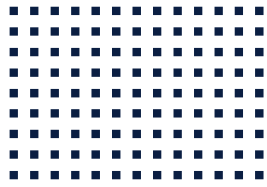


CETONI

CE ULTRA HIGH PRESSURE Syringe Manual



ORIGINAL INSTRUCTIONS 1.10 – MAY 2018



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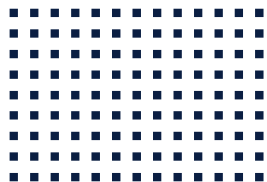
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1.2 Revision History

REV	DATE	CHANGE
1.00	03.08.2016	Creation of the neMESYS Ultra High Pressure Syringe Manual
1.01	07.10.2016	Data of the 75 ml syringe added
1.02	19.10.2016	Instructions for the 75 ml syringe added
1.10	04.05.2018	100 ml and 250 ml syringes revised

2 Introduction

2.1 Preface

Thank you for purchasing a product from CETONI. With this user manual we would like to support you as well as possible when handling the device. If you have any questions or suggestions, please do not hesitate to contact us.

2.2 Symbols and Keywords Used

The following symbols are used throughout this manual to help you navigate through this document:



HINT. 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. Indicates 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 Norms and guidelines

When used as intended, the neMESYS Ultra High Pressure Syringes do not reach the limit values listed in Article 4, Paragraph. 1, Letters a to c and Paragraph 2 of Directive 2014/68/EU. They are therefore not subject to the requirements of Annex 1 of the Directive. Consequently they do not bear a CE marking.

2.4 Use

2.4.1 General description of the device

The neMESYS Ultra High Pressure Syringes are precise, chemically resistant metal syringes for higher pressures.

2.4.2 Intended use

The neMESYS Ultra High Pressure Syringes are intended exclusively for use with the NEMESYS XL ultra-high pressure module. In this combination, they serve to generate defined flow rates and pressures. Application usually takes place in laboratory-like rooms.

2.4.3 Reasonably Foreseeable Faulty Application

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



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

2.4.4 Safety measures

Safety for the operator as well as trouble-free operation of the device are ensured only when using original equipment parts and original accessories. Warranty claims will not be accepted for damage due to the use of alien accessories or expendables.

The device has been developed and designed to avoid harmful situations during intended use. However, the following safety measures have to be observed to exclude potentially remaining risks:

- CETONI GmbH points out the operator responsibility during use. Relevant laws and regulations at the location of use must be observed. In the interest of safety, operators and users are responsible to adhere to all relevant regulations.
- The device must neither be used as a medical product nor in medical applications.
- The device is designed and approved to work in fluidic systems, which fall within the scope of Article 4 Paragraph 3 of the Pressure Equipment Directive 2014/68/EU.

This means that the system may not exceed a maximum volume of 1 liter. With the use of fluids from Group 1 according to Article 13 of the Pressure Equipment Directive 2014/68/EU, the maximum allowable system pressure is 200 bar. For fluids from Group 2 it is 1000 bar. If different, product-specific values for the maximum pressure are given in the section "Technical Data", these values must be complied with. Regarding the maximum operating temperature, the specification from the section "Technical Data" must be observed.

CETONI GmbH is not liable for consequences that may arise if the user expands the system by peripheral devices, such that one of the values or both values are exceeded.

It is the user's responsibility to become familiar with the mentioned Pressure Equipment Directive and to comply with the prevailing requirements.

- The operator has to ensure functional safety and proper condition of the device before use.
- The operator must be familiar with how to operate the device and the software.
- The device, accessories, and cables must be checked for damages before use. Damaged cables and interfaces must be replaced immediately.
- Cables and tubing are to be laid out such as to prevent the danger of tripping.
- The device must only be operated with the safety cover firmly attached. Any safety installations must not be tampered with nor rendered in-operational.
- Touching any of the devices moving parts during operation must be avoided due to the danger of contusions.
- It is forbidden to use the device in an explosive atmosphere or with potentially explosive materials.
- Safety goggles must be worn when operating or handling the device, in particular with corrosive, hot, or otherwise dangerous substances.
- Please note that continuous use may cause wear of the syringes. This may increase the likelihood of leakages. Leaking syringes must be replaced immediately.
- Transport, storage, and operation of the device at a temperature below 0°C/32°F with water within the fluidic system may cause damage to the device.

2.4.5 Device condition

Despite a faultless manufacture of the unit, damage may occur at any time whilst the unit is in operation. With this in mind, the user must always carry out a visual check of the device and any attached or co-operated components prior to use. Particular attention must be paid to damaged connections and seals. If you notice any damage to the device, you cannot resolve yourself with the help of this manual yourself, CETONI GmbH should be informed. CETONI will ensure that operational conditions are reestablished within a reasonable time.

2.5 Warranty and Liability

This device left our company in perfect condition. The duration of the warranty is 1 year from the date of delivery. It is not extended or renewed due to work carried out under warranty.

CETONI GmbH considers itself responsible for the device with regard to safety, reliability, and function only if it is used in accordance with this manual.

2.6 Scope of Delivery

The following items should be included in the scope of supply

NEMESYS ULTRA HIGH PRESSURE SYRINGE

- Syringe (Size as per order)
- Replacement seals



3 Technical Data

3.1 Material

The materials the syringes consist of can be found in the following table. O-rings are used as seals. They will be complemented by sliding rings in the future. For some syringes sliding rings are already available upon request.

O-rings have a significantly lower leakage, however, wear out much more quickly and generate abrasion. Sliding rings wear out much slower, however, exhibit higher leakage. The preload of the sliding rings is also generated by O-rings.

Backup rings avoid, that the O-rings are damaged at very high pressure. They have no direct media contact, but come into contact with leakage.

SYRINGE	MATERIAL	MATERIAL O-RINGS	MATERIAL BACKUP RING	MATERIAL SLIDING RING
10 ml NEM-B506-01 B	1.4462 & 1.4404 / 1.4571 (318 LN & 316 L / 316 Ti)	FKM 80 shore A min.	PEEK modified	/
25 ml NEM-B514-01 A	1.4571 (316 Ti)	FKM 80 shore A min.	PEEK modified	/
75 ml NEM-B551-01 A	1.4404 / 1.4571 (316 L / 316 Ti)	As ordered 70 shore A min.	PEEK modified	PTFE filled with carbon
100 ml NEM-B515-03 A	1.4571 (316 Ti)	FKM 70 shore A min.	PEEK modified	PTFE filled with carbon
250 ml NEM-B516-01 A	1.4571 (316 Ti)	FKM 70 shore A min.	PEEK modified	PTFE filled with carbon



ATTENTION. Before using the Syringes, please check the chemical resistance of the wetted materials against the dosing liquid.

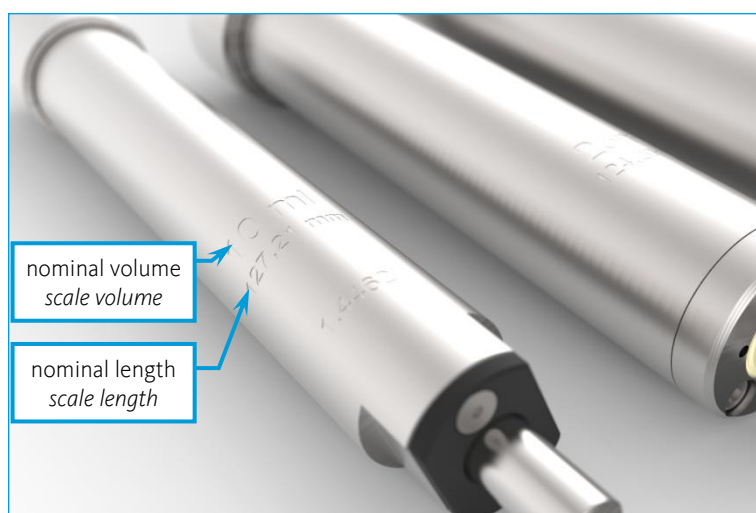


ATTENTION. Only use fittings, capillaries and seals specified for the anticipated pressure levels.

3.2 Fluidic data

The fluidic data and values that you also require for syringe configuration are listed in the table below. Additionally, the nominal stroke of the syringe, which corresponds to the nominal volume, is engraved on the syringe. Originating from glass syringes, the nominal stroke is denominated *scale length* in the software and the nominal volume is termed *scale volume*. By default, the syringes have a small safety reserve in stroke length – the maximum stroke length is also given in the table below, called *piston stroke*. Thus, all values are available in order to completely configure the syringe.

After the initial configuration, the syringe can be stored in the software so that later it can be accessed quickly and easily.



NOM. VOLUME <i>scale volume</i> [ml]	NOM. STROKE <i>scale length</i> [mm]	MAX. STROKE <i>piston stroke</i> [mm]	MAX. PRESSURE [bar]	MIN. FLOW [nl/s]	MAX. FLOW [ml/s]
10 NEM-B506-01 B	127,21	130	890	0,20	1,03
25 NEM-B514-02 A	124,20	128	345	0,52	2,63
75 NEM-B551-01 A	121,71	130	110	1,58	8,06
100 NEM-B515-03 A	124,24	128	85	2,06	10,53
250 NEM-B516-02 A	127,25	130	35	5,04	25,69

4 Transport and Storage

Although the syringes are made of corrosion-resistant material, surface corrosion may be caused by media residues during storage. For that reason, disassemble and clean the syringes prior to periods of non-use.



ATTENTION. Transportation, storage or operation of the syringes below 0°C with water in the fluid passages may cause damage.

5 Operation and maintenance

The syringes are wear parts. The piston seal rubs on the cylinder, whereby the seal wears out. The same applies to a lesser extent for the cylinder. The amount of wear and abrasion depends on many factors, such as pressure, flow rate and the utilized medium.

Excessive wear of the seals can lead to leaks. Therefore, check the condition of the seals at regular intervals. If your application is sensitive to abrasion, we recommend the installation of filters.



ATTENTION. Check the seals of the syringe at regular intervals to prevent leaks and resulting damage.

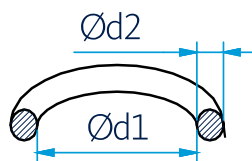


ATTENTION. In order to protect the application against abrasion particles, equip your system with filters.

The syringes are made from the actual syringe cylinder, and a front and an rear cap as well as the piston. Depending on the syringe size the mechanical construction varies slightly. Therefore, hereinafter, the (dis)assembly will be described for each syringe size.

When O-ring dimensions are mentioned, the inner diameter ($\varnothing d1$) and the cord diameter ($\varnothing d2$) are meant.

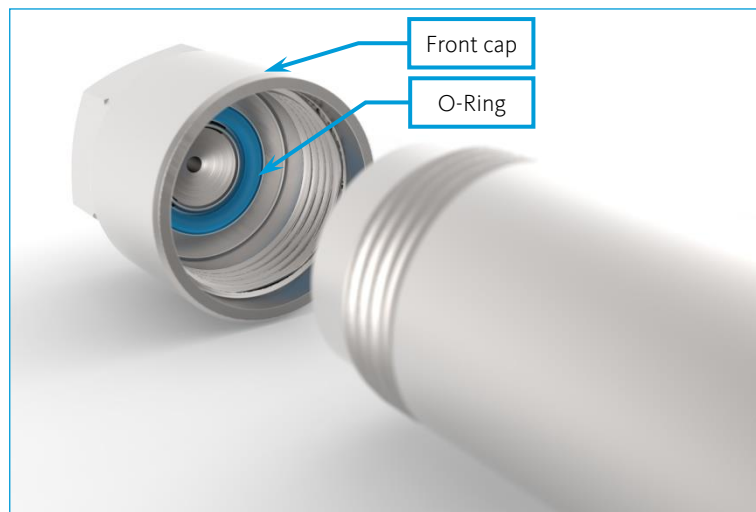
Example: O-ring 12x2 $\rightarrow \varnothing d1=12; \varnothing d2=2$



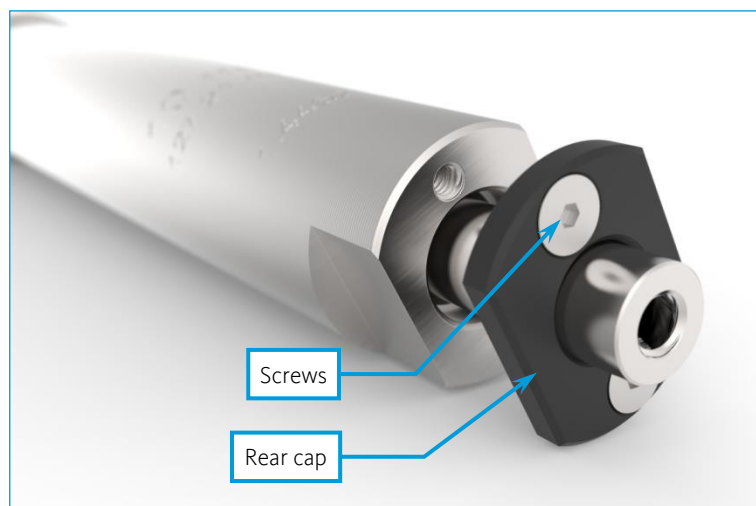
5.1 10 ml syringe NEM-B506-01 B

The front cap of the 10 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench while holding backup on the rear of the cylinder with an 18 mm wrench.

The front cap contains an O-ring of dimensions 12 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 3.1 when you exchange the O-rings.

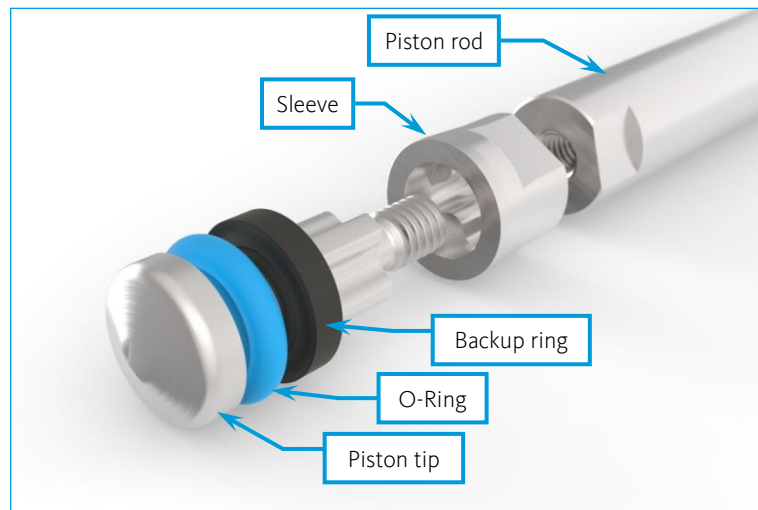


To remove the rear cap, simply unscrew the two screws with a 2 mm Allen key.



When the rear cap is removed, you can pull out the piston. To replace the O-ring (6x2), you need to disassemble the piston. Unscrew the piston tip by turning the sleeve with an 8 mm open-end wrench

while holding backup on the piston with a second 8 mm wrench. Make sure that the concave side of the backup ring points towards the O-ring.

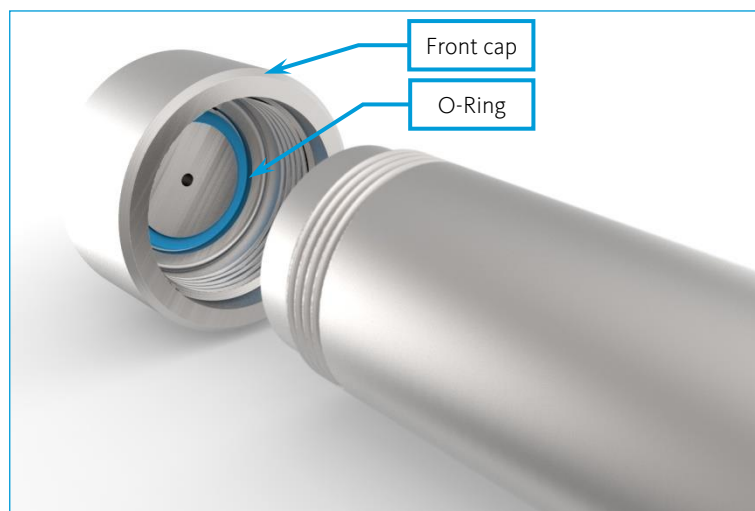


When reassembling simply proceed in the reverse order.

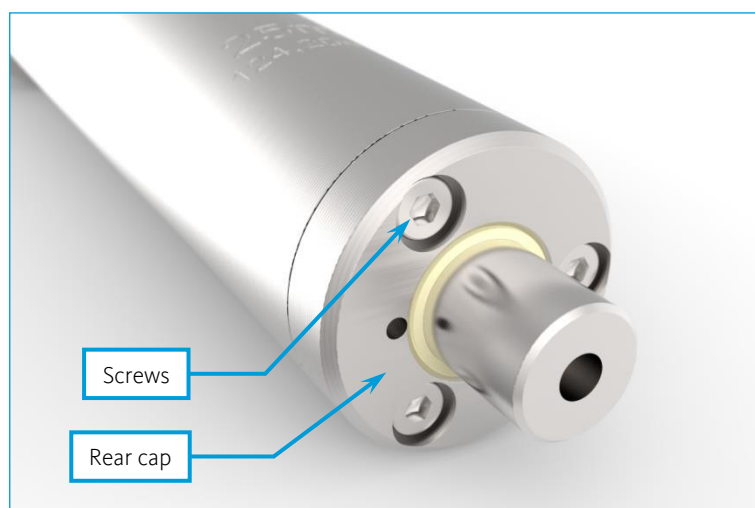
5.2 25 ml syringe NEM-B514-01 A

The front cap of the 25 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench.

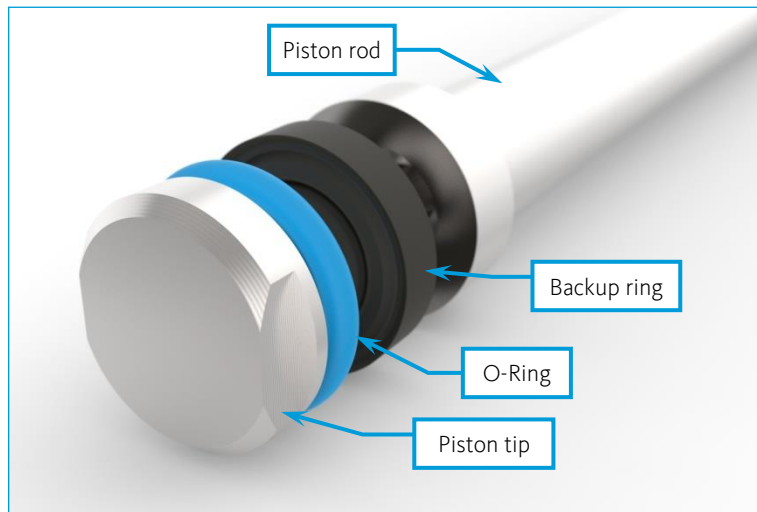
The front cap contains an O-ring of dimensions 18 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 3.1 when you exchange the O-rings.



To remove the rear cap, simply unscrew the three screws with a 2.5 mm Allen key.



When the rear cap is removed, you can pull out the piston. To replace the O-ring (12x2), you need to disassemble the piston. Unscrew the piston tip with an 8 mm open-end wrench. Make sure that the concave side of the backup ring points towards the O-ring.

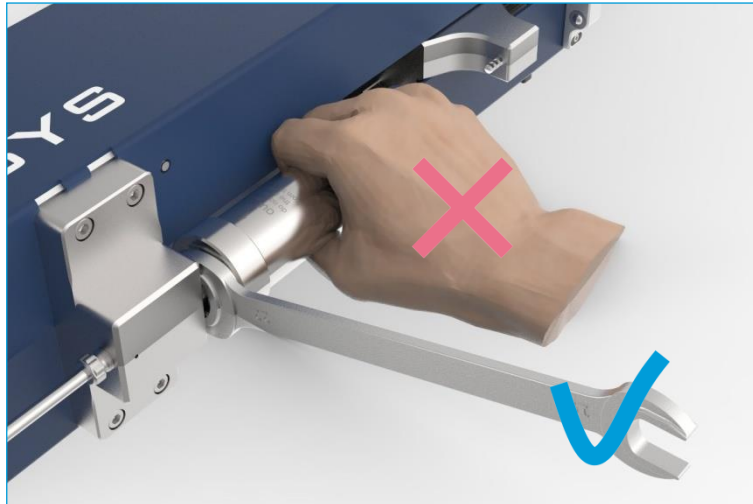


When reassembling simply proceed in the reverse order.

5.3 75 ml syringe NEM-B551-01 A

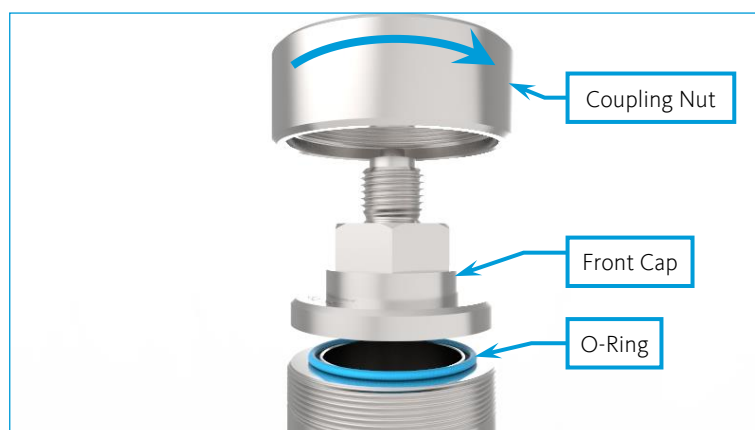


CAUTION. In order to torque down the syringe on the pump module, do not twist the cylinder. Instead, use a 22 mm open-end wrench and twist the front cap, which is provided with appropriate spanner flats.



5.3.1 (Dis-)Assembly of the Front Cap and Seal

The front cap of the 75 ml syringe is screwed onto the cylinder with a coupling nut. After unscrewing the coupling nut, you can simply remove the front cap and exchange the O-ring (31 x 1.5), if necessary. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench. This O-ring does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 3.1 when you exchange the O-rings.



For assembly, hold the syringe upright, place the O-ring on the cylinder, and then screw on the front cap with the coupling nut.

5.3.2 (Dis-)Assembly of the Piston

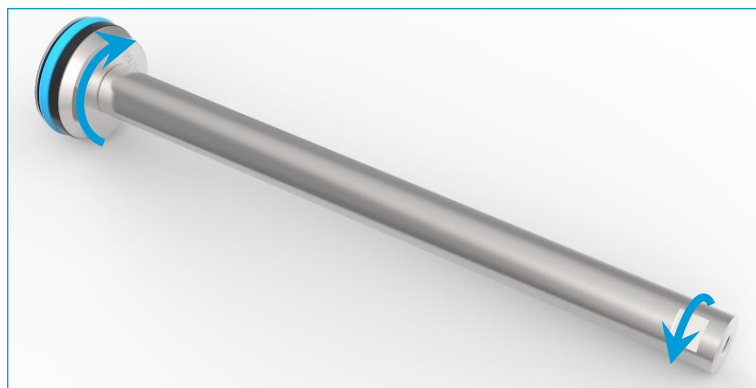
Pull the piston out until it touches the rear cap. Then unscrew the rear cap from the piston and gently pull the piston out of the cylinder as straight as possible.

For assembly gently slide the piston into the cylinder as straight as possible to avoid tilting. Then mount the cap with the sliding guide.



5.3.3 (Dis-)Assembly of the piston seal

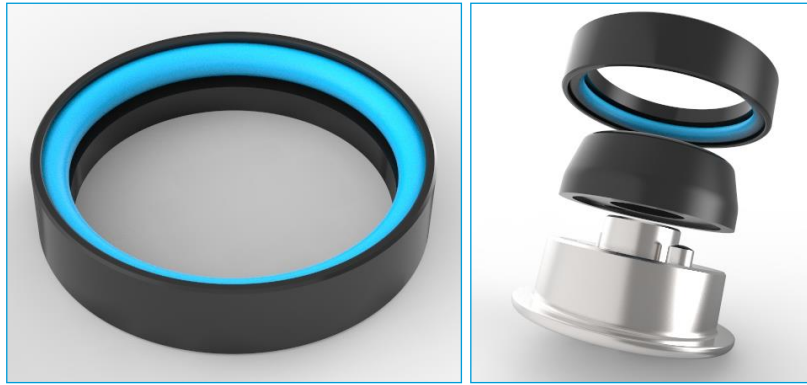
Use a 10 mm and a 19 mm open-end wrench to disassemble the piston.



You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

- Assembly of the sliding ring

Insert the O-ring (23x2.5) into the sliding ring. Then use the mounting tool to slide the seal on to the piston tip.



- Assembly of O-ring and backup ring

Slide the O-ring (23x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.

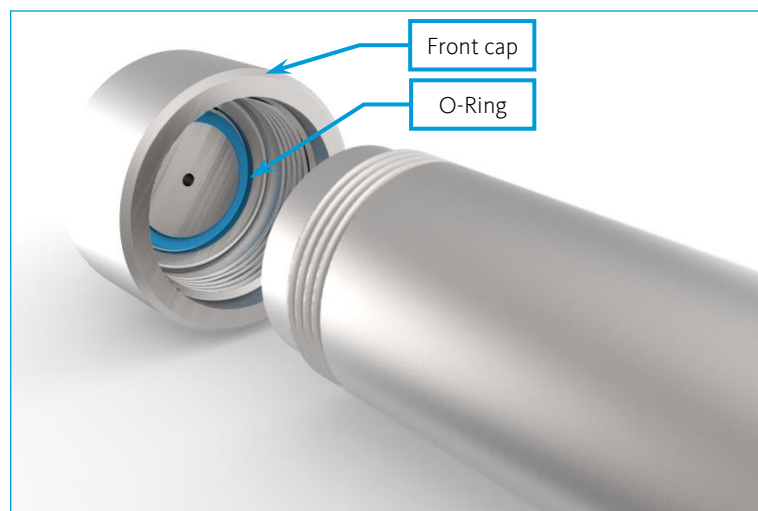


Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. Be particularly careful when mounting the piston, especially in the area of the threaded holes, so as not to damage the seal. The syringe is now ready for use again.

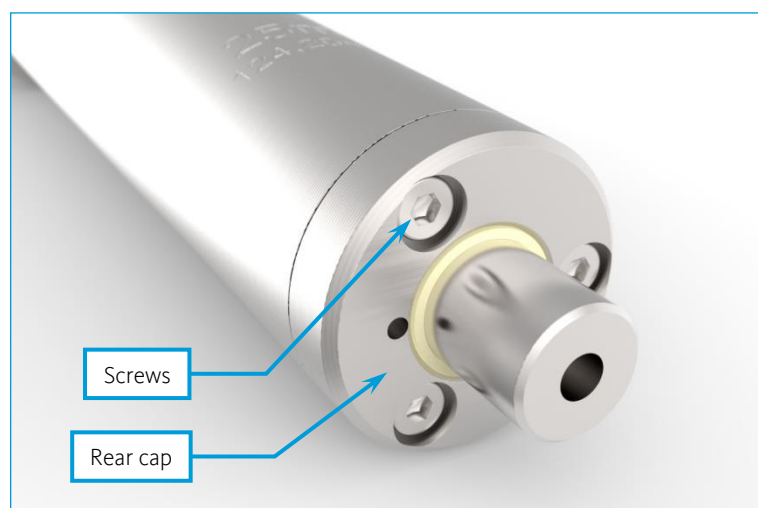
5.4 100 ml syringe NEM-B515-01 A

The front cap of the 100 ml syringe is screwed directly onto the cylinder and can be unscrewed for maintenance purposes. If the cap is too tight and cannot be moved by hand, use a 24 mm open-end wrench.

The front cap contains an O-ring of dimensions 34 x 2, which is shown in blue in the picture below. This does not wear normally, but can be changed for reasons of chemical resistance. Please observe the information on the hardness in Chapter 3.1 when you exchange the O-rings.



To remove the rear cap, simply unscrew the three screws with a 2.5 mm Allen key.



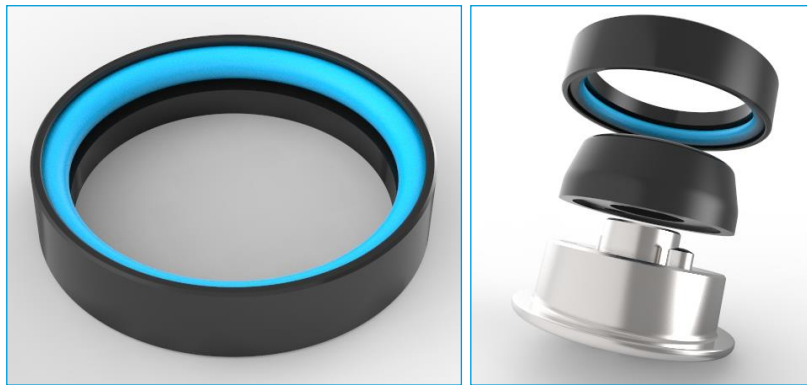
5.4.1 (Dis-)Assembly of the piston seal

When the rear cap is removed, pull the piston carefully and as straight as possible out of the cylinder and disassemble the piston with a 10 mm and 24 mm open-end wrench.

You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

- Assembly of the sliding ring

Insert the O-ring (27x2.5) into the sliding ring. Then use the mounting tool to slide the seal onto the piston tip.



- Assembly of O-ring and backup ring

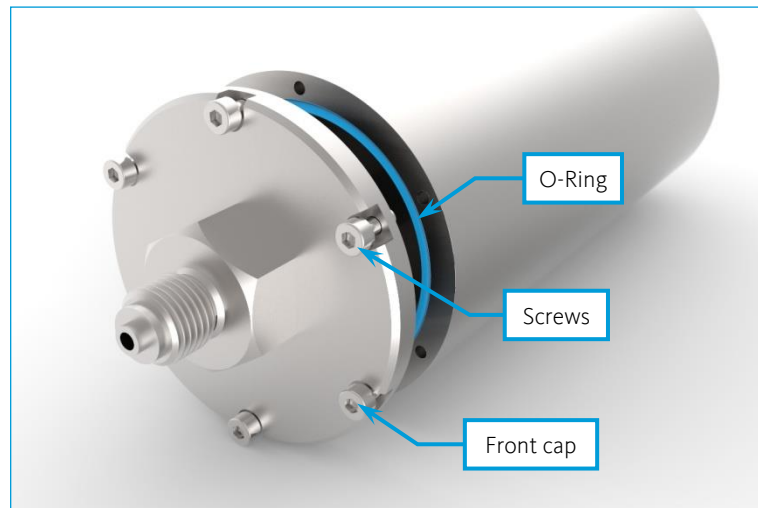
Slide the O-ring (26x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.



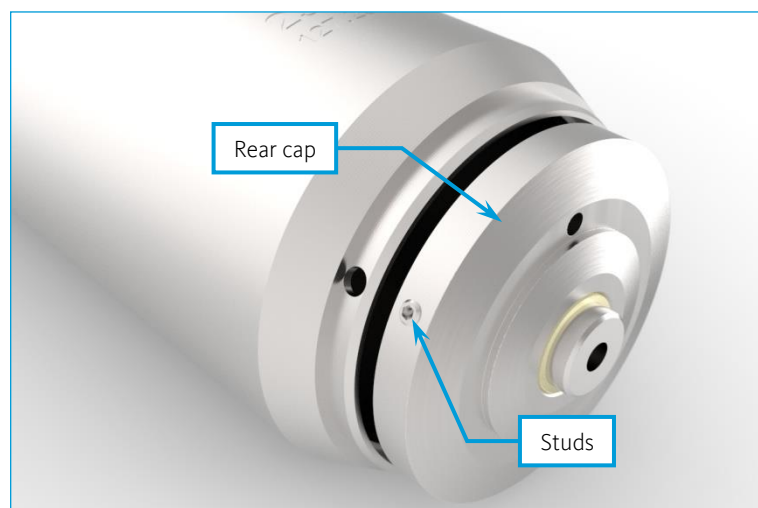
Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. Be particularly careful when mounting the piston, especially in the area of the threaded holes, so as not to damage the seal. The syringe is now ready for use again.

5.5 250 ml syringe NEM-B516-01 A

To remove the front cap of the 250 ml syringe, the six screws need to be unscrewed using a 2.5 mm Allen wrench. Now you can access the O-ring (50x2).



The rear cap is held in place by three studs. They need to be screwed in far enough to be able to remove the cover. Thereafter the piston can be pulled out.



5.5.1 (Dis-)Assembly of the piston seal

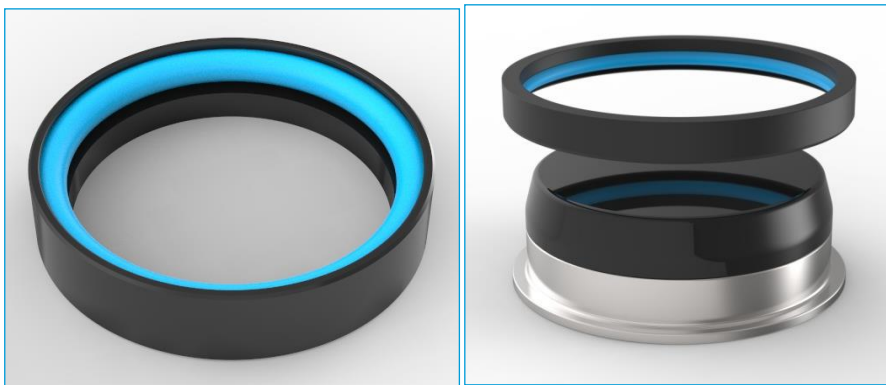
When the rear cap is removed, pull the piston carefully and as straight as possible out of the cylinder. To access the seal, remove the three screws with a 2.5 mm Allen key.



You can now remove the seal and replace it with a new one. To avoid damaging the seal, do not use sharp or pointed objects to remove the seal. You can choose between a sliding ring and an O-ring seal with backup ring:

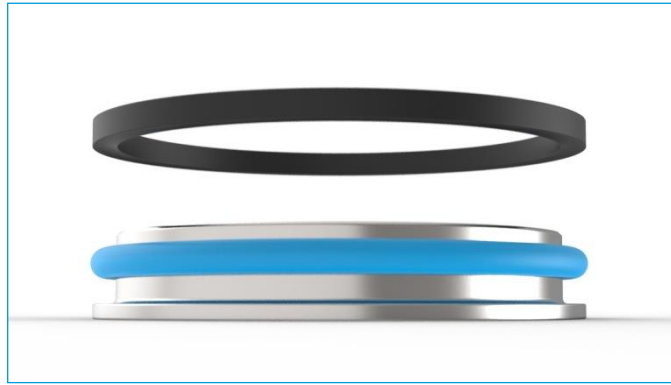
- Assembly of the sliding ring

Insert the O-ring (44x2.5) into the sliding ring. Then use the mounting tool to slide the seal onto the piston tip.



- Assembly of O-ring and backup ring

Slide the O-ring (44x3) and the backup ring onto the piston tip. Make sure that the concave side of the backup ring points towards the O-ring.



Reassemble the piston. Insert the piston as straight as possible and without tilting into the syringe cylinder and fit the rear cap as soon as possible. The syringe is now ready for use again.

6 Disposal

If the syringes are not contaminated with hazardous chemicals, or biologically contaminated, they can be disposed of with municipal waste. Otherwise, they should be disposed of as hazardous waste.