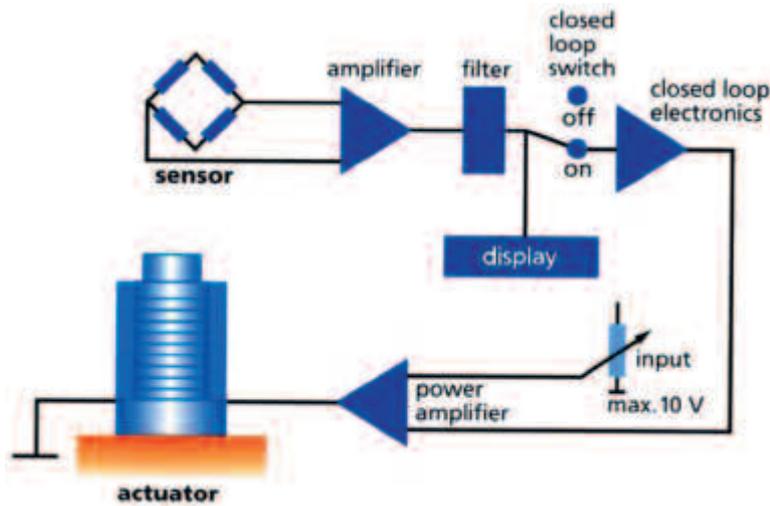


options

types of integrated measurement systems

piezosystemjena



Strain gage measurement systems are very compact and can be integrated into most of our translation systems (SG option). Strain gage measurement systems are applied as a full wheatstone bridge, and are mostly temperature compensated. Piezo elements of the series PA and PAHL, equipped with strain gage measurement systems, reach an accuracy of typically <math><0.5\%</math>, can fulfill most requirements, and are optimally priced.

Further information

- The closed loop motion of the actuator is 80% of the open loop motion.
- Most of the systems are available with a vacuum-and cryogenic temperature version.
- Our closed loop electronic systems (e.g. ENV 40 SG or NV 40/1CLE) can work in either modes: open loop or closed loop.

You can find the detailed technical parameters in the sections of each element with a SG option.

Please find more technical data about capacitive measurement systems in the chapter piezoline, section 8.

translation systems with capacitive and strain gage measurement system

Capacitive measurement systems offer the highest resolution and linearity. They are ideally suited for positioning of the highest accuracy in the semiconductor industry, as well as high resolution optical systems (e.g. atomic force microscopes).

To achieve optimal results in measurement accuracy, translation systems with integrated capacitive measurement systems have to work under stable environmental conditions.

Further information

- Piezos with part numbers ending with the suffix "E" or "D" have a 2m cable.
- The closed loop motion of the actuator is 80% of the open loop motion.
- Most of the systems are available with a vacuum and cryogenic temperature version.
- Our closed loop electronic systems (e.g. ENV 40 CAP) can work in either modes: open loop or closed loop.

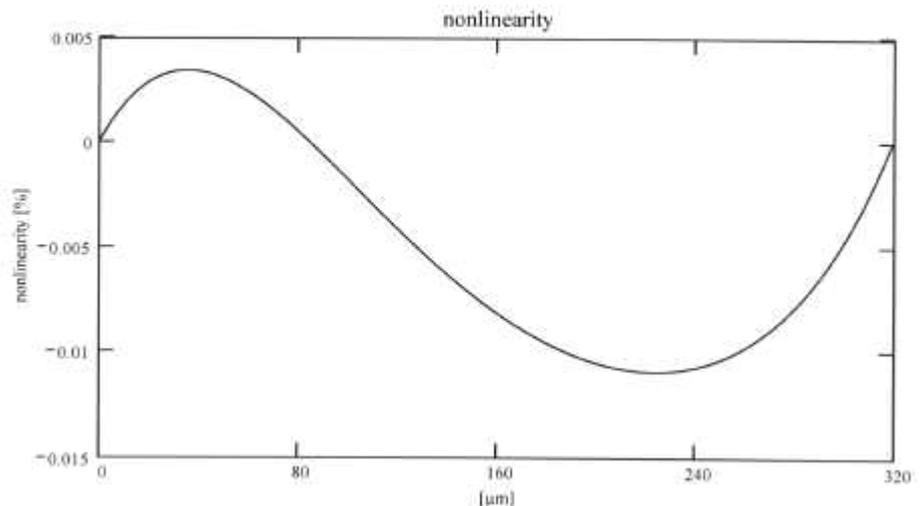
You can find detailed technical parameters in the sections of each element with a CAP option.

Capacitive sensors can be equipped inside the translation system due to their compact size. The positioning accuracy (linearity) of closed loop piezo electrical systems with a capacitive feed back sensor is better than 0.05% relative to the full motion.

Linearität - linearity

max. nonlinearity : absolut = 46 nm

relativ = 0.014%



options elements with integrated measurement systems

High precision applications often require long term stability of the positioning system. Integrated feed back sensor systems enable **piezosystem jena** positioning stages to measure the motion and to do corrective actions in order to reach the highest positioning accuracy. In general we offer integrated capacitive or strain gage feedback sensor systems for nearly every system.

The resolution of our piezoelements is on the order of only a few nanometers or better when working combined with our standard power supplies as a complete system (see also the section "resolution" in chapter 3.3 of the piezoline).

piezosystem jena offers different measurement systems:

- SG strain gage measurement systems**
- CAP capacitive measurement systems**

general remarks

If a measurement system is combined with a translation system and closed loop electronics, then the technical parameters (linearity, repeatability, resolution, and frequency) are determined based on all off the components of the system.

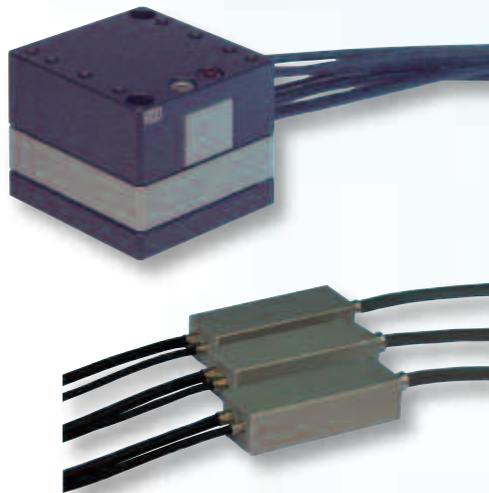
If a measurement system is used externally, the experimental setup must be chosen very carefully to avoid additional failures (e.g. Cosine and Abbe errors.)

Work in open loop

The motion of the translation system will be measured and will be indicated on the display. The voltage at the monitor output of the closed loop electronics is proportional to the measured motion.

Work in closed loop

The input signal defines the motion that is needed. The motion is measured by the sensor. The closed loop electronic holds the



- no hysteresis
- no creep
- high accuracy
- high resolution

piezosystem jena

input position. Each change in the position which is measurable will be corrected by the electronics. Additional voltage range is needed based on the principle of the controller. This is the main reason closed loop motion is 80% of the open loop motion (e.g. PX 100 SG part.no.:T-104-01 motion open loop: 100µm; motion in closed loop mode: 80µm).

Dynamic work

The dynamic behavior of a closed loop system depends on the dynamic parameter of each part: the translation system with the environmental conditions, the electronics and the measurement system. Often high dynamic, and high positioning accuracy conflict with each other. To reach a high resolution and high stability, filters are integrated into the electronics. These filters limit the dynamic response of the system. In general our electronics are optimized for the highest achievable positioning accuracy for work done under static conditions. However, per customer request, specified loads (up to the max. load) can be calibrated during the manufacturing process. This will allow us to create an optimized system being able to achieve the fastest possible closed loop motion.

Dynamic work in open loop

All systems with closed loop electronics can be operated in open loop to achieve higher dynamics as well.

Feed back sensor-external preamplifier system

The signal values provided by the feed back sensors are quite low. This low level of signal, limits the maximum possible length of the cable.

piezosystem jena has developed a special sensor signal preamplifier contained in a small box located closed to the piezo stage or actuator. The pre amplified sensor signal is a lot less sensitive.

The external measurement system has even more advantages that allow for an easy and uncomplicated handling: in case an actuator has to be replaced, it is possible to interchange actuators of the same model. So a new adjustment of the controller electronics is not necessary. Please look also at "ASI". In addition, different lengths of cable extension are also possible: the distance between the measuring point and the sensor-pre-amplifier is initially defined. The length of the cable between the sensor-pre-amplifier and the controller can be extended up to 25 m.

Actuators with an integrated feedback sensor, with part numbers ending in the suffix "D" or "E", have an external measurement system that is housed by a small cable box. The cable length of those actuators is 2.0 meter.