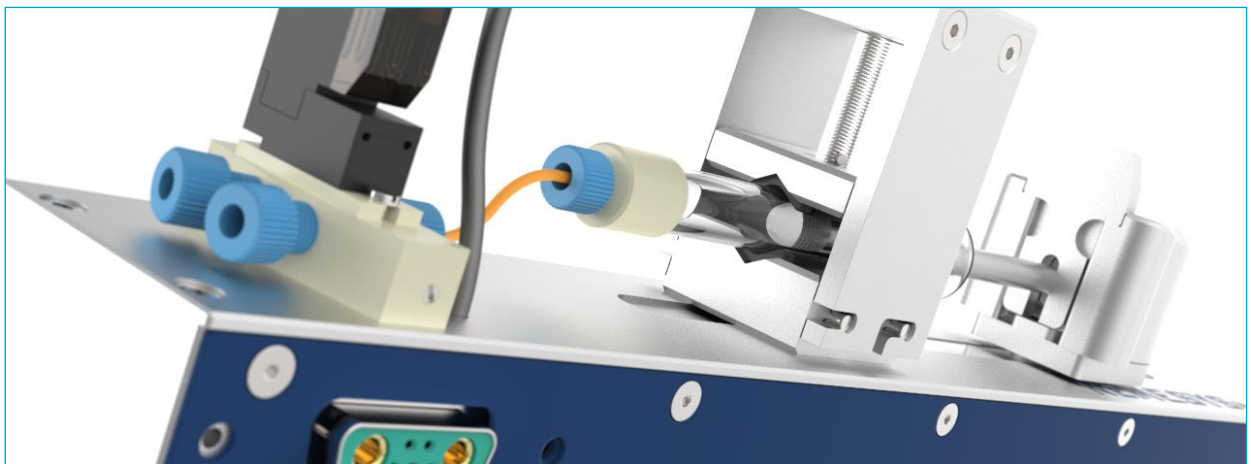
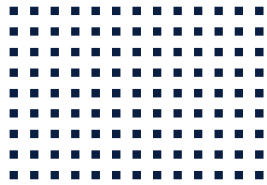


# CETONI

## **CE** NEMESYS LOW PRESSURE Hardware Manual and Reference



ORIGINAL INSTRUCTIONS 1.01–MAY 2020



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# 1 Overviews and Directories

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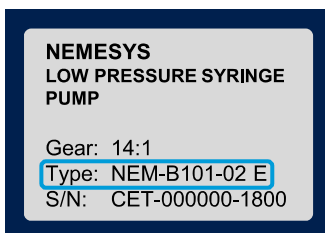
## 1.2 Revision History

REV	DATE	CHANGE	VALID FOR
1.00	16.01.2020	Separation of the neMESYS manual into individual device manuals	NEM-B101-01 D, E NEM-B101-02 C, D, E NEM-B101-03 A
1.01	07.05.2020	New layout of revision history Added section Scope of Delivery	



**IMPORTANT.** In its current revision, this manual applies only to the product types listed in the last line. Should you require a manual from a previous revision, please do not hesitate to contact us. Please let us know your device type and email address and we will send you the appropriate manual as a pdf file.

The type of your product can be found on the label behind "Type:", according to the marked number in the following example:



# 2 Introduction

## 2.1 Foreword

Thank you for choosing a product from CETONI. With this user manual we would like to support you as much as possible in using your neMESYS pump. If you have any questions or suggestions, please do not hesitate to contact us directly.

The neMESYS syringe pump may only be put into operation after having read this manual thoroughly. We wish you every success in working with the device.

## 2.2 Symbols and Key Words Used

The following symbols are used in this manual and are designed to aid your navigation through this document:



**HINT.** Describes practical tips and useful information to facilitate the handling of the software.



**IMPORTANT.** Signifies important hints and other useful information that may not result in potentially dangerous or harmful situations.



**ATTENTION.** Identifies a potentially harmful situation. Failure to avert this situation may result in damage to the product or anything in its proximity.



**CAUTION.** Indicates a potentially dangerous situation. Failure to avert this situation may result in light or minor injuries or property damage.

## 2.3 Norms and Guide Lines



CETONI GmbH declares under its sole responsibility, that the device complies with the health and safety requirements of the relevant European directives.

## 2.4 Application Purpose

### 2.4.1 General Description of the Advice

The neMESYS devices are syringe pumps. They allow emptying and filling syringes by the relative linear movement of a syringe- and a piston holder.

### 2.4.2 Intended Use

The neMESYS syringe pump serves for precise and pulsation-free dosing of fluids in the range of nanolitres per second up to millilitres per second. Pressures of up to several hundred bar can be reached depending on the device.

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 unit must not be used as a medical device or for medical purposes.



## 2.4.4 Safety Advice

The safety of the user and a failure-free operation of the devices are assured only if original parts are used. Only original accessories may be used. Warranty claims will not be accepted for damage due to the use of alien accessories or expendables.

The devices have been developed and constructed in such a way as to largely rule out hazards due to its intended use. Nevertheless, you must observe the following security measures in order to exclude any remaining hazards:

- CETONI GmbH points out the responsibilities of the operator for the operation of the devices. The laws and regulations of the place of installation must be observed while operating the devices! To ensure a safe work routine, operators and users must assume responsibility for adhering to regulations.
- The devices must not be used as a medical device or for medical purposes.
- Before operating the unit, the user must at all times ensure the operational reliability and the adequate and orderly condition of the unit.
- The user must be familiar with the operation of the devices and the software.
- The devices and pipes must be checked for damage before operation. Damaged pipes and plug devices must be replaced immediately.
- Cables must be laid in a way that avoids any risk of stumbling.
- Any moving parts must not be touched whilst the devices are in operation. There is a risk of crushing!
- It is not allowed to use the devices in an explosive atmosphere or with potentially explosive substances.
- 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.

- Wear protective glasses if you are working with corrosive, hot or otherwise dangerous substances during assembly work on the device.
- Transportation, storage or operation of the devices below 0°C with water in the fluid passages may cause damage to the modules.

## 2.4.5 Measures for Safe Operation

### 2.4.5.1 ELECTROMAGNETIC EMISSIONS

The Qmix system is intended for use in any type of facility, connected directly to the public power supply network that supplies buildings used for domestic purposes.

### 2.4.5.2 ELECTROSTATIC DISCHARGE

Floors should be made of wood, concrete, or ceramic tiles. If the flooring is made of a synthetic material; the relative humidity must be at least 30%.

### 2.4.5.3 ELECTRIC DISTURBANCES

The quality of the supply voltage should be to the standard of a typical business or hospital environment.

### 2.4.5.4 MAGNETIC DISTURBANCES

Do not place power connector cables, even of other appliances, in close proximity of the devices and their cables. Mobile communication devices may not be used in closer proximity of the devices or their cables than the recommended safety distance!

## 2.4.6 Safety Devices on the System

The system can be switched off at any time in an emergency using the mains switch on the Base Module (toggle switch on the side of the housing); this will cause no damage to the unit.

## 2.4.7 Condition of the Devices

Irrespective of the faultless manufacture of the devices, damage can occur whilst the unit is in operation. With this in mind, always carry out a visual check of the components mentioned before use. Pay particular attention to crushed cables, damaged tubing, and deformed plugs. If you should notice any damage, please do not use the devices and inform CETONI GmbH without delay. CETONI will put

your devices back to an operational condition at the earliest. Do not attempt to repair the devices yourself.

## 2.5 Warranty and Liability

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

The duration of the warranty is 1 year 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 authorized centre, and if the devices have been used in accordance with the instruction manual.

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

# 3 Scope of Delivery

The following items are supplied with your neMESYS syringe pump:

**NEMESYS LOW PRESSURE SYRINGE PUMP  
INCLUDING:**

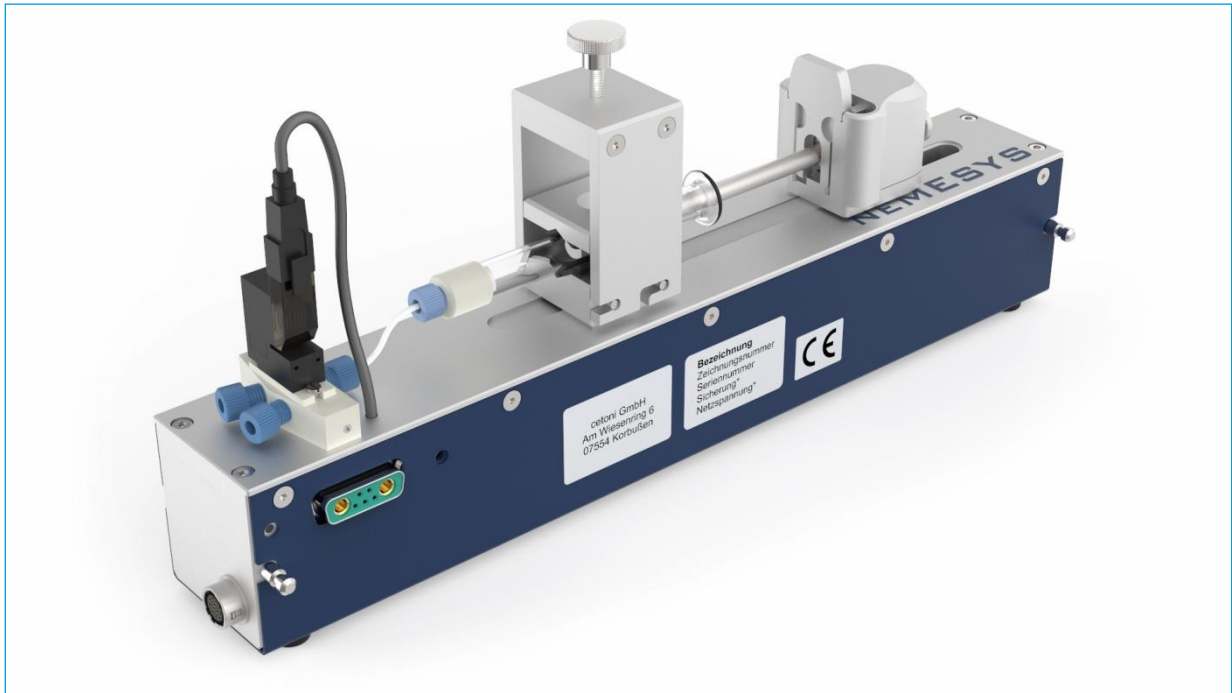
- 3/2-way solenoid valve
- 30 mm syringe holder



Other accessories such as syringes, tubing material, pressure sensors etc. have to be purchased separately.

# 4 Technical Data

## 4.1 Product Image



## 4.2 Environment

<b>OPERATING TEMPERATURE</b>	0°C to 45°C
<b>STORAGE TEMPERATURE</b>	-20°C to 75°C
<b>OPERATION AIR HUMIDITY</b>	20% to 90%, non-condensing
<b>STORAGE AIR HUMIDITY</b>	20% to 90%, non-condensing

## 4.3 Mechanical Data

<b>DIMENSIONS (L X W X H)</b>	310 x 47 x 56 mm
<b>WEIGHT</b>	≈1300 g

## 4.4 Electrical Data

<b>SUPPLY VOLTAGE</b>	24 VDC
<b>CURRENT DRAW</b>	0,3 A
<b>POWER CONSUMPTION</b>	7 W

## 4.5 Interfaces

<b>CAN</b>	1 Mbit/s
<b>RS-232</b>	section 7
<b>ACCESSORY PORT</b>	section 6

## 4.6 Dosing Performance

The following table provides an overview of minimum and maximum dosing speeds of the various gear configurations as well as the resulting flow rates, using the example of a 1 ml syringe with a 60 mm stroke. Dosing precision slowly decreases below the speeds and flow rates referred to as pulsation-free.

Gear		w/o	<b>14:1</b>	29:1
Min. speed [ $\mu\text{m}/\text{min}$ ]		1	<b>0,071</b>	0,034
Min. pulsation-free speed [ $\mu\text{m}/\text{min}$ ]		878,9	<b>62,5</b>	30,141
Max. speed [mm/s]		89	<b>6,33</b>	3,05
1 ml syringe with 60mm stroke	Min. flow [nl/min]	16,667	<b>1,185</b>	0,572
	Min. pulsation-free flow [ $\mu\text{l}/\text{min}$ ]	14,648	<b>1,042</b>	0,502
	Max. flow [ml/min]	89	<b>6,33</b>	3,05

## 4.7 Valve



### 4.7.1 Technical Data

<b>HOUSING MATERIAL</b>	PEEK
<b>SEALING MATERIAL</b>	FFKM (perfluoroelastomer)
<b>MEDIA TEMPERATURE</b>	0 to +50°C
<b>MAX. VISCOSITY</b>	21 mm <sup>2</sup> /s
<b>INTERNAL VOLUME</b>	approx. 45 µl
<b>MAX. PRESSURE</b>	3 bar
<b>NOMINAL SIZE</b>	0,6 mm
<b>FLUIDIC CONNECTIONS</b>	¼" – 28 UNF

# 5 Hardware Operation

Connect the syringe pump to your base module / system as described in the CETONI System manual.

If the module has not been configured, you will be required to perform a reference move during the configuration process. During the reference move the piston holder will move to its front position and be synchronized with the software display. To avoid damage the reference move may only be performed without a syringe.

After deactivating the base module the piston holder can be moved by applying some force (e.g. through residual pressure in the system). Therefore, it is sensible to repeat the reference run from time to time.



**ATTENTION.** The reference move must be performed without syringe. Otherwise the device or the syringe may be damaged.



**CAUTION.** Do not touch any moving parts on the device during operation! There is a danger of crushing.

## 5.1 Mounting a Syringe

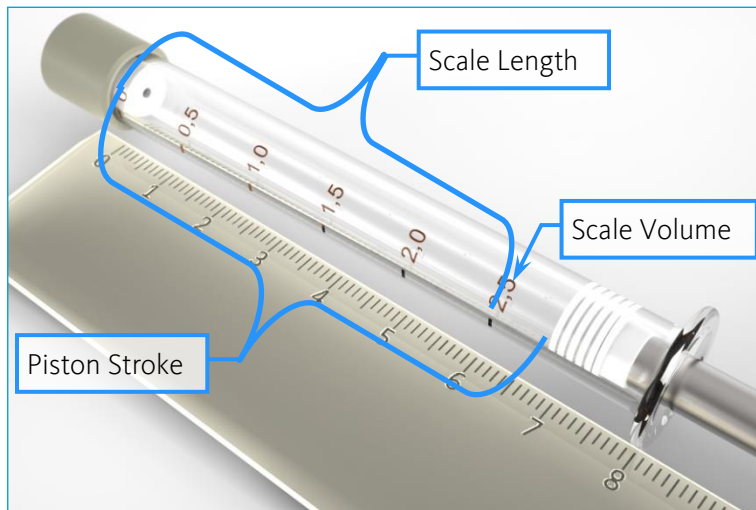
The syringe holder of Low Pressure Syringe Pump allows the use of syringes with outside diameters ranging from 6 to 30 mm and a piston stroke of up to 65 mm.



**IMPORTANT.** Please use high-quality glass syringes with outside diameters ranging from 6 to 30 mm to ensure precise flow rates.

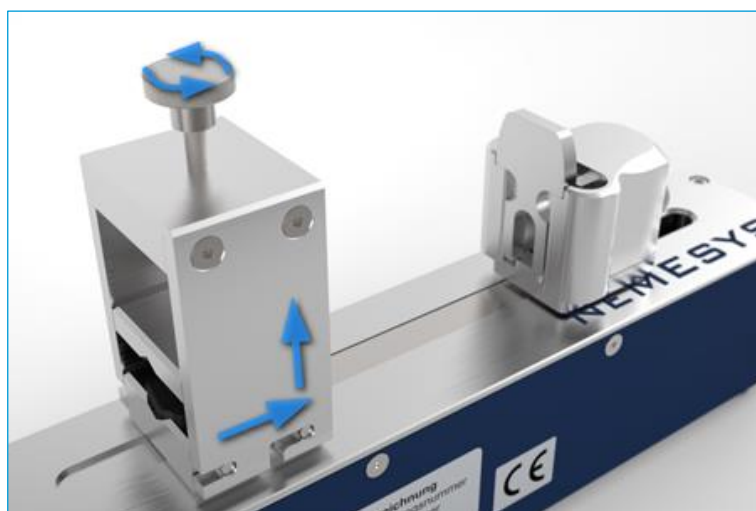
Before mounting a syringe to the Low Pressure Syringe Pump, it must be configured and selected in the operating software. The respective process is described in the software manual. You need the volume (scale volume), the nominal stroke (scale length) and the total stroke (piston stroke), which may be different.





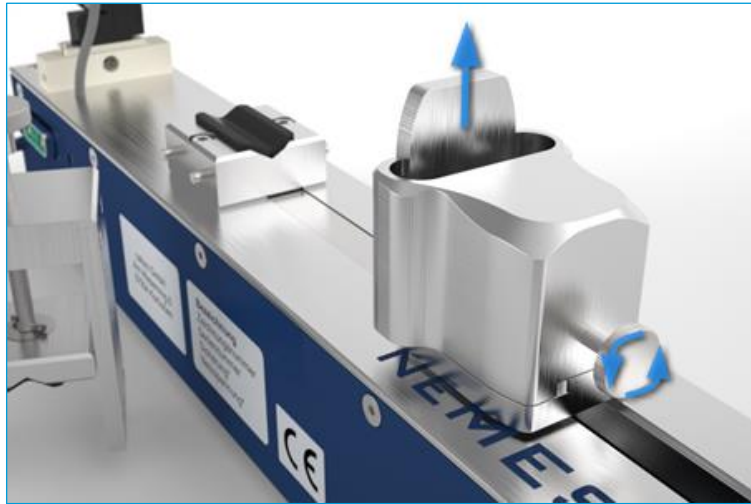
Use the following process to mount a syringe to the Low Pressure Syringe Pump:

Loosen the knurled screw of the syringe receptacle. Now you can push the bracket off the pins and lift it up.



Disassembly syringe holder

Loosen the knurled screw of the piston holder and remove the adapter plate. Lift up the clamping piece.



Disassembly piston holder

In order to make use of the entire syringe volume, move the piston holder to the front position through the software. Place an empty syringe on the remaining base of the syringe holder in such way that the piston touches the piston holder.

The syringe position can be varied somewhat by moving the piston holder. For this purpose loosen the screw with a 4 mm Allen wrench.



**ATTENTION.** To avoid damage, please make sure that the remaining syringe stroke is always the same as or larger than that of the module.



Replace the bracket of the syringe holder, insert into the pins and lock the syringe by using the large knurled screw.



Replace the clamping piece and insert the adapter plate suitable for the piston diameter in such way that the “piston plate” is located between piston holder and adapter plate.

The piston is locked in place by slightly tightening the knurled screw on the back. Make sure that syringe and syringe piston are in alignment.

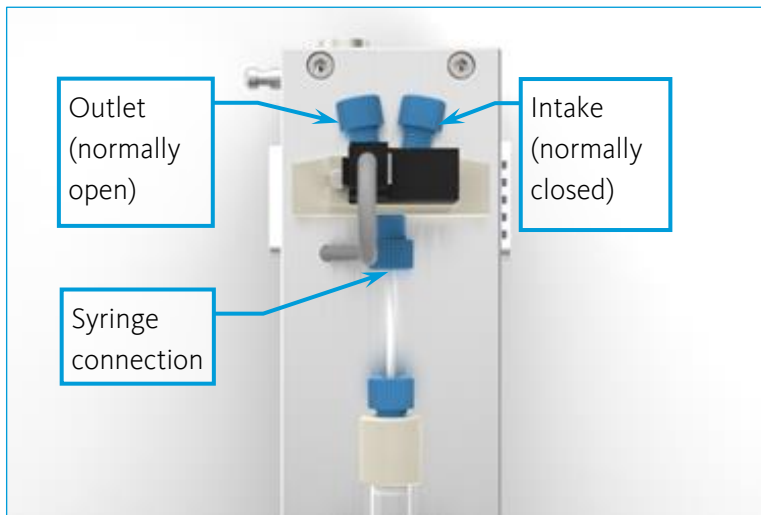


**IMPORTANT.** The syringes, particularly the seals, are wear parts. Check them on a regular basis and replace them, if necessary.

## 5.2 Fluidics / Valve

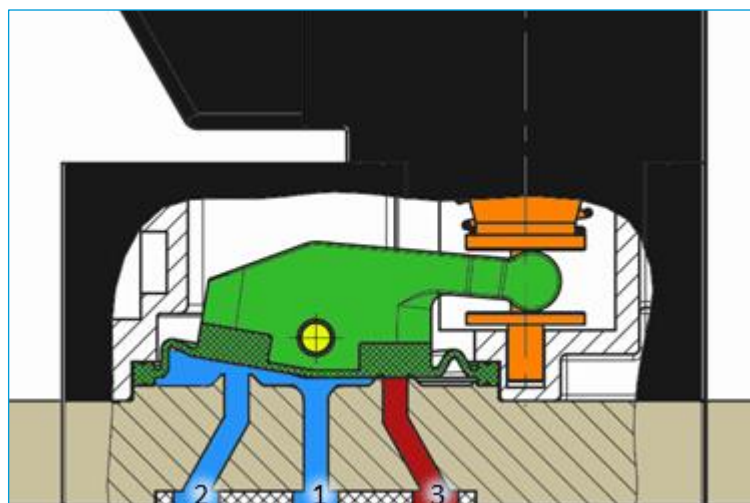
The Low Pressure Syringe Pump can be fitted with an optional valve. The valve allows you to switch the syringe connection between your application (outlet) and a reservoir (intake), allowing an automatic refilling of the syringe. Through the software, you can set the valve in such way that it automatically switches to the intake during filling.

The three connections are fitted with a ¼“-28 UNF thread and therefore allow the use of common HPLC fittings.



A rocker inside the valve (green) connects the syringe port (1) alternatively with the outlet (2) or the intake (3). In the following image the syringe is connected with the outlet (blue), while the intake is closed (red).

A FFKM membrane connected to the rocker (shaded in green) seals the fluidic system. This membrane limits the operating pressure of the valve to 3 bar.



**ATTENTION.** To avoid damaging the valve, please observe the maximum operating pressure of 3 bar.



**ATTENTION.** Before using the valve, please check the chemical resistance of the PEEK housing material and the FFKM sealing material (perfluoroelastomer) against the dosing liquid.

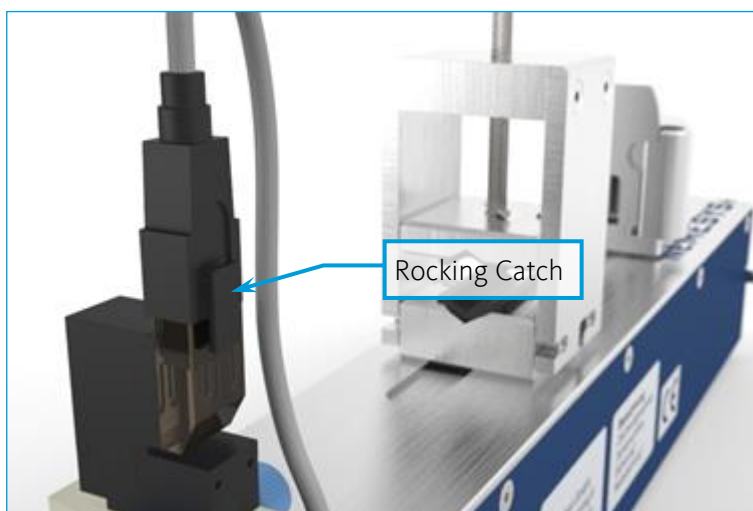
## 5.2.1 Valve Installation and Removal

The valve can be removed from the device in a few simple steps. This simplifies the fitting of tubes as well as cleaning. It also allows operation without a valve, in cases where it is not needed.

To remove the valve press the rocking catch at the plug and remove the plug. When replacing it later please observe the orientation of the plug (the white surface must face the valve, the rocking catch must face away from the valve).



**ATTENTION.** Observe the orientation of the valve plug (the white surface must face the valve, the rocking catch must face away from the valve).



In the next step you can simply pull up the valve to remove it.



# 6 Accessory Port

The neMESYS syringe pump is equipped with an accessory port or can be equipped with it as an optional extra. The additional port allows the use of a pressure sensor, for example.

The pin assignment of the connector at the module and the wire colors of the connecting cable, which can be purchased from CETONI, can be found in the table on the next page. Of course, you can also purchase ready-made periphery devices from CETONI GmbH.

A matching connector plug is also available from Hirose (order number HR10A-10P-12P(73)).

The configuration of pressure sensors is described in the software manual. Read and observe the relevant section before connecting a pressure sensor.



PIN	SIGNAL	DESCRIPTION		
1	Analog input AI1	0-5 V (to Pin 12)		
2	Analog input AI2	0-5 V (to Pin 12)		
3	Digital input 1	<0,8 V $\triangleq$ Low	>2 V $\triangleq$ High	24 V max.
4	Digital input 2	<0,8 V $\triangleq$ Low	>2 V $\triangleq$ High	24 V max.
5	Digital input 3	<1,7 V $\triangleq$ Low	>4,2 V $\triangleq$ High	24 V max.
6	Digital output 1 Valve voltage	NPN Max. 1 A	Active: 0 V (GND)	Inactive: open
7	Digital output 2 Switch valve	NPN Max. 1 A Active: 0 V (GND) Inactive: open		
8	Digital output 3	NPN Max. 1 A Active: 0 V (GND) Inactive: open		
9	Digital ground			
10	+24 V Out	+24 VDC / < 1 A		
11	+5 V Out	+5 VDC / < 150 mA		
12	Analog ground			

# 7 RS232 Connection

## 7.1 Pin Assignment of Module Interfaces



PIN		
1	Not connected	RS232 RX
2	Not connected	RS232 TX
3	CAN High	CAN High
4	CAN Low	CAN Low
5	Signal GND	Signal GND
A1	+24 V	+24 V
A2	GND	GND

## 7.2 OEM RS232 Cable Set

### 7.2.1 RS232 Wiring

Insert the mixed D-Sub plug of the cable into the socket of the final module. The system should be deactivated when you do this. Tighten both screws on the plug manually. You do not need a bus termination plug, since the plug of the RS232 cable already contains a bus termination resistor.

Now, plug the 9-pin D-Sub socket of the cable into an RS232 connection on your PC or other controller. For greater distances to the socket please use a 1:1 cable with a 9-pin D-Sub plug.



Now, you can reactivate your system and send or receive data through RS232. Since every module contains a gateway from RS232 to the system’s internal CAN bus, you can now address each module of your system with only one RS232 cable.

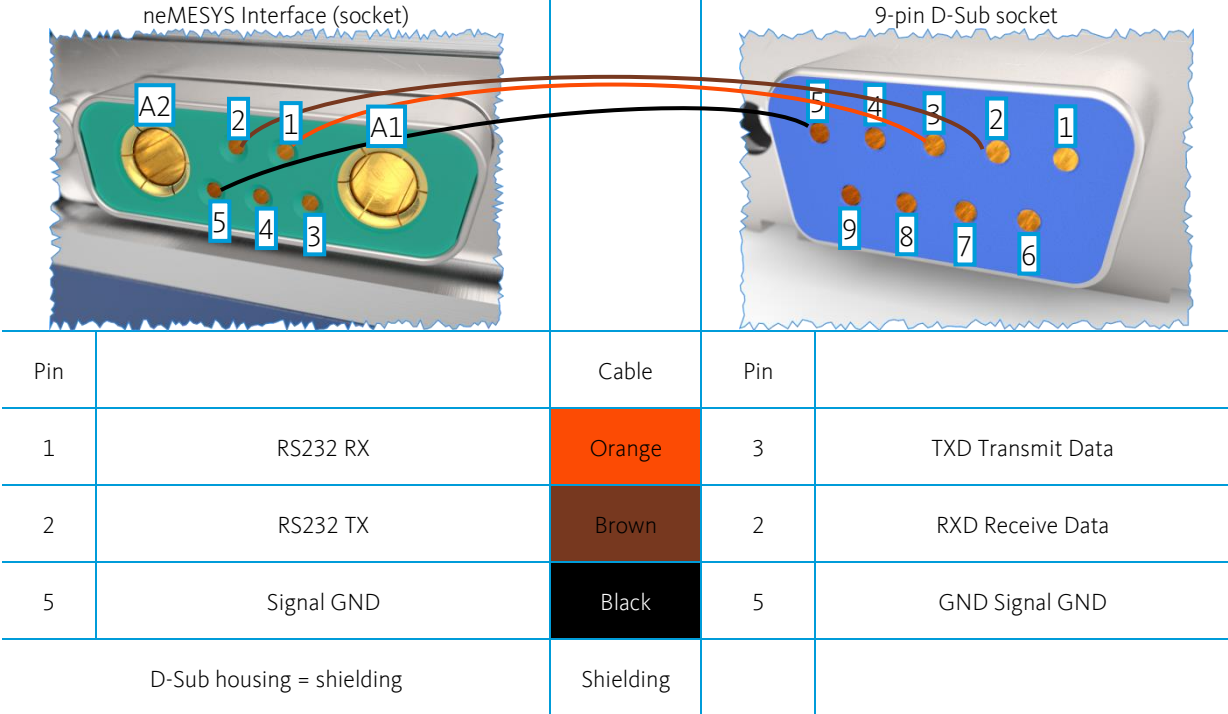
## 7.2.2 Communication Settings

For a functioning communication with the neMESYS modules you have to make the following communication settings for the serial interface on your PC or other controller:

- Baud rate: 115200
- Data bit rate: 8
- Parity: none
- Stop bits: 1
- Flow control: none

## 7.2.3 Pin Assignment of the RS232 Cable

The OEM RS232 cable adapts the neMESYS device interface to a standard 9-pin D-Sub plug. The following table shows the pin assignment of the neMESYS interface and the 9-pin D-Sub:



# 8 Transport and Storage

Please do not lift or transport the modules while they are plugged into each other. Transport in assembled state is only permissible when using the original packaging.

Use the original packaging for shipping the modules. For storage, observe the information in the technical data section (chapter 4.2 Environment).



**ATTENTION.** Danger of damaging the device! Never transport modules while they are plugged into each other.

# 9 Maintenance and Care

When used properly, the device is maintenance-free. In case of problems that you cannot fix yourself or that require opening the device, please contact CETONI GmbH to coordinate any further actions. The device may be opened only by CETONI GmbH or authorized service personnel. Failure to adhere to this rule will void the warranty.

The software manual includes detailed information about malfunctions with respect to the operating software.

Wipe the device with a moist (not wet) cloth in such way that no liquids get into the inside. In case of heavy soiling you may use some detergent or alcohol.

# 10 Disposal

Please send your old devices back to CETONI GmbH. We will take care of proper disposal according to electric devices regulations.

If necessary, please decontaminate the device before sending it back and attach a completed decontamination declaration with your shipment.