

INSTRUCTIONS FOR USE

# STARRSED COMPACT INSTRUCTIONS FOR USE

Version 1.02 MRN-034-EN



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<b>Manufacturer:</b>	Mechatronics Manufacturing B.V.
<b>Phone:</b>	+31 (0)229 - 29 11 29
<b>Fax:</b>	+31 (0)229 - 24 15 34
<b>E-mail:</b>	support@mechatronics.nl
<b>Internet:</b>	<a href="http://www.mechatronics.nl">http://www.mechatronics.nl</a>
<b>Postal address:</b>	P.O. Box 225 1620 AE Hoorn The Netherlands
<b>Office address:</b>	De Corantijn 13 1689 AN Zwaag The Netherlands

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## 1. INTRODUCTION

The **StaRRsed Blood Sedimentation Rate Instrument** (hereafter called StaRRsed Compact) is an in vitro diagnostic medical device that automatically carries out the erythrocyte sedimentation rate analysis according to the **Westergren** method, conforming to CLSI approved standard H02-A5, using closed sample tubes filled with citrate or EDTA blood.

The StaRRsed Compact is an advanced ESR system that offers many unique features and benefits over the traditional ESR procedures. Automating this method has the following advantages:

- The Westergren pipettes are always filled to the correct level.
- Using closed sample tubes reduces the possibility of contamination for the user and environment.
- Standard glass Westergren pipettes are used, in which the measurement can be corrected to a constant temperature (18 C° Celsius). Even small abnormalities can be detected over a longer period of time, irrespective of where and when the blood sample was taken.
- Every sedimentation measurement is directly linked to an identified sample, so that a manual work sheet is unnecessary. Patient ID errors are reduced to a minimum by using the bar-code reader.
- In the EDTA mode, the accuracy of dilution of EDTA blood with citrate is considerably better than manual dilution achieved either by "tipping off" or using evacuated blood collection tubes pre-filled with citrate solution.
- The data can be send to your Lab Information System.
- The used sedimentation pipettes are automatically washed and dried.
- Minimum sample volume is 1.3 ml for the StaRRsed Compact.
- The StaRRsed Compact can use a variety of closed tubes from different manufacturers.







## 2. INSTRUMENT DESCRIPTION

This manual describes the **Stand-alone** Compact analyser. The Instrument consists of the following:

- Basic unit with a belt holding 84 precision bore glass Westergren pipettes.
- Sampling unit, measuring unit, pipette-washing station.
- Barcode reader for sample identification.
- Serial / parallel interface.
- Easy accessible keypad with light key pressure due to piezo technology.
- LCD screen.
- Battery backup memory.
- Accessories kit.
- Built in vacuum unit.





## 2.1. Technical specifications

Technical specifications for the StaRRsed Compact:

**StaRRsed Compact instrument models:**

Model	Model name	Catalogue number
	<b>StaRRsed Compact</b>	<b>ESRI109000</b>

**ESR method:**

<b>ESR method</b>	Westergren method
<b>Temperature compensation method</b>	R.W. Manley: J. clin Path (1957), 10, 354
<b>30 minute method</b>	R. Rogers: Medical Laboratory World 1994
<b>Allowed blood specimen types</b>	<ul style="list-style-type: none"> <li>For EDTA mode: Whole blood with &lt; 1% EDTA anticoagulant.</li> <li>For Citrate mode: Whole blood (4 vols.) with sodium citrate anticoagulant-diluent (1 vol.)</li> </ul>
<b>Automatic dilution</b>	4 vols. blood + 1 vol. sodium citrate diluent (3.2% NaCl); accuracy $\pm 3\%$
<b>Reported result</b>	mm after 1 hour

**Reagents:**

<b>Reagents used</b>	QRR 010931 Diluent QRR 010947 Disinfectant QRR 010933 Saline QRR 010934 Rinse solution De-ionized water
<b>Reagent barcode label information</b>	Code39

**Blood volume:**

<b>Aspirated blood volume per sample</b>	1.4 ml in EDTA mode 1.6 ml in Citrate mode
--	---



**StaRRsed Compact:**

<b>Mains voltage</b>	100/240V	50-60Hz
<b>Fuse (20 x 5 mm)</b>	Slow blow 220V	2.5 Amp
	Slow blow 110V	5.0 Amp
<b>Power consumption</b>	Standby	60 VA
	Maximum	500 VA
<b>Heat output</b>	Standby	70 Watt
	Full operation	360 Watt
<b>Interface</b>	Serial male 9 pin sub-D	
	Parallel female 25 pin sub-D	

**Barcode reader:**

<b>Barcode reader type</b>	CCD.	
<b>Reading capabilities</b>	Most common barcode labels	
	Code39, ITF, Industrial 2 or 5, CodaBar,	
	EAN/UPC and CODE128.	

**Compact overall dimensions:**

<b>Dimensions</b>	Width	740 mm
	Height	770 mm
	Depth	400 mm
<b>Total weight</b>	45 kg	
<b>Min. table size</b>	Width	800 mm
	Depth	600 mm



**StaRRsed Compact environment:**

<b>Sound level</b>	Less than 65 dBA
<b>Environment temperature</b>	18 - 28 °C
<b>Relative humidity</b>	10-90%

**Data storage:**

<b>Storage medium</b>	Battery back-up memory
<b>Storage capacity</b>	Results and raw data of 256 samples

## 2.2. Accessories kit

The StaRRsed Compact comes with an accessories kit. For a complete list of the the contents of accessories kit, see **Appendix - Article reference code for Compact** (on page 102)



### **3. INSTALLATION**

The instrument must be unpacked, installed and checked by a trained engineer prior to first operation.

Detailed installation instructions are given in the StaRRsed Compact User Manual.







## 4. SAFETY WARNING

When there was an incident with the StaRRsed Compact which caused damage to the instrument, please notify your superior and your local equipment dealer before you continue using the instrument.

**Example:**

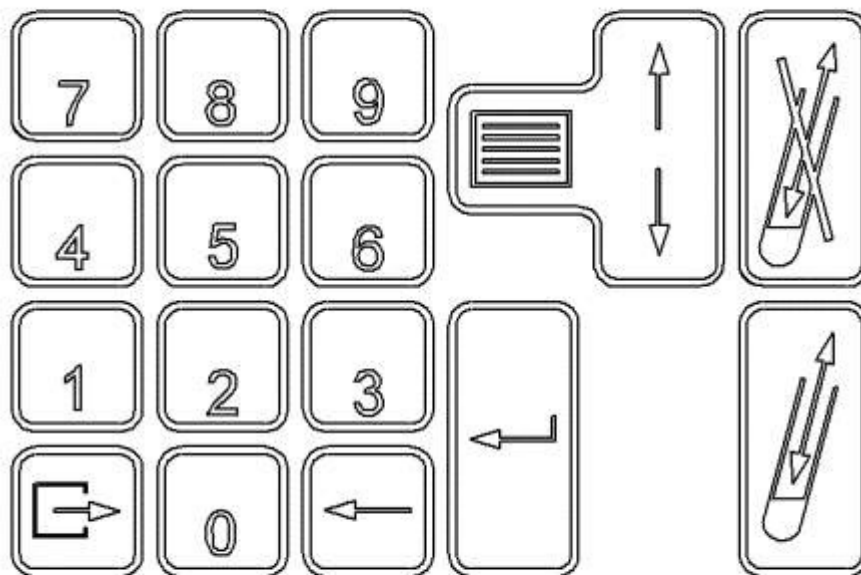
- A collision with a moving object or a person
- Something falling on the instrument
- Liquids spilling into the instrument







## 5. KEYBOARD





## 5.1. Navigating through the menus items

The main menu is displayed during operation. To access all the menus on the screen choose the required number on the display and press the return key.

To access other menus use the scroll key with the arrow.

The default settings in the different menus are printed in Bold

Menu 1*	Sampling sequence
Menu 2	The fluid system
Menu 3	Timing and language
Menu 4	Barcode reader, measure unit and pipette position
Menu 5	RS232 communications.
Menu 6*	Error Handling
Menu 7*	Service and testing *
Menu 8*	Empty in the Compact stand alone version
Menu 9	Solenoid valves and valves actuators *
Menu 0	Pumps and vacuum pump *

\* Is not explained in this manual

### 5.1.1. Navigating the keyboard

The legend is:

[BOLD TEXT] is a text line in the display

(MENU 2-8) is menu 2 function 8

BOLD TEXT is the default setting

[ESC] is the key function

< NOT FILLED > is information on the LCD screen

Easy accessible keypad, light key pressure due to piezo technology.

The StaRRsed Compact has a menu-controlled operating system, each menu can be selected by pressing the **[MENU]** key first (main-menu) and scroll using the **[ARROW]** key. Functions are displayed on the LCD screen.

When the **[START FILL]** key is pressed the fill sequence starts.

When the **[STOP FILL]** key is pressed the fill sequence stops.

## 5.2. Display

In addition to showing the various functions the LCD screen may also show <ERROR> messages and system information.



### 5.3. Version number

From version number 1.64, additional information is added to the version indication on a **Stand-alone Compact**.

The version indication on the display includes a single alpha character. This character indicates the serial output format:

- A. Standard Compact serial output. (Appendix - String format for StaRRsed)
- B. Sedimatic 15 serial output.
- C. Sedimatic 100 serial output.
- D. Vesmatic serial output.
- E. Sysmex R-3500 serial output.
- F. MECHATRONICS-02 serial output.



## 5.4. Menu structure Compact stand alone

Function Key table for the User for Software version >1.68

	<b>Menu 1</b>
1	RUN MODE
2	Not in use
3	STATUS PATIENT
4	STATUS POSITION
5	PRINT DATA BUFFER
6	SEND DATA BUFFER TO HOST
7	EDTA MODE (ON/OFF)
8	ACCEPT ERROR SIGNAL
9	DISPLAY ERROR LIST
0	PRINT HEADER

	<b>Menu 3</b>
1	ESR SEDIMENTATION TIME (MIN)
2	PIPETTE WASH TIME
3	PIPETTE DRY TIME (SEC.)
4	SAMPLE PROBE DEPTH (MM)
5	SET SYSTEM TIME
6	SET SYSTEM DATE
7	TEMP CORR [ON/OFF]
8	SET MANUAL ASPECT CODE
9	ADJUST TEMP. SENSOR
0	SELECT LANGUAGE

	<b>Menu 2</b>
1	PRIME RINSE SOLUTION
2	PRIME SALINE
3	PRIME DILUENT
4	PRIME DE-IONIZED WATER
5	PRIME DISINFECTANT
6	WASH EACH PIPETTE (ON/OFF)
7	WASH ONLY SAMPLE PIPETTES (ON/OFF)
8	WASH ALL PIPETTES (ON/OFF)
9	FILL & CLEAN ALL
0	PRIME ALL UNITS

	<b>Menu 4</b>
1	MEASURE
2	TURN ONE POSITION
3	TURN TO POSITION (Esc)
4	PIPETTE NUMBER AT RINSE POS.
5	MEAS/FILL/TEMP SENSOR CHECK
6	DILUTER START SENSOR CHECK
7	FLOW SENSOR CHECK
8	PRINT SETTINGS
9	BAND POSITION <-- !!!
0	READ BARCODE



	<b>Menu 5</b>
1	SET BAUDRATE
2	Not in use
3	Not in use
4	RESULTS AT LIMIT ERROR (ON/OFF)
5	CHECKSUM (ON/OFF)
6	ACK/NACK (ON/OFF)
7	30 MIN. OUTPUT (ON/OFF)
8	30 MIN. METHOD (ON/OFF)
9	PRINTER (ON/OFF)
0	Not in use

	<b>Menu 7 *</b>
1	RAW DATA => PRINTER/RS232
2	PRINT RAW MEASURE DATA (ON/OFF)
3	DILUTION ADJUST 60....140%
4	ADRC (ON/OFF)
5	PIPETTE FLOW TEST
6	SERVICE (S) & SAMPLE (M) COUNTER
7	CLEAR SERVICE COUNTER
8	CLEAR ERROR LOG
9	QUICK BELT POS. CHECK
0	TYPE OF BARCODE READER

	<b>Menu 6</b>
1	CLEAR FATAL ERROR
2	REPEATED SAMPLE SEQ.(ON/OFF)
3	DISPLAY DILUTION (ON/OFF)
4	DILUTION ERR. 0.... 25%
5	Not in use
6	Not in use
7	DELETE PIPETTE DATA
8	DELETE HISTORICAL DATA
9	SHUT DOWN PROCEDURE (ESC)
0	PASSWORD

	<b>Menu 8</b>
1	Not in use
2	Not in use
3	Not in use
4	Not in use
5	Not in use
6	Not in use
7	Not in use
8	Not in use
9	Not in use
0	Not in use



## Keyboard

	<b>Menu 9 *</b>
1	SAMPLE PROBE UP / DOWN
2	SAMPLE TUBE HOLDER UP/DOWN
3	FILL NOZZLE UP/DOWN
4	VALVE OUTER NEEDLE ON/OFF
5	RINSE NOZZLE UP/DOWN
6	RINSE ACTUATOR ON/OFF
7	FILL ACTUATOR ON/OFF
8	SAMPLE CONTROL SOLENOID ON/OFF
9	V-VALVE WASH SECTION ON/OFF
0	V-VALVE FILL SECTION ON/OFF

	<b>Menu 10 *</b>
1	VACUUM PUMP ON/OFF
2	WASTE PUMP ON/OFF
3	SALINE PUMP ON/OFF
4	RINSE PUMP ON/OFF
5	SET TUBE NUMBER (RINSE POS)
6	PIPETTE NUMBER AT RINSE POS.
7	Not in use
8	Not in use
9	DIAGNOSTICS MOTOR CURRENT
0	ALL PUMPS OFF

\* Is not explained in this manual



### 5.4.1. Menu 1

This menu has all the instructions related to the sampling sequence.

	MENU 1
1	RUN MODE
2	Not in use
3	STATUS PATIENT
4	STATUS POSITION
5	PRINT DATA BUFFER
6	SEND DATA BUFFER TO HOST
7	EDTA MODE (ON/OFF)
8	ACCEPT ERROR SIGNAL
9	DISPLAY ERROR LIST
0	PRINT HEADER

#### 1. [RUN MODE]

The screen changes to a different layout when switched to fill sequence.

Insert a sample tube in the tube adapter with barcode label to the left and press **[START FILL]**.

Barcode will read and sampling sequence will take place.

For tubes without a barcode ID, the patient ID number must be keyed in. Press **[START FILL]** and aspiration sequence will start.

Press the **[ESC]** key or the **[MENU]** key to return to the main menu.

Pressing the **[STOP FILL]** key interrupts the aspiration.

#### 2. Not in use

#### 3. [STATUS PATIENT]

Select function, type the patient ID number, and press the **[ENTER]** key.

Patient ID, pipette position and remaining ESR time will be displayed on the LCD screen. (ttg= means time to go).

Insert the sample tube in the tube adapter. Press the **[START FILL]** key. The barcode will read and the information will be displayed on the LCD screen.

If the status is asked during the ESR time, the information displayed is Patient ID, pipette position and remaining ESR time.

If the status is asked after the ESR has been measured the information displayed is Patient ID, ESR60=10, ERROR=0

The codes are defined as follows:

ESR60= 1 to 140 mm is the length of the plasma found.

ESR60= 0 a good result was not found during the measure, the error number is given as Error=X. The error codes are:



0	NO ERRORS		
1	No cells/plasma found	ERROR	No contents could be detected in the pipette.
2	ESR Probably > 140 mm	ERROR	Extremely high ESR value.
3	Too many borders found	ERROR	More than three borders found, possibly air bubbles. See Section Trouble shooting <b>Air bubbles</b> (on page 62).
4	Column height <nnn>	WARNING	Column height must be between 180 and 210mm. <nnn> = the actual column height.
5	Measure error	WARNING	The down count is not equal to the up count from the measure head.
6	Bubbles on top	WARNING	Air bubbles on top of the ESR. See Section Trouble shooting <b>Air bubbles</b> (on page 62).
7	Limit error	ERROR	One of the following limits are out of the setting range: <ul style="list-style-type: none"> <li>• ESR Time</li> <li>• Column height</li> <li>• Dilution</li> </ul>

If the data is on the display, the **[ARROW]** keys have a special function.

The **[ARROW UP]** key will print data.

The **[ARROW DOWN]** key will send data to the RS 232 port.

Any other key will end this function.

#### 4. [STATUS POSITION]

Select function, type the pipette number, and press the **[ENTER]** key.

Patient ID, pipette position and remaining ESR time will be displayed on the LCD screen. (ttg= means time to go.)

After the rinse sequences the message will be < NOT FILLED >

#### 5. [PRINT DATA BUFFER]

The sample results are stored in a battery back-up memory. The maximum storage capacity is 256, then the 'first in' 'first out' rule applies. These results may be printed at any time using this function.

Select function and confirm with **[ENTER]**.

#### 6. [SEND DATA BUFFER TO HOST]

Sending only the data buffer to the host computer and not to the local printer.



7. [EDTA MODE ON/OFF]  
Select fill mode, EDTA or CITRATE.  
Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.  
This setting is protected and can only be changed when Service mode is active.
8. [ACCEPT ERROR SIGNAL]  
This function will suspend the Error buzzer for a period of 5 minutes.  
Error message stays on the LCD screen.
9. [DISPLAY ERROR LIST]  
This function will display the last 15 errors of the instrument.  
The display is refreshed by the function first in first out.  
If no errors are displayed the last clear error time and date is shown in the display.  
"Hit ANY KEY" returns to normal menu display.
10. [PRINT HEADER] (Note: 0 is displayed)  
Send Header includes date and time to the printer. Select function and confirm with **[ENTER]**.



### 5.4.2. Menu 2

This menu has all the functions related to the fluid system.

	MENU 2
1	PRIME RINSE SOLUTION
2	PRIME SALINE
3	PRIME DILUENT
4	PRIME DE-IONIZED WATER
5	PRIME DISINFECTANT
6	WASH EACH PIPETTE (ON/OFF)
7	WASH ONLY SAMPLE PIPETTES (ON/OFF)
8	WASH ALL PIPETTES (ON/OFF)
9	FILL & CLEAN ALL
0	PRIME ALL UNITS

After each reagent change, the fluid system must be primed to fill the relevant tubes with reagent and remove air. This is also part of the daily start-up. Use the applicable button to perform the automatic priming cycle for this reagent:

1. PRIME RINSE SOLUTION:

After each measurement, the pipettes are washed and dried automatically.  
Select this function and the prime rinse is carried out automatically.

2. PRIME SALINE:

After each aspiration, the outer needle, sample probe and fill nozzle are washed with saline.  
Select this function and the prime saline is carried out automatically.

3. PRIME DILUENT:

The Diluter prime cycle is 5 strokes of the syringe.  
Select this function and the prime diluter is carried out automatically.

4. PRIME DE-IONIZED WATER:

After each aspiration, the fill nozzle is flushed with de-ionized water.  
The fill-nozzle will contaminate during normal operation. Select this function and the fill nozzle flush is carried out automatically.

5. PRIME DISINFECTANT:

During a pipette rinse cycle, a small amount of disinfectant is flushed around the bottom of the pipette and into the waste system.  
Select this function and the prime disinfectant is carried out automatically.



**6. WASH EACH PIPETTE (ON/OFF):**

When pipette belt turns one position at a time, each pipette will be rinsed and dried. Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.

**7. WASH ONLY SAMPLE PIPETTES (ON/OFF):**

Only the pipettes with samples are washed and dried automatically.

Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.

Warning on the display <PIPETTE DATA WILL BE LOST>

---

**Note:** Before executing this function, ensure that the pipette belt is free of samples. If there are any remaining samples, they will be washed away and will not be read.

---

**8. WASH ALL PIPETTES (ON/OFF):**

All pipettes on the pipette belt are washed and dried automatically.

Use the **[ARROW]** keys to toggle and press **[ENTER]** to select. Warning on the display <PIPETTE DATA WILL BE LOST>.

The Wash all pipettes function is interruptible by the **[ESC]** key. This will also be displayed.

---

**Note:** Before executing this function, ensure that the pipette belt is free of samples. If there are any remaining samples, they will be washed away and will not be read. Activate (MENU 2- 8) and **[ARROW DOWN]** again will stop this function.

---

**9. FILL & CLEAN ALL:**

Automatic fill and clean function, each individual pipette on pipette belt will be filled with cleaning solution. Use the **[ARROW]** keys to toggle and press **[ENTER]** to select. This fill and clean cycle takes about 90 minutes. Fill and clean function is part of the monthly maintenance procedure.

Warning on the display <PIPETTE DATA WILL BE LOST>

---

**Note:** The clock in the display is not updated during filling the pipettes.

---

**10. PRIME ALL UNITS: (Note: 0 is displayed)**

This function will automatically perform all prime sequences (menu items 1 to 5) subsequently. When the StaRRsed Compact has been idle for more than eight hours, some reagents may have dropped from the tubes due to gravity.

Confirm with **[ENTER]**.

---

**Note:** The system must be checked for air bubbles.

---



### 5.4.3. Menu 3

This menu has all the functions related to the Timing and language.

	MENU 3
1	ESR SEDIMENTATION TIME (MIN)
2	PIPETTE WASH TIME
3	PIPETTE DRY TIME (SEC.)
4	SAMPLE PROBE DEPTH (MM)
5	SET SYSTEM TIME
6	SET SYSTEM DATE
7	TEMP CORR [ON/OFF]
8	SET MANUAL ASPECT CODE
9	ADJUST TEMP. SENSOR
0	Not in use

#### 1. [ESR SEDIMENTATION TIME (MIN)]

Default sedimentation time is 60 minutes, however this time can only be changed when the instrument is in Service mode. This value cannot be changed in the run mode.. In the Run mode a warning is displayed <NOT ALLOWED NOW!>

Go to (MENU 6-10) [PASSWORD] enter the password.

Enter a new ESR sedimentation time and press the **[ENTER]** key.

Press **[ESC]** key to abort entry.

This setting is protected and can only be changed when Service mode is active.

---

**Note:** The Westergren method stipulates a **60**-minute sedimentation time. The bottom line on the LCD screen shows the current setting. The changed value will be used only if the instrument is operated in the Service mode. When the instrument is in the Running mode the default value 60 minute is used.

---

#### 2. [PIPETTE WASH TIME] (Default 7 sec)

The pipette wash time is set to **7** seconds, however this time can be changed if the instrument is in the Service mode. This value cannot be changed in the run mode. In the Run mode a warning is displayed <NOT ALLOWED NOW!>

Go to (MENU 6-10) [PASSWORD] enter the password.

Enter a new pipette wash time and press the **[ENTER]** key.

Press **[ESC]** key to abort entry.

This setting is protected and can only be changed when Service mode is active.

---

**Note:** Changing the pipette wash time has the following consequences.

---

- Making the pipette wash time longer will slow down the Compact throughput.



- Making the pipette wash time shorter may cause the pipettes to be insufficiently cleaned after the wash cycle and affect the sample results!
- The bottom line on the LCD screen shows the current setting.
- The changed value will be used only if the instrument is operated in the Service mode. When the instrument is in the Running mode the default value 7 sec is used.

### 3. [PIPETTE DRY TIME (SEC.)] (Default **9** sec)

The pipette dry time is set to **5** seconds, however this time can be changed if the instrument is in the Service mode. This value cannot be changed in the run mode. In the Run mode a warning is displayed <NOT ALLOWED NOW!>. Go to (MENU 6-10) [PASSWORD] enter the password. Enter a new pipette dry time and press the **[ENTER]** key. Press **[ESC]** key to abort entry. This setting is protected and can only be changed when Service mode is active.

---

**Note:** Changing the pipette dry time has the following consequences.

---

- Making the pipette dry time longer will slow down the Compact throughput.
- Making the pipette dry time shorter may cause the pipettes to be dried insufficiently after the wash cycle, affecting the sample results!
- The bottom line on the LCD screen shows the current setting.
- The changed value will be used only if the instrument is running in the Service mode. When the instrument is in the Running mode the default value 9 sec is used.

### 4. [SAMPLE PROBE DEPTH (MM)]

Can be changed if the instrument is in the Service mode. This value cannot be changed in the run mode.

In the run mode a warning is displayed <NOT ALLOWED NOW!>

Go to (MENU 6-10) [PASSWORD] enter the password.

For each manufacturers type of blood collection tube the sample probe depth must be checked and set. Measure overall sample tube length. The sample probe depth is usually slightly less than the overall length of the tube, enter this depth in millimeters. This will be the depth that the sample probe goes down into the sample tube.

Example:

Tube length            75 millimeters.

Set probe to           73 millimeters.

This setting is protected and can only be changed when Service mode is active.



## Keyboard

---

**Note:** Setting the needle too close to the tube bottom may cause a fill time error. There should be approximately 2-millimeter clearance between the sample tube bottom and sample probe. The bottom line on the LCD screen shows the current setting.

---

### 5. [SET SYSTEM TIME]

Compact system time.

System time can only be changed if the pipette belt is completely empty.

Set time HH:MM:Confirm with the **[ENTER]** key.

---

**Note:** Changing the system time during the sedimentation time is not allowed, a warning is displayed <NOT ALLOWED NOW!>

---

### 6. [SET SYSTEM DATE]

Compact system date.

System date can only be changed if the pipette belt is completely empty.

Set date DD-MM-YYYY: Confirm with the **[ENTER]** key.

---

**Note:** Changing the system date during the sedimentation time is not allowed, a warning is displayed <NOT ALLOWED NOW!>

---

### 7. [TEMP CORR [ON/OFF] ]

Default setting is temperature correction on, meaning that two result columns are printed.

Column **esr** = result as measured.

Column **tc** = temperature corrected result.

This setting is protected and can only be changed when Service mode is active.

### 8. [SET MANUAL ASPECT CODE]

The manual aspect code is a one or two digit numerical code.

The number will be printed together with the normal aspect code. The manual aspect code can be found under the row "**ma** (on page 41)" on the printout.

See section **Reporting** (on page 41)

### 9. [ADJUST TEMP. SENSOR]

Enter the actual room temperature: Confirm with the **[ENTER]** key. The bottom line on the LCD screen shows the current setting.

### 10. [Not in use]



#### 5.4.4. Menu 4

This menu has all the functions related to the Barcode reader, measure unit and pipette position.

	MENU 4
1	MEASURE
2	TURN ONE POSITION
3	TURN TO POSITION (ESC)
4	PIPETTE NUMBER AT RINSE POS.
5	MEAS/FILL/TEMP SENSOR CHECK
6	DILUTER START SENSOR CHECK
7	FLOW SENSOR CHECK
8	PRINT SETTINGS
9	BAND POSITION <-- !!!
0	READ BARCODE

1. [MEASURE]

To overwrite the automatic measure function and manually measure sedimentation. Pipette at the measure position will be read and result printed.

2. [TURN ONE POSITION]

Pipette belt moves one position.

3. [TURN TO POSITION (ESC)]

Enter a pipette number; to move the pipette to the stop position, which is always the wash/rinse station

Press **[ESC]** key to abort entry.

4. [PIPETTE NUMBER AT RINSE POS.]

This function will show the current pipette number at the rinse position.

5. [MEAS/FILL/TEMP SENSOR CHECK]

LCD screen shows the sensor status.

Values must be within the following limits:

Measure sensor MS 40..**50**..60

Fill stop sensor FS 90..**140**..165

Temperature sensor TS [Room temperature]



**Note:** Clean sensors first before executing this function **WI-172 Cleaning Measure sensor** (on page 92).

---

6. [DILUTER START SENSOR CHECK]

In EDTA mode, if the diluter does not start during the aspiration, the status of this sensor must be checked.

Diluter start sensor            400-700. If incorrect contact the distributor.

7. [FLOW SENSOR CHECK]

During the aspiration sequence the airflow is monitored. The vacuum unit switches on and the following values are shown on the LCD screen:

Flow: 0925.....1020            Abs: 0320....0360            Offset: 0045...0055

8. [PRINT SETTINGS]

Print settings from the Compact to printer.

The following settings are printed;

M1-7 EDTA MODE (ON/OFF): ON

M3-1 ESR SEDIMENTATION TIME (MIN): 60

M3-2 PIPETTE WASH TIME: 7

M3-3 PIPETTE DRY TIME (SEC.): 9

M3-4 SAMPLE PROBE DEPTH (MM): 5

M3-7 TEMP CORR [ON/OFF] : ON

M5-1 SET BAUDRATE: 2400

M5-4 RESULTS AT LIMIT ERROR (ON/OFF): ON

M5-5 CHECKSUM (ON/OFF): OFF

M5-6 ACK/NACK (ON/OFF): OFF

M5-7 30 MIN. OUTPUT (ON/OFF): OFF

M5-8 30 MIN. METHOD (ON/OFF): OFF

M6-2 REPEATED SAMPLE SEQ.(ON/OFF): OFF

M6-4 DILUTION ERR. 0.... 25%: 20

M7-0 TYPE OF BARCODE READER: Opticon

M7-3 DILUTION ADJUST 60....140%: 100

M7-4 ADRC (ON/OFF): OFF



9. [BAND POSITION <-- !!!]

With this function the carrousel can be moved one position backwards.

---

**Warning:** Only for trained personal. When this function is used, the built in safety functions are not active.

---

10. [READ BARCODE] (Note: 0 is displayed)

This function will trigger the barcode reader. Label ID number will be seen on the LCD display. Normally the **[START FILL]** key triggers the barcode reader key, however for checking bar code labels, this may be used.



### 5.4.5. Menu 5

This menu has all the functions related to RS232 communications.

	MENU 5
1	SET BAUDRATE
2	Not in use
3	Not in use
4	RESULTS AT LIMIT ERROR (ON/OFF)
5	CHECKSUM (ON/OFF)
6	ACK/NACK (ON/OFF)
7	30 MIN. OUTPUT (ON/OFF)
8	30 MIN. METHOD (ON/OFF)
9	PRINTER (ON/OFF)
0	Not in use

1. [SET BAUDRATE]

Use the **[ARROW]** keys to select and the **[ENTER]** key to confirm. Baud rate selection: 1200, 2400, 4800, 9600 and 19200 (**8-N-1**).

Compact default communication settings:

Baud rate **2400** (**8-N-1**)

2. [Not in use]

3. [Not in use]

4. [RESULTS AT LIMIT ERROR (ON/OFF)]

For the ESR time, Dilution errors and Column height result at limit can be set for transmitting data OFF or ON.

RESULTS AT LIMIT ERROR is ON: transmit data to the output.

RESULTS AT LIMIT ERROR is OFF: transmit no data to the output when the ESR results are outside the selected range.

5. [CHECKSUM (ON/OFF)]

Checksum output string: 1 byte checksum = 256 - (modulo 256, ASCII string sum).

Use the **[ARROW]** keys to select and the **[ENTER]** key to confirm.



**6. [ACK/NACK (ON/OFF)]**

Allows data from Compact to be sent again to the host computer if there is an error in transmission.

Use the **[ARROW]** keys to select and the **[ENTER]** key to confirm. If this function is active, a confirmation is expected from the host computer after serial transmission. After receiving a "Nack" StaRRsed sends the data again (maximum two times). An "Ack" will let the StaRRsed carry on immediately. If "Ack/Nack" is not received, the StaRRsed carries on after a pause of 1 second between the transitions. "**ACK**"= Acknowledge, "**NACK**"= Not acknowledge.

**Ack/ Nack**

The **Ack / Nack** modus can be useful if transmission lines are extremely busy. A Nack (not acknowledge) character may be sent by the Host if the data string is incomplete or the check sum is incorrect. The StaRRsed will transmit the data string again.

If an Ack (acknowledge) character is sent by the Host the next string will be transmitted

Ack character = Hex 6, decimal 6 or Ctrl F

Nack character = Hex 15, decimal 21 or Ctrl U.

**7. [30 MINUTE OUTPUT ON/OFF]**

Special prints out, for detailed information see Appendix String format for Compact and StaRRsed and Reporting 60-minute mode. Use the **[ARROW]** keys to select and the **[ENTER]** key to confirm.

This setting is protected and can only be changed when Service mode is active.

---

**Note:** Changing the output during the sedimentation time is not allowed, a warning is displayed  
<NOT ALLOWED NOW!>

---



**8. [30 MINUTE METHOD ON/OFF]**

The Compact performs the ESR after 30 minutes (instead of 60 minutes) and converts this value to a 60 minute Westergren standard. The method has the advantage that sample results become available after 30 minutes to the operator, however this method is not according to the Westergren method and results may deviate from the original Westergren results.

If this method is switched ON, the ESR time automatically switches to 30 minutes and cannot be changed manually. If this method is switched OFF, the ESR time automatically switches to 60 minutes.

The actual measured 30-minute result will only be printed and sent to the host computer if (MENU 5-7) [30 MINUTE OUTPUT ON/OFF] is set to 'ON' as well. The converted Westergren standard (60 minute result) is sent to the printer and the host computer.

This setting is protected and can only be changed when Service mode is active.

---

**Note:** It is not recommended to use the 30-minute method on pre-citrated sample tubes.

**Note:** Changing the method during the ESR time is not allowed, a warning is displayed <NOT ALLOWED NOW!>

---

**9. [PRINTER (ON/OFF)]**

Toggle function, enable printer or disable printer.

Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.

Printer status is displayed on the LCD screen.

**10. Not in use (Note: 0 is displayed)**



### 5.4.6. Menu 6

This menu has all the functions related to Error Handling.

	MENU 6
1	CLEAR FATAL ERROR
2	REPEATED SAMPLE SEQ.(ON/OFF)
3	DISPLAY DILUTION (ON/OFF)
4	DILUTION ERR. 0.... 25%
5	Not in use
6	Not in use
7	DELETE PIPETTE DATA
8	DELETE HISTORICAL DATA
9	SHUT DOWN PROCEDURE (ESC)
0	PASSWORD

#### 1. [CLEAR FATAL ERROR]

If a <WASTE FULL ERROR> occurs the Compact will stop all functions, the Waste container must be emptied or replaced.

In order to resume the process this function must be used.

Confirm with the **[ENTER]** key.

#### 2. [REPEATED SAMPLE SEQ.(ON/OFF)]

Default setting is off.

This function only operates during [RUN MODE].

Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.

Function ON; place sample tube with barcode in the sample tube adapter and press start fill-sequence. As soon as the aspiration has finished, replace the sample tube and the next sample will be identified and aspirated.

This continues until the same sample ID has been read twice or no new sample tubes are placed on the instrument. Ensure that the sample tubes are placed correctly in the sample tube adapter. With this function active, there is a risk that the sample tube adapter can close, even when a sample tube has not been placed correctly!

#### 3. [DISPLAY DILUTION (ON/OFF)]

This function only works during the [RUN MODE].

Use the **[ARROW]** keys to toggle and press **[ENTER]** to select.

This function shows the dilution rate after each aspiration, the normal rate must be between 95%...105%.



---

**Keyboard**

---

**4. [DILUTION ERR. 0.... 25%]**

Dilution Error deviation report. If a dilution error occurs during the aspiration sequence, an audible alarm sounds and the deviation value will be shown on the LCD screen. When the measure unit has evaluated the sample, the deviation value will be printed after the text "EDTA"

Example: At the end of the print out, EDTA 085 is shown, indicating that this sample had only an 85% dilution.

**5. [Not in use]****6. [Not in use]****7. [DELETE PIPETTE DATA]**

This function will erase all pipette data. Make sure that there are no samples on the pipette belt. Confirm with the **[ENTER]** key.

**8. [DELETE HISTORICAL DATA]**

This function will erase all preset pipette data and clean the historical buffer. Make sure that there are no samples on the pipette belt. Confirm with the **[ENTER]** key.

**9. [SHUT DOWN PROCEDURE (ESC)]**

All pipettes will be washed once and needle, fill-nozzle and wash station are primed. Confirm with the **[ENTER]** key. The Shutdown function is interruptible by the **[ESC]** key. This will also be displayed.

**10. [PASSWORD] (Note: 0 is displayed)**

Password is needed to open the service menus 7 to 10. Password is 3964. Press the **[ENTER]** key.

---

**Note:** If the service mode is active <- SERVICE MODE -> is flashing in the Compact display.

---



## 6. REPORTING

The Compact is able to transmit different types of reports to the printer and the serial output port. Default mode the standard 60-minute report is used.

In **Menu 5**, the following options are selectable.

Checksum (on/off)	Menu 5 - 5
ACK/NACK (on/off)	Menu 5 - 6
30 minute output (on/off)	Menu 5 - 7
30 method (on/off)	Menu 5 - 8

**Checksum** is select ON (MENU 5 - 5), at the end of the string an extra byte is added. Checksum output string: 1 byte checksum = 256 (modulo 256 (ASCII string sum)). This output is also known as the advanced output.

**ACK/NACK** is select ON (MENU 5 - 6); a confirmation is expected from the host computer after serial transmission. After receiving a **"Nack"**, StaRRsed sends the data again (maximum two times). An **"Ack"** will let the StaRRsed carry on immediately.

If "Ack/Nack" is not received, the Instrument carries on after a pause of 1 second between the transitions. (**"ACK"** = Acknowledge, **"NACK"** = Not acknowledge.)

See also Appendix - String format for StaRRsed

[30 minute output] is ON (MENU 5 - 7) the format of the report is changed independent of the selection of the status of checksum or ACK/NACK.

[30 METHOD] is ON (MENU 5 - 8) the ESR time automatically switches to 30 minutes and cannot be changed manually. The actual measured [30-MINUTE] result will only be printed and sent to the host computer if 30 MINUTE OUTPUT is set to 'on' as well. If this method is switched **OFF** the ESR time automatically switches to 60 minutes. The converted Westergren standard (60 minute result) is sent to the printer and to the serial port.

The StaRRsed Compact performs the **ESR after 30 minutes** (instead of 60 minutes) and converts this value to a 60 minute **Westergren** standard. The method has the advantage that sample results become available after 30 minutes to the operator, however this method is not according to the Westergren method and results may deviate from the original Westergren results. For conversion to a standard Westergren, a table is used which correlates a **30-minute** ESR to a **60-minute** **ESR** result.

The method has been proposed and evaluated by Mr. Richard Rogers of the Royal Berkshire Hospital, Reading (U.K.). (See Medical Laboratory World, April 1994.)

---

**Note:** It is not recommended to use the 30-minute method on pre-citrated sample tubes.

---



## **6.1. Protocols**

A protocol is a set of rules governing the communication and the transfer of data between machines, as in a computer system. Also a formal set of rules and procedures to be followed during a request for information before data is transferred between machines and computer systems. The protocol is installed before delivery.

The version indication on the display includes a single alpha character. This character indicates the serial output format:

- A. Standard Compact serial output. (Appendix - String format for StaRRsed)
- B. Sedimatic 15 serial output.
- C. Sedimatic 100 serial output.
- D. Vesmatic serial output.
- E. Sysmex R-3500 serial output.
- F. MECHATRONICS-02 serial output.

## **6.2. Result Printout**

The results of the ESR measurements are send to the printer. The layout of the report depends on the selection of the 60- or 30 minute method.



## 6.2.1. Report 60-Minute mode

### +++++ REPORT EXAMPLE +++++ (Not to scale)

-- StaRRsed--		Date 20/05/07				Time 15:28				
						:				
1	2	3	4	5	6	7	8	9	10	11
Sample ID		ESR	Tc	ASPECT	Manual aspect	Pip.	Time	T	Error	EDTA
972005001		84	75	CLEAR		17	60	23		EDTA
972005002		14	13	Hazy<10m m		18	60	23		EDTA
972005003		22	21	Hazy<25m m		19	60	23		EDTA
972005004		67	61	Hazy>25m m		20	60	23		EDTA

Sample result with a manual aspect, where the manual aspect is shown as a number **3** in column 6 of this data record sample.

972005005	5	4	CLEAR	<b>3</b>		21	60	23		EDTA
-----------	---	---	-------	----------	--	----	----	----	--	------

In this sample, the dilution rate has a dilution failure of 21% and that is printed as **EDTA 079**.

972005006	5	5	CLEAR			22	60	23		<b>EDTA 079</b>
-----------	---	---	-------	--	--	----	----	----	--	---------------------

Sample results with a text error. This sample gives Too many borders found. Result of a pipette possibly filled with air bubbles.

972005007						24	60	23	Too many borders found	
-----------	--	--	--	--	--	----	----	----	------------------------	--

Sample result with a text error. This sample is given limit error L\_err(---/ 84/ 75/200)

972005001						25	60	23	<b>L_err(---/ 84/ 75/200)</b>	EDTA
-----------	--	--	--	--	--	----	----	----	-----------------------------------	------



## **Reporting**

---

1. Patient number.
2. Not corrected 30-minute ESR result (only in use if 30 minute mode is active).
3. Not corrected 60-minute ESR result.
4. 60-minute ESR result in millimeters, corrected for **18°C**. (only in use if temperature correction is active).
5. Aspect (clear, hazy).
6. Manually entered code number.
7. Sedimentation pipette number (number on the pipette belt).
8. Actual sedimentation time in minutes.
9. Temperature (in degrees Centigrade).
10. Error message (if the Analyser detects an error).
11. EDTA mode.



## 6.2.2. Report 30 Minute mode

### +++++ REPORT EXAMPLE +++++ (Not to scale)

- StaRRsed--		Date 20/05/07				Time 15:28				
						:				
1	2	3	4	5	6	7	8	9	10	11
Sample ID	Hh	ESR	Tc	ASPECT	Manual aspect	Pip.	Time	T	Error	EDTA
972005001	42	84	75	CLEAR		17	30	23		EDTA
972005002	5	14	13	Hazy<10m m		18	30	23		EDTA
972005003	8	22	21	Hazy<25m m		19	30	23		EDTA
972005004	32	67	61	Hazy>25m m		20	30	23		EDTA

Sample result with a manual aspect, where the manual aspect is shown as a number **3** in column 6 of this data record sample.

972005005	2	5	4	CLEAR	<b>3</b>	21	30	23		EDTA
-----------	---	---	---	-------	----------	----	----	----	--	------

In this sample, the dilution rate has a dilution failure of 21% and that is printed as **EDTA 079**.

972005006	2	5	5	CLEAR		22	30	23		<b>EDTA 079</b>
-----------	---	---	---	-------	--	----	----	----	--	---------------------

Sample results with a text error. This sample gives Too many borders found. Result of a pipette possibly filled with air bubbles.

972005007						24	30	23	Too many borders found	
-----------	--	--	--	--	--	----	----	----	------------------------	--

Sample result with a text error. This sample is given limit error L\_err( 42/ 84/ 75/200)

972005001				Hazy<10m m		25	30	23	<b>L_err(---/ 84/ 75/200)</b>	EDTA
-----------	--	--	--	---------------	--	----	----	----	-----------------------------------	------



## **Reporting**

---

1. Patient number.
2. Not corrected 30-minute ESR result (only in use if 30 minute mode is active).
3. Not corrected 60-minute ESR result.
4. 60-minute ESR result in millimeters, corrected for **18°C**. (only in use if temperature correction is active).
5. Aspect (clear, hazy).
6. Manually entered code number.
7. Sedimentation pipette number (number on the pipette belt).
8. Actual sedimentation time in minutes.
9. Temperature (in degrees Centigrade).
10. Error message (if the Analyser detects an error).
11. EDTA mode.

### **6.2.3. ESR Error**

Error messages can be found on the printout in column 10.

If errors are found during the measurement, the Compact will give an audible alarm.

The Error message is displayed on the main screen.



#### 6.2.4. Results at limit errors

When this option is set to YES and this limit error occurs, results will be printed/send to the LIMS.

When this option is set to NO and this limit error occurs, the fields for *30 min ESR*, *60 min ESR* and the *temperature corrected ESR* are filled with spaces and thus results are not printed/send to the LIMS.

The error message in the error field (column 10) indicates that at least one of the limits (ESR time, dilution rate or column height) has been exceeded.

Together with the sedimentation time and dilution rate (which are still printed at the usual position), the operator/analyst can see what caused the error and may or may not use the ESR values which are preserved in the error message.

Description of the error message **L\_err(hhh/www/ttt/ccc)** :

- **L\_err** means it is a "limit error"
- **hhh** is the 30 minutes ESR
- **www** is the 60 minute ESR
- **ttt** is the temperature corrected 60 minute result
- **ccc** is the column height

Example of a limit error message:

- L\_err( 42/ 84/ 75/200) means 42 mm in the 30 minute method and temperature correction 75 with a correct column height.
- L\_err(---/ 84/ 75/200) means 84 mm in the 60 minute method and temperature correction 75 with a correct column height.

ESR "ERROR" and "WARNING" code messages



## Reporting

This code appears in the "sample data record" at column 10.

The following codes are defined:

0	No ERRORS		
1	No cells/plasma found	ERROR	No contents could be detected in the pipette.
2	ESR Probably > 140 mm	ERROR	Extremely high ESR value.
3	Too many borders found	ERROR	More than three borders found, possibly air bubbles. See Section Trouble shooting <b>Air bubbles</b> (on page 62).
4	Column height <nnn>	WARNING	Column height must be between 180 and 210mm. <nnn> = the actual column height.
5	Measure error	WARNING	The down count is not equal to the up count from the measure head.
6	Bubbles on top	WARNING	Air bubbles on top of the ESR. See Section Trouble shooting <b>Air bubbles</b> (on page 62).
7	Limit error	ERROR	One of the following limits are out of the setting range: <ul style="list-style-type: none"> <li>• ESR Time</li> <li>• Column height</li> <li>• Dilution</li> </ul>

### 6.2.5. Reporting range

The reporting range in the columns 2, 3 and 4 are in millimeters. The start of the measure range is at the top of the meniscus down to 140 mm. If the detection of cells/plasma is over 140 mm then the report will be >140.

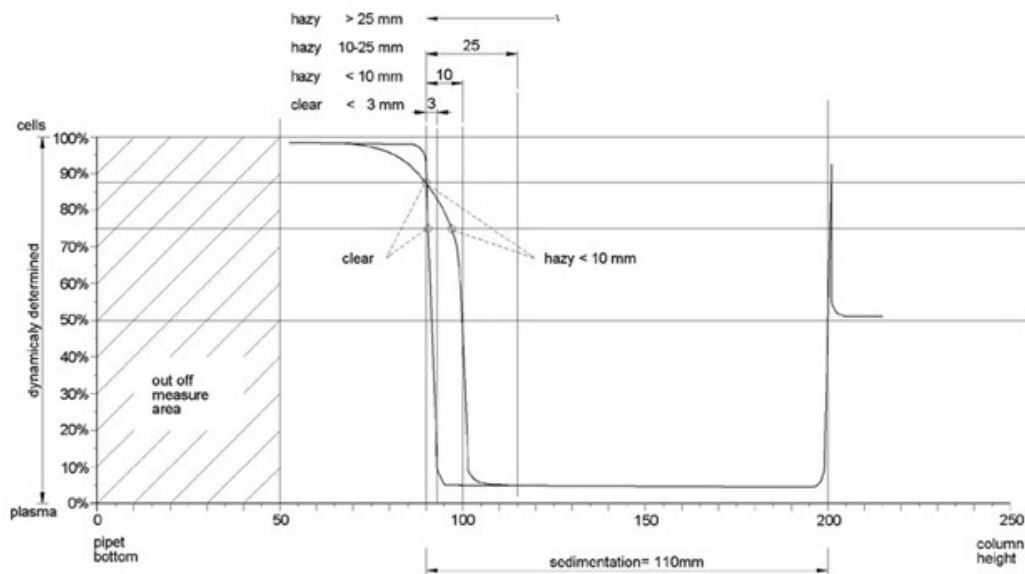


### 6.2.6. Aspect Hazy

The automatic reading of the Westergren sedimentation pipettes is carried out by moving an optical sensor along the pipettes. While the sensor is moving, a reading is made every 0.25 mm. The sensor is reading the absorption of infra red light through the Westergren pipette filled with blood. From these readings, values at a number of absorption levels are determined. All absorption figures are relative to the darkest and lightest reading (darkest = 100 % and the lightest = 0 % absorption respectively).

By definition the levels are:

87.5%	Cells/ plasma separation
75.0%	Hazy detection
50.0%	Meniscus detection



Graphic showing typical absorption values of a sample



## Reporting

The 'sedimentation' value is the distance in millimeters between the cells/plasma level (87.5% absorption) and the meniscus. If there is no haze, the absorption drops quickly to a value below the 75% level. If the distance between the 87.5% and the 75% level is less than 3mm, the report will state 'CLEAR'. If the distance between 87.5% and 75% level is more than 3mm then the report will state 'HAZY'.

Depending on the length of the 'hazy' area, three classes of 'haziness' are reported,

Length of area		Reported class	
Hazy area	>25 mm	Hazy	>25 mm
Hazy area	>10 mm <25 mm	Hazy	<25 mm
Hazy area	>3 mm < 10 mm	Hazy	<10 mm
Hazy area	< 3 mm	CLEAR	<3 mm

Hazy reports are shown when the change from the hazy level to the cell/plasma separation level occurs not within a given distance. The following code messages are reported in column 5.

### 6.2.6.1. Analyser "HAZY" code messages

This code appears in the "sample data record" at column 5.

The following 4 codes are defined:

0	Sample is clear.
1	Sample is Hazy < 10
2	Sample is Hazy < 25
3	Sample is Hazy > 25

Results with hazy aspect can be suppressed in the menu Limit error settings.



## 7. OPERATION

### 7.1. Quick start-up

This section describes a quick start-up procedure and a general description of what to do before starting a large batch of samples to run through the system.

#### 7.1.1. Check list

Run this checklist before each large batch of samples.

1. If applicable printer must be switched on and online, and enough paper installed.
2. Waste container is empty.
3. Check the liquid levels.

#### 7.1.2. Priming system

Use "**ARROW**" keys and select MENU 2 to perform all prime sequences manually. Check fluid flow through the applicable tubing. repeat a step if fluid flow is not correct.

1. PRIME RINSE SOLUTION, activates the Rinse pump. Rinse solution must flow through the pipette.
2. PRIME SALINE, activates the Saline pump. Liquid must flush through the needle assembly.
3. PRIME DILUENT, activates the diluter prime cycle. Diluter system must be filled with diluent and free of air bubbles.
  - Diluter prime cycle is executed once. In order to fully prime the system it will be necessary to perform this step several times. (One cycle is 5 strokes of the Diluter)
4. PRIME DE-IONIZED WATER, activates the fill nozzle water valve. De-ionized water must flow through the tube connected to the fill nozzle cap.
5. PRIME DISINFECTANT, activates the disinfectant valve. Disinfectant must flow through the small tube connected to the pipette wash station.

When the StaRRsed Compact has been idle for more than eight hours, some reagents may have dropped from the tubes due to gravity. Prime all tubing before sampling with:

PRIME ALL UNITS

All priming functions are sequentially performed one time. (MENU 2-10).

---

**Note:** The system must be checked for air bubbles.

---







## 7.2. Fill procedure

Before you run a large batch of samples check the fill status in (MENU 1-7) and select the correct mode **EDTA** or **CITRATE**.

1. Press the [MENU] key and select function "1" - [RUN MODE].
2. Ensure samples are thoroughly mixed and sample tubes contain at least 2 ml of whole blood.
3. According to the ICSH, a sample should be flipped at least eight times.
4. Place the sample tube with barcode label facing to the left in the Compact sample tube adapter and with the cap upwards.
5. Press the [START] key.
6. On manual mode type ID number and press the [START] key.

---

**Note:** BE SURE THAT THE COMPACT IS SET TO THE CORRECT MODE. i.e. EDTA or CITRATE.

---



Place the sample tube with barcode label facing to the left

### 7.2.1. Liquid levels

Liquid containers and levels must be checked frequently.

If the small onboard bottles are used, wash and keep the bottles clean to avoid bacterial growth.

The StaRRsed Compact has liquid level sensors. When the level sensor alarm appears, replace reagent as soon as possible.

### 7.2.2. Reagents preparation

1. Reagents preparation.



---

## Operation

---

- Use only the reagent containers which are supplied with the StaRRsed Compact.
  - To open the bulk reagent packages, remove the perforated flap from the cardboard box, pull the opening out of the box and fit the taps.
2. Fill up the containers with the reagents.
  3. Replace the reagent containers.
  4. Replace screw caps with level sensors.

### 7.3. Checks during operation

- Perform regularly visual checks for air bubbles in the sample pipettes, see **Air bubbles** (on page 62).

In case of a considerable number of pipettes with air bubbles:

- Perform the necessary maintenance or contact the service representative.

### 7.4. Turn off Compact

It is good practice to carry out the Daily maintenance procedure **WI-170 Daily** (on page 82). Use the **[ARROW]** and select **(Menu 6-9)** for the [SHUT DOWN PROCEDURE]. Start a complete prime fluid cycle and all tubing that is susceptible to blood is flushed.

---

**Note:** The Shutdown function is interruptible by the **[ESC]** key. This will also be displayed.

---

#### 7.4.1. Standby LCD screen back light off

There is no need to switch OFF the Compact as it switches automatically to the "**Standby**" mode. The power consumption in standby mode will drop at a level around 60VA.

---

**Attention:** After 10 minutes of no keyboard activity the display backlight switches off.

---



## **8. QUALITY CONTROL**

### **8.1. Control pipettes**

The correct function of the hardware and software of the StaRRsed Compact measurement unit should be checked at regular intervals with the aid of Mechatronics Control Pipettes (Order nr. QTST049000). More information can be found in the Control Pipette User Manual (MRN-019).



## 9. WASTE DISPOSAL

The waste container has a level sensor and as soon as the level sensor generates a waste error, the waste container must be emptied. The waste must be treated as potentially infectious (biohazardous) material and disposed of according to local regulations. Preferably, discard the complete waste container and replace it with a cleaned one. Press **[ESC]** to clear the error.



---

**Disclaimer:** Check your local environment rules about discharging the waste.

---



## 10. DATA SAFETY MANAGEMENT

All data in the StaRRsed Compact is stored in a **battery backup** memory.

This means that all raw data and results are kept, irrespective of a power failure or if the instrument is un-intentionally turned off. After the start-up procedure the software checks whether there are any ESR's still outstanding. If so, these will be carried out first. After a power failure the sedimentation time (60 or 30 min.) may be exceeded. However, the start time is saved and therefore the actual sedimentation time can be checked.

A limited amount of sample data can be stored, see Technical Specifications.

### 10.1. Power failure

If a power failure occurs it is recommended that the StaRRsed Compact is switched **OFF** by the power switch. When the power returns, the instrument can be switched **ON**. After the standard start-up process the StaRRsed Compact will continue to process the remaining samples.







## **11. TROUBLE SHOOTING**

Occasionally small faults may cause major problems. This chapter may help to solve the most common faults and explain why a specific problem occurs.

A lot of the problems or errors are due to a lack of maintenance. Remember that this instrument operates with a considerable amount of whole blood, virtually undiluted, stores it in a pipette for one hour and then cleans pipettes for re-use. Therefore, it is important to keep to the maintenance schedules. It is recommended that trained service personnel checks and applies service to the instrument at least once a year.

### **11.1. Compact stalls**

1. Check main power connection and the two fuses at the main power inlet.
2. Check the display:
  - Text or blinking cursor visible
  - Backlight on or off
  - Clock: observe the seconds, if the system stalls, usually the clock stops or or up-dates 2 seconds at a time.
3. Response to key inputs

Report this to the distributor.

### **11.2. Liquid level sensor not sensing**

1. Liquid in the container is not detected. This occurs sometimes with the De-ionized water bottle and is caused by a very low conductivity.
2. Add one or two drops of Saline to the De-ionized water to increase the conductivity.



### 11.3. Flushing liquids

After each sample aspiration the entire system is washed automatically.

If there is no liquid flow:

- Check that the peristaltic pumps are running. If the pump tubes are worn or leaking, replace the tubes.
- Check that the pump tubes are installed correctly.
- Check the tubes between the containers and pumps/valves.
- Unscrew the cap from the container. Check the pick-up tubes in the container and that there is enough liquid in the container.
- Check the tubes for blockages or kinks.

### 11.4. Tube adapter

As soon as the barcode is accepted or the ID number keyed in manually, the tube adapter closes.

#### 11.4.1. Tube adapter does not close

Check for mechanical obstructions.

1. The sample tube size must be within the span of the sample tube adapter.
  - Only qualified service engineers may change the sample tube adapter span.
2. Electronic failure, fatal error, **technical assistance** is needed.
3. Mechanical failure, fatal error, **technical assistance** is needed.

#### 11.4.2. Sample probe fails to go down

Under normal circumstances, the sample probe goes down when the sample tube adapter closes.

If sample probe fails to go down check the following.

1. Sample probe depth wrong. Set the correct needle depth in MENU 3-4.
  - If the sample probe has being set too deep, it will touch the bottom of the sample tube. The sample probe then pushes the sample tube slightly down wards, and the aspiration cycle will be aborted.
2. A broken outer needle may cause a similar fault.
3. Check for mechanical obstructions.
4. Electronic failure, fatal error, **technical assistance** is needed.



5. Mechanical failure, fatal error, **technical assistance** is needed.



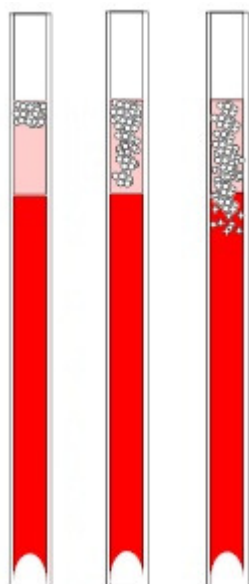


## 11.5. Air bubbles

After a normal aspiration, the Westergren pipette must be free of air bubbles. In the following examples different patterns of air bubbles which can appear in the pipettes are shown. Air bubbles can affect the sedimentation and are mostly reported as errors and no ESR result is reported.

Usually bubbles are caused by a leakage at the bottom of the pipette. If air bubbles are visible in the pipette, check the following :

### 11.5.1. Foam in column



A layer of air bubbles that is concentrated on top of the blood column does not affect the sedimentation process itself. The sedimentation develops normally below the bubbles. However, too many bubbles bring about a shortening of the effective blood column, which is a deviation from the Westergren method.

A layer of bubbles up to 5 mm: No message. Normal ESR result is reported.

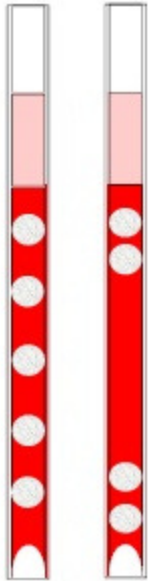
A layer of bubbles from 5 to 25 mm: ESR warning 6: "Bubbles on top". Results should be reviewed before release.

A layer of bubbles larger than 25 mm: ESR Error 3: "Too many borders found". No ESR result is given.

1. Check that tube connections are not leaking.
2. Check the fill nozzle condition:
  - Inspect for any cracks or deep scratches in the base that holds the fill nozzle washer or O-ring.
3. Check for air in diluter system.
4. Check that the sample probe O-ring is not leaking.
5. Check transparent T- piece or Y-piece block for cracks.



### 11.5.2. Pipette looks like zebra crossing



If this always occurs in the same pipette, check the bottom of the pipette for the following:

1. Glass may be chipped.
  - Replace pipette.
2. Dirt, e.g. dried blood.
  - Clean the pipette.
  - Check disinfectant flow at the rinse nozzle.
3. Perpendicularity and straightness of the bottom face.
  - Replace pipette.

If this happens randomly or with each pipette, check the following:

1. Fill nozzle O-ring or flat washer.
2. Fill nozzle alignment to pipette.
  - Check the nozzle arm is tight on the rear vertical shaft. Usually engineer's assistance is required.

A pipette which looks like zebra crossing gives ESR Error 3.

### 11.5.3. One air bubble about 5 mm under meniscus



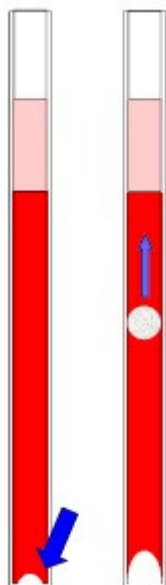
The filling (aspiration) speed is not critical but should be within certain limits.

1. If just one air bubble is found about 5mm below the meniscus, the filling speed may be too high.
2. The blood column should not exceed the filling height sensor by more than 10mm.

One air bubble can result in ESR Error 3.



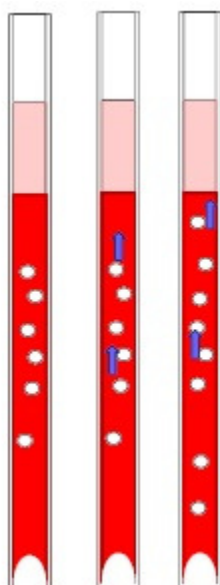
#### 11.5.4. One air bubble rising in pipette



1. Usually this is caused by a wet or dirty fill nozzle.
  - The blood column should not reach right to the base of the pipette. There must be a clear air gap of 4...5mm at the bottom of each pipette.
2. Insufficient sample volume.
  - Need more blood in the sample tube.

One air bubble rising can result in ESR Error code 3.

#### 11.5.5. Small air bubbles rising in pipette



Usually this is caused by a dirty or damaged fill nozzle.

- Observe the maintenance schedules.
- Clean the fill nozzle.
- Check the fill nozzle for damage. If necessary, replace the fill nozzle.

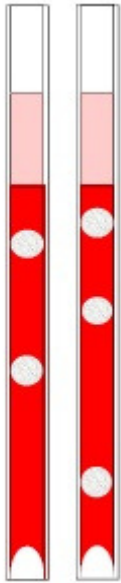
Sample tube is leaking on the fill nozzle side.

- Replace the silicon sample tube

Small air bubbles result in ESR Error 3.



### 11.5.6. Random air bubbles in pipette



1. Check Diluent flow by priming the diluter system.
2. Insufficient sample volume.

Random air bubbles result in ESR Error 3.

### 11.5.7. One air bubble random in pipette



When air bubbles are seen after filling.

This can be caused during preparation of the sample. If the sample tube is, not mixed or inverted well air can arise in the blood. This causes an air bubble occurs in the pipette.

According to the ICSH, a sample should be gently inverted at least eight times. Do not shake the sample.



## 11.6. Leaking pipettes

If blood or cleaning solutions leak from a pipette, perform the following procedures and check the performance of the system after each step to see if the problem has been solved. If the completion of the following steps does not result in a correction of the problem contact technical support.

1. Check for specks of dirt or hairs in the pipette valves.
2. A scratched valve tube.
3. A scratched valve body.
4. Valve on top of the pipette is dirty or damaged.
5. Check pipette bottom, glass may be chipped.
6. Check the pipette valve for contamination or wear.

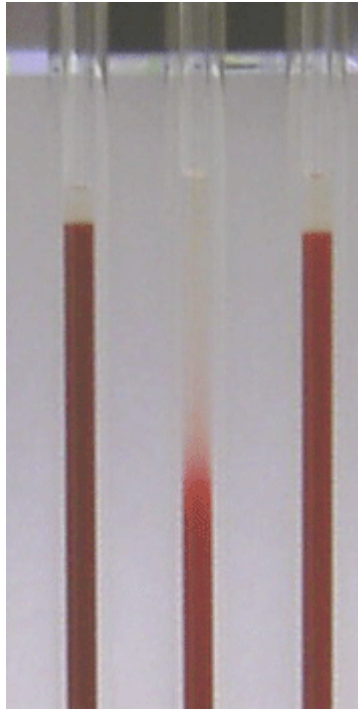




## 11.7. Hazy reports

"Hazy" reports are usually caused by build-up of proteins on the inner wall of the pipettes. Another cause is growth of micro organisms in the diluter system. It is extremely important that the system is kept sterile.

First run an extra Fill & Clean sequence, then check after a day's run if haziness is decreased. When there are still many reports, it is recommended to fill the diluter system with a 5% chlorine solution. See **WI-195 Cleaning the diluent system** (on page 97)



A picture example of haziness



## 11.8. Contaminated instrument

The StaRRsed Compact has bacterial and micro organism's growth. Clean the instrument with a strong cleaning agent (Menu 2-9) [Fill & clean all] .See **WI-167 Fill and clean** (on page 81) and **WI-178 Hazy problems** (on page 96) for details.



Compact Stand alone



## 11.9. Fill time-out error

Normally the fill sequence takes about 15 seconds. However, if the fill sequence exceeds 20 seconds, a fill time-out will be generated. The Compact aborts the fill sequence and this error message will be shown on the display and reported to the printer.

Fill time-out error may be caused by:

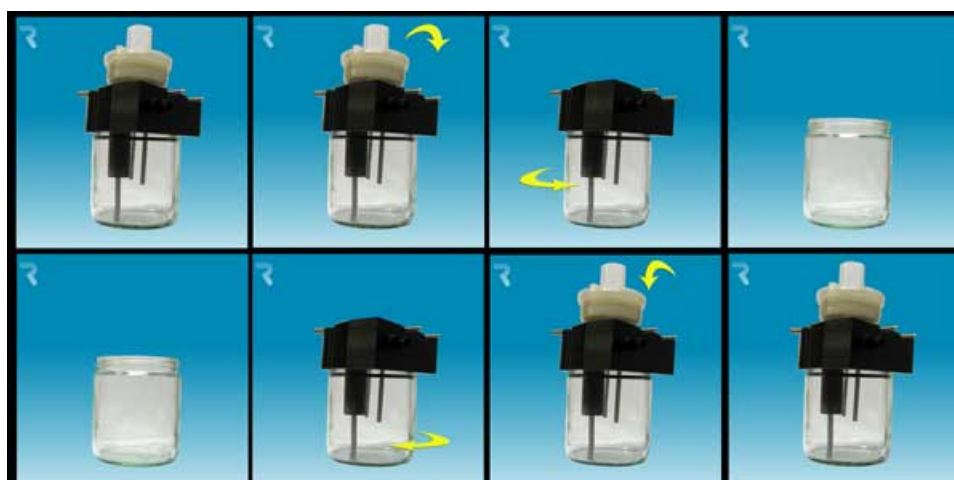
1. Blood clots or rubber debris from the tube cap in the sample.
  - Check the condition of the outer needle.
2. Filling procedure stopped by operator.
3. Insufficient sample volume.
  - Should be at least 1.4 ml.
4. Faulty filling nozzle or filling nozzle washer/O-ring.
  - Check filling nozzle and washer/O-ring.
5. Incorrectly adjusted sample probe depth.
  - Check needle depth MENU 3- 4.<default 5 mm>
6. No or poor vacuum.
  - Check vacuum MENU 4- 7.



## 11.10. Separator error

If it takes too long for the waste pump to empty the liquid separator, the system generates a separator error.

Separator error may be caused by:	
Extensive foam build-up in the liquid separator.	Check the separator assembly and connections for possible air leaks.
Waste-tube between liquid separator and waste pump is blocked.	Replace the tube.
Waste-tube between waste pump and waste container blocked.	Replace the tube.
Waste pump failure.	Exchange the waste pump cassette. If the error returns, call for service.
Electrical bridge between the waste-level electrodes.	Clean liquid separator, see <b>WI-196 Cleaning liquid separator</b> (on page 98)



## 11.11. Reagents

Check the expire dates of the reagents regularly. Do not use the reagents if expired.

**Note:** If expired reagent has been used accidentally, the results obtained with these reagents may only be used, when the expire date was not exceeded more than 30 days.

Diluent is sensitive for bacterial growth. The solution should be discarded if it becomes turbid or infected. When using the small onboard containers, clean the Diluent container thoroughly with 10% Na-hypochlorite. Make sure that the container has been thoroughly rinsed after cleaning.



## **11.12. Fill nozzle**

Normally the fill sequence takes about 3 seconds. However, if the fill sequence exceeds 10 seconds, a fill time-out error will be generated. The Compact aborts the fill sequence and this error message will be shown on the display and reported to the printer. Check for mechanical obstructions and remove them. If the error returns, call for service.

### **11.12.1. Fill nozzle does not engage with pipette**

1. Motor time out generated, fill nozzle stops half way up.
2. Check for mechanical obstruction.
3. Motor failure. Fatal error, call distributor.

### **11.12.2. Fill nozzle not at fill position**

The fill nozzle did not reach the fill position in a certain time limit.

Possible reason;

- Fill nozzle motor is faulty.
- Fill nozzle motor driver is faulty.
- Fill nozzle is blocked.
- Fatal error, call distributor.

### **11.12.3. Fill nozzle not at home position**

The fill nozzle did not reach the home top sensor with a certain time limit.

- Fill nozzle motor faulty.
- Fill nozzle motor driver is faulty.
- Fill nozzle is blocked.
- Fatal error call distributor.



## 12. MAINTENANCE

The **StaRRsed Compact** is an analyzer that operates with considerable amounts of whole blood virtually undiluted, and stores it in a pipette for one hour. For this reason instrument maintenance is of the utmost importance.

To maintain the maximum reliability of the instrument, the maintenance procedures must be strictly followed. All procedures are based on a number of samples.

Maintenance levels	Work instruction
Daily	<b>WI-170 Daily</b> (on page 82)
Weekly	<b>WI-171 Weekly</b> (on page 83)
Level 4 Maintenance	<b>WI-173 Level 4 maintenance</b> (on page 86) Every 5000 samples
Level 3 maintenance	WI-174 Level 3 maintenance Every 15000 samples
Level 2 maintenance	Every 30000 samples
Level 1 maintenance	Every 60000 samples

**Note:** Numbers are based on 5 days week with 230 sample per day.

### WARNING!!!

Always be aware of the danger of infection, especially during maintenance. Take appropriate precautions. There is blood involved and therefore a **BIO HAZARD**



### 12.1. Daily

The purpose of the daily maintenance is to keep the instrument clean and contamination as low as possible.

Clean all parts that are exposed to blood, wipe the outer surface and the stainless steel plate below the pipette belt.

Detailed instructions of this procedure can be found in the Work Instruction **WI-170 Daily** (on page 82) and **WI-177 Sample probe** (on page 94)



## 12.2. Weekly

The purpose of the weekly maintenance is to carry out the daily maintenance and additionally check the optical sensor of the measure head and the vacuum pressure.

Detailed instructions of this procedure can be found in the Work Instruction **WI-171 Weekly** (on page 83).

### 12.2.1. Vacuum pressure Compact

The airflow is monitored during the aspiration sequence. Go to (MENU 4 - 7), [FLOW SENSOR CHECK] and check the flow values on the display. The vacuum unit switches on and the following values are shown on the display:

Flow: 0925....1020    Abs: 0320....0360    Offset: 0045....0055

If the vacuum is not in range there is a possibility that there is a blockage in the flow. The value in the flow will be: Offset: 0045-**0050**-0055. Press the **[ESC]** key to return to the normal mode.

### 12.2.2. Cleaning liquid separator

The separator is designed to separate liquid from the air and can handle a lot of blood, rinse and other used reagents from the instrument. After a period of time the separator is getting dirty and therefore it needs to be cleaned weekly.

Detailed instructions of this procedure can be found in the Work Instruction **WI-196 Cleaning liquid separator (on page 98)**.

#### Symptoms of a dirty separator:

1. Separator errors.
2. Foam in the separator.
3. Waste pump cannot sufficiently remove the waste from of the separator.

### 12.2.3. Measure sensor check

Use the **[ARROW]** key to select (MENU 4-5) and check the values on the display in the bottom line. The values must be in the following limits: Measure sensor                      MS 40..**50**..60

If the measure sensor is out of range the sensor must be cleaned first.

Detailed instructions of this procedure can be found in the **WI-172 Cleaning Measure sensor (on page 92)**.

### 12.2.4. Fill stop sensor check

Use the **[ARROW]** key to select (MENU 4-5) and check the values on the display in the bottom line. The values must be in the following limits: Fill stop sensor    FS 90..**140**..165







## 12.3. Level 4 maintenance

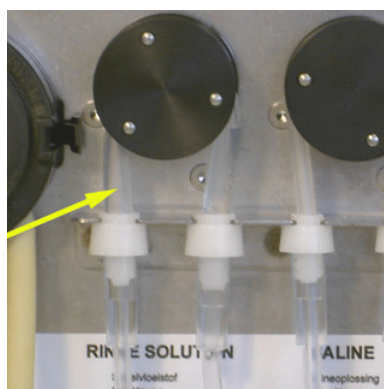
The purpose of level 4 maintenance is to carry out the daily and the weekly maintenance. Replace the pump tubing, bacterial filters and the Fill nozzle O-ring. After replacing those items, the Instrument needs a Fill and Clean sequence to clean the pipettes.

Over a monthly period protein builds up in the Westergren pipettes and needs to be deproteinized using a strong cleaning agent.

Detailed instructions of this procedure can be found in the Work Instruction **WI-173 Level 4 maintenance** (on page 86).

### 12.3.1. Rinse-pump tube replacement

New rinse pump tube assembly **ESRI090902**.



Open left cover.

New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.

If the tube is not fitted correctly or is worn the following symptoms can occur.

- Liquid flowing back into the container.
- First glass tube on the pipette belt is not washed sufficiently.

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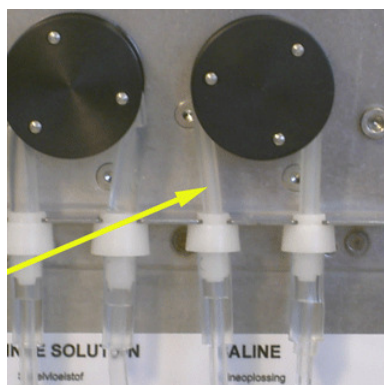
**Note:** The wider bore tube is for the rinse pump.

---



### 12.3.2. Saline-pump tube replacement

New saline pump tube assembly **ESRI090903**



Open left Cover.

New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.

If the tube is not fitted correctly or is worn the following symptoms can occur.

- Liquid flowing back into the container.
- Sample needle is not washed sufficiently.

---

**Note:** The narrower bore tube is for the saline pump.

---

### 12.3.3. Replace bacterial filters

Detailed instructions of this procedure can be found in **WI-196 Cleaning liquid separator (on page 98)**.

As part of the Cleaning liquid separator procedure the bacterial Hepa filter **QWLV040002** is replaced with a new one.

Exchange bacterial filter **QWLV040001** on the waste bottle assembly.



#### **12.3.4. Fill-nozzle O-ring replacement**

As the fill nozzle O-ring (**QWL V050004**) ages, it loses its flexibility and air-bubbles may occur in the Westergren pipettes, the washer needs to be replaced.

##### **Symptoms for a bad fill-nozzle O-ring**

After the aspiration, the Westergren pipette has a zebra pattern (air- blood- air -blood, nicely divided in the column.)

Vacuum stabilisation errors may occur.



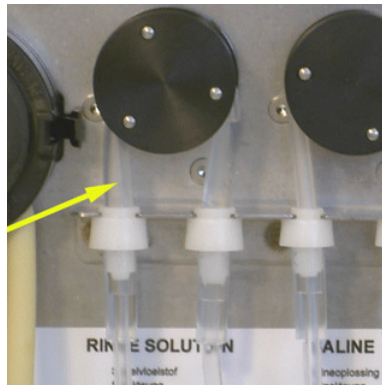
## **13. WORK INSTRUCTION STARRSED COMPACT**

Work instruction section



<p><b>RR</b> <b>mechatronics</b></p>	
<b>Work instruction Number 162</b>	
<b>Page 1 of 1</b>	<b>Purpose:</b> Change Rinse pump tube
<b>Safety:</b> None Bio Hazard area	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2012

New rinse pump tube assembly **ESRI090902**.




Open left cover.

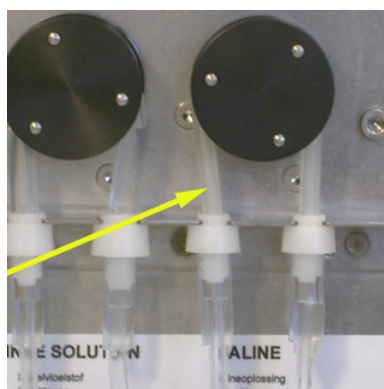
New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.



	
<b>Work instruction Number 163</b>	
<b>Page 1 of 1</b>	<b>Purpose:</b> Change Saline pump tube
<b>Safety:</b> None Bio Hazard area	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2012

New saline pump tube assembly **ESRI090903**




Open left Cover.

New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.



	
<b>Work instruction Number 167</b>	
<b>Page 1 of 1</b>	<b>Purpose:</b> Fill and Clean the pipettes
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2012

Cleaning agent preparation :

1. Prepare a flask filled with 150 ml of hot de-ionized water (80°C)
2. Add 15 ml cleaning agent QRR 010905.
3. Mix well do not shake


Start fill and clean procedure:

1. From the (MENU 2-9) select FILL & CLEAN ALL.
2. The sample probe will lower halfway; connect the extension tube carefully to the sample probe. (Extension tube **ESRI 110004** must be in the flask with the cleaning agent.)
3. Press **[ENTER]** to start the fill and clean procedure.



**Note:** Each pipette on the pipette belt will be filled with cleaning agent, after one hour the first pipette is washed and dried. Fill and clean takes about 1 ½ hours to complete.



	
<b>Work instruction Number 170</b>	
<b>Page 1 of 1</b>	<b>Purpose:</b> Daily
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2012

- Prepare disinfectant:** (if not already prepared).  
Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**  
This disinfectant is for cleaning of all external parts that are exposed to blood.  
Perform the (MENU 6 - 9) [SHUT DOWN PROCEDURE] function.
- Check system for leakage.
- Inspect the peristaltic pump tubes and connections for leaks.
- Check that liquid does not run back into the supply bottles after the pumps have stopped.
- Inspect sample needle condition.  
If necessary replace the sample probe or outer needle. See Work Instruction Sample probe or outer needle replacement.
- Check tubing from the syringe for trapped air bubbles.
- Check Diluent syringe for trapped air bubbles.
- If trapped air bubbles are found, perform (MENU 2- 3) [PRIME DILUENT].
- Wipe outer surface and stainless steel plate below the pipettes with disinfectant.

Clean and inspect the outer needle.

- Loosen the two knurled nuts and remove the safety screen..
- Dip a cotton bud in the disinfectant.
- Clean the outer needle.

Re-install the safety screen and fasten the two knurled nuts.



<p><b>RR</b> <b>mechatronics</b></p>	
<b>Work instruction Number 171</b>	
<b>Page 1 of 6</b>	<b>Purpose:</b> Weekly
<b>Safety:</b> Bio Hazard area	
<b>Instrument:</b> Compact	<b>Revision:</b> Version 3, March 2010

**Prepare disinfectant:** (if not already prepared).

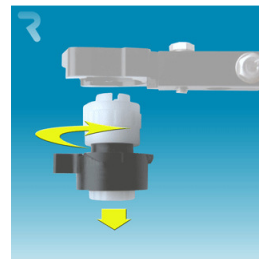
Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**

This disinfectant is for cleaning of all external parts that are exposed to blood.

### Fill nozzle

Disassemble the fill-nozzle:

1. Turn the holder to the right.
2. The fill-nozzle can now be removed.
3. Disconnect the silicon tube from the fill nozzle.



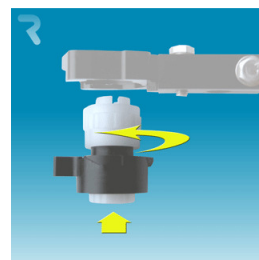
Clean fill-nozzle:

The use of a toothbrush and detergent is recommended.

1. Carefully scrub the fill nozzle inner part.
2. Use a tissue to dry the fill nozzle.

Assemble fill-nozzle:

1. Connect the silicon tube to the fill nozzle.
2. Put the fill nozzle into the holder.
3. Push the fill nozzle upwards and turn the holder to the left.



### Liquid separator

Removing the liquid separator

1. Open the left cover and remove the waste container. The liquid separator is now visible.
2. Lift the stainless steel vacuum tube with use of the lever.
3. Pull the liquid separator towards the front of the Compact. (Note: The separator has two sensor connectors at the rear)



4. Disconnect the silicon tube from the tube connection on the top section.
5. Remove bacterial HEPA filter.
6. Remove and disassemble the liquid separator.

#### Cleaning liquid separator

1. Clean all parts with hot water and a brush.
2. Use some acid free vaseline on the screw-thread of the glass jar.
3. Assemble the separator.

#### Replacing the liquid separator

1. Replace the top section.  
A little silicon grease on the rim of separator will make the assembling and adjustment easier.
2. If applicable replace the bacterial HEPA filter  
(For Maintenance Level 4: Exchange bacterial HEPA filter QWLV040002)
3. Re-connect the silicon tube to the tube connector on the top section.
4. Lift left cover.
5. Lift stainless steel vacuum tube up.
6. Insert the liquid separator sliding it over the support shelf.
7. Push the liquid separator towards the rear, with the sensor connectors in the holes.
8. Release the stainless steel vacuum tube.
9. Replace the waste container.
10. Close left cover.



#### Sensor check

##### Optical sensor check:

1. Use the arrow keys to select (MENU 4-5), [MEAS/FILL/TEMP SENSOR CHECK]
2. Values must within the following range;
  - Measure sensor MS 40..**50**..60
  - Fill stop sensor FS 90..**140**..165
3. Measure head out of range: clean sensor of measure head. Work Instruction 172.



Vacuum pressure:

1. Use the arrow keys to select (MENU 4-7), [FLOW SENSOR CHECK].
2. The vacuum unit switches on and the following values are shown on the display:
  - Flow: 0925.....1020    Abs: 0320.....0360    Offset: 0045.....0055

If the vacuum is not in range there is a possibility that there is a blockage in the flow. The value in the flow will be: Offset: 0045-**0050**-0055. Press the **[ESC]** key to return to the normal mode.

## **Final preparation**


**Prepare disinfectant:** (if not already prepared).

Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**

This disinfectant is for cleaning of all external parts that are exposed to blood.

1. Check system for leakage.
2. Inspect the peristaltic pump tubes and connections for leaks.
3. Check that liquid does not run back into the supply bottles after the pumps have stopped.
4. Inspect sample needle condition.  
If necessary replace the sample probe or outer needle. See Work Instruction Sample probe or outer needle replacement.
5. Check tubing from the syringe for trapped air bubbles.
6. Check Diluent syringe for trapped air bubbles.
7. Wipe outer surface and stainless steel plate below the pipettes with disinfectant.

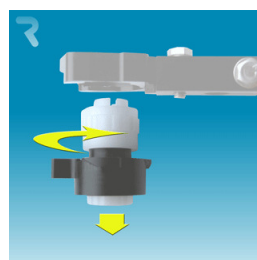


	
<b>Work instruction Number 173</b>	
<b>Page 1 of 11</b>	<b>Purpose:</b> Level 4 Maintenance
<b>Safety:</b> Bio Hazard area	
<b>Instrument:</b> Compact	<b>Revision:</b> Version 3, October 2012

## Fill nozzle

Disassemble the fill-nozzle:

1. Turn the holder to the right.
2. The fill-nozzle can now be removed.
3. Disconnect the silicon tube from the fill nozzle.



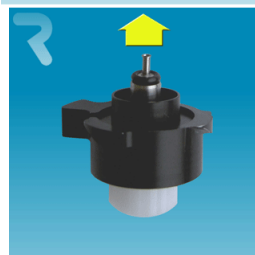
Disassemble fill nozzle holder:

1. Turn the holder to the right.
2. The holder can now be removed

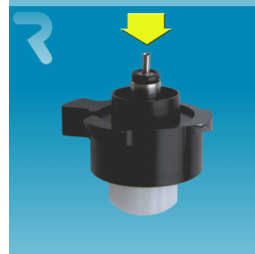


Replace O-ring:

1. Remove the O-ring. (QWLV050004)



1. Install new O-ring. (QWLV050004)

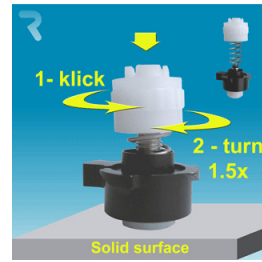




Assemble fill nozzle holder:

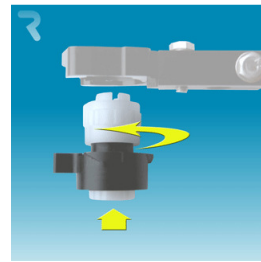
Push the plastic top part down against the spring pressure.

1. Turn the plastic top part anti clockwise until you hear or feel a click.
2. Turn the plastic top part clockwise for 1.5 turns.



Assemble fill-nozzle:

1. Connect the silicon tube to the fill nozzle.
2. Put the fill nozzle into the holder.
3. Push the fill nozzle upwards and turn the holder to the left.



## Liquid separator

Removing the liquid separator

1. Open the left cover and remove the waste container. The liquid separator is now visible.
2. Lift the stainless steel vacuum tube with use of the lever.
3. Pull the liquid separator towards the front of the Compact. (Note: The separator has two sensor connectors at the rear)
4. Disconnect the silicon tube from the tube connection.
5. Remove bacterial HEPA filter.
6. Open the liquid separator by pulling off the top section.

Cleaning the liquid separator

1. Clean the internal parts of the separator with disinfectant.

Cleaning liquid separator

1. Clean all parts with hot water and a brush.
2. Use some acid free vaseline on the screw-thread of the glass jar.
3. Assemble the separator.

Replace the liquid separator

1. Replace the top section.  
A little silicon grease on the rim of separator will make the assembling and adjustment easier

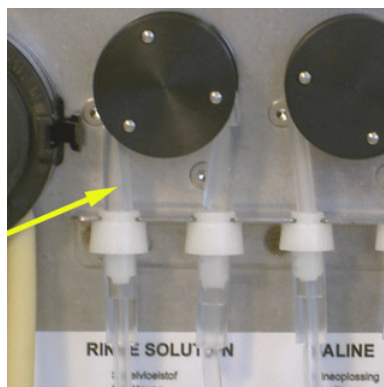


2. If applicable replace the bacterial HEPA filter  
(For Maintenance Level 4 exchange bacterial HEPA filter QWLV040002)
3. Re-connect the silicon tube to the bottom tube connector.
4. Lift left cover.
5. Lift stainless steel vacuum tube up.
6. Insert the liquid separator sliding it over the support shelf.
7. Push the liquid separator towards the rear, with the sensor connectors in the holes.
8. Release the stainless steel vacuum tube.
9. Replace the waste container.
10. Close left cover.

Exchange bacterial filter **QWLV040001** on the waste bottle assembly.

### Rinse and saline tube

New rinse pump tube assembly **ESRI090902**.

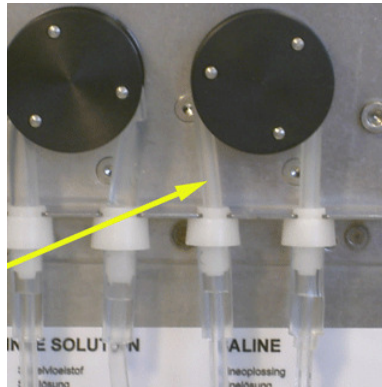


Open left cover.

New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.



**New saline pump tube assembly ESRI090903**

Open left Cover.

New tube replacement:

1. Pull pump tube slightly downwards and at the same time towards the front of the unit to release the tube out of the pump plate holder.
2. Remove the old tube from the peristaltic pump rotor.
3. Disconnect the tubing at both ends of the tube connectors.
4. Connect new tubing to both ends of the connectors.
5. Place one end of the tube in the pump plate holder.
6. Pull the new tube over the peristaltic pump rotor.
7. Pull pump tube slightly downwards and at the same time towards the back of the StaRRsed Compact.



## Fill and clean

Cleaning agent preparation :

1. Prepare a flask filled with 150 ml of hot de-ionized water (80°C)
2. Add 15 ml cleaning agent QRR 010905.
3. Mix well do not shake

Start fill and clean procedure:

1. From the (MENU 2-9) select FILL & CLEAN ALL.
2. The sample probe will lower halfway; connect the extension tube carefully to the sample probe. (Extension tube **ESRI 110004** must be in the flask with the cleaning agent.)
3. Press **[ENTER]** to start the fill and clean procedure.



**Note:** Each pipette on the pipette belt will be filled with cleaning agent, after one hour the first pipette is washed and dried. Fill and clean takes about 1 ½ hours to complete.

## Check sensors

Optical sensor check:

1. Use the arrow keys to select (MENU 4-5), [MEAS/FILL/TEMP SENSOR CHECK]
2. Values must within the following range;
  - Measure sensor MS 40..**50**..60
  - Fill stop sensor FS 90..**140**..165
3. Measure head out of range: clean sensor of measure head. Work Instruction 172.

Vacuum pressure:

1. Use the arrow keys to select (MENU 4-7), [FLOW SENSOR CHECK].
2. The vacuum unit switches on and the following values are shown on the display:
  - Flow: 0925.....1020    Abs: 0320.....0360    Offset: 0045.....0055



If the vacuum is not in range there is a possibility that there is a blockage in the flow. The value in the flow will be: Offset: 0045-**0050**-0055. Press the **[ESC]** key to return to the normal mode.

## **Final preparation**


**Prepare disinfectant:** (if not already prepared).

Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**

This disinfectant is for cleaning of all external parts that are exposed to blood.

1. Check system for leakage.
2. Inspect the peristaltic pump tubes and connections for leaks.
3. Check that liquid does not run back into the supply bottles after the pumps have stopped.
4. Inspect sample needle condition.  
If necessary replace the sample probe or outer needle. See Work Instruction Sample probe or outer needle replacement.
5. Check tubing from the syringe for trapped air bubbles.
6. Check Diluent syringe for trapped air bubbles.



	
<b>Work instruction Number</b> 172	
<b>Page 1 of 2</b>	<b>Purpose:</b> Cleaning measure sensor
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2001

Remove of the top cover

1. Switch StaRRsed Compact **OFF**.
2. Remove the two rear screws of the top cover.
3. Lift the top cover carefully from the instrument.

If the measure sensor is out of range, the sensor must be cleaned.

In order to clean the measure sensor remove the pipette at the measuring position (complete with top and bottom clamp).

For cleaning use a cotton bud dipped in deionised water or aerosol air blower, make sure the cotton bud is just damp. Do not use any organic solvents.

Pipette removal

1. Push and pull vertically the pipette from the holding position of the belts.
2. Take pipette off the carousel.
3. Store the pipette on a safe place.



Switch Compact **ON**

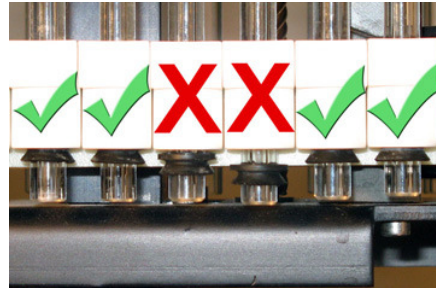
1. Carefully clean the inner part of the measuring sensor by using a cotton bud.
2. Check the values of the Measure sensor MS 40..**50**..60 by using the CHECK MEASURE SENSOR function.
3. If not in range repeat cleaning the inner part of the measuring sensor.



4. When in range switch **OFF** the Compact.

#### Pipette installation

1. Hook pipette assembly on to the pipette belts.
2. Make sure that pipettes are correctly fitted on to the pipette belts,
3. Visually check height of all pipette valves, they must all be at the same height.
4. Visually check the bottom of the pipette V shape ring.
5. Incorrect fitted pipettes may cause **mechanical damage** to the instrument.
6. Check for leakage after the first **Fill & Clean**




#### Replace the top cover: (172)

1. Put the cover carefully over the instrument.
2. Replace the two rear screws of the top cover. (If present or if needed).

Switch **ON** the Compact.



	
<b>Work instruction Number 177</b>	
<b>Page 1 of 3</b>	<b>Purpose::</b> Sample probe or outer needle replacement
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> StaRRsed Compact	<b>Revision:</b> 001, October 2012

Removal of the Right-hand cover:

1. Switch OFF the Compact.
2. Loosen the three screws.
3. Move the side-cover to the right.

Safety screens removal:

1. Remove the two knurled knobs from the safety screen..
2. Remove the needle safety screen. (A)
3. Remove the counter sunk screw holding the protection screen; the screw is located in the T-piece or Y piece.
4. Remove the protection screen. (C)
5. Remove the guide strip ESRI050030. (D)



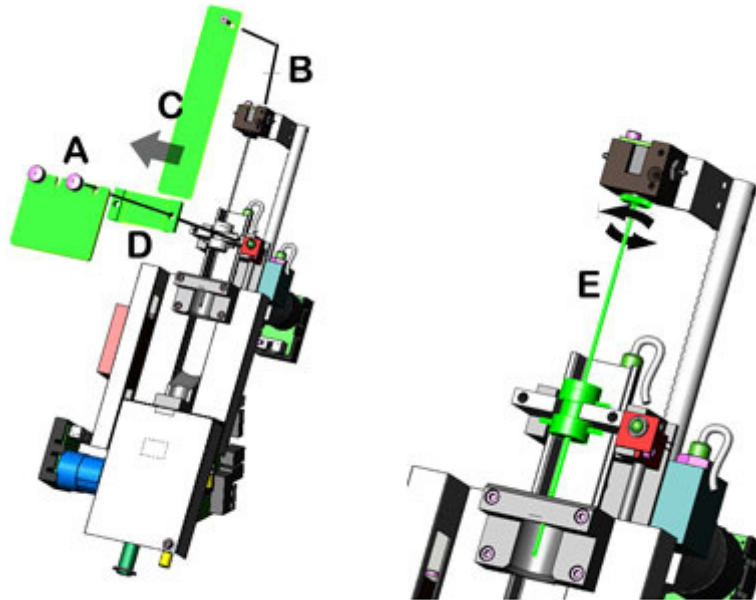
Needle exchange:

1. Unscrew sample probe manually. (E)
2. Mark each tube for easier reconnecting to the correct nipple.
3. Disconnect the tubes from the outer needle.
4. Pull the sample probe, complete with outer needle, towards the front edge of the Compact. The outer needle must be supported to protect it from falling.
5. Slide the new sample probe into the (new) outer needle.
6. Make sure the Sample probe has a (new) O-ring QWLV050003.
7. Install (new) sample probe ESRI050909 together with the (new) outer needle ESRI050901.
8. Tighten the sample probe. Do not over-tighten the sample probe in the T-piece / Y-piece or it will crack or strip the threading inside the block.
9. Replace the correct tubes on the outer needle.




Replace covers for the Compact stand alone:

1. Replace the guide strip and protection screen.
2. Replace the safety screen and tighten the screw.
3. Re-install side cover, replace needle-safety screen and tighten the two knurled knobs.





	
<b>Work instruction Number 178</b>	
<b>Page 1 of 1</b>	<b>Purpose:</b> Hazy problems
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> StaRRsed Compact	<b>Revision:</b> 001, October 2012

**Prepare disinfectant:** (if not already prepared).

Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**

This disinfectant is for cleaning of all external parts that are exposed to blood.

Cleaning the diluent system:

#### Step 1

1. Remove the suction-tube from the diluent bottle.
2. Place the suction tube in chlorine solution.
3. Use the [PRIME DILUENT] function. This fills the dispenser system with the disinfectant.
4. After the prime sequence stops press the [PRIME DILUENT] key 5 times to fill the dispenser system with the disinfectant.
5. Leave the disinfectant in the system for 15 minutes.

#### Step 2

1. Take the diluent suction tube out of the disinfectant.
2. Wipe the tube clean and dry with a tissue.
3. Take hot de-ionized water (80 °C).
4. Use the [PRIME DILUENT] function.
5. After the prime sequence stops press the [PRIME DILUENT] key 5 times to fill the dispenser system with the hot water.


#### Step 3

1. Clean the diluent bottle(s) with the disinfectant.
2. Rinse the diluent bottle with hot de-ionized water (80 °C).
3. Rinse the diluent bottle with diluent solution.
4. Refill the diluent bottle with new diluent solution.
5. Use the [PRIME DILUENT] function.
6. After the prime sequence stops press the [PRIME DILUENT] key 5 times to fill the dispenser system with the new diluent solution.

#### Step 4

1. Prepare a Fill and Clean arrangement.
2. Run the fill and clean sequence. When all the pipettes are filled the needle goes back to the home position.
3. Remove the Fill and clean arrangement.



	
<b>Work instruction Number</b> 195	
<b>Page 1 of 1</b>	<b>Purpose:</b> Cleaning diluent system
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, September 2011

**Prepare disinfectant:** (if not already prepared).

Add **10 ml** bleach (sodium hypochlorite) to **190 ml** de-ionized water. **(5% solution)**

This disinfectant is for cleaning of all external parts that are exposed to blood.

#### Step 1

1. Remove the suction-tube from the diluent bottle.
2. Place the suction tube in chlorine solution.
3. Use the [PRIME DILUENT] function. This fills the dispenser system with the disinfectant.
4. After the prime sequence stops press the [PRIME DILUENT] key 5 times to fill the dispenser system with the disinfectant.
5. Leave the disinfectant in the system for 15 minutes.


#### Step 2

1. Take the diluent suction tube out of the disinfectant.
2. Wipe the tube clean and dry with a tissue.
3. Take hot de-ionized water (80 °C).
4. Use the [PRIME DILUENT] function.
5. After the prime sequence stops press the [PRIME DILUENT] key 5 times to fill the dispenser system with the hot water.

#### Step 3

1. Clean the diluent bottle with hot de-ionized water (80 °C)
2. Refill the diluent bottle with new diluent solution.
3. Use the "Prime diluent" function.
4. After the prime sequence stops press button "Prime diluent" 5 times to fill the dispenser system with the new diluent solution.



	
<b>Work instruction Number</b> 196	
<b>Page 1 of 3</b>	<b>Purpose:</b> Cleaning liquid separator Version 2
<b>Safety:</b> <i>Bio Hazard area</i>	
<b>Instrument:</b> Compact	<b>Revision:</b> 001, October 2012

#### Removing the liquid separator

1. Open the left cover and remove the waste container. The liquid separator is now visible.
2. Lift the stainless steel vacuum tube with use of the lever.
3. Pull the liquid separator towards the front of the Compact. (Note: The separator has two sensor connectors at the rear)
4. Disconnect the silicon tube from the tube connection on the top section.
5. Remove bacterial HEPA filter.
6. Remove and disassemble the liquid separator.

#### Cleaning liquid separator

1. Clean all parts with hot water and a brush.
2. Use some acid free vaseline on the screw-thread of the glass jar.
3. Assemble the separator.

#### Replacing the liquid separator

1. Replace the top section.  
A little silicon grease on the rim of separator will make the assembling and adjustment easier.
2. If applicable replace the bacterial HEPA filter  
(For Maintenance Level 4: Exchange bacterial HEPA filter QWLV040002)
3. Re-connect the silicon tube to the tube connector on the top section.
4. Lift left cover.
5. Lift stainless steel vacuum tube up.
6. Insert the liquid separator sliding it over the support shelf.
7. Push the liquid separator towards the rear, with the sensor connectors in the holes.
8. Release the stainless steel vacuum tube.
9. Replace the waste container.
10. Close left cover.











## **14. APPENDIX FOR STARRSED COMPACT**

Appendix section



## Appendix - Article reference list Compact

The Compact is delivered with a complete accessories kit ESRI 110991. This reference list is for article order numbers only.

Part number	Description
QWFG010200	Bottle 2.5 litres
QWFG010201	Cap bottle 2.5 litres
ESRI010246	Pinch valve tube
QWLV040002	Bacterial Filter (waste separator)
ESRI010907	Cap waste bottle
QRR 010905	Cleaning agent
QRR 010931	Diluent
QRR 010947	Disinfectants
QRR 010933	Saline
QRR 010934	Rinse solution
QWLV050004	O-ring for Fill Nozzle
ESRI030903	Westergren pipette assembly
QWLV050003	O-ring Sample Probe
ESRI050909	Sample Probe assembly
QWLV040001	Disc filter 25mm Waste cont. (White)
QWLV040003	Disc filter Vacuum Regulator (Blue)
ESRI090902	Rinse Tube assembly
ESRI090903	Saline Tube assembly
ESRI090921	Waste cassette assembly
ESRI090026	Blotting washer
QEPT100001	Parallel Printer cable
ESRI110001	Ruler StaRRsed Compact
ESRI110004	Tube silicon 1.5*3.2 (Fill & clean)
ESRI110011	User manual Compact
QEDK10001	Euro power cord
ESRI110019	Taps for the reagents containers
QEDV130022	Fuse 5 A. (110V) Slow 5x20 mm.
QEDV130019	Fuse 2.5 A. (230V) Slow 5x20 mm.



ESRI110105	Waste sticker 2500 ml
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## Appendix - Compact system messages

The Compact generates four main types of error messages;

- System messages.
- Test messages.
- System time-out messages.
- Error messages.

During normal operation the following "**System messages**" may occur:

### 1. *Waiting tube*

- If a filled pipette is at the measuring position before the elapsed time has finished and the operator is ready to fill the next pipette, the *Waiting tube* message will be displayed.
- To continue the sample loading sequence the operator must wait until the pipette at the measuring position has been measured.

### 2. *Printer failure*

- When the printer is off in the display. Go to [MENU 5-4 PRINTER ON/OFF]" and toggle on.
- Check paper feed and quantity.
- Check printer cable connection.
- Printer must be on-line.
- Note: data will be stored in the buffer and can be printed afterwards

### 3. *Reagents level empty message*

- All reagent containers have level detectors; the display shows an error that indicates which reagent container(s) is (are) empty.
- The expiry date of the reagent is exceeded or the container is opened longer than three months.  
Prepare new reagent as described in section Reagents preparation.

### 4. *Waste bottle full message*

- The waste container also has a level detector. If the "*Waste bottle full*" message is indicated on the display, the compact will stop the "rinse and fill" cycle until a new or empty container has been installed.
- [MENU 6-1 CLEAR FATAL ERROR]. must be carried out before the compact will start again.



- 

#### 5. *Fatal separator error*

- The separator container has also a level detector. If the "*Fatal separator error*" message is indicated on the display, the Compact will stop the "rinse" cycle until the separator is empty.
- The cause of this problem can be foam, or the waste pump is not working. The compact will continue to measure and send the ESR results on time to the printer, but the rinse and fill sequences are stopped until the error is solved.

During the start-up sequence, all the positioning sensors are tested. If incorrect the instrument will generate one of the following **test messages**.

1. Switch printer on.
  - Compact checks printer availability, if printer is off line or busy this message will appear.
2. Test fill-nozzle unit.
  - Checks position of the fill-nozzle unit, if incorrect the unit will be re-positioned by the system.
3. Test rinse-unit.
  - Checks position of the rinse-unit, if incorrect the unit will be re-positioned by the system.
4. Test measure-unit.
  - Checks position of the measure-unit, if incorrect the unit will be re-positioned by the system.
5. Test needle-unit.
  - Checks position of the needle-unit, if incorrect the unit will be re-positioned by the system.
6. Test drive.
  - Checks position of the drive unit, if incorrect the unit will be re-positioned by the system.



During normal operation the following "**System time-out**" errors may occur. These are usually fatal errors. Call distributor or your local supplier of the Compact.

1. Drive-unit.
  - Compact was not able to position the pipette belt within a certain time limit.
  - Check for mechanical obstructions.
2. Measure-unit.
  - Compact was not able to position the measure-unit within a certain time limit.
  - Check for mechanical obstructions.
3. Rinse-unit.
  - Compact was not able to position the rinse-unit within a certain time limit.
  - Check for mechanical obstructions.
4. Fill-nozzle unit.
  - Compact was not able to position the fill-nozzle unit within a certain time limit.
  - Check for mechanical obstructions.
5. Needle adapter.
  - Compact was not able to position the needle adapter within a certain time limit.
  - Check for mechanical obstructions.
6. Sample probe.
  - Compact was not able to position the sample probe within a certain time limit.
  - Check for mechanical obstructions.



The following "**Error messages**" may occur during normal operation.

1. Vacuum error.
  - Check if vacuum is available.
  - Check if the flow sensor is working in [MENU 4-7].
  - Fatal error, call distributor.
2. Vacuum stabilization error.

Compact was not able to get a stable reading during the vacuum test before aspirating the sample.

  - Check for leakage on the pipette or fill nozzle.
  - Fatal error, call distributor.
3. Fill time error.

The fill sensor was not triggered in time.

  - Not enough liquid was sucked up in the pipette.
  - Insufficient sample volume.
  - No or poor vacuum, blocked needle or fill block.
4. Dilutor error.
  - Dilutor not started.
  - Can be seen in the run mode display as EDTA 001.
  - Check the value of the dilutor sensor in [MENU 4-6].
  - Check if vacuum is available.
  - Check if the flow sensor is working in [MENU 4-7].
  - Fatal error, call distributor.
5. Position error.

Compact was not able to position the carousel. There was a difference found in the position table and the actual measured position of the position sensor.

  - Check in MENU 4 - 4 [PIPETTE NUMBER AT RINSE POSITION]
  - If not correct select MENU 6-0 [PASSWORD], MENU 10 - 5 [SET TUBE NUMBER] and type the correct number of the pipette at the rinse station. Run MENU 7-9 [QUICK BELT POS. CHECK].
6. Up or down sensor error.

Compact was not able to detect the position of the fill nozzle on the sensors.

  - Up sensor failure, the fill nozzle is not at the fill position.
  - Down sensor failure the fill nozzle is not at the home position.
  - Check for mechanical obstruction around the fill nozzle.
  - Fatal error, call distributor.



7. Rinse head up error.  
The rinse head down sensor was not triggered during the movement time of the carousel.
  - Check the gap between the top of the rinse nozzle and the bottom of the pipette this should be 1.5 to 2 mm.
  - Check if the sensor is correct, or readjust the sensor.
  - Fatal error, call distributor.
8. Measure head not home error.  
Measure head is not at the home position.
  - Check the home sensor
  - Measure motor faulty.
9. Separator full error  
It takes too long for the waste pump to empty the liquid separator
  - Check separator assembly on air leaks
  - Replace waste tubes
  - Exchange waste pump cassette
  - Clean liquid separator



## Appendix - Maintenance schedule

Maintenance schedule StaRRsed Compact				Daily	Once a week	Level 5	Level 4 30 days	Level 3 90 days	Level 2 180 days	Level 1 365 days	Total amount / year
Sample volume	200-400	Per day									
			Clean outside of the aspiration needle	X							
			Perform End-of-day wash	X							
Check			Measure sensor MS 40.. <b>50</b> ..60		X						
Check			Fill stop sensor FS 90.. <b>140</b> ..165		X						
Check			Flow sensor Flow: 0925- <b>0980</b> -1020 Abs: 0300- <b>0327</b> -0345		X						
Check			Diluter start sensor 400-700		X						
Check			Temperature sensor TS [Room temperature]		X						
Check			Diluent flow sensor check Signal down and signal Up must be green		X						
Based on	1500	Fill Nozzle cleaning		every	7	days					
Based on	1500	Clean liquid separator		every	7	days					
Based on	6000	Run fill and clean procedure (Cleaning agent)		every			30	days			



ESRI050909	C/R	Sample Probe assembly							X	
QTST040001	C/R	Valve Tubing silicon							X	84
ESRI070914	Replace	Sample tube assembly							X	1
ESRI079200		Tubing Set Compact							X	1
ESRI090920	C/R	Waste pump motor assembly							X	1
Note: C/R = <b>C</b> heck: if not correct -> <b>R</b> eplace the part										



Maintenance schedule StaRRsed Compact		Daily	Once a week	Level 5	Level 4 30 days	Level 3 90 days	Level 2 180 days	Level 1 365 days	
Sample volume 200-400 Per day									
Daily Sample volume 300									
Article number	Article description								
QWLV040002	Bacterial Air Filter (Hepa)				X				12
QWLV050004	O-ring 2.5x1.5 (Valve body A) (Fill nozzle)				X				12
QWLV040001	Disc Filter 25 mm (white) (only if internal waste container is used)				X				12
QWLV040003	Disc filter (blue)				X				22
ESRI090902	Rinse Tube assembly				X				12
ESRI090903	Saline Tube assembly				X				12
ESRI090921	Waste cassette assembly					X			4
QWLV030901	Teflon tip repair set (1 ring)						X		2
ESRI030906	Flat washer for fill block							X	1
ESRI010246	Pinch valve tube					X			4
ESRI090026	Blotting washer					X			4
ESRI050909	Sample Probe assembly							X	1
ESRI090920	Waste pump motor assembly							X	1
QTST040001	Valve Tubing silicon (pipettes)							X	84



Appendix for **StaRRsed Compact**

For older models

QWLV060001	Flat Washer Fill-Nozzle EDTA				X				12
ESRI060911	Teflon tip repair set (Version I diluter 2 rings)						X		2
QWLV010104	One-way check valve (Version I diluter 2 rings)							X	1



## 15. GLOSSARY OF TERMS

### E

#### 15.1.1.1.1. ESR

**ESR** is short for **Erythrocyte Sedimentation Rate**. It is the amount of sedimentation (setting) of erythrocytes (red blood cells) in a blood column during a specified time.

### H

#### 15.1.1.1.2. Hazy

A sedimentation is reported to be "**hazy**", when the boundary between blood plasma and erythrocytes can not be defined clearly.

### M

#### 15.1.1.1.3. MRN

**MRN** is short for **Master Registration Number**. It is used as an identification number for any manual for Mechatronics products.

### W

#### 15.1.1.1.4. WI

**WI** is short for **Work Instruction** and is used with an index number for a range of work instructions.



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