

Starrsed ST Service Manual general index

Starrsed ST Service information:

Starrsed Parts catalogue ST_Parts.pdf



RR Mechatronics

Masters of Measurement

Manufacturer:	RR Mechatronics Manufacturing B.V.
Phone:	+31 229 291 129
Fax:	+31 229 241 534
E-mail:	support@rrmechatronics.com
Internet:	http://www.rrmechatronics.com
Postal address:	P.O. Box 225 1620 AE Hoorn The Netherlands
Office address:	De Corantijn 13 1689 AN Zwaag The Netherlands



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Document history overview

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1.03	May 2016	All	<ul style="list-style-type: none"> • Updated parts lists • Needle/needle sealing block instructions • New waste sensor • Minor textual changes 	H. Schavemaker
1.02	March 2015	All	<ul style="list-style-type: none"> • Manual structure changed • New display screens introduced • Annual update with changes throughout all chapters 	H. Schavemaker
1.01	October 2013	All	<ul style="list-style-type: none"> • Add samples stored in memory • Add appendix chip card password • Change fill nozzle adjustment • D351 valves • Addition flow diagrams • Add Error 70 trouble shooting 	H. Schavemaker
1.00	December 2012	All	<ul style="list-style-type: none"> • Extends the work instructions • +Annual update 	H. Schavemaker
0.02	May 2012	All	<ul style="list-style-type: none"> • Parts from the User manual MRN141 and the Drawing manual MRN142 are incorporated 	H.E. van Dijk
0.01	August 2011	All		H.E. van Dijk
0.00	August 2010	All	<ul style="list-style-type: none"> • Start of the manual 	H.E. van Dijk

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1. INSTRUMENT DESCRIPTION

The **<Instrument>** is a semi-automatic ESR instrument. The blood sample tubes must be mixed externally before they are loaded into the sample holder one at a time. The instrument is configured to work with EDTA anticoagulated samples (EDTA mode).

The sodium citrate dilution takes place in a 4+1 ratio and is achieved with $\pm 3\%$ accuracy.

Twenty-four Westergren pipettes are housed in the carousel. Each is of precision bore glass.

The fill line is back-flushed with sodium citrate diluent.

Positive sample identification is achieved with a barcode-reader and takes place before aspiration of the sample.

The temperature is corrected to the standard value of 18°C and ESR's may be read after one hour or 30 minutes. A predicted one-hour result is presented in the 30-minute mode.

Results of the test are expressed in millimeters and printed on the build-in printer.

The **<Instrument>** can be interfaced bi-directional with Laboratory Information Management Systems (LIMS) through interface protocols developed by Mechatronics.

The main features of the **<Instrument>** are:

- Single unit with small footprint, housing all units and containers.
- Closed compartment with a carousel holding 24 precision bore glass Westergren pipettes, measuring unit and pipette filling station.
- Build-in printer.
- Chip card system.
- Barcode reader for sample identification.
- Serial / parallel interface.
- Easy accessible keypad with light key pressure due to piezo technology.
- Battery backup memory.
- Accessories kit.



1.1. Chip card system

The <instrument> uses a chip card system which makes it possible to employ the instrument either in a pay-per-test scheme or on customer-owner basis. Specific types of chip cards also grant access to specific instruments settings.

A chip card must always be present in the card reader to operate the instrument.

The card reader is located on the left side of the <instrument>. Insert the chip card into the card reader with the printed side facing forward. The chip card is correctly inserted when it appears as shown in the picture:



1.1.1. Chip card type A to E

Chip cards of the types **A** to **E** are used to operate the instrument in a pay-per-test scheme. The chip cards contain a certain amount of credits units. How many tests can be performed with this amount of credits depends on the configuration which is made by the local <instrument> dealer. The following amounts of credit units are available:

Card type	Credit units
A	100.000
B	500.000
C	1.000.000
D	5.000.000
E	10.000.000



NOTE:

Available card types and amount of credit units per card may be subject to changes.

The total amount of credit units on the chip card is transferred to the <instrument> at once and the chip card is then rendered void. It is not possible to use the same chip card to transfer credits to more than one instrument.

This type of card is dealer dependent. The instrument only accepts chip cards of the dealer to which the instrument is configured.

1.1.2. Chip card type I

Chip cards of type **I** ("Installation card") are used by authorised staff of the dealer to install and prepare the instrument for the customer. When this type of chip card is inserted in the card reader, a PIN code must be entered to unlock the protected menus.

1.1.3. Chip card type Q

Chip cards of type **Q** are used to operate the instrument in ownership without credit limitations and can only be used on instruments which are configured to accept the **Q** chip card.

1.1.4. Chip card type R

Chip cards of type **R** ("Reset card") are exclusively used by authorised staff of the dealer to reset the credit settings in the instrument to factory defaults. When this type of chip card is inserted in the card reader, a PIN code must be entered to unlock the protected menus.

1.1.5. Chip card type S

Chip cards of type **S** ("Supervisor card") are used by lab supervisors to grant them access to important instrument settings. When this type of chip card is inserted in the card reader, a PIN code must be entered to unlock the protected menus.

1.1.6. Chip card type T

Chip cards of type **T** ("Technician card") are used by service technicians to install and prepare the instrument for routine operation and to perform service functions. When this type of chip card is inserted in the card reader, a PIN code must be entered to unlock the protected menus.

1.1.7. PIN code

The following pin codes are applicable for the following cards

Card type	Credits	password
A	100.000	n.a.
B	500.000	n.a.
C	1.000.000	n.a.
D	5.000.000	n.a.
E	10.000.000	n.a.
Q	Owner card	n.a.
R	Reset card	4711
S	Supervisor card	3964
T	Technician card	4711
I	Installation card	4711

n.a.= not applicable

1.2. Technical specifications

Technical specifications for the <Instrument>:

Instrument model	Model name	Catalogue number (REF)
	Starrsed ST	BANG109000

ESR method	Westergren method ICSH J. M. Jou; Int. Journal of Laboratory Hematology 2011; 33: 125-132 CLSI Procedures for the Erythrocyte Sedimentation Rate Test; Approved Standard- Fifth Edition H02-A5, Vol. 31 No. 11; 2011
Temperature compensation method	R.W. Manley: J. clin Path (1957), 10, 354
30 minute method	R. Rogers: Medical Laboratory World 1994
Allowed blood specimen types	For EDTA mode: Whole blood with < 1% EDTA anticoagulant.
Automatic dilution	4 vols. blood + 1 vol. sodium citrate diluent (3.2% NaCl); accuracy $\pm 3\%$
Reported result	mm after 1 hour
Throughput:	
30 minute method	36/hour
60 minute method	24/hour
Reagents:	
Reagents used	QRR 010931 Diluent QRR 010946 X-Clean
Blood volume:	
Aspirated blood volume per sample	1.2 ml in EDTA mode
Tube types:	
Sample tube types	Most commonly used brands/types. Closed tubes with concentric cap only. Total length: 73 ... 93 mm Body diameter: 11.5 ... 15.5 mm Cap diameter: 13 ... 18 mm

Barcode reader:

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

Total power specifications:

Mains voltage	115 - 230V, 50-60Hz
Fuse (20 x 5 mm)	Slow blow 230V, 1.6 Amp / 115V 2.5 Amp
Power consumption	Standby 30 VA / Maximum 100 VA
Heat output	Standby 16 Watt / Operation 30 Watt

Environment:

Sound level	Less than 58 dBA
Environment temperature	18 - 28 °C
Relative humidity	10-90%

Dimensions

Table space	330x550 mm
Height	770 mm
Weight empty	23 kg

LIS connectivity:

Communication	Serial, bi-directional according various protocols
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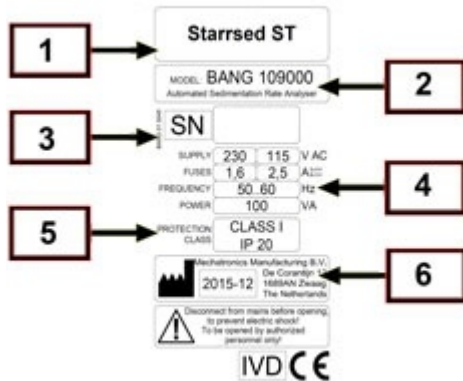
Data storage:

Storage medium	Battery back-up memory
Storage capacity	Results and raw data of 896 samples

1.2.1. CE Mark <Instrument>

The CE Mark is found on the Mechatronics instrument identification plate, an illustration of which is shown below with explanations.

The instrument identification plate is fitted at the left side of the rear panel of the <Instrument>.



Explanation:

1. Instrument name <Instrument>
2. Instrument type and model
3. Instrument serial number
4. Electrical information
5. Protection class
6. Manufacturer information and Date of manufacture

1.3. Accessories kit

The <Instrument> comes with an accessories kit. For a complete list of the the contents of accessories kit, see Appendix - Article reference list Starrsed ST

2. STARRSED LINE OF ESR INSTRUMENTS

The Starrsed line of ESR automated instruments is unique by the fact that it has automated the Westergren Method and fully complies with the published reference method, including working with diluted EDTA blood. The Starrsed line offers several types of ESR analyzers. Our solutions range from tube-based to rack-based to track-based, the latter resulting in the highest level of automation possible. Laboratories that operate different Starrsed instruments in different capacities are assured that correlations are precise and fully reliable.

Starrsed ST, Starrsed RS, Starrsed RL and Starrsed TL are instrument names of RR Mechatronics. Until 2014 the Starrsed ST was called Inversa 24M, the Starrsed RS was called AutoCompact, the Starrsed RL was called Interrliner (Standalone). RR Mechatronics changed the product names to benefit better from the worldwide recognizability of the brand name Starrsed.

3. GENERAL INTRODUCTION

Click on the link if the link is applicable;

- **How to use the service manual** (on page 17)
- Maintenance schedule
 - <Instrument> Appendix - Maintenance schedule
- Trouble shooting information
- **Block diagrams <Instrument>** (on page 21)
- FAQ index page
- **Visual board reference <Instrument>** (on page 23)
- **General electronics board information <Instrument>** (on page 25)
- **General Motor and Sensors information** (on page 27)

3.1. How to use the Service Manual

In the service manual the following description structure is used to explain an **Assembly** or **Unit**.

1. **Assembly** quick reference to Drawings of the assembly.
This section has the main contents to all other sections in this chapter.
All this assembly drawings are collected in a table.
2. **Assembly** general information.
All the information what is useful to know to get a better understanding of the assembly.
3. **Assembly** control with the Menu structure of the software.
In this section all the key functions to control the assembly.
4. **Assembly** error messages.
All the error messages what is caused by a faulty assembly.
 1. **Assembly** fault symptoms.
All symptoms what can be caused by a faulty assembly.
5. **Assembly** work instructions.
Instructions for performing often used maintenance procedures.
6. Special tools requirement for this **assembly**.
List of special not common used tools.
7. **Assembly** or **unit** block diagrams.
8. **Assembly** sensor information.
All the information about the sensors in use by the assembly.
 1. How to make the proper sensor adjustment.
 2. **Assembly** label information.
 3. **Assembly** sensor and motor reference.
 4. **Assembly** sensor adjustments.
9. **Assembly** hardware replacement.
Only hardware replacement is mentioned in this section, like motors and sensor replacement.
10. **Assembly** hardware adjustment.
When hardware adjustment is required, instructions are mentioned in this section.
11. All trouble shooting on the **assembly**.
A combination of the Trouble shooting in the User manual of the instrument and extra trouble shooting on engineer level.
12. Useful and *previous* information about the **assembly**.
Extra useful and previous information about hardware and adjustments on the **assembly**.
13. Applicable drawings from the **assembly**.

3.2. Explanation of available documentation

Manuals for the <Instrument> are available on three levels: for the operator, the supervisor and the service engineer.

The following manuals are available:

1. Instructions for Use (IFU)
Intended for the operator: Contains instructions for normal operation, safety, preventive maintenance and trouble shooting procedures to solve the most common problems. Available in several languages.
2. User Manual (UM)
Intended for the lab supervisor. Contains information from the IFU and additional information concerning settings, service, higher maintenance levels and trouble shooting procedures to solve more complicated problems. Only available in English.
3. Service Manual (SM)
Intended for trained service engineers. Describes maintenance, servicing and repair of the instrument in detail. Contains detailed descriptions of parts, assembly drawings, modifications, extended trouble shooting, flow diagrams etc. Only available in English.
4. Installation Manual (IM)
Intended for trained service engineers. Contains instructions and procedures for installation and start-up. Only available in English.

Manuals are available in PDF and HTML-format and can be downloaded from <http://www.rrmechatronics.com>.

3.3. Trouble shooting information

Here all kind of existing trouble shooting what cannot be captured by FAQ's or which are not mentioned at all in the service or user manual.

3.4. Block diagrams <Instrument>

BANG100001 Flow diagram

BANG100001 Flow diagram Detail

Block diagram Drive unit

Block diagram Measure unit

Block diagram Nozzle unit

Label information motors and valves

Label information sensors (on page 28)

Inversa Flow Block diagram

Nieuwe links

>

> Block diagram Drive unit

|

|

!

E25	Filling motor could not go to home position. Gripper is closed.		<ul style="list-style-type: none"> • Gripper must be open. • ! malfunction.
E26	Not allowed to start Filling motor. Carousel is not at a defined position.		<ul style="list-style-type: none"> • ! malfunction.
E27	Filling motor could not go down all the way. Gripper is closed.		<ul style="list-style-type: none"> • Gripper must be open. • malfunction.
E28	Filling motor pulse disk error.		No pulses were detected. Position of filling motor unknown. <ul style="list-style-type: none"> • Pulse disk malfunction. • jammed or malfunction.
E29	(Number not assigned)		
E30	(Number not assigned)		
E31	Carousel could not turn. Gripper is closed.		<ul style="list-style-type: none"> • Gripper must be open. • Gripper sensors malfunction.
E32	Carousel could not turn. Measure head not at home position.		<ul style="list-style-type: none"> • malfunction.
E33	Carousel could not turn. Nozzle not at home position.		<ul style="list-style-type: none"> • ! malfunction.

•

3.5. Visual board reference <Instrument>

Appendix - PC Main board Starrsed ST

Appendix - PCB Back panel board Starrsed ST

Appendix - PC Keyboard Starrsed ST

3.6. General electronics board information <Instrument>

The following common used boards can be found in <Instrument>;

1. 24 volt Power supply.
2. Back panel board.
 - All the wire connections from the main board to motors and sensors are connected via the back panel board.
 - Chip card Interface for reading the Chip cards.
3. Main Processor board.
 - This board controls all the functions from the motors, sensors and valves.
4. Keyboard control board.
 - Controls the key path.
 - Controls the display.

3.7. General Motor and Sensors information

Here a capture of de-assembling and assembling on motors with their attachments.

3.7.1. Principle of Motor with coupler

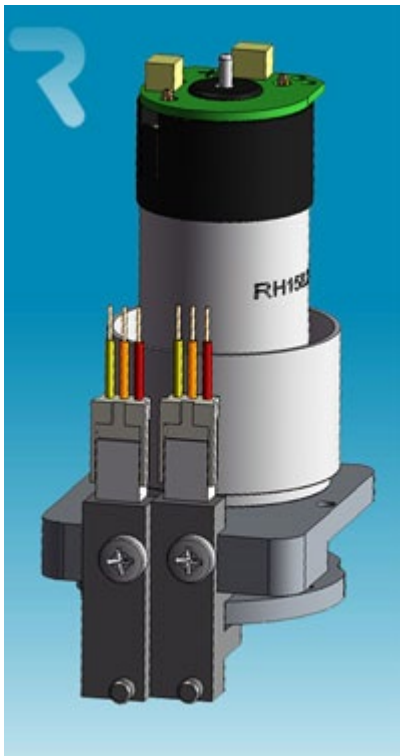
When motor need to be replaced;



- Unplug the motor connections from the motor PC board.
- Disassemble the motor bracket by unfasten the screws from the motor bracket.
- Pull the motor assembly loose.
- Remove the Coupling by pulling it from the motor axis.
- Remove the screws which hold the motor attached to the motor bracket.
- Replace the motor and fasten the bolts.
- Re-install and fasten the coupling.
- Re-install the cable and connect the sensor onto the motor PC board.

3.7.2. Principle of Motor with sensors attached

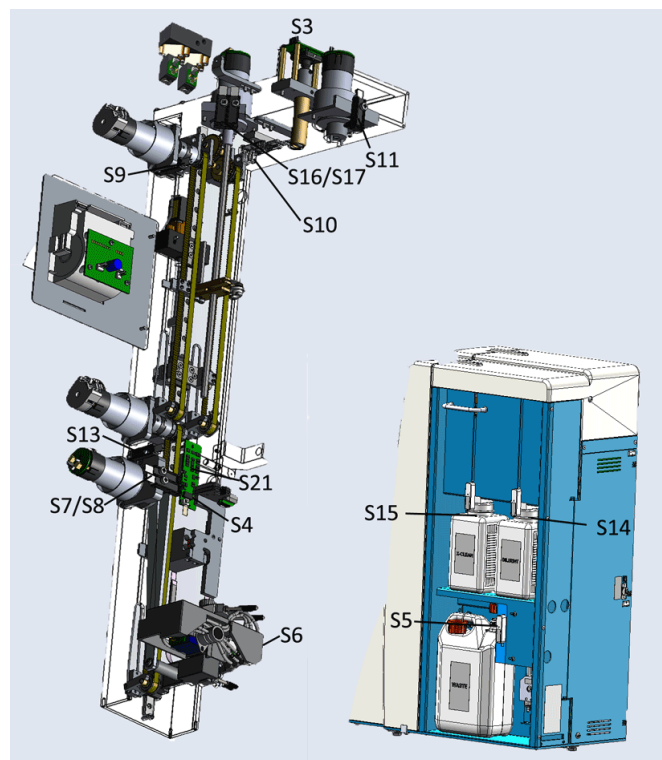
When motor need to be replaced;



- Unplug the motor connections from the motor PC board and the attached sensor(s).
- Disassembly the motor bracket by unfasten the screws from the motor bracket.
- Pull the motor assembly loose.
- Remove the sensor(s).
- Remove "the coupling" from the motor axe.
- Remove the screws which hold the motor attached to the motor bracket.
- Replace the motor or sensor(s) and fasten the screws.
- Re-install and fasten "the coupling".
- Re-install the sensor(s).
- Re-install the motor connection and the sensor(s) connection(s).

Note: "the coupling" can be a disk, a pulley or a mechanical connection to an assembly.

3.7.3. Label information sensors



Label Number	Function	Part number	Replacement of
S3	Carousel position sensor	BANG029003	
S4	Measure head	BANG089004	
S5	Waste sensor	BANG019017	BANG019005/BANG019015
S6	Blood sensor	BANG080013	
S7	Nozzle top sensor	QEOP100005	
S8	Nozzle bottom sensor	QEOP100005	
S9	Filling home sensor	QEOP100005	
S10	Piston detection sensor	QEOP100005	
S11	Carrousel motor home sensor	QEOP100005	
S13	Measuring home sensor	QEOP100005	
S14	Diluent level sensor	BANG019006	
S15	X-Clean level sensor	BANG019006	
S16	Gripper home sensor	QEOP100005	
S17	Gripper close sensor	QEOP100005	
S18	Needle home sensor	QEOP100005	
S19	Needle bottom sensor	QEOP100005	
S21	Temperature sensor	on BANG080004	

4. GENERAL SAFETY INSTRUCTIONS

The instrument described in this manual is designed to be used by properly trained personnel only. For the correct and safe use of this instrument it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

- Execute your work according to this manual. Read the instructions before operating the instrument. Observe all cautionary markings in the manual and on the instrument. Keep this manual for future reference.
- Follow the bio safety procedures when working with blood-contaminated parts.
- Be cautious to prevent stinging during cleaning or replacing the needle assembly.
- Repair can only be executed by trained and qualified personnel.
- Wear protective clothing.
- When the instrument is running it is not allowed to:
 - Open and remove safety covers.
 - Touch moving parts.
- It is not allowed to give access to the instrument to a non-authorized person at any time.
- Whenever it is likely that safety-protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation. The matter should then be referred to qualified technicians.
- Safety protection is likely to be impaired if, for example, the instrument fails to perform the intended measurements or shows visible damage or unusual smells, smoke, liquids are flowing out.

4.1. Explanation of symbols

The following symbols can be used in this manual and for the instrument:



Warning sign to prevent personal injury due to biohazard.

Installation by engineer



Warning sign to prevent personal injury due to rotating parts.

->



Warning sign to prevent personal injury due to sharp objects.

->

>

>



Warning sign to prevent personal injury due to hot surfaces.

>



Warning sign to prevent personal injury due to electrical shocks.



General warning.



General note.



This symbol indicates a reference to this or other product documentation

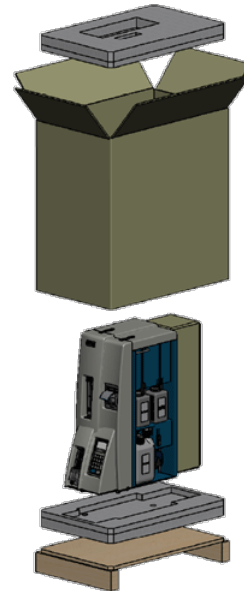
5. INSTALLATION

Before unpacking the <Instrument>, we recommend that the packaging should be checked for damage. Any damage must be reported to the distributor.

Follow the next installation instruction steps.

5.1. Unpacking <Instrument> system

1. Cut the binding of box and take out the top protection cover.
2. Remove the out box.
3. Remove the accessories box.
4. Remove the plastic bag from the <Instrument>.
5. Lift the <Instrument> from the bottom protection cover onto a table.



5.2. Install at chosen location

Install the <Instrument> in a location with the following specifications,

1. Avoid direct sunlight shining on the <Instrument>.
2. Avoid droughts which may cause temperature changes.
3. Place the <Instrument> on a **stable table**, with no nearby vibration.
4. Do not place in direct airflow of an air conditioning unit.
5. Leave a space of approximately 15 centimeters between the back side of the instrument and the wall to allow warm air to escape and to connect or run interface cables.
6. Use a power connection with a proper earth connection.
7. Level the instrument by using the three adjustable feet and the leveling-gauge, which is situated at the carousel.

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