ANTEC
LEYDEN

# ALEXYS AS 100
## Autosampler

### Preventive maintenance procedure

# Symbols

The following symbols are used on the equipment:

Consult the manual for further safety instructions

Frame or chassis ground terminal

The following pictograms are used in this manual:

Caution

Caution, risk of electric shock or other electrical hazard (high voltage)

# Safety practices

The following safety practices are intended to ensure safe operation of the equipment.

**Electrical hazards**

- Removal of panels may expose users to dangerous voltages. Disconnect the AS 100 from all power sources before removing protective panels.
- Always replace blown fuses with fuses of the size and rating indicated on the fuse panel and holder. Refer to Appendix B of this manual for more information on fuses.
- Replace or repair faulty insulation on power cords.
- Check that the actual power voltage is the same as the voltage for which the AS 100 is wired. Make sure power cords are connected to correct voltage sources.
- The AS 100 must only be used with appliances and power sources with proper protective grounding.

**Take precautions against electrostatic discharge during installation/removal of boards, EPROM's or other electrical components at all time to prevent damage of the circuit boards.**

**Other precautions**

The AS 100 has sharp needles and moving parts care should be taken to prevent personal injury or damage to parts of the AS 100.

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C H A P T E R 1

# Introduction

This Preventive Maintenance procedure describes step-by-step the complete Preventive Maintenance on the AS 100 autosampler. The procedure gives the instruction on which parts should be checked or replaced. It will give also all information needed to check or replace each part. The Preventive Maintenance Checklist is used for each module to mark every checked item.

The procedure is written for trained and qualified service engineers, who are experienced with the AS 100 and ALEXYS data system software. For more details on adjustments, assembling and troubleshooting use the service manual (p/n 181.0020) as reference. For instructions on the ALEXYS data system, use the Help file of ALEXYS or the user manual (p/n 185.0010) as a reference.

Before you start, be sure you have read and understood the procedure and the information.

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# Tools

The list bellows gives an overview of the tools needed to perform the Preventive Maintenance:

**Service tools**

Philips screwdriver #1
Philips screwdriver #2 (long shaft)
Flat head screwdriver
Hex key 1.5mm
Hex key 1.6mm
Hex key 2 mm
Hex key 2.5mm
Hex key 3mm
Hex key 9/64” (Injection valve)
Wrench 5.5 mm
Ring wrench 7mm (with open inlet)
Ring wrench 13mm (Syringe valve nut)
Wrench ¼” + 5/15”

**Solvents / Tubing**

Uracil solution 50 ppm in water
PEEK tubing L=10 M OD: 1.6mm ID:0.25mm (1/16”x0.01”)

**Test equipment**

UV detector 254nm (specs: noise $9x10^{-5}$ AU, Linearity 0-1.3AU)
LC 100 pump
AC 100 & ALEXYS data system / recorder

## Contents of shipping box

Check the contents of the shipping box, before you start the Preventive Maintenance, to make sure you will have all necessary parts available:

The Shipping box contents the following parts:

- Preventive Maintenance procedure.
- Preventive Maintenance checklist.
- Preventive Maintenance parts according the following lists.

181.3000 Spare part kit for the AS 100 Cool & Standard (181.0035/36):

| Part no. | Description |
|---|---|
| 181.0312 | St. steel sample needle 15µL valco |
| 181.0344 | Syringe 250 µL |
| 181.0542 | Plunger replacement tip 250µL (pck/10) |
| 181.0322 | Air/prepuncturing needle |
| 181.0328 | Syringe valve |
| 181.0318 | Buffer tubing 500 µL |
| 181.0332 | Rotor seal for Valco C2-2006 |

181.3002 Spare part kit for the AS 100 Micro, cool (181.0037):

| Part no. | Description |
|---|---|
| 181.0366 | Fused silica sample needle 5.3 uL valco |
| 181.0342 | Syringe 100 µL |
| 181.0310 | Plunger replacement tip 100 µL (pck/10) |
| 181.0322 | Air/prepuncturing needle |
| 181.0328 | Syringe valve |
| 181.0318 | Buffer tubing 500 µL |
| 181.0368 | Rotor seal micro for Valco C2-1006 |

Contact your supplier in case of damage or if not all marked items on the checklist are included.

**The contents should be customized for different type of needles, valves syringe and buffer tubing sizes.**

## Recommended available repair parts

The following list gives an overview of the parts, which are recommend to have available when performing a preventive maintenance on a AS 100. Refer to the service manual (p/n 181.0020) for instructions on replacement.

| Part no. | Description |
|---|---|
| 181.0336 | Stator for C2-2006 valve, or |
| 181.0372 | Stator for C2-1006 valve |
| 181.0308 | Transport nut M5 (for sample needle movement) |
| 181.0560 | Belt 25.0 x 1.2 (for sample needle movement) |

## Preliminary Observations

Before a PM is started, talk to the end users about any unusual observations they have made, or anything that has changed since the last PM or service visits.

C H A P T E R 2

# PM procedure AS 100 autosampler

This section describes the complete PM procedure of the AS 100 autosampler step-by-step:

The following parts should be replaced on the AS 100 autosampler:

- Air-prepuncturing needle
- Sample needle (Standard/Peek/Fused Silica)
- Buffertubing (500µL or 2000µL)
- Syringe (100µL, 250µL, 500µL, 1000µL or 10.000µL)
- Syringe valve
- Rotor seal (C2-2006, C2-1006 or C2-2346)

Before starting make sure you have all correct parts available.

# Injection valve

**Rotor seal replacement**

For checking and replacing the rotor seal of the Valco valves, proceed as follows:

1. Remove the two large hex key screws 9/64” located on the stator of the valve.
2. Remove the stator; check the rotor seal for any kind of scratch marks or scoring.
3. Replace if scratches are present.
4. If the rotor seal needs to be replaced, pull old seal off the valve directly toward you.

*Fig. 1.* Front view of injection valve with removed stator

5. Due to the shape of the rotor seal notches, there is only one way to install the new rotor seal.

**Make sure the rotor seal grooves are facing forwards.**

### Stainless steel stator

For checking of the stator of the Valco valves, proceed as follows:

6. Check the flat surface of the stator for scratches.
7. Replace if there are any scratches present on the stator.
8. Tighten the stator screws until the stator is flat assembled to the valve body. There should be no gap between the valve body and the stator.
9. Check if the O-ring around the valve is present, to prevent a leakage of the valve comes inside the instrument

### Switching valve verification

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

10. Enter the AS 100 Main screen in the ALEXYS data system:

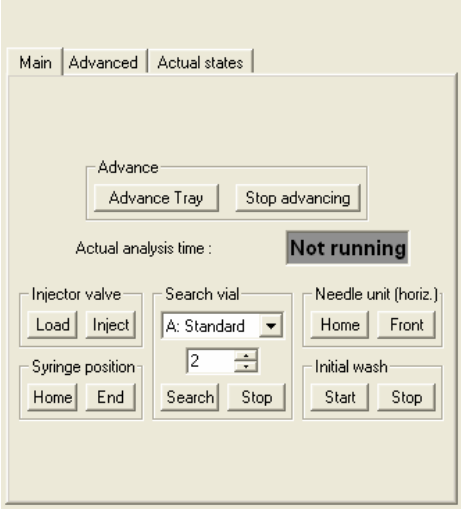


*Fig. 2.* Main screen ALEXYS AS 100 driver.

Perform the following actions :

11. Push [LOAD] button in the Injector valve box.
12. Push [INJECT] button in the Injector valve box.
13. Alternate these actions to check if the valve switches correctly.

## Replacing the syringe

The Triathlon has standard a 250µL syringe installed. The new style of 250µL syringe has a direct connection to the syringe valve. All other syringe types are using a luerlock in-between the syringe and the syringe valve.

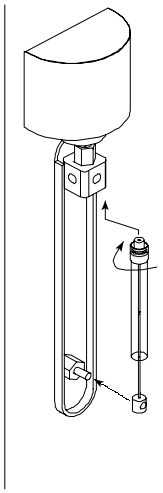

*Fig. 3*. Schematic drawing of 250µL AS 100 syringe.

To install a new syringe, proceed as follows:

1. Push Syringe position “End” button in AS 100 interface of the ALEXYS data system (see Fig. 2).
2. Unscrew the top of the syringe (turn counter-clockwise).
3. Pull the plunger of the syringe towards you and remove syringe.
4. Fill the new syringe with wash solvent.
5. Re-install new syringe (see Fig. 3).
6. Tighten the syringe firmly.
7. Push syringe position “Home” button in software.
8. Cycle a few times between syringe “Home” and “End” (if air bubbles are present).
9. Push “Start” button in Initial wash box to fill and rinse all tubing connected to syringe valve.

**Always use properly degassed wash solvent.**

## Replacing the syringe valve

For replacing the syringe valve, proceed as follows:

1. Turn mains power off
2. Remove the top cover and left side cover. Refer to the AS 100 service manual (p/n 181.0020) for detailed instructions.
3. Remove the waste, wash and buffer tubing.
4. Remove the syringe dispenser connectors J2, J3, J4, J5, J6 and J7 from the syringe PCB.

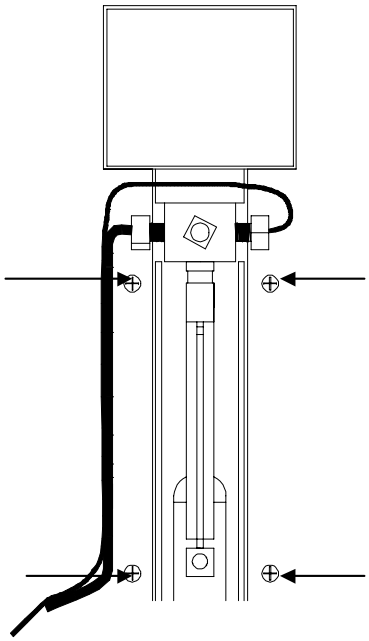

*Fig. 4.* Front view of syringe dispenser.

5. Remove the 4 marked screws.
6. Slide the syringe dispenser backwards and towards the left out of the instrument.
7. Turn the syringe spindle counter clock wise, and remove the syringe.
8. Remove the 2 screws from the top cover of the syringe dispenser
9. Release belt tension by loosening the stepper motor mounting screws 1 turn and sliding the motor to the valve side.
10. Remove the top cover of the syringe dispenser by lifting it up.

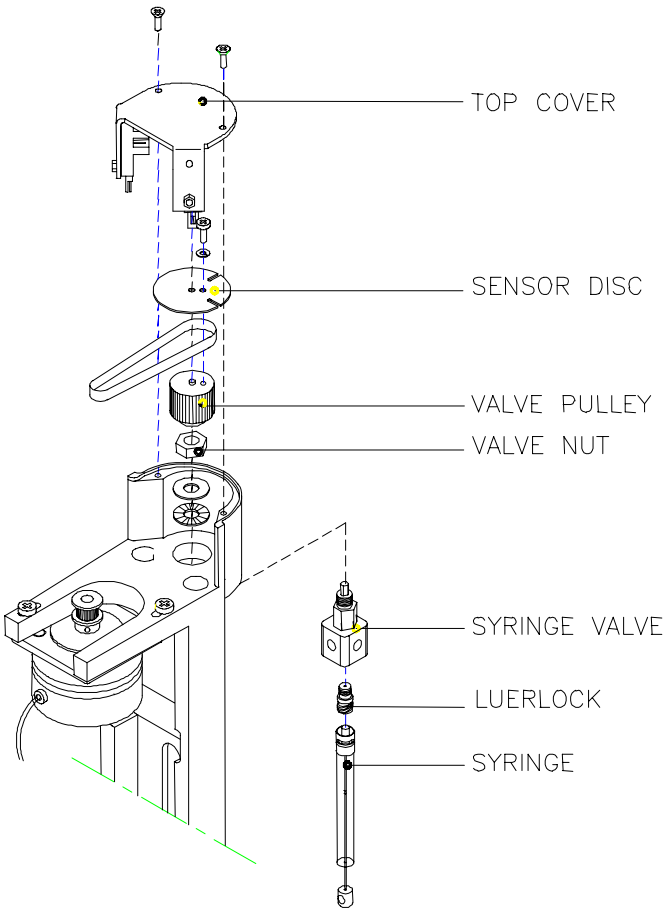


*Fig. 5.* Exploded view of syringe dispenser.

11. Remove the sensor disc.
12. Loosen the hex screw from the pulley and lift the pulley up.
13. Loosen the valve nut and remove the valve downwards.
14. Install the new syringe valve and reinstall the syringe dispenser into the instrument.

**The sensor disk takes care for the correct position of the valve; there is no initial position for replacing the valve.**

## Replacement of needles

The needle used for sampling consists of two parts:

- prepuncturing needle: a hollow needle used for puncturing of the septum, capmat or sealer; also used to put headspace pressure on the sample (approximately 0.5 bar).
- sample needle: placed inside the hollow prepuncturing needle; used for the actual transport of sample. If a needle with deviating diameter is used, a different air outlet nut (see, number 6) must be used that matches the injection needle.

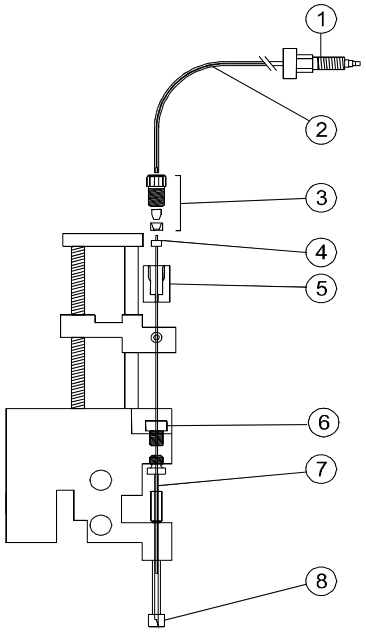


*Fig. 6.* Needle assembly.

The following elements can be identified in figure 6:

1. Nut and ferrule
2. Needle tubing
3. Needle connection nut
4. Sample needle
5. Needle holder
6. Air outlet nut
7. Prepuncturing needle
8. Vials stripper/vial sensor.

**The numbers 1, 2, 3, 4, and 6 constitute the sample needle, which is only available as a complete spare.**

Execute the following steps to replace a sample and air-prepuncturing needle:

1. Loosen the nut from the injection valve (1, Fig. 6).
2. Loosen the needle connection nut (3, Fig. 6).
3. Carefully pull out sample needle and tubing.
4. Remove the stainless steel bracket on the right hand side of the needle arm (2x philips screw, see marked screw in Fig. 7).
5. Remove the air-prepuncturing needle by unscrewing the needle out of the plastic block (7, Fig. 6).
6. Install a new air-prepuncturing needle.
7. Insert a new sample needle and tube through the needle holder (5) and tighten the nut (4, Fig. 6).
8. Connect the other end of the tube to port #4 of the injection valve using the correct nut and ferrule. Do not tighten too much to prevent block of tubing.
9. Push “Start” button in the “Initial wash” box to to clean the new sample needle.

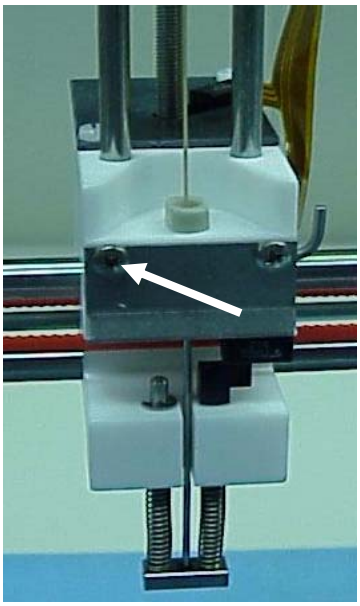

*Fig. 7*. Needle arm.

## Needle penetration point check

To check the alignment of the needle, proceed as follows:

1. Place 3 empty capped vials in the first 3 vial positions.
2. Create an system using an injection method with a short analysis time.
3. Create a sample queue consisting of 3 runs using this system and injection method.
4. Start the sample queue.
5. Check the pierced caps.

Specification: Centre ±0.6mm

## Needle penetration adjustment

The needle arm of the AS 100 can be adjusted for the horizontal movement with the code strip, located on the left side of the needle arm.

To adjust the needle arm, proceed as follows:

1. Check if the needle arm should be moved forwards or backwards.
2. Loosen the Philips screw as marked in Fig. 8 on the left side of the needle arm 1 turn.
3. Slide the code strip forwards or backwards as much as it needs to center the needle in the vial.
4. Tighten the Philips screw on the left side of the needle arm.
5. Perform a new penetration check as described in the section needle penetration point check.
6. Repeat the steps above if necessary until the needle will be centred within specifications.

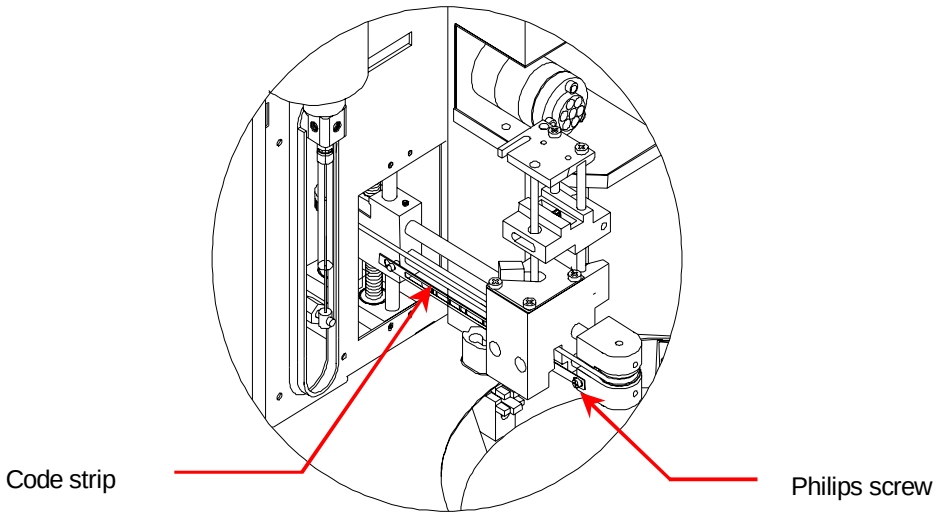


*Fig. 8*. Positions of code strip and adjustment screw.

## Needle depth check

The needle depth is adjustable in the software, but can also be changed by sliding the needle body up or downwards.

To check the needle depth, proceed as follows:

1. Install a flat bottom sample vial on position A3.
2. Set the needle height to 00 mm in the AS 100 driver interface of the ALEXYS data system.

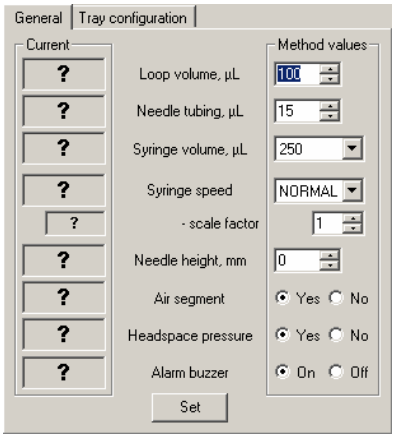


*Fig. 9.* Setting needle height in AS 100 driver.

3. Save the system with this setting.
4. Execute a single determination with the system and use vial position A3 for the injection.

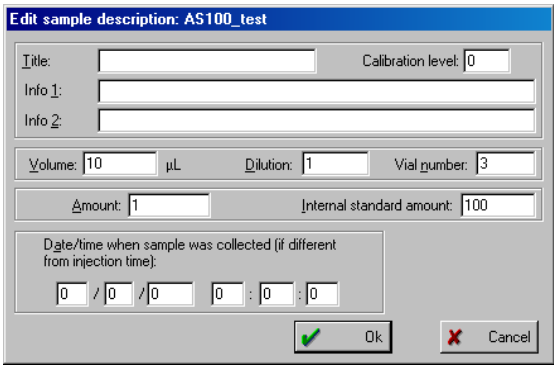


*Fig. 10*. Single determination using vial A3.

5. Turn mains power of the AS 100 off, when the sample needle movement is performed to the maximum depth.
6. Remove the tray segment left from position A1, to get a good view of the penetrated sample vial.
7. Check the distance between the tip of the sample needle and the bottom of the vial

Successful performance: Distance between the sample needle tip and vial bottom is approximately 1mm.

## Needle depth adjustment

The needle depth can be adjusted when the needle depth check is not successfully performed.

To adjust the needle depth, proceed as follows:

1. Perform the procedure of the needle depth check.
2. Loosen the 1.5mm hex screw, which secures the needle body.
3. Slide the needle body up/downwards, to set the tip of the needle 1mm above the vial bottom.

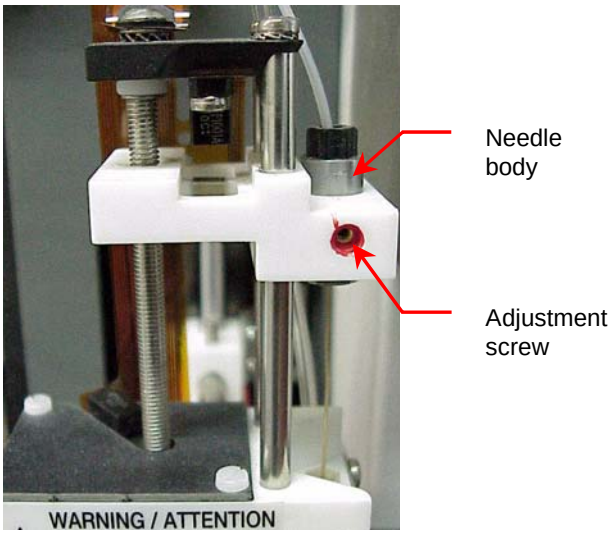


*Fig. 11.* Position of needle depth adjustment screw.

## Buffer tubing replacement

The buffer tubing will prevent sample entering the syringe, to improve the lifetime of the syringe and the syringe valve. The buffer tubing connects port # 3 of the injection valve to the front port of the syringe valve.

1. Replace the buffer tubing.
2. Use the tubing guides, to prevent the buffer tubing will obstruct the movement of the needle arm.

Do not over-tighten the fittings, to prevent obstruction of the sample flow path.

C H A P T E R 3

# Reproducibility test

After replacement of all parts in the preventive maintenance procedure the performance of the AS 100 should be checked by means of a reproducibility test.

| | |
|---|---|
| Eluent: | Distilled water |
| Sample: | Uracil in distilled water (50 ppm) |
| Injection volume: | 10 µL (partial loop fill) |
| Detector: | UV 254 nm (noise $9x10^{-5}$ AU, Linearity 0-1.3AU) |
| Pump: | flowrate 1.5 mL/min |
| PEEK tubing: | Tubing with L=10 meters ID=0.25mm (0.01") |

*Configuration:*

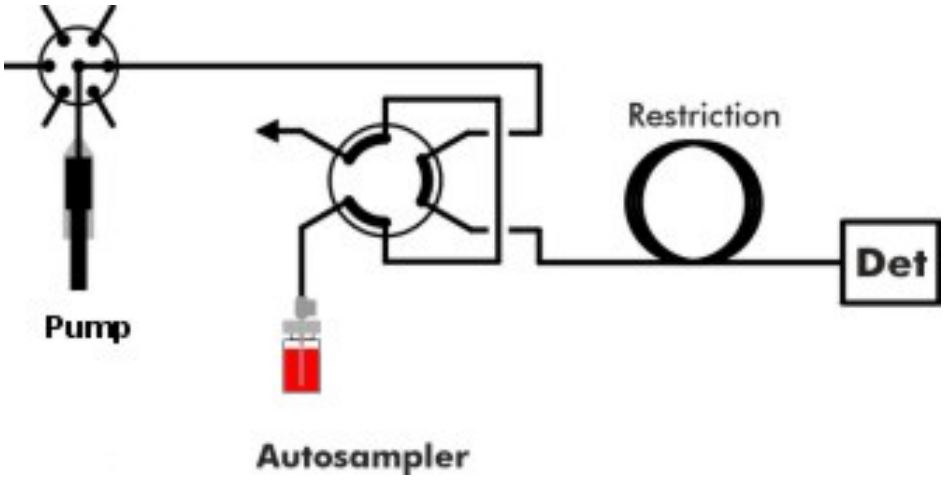


*Fig. 12.* Schematic drawing of test set-up.

*Note:* For a good pump performance it is necessary to install a restriction capillary between pump and injector with such dimensions that a pressure of > 50 bar is generated at a flow rate of 1.5 mL/min. Furthermore it is adviced to install a second restriction capillary behind the UV cell (< 10 bar). Please refer to the manual of the UV detector what the maximum pressure is which the UV detector can handle.

*Method:*

1. Create ALEXYS system with AS 100 injection method with the following settings:

    a. Flush volume: minimal 2 x tubing volume
    b. Partial loop fill: 10 µl
    c. Number of injections per vial: 10
    d. Headspace pressure On (except in case of open vials)
    e. Syringe speed normal
    f. Air segment On
    g. Wash OFF

2. Set pump flow to 1.5mL/min.
3. Insert sample vial 1 with 50 ppm Uracil.
4. Insert sample vial 2 with eluent.
5. Run the programmed method for vial #1 and #2.
6. Record the results in the Preventive Maintenance Checklist.

*Criteria:* RSD < 0.5%
Carry over < 0.2% (without needle wash)

*Formulas:*

$$\overline{Peak\ area} = \frac{\sum Peak\ area}{n}$$

$$\sigma_{n-1} = \sqrt{\frac{\sum \left( Peak\ area - \overline{Peak\ area} \right)^2}{n-1}}$$

$$RSD\% = \frac{\sigma_{n-1}}{\overline{Peak\ area}} \times 100\%$$