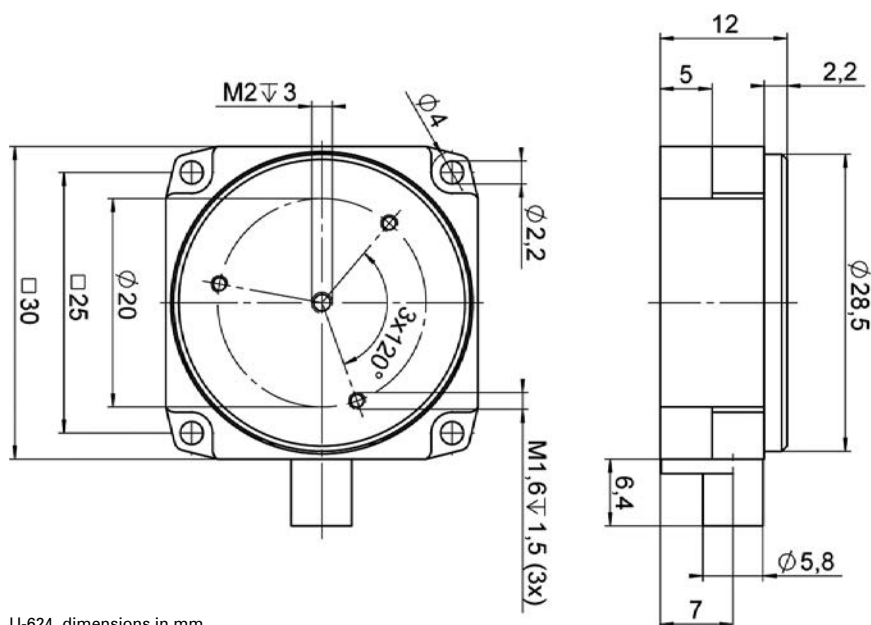
generation. No drive noises. High velocity to 720 °/s.  
Holding torque 10 mNm

### Fields of application

Sample handling and positioning in research and industry for installations limited in space. Vacuum version for 10<sup>-6</sup> hPa optional

Preliminary Data	U-624.03	Unit	Tolerance
Active axes	$\theta_z$		
<b>Motion and Positioning</b>			
Rotation range	>360	°	
Integrated sensor	Incremental encoder		
Design resolution	35	$\mu\text{rad}$	
Min. incremental motion	105	$\mu\text{rad}$	typ.
Bidirectional repeatability	$\pm 210$	$\mu\text{rad}$	
Velocity	720	°/s	max.
<b>Mechanical Properties</b>			
Load capacity / axial force	1	N	max.
Holding torque	0.01	Nm	max.
Torque cw / ccw ( $\theta_z$ )	0.01	Nm	max.
<b>Drive Properties</b>			
Motor Type	PILine® ultrasonic piezomotor, performance class 1		
Reference point switch	Optical		
<b>Miscellaneous</b>			
Operating temperature range	0 to 40	°C	
Material	Al (black anodized)		
Mass	130	g	$\pm 5\%$
Cable length	1.5	m	$\pm 10\text{ mm}$
Connector	Sub-D connector, 15-pin (m)		
Recommended controller/driver	C-877.1U11: 1 channel, affordable compact device C-877.2U12: 2 channels, affordable bench-top C-867.1U: 1 channel C-867.2U: 2 channels		

Ask about custom designs!



U-624, dimensions in mm

# Fast Rotation Stage with Small Footprint

WITH ULTRASONIC PIEZOMOTOR



## U-628

- Edge length 50 mm, height 19 mm
- Integrated, direct-measuring incremental encoder
- Rotation range  $>360^\circ$
- High velocity 720 °/s
- Drive torque to 25 mNm, center load to 5 N
- Clear aperture

### Precision-class rotation stage

Integrated optical encoder for direct metrology. Rotation range  $>360^\circ$ . Optical reference point switch. Central clear aperture with 7 mm diameter

### PILine® ultrasonic piezo motor

Oscillating piezoceramic actuators act directly on the

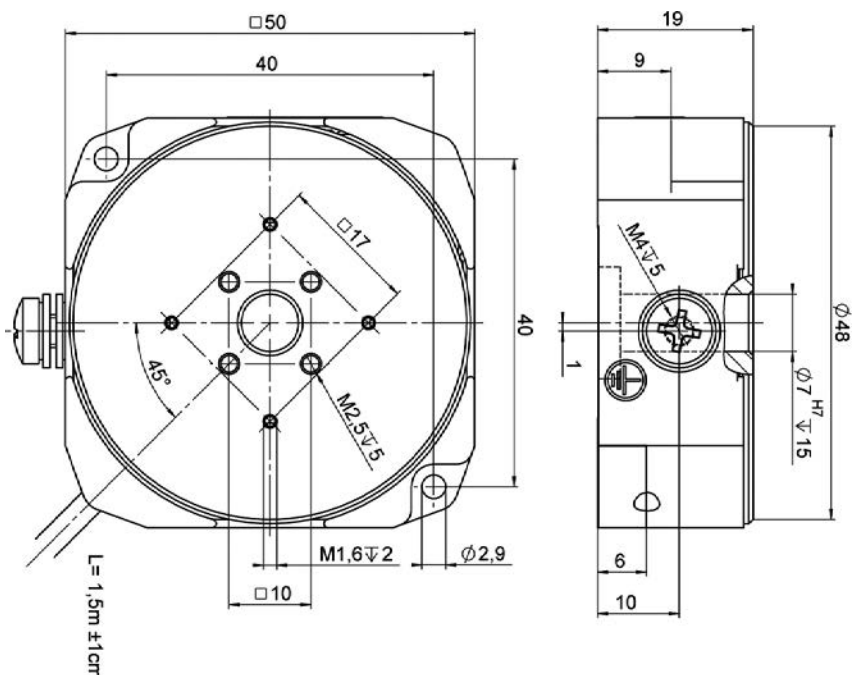
ring-shaped runner. Self-locking at rest, thus no heat generation. High velocity to 720 °/s. Holding torque 25 mNm

### Fields of application

Sample handling and positioning in research and industry for installations limited in space. Vacuum version for  $10^{-6}$  hPa optional

	U-628.03	Unit	Tolerance
Active axes	$\theta_z$		
<b>Motion and Positioning</b>			
Rotation range	>360	°	
Integrated sensor	Incremental encoder		
Design resolution	17	$\mu\text{rad}$	
Min. incremental motion	51	$\mu\text{rad}$	typ.
Bidirectional repeatability	$\pm 102$	$\mu\text{rad}$	
Velocity	720	°/s	max.
<b>Mechanical Properties</b>			
Load capacity / axial force	5	N	max.
Holding torque	0.03	Nm	max.
Torque cw / ccw ( $\theta_z$ )	0.025	Nm	max.
<b>Drive Properties</b>			
Motor Type	PILine® ultrasonic piezomotor, performance class 1		
Reference point switch	Optical		
<b>Miscellaneous</b>			
Operating temperature range	0 to 40	°C	
Material	Al (black anodized)		
Mass	300	g	$\pm 5\%$
Cable length	1.5	m	$\pm 10\text{ mm}$
Connector	Sub-D connector, 15-pin (m)		
Recommended controller/driver	C-877.1U11: 1 channel, affordable compact device C-867.1U: 1 channel C-867.2U: 2 channels, C-877.2U12: 2 channels, affordable bench-top		

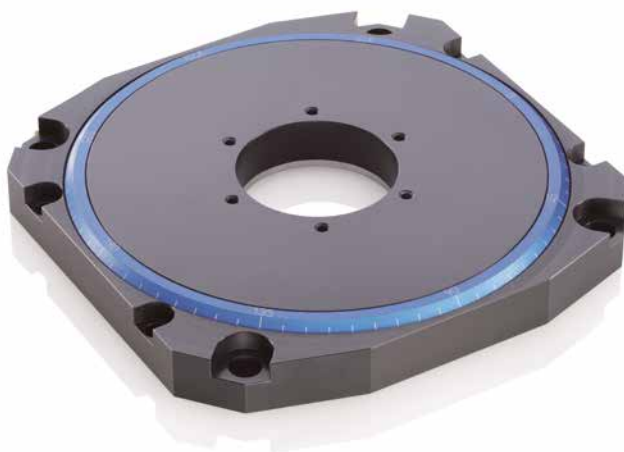
Ask about custom designs!



U-628, dimensions in mm

# Rotation Stage with Low-Profile Design

FAST PILINE® DIRECT DRIVE



## U-651

- Low profile: Only 14 mm height
- Integrated, direct-measuring incremental encoder with up to 4  $\mu$ rad resolution
- Rotation range  $>360^\circ$
- High velocity of 720  $^\circ$ /s
- Drive torque to 0.3 Nm in both directions of rotation
- Clear aperture with 36 mm diameter

### Precision-class rotation stage

Integrated, direct-measuring incremental encoder.  
Rotation range  $>360^\circ$ . Optical reference point switch.  
High guiding accuracy due to crossed roller bearings.  
Clear aperture center load capacity to 20 kg

### PILine® ultrasonic piezo motor

Oscillating piezoceramic actuators act directly on the ring-shaped runner. Self-locking at rest, therefore no heat

generation. No drive noises. High velocity up to 720  $^\circ$ /s.  
Dynamic start / stop dynamics. Holding torque 0.3 Nm

### Valid patents

US patent no. 6,765,335B2  
European patent no. 1267425B1

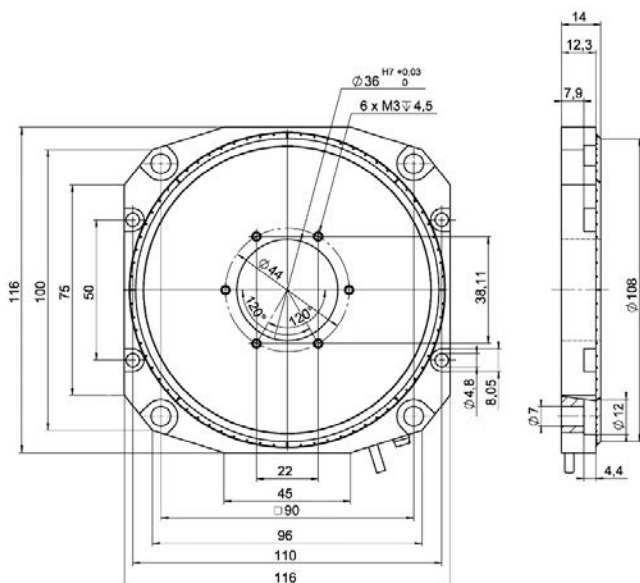
### Fields of application

Industry and research. For micromanipulation, automation, optical metrology



Preliminary Data	U-651.03	U-651.04	Unit	Tolerance
Active axes	$\theta_z$	$\theta_z$		
<b>Motion and Positioning</b>				
Rotation range	>360	>360	°	
Integrated sensor	Incremental encoder	Incremental encoder		
Design resolution	9	4	$\mu\text{rad}$	
Min. incremental motion	27	12	$\mu\text{rad}$	typ.
Bidirectional repeatability	$\pm 54$	$\pm 24$	$\mu\text{rad}$	
Velocity	720	720	°/s	max.
<b>Mechanical Properties</b>				
Load capacity / axial force	20	20	N	max.
Holding torque	0.3	0.3	Nm	max.
Torque cw / ccw ( $\theta_z$ )	0.3	0.3	Nm	max.
<b>Drive Properties</b>				
Motor Type	PILine® ultrasonic piezomotor, performance class 2	PILine® ultrasonic piezomotor, performance class 2		
Reference point switch	Optical	Optical		
<b>Miscellaneous</b>				
Operating temperature range	0 to 40	0 to 40	°C	
Material	Al (black anodized)	Al (black anodized)		
Mass	500	500	g	$\pm 5\%$
Cable length	1.5	1.5	m	$\pm 10\text{ mm}$
Connector	Sub-D connector, 15-pin (m)	Sub-D connector, 15-pin (m)		
Recommended controller/driver	C-867.1U: 1 channel C-867.2U: 2 channels C-877.2U12: 2 channels, affordable bench-top	C-867.1U: 1 channel C-867.2U: 2 channels, C-877.2U12: 2 channels, affordable bench-top		

Ask about custom designs!  
The U-651 stage series replace the M-660 series



U-651, dimensions in mm