

## stack type actuators

### series PA

- excellent dynamic properties due to high resonant frequencies
- modern multilayer technique
- integrated mechanical preload
- tensile forces up to 150 N
- motion up to 145  $\mu\text{m}$  (larger motions available)
- high stiffness up to 190 N/ $\mu\text{m}$

#### applications:

- nan positioning
- scanning microscopy
- micro manipulation
- micro injection
- optical adjustment
- laser fine tuning
- mirror adjustment
- mirror positioning
- vibration generation and cancellation



fig.: series PA

#### Concept

The PA series of actuators are based on stack type actuators made by the multilayer technology. They are internally preloaded by a mechanical spring. This makes them ideal for dynamic applications. The abilities to generate a large force and to be subjected to high mass loading make them particularly useful for machine tools and dynamic scanning systems.

#### Specials

The series PA provides micro-second response time. The resolution is limited by the control signal noise only. As an option, these actuators are available with strain gage sensors for motion control. This option will increase the outside diameter from 12 mm to 14 mm. The accuracy will be <0.5%.

#### Mounting/Installation

Actuators should only be fastened with screws or clamps on the bottom plate. Your sample can then be mounted on the top plate with a threaded screw. Please avoid any torque forces while mounting the sample or during assembly. For assembling please use the spanner flats. Please avoid tensile forces greater than the given preload!

**technical data:**

series PA	unit	PA 4/12	PA 8/12	PA 16/12	PA 25/12	PA 35/12	PA 50/12	PA 65/12	PA 80/12	PA 100/12	PA 120/12	PA 140/12	
part. no.		P-150-00	P-151-00	P-152-00	P-153-00	P-154-00	P-155-00	P-156-00	P-157-00	P-159-00	P-160-00	P-162-00	
motion (-10/+20)%*	µm	4.5	9.5	21	31	42	63	74	84	105	125	145	
capacitance (±20%)**	µF	0.34	0.7	1.8	2.5	3.6	5.4	6.3	7.2	9.0	10.8	12.6	
resolution***	nm	0.009	0.019	0.04	0.06	0.08	0.12	0.15	0.17	0.21	0.25	0.29	
resonant frequency***	kHz	65	40	22	15	12	8	7	6	4	4	3	
stiffness	N/µm	190	90	40	27	20	13	11	10	8	7	6	
blocking force	N	850	850	850	850	850	850	850	850	850	850	850	
pre-load	N	150	150	150	150	150	150	150	150	150	150	150	
operating voltage	V	-20...+130											
connector	voltage	- LEMO 0S.302											
cable length	m	1											
dimensions	length L	mm	22	26	35	44	53	71	80	89	107	125	143
	diameter D	mm	12	12	12	12	12	12	12	12	12	12	12
series PA with spherical end R2.5	unit	PA 4/12 R2.5	PA 8/12 R2.5	PA 16/12 R2.5	PA 25/12 R2.5	PA 35/12 R2.5	PA 50/12 R2.5	PA 65/12 R2.5	PA 80/12 R2.5	PA 100/12 R2.5	PA 120/12 R2.5	PA 140/12 R2.5	
part. no.		P-150-50	P-151-50	P-152-50	P-153-50	P-154-50	P-155-50	P-156-50	P-157-50	P-159-50	P-160-50	P-162-50	
dimensions	length L	mm	23	27	36	45	54	72	81	90	108	126	144

series PA SG with integrated measurement system	unit		PA 8/14 SG	PA 16/14 SG	PA 25/14 SG	PA 35/14 SG	PA 50/14 SG	PA 65/14 SG	PA 80/14 SG	PA 100/14 SG	PA 120/14 SG	PA 140/14 SG
part. no.			P-151-01	P-152-01	P-153-01	P-154-01	P-155-01	P-156-01	P-157-01	P-159-01	P-160-01	P-162-01
motion (±0.2)%* closed loop	µm-		7.6	17	25	34	50	59	67	84	100	116
integrated measurement system			strain gage									
resolution*** closed loop	nm		0.12	0.3	0.5	0.7	1.0	1.3	1.6	2.0	2.4	2.8
typ. repeatability	nm		1.2	1.2	1.4	1.5	2	1.6	2.3	2.6	9	12
dimensions	length L	mm	28	37	46	55	73	82	91	109	127	144
	diameter D	mm	14	14	14	14	14	14	14	14	14	14
series PA SG with integrated measurement system spherical end R2.5	unit		PA 8/14 SG R2.5	PA 16/14 SG R2.5	PA 25/14 SG R2.5	PA 35/14 SG R2.5	PA 50/14 SG R2.5	PA 65/14 SG R2.5	PA 80/14 SG R2.5	PA 100/14 SG R2.5	PA 120/14 SG R2.5	PA 140/14 SG R2.5
part. no.			P-151-51	P-152-51	P-153-51	P-154-51	P-155-51	P-156-51	P-157-51	P-159-51	P-160-51	P-162-51
dimensions	length L	mm	29	38	47	56	74	83	92	220	128	145

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

\*\* typical value for small electrical field strength

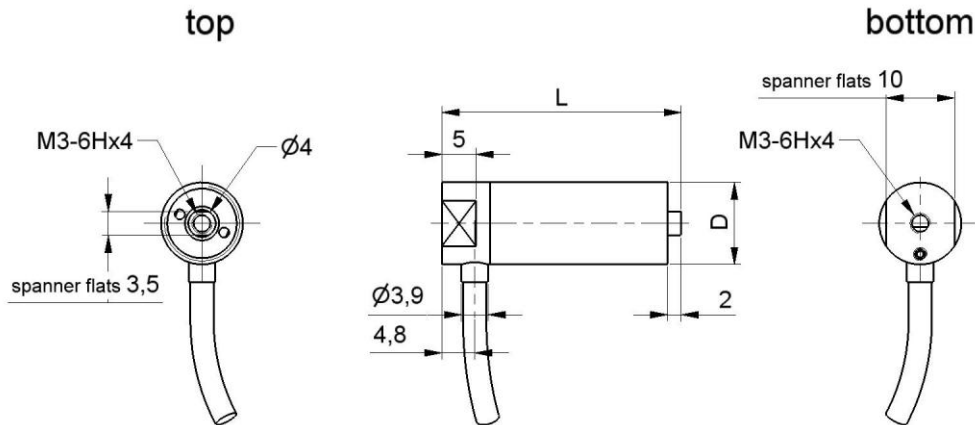
\*\*\* please see piezoline

**options:**

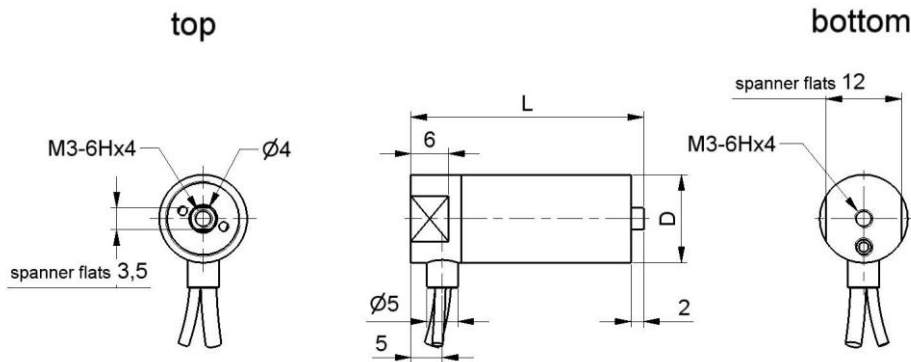
- vacuum version
- cryogenic temperature version
- full bridge strain gage sensors (outer diameter changes to 14mm)
- top plate: spherical tungsten carbide (part no./size: see table)
- other options available upon request

**accessories:**

- flat-tip adapter for M3 thread on top plate  
size: diameter 4mm, length 1mm (part no. P-150-11)
- flexure hinge for PA XXX/12 & PA XXX/14  
size: diameter 10mm, length 12mm (part no. Z-100-04)

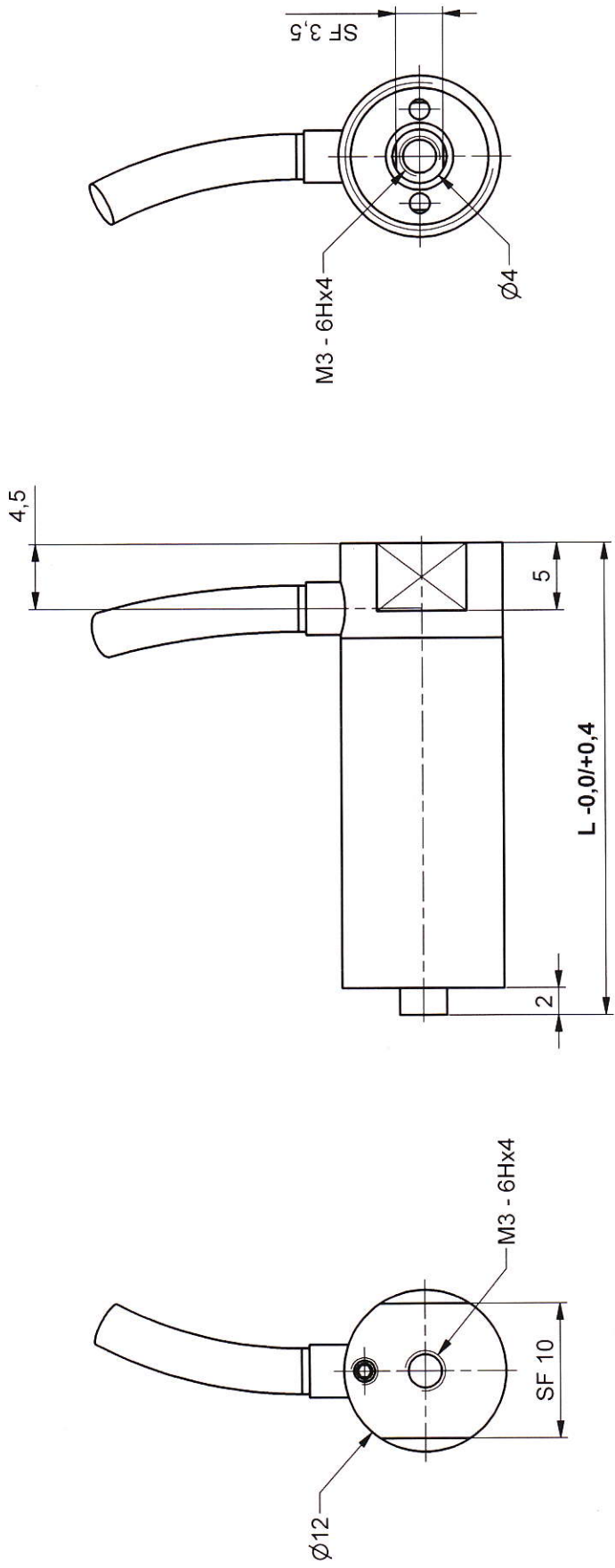


**series PA XXX/12**




**series PA XXX/14 SG**

Please pay attention to our “notes for mounting”, which are available as download on our homepage.

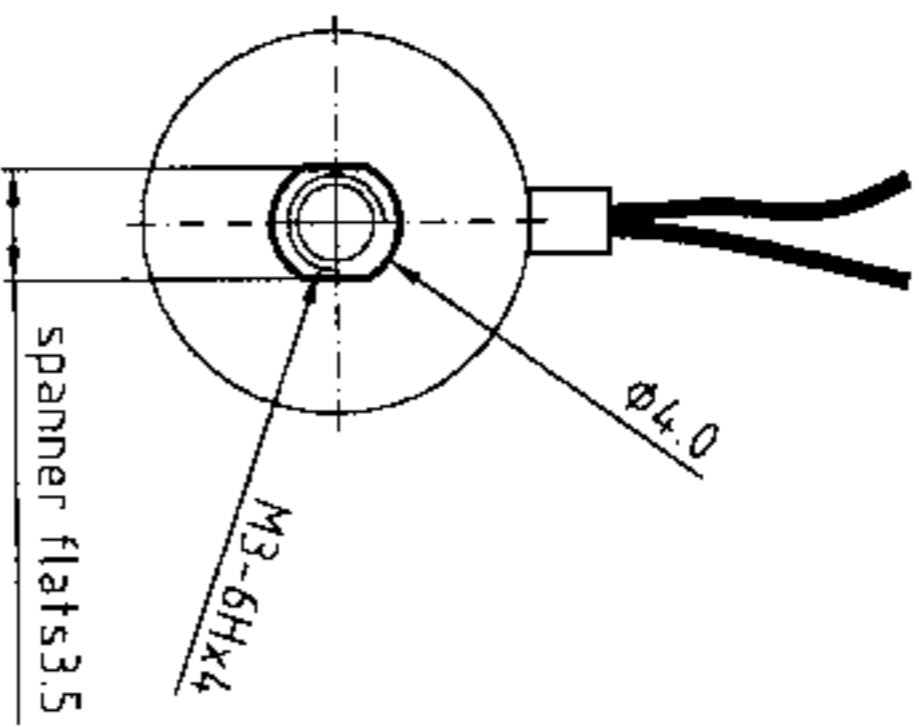
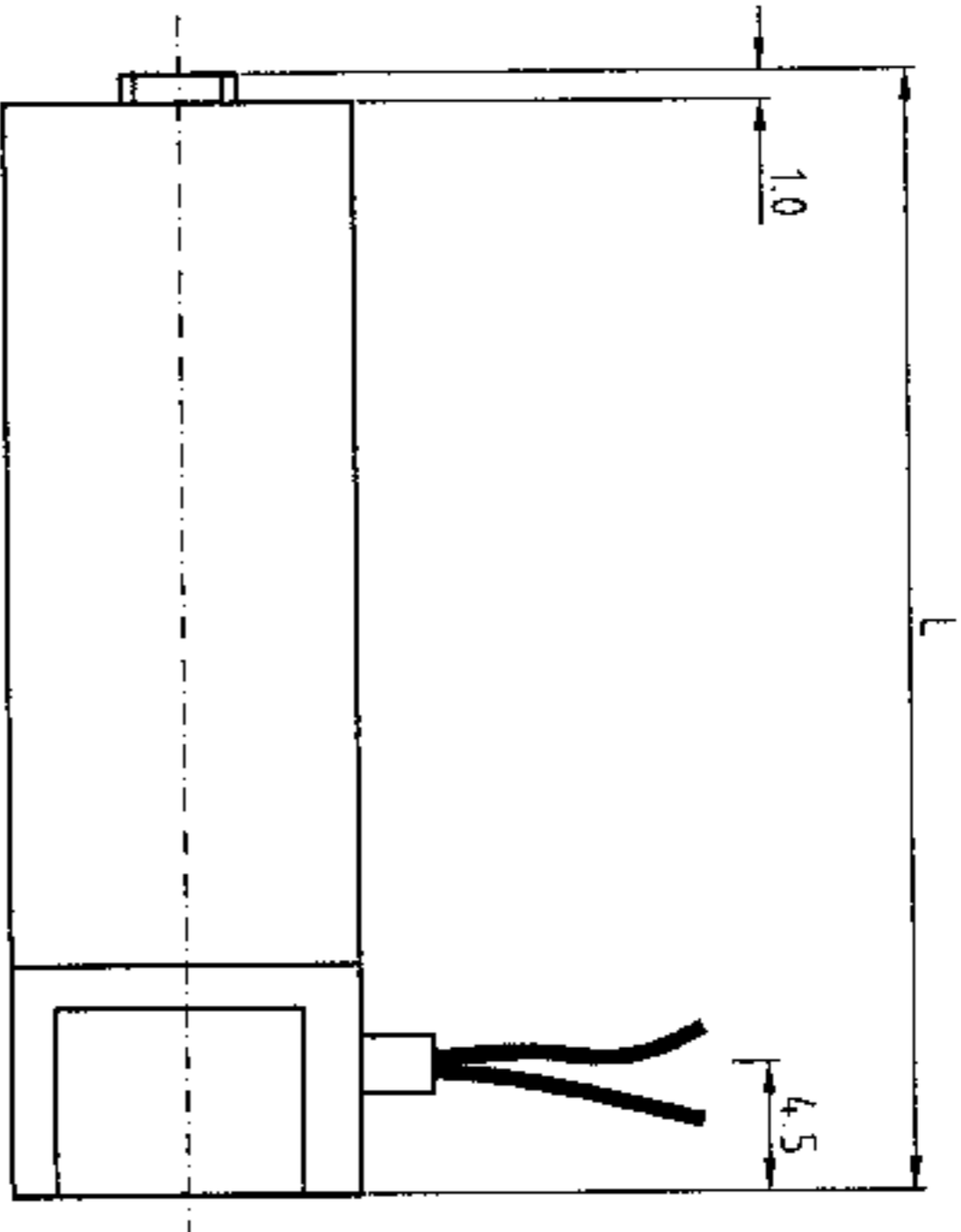
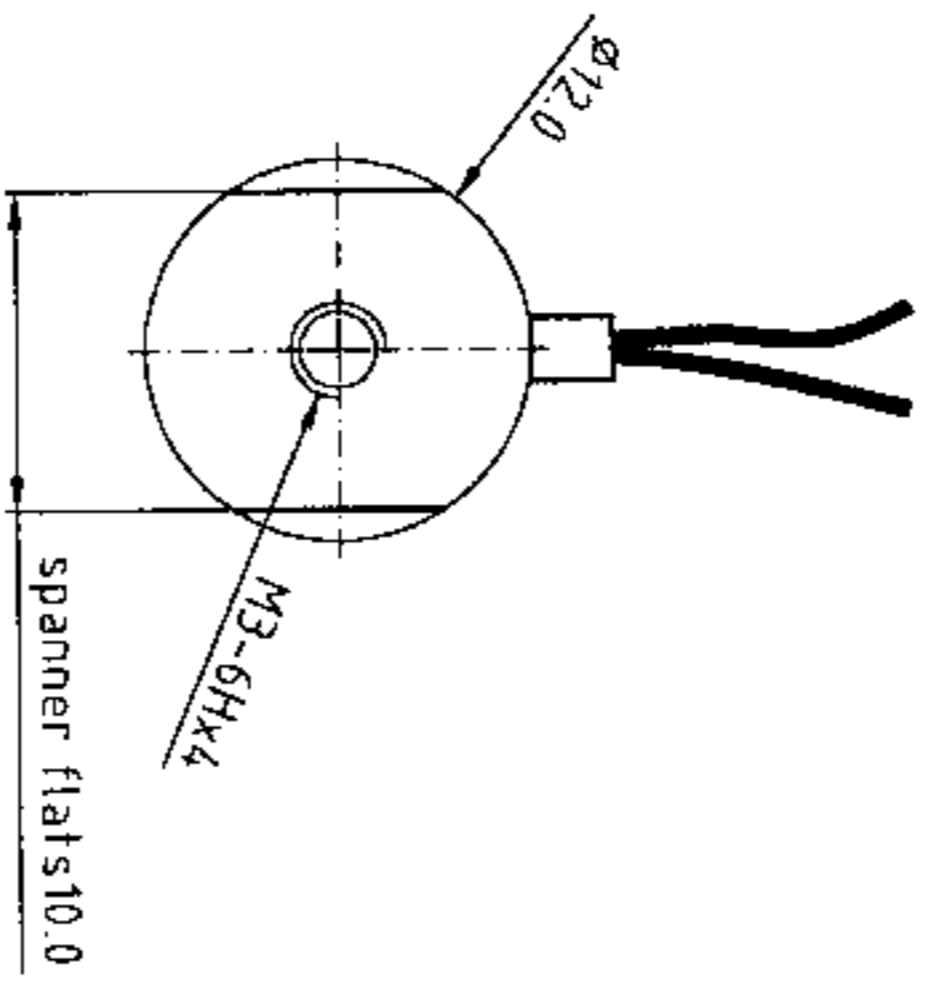


**ORIGINAL**

type	PA4/12	PA8/12	PA16/12	PA25/12	PA35/12	PA50/12	PA65/12	PA80/12	PA100/12	PA120/12	PA140/12
part no.	P-150-00	P-151-00	P-152-00	P-153-00	P-154-00	P-155-00	P-156-00	P-157-00	P-159-00	P-160-00	P-162-00
L	22	26	35	44	53	71	80	89	107	125	143

part.-no.	P-150-00...P-162-00		part.-name	PA4/12...PA140/12	
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	scale		2:1		
piezosystem jena					

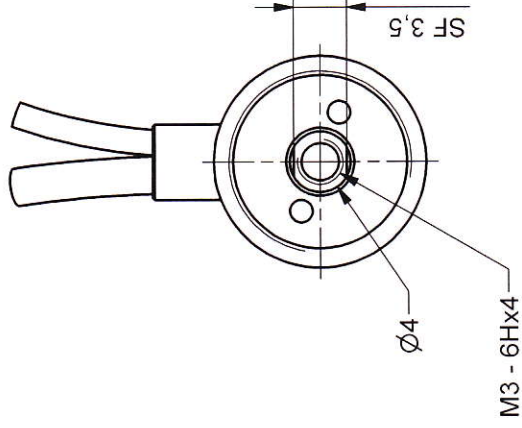
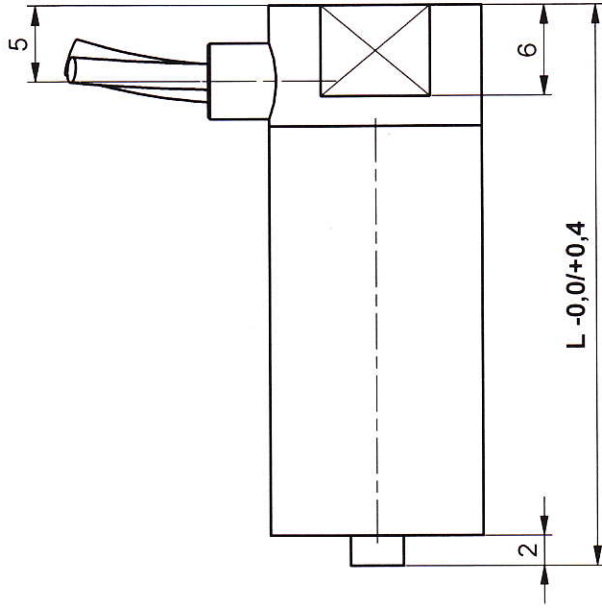
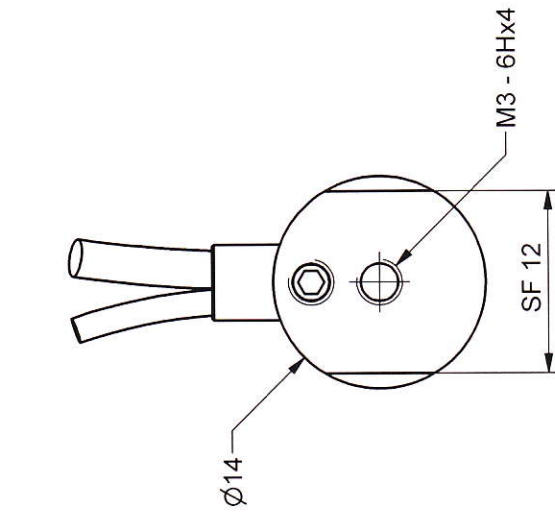
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typ	PA8/12-V	PA16/12-V	PA25/12-V	PA35/12-V	PA50/12-V	PA80/12-V	PA100/12-V
part no.	P-151-02	P-152-02	P-153-02	P-154-02	P-155-02	P-157-02	P-159-02
L	26	35	44	53	71	89	107

ORIGINAL

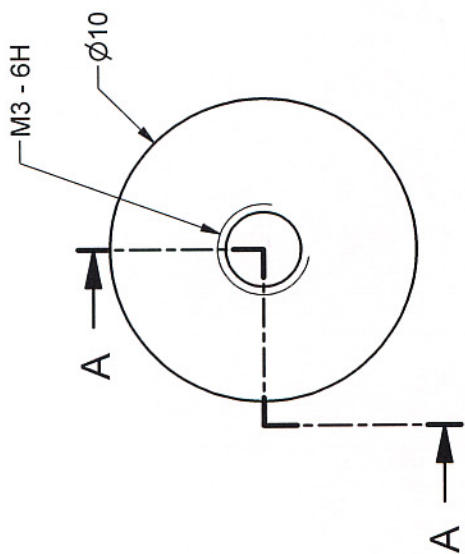
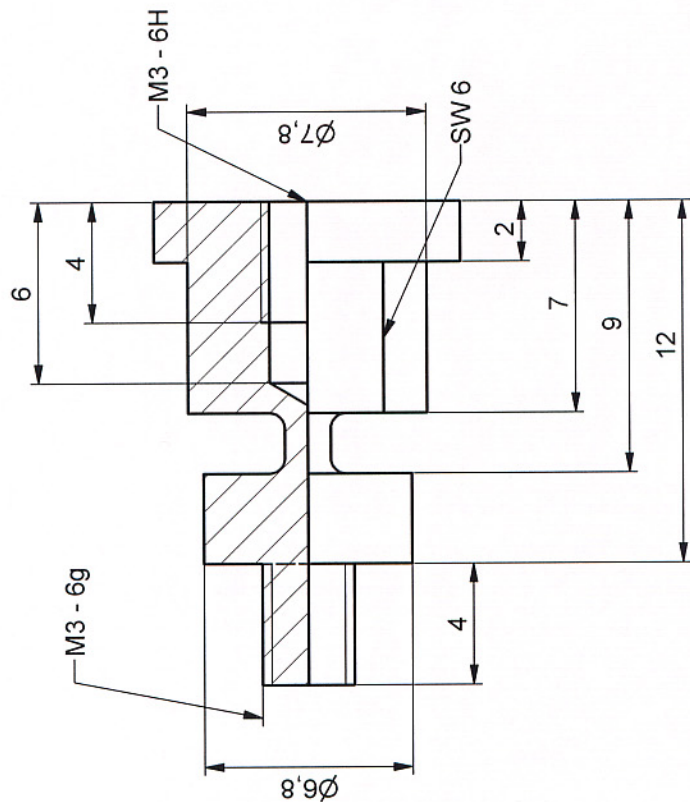
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scale	ÄZ 0		customers drawing	piezosystem jena	
scale	2:1				



type	PA 8/14 SG	PA 16/14 SG	PA 25/14 SG	PA 35/14 SG	PA 50/14 SG	PA 65/14 SG	PA 80/14 SG	PA 100/14 SG	PA 120/14 SG	PA 140/14 SG
part no.	P-151-01	P-152-01	P-153-01	P-154-01	P-155-01	P-156-01	P-157-01	P-159-01	P-160-01	P-162-01
L	28	37	46	55	73	82	91	109	127	144

part.-no.	part.-name	
P-151-01...P-162-01	PA8/14SG...PA140/14SG	
file name	ÄZ 1	OK: date/sign.
PP1XX01		- 5. JULI 2010
	scale	customers drawing
	2:1	<b>piezosystem jena</b>

**ORIGINAL**



(1:1)



ORIGINAL

part.-no.	Z-100-04	part.-name	Biegeelenk PA X/12 M3
file name	PZ10004.idw	OK: date/sign.	17. SEP. 2008
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			customers drawing
			piezosystem jena