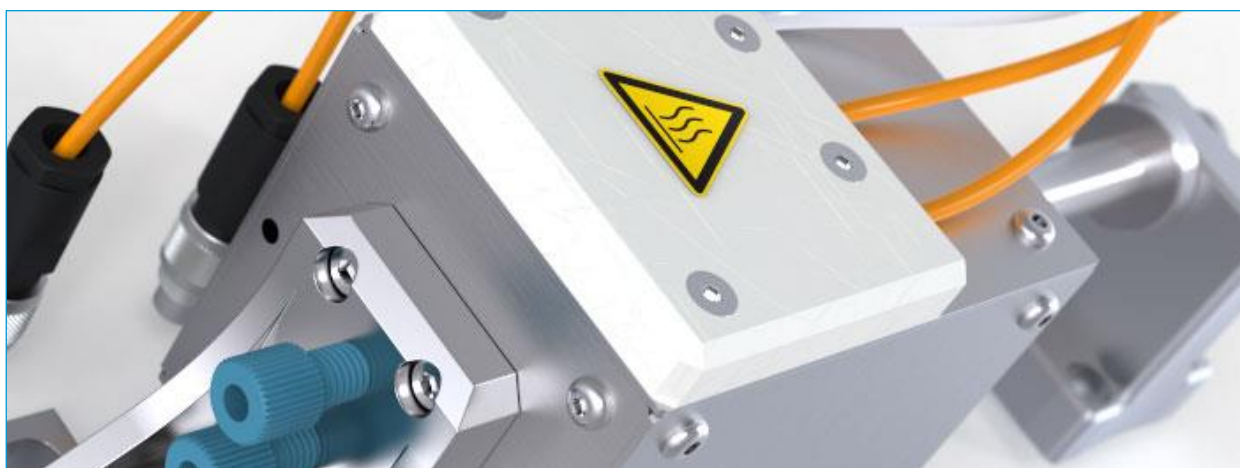


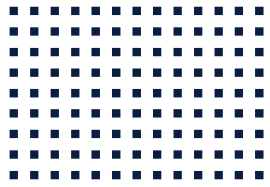
CETONI

CE HEATED SYRINGES AND HEATING HOSES

Manual



ORIGINAL INSTRUCTIONS 1.11 – MAY 2018



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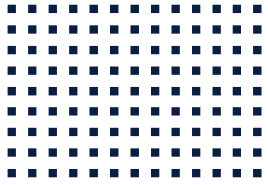
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1.2 Change History

REV	DATE	CHANGE
1.00	14.10.2013	First version of the manual
1.01	24.03.2016	Revision Guide Design
1.10	06.02.2017	Updated syringes
1.11	29.05.2018	<ul style="list-style-type: none">- Legal information added on page 3- "Warranty and Liability" (Item 2.3) inserted- media-contacting materials added- For instructions with the risk of burns: symbol "Caution" replaced by " Attention"- designation "heated tubes" changed in "heating hoses"- Added warning for mechanical damage caused by the hot heating hoses

2 Introduction

2.1 Preface

Thank you for purchasing a CETONI product. With this manual we would like to support you as far as possible in the operation and maintenance of heated syringes and heating hoses.

2.2 Symbols and Keywords Used

The following symbols are used in this manual and should assist you in navigating through this document:



TIPP. Indicates application tips and useful hints to facilitate operation.



IMPORTANT. Indicates important information and other particularly useful information that does not describe dangerous or harmful situations.



ATTENTION. Identifies a potentially harmful situation. If it is not avoided, the product or something in its environment may be damaged.



CAUTION. Indicates a potentially dangerous situation. If it is not avoided, slight or minor injuries and property damage may result.

2.3 Warranty and Liability

The devices left our company in perfect condition. Only the manufacturer is permitted to open the devices. All warranty and liability entitlements, particularly damage entitlements due to personal injuries, are void if the devices are opened by an unauthorised person.

The duration of the warranty is 1 year of technical equipment (except wear parts) from the day of delivery. It is not extended or renewed due to work carried out under warranty.

CETONI GmbH considers itself responsible for the devices with regard to safety, reliability and function only if assembly, new settings, changes, extensions and repairs are carried out by CETONI GmbH or an authorised centre, and if the devices have been used in accordance with the instruction manual.

The product conforms to the basic safety regulation standards. Industrial property rights are reserved on the circuits, methods, names, software programs, and units.

3 Purpose

3.1 General Description

The heated syringe and the heating hoses serve as an accessory to the neMESYS syringe pump system and enable the heating of media within the syringe and the transport of the media within a heated conveyor line (tube).

3.2 Intended Use

The heated syringe and the heating hoses are only intended for use on the medium pressure module of the neMESYS syringe pump system. The heated syringe is used for the defined heating of media or the holding of a defined temperature by means of software control of a control loop. The heating hoses are used to transport the heated media under defined temperature conditions. The use is usually carried out in a laboratory-like room.

3.3 Reasonably Foreseeable Misuse

A use for applications distinct from the intended purpose can lead to dangerous situations and is to be omitted.



CAUTION. The devices must not be used as medical devices or for medical purposes.

3.4 Safety measures

For the safe operation of the heating syringe and heating hoses, the safety measures from the manual for the neMESYS syringe pump system must be observed.



IMPORTANT. Please read this manual, as well as the general section for the Qmix Microreaction System and the corresponding software manual, carefully and completely before using your heated syringe and heating hoses.

4 Transport and Storage

Observe the specifications in chapter "Technical data" for storage.



CAUTION. Transport, storage or operation of the modules below 0 ° C with water in the fluid ducts can cause damage to the device.

5 Technical Data

5.1 Technical Data Heated Syringes

5.1.1 Heater

MAX. HEATING TEMPERATURE	Ambient Temperature +170 K (200°C max.)
MAX. HEATING POWER	42 W
OPERATING HUMIDITY	20% – 90%, non-condensing
STORAGE HUMIDITY	20% – 90%, non-condensing
STORAGE TEMPERATURE	-20°C to 75°C

5.1.2 Connections

FLUIDIC	G 1/8 internal thread, opt. ¼"-28 UNF internal thread
PISTON	M3 internal thread
POWER SUPPLY CONNECTOR	24 V DC
CONNECTORS FOR TEMPERATURE CONTROL	2 x PT100

5.1.3 Wetted Materials

SYRINGE	1.4301 / X5CrNi18-10 / AISI Typ 304 (standard old) 1.4404 / X2CrNiMo17-12-2 / 316L (standard new) 1.4462 / X2CrNiMoN22-5-3 / 318LN 2.4602 / NiCr21Mo14W / alloy C-22 2.4819 / NiMo16Cr15W / alloy C-276 (others on request)
SEALS	PTFE and FKM (others on request)



ATTENTION. Before using the syringes, make sure that the wetted material is resistant against the fluid you want to pump.

Further data of the syringes that is for instance needed for configuration, can be found plate on top of the syringe.

5.2 Technical Data Heating Hoses

5.2.1 Heater

MAX. HEATING TEMPERATURE	150°C (up to 200°C see 6.2.1.4)
MAX. HEATING POWER	42 W
OPERATING HUMIDITY	20% – 90%, non-condensing
STORAGE HUMIDITY	20% – 90%, non-condensing
STORAGE TEMPERATURE	-20°C to 75°C

5.2.2 Connections

POWER SUPPLY CONNECTOR	24 V DC
CONNECTOR FOR TEMPERATURE CONTROL	1 x PT100

5.2.3 Wetted Materials

The heating hoses have no media contact. They only serve as sleeves for capillaries from the material of your choice. The capillaries may have a maximum outer diameter of 3.2mm (1/8”).

6 Hardware Operation

6.1 Operation of the Heated Syringe

6.1.1 Syringe Configuration

To obtain accurate flow rates during operation, the syringes must be configured in the software, if they are not already preconfigured.

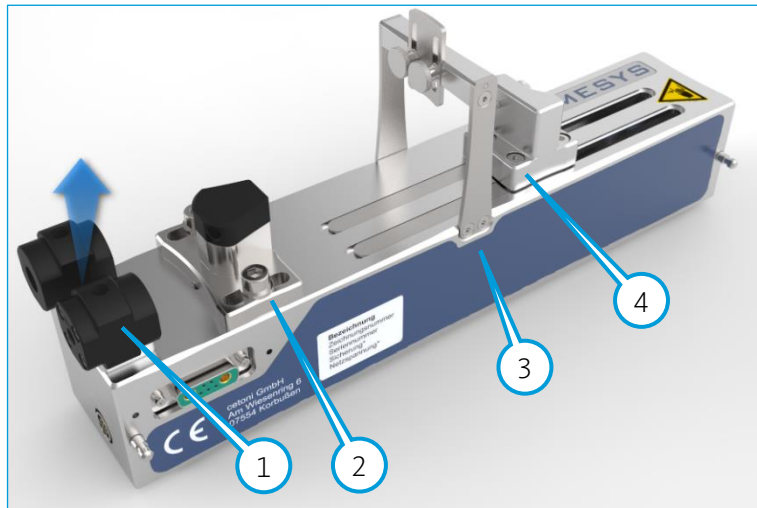
The values needed to configure the heated syringes in the software can be found on the plate on top of the syringe.

The required values are the nominal volume and the nominal stroke. The nominal stroke is the stroke at which the syringe contains the nominal volume. Coming from scaled glass syringes, in the software the nominal stroke is referred to as *Scale Length*, the nominal volume as *Scale Volume*. The actual possible *Piston Stroke* is 60 mm unless otherwise stated. The actual usable volume is accordingly also slightly larger than the nominal volume.

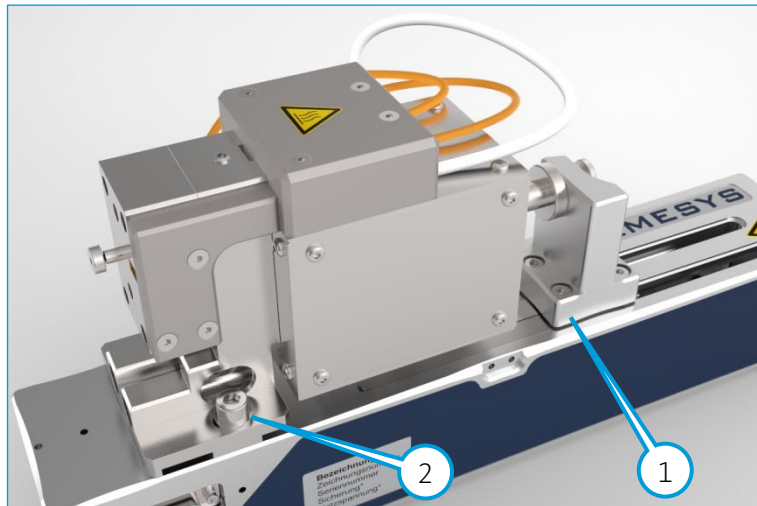
Once the configuration of a specific syringe type has been stored in the software, this configuration may be used directly for later setups.

6.1.2 Mounting the Syringe on the Pump

To mount the heated syringe on the mid pressure module, the existing components on top of the mid pressure module have to be removed. Therefore simply pull the valves (1) off the device. In order to remove the syringe holder, remove the two bolts (2) with a 5 mm Allen key. Two screws (3) on each side of the module have to be removed with a 2 mm Allen key, to take off the blank holder. Finally, the piston holder is fitted with 4 screws (4), that have to be unscrewed using a 3 mm Allen key. It is additionally kept in position by two bolts; so some strength may be required to remove it.



After everything is dismantled, you can assemble the new piston holder using the four previously removed screws (1). Also, the syringe stand is screwed on with the two existing screws. (2)



ATTENTION. Before performing a reference move, slightly loosen the screws of the syringe stand and retighten them again after the reference move. Otherwise, the module or the syringe may be damaged.

6.1.3 Connecting the Heated Syringe

6.1.3.1 ELECTRICAL CONNECTION OF THE SYRINGE

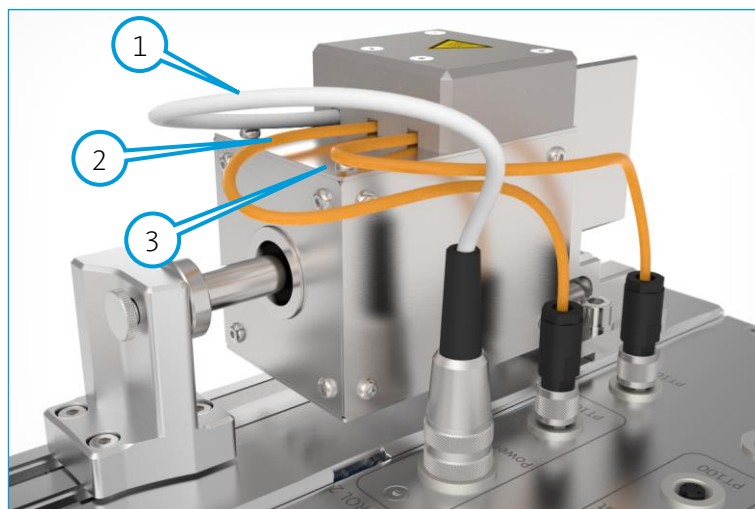


ATTENTION. To avoid damage to the equipment, perform all wiring in the switched-off state.

The heated syringe has three electrical connections. The white cable (1) with the larger connector is used for power supply. The two orange cables are connected with PT100 temperature sensors.

The sensor, whose cable (2) leaves the syringe next to the power supply cable, is used to measure the temperature of the syringe cylinder. The second sensor (3) measures the temperature in the syringe stand close to the outlet. The temperature is usually slightly higher at the syringe cylinder than at the outlet.

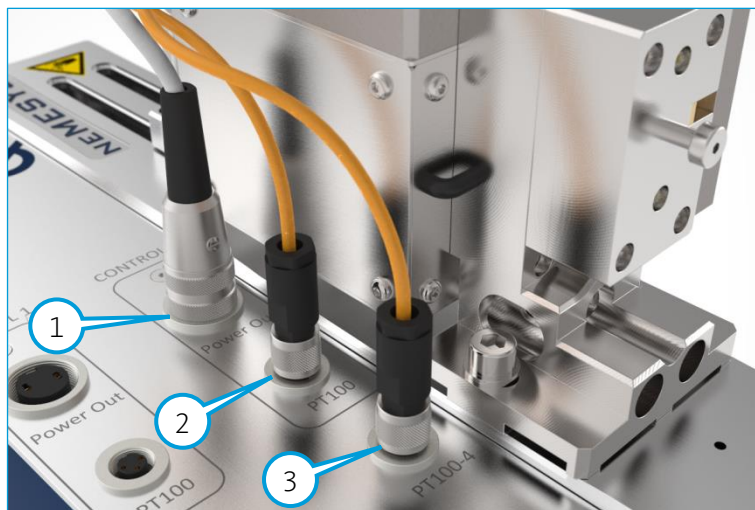
If your medium reacts critically to high temperatures, you should accordingly use the sensor of the syringe cylinder (2) for temperature control. If, however, it threatens to cure falling below a certain temperature, it may be more useful to use the sensor at the outlet (3) for temperature control.



The heated syringe is operated with the temperature control module Qmix TC. Connect the large plug for the power supply to the socket, labeled "Power Out" (1), of one of the two control loops of the Qmix TC. Plug the connector with respect to the orientation and slightly tighten the union nuts.

On the Qmix TC Module a connector for PT100 temperature sensors is assigned to the power supply connector (illustrated by a frame line). Plug the connector of the PT100 sensor you have chosen for temperature control into this socket (2). The second sensor can be connected to the socket outside the frame line (3). The values measured by this sensor can also be displayed in the software, but will not

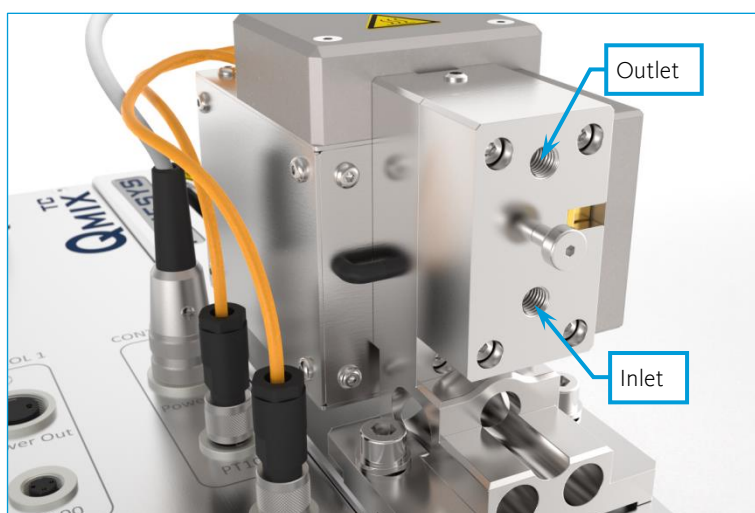
affect the temperature control. When inserting the connectors, pay attention to the correct orientation and then tighten the union nuts slightly.



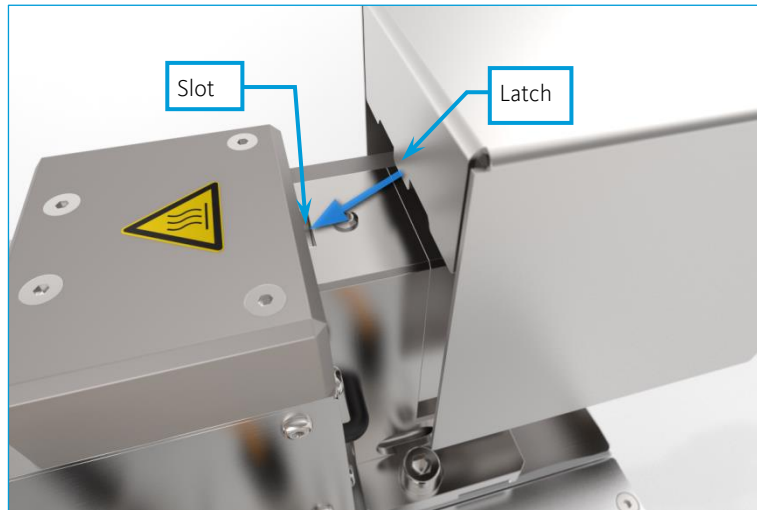
6.1.3.2 FLUIDIC CONNECTION OF THE SYRINGE

The syringe stand is equipped with integrated check valves that switch automatically between inlet and outlet when the flow direction changes. Both, inlet and outlet have ¼"-28 UNF threads, which allows the use of appropriate fittings and capillaries.

The connection of heating hoses is treated in section 6.2.1.



The syringe stand may become very hot when in operation. Therefore mount the safety cover before putting the syringe into operation. The latch of the cover must engage with the slot in the back of the syringe stand. Install the protective cover, no matter if you want to use normal or heating hoses.

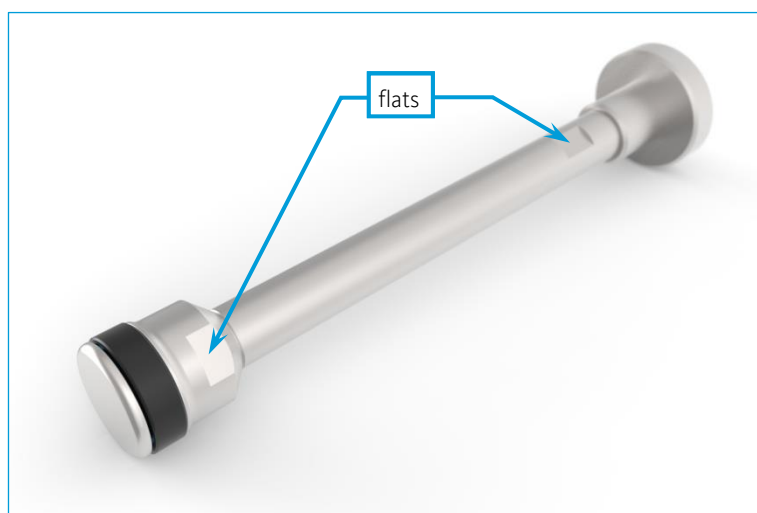


CAUTION. Mount the safety cover before putting the syringe into operation. Otherwise there is a risk of burns. Other surfaces of the syringe may become very hot as well. Avoid any contact while the heated syringe is in operation. Do not perform any installation work before a sufficient amount of cooling time.

6.1.4 Maintenance and Care of the Syringes

Except for the seals, the syringes are maintenance-free if used as intended. Replacement seals can be obtained from CETONI GmbH. In order to clean the syringes thoroughly, or to change the seals, the syringes must be disassembled. The procedure is explained below.

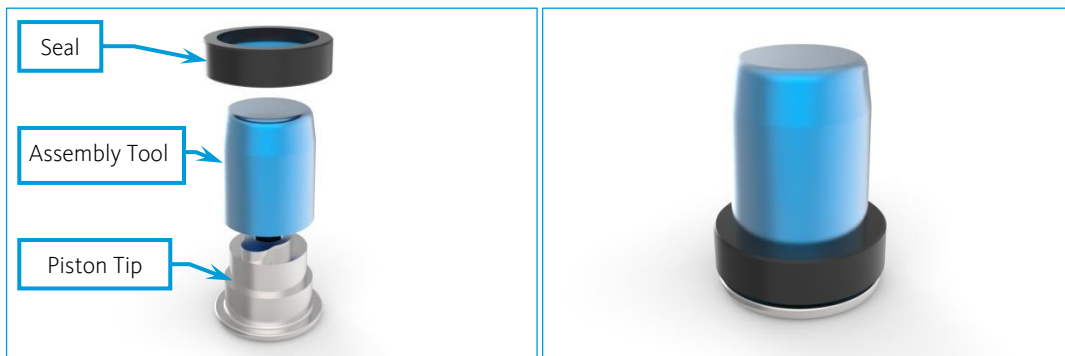
First, pull the piston out of the syringe. To get the seal from the piston, you have to disassemble the piston. Therefore unscrew the forepart of the piston. Use the flats to release the piston from the piston rod using appropriate open-end wrenches.



You can then remove the seal, consisting of O-ring and sliding ring / backup ring, clean it and replace it if necessary. Do not use sharp or pointy objects to disassemble the seal to avoid damaging the seal.



Proceed in the reverse order for reassembly. For the version with slide seal, insert the O-ring into the sliding ring and then slide the seal onto the piston tip using the assembly tool.



For the version with O-ring, slide the O-ring onto the piston tip, followed by the backup ring (the concave side of the backup ring must face the O-ring) with the aid of the assembly tool. When the seal is installed, insert the rear half of the piston and install the piston rod using the two open-end wrenches.

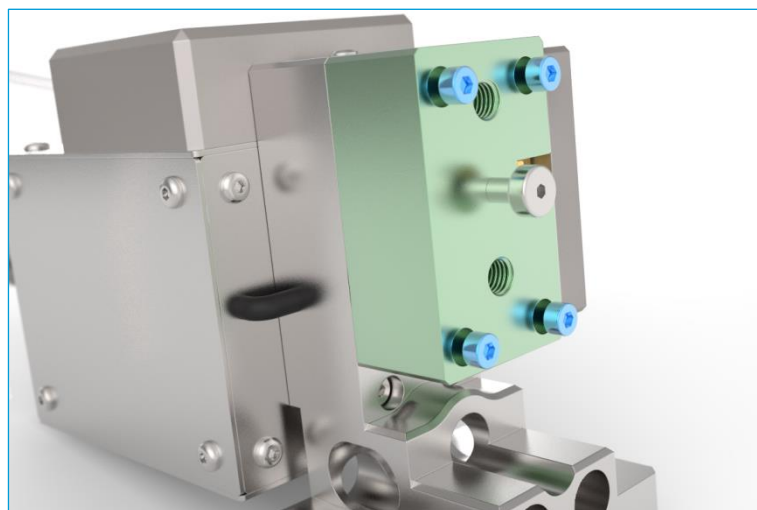


ATTENTION. Be careful when installing the piston to avoid damaging the seal. Insert the piston as straight as possible without tilting.

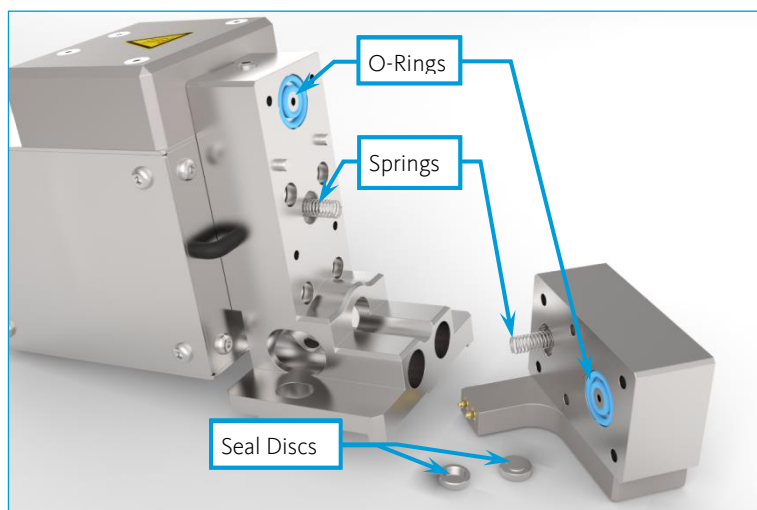
6.1.4.1 CHECK VALVES

Two check valves are integrated in the syringe stand. If they should no longer work sufficiently, it may become necessary to clean the seals or even replace them.

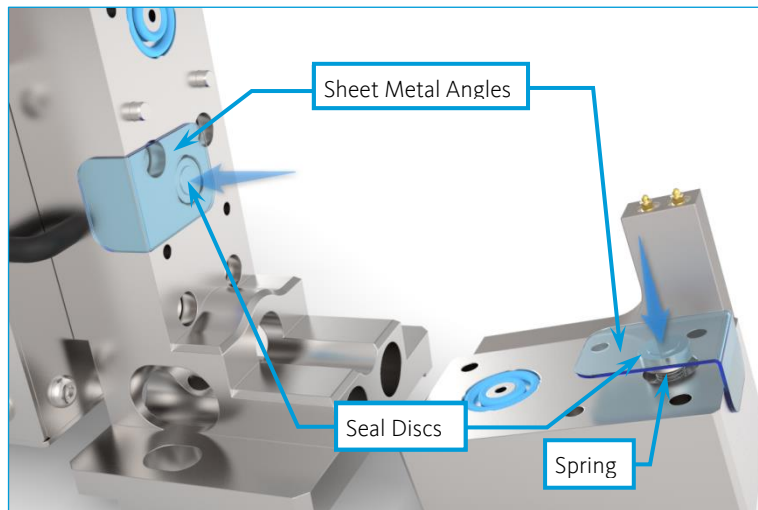
To do this, remove the four screws marked in blue in the picture. Once you remove the last screw, keep the green marked block in place and take it off slowly. Otherwise, the springs of the valves can pop out and get lost.



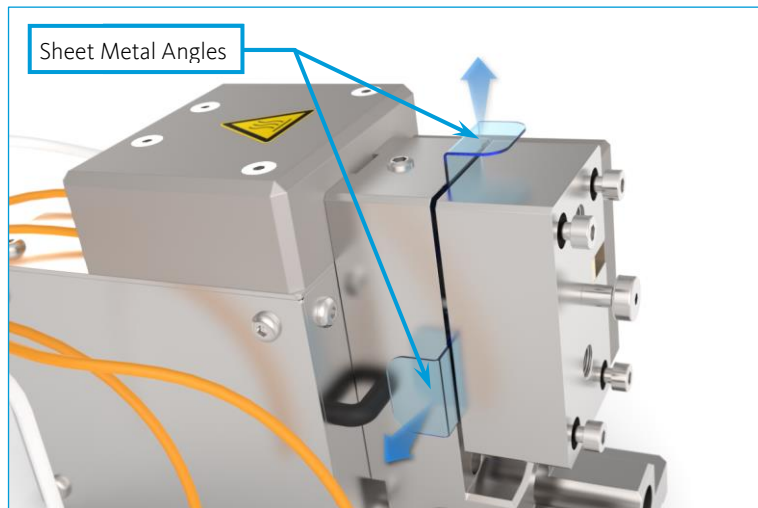
After you have removed the block, the O-rings (highlighted blue), the springs and the seal discs can be cleaned or replaced.



To reassemble, first insert the O-rings into their seats. Next, put the seal discs onto the springs with their hollow side. Then push these units completely into the corresponding bore holes. Use the two sheet metal angles (transparent blue in the picture), to prevent the springs and seal discs from popping out during the assembly of the block.



After locating the block, carefully remove the sheet metal angles and screw the four fastening bolts back in.



6.2 Operation Heating Hoses

6.2.1 Connection of Heating Hoses

6.2.1.1 ELECTRICAL CONNECTION OF THE HEATING HOSES



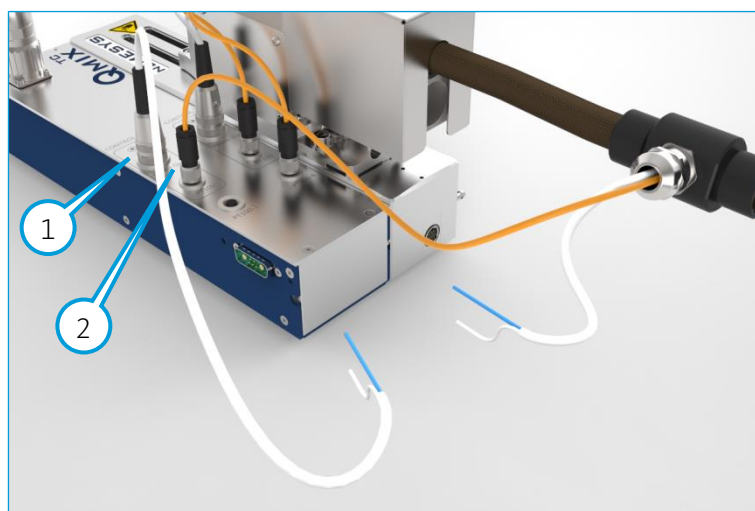
ATTENTION. To avoid damage to the equipment, perform all wiring in the switched-off state.

The heating hose has two electrical connections. The white cable (1) is used for power supply. The orange cable with the connector is connected to a PT100 temperature sensor.

The heating hoses are operated with the temperature control module Qmix TC. Mostly, one of the control loops of the Qmix TC module is already in use for the heated syringe. The second control loop can be used to electrically operate the heating hose.

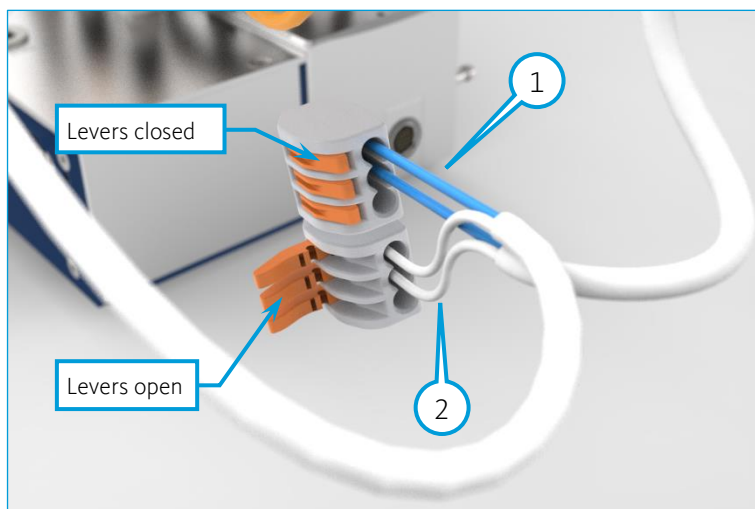
Connect the large plug of the white cable (1) supplied separately to the socket, labeled "Power Out", of a free control loop of the Qmix TC. Plug the connector with respect to the orientation and slightly tighten the union nut.

Plug the connector of the PT100 sensor (2) into the socket assigned to the power supply connector (illustrated by a frame line).



Next, the free ends of the two white cables, coming from the hose and the connector, need to be connected. Therefore, open the levers of the terminal clamps, you find enclosed. Insert the two blue cable strands (1) into two of the terminals ports and then close the levers. Insert the two white cable

strands into two ports of the other terminal clamp and close these levers as well. The hose may be used now.



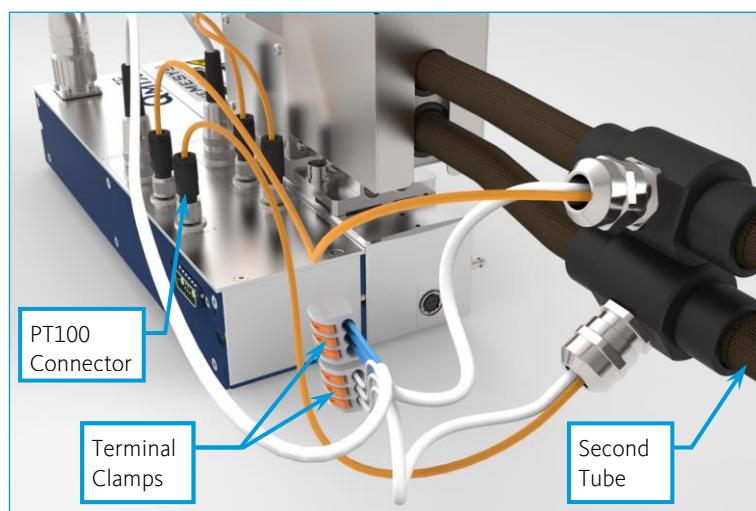
6.2.1.2 OPERATION OF TWO HEATING HOSES

If you not only want to dispense but also to refill your syringe, you may have to use a second heating hose. You can do this as described above, using a second Qmix TC Module.

Alternatively, the second heating hose can be operated together with the first one, using the same port. However, this has the result that only the temperature of the first hose is actively controlled. The temperature of the second hose is driven parallel but can differ by several Kelvin from the temperature of controlled hose.

If your application can tolerate this, perform as follows, to connect the second heating hose:

Connect the blue and the white cable strands of the white power supply cable to the free ports of the corresponding terminal clamps. The orange cable with the connector can be plugged into the free PT100 socket on the Qmix TC module. This allows you to monitor the temperature of the second hose within the software.



6.2.1.3 FLUIDIC/ MECHANICAL CONNECTION OF THE TUBE

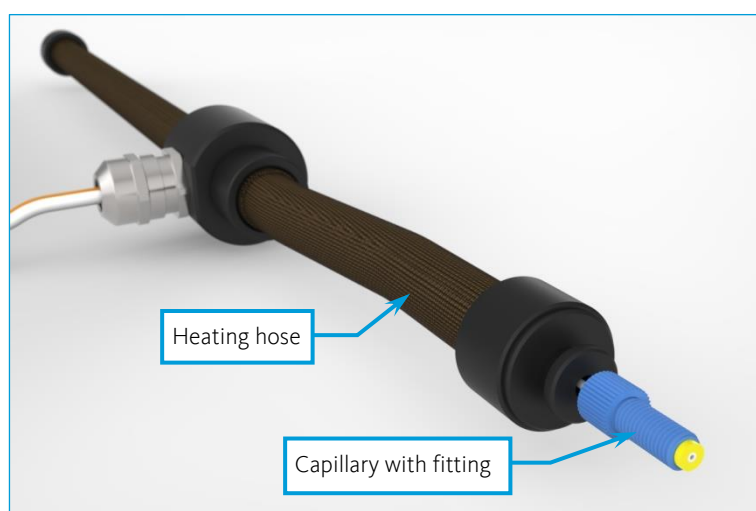


ATTENTION. To avoid damage to the heating hose, only carry out installation work when the heating hose is cold and switched off (room temperature). The core of the heating hose consists of a PTFE hose that becomes softer as the temperature rises. During assembly work when heated, there is a risk of irreparable compression or buckling.



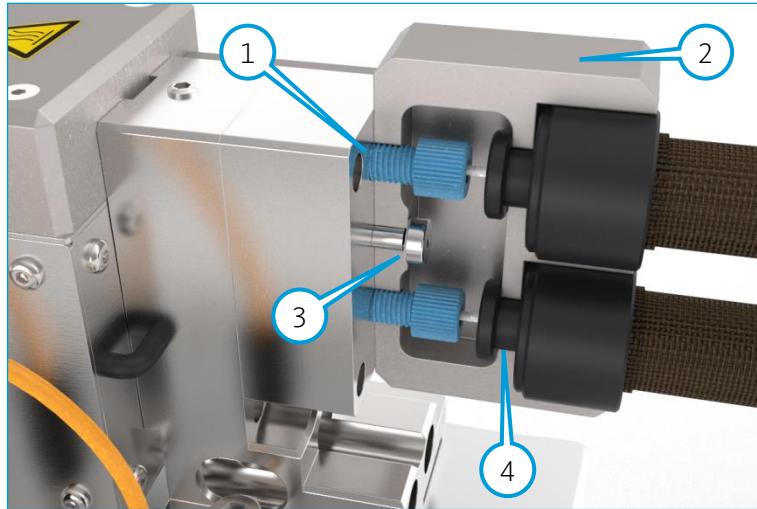
CAUTION. Only carry out installation work when the heating hose is cold and switched off (room temperature). Otherwise there is a risk of burns.

Lead a capillary of your choice through the heating hose and equip it with a suitable fitting.

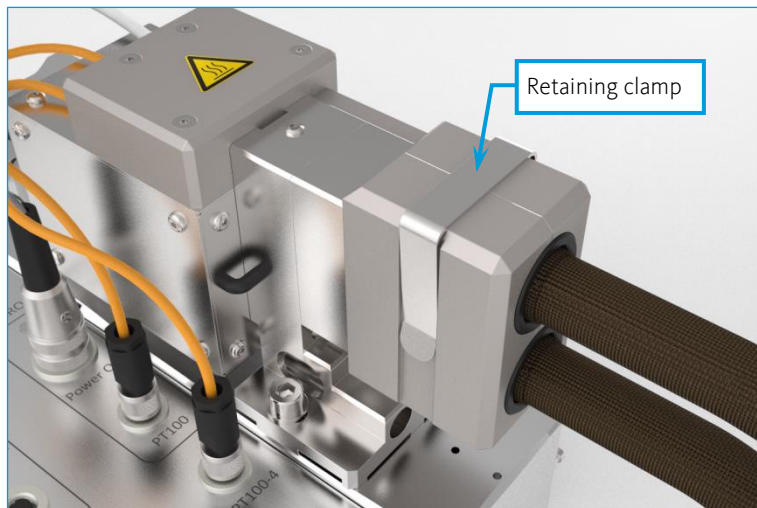


Screw the fittings (1) into the ports of the heated syringe. The heating hoses can be attached to the heated syringe with a pair of half shells (2). Install the first half shell, so that it hooks to the retaining

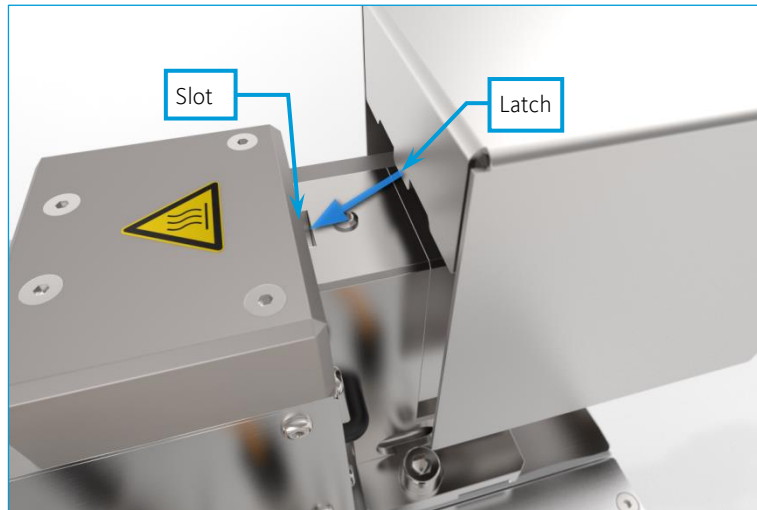
screw (3), located between the two fittings. Insert the grooved end caps (4) of the heating hoses into the opposite side of the half shell.



Next, attach the second half shell and joint the two halves with the retaining clamp.



The syringe stand may become very hot when in operation. Therefore mount the safety cover before putting the syringe into operation. The latch of the cover must engage with the slot in the back of the syringe stand. Install the protective cover, no matter if you want to use normal or heated tubes.



CAUTION. Mount the safety cover before putting the syringe into operation. Otherwise there is a risk of burns. Other surfaces of the syringe may become very hot as well. Try to avoid any contact.

6.2.1.4 ADDITIONAL INSULATION

The maximum temperature of the heating hoses is about 150°C, depending on the ambient conditions. It can be increased to about 200°C by using the thick black insulating tubes. By using the thick black insulating sleeves of EPDM foam, the heat loss can be reduced. Thus, the core temperature can be increased to about 200 ° C., or a more uniform temperature distribution can be achieved in the interior at lower temperatures.

The thick black insulating tube is delivered as one piece. Use a cutter knife or scissors to cut the insulating tube so that it fits your application. Insert the heating hoses into the insulation tubes and fix the insulation for example with cable ties or adhesive tape. The fewer gaps the insulation comprises, the more homogeneous the temperature distribution will be inside the tube.



ATTENTION. To avoid damage to the heating hose, only carry out installation work at room temperature. During assembly work when heated, there is a risk of irreparable compression or buckling.



CAUTION. Only install the additional insulation when the heating hose is cold and switched off (room temperature). Otherwise there is a risk of burns.