

## PXY 16 series

### xy – Piezo Scanner

- 16 x 16  $\mu\text{m}^2$  positioning / scanning area
- parallel high-resolution capacitive metrology
- 0.04 nm resolution
- excellent guidance accuracy
- parallel kinematics
- large  $\varnothing$  66 mm aperture
- improved reliability and robustness

#### application:

- fast scanning applications, as well as nanopositioning and adjustment in the field of scanning microscopy, image processing, semiconductors, automation etc.



fig.: PXY 16 OEM

#### Concept

The PXY 16 is a biaxial linear stage with a scanning and positioning range of 16 x 16  $\mu\text{m}^2$ . With its wide opening, it allows to be used in a variety of optical applications.

The parallel kinematics optimized by FEM show an excellent and independent behaviour of both axes. Due to the high stiffness and robustness compared to conventional designs, the PXY 16 series offers the highest level of dynamics combined with excellent tracking accuracy.

On request, vacuum and low temperature modifications are available, as well as material variations like aluminium, invar, superinvar or titanium.

The optional sensor pre-amplifier ("external" / "digital" version) allows implementations independent of cable lengths.

#### Characteristics

In combination with high-resolution capacitive direct metrology from **piezosystem jena's**, the highest level of position accuracy, stability, linearity and repeatability is possible in closed loop operation.

In addition, the digital amplifiers from **piezosystem jena** allow the modification of various control parameters, including e.g. PID values and notch filter bandwidth. Using an internal wobble generator, mechanical resonances can be determined in order to eliminate them from the control signal via the notch filter adaptation to avoid the stimulation of resonances.

It is thus easy for the user to determine the optimal system setup via iterative trial and error operation, depending on the current load scenario.

#### Mounting/Installation

The force and expansion behaviour of piezo actuators is based on solid-body effects. Thus, the resolution is only dependent on the noise of the control electronics. Piezo actuators are neither influenced by nor do they generate magnetic fields. In cryogenic environments they work close to 0K with a linear decreasing relative expansion. Even under vacuum conditions, piezo actuators can be used. Both scenarios, however, need special adaptations. Due to the reduced dielectric breakdown field strength in air they do not work between 10 Pa and 10 kPa.

The grid with its thread holes and through holes allows easy integration of the piezoelectric element into a variety of standardized and customized applications.

## PXY 16 series

### technical specifications:

	unit	PXY 16 OEM		PXY 16 CAP	PXY 16 CAP external	PXY 16 CAP digital	
part no.	-	S-644-00	S-646-00	S-644-06	S-644-06E	S-644-06D	
axes	-	X and Y					
stroke	open loop ( $\pm 10\%$ )*	16					
	closed loop ( $\pm 0,2\%$ )*	-			12		
electrical capacitance ( $\pm 20\%$ )**	$\mu\text{F}$	3.6 per axis					
feedback sensor	-	w/o		capacitive			
resolution***	open loop	0.04		0.04			
	closed loop	-		1			
typ. repeatability	nm	-		5			
typ. nonlinearity	%	-		0.02			
resonant frequency	add. mass = 10g	Hz		335			
	add. mass = 130g	Hz		325			
	add. mass = 360g	Hz		305			
	add. mass = 540g	Hz		285			
stiffness (x / y / z)	N/ $\mu\text{m}$	10 / 10 / 15					
max. push / pull force	open loop	N		200 / 50			
	closed loop****	N		20 / 20			
max. loading	N	50					
max. lateral force	N	20					
tilt	x, y, z	$\mu\text{rad}$					
		5 / 5 / 5					
dimensions (l x w x h)	mm <sup>3</sup>	98 x 98 x 20		104 x 104 x 20			
aperture	mm	$\varnothing 66$					
voltage range	V	-20 ... +130					
connector****	voltage	-	LEMO 0S.250	-	LEMO 0S.302		d-sub
	sensor	-	-		LEMO 0S.650	ODU.4pol	
cable length****	m	1.2	1.0	1.6	2.0	2.0	
temperature range	$^{\circ}\text{C}$	-20 ... +80					
material	-	aluminium / stainless steel					
total mass	g	725	700	900			

\* measured with 30V300 CLE

\*\* typical small signal strength behaviour

\*\*\* resolution is only limited by the noise of the amplifier and metrology

\*\*\*\* maximum load in controlled operation

#### recommended configuration:

actuator	1 x	<b>PXY 16 CAP digital</b>	S-644-06D
controller	1 x	<b>NV 40/3 CLE</b>	E-101-23
actuator	1 x	<b>PXY 16 CAP</b>	S-644-06
controller	2 x	<b>ENV 300 CAP</b>	E-270-600
power supply	1 x	<b>ENT 400 (230V / 115V)</b>	E-103-33 / 34
PC interface	1 x	<b>EDA 4</b>	E-202-40
casing	1 x	<b>case 19" / 84 TE</b>	E-103-911
actuator	1 x	<b>PXY 16 CAP digital</b>	S-644-06D
controller	2 x	<b>EVD 50</b>	E-720-300
casing	1 x	<b>d-Drive case with EDS2 interface</b>	E-751-000

## PXY 16 series

### drawings:

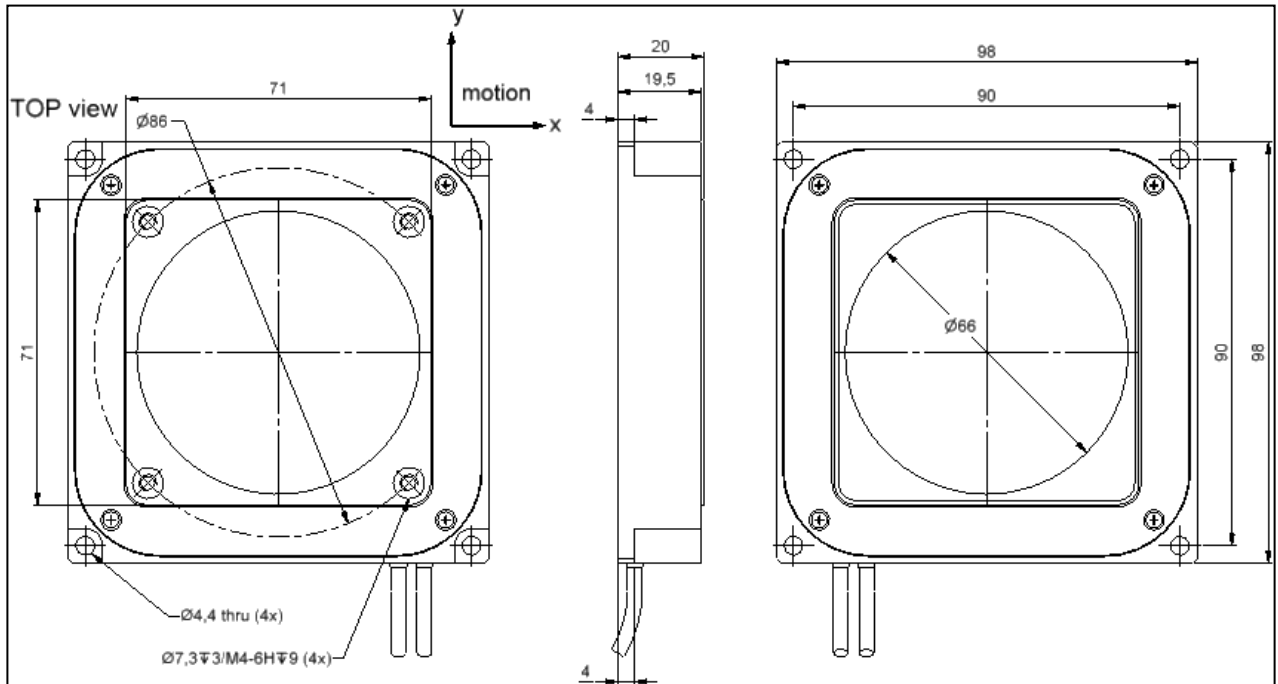


fig.: PXY 16 OEM

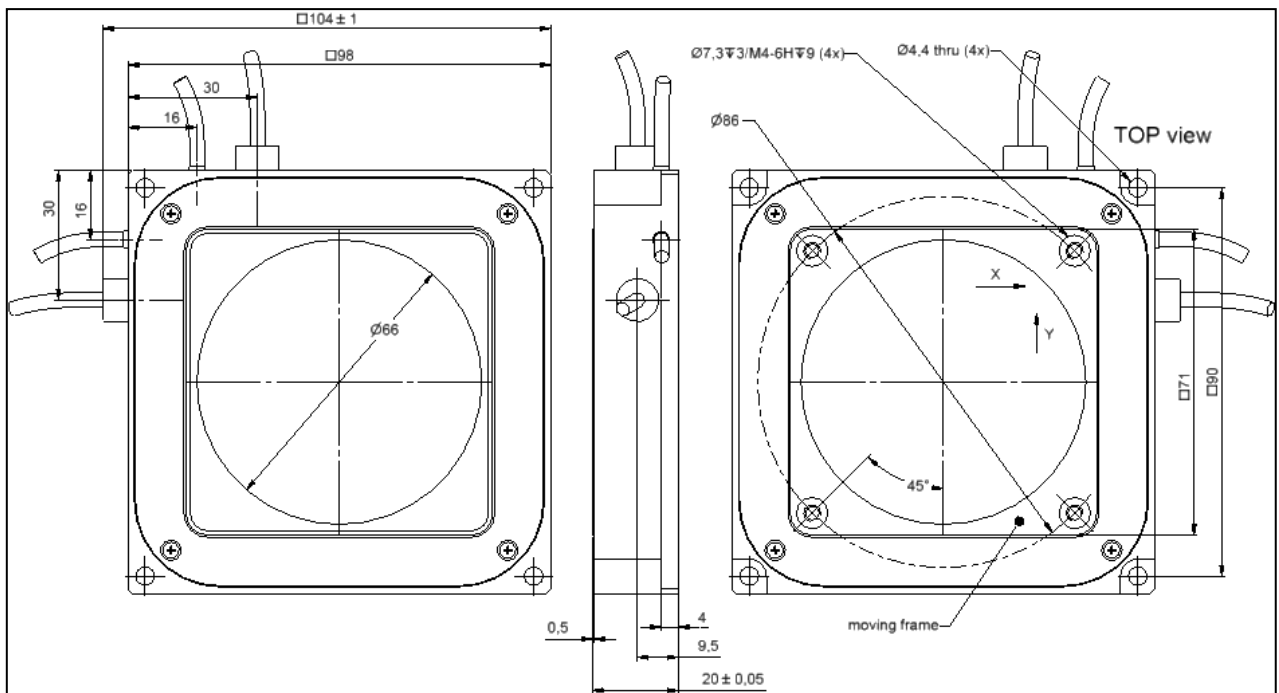


fig.: PXY 16 CAP / PXY 16 CAP extern / PXY 16 CAP digital

Please pay attention to the “handling instructions” you can download from our homepage.

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## PXY 38

### *compact 2-axes translation stages*

#### **Concept:**

The systems of the series PXY 38 are ideally suited for nm-precise positioning of optic components such as mirrors and laser diodes, adjustment and mounting in semiconductor technologies and electronics, and applications in measurement technologies and quality assurance as well as microbiology.

The series PXY 38 consist of piezo electrical actuator in stage design with a solid top and bottom plate for easily integration in optical setups. The monolithic flexure hinges design offers high precision motion range, high stiffness and in due of this excellent dynamical performance for extremely fast and accurate positioning tasks.

#### **Specials:**

With the use of a control signal, the X and Y-axis can be controlled separately. The axis are located orthogonal to each other and the direction of motion is show by small markings on the stage. As an option they may come equipped with strain gage or capacitive position sensors, depending on the system configuration, to achieve very accurate repeatability in the low nanometer range. The systems of this series are available in vacuum and cryogenic temperature configurations.

#### **Interfaces:**

The elements of the series PX are actuators integrated with an inner lever transmission in housing. Since the lever mechanism works in both directions, pulling forces between bottom and top plate need to be avoided, as they could damage the stage. The stage is fixed to a base plate.

Components can be mounted on the top plate by two threaded diagonal holes and can be accurately affixed using the precise pin holes.



image: PXY 38

#### *Product highlights:*

- accurate parallel motion
- up to 38 $\mu$ m motion range
- without mechanical play
- easily combined with other piezo electrical systems
- precision pin holes for accurate adjustment
- high dynamic range

#### *Applications:*

- fiber positioning
- 2D-scanning systems
- beam alignment
- semiconductor
- micro manipulation

## PXY 38

### Technical data:

linear positioning stage	unit	PXY 38	PXY 38 SG
<b>part no.</b>		T-201-00	T-201-01
<b>axis</b>	-	X,Y	X,Y
<b>motion in open(±10%)/closed loop (±0.2%)*</b>	µm	38/ -	38/32
<b>capacitance (±20%)**</b>	µF	0.7	0.7
<b>resolution (open/closed loop)***</b>	nm	0.07/ -	0.07/0.7
<b>integrated measurement system</b>	-	-	strain gage
<b>typ. repeatability</b>	nm	-	±1.5
<b>typ. non-linearity</b>	%	-	0.03
<b>resonant frequency (unloaded)</b>	Hz	730/1090	730/1090
<b>max. push/pull forces</b>	N in x	59/6	59/6
	N in y	53/5	53/5
<b>stiffness x/y</b>	N/µm	1.55/1.4	1.55/1.4
<b>voltage range</b>	V	-20...130V	-20...130V
<b>connector (additional variation please see table below) ****</b>	-	LEMO 0S.302	LEMO 0S.302/ LEMO 0S.304
<b>cable length</b>	m	1	1.2
<b>temperature range</b>	°C	-20°C ... +80°C	-20°C ... +80°C
<b>material</b>	-	aluminum/stainless steel	
<b>dimensions (LxWxH)</b>	mm	25x25x16	40x40x23
<b>weight</b>	g	45	100

\* typical value measured with NV 40/3 amplifier (closed loop: NV 40/3 CLE amplifier )

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology

\*\*\*\* additional connectors configuration examples please see table blow

Product name	Description	Specials	Part. No Suffix.
PXY 38 Digital	Version for digital controller series d-Drive and 30DV50 in combination with additional functionalities	Connector Sub-D 15	T-201-00D
PXY 38 SG Extern	Version with sensor pre-amplifier for the use with „CLE“ amplifier units and with the additional functionalities: Interchangeability, ASI	Sensor-Connector ODU 4pin	T-201-01E

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## PXY 100

### *compact 2-axes translation stages*

#### **Concept:**

The systems of the series PXY 100 are ideally suited for nm-precise positioning of optic components such as mirrors and laser diodes, adjustment and mounting in semiconductor technologies and electronics, and applications in measurement technologies and quality assurance as well as microbiology.

The series PXY 100 consist of piezo electrical actuator in stage design with a solid top and bottom plate for easily integration in optical setups. The monolithic flexure hinges design offers high precision motion range, high stiffness and in due of this excellent dynamical performance for extremely fast and accurate positioning tasks

#### **Specials:**

With the use of a control signal, the X and Y-axis can be controlled separately. The axis are located orthogonal to each other and the direction of motion is show by small markings on the stage. As an option they may come equipped with strain gage or capacitive position sensors, depending on the system configuration, to achieve very accurate repeatability in the low nanometer range. The systems of this series are available in vacuum and cryogenic temperature configurations.

#### **Interfaces:**

The elements of the series PXY are actuators integrated with an inner lever transmission in housing. Since the lever mechanism works in both directions, pulling forces between bottom and top plate need to be avoided, as they could damage the stage. The stage is fixed to a base plate.

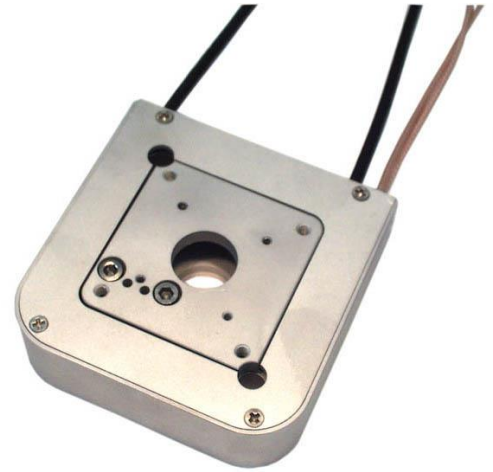


image: PXY 100 CAP Vacuum

#### *Product highlights:*

- accurate parallel motion
- up to 100µm motion range
- without mechanical play
- easily combined with other piezo electrical systems
- precision pin holes for accurate adjustment
- high dynamic range

#### *Applications:*

- fiber positioning
- 2D-scanning systems
- beam alignment
- semiconductor
- micro manipulation

## PXY 100

### Technical data:

linear positioning stage	unit	PXY 100	PXY 100 cryo
<b>part no.</b>		T-203-00	T-203-50
<b>axis</b>	-	X,Y	X,Y
<b>motion in open(±10%)/closed loop (±0.2%)*</b>	µm	100/ -	100/ -
<b>capacitance per axis (±20%)**</b>	µF	1.8	1.8
<b>resolution (open/closed loop)***</b>	nm	0.2/ -	0.2/ -
<b>integrated measurement system</b>	-	-	-
<b>typ. repeatability</b>	nm	-	-
<b>typ. non-linearity</b>	%	-	-
<b>resonant frequency x/y (unloaded)</b>	Hz	340/480	350/350
<b>max. push/pull forces</b>	N in x	110/11	110/11
	N in y	95/10	95/10
<b>stiffness x/y</b>	N/µm	1.1/0.95	0.36/0.45
<b>voltage range</b>	V	-20...130V	-20...130V
<b>connector (additional variation please see table below) ****</b>	-	LEMO 05.302	LEMO 05.302/ LEMO 05.304
<b>cable length</b>	m	1	cryo 0.6/airside 2.0
<b>temperature range</b>	°C	-20°C ... +80°C	-273°C ... +80°C
<b>material</b>	-	aluminum/stainless	CuBe2/aluminum
<b>dimensions (LxWxH)</b>	mm	40x40x20	40x40x20
<b>weight</b>	g	102	105

\* typical value measured with NV 40/3 amplifier (closed loop: NV 40/3 CLE amplifier )

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology



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PXY\_100\_ds\_Rev04\_2017\_10\_05

## PXY 100

### Technical data:

linear positioning stage	unit	PXY 100 SG	PXY 100 CAP
<b>part no.</b>		T-203-01	T-203-06
<b>axis</b>	-	X,Y	X,Y
<b>motion in open(±10%)/closed loop (±0.2%)*</b>	µm	100/80	100/80
<b>capacitance per axis (±20%)**</b>	µF	1.8	1.8
<b>resolution (open/closed loop)***</b>	nm	0.2/2	0.2/1
<b>integrated measurement system</b>	-	strain gage	capacitive
<b>typ. repeatability</b>	nm	±2	±8
<b>typ. non-linearity</b>	%	0.02	0.08
<b>resonant frequency x/y (unloaded)</b>	Hz	340/480	340/480
<b>max. push/pull forces</b>	N in x	110/11	110/11
	N in y	95/10	95/10
<b>stiffness x/y</b>	N/µm	1.1/0.95	1.1/0.95
<b>voltage range</b>	V	-20...130V	-20...130V
<b>connector (additional variation please see table below) ****</b>	-	LEMO 0S.302/ LEMO 0S.304	LEMO 0S.302/ LEMO 0S.650
<b>cable length</b>	m	1.2	1.6
<b>temperature range</b>	°C	-20°C ... +80°C	-20°C ... +80°C
<b>material</b>	-	aluminum/stainless steel	
<b>dimensions (LxWxH)</b>	mm	60x60x21	65x65x20
<b>weight</b>	g	175	300

\* typical value measured with NV 40/3 amplifier (closed loop: NV 40/3 CLE amplifier )

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology



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PXY\_100\_ds\_Rev04\_2017\_10\_05



## PXY 100

### Options:

\*\*\*\* additional connectors configuration examples please see table blow

Product name	Description	Specials	Part. No Suffix.
PXY 100 CAP Digital	Version for digital controller series d-Drive and 30DV50 in combination with additional functionalities: Interchangeability, ASI, ASC	Connector Sub-D 15	T-203-06D
PXY 100 SG Extern	Version with sensor pre-amplifier for the use with „CLE“ amplifier units and with the additional functionalities: Interchangeability, ASI	Connector Sensor: ODU 4pin	T-203-01E



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PXY\_100\_ds\_Rev04\_2017\_10\_05

## PXY 102

### *2D piezo positioning stages with central opening*

#### **Concept:**

The piezo 2D stage PXY 102 is extremely compact and offer motions of up to 100  $\mu\text{m}$  in open loop in XY axes. The unique cube like mechanical design allows parallel motion without play. They are well suited for many applications reaching from optical research to OEM systems. Probe alignment in microscopes usually requires an open center space (e. g. for the passage of light). The 2D piezo stage model PXY 102 with their central aperture of 40 mm were developed considering such applications. High stiffness, in combination with excellent straightness of motion, make the PXY 102 ideal for high precision in the nano meter range for optics, laser-technique, and any other type of high resolution positioning applications.

#### **Specials:**

Piezo electrical actuators can act much faster, and with a higher accuracy to a signal change, than any motorized drive available. Each axis can be controlled separately in closed loop mode. An integrated sensor system is an available option that guarantees accuracy in the nanometer range. The simultaneous motion, available in XY directions, offers a large degree of freedom during use. The PXY 102 can be made with special materials for extraordinary applications such as vacuum or cryogenic applications.

#### **Assembling:**

The stages are designed to be mounted, by the use of two through holes located diagonal from each other. Components can be mounted on the top plate by two diagonal tapped holes and can be accurately located by using the precision pin holes.



Image: PXY 102

#### *Product highlights:*

- 2D nano positioning stage
- central opening 40 mm
- XY motion range 100  $\mu\text{m}$
- optional integrated feedback sensors
- motion without mechanical play
- highest positioning resolution
- stage design for microscopy platforms
- high resonant frequency precise for line scanning application

#### *Application:*

- AFM and microscopy
- Micromanipulation
- Cantilever adjustment
- Probe scanners
- Wafer stepper and lithographic

## PXY 102

### Technical data:

PXY 102	unit	PXY 102	PXY 102 SG	PXY 102 CAP
<b>part no.</b>	–	T-205-10 (D-E)	T-205-11 (D-E)	T-205-16 (D-E)
<b>axes</b>	–		X/Y	
<b>motion in open loop (<math>\pm 10\%</math>)*</b>	$\mu\text{m}$	100	100	100
<b>motion in closed loop *</b>	$\mu\text{m}$	–	80	80
<b>electrical capacitance per axis (<math>\pm 20\%</math>)</b>	$\mu\text{F}$	1.7	1.7	1.7
<b>integrated measurement system</b>	–	–	SG	CAP
<b>resolution***</b>	nm	0.2	2	1
<b>typ. repeatability</b>	nm	–	$\pm 17$	$\pm 10$
<b>resonant frequency (X/Y)</b>	Hz	330/320	330/320	330/320
<b>stiffness (X/Y)</b>	N/ $\mu\text{m}$	1/1	1/1	1/1
<b>max. force generation (X/Y)</b>	<b>pull</b> N <b>push</b>	10/10/ 100/100	10/10 100/100	10/10 100/100
<b>cable length</b>	m	1.0	1.2	1.6
<b>material</b>	–	stainless steel/aluminum		
<b>dimensions (LxWxH)</b>	mm	80 x 80 x 30	80 x 80 x 30	80 x 80 x 30
<b>central opening <math>\emptyset</math></b>	mm	40	40	40
<b>weight</b>	g	520	610	700

\* typical value measured with NV40/3 CLE amplifier

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology



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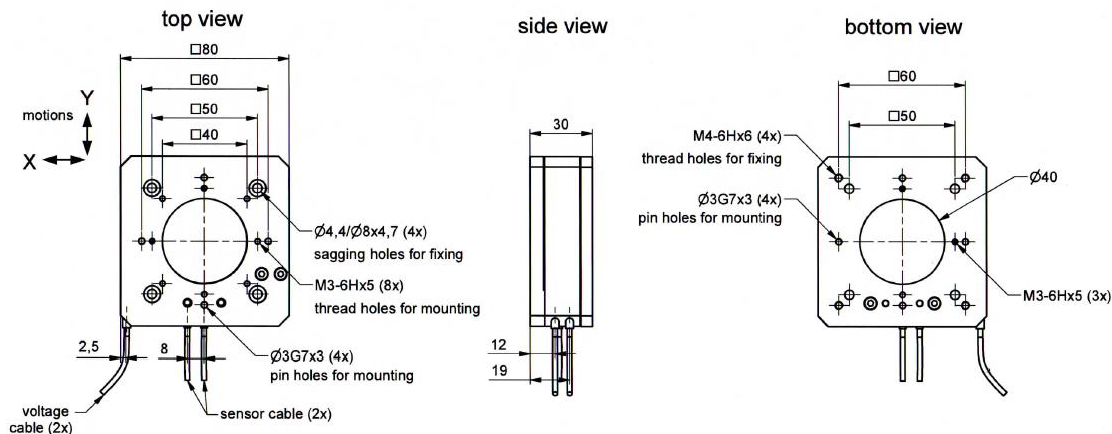
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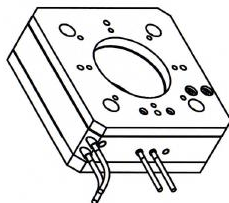
# PXY 102

## Types of connectors:

Product name	Description	Specials	Part. No Suffix.
PXY 102 Digital	Version for digital controller series d-Drive and NV40/3 controller in combination with additional functionalities: Interchange ability, ASI and ASC		T-205-10 D
PXY 102 SG Digital		Connector Sub-d 15	T-205-11 D
PXY 102 CAP Digital			T-205-16 D
PXY 102 SG Extern	Version with sensor pre-amplifier for the use of additional functionalities: Interchange ability, ASI	Plug voltage: LEMO 0S.302	T-205-11 E
PXY 102 CAP Extern		Plug sensor SG: ODU 4pin Plug sensor CAP: LEMO 0S.650	T-205-16 E
PXY 102			T-205-10
PXY 102 SG	Connector style according to the piezo controller series ENV, 30V300 OEM and 12V40 OEM	Plug voltage: LEMO 0S.302 Plug sensor SG: LEMO 0S.304	T-205-11
PXY 102 CAP		Plug sensor CAP: LEMO 0S.650	T-205-16



model ( 1 : 2 )



**cable length**  
 standard version 1,2m  
 external / digital version 2m  
 vacuum version on request

**ORIGINAL**

part.-no.	T-205-x1 (D/E)	part.-name	PXY 102 SG (DIG) (VAC)
file name	PT205x1	OK: date/sign.	15. JUL 2014
scale	1:2	customers drawing	piezosystem jena

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PXY\_102\_ds\_Rev02\_2017\_10\_04

## PXY 200

### *compact 2-axes translation stages*

#### **Concept:**

The systems of the series PXY 200 are ideally suited for nm-precise positioning of optic components such as mirrors and laser diodes, adjustment and mounting in semiconductor technologies and electronics, and applications in measurement technologies and quality assurance as well as microbiology.

The series PXY 200 consist of piezo electrical actuator in stage design with a solid top and bottom plate for easily integration in optical setups. The monolithic flexure hinges design offers high precision motion range, high stiffness and in due of this excellent dynamical performance for extremely fast and accurate positioning tasks

#### **Specials:**

With the use of a control signal, the X and Y-axis can be controlled separately. The axis are located orthogonal to each other and the direction of motion is show by small markings on the stage. As an option they may come equipped with strain gage or capacitive position sensors, depending on the system configuration, to achieve very accurate repeatability in the low nanometer range. The systems of this series are available in vacuum and cryogenic temperature configurations.

#### **Interfaces:**

The elements of the series PXY are actuators integrated with an inner lever transmission in housing. Since the lever mechanism works in both directions, pulling forces between bottom and top plate need to be avoided, as they could damage the stage. The stage is fixed to a base plate.

Components can be mounted on the top plate by two threaded diagonal holes and can be accurately affixed using the precise pin holes.

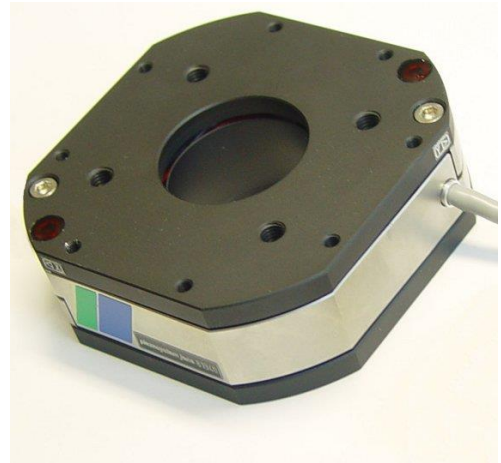


image: PXY 200

#### *Product highlights:*

- accurate parallel motion
- up to 200µm motion range
- without mechanical play
- easily combined with other piezo electrical systems
- precision pin holes for accurate adjustment
- high dynamic range

#### *Applications:*

- fiber positioning
- 2D-scanning systems
- beam alignment
- semiconductor
- micro manipulation

## PXY 200

### Technical data:

linear positioning stage	unit	PXY 200	PXY 200 SG
<b>part no.</b>		T-227-00	T-227-01
<b>axis</b>	-	X,Y	X,Y
<b>motion in open(±10%)/closed loop (±0.2%)*</b>	µm	200/ -	200/160
<b>capacitance per axis (±20%)**</b>	µF	5.2	5.2
<b>resolution (open/closed loop)***</b>	nm	0.4/ -	0.4/4
<b>integrated measurement system</b>	-	-	strain gage
<b>typ. repeatability</b>	nm	-	±5
<b>typ. non-linearity</b>	%	-	0.04
<b>resonant frequency x/y (unloaded)</b>	Hz	350/350	350/350
<b>max. push/pull forces</b>	N in x	130/13	130/13
	N in y	130/13	130/13
<b>stiffness x/y</b>	N/µm	0.65/0.65	0.65/0.65
<b>voltage range</b>	V	-20...130V	-20...130V
<b>connector (additional variation please see table below) ****</b>	-	LEMO 0S.302	LEMO 0S.302/ LEMO 0S.304
<b>cable length</b>	m	1	1.2
<b>temperature range</b>	°C	-20°C ... +80°C	-20°C ... +80°C
<b>material</b>	-	aluminum/stainless steel	
<b>dimensions (LxWxH)</b>	mm	70x70x25	70x70x25
<b>central aperture (diameter)</b>	mm	28	28
<b>weight</b>	g	350	350

\* typical value measured with NV 40/3 amplifier (closed loop: NV 40/3 CLE amplifier )

\*\* typical value for small electrical field strength

\*\*\* the resolution is only limited by the noise of the power amplifier and metrology

\*\*\*\* additional connectors configuration examples please see table blow

Product name	Description	Specials	Part. No Suffix.
PXY 200 Digital	Version for digital controller series d-Drive and 30DV50 in combination with additional functionalities.	Connector Sub-D 15	T-227-00D
PXY 200 SG Extern	Version with sensor pre-amplifier for the use with „CLE“ amplifier units and with the additional functionalities: Interchangeability, ASI	Connector Sensor: ODU 4pin	T-227-01E

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