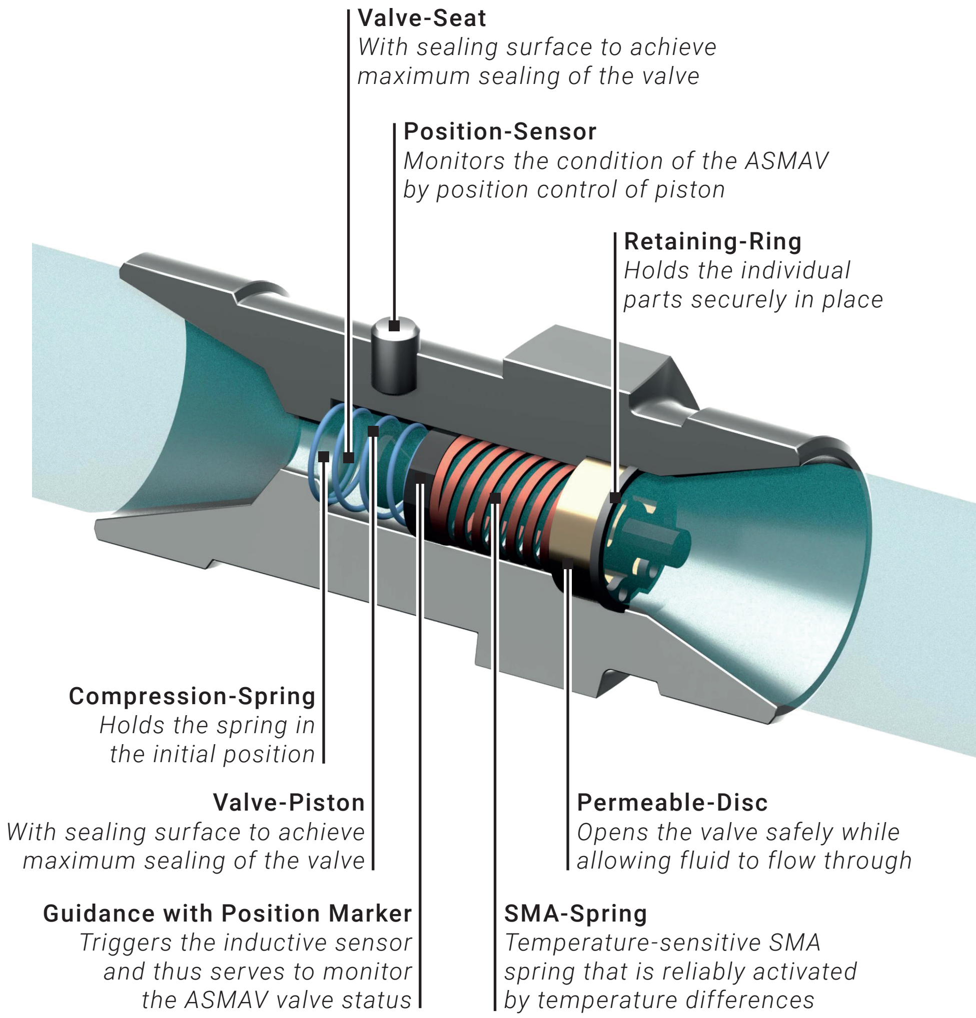
# ASMAV

## Advanced Shape Memory Alloy Valve

## Overview




## Structural and functional design

The ASMAV operates without any drive or additional controller, fully independent of power supply, relying solely on the media temperature.

It is precisely tailored onto the demand of the customer application by adjusting the alloy composition and microstructure of the SMA spring. This ensures the highest level of plant safety.

The ASMAV is a reliable solution for the passive control of fluid flows. The fluid temperature activates the phase transformation of interior SMA elements which let the ASMAV finally close smooth and in a controlled manner.

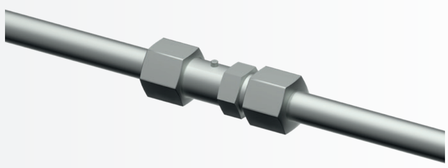
Beside temperature control, the ASMAV is equally effective when controlled just via system pressure. A pressure drop ($\Delta p$) within the system activates the mechanism, allowing the ASMAV to close safely and reliable. This ensures dependable shut-off functionality under varying operating conditions.

## Benefits

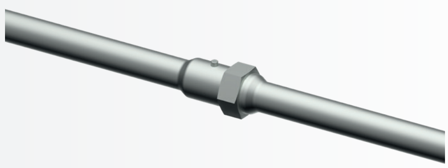
- ✓ **Passive operation**
- ✓ **With position indicator**
- ✓ **Highly customizable**
- ✓ **High reversible elongation**
- ✓ **High closing force = High energy density**
- ✓ **Earthquake-proof**
- ✓ **Category B in according to IAEA definition**

## Connection Types

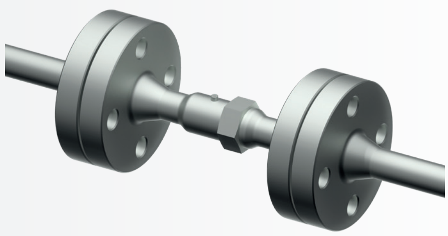
**Threaded**



**Welded**



**Welded with flange**



## Technical Data

| | |
|---|---|
| System -Temperature | **up to 752 °F**<br>400 °C |
| System - Pressure | **up to 4.3 psi**<br>300 bar |
| Sizes | **3/8 to 4 inch**<br>DN 10 – 100 |

Suitable for various media

Available in various materials

# ASMAV

## Advanced Shape Memory Alloy Valve

## Shape Memory Alloy (SMA)

Shape memory alloys (SMA) are functional materials or so called smart materials. SMAs have the ability to return to their initial state after a severe, seemingly plastic deformation. This effect can be induced both thermally (one- and two-way effect) and mechanically (pseudoelasticity).

Compared to other functional materials, SMA is characterized by large reversible strains at high actuation forces, making them to be a functional material of highest energy density. This plays an important role when SMAs are to perform mechanical work, e.g. as actuators.

The fundament for the shape memory effect is the martensitic phase transformation. The SMA can be present in two states, the high-temperature phase austenite, and the low-temperature phase martensite. In order to utilize the SMA effect, an actuator component is first deformed in the martensite by an external force (system pressure, bias spring). If then heated above austenite start temperature, heat is going to be converted into mechanical work, and actuator stroke an actuator force are generated. The martensitic phase transformation in SMA is reversible, so that actuator elements can be cyclically activated.

From the industrial perspective, Nickel-Titanium SMA with its ternary and quaternary derivatives are the most relevant SMAs. Customizing compositions in combination with tailored microstructures allow for the precise control of phase transformation temperatures, functional and mechanical properties, respectively.

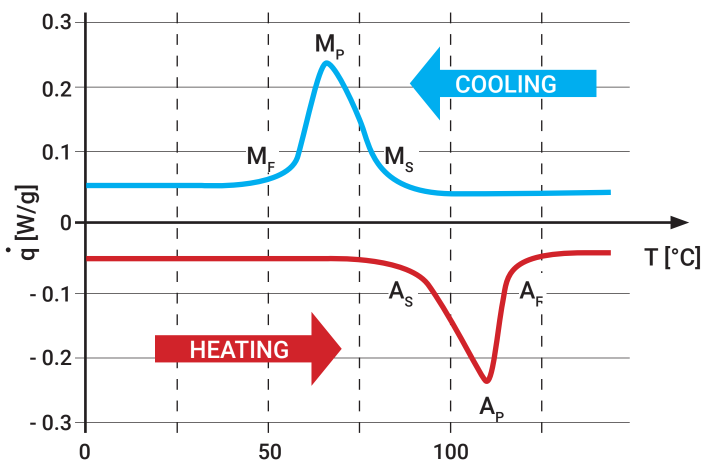



*Fig.: Illustration of a DSC analysis of a NiTi SMA*

NiTi SMA can be produced in various semi-finished products. Typical forms for actuator elements are tension wires, compression springs or torque tubes. The transformation temperatures and hysteresis of the SMA elements usually have to be customized onto specific requirements derived from a certain application.

## Development partners

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## Legend

| | |
|---|---|
| $\dot{q}$ [W/g] | Heat flux |
| T [°C] | Specimen temperature |
| $M_F$ | Martensite finish temperature |
| $M_P$ | Martensite peak temperature |
| $M_S$ | Martensite start temperature |
| $A_F$ | Austenite finish temperature |
| $A_P$ | Austenite peak temperature |
| $A_S$ | Austenite start temperature |

## Information / Distribution

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