

# Application Note

## MEMETIS SHAPE MEMORY ALLOY (SMA) NC/NO MINIATURE VALVES / EVALUATION KIT

Thank you very much for choosing the Serie09 NC/NO valve or the evaluation kit. With the purchase, you have received a new generation of ultra-compact Shape Memory Alloy valves. With its size, it is suited even for complex fluidic systems with a multitude of fluidic components.

### Important notes

**Control:** For testing purposes we recommend using the valves with our electronic control unit (ECU), otherwise there is a risk that the valve will be damaged due to overheating. For customer-specific electronic control and instructions please contact our customer support via [support@memetis.com](mailto:support@memetis.com).

**Storage:** Avoid moisture and store all parts at a dry place. Temperatures should stay between  $-10\text{ }^{\circ}\text{C}$  and  $90\text{ }^{\circ}\text{C}$ .

**Operation Temperature:**  $10\text{ }^{\circ}\text{C}$  to  $50\text{ }^{\circ}\text{C}$

**Fluid Compatibility:** Depending on the configuration, the wetted materials are PEEK/PPS (housing) and Silicone (sealing). Please check the compatibility of the fluids used with the valve materials before use. If required, valves can be provided with other materials (for example: POM or PMMA for the housing and FKM or EPDM for sealing). Please contact us at [support@memetis.com](mailto:support@memetis.com) for further information.

**Pressure range:** 0.1 to 2 bar @input for air and water.

**Do not attempt to open the valve housing, as this may irreversibly destroy the valve!**

Please check our datasheets for further information on the valve's properties

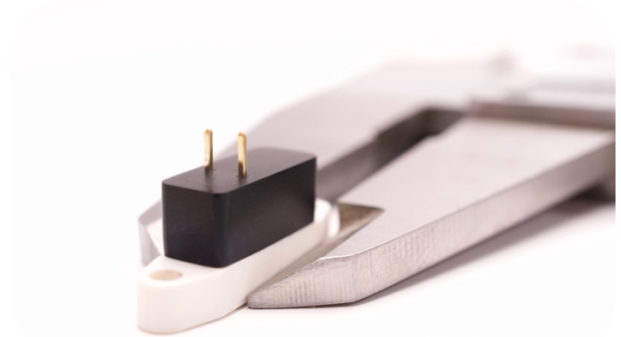


Fig. 1: SMA miniature valve NO/NC (Series09)

### Integration of valves

memetis miniature valves have O-rings on the bottom side for sealing and a flange-mount connection with two M1.6 screws. The dimensions of the drilling holes for fixation on the backplane and the inlet and outlet of the fluid channels are shown in Fig. 2.

Our valve evaluation kits include a fluidic adapter on which the valve is mounted using two M1.6 screws, to enable a quick connection to tubes. We offer the fluidic adapter with Male LUER fittings, fittings from IDEX for tubes with OD 1.6 mm and from FESTO for tubes with OD 4.0 mm. The inlet and outlet are marked on the fluidic adapter.

The correct orientation of the valve (inlet/outlet) must be considered when mounting the valves onto the fluidic adapters (see drawing).

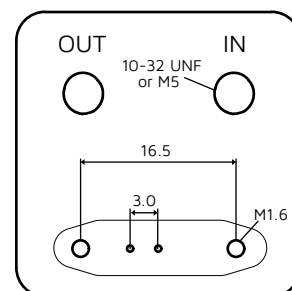


Fig. 2: Fluidic adapter with threads cut and indicated fluidic inlet and outlet. All units in mm.

The dimensions of the SMA miniature valve can be seen in Fig. 3.

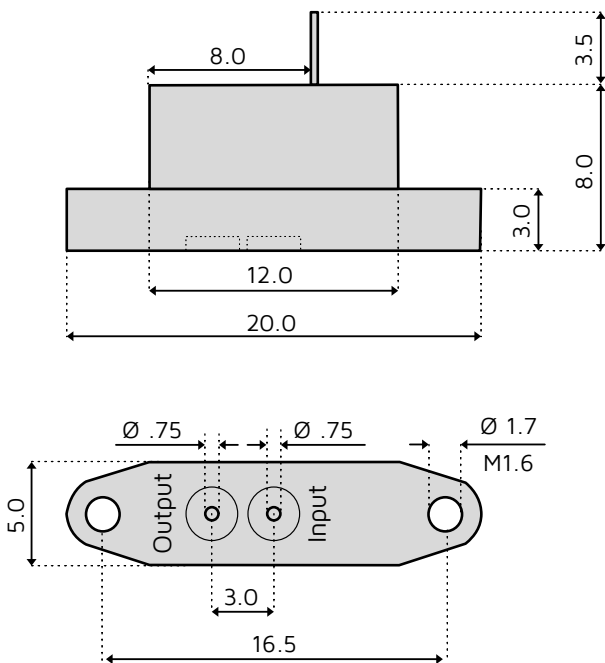


Fig. 3: Dimensions of the NC miniature valve (height of 1.2 lower). All units in mm.

## Electronic control unit

memetis offers a pre-programmed electronic control unit (ECU-P2) to operate the valve intuitively and give you an easy start (Fig. 5). You can find a data sheet and a troubleshooting guide on our download page: [www.memetis.com/en/download-page/](http://www.memetis.com/en/download-page/)

### Powering the ECU

The ECU is powered via a microUSB cable that is powered by 5 V. The maximum power that is available depends on the source the ECU is connected to:

- USB charger wall plug up to 1500 mA
- PC connection is limited to 100 mA/500 mA (depending on the USB host)



Fig. 4: Electronic control unit for the control of NC/NO valves.

In any case, the ECU will monitor the current that it consumes and detects if more power is consumed than allowed.

If an over-current condition is detected, the outputs will be turned off immediately and cannot be turned back on for 2 s. The *white LED* will flash.

If this happens, try using another power source. A USB charger with a 2 A rating gives the highest output power.

### Connecting a valve

Make sure you select an ECU configured for NO/NC valves. These units have a **blue** front and back panel and are labeled (NO/NC).

Connect the NO/NC valve to one of the two output connectors on the front of the ECU with the supplied cable.

### Switching a valve

To switch the valve from its default state, press the push button on the front panel for the channel the valve is connected to. The valve will be powered from the ECU and the *blue LED* for the channel lights up.

If the *blue LED* starts flashing the connection to the valve is broken or the ECU is unable to maintain the required output current. The valve stays powered until the push button is pressed again.

In addition to the push button, the valve can be switched via the respective IO channel on the back side of the unit. The valve will be powered while the IO channel is HIGH.

### Using the IO interface

The IO interface on the back side of the unit can be used to enable the output channels.

The two inputs are electrically isolated. Any voltage from **1.8 V to 5 V** can be used as long as the **polarity** is correct. The positive and negative side of each input is labeled with + and - signs.

The input needs a current of around 2 mA with a 1.8 V signal and around 10 mA with a 5 V signal. The absolute maximum input current is 20 mA.

The IO interface can directly be connected to Raspberry-Pi or Arduino GPIO pins. The + input should be connected to the GPIO pin and - input to GND.

## Contact information

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### LEDs

- The *white LED* on the front side of the ECU will light up after powering.
- If too much current is drawn from USB, the *white LED* will flash.
- The *blue LEDs* on the front will light up if the respective output is enabled and the output current is correct.
- The *blues LEDs* will flash if the ECU is unable to maintain output current regulation.

### Data connection to the ECU

A digital interface to the ECU is available via USB (virtual COM port) and I2C.

The ECU implements a serial communication protocol to set the output current, enable/disable output channels and set/read various configuration parameters. In addition, the data connections allow reading back the momentary output current and voltage.

The USB interface can be used to power the ECU and communicate at the same time. This allows the valves to be controlled by a PC with a single connection.

The I2C connector is directly connected (not isolated) to the internal circuit and has a strict 3.3 V requirement. Do **not** connect a 5 V Arduino I2C interface to the ECU.

All in- and outputs of the ECU can be seen in Figure 5.

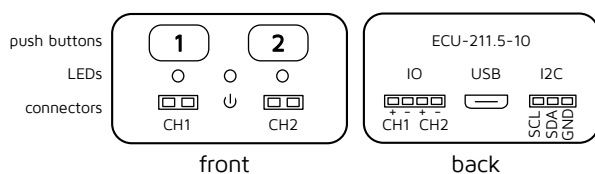


Fig. 5: Electronic control - Inputs, controls, and

If you have any problems with the ECU or need support for set up of the evaluation kit, you can contact our customer support team at [support@memetis.com](mailto:support@memetis.com).

Also, if you prefer a customized valve solution, please contact us.