Science Together

KNAUER

AZURA

# Autosampler AS 6.1L

## Service instructions


Document no. VSM-010

HPLC

**Note:** For your own safety, read the instructions and observe the warnings and safety information on the device and in the instructions. Keep the instructions for future reference.


**Customer Support:**

Telefon: +49 30 809727-111 (9-17h, Central European Time)
Fax: +49 30 8015010
E-Mail: support@knauer.net
Languages: German, English

**Publisher:**

KNAUER Wissenschaftliche Geräte GmbH
Hegauer Weg 38
14163 Berlin
Telefon: +49 30 809727-0
Fax: +49 30 8015010
Internet: www.knauer.net
E-Mail: info@knauer.net



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For the latest version of the service instruction, visit the partner area on our website (login required):
www.knauer.net/Service-instructions

# Table of Contents

# 1. About this manual

This manual is written for service technicians who use the AZURA® Autosampler AS 6.1L for execution of analytical runs.

This manual offers the following information:

- Chapter 2 describes the saftey instructions
- Chapter 3 describes an introduction
- Chapter 4 describes identification of parts
- Chapter 5 describes the ASM control software
- Chapter 6 describes maintenance instructions
- Chapter 7 describes trouble shooting
- Chapter 8 describes repair and assembly
- Chapter 9 describes adjustments
- Chapter 10 describes performance inspection
- Chapter 11 contains exploded views and PCB layouts

- Appendix A provides information on Control I/O
- Appendix B lists error codes
- Appendix C lists accessories and spare parts
- Appendix D Maintenance logbook
- Appendix E describes procedures for storage, packaging and end-of-life

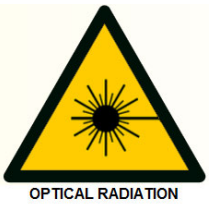
An index has been provided for easy reference.

Read the safety instructions and the rest of this guide before you start using the AS 6.1L.

## 1.1 Pictorials used in this manual

The following pictorials may be used in this manual:

| | |
|---|---|
|  | This sign warns about the risk of electrical shock. It calls attention to a procedure or practice which, if not adhered to, could result in electrocution.<br><br>Do not proceed beyond this danger sign until the indicated conditions are fully understood and met. |
|  | The warning sign denotes a hazard. It calls attention to a procedure or practice which, if not adhered to, could result in severe injury, loss of life or damage or destruction of parts or all of the equipment.<br>Do not proceed beyond a warning sign until the indicated conditions are fully understood and met. |
|  | The caution sign denotes a hazard. It calls attention to a procedure or practice which, if not adhered to, could result in damage or destruction of parts or all of the equipment.<br>Do not proceed beyond a cautions sign until the indicated conditions are fully understood and met. |
|  | The fire hazard sign draws attention to the fact that use of flammable solvents or samples may cause a significant safety risk. |
|  | The toxic hazard sign draws attention to the fact that use of toxic solvents or samples may carry a significant health risk. |
|  | The biohazard sign draws attention to the fact that use of biological materials, viral samples and needles may carry a significant health risk. |
|  | The hot surface sign calls attention to parts in the instrument that must not be touched, as they may cause burns. |

| | |
|---|---|
|  | The optical radiation sign warns about possible eye injury due to hazardous optical radiation. |
|  | The attention sign signals relevant information. Read this information, as it might be helpful. |
|  | The note sign signals additional information, providing advice or a suggestion that may support you in using the equipment. |
|  | This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment. |
|  | The 84+3 sign indicates information that concerns the 84+3 sample tray only. |

# 2. Safety instructions

Adhere to the following standard quality control procedures and the following equipment guidelines when using the autosampler:


**General safety**

The autosampler is intended to be used in an (U) HPLC system.

The system is intended to be used in a regulated laboratory environment with trained operators following good laboratory practices.

Use this system ONLY for its intended use. Use of the system for any other purpose may cause unsafe situations.

Do not use the system if there is any visible damage.

The system working environment should meet te specifications indicated in this manual.


**Operational safety**

The autosampler houses a sharp needle that is used to pierce caps/septa. This needle may cause cutting injuries if operating instructions are not followed.

Make sure that covers and doors are closed before starting the autosampler.

Make sure that the power has been switched off while replacing needles or while servicing any parts in the direct proximity of the pierce needle.

Handle needles with care during replacement.


**System operation and maintenance**

To keep up the specified performance of the system, maintenance must be carried out as indicated in this manual

Service contracts and preventive maintenance services are available. Please contact your local dealer or the nearest sales office for more information.


**Solvent handling**

When handling solvents always observe good laboratory practices. Know the properties of the solvents used. This information can be found in Material Safety Data Sheets (MSDS) supplied by the vendor.

Avoid the use of the following solvents when using a steel containing flow path:

- Solvents containing strong complexing agents like EDTA.
- Strongly acidic mobile phases (pH <1).
- Halogenated solvents or additives that form radicals and/or acids.
- Solvents able to form peroxides like chromatographic grade ether and non-stabilized THF, dioxane and diisopropyl ether. In case use of these solvents is unavoidable, they need to be filtered through dried aluminium oxide in order to remove the peroxides.


**Electrical safety**

The system must be connected to a suitable mains power supply with a correctly installed protective earth conductor. Never use the system without a properly connected protective earth conductor.

Read the installation instructions before connecting the system to the mains power supply.

Removal of panels may expose users to lethal voltages. For that reason this should only be done by qualified service engineers.

Disconnect the system from the mains power supply by removing the mains power cord before removing protective panels.

Replace blown fuses only with types as indicated in the specification.

Replace or repair damaged mains power cords immediately.


**Solvents**

The solvents used may be flammable and toxic. The room in which the system is installed should be well ventilated to prevent that solvent vapors cause a fire. Use of open fire in the vicinity of this system must be strictly prohibited. Do not install the system in the same room with any other equipment that emits or could potentially emit sparks.

Sample containers (vials) should be sealed to minimize any risks related to solvent vapor.

Do not allow solvents to accumulate in the system. Perform periodic leak checks on supply lines.


### Toxic hazard

When you use or analyze toxic fluids you need to take all possible precautions and treat all specimens as potentially toxic.

Always wear protective goggles and gloves when handling toxic samples.


### Biological hazard

When you analyze biological fluids you need to take all possible precautions and treat all specimens as potentially infectious.

Always wear protective goggles and gloves when handling toxic or biologically infectious samples.


### Waste disposal

Dispose of waste (samples, solvents, device) in accordance with a regulated waste disposal program.

Follow a regulated, approved waste disposal program and never dispose of solvents through the municipal sewage system.

### Applications: quality control

It is recommended that you routinely run several quality control samples.

Quality control samples should represent low, average and high levels of a compound. Make sure that quality control sample results are within an acceptable range, and evaluate precision from day to day and run to run.

Data collected when quality control samples are out of range may not be valid. Do not report this data until you are certain that system performance is acceptable.

Apart from use of quality control samples, we recommend that you use blanks. The blanks will help you assess whether carry-over is within an acceptable range and monitor the integrity of your data.

It is also recommended that you use a proper internal standard.

If the system runs into an error state the results for the processed sample should not be trusted.

# 3. Introduction

The AZURA® Autosampler AS 6.1L (or short "AS 6.1L") is a high throughput autosampler of robust design, developed to meet the challenge of the modern analytical laboratory. It is a very complete autosampler that needs little bench space. The AS 6.1L is designed for indoor use.

The AS 6.1 L features among other things:

- PASA™ injection concept.
- High-resolution syringe control; this ensures very high precision for injection and reagent addition.
- Internal standard addition, sample dilution or derivatization can simply be programmed.
- Special attention has been paid to service-friendly design.
- To enhance safety, speed of operation of the AS 6.1L will decrease when the door is opened.
- When the door to the sampling compartment is opened, the tray automatically moves to the front position to allow for direct access to the samples; when the door is closed again, the tray automatically moves to home (processing) position.
- Correct piercing location of the sample needle is checked after every series or run; in case of '1-line-1-sample' this means that the piercing location is checked after every sample.
- Optional sample cooling and heating ensures consistent results.

## 3.1 Instrument description

The AS 6.1L is a complete autosampler that requires very little bench space.

Standard high or low well plates or vial trays can be used. The sampling compartment of the AS 6.1L can house two different well plates.

Any combination of well plates is allowed, except for 384 Low on the left and 96 High on the right. In addition, the custom-made 84+3 vial tray can be used.

All replaceable parts are easily accessible. Refer „Appendix C. List of accessories and spares" for more information.

# 4. Identification of parts

## 4.1 AS 6.1L - front view

**Legend**

1. Syringe
2. Needle arm
3. Injection valve
4. Valve leak bin
5. Sample compartment
6. Needle wash position
7. Wash liquid bottle

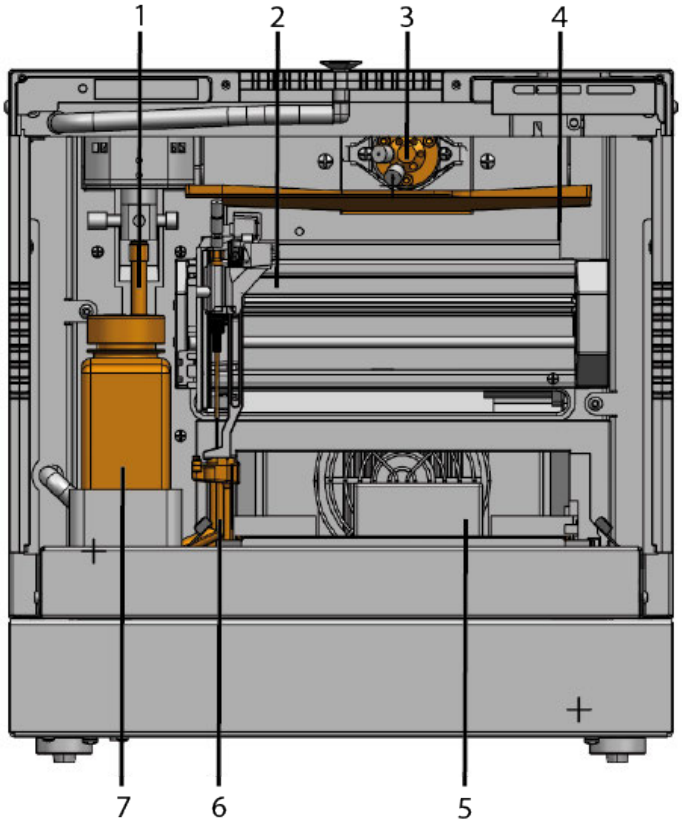



**Fig. 1:** Front of Autosampler

**Legend**

1. Tubing guide
2. Wash/waste and condensed water/leakage
3. Cooling cover

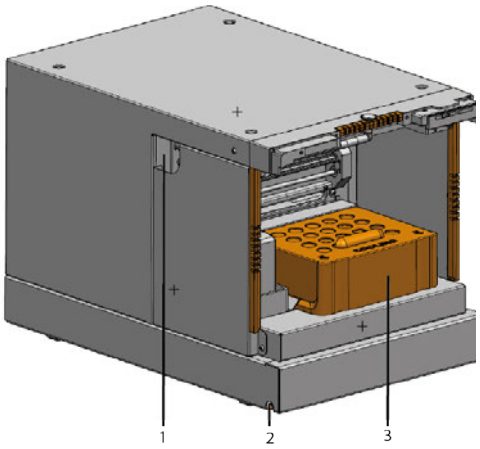



**Fig. 2:** Autosampler with door open

## 4.2 AS 6.1L - rear view

**Legend**

1. LAN Connection
2. I/O connection (9-pin)
3. Power switch
4. Fuse box
5. Socket for power connection
6. Optional ventilator for Cool/Heat-Version
7. Serial number and year of manufacture of device

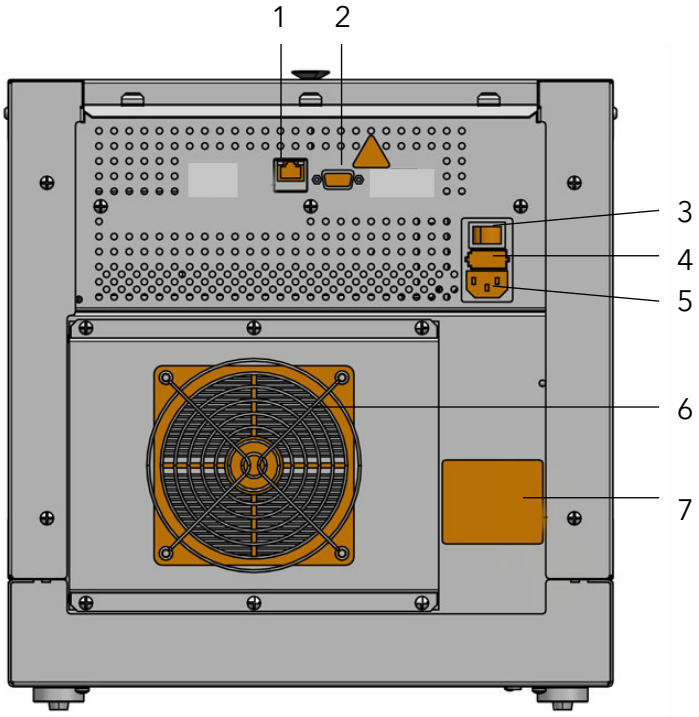



**Fig. 3:** Rear side of Autosampler

The AS 6.1L is equipped with an ethernet connector.

The main board also has 2 fuses; both are 5 A Slow.

### 4.2.1 AS 6.1L fluid connections

When all items have been installed, the following fluid connections are in place:

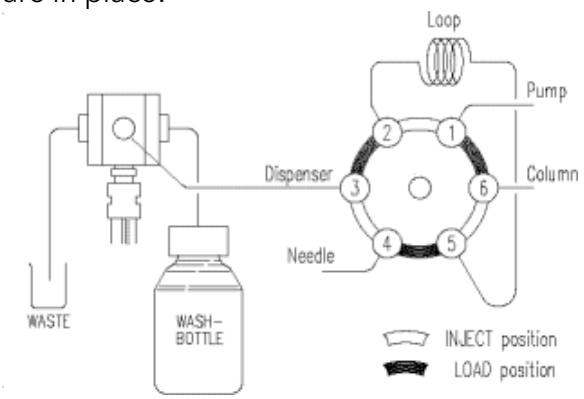



**Fig. 4:** Fluid connections

Use the tubing guide:

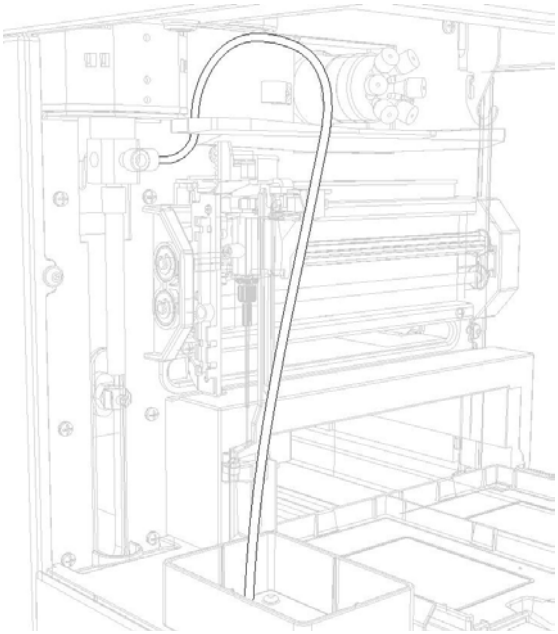


**Fig. 5:** Tubing guide

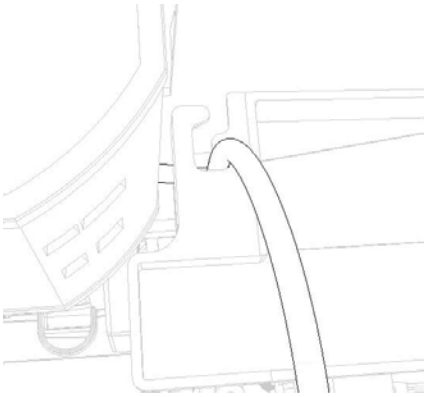


**Fig. 6:** Top view of tubing guide

# 5. AS 6.1L Service Manager control software

Since the AS 6.1L has no keypad, the AS 6.1L Service Manager (ASM) must be used for:

- Direct control
- Service and Adjustments
- Run injection methods
- Upload new firmware.

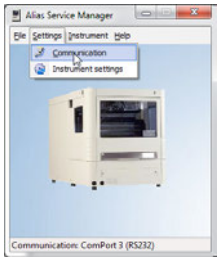

Refer to online help with ASM for more information.

## 5.1 Connecting the AS 6.1L

AS 6.1L communication takes place through ethernet.

To control the AS 6.1L with the help of ASM, proceed as follows:

1. Open ASM, select **Settings > Communication.**




2. The Communication dialog appears. Select the ethernet tab.

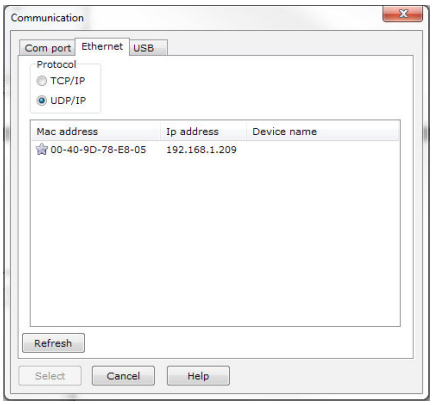



**Fig. 7:** Ethernet tab

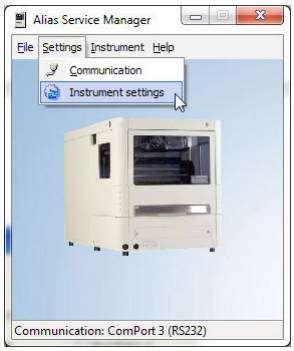
3. Click **Refresh**. A list of IP address(es) appears.
4. Select TCP or UDP in the Protocol group box.
5. Select the MAC address of the AS 6.1L.
6. Click Select. The icon in front of the MAC address turns green to indicate that this address will be used.

## 5.2 Instrument settings

Before using Maintenance or Service commands, check Instrument settings!

To check or program the instrument settings, proceed as follows:

1. In ASM, select **Settings > Instrument settings:**




2. The instrument settings dialog appears:

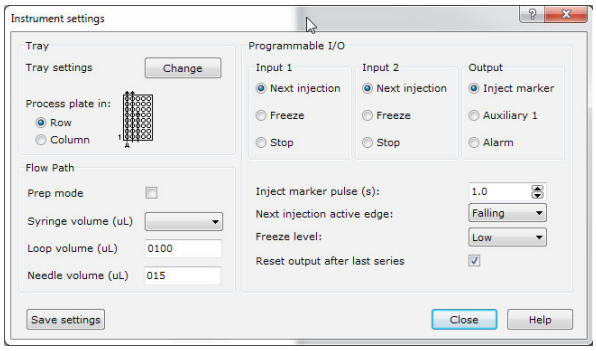



**Fig. 8:** Instrument settings

3. Use the instrument dialog to control the Tray settings, Flow path and Programmable I/O settings.

4. Click **Change**. The Tray settings dialog appears.


Selected tray type should be identical to the used tray type!
Difference in tray types might result in a damaged instrument.

5. Select the tray type for the left and the right plate you will be using and click **OK**.

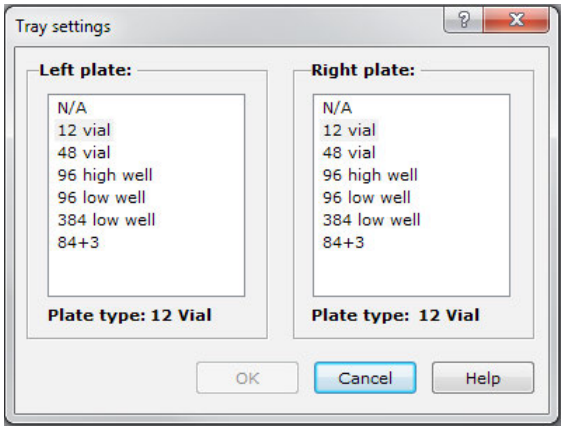



**Fig. 9:** Tray settings

To achieve expected analytical results:

Set Syringe, Loop and Needle volumes to the same values as actually installed.

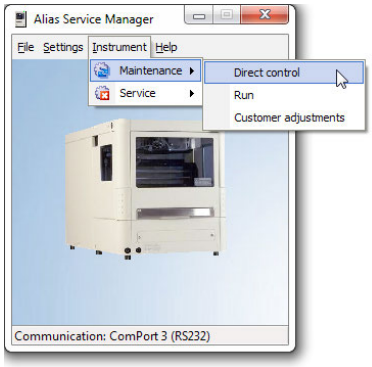
## 5.3 Direct control

A Direct Control function is available to allow for:

- Easy maintenance
- Control of individual parts of the AS 6.1L

To access Direct control, proceed as follows:

1. In ASM, select **Instrument** > **Maintenance** > **Direct Control**.



2. The Direct control dialog appears. It contains two tabs: **Maintenance** and **Info.**

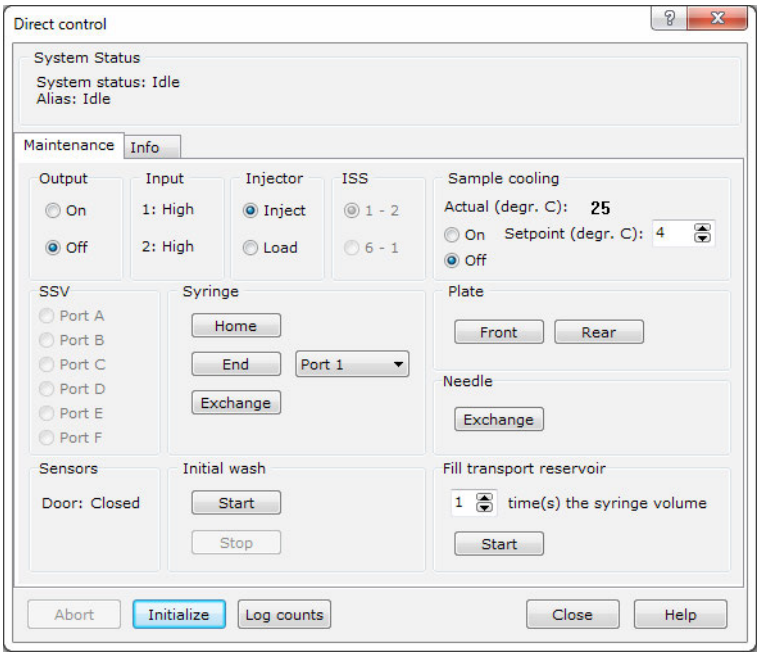



**Fig. 10:** Direct control

Sections that apply to options that are not installed may be greyed out.

Refer to the sections below for more specific information.

## 5.3.1 Maintenance tab

| | |
|---|---|
| **Output** | Switch output on or off |
| **Input** | Readout of the input signals. |
| **Injector** | Allows switching of the injection valve in 2 positions.<br>Inject position: port 1 and 2 are connected<br>Load position: port 1 and 6 are connected |
| **ISS (optional)** | Allows switching of the optional ISS valve in 2 positions.<br>(1-2) position.<br>(6-1) position. |
| **Sample cooling (optional)** | Control of the optional Sample cooling.<br>Choose the desired set point and select on. |
| **SSV (optional)** | Allows selecting any of the ports from the optional Solvent selection valve. |

| | |
|---|---|
| **Syringe** | Control the movements of the Syringe, and Syringe valve.<br>Home: Standard position before aspiration. |
| **Plate** | Moves the plate to the desired position. |
| **Needle** | Moves the sample needle to the exchange position. |
| **Sensors** | Readout of the optical sensor of the door. |
| **Initial wash** | Perform or stop an initial wash of the autosampler |
| **Fill transport reservoir** | Fill the transport reservoir with the selected number of syringe volumes. |

### 5.3.2 Info tab

The Info tab provides information about the installed hard/software versions in the instrument.

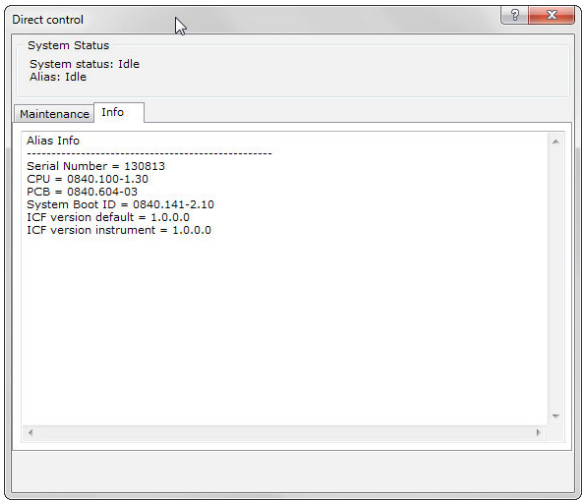



**Fig. 11:** Info tab

## 5.4 Log counts

Log counts provides a list of moving parts in the autosampler that need periodic maintenance. It keeps record of the number of movements of these parts. This number has to be reset when a part is replaced by the following procedure:

1. Click **Log counters** in the Direct control window to open the Log counts dialog.
2. Enter the number of movements counted for the part concerned in the Maintenance logbook (see „Appendix D. Maintenance Logbook“). Fill in whatever other information is required by the log.
3. In the log counters dialog: tick the checkbox for the part you have replaced.
4. Click OK. The counter is now set to 0 for the part concerned.
5. Exit log counters.

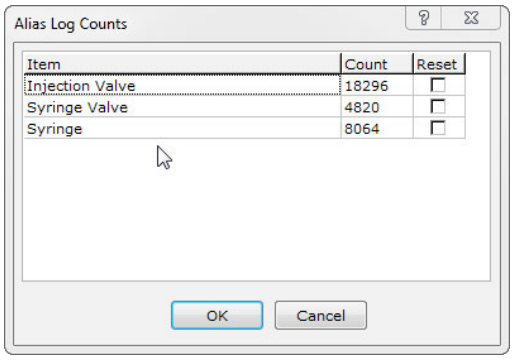



**Fig. 12:** Log counts

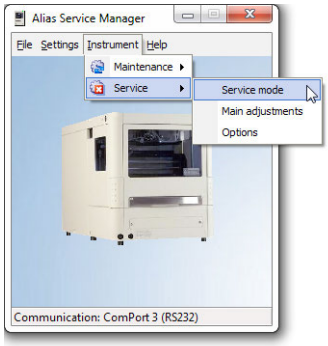
## 5.5 Service mode

A Service Mode Control function is available for:

- Control of different parts of the autosampler
- Readout of optical sensors

To access Service mode, proceed as follows:

1. In ASM, select **Instrument > Service > Service Mode.**




2. The Password dialog box appears:

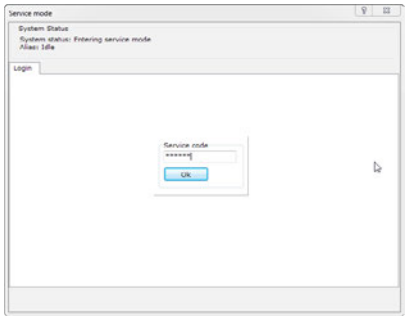


**Fig. 13:** Password dialog

Enter password: **101163** and click **OK**.

The Service mode dialog appears.

The Service mode screen provides five tabs:

- **Movements**
- **I/O**
- **Wash-Cool**
- **Validation-Lifetest**
- **Info**

Refer to the sections below for more information.

### 5.5.1 Movements tab

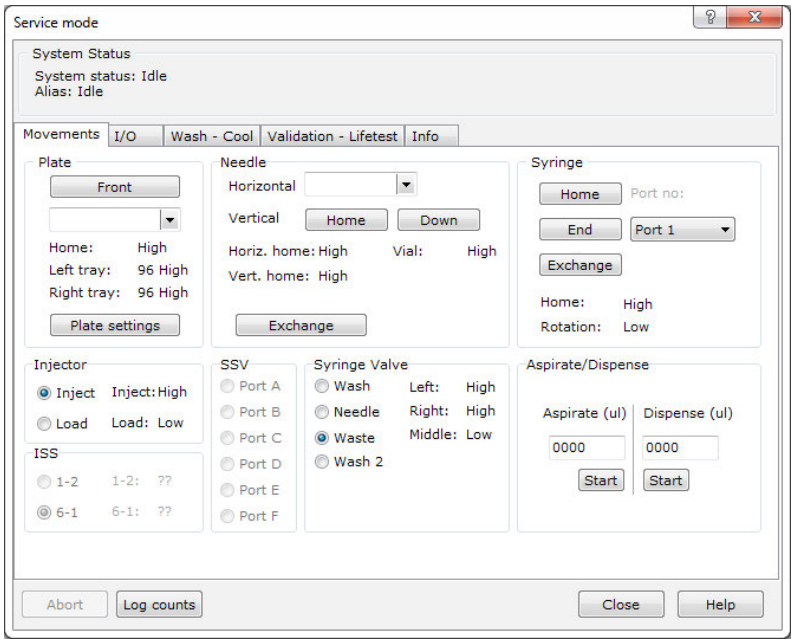



**Fig. 14:** Service mode – Movements tab

| | |
|---|---|
| **Plate** | Allows to move the tray plate to any position.<br>Home sensor status. : High if tray is completely at the rear.<br>The programmed tray type is also displayed. |
| **Needle** | Allows to move the needle in any horizontal and vertical position.<br>Exchange button can be used for easy access to the needle<br>Horiz. home sensor status: High if needle is at the outmost left position.<br>Vial sensor status: High if the vial stripper is at lowest position<br>Vert. home sensor status: High if needle is completely up |
| **Syringe** | Allows to control the syringe drive.<br>Home sensor status: High if syringe is completely up.<br>Rotation sensor: is used to check for any rotation errors, status is undefined and can be checked for functionality by rotating the spindle by hand. |
| **Injector / ISS (optional)** | Allows setting the Injection and ISS valve in the 2 different positions.<br>Inject sensor status: High if valve is in inject (1-2) position.<br>Load sensor status: High if the valve is in the load (6-1) position. |
| **SSV (optional)** | Allows selecting any of the ports from solvent selection valve. |

| | |
|---|---|
| **Syringe valve** | Allows control over the Syringe valve.<br>Table to check the sensor readout: |

| Position | Status of left sensor | Status of right sensor | Status of middle sensor |
|---|---|---|---|
| Wash | Low | High | Low |
| Needle | Low | Low | Low |
| Waste | High | High | High |
| Wash 2 | High | Low | Low |

## 5.5.2 I/O tab

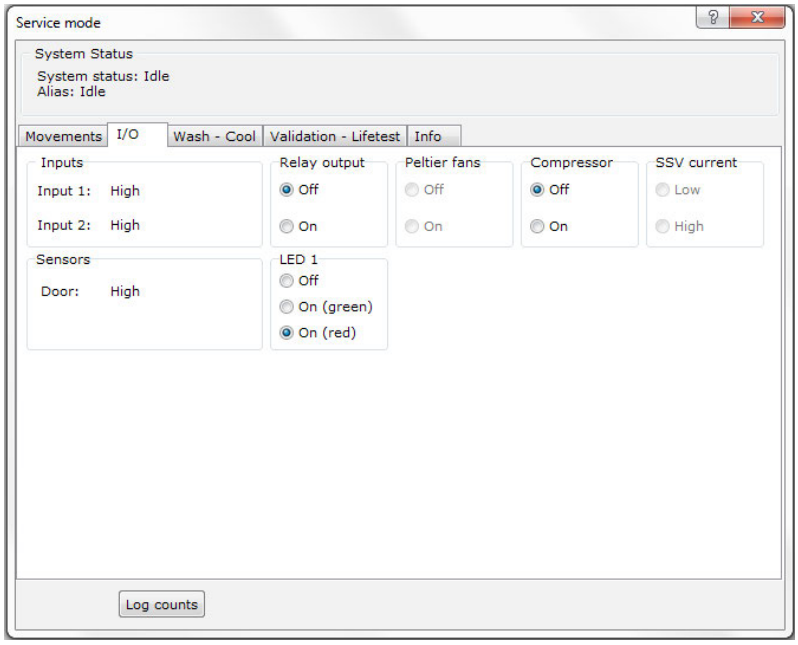



**Fig. 15:** Service mode – I/O tab

| | |
|---|---|
| **Inputs** | Readout of the inputs. |
| **Relay output** | Switch the output relay on or off. |
| **Peltier fans** | Switch the peltier fans on or off (part of optional tray cooling). |
| **Compressor** | Switch the PASA compressor on or off. |
| **SSV current** | Choose to use high or low current for switching the optional SSV valve. |
| **Sensors** | Status of the door sensor. |
| **LED 1** | Controlling the status LED. |

### 5.5.3 Wash – Cool tab

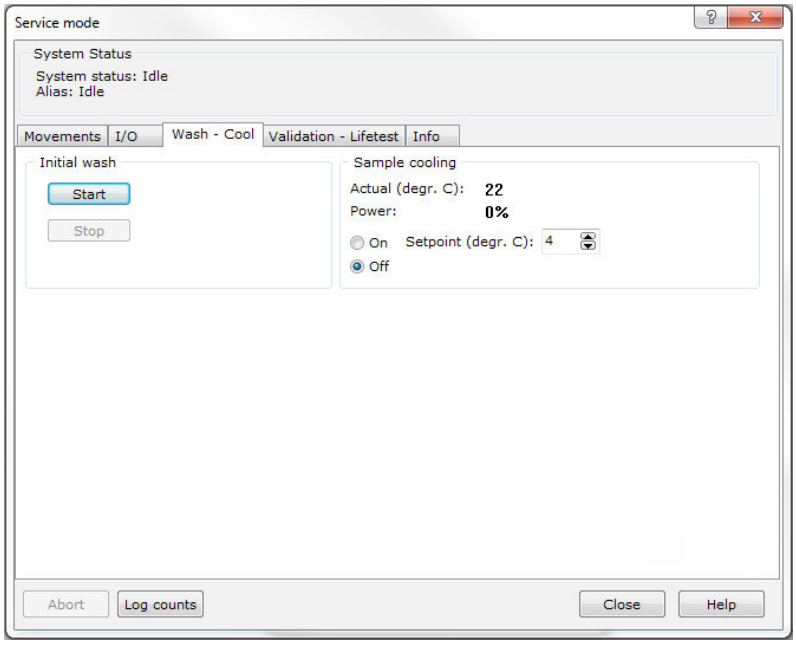



**Fig. 16:** Service mode – Wash - Cool

| | |
|---|---|
| **Initial wash** | Click start to perform an initial wash of the autosampler |
| **Sample cooling/ heating (optional):** | Actual: Readout of the current temperature in sample compartment.<br>Power: The power used by the option.<br>Setpoint: enter value to set desired Temperature (When activated ("On" selected))<br>Temperature range: 4 - 40 °C (cool/heat option)<br>4 °C (cool option) |

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### 5.5.4 Validation - Lifetest tab

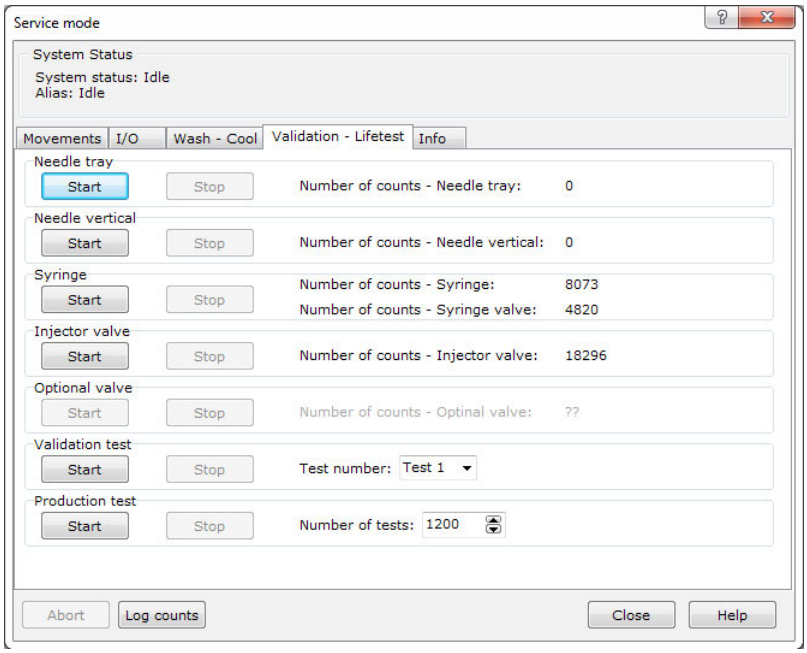



**Fig. 17:** Service mode - Validation - Life test tab

Control or test moving parts of the AS 6.1L. e.g. **Needle, Syringe**, or **Valves**. A counter will be started to indicate the numbers of movements.

With the **Validation test** a pre-programmed test procedure can be started within seconds.

Four test procedures are available:

- Test #1 is a µL Pickup test on positions A1-A5 on a 96 deep well plate
- Test #2 is a partial loopfill test on positions A6-A12 on a 96 deep well plate
- Test #3 is a full loop test on positions A1-A5 on a 96 deep well plate
- Test #4 is a partial loopfill test in Prep mode with a vial rack for 10 mL vials.

For more information on the **Validation test,** see chapter: „Performance inspection“ on page 71.

The **Production test** is an endurance test of the instrument.
This is a factory test.

### 5.5.5 Info tab

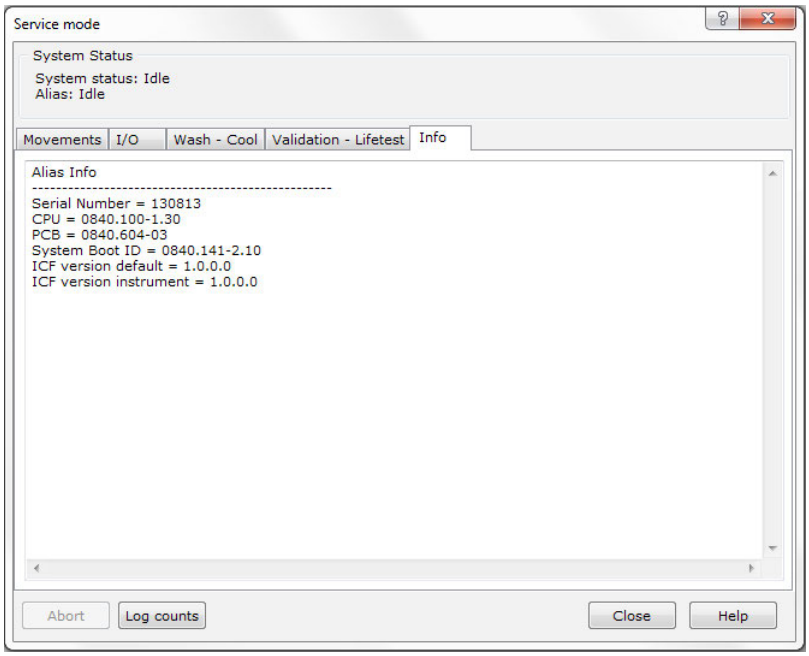



**Fig. 18:** Service mode – Info tab

The Info tab provides information on the installed hard/software versions in the instrument.

# 6. Maintenance

For all maintenance procedures:

1. Open the door of the AS 6.1L.
2. If the cooling option is installed: remove the cooling cover by sliding it towards you.
3. Remove the side doors.
4. Remove the hood?

It is not necessary to disconnect the AS 6.1L from the power source for these maintenance procedures.

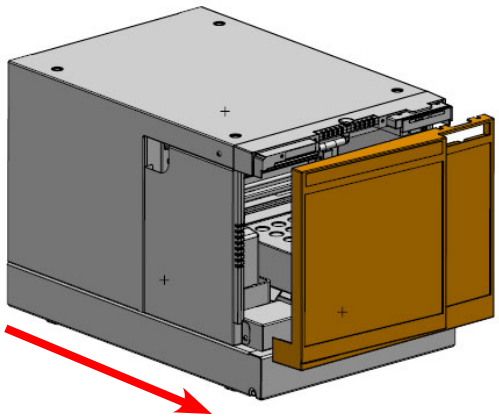
Software control using ASM will still be possible.

## 6.1 Removing the front cover, side doors and cooling option (optional)

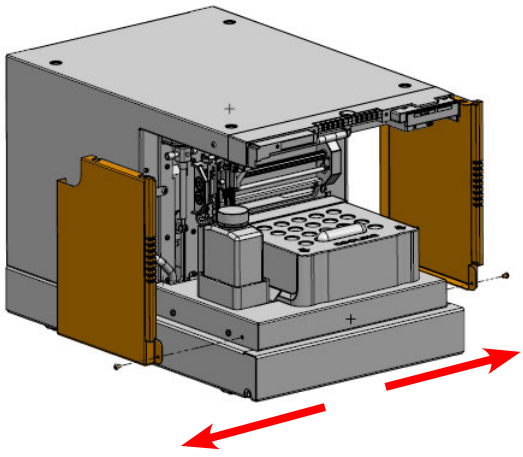
To get access to the assemblies, the front cover needs to be removed.

Proceed as follows:

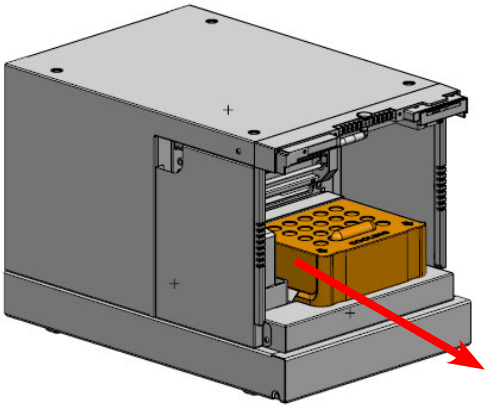
1. Handle the front door with both hands and remove it forwards.



2. Loosen both screws with hexagon socket wrench.
3. Remove the side doors.

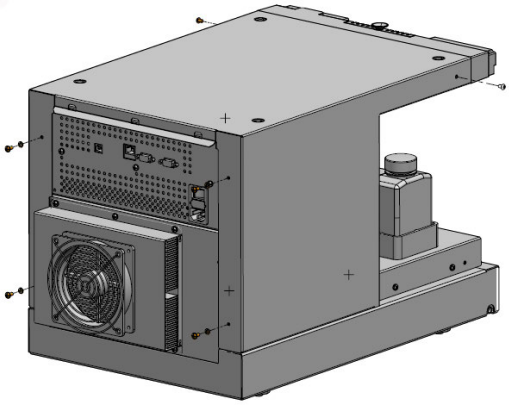


4. Remove the (optional) cooling cover, by sliding it gently out of the autosampler.

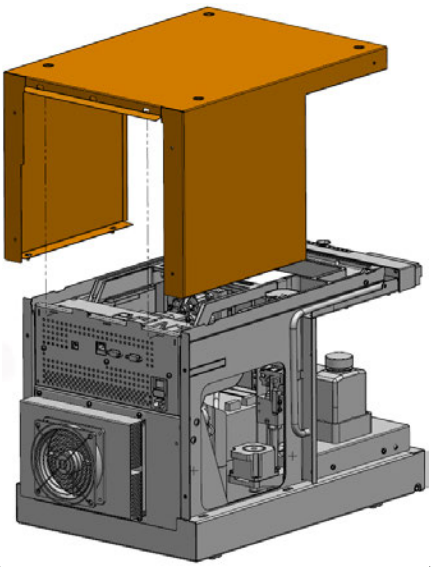


## 6.2 Removing the hood

1. Loosen the 6 marked screws on both sides.



2. Remove the hood of the autosampler.



## 6.3 Cleaning

In general, the AS 6.1L needs very little maintenance. You can clean the outside with a damp cloth with non-aggressive cleaning liquid. Other items that may need periodic cleaning:

- **Valve leak bin** (see „AS 6.1L - front view“ on page 8) a special leak bin is installed underneath the injection valve. You can clean this bin with a damp cloth with non-aggressive cleaning liquid.
- **Sample tray:** if sample has been spilled on the sample tray, clean the tray with a damp cloth with non-aggressive cleaning liquid.
- **Drain tubing:** regularly flush the drain tubing with solvent to prevent clogging and to ensure that liquids and condensate are disposed of.

## 6.4 Injection valve and rotor seal

The AS 6.1L is equipped with an injection valve with fixed mounting.

Execute the following steps to remove the injection valve:

1. Disconnect tubing from the valve. The sample loop may remain on the valve.
2. Remove the 2 marked Philips screws and remove the valve from the unit.

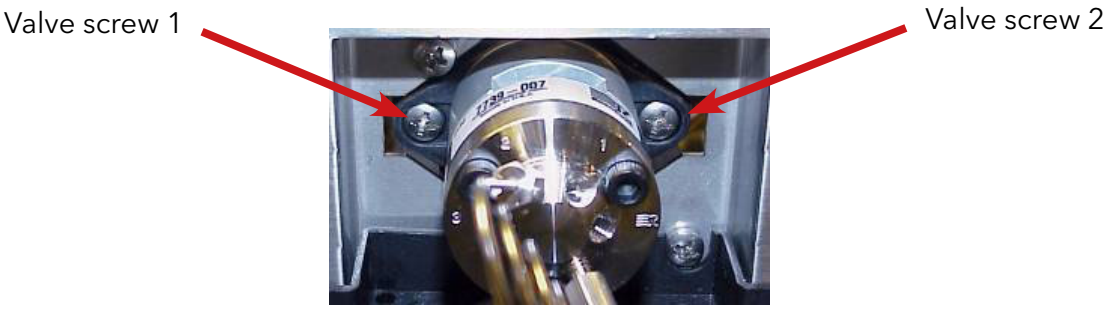



**Fig. 19:** Figure 28: Fixed mounting

Note the position of the pin in the shaft of the removed valve!

Make sure the pin is in the same position when reinstalling the valve in the unit.

3. Check the brand and type of the valve and select the appropriate section below for the cleaning procedure of the valve.

### 6.4.1 Maintenance on the Valco C2-2006/2346 Injection valve

Cleaning a valve can often be accomplished by flushing all lines with appropriate solvents.

**Disassembly:**

1. Use a 9/16 hex driver to remove the socket head screws which secure the cap on the valve.
2. To insure that the sealing surface of the cap is not damaged, rest it on the outer face. Or, if the tubing is still connected, leave it suspended by the tubing.
3. With your fingers or small tool, gently pry the rotor away from the driver.

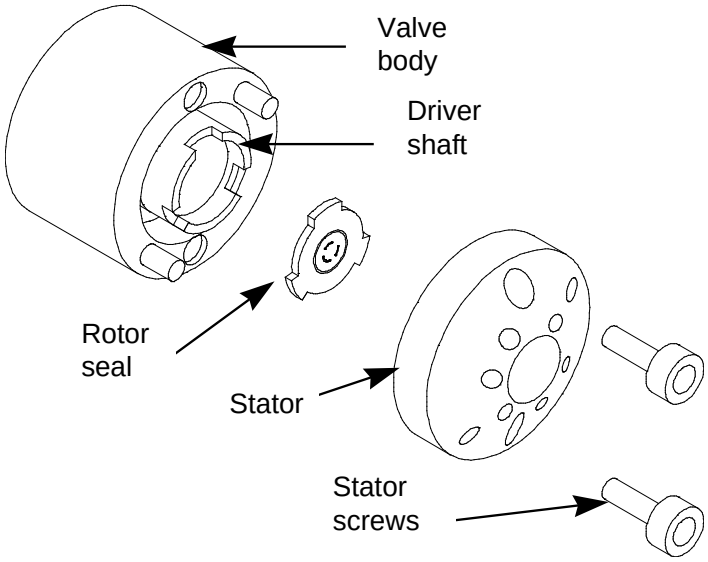



**Fig. 20:** Valco C2-2006/2346

4. Examine the rotor sealing surface for scratches. If scratches are visible to the naked eye, the rotor must be replaced.
5. If no scratches are visible, clean all the parts thoroughly with an appropriate solvent, taking care that no surfaces get scratched. (The most common problem in HPLC is the formation of buffer crystals, which are usually water-soluble). It is not necessary to dry the rotor.

**Reassembly:**

1. Replace the rotor in the driver, making sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.
2. Replace the cap. Insert the two socket head screws and tighten them gently until both are snug. **Do not over-tighten them** - the screws simply hold the assembly together and do not affect sealing force, which is automatically set as the screws close the cap against the valve body.
3. Test the valve by pressurizing the system. If it doesn't hold pressure, the valve should be returned for repair.

### 6.4.2 Maintenance on the Rheodyne Model 7739 Valve

With normal use the valve will give many tens of thousands of cycles without trouble. The main cause of early failure, which is seen as a leak in the valve, is abrasive particles in the sample and/or mobile phase which may scratch the rotor seal.

Following is the procedure for changing the rotor seal:

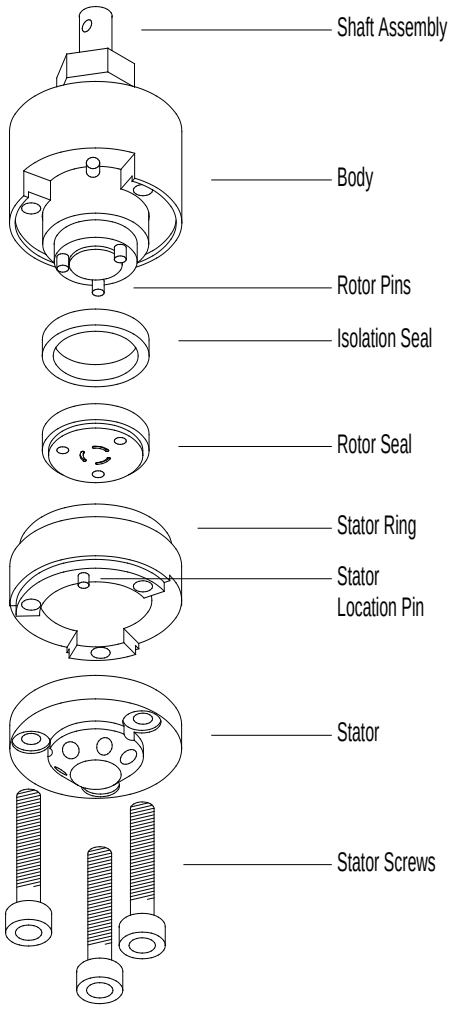



**Fig. 21:** Rheodyne Model 7739

1. Remove the three stator screws with the 9/16" hex key.
2. Remove the stator and stator ring from the valve body.
3. Pull the rotor seal off the pins.
4. Install the new rotor seal. The three pins on the shaft assembly fit into the mating holes in the rotor seal only one way.
5. Mount the seal with the grooves facing the stator.
6. Replace the stator ring so that the body locating pin in the stator ring enters the mating hole in the body.
7. Mount the stator on the valve so that the stator locating pin in the stator ring enters the mating hole in the stator.

8. Replace the three stator screws. Tighten each an equal amount until the screws are tight.

### 6.4.3 Maintenance on the Rheodyne Model 9740 Valve


Do not use metal nuts / ferrules

This causes irreparable damage to the stator!

With normal use the valve will give many tens of thousands of cycles without trouble. The main cause of early failure, which is seen as a leak in the valve, is abrasive particles in the sample and/or mobile phase which can scratch the rotor seal.

Following is the procedure for changing the rotor seal, stator face assembly.

1. Remove the three stator screws with a 9/64 inch hex key.

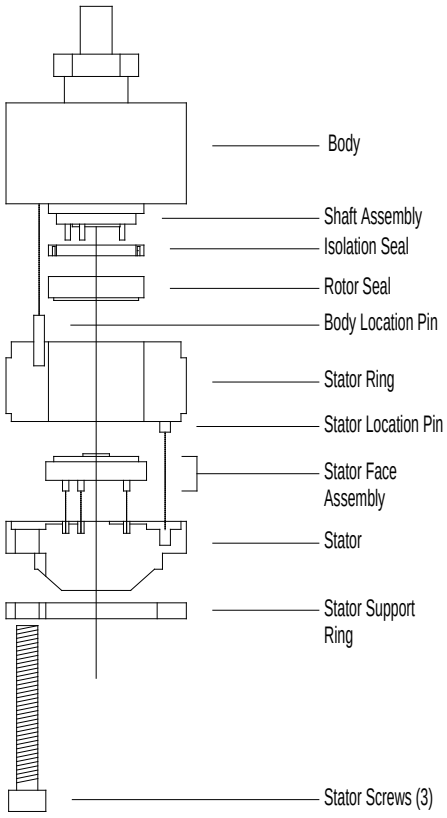



**Fig. 22:** Rheodyne Model 9740

2. Remove the stator, stator face assembly and stator ring from the valve body.
3. Pull the rotor seal off the pins.
4. Mount the new rotor seal. The three pins on the shaft assembly fit into the mating holes in the rotor seal only one way. Mount the seal with the grooves facing the stator.

5. Replace the stator ring so that the body locating pin in the stator ring enters the mating hole in the body.
6. Put the new stator face assembly on the stator. The three pins on the assembly fit the mating holes in the stator only one way.
7. Mount the stator and stator face assembly on the valve so the stator locating pin in the stator ring enters the mating hole in the stator.
8. Replace the three stator screws. Tighten each an equal amount until the screws are tight.
9. Hold the valve for mounting with port 1 pointing upward.
10. Place the valve into its slot and fasten it.
11. Reconnect all tubing to the valve.
12. In Direct control, click Initialize to make sure that the valve is in INJECT position
13. Perform a standard wash (Initial wash group box - Direct control).
14. The AS 6.1L is now ready for use.

### 6.4.4 Maintenance on the Spark OEM valve

For maintenance on a Spark OEM Stainless Steel or PEEK flow path valve, proceed as follows:

1. Remove the three 3mm hex key screws, holding the stator to the housing of the valve.
2. Remove the stator from the valve.
   To prevent damage to the sealing surface of the cap, rest it on the outer face.

**Fig. 23:** Stainless Steel Spark OEM valve

**Fig. 24:** Spark OEM valve with PEEK flowpath

3. Remove the rotor seal, by pulling the old seal of the valve directly toward you.

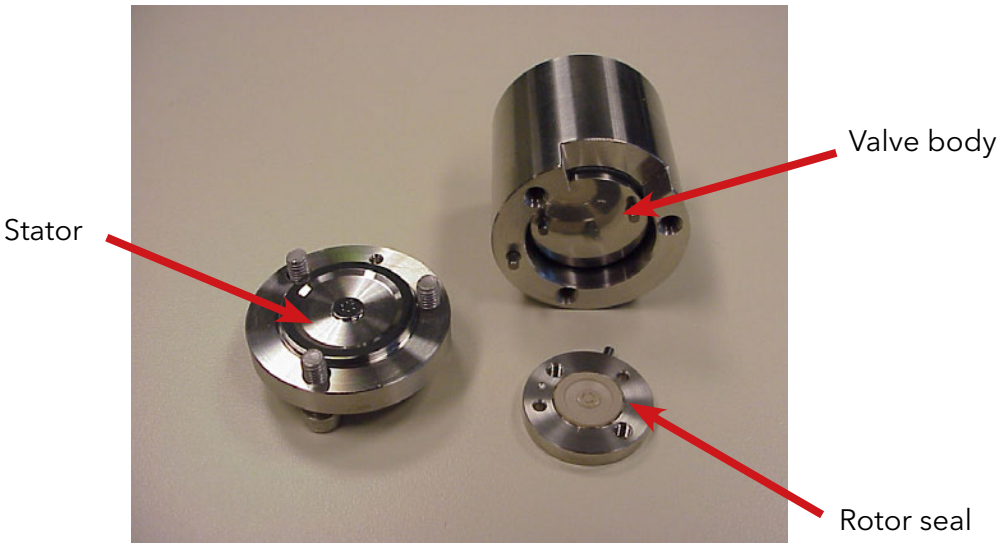



**Fig. 25:** Remove the rotor seal

1. Install the new rotor seal. The rotor seal is keyed by the 2 holes and a drive pin which guide you to install the rotor seal only in one way. Make sure the rotor seal grooves are visible.
2. Check the flat surface of the stator for scratches.
3. Replace the stator if any scratches are present.
4. Slide the stator on the guiding pin of the valve body.
5. Reinstall the three 3 mm hex key screws.
6. Tighten the stator screws until the stator is flat assembled to the valve body.
7. Make sure there is no gap between the valve body and the stator!
8. Check if the O-ring is present on the valve, this ring prevents leakage entering the instrument

To check the function of the Injection valve, proceed as follows:

1. Power up the Autosampler.
2. Start the ASM software.
3. Go to Direct control .
4. Switch the valve from the Inject to the Load position and back.
5. Select [LOAD].
6. Select [INJECT].

The valve is functioning correctly if no strange noises are noticed.

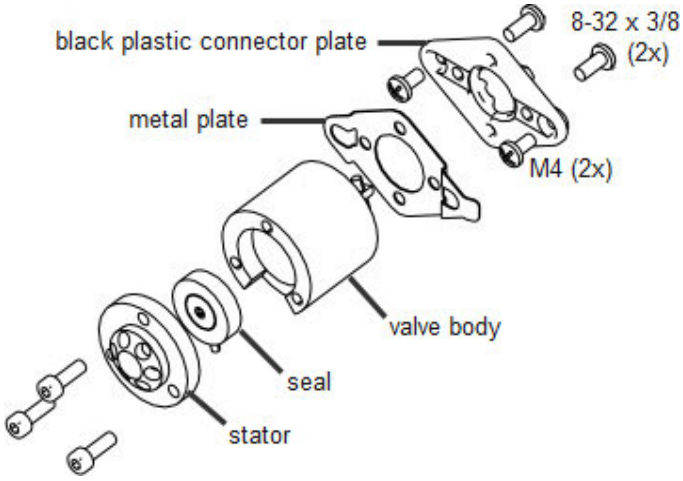



**Fig. 26:** Spark OEM valve

## 6.5 Sample loop

The HPLC AS 6.1L is standard fitted with a 100 µL sample loop, the UHPLC AS 6.1L has a 10 µL sample loop. A different sample loop size can be installed, but note that you will need the proper combination of syringe and tubing to ensure good results.

Take the following into account when you have installed a sample loop:

- connect the loop between ports 2 and 5 of the injection valve
- go to the configuration settings and adapt settings in the flowpath group box if you have installed a loop with a different volume.

Remember that the maximum injection volumes are calculated with the following formulas:

- Full loop: max. injection volume = loop volume
- Partial loopfill: max. injection volume = 50% of the loop volume
- µL pickup: max. injection volume = loop volume

## 6.6 Replacing the sample needle

Execute the following steps to replace the sample needle:

1. Open Maintenance (Service Manager).
2. Click **Exchange** in the Needle group box. The needle moves to exchange position.
3. Loosen the needle connection nut (number 3).
4. Loosen the nut (number 1) that connects the tubing (number 2) to port 4 of the injection valve.
5. Remove the sample needle by pulling it out of its fitting by the tubing.
6. Install a new needle assembly.
   Tighten the needle assembly with the needle connection nut.

7. Connect the other end of the needle connection tubing to port 4 of the injection valve. Do not tighten too much as this may block the tubing.
8. Click Initialize in Maintenance. The sample needle moves back to home position.
9. Perform a wash routine to clean the new needle by clicking Start in the Initial wash group box of Maintenance. Click Stop to end the wash routine.
10. Use the Instrument/Adjustment option to adapt Needle - Tray settings.


If you use trays with 12 vials or 48 vials, make sure that the needle height settings is > 2mm to prevent the needle from touching the bottom of the vials.

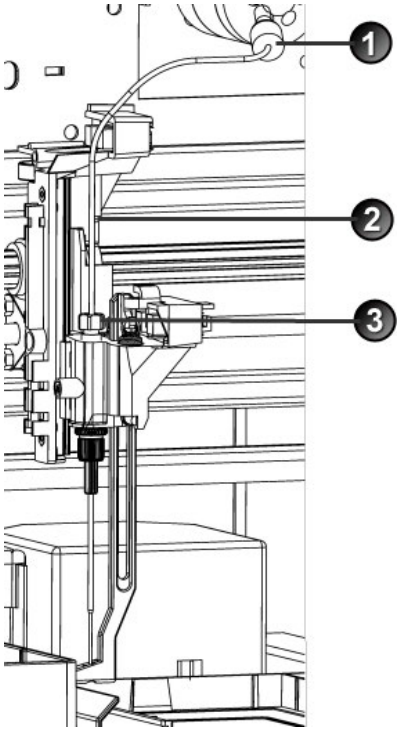



**Fig. 27:** Replacing the sample needle

## 6.7 Replacing the air needle

Execute the following steps to replace the air needle:

1. Remove the sample needle (Replacing the sample needle).
2. Unscrew the chrome locking nut to remove the air needle.
3. Unscrew the chrome locking nut from the adjustment nut.
4. Screw the height adjustment nut to the chrome locking nut (thread of the height adjustment nut must be level with the lower part of the locking nut). Make sure the O-ring seal is in the locking nut.
5. Install the air needle.
6. Install the sample needle.

7. Program the proper needle height for the new needle in the ASM settings window. Go to Adjustment to adapt Needle - Tray settings, if necessary.


If you use trays with 12 vials or 48 vials, make sure that the needle height settings is > 2mm to prevent the needle from touching the bottom of the vials.

8. Perform an initial wash from Maintenance to rinse the needle.

## 6.8 Syringe dispenser installation

The AS 6.1L in HPLC (700 bar) and UHPLC (1240 bar) version is as standard supplied with a 250 µL syringe, but a 2500 µL syringe can also be installed for the Prep version.

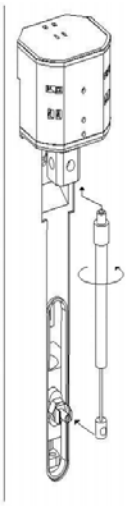


**Fig. 28:** Syringe

Execute the following steps to install a different syringe:

1. In Maintenance, click **Exchange** in the Syringe group box.
2. Unscrew the syringe from syringe valve, but make sure that the connector in the valve remains in place.
3. Disconnect the plunger from the syringe drive.
4. Fill the new syringe with wash solvent, preferably IPA (isopropanol). Make sure that most air bubbles are removed from the syringe.
5. Connect the plunger of the filled syringe to the syringe drive and connect the syringe with the connector at the syringe valve.
6. Screw the syringe firmly into the connector.
7. In Maintenance, click Home in Syringe group box. The syringe moves to home position and its content will be dispensed to syringe waste.
8. If there is still some air in the syringe, click End again in Maintenance. The syringe is filled with wash solvent. Use IPA.
9. Click Home again to dispense the wash solvent to waste.

If there is still air in the syringe, repeat steps 8 and 9 and gently tap the syringe as the wash solvent is dispensed to syringe waste.

Perform a standard wash routine (Maintenance: click **Start/Stop** in the Initial wash group box). All tubing connected to the syringe valve will be refilled and flushed.

## 6.9 Replacing the syringe plunger and plunger tip

Execute the following steps to replace the plunger or plunger tip:

1. In Maintenance, click **Exchange** in the Syringe group box.
2. Remove the syringe (see Syringe dispenser ).
3. Slide the plunger out of the glass part of the syringe.
4. With pliers: remove the tip carefully and make sure you do not damage the stainless steel plunger.
5. Dampen the new tip with for example isopropanol.
6. Press the new tip on the plunger.
7. Insert the plunger in the glass part the syringe.

Move the plunger inside the syringe over the whole length.

Check if the resistance of the plunger on the glass is constant.

If this is not the case, replace the complete syringe!

8. Install the syringe (see Syringe dispenser) in the autosampler again.

# 7. Trouble shooting

Even though great care was taken in the design of the AS 6.1L, problems may occur:

- **instrument errors**: these can be caused by a variety of reasons.
- **software errors**: usually caused by faulty communication between instruments, or by faulty installation of the software.
- **analytical problems**: these may occur e.g. as a result of wear of parts, errors in injection settings and methods, or a wrong combination of sample loop, buffer tubing and syringe.

Service Manager contains a Service option (select Instrument**/Service)**. Note that an access code is required for this option, and that the service option is intended for service engineers only.

Contact your supplier if a problem occurs that you cannot solve.

## 7.1 Instrument errors

Incidental fault conditions may occur in any instrument. The AS 6.1L will generate an instrument error message with an error number, a short description of the error and instructions on how to proceed.

In most cases, you will be asked to either initialize the system, or to switch the system off and then on again. Always click **OK** and follow the instructions to resolve the error status. Use **Instrument/Maintenance** in Service Manager to monitor the error. Initialize the system in the AS 6.1L /Maintenance window.

Make sure that maintenance is performed regularly. If errors 295 and/ or 308 keep occurring, instrument Adjustments may be required (via the control software).


Make sure AS 6.1L is connected to a grounded power source.

If the LED is not lighted, a fuse may have blown.

Checking a valve implies that you remove the valve and check all parts for wear and dirt. Execute the following steps after any problem with a valve has been resolved:

1. Select **Instrument/Maintenance**. The Maintenance window appears.
2. Click **Initialize**.
3. In the Initial wash group box, click **Start** to start the wash.
4. Click **Stop** to end the wash.
5. Click **Close** to exit the Maintenance window.

Execute the following steps if you are asked to initialize the system:

1. Select **Instrument/Maintenance.** The Maintenance window appears. From this window you can control separate parts of the autosampler to check whether they function as intended.
2. Click **Initialize** to reset the system and prepare it for normal use.

Execute the following steps if you are asked to switch the system off, and then on again:

1. Check that the communication cable between AS 6.1L and PC is properly installed.
2. Turn the instrument off with the on/off switch at the back of the autosampler.
3. Turn the system on again with the on/off switch. The system is initialized and is now ready for use.

## 7.2 Software errors

Software errors usually are caused by faulty installation of the software, or by faulty communication between instruments; you will be asked to re-install the software on the PC that controls the system.

If a software error message appears, first check if it may be caused by faulty communication between instruments:

1. Check all cable connections between instruments.
2. Open AS 6.1L Service Manager.
3. Select **Instrument/Maintenance**.
4. Click **Initialize**.

## 7.3 Analytical trouble shooting

Analytical problems like bad reproducibility or carry-over may occur in any (U)HPLC system. It may be hard to find the cause; you may have to try out several procedures. The first thing to do is to determine whether the problem is caused by the autosampler or by the rest of the system:

1. Replace the valve by a manual injection valve to discriminate between valve problems and other problems.
2. Do a number of Full loop injections. If the results are fine, the fault is in the autosampler; if not, check the rest of the (U)HPLC system.

Please bear in mind that analytical problems may also be caused by external influences like temperature or light-sensitive samples. Make sure that the application was running trouble-free before and that no changes have been made to the system.

A number of causes and possible solutions for analytical problems is listed below. Contact service if you need further help.

If **reproducibility** is not according to specifications, check the following possible causes:

| Causes: | Solutions: |
|---|---|
| Air in flow path. | Do an initial wash (select **Instrument/Maintenance** in AS 6.1L Service Manager) |
| Leaking syringe. | If leakage occurs at the top of the syringe, check whether it has been properly mounted.<br>If leakage occurs at the bottom of the syringe, replace plunger tip or syringe. |
| Leaking syringe valve. | Check or replace valve. |
| Rotor seal worn out. | Replace seal. Check stator. Replace valve for UHPLC. |
| Dead volumes in tubing connections. | Redo connections with new ferrules and nuts. |

If a **blank gives a peak that is too high** for your criteria:

| Causes: | Solutions: |
|---|---|
| Solubility problem. | You can either modify your sample, or accept carry-over. |
| Bad match between sample characteristics and hardware. | Check hardware:<br>Needle: either use an extra wash (to wash the inside and outside needle), or install a different type of needle (Steel or Silica-coated)<br>Valve: replace rotor in valve by Valco E or H type.<br>Tubing: install different tubing (Steel, Peek) between autosampler and column, or use different wash solvents |
| The blank you use has been soiled. | Use a new blank. |
| Cause not clear. | Check if you can solve the problem by using more variation in solvents. |

If **no injection** takes place:

| Causes: | Solutions: |
|---|---|
| Blockage in flow path | Disconnect needle from valve.<br>Start a manual wash.<br>If solvent flows from the injection port, check the needle; if no solvent flows from the injection port, disconnect buffer tubing from valve.<br>Start a manual wash.<br>If solvent flows from open end: check rotor seal; if not: disconnect buffer tubing from syringe valve.<br>Start a manual wash.<br>If solvent flows from syringe valve: check buffer tubing; if not, check for over-tightened connections in the entire flow path and check the syringe valve. |
| Leakage in the injection valve | Disconnect the needle tubing and buffer tubing.<br>Connect port 1 to an (U)HPLC pump.<br>Block port 6.<br>Start the pump at a low flow.<br>Observe ports 3 and 4 for leakage.<br>If leakage occurs at ports 3 and 4: check rotor seal; if not: recheck with manual valve. |
|  | Observe the maximum allowed pressure of 700 bar to prevent leakage in the valve (HPLC)!<br>For UHPLC the maximum allowed pressure is 1240 bar. |

# 8. Repair and replacement

The modular design of the AS 6.1L simplifies replacements, reducing repair time and minimizes downtime.

This chapter describes how the different assemblies of the AS 6.1L can be removed, repaired or adjusted.

**Prerequisite**

Remove the doors, cooling option and hood of the device (see chapter 6.1 on page 23).


Disconnect the instrument from the AC power source to prevent an electrical shock.

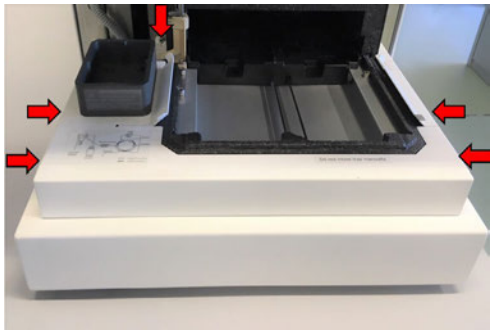
## 8.1 Required tools

The following tools are required for servicing the AS 6.1L autosampler:

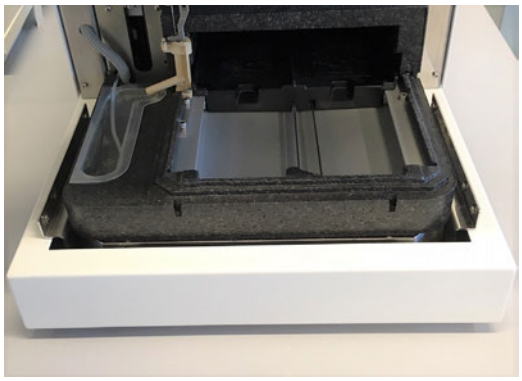
- Philips screwdriver #1
- Philips screwdriver #2 (long shaft)
- Flathead screwdriver
- Hex key 1.5mm
- Hex key 1.6mm
- Hex key 2 mm
- Hex key 2.5 mm
- Hex key 3 mm
- Hex key 9/64" (Injection valve)

## 8.2 Removing the tray cover

1. To remove the tray cover remove the 5 indicated screws.
2. Slightly lift the tray cover (approx. 5 mm) and carefully pull it towards you.



When reinstalling the cover, make sure the waste tubing of the syringe dispenser is inserted in the drain channel (in between the two parts).

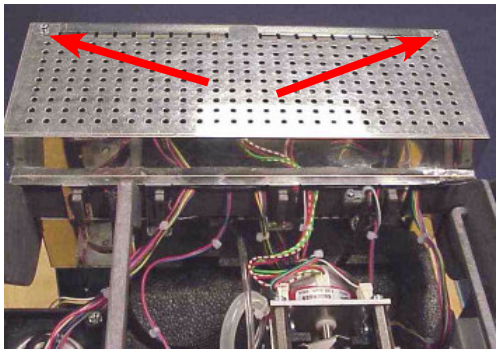


## 8.3 Main PCB board replacement

To replace the main PCB board, proceed as follows:

Picture shows the top view of an AS 6.1L with shielding cover!

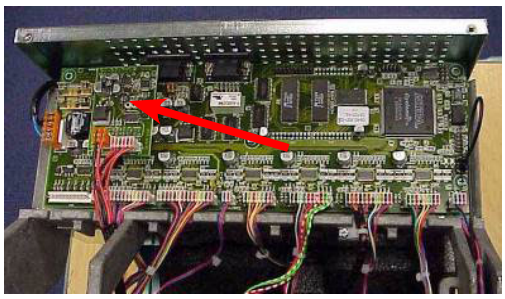
1. Remove the 2 marked screws.
2. Remove the shielding cover.



**Note:** There is no shielding cover on instruments with serial number 70100 and higher.

Due to a revision of the main PCB board, the shield is no longer necessary.

Picture shows a mainboard with additional cooling PCB board:



3. Disconnect all connectors.
4. Remove the Philips screws and sub-D connector's screws.
5. Replace the PCB board, and reconnect all connectors.

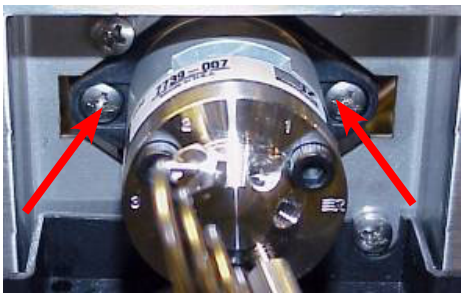
After replacing the main PCB board:

6. Select the installed options (see:„Options").
7. Program the instrument parameters (see: „Adjustment parameters").

## 8.4 Injection valve / valve unit replacement

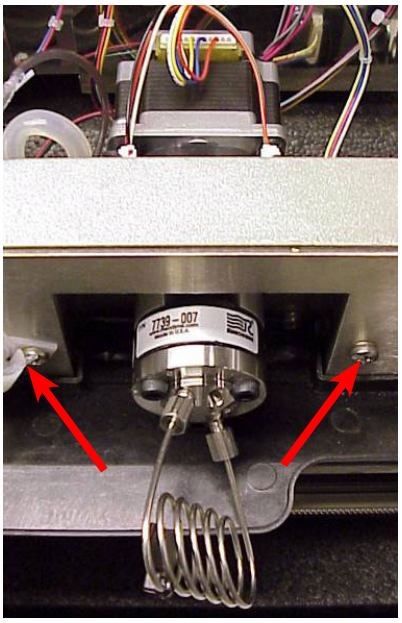
**Injection valve replacement:**

1. Remove all tubing from the valve except for the loop.
2. Remove the two marked screws.
3. Remove the injection valve.



**Valve unit replacement:**

**Note:** Top view of valve unit assembly from serial number 60008 and up.



4. Remove the front cover of the instrument.
5. Unplug the connector from the main PCB board.
6. Remove the 2 marked screws.
7. Removing the complete valve assembly.

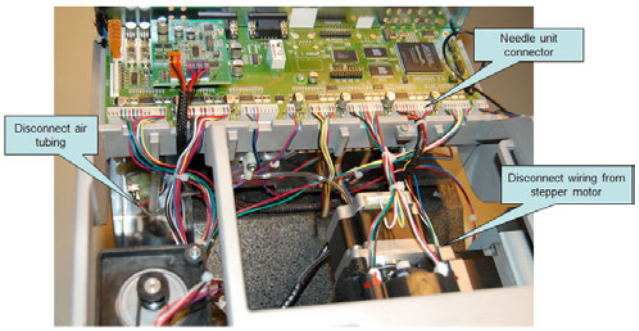
**Install the new unit in reversed order.**

## 8.5 Needle unit replacement.

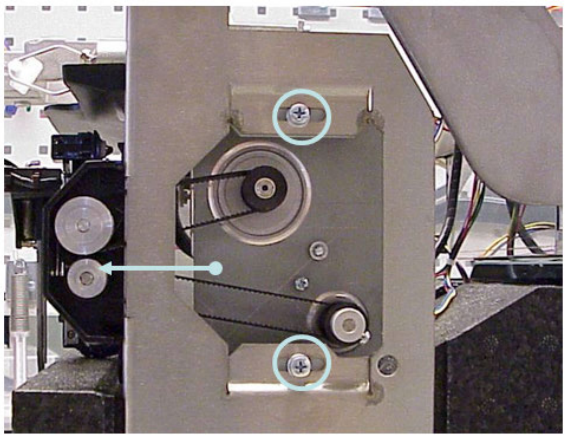
The needle unit assembly is a complex assembly.

Therefore it's only available as a complete assembly.

1. Remove the hood and side covers.
2. Remove the sample needle: see section: "Replacing the sample needle"



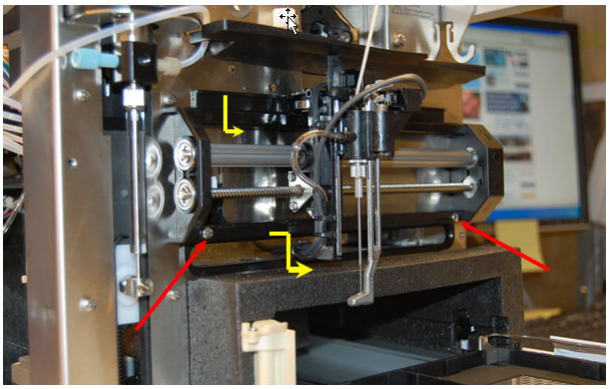

3. Loosen the 2 marked screws and slide the needle motor bracket to the left.
4. Remove the belts.



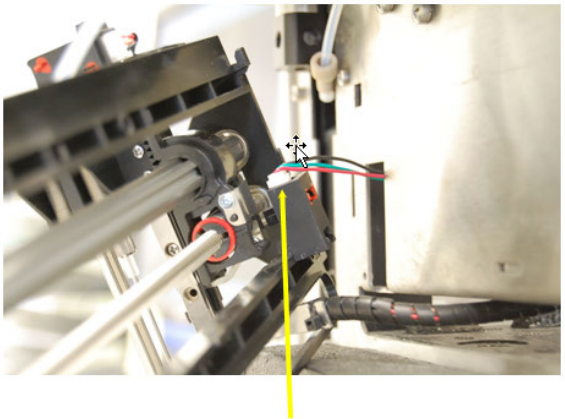
5. Remove the 2 marked screws (red).

**Note:** Do not pull the assembly to the front!

6. Push the assembly down until the 2 notches on top of the assembly are released from the frame.



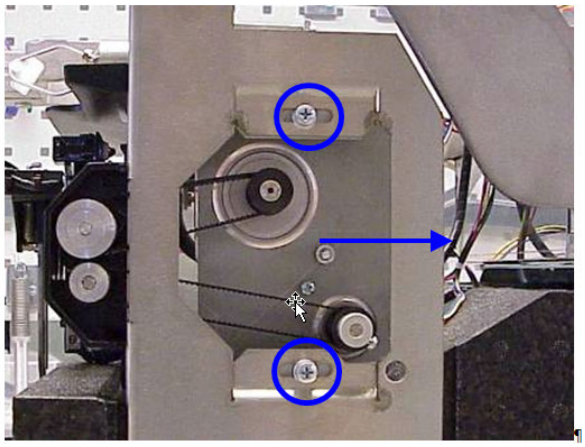
7. Disconnect the horizontal home sensor. And remove the needle drive.
8. Place the new unit in reversed order.



**Adjusting belt tension**

To achieve a reliable needle movement, make sure there is no play between the stepper motors and the spindle/spline shaft.

1. Slide the motor frame to the right (as indicated) until there is no more slack in the belts.
2. Make sure there is too much tension on the belts.

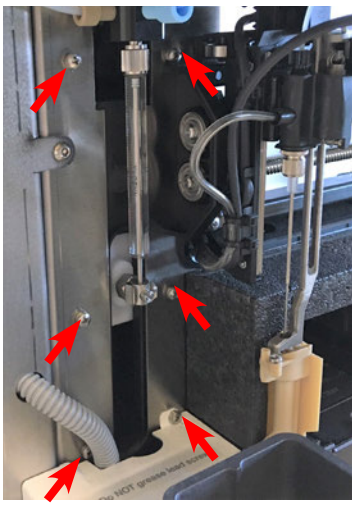


## 8.6 Syringe dispenser assembly replacement


Remove the syringe before removing the syringe assembly

**Prerequitite:** To remove the syringe dispenser assembly, remove the **hood, left side** and **tray cover**.

1. Unplug the 2 connectors from the main PCB board.
2. Remove all tubing from the syringe valve.
3. Remove the 6 marked screws.
4. Slide the syringe dispenser backwards out of the main frame.



**Note:** Note the position of the waste tubing on the bottom of the dispenser.


When reinstalling the dispenser make sure the waste tubing is placed inside the clear drip tray (in between the two parts)!

## 8.7 Syringe valve replacement

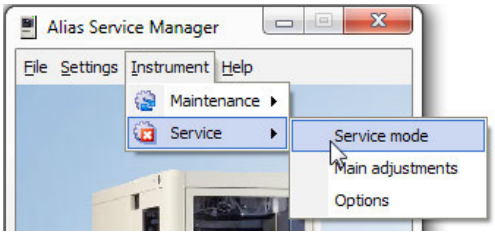
The syringe valve is subject to wear and tear and it must be replaced periodically.

A worn out valve may cause a bad performance of the instrument.

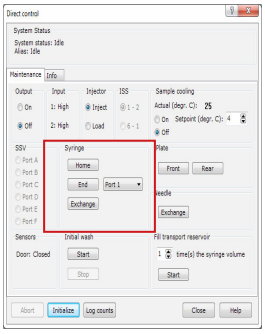
Place the syringe valve in Wash port 2 position before you replace the syringe valve. In this position, the mounting screws are opposite/in line with the holes.

Proceed as follows to replace the syringe valve:

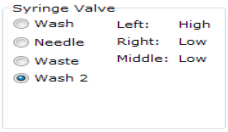
1. Open ASM.
2. Go to Service mode: Select instrument > Service > service mode.
3. Enter password: 101163



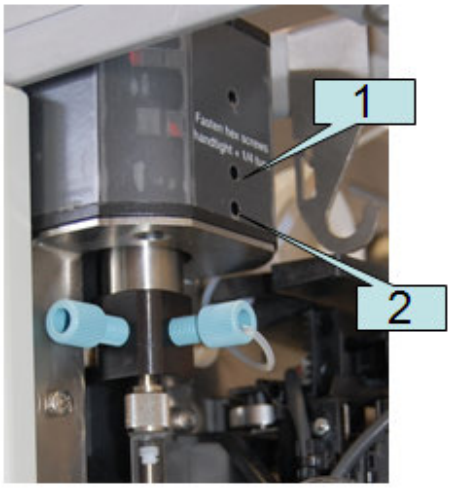

4. Click **Exchange**. The syringe will move half way down.
5. Remove the syringe.



6. Select Syringe Valve position: **Wash 2.**

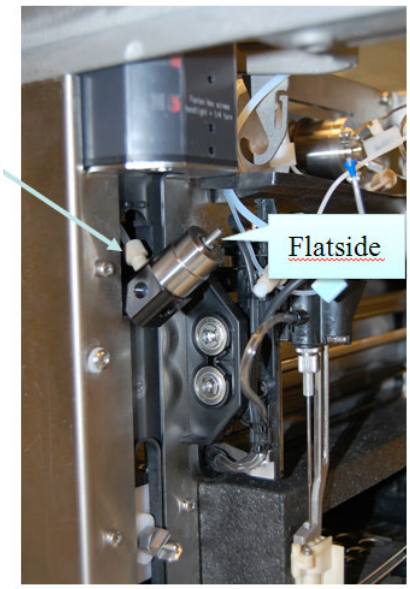



7. Remove all tubing from the valve.
8. Loosen the lower socket-head screw (number 2) a full rotation counter-clockwise.
9. Loosen the upper socket head screw (number 1) a full rotation counter-clockwise.



**10.** Disconnect the waste tubing and remove the syringe valve.

**11.** Connect the waste tubing to the back of the new valve.




**Important!**

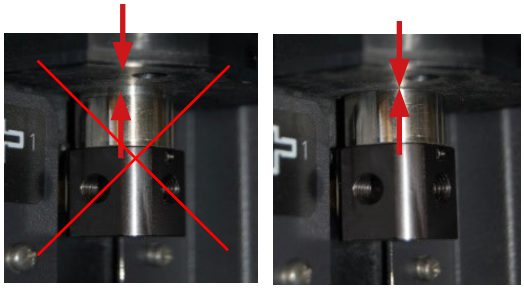
**When reinstalling the new syringe valve, the flat side on the valve shaft should be facing forwards!**

**12.** Make sure the valve is completely up when retightening the 2 screws.

**Important!**

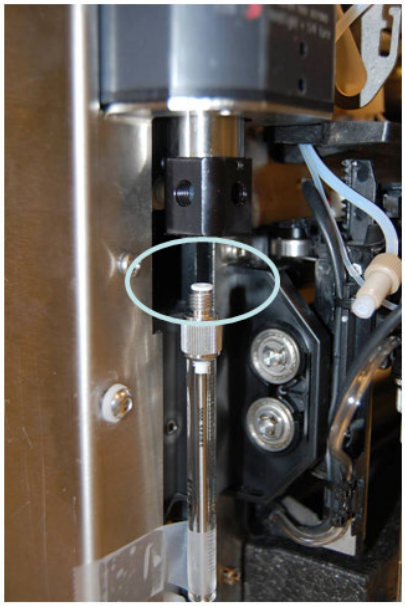
**Do not overtighten the screws!**

**This might result in an unrepairable syringe assembly** (fingertight + 1/4 turn).



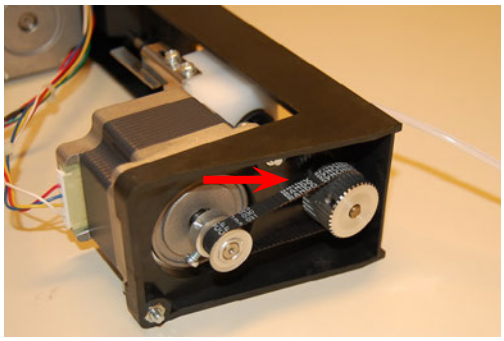
**13.** Install the syringe with a new Teflon seal.

**14.** Reconnect all tubing and initialize the instrument.



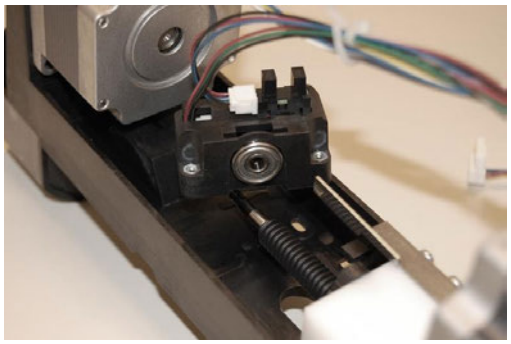
## 8.8 Syringe spindle replacement

1. Loosen the marked screw with a hex key (2mm).
2. Carefully slide the pulley off the spindle.

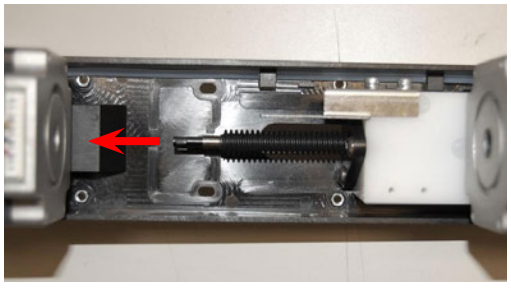


3. Remove the 2 marked screws.

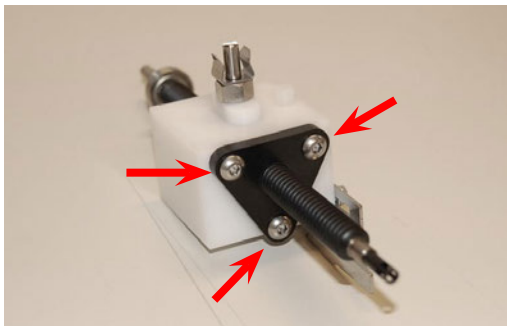
4. Remove the bearing block that houses the optical sensors.
5. The wires may remain connected.



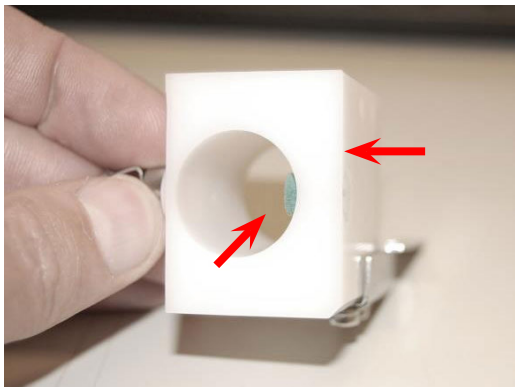
6. Remove the spindle in the indicated direction.



7. Remove the 3 marked screws with a hex key (2.5 mm).
8. Remove the spindle.



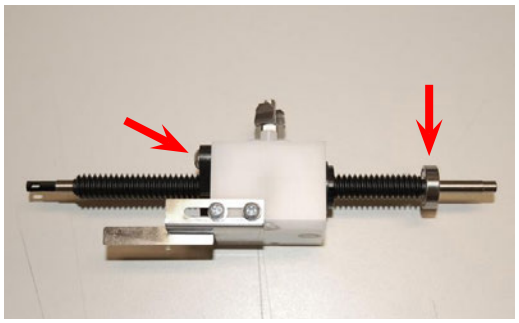
**9.** Remove the white screw from the transport block and remove the small piece of foam.



**10.** Place the new spindle in the transport block and mount the three screws.

**11.** Do not tighten the three screws yet.

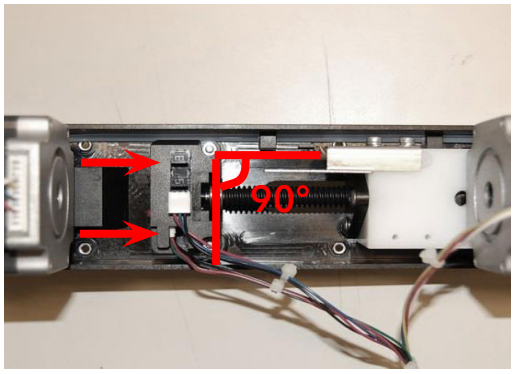
**12.** Place the bearing back on the spindle and place the spindle back in the dispenser frame.



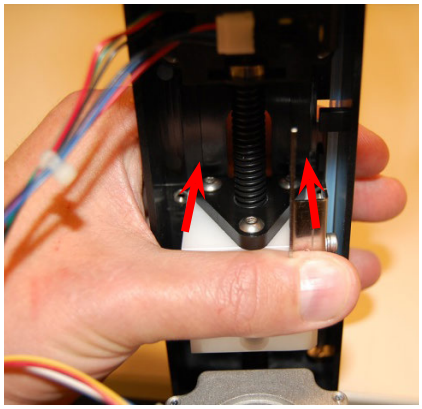
**13.** Put the bearing block on the spindle and mount the two screws.

**Important!**
Make sure the bearing block

- is pushed tightly down to prevent play in the spindle.
- is at an angle of 90 degrees when tightening the two screws.

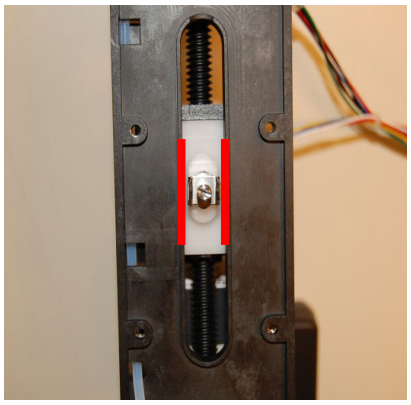



**14.** Push the transport block against the dispenser frame.



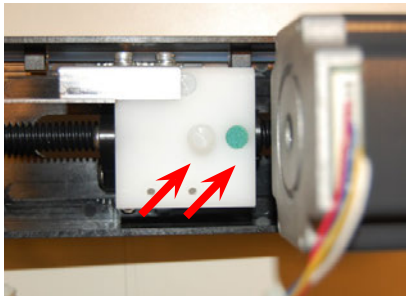
**15.** Readjust the syringe transport block until it is in the middle.

**Important!**
While holding it in this position, tighten the 3 screws.



**16.** Place the foam back in the hole and tighten the screw until it is even with the transport block.

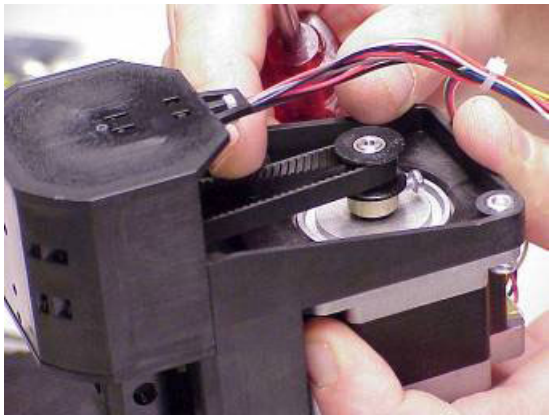
**17.** Mount the pulley back on the spindle and tighten the hex key.



## 8.9 Tensioning geared belts

The tension of the geared belts is very important!

1. If both belts can be twisted to about 45 degrees, the tension is correct.
2. Make sure to turn the pulley to line up the timing belt, before testing the tension.



## 8.10 Adjusting the tension

1. Move the motors to the back to tension the belts. Make sure that the belts are just free of play and not too tight.
2. The motor should be pressed to the right by finger pressure only while tensioning the mounting screws.

# 9. Adjustments

Most alignments of the AS 6.1L are done by software compensation. The corrections are programmed with a wizard.

ASM for AS 6.1L offers two adjustments options:

- A **Main adjustments** option for service engineers.
- A **Customer adjustments** option. This option allows the user to fine-tune the needle-tray piercing location.

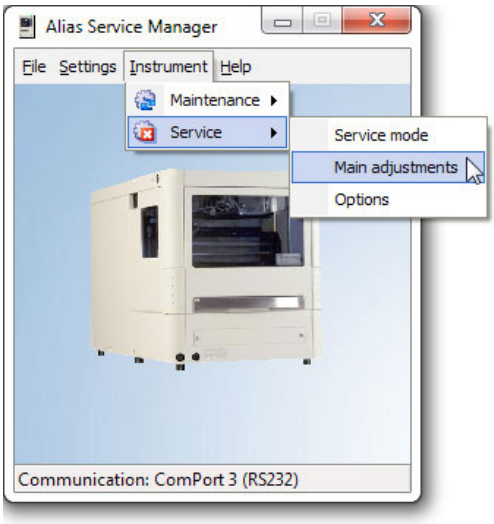
## 9.1 Main adjustments

This section describes adjustment of the following parts:

- Tray-needle
- Wash position
- Syringe

The factory adjustment parameters are written down on a label to make a PCB board replacement more convenient as these values are stored in the mainboard. See section „Adjustment parameters“ on page 55.

In ASM, select **Instrument > Service > Main adjustments**.




If asked, enter password: **101163** and click **OK**.

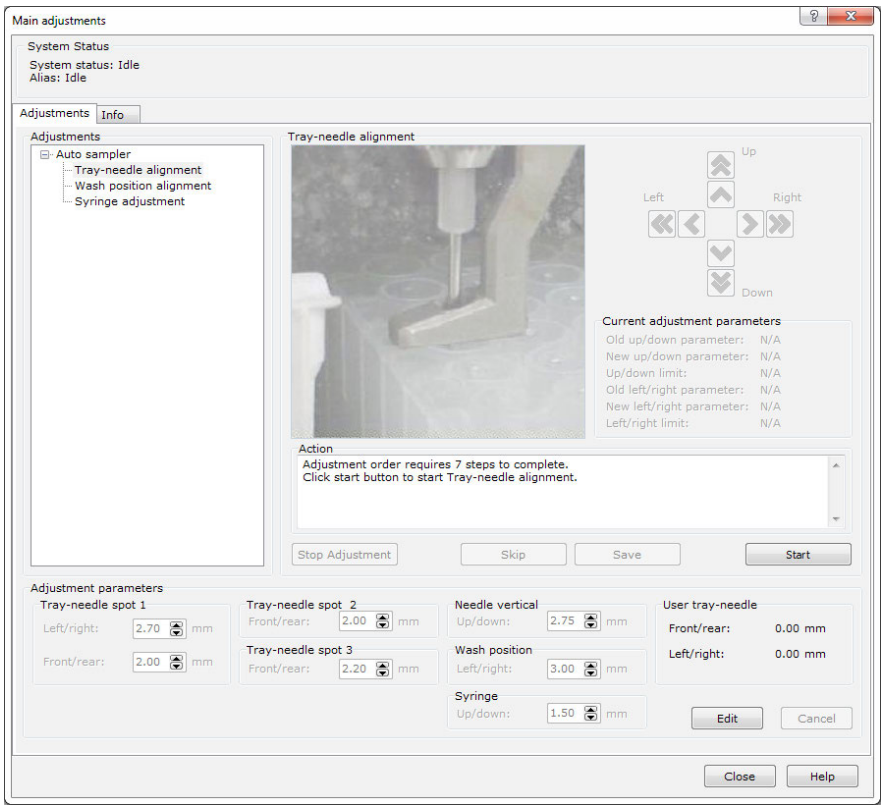



**Fig. 29:** Main adjustments

In the adjustments section (left), select the part that must be adjusted.

## 9.1.1 Tray-needle alignment

1. Click **Tray needle alignment** to select it.
2. Click **Start** and follow the wizard steps in the action screen; this will guide you through the alignment procedure.
3. Remove the plates from the carrier and click **Next**.
4. Install the needle stripper tool: The needle stripper tool is required to set the needle height and piercing position.

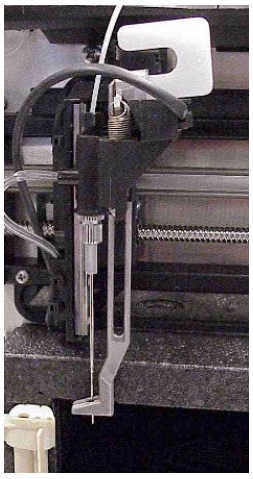


**Fig. 30:** Needle unit with installed stripper tool

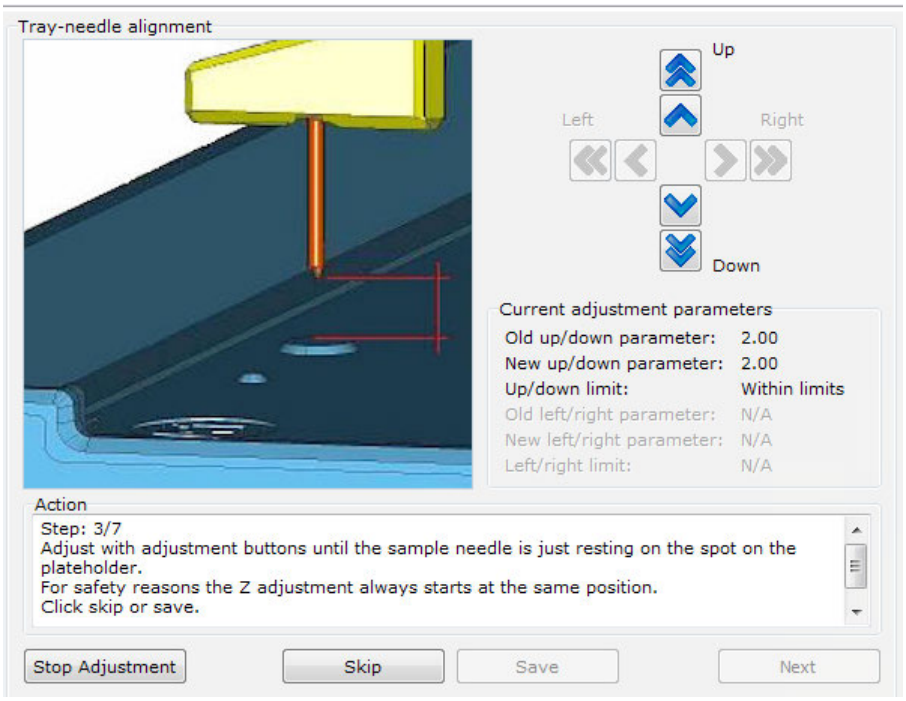



**Fig. 31:** Adjustment screen Needle-Tray step 3

5. Adjust the height of the needle using the up/down buttons or click Skip.
6. When ready, click **Save** and **Next.**

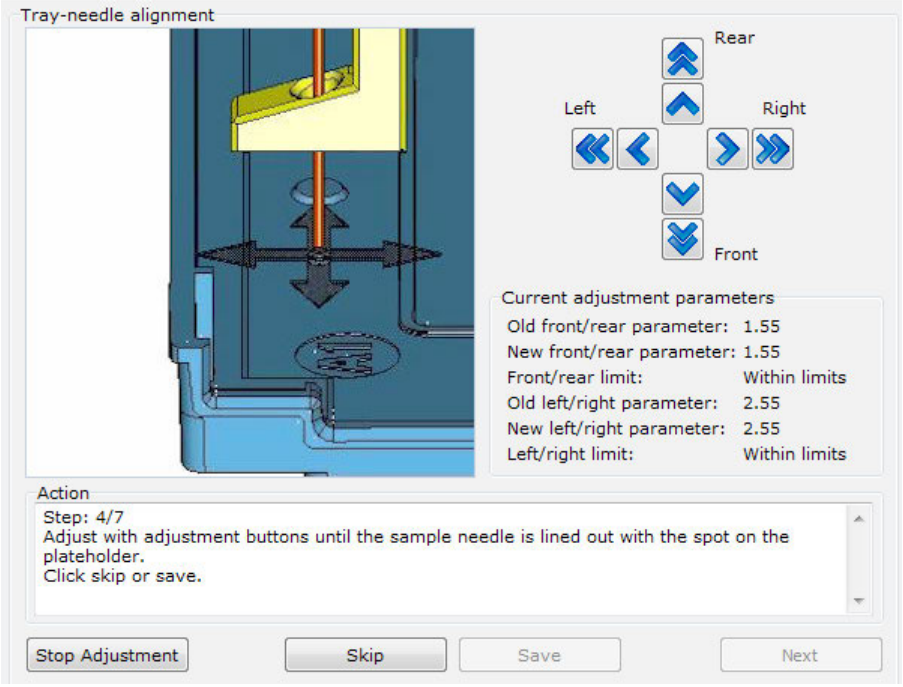



**Fig. 32:** Needle adjustment – step 4

7. Make the adjustment with the control buttons or click **Skip**.
8. When ready, click **Save** and **Next.**

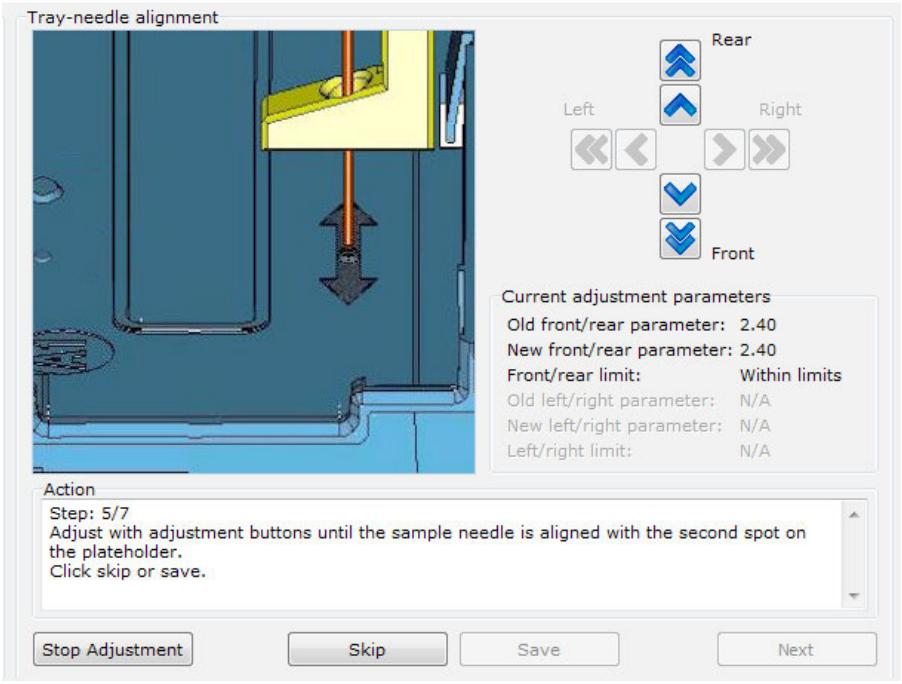



**Fig. 33:** Needle adjustment – step 5

9. Make the adjustment with the up/down buttons or click **Skip**.
10. When ready, click **Save** and **Next.**

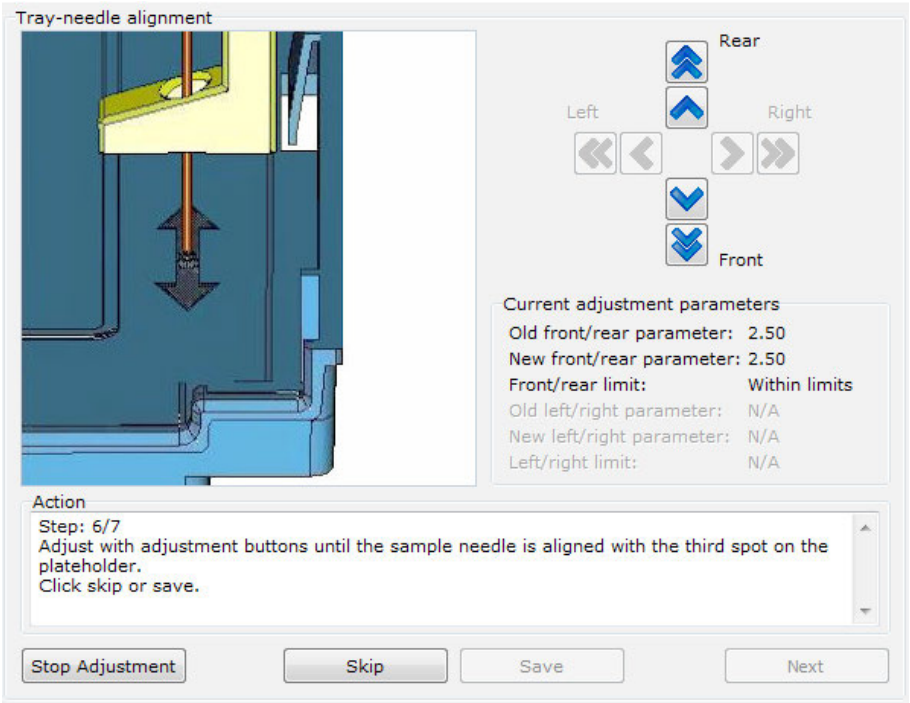



**Fig. 34:** Needle adjustment – step 6

11. Make the adjustment with the up/down buttons or click **Skip**
12. When ready, click **Save** and **Next**.
13. Remove the stripper tool.
14. Click **Finish**.

## 9.1.2 Wash position alignment

1. Click **Wash** position alignment to select it.
2. Click **Start** and follow the wizard in the action screen; this will guide you through the procedure.

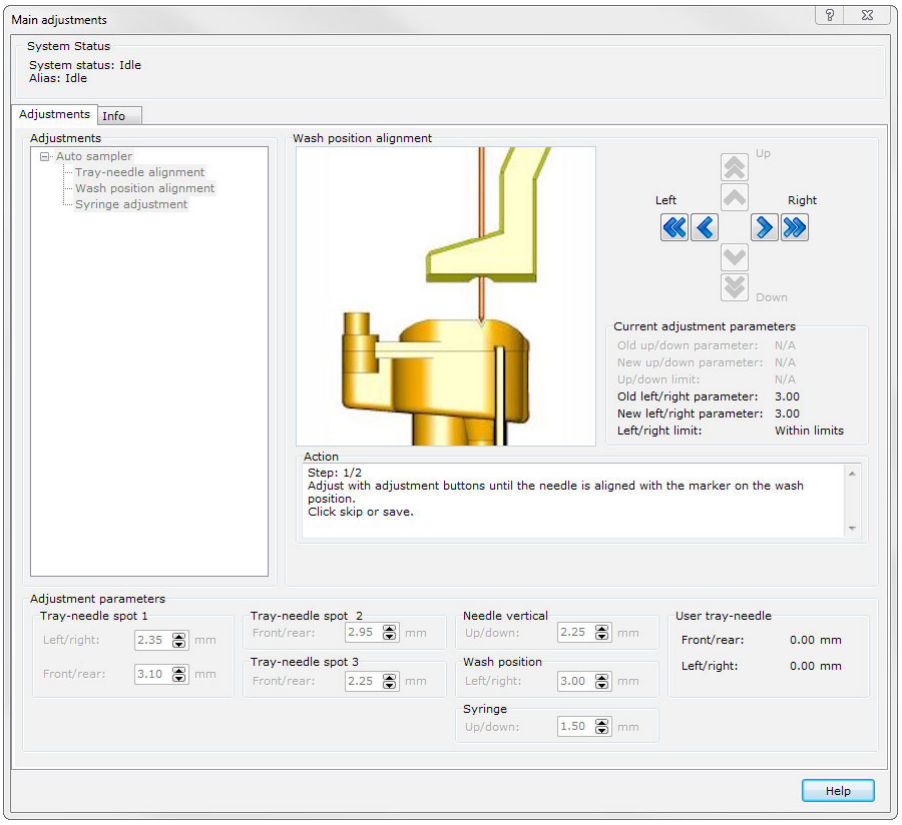



**Fig. 35:** Wash position adjustment

3. Make the adjustment with the left/right buttons or click **Skip**
4. When ready, click **Save** and **Finish**.

### 9.1.3 Syringe adjustment

1. Click **Syringe adjustment** to select it.
2. Click **Start** and follow the wizard in the action screen; this will guide you through the procedure.

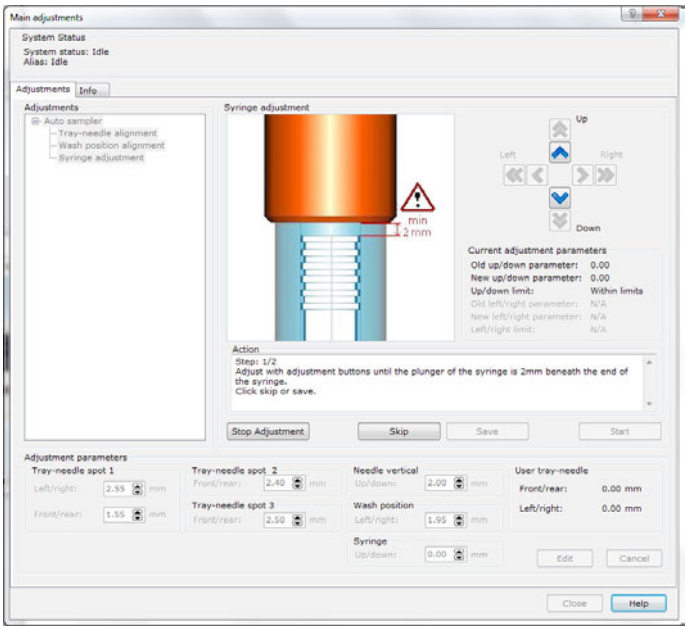



**Fig. 36:** Syringe adjustment

3. Make the adjustment with the up/down buttons or click **Skip**
4. When ready click, **Save** and **Finish.**

### 9.1.4 Adjustment parameters

The factory adjustment parameters are written down on a label to make a PCB board replacement more convenient as these values are stored in the mainboard.

The label is attached to the left side of the instrument.

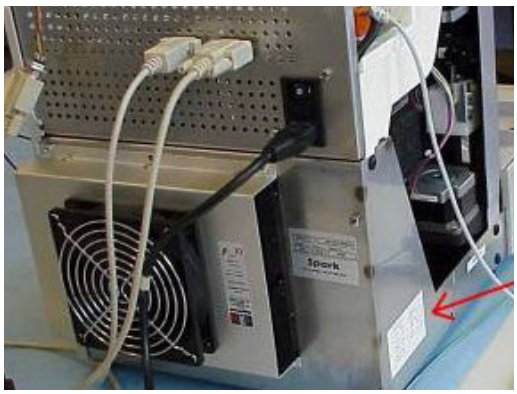


**Fig. 37:** Position of Label on Autosampler

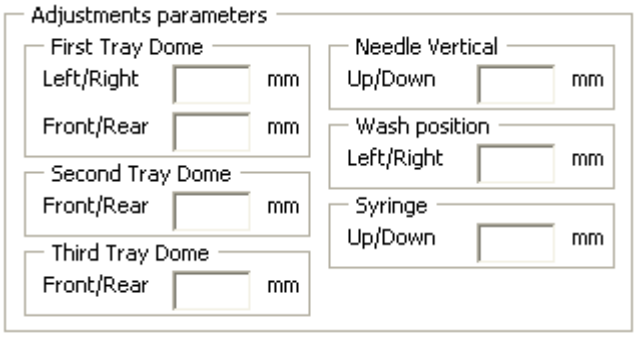



**Fig. 38:** Adjustment parameters label

- To manually change parameters, click **Edit**
- To store the parameters in the instrument, click **Set**.

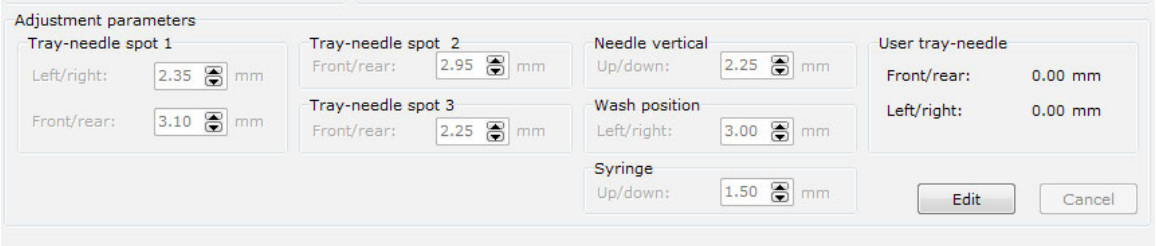



**Fig. 39:** ASM adjustment parameters

## 9.2 Customer adjustments

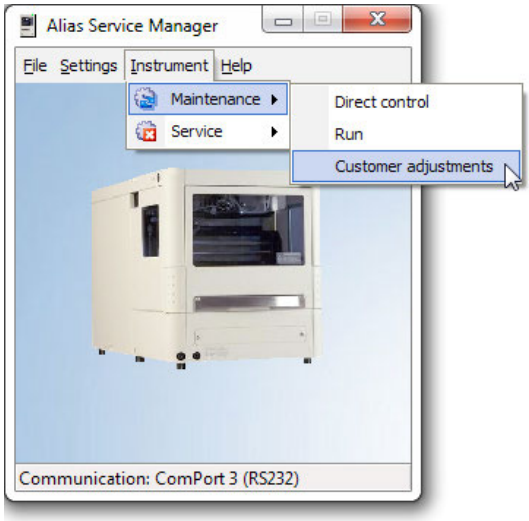
The customer adjustments section provides the ability to finetune the needle piercing point and syringe by the customer. No password is needed to perform these actions.

Maximum adjustment is limited.

In this section the following parts can be adjusted:

- Needle - Tray
- Syringe
- An Info tab provides information on installed software versions.

In ASM, select **Instrument > Maintenance > Customer adjustments**.




The customer adjustments window opens.

### 9.2.1 Needle-Tray tab

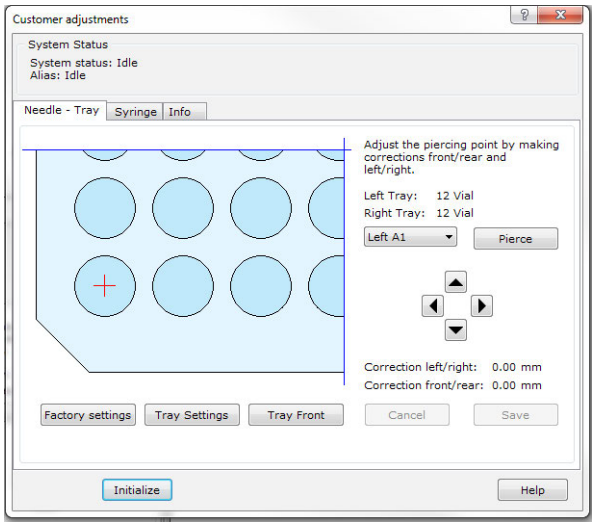



**Fig. 40:** Customer adjustments - Needle –Tray tab

| | |
|---|---|
| **Factory settings** | Reset any change to Factory default settings. |
| **Tray settings** | The plate settings can be changed to 12 vial, 48 vial, 96 high well, 96 low well, 384 low well and 84+3 tray. |
| **Tray front** | Moves the tray to the front position |
| | The piercing point can be adjusted/corrected to customer requirements. Use the arrow buttons to change the needle piercing point.<br>Click **Save** to store the correction. Click **Cancel** to abort |

### 9.2.2 Syringe tab

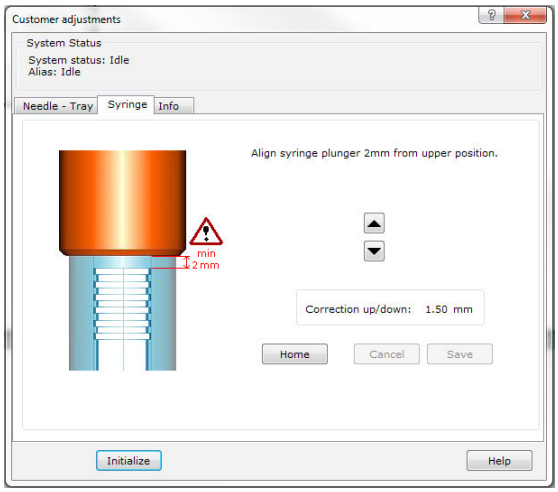



**Fig. 41:** Customer adjustments - Syringe tab

Align the syringe plunger 2mm from the upper position.

- Use the arrow buttons to adjust/correct the position.
- Click **Home** to initialize the dispenser. Click **Save** to store the correction. Click **Cancel** to abort.

### 9.2.3 Info tab

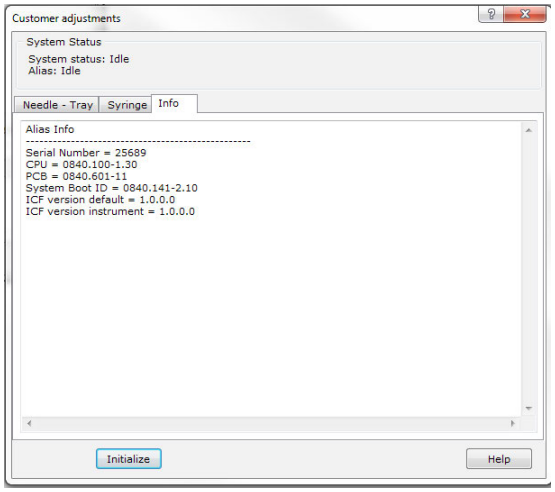



**Fig. 42:** Customer adjustments – Info tab

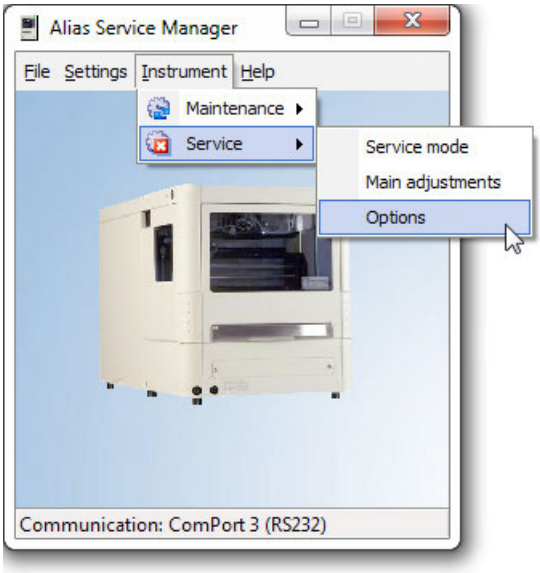
This tab provides information on the installed hard/software versions in the instrument.

## 9.3 Options

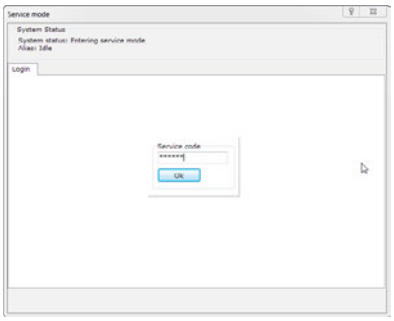
In this menu the installed options can be managed.

If an option is added or main PCB board is replaced, the settings must be programmed here.

1. In ASM, select **Instrument > Service > Options**.




The Password dialog box appears:



2. Enter password: **101163**
3. Click OK. The service options window appears. Available tabs in this window are discussed in the following sections.

### 9.3.1 Options tab

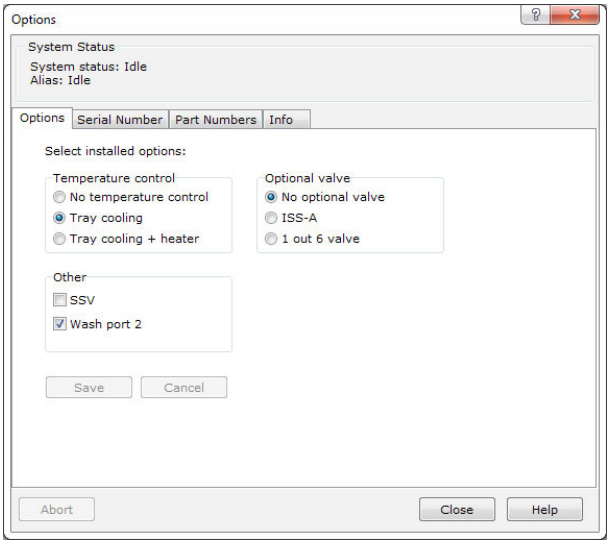



**Fig. 43:** Options - Options tab

1. Activate the installed options by selecting them.
2. Click Save to store the changes.

Do not activate options that are not physically installed.

### 9.3.2 Serial number tab

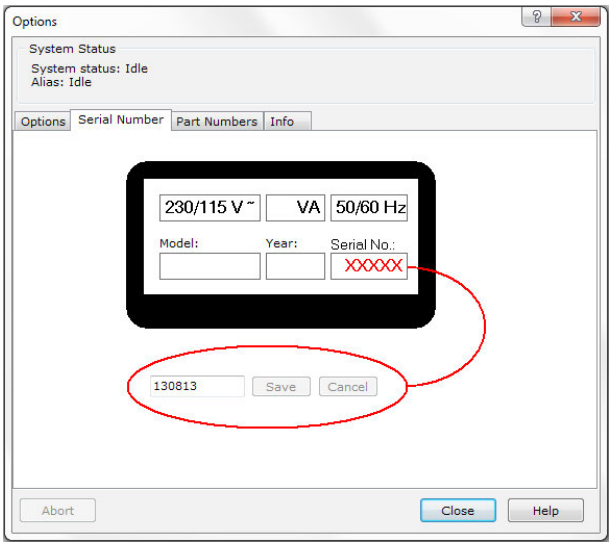



**Fig. 44:** Options - Serial number tab

1. Enter the serial number of the instrument (on the rear side of the instrument).
2. Click **Save** to store the changes.

### 9.3.3 Part Numbers tab

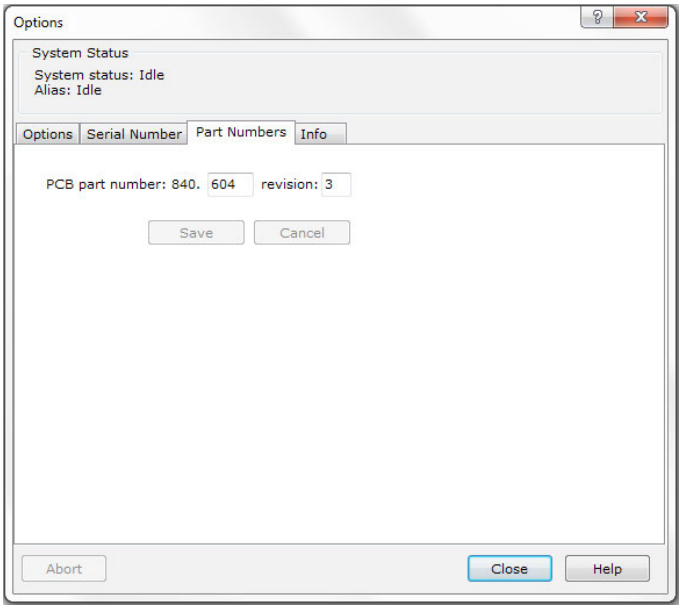



**Fig. 45:** Options – Part Numbers tab

1. Enter the Part number and revision of the installed main PCB.
2. Click Save to store the information.

### 9.3.4 Info tab

This tab provides information on the installed hard/software versions in the instrument.

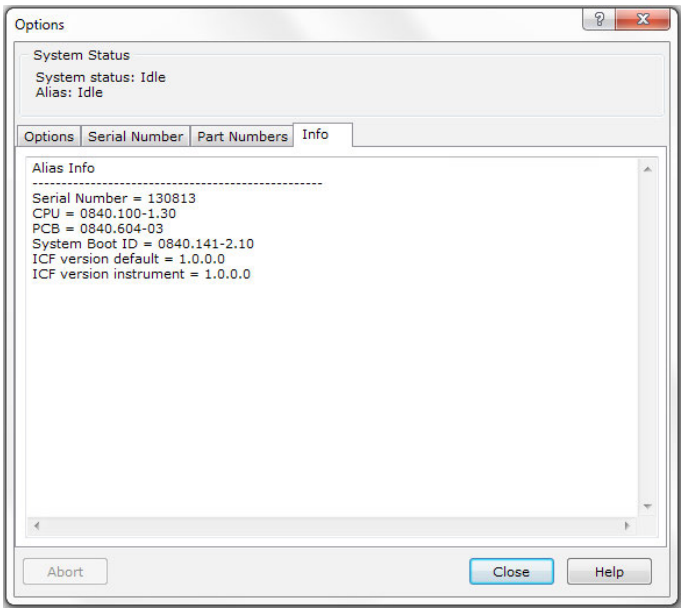



**Fig. 46:** Options - Info tab

## 9.4 Updating firmware

Via the Ethernet port the firmware of the AS 6.1L can be upgraded from the PC by uploading a flash file to the Autosampler.

### 9.4.1 Upload procedure

Uploading of software can only be done when the AS 6.1L is in the Ready status. When the AS 6.1L flash memory already contains software, use the following procedure.

1. In ASM, select **File > Flash > Flash upload.**

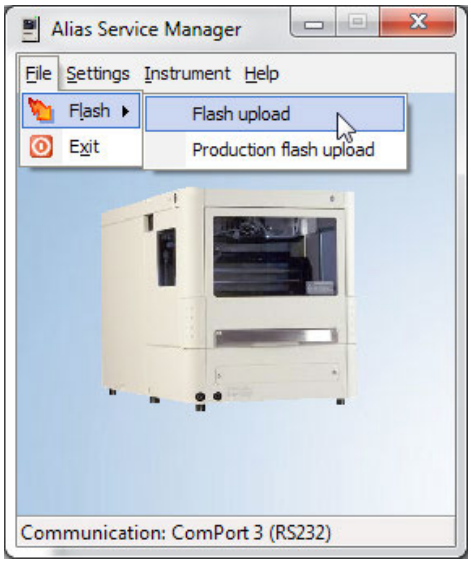



**Fig. 47:** Flash

2. Connect the ethernet cable.
3. Start the ASM.
4. Select File > Flash > Flash upload.
5. Click **Browse** and go to the flash file you wish to upload.

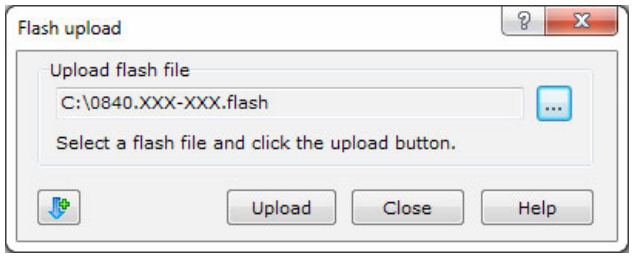



**Fig. 48:** Flash upload

6. Click **Upload** to initiate the upload process.
   The following dialog appears:

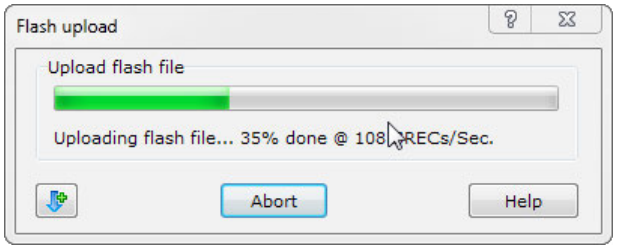



**Fig. 49:** Upload in progress

The upload is successful if the following dialog appears and the AS 6.1L is initializing:

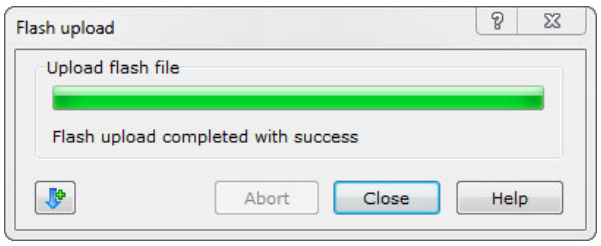



**Fig. 50:** Upload successful

You can check firmware version via Direct control.

### 9.4.2 Upload error

The upload has failed if the following dialog appears:

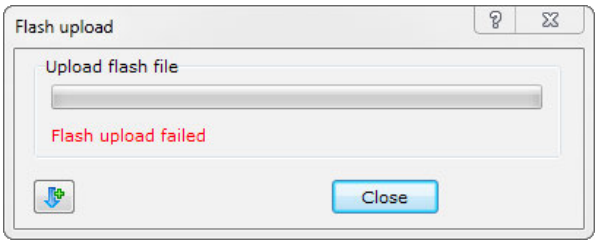



**Fig. 51:** Flash upload error

Perform the following actions if the upload has failed:

1. Check the communication settings. RS232, USB, Ethernet.
2. Attempted to load the wrong flashfile. It is only allowed to load a flash with same part number.

Flash file Part number setup:

| Type of instrument | Version | Revision |
|---|---|---|
| 0840 (AS 6.1L) | XXX | XXX |

Type of instrument and version should be the same as installed, otherwise the upload will fail.

Contact your Technical Support Specialist if there still are problems during uploading.

### 9.4.3 Reset of correct communication settings

**Note:** This section describes the resetting of communication parameters.

After firmware upload the communication settings can be incorrect.

Perform the steps below only if problems with communication are observed.

1. Start a web browser and enter the IP address of the AS 6.1L to connect with the autosampler (the IP address can be read out via the ASM software).

2. After the page is loaded use the following Login data:
   - Username: **root**
   - Password: **dbps**


**Fig. 52:** Login to configuration interface

3. IMPORTANT: Create a backup of the current settings first.
   Select "**Backup/Restore**", create a backup and save the file.
   (In case the backup has to be restored, use the same menu and select the saved backup file.)

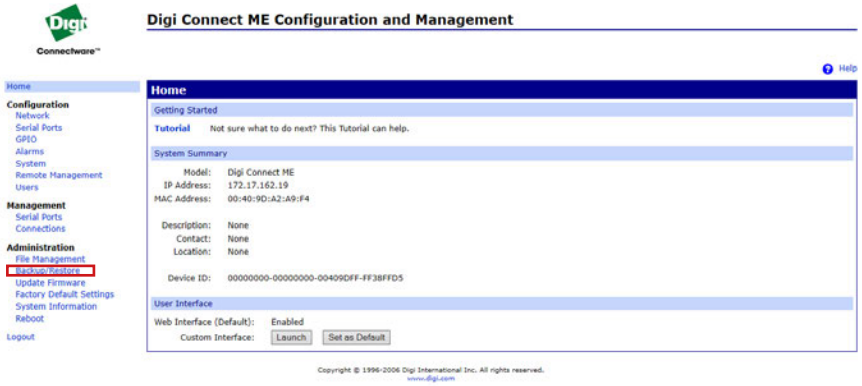



**Fig. 53:** Backup/Restore option

4. Select "**Serial Ports**" to check the current communication settings.

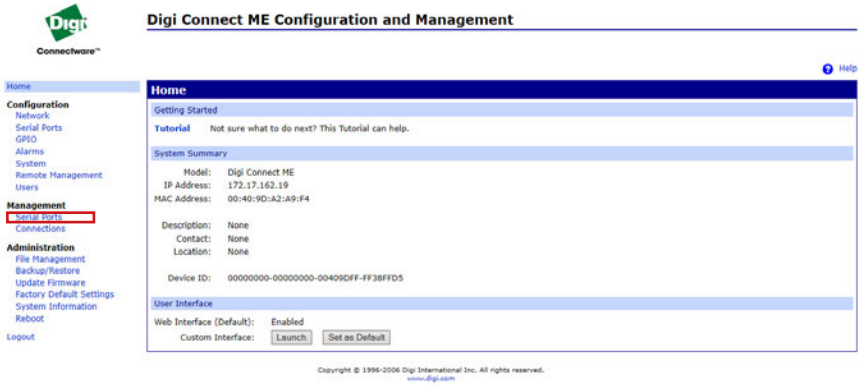



**Fig. 54:** Serial ports option

The "**Serial port configuration**" must be configured as follows:

- Port: Port 1
- Description: None
- Profile: TCP Sockets
- Serial Configuration: 9600 8N1

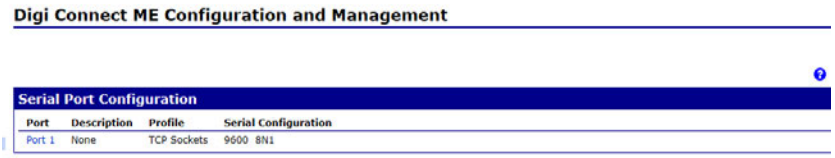



**Fig. 55:** Serial port configuration

If the configuration is not as indicated, proceed with the following steps.

5. Click "**Port 1**" to access the "**Serial Port Configuration**" menu.

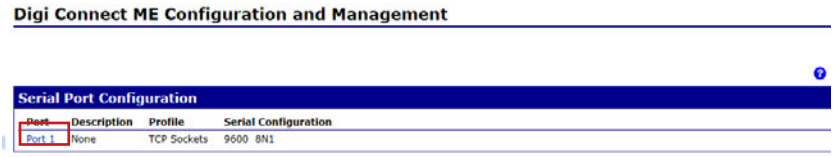



**Fig. 56:** Selecting "Port 1"

6. Check if the tab "**Port Profile Settings**" lists TCP Sockets as current port profile.


**Fig. 57:** Current profile: TCP sockets

If necessary, change the profile by clicking "**Change Profile...**" and selecting "**TCP Sockets**" in the respective menu.

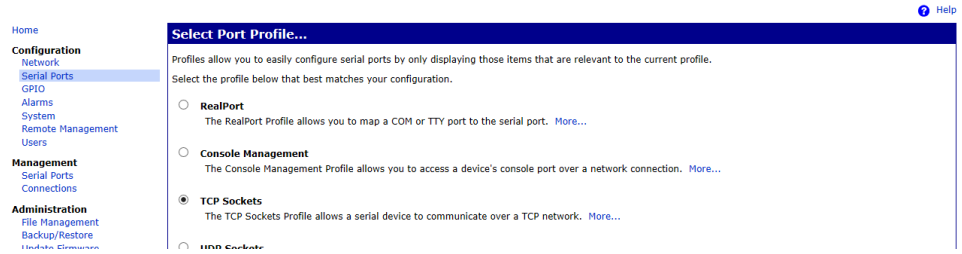



**Fig. 58:** Changing current profile

Also check the "**TCP Server Settings**" in the "**Port Profile Settings**" tab and change to the following values if necessary:

- Enable Telnet access using TCP Port: 2001
- Enable Raw TCP access using TCP Port: 2101
- Enable Secure Socket access using TCP Port: 2601

The option "**Automatically establish TCP connections**" in the "**TCP Client Settings**" section has to be de-activated.

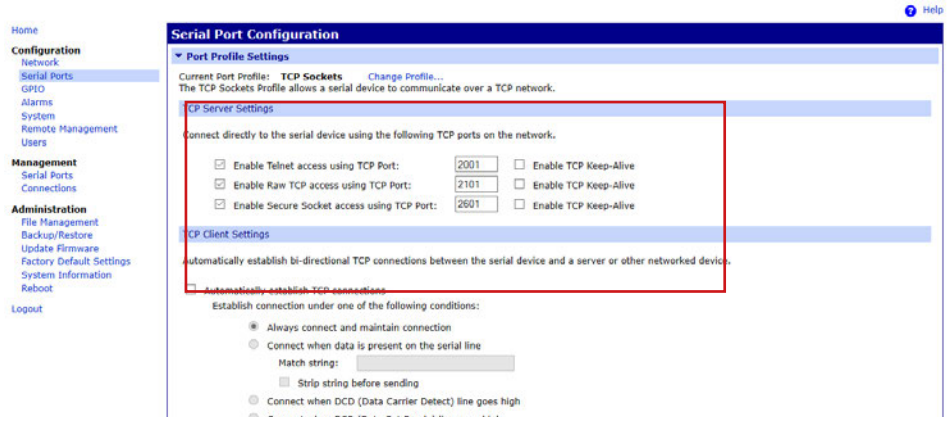



**Fig. 59:** Port Profile Settings

7. Select the "**Basic Serial Settings**" tab in the "**Serial Port Configuration**" menu and set the parameters as follows:

- Description: empty
- Baud Rate: 9600
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

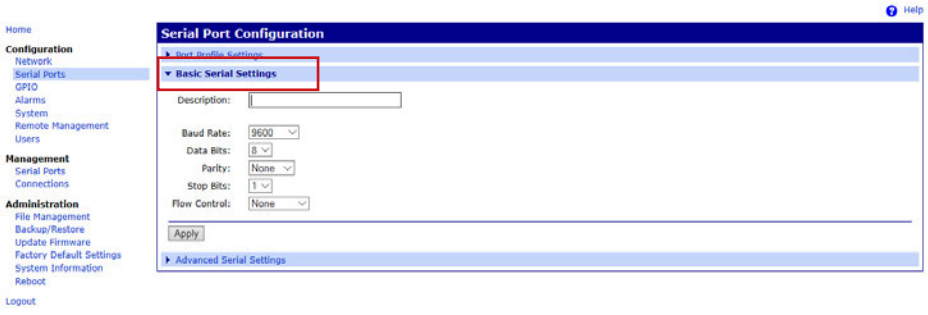



**Fig. 60:** Basic Serial Settings

8. Click "**Apply**" to confirm settings.

9. Click "**Reboot**" and wait 1 min before you proceed to work with the AS 6.1L.

**Optional:**

**10.** To verify the correct settings first check if the "**Telnet Client**" is activated. Open the "P**rogram and Features**" menu of Windows and click "**Turn Windows features on or off**".

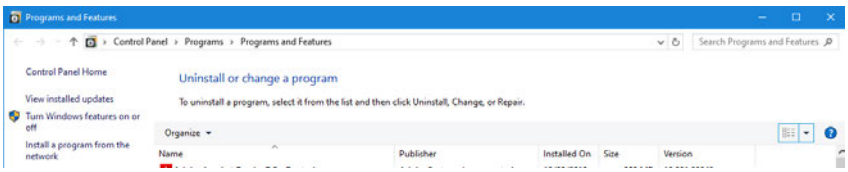



**Fig. 61:** Windows program features menu

If necessary,activate the "**Telnet Client**".

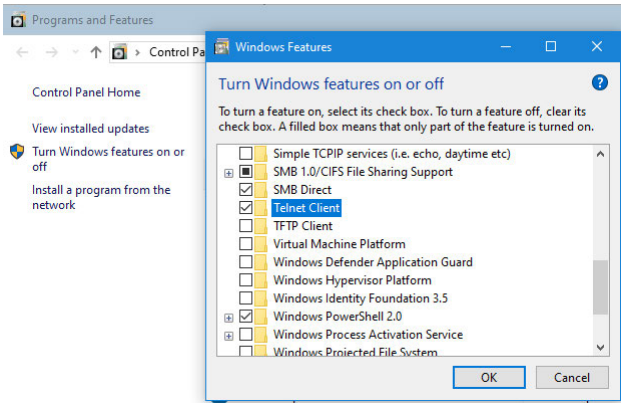



**Fig. 62:** Activating Telnet Client in Windows features

**11.** Open the CMD shell (cmd.exe), type "ping <AS6.1L_ip-address>" and press enter. In the example the IP address is 172.17.162.19.

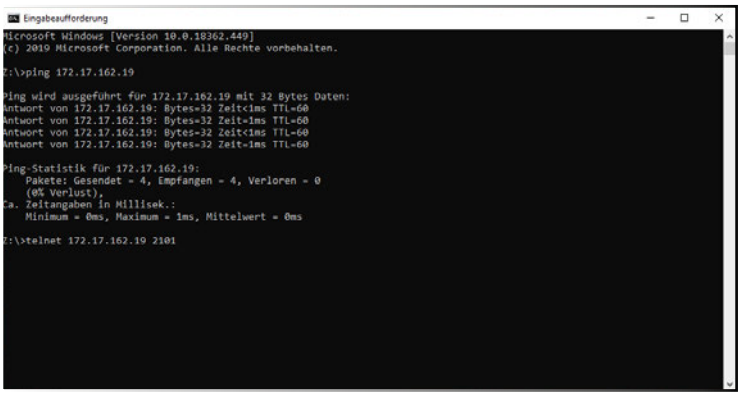



**Fig. 63:** CMD shell with IP address 172.17.162.19.

**12.** If ping was successful, type “telnet <AS6.1L_ip-address> 2101” and press enter (e.g. “telnet 172.17.162.19 2101”).

The shell should be completly empty now (“black screen”). Now press <CTRL+B>, type 61011001000152 and press <CTRL+C>. After the last command <CTRL+C> a response listing the numbers 61010152000000 will be displayed on the screen.


**Fig. 64:** Successful response in CMD shell

**Note:** Avoid making any mistakes when entering the characters. All numbers must be entered without spaces. <CTRL+B> means: hold ‘Control’ key, and press <B>. During the entering of the numbers, the characters will not be echoed.

# 10. Performance inspection

## 10.1 Analytical test

The analytical performance of the AS 6.1L is tested with the following procedure.

This procedure describes two versions of the AS 6.1L:

- The Standard version
- The Prep version.

The test routines are pre-programmed in AS 6.1L Service Manager (ASM) to access them:

1. Open ASM, select **Instrument > Service > Service Mode**.
2. Enter password: 101163 and click **OK**.
3. Select the Validation – Lifetest tab.

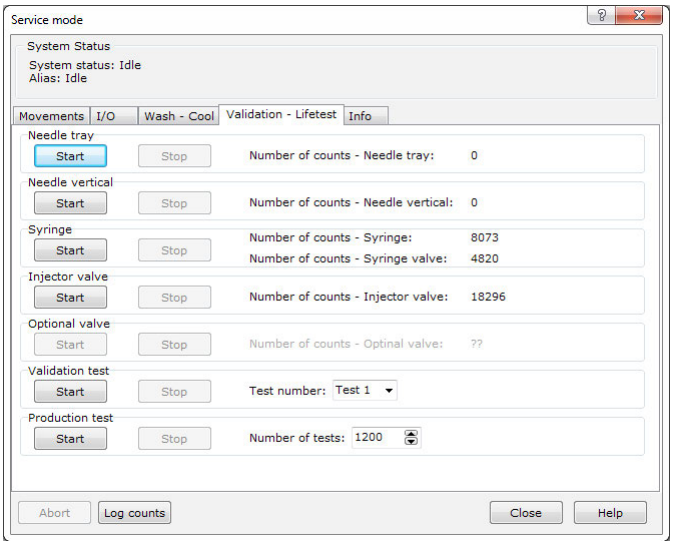



**Fig. 65:** Validation - Lifetest

4. Select the required test number.
   - # 1: µL pickup,
   - # 2: partial loop fill
   - # 3: full loop
   - # 4: prep mode
5. Click **Start**.

## 10.2 Test procedure: AS 6.1L standard

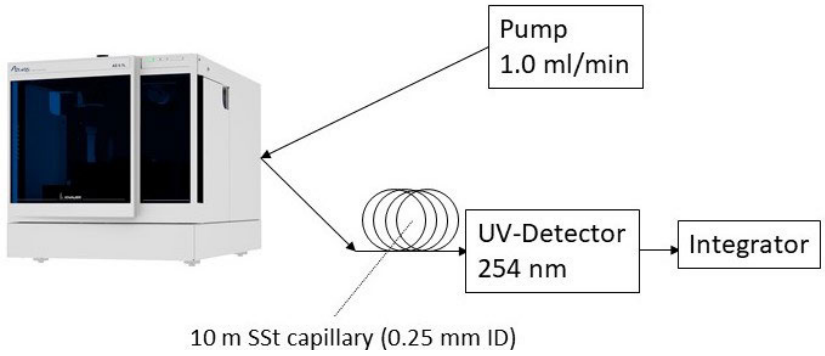



**Fig. 66:** AS 6.1L in analytical test setup

**Settings:**

| | |
|---|---|
| Mobile phase and wash solvent: | H2O |
| Volume of installed loop: | 100 µL |
| Syringe volume: | 250 µL |
| Syringe speed | normal |
| Needle-valve tubing volume **:** | 15 µL |
| Buffer tubing: | 500 µL |
| Tray type: | High 96 well |
| Head space pressure | no |
| Air segment: | no |

**Methods**:

| **Test #1** | **µL pick-up** |
|---|---|
| Injection volume: | 10 µL |
| Wash: | Between injections |
| Wash volume: | 500 µL |
| Analysis time: | 01:00 |
| Sample | 50 ppm uracil |
| Injections/well: | 3 |
| First sample: | A1 |
| Last sample: | A5 |

| **Test #2** | **Partial loop fill** |
|---|---|
| Injection volume: | 10 µL |
| Flush volume: | 45 µL |
| Wash: | Between injections |
| Analysis time: | 01:00 |
| Sample: | 50 and<br>1000 ppm uracil |
| Injections/well | 3 |
| First sample: | A6 |
| Last sample: | A12 |

Fill the following wells:

| | |
|---|---|
| A 1 - A10: | 50 ppm uracil |
| A11: | 1000 ppm uracil |
| A12: | $H_2O$ |

Determine for µL pick-up the RSD and determine the RSD and carry-over of the partial loop fill injection by:

$$RSD\% = \frac{\sigma_{n-1}}{Peak\ area} \times 100\% \qquad Carry\ over = \frac{Peak\ area\ blank \times 5}{Peak\ area\ \theta\ \ ppm}\ \%$$

**Note:** If carry over is out of specs, this might be caused by contamination of the used liquids.

The calculated RSD and carry over must be within the following specs:

| | |
|---|---|
| Reproducibility | ■ RSD ≤ 1.0% for µl pick-up injections<br>■ RSD ≤ 0.5% for partial loop fill injections |
| Cary over | < 0.05% with programmable needle wash |

## 10.3 Test procedure AS 6.1L Prep

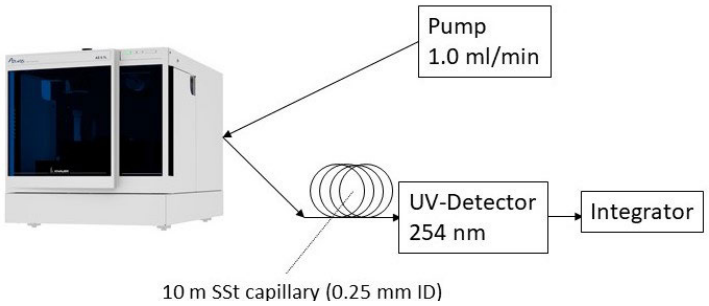



**Fig. 67:** Prep AS 6.1L in analytical test setup

**Settings:**

| | |
|---|---|
| Mobile phase and wash solvent: | H2O |
| Volume of installed loop: | 10 mL |
| Syringe volume: | 2500 µL |
| Syringe speed | normal |
| Needle-valve tubing volume: | 60 µL |
| Buffer tubing: | 2000 µL |
| Tray type: | 12-vial plate |
| Head space pressure | yes |
| Air segment: | no |

**Method:**

| Test #3 | Partial loop fill |
|---|---|
| Injection volume: | 100 µL |
| Flush volume: | Automatically taken from needle-valve tubing volume |
| Wash: | Between injections |
| Wash volume: | 500 µL |
| Analysis time: | 01:00 |
| Sample | 5 and 100 ppm uracil in H2O |
| Injections/well: | 3 |
| First sample: | A1 |
| Last sample: | B3 |

Fill the following wells:

| | |
|---|---|
| AA1 – B15: | 5 ppm uracil |
| B2: | 100 ppm uracil |
| B3: | $H_2O$ |

$$RSD\% = \frac{\sigma_{n-1}}{Peak\ area} \times 100\% \qquad Carry\ over = \frac{Peak\ area\ blank \times 5}{Peak\ area\ 5\ ppm}\ \%$$

The calculated RSD and carry over must be within the following specs:

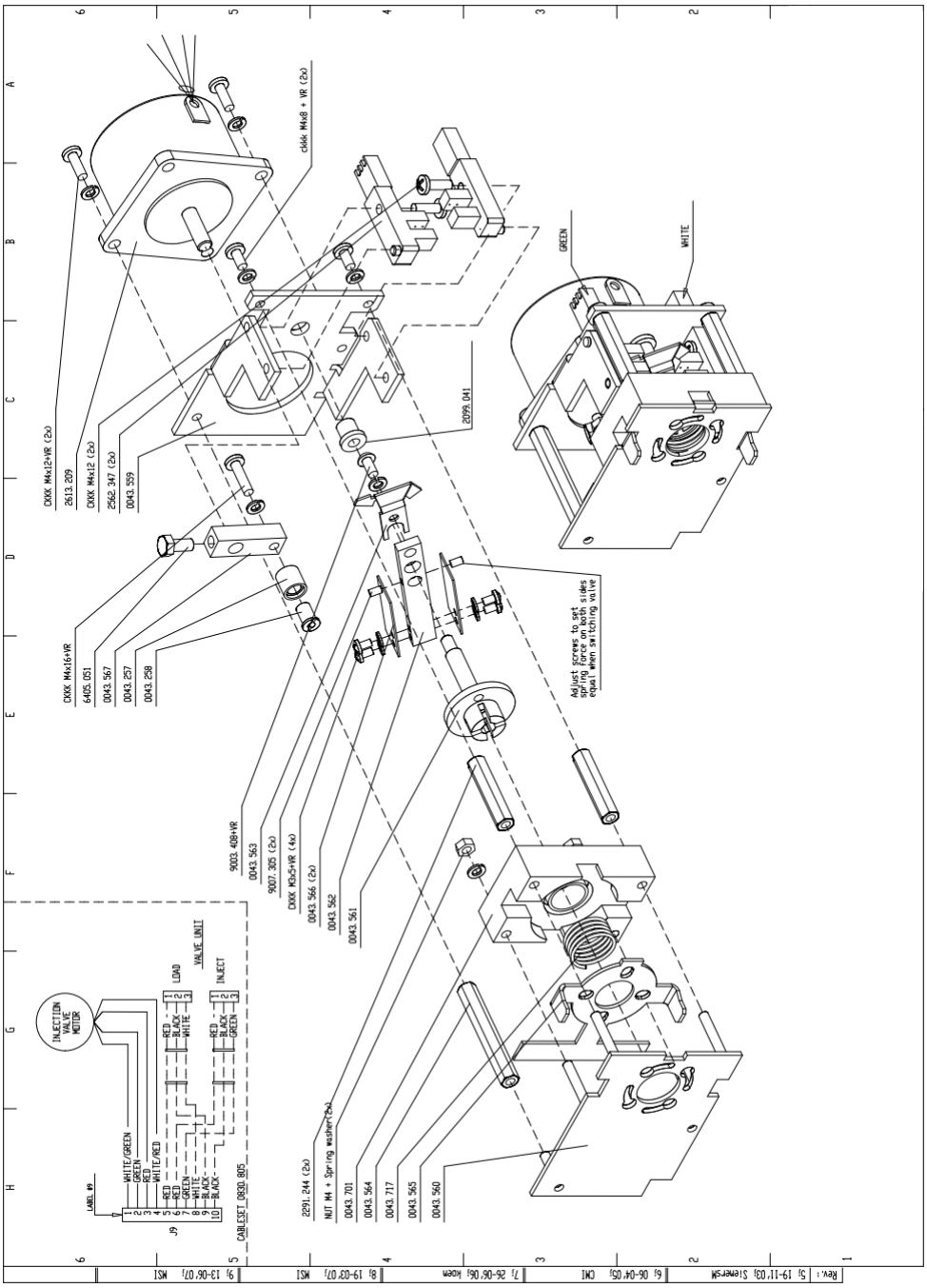
| | |
|---|---|
| RSD | ≤ 1.0% |
| Cary over | < 0.05% |

# 11. Exploded views and PCB layouts

## 11.1 Valve unit

### 11.1.1 Exploded view: Valve unit

Valve unit assembly up to serial number 60008



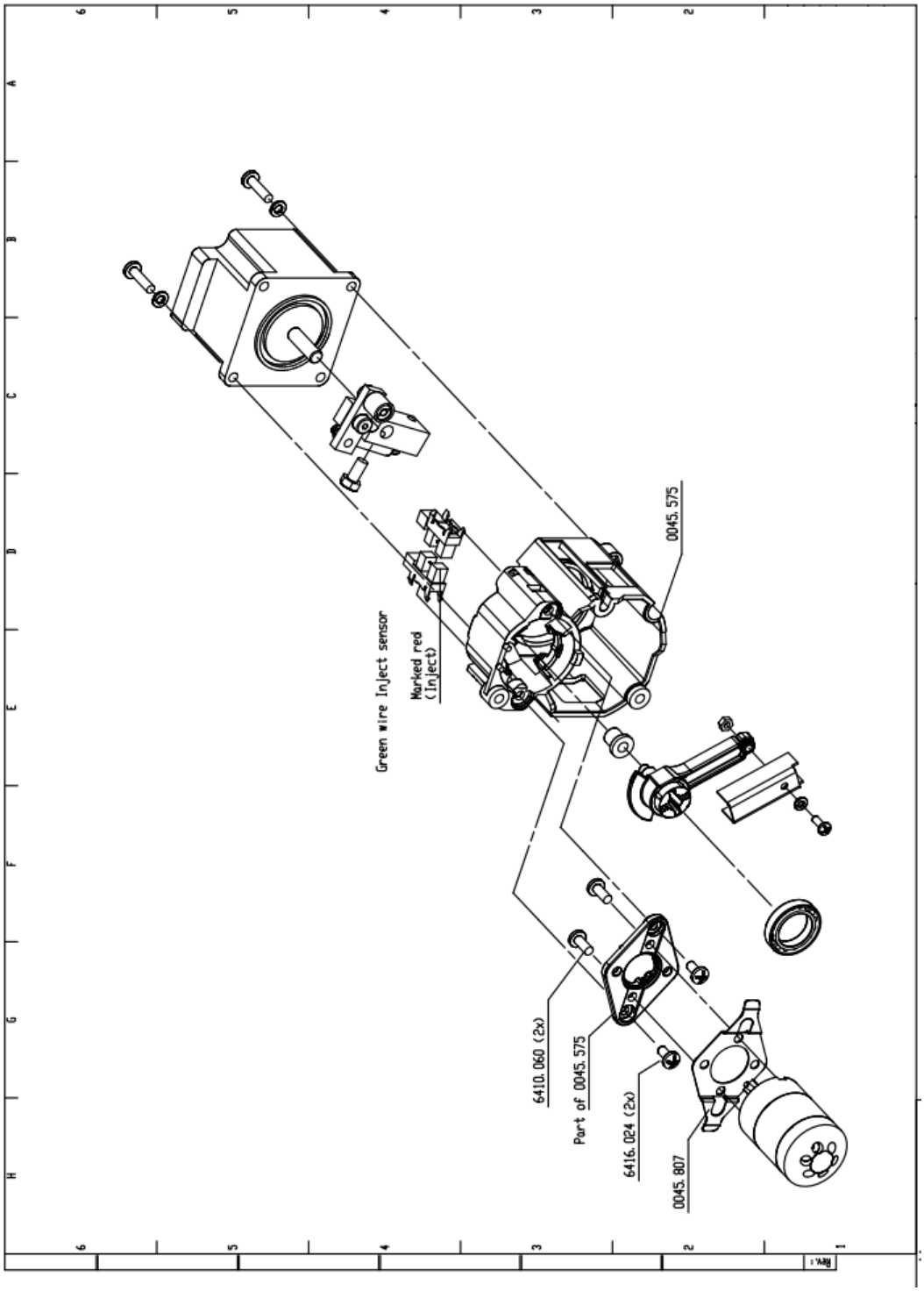
### 11.1.2 Parts list: Valve unit

| Comp. Item | Description | Qty |
|---|---|---|
| 0043.257 | Sleeve bearing | 1 |
| 0043.258 | Bearing axle | 1 |
| 0043.559 | Sensor motor plate | 1 |
| 0043.560 | Valve plate | 1 |
| 0043.561 | Connection axle | 1 |
| 0043.562 | Valve lever | 1 |
| 0043.563 | Sensor flag | 1 |
| 0043.564 | Column 830 | 1 |
| 0043.565 | Locking plate | 1 |
| 0043.566 | Valve spring | 2 |
| 0043.567 | Motor Lever | 1 |
| 0043.701 | Support block 830 | 1 |
| 0043.717 | Bajonet spring | 1 |
| 0830.805 | Valve wiring set | 1 |
| 2099.041 | Nylon bearing 5mm | 1 |
| 2291.244 | Distance bush M4x7x35 | 2 |
| 2562.347 | Optical Sensor | 2 |
| 2613.209 | Repl. Stepper motor incl. valve wiring | 1 |
| 6405.051 | Bolt hexagonal SS M5x10 | 1 |

## 11.2 Valve unit 840

### 11.2.1 Exploded view: Valve unit 840

Valve unit assembly from serial number 60008 and up.



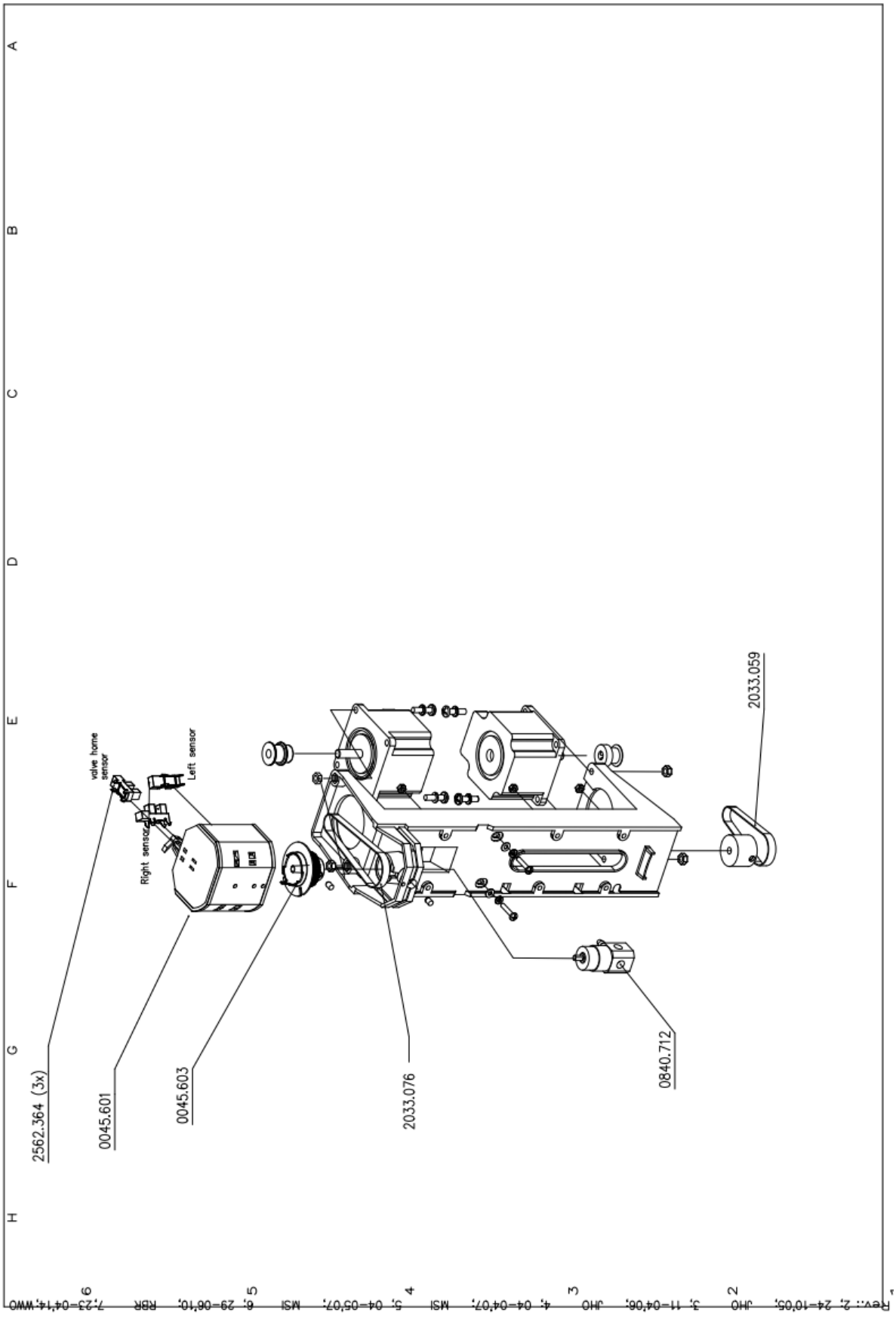
The Valve unit assembly is only available as a complete assembly!

### 11.2.2 Parts list: Valve unit 840

| Article no. | Component | Description | Qty |
|---|---|---|---|
| | 0045.575 | Base frame | 1 |
| | 0045.807 | Valve screw holder | 1 |
| M2065 | 2562.364 | Optical Sensor KIT5031C | 2 |
| | 6410.060 | Screw SS | 2 |

## 11.3 Syringe Dispenser 840

### 11.3.1 Exploded view: Syringe Dispenser 840



### 11.3.2 Parts list: Syringe Dispenser 840

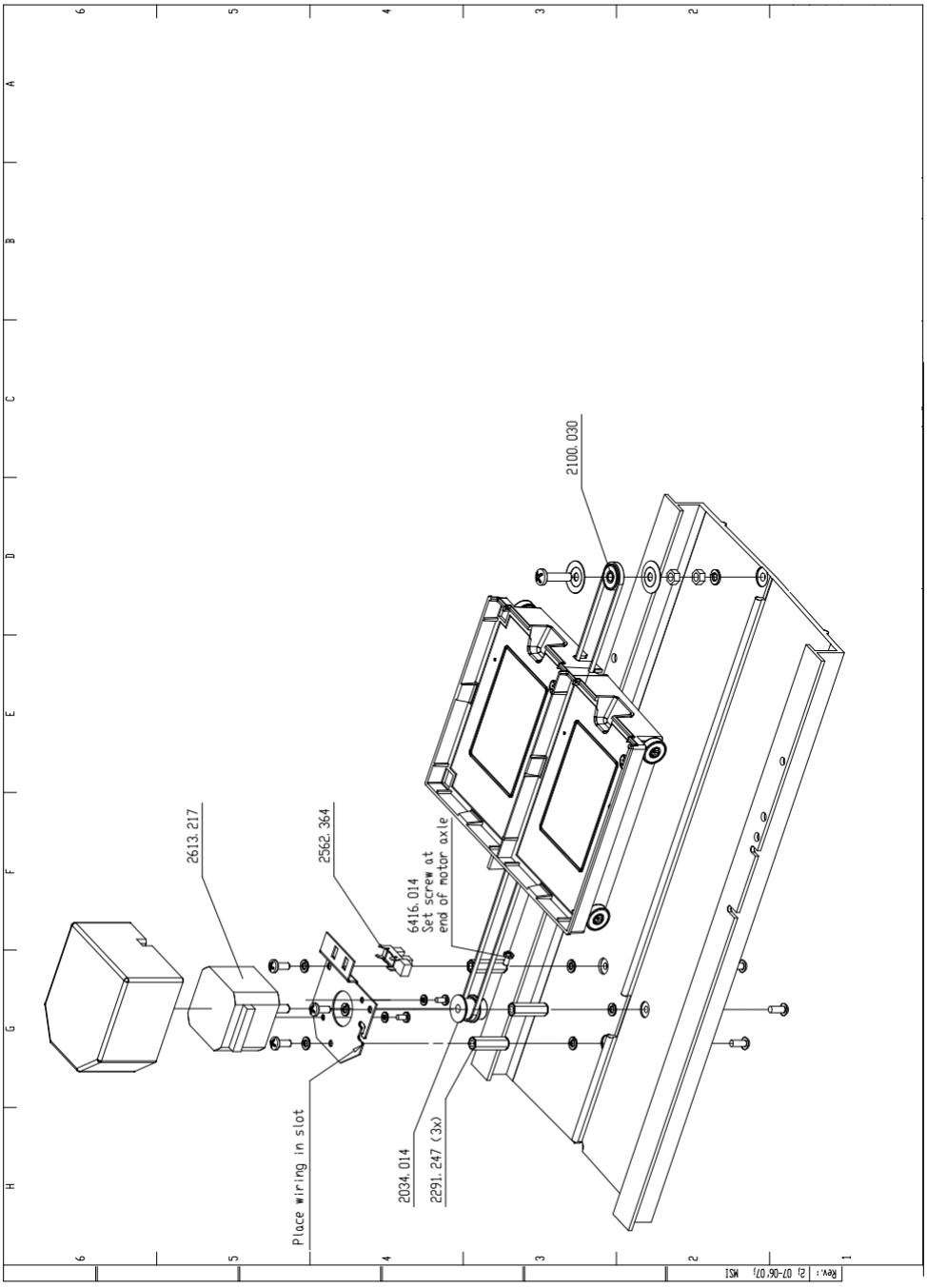
| Article no. | Component | Description | Qty |
|---|---|---|---|
| M2060 | 2033.059 | Toothed belt 600 MXL025 | 1 |
| M2061 | 2033.076 | Geared belt 760 MXL 025 | |
| | 0045.601 | Valve sensor hood | 4 |
| M20542 | 0045.603 | Timing belt pulley 40MXL | |
| M2065 | 2562.364 | Optical Sensor KIT5031C | 1 |
| M2052 | 0840.712 | Syringe valve including valve bush | 1 |

## 11.4 Needle module 840

The needle unit assembly is only available as a complete assembly! Therefore, no exploded view is available.

# 11.5 Tray drive

## 11.5.1 Exploded view: Tray drive

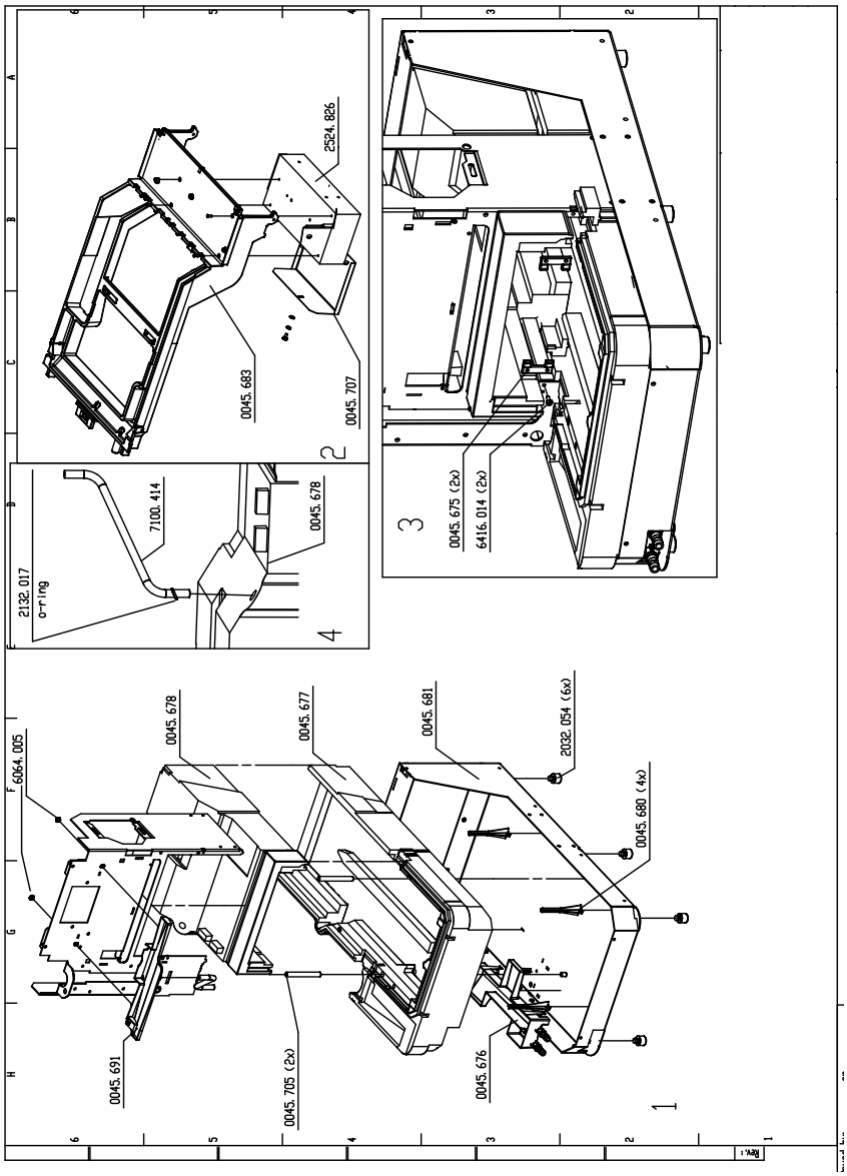



## 11.5.2 Parts list: Tray drive

| Article no. | Component | Description | Qty |
|---|---|---|---|
| | 2034.014 | Pulley PLA 20MXL025 / 6F-5 | 1 |
| | 2100.030 | Ballbearing 625-2Z-SS Economy | 4 |
| M2065 | 2562.364 | Optical Sensor KIT5031C | 1 |
| M20651 | 2613.217 | Stepper motor KH42HM2B155 | 1 |

## 11.6 AS 6.1L Mainframe

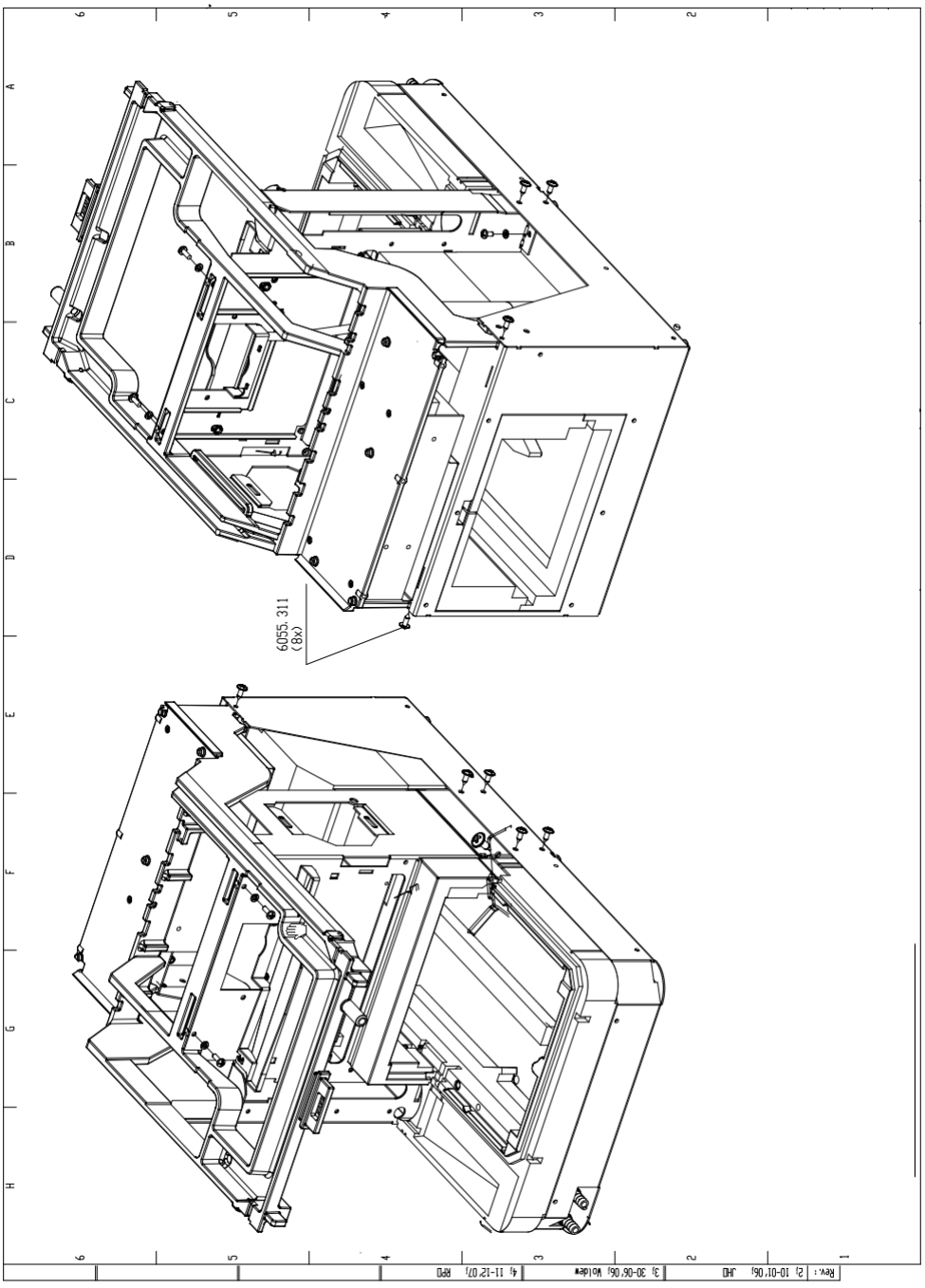
### 11.6.1 Exploded view: Mainframe page 1/9



## 11.6.2 Parts list: Mainframe page 1/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0045.675 | Position plate | 2 |
| | 0045.676 | Drain reservoir | 1 |
| | 0045.677 | Insulation bottom | 1 |
| | 0045.678 | Insulation top | 1 |
| | 0045.680 | Snap-in spacer | 4 |
| | 0045.681 | Bottom plate | 1 |
| | 0045.683 | Top frame casting | 1 |
| | 0045.691 | Leak bin valve | 1 |
| | 0045.705 | Bush tray frame | 2 |
| | 0045.707 | Power supply air plate | 1 |
| | 2032.054 | Skiffy feet 16x12 mm | 6 |
| | 2132.017 | O-ring NBR 9,25 x 1,78 | 1 |
| M2064 | 2524.826 | Power supply 200 Watt 24 Volt | 1 |
| | 7100.414 | Silicon hose ID=5,0 OD=8,0 | 0.3 |
| | 6064.005 | Nut M5 | 2 |
| | 6416.014 | Screw SS M3x6 | |

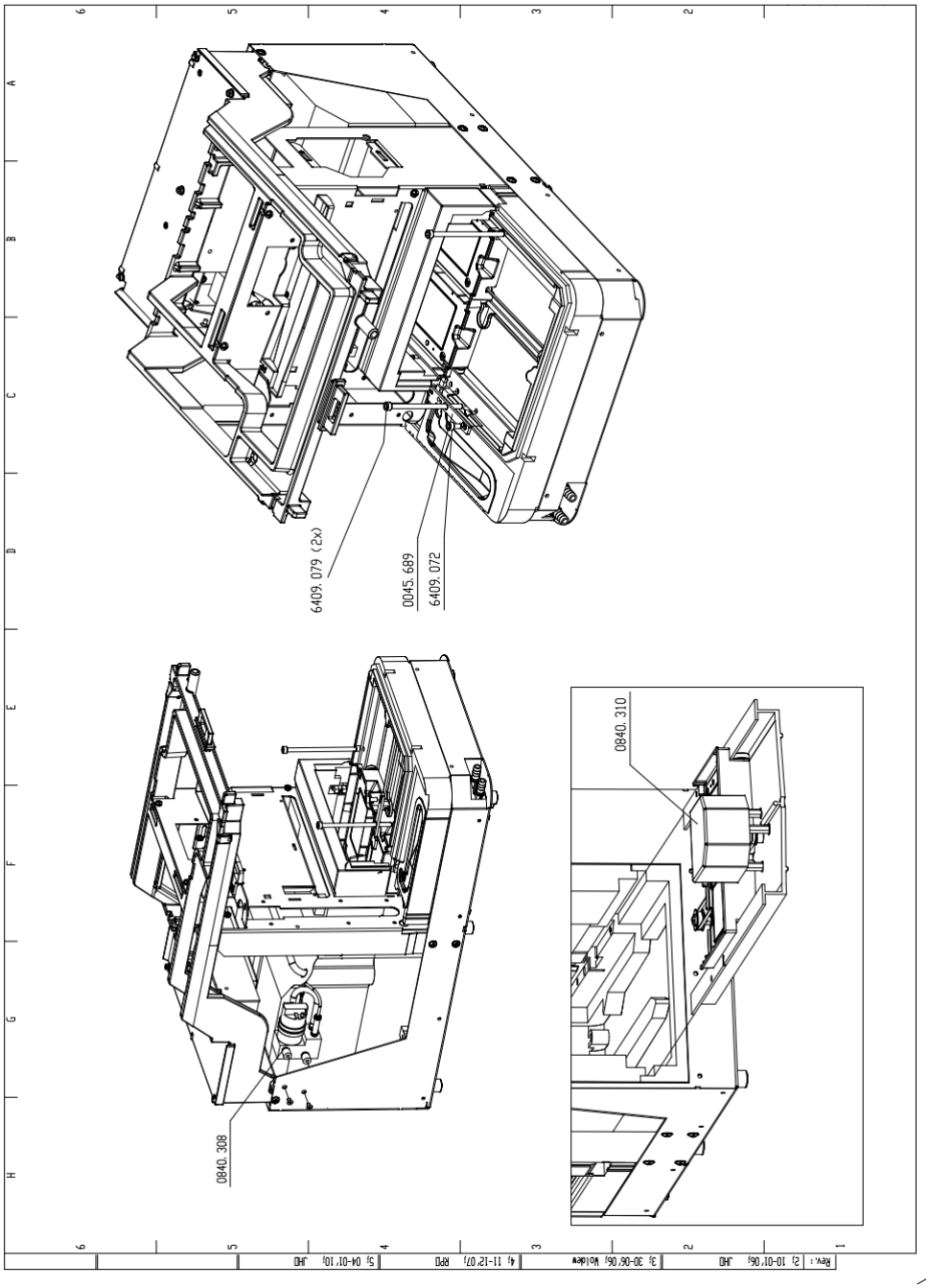
## 11.6.3 Exploded view: Mainframe page 2/9




## 11.6.4 Parts list: Mainframe page 2/9

| Comp. Item | Description | Qty |
|---|---|---|
| 6055.311 | Screw 4.2x13mm | 8 |

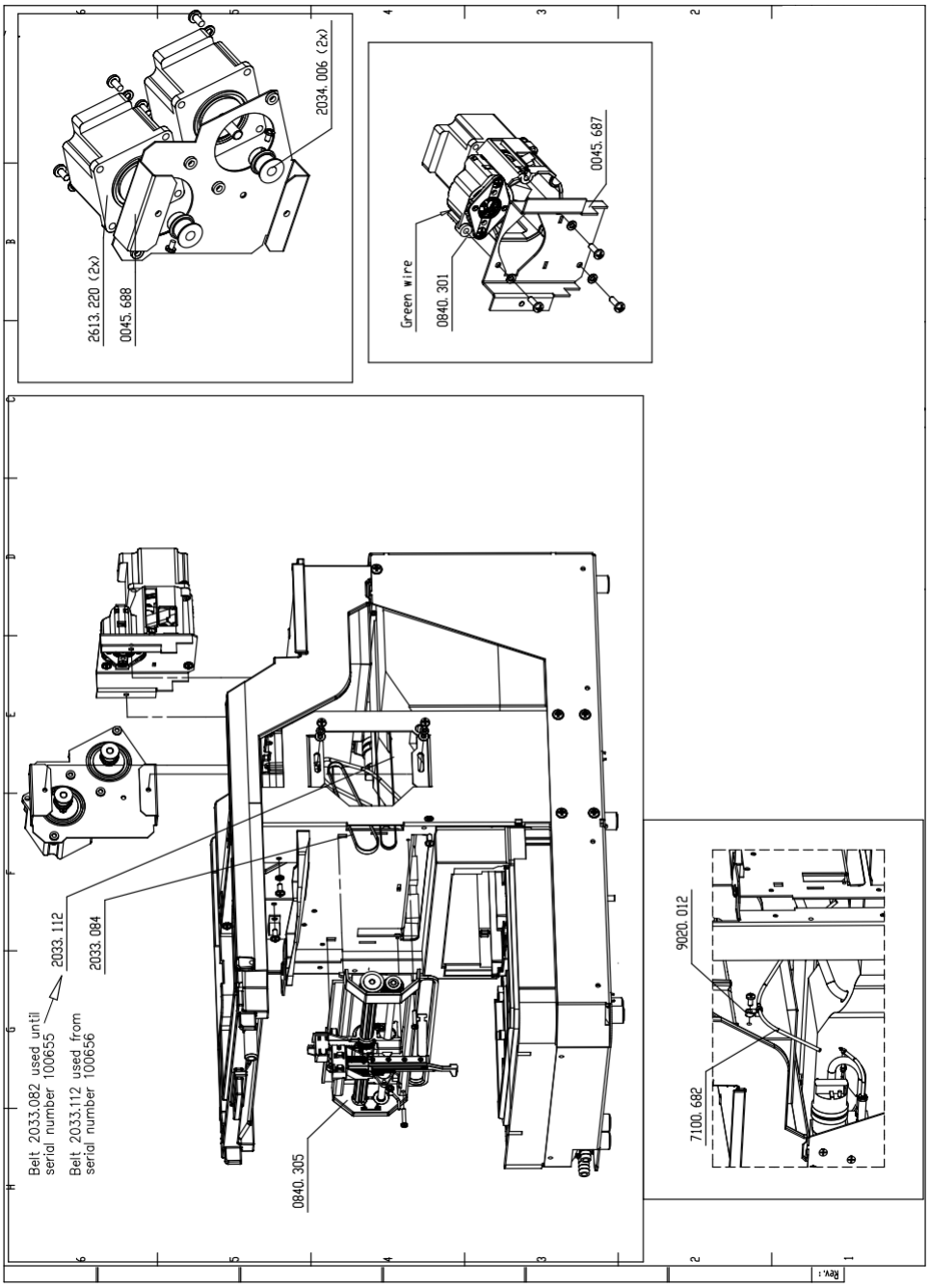
## 11.6.5 Exploded view: Mainframe page 3/9




## 11.6.6 Parts list: Mainframe page 3/9

| Article No. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0840.308 | Compressor unit | 1 |
| M2047 | 0840.310 | Tray drive | 1 |
| | 0045.689 | Wash position plate | 1 |
| | 6409.072 | Screw SS M5x10 | 1 |
| | 6409.079 | Screw SS M5x90 | 2 |

## 11.6.7 Exploded view: Mainframe page 4/9



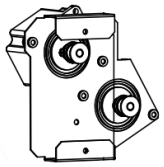
Old revision motor frame:
0045.688. Used up to serial number 100655.

In combination with toothed belts:
2033.082/084.

New revision motor frame:
0045.688. Used from serial number 100656.

In combination with toothed belts:
2033.084/112

Old

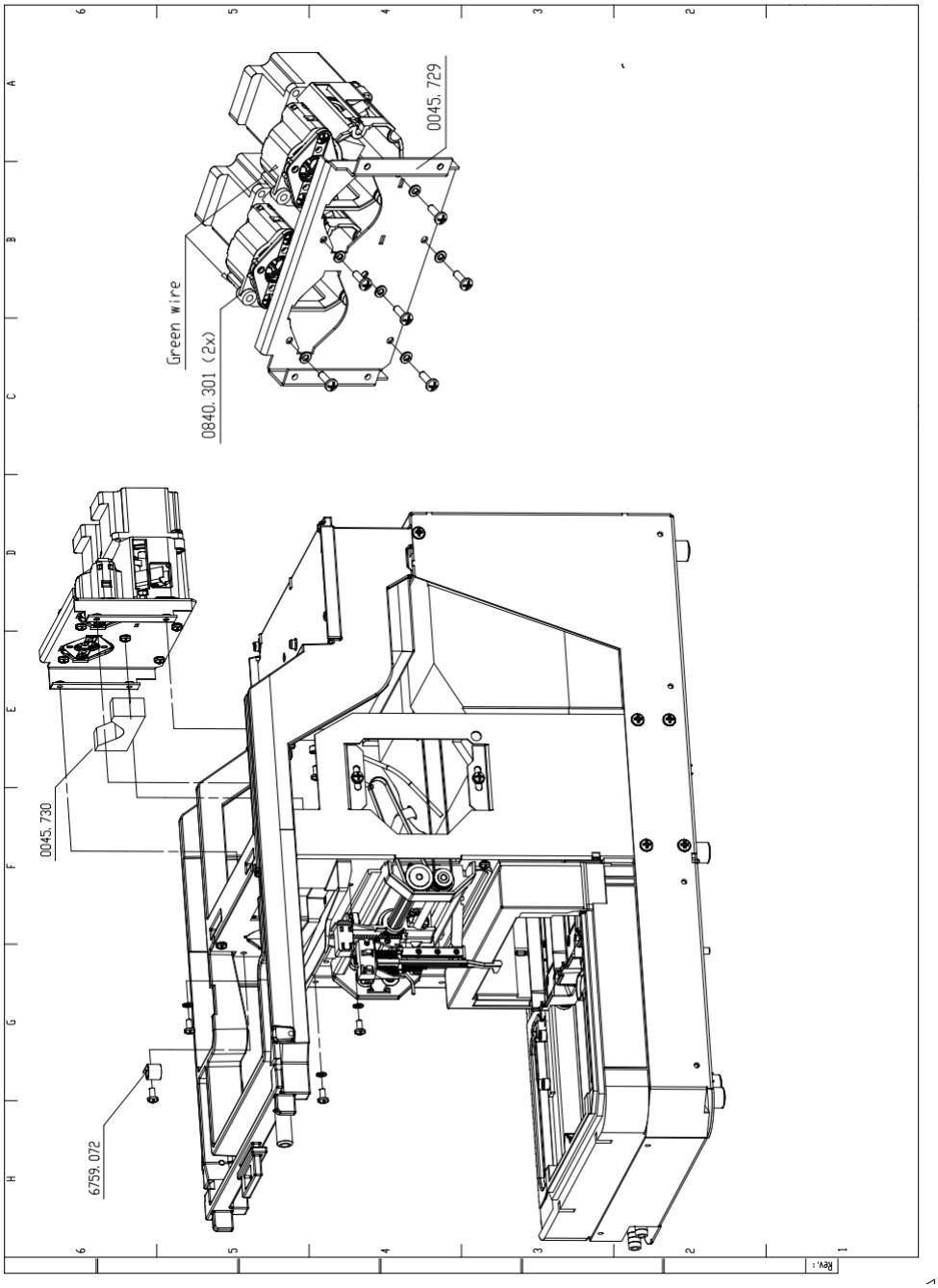


New

## 11.6.8 Parts list: Mainframe page 4/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| M2823 | 0045.687 | Sub frame valve | 1 |
| | 0045.688 | Motor frame | 1 |
| M2044 | 0840.301 | Valve unit 840 | 1 |
| M2046 | 0840.305 | Needle module | 1 |
| | 2033.084 | Toothed belt 840 MXL 025 | 1 |
| M2552 | 2033.112 | Toothed belt 1120 MXL 025 | 1 |
| M2059 | 2034.006 | Pulley PLA 20 MXL025 / 6F-1/4" | 2 |
| M20654 | 2613.220 | Stepper motor KH56JM2U080 | 3 |
| | 7100.682 | Air hose 1/8"x1/16" transparent. | |
| | 9020.012 | Cable clip | 1 |

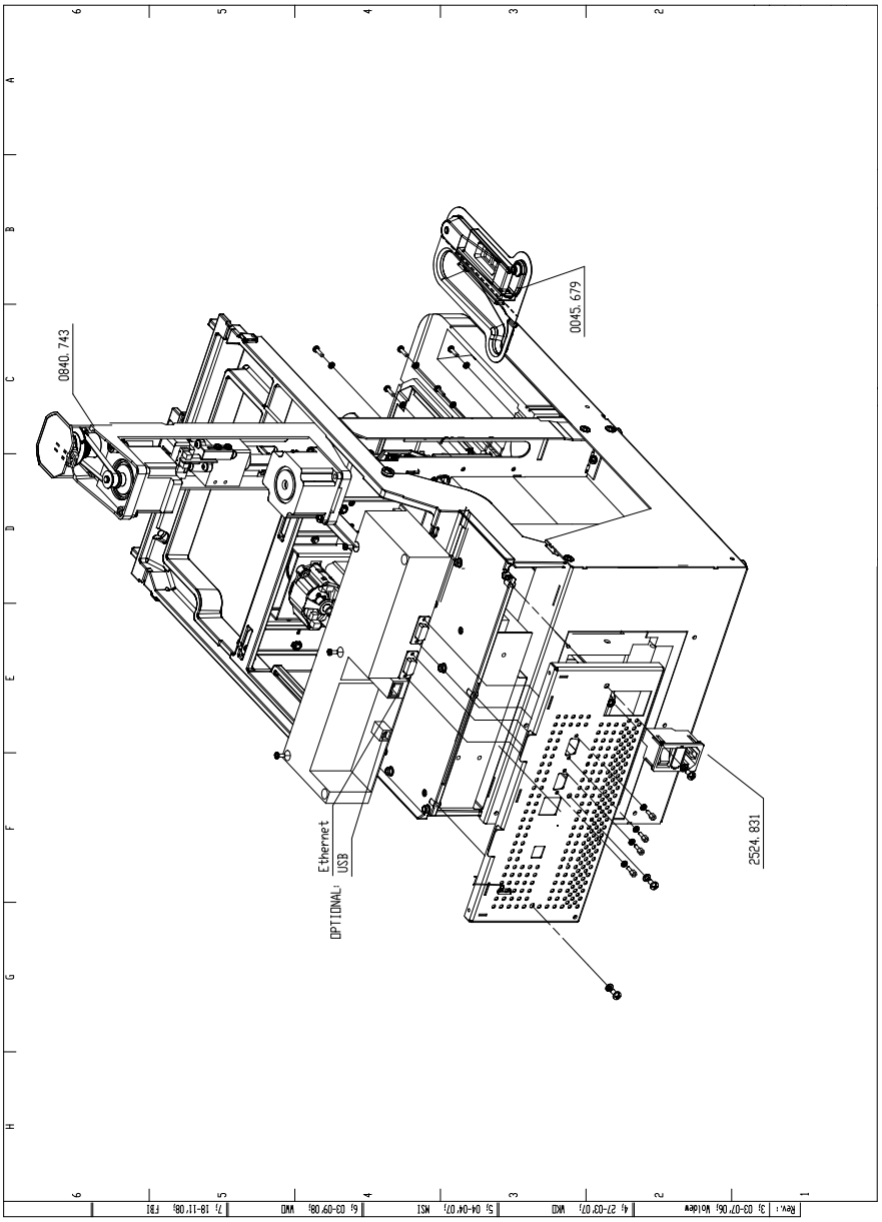
## 11.6.9 Exploded view: Mainframe page 5/9




## 11.6.10 Parts list: Mainframe page 5/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 6759.072 | Wire harnass WHC 375-01 | 1 |
| | 0045.703 | Cover side panel left | 1 |
| M2044 | 0840.301 | Valve unit 840 | 1 or 2 |
| | 0045.729 | Sub frame two valves | 1 |

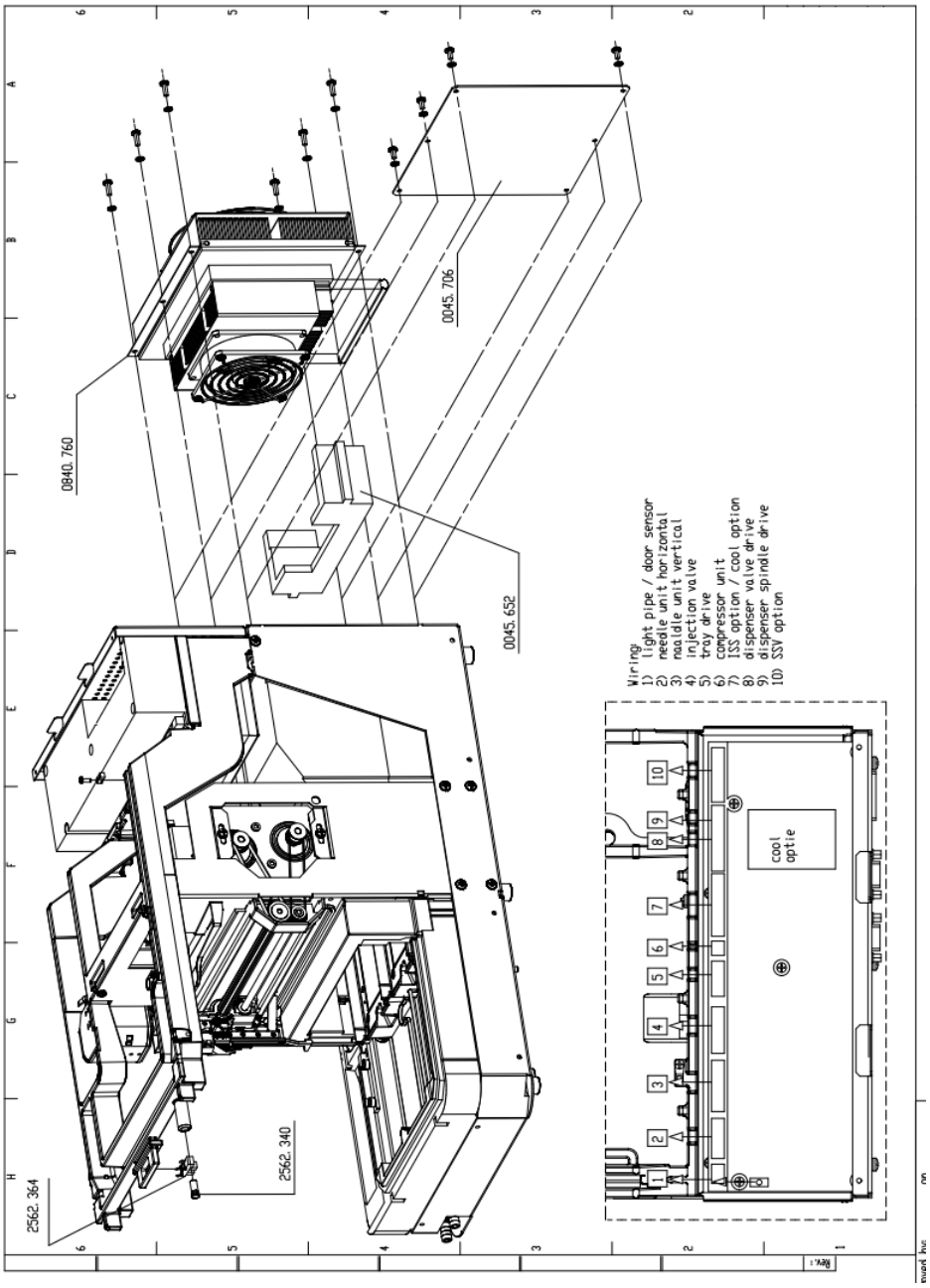
## 11.6.11 Exploded view: Mainframe page 6/9




## 11.6.12 Parts list: Mainframe page 6/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0840.743 | Dispenser module including labels | 1 |
| M3100 | 0045.679 | Drain channel | 1 |
| | 2524.831 | Mainsinlet and fuseholder | 1 |

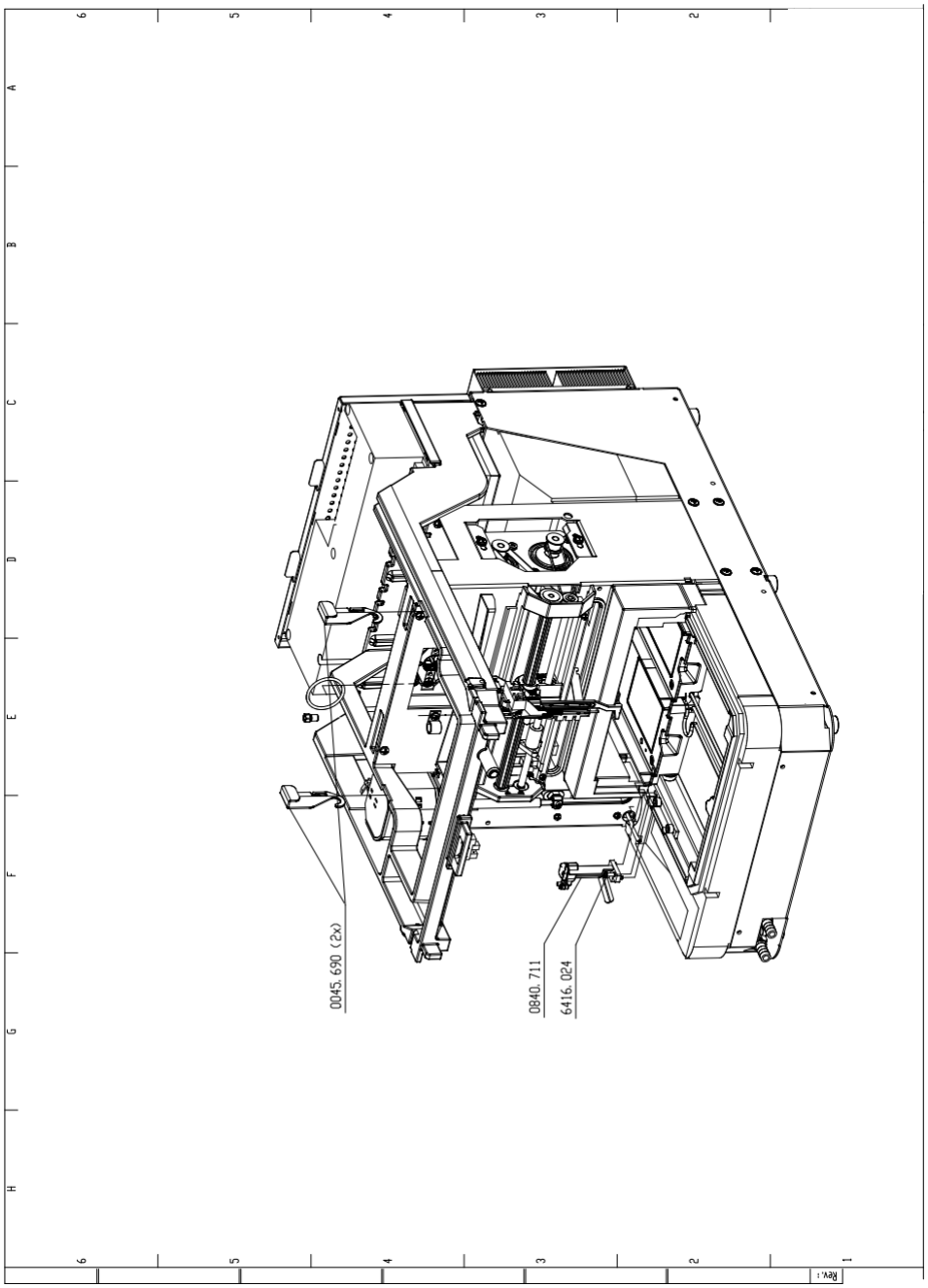
### 11.6.13 Exploded view: Mainframe page 7/9




### 11.6.14 Parts list: Mainframe page 7/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0045.652 | Cooling seal | 1 |
| | 0045.706 | No cool cover plate | 1 |
| | 2562.340 | Light pipe FLP5 | 1 |
| M2065 | 2562.364 | Optical Sensor KIT5031C | 1 |
| | 7150.306 | Deur seal | 1 |
| M4024 | 0840.760 | Replacement cooling module | 1 |

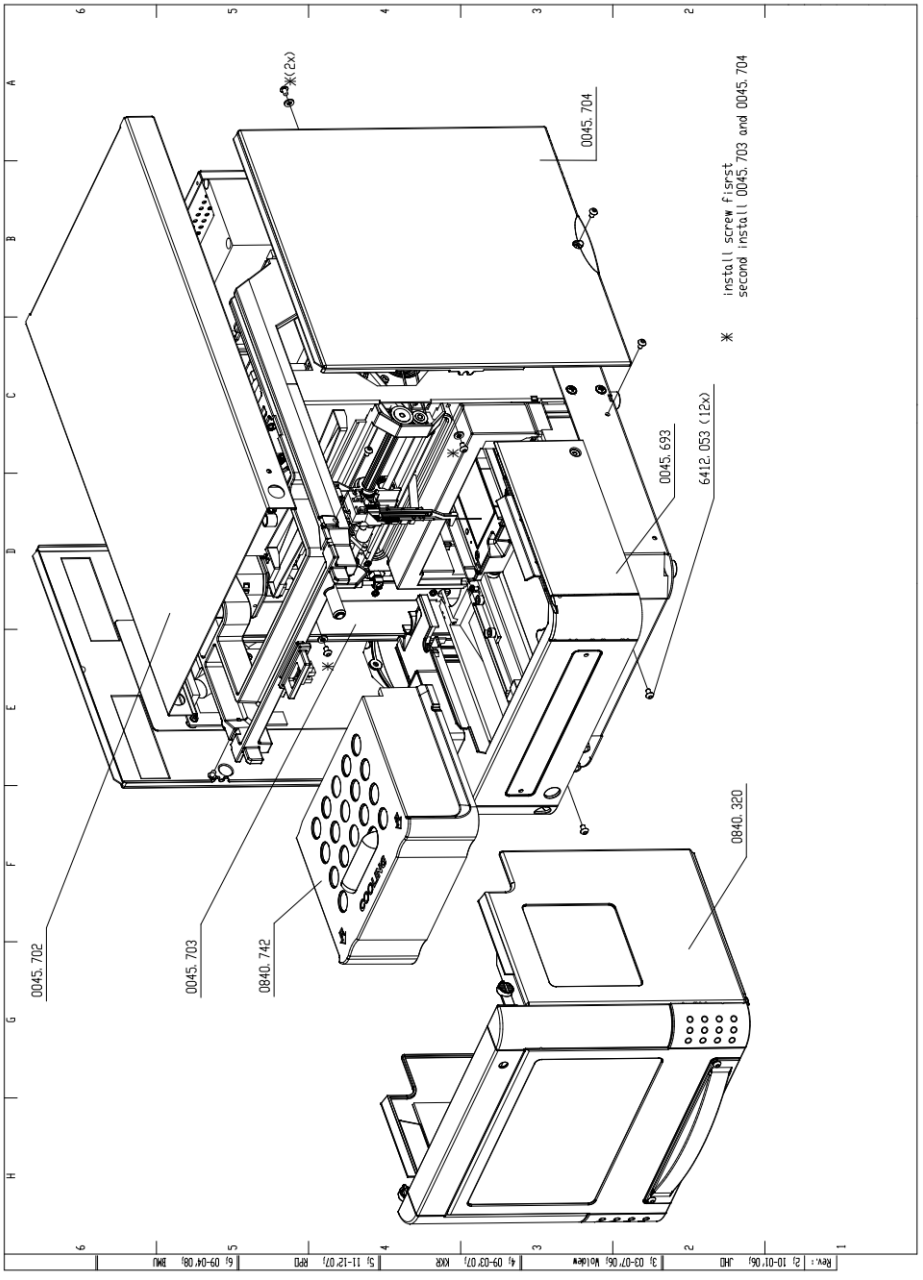
## 11.6.15 Exploded view: Mainframe page 8/9




## 11.6.16 Parts list: Mainframe page 8/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0045.690 | Column hook | 2 |
| | 6416.024 | Screw SS M4x8 | 7 |
| M2051 | 0840.711 | Wash position incl. screws | 1 |

## 11.6.17 Exploded view: Mainframe page 9/9

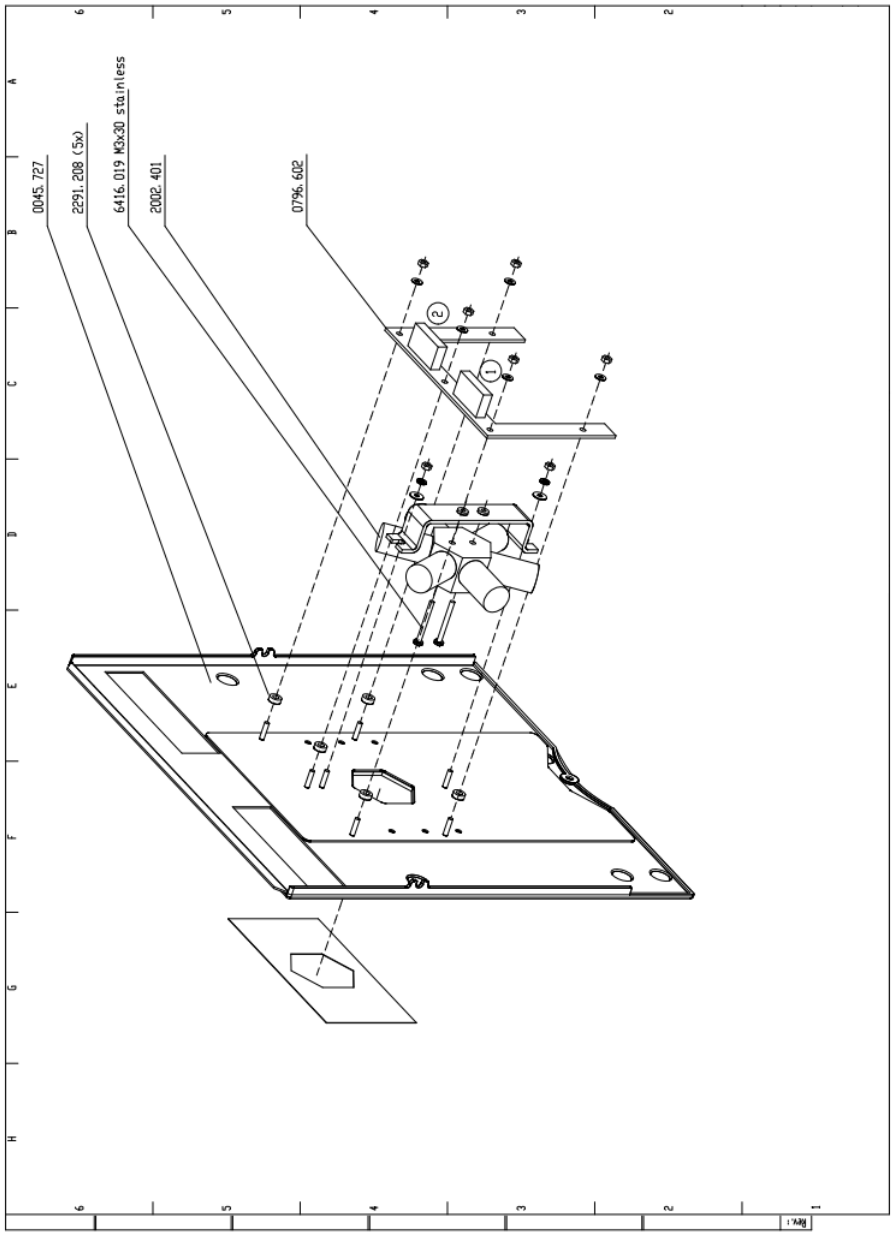



## 11.6.18 Parts list: Mainframe page 9/9

| Article no. | Comp. Item | Description | Qty |
|---|---|---|---|
| | 0045.693 | Front cover painted | 1 |
| | 0045.702 | Cover top plate painted | 1 |
| | 0045.703 | Cover side panel left painted | 1 |
| | 0045.704 | Cover side panel right painted | 1 |
| | 0840.320 | Swing door 840 | 1 |
| M4021 | 0840.742 | Tray cover shell incl. insulation | 1 |
| | 6412.053 | Screw SS M4x6 | 12 |

# 11.7 SSV Option

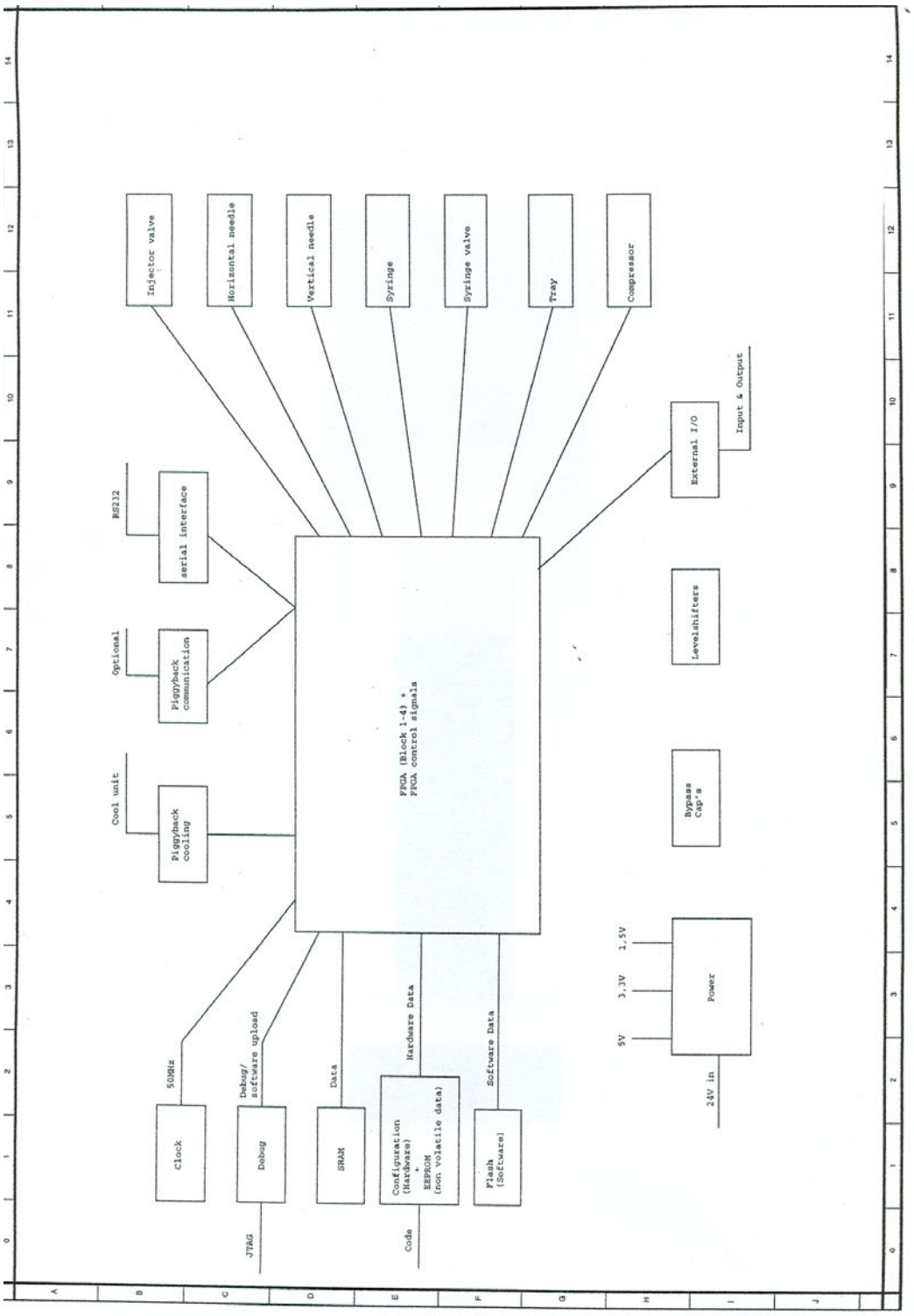
## 11.7.1 Exploded view: SSV Option



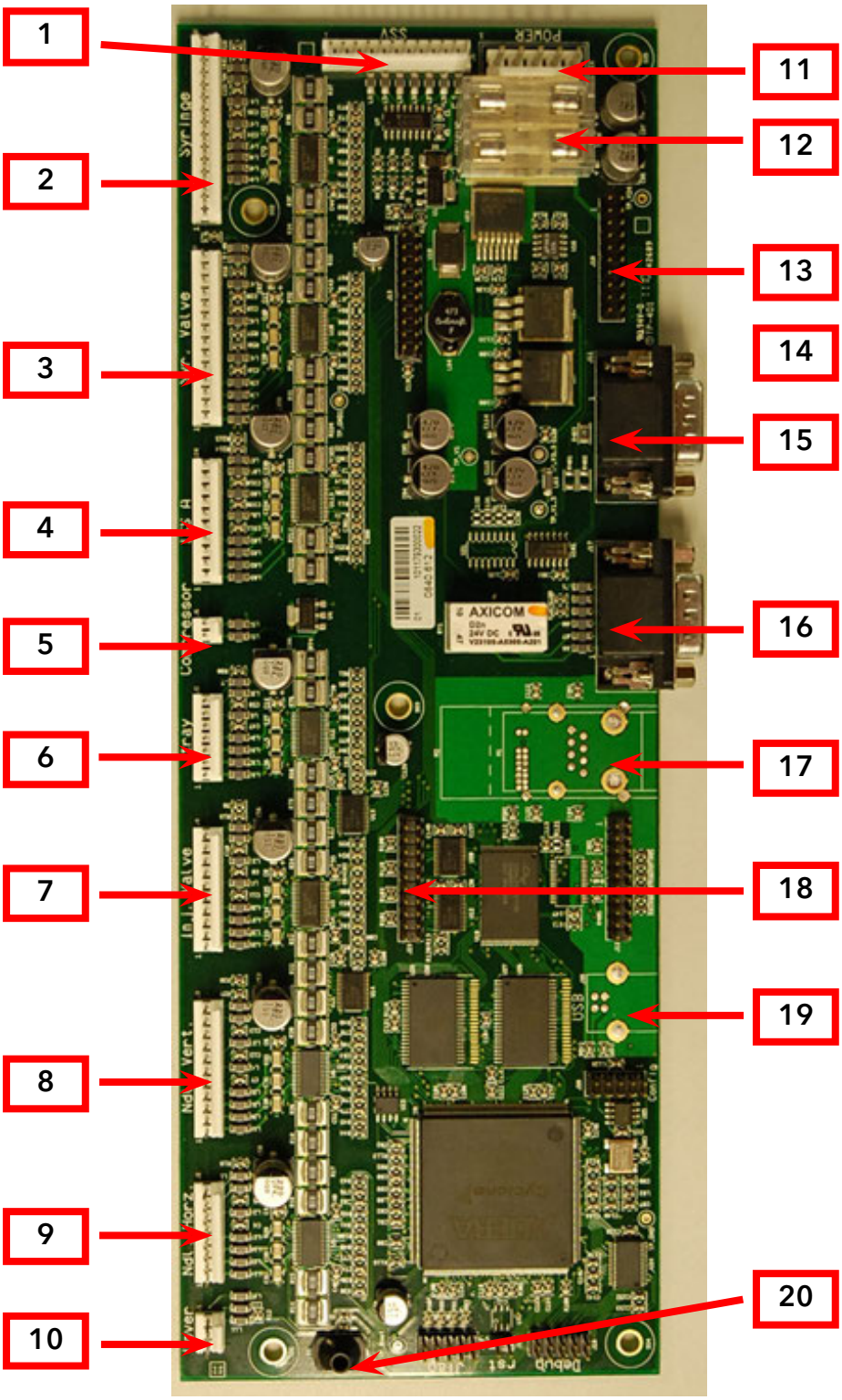

## 11.7.2 Parts list: SSV Option

| Comp. Item | Description | Qty |
|---|---|---|
| 6416.019 | Screw CK-KK M3x30 stainless | 2 |
| 0042.955 | Valve / dampner brace | 1 |
| 0796.602 | Valve leds PCB assy | 1 |
| 0796.711 | SSM valve (short wiring) | 1 |
| 2291.208 | Skiffy bush 3xR8 4 inw | 1 |

## 11.8 Block diagram main board



## 11.9 Main PCB board

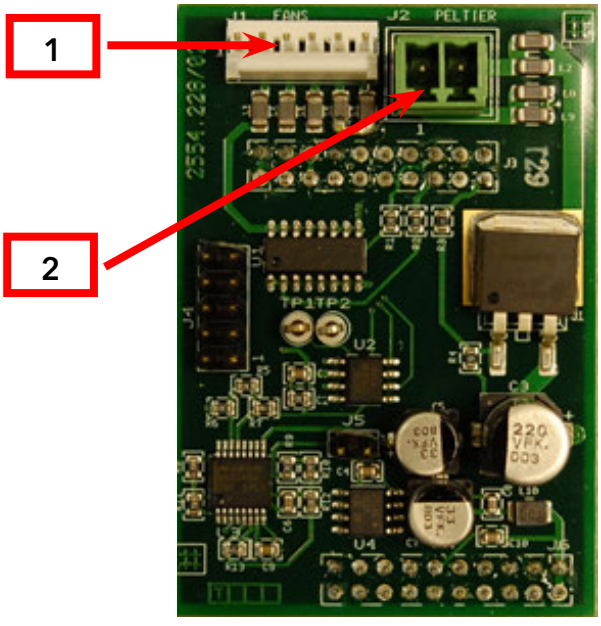


**Legend**

| | | | |
|---|---|---|---|
| **1** | SSV option | **11** | Power connection |
| **2** | Syringe motor | **12** | Fuses |
| **3** | Syringe valve | **13** | Cool or Cool/heat pcb connector (1) |
| **4** | ISS A valve unit | **14** | Cool or Cool/heat pcb connector (2) |
| **5** | Compressor | **15** | Communication (RS 232) |
| **6** | Tray | **16** | I/O connector |
| **7** | Injection valve | **17** | Communication (Ethernet) optional |
| **8** | Needle unit vertical | **18** | External Multilink |
| **9** | Needle unit horizontal | **19** | Communication (USB) optional |
| **10** | Door sensor | **20** | LED (lightpipe) |

Contact the Service department for Part numbers of OEM versions of the Main PCB boards

## 11.10 Cooling PCB board

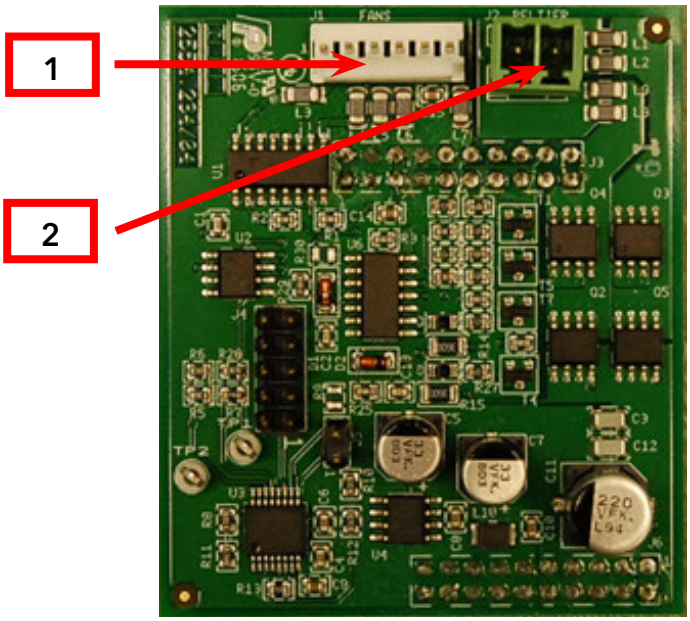



**Legend**

| | |
|---|---|
| **1** | Fans cool option |
| **2** | Peltier elements |

The connectors on the rear of the Cooling PCB connect to the main PCB board. No: 13/14

## 11.11 Cool / Heat PCB board




**Legend**

| | |
|---|---|
| **1** | Fans cool option |
| **2** | Peltier elements |

The connectors on the rear of the Cool / Heat PCB connect to the main PCB board. No: 13/14

# Appendices

## Appendix A. Control I/O connections


The manufacturer will not accept any liability for damages directly or indirectly caused by connecting this machine to instruments which do not meet relevant safety standard.

The IO connector contains active high or active low TTL inputs and one contact closure output, user definable in the System Settings. The two inputs can be programmed as **Next Injection Input**, **Freeze Input** or **Stop Input**. The **Next Injection Input**, **Freeze Input** and **Stop Input** can be used to control the autosampler by other devices.

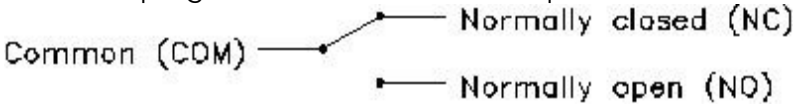
The contact closure output can be programmed as **Inject Marker**, **Auxiliary** or **Alarm output**.

IO connector - Contact closure output and TTL inputs:

| Pin no: | Description: | Cable colors: |
|---|---|---|
| 1 | Output - Common | RED (3-wired) |
| 2 | Output - Normally open | BLACK (3-wired) |
| 3 | Input 1 | RED (4-wired) |
| 4 | Input 2 | BLACK (4-wired) |
| 5 | GND | |
| 6 | Output - Normally closed | BROWN (3-wired) |
| 7 | GND | |
| 8 | GND | ORANGE (4-wired) |
| 9 | GND | BROWN (4-wired) |

Contact closure output can be defined as:

- Inject Marker Output (default): an Inject marker output will be generated when the injection valve switches from LOAD to INJECT. Status duration of the Inject Marker is the same as for the setting for the Inject marker pulse. Range of the adjustment of the inject marker pulse is 0.1 - 2.0 seconds. Note that in User Program (optional) the Inject marker pulse is programmed by means of the User program Marker actions.
- Alarm Output: the Alarm Output will be activated whenever an error occurs, see appendix C for a description of the error codes of the autosampler.
- Auxiliary: the contact closure output can be used as an Auxiliary which can be programmed on a time base up to 4 times On/Off.



Contact closure output: Vmax = 28 Vdc / Vac , Imax = 0.25 A

TTL inputs can be defined as:

- Next Injection Input (default): this input will start the next injection sequence After finishing the injection sequence the autosampler will wait for the Next Injection Input.
- Freeze input: the autosampler will freeze the analysis time for the time this input is active. If the Freeze Input is activated while the analysis time is not running, the autosampler will perform all programmed pre-injection sample handling (sample loop). But the autosampler will wait with injecting the sample until the Freeze Input is no longer active.
- Stop Input: with this input the run of the autosampler is immediately aborted.

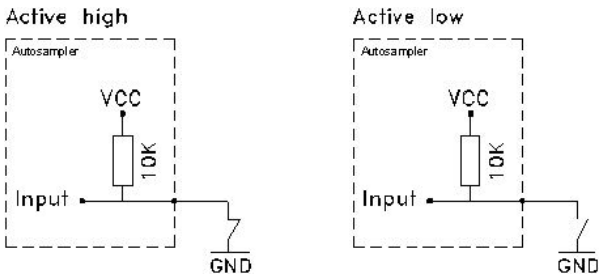



**Fig. 68:** TTL input

# Appendix B. Error Codes

The software continuously checks the status of the autosampler and provides feedback in the form of an error code in case of a malfunction.

**Tray unit**

| Error | Cause | Action |
|---|---|---|
| 294 | Home sensor not reached. | Check for any obstructions on the tray movement, by sliding the tray forward and backwards. |
| 295 | Deviation of more than +/-2mm towards home. | Check for any visible obstructions in the tray area<br>Check belt on tension or visible damage In case of weak belt tension, check belt tension mechanism at bottom side of tray. |
| 296 | Home sensor not de-activated. | Check if the transport foam is removed from the tray compartment.<br>Check home sensor in service mode.<br>Check for any obstruction of tray movement.<br>Check function of stepper motor. |
| 297 | Home sensor activated when not expected. | Check home sensor in service mode. |
| 298 | Tray position is unknown. | Initialize instrument in direct control screen. |

**Needle unit**

| Error | Cause | Action |
|---|---|---|
| 303 | Horizontal: needle position is unknown. | Initialize instrument in direct control. |
| 304 | Horizontal: home sensor not reached. | Check movement for any obstruction<br>Check function of sensor in service mode. |
| 306 | Horizontal: home sensor not de-activated. | Check movement for any obstruction<br>Check function of sensor in service mode. |
| 307 | Horizontal: home sensor activated when not expected. | Check function of sensor in service mode. |
| 308 | Incorrect amount of steps executed to reach the home position | Check for an obstruction in the horizontal movement, or a too high torque in the movement |
| 312 | Vertical: needle position is unknown. | Initialize instrument in direct control. |
| 313 | Vertical: home sensor not reached. | Check movement for any obstruction<br>Check function of sensor in service mode<br>Check stepper motor for vertical needle movement<br>Check belt and pulleys. |
| 315 | Vertical: home sensor not de-activated. | Check movement for any obstruction<br>Check function of sensor in service mode<br>Check stepper motor for vertical needle movement<br>Check belt and pulleys. |
| 316 | Vertical: home sensor activated when not expected. | Check function of sensor and wiring set. |
| 317 | Vertical: stripper did not detect plate (or wash/waste). | Check if plates or vials are installed.<br>Check function of vial sensor in service mode. |
| 318 | Vertical: stripper stuck. | Check if stripper is in total down position<br>Check spring mechanism for stripper<br>Make sure adjustment tool for penetration point check is removed from needle arm<br>Check stripper for any obstruction/dirt<br>Check sensor and wiring set. |

| | | |
|---|---|---|
| 319 | Vertical: The sample needle arm is at an invalid position. | Check vertical home sensor in service mode<br>Check function of stepper motor, pulleys and belt. |

**Syringe dispenser unit**

| Error | Cause | Action |
|---|---|---|
| 324 | Syringe valve didn't find wanted position. | Check optical sensors of syringe valve in service mode<br>Check function of stepper motor<br>Check belt and pulleys. |
| 330 | Syringe home sensor not reached. | Check optical sensor of syringe home in service mode<br>Check function of stepper motor<br>Check belt and pulleys<br>Check spindle and transport block on rotating torque.<br>Check flow path on restriction by performing a wash with direct control. |
| 331 | Syringe home sensor not de-activated. | Check optical sensor of syringe home in service mode<br>Check function of stepper motor<br>Check belt and pulleys<br>Check spindle and transport block on rotating torque.<br>Check flow path on restriction by performing a wash with direct control. |
| 332 | Asked syringe load volume is too high. | Check program and system settings on correct syringe volume. |
| 333 | Ask syringe unload volume is too high. | Check program and system settings on correct syringe volume. |
| 334 | Syringe position is unknown. | Initialize syringe in direct control. |
| 335 | Syringe rotation error. | Check optical sensor of syringe rotation in service mode<br>Check function of stepper motor<br>Check belt and pulleys<br>Check spindle and transport block on rotating torque.<br>Check flow path on restriction by performing a wash with direct control. |

**Injection valve unit**

| Error | Cause | Action |
|---|---|---|
| 340 | Indicated position not reached. | Check optical sensors in service mode<br>Check for high switching torque on injection valve (might indicate extensive wear or leakage). |
| 341 | Wear-out limit reached. | Check injection valve thoroughly on wear and tear/leakage.<br>Reset wear out limit. |
| 342 | Illegal sensor readout. | Check optical sensors in service mode. |

**ISS valve unit**

| Error | Cause | Action |
|---|---|---|
| 344 | ISS valve wanted position not reached | ▪ Check optical sensors in service mode<br>Check for high switching torque on valve (might indicate extensive wear or leakage) |
| 345 | ISS valve wear-out limit reached | ▪ Check valve thoroughly on wear and tear/leakage.<br>Reset wear out limit |
| 346 | ISS valve illegal sensor readout | Check optical sensors in service mode |

**Cooling unit**

| Error | Cause | Action |
|---|---|---|
| 347 | Temperature above 48°C at cooling ON. | Check temperature sensor for showing the correct ambient temperature, when cooling is turned off for longer period<br>Check if Peltier elements, wirings and connector are correct installed (reversed?). |

**Electronics**

| Error | Cause | Action |
|---|---|---|
| 280 | EEPROM write error. | Check if upload procedure is followed. |

| | | |
|---|---|---|
| 282 | EEPROM error in settings. | During power ON, the settings values are not correct read from EEPROM.<br>Restart instrument, if problem remains, reprogram EEPROM. |
| 283 | EEPROM error in adjustments. | During power ON, the adjustment values are not correct read from EEPROM.<br>Restart instrument, if problem remains, reprogram EEPROM. |
| 284 | EEPROM error in log counter. | During power ON, the Log counter values are not correct read from EEPROM.<br>Restart instrument, if problem remains, reprogram EEPROM. |
| 290 | Error occurred during initialization, Autosampler cannot start. | During power ON, the instrument came up with an error. By ignoring this error, the Autosampler can continue to program. However an essential function of the Autosampler is not properly working and the Autosampler cannot start to inject samples.<br>Turn mains power OFF/ON and check the error code. |

**Tray 48~3**

| Error | Cause | Action |
|---|---|---|
| 362 | No reagent vial. | Place vial in reagent vial position |
| 364 | Missing reagent A vial. | Place vial in reagent vial position |
| 365 | Missing reagent B vial. | Place vial in reagent vial position |

# Appendix C. List of accessories and spares

The following accessories and spares are available for the AS 6.1L autosampler:

### Preventive Maintenance Kits

A preventive maintenance kit includes: sample needle with tubing, air needle, rotor seal, buffer tubing, syringe, syringe valve, wash position (only incl. in A5009-1 & A5009-2).

| Art. no. | Type |
|---|---|
| A5009-1 | Preventive Maintenance Kit for AS 6.1L, 1240 bar (AAA10AA, AAA11AA) |
| A5009-2 | Preventive Maintenance Kit for AS 6.1L, 700 bar (AAA00AA, AAA01AA) |
| A5009-3 | Preventive Maintenance Kit for AS 6.1L, 350 bar, Bio (AAA20AA, AAA21AA) |
| A5009-4 | Preventive Maintenance Kit for AS 6.1L, 200 bar, Prep (AAA40AA, AAA41AA) |
| A5009-5 | Preventive Maintenance Kit for AS 6.1L, 200 bar, Bio-Prep (AAA31AA) |

| **Air needles** | | | **Protrusion length** | |
|---|---|---|---|---|
| **Art. no.** | **Comp. item** | **Type** | **from** | **to** |
| M20401 | 0045.503 | 50 mm, yellow | 34 | 40 |
| M20402 | 0045.504 | 56 mm , red | 28 | 34 |
| M2040 | 0045.505 | 62 mm, white (standard needle) | 22 | 28 |
| M20403 | 0045.506 | 68 mm, blue | 16 | 22 |
| M20404 | 0045.507 | 74 mm, green | 10 | 16 |
| M20405 | 0045.508 | 80 mm black | 4 | 10 |

**Buffer tubings**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2870 | 0840.710 | Buffer tubing 1000µL ETFE (Tefzel) with Rh. connections |
| M2053 | 0840.713 | Buffer tubing 1000µL ETFE (Tefzel) with Valco connections |
| M2309 | 0840.714 | Buffertubing 1/32" 250uL PEEK |
| | 0840.721 | Buffertubing Tefzel 2000uL with Valco connections |
| | 0840.722 | Buffertubing Tefzel 200uL with valco connections |

| | | |
|---|---|---|
| M20531 | 0840.723 | Buffertubing Tefzel 2000uL with valco connections |
| M20532 | 0840.724 | Buffer tubing 500 µL ETFE (Tefzel) with Valco connections |

**Fuses**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2067 | 2655.250 | Fuse 2.5A slow (used in fusebox on rearside) |
| | 2655.500 | Fuse 5A slow (used at mainboard) |

**Sample needles**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2139 | 0840.303 | Sample needle (15µL) stainless steel with Rheodyne connections |
| M2871 | 0840.304 | Sample needle (15µL) coated for bio-inert flowpath with Rheodyne connections |
| M2048 | 0840.313 | Sample needle (15µL) stainless steel with Valco connections |
| M2049 | 0840.314 | Sample needle (15µL) coated for bio-inert flowpath with Valco connections |
| M20491 | 0840.319 | Serum sample needle with Valco connections |

**Syringe dispenser parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M0360 | 4400.000 | Syringe 1000 µL |
| M0361 | 4400.250 | Syringe 250 µL |
| M2070 | 4400.500 | Syringe 500 µL |

**Rheodyne injection valves. Spare parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M4027 | 3796.091 | Stator for 7739 stainless steel injection valve |
| M0295 | 3796.092 | Rotor seal (Vespel) for 7739 stainless steel injection valve |
| M0296 | 3796.093 | Rotor seal (Tefzel) for 7739 stainless steel injection valve |
| M2555 | 3796.095 | Peek stator for 9740 Peek injection valve |
| M2872 | 3796.096 | Stator face assembly for 9740 Peek injection valve |
| M0366 | 3796.097 | Peek rotor seal for 9740 injection valve |
| | 2002.226 | Rheodyne 7739 injection valve stainless steel version (only for instruments with s/n 60008 and higher) |
| | 2002.231 | Rheodyne 9740 injection valve PEEK/ ceramic version (only for instruments with s/n 60008 and higher) |
| | 0830.731 | Rheodyne 7739 injection valve, stainless steel version, incl. bayonet pins. |
| M3038 | 0830.732 | Rheodyne 9740 injection valve, PEEK/ ceramic version, incl. bayonet pins. |

**Rheodyne injection valves. Loops, nuts and ferrules:**

| Art. no. | Comp. item | Type |
|---|---|---|
| | 3796.035 | Rheodyne loop 5µL |
| | 3796.009 | Rheodyne loop 10µL |
| M2993 | 3796.010 | Rheodyne loop 20µL |
| | 3796.011 | Rheodyne loop 50µL |
| M2822 | 3796.012 | Rheodyne loop 100µL |
| | 3796.013 | Rheodyne loop 200µL |
| | 3796.014 | Rheodyne loop 500µL |
| M0694 | 3796.015 | Rheodyne loop 1000µL |
| | 3796.076 | Rheodyne PEEK loop 20µL |
| | 3796.016 | Rheodyne PEEK loop 100µL |
| | 3796.034 | Rheodyne PEEK loop 500µL |
| | 0700.002 | Rheodyne nut stainless steel (pck/10) |
| | 0700.003 | Rheodyne ferrule stainless steel (pck/10) |
| M0291 | 0700.008 | Rheodyne Rhe-flex ferrule (pck/10) |
| M0292 | 0700.009 | Rheodyne Rhe-flex nut (pck/10) |

**Valco injection valves. Spare parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| | 2002.245 | Valco injection valve stainless steel, C2-2006 SPHMI (only for instruments with s/n 60008 and higher) |
| | 2002.250 | Valco injection valve PEEK, C2-2346 SPHMI (only for instruments with s/n 60008 and higher) |
| | 0830.733 | Valco injection valve, stainless steel version, C2-2006 SPHMI, incl. bayonet pins |
| M6090 | 0830.734 | Valco injection valve, PEEK version, C2-2346 SPHMI, incl. bayonet pins. |
| M0357 | 3796.043 | Valco rotor seal for injection valve C2-2006 |
| M2873 | 3796.044 | Valco stator for injection valve C2-2006 |
| M1245 | 3796.048 | Valco rotor seal PEEK for injection valve C2-2346 |
| M2874 | 3796.087 | Valco PEEK stator for injection valve C2-2346 |

**Valco injection valves. Loops nuts and ferrules:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2874 | 3796.087 | Valco PEEK stator for injection valve C2-2346 |
| M2041 | 0700.004 | Valco Ferrule (pck/10) |
| M2042 | 0700.005 | Valco Nut (pck/10) |
| M500817 | 3796.046 | Valco loop 5 µL with fittings |
| M20693 | 3796.029 | Valco loop 20 µL with fittings |
| M20694 | 3796.054 | Valco loop 50 µL with fittings |
| M500819 | 3796.030 | Valco loop 200 µL with fittings |
| M2069 | 3796.086 | Valco loop 100 µL with fittings 0.7mm bore |
| M20695 | 3796.134 | Valco loop 100 µL with fittings 0.4mm bore |
| M500821 | 3796.031 | Valco loop 500 µL with fittings |
| M500822 | 3796.088 | Valco loop 20 µL PEEK with fittings |
| M500823 | 3796.085 | Valco loop 100 µL PEEK with fittings |

**Spark OEM injection valves. Spare parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2056 | 2002.500 | Spark OEM valve SS 0.4mm |
| M2057 | 2002.501 | Rotor seal PEEK for 0.4mm SS Spark OEM valve 2002.500 |
| M2058 | 2002.502 | Stator for 0.4mm SS Spark OEM valve 2002.500 |
| M4013 | 2002.503 | Spark OEM valve PEEK 0.25mm |
| M20563 | 2002.504 | Rotor seal PEEK for 0.25mm PEEK Spark OEM valve 2002.503 |
| M4014 | 2002.505 | Stator for 0.25mm PEEK Spark OEM valve 2002.503 |
| | 2002.506 | UHPLC Spark OEM valve |
| M2643 | 2002.508 | Injection valve UHPLC ILD |
| M2644 | 2002.512 | Rotor seal for injection valve UHPLC ILD |
| M2645 | 2002.513 | Stator for injection valve UHPLC ILD |
| | 2002.511 | OEM injection valve UHPLC |
| | 2002.515 | Rotor seal for OEM UHPLC injection valve |
| | 2002.516 | Stator for OEM UHPLC injection valve |

**Prep AS 6.1L Spare parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M20561 | 2002.248 | Valco C2-3006 SPHMI PREP valve |
| M1988 | 3796.110 | Rotor seal for PREP valve C2-3006 |
| | 3796.112 | Stator for PREP valve C2-3006 |
| M20701 | 4400.255 | Syringe 2.5mL |
| M20691 | 3796.094 | Sample loop 10mL |
| | 0700.002 | Plunger replacement tip set for 2.5mL syringe (pck/10) |
| M20401 | 0045.503 | Yellow air needle for 10ml PREP vials |
| M20491 | 0840.319 | Sample needle Large Volume Sampling (60µL) |
| M4015 | 0900.755 | Set of 10mL vials including septa and caps (pck/4) |
| M4016 | 0900.750 | 10mL vials (pck/125) |
| M4017 | 0900.751 | Caps for 10mL vials (pck/125) |
| M4018 | 0900.752 | Septa (extra thin) for 10mL vials (pck/125) |

**PCB boards:**

Contact the Service department for Part numbers of OEM versions of the Main PCB boards

**Various parts:**

| Art. no. | Comp. item | Type |
|---|---|---|
| M2051 | 0840.711 | Wash position incl screws |
| M2052 | 0840.712 | Syringe valve including valve bush |
| M2054 | 0840.715 | Washbottle rectangular 250 mL modified cap |
| M4019 | 0840.716 | Wash bottle adapter incl. label |
| M4020 | 0840.717 | Wash bottle glas with modified cap |
| | 0840.740 | Wash bottle 250 ml rectangular with hole |
| M4021 | 0840.742 | Tray cover shell incl. insulation |
| M3100 | 0840.743 | Dispenser module incl labels |
| M4022 | 0840.744 | Assy tubing waste line pkg of 2 |
| M4023 | 0840.746 | Service Manager AS 6.1L only |
| M4024 | 0840.760 | Replacement cooling module |
| M4025 | 0045.131 | 48 vial adapter for 1.5ml vials |
| M2072 | 0045.137 | 12 vial adapter for 10ml vials |
| M2877 | 0045.606 | Leadscrew moulded frame |

# Appendix D. Maintenance Logbook

Note log counters before resetting.

**Wetted parts**

| Date | Injector valve | ISS | Syringe valve | Syringe |
|---|---|---|---|---|
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**Mechanical parts**

| Date | Injector valve | ISS | Syringe valve | Syringe |
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# Appendix E. Storage, packaging, recycling and disposal

If the autosampler needs to be stored for a long time, or if it must be shipped to a different location, proceed as follows:

1. Thoroughly flush the system.
2. Disconnect and remove all tubing, except for the sample loop.
3. Switch off the autosampler.
4. In case of biohazard materials: remove and throw away the needle and other flow path materials, in accordance with an approved waste disposal program.
5. Use the original packaging materials to package the autosampler; also place the foam block in the tray location.
6. Fill in a health & safety form for the instrument and include the form in the package.
7. Dispatch the package; make sure any tax/import/export requirements are met.

Contact your supplier if you need more information.

#### Decontamination

The instrument shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

#### General instructions for disposal

When taking the instrument out of service, the different materials must be separated and recycled according to national and local environmental regulations.

#### Hazardous substances

The instrument contains hazardous substances. Contact the manufacturer for more detailed information.

#### Disposal of electrical components

Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.

# Index

## S



## T



## U



## V



## W

Science Together

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KNAUER
Wissenschaftliche Geräte GmbH
Hegauer Weg 38
14163 Berlin

Phone: +49 30 809727-0
Fax: +49 30 8015010
E-Mail: info@knauer.net
Internet: www.knauer.net