OPERATING INSTRUCTIONS

Version 1.1

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Manufacturer

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Product

Solenoid Valve E2-Family

Changelog

Version	Changes	Author	Verification	Release Date
V1.1	Baseline	Niklas Peter	Tizian Rieger	19.12.2025

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1 SAFETY

SAFETY

Strict compliance with these operating instructions is essential for the safe and enduring use of this product. No warranty is given in case of non-compliance with the operating instructions or improper handling of the product. This product is intended exclusively for use with the fluids specified in the respective data sheet of the valve. Use of the product under conditions not specified in the data sheet or contrary to the instructions contained therein is understood to be IMPROPER. The manufacturer assumes no liability for damage or loss resulting from improper use of the product.

No warranty is given in case the customer opens the product without prior written agreement of deltaVision GmbH.

WARNING

- The generally applicable safety regulations must be observed when planning, installing, and using the product. This encompasses, but is not limited to, regulations regarding safety in working with electrical systems, pressurized systems and hot objects.
- Appropriate measures must be taken to prevent unintentional incorrect handling or damage to the product.
- Valves or connections in the system must not be unscrewed or dismantled under pressure. Before dismantling pressure lines, make sure that they are depressurized.
- Before any intervention in the system, the supply voltage must be disconnected

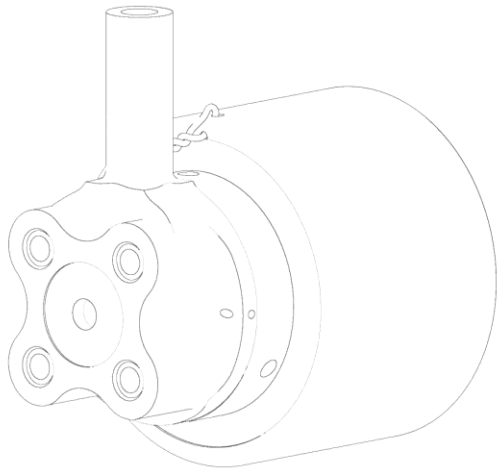
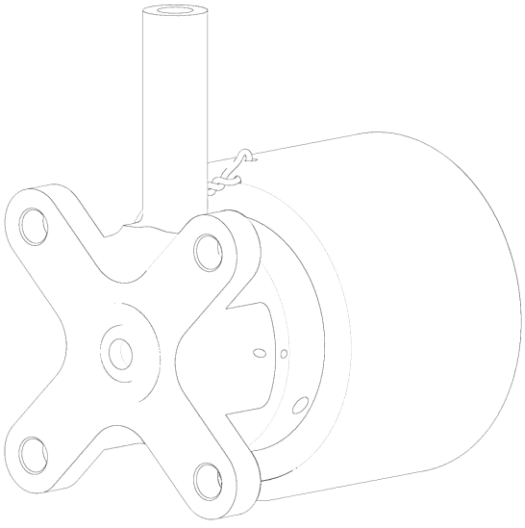
DANGER

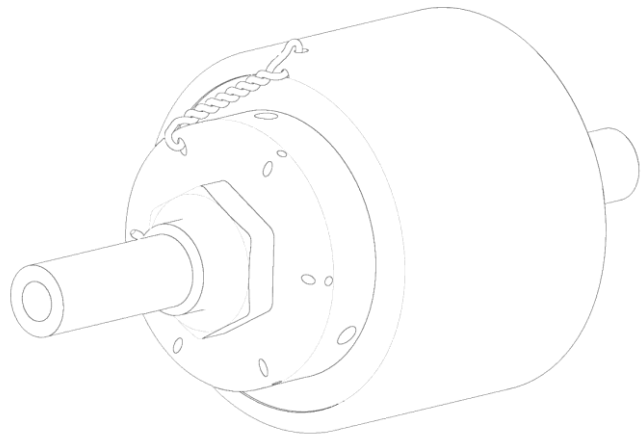
Risk of injury! The coil can reach high temperatures during operation. Do not touch the valve during operation. Allow the valve to cool down for a couple of minutes after operation before touching it.

2 VALVE CONFIGURATIONS

E2-Family – References

The entire manual is applicable to the entire E2 valve family, except for the sections referenced in the table below, which provide model-specific operational details.

	**E2a** For model-specific operational details, see Section 4.1.1 Section 4.2.1 Section 5.2.1
	**E2a X** For model-specific operational details, see Section 4.1.2 Section 4.2.1 Section 5.2.2

	***E2b*** For model-specific operational details, see Section 4.2.2 Section 5.1.1

3 HANDLING

Before opening any packaged valve, ensure that you identify the grade of cleanliness. If a note on the vacuum-sealed bag containing the valve indicates a cleanroom-processed grade, the steps outlined in Section 3.2 must be followed to warrant that the level of cleanliness is maintained. If no indication is present, follow the steps in Section 4.1.

3.1 Regular Handling

Open and handle the package and its contents only on a stable and clean surface, free from dust, chips/shavings, oil, and other substances. Remove the vacuum-sealed bag from the parcel and place it carefully onto the stable and clean surface. Cut open the vacuum-sealed bag at one of its sides with a clean, sharp knife or pair of scissors. Ensure that you do not damage the valve inside by keeping the utilized blades far from all parts of the valve, especially the cables. Remove the bubbled-wrapped valve from the vacuum bag and place it carefully on a stable, clean surface. Then start unwrapping the bubble wrap. Inside, you will find a hermetic plastic bag containing the valve. Always handle the valve with clean, washed hands or while wearing powder-free disposable gloves (e.g., from nitrile, latex, or similar materials)! Prepare yourself accordingly before opening the bag. Do not remove the orange Kapton tape covering the fluidic ports! To install the valve in a fluid system, follow the steps outlined in Section 5.1. When the valve is not in use, ensure it is stored in accordance with the procedures outlined in Section 7.

3.2 Cleanroom Handling

Open and handle the package and its contents only on a stable and clean surface, free from dust, chips/shavings, oil, and other substances. Remove the vacuum-sealed bag from the parcel and place it carefully onto the stable and clean surface. Cut open the vacuum-sealed bag at one of its sides with a clean, sharp knife or pair of scissors. Ensure that you do not damage the bubble-wrapped anti-static bag inside! Remove the bubbled-wrapped anti-static bag from the vacuum bag and place it carefully on a stable, clean surface. Then start unwrapping the bubble wrap. Inside, you will find a hermetic anti-static plastic bag containing the valve in a sealed extra bag. Do not open any contents of the anti-static bag outside of a cleanroom! Bring the bag near a cleanroom. Before entering the cleanroom with the bag, wipe the entire bag down with a lint-free wipe wetted with isopropyl alcohol (>90% concentration). Afterwards, blow all sides with pressurized, dry, and filtered gas and immediately commence entering the cleanroom. Inside, open the anti-static bag and remove the sealed bag containing the valve. Cut open the sealed bag at one of its sides with a clean, sharp knife or pair of scissors. Ensure that you do not damage the valve inside by keeping the utilized blades far from all parts of the valve, especially the cables. Always handle the valve while wearing powder-free disposable gloves (e.g., made from nitrile, latex, or similar materials), a cleanroom suit, and a hairnet. Prepare yourself accordingly before opening the bag. Do not remove the orange Kapton tape covering the fluidic ports! To install the valve in a fluid system, follow the steps outlined in Section 5.1. This shall only be done inside a cleanroom. The valve may only be removed from the cleanroom when its outlets are connected to a closed fluid system (see Section 5.1) or are securely capped (see Section 7). Beware that removing the valve from a cleanroom environment without putting it in a hermetically sealed bag or container beforehand, even with capped/connected fluid ports, will void the cleanliness standard of its outside. When the valve is not in use, ensure it is stored in accordance with the procedures outlined in Section 7.

4 INTERFACES

4.1 Mechanical Interfaces

4.1.1 E2a

There are four threaded blind holes in the outlet face of the valve body. For dimensions, refer to the respective datasheet.

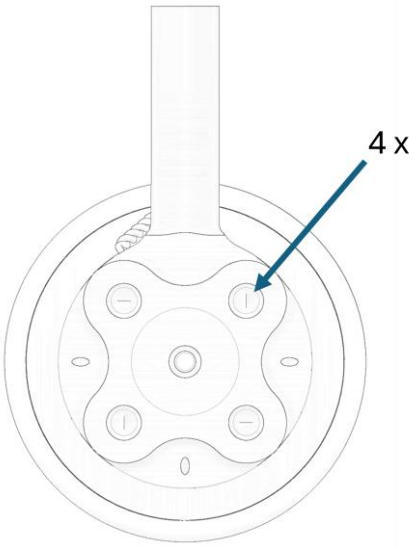


Figure 1: Mechanical mounting interface of E2a valves.

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4.1.2 E2a X

There are four clearance holes in the outlet face of the valve body. For dimensions, refer to the respective datasheet.

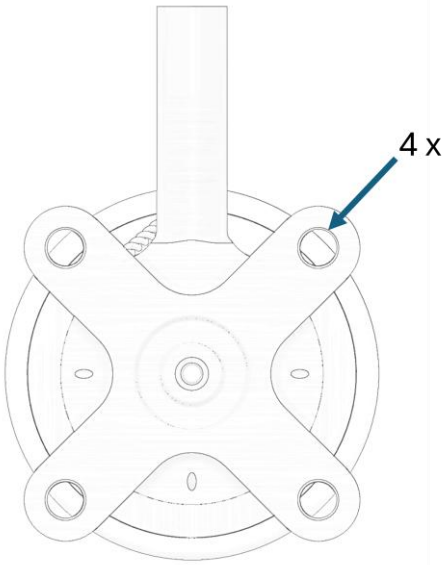

Figure 2: Mechanical mounting interface of E2a X valves.

4.2 Fluidic Interfaces

4.2.1 E2a / E2a X

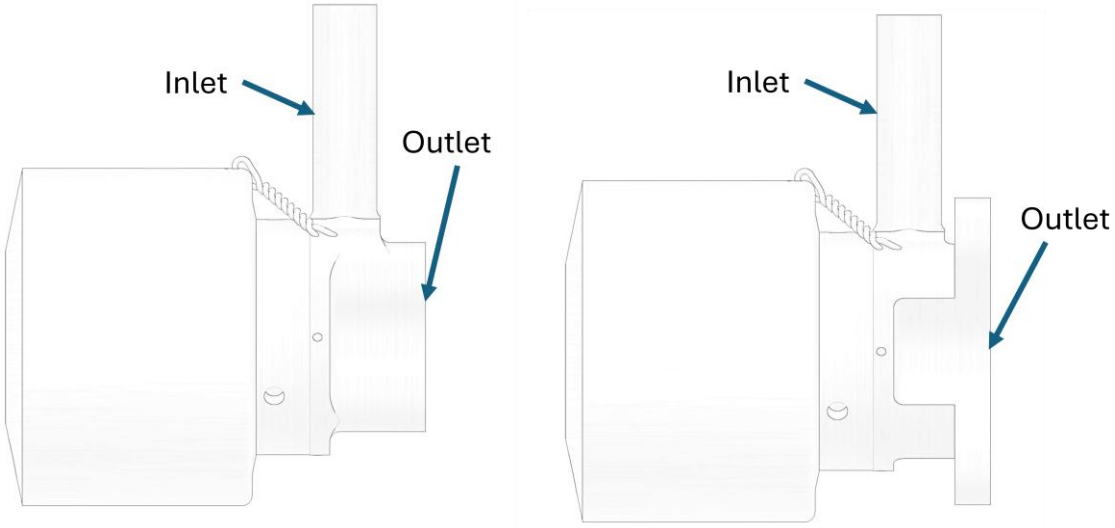

Figure 3: Fluidic interfaces of E2a (left) and E2a X (right) valves.

4.2.2 E2b

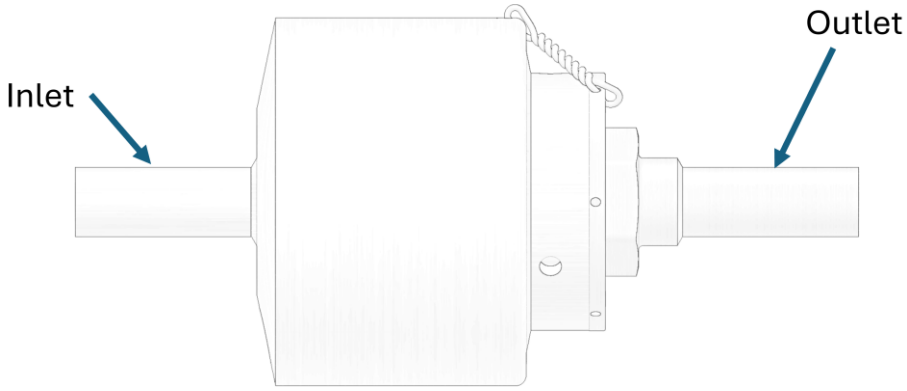

Figure 4: Fluidic interfaces of E2b valves.

4.3 Electrical Interfaces

There are two cables in the valve. They power the internal coil, which actuates the valve.

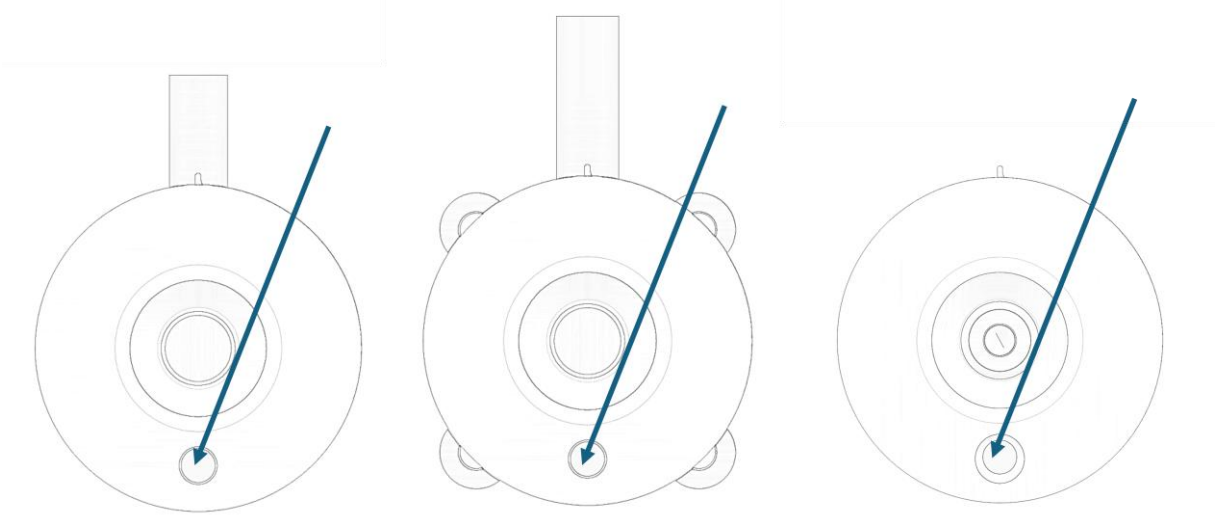

Figure 5: Electrical interfaces of the E2 family valves.

5 INSTALLATION

Ensure that you always follow the handling instructions outlined in Section 4, relevant to your product, during the installation process.

5.1 Fluidic Installation

Ensure the valve is not connected to any power source before installing it. When not installed in a fluid system, all valve ports must always be covered with clean caps/plugs or Kapton tape. Only remove the covers immediately before installing the valve into a fluid system to prevent contaminants from entering and potentially impairing its functionality. All tubing connected to the valve must be free of free from dust, chips/shavings, oil, and other substances before installation. Only operate the valve with an appropriate filter (pore size of ≤ 50 µm) installed upstream of its inlet. If the outlet is connected to an environment with a lower cleanliness grade than the valve itself, measures must be taken to prevent contaminants from entering the valve. This can be achieved by installing an appropriate filter (pore size of ≤ 50 µm) or a check valve downstream of the valve.

5.1.1 E2a / E2a X

The inlet of the valve is a tube that can be connected to a fluid system using either an appropriate tube fitting system or orbital welding to an existing metal tubing system. For applying a tube fitting system (offered by companies such as Swagelok Company or FITOK Group), choose a ferrule set that fits the outer diameter of the valve's inlet/outlet tubes (refer to the respective data sheet of the valve) and swage it according to the manufacturer's specification. Ensure the material of the ferrules is applicable for installation on the tube material of the valve.

When welding the valve into a fluid system, take appropriate measures to ensure the valve, apart from the inlet/outlet tubes, is not heated beyond the permissible maximum operating temperature (refer to the respective data sheet of the valve), as this could permanently damage the product. If the application of corrosive media is projected, ensure an appropriate amount of purge gas is used during the welding process to not compromise the material's corrosion resistance at the welding seam. For optimal results, we recommend testing and calibrating the welding process with a test tube from the same material and with the same dimensions as the valve's inlet and outlet. For exact material information, refer to the respective data sheet of the valve.

The outlet of the valve is a flange connection. To seal it, apply an FFKM (hardness ≤ 80 Shore A) O-ring in the groove in the outlet flange. For dimensions, refer to the valve's respective data sheet. Ensure the contact side of the O-ring on the system side has a surface roughness of ≤ Ra0.4 and is milled concentrically to the fluid path. For information on the flange joint, refer to the respective subsection in Section 5.2.

5.1.2 E2b

The inlet and outlet of the valve are tubes that can be connected to a fluid system using either an appropriate tube fitting system or orbital welding to an existing metal tubing system. For applying a tube fitting system (offered by companies such as Swagelok Company or FITOK Group), choose a ferrule set that fits the outer diameter of the valve's inlet/outlet tubes (refer to the

respective data sheet of the valve) and swage it according to the manufacturer's specification. Ensure the material of the ferrules is applicable for installation on the tube material of the valve.

When welding the valve into a fluid system, take appropriate measures to ensure the valve, apart from the inlet/outlet tubes, is not heated beyond the permissible maximum operating temperature (refer to the respective data sheet of the valve), as this could permanently damage the product. If the application of corrosive media is projected, ensure an appropriate amount of purge gas is used during the welding process to not compromise the material's corrosion resistance at the welding seam. For optimal results, we recommend testing and calibrating the welding process with a test tube from the same material and with the same dimensions as the valve's inlet and outlet. For exact material information, refer to the respective data sheet of the valve.

5.2 Mechanical Installation

5.2.1 E2a

The valve should be bolted to a sturdy surface using the threaded blind holes depicted in Section 4.1 and ISO 4762 or ISO 14579 cylindrical head screws. Insert the bolts from the valve's outlet face. The bolt size is to be chosen to fit the hole's threads (refer to the respective data sheet of the valve). The mechanical mounting should be implemented in a way that ensures there are no external strains on the valve's fluidic and electrical connections. The rigidity of the structure to which the valve is mounted, as well as the bolt material and the torque used to tighten the mounting bolts, should be chosen depending on the external forces acting on the valve (such as acceleration/vibration forces). Appropriate measures should be taken to prevent bolt loosening, depending on the expected vibrations the system will experience.

5.2.2 E2a X

The valve should be bolted to a sturdy surface using the clearance holes depicted in Section 4.1 and ISO 4762 or ISO 14579 cylindrical head screws. Insert the bolts from the side opposing the valve outlet face. The bolt size is to be chosen to fit the hole diameters (refer to the respective data sheet of the valve). A connection to a flange with clearance holes and nuts or to threaded blind holes is both possible. Ensure the material and dimensions of the flange are adequately sized for the expected fluidic and external loads. If chosen, ensure that the material the threads of dead holes are cut in, as well as their length, is adequate for the required tightening torque of the bolt joint. The mechanical mounting should be implemented in a way that ensures there are no external strains on the valve's fluidic and electrical connections. The rigidity of the structure to which the valve is mounted, as well as the bolt material and the torque used to tighten the mounting bolts, should be chosen depending on the external forces acting on the valve (such as acceleration/vibration forces). Appropriate measures should be taken to prevent bolt loosening, depending on the expected vibrations the system will experience.

5.3 Electrical Installation

To connect the valve's cables, first remove 6 mm of insulation from their ends using stripping tongs suitable for the cable diameter (refer to the respective data sheet of the valve). To prevent damage to the cable core, press appropriately sized wire-end ferrules on the open wire ends using a crimping tool or install a plug. Use a multimeter to measure the resistance of the coil by

measuring between the cables and comparing it to the given values from the respective datasheet of the valve to verify there is no damage to the coil. Verify whether the temperature of the valve body falls within the same range as the temperature specified for the resistance in the datasheet, as different temperature levels influence the coil resistance. If the value is within specification, attach both crimped wire ends/plugs to a suitable solenoid driver or power source (for power requirements, refer to the respective data sheet of the valve). A suitable solenoid driver is the SDa driver by deltaVision. For details on its installation, refer to its user manual. Ensure that no mechanical strains are placed on the cables during installation and in the final position. Should the cable length not suffice, do not attempt to pull on the cables, but elongate them by soldering an extension cable of the same specification as the original one (refer to the respective data sheet of the valve for details on the cables) to its ends.

6 OPERATION

Before beginning nominal operation, ensure that you follow the steps outlined in Section 5. Additionally, before every first usage in a system, perform the actions described in Section 6.1.

6.1 Commissioning

The E2 family valves are normally closed valves, meaning in an unpowered state they are in a closed state. Before commencing nominal operation, we recommend conducting the following functional tests to verify the product's full functionality and to rule out any potential damage from transport that may impair its performance. Actuate the valve a couple of times (around 5 times suffices) by powering it and reversing the current direction or controlling it via a suitable solenoid driver to verify the actuator's functionality. Adhere to the nominal supply voltage given in the valve's respective data sheet. Apply an inert gas (such as Nitrogen) at the maximum expected operating pressure (MEOP) of the system upstream of the valve. Ensure beforehand that the MEOP of the system is within the permissible operating range specified for the valve in its respective datasheet. Perform a flow measurement downstream of the valve to detect any potential leakage exceeding the value for internal leakage specified in the respective datasheet of the valve. If no behaviour outside of specification is detected, the valve can be operated nominally. When no flow measurement is possible, a pressure measurement upstream of the valve can pose an alternative way to test the valve's tightness. However, this will only lead to tangible results if the tightness of the fluid system upstream of the valve is qualified against external leaks exceeding the internal and external leak rates specified in the datasheet of the valve.

6.2 Nominal Operation

The valve is closed in an unpowered state. For bringing the valve into an open state, the actuation voltage must be applied to one of its coils. Figure 6 shows the qualitative actuation curve (current-time-plot) created by opening against the valve's maximum differential pressure. The valve is to be powered for the time it is supposed to be open. Be aware that prolonged opening periods can cause the valves to heat significantly. Before touching the valve during or after the operation, ensure it is not powered. To avoid potential burns, always verify whether the cylindrical housing of the valve is hot before touching it. This can be done with a thermometer. If no thermometer is available, always hover your bare hand a few millimetres over the cylindrical part of the valve. If you feel any heat radiating from the valve, proceed with caution and only touch the valve wearing protective gloves suitable to shield against elevated temperature levels (such as insulated gloves compatible with high temperatures or leather gloves). Before disconnecting and transporting the valve with your hands, even when wearing gloves, hold it in the mechanically installed state for 10 seconds. If you start to feel uncomfortable levels of heat, release the valve and allow it to cool for 5 minutes before retrying.

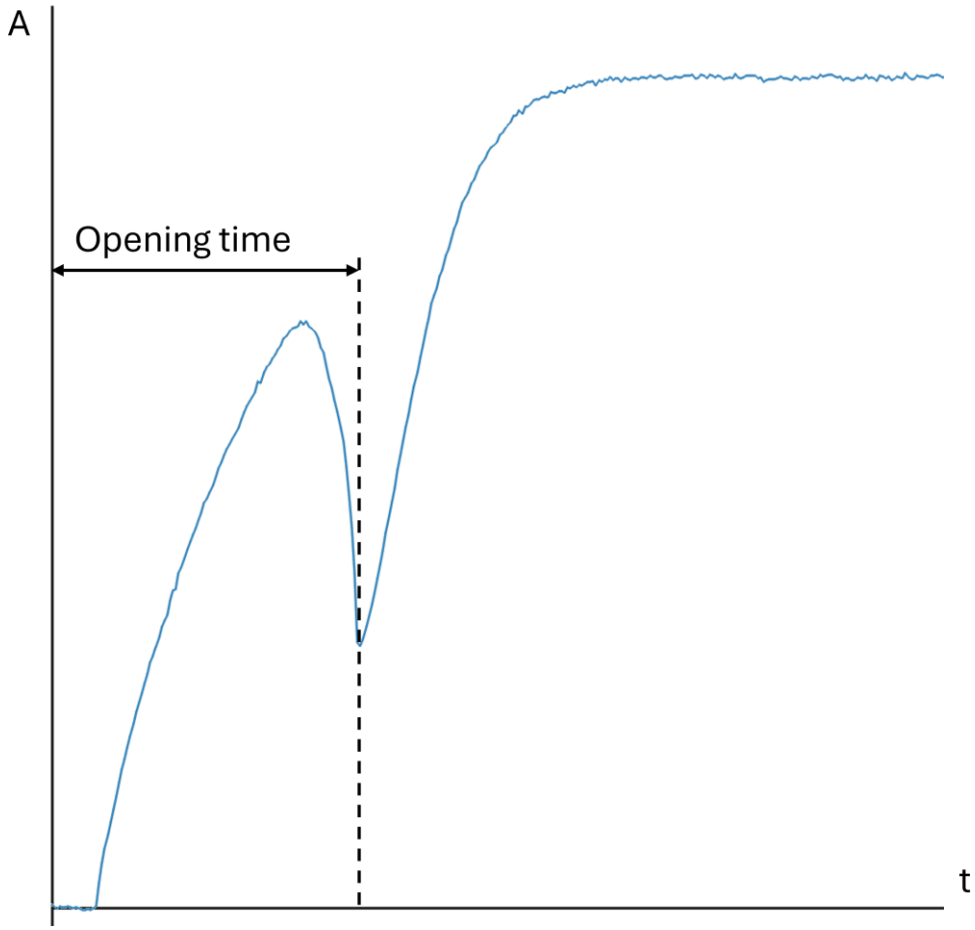

Figure 6: Qualitative current draw over time for an E2 family valve.

When working with an SDa solenoid valve driver by deltaVision GmbH, refer to the respective user manual for operational instructions.

7 STORAGE

In case the valve is not used in a fluid system, it must be appropriately stored to maintain its full performance capabilities. Depending on the cleanliness level of the product, adhere to the following respective steps. When uninstalling a valve, first disconnect its cables from the power source, roll them up, and secure them with a suitable measure, such as zip-ties. Be sure not to pinch any cables while doing so to prevent potential damage.

7.1 Regular Storage

After all cables are disconnected and secured, you can disconnect the fluidic connections one at a time. Ensure to directly close each valve port after disconnecting it. When a tube-fitting system is utilized to connect the valve, this may be done by applying suitable-sized, clean stainless-steel caps, free of chips/shavings, oil, and other substances. If no caps are available, the ports can be closed by applying clean Kapton tape on the ports. Ensure the tape is applied securely, with no gaps remaining. Do not use any tapes that leave residues, such as duct tape! After all fluidic connections are removed and the ports closed off as aforementioned, you may remove the mechanical mounting. Ensure that the valve is suitably supported before removing the last bolt securing the valve, to prevent it from dropping. After the valve is uninstalled, put it in a clean, sealable bag or container that does not contain any sharp objects. Make sure the cables are not pinched while doing so. Then store it in a clean, cool, and dry place.

7.2 Cleanroom Grade Storage

Only start disconnecting the fluidic connections once the valve is in a cleanroom environment! After the connections are removed, close each valve port. When a tube-fitting system is utilized to connect the valve, this may be done by applying suitable-sized, clean stainless-steel caps, free of chips/shavings, oil, and other substances. If no caps are available, the ports can be closed by applying clean Kapton tape on the ports. Ensure the tape is applied securely, with no gaps remaining. Only use caps or tape that meets cleanroom standards. Do not use any tapes that leave residues, such as duct tape! After all fluidic connections are removed and the ports closed off as aforementioned, you may remove the mechanical mounting. Ensure that the valve is suitably supported before removing the last bolt securing the valve, to prevent it from dropping. After the valve is uninstalled, put it in a clean, hermetically sealable bag or container that does not contain any sharp objects. Only then may you remove the valve in its packaging from the cleanroom environment. Store it in a clean, cool, and dry place.

8 TROUBLESHOOTING

There are numerous potential failure cases that may occur over a valve's lifecycle. The following presents a non-comprehensive list of relevant problems that may be encountered and how they may be addressed.

Problem	Measures
The valve does not actuate	Verify that the applied upstream pressure is within the valve's specifications.
	Check whether the valve is correctly connected to the power supply (note the polarity) and the cables are intact (no pinches or damage to their exterior).
	Check whether the power supply is functioning properly and supplying the correct voltage within the valve's nominal specifications. If feasible, supply the valve with a voltage at the upper end of its specification range.
	Perform a resistance measurement and continuity test of the coil with a multimeter. ▪ If the resistance deviates significantly from the value specified in the datasheet, see if the valve is hot. If it is, let it cool and retry the valve. If the deviation persists, please contact deltaVision. ▪ If there is no continuity, contact deltaVision.
The valve leaks	Verify that the fluid system is clean and free of contaminants. ▪ If contaminants are detected, clean the system ▪ Look into the valve's ports under a microscope to check for contaminants ○ If contaminants are detected, flush the valve with > 99% concentration isopropyl alcohol and purge it with a dry, filtered inert gas afterwards ▪ If the leakage remains, contact deltaVision Under no circumstances open the valve without prior written authorization by deltaVision GmbH, as this will void the warranty!
The valve exhibits a higher pressure drop than specified	When performing a pressure drop test/Kv test, make sure no T-, cross- or elbow-connections are placed within a distance of 5 times the nominal diameter of the valve. Otherwise, this will ditort the measurements.
	Verify that the fluid system is clean and free of contaminants. ▪ If contaminants are detected, clean the system ▪ Look into the valve's ports under a microscope to check for contaminants ○ If contaminants are detected, flush the valve with > 99% concentration isopropyl alcohol and purge it with a dry, filtered inert gas afterwards

	Under no circumstances open the valve without prior written authorization by deltaVision GmbH, as this will void the warranty!

9 PACKING

9.1 Regular Packaging

Before packing the valve, ensure all fluidic ports are securely closed/capped, and the cables are rolled up and secured without being pinched, as specified in Section 7.1. Put the valve in a hermetically sealed bag together with a validated desiccant and a humidity indicator card. Cushion the component securely within shock-absorbent foam and enclose it in a sealed, rigid container. Ensure the container is clearly marked as “Fragile” along with the component’s model number, identification code, and packaging date. Finally, close the container using tamper-evident tapes or seals to maintain integrity and provide assurance of proper handling.

9.2 Cleanroom Grade packaging

For all packaging efforts inside a cleanroom, exclusively use products cleaned to cleanroom-grade. Ensure the steps in Section 7.2 have been performed inside a cleanroom environment! The bag with the valve shall be added with a validated desiccant and a humidity indicator card. Afterwards put the hermetically sealed bag with the valve inside another plastic bag and heat-seal it. Place a brightly coloured sticker signifying the bag’s contents may only be opened in a cleanroom on a clearly visible spot on the outside of the bag. Only then may the bag with its contents be removed from the cleanroom environment! Cushion the component securely within shock-absorbent foam and enclose it in a sealed, rigid container. Ensure the container is clearly marked as “Fragile” and “Cleanroom Grade Components Inside” along with the component’s model number, identification code, and packaging date. Finally, close the container using tamper-evident tapes or seals to maintain integrity and provide assurance of proper handling.

10 TRANSPORTATION

To ensure safe and reliable transport, shipments should be maintained within a stable temperature range of 15°C to 25°C, avoiding fluctuations greater than ±5°C. For added assurance, it is recommended to equip each package with active data loggers to monitor temperature, humidity, and shock throughout transit. Additionally, all shipments should be accompanied by proper documentation, including the transit manifest and a cleanliness certificate to confirm compliance with handling and quality requirements.