

# Piezo data sheet





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Low voltage 150 V

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## Overview: main operating parameters

### Piezoactuators

**PSt 150, HPSt 150, PCh 150, HPCh 150**

**Max. Voltage ranges: -30V thru +150V**

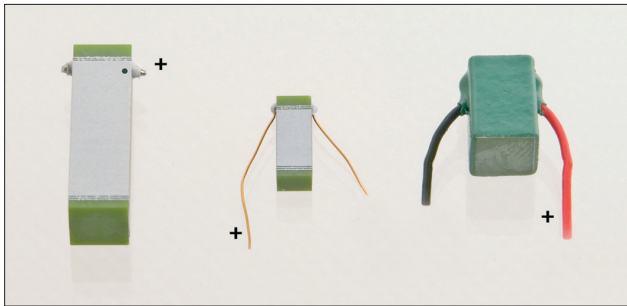
Typical operating schemes:

**Unipolar range: 0V/+150V**

for high power applications

**Semi-bipolar range: -30V thru +150V**

for quasistatic low power applications with enhanced stroke/blocking force



Actuator's poling

Piezo-actuators are poled components from factory  
Usually, the **positive** pole is indicated e.g. by  
**red insulation wires**, **dots**, **longer wire**

### Strokes A/B

Max. ratings shown in data sheet

A, for max. semi bipolar

B, for max. unipolar activation

Example:

Max. stroke: PSt 150/7/20 VS12

A/B = 27 $\mu$ m/20 $\mu$ m

### Stiffness

Inverse compliance,

– measured for open loop voltage control operation

– measured with a static preload of at least of

10% of actuator's maximum load.

### Blocking force/max force generation

Means maximum force generation of an actuator.

Depends on the applied voltage variation.

Stated values refer to maximum semi-bipolar operation.

Maximum uni-polar operation gives about 30% lower values

### Resonant frequency

– Refers to axial mode

– Defined for one side fixed piezo-element

(other modes like planar diameter not taken into)

### Capacitances

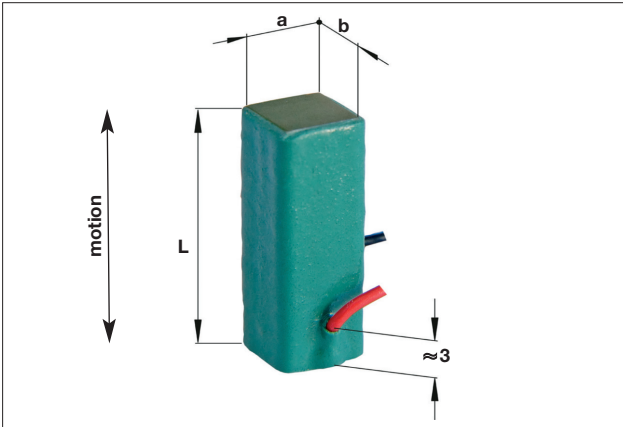
– Measured at low field excitation at room temperature

– Manufacturing tolerances up to +/- 20%

– Capacitance can depend on high field excitation and temperature



## 1. Cofired monolithic solid stacks PSt 150/axb/... (osi-type)



**max. Voltage range -30V/+150V**

**Dimensions a, b, L** refer to ceramic body only, coating not included

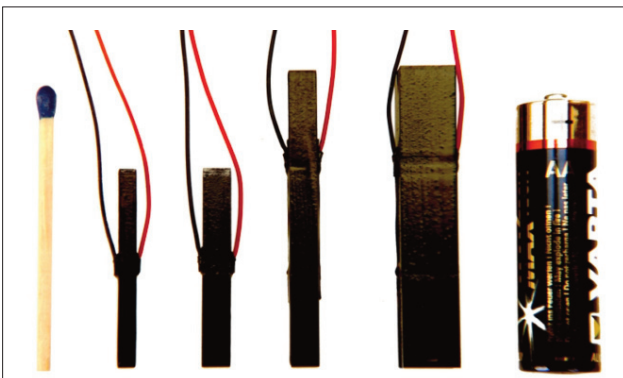
Length L: tolerance +/-0.1 mm

Actuator PSt with thick epoxy-coating

type osi-stack (+) $U_{max}$ 150 V	ceramic- crosssection a x b/mm	length L <sup>1)</sup> mm	max. stroke <sup>2)</sup> µm	capacitance nF	resonance frequency kHz	stiffness N/µm	blockingforce <sup>3)</sup> N	max. load force N
PSt 150/2x3/5	2 x 3	5	6.5/5	100	150	45	300	300
PSt 150/2x3/7	2 x 3	9	13/9	170	100	25	300	300
PSt 150/2x3/20	2 x 3	18	28/20	420	50	12	300	300
PSt 150/3.5x3.5/7	3.5 x 3.5	9	13/9	350	100	50	800	800
PSt 150/3.5x3.5/20	3.5 x 3.5	18	28/20	800	50	25	800	800
PSt 150/5x5/7	5 x 5	9	13/9	800	100	120	1600	2000
PSt 150/5x5/20	5 x 5	18	28/20	1800	50	60	1600	2000
PSt 150/7x7/7	7 x 7	9	13/9	1400	100	240	3500	4000
PSt 150/7x7/20	7 x 7	18	28/20	3400	50	120	3500	4000
PSt 150/10x10/7	10 x 10	9	13/9	3000	100	500	7000	8000
PSt 150/10x10/20	10 x 10	18	28/20	6500	50	250	7000	8000
PSt 150/14x14/20	14 x 14	18	28/20	14500	47	500	15000	16000
PSt 150/25x25/20	25 x 25	18	28/20	32000	on request			

<sup>1)</sup> axis of motion    <sup>2)</sup> -30V-150V // 0V-150V    <sup>3)</sup> max. force for (-)30V-150V activation (blocking)

## Combined longer stacks for increased stroke



**27 mm, 36 mm, 54 mm ... on request**

Monolithic stacks with modified PZT ceramic formula for

high temperature operation,  
reduced capacitance values

on request

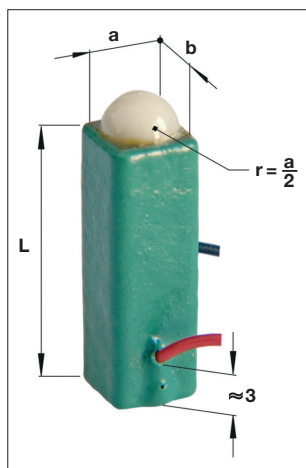




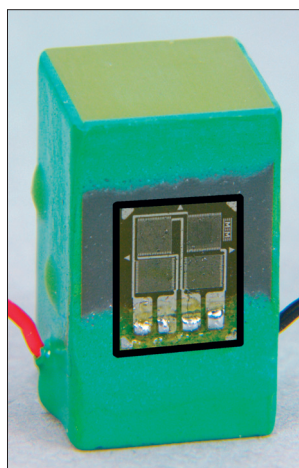
## Further specs and options

### Spherical end pieces

Half balls,  
corundum  $\text{Al}_2\text{O}_3$



Actor with spherical end-piece



### Strain gages

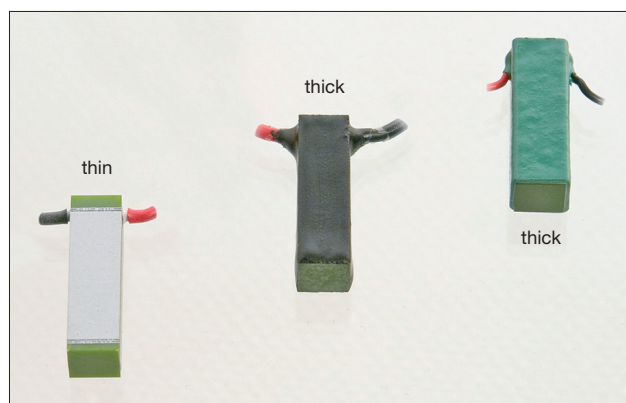
for position detection  
and feedback

4-element strain gage-bridge  
configuration on a piezo stack  
Typical gage resistance:  
1.2 kiloOhms

### Coatings

**Thin type** (thickness approx 100  $\mu\text{m}$ ),  
**color grey/white** order code g or w  
for max. temperature range  $\ll -50^\circ\text{C}$  thru  $100^\circ\text{C}$   
( $120^\circ\text{C}$  non-operating)

**Thick type** (thickness approx 0,5mm),  
**color green or black** order code gr or bl  
For mechanical ruggedizing  
temperature range  $> -50^\circ\text{C}$  thru  $100^\circ\text{C}$   
( $120^\circ\text{C}$  non-operating)



Different kinds of stack coatings

### Cryogenic operation:

**On request:**

**Special coating**

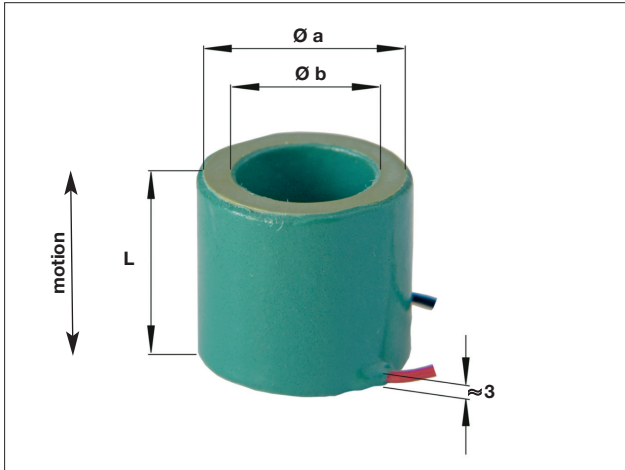
**Electrical wiring:** Kapton insulated manganin-wires  
to minimize thermal heat conduction/thermal load to  
cryostat

**Vacuum compatibility:** standard for all kinds of  
coating, UHV on request

**Special modifications:** feel free to ask our  
engineers for special solutions.



## Cofired monolithic ring stacks HPSt 150/a-b/... (osi-type, tubular design)



**Voltage range -30V / +150V**

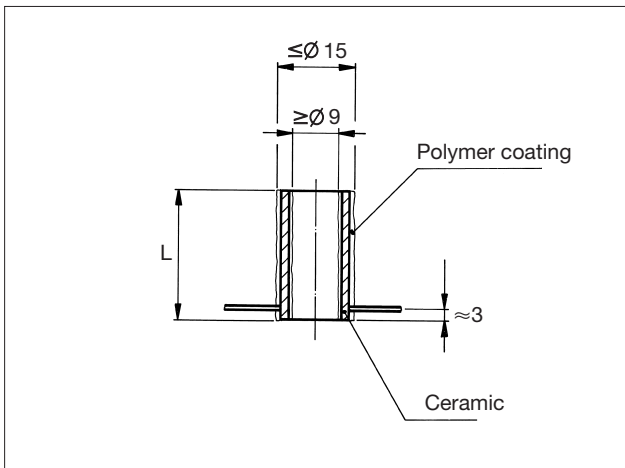
Dimensions a,b, L: ceramic stack only  
(no coating included)  
L tolerance +/- 0.1 mm

coatings: check page 4

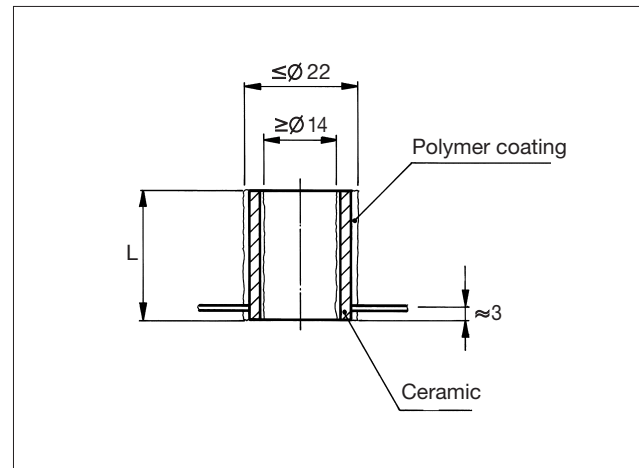
Ringactuator HPSt 150/a-b/...

type osi-stack (+) $U_{max}$ 150 V	ceramic- crosssection a x b/mm	length L <sup>1)</sup> mm	max. stroke <sup>2)</sup> $\mu$ m	capacitance nF	resonance frequency kHz	stiffness N/ $\mu$ m	blockingforce <sup>3)</sup> kN	max. load force kN
HPSt 150/14-10/12	14 - 10	13.5	16/12	2600	75	250	4,5	7
HPSt 150/20-15/12	20 - 15	13.5	16/12	5300	75	450	8	12

<sup>1)</sup> axis of motion    <sup>2)</sup> -30V-150V // 0V-150V    <sup>3)</sup> max. force for (-)30V-150V activation (blocking)



Ringactuator HPSt 150/14 - 10/xx  
free aperture 9 mm



Ringactuator HPSt 150/20 - 15/xx  
free aperture 19 mm



## Combined longer ring stacks HPSt150 for increased stroke



<sup>1)</sup>Stroke A/B:

A: for -30V thru +150V

B: for 0V thru +150V

Ringactuators HPSt 150, various types

type	diameters mm	length L mm	<sup>1)</sup> max. stroke $\mu\text{m}$	capacitance $\mu\text{F}$	resonance Hz	stiffness $\text{N}/\mu\text{m}$
HPSt 150/14-10/25	14 – 10	27	30/25	5.2	20	120
HPSt 150/14-10/40	14 – 10	40.5	50/40	8	on request	

Max. load approx. 7 kNewtons

Blocking force: 4500 Newtons, (-)30V/(+150V)

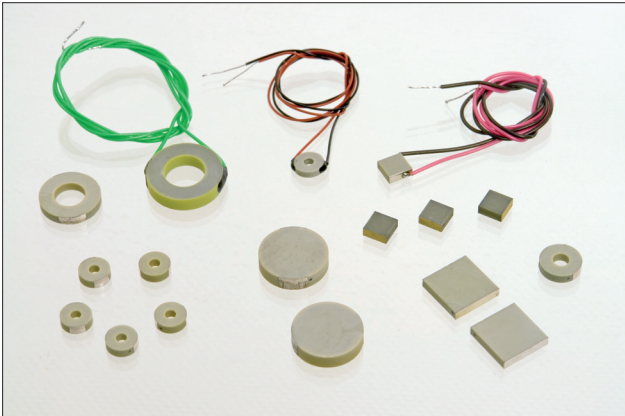
type	diameters mm	length L mm	<sup>1)</sup> max. stroke $\mu\text{m}$	capacitance $\mu\text{F}$	resonance Hz	stiffness $\text{N}/\mu\text{m}$
HPSt 150/20-15/25	20 – 15	27	32/25	10	22	230
HPSt 150/20-15/40	20 – 15	40.5	50/40	15	on request	

Max. load approx. 12 kNewtons

Blocking force: 8 kNewtons, (-)30V/(+150V)



## Flat piezo-chips and rings PCh150 / HPCh150 (isi technology)



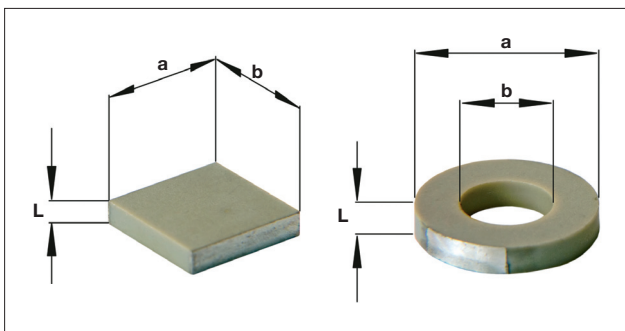
Piezo-chips

actor type solid-stacks	ceramic crosssection a x b/mm <sup>2</sup>	thickness L <sup>1)</sup> mm	max. stroke <sup>2)</sup> µm	capacitance nF	resonance- frequency kHz	stiffness N/µm	blockingforce <sup>3)</sup> N	max. load force N
(+) U <sub>max</sub> 150 V PCh 150/3x3/2	3x3	2	>3/>2	30	>500 kHz	190	500	500
PCh 150/5x5/2	5x5	2	>3/>2	110	>500 kHz	500	1500	2000
PCh 150/7x7/2	7x7	2	>3/>2	240	>500 kHz	1000	3000	5000
PCh 150/10x10/2	10x10	2	>3/>2	480	>500 kHz	1900	6000	10000
ring-chips (+) U <sub>max</sub> 150 V	diameters a - b							
HPCh 150/6-2/2	6-2	2	>3/>2	110	>500 kHz	400	1500	2000
HPCh 150/8-3/2	8-3	2	>3/>2	200	>500 kHz	900	2500	4000
HPCh 150/10-5/3	10-5	3	>4/>3	375	>300 kHz	900	3000	4500
HPCh 150/12-6/2	12-6	2	>3/>2	500	>500 kHz	1400	5000	5000
HPCh 150/15-8/3	15-8	3	>4/>3	790	>300 kHz	1800	7000	10000

<sup>1)</sup> direction of expansion

<sup>2)</sup> semi-bipolar/unipolar activation

<sup>3)</sup> blocking force = max. force generation defined for max. semi-bipolar operation



**Dimensions:** a, b, L

**tolerances:** a, b +/- 0.3 mm, L +/- 0.1 mm

**Maximum voltage ranges**

PCh 150: -30 V/+150 V

**Temperature range**

-273 °C thru approx. +130 °C

**Surface insulation**

buried electrode, no coating

**wiring on request:** insulation: teflon, kapton

Piezo-chips PCh, HPCh



## Further specs and options

### Strain gages

for position detection and feedback: ask for details

### Coatings

**Thin type:** (approx 100  $\mu\text{m}$ ), color grey/white  
for max. temperature range  $\ll -50^\circ\text{C}$  thru  $100^\circ\text{C}$   
( $120^\circ\text{C}$  non operating)

**Thick type:** (approx 0,5mm), color green or black  
mechanically ruggedized version  
temperature range  $> -50^\circ\text{C}$  thru  $100^\circ\text{C}$   
( $120^\circ\text{C}$  non-operating)

### Cryogenic operation

Special coating

### Electrical wiring

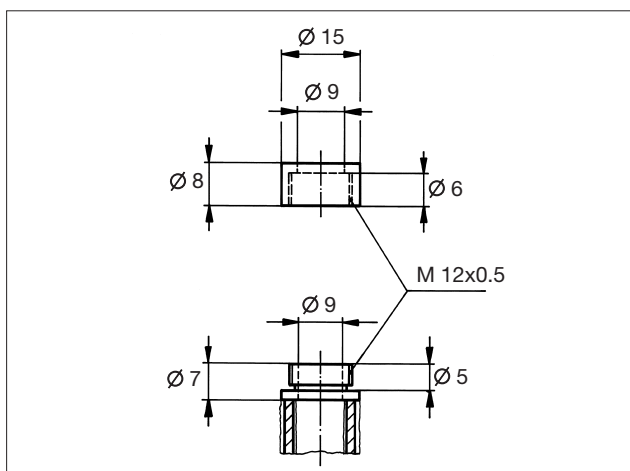
Kapton insulated manganin-wires to minimize  
thermal heat conduction / thermal load to cryostat

### Special modifications

feel free to ask our engineers for special solutions

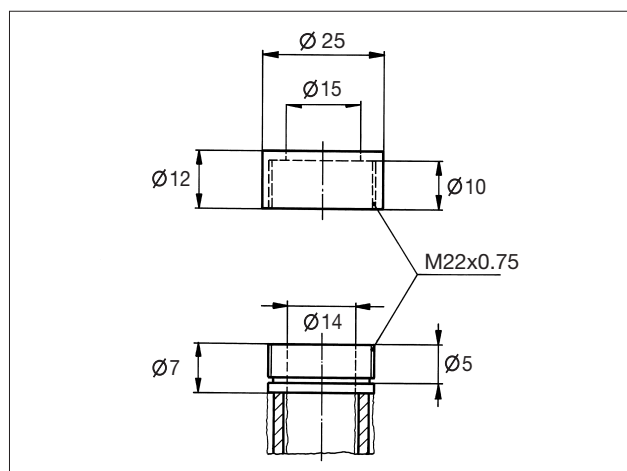
### Threaded endpiece HAg 9 for HPSt 150/14 - 12/xx

free aperture 9 mm



### Threaded endpiece HAg 14 for HPSt 150/20 - 15/xx

free aperture 14 mm



Optic adaptors 0A1/2" and 0A1";  
see Chapter Accessories



## 2. Low voltage actuators PSt150 with preloaded casings VS

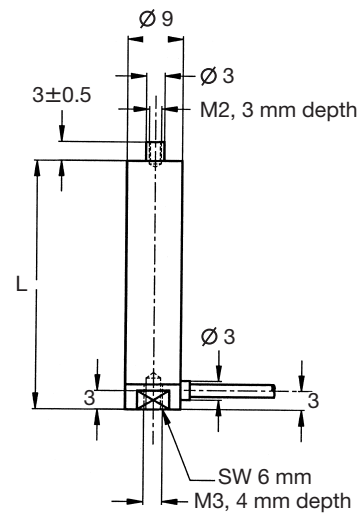
### PSt 150/4 /... VS9

Prestress force = max. tensile force = approx. 40 N

Max. load force: 300 N

Max. force generation: 300 N<sup>1)</sup>

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/4/7 VS9: approx. 0.05 Nanometer



type	max, stroke <sup>2)</sup>	length	el. capacitance nF	stiffness N/μm	resonance frequency kHz
	μm	mm			
PSt 150/4/7 VS9	13/9	19	170	25	40
PSt 150/4/20 VS9	27/20	28	340	12	30

#### Standard configuration:

Tapped hole in moving end

Electrical connection: 1 m coaxial cable RG 178 with BNC connector

#### Options:

Coaxial cable RG 178 with LEMO connectors 00250 or 0S250

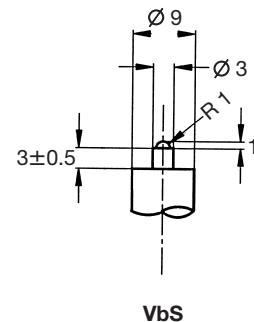
Moving end with spherical end piece **VbS**

UHV compatibility

Accessories see section 6

<sup>1)</sup>Max. force generation: for -30 V thru +150 V

<sup>2)</sup>Stroke A/B                    A: for -30 V thru +150 V  
   B: for 0 V thru +150 V







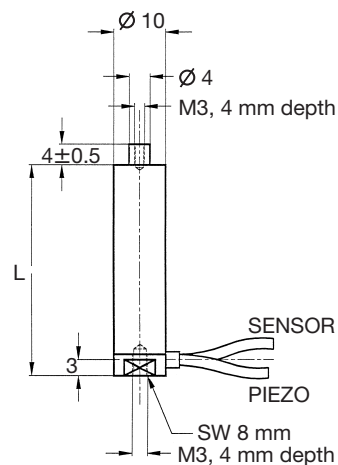
## PSt 150/5/... VS10

Prestress force = max. tensile force = approx. 150 N

Max. load force: 800 N

Max force generation: 800 N

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/5/7 VS10: 0.05 Nanometer



type	max, stroke μm	length mm	el. capacitance nF	stiffness N/μm	resonance frequency kHz
PSt 150/5/7 1 VS10	13/9	19	350	50	40
PSt 150/5/20 VS10	27/20	28	800	25	30
PSt 150/5/40 VS10	55/40	46	1600	12	20
PSt 150/5/60 VS10	80/60	64	2400	8	15
PSt 150/5/80 VS10	105/80	82	3200	6	12
PSt 150/5/100 VS10	130/100	100	4000	5	10

### Standard configuration:

Tapped hole in moving end

Electrical connection: 1 m coaxial cable RG 178 with BNC connector

### Options:

Coaxial cable RG 178 with LEMO connectors 00250 or 0S250

Moving end with spherical end piece **Vbs**

Moving end with threaded pin **VAg**

Moving end plane **pF**

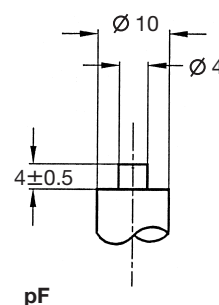
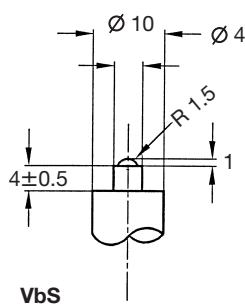
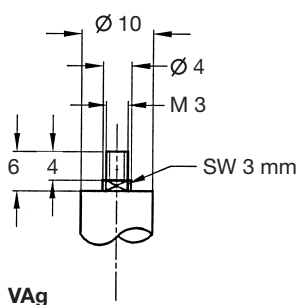
Thermostable modification

Low temperature modification

UHV compatibility

Position detection

Accessories see section 6





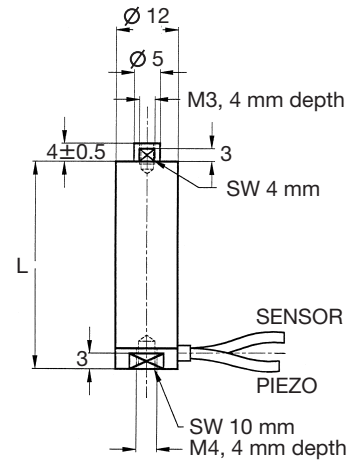
## PSt 150/7/... VS12

Prestress force = max. tensile force = 300 N

Max. load force: 1800 N

Max. force generation: 1800 N

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/7/7: 0.05 Nanometer



type	max, stroke $\mu\text{m}$	length mm	el. capacitance $\mu\text{F}$	stiffness N/ $\mu\text{m}$	resonance frequency kHz
PSt 150/7/7 VS12	13/9	19	0.8	120	40
PSt 150/7/20 VS12	27/20	28	1.8	60	30
PSt 150/7/40 VS12	55/40	46	3.6	25	20
PSt 150/7/60 VS12	80/60	64	5.4	15	15
PSt 150/7/80 VS12	105/80	82	7.2	12	12
PSt 150/7/100 VS12	130/100	100	9	10	10
PSt 150/7/120 VS12	160/120	118	11	8	8
PSt 150/7/140 VS12	190/140	136	13	7	6
PSt 150/7/160 VS12	210/160	154	15	6	5

### Standard configuration:

Tapped hole in moving end

Electrical connection: 1 m coaxial cable RG 178 with BNC connector

### Options:

Coaxial cable RG178 with LEMO connectors  
00250 or 0S250

Moving end with spherical end piece **VbS**

Moving end with threaded pin **VAg**

Moving end plane **pF**

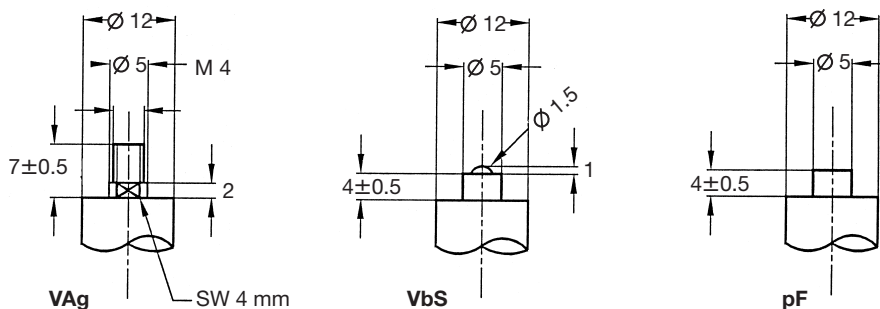
Thermostable modification

Low temperature modification

UHV compatibility

Position detection

Accessories see section 6





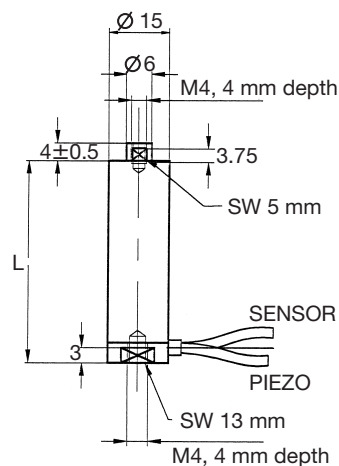
## PSt 150/10/... VS15

Prestress force = max. tensile force = approx. 400 N

Max. load force: 4000 N

Max. force generation: 3500 N

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/10/7 VS15: 0.05 Nanometer.



type	max, stroke µm	length mm	el. capacitance µF	stiffness N/µm	resonance frequency kHz
PSt 150/10/20 VS15	27/20	128	3.6	120	30
PSt 150/10/40 VS15	55/40	146	7.2	60	20
PSt 150/10/60 VS15	80/60	164	11	35	14
PSt 150/10/80 VS15	105/80	182	14	25	12
PSt 150/10/100 VS15	130/100	100	18	20	10
PSt 150/10/120 VS15	160/120	118	21	15	8
PSt 150/10/140 VS15	190/140	136	25	14	7
PSt 150/10/160 VS15	210/160	154	28	13	6
PSt 150/10/180 VS15	240/180	172	33	11	5
PSt 150/10/200 VS15	270/200	190	37	10	4

### Standard configuration:

Tapped hole in moving end

Electrical connection: 1 m coaxial cable RG 178 with BNC connector

### Options:

Coaxial cable RG 178 with LEMO connectors  
00250 or 0S250

Moving end with spherical end piece **Vbs**

Moving end with threaded pin **VAg**

Moving end plane **pF**

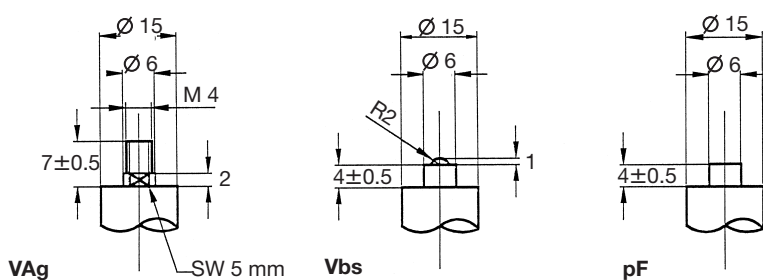
Thermostable modification

Low temperature modification

UHV compatibility

Position detection

Accessories see section 6





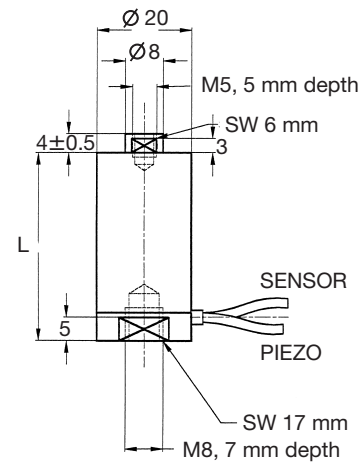
## PSt 150/14/... VS20

Prestress force = max. tensile force = approx. 1000 N

Max. load force: 7000 N

Max. force generation: 7000 N

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/14/20: approx. 0.1 Nanometer



type	max, stroke	length mm	el. capacitance µF	stiffness N/µm	resonance frequency kHz
	µm				
PSt 150/14/20 VS20	27/20	35	17	250	30
PSt 150/14/40 VS20	55/40	53	14	120	20
PSt 150/14/60 VS20	80/60	71	22	70	14
PSt 150/14/80 VS20	105/80	89	30	50	12
PSt 150/14/100 VS20	130/100	107	39	40	10
PSt 150/14/120 VS20	160/120	125	47	35	8
PSt 150/14/140 VS20	190/140	143	55	30	7
PSt 150/14/160 VS20	210/160	161	63	25	6
PSt 150/14/180 VS20	240/180	179	71	22	5
PSt 150/14/200 VS20	270/200	197	80	20	4

### Standard configuration:

Tapped hole in moving end  
1 m coaxial cable RG 178 with BNC connector

### Options:

Coaxial cable RG178 with LEMO connectors  
00250 or 0S250  
Coaxial cable RG 316 for power applications

Moving end with spherical end piece **VbS**

Moving end with threaded pin **VAg**

Moving end plane **pF**

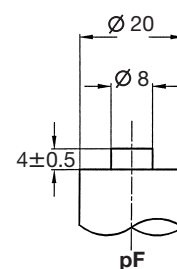
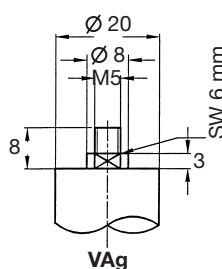
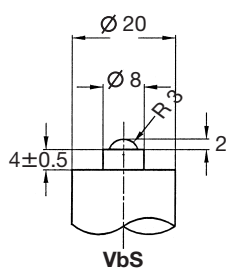
Thermostable modification

Low temperature modification

UHV compatibility

Position detection

Accessories see section 6





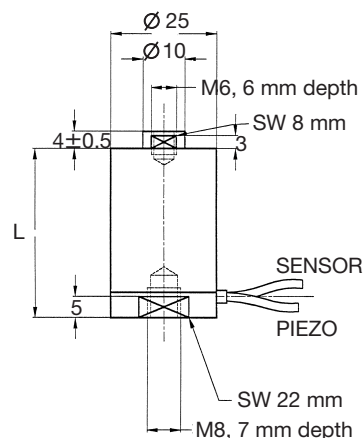
## PSt 150/20/... VS25

Prestress force = max. tensile force = approx. 1500 N

Max. load force: 14000 N

Max. force generation: 11000 N

Open loop sensitivity at 1 mV amplifier noise for actuator PSt 150/20/20 VS25: approx. 0.1 Nanometer



type	max, stroke μm	length mm	el. capacitance nF	stiffness N/μm	resonance frequency kHz
PSt 150/20/20 VS25	25/20	37	15	500	28
PSt 150/20/40 VS25	50/40	57	30	250	20
PSt 150/20/60 VS25	75/60	77	45	160	13
PSt 150/20/80 VS25	95/80	97	60	100	11
PSt 150/20/100 VS25	120/100	117	75	180	9
PSt 150/20/120 VS25	150/120	137	90	165	7
PSt 150/20/140 VS25	175/140	157	105	155	6
PSt 150/20/160 VS25	200/160	177	120	150	5
PSt 150/20/180 VS25	230/180	197	135	145	4
PSt 150/20/200 VS25	250/200	217	150	140	3

### Standard configuration:

Tapped hole in moving end

Electrical connection: 1 m coaxial cable RG 178 with BNC connector

### Options:

Coaxial cable RG178 with LEMO connectors 00250 or 0S250

Coaxial cable RG 316 for power applications

Modified end pieces on request

**Stroke A/B** A: for -30 V thru +150 V

B: for 0 V thru +150 V

**Max. force generation: for -30 V thru +150 V**

Thermostable modification

Low temperature modification

UHV compatibility

Position detection

Accessories see section 6



### 3. Low voltage HPSt150 piezo-ring actuators with preloaded casings (tubular design)

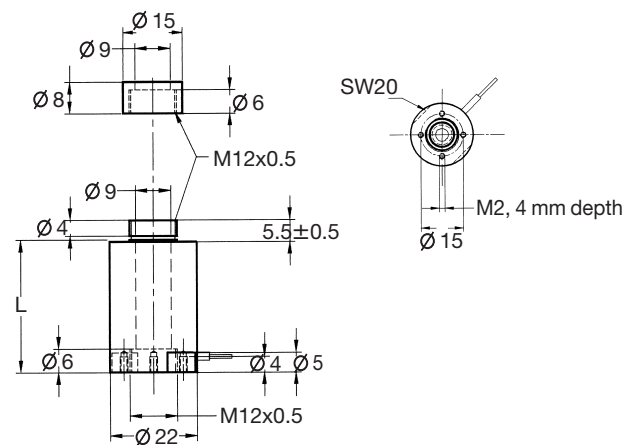
#### HPSt 150/14-10/... VS22

Prestress force = max. tensile force = 400 N

Maximum load: 6000 N

Maximum force generation: 4500 N (-30V/+150V)

Open loop sensitivity for 1 mV amplifier noise for actuator HPSt 150/14-10/12 VS22: approx. 0.1 Nanometer



type	max, stroke <sup>1)</sup> µm	length mm	el. capacitance µF	stiffness N/µm	resonance frequency kHz
HPSt 150/14-10/12 VS22	16/12	31	2.6	250	30
HPSt 150/14-10/25 VS22	32/25	44	5.2	120	20
HPSt 150/14-10/40 VS22	50/40	58	7.8	70	14
HPSt 150/14-10/55 VS22	70/50	71	11.6	50	9

<sup>1)</sup>Stroke A/B: A: for -30 V thru +150 V

B: for 0 V thru +150 V

#### Standard configuration:

Coaxial cable RG 178 length 1 m with BNC connector

#### Options:

Coaxial cable RG 178 length 1 m with LEMO 00250 or 0S250 connector

UHV compatibility

Low temperature application

Thermostable modification

Position sensor

Optics adaptor 0A 1/2": see section 6: accessories

Adaptor rings AR: see section 6: accessories





### 3. Low voltage HPSt150 piezo-ring actuators with preloaded casings (tubular design)

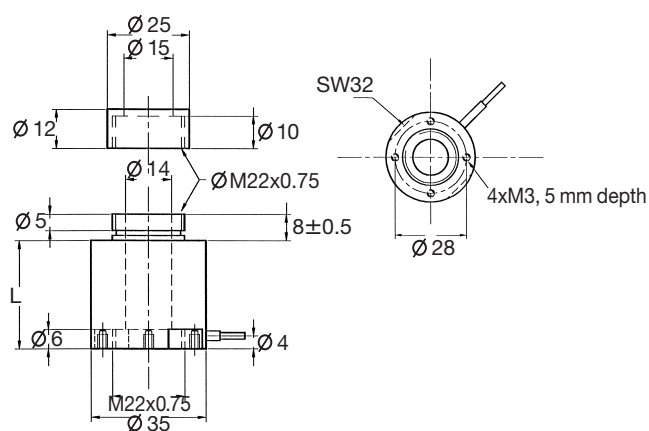
#### HPSt 150/20-15/... VS35

Prestress force = max. tensile force = 700 N

Maximum load: 11000 N

Maximum force generation: 8000 N (-30V/+150V)

Open loop sensitivity for 1 mV amplifier noise for actuator HPSt 150/20-15/12 VS35: approx. 0.1 Nanometer



type	max, stroke <sup>1)</sup>	length mm	el. capacitance µF	stiffness N/µm	resonance frequency kHz
	µm				
HPSt 150/20-15/12 VS35	16/12	31	5.5	450	30
HPSt 150/20-15/25 VS35	32/25	44	10	230	20
HPSt 150/20-15/40 VS35	50/40	58	15	150	17
HPSt 150/20-15/55 VS35	70/50	71	20	100	15

#### Standard configuration:

Coaxial cable RG 178 length 1 m with BNC connector

#### Options:

Coaxial cable RG 178 length 1m with LEMO 00250 or 0S250 connector

UHV compatibility

Low temperature application

Thermostable modification

Position detector

Optics adaptor 0A 1": see section 6: accessories

Adaptor rings AR: see section 6: accessories

<sup>1)</sup>Stroke A/B:      A: for -30 V thru +150 V  
                          B: for    0 V thru +150 V



#### **4. Piezocartridges: Low voltage actuators in casings with front mount threading**



Stack actuators in cartridge-version offer elegant design features by simple attachment of an actuator to the mechanics using a front mounting thread. Using this thread a coarse adjustment for the system is provided. Piezocartridges can retrofit conventional lead screws. Mechanical arrangements for adjusting purposes can be very simply upgraded by using piezocartridges.

##### **Standard configuration:**

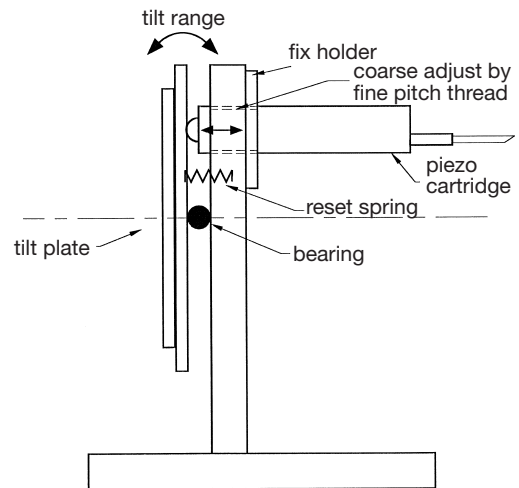
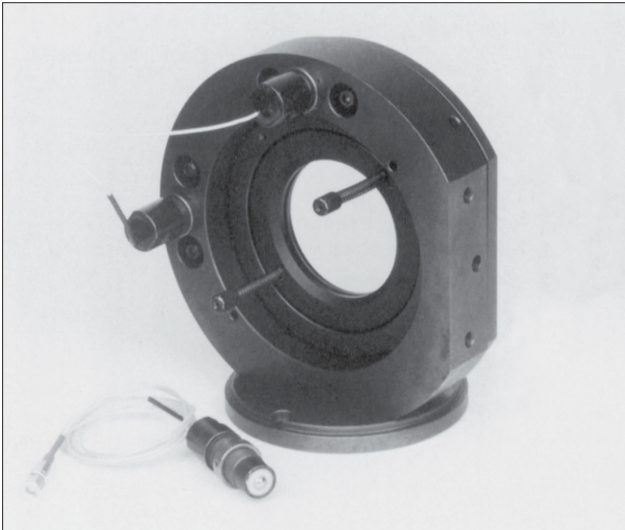
Casing: stainless steel  
Electrical connection: 1 m coaxial cable RG 178 with BNC connector

##### **Options:**

Coaxial cable RG178 with LEMO connectors  
00250 or 0S250  
Position detection  
Thermostable



#### 4. Piezocartridges: Low voltage actuators in casings with front mount threading



Schematic of a mirror mount based on piezo cartridges for coarse adjust by mounting screw and ultra fine adjustment by piezo action.

Piezoactuator types: FPSt M12(BD)



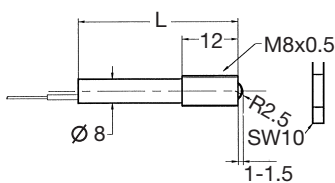
## Frontmount piezo-cartridges FPSt 150

### FPSt 150/4/... M8x0.5

(no internal prestress)

Maximum load: 150 N

Open loop sensitivity at 1 mV amplifier noise for actuator FPSt 150/4/20: approx. 0.1 Nanometer



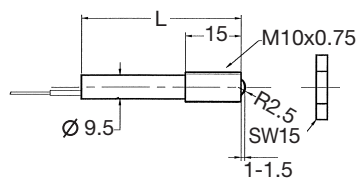
type	max, stroke	length	el. capacitance
	$\mu\text{m}$	mm	nF
FPSt 150/4/20 M8	27/20	22	340
FPSt 150/4/40 M8	55/40	40	700
FPSt 150/4/60 M8	80/60	58	1000

### FPSt 150/5/... M10x0.75

(no internal prestress)

Maximum load 600 N

Open loop sensitivity at 1 mV amplifier noise for actuator FPSt 150/5/20: approx. 0.1 Nanometer



type	max, stroke	length	el. capacitance
	$\mu\text{m}$	mm	nF
FPSt 150/5/20 M10	27/20	23	800
FPSt 150/5/40 M10	55/40	41	1600
FPSt 150/5/60 M10	80/60	59	2400
FPSt 150/5/80 M10	105/80	77	3200
FPSt 150/5/100 M10	130/100	95	4000

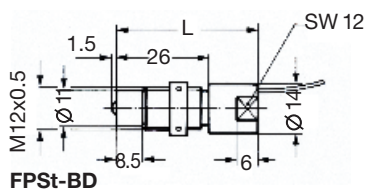
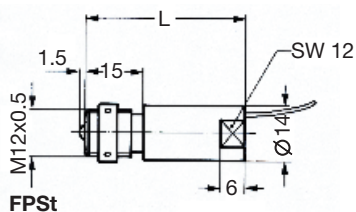
### FPSt 150/5/... M12x0.5(-BD) (former versions MPSt(-BD))

(no internal prestress)

For retrofitting translation stages MRL 80.25 and Newport mirror mounts SL

Maximum load: 600 N

Open loop sensitivity at 1 mV amplifier noise for actuator FPSt 150/5/20 : approx. 0.1 Nanometer



type	max, stroke	length	el. capacitance
	$\mu\text{m}$	mm	nF
FPSt 150/5/20 M12 (BD)	27/20	25 (27)	800
FPSt 150/5/30 M12 (BD)	40/30	34 (34)	1200
FPSt 150/5/40 M12 (BD)	55/40	43 (43)	1600
FPSt 150/5/60 M12 (BD)	80/60	61 (64)	2400
FPSt 150/5/80 M12 (BD)	105/80	79 (82)	3200
FPSt 150/5/100 M12 (BD)	130/100	97	4000
FPSt 150/5/120 M12 (BD)	160/120	115	4800
FPSt 150/5/140 M12 (BD)	190/140	133	5600



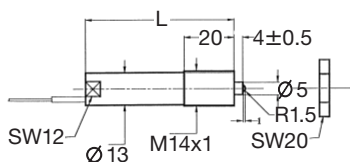
## Frontmount piezo-cartridges FPSt 150

### FPSt 150/7/... M14x1

Prestress force = max. tensile force = 200 N

Maximum load: 1500 N

Open loop sensitivity at 1 mV amplifier noise for actuator FPSt 150/7/20: approx. 0.1 Nanometer



type	max, stroke µm	length mm	el. capacitance µF
FPSt 150/7/20 M14	27/20	28	1.8
FPSt 150/7/40 M14	60/40	46	3.6
FPSt 150/7/60 M14	80/60	64	5.4
FPSt 150/7/80 M14	105/80	82	7.2
FPSt 150/7/100 M14	130/100	100	19
FPSt 150/7/120 M14	160/120	118	11
FPSt 150/7/140 M14	190/140	136	13
FPSt 150/7/>140 M14	>140	on request	

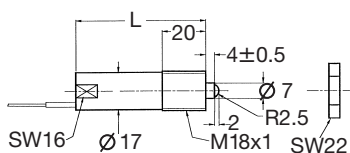
### FPSt 150/10/... M18x1

(with internal prestress)

Prestress force = max. tensile force = 400 N

Maximum load: 3000 N

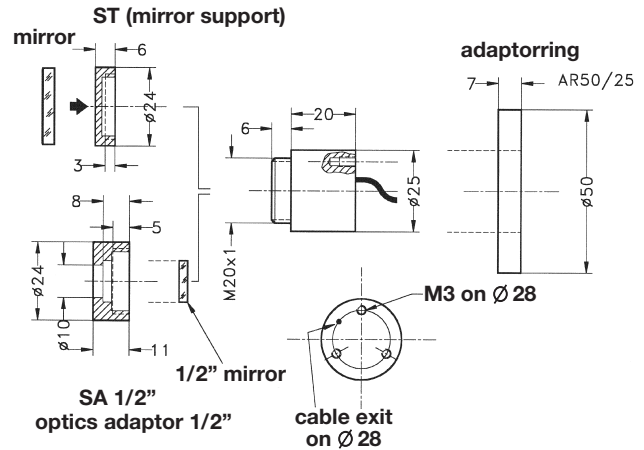
Open loop sensitivity at 1 mV amplifier noise for actuator FPSt 150/10/20: approx. 0.1 Nanometer



type	max, stroke µm	length mm	el. capacitance µF
FPSt 150/10/20 M18	27/20	28	3.6
FPSt 150/10/40 M18	55/40	46	7.2
FPSt 150/10/60 M18	80/60	64	11
FPSt 150/10/80 M18	105/80	82	14
FPSt 150/10/100 M18	130/100	100	18
FPSt 150/10/120 M18	160/120	118	21
FPSt 150/10/140 M18	190/140	136	25
FPSt 150/10/>140 M18	>140	on request	



## 5. Piezo Mirror-shifter STr-25



Piezo mirror-shifters are used for ultrafine axial positioning of mirrors and other optical components without the use of heavy stages or other external guiding mechanisms.

Piezo mirror-shifters are internally preloaded resulting in high resonance frequencies, outperforming hereby conventional arrangements like stages etc. with regard to dynamics and stability.

Piezo mirror-shifters are mainly used in coherent optics like interferometry or holography eg. phase shift arrangements for measuring surface topographies with a resolution in the submicron range.

Mounting of piezo mirror-shifters is done by

- using an adaptorring for fitting to mirror mounts
- using the rear side tapped holes
- clamping at the circumference.

For attaching mirrors to the shifter, mirror supports or optic adaptors are used.

The mirror support ST is a flat screw-on cap where the mirrors are glued on.

The optic adaptors SA are especially for easy mounting and changing of 1/2 and 1 mirrors.

The mirror-shifters are driven by standard amplifiers described in the corresponding data sheet. In applications where not the full travel of the shifter is used, it is reasonable to use power supplies with lower output voltage. Usually such electronics show higher output currents, which results in a wider frequency range of the shifters operation.

Technical data	max. operating voltage V	max. stroke µm	capacitance nF	resonance frequency kHz
STr-25/150/6	-30/+150	6	2500	15

Option: inverse polarity

Max. weight of optics, when mounted horizontally:  
20 g

Electrical

connection: 1 m coaxial cable with BNC-connector or LEMOSA (see catalog "amplifiers")

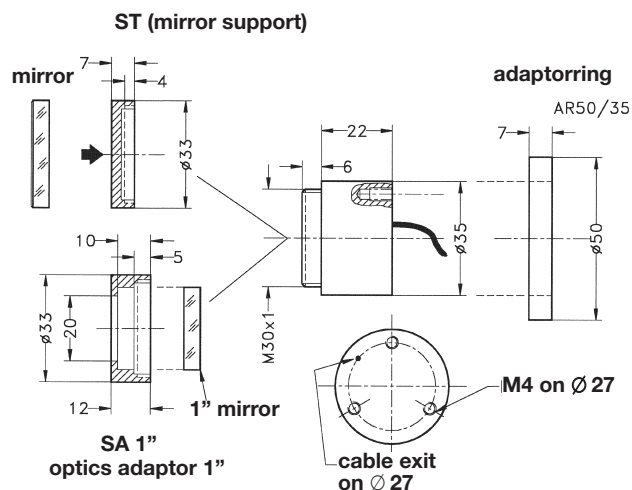
**The mirror shifter is delivered incl. 1 mirror support ST.**

Accessories: mirror support ST25 (for glueing on the mirror)  
optic adaptor SA 1/2 for inserting 1/2 optics  
adaptorring for mounting the shifters to mirror mounts AR 25/50  
other sizes of adaptor rings on request





## Piezo Mirror-shifter STr-35



Technical data	max. operating voltage V	max. stroke $\mu\text{m}$	capacitance nF	resonance frequency kHz
STr-35/150/6	-30/+150	6	2800	10

### The mirror shifter is delivered incl. 1 mirror support ST.

Max. weight of optics, when mounted horizontally: 40 g

Electrical connection:

1 m coax cable with BNC-connector or LEMOSA (see catalog "amplifiers")

Accessories: mirror support ST 35  
optics adaptor SA 1  
adaptor ring AR 35/50  
(other dimensions on request)



## 6. Accessories

### 6.1 Electricals

**Supply coaxial cables:** one side connector, other side free for attaching piezocomponents such as bare stacks etc.

Cable type RG 178 (PTFE), thickness 1.8 mm:  
length 1.5 m

Connectors available: BNC, LEMO 0S250,  
LEMO 00250

**Extension cables:**

Cable types RG 178, length 2 m/4 m/6 m



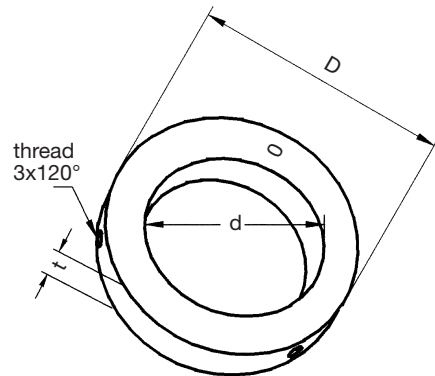
**Connecting adaptors** for matching different connecting systems BNC/LEMO 0S250, BNC/LEMO 00250

### 6.2 Mechanics

**Adaptor rings**

The adaptor rings are normally used to match the diameter of actuators with casing to mirror mounts, defined for a distinct mirror's diameter. An often

used combination are ring actuators (e.g. with casing VS22), which are adopted to 2" mirror mount system. The proper adaptor ring is an AR (51/22).



Designation AR X/Y X external diameter, Y internal diameter (corresponds to actuator's casing's diameter), T thickness of ring (all dimensions in mm)

AR	25/10	t	5
AR	25/12	t	5
AR	25/18	t	5
AR	50/18	t	7
AR	50/20	t	7
AR	50/22	t	7
AR	50/25	t	7
AR	50/35	t	7

AR	31/12	t	7
AR	31/22	t	7
AR	31/25	t	7
AR	51/18	t	7
AR	51/20	t	7
AR	51/22	t	7
AR	51/25	t	7
AR	51/35	t	7



### 6.3 Optic adaptor for ring actuators

Ring actuators are often used within optical arrangements for precise adjustment of transmissive optical components e.g. within laser resonators or tunable etalons. The optic adaptors allow the simple mounting and changing of circular optics with the standard diameters 1/2" and 1".

#### Optic adaptor OA 1/2"

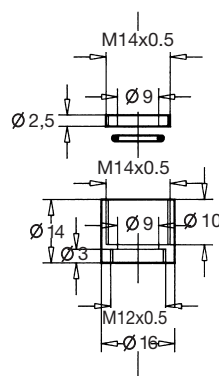
This element allows mounting of optics with diameter 1/2" up to a thickness of 8 mm. It can be simply attached using the M12x0.5 thread to all the



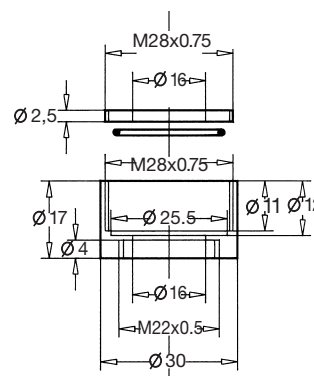
corresponding ring actuators with a HAg M12x0.5 end piece (bare rings) such as the HPSt 150/14-10/..., or the equivalent cased types with a VS22 casing.

#### Optic adaptor OA 1"

This element allows mounting of optics with diameter 1" up to a thickness of 8 mm. It can be simply attached using the M22x0.5 thread to all the corresponding ring actuators with a HAg M22x0.75 end piece (bare rings) such as the HPSt 150/20-15/...



OA 1/2"



OA 1"

### 6.4 Screw in front adaptor SE

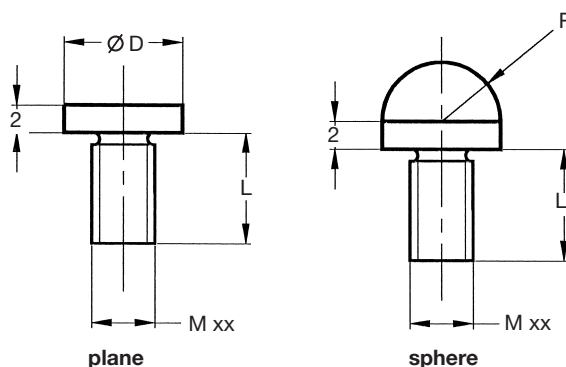
(For stacks with casings VS)

The adaptors have a threaded pin for simple attachment to the standard front pieces VS with tapped hole and provide a plane or spherical front to match



the actuator for various uses. For example small mirrors can be glued onto the plane faces.

**Designation:** SE xx plane and SE xx sphere, where xx represents the casing's diameter, where it is mounted to (e.g. 12 for VS 12).



Type	Mx (mm)	D (mm)	L (mm)	R (mm)
SE9	2.3	5	3	2.5
SE10	3	6	3	2.5
SE12	3	7	4	3.5
SE15	4	8	4	3.5
SE18/20	5	10	4	4

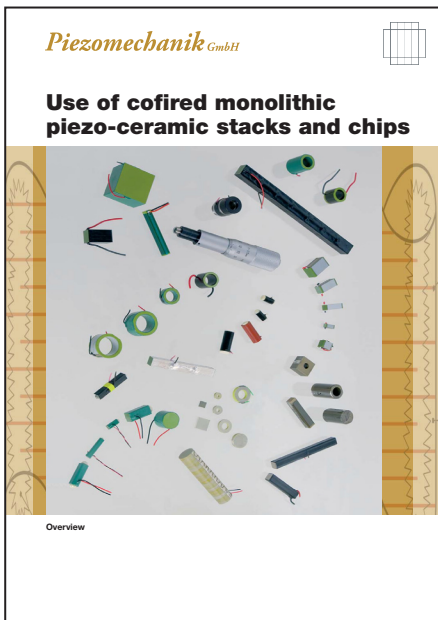
#### Magnetic front pieces

Based on the above described front adaptors, MA components with magnetic plane face are offered for VS10 and VS12 casings (designation MA10 / MA12). Small ferromagnetic components can be easily attached to the moving pin of stack actuators.



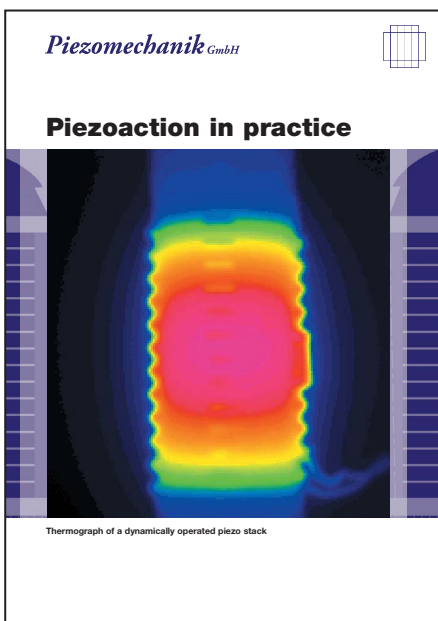
## Electronics/amplifiers

Using the full potential of piezo-actuators regarding precision and dynamics requires a proper power supply with regard to voltage range, current (power), noise, well adapted to your application.



## Summary

A few basics about cofired monolithic piezo-ceramic actuators and chips regarding handling, properties, modifications, technology.



## Extended

More details on PZT- actuating structures, operating parameters, design aspects, “must not”s and the interaction between PZT-actuators and attached mechanics as well as the importance of a well-adapted electronics to get the optimum performance out of your system.

**PIEZOMECHANIK** is a globally recognized supplier of first-class piezo systems.

Our actuator specialists are excellent connoisseurs of the current actuator scene. This allows you to point out certain intricacies of the topic, which you will not find in the usual company scripts.

**PIEZOMECHANIK** successfully provides advice and development contributions even for unorthodox piezoaktorian applications, some of which go far beyond the classical approaches.

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