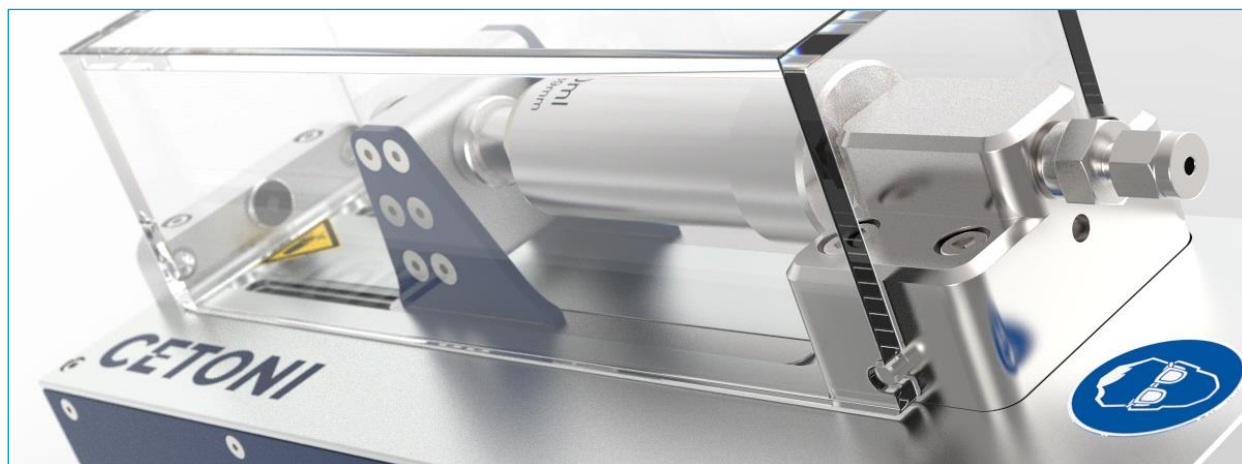


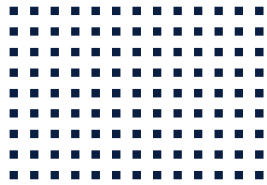


CETONI

CE Nemesys High Pressure Hardware Manual



ORIGINAL INSTRUCTIONS 1.02–FEBRUARY 2021



CETONI GmbH
Wiesenring 6
07554 Korbussen
Germany

T +49 (0) 36602 338-0

F +49 (0) 36602 338-11

E info@cetoni.de

www.cetoni.de

The information and data contained in this document are subject to change without notice. CETONI GmbH is constantly striving to develop all its products. This means that there may be changes in form, equipment and technology. Claims can therefore not be made on the basis of information, illustration or descriptions in these instructions. The description for the product specification in this manual does not constitute an integral part of the contract.

If you control the products with a software from CETONI GmbH, you agree to the applicable license agreement, which can be read in the corresponding software manual. This and all other current product manuals can be found at <https://www.cetoni.com/service/manuals>.

CETONI GmbH grants its customers the right to reproduce this manual for the purpose of providing technical information to potential users of CETONI products. Extracts of these documents may only be reproduced or transmitted with a precise reference to the authorship of CETONI GmbH, irrespective of the manner in which they are reproduced or transmitted, either electronically or mechanically. Any duplication or use of excerpts for other purposes requires the written permission of CETONI GmbH.

We are always open to comments, corrections and requests. Please send them to info@cetoni.de.

The general terms and conditions of CETONI GmbH shall apply. Alternative agreements must be in written form.

Copyright © CETONI GmbH – Automation and Microsystems. All rights reserved.

1 Overviews and Directories

1.1 Table of Contents

1	Overviews and Directories	4
1.1	Table of Contents	4
1.2	Revision History	6
2	Introduction	7
2.1	Foreword	7
2.2	Symbols and Key Words Used	7
2.3	Norms and Guide Lines	8
2.4	Application Purpose	8
2.4.1	General Description of the Advice	8
2.4.2	Intended Use	8
2.4.3	Reasonably Foreseeable Faulty Application	8
2.4.4	Safety Advice	9
2.4.5	Measures for Safe Operation	10
2.4.6	Safety Devices on the System	10
2.4.7	Condition of the Devices	10
2.5	Warranty and Liability	11
3	Scope of Delivery	12
4	Technical Data	13
4.1	Product Image	13
4.2	Environment	13
4.3	Wetted Parts	13
4.4	Mechanical Data	14
4.5	Electrical Data	14
4.6	Interfaces	14

4.7	Dosing Performance	15
5	Hardware Operation	16
5.1	Mounting the Safety Hood	16
5.2	Fluidic Connections	17
5.2.1	First-Time Installation	17
5.2.2	Dismantling	17
5.2.3	Reassembly	18
5.2.4	Replacing the Conduit Fitting	18
5.3	Mounting a Syringe	19
5.4	Pressure Sensor	21
6	Accessory Port	22
7	RS232 Connection	24
7.1	Pin Assignment of Module Interfaces	24
7.2	OEM RS232 Cable Set	24
7.2.1	RS232 Wiring	24
7.2.2	Communication Settings	25
7.2.3	Pin Assignment of the RS232 Cable	25
8	Transport and Storage	26
9	Maintenance and Care	27
10	Disposal	28

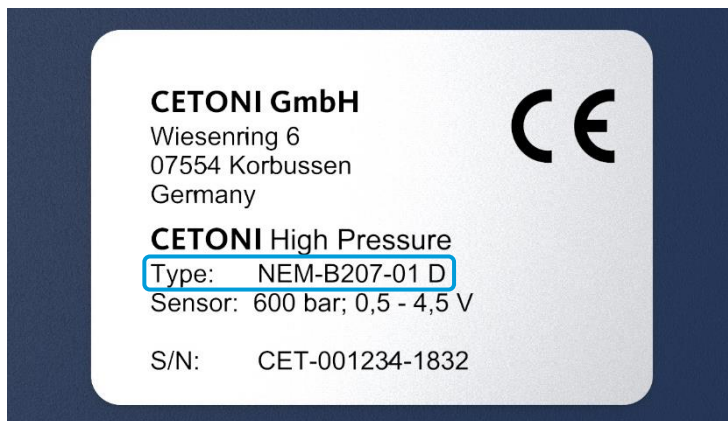
1.2 Revision History

REV	DATE	CHANGE	VALID FOR
1.00	16.01.2020	Separation of the Nemesys manual into individual device manuals	NEM-B207-01 D
1.01	07.05.2020	New layout of revision history Added section Scope of Delivery	
1.02	26.02.2021	Images updated	



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 HIGH PRESSURE SYRINGE PUMP

INCLUDING:

- safety hood
- tube fitting



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

4 Technical Data

4.1 Product Image



4.2 Environment

OPERATING TEMPERATURE	0°C to 45°C
STORAGE TEMPERATURE	-20°C to 75°C
OPERATING AIR HUMIDITY	20% to 90%, non-condensing
STORAGE AIR HUMIDITY	20% to 90%, non-condensing

4.3 Wetted Parts

SYRINGE HOLDER AND FITTING	Stainless steel 1.4404 (316L)
PRESSURE SENSOR	Aluminium oxide (Al ₂ O ₃)
PRESSURE SENSOR SEAL	Perfluoroelastomer FFKM

4.4 Mechanical Data

DIMENSIONS (L X W X H)	310 x 110 x 136 mm
WEIGHT	≈4500 g

4.5 Electrical Data

SUPPLY VOLTAGE	24 VDC
CURRENT DRAIN	1,9 A
POWER CONSUMPTION	45 W

4.6 Interfaces

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

4.7 Dosing Performance

The following table provides an overview of minimum and maximum dosing speeds. The resulting flow rates shown here are based on CETONI stainless steel syringes. Dosing precision slowly decreases below the speeds and flow rates referred to as pulsation-free.

The table also indicates the maximum pressure that can be achieved with the High Pressure Syringe Pump in combination with the respective syringe.

You need the nominal stroke and the maximum stroke for the software configuration of syringes. Please read the relevant sections in the software and syringe manual.

SPEED			MIN [$\mu\text{m}/\text{min}$]	MIN PULSATION-FREE [$\mu\text{m}/\text{min}$]	MAX [mm/s]
			0,087	38,147	7,00
SYRINGE	NOMINAL / MAX STROKE [mm]	MAX. PRESSURE	FLOW RATES		
			MIN [nl/min]	MIN PULSATION-FREE [$\mu\text{l}/\text{min}$]	MAX [ml/s]
3 ml	59,64 61	517 bar 7497 psi	4,3	1,919	0,35
5 ml	58,81 61	306 bar 4435 psi	7,4	3,243	0,60
10 ml	58,89 61	153 bar 2221 psi	14,7	6,478	1,19
25 ml	50,86 60	53 bar 767 psi	42,7	18,751	3,44
50 ml	51,91 60	27 bar 392 psi	83,6	36,743	6,74
100 ml	50,89 60	13 bar 192 psi	170,6	74,960	13,76

5 Hardware Operation

Connect the syringe pump to your base module / system as described in the CETONI System manual. The High Pressure Syringe Pump only works with an installed safety hood and may only be operated with it in place. Please refer to section 5.1 for more information about using the safety hood.

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.

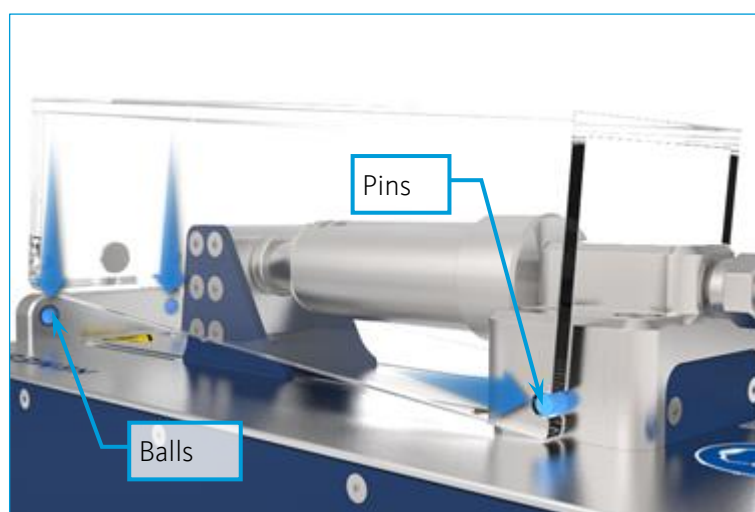
After deactivating the base module the piston holder can be moved by applying some force (e.g. through residual pressure in the system). Therefore, it is sensible to repeat the reference run from time to time.



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

5.1 Mounting the Safety Hood

Place the safety hood on the device in such way that the pins slide into the gaps provided for them (blue in image). Push down on the opposite end of the hood until the spring-loaded balls (also shown in blue) settle into the holes provided for them in the hood. To remove the hood, simply reverse this process.





CAUTION. Only use the High Pressure Syringe Pump with the mounted safety hood!
Do not touch any moving parts on the device during operation!



IMPORTANT. If you remove the safety hood during operation, the High Pressure Syringe Pump will stop automatically.

5.2 Fluidic Connections

A Swagelok® tube fitting is used for fluidic connection. It is suitable for using capillaries made from metal (e.g. stainless steel, titanium) and plastic (e.g. PTFE, PEEK). Please refer to information provided by the respective manufacturer with respect to maximum pressure.

Following is a description of using the tube fittings:

5.2.1 First-Time Installation

- (1)** Fully insert the tube / hose into the fitting and against the shoulder; rotate the nut finger-tight.
- (2)** Mark the nut at the 6 o'clock position.
- (3)** Tighten the nut three-quarters turn to the 3 o'clock position with an open-end wrench.

5.2.2 Dismantling



ATTENTION. Release pressure from the system before loosening the fittings.

- (1)** Before dismantling, draw a marker line across the nut and the fitting body. In this way you create a reference for retightening the cap nut to exactly the same position it was in before.
- (2)** Pull out the capillaries. The nut and the ferrules remain on the capillary.

5.2.3 Reassembly

- (3) To reassemble, insert the capillary with preassembled ferrules into the fitting body until the front ferrule seats against the fitting body.
- (4) Rotate the nut with open-end wrench to the previously pulled-up position as indicated by the marks you made before; at this point you will feel a significant increase in resistance.
- (5) Retighten the nut slightly. Done!

You can purchase additional connecting material from Swagelok®, such as replacement clamping rings (ordering number SS-100-SET).



IMPORTANT. Only use capillaries specified for the anticipated pressure levels. The supplied 1/16" PEEK tubes are suitable for pressures up to 200 bar.



ATTENTION. After connecting, check the tightness of all fluidic connections on a regular basis.

5.2.4 Replacing the Conduit Fitting

The tube fitting is screwed into the syringe holder and can be loosened or tightened with a 9/16" open end wrench. For this purpose, place the wrench onto the large hexagon nut (not the small one of the cap nut)!

There is a metal bushing behind the conduit fitting for sealing purposes. This bushing can remain in the borehole while the conduit fitting is replaced.

Firmly tighten the newly mounted conduit fitting to achieve a sealed connection.

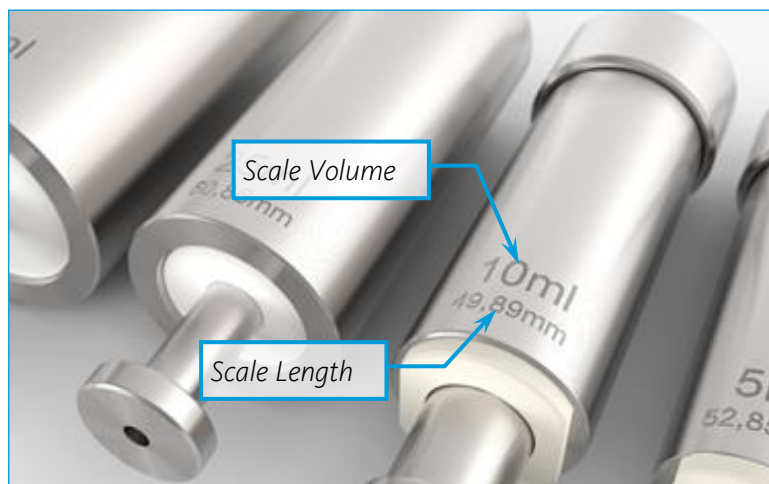


5.3 Mounting a Syringe

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

The *scale volume* and *scale length* values are engraved on CETONI stainless steel syringes. Unless otherwise stated, the *piston stroke* is 60 mm. These values can also be found in the table in section 4.7.

Additional information can be found in the syringe manual.

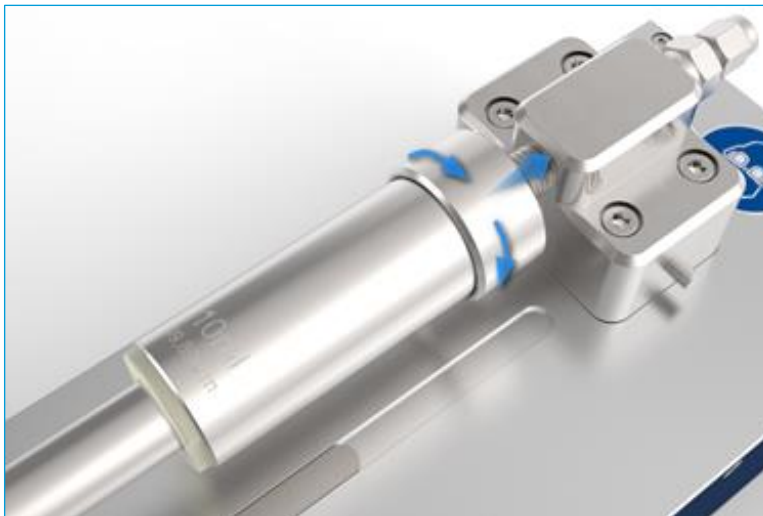


Follow these steps to mount a syringe on the High Pressure Syringe Pump:

To be able to screw the syringe into the mounting bore while establishing a sealed connection, please insert one of the provided O-rings (3 mm inside diameter and 1.5 mm cord thickness) into the indentation at the syringe outlet (blue in image).



Position the piston holder in such way as to make sufficient space to screw in the syringe. Remove the safety hood as described in section 5.1. Screw the syringe into the syringe holder as far as it will go.



Put the safety hood back on the device and advance the piston holder until it touches the piston. Take off the safety hood and attach the piston to the piston holder using the knurled screw.



After putting the safety hood back on, you are ready for dosing.



ATTENTION. Before operation, check the resistance of the syringe seal against the dosing medium. If necessary, replace the seal with a seal made from a different material.



IMPORTANT. Syringes, and particularly seals, are wear parts. Check them on a regular basis and replace them if necessary.

5.4 Pressure Sensor

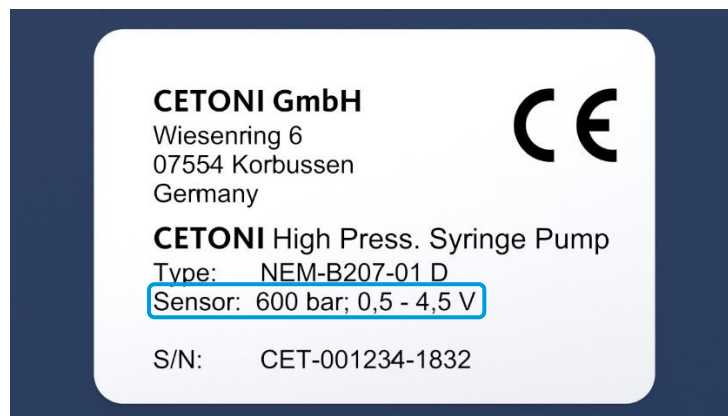
There is an integrated pressure sensor in the syringe holder of the High Pressure Syringe Pump. This allows the device to stop automatically upon reaching the preset maximum pressure.



ATTENTION. Before using the device, check the chemical resistance of wetted materials against the fluid to be metered.

The pressure sensor must be configured in the software before use. The associated process is described in the software manual.

For the configuration you will need the pressure range of the sensor (e.g. 0 – 600 bar) and the range of the output signal (e.g. 0.5 – 4.5 V). These values can be found on the nameplate on the side of the device under sensor:



ATTENTION. Configure the pressure sensor before use, to avoid damaging the device or your application.

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.



IMPORTANT. Pin 1 is not assigned at the accessory port of the High Pressure Syringe Pump, because analogue input AI1 is already used for the built-in pressure sensor.



PIN	SIGNAL	DESCRIPTION		
1	n.a.	used for internal pressure sensor		
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.

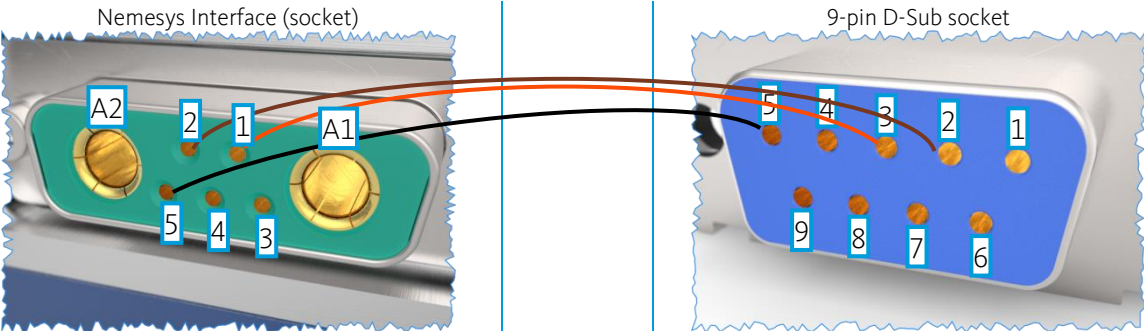
7.2.2 Communication Settings

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:



Pin		Cable	Pin	
1	RS232 RX	Orange	3	TXD Transmit Data
2	RS232 TX	Brown	2	RXD Receive Data
5	Signal GND	Black	5	GND Signal GND
D-Sub housing = shielding		Shielding		

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 Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.).



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.