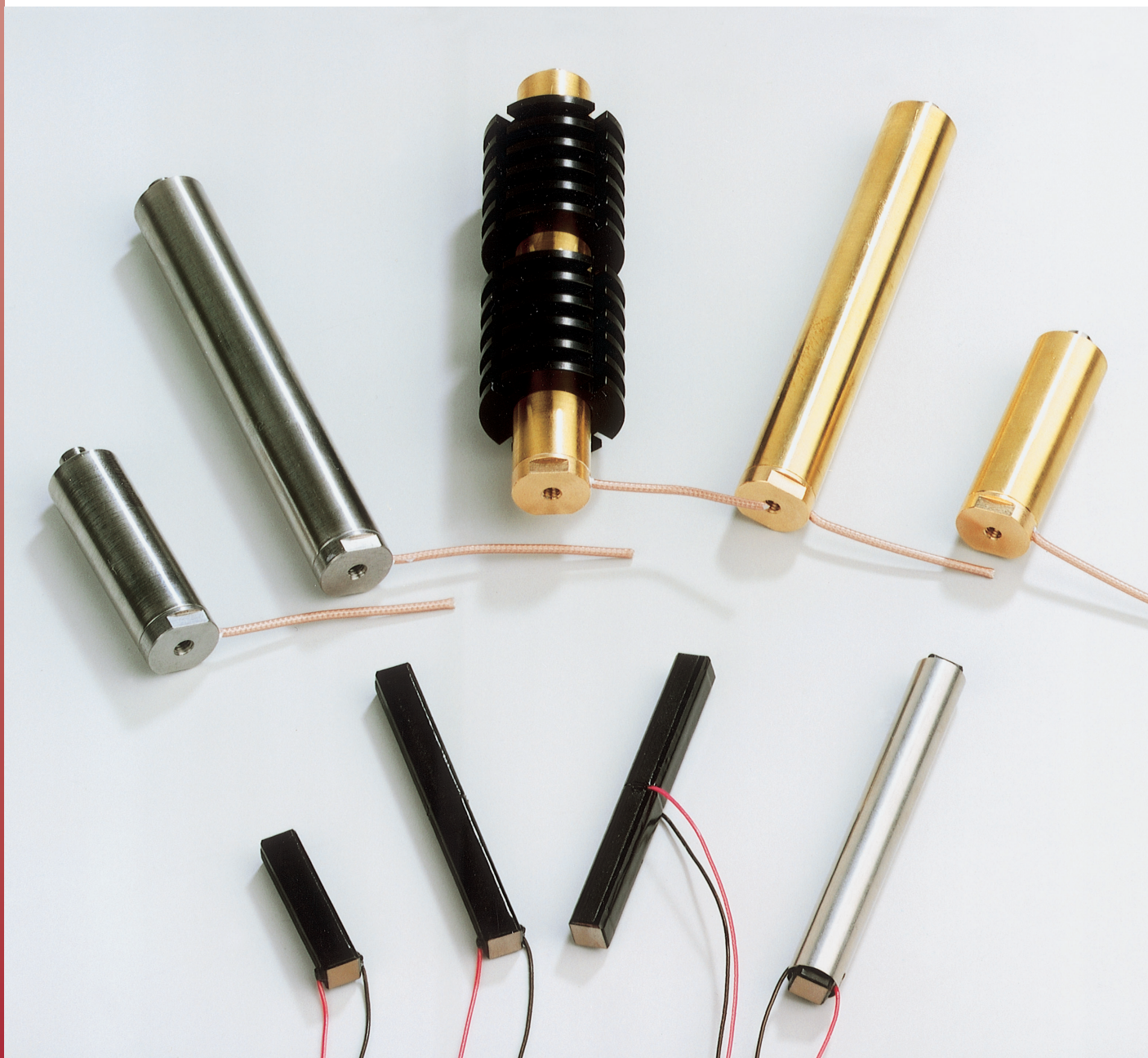


**Low voltage  
Highly Dynamic  
Piezo Actuators**

**PSt-HD 200**

for  
Rapid valve switching  
Adaptive structures  
High temperature actuation  
and others



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# What's new?

The new PSt-HD200 low voltage actuators are a spin-off of the novel fuel injection piezo actuators used together with the top modern Common Rail Systems in automotive cars and light trucks. They are operated there with 80  $\mu$ sec rise-/fall-times with repetition rates up to 200 Hz. Because the actuators are located near the hot engine, a high temperature resistance is a must.

It is self-evident, that such unique elements are aiming for other heavy duty applications too.

The PSt-HD200 co-fired monolithic stacks are based on a brand-new low dielectric high-strain PZT ceramics featuring **low power consumption** and **high temperature operation capability**.

Additionally, the internal supply electrodes of the stack withstand **high charging currents** and **high mechanical acceleration** rates to achieve **large cycle numbers** ( $10^{10}$ ) without degradation.

Therefore, these stacks are the optimum choice, when you seek

for

- low dynamic power consumption (low capacitance)
- low dynamic losses (low self-heating)
- high operating temperatures (150°C and higher)
- high strain operation.

## PSt-HD 200/7x7/45, bare stack

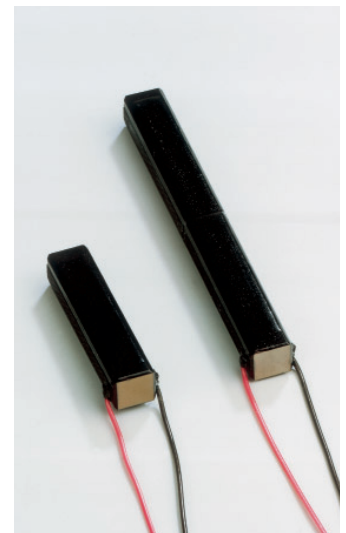
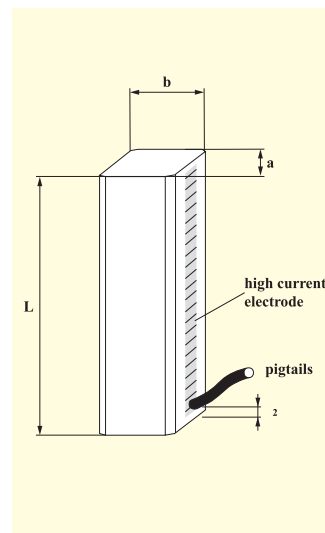
### Technical data:

Max. voltage range : (-) 50 V/ (+)200V

Length L : 32.5 mm

Strokes ( $\mu$ m)	-50V/200V	0V/200 V	0V/150V
	65 $\mu$ m	45 $\mu$ m	35 $\mu$ m
Block. force	1800	1400	1100

Max. load : approx. 2800 Newtons  
 Stiffness : 33 N/ $\mu$ m  
 El. capacitance : 4.5  $\mu$ F effective for 0V/200V step  
 Resonance frequency : approx. 40 kHz



### Operating requirements:

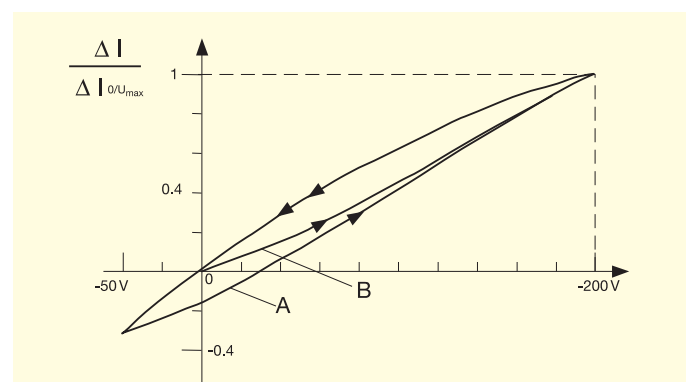
Preloaded operation generally recommended

Preload stiffness < 3 N/ $\mu$ m recommended

Preload force minimum 750 Newtons for pulsed operation

Apply 200 V only with a duty cycle of max. 5%

Apply 150V maximum longterm



Stroke/voltage diagram for unipolar and semibipolar activation (constant force condition)

## Thermal properties

Temperature range :

standard -50°C thru + 150°C ( incl. self-heating )

on request : 200°C short term

Stack's temperatures for various cycling conditions

both sides of stack clamped in a metal frame /20°C  
air convection ,

temperature measured at stack's mid section

repetition rate	applied voltage swing	Temperature
100 Hz	100 Vpp	30°C
100 Hz	150 Vpp	57°C
100 Hz	200 Vpp	71°C
170 Hz	200 Vpp	100°C

**By additional heat management**, eg. proper heat sinking or forced air cooling , the acceptable max. repetition rate increases by factors (see PSt-HD200/10/xx VS15 with internal heat management)

## Available options:

Position sensing

Humidity protection HuP

Corundum endplate pl (add 1 mm in length)

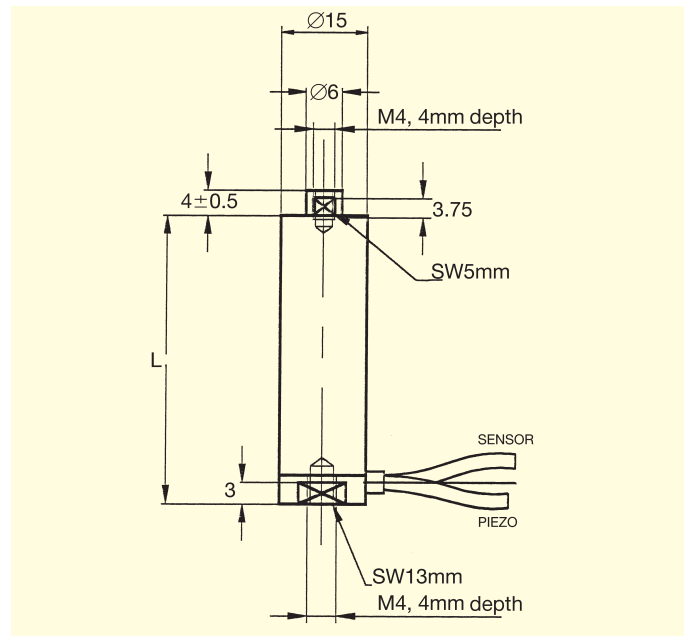
Corundum half spheres sph (add 3.5mm in length)

Longer stack PSt-HD200/7x7/90 on request

(Notice: not all combinations of options are available)

# PSt-HD 200/10/xx VS 15 with preloaded casing

(cased versions of the PSt-HD200/7x7/xx stacks)



Internal preload 800 Newtons

Max.load force : 2000 Newtons

Blocking force = max. force generation : 1800 Newtons ( -50V/+200V )

		Max. stroke µm	Length L mm	capacitance µF	stiffness N/µm	resonance kHz
		-50V=>200V				
		0V=>200V				
		0V=>150V				
PSt-HD 200/10/45	VS15	65/45/35	46	4.5	60	25
PSt-HD 200/10/90	VS15	130/90/70	79	9	30	17
PSt-HD 200/10/135	VS15	190/135/105	111	13.5	15	9
PSt-HD 200/10/180	VS15	260/180/140	144	18	7	6

## Standard configuration:

Stainless steel casing , no internal heat management:  
suitable for

- standard and high temperature operation (static, low dynamics)
- power operation : long-term power input < 20 Watt (at 20° ambient)

1.5 coaxial cable RG 178 with BNC connector

M4 tapped hole in moving top

PZT - Polarity : positive

Operating range -50V/+200V

## Available Options:

**Position** sensing

**Humidity** protection HuP

**Connector** systems : LEMO 00 250 / LEMO 0S 250

## Heat management

- “thermostable” ( indicated by brass or copper casing)  
for power levels : long-term > 20 watts  
Example:  
max. power input of a LE 200/070 amplifier  
(0V/+200V , 700 mA)  
into a PSt-HD200/10/45 VS15 /thermostable :  
at 285 Hz full stroke operation ,  
casing heat-sinked to 20°C at socket  
=> actuator’s temperature 45° C
- air fin fittings : details on request  
PSt-HD200/10/45 VS15 thermostable +  
air fins/forced air flow  
Operating conditions as above :285 Hz / 0V - 200V  
=> actuator’s temperature : 35°C

## Electrical driving conditions :

A full stroke semi-bipolar operation -50V/+200 V is applicable for temperatures below 70°C.

At higher stack temperatures (due to environmental temperature or self-heating) a unipolar operation within 0V/200V is recommended.

The application of 200V operation is recommended only short-term during dynamic cycling

Apply +150V max. voltage under static operation

Recommended supplies :

SVR 150 , SVR200,

LE 200/020,

LE 150/100 , LE 200/070, LE 200/500

HVP 200

150 V supplies result in smaller stroke, but higher bandwidth due to the higher current ratings compared to the equivalent 200V power supplies.



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