

## MICRO VALVES SMLD

### Sub – Micro – Liquid – Dispenser

- › Wide range of media and viscosities can be dispensed
- › Dispensing speed up to 4000 Hz
- › Dispensing volumes below 10 nl possible
- › Hard-sealing valve structure with sapphire and ruby
- › High repeatability
- › Optimized for contactless dispensing
- › Grid width from 4 mm

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## INNOVATION MICRO VALVES SMLD

Since 1992, Gyger has been developing and producing high-quality, electromagnetic, 2/2-way micro valves based on hard material components. The newest generation, the modular micro valves, are used in the areas of life science, printing industry and automation. Gyger's technology sets high standards regarding size,

precision, speed and service life. Thanks to many years of experience with contactless micro dispensing of media with different viscosities, Gyger is a reliable partner offering modular dispensing systems in the micro- and nanolitre range.

## NOTES

### SAFETY INFORMATION



The product brochure contains safety information. Safety information warns of dangerous situations and includes tips on how to avoid danger.

### USER INFORMATION



The product brochure must be read and understood by all persons working with micro valves. The product brochure allows persons to safely and properly execute all activities for using micro valves.



This product brochure primarily describes the micro valves, the valve coils and valve holders. Information about our other components are in their corresponding separate product brochures.

## USAGE

### PROPER USAGE

The 2/2-way micro valves must only be used for dispensing liquids and gases in the micro- and nanolitre range. The manufacturer will provide you with information about the type and compatibility of the medium to be used. Proper use of the equipment includes following all procedures in accordance with the product brochure.

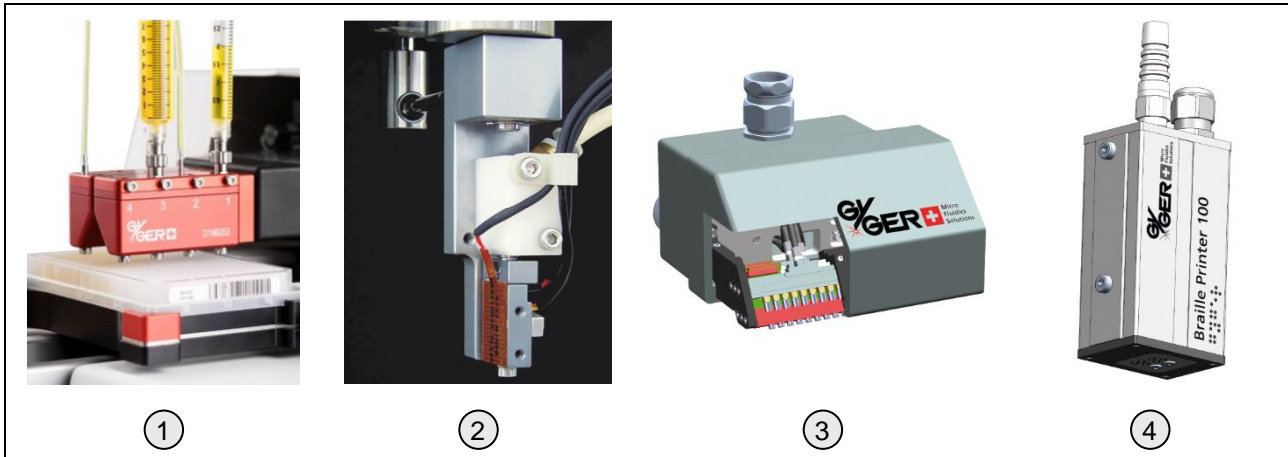
### IMPROPER USAGE

Improper use of the micro valves includes any form of use of the equipment, which deviates from the specified proper use or which goes beyond the defined scope of usage.

## RANGE OF APPLICATIONS

- > Life Science
  - > Automation
  - > Mechanical engineering
  - > Printing industry
- > Electronics
  - > Automotive industry
  - > Watch-making industry
  - > Schools, institutes and universities

## EXAMPLES



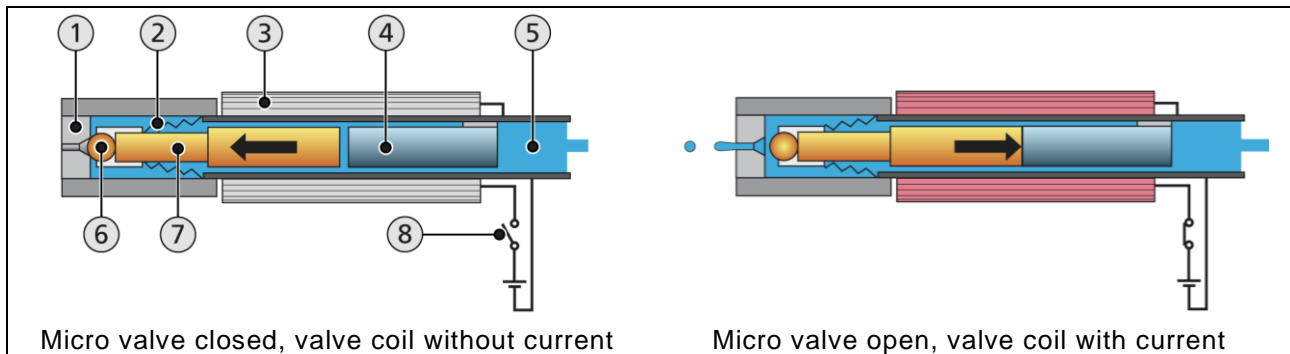
Example	1. Life Science	2. Automation	3. Mechanical engineering	4. Printing industry
Application	Dispenser for well plates, (e.g. Certus Flex)	Grease dispensing system for ball bearings	Dispensing head for filling machine	Industrial inkjet printer
Valve type	SMLD 300 SMLD 300G	SMLD 300G	SMLD 300G	SMLD 300 SMLD 300G
Dispensing volume per shot	20 nl – 2.5 ml	250 nl	700 µl	20 nl - 220 nl
Nozzle diameter	Ø 0.1 – 0.45 mm	Ø 0.30 mm	Ø 0.30 mm	Ø 0.1 - 0.30 mm
Medium	Cells, DNA, RNA, Proteins, Buffer, Beads, Solvents (e.g. DMSO)	Grease	Saline solution	Various inks and varnishes
Medium pressure	0.1 - 1 bar	8 bar	1 bar	0.3 - 5 bar
Temperature	20° C	80° C	20° C	20 - 50° C
Number of micro valves	1 - 8	1	60	1 - 48

## CUSTOMER-SPECIFIC APPLICATIONS

Dispensing solutions based on contactless micro dispensing can be developed, combined and produced customer-specifically for different

media. All components for a dispensing system are combined individually and thereby flexibly covering the various requirements.

## FUNCTIONAL PRINCIPLE

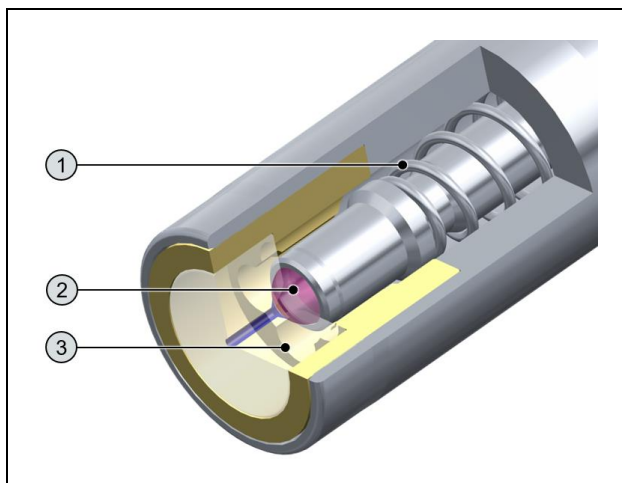


- |                             |                  |
|-----------------------------|------------------|
| 1. Valve seat, valve nozzle | 5. Medium        |
| 2. Closing spring           | 6. Valve ball    |
| 3. Valve coil               | 7. Mobile anchor |
| 4. Stationary anchor        | 8. Switch        |

The micro valve is actuated electromagnetically and medium flows through it directly. When there is no current, the micro valve is closed. The closing spring acts on the mobile anchor with the valve ball.

When there is a current feed through the valve coil, the mobile anchor with the valve ball is magnetically pulled by the magnetic field of the stationary anchor. The micro valve opens and the medium emerges.

## HARD-SEALING VALVE STRUCTURE WITH SAPPHIRE AND RUBY



1. Closing spring
2. Valve ball
3. Valve seat, valve nozzle

Thanks to the use of hard materials for the valve seat (sapphire) and the valve ball (ruby), unrivalled possibilities open up for micro valve applications.

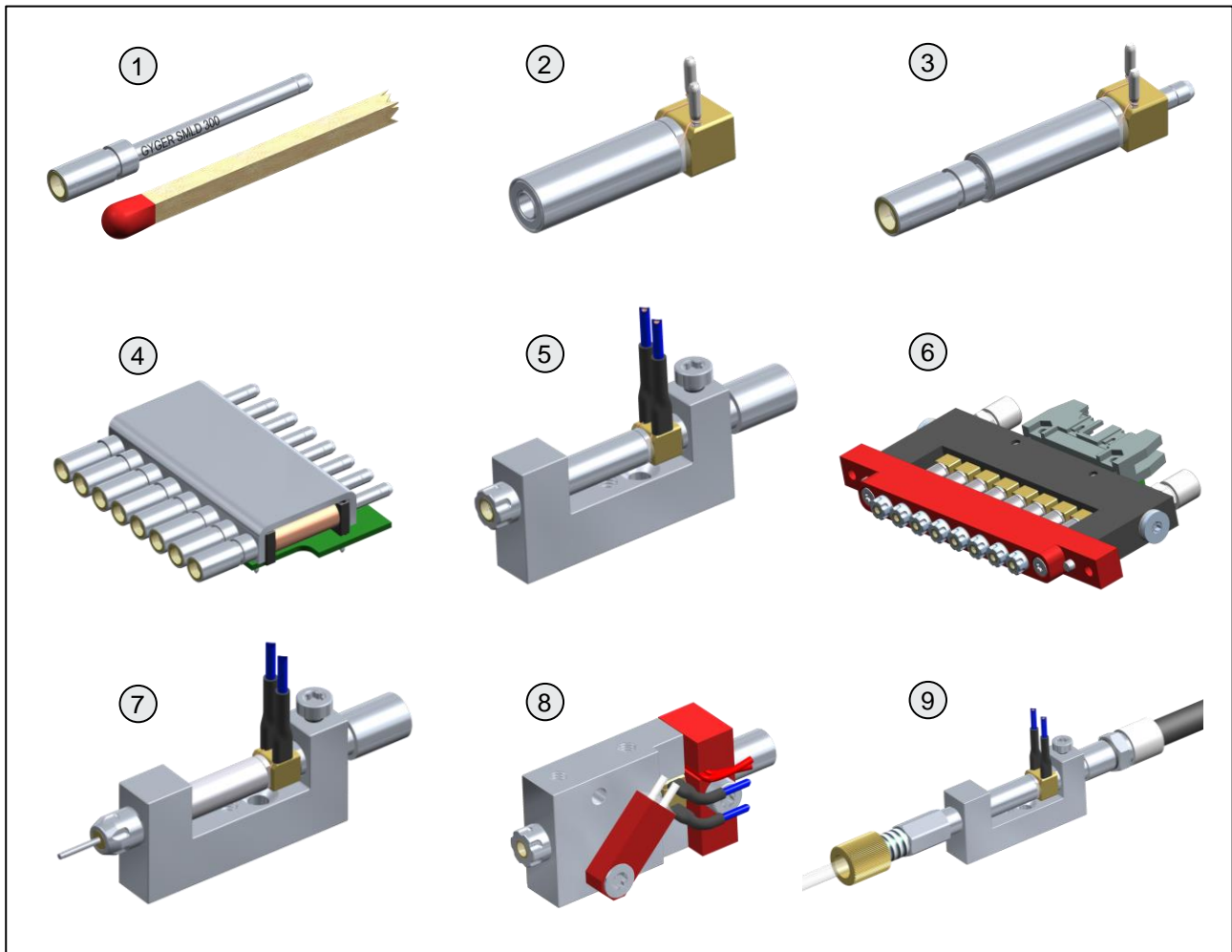
The hard-sealing valve structure makes precise opening strokes possible of a few hundredths of a millimetre and repeat accuracies in the range of thousandths of a millimetre.

The short opening travel and the correct actuation allow the micro valve to be switched 4000 times per second long-term. The finely ground and polished optimal inner forms of the valve nozzle and valve seat provide the best possible flow properties before emergence.

This results in an exactly dispensing jet for contactless dispensing and optimal drop formation.

Additional guide elements in and around the hard material components and the already mentioned advantages, if properly applied, make for a long micro valve life-time. By using these high-quality materials, high chemical and mechanical resistance and compatibility values are also achieved.

## MODULAR COMPOSITION, MICRO VALVES SMLD



- |                                     |  |
|-------------------------------------|--|
| 1. Micro valve                      | 6. Dispensing module with 8 micro valves |
| 2. Valve coil                       | 7. Micro valve with adapter nozzle       |
| 3. Micro valve with valve coil      | 8. Heated valve holder with micro valve  |
| 4. 8 Micro valves with coil package | 9. Micro valve, inline variant           |
| 5. Valve holder with micro valve    |  |

At Gyger, modularity has high priority in the area of nano- and microlitre dispensing. The coil and the actual valve can be separated. For this reason, the micro valves can be replaced quickly and easily. The micro valves can be installed with single coils or with coil packages having a pattern width starting from 4 mm. The impressively simple handling of the versatile holder design allows modular installation in existing or new systems.

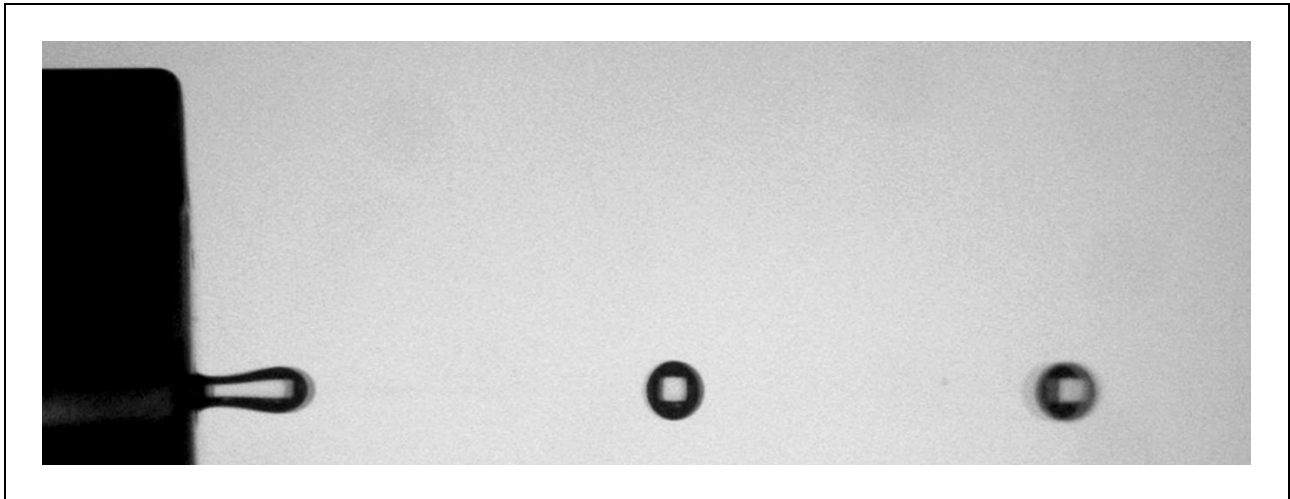
The valve holders can either be inserted individually or in a row. For highly viscous media, the valve holder with the integrated heater provides an optimal solution. In addition, there is the option of manufacturing dispensing modules with the desired number of micro valves according to customer wishes. This carefully designed modular system is complemented by a variety of connection options.

## MICRO VALVE SELECTION

The right micro valve is selected primarily based on the following parameters and properties:

- > Dispensing media, viscosity, temperature
- > Dispensing time, dispensing volume
- > Medium feeder, pressure

The table below shows an overview of which valve type is suitable depending on the viscosity and the dispensing volume. Contact us for a guidance of choosing the valve type for your specific application.



Viscosities	Low Up to 110 mPa.s	Medium 110 - 500 mPa.s	High 500 - 15000 mPa.s
Dispensing media	Gases Water Buffers Cells Inks Reagents Solvents (i.a. Alcohols, DMSO, MEK) etc.	Mineral oils Glycerine Detergents Liquid adhesives UV-varnish etc.	Greases Pastes Adhesives Varnish etc.
Minimal dispensing volume	< 10 nl	> 50 nl	> 100 nl
Medium pressure	0.1 - 5 bar	3 - 12 bar	8 - 50 bar
Temperature	Room temperature	30 - 70° C	50 - 100° C
Nozzle diameter	Ø 0.10 and Ø 0.15 mm	Ø 0.20 and Ø 0.30 mm	Ø 0.3 and Ø 0.45 mm
Valve travel	0.03 and 0.06 mm	0.06 and 0.10 mm	0.10 and 0.15 mm
Valve type	SMLD 300 and 300G	SMLD 300G	SMLD 300G

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## DISPENSING VOLUME

The smallest possible dispensing volume is achieved with the optimal nozzle diameter, a valve travel corresponding to the medium and a fast and precise actuation of the micro valves.

We recommend our Gyger valve controllers for the best possible actuation. These ensure optimal control of the current profile with  $\mu\text{s}$  accuracy.

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## MEDIUM PRESSURE

If possible, the medium should be discharged from a pressure container. If the medium absorbs air, this can lead to fluctuations in the dispensing volume as well as satellite splatters. To prevent this, the medium and the air can be separated by a piston. We recommend that the

cross section of the feed line up to the micro valve be selected as large as possible for highly viscous media, in order to avoid the dispensing system to operate under unnecessary high pressure.

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## TEMPERATURE

When using highly viscous media that cannot be dispensed at room temperature, a valve heater can be used. This changes the viscosity of the medium and thus ensures the best possible

dispensing. The heating of the micro valve is limited to max. 100 °C. Our MVC 1 can control up to 4 heating systems.

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## RELATIONSHIP BETWEEN NOZZLE DIAMETER AND VALVE TRAVEL

Nozzle diameter and valve travel are important parameters for the drop formation. In order to achieve the best dispensing results, the nozzle diameter and the valve travel have to be matched and combined with each other. The table shows the recommended standard combinations. Larger nozzle diameters and valve

travels are used for larger flow volumes and media with higher viscosity. Smaller diameters with small valve travel in turn are suitable for small dispensing volumes for the longest life-time.

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## DETERMINING THE VALVE TYPE

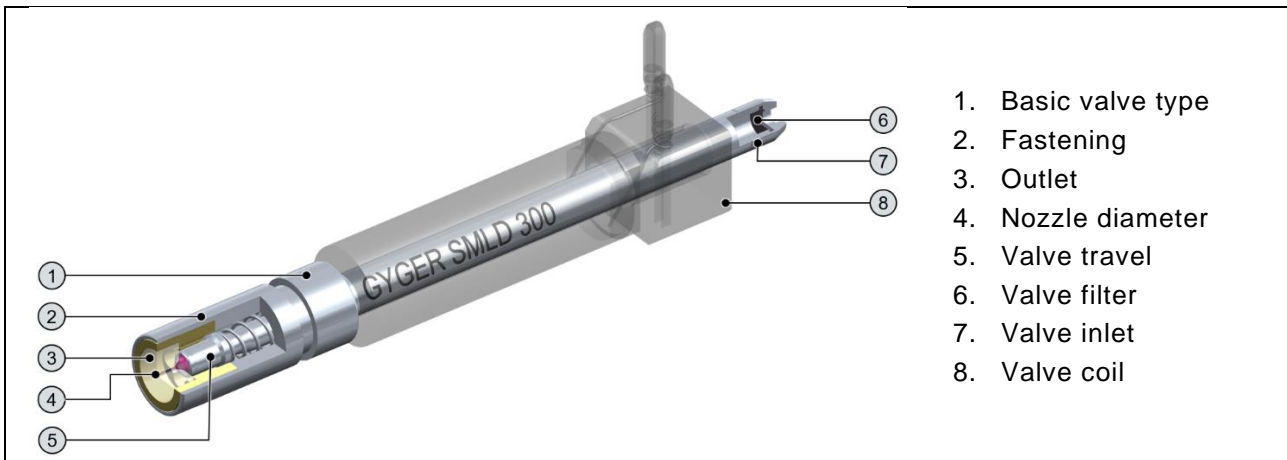
### SMLD 300, the smallest

With a minimum grid width of just 4.5 mm (with a special coil package even only 4 mm), the micro valves SMLD 300 are suitable for the tightest of spaces. Low-viscosity media can be dispensed with small flow rates. This type of valve offers a small internal volume of only 25  $\mu\text{l}$ .

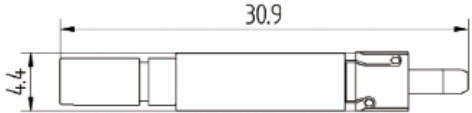
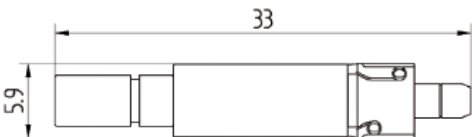
### SMLD 300G, the flexible one

With a minimum grid width of 6 mm, the SMLD 300G is very space-saving, while offering maximum flexibility. These micro valves are suitable for a wide range of viscosities and are available in many configurations. Valve holder with integrated heating can also be combined with it. The internal volume is 65  $\mu\text{l}$ .

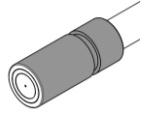
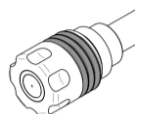
## OVERVIEW OF MICRO VALVE CONFIGURATION AND VARIANTS




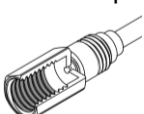
### 1. BASIC VALVE TYPE

Variants	Usage
<p>SMLD 300</p> 	<ul style="list-style-type: none"> <li>- Smallest size</li> <li>- Small dispensing volumes</li> <li>- Low-viscosity media</li> <li>- Inner volume 25 <math>\mu</math>l</li> <li>- Minimal grid width 4.5 mm (With special coil package 4 mm)</li> </ul>
<p>SMLD 300G</p> 	<ul style="list-style-type: none"> <li>- Low- and high-viscosity media</li> <li>- Small and large dispensing volumes</li> <li>- Inner volume 65 <math>\mu</math>l</li> <li>- Minimal grid width 6 mm</li> <li>- Can be combined with heated valve holder</li> </ul>

### 2. FASTENING

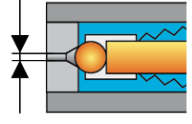
Variants	Usage
<p>Cylinder</p> 	<p>Grid width with highest resolution, small size. Suitable to our adapter nozzles.</p>
<p>Thread</p> 	<p>The micro valve can be screwed into a valve holder from the front, which allows easy replacement; Suitable for our valve holders.</p>

### 3. OUTLET

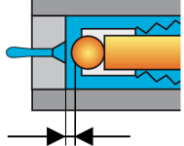
Variants	Usage
<p>Jet</p> 	<p>Precise free jet dispensing, directly from the valve nozzle.</p>
<p>Outlet adapter</p> 	<p>For connecting tubes to the valve output. Only in connection with the "thread" fastening type.</p>



## 4. NOZZLE DIAMETER

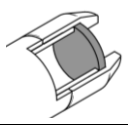

Picture	Usage
	<p>The nozzle diameter and valve travel are important influential parameters for drop formation and the dispensing volume. Depending on the desired dispensing result, corresponding combinations can be selected.</p>

## 5. VALVE TRAVEL

Picture	Usage
	<p>The valve travel (stroke) defines how much the ball lifts out of the seat at the opening. The valve travel together with the nozzle diameter has a great influence on the drop formation and dispensing quantity.</p>



## 6. VALVE FILTER

If the valve with filter is selected, a filter disc made of stainless wire mesh is integrated in the inlet connector. This filter protects the valve interior from harmful particles. An upstream large-area filter with fine grid for basic cleaning of the dispensing medium is recommended.

Variants	Usage
<p>With Filter</p> 	<p>Low-viscosity, filterable media. Only in connection with the „manifold“ valve inlet.</p>
<p>Without Filter</p> 	<p>High-viscosity or non-filterable media (E.g. certain types of grease or reagents)</p>

## 7. VALVE INLET

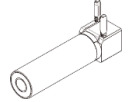
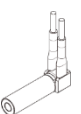
Two different inlet connectors are available. The manifold connection offers the greatest possible flexibility. In combination with our valve holders, a large number of inlet adapters with standard threads can be used.

Variants	Usage
<p>Manifold</p> 	<p>Suitable for our valve holders, installation in distributor systems with O-ring seal.</p>
<p>Barbed Tube connector</p> 	<p>The tube is directly connected to the micro valve. Only in connection with “cylinder” fastening type.</p>

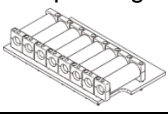
## 8. VALVE COIL

The valve coils are removable and available in different versions. They are optimised for very fast actuation times and minimal size.

### Single

Variants	Usage
<p>Single coil</p> 	<p>With solder connections, suitable for installation on printed circuit boards or for customer-specific wiring.</p>
<p>Single coil with wire</p> 	<p>With wire AWG26, end tinned or with plug, the plug fits our cable sets.</p>

### Package

Variant	Usage
<p>Coil package</p> 	<p>Coil packages for multi-channel systems on printed circuit board in various designs.</p>



The various configuration options are described on the next page and on our website.

## ORDERING MATRIX, MICRO VALVES SMLD

Valve coils must be ordered separately.

### MICRO VALVE SMLD 300

Valve outlet	
Jet	10-32 UNF conical

Valve fastening	
Ø 3.50 mm	M5x0.5
	M5x0.5 With O-ring seal

Valve nozzle
Ø 0.10 mm
Ø 0.15 mm
Ø 0.20 mm

Valve travel
0.03 mm (T1)
0.06 mm (T2)

Valve inlet	
Manifold Ø 1.80 mm	Tube connector Ø 1.25 mm

Valve filter	
17 µm	Without

### MICRO VALVE SMLD 300G

Valve outlet	
Jet	¼-28 UNF
	M5
	10-32 UNF conical

Valve fastening	
Ø 4.00 mm	M6x0.75
	M6x0.75 With O-ring seal

Valve nozzle
Ø 0.10 mm
Ø 0.15 mm
Ø 0.20 mm
Ø 0.30 mm
Ø 0.45 mm
Ø 0.60 mm

Valve travel
0.03 mm (T1)
0.06 mm (T2)
0.10 mm (T3)
0.15 mm (T4)

Valve inlet	
Manifold Ø 2.70 mm	Tube connector Ø 2.30 mm

Valve filter	
40 µm	Without

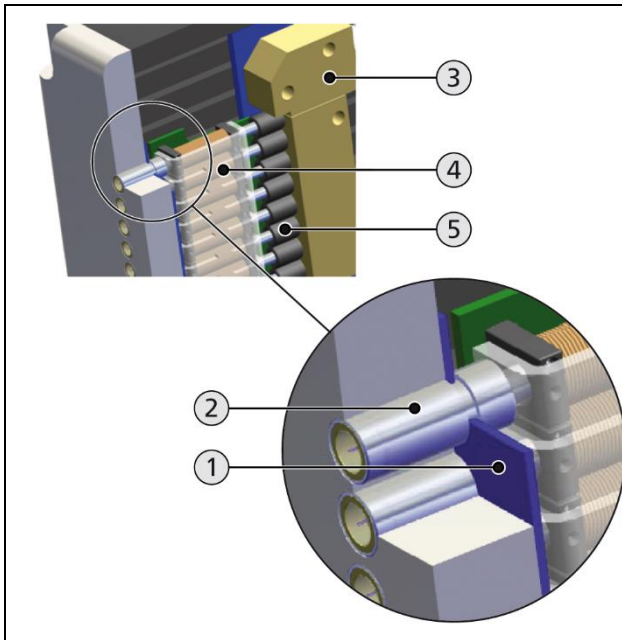
## SPECIFICATIONS OF THE MICRO VALVES WITH VALVE COILS

Characteristic data	Micro valve SMLD 300	Micro valve SMLD 300G
Maximum pressure <sup>1)</sup>	Valve travel 0.03 (T1): 40 bar Valve travel 0.06 (T2): 35 bar	Valve travel 0.03 (T1): 70 bar Valve travel 0.06 (T2): 65 bar Valve travel 0.10 (T3): 50 bar Valve travel 0.15 (T4): 25-35 bar
Life-time <sup>1)</sup>	up to 500 million cycles	
Viscosity range	1 - 200 mPa.s	1 - 1000 mPa.s <sup>2)</sup>
Maximum flow rate <sup>1)</sup> (water, 1 bar)	Nozzle Ø 0.10 mm: 4 ml/min Nozzle Ø 0.15 mm: 10 ml/min Nozzle Ø 0.20 mm: 18 ml/min	Nozzle Ø 0.10 mm: 4 ml/min Nozzle Ø 0.15 mm: 10 ml/min Nozzle Ø 0.20 mm: 18 ml/min Nozzle Ø 0.30 mm: 42 ml/min Nozzle Ø 0.45 mm: 90 ml/min Nozzle Ø 0.60 mm: 100 ml/min
Leakage rate, valve closed (air, 1bar)	Typical: 5 µl/min = 8.33*10 <sup>-5</sup> mbar l/s Maximum: 25 µl/min = 4.16*10 <sup>-4</sup> mbar l/s	
Minimal dispensing volume <sup>1)</sup>	under 10 nl possible	
Inner volume	25 µl	65 µl
Built-in filter	Filter 17 µm or without filter	Filter 40 µm or without filter
Materials in contact with medium	Stainless steels: 1.4404, 1.4301, 1.4310, 1.4105 IL / PEEK, sapphire, ruby	
Typical response time <sup>1)</sup>	200 - 320 µs	200 - 450 µs
Maximum dispensing frequency <sup>1)</sup>	up to 4000 Hz	
Coil resistance	11 Ohm	6 Ohm
Coil inductance (valve coil mounted on micro valve)	1.23 mH	0.8 mH
Maximum permissible coil temperature	100° C	
Electric connection	Soldering pins / 300 mm wire, tin-plated or with plug, 2-pin, Molex type 70066-176	
Recommended peak current <sup>1)</sup>	0.8 – 1.2 A (default 1A) during 150 – 400 µs	0.8 – 1.2 A (default 1A) during 150 – 1000 µs
Recommended holding current <sup>1)</sup>	80 - 220 mA (0.9 – 2.4 V DC) (default 200 mA) no time limit	160 - 330 mA (1.0 – 2.0 V DC) (default 200 mA) no time limit
Micro valve weight with valve coil	1.9 g	3.1 g
Repeat accuracy	< 5% CV <sup>1)</sup>	
Minimum pattern width	4 mm	6 mm
Dispensable media	Gases, aqueous media, reagents, cells, detergents, solvents (e.g. alcohols, DMSO, MEK), softening agents, inks, varnish, oils, liquid adhesives, greases, pastes, etc.. <sup>1)</sup>	

<sup>1)</sup> Depending on: Configuration, surroundings and application      <sup>2)</sup> Heated, depending on the medium, up to 15000 mPa.s

## INSTALLATION / ASSEMBLY

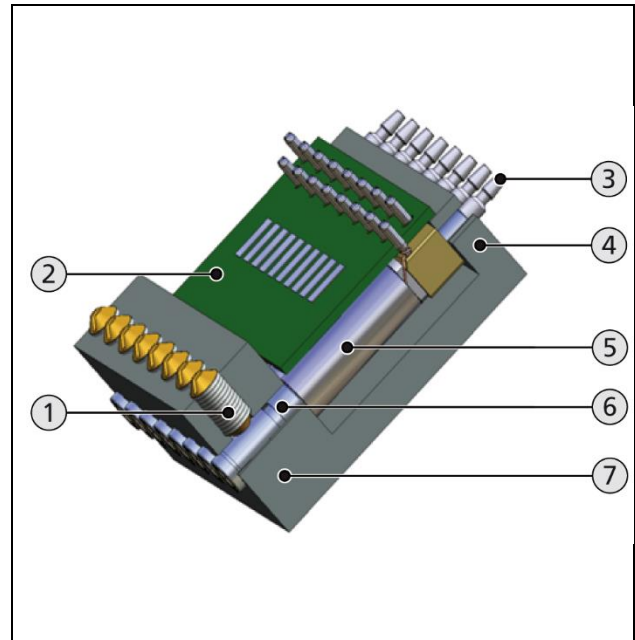
### MICRO VALVES SMLD WITH CYLINDER FASTENING TYPE



1. Holding plate
2. Micro valve
3. Fluid distributor
4. Shielding plate, coil package
5. Transition seal

The holding plate has semicircular cutouts for positioning in the micro valves. The application-specific transition seal for the fluid supply is designed as a molded part.

The fastening types are especially suited if the micro valve grid has to be as tight as possible, for example in a print head.



1. Clamping screw
2. Print, coil package
3. Tube connector fluid supply
4. Valve support
5. Valve coil
6. Micro valve
7. Valve holder

The clamping screw fixes the micro valve in the receptacle of the valve holder.

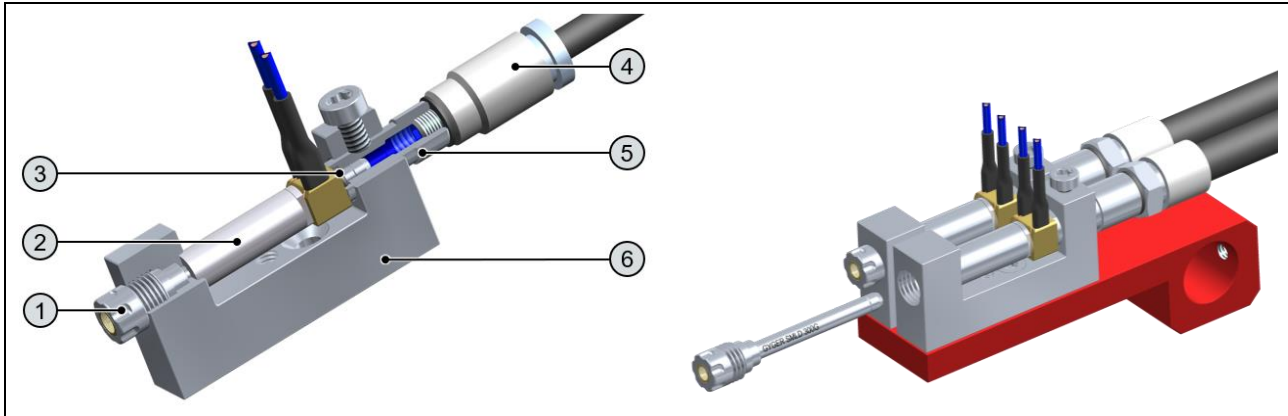
The valve support protects the micro valve (tube connection inlet) when connecting the tube supply line.



When installing the micro valve with a clamping screw, make sure that soft material, such as brass or plastic is used. Otherwise, there is a danger of damage to the micro valves.

## INSTALLATION / ASSEMBLY

### MICRO VALVES SMLD WITH THREAD FASTENING TYPE



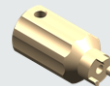
- |                |                  |
|----------------|------------------|
| 1. Micro valve | 4. Fluid supply  |
| 2. Valve coil  | 5. Inlet adapter |
| 3. O-Ring      | 6. Valve holder  |

The thread fastening is designed to allow an easy exchange of the micro valves. especially suited when the micro valves should be as easy to exchange as possible. The micro valve can be exchanged quickly and without dismantling the entire valve holder and without disconnecting the electric connections.

Ideally, this fastening type can be combined with our valve holders. Our valve holder concept covers the needs of a wide variety of applications and will convince you with its easy handling.



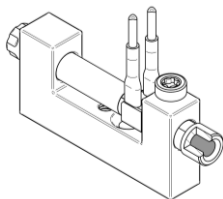
The micro valve inlets must not be touched or contaminated (skin particles). Using too much torque when mounting micro valves with threads leads to defects.



Spanner for the fastening / unfastening of micro valves.  
SMLD 300: Part-# 19237  
SMLD 300G: Part-# 19236

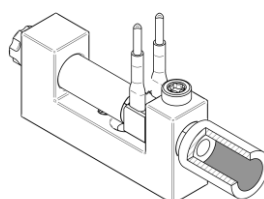
### VALVE HOLDER VARIANTS

SMLD 300



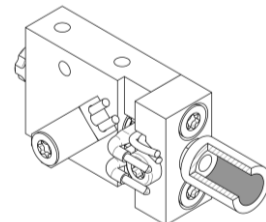
Part-#	Description
19324	6-32 UNC flat
19328	M3
19321	10-32 UNF conical

SMLD 300G



Part-#	Description
19318	¼-28 UNF
19320	M5
19314	10-32 UNF conical
24543	Luer Lock

Valve heater SMLD 300G



Part-#	Description
20413	¼-28 UNF
19256	M5
19255	10-32 UNF conical
24583	Luer Lock

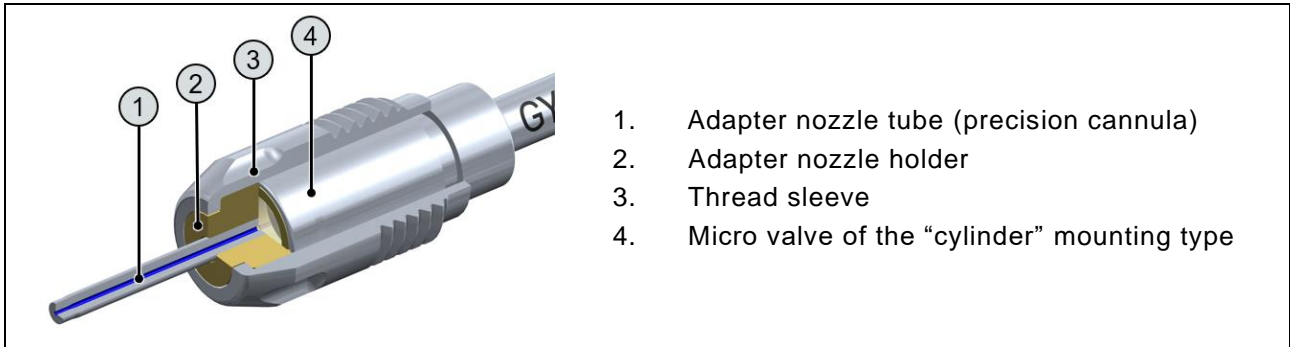
Part-# contains holder, coil unit with 300 mm wire and plug, inlet adapter with O-ring (viton)  
Valves must be ordered separately!

## ADAPTER NOZZLE

To achieve best results with our valves, contactless dispensing is carried out directly from the sapphire nozzle. For certain media and other

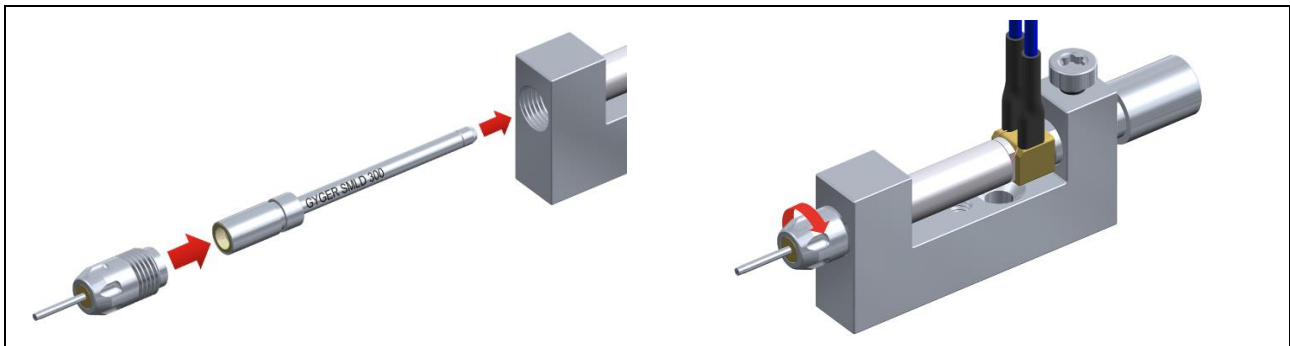
applications, an elongated, needle-shaped nozzle can be used.

## ASSEMBLY AND INSTALLATION



The adapter nozzles consist of a precision cannula, which is fastened in a holder with a threaded sleeve. The materials of the adapter nozzle are exclusively stainless steel and PEEK. This unit can simply be placed over the valve and screwed into the valve holder.

The nozzle tube is centered exactly in front of the valve nozzle and allows a nearly dead-volume free connection. When the adapter nozzle is tightened, the special shape of the parts creates a reliable seal to the valve.

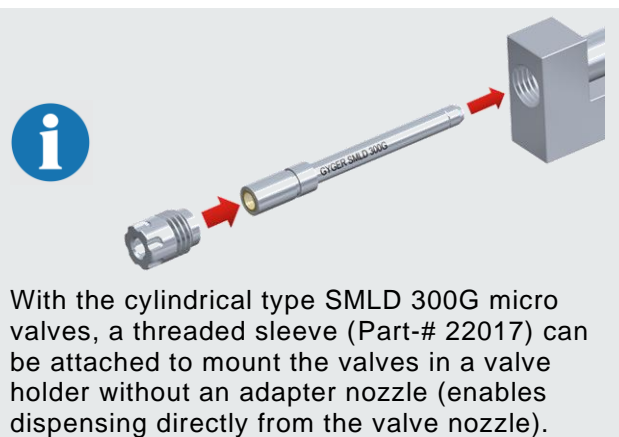


Similar to the assembly, the adapter nozzles can be unscrewed and disconnected from the valve at any time (e.g. for cleaning in an ultrasonic bath).

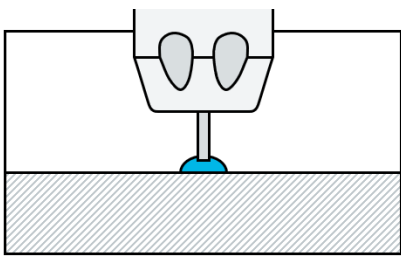
The best way to remove the valve is to use tweezers to pull it out of the valve holder.



The adapter nozzles should be tightened with a maximum torque of 20 Ncm.

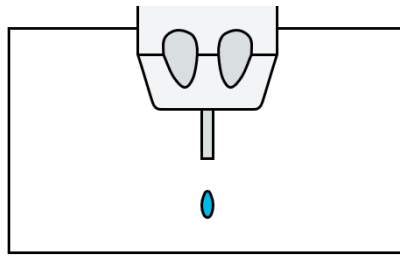


## APPLICATION AREAS



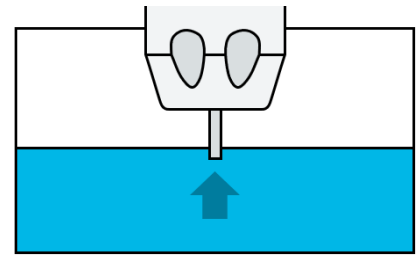
### Semi-Touch

The semi-touching application is suitable if the media drop needs to be gently placed or if the tearing of a drop is not achieved in contactless dispensing (e.g. special pasty media).



### Jet and «Slow Drop»

Contactless jetting is also possible. If larger drops ( $\mu\text{l}$  range) are required to be placed, we recommend a large adapter nozzle in combination with a small valve nozzle.



### Aspiration

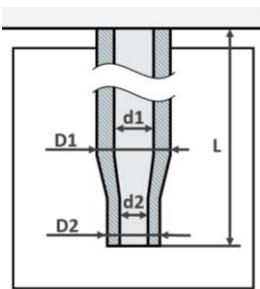
Certain applications require media to be aspirated or pipetted (pick and drop). Also in the aspiration mode, the precision of the SMLD microvalves allow a controllable media intake down to the nl range.

## ADAPTER NOZZLE VARIANTS

The adapter nozzles are available in two basic types: cylindrical or tapered end. The adapter nozzle is defined by three main parameters; Outside- $\varnothing$  (D), Inside- $\varnothing$  (d) and the

nozzle length (L). The available variants are listed below. We are happy to produce other variants on request.

### Tapered end build type



All values in mm

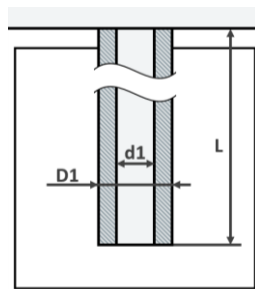
#### SMLD 300

Part-#	D1	d1	D2	d2	L
21691	0.79	0.2	0.74	0.15	15

#### SMLD 300G

Part-#	D1	d1	D2	d2	L
21278	0.60	0.19	0.50	0.10	20
24060	0.79	0.20	0.74	0.15	15
25107	0.79	0.20	0.74	0.15	20

### Cylindrical build type



All values in mm

#### SMLD 300G

Part-#	D1	d1	L
24405	0.79	0.10	2.4
19392	0.30	0.15	2.4
21220	0.30	0.15	10
25101	0.60	0.19	2.4
21275	0.60	0.19	20
19394	0.50	0.30	2.4
21117	0.50	0.30	6.0
25103	0.50	0.30	20
21303	0.50	0.30	22
24357	0.80	0.60	15
24354	1.20	0.80	15

#### SMLD 300

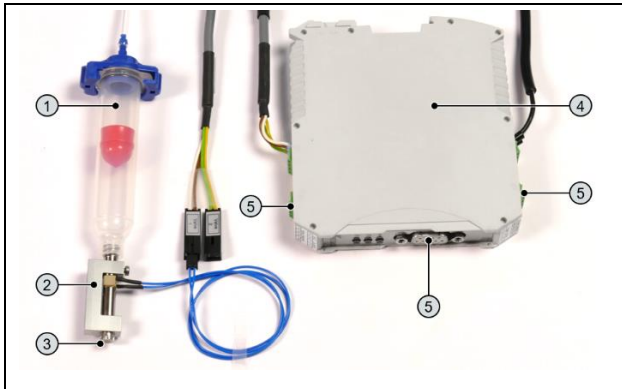
Part-#	D1	d1	L
21023	0.30	0.15	2.4
20580	0.30	0.15	10
21534	0.30	0.15	15
21690	0.79	0.20	15
19391	0.50	0.30	10

Depending on the task, the associated valve with the same or smaller nozzle diameter is selected.



Adapter nozzles can only be used with microvalves of the «cylinder» mounting type!

## CONSTRUCTION OF A TEST OR COMPLETE SYSTEM



1. Fluid supply
2. Valve holder
3. Micro valve
4. Valve controller
5. Interfaces

A basic dispensing system can be put together with little effort. In the simplest case, the fluid is supplied via a syringe cartridge and flanged directly onto the valve holder or supplied via a hose from a storage container.

All Gyger micro valve holders (with and without heating) offer a wide range of integration and fastening options and enable an easy valve change.

The Gyger valve controllers can be integrated into existing systems as intelligent valve drivers or used as a powerful, independent solution.



All Gyger valve controllers enable advantageous control using the “peak and hold” principle.

## FLUID SUPPLY AND ACCESSORIES



1. Tubes
2. Cartridge systems
3. Filter units
4. Tube connectors
5. Liquid containers
6. Bottle holders

Gyger can supply everything you need from the tubing to the bottle holder. The various accessories enable simple integration.



Detailed information can be found in the separate microvalve accessories product catalog.

## VALVE HOLDER

The valve holders allow a diverse adaptation to standardised connections, as well as easy

attachment and interchangeability of the micro valves (see page 12)




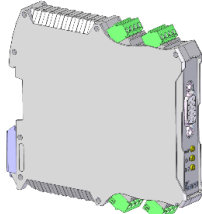

## VALVE CONTROLLERS

### Diverse and flexible

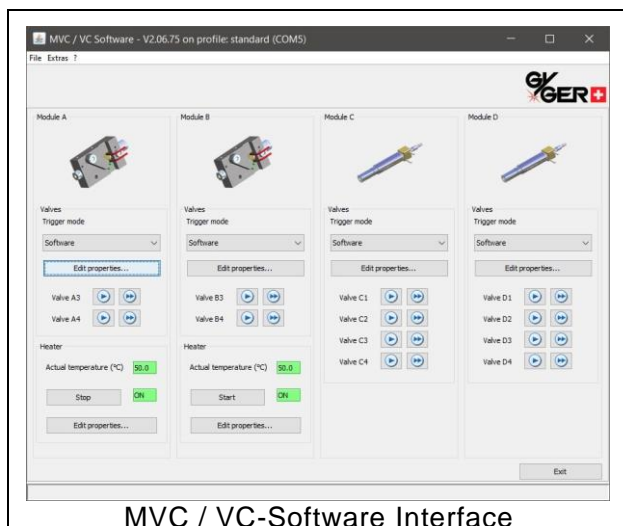
The Gyger valve controllers ensure optimal dispensing accuracy by  $\mu$ s precise control with the “peak and hold” principle. The interfaces allow a straightforward integration into existing systems if required.



You can find detailed information in our valve control brochure.

Variants	Usage
<b>MVC 1</b> 	<p>The modular valve controller MVC 1 is available in various configurations.</p> <ul style="list-style-type: none"> <li>&gt; Max. 16 micro valves</li> <li>&gt; Max. 4 valve heaters / stepper motors</li> <li>&gt; Interface: RS232 / USB, digital I/Os</li> <li>&gt; MVC / VC Mini software</li> <li>&gt; Dimensions: 250 x 100 x 70 mm</li> </ul>
<b>VC Mini</b> 	<p>The valve controller VC Mini offers a slim, complete solution to control max. 2 micro valves.</p> <ul style="list-style-type: none"> <li>&gt; Max. 2 micro valves</li> <li>&gt; Interface: RS232 / USB, digital I / Os</li> <li>&gt; MVC / VC Mini software</li> <li>&gt; Dimensions: 114 x 103 x 18 mm</li> </ul>
<b>ZC1</b> 	<p>The ZC1 is a compact 1-channel controller, also available with cover.</p> <ul style="list-style-type: none"> <li>&gt; 1 micro valve</li> <li>&gt; Interface: RS232 / USB, digital and analogue input</li> <li>&gt; Dimensions: 83 x 27 x 10 mm (without housing)</li> </ul>

## SOFTWARE



The MVC / VC software (Java-based) allows convenient operation via a graphical user interface.

All installed power modules and their functions are visualized in the software and the associated parameters (e.g. valve opening time, heating temperature) can be set and precisely matched to the dispensing application. The functions can be controlled directly from the software (e.g. triggering dispensings).



The software is only available for the MVC and the VC Mini!

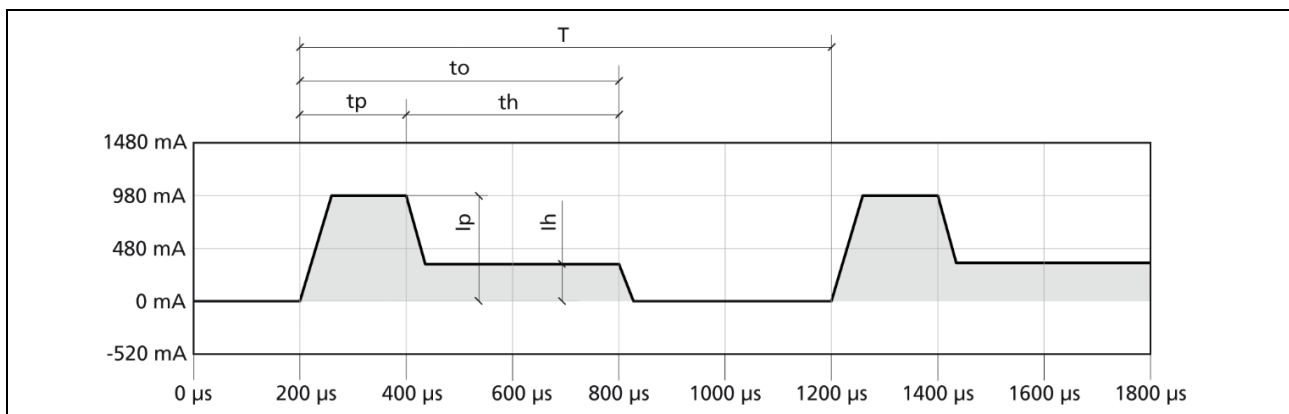
## ELECTRIC CONTROL, MICRO VALVES SMLD

In order to achieve minimum response times with minimum heat development, the electric control should preferably use the “peak and hold” method.

We recommend the Gyger valve controllers for actuation. Precise control of the current curve and optimal cut off when closing the micro valves is thus ensured.

Increasing the peak current for a short time allows the micro valve to be opened quickly under defined conditions. If the micro valve is open, a lower holding current is sufficient during the remaining opening time.

The shielded valve coils are available in versions with soldering pins, completely wired with braids or with connectors.



T Period, cycle time  
to Valve opening time  
tp Peak time

th Holding time  
Ip Peak current  
Ih Holding current



If the currents are too high, the coil temperature can get very hot, which can cause burning! Observe the specifications about the permissible peak current. Do not touch overheated valve coils. Allow them to cool off!



Incorrect voltages and current parameters can lead to the valve coils burning, especially at higher dispensing frequencies. The maximum permissible coil temperature is 100°C.

Description	Micro valve SMLD 300	Micro valve SMLD 300G
Recommended peak time <sup>1)</sup>	150 - 400 µs (default 400 µs)	150 - 1000 µs (default 400 µs)
Recommended peak current <sup>1)</sup>	0.8 – 1.2 A (default 1 A)	
Recommended holding current <sup>1)</sup>	80 - 220 mA (0.9 – 2.4 V DC) (default 200 mA) no time limit	160 - 330 mA (1.0 – 2.0 V DC) (default 200 mA) no time limit
Typical response time <sup>1)</sup>	200 - 320 µs	200 - 450 µs
Coil resistance	11 Ohm	6 Ohm
Coil inductance (valve coil mounted on micro valve)	1.23 mH	0.8 mH

<sup>1)</sup> Depending on: Configuration, surroundings and application

## CLEANING

Permissible cleaning types for the micro valves:

- > Ultrasonic cleaning
- > Cleaning with solvents
- > Sterilization at 121°C
- > Periodical rinsing cycle

**Notice:**



Suitable solvents must be specified depending on the used dispensing media. If you have any questions, contact the dispensing medium manufacturer.

In automated operation, a periodic rinsing cycle can be carried out with the dispensing medium, or it can be switched over to a cleaning fluid.



Do not clean the valve coil using ultrasonic cleaning procedures!

Specific cleaning solutions for the micro valves:

Varianten	Verwendung
CLEANING KIT 21986 	The CLEANING KIT allows easy and quick manual cleaning of the SMLD 300G microvalves. <ul style="list-style-type: none"> <li>&gt; For individual SMLD 300G micro valves (without outlet adapter)</li> <li>&gt; Cleaning possible in both directions</li> <li>&gt; Can be used inside an ultrasonic bath</li> </ul>
CLEANING STATION 	The CLEANING STATION is designed to facilitate and automate the cleaning of SMLD microvalves. <ul style="list-style-type: none"> <li>&gt; Use of up to 3 cleaning fluids</li> <li>&gt; Clean up to 8 valves at once</li> <li>&gt; Can be used inside an ultrasonic bath</li> <li>&gt; Automatic drying of the micro valves with compressed air</li> </ul>

## DISPOSAL

Micro valves can be hazardous to the environment due to the residue of dispensing media, so must be disposed accordingly. Follow all

respective, applicable guidelines, directives and regulations regarding disposal and environmental protection.

## LIFE-TIME AND WARRANTY

The micro valves with a short valve travel (0.03 mm) have a life-time of 500 million cycles or more. The specified life-time information is based on long-term tests carried out with isopropanol. Using a medium with lubricating properties increases the life-time of the micro valves. Running them dry is only possible under certain conditions. This reduces the life-time to a few million cycles. Particles or pigments contained in the medium can limit the life-time.

Contaminants or dirt particles can cause the micro valves to clog or leak. We recommend that built-in valve filters be used, if possible. For basic medium cleaning, we recommend an additional upstream prefilter outside of the micro valve.

The micro valve is a product subject to use. There is no warranty for damages caused by wear and tear.

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Subject to change, technical specifications not guaranteed.

Fritz Gyger AG does not accept any liability for damage resulting from the use of their products.



## THE COMPANY FRITZ GYGER AG

Fritz Gyger AG was founded in 1959. Today the company with 35 employees is managed by the 2nd and 3rd generation together in a new building built in 2005 in Thun-Gwatt, 30 km from Bern, Switzerland.

Since 1992, high-quality electromagnetic 2/2-way micro valves based on hard material components have been developed and produced.

The newest generation, the modular micro valves, are used in the areas of life science, printing industry and automation, among others. Gyger's technology sets high standards in regard to size, precision, speed and life-time. Thanks to many years of experience with contactless micro dispensing of media with different viscosities, Gyger is a reliable partner offering modular dispensing systems in the micro- and nanoliter range.

Gyger has clearly become a solution provider of complex, fine and micro mechanical components and systems in both small- and medium-batch series. For special machining solutions and most cost efficient production, the customers are assisted professionally from the development to the manufacturing including the assembling.

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