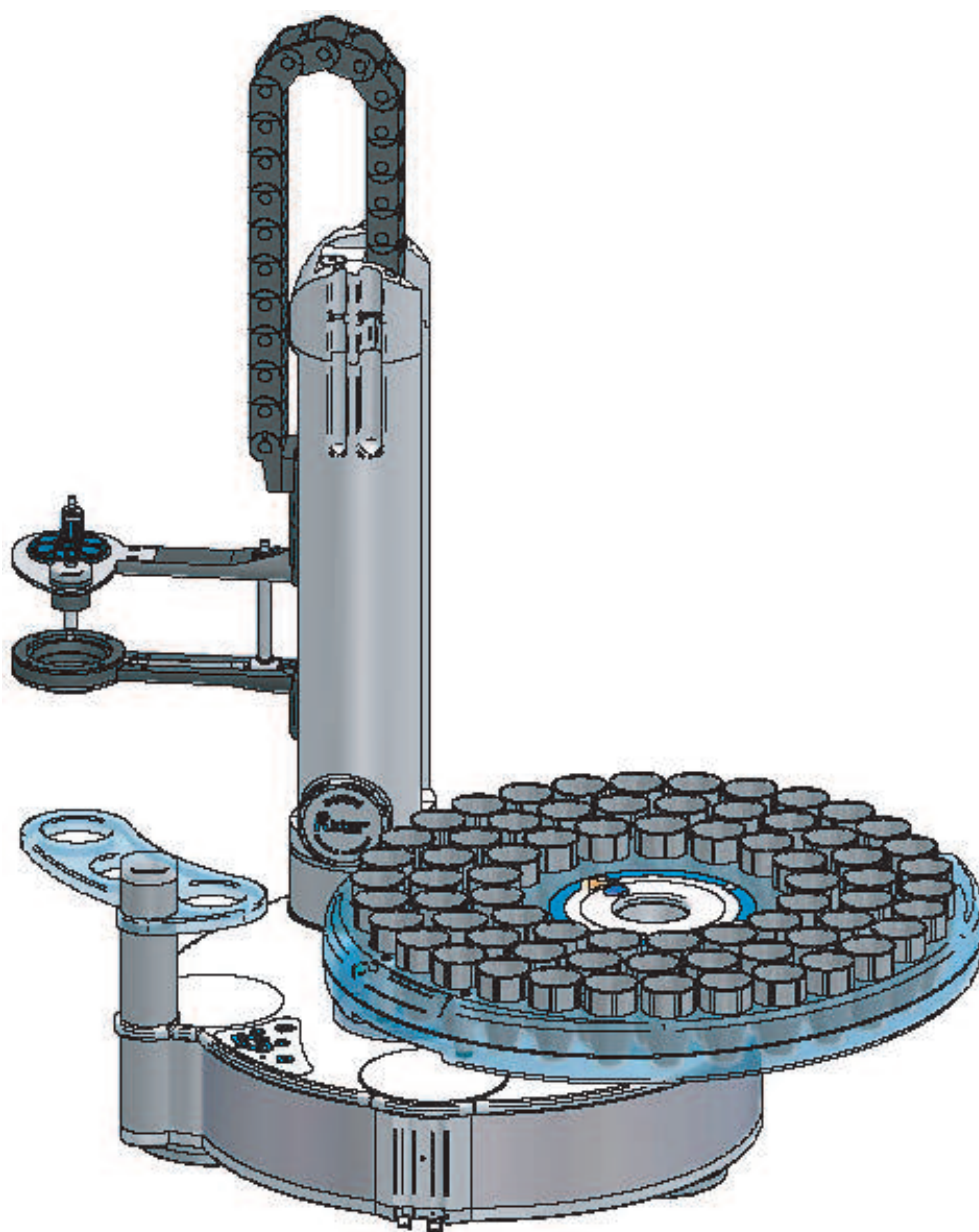


TitraLab[®]

SAC850 & SAC950

Sample Changers

User's Guide



D21T085

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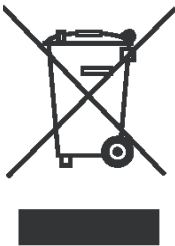

General information

Safety Information

Please read this entire manual before unpacking, setting up, or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment. To ensure that the protection provided by this equipment is not impaired, do not use and do not install this equipment in any manner other than that specified in this manual.

Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	<p>Electrical and electronic equipment marked with this symbol may not be disposed of in European public disposal systems after 13 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.</p> <p>Note: For equipment supplied or produced by "Radiometer Analytical", please contact www.hach-lange.com and select your country for instructions on how to return your equipment for proper disposal."</p>
	This symbol, when noted on the product, identifies the location of a fuse or current limiting device.

Warning !

The sample changer has been developed to meet the requirements of volumetric titration applications. It is therefore aimed at experienced users who have the knowledge required to operate the instrument and implement the security instructions enclosed. Please remember that the sample changer must not, under any circumstances, be used to perform tests on living beings.

We accept no responsibility for using the sample changer and its peripheral devices under conditions that are not specified in this User's Guide.

Compliance with FCC rules, part 15 Information to the user

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- Use a shielded RS232 serial cord and a shielded USB cord fitted with a ferrite.

Warning!!

Changes and modifications that are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1. Introduction

The SAC850 and SAC950 Sample Changers are designed for automatic analysis in various types of trays.

Each tray can hold up to 70 samples depending on the sample volume and the application to be performed.

The SAC850 Basic model is dedicated for small sample series automation. The SAC850 is fitted with a single radius tray and can hold 14 to 25 samples.

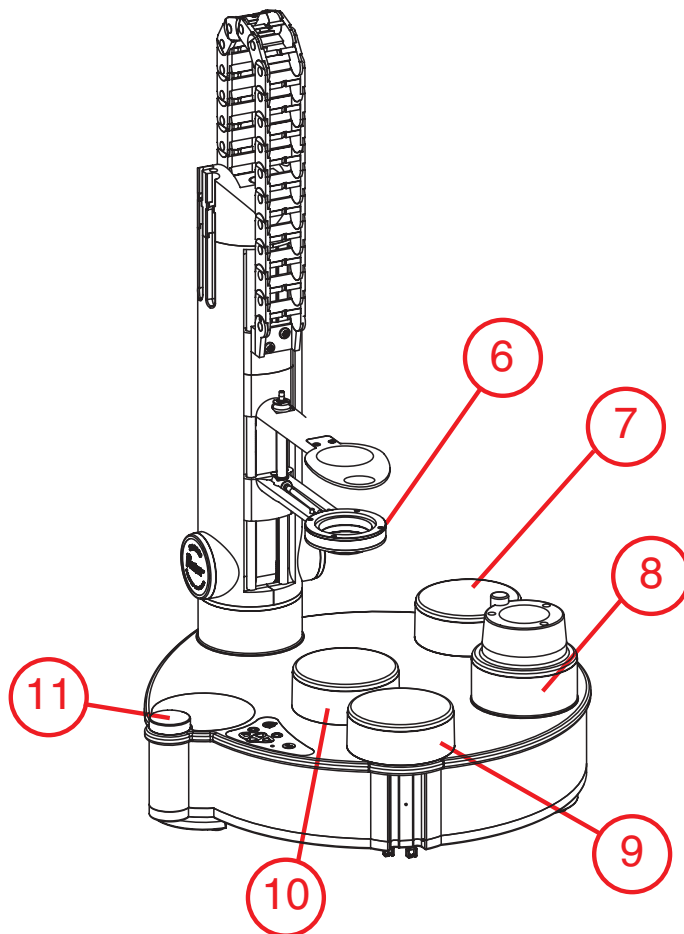
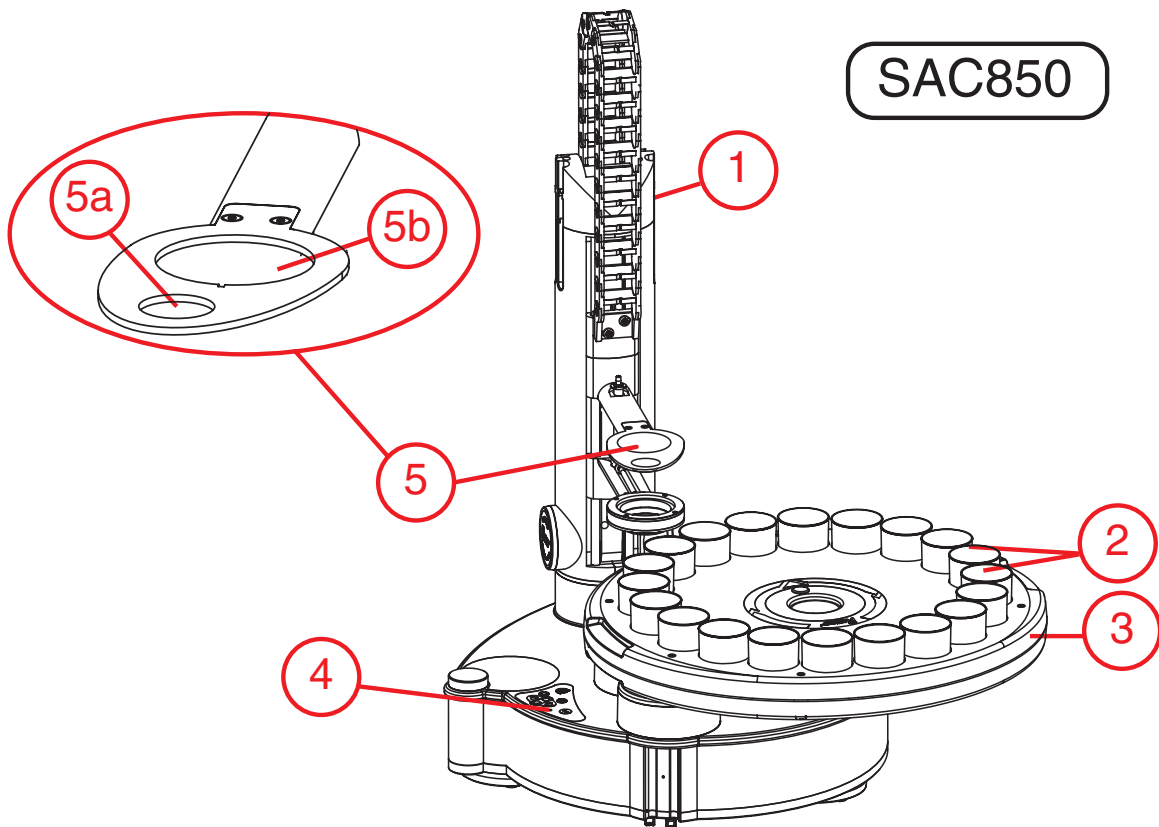
The SAC950 Extended model is dedicated for large sample series automation. The SAC950 is fitted with a 1, 2 or 3-radii tray and can hold 14 to 70 samples.

The SAC850 and SAC950 Sample Changers are ideal for handling samples in TitraLab® or MeterLab® compatible systems.

The aim of this User's Guide is to provide you with detailed information about setting up and operating your sample changer.

For information on how to enter data into your workstation, please refer to the instructions delivered with the workstation.

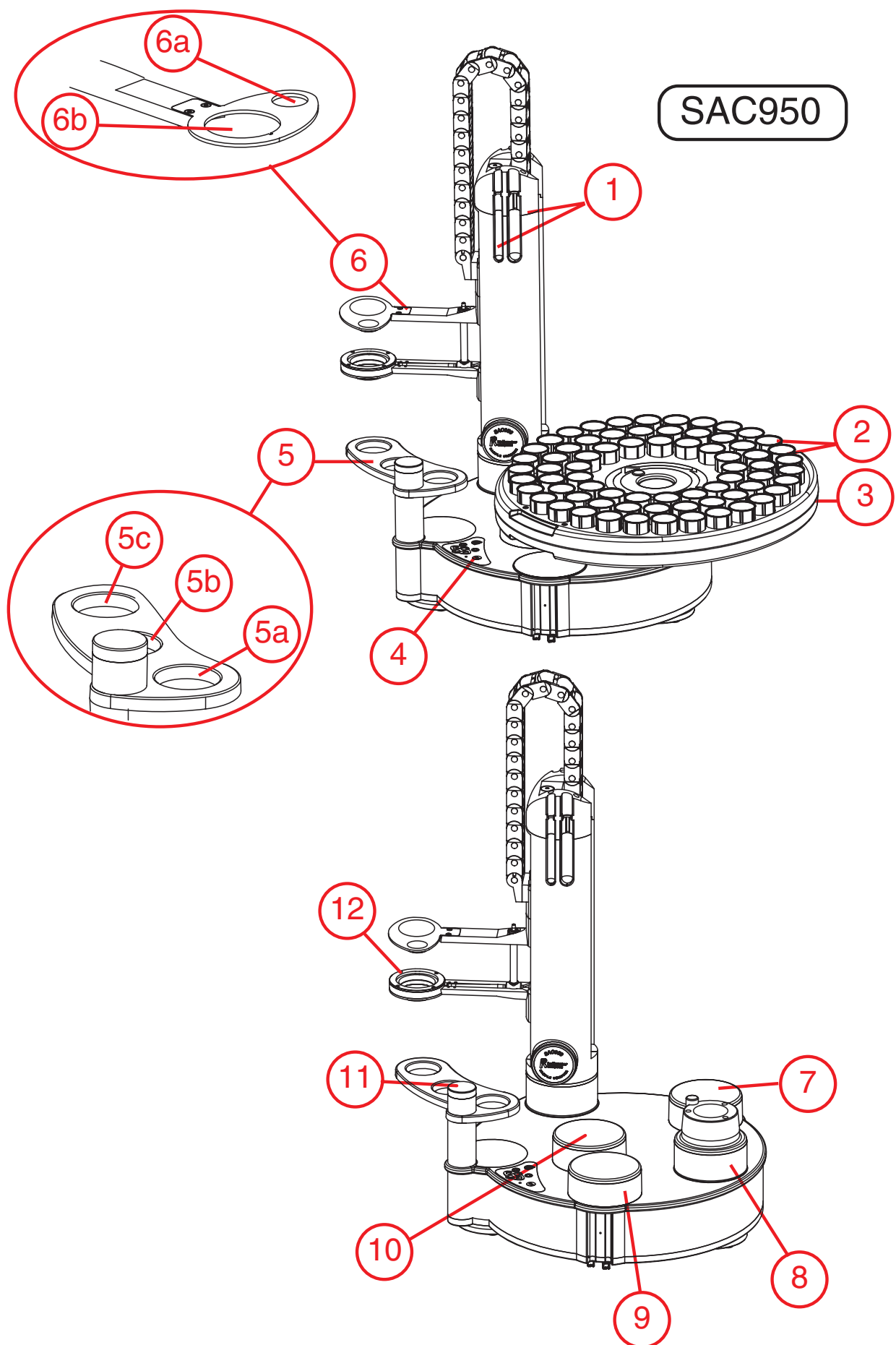
SAC850



2. Presentation

SAC850

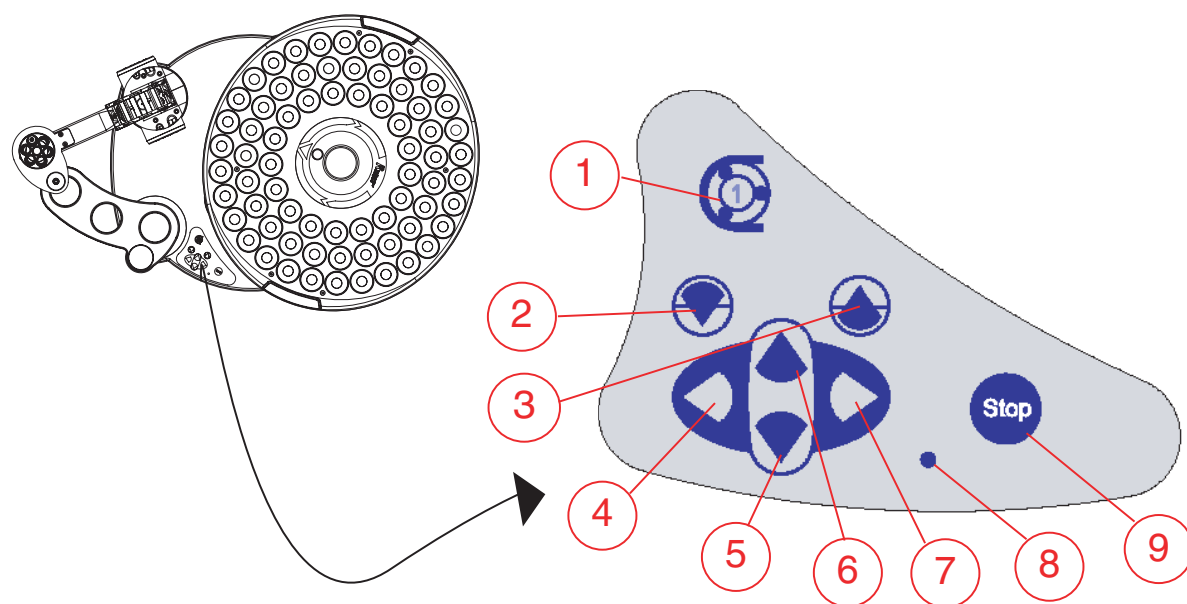
- ① 4 locations for spare electrodes and antidiffusion delivery tips (2 locations on each side).
- ② Sample/Rinse/Park beakers (1 Park, 0 to 2 Rinses, remaining positions dedicated for samples).
- ③ Mono radius turntable. Capacities depend on the beaker size and diameter : see chapter "Accessories" - Table "Turntables and beakers (SAC850 and SAC950)".
- ④ Keypad.
- ⑤ Electrodes/Stirrer/Beaker presence detector holder.
Beaker presence detector location **(5a)**.
Electrodes/stirrer head holder location **(5b)**.
- ⑥ Shower rinse holder represented here with the shower head assembly.
- ⑦ Optional peristaltic pump (optional).
- ⑧ Turntable holder.
- ⑨ Optional shower rinse pump/emptying pump module. Comprises 2 diaphragm pumps (rinsing and emptying).
- ⑩ Magnetic stirrer assembly comprising also a RFID reader device for turntable automatic recognition.
- ⑪ Status lamp:
Blue : Free for operation. Manual operations possible.
Purple: Sample changer controlled by the workstation (analysis in progress). Only the keyboard **Stop** key is available.
Red: An error has been detected.



SAC950

- ① 4 locations for spare electrodes and antidiffusion delivery tips (2 locations on each side).
- ② Sample beakers.
- ③ 1, 2 or 3 radii turntable. Capacities depend on the beaker size and diameter : see chapter "Accessories" - Tables "Turntables and beakers".
- ④ Keypad.
- ⑤ Beaker extension with Park **(5a)**, Rinse 1 **(5b)** and Rinse 2 **(5c)** beaker locations.
- ⑥ Electrodes/Stirrer/Beaker presence detector holder.
Beaker presence detector location **(6a)**.
Electrodes/stirrer head holder location **(6b)**.
- ⑦ Optional peristaltic pump.
- ⑧ Turntable holder.
- ⑨ Optional shower rinse pump/emptying pump module. Comprises 2 diaphragm pumps (rinsing and emptying).
- ⑩ Magnetic stirrer assembly comprising also a RFID reader device for turntable automatic recognition.
- ⑪ Pilot lamp indicating the operating status of the instrument:
Blue : Free for operation.
Manual operations on keyboard are possible
Purple: The sample changer is controlled by the workstation unit (analysis in progress). Only the keyboard **Stop** key is available.
Red: An error has been detected.
- ⑫ Shower rinse holder represented here with the shower head assembly.

Keypad (SAC950 only)



- ① Starts adding reagent with peristaltic pump (*). Stops addition when the key is latched down.
- ② Starts shower rinsing using a membrane pump of the Dynamic rinsing module (**). Stops action when the key is latched down.
- ③ Starts emptying a beaker using the second membrane pump of the Dynamic rinsing module (**). Stops action when the key is latched down.

(*) If a Reagent addition module is installed (see chapter "Setting up") and if the electrode holder is at its downmost position.

(**) If a Dynamic rinsing module is installed (see chapter "Setting up") and if the electrode holder is at its downmost position.

- ④ Moves to the previous beaker. If the electrodes dip into the beaker (or are above the beaker) before pressing the key, at the end of the operation, they will dip into the previous beaker (or will be above the previous beaker). The beakers are ranked as follows:

Rinse beaker 2 (R2)
Rinse beaker 1 (R1)
Park beaker
Beaker no.1 of the turntable
.....
Beaker no.n-1 of the turntable
Beaker no.n (last beaker) of the turntable
Rinse beaker 2 (R2)
.....

- ⑤ Moves the arm (electrode head holder) downwards.
- ⑥ Moves the arm (electrode head holder) upwards or moves the electrodes above the Park beaker if the electrodes are already on service position (upmost position).
- ⑦ Moves to the next beaker. Same observations as for the "Moves to the previous beaker" key (④).
- ⑧ Blue pilot lamp. Lights on when a key is pressed and lights off when the key is latched down. This lamp blinks when the key is not available (example: during an analysis, when a key other than **Stop** is pressed).
- ⑨ **Stop** key. Stops the action in progress while a sequence is running. Removes an error status (red status pilot lamp). The **Stop** key is the only active key while a sequence is running.

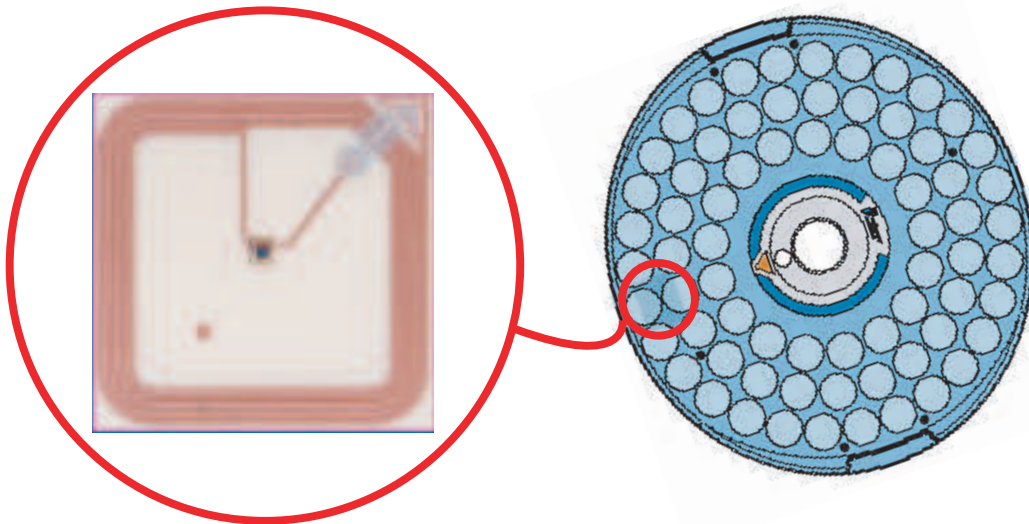
RFID technology on turntables

What's RFID means and how does it work?

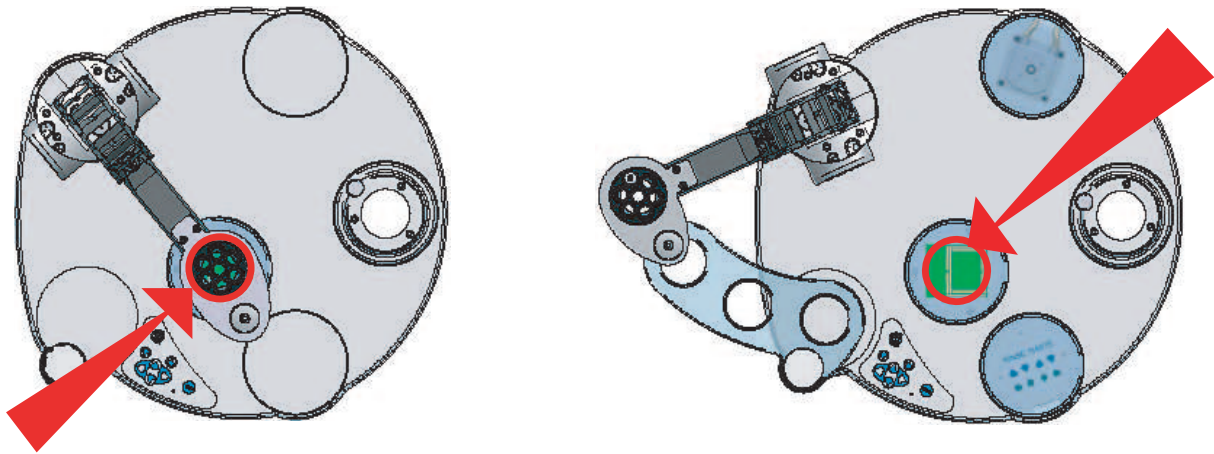
Radio Frequency IDentification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies.

It's the combination of a "tag" and a "reader". A typical RFID tag consists of a microchip attached to a radio antenna mounted on a substrate. The chip can store data. The reader is used to retrieve the data stored on an RFID tag. A typical reader is a device that has one or more antennas that emit radio waves and receive signals back from the tag. The reader then passes the information in digital form to a computer system.

In our assembly an RFID tag is attached inside the turntable at the first beaker level position. This tag is clearly visible.



RFID tag placed on the turntable



*RFID reader mounted inside the Magnetic stirrer assembly
SAC850 on the left and SAC950 on the right*

The RFID reader is mounted inside the Magnetic stirrer assembly (see figure above). When an analysis is started and a turntable is in place, the sample changer rotates the tray (and the arm in the case of a SAC950) so that the tag and the reader are face to face for a moment.

Which data contains a turntable RFID tag?

The turntable identification data (type of turntable, number of beakers, beaker location and beaker size/height).

Benefits of using RFID technology on turntables

The Sample Changer knows at any moment if a turntable is installed and which turntable is used.

Possibility of working with magnetic bars without risks of interferences.

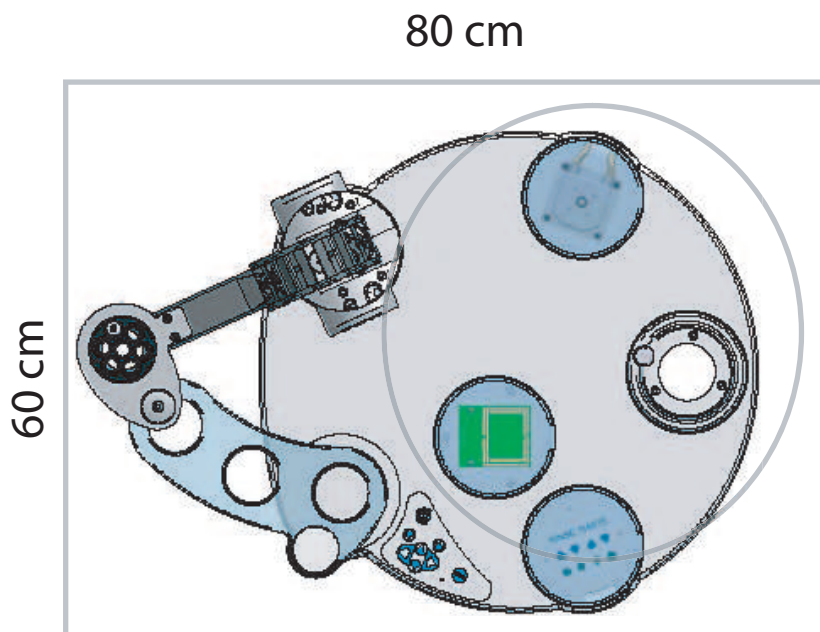
3. Setting up

Unless otherwise indicated, the following setting up instructions are common to both SAC850 and SAC950 Sample Changers.

Set up the instrument on a flat surface and in a properly ventilated place. The power supply connectors on the rear panel must remain accessible so that you can quickly disconnect the cables in case of emergency. The room temperature should not exceed 40°C.

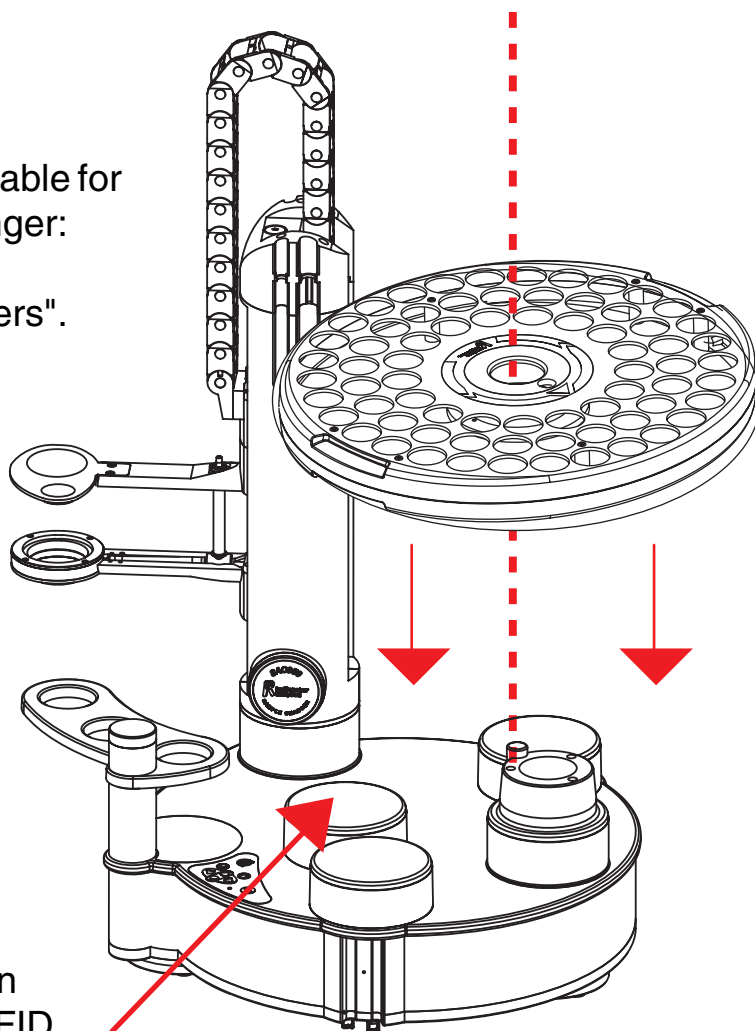
The relative humidity must be between 20 and 80%.

Minimum space requirements: 80 cm x 60 cm (32" x 24")



Mounting the turntable

Several turntables are available for each model of sample changer: see chapter "Accessories", table "Turntables and beakers".



The turntable is identified on starting an analysis. The RFID reader reads the turntable RFID tag

Placing beakers

Park beaker

At the end of a sample series, the electrodes are dipped in the park beaker or left above the park beaker. The park beaker can also be used to rinse dynamically the electrodes.

Positioning of the park beaker (see figures below):

SAC850: Last position of the turntable

SAC950: On the electrode reconditioning extension

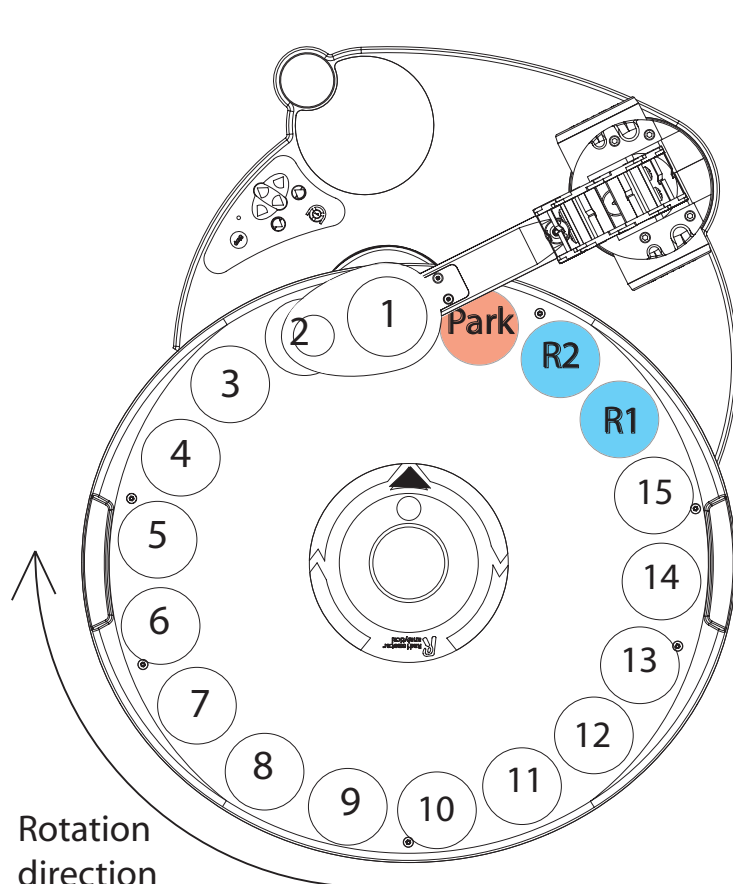
Static rinse beakers

Between 2 sample runs, the electrodes are dipped once or twice into a rinse solution under stirring. 1 or 2 static rinse beakers can be used.

Positioning of the static rinse beaker(s)

SAC850: Last but one (**R1**) and previous (**R2**) positions of the turntable

SAC950: On the electrode reconditioning extension, positions (**R1**) and (**R2**)

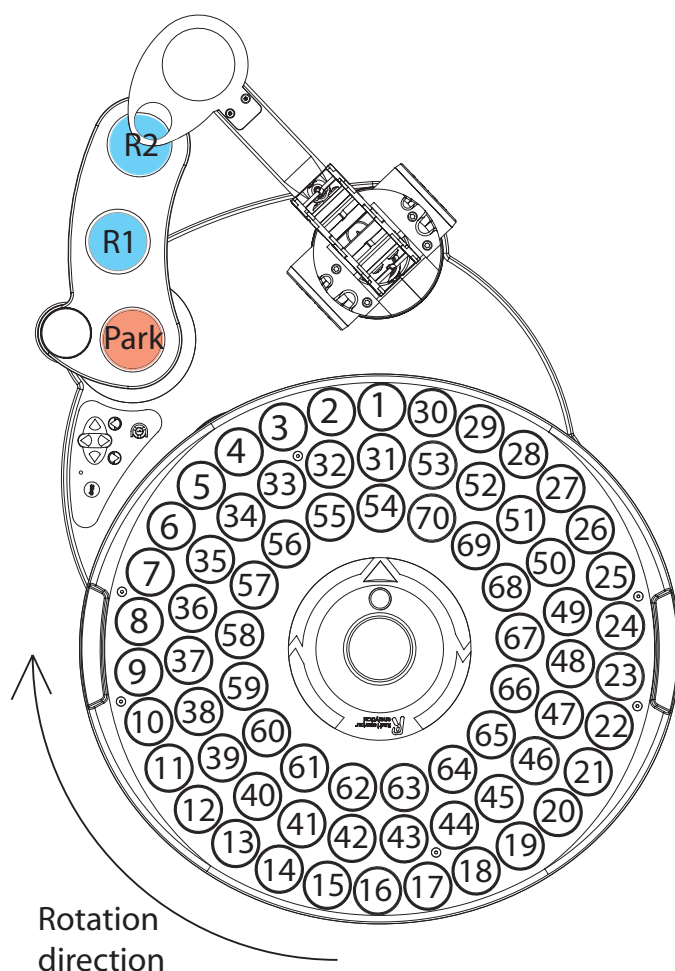


R1: Static rinse beaker no. 1

R2: Static rinse beaker no. 2

Other positions: Sample beakers (15 free position if 2 static rinses programmed)

*Position of the beakers on a SAC850
Example of a 18-position turntable*



R1: Static rinse beaker no. 1
R2: Static rinse beaker no. 2

Positions 1 to 70:
 Sample beakers

*Position of the beakers on a SAC950
 Example of a 70-position turntable*

SAC850 users:

Park, static rinse and sample beaker sizes depend on the type of turntable used. These beakers are supplied with the turntable kit (see chapter "Accessories").

SAC950 users:

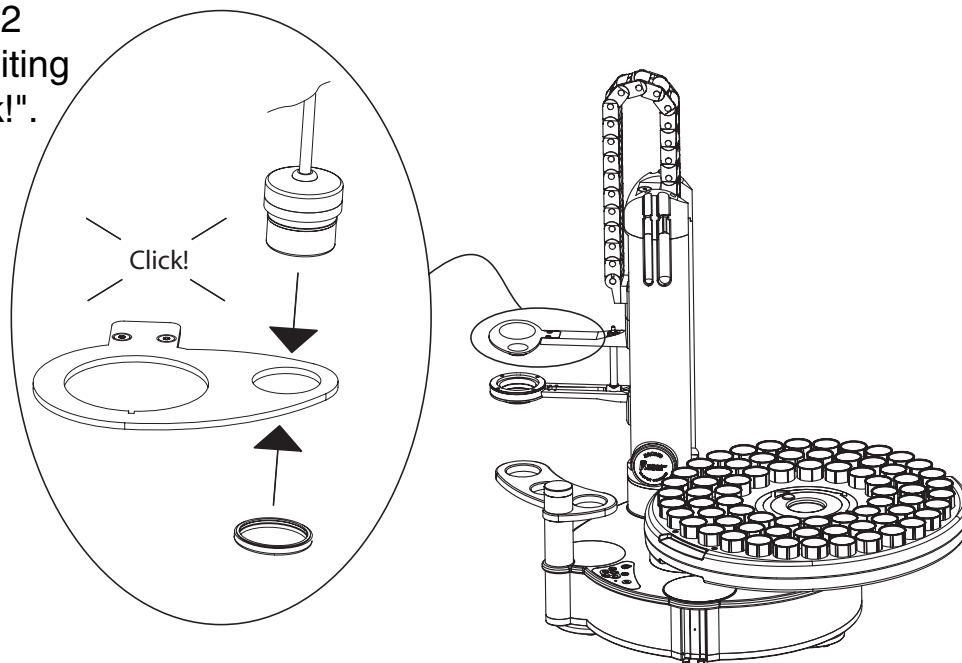
Park and static rinse beakers are 40-100 ml PP titration vessel, supplied with the SAC950, part no.: X91T055 (10 pcs).

Sample beaker sizes depend on the type of turntable used. These beakers are supplied with the turntable kit (see chapter "Accessories").

Mounting the beaker presence detector

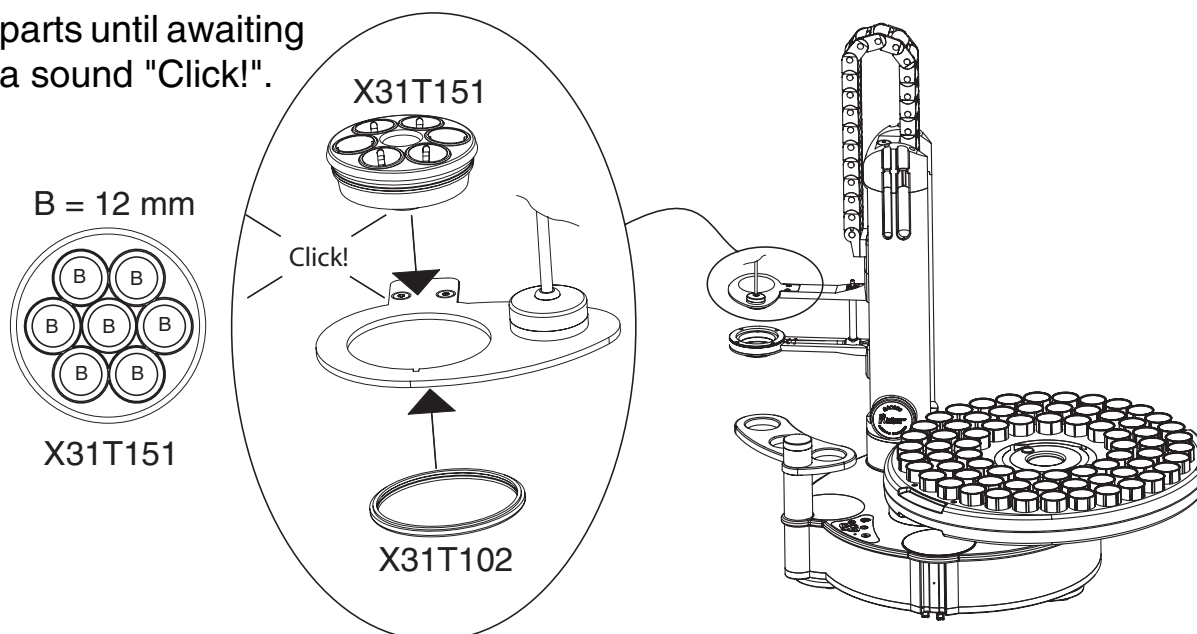
The beaker presence detector is an ultrasonic transducer that detects empty positions on the turntable.

Assemble the 2 parts until awaiting a sound "Click!".

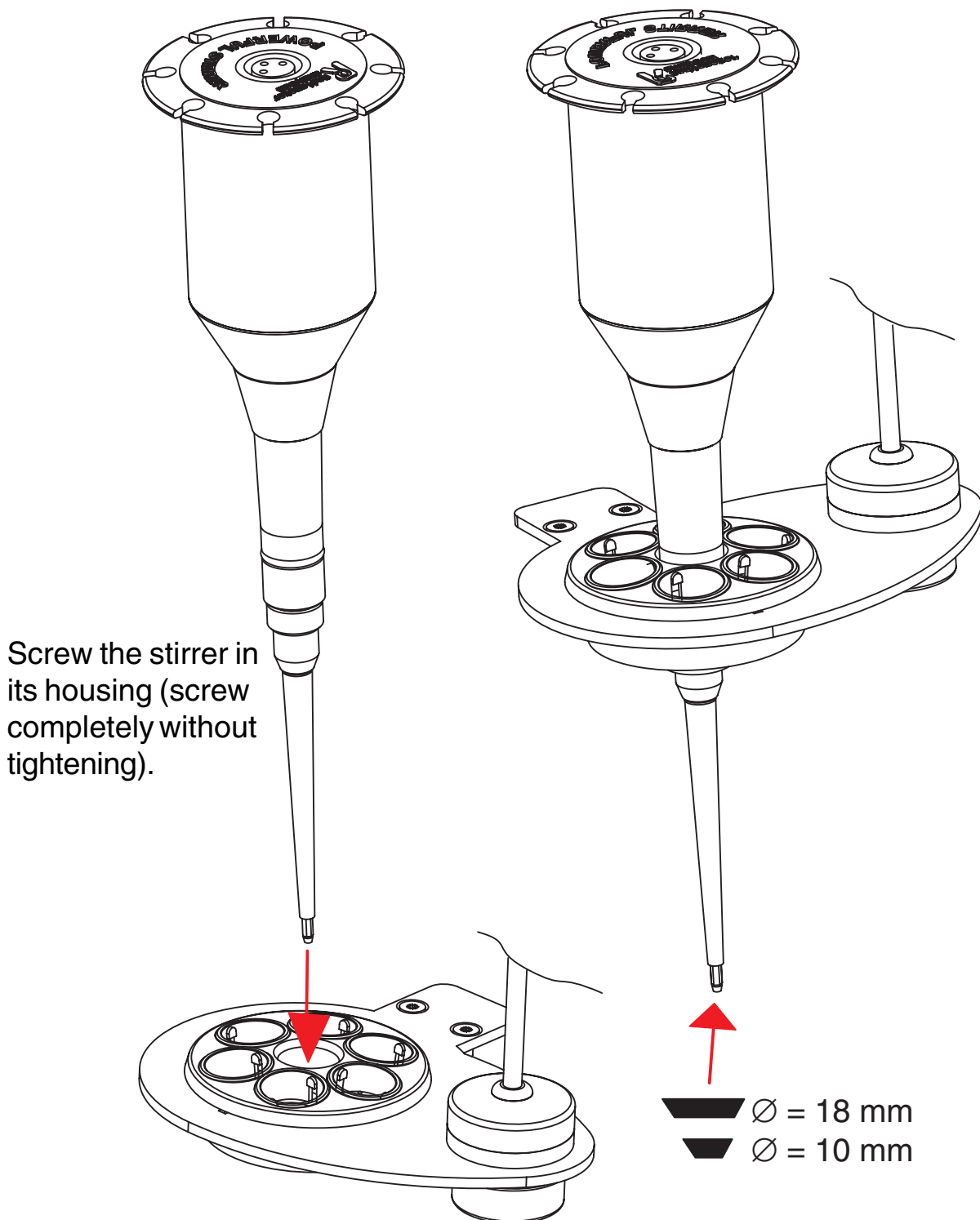


Assembling the electrode head

Assemble the 2 parts until awaiting a sound "Click!".

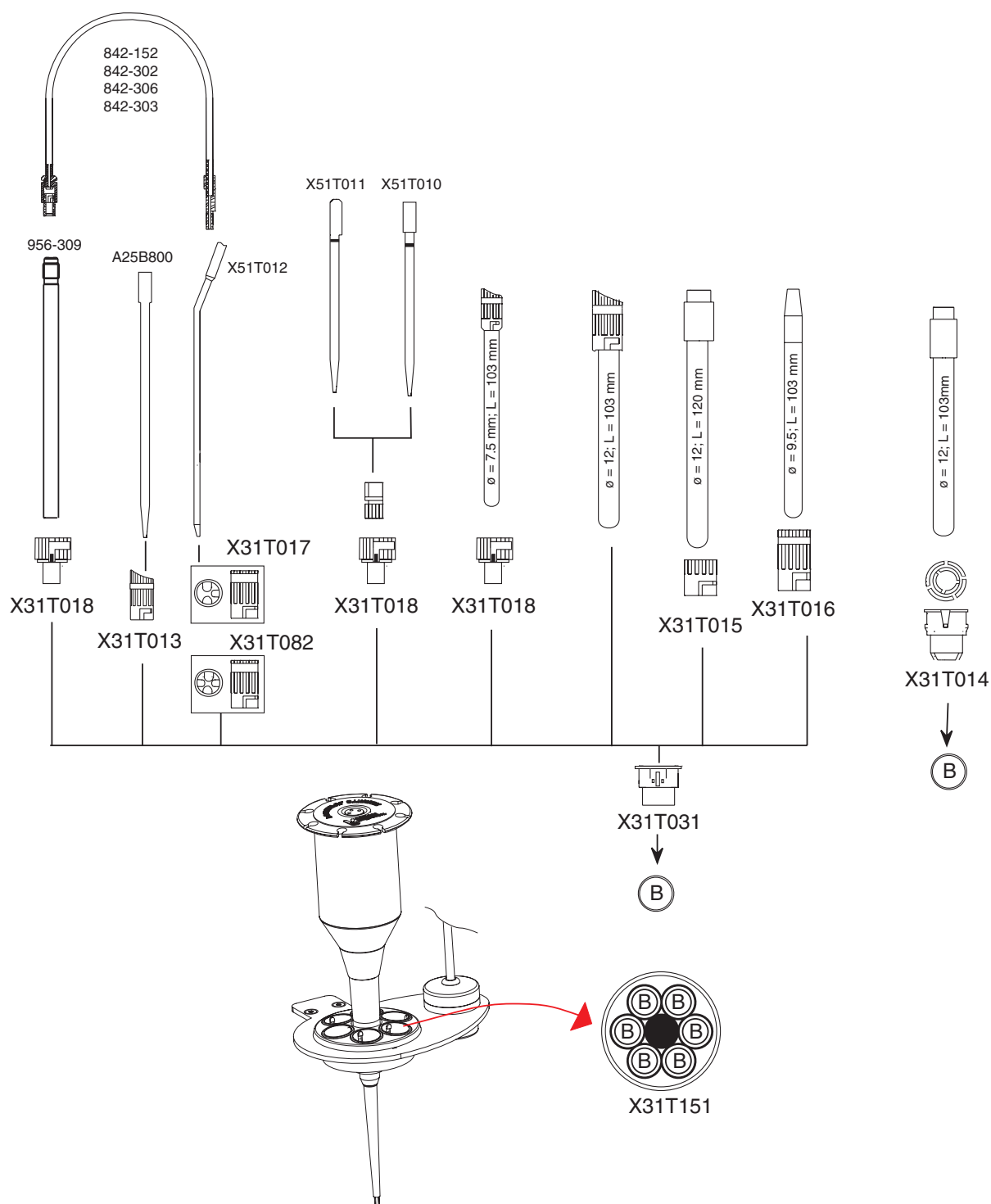


Mounting the propeller stirrer

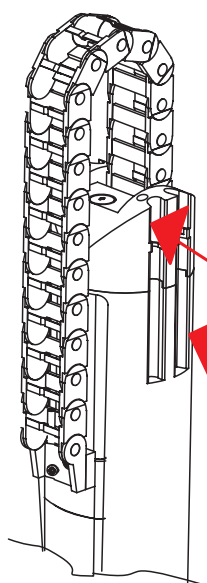


The propeller stirrer is supplied with 2 propellers 10 & 18 mm.
Fit the right propeller according to the size of the beaker
(see chapter "Accessories",
table "Turntables and beakers").

Mounting the electrodes and addition tips

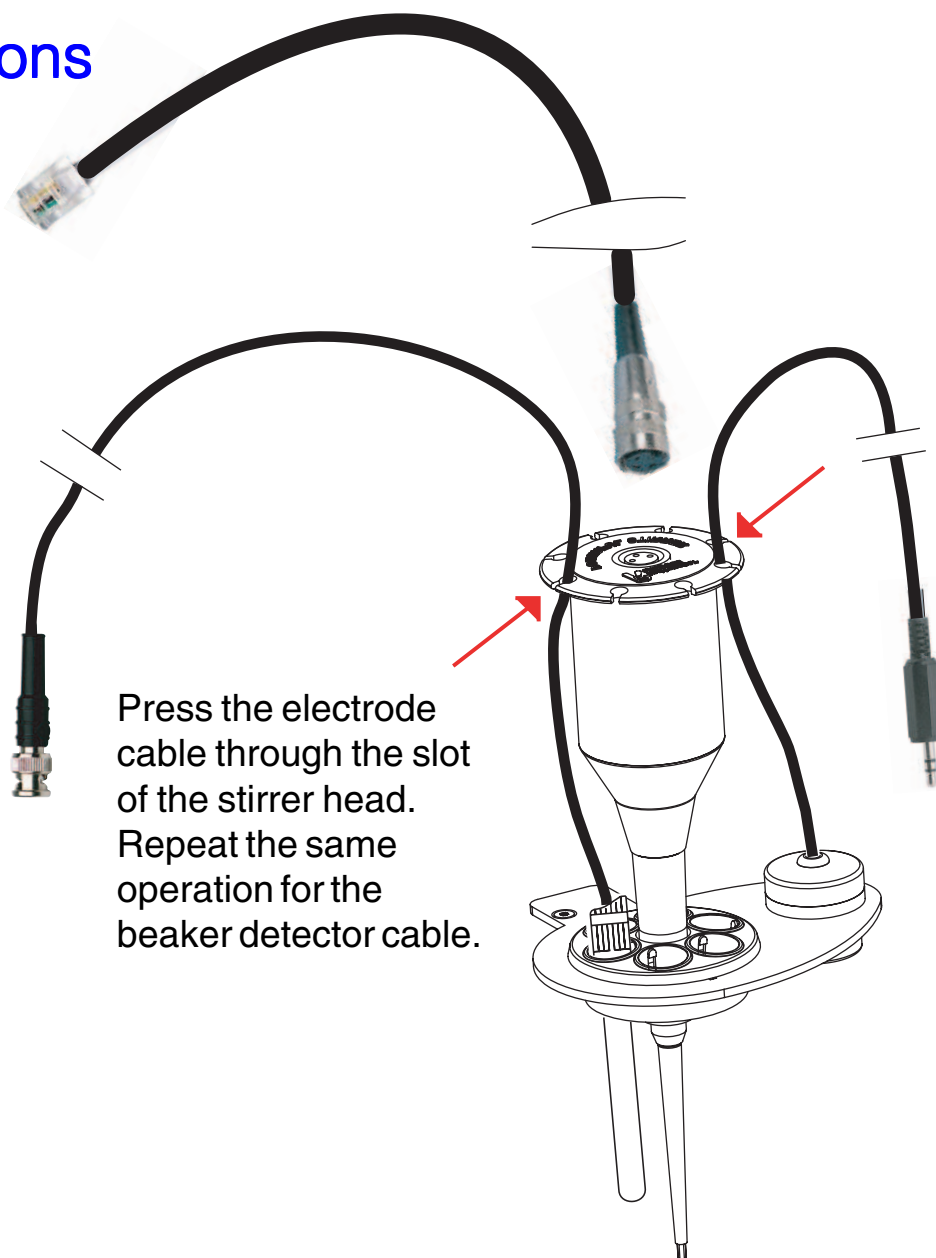


A set of adapters for bayonet electrode heads, part no. X91T002 is supplied with the sample changer turntable.

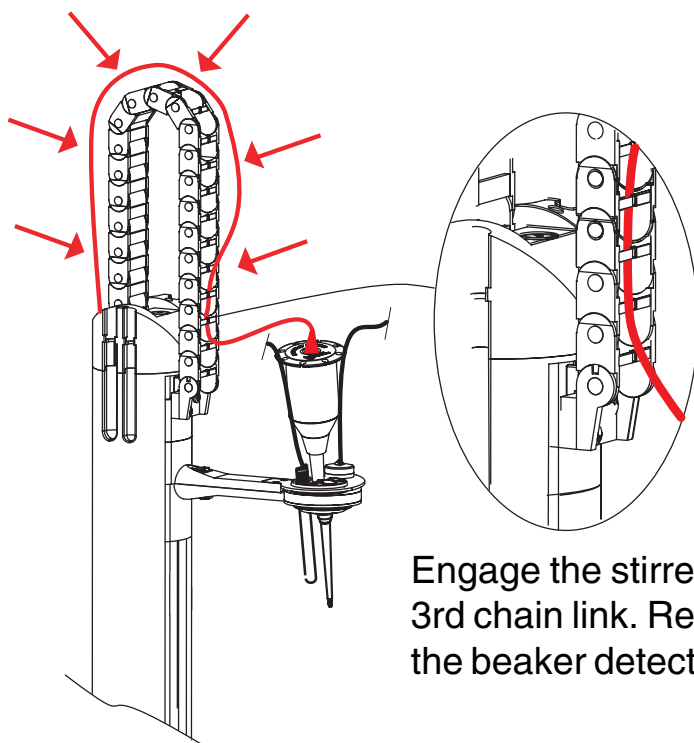


4 locations for spare electrodes
and antidiffusion delivery tips (2
locations on both side)

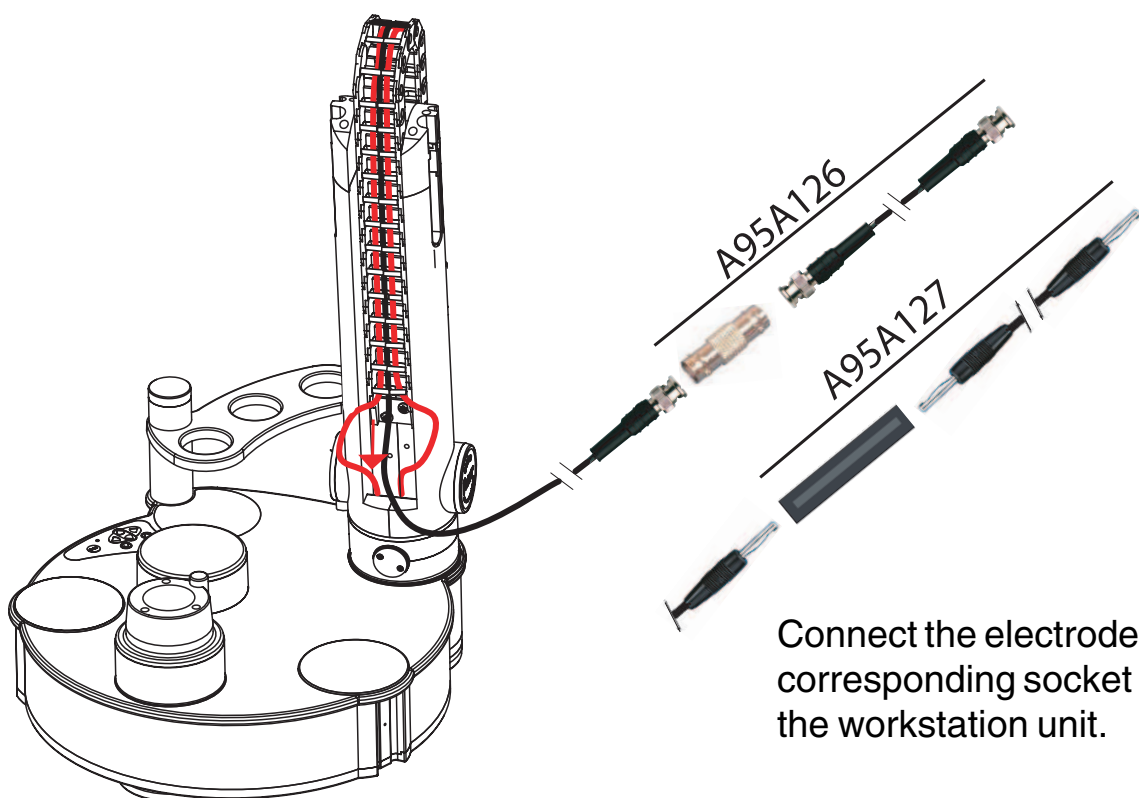
Connections



Press the electrode
cable through the slot
of the stirrer head.
Repeat the same
operation for the
beaker detector cable.



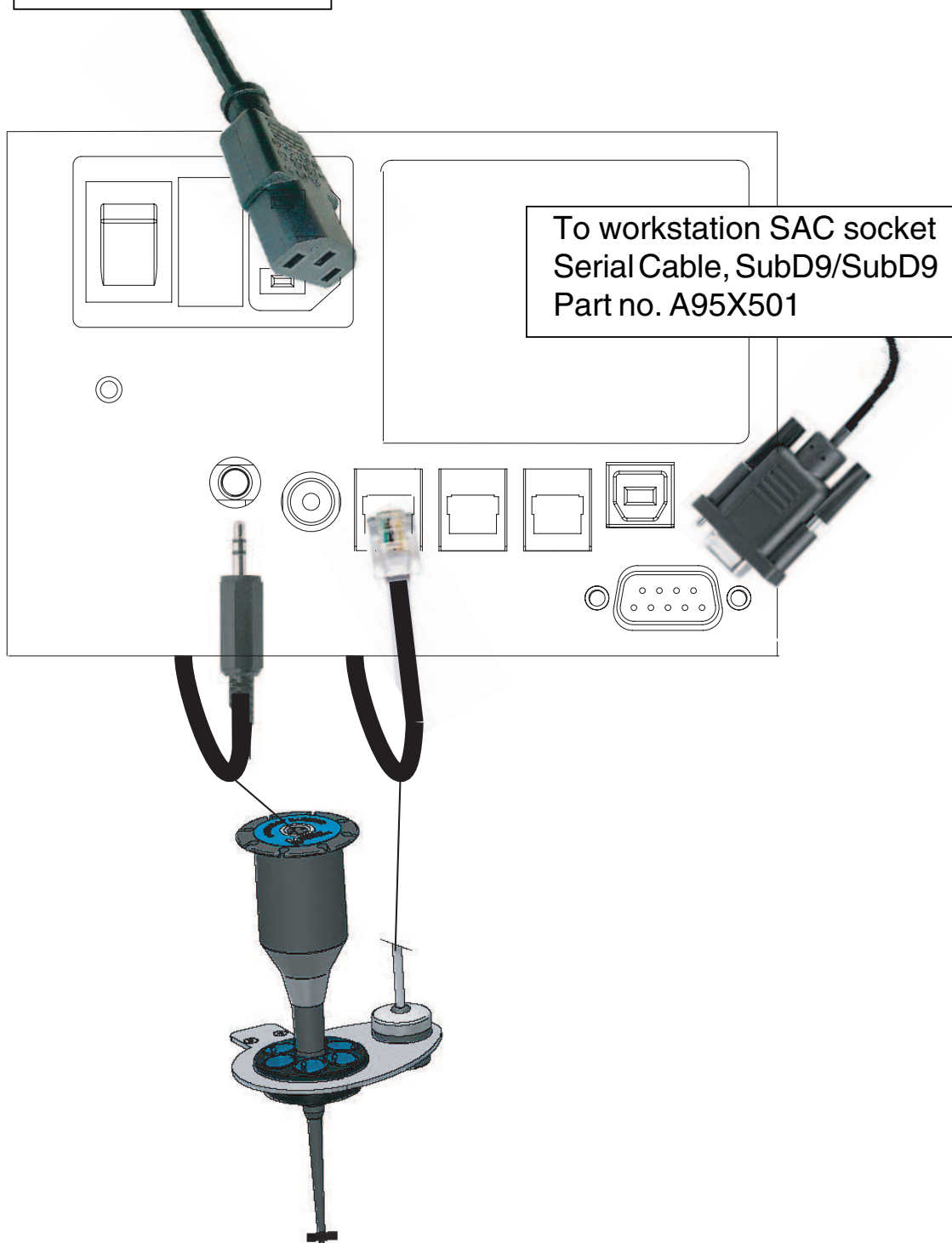
Engage the stirrer cable in the chain from the 3rd chain link. Repeat the same operation for the beaker detector and electrode cables.



Connect the electrode the corresponding socket of the workstation unit.

Insert the stirrer and beaker detector cables in the opening of the arm then slip these cables under the sample changer in order to present the plugs at the connection panel of the instrument. Slightly level up the instrument to facilitate this operation.

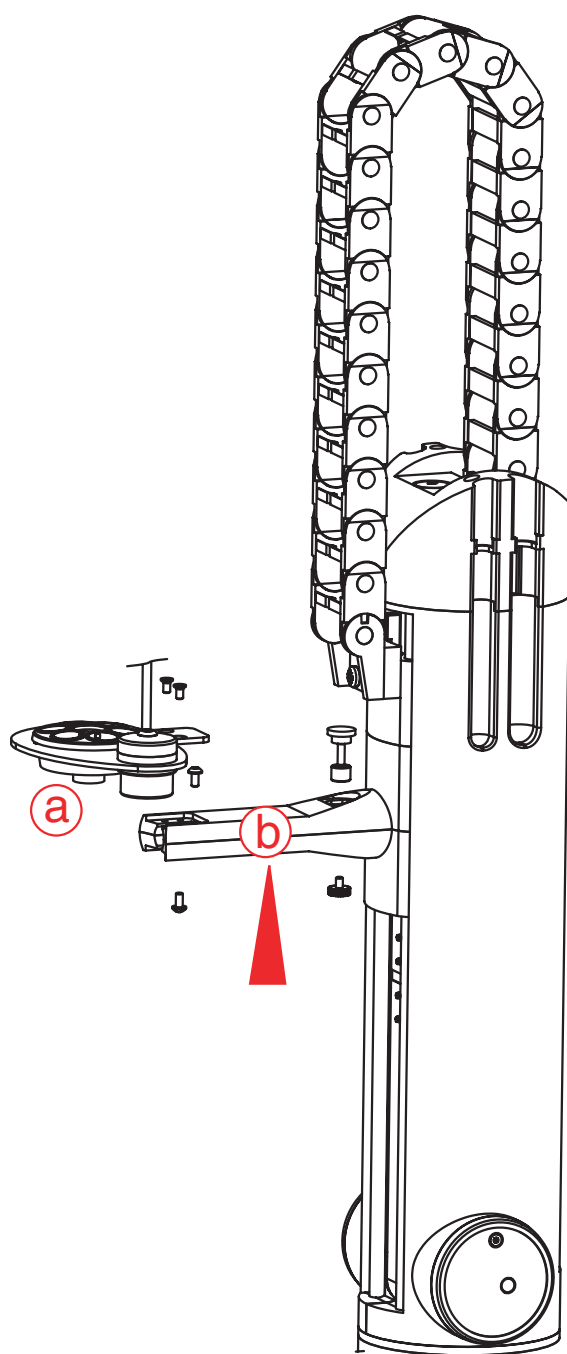
To a mains socket.
Mains cable, Part no.
A95S001 (230 V)
A95S002 (115 V)



Assembling option accessories

Dynamic rinse module

The Dynamic rinse module is used for shower rinsing and emptying operations. It consists of a pump assembly (two membrane pumps, one for rinsing and the other for emptying), a shower head, a suction tip and silicon tubings.



Switch on the sample changer and move the arm at its upmost position:

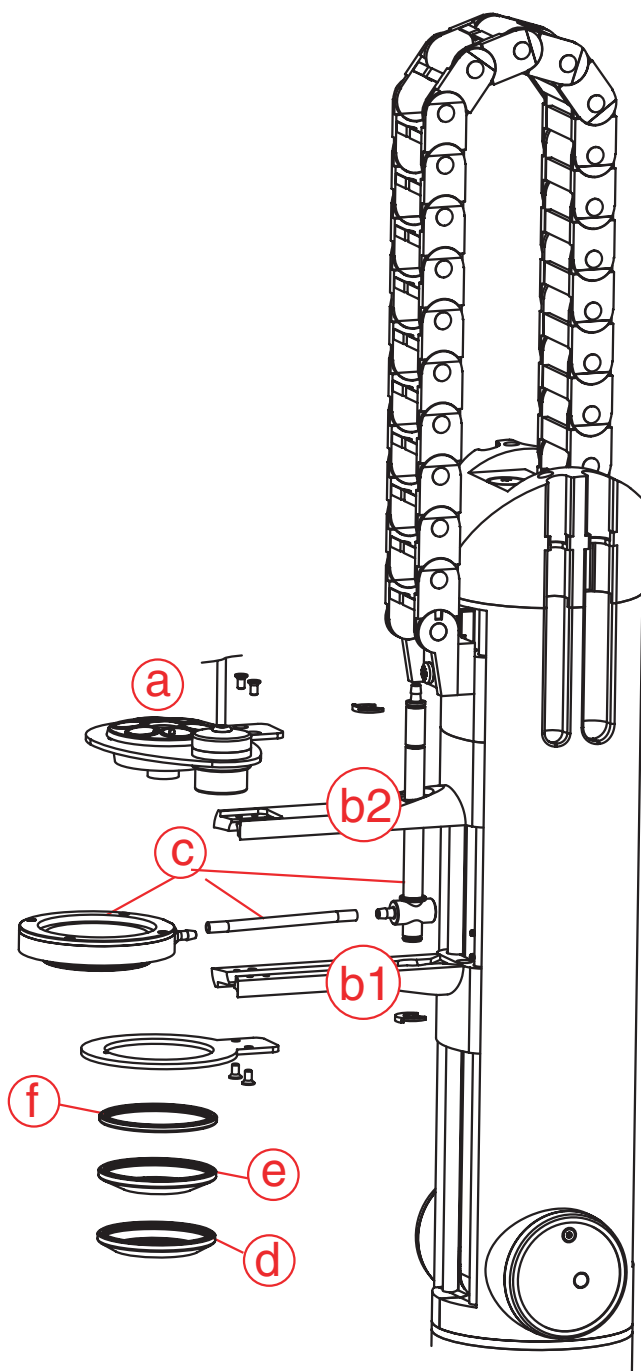
- SAC850: push up under part **(b)** (see arrow opposite).
- SAC950: as for the SAC850 or

press key 

(see chapter "Presentation - Keypad", key **(7)**).

Switch off the sample changer.

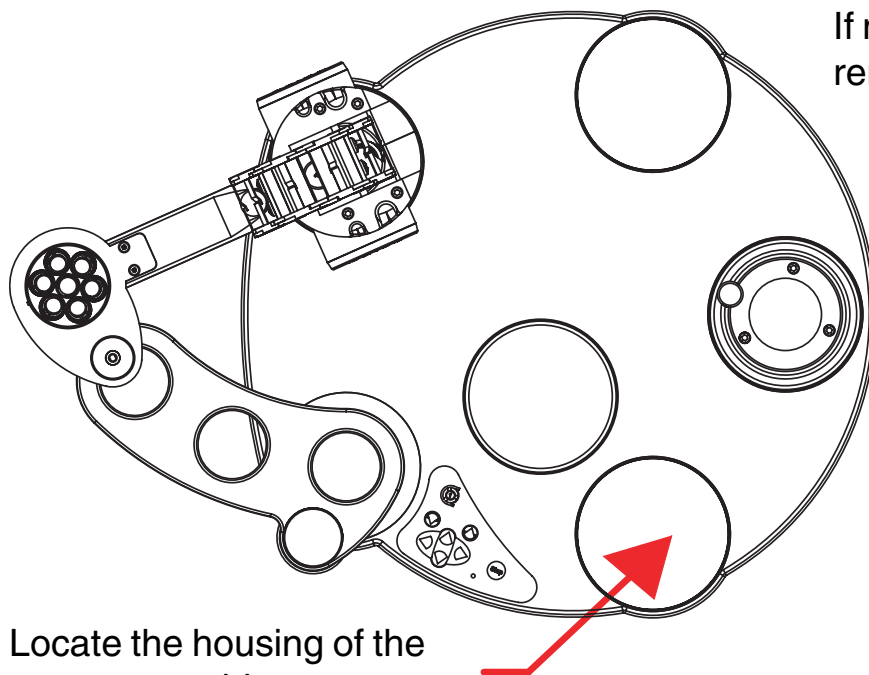
Remove the electrode head holder **(a)** (2 screws).



Separate part **(b)** in 2 pieces **(b1)** and **(b2)** (2 screws).

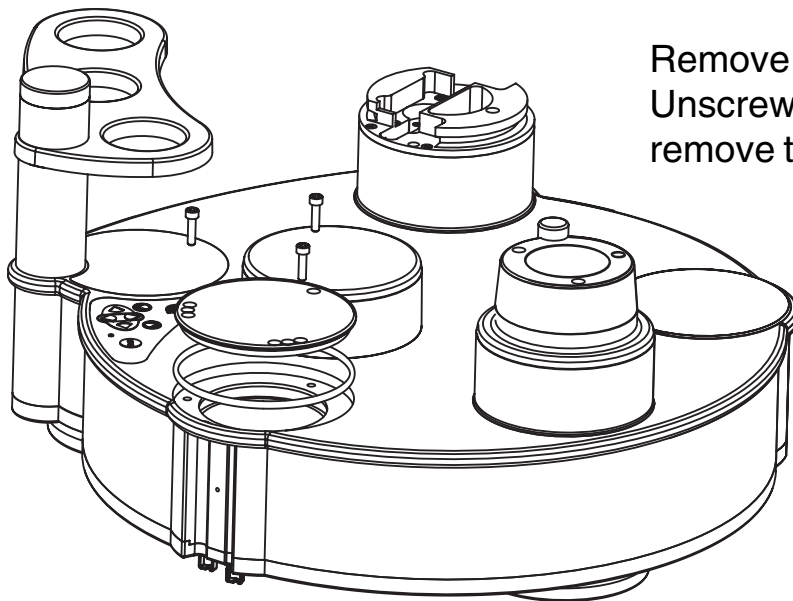
Assemble the shower head **(c)** and shower head skirt **(d)** or **(e)** (or clip **(f)**) on part **(b1)**. The use of a **(d)** or **(e)** shower head skirt depends on the diameter of the beaker used (see chapter "Accessories", table "Turntables and beakers"). Use a clip **(f)** if you do not use a shower head skirt.

Fit the electrode head **(a)** onto part **(b2)** (2 screws).



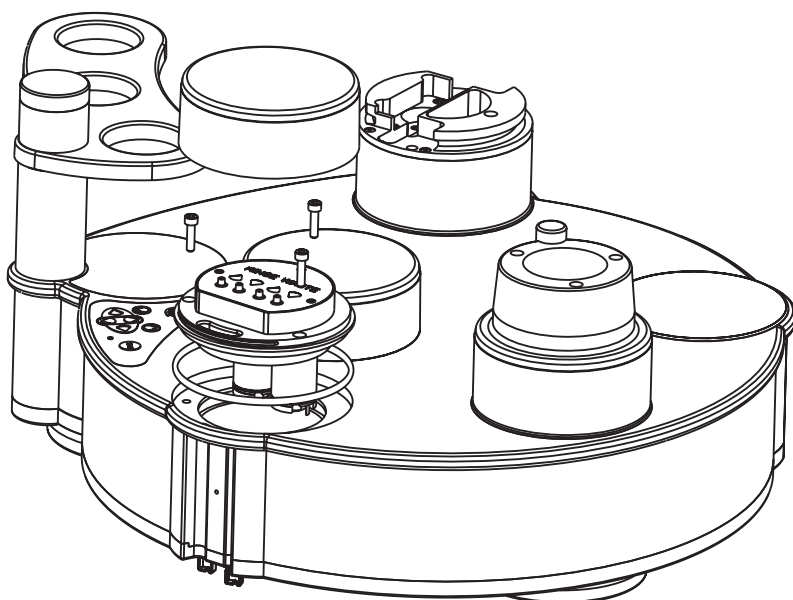
If not already done,
remove the turntable.

Locate the housing of the
pump assembly.

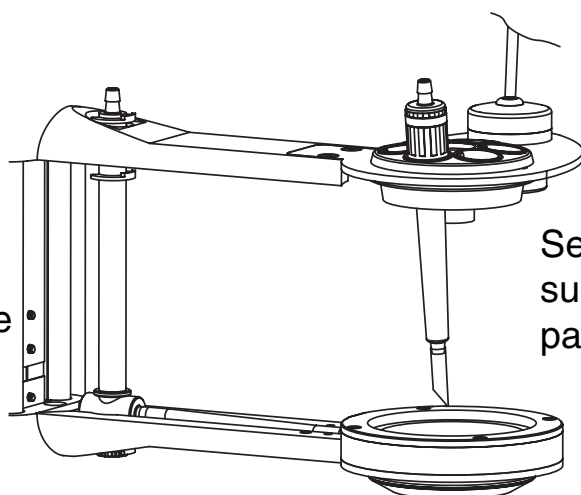
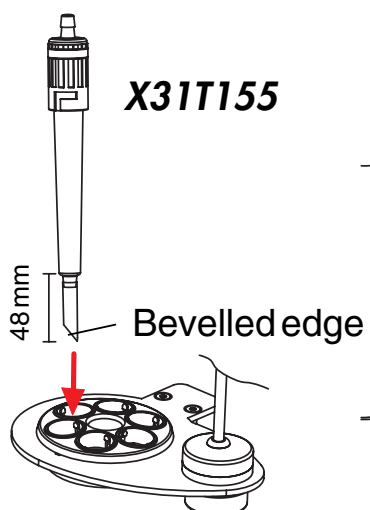


Remove the protection sticker.
Unscrew the 3 screws then
remove the cover plate.

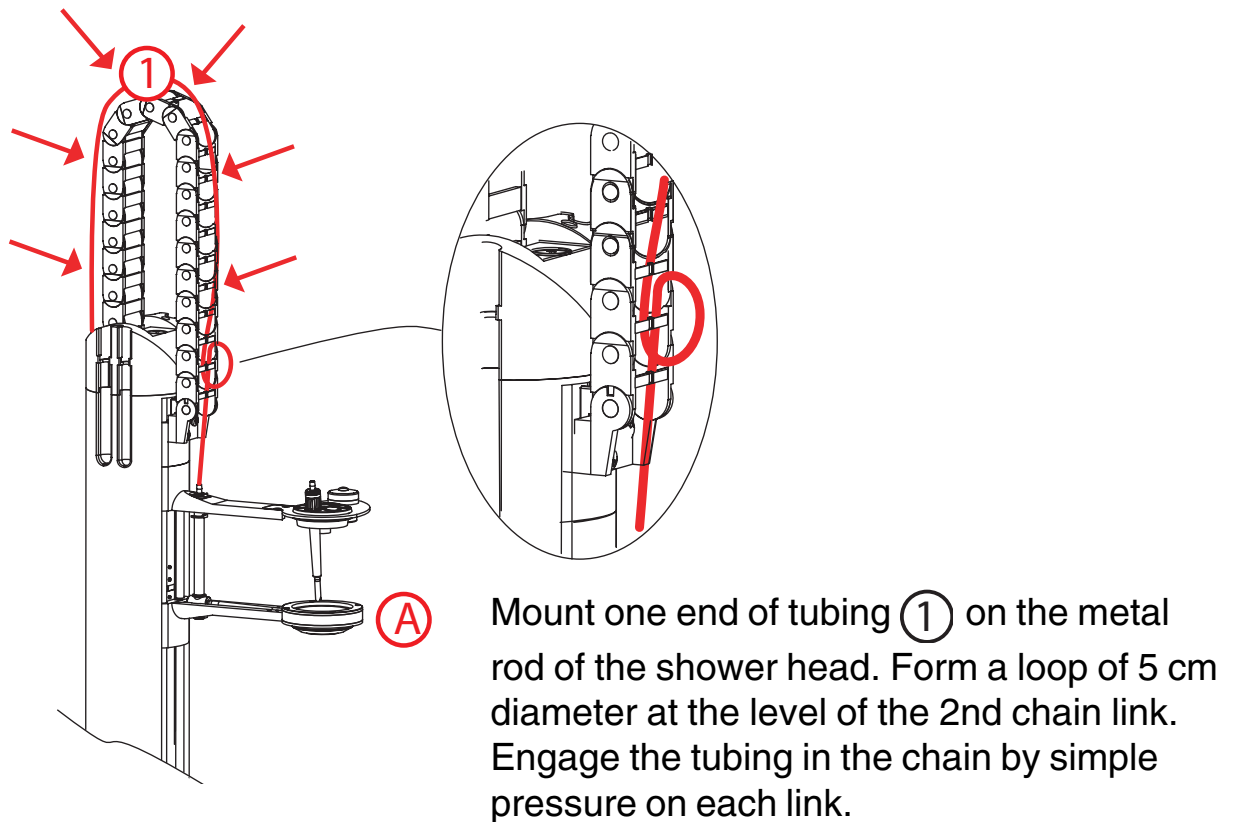
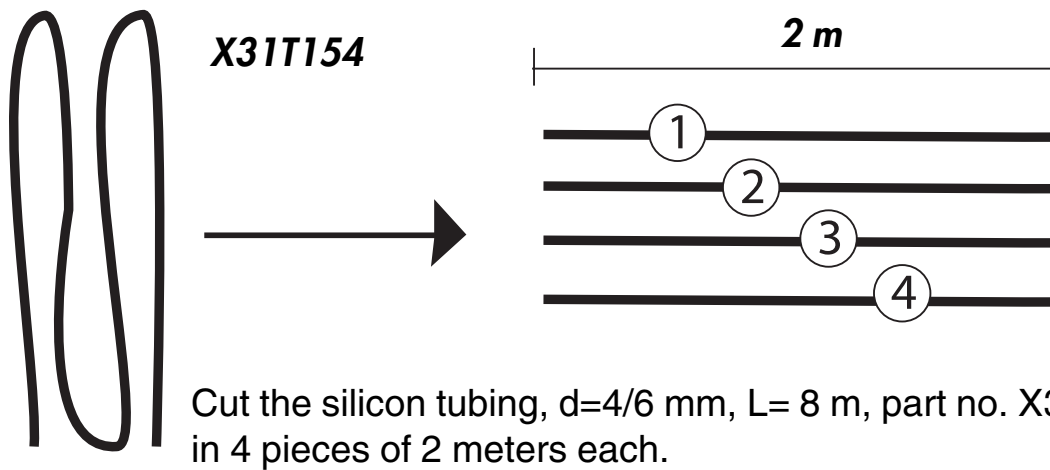
Connect the 2 pump cable plugs to
the corresponding sockets.




Insert the pump assembly and fix it in place with the 3 screws.

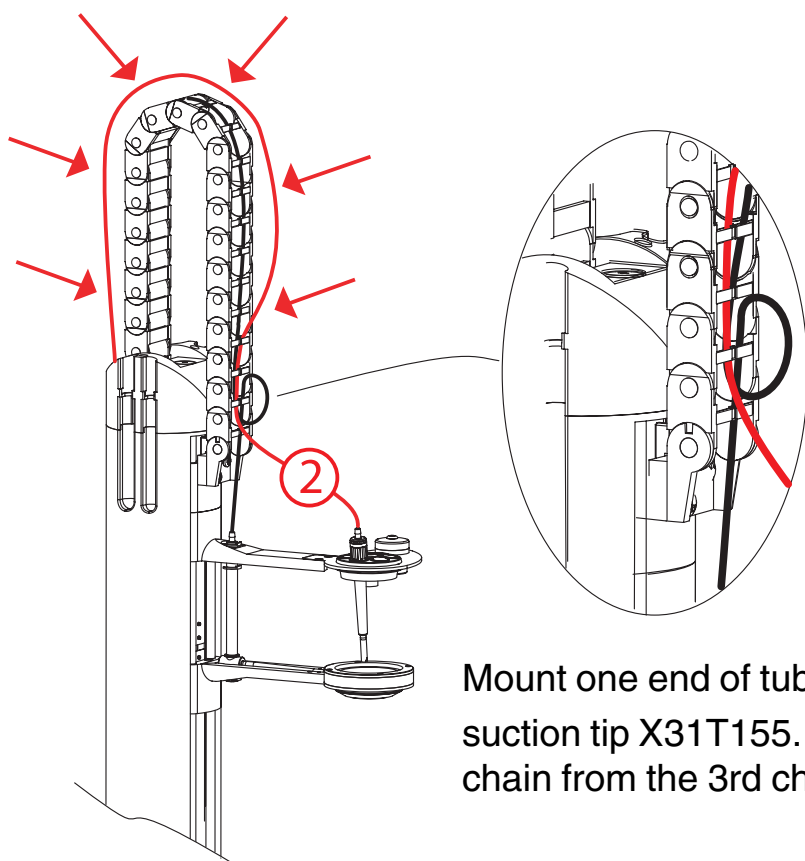


Setting up of the suction tip, part no. X31T155.

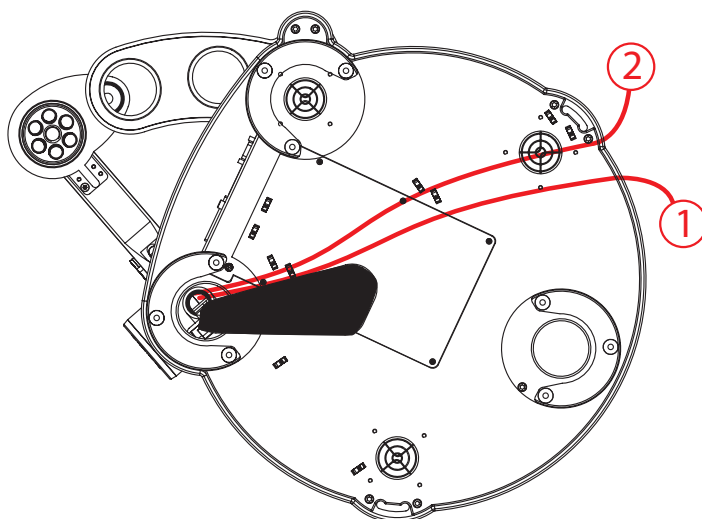
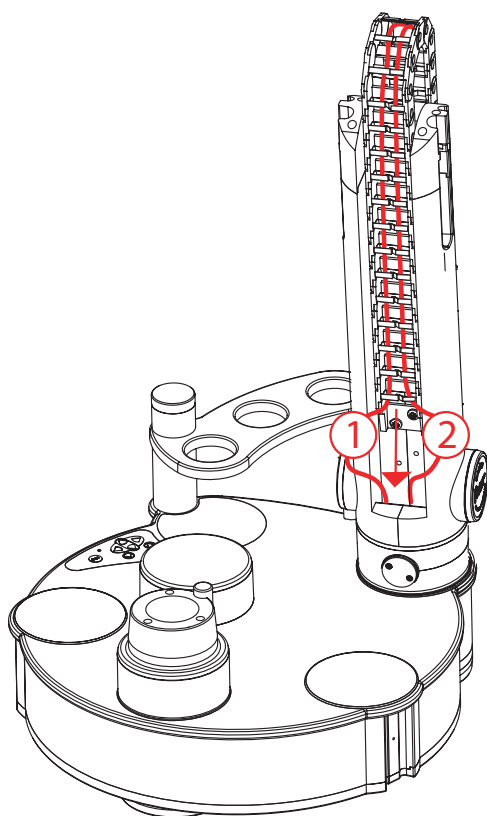


Important

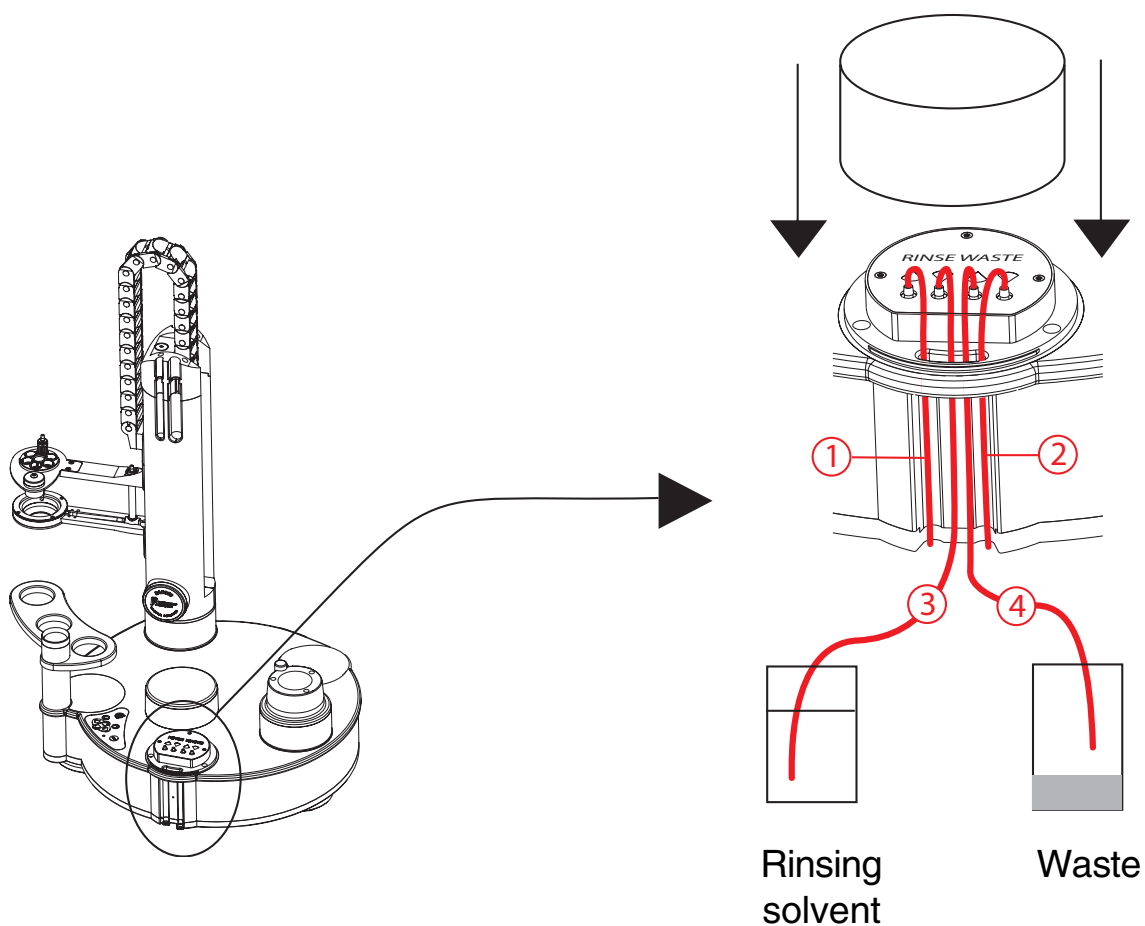
It is important to check at this stage that the tubing slides well and when moving up part (A), this particularly after having set up all tubings and wires. To move up part (A), push up under this part or press key  of SAC950 keypad.



Mount one end of tubing ② on the head of the suction tip X31T155. Engage the tubing in the chain from the 3rd chain link.



Insert tubings ① and ② in the opening of the arm then slip these tubings under the sample changer in order to present them at the rinsing/ draining pumps. The tubings must pass on the side of the black cable guide part. Slightly level up the instrument to facilitate this operation.



Mount tubing ① on the outlet of the rinsing pump and tubing ② on the inlet draining pump.

Mount one end of tubing ③ on the inlet of rinsing pump and dip the other end in a can filled with rinsing solvent (demineralised water for example).

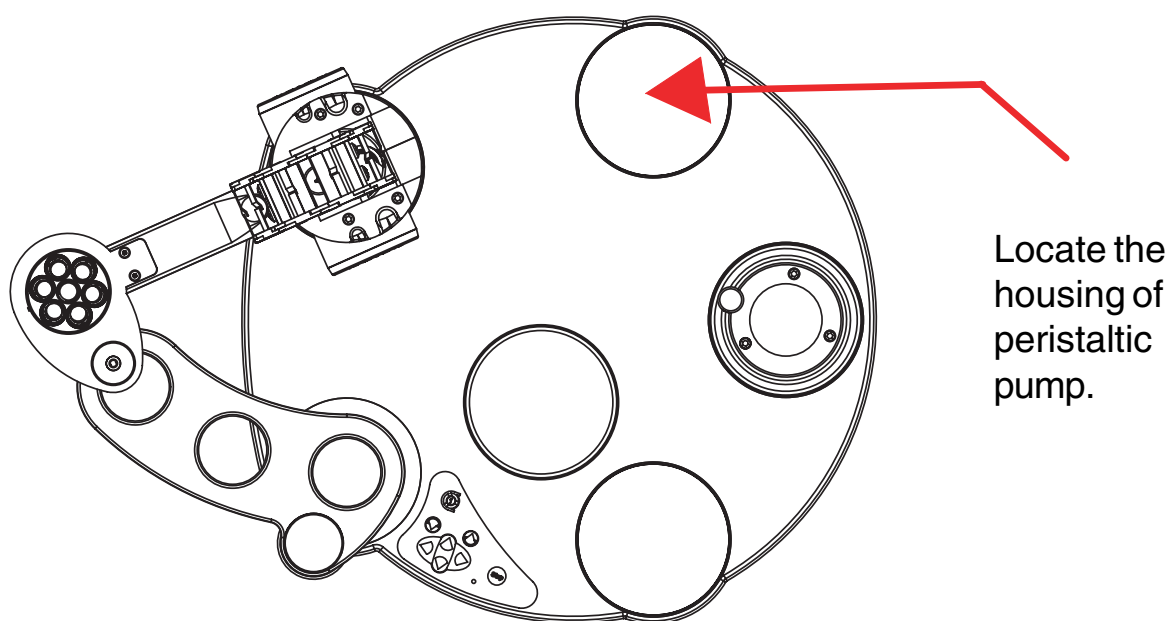
Mount one end of tubing ④ on the outlet of draining pump and dip the other end into a waste.

Cover the pump assembly with the protection lid provided.

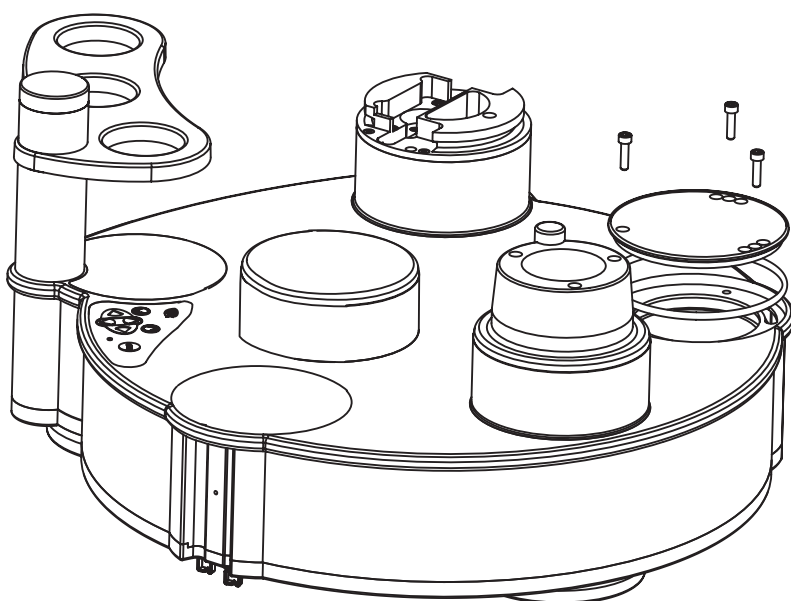
Reagent addition module

A reagent addition module can be mounted on the SAC850 or SAC950 sample changer. This peristaltic pump is used to add reagent as be part of a sample preparation. Volumes are added with an accuracy around 1%. A reagent addition module consists of a peristaltic pump assembly, a reagent addition tip, silicon and Maprene[®] tubings.

If not already done, remove the turntable.



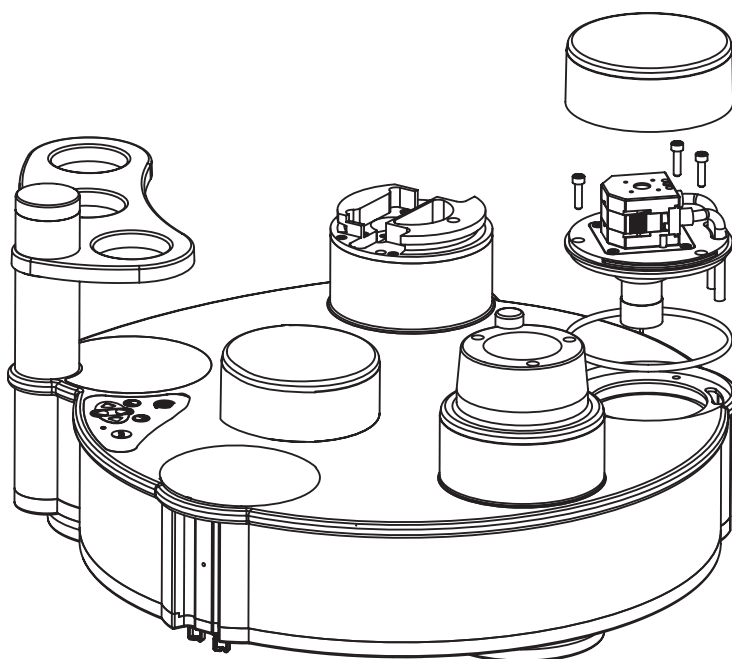
Locate the housing of peristaltic pump.



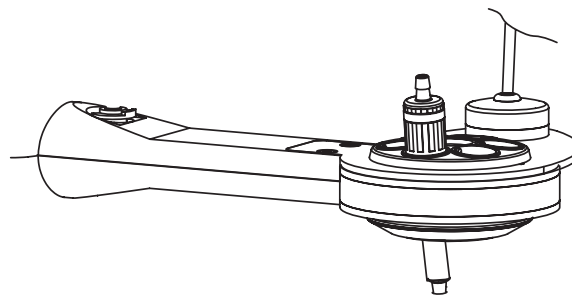
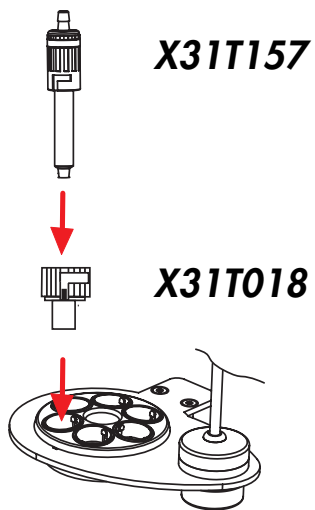
Remove the protection sticker, unscrew the 3 screws then remove the cover plate.

Setup the
Maprene® tubing,
part no. X31T156,
in the peristaltic
pump.

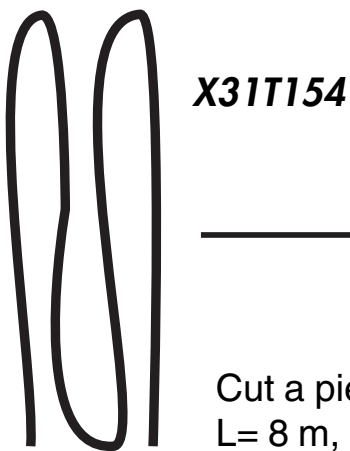
Connect the 2 pump cable plugs
to the corresponding sockets.



Insert the
peristaltic pump
assembly and fix it
in place with the 3
screws.



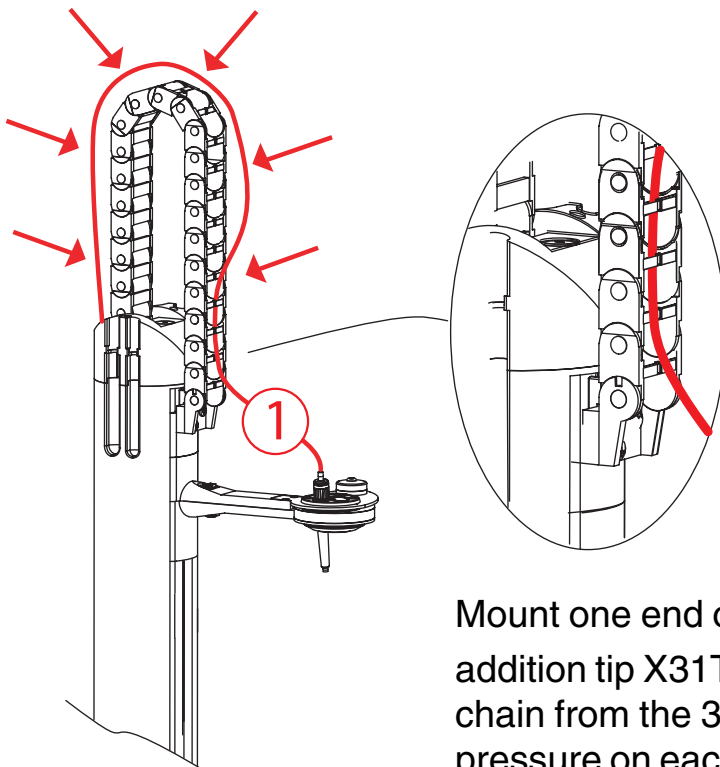
Set up the addition tip,
part no. X31T157.



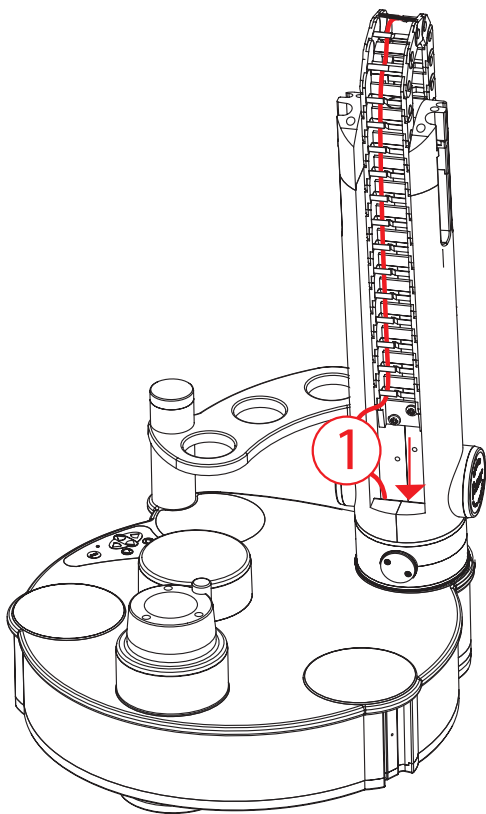
X31T154



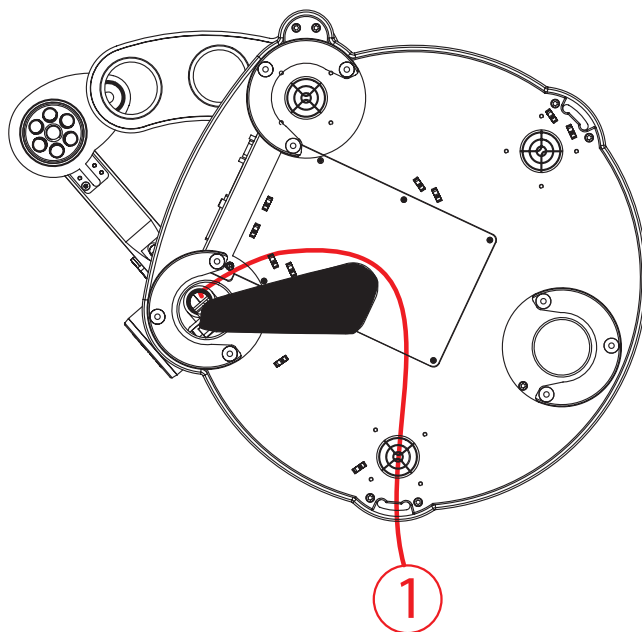
Cut a piece from 2 m long in the silicon tubing, $d=4/6$ mm,
 $L=8$ m, part no. X31T154.



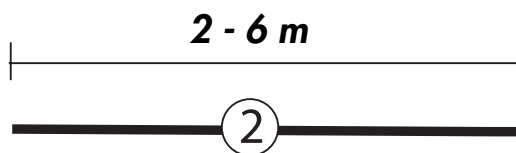
Mount one end of tubing ① on the head of the
addition tip X31T157. Engage the tubing in the
chain from the 3rd chain link (by simple
pressure on each link).



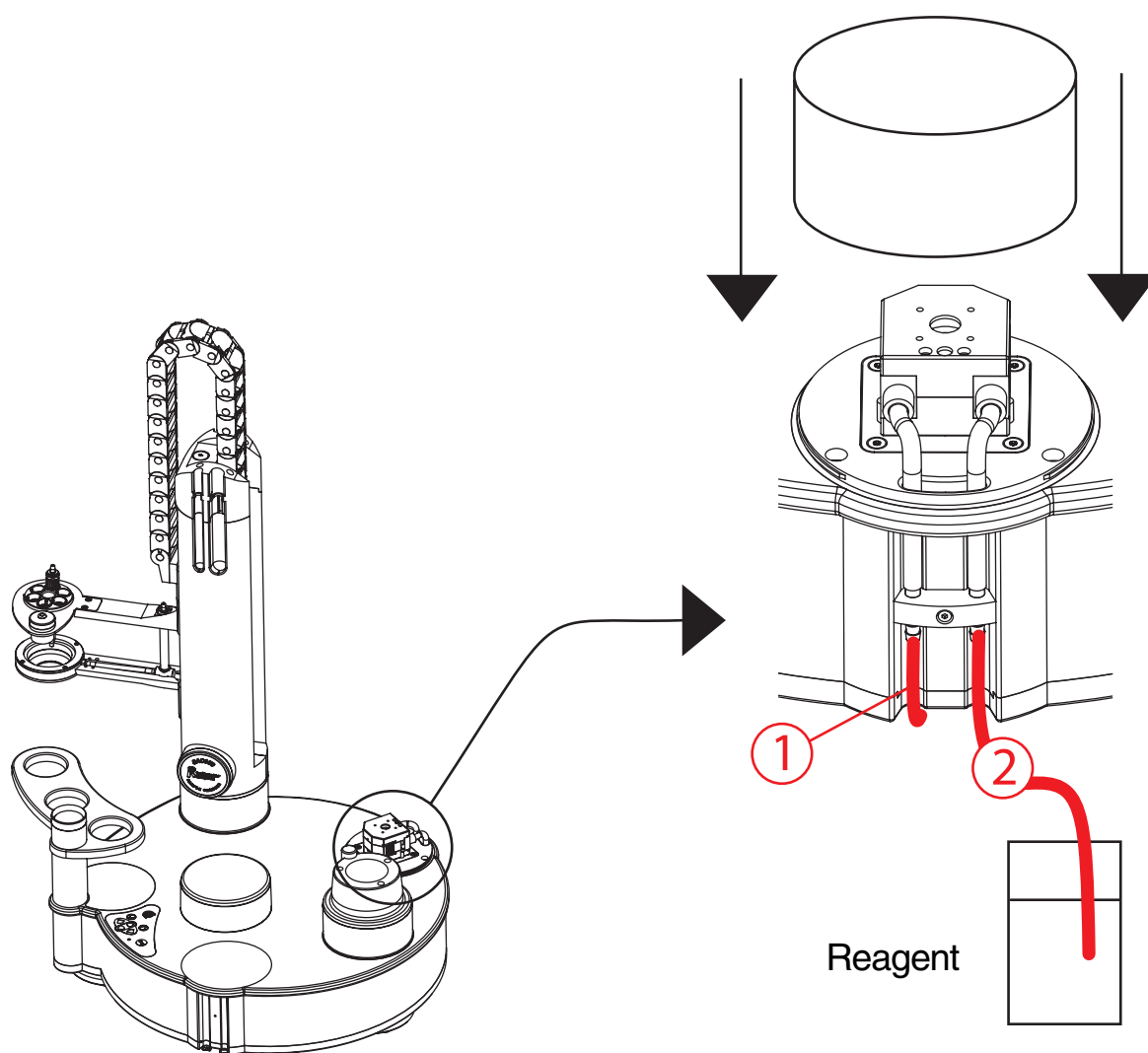
Insert tubing ① in the opening of the arm then slip this tubing under the sample changer in order to present it at the peristaltic pump. The tubing must pass on the side of the black cable guide part. Slightly level up the instrument to facilitate this operation.



X31T154



Cut a piece from 2 to 6 m long in the remaining part of silicon tubing, part no. X31T154.



Mount tubing ① on the outlet of the peristaltic pump.

Mount one end of tubing ② on the inlet of peristaltic pump and dip the other end in the reagent flask.

Cover the pump with the protection lid provided.

4. Use

Switching on

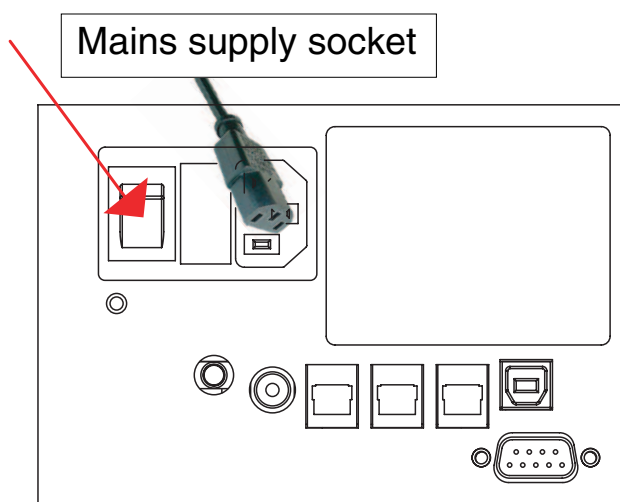
1. Connect the mains socket of the SAC 850/SAC950 sample changer and the workstation (TIMxxx or IONxxx) to the mains supply using the 3-lead power cord provided.
In the USA or Canada, use a UL listed power cord only.

Important:

The sample changer and the workstation must be connected to an earthed mains socket for safety reasons. Efficient grounding is essential for reliable measurements and security.

The power supply connector on the rear panel must remain accessible and close to the user (2 m maximum) so that you can quickly disconnect the cables in case of emergency.

2. Switch on the sample changer (O/I power switch on the rear panel set to "I", see below) then the workstation.



The sample changer runs its autotest routine:

- Lifts/lowers the arm to search for the arm upmost position,
- Rotates the tray and arm to search for reference positions of both arm and tray.
- Dips the electrodes into the Park beaker. If no Park beaker detected, leaves the electrodes above the Park beaker position.

Running sequence with a workstation

After having started a sequence from the workstation or TitraMaster 85, the sample changer performs the following operations if 1 to 9 dynamic rinses and if 2 static rinses R1 and R2 have been programmed (*):

1. Moves to Park beaker (**) and starts rinsing dynamically the electrodes. At the end, the Park beaker is left empty.
See paragraph "Dynamic rinsing".
2. Moves to R1 beaker (***), dips the electrodes into that beaker and rinses under stirring during a preset delay. *See paragraph "Stirring".*
3. Moves to R2 beaker (***), dips the electrodes into that beaker and rinses under stirring during a preset delay. *See paragraph "Stirring".*
4. Moves to beaker no.1, prepares sample/standard running the sample preparation number attached to the method. During this time, the workstation displays the message "Sample changer processing in beaker 1" message.
See paragraph "Sample preparation".
5. At the end of analysis, starts rinsing dynamically the electrodes. At the end, the beaker no.1 is left nearly empty with a small amount of solvent that was used to flush the electrodes and delivery tips.

(*) The number of static rinses (0, 1 (R1) or 2 (R1 and R2)), the duration of static rinses and the number of dynamic rinses (0 to 9) are programmed in the Setup > Configuration parameters of the workstation (refer to the Reference Manual of the workstation used).

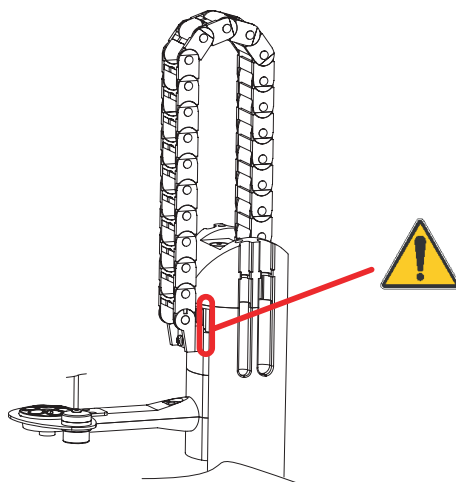
(**) A dynamic rinse before first beaker analysis can occur in the Park or in the R1 beaker if 0 or 1 static rinse has been programmed. Selection between Park and R1 is made in the Setup > Configuration parameters of the workstation (refer to the Reference Manual of the workstation used).

(***) R1: Static rinse beaker no.1. R2: Static rinse beaker no.2. The position of these beakers is given in chapter "Setting up - Placing beakers".

6. Repeats steps 2 and 3.
8. Dips the electrodes in beaker no. 2, prepares sample/standard running the sample preparation number attached to the method.
7. At end of the sequence (end of analysis in the last beaker of the sequence):
 - starts rinsing dynamically the electrodes,
 - repeats steps 2 and 3,
 - moves the electrodes above the Park beaker,
 - left the electrodes as is or dip the electrodes into the Park beaker depending on the selection made in the Setup > Configuration parameters of the workstation (refer to the Reference Manual of the workstation used).



At the position indicated, the vertical axis moving is likely to pinch the skin of the user!



Dynamic rinsing

1 to 9 Dynamic rinses (or shower rinse/emptying operations) can be performed between 2 sample runs. A Dynamic rinse is carried out in the just analysed sample beaker or in the Park beaker (*). At the start of a sequence, the dynamic rinse can be performed either in the Park beaker or in R2 (static rinse no.2) beaker (*). Dynamic rinses never take place in calibration beakers. At the end of a calibration beaker analysis, the dynamic rinse is performed in the Park or R2 (static rinse no.2) beaker (*). A Dynamic rinse consists of the following operations:

1. The electrode are positioned above the rinse beaker.
2. The electrodes move down in the beaker. The beaker is emptied to a waste in the same time. At the end, the electrodes are located in the emptied beaker at their downmost position.
3. The electrodes move up slowly. In the same time, the electrodes are washed with rinse solution (usually demineralised water) and the resulting solution is emptied very slowly to a waste. At the end, the electrodes are located above a beaker filled with rinse solution and some remaining impurities.
4. The electrodes move down in the beaker. The beaker is emptied to a waste in the same time. At the end, the electrodes are located in the emptied beaker at their downmost position. Then, a last rinsing of the electrodes and delivery tips is carried out.
5. The electrodes move up. At the end, the electrodes are located above a nearly emptied beaker containing a little solvent that was used to flush the electrodes and delivery tips.

Steps **3** and **4** can be repeated up to 8 times as up to 9 dynamic rinses can be programmed. Steps **2** to **4** are performed under stirring.

- (*) Depending on the selection made in the Setup > Configuration parameters of the workstation (refer to the Reference Manual of the workstation used).

Stirring

A magnetic and a propeller stirrer can be used to stir the solutions. When the propeller stirrer is connected (see chapter "Setting up"), it will be automatically used in place of the built-in magnetic stirrer. The stirrer speed is set in the Cell menu of the workstation (value adjustable between 100 and 1100 rpm by steps of 50 rpm).

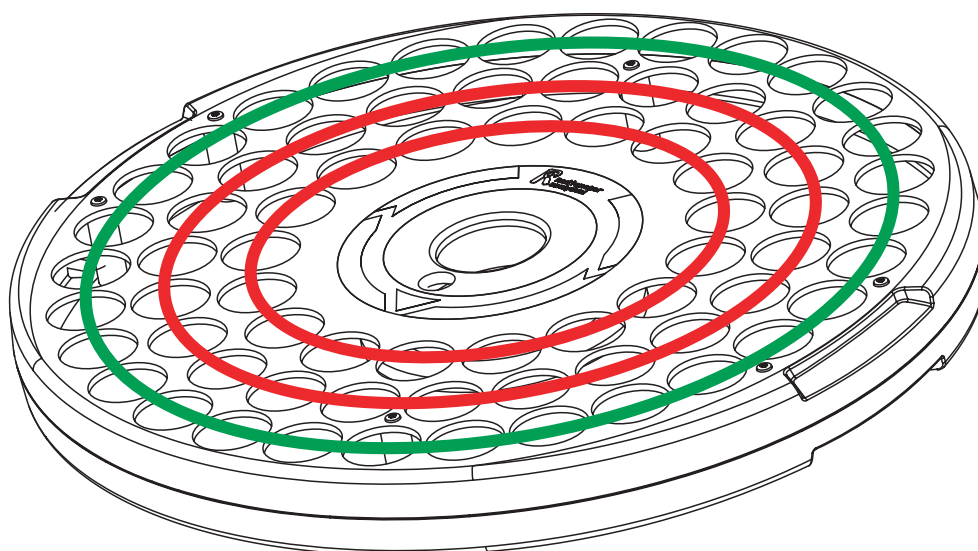
Dynamic and static rinses are performed under stirring.

Magnetic stirring with a SAC950

When using a 2 or 3-radii turntable with a SAC950, you must use a propeller stirrer to stir the solutions that are placed on the smallest row (2-radii turntable) or on the 2 smallest rows (3-radii turntable).

Green positions : magnetic and propeller stirring possible

Red positions : propeller stirring only



Sample preparation

A SAC850 or SAC950 can run up to 10 different sample preparations in a sequence. Sample preparations are created and edited from TitraMaster 85 PC software.

Each element of a sample changer sequence is associated to a sample preparation. A sample preparation is a succession of up to 10 elementary actions required by the sample changer to prepare each sample beakers to be run thereafter.

On running a sequence, the workstation sends to the sample changer all sample preparations to be runned for the sequence. The compatibility between the sample preparation and the sample changer used is tested and an error message is displayed in case of failure (example: use of a peristaltic pump that is not installed yet).

See TitraMaster 85 on line help, topics "Handling sample preparations".

Important:

When starting a sample preparation, if you have a solid or powder sample in the beaker or if you have, for some beakers, less liquid than a minimum height limit (see chapter "Accessories - Beakers"), then you must disable the "beaker presence detection" option before running the sequence. If you keep that option activated, then the sample changer will not prepare the sample in that beaker and will jump to the next beaker considering that the current position is empty.

To disable the "beaker presence detection" option in TitraMaster 85 , see TitraMaster 85 on line help, topics "Editing an application - Configuration".

Actions that can be done during a sample preparation:

Control peristaltic pump.

Start/stop electrode rinsing.

Start/stop beaker emptying.

Control stirring.

Set delay.

Control stirrer.

TTL command (wait for a TTL IN for a preset time).

5. Troubleshooting

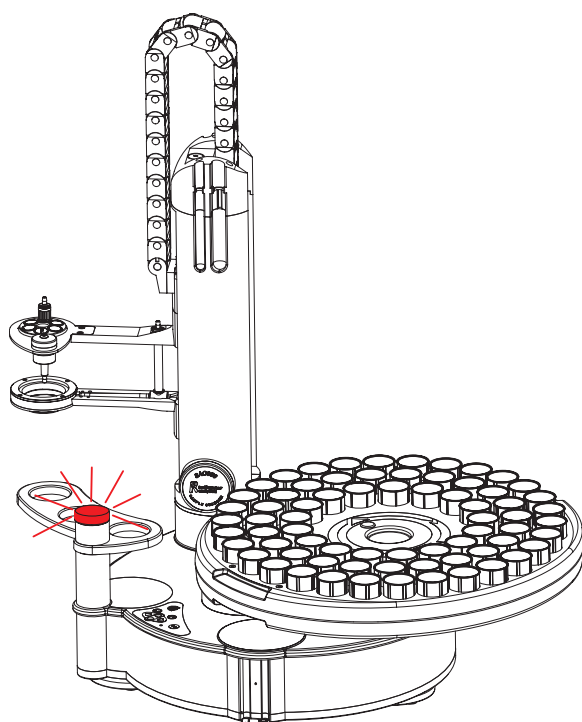
A number of tests are automatically performed when the sample changer is switched on and during calibration and sample batch measurements. The errors reported can be divided in two groups:

- Autotest errors occurring on switching on the sample changer and errors occurring while operating the sample changer alone (manual mode without workstation).
- Errors displayed by the workstation.

Autotest and manual mode errors

If an error is detected, the sample changer stops the current action and the status lamp turns to red.

Switch off the sample changer, identify the causes of the error (generally, arm or turntable blocked or arm or turntable movement obstructed), correct the error then switch on the instrument.



Errors displayed by the workstation

Messages	Error/Action
ARM or TURNTABLE OBSTRUCTED	The arm or turntable has been blocked and cannot function properly. Remove the obstruction and press Resume analysis (key 1) to continue the sequence from the point it stopped.
MISSING TRAY	On starting a sequence, the sample changer cannot read the RFID tag of the turntable. Check that a turntable is correctly mounted on the sample changer. Check the model of turntable used. See chapter "Accessories". Restart the sequence.
NO BEAKER	A rinse beaker is missing or has not been positioned properly on the sample changer. Either position a beaker or terminate the operation and enter the correct number of rinses. If you want to continue with the next beaker in the analysis, press 1 Resume analysis.
SAMPLE CHANGER	Either the data transmission between sample changer and the workstation cannot be performed properly, in which case you should check the cable connections, or the measurement stopped due to a movement error. Terminate the cycle by pressing key Stop on the SAC950 sample changer keypad or key Stop of the workstation, and check that nothing is obstructing sample changer's movements.

Messages	Error/Action
SAMPLE PREPARATION IMPOSSIBLE	<p>The sample changer cannot run the sample preparation the workstation is asking for.</p> <p>Example: A reagent addition is programmed in the sample preparation and no peristaltic pump is installed on the sample changer.</p> <p>Review the Edit method parameters, parameter Sample preparation no and/or install missing pumps</p> <p>For TitraMaster 85 users only, check and, if necessary, edit the sample preparation routine.</p>
RINSE PROCEDURE IMPOSSIBLE	<p>The sample changer cannot run the rinse programmed.</p> <p>Example: You have programmed 2 static rinses and a first dynamic rinse in the second static rinse beaker (R2 beaker). Only 1 beaker is available for static rinses (beaker R1) if you intend to rinse dynamically the electrodes in a static rinse beaker.</p> <p>Review the Setup > Configuration parameters.</p>

6. Maintenance

Cleaning

The sample changer requires minimum maintenance. The exterior surface should be cleaned regularly with tepid water or a mild detergent and wiped dry with a soft damp cloth.

Transporting the instrument

Always use the packaging supplied by the manufacturer.

IMPORTANT!

Remove the tray before transporting the instrument.

Never pick-up or carry the instrument by the electrode head holder or by the arm.

Servicing

DO NOT ATTEMPT TO SERVICE THIS PRODUCT YOURSELF, except as noted in this User's Guide. For servicing, please contact your Radiometer Analytical service representative at the address given below:

RADIOMETER ANALYTICAL SAS
72, rue d'Alsace
69627 Villeurbanne CEDEX - France
Tel.: +33 (0) 4 78 03 38 38
Fax: +33 (0) 4 78 03 38 27
E-mail: radiometer@nalytical.com

or your local service representative:

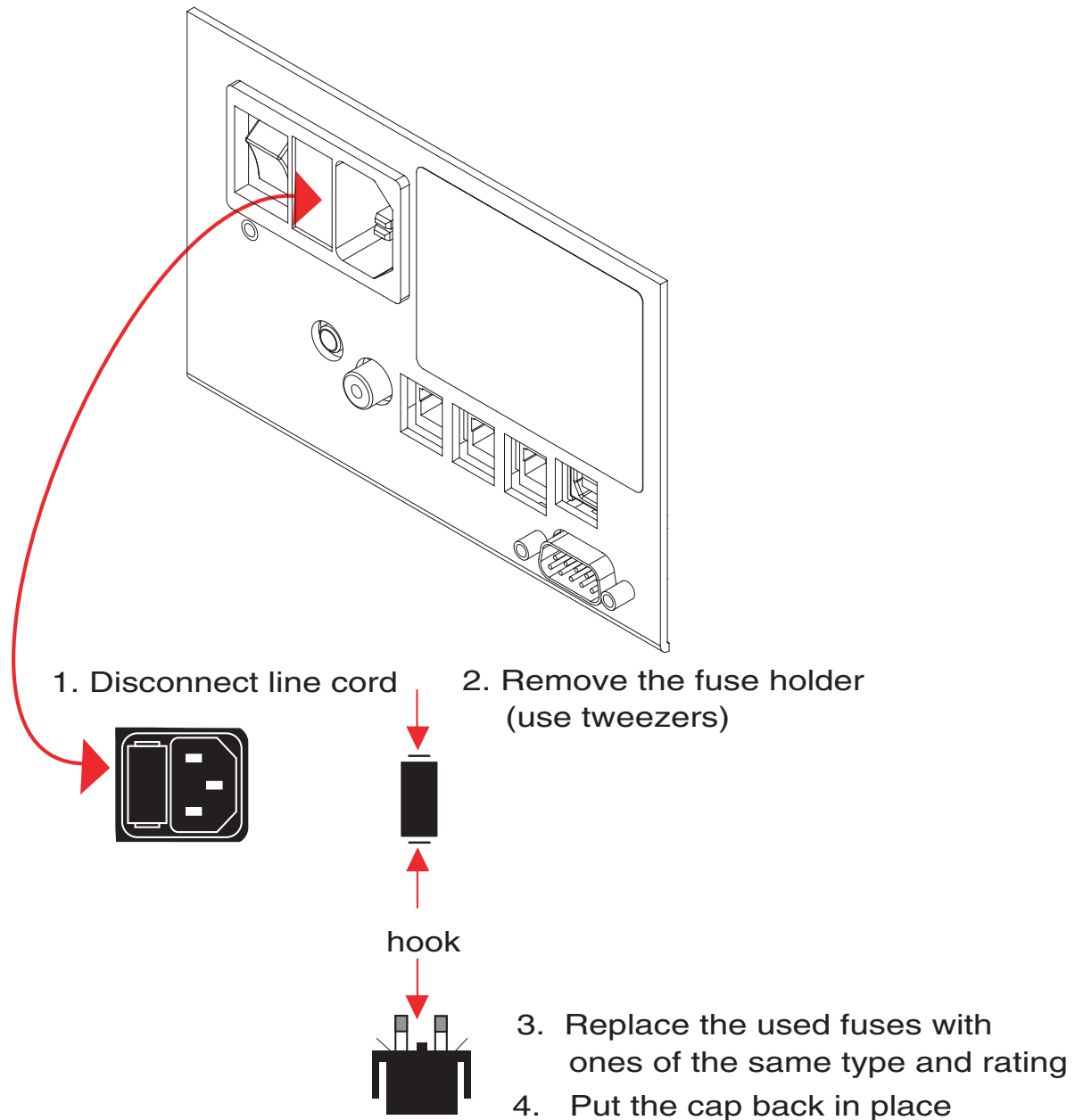
Replacing the fuses

For continued protection replace the fuse with one of a high interrupting capacity, same type and rating:

2 x fuses, slow blow, T2.5A L250V (5 x 20 mm), part no. X16T017.

To replace the fuses:

Locate the fuse housing on the rear panel of the sample changer.



7. Accessories

Dynamic rinse module for SACxxx

Dynamic rinse/waste module for SACxxx, part no. X91T095 comprising:

- | | | |
|---|---------|--|
| 1 | X31T153 | Shower head for SACxxx |
| 1 | X16T019 | Pump membrane assembly for SACxxx |
| 1 | X31T154 | Silicon crystal tube, d=4/6 mm, L= 8 m |
| 1 | X31T155 | Suction tip for SACxxx |
| 1 | X31T158 | Shower head skirt for 22-45 & 8-25 ml PP beakers |
| 1 | X31T159 | Shower head skirt for 100 ml glass beakers |

Reagent Addition Module for SACxxx

Reagent Addition Module for SACxxx, part no. X91T096 comprising:

- | | | |
|---|---------|--|
| 1 | X16T020 | Peristaltic pump assembly for SACxxx |
| 1 | X31T156 | Maprene ® tube, d=4/7,2 mm, L= 2 m |
| 1 | X31T154 | Silicon crystal tube, d=4/6 mm, L= 8 m |
| 1 | X31T157 | Addition Tip for SACxxx |

Kit of cables for SACxxx

Kit of cables for SACxxx, part no. X91T097 comprising:

- | | | |
|---|---------|---|
| 1 | A95S001 | Line Cord 230V Euro |
| 1 | A95S002 | Line Cord 115V |
| 1 | A95X501 | Serial Cable, SubD9/SubD9 |
| 2 | X16T017 | Fuse, slow blow, 2.5A (5x20mm) |
| 1 | X16T018 | Beaker detection module - Ultrasonic transducer |
| 2 | A95A126 | Cable, BNC/1m/BNC with Adapter BNC f/f |
| 1 | A95A127 | Cable, Banana-m/1m/Banana-m with Adapter Banana f/f |

Turntables (SAC850 and SAC950)

Kit 25-position turntable, SAC850, 50 ml glass low form, 22-45 ml & 8-25 ml PP beakers, X91T080 comprising:

1	X31T136	25-position turntable, beakers d= 44 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	904-488	Titration Vessel PP, 8-25 ml (50 pcs)
1	904-489	Titration Vessel PP, 22-45 ml (50 pcs)
1	X31T151	SACxxx Electrode Head, standard

Kit 22-positions, turntable, SAC850, glass 100ml tall form beakers, X91T082 comprising:

1	X31T138	22-position turntable, beakers d= 48 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T151	SACxxx Electrode Head, standard

Kit 20-position turntable, SAC850, glass 150ml tall form beakers, 40-100 ml PP beakers, X91T084 comprising:

1	X31T140	20-position turntable, beakers d= 60 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	904-490	Titration Vessel PP, 40-100 ml (50 pcs)
1	X31T151	SACxxx Electrode Head, standard

Kit 20-position turntable, SAC850, GOSSELIN 125-180 ml PP beakers, X91T086 comprising:

1	X31T142	20-position turntable, beakers d= 54 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T087	Beakers with cover, PP, 125 ml, 50 pcs
1	X31V005	Beakers with cover, PP, 180 ml, 50 pcs
1	X31T151	SACxxx Electrode Head, standard

Kit 18-position turntable, SAC850, glass 250ml tall form beakers, X91T088 comprising:

1	X31T144	18-position turntable, beakers d= 60 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T151	SACxxx Electrode Head, standard

Kit 15-position turntable, SAC850, glass 250ml low form beakers, X91T090 comprising:

- | | | |
|---|---------|---|
| 1 | X31T146 | 15-position turntable, beakers d= 70 mm |
| 1 | X91T002 | Set of bayonet adapters |
| 2 | 842-302 | Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml |
| 1 | X31T151 | SACxxx Electrode Head, standard |

Kit 15-position turntable, SAC850, glass 400ml tall form beakers, X91T092 comprising:

- | | | |
|---|---------|---|
| 1 | X31T148 | 15-position turntable, beakers d= 70 mm |
| 1 | X91T002 | Set of bayonet adapters |
| 2 | 842-302 | Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml |
| 1 | X31T151 | SACxxx Electrode Head, standard |

Turntables (SAC950 only)

Kit 70-position turntable, 50 ml glass low form, 22-45 ml & 8-25 ml PP beakers, X91T081 comprising:

1	X31T137	70-position turntable, beakers d= 44 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
2	904-488	Titration Vessel PP, 8-25 ml (50 pcs)
2	904-489	Titration Vessel PP, 22-45 ml (50 pcs)
1	X31T151	SACxxx Electrode Head, standard

Kit 42-position turntable, 100 ml glass tall form beakers, X91T083 comprising:

1	X31T139	42-position turntable, beakers d= 48 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T151	SACxxx Electrode Head, standard

Kit 36-position turntable, 150 ml glass tall form, 40-100 ml PP beakers, X91T085 comprising:

1	X31T141	36-position turntable, beakers d= 60 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	904-490	Titration Vessel PP, 40-100 ml (50 pcs)
1	X31T151	SACxxx Electrode Head, standard

Kit 36-position turntable, GOSSELIN 125/180 ml PP beakers, X91T087 comprising:

1	X31T143	36-position turntable, beakers d= 54 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T087	Beakers with cover, PP, 125 ml, 50 pcs
1	X31V005	Beakers with cover, PP, 180 ml, 50 pcs
1	X31T151	SACxxx Electrode Head, standard

Kit 30-position turntable, 250 ml glass tall form beakers, X91T089 comprising:

1	X31T145	30-position turntable, beakers d= 60 mm
1	X91T002	Set of bayonet adapters
2	842-302	Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml
1	X31T151	SACxxx Electrode Head, standard

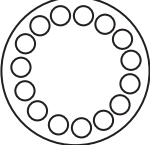

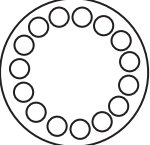

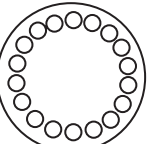

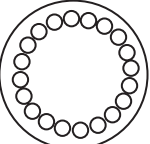


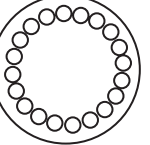


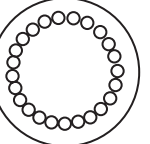

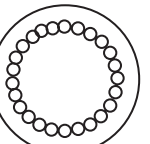



**Kit 25-position turntable, 250 ml glass low form beakers, X91T091
comprising:**

- | | | |
|---|---------|---|
| 1 | X31T147 | 25-position turntable, beakers d= 70 mm |
| 1 | X91T002 | Set of bayonet adapters |
| 2 | 842-302 | Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml |
| 1 | X31T151 | SACxxx Electrode Head, standard |

**Kit 25-position turntable, 400 ml glass tall form beakers, X91T093
comprising:**

- | | | |
|---|---------|---|
| 1 | X31T149 | 25-position turntable, beakers d= 70 mm |
| 1 | X91T002 | Set of bayonet adapters |
| 2 | 842-302 | Delivery Tubing Long, 325 cm, for burette stand ≥ 5 ml |
| 1 | X31T151 | SACxxx Electrode Head, standard |

Turntables and beakers (SAC850 and SAC950)

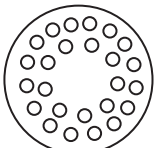

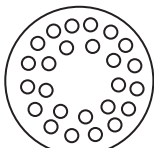

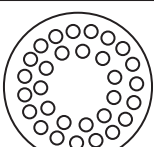

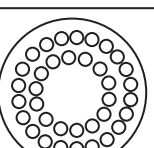


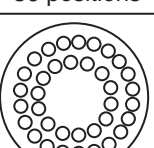


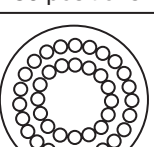

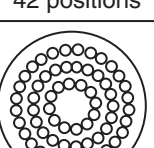



Beaker part no.	Volume min./max.	Turntable to be used	Dynamic rinsing - Shower head skirt	Propeller size
400 ml tall form * d = 70 mm	300 - 360 ml	 X31T148 15 positions	Not used	18 mm 
250 ml low form * d = 70 mm	130 - 225 ml	 X31T146 15 positions	Not used	18 mm 
250 ml tall form * d = 60 mm	180 - 225 ml	 X31T144 18 positions	Not used	18 mm 
125 ml Gosselin, d = 54 mm, PP,** X31T087 (50pcs)	70 - 110 ml	 X31T142 20 positions	Not used	18 mm 
180 ml Gosselin, d = 54 mm, PP,** X31V005 (50pcs)	100 - 160 ml		Not used	18 mm 
150 ml tall form * d = 60 mm	95 - 135 ml	 X31T140 20 positions	Not used	18 mm 
40 - 100 ml PP 904-490 (50 pcs) d = 60 mm	55 - 90 ml		Not used	18 mm 
100 ml tall form * d = 48 mm	50 - 90 ml	 X31T138 22 positions	Required, X31T159	18 mm 
50 ml low form * d = 44 mm	30 - 45 ml	 X31T136 25 positions	Required, X31T158	18 mm 
904-489 (50 pcs) d = 44 mm	22 - 45 ml		Required, X31T158	18 mm 
904-488 (50 pcs) d = 44 mm	10 - 22 ml		Required, X31T158	10 mm 

* Standard glass beakers specified in accordance with DIN12331 ISO3819.

** Metal covers, X31T129 (for 180 ml beakers) and X31T130 (for 125 ml beakers)

Beakers can be covered/uncovered using the Beaker cover module for SACxxx, X16T016.

Turntables and beakers (SAC950 only)

Beaker part no.	Volume min./max.	Turntable to be used	Dynamic rinsing - Shower head skirt	Propeller size
400 ml tall form * d = 70 mm	300 - 360 ml	 X31T149 25 positions	Not used	18 mm 
250 ml low form * d = 70 mm	130 - 225 ml	 X31T147 25 positions	Not used	18 mm 
250 ml tall form * d = 60 mm	180 - 225 ml	 X31T145 30 positions	Not used	18 mm 
125 ml Gosselin, d = 54 mm, PP,** X31T087 (50pcs)	70 - 110 ml	 X31T143 36 positions	Not used	18 mm 
180 ml Gosselin, d = 54 mm, PP,** X31V005 (50pcs)	100 - 160 ml		Not used	18 mm 
150 ml tall form * d = 60 mm	95 - 135 ml	 X31T141 36 positions	Not used	18 mm 
40 - 100 ml PP 904-490 (50 pcs) d = 60 mm	55 - 90 ml		Not used	18 mm 
100 ml tall form * d = 48 mm	50 - 90 ml	 X31T139 42 positions	Required, X31T159	18 mm 
50 ml low form * d = 44 mm	30 - 45 ml	 X31T137 70 positions	Required, X31T158	18 mm 
904-489 (50 pcs) d = 44 mm	22 - 45 ml		Required, X31T158	18 mm 
904-488 (50 pcs) d = 44 mm	10 - 22 ml		Required, X31T158	10 mm 

* Standard glass beakers specified in accordance with DIN12331 ISO3819.

** Metal covers, X31T129 (for 180 ml beakers) and X31T130 (for 125 ml beakers)
Beakers can be covered/uncovered using the Beaker cover module for SACxxx, X16T016.

Beakers

Beaker type Ø x H (mm)	Volume min./max.	Detection min. height **	Part no.
400 ml tall form * 70 x 130	300 - 360 ml	10 mm (40 ml)	
250 ml low form * 70 x 95	130 - 225 ml	0 mm	
250 ml tall form * 60 x 120	180 - 225 ml	10 mm (30 ml)	
125 ml, Gosselin, PP, 54 x 72	70 - 110 ml	0 mm	X31T087 (pack of 50)
180 ml, Gosselin, PP, 54 x 102	100 - 160 ml	10 mm (25 ml)	X31V005 (pack of 50)
150 ml tall form * 60 x 80	95 - 135 ml	0 mm	
40-100 ml, PP 60 x 80	55 - 90 ml	0 mm	904-490 (pack of 50)
100 ml tall form * 48 x 80	50 - 90 ml	0 mm	
50 ml low form * 42 x 60	30 - 45 ml	0 mm	
22-45 ml, PP 44 x 70	22 - 45 ml	0 mm	904-489 (pack of 50)
8-25 ml, PP 44 x 70	10 - 22 ml	0 mm	904-488 (pack of 50)

* Standard glass beakers specified in accordance with DIN12331 ISO3819.

** When starting an analysis, if you have less liquid sample than this specified value, then the beaker automatic detection can not work. When working with a workstation, you must clear the option "Beaker detection" in TitraMaster 85 (refer to the TitraMaster 85, on-line help, topics "Editing an application - Configuration").

Adapters for Bayonet Electrode Head

Adapters for Bayonet Electrode Head, X91T002 comprising:

5	X31T031	Bayonet Socket ø 12 mm with washer
2	X31T013	Bayonet Adapter for PAF-X3 and D4362 delivery tips
2	X31T014	Bayonet Adapter for 103 mm screw cap electrode
2	X31T015	Bayonet Adapter for 120 mm screw cap electrode
2	X31T016	Bayonet Adapter for ø 9.5 mm electrode, type GK2401
2	X31T018	Bayonet Adapter ø 12 mm to ø 7.5 mm
1	X31T127	Stirring Shaft, PP, L = 96 mm with propellers 10&18 mm
2	X31T032	Bayonet Stopper ø12 mm
2	X31T033	Bayonet Stopper ø7.5 mm

8. Technical specifications

Functions

Easy removable turntables, automatic identification of turntable model by RFID:

- SAC850: 1 radius
- SAC950: 1, 2 or 3 radii

Dip rinse and/or reconditioning: 0 to 2 positions.

Service position (electrodes above the park beaker).

Automatic detection of empty position by ultrasonic transducer.

Stirring: magnetic or propeller stirring. Magnetic stirring if propeller stirrer not connected. 0 to 1100 rpm by steps of 50 rpm.

Built-in keypad: lift electrode head up/down, move to next/previous beaker, start/stop dynamic shower rinse, start/stop emptying to waste, start/stop adding a reagent, stop action.

Embedded programmable sample preparation sequences.

Unused electrodes and delivery tips storage: 4 positions Ø16 mm, on the top of the sample changer arm.

Optional modules

Dynamic shower rinse & Beaker emptying: Shower rinse and emptying operations controlled by 2 PTFE membrane pumps, available in any beaker size. Flow rate: up to 600 ml/min. Pumps can be controlled manually and individually through keypad.

Addition of a reagent with a peristaltic pump to prepare sample. The pump can be controlled manually through keypad. The pump can be programmed individually as part of sample preparation sequence.

Beaker cover option (SAC950 only): Remove beaker covers using an electro-magnet. Covers are disposed beside the sample changer in a dedicated location once removed.

Inputs/outputs

USB-B (Slave) connection to computer for sample preparation programming sequence.

RS232C serial connection to workstation unit.

TTL I/O. Start external peripherals (RJ11 socket). Wait for external signal to continue the sample preparation sequence.

Electro-magnet input for beaker cover option (RJ11 socket).

Propeller stirrer output (RJ11 socket).

Temperature input (CINCH socket) for use as input in a sample preparation sequence.

Ultrasonic transducer input for beaker detection module (Jack socket 3.5 mm).

Casing, keyboard

PETP – PVC and/or PE

Protected against projections, IP54 – For use in a laboratory environment

Dimensions (H x W x D)

70 x 58 x 68 cm.

Weight

27 kg.

Power requirements

47.5 - 63 Hz. 115/230 Vac +15 -18%. 76VA

Fuses: 2 mains fuses : slow blow T2.5A L250V (230 V)

Environmental operating conditions

Interior use only

10 to 40°C temperature.

20 to 80% relative humidity.

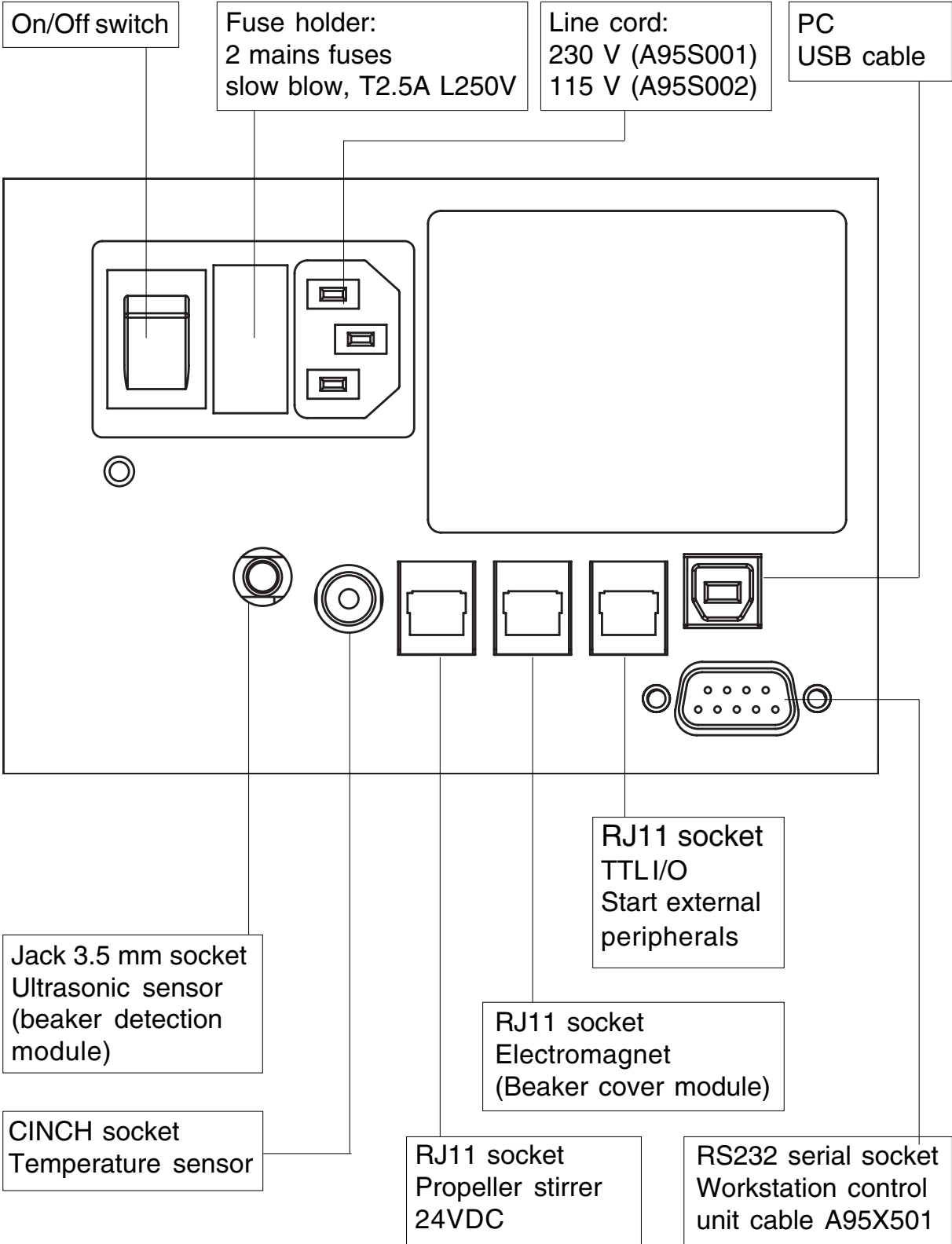
Altitude \leq 2000 m.

Variations of the mains voltage do not exceed $\pm 10\%$ of the nominal value.

Level of pollution: 2.

Transitory overvoltage: level II.

Rear panel



International Standards



EMC Directive (89/336/CEE)

The sample changer complies with following standards:

Class A equipment for laboratory use, according to the standard EN 61326-1.

Emission:

EN 61000-4-2 level 2

EN 61000-4-3 level 1

EN 61000-4-4 level 2

EN 61000-4-5 level 2

EN 61000-4-6 level 2

EN 61000-4-11

Low Voltage Directive (73/83/CEE)

The sample changer complies with the following standard:

Reference standard: EN 61010-1.



The Titration Manager complies with the following standards:

UL 61010A - 1

CAN / CSA C22 2 N° 1010.1 - 92.



The sample changer complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

See "Compliance with FCC rules, part 15 - Information to the user" on page 6.

