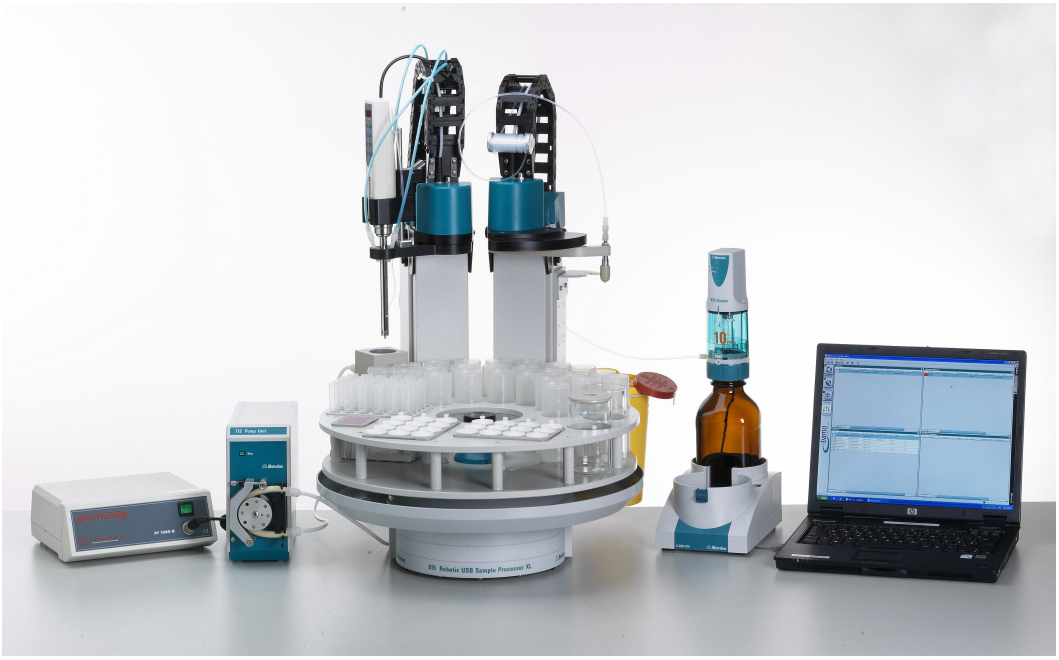
815 Robotic Soliprep



2.815.1110 / 2.815.2110 / 2.815.3110

Manual

8.815.8004EN / 2020-02-29

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This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

Table of contents

1 Introduction

1.1 Area of application

The 815 Robotic Soliprep systems are automation systems suitable for a variety of uses. They have been designed exclusively for utilization in factories and laboratories and cover a wide range of applications. Soliprep systems can be used for automation purposes wherever a complex sample preparation of solid substances is required, e.g. for pharmaceutical or food analysis.

The Robotic Sample Processors, which have proven their worth for many years, form the basis for a versatile system that has been expanded to include opportunities for the dispersion, filtration and bottling of samples of all sorts. This versatile concept can be expanded as required.

Thanks to the integration of high-performance communication interfaces (USB, RS-232), they can be incorporated seamlessly into a variety of instrument systems, and not only those manufactured by Metrohm. Operation by the high-performance *tiamo*™ software ensures not only user-friendly operation and programming of automation sequences, but also allows 100% compliance of the entire automation system with FDA (Food and Drug Administration) regulations. This applies in particular with regard to regulation *21 CFR Part 11, Electronic records and signatures*.

Soliprep systems are not intended for clinical or biological applications.

1.2 Model versions

815 Robotic Titration Soliprep (2.815.1110)

- Dispersion and titration

The automation system for titration of solid samples. A workstation equipped with a dispersion device is used to shred the sample. The dispersion aggregate is cleaned in a special rinsing station. The second workstation is designed as a complete titration workplace with rinsing and aspirating equipment.

815 Robotic Flexible Soliprep (2.815.2110)

- Dispersion, filtration and bottling

The universal automation system for sample preparation in chromatography. A workstation equipped with a dispersion device is used to shred the sample. The dispersion aggregate is cleaned in a special rinsing station. The second workstation is equipped for sample transfer with a universal robotic arm with a Luer adapter. It is used for picking up syringe needles

(for aspirating the dispersed sample and bottling the filtrate in sealed vials) and membrane filters (for filtering the sample in sample vials).

Needles, filters and sample vials are kept ready in replaceable inserts. The needles and filters are automatically stripped off after use and disposed of in a waste container.

A versatile dosing drive (800 Dosino) is used as auxiliary device for transferring the sample solution and rinsing.

815 Robotic Filtration Soliprep (2.815.3110)

- Dispersion and filtration

The universal automation system for sample preparation in instrumental analysis, e.g. photometry. A workstation equipped with a dispersion device is used to shred the sample. The dispersion aggregate is cleaned in a special rinsing station. The second workstation is equipped for sample transfer with a universal robotic arm with a Luer adapter. It is used for picking up syringe needles (for aspirating the dispersed sample) and membrane filters (for filtering the sample in sample vials).

The needles and filters are kept ready in replaceable inserts and are automatically stripped off after use and disposed of in a waste container.

A versatile dosing drive (800 Dosino) is used as auxiliary device for transferring the sample solution and rinsing.

1.3 About this documentation

1.3.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Carry out these steps in the sequence shown.
Method	**Dialog text**, **parameter** in the software
File ▶ New	Menu or menu item
[Next]	**Button** or **key**
	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.

	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**WARNING** This symbol draws attention to a possible biological hazard.
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
	**NOTE** This symbol highlights additional information and tips.

1.4 Safety instructions

1.4.1 General notes on safety

WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.4.2 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.

WARNING

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.

WARNING

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Supply voltage

WARNING

An incorrect supply voltage can damage the instrument.

Only operate this instrument with a supply voltage specified for it (see rear panel of the instrument).

Protection against electrostatic charges

WARNING

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Do not fail to pull the power cord out of the power socket before you set up or disconnect electrical plug connections at the rear of the instrument.

1.4.3 Personnel safety

WARNING

Wear protective goggles and working clothes suitable for laboratory work while operating the 815 Robotic Soliprep. It is also advisable to wear gloves when caustic liquids are used or in situations where glass vessels could break.

WARNING

Always install the safety shield supplied with the equipment before using the instrument for the first time. Pre-installed safety shields are not allowed to be removed.

The 815 Robotic Soliprep may not be operated without a safety shield!

WARNING

Personnel are not permitted to reach into the working area of the instrument while operations are running!

A **considerable risk of injury** exists for the user.

WARNING

In the event of a possible blockage of a drive, the power plug must be pulled out of the socket immediately. Do not attempt to free jammed sample vessels or other parts while the device is switched on. Blockages can only be cleared when the instrument is in a voltage-free status; this action generally involves a **considerable risk of injury**.

WARNING

The 815 Robotic Soliprep is **not** suitable for utilization in biochemical, biological or medical environments in its basic equipment version.

Appropriate protective measures must be implemented in the event that potentially infectious samples or reagents are being processed.

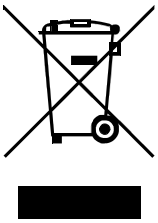
1.5 Flammable solvents and chemicals

WARNING

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.6 Recycling and disposal



This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2 Robotic Titration Soliprep 2.815.1110

2.1 Installation

These installation instructions assume that the required adjustment of turntable and Swing Heads was already performed for the concerned Robotic Sample Processor.

2.1.1 Preparing the Sample Processor

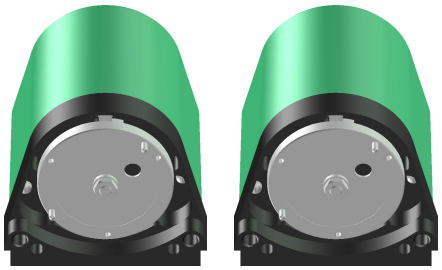
Connecting the Swing Heads

NOTICE

The necessary settings must first be made in the control software (*tiamo*) before the robotic arms can be mounted on the Swing Heads. For this purpose, the two Swing Heads are connected but the robotic arms are not yet mounted.

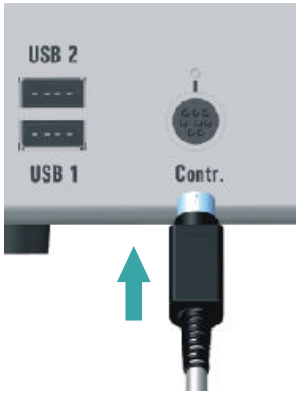
1 Connect both Swing Heads to one tower.

The connector is located in each case on the rear side of a tower.



The Swing Heads can be laid down flatly, but not with the drive disk downwards.

Connecting the controller cable

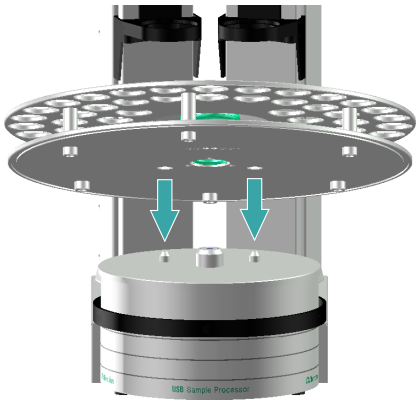


1 Connect the controller cable 6.2151.000 to the rear of the instrument.

NOTICE

The plug on the instrument end of the 6.2151.000 controller cable is protected against accidental disconnection by means of a pull-out protection feature. If you wish to pull out the plug, you first need to pull back the outer plug sleeve marked with arrows.

Attaching the sample rack



1 Attach the sample rack in such a way that both openings in the bottom of the rack engage in the guide bolts of the turntable.

2 Screw tight the handles of the sample rack.

2.1.2 Connecting the instrument to the power grid

WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 0.75 mm^2 / 18 AWG
- Power plug:
  - according to customer requirement (6.2122.XX0)
  - min. 10 A

NOTICE

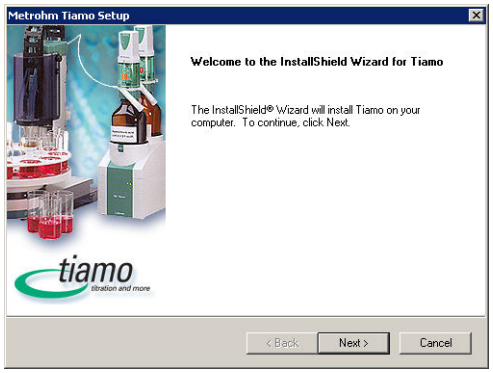
Do not use a not permitted power cord!

1 **Plugging in the power cord**

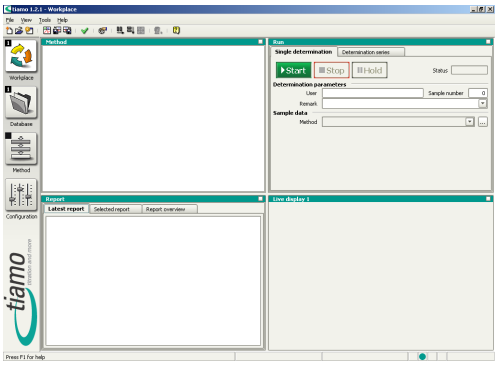
- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

2.1.3 Installing tiamo™

Installing tiamo



1 Insert the *tiamo* CD into the CD drive of the PC and carry out the installation following the instructions. Then start *tiamo*.



2.1.4 Configuring the Swing Heads

Connecting the controller cable on the computer

1 Connect the controller cable to a USB connector of the computer.

The instrument is recognized. Depending on the version of the Windows operating system used, the driver installation proceeds differently afterwards.

Either the necessary driver software is installed automatically or an installation wizard is started.

2 Follow the instructions of the installation wizard.

If problems should occur during installation, contact your company's IT support team.

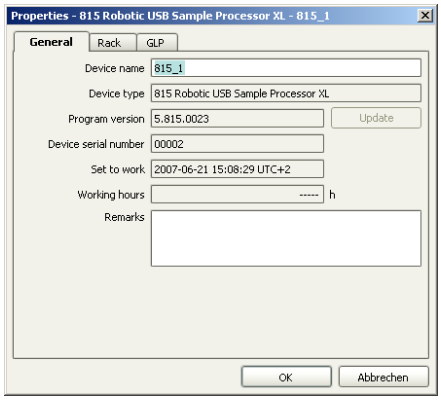
Instrument registration

Start *tiamo*.

The USB Sample Processor is automatically recognized by *tiamo*.

1 Confirm with **[Yes]**.

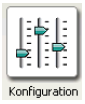
The properties window for configuring the instrument is displayed.



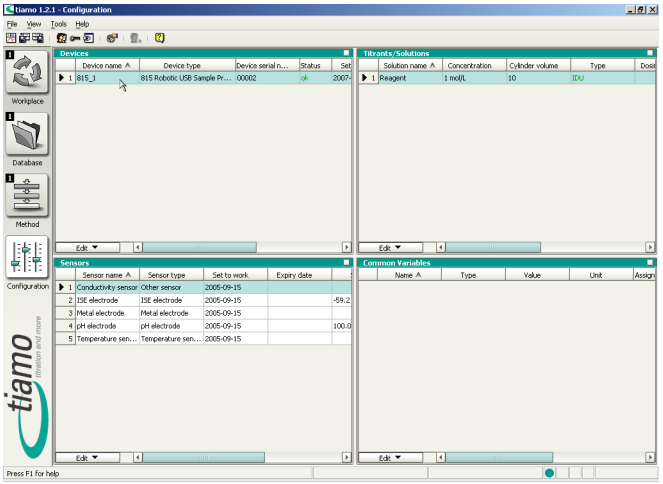
2 Confirm with **[OK]**.

Configuring the Swing Heads

Configure the robotic arms for both towers.

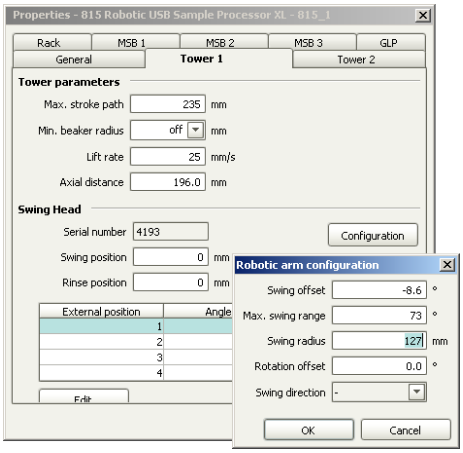


1 Click on the **Configuration** symbol.



2 Double-click on the instrument name **815_1** in the **Devices** window.

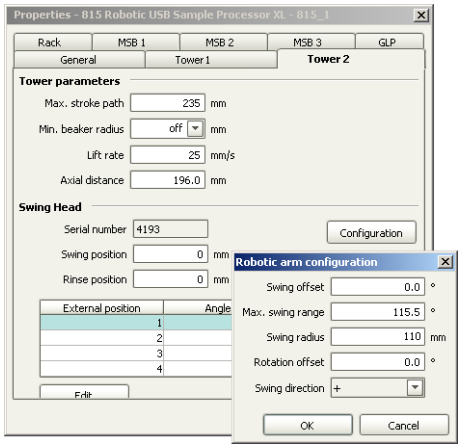
3 Click the **Tower 1** tab and then **Configuration**.



Enter the following settings:

- Swing offset = **–8.0°**
- Max. swing range = **73°**
- Swing radius = **127 mm**
- Rotation offset = **0.0°**
- Swing direction = **–**

4 Click the **Tower 2** tab and then **Configuration**.



Enter the following settings:

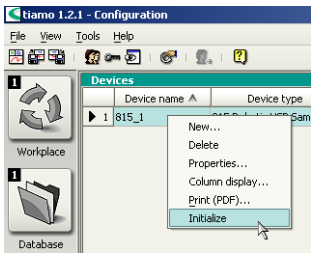
- Swing offset = **0.0°**
- Max. swing range = **115.5°**
- Swing radius = **110 mm**
- Rotation offset = **0.0°**
- Swing direction = **+**

5 Confirm the settings with **[OK]**.

For the settings to take effect, the instrument must be reinitialized.

6 Click **[OK]** on the tab.

7 Right-click on the instrument name **815_1** in the **Devices** window and click on **Initialize**.



The Sample Processor is initialized. The settings of the Swing Heads and robotic arms are now activated.

2.1.5 Configuring the towers

Different lift positions must be set for lift 1 and lift 2 before process methods are generated for the 815 Robotic Soliprep.

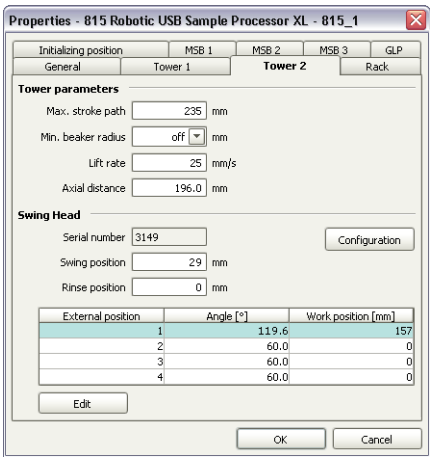
Tower 2

Configure the positions for tower 2:

1 Click the **Tower 2** tab.

2 Enter the following settings:

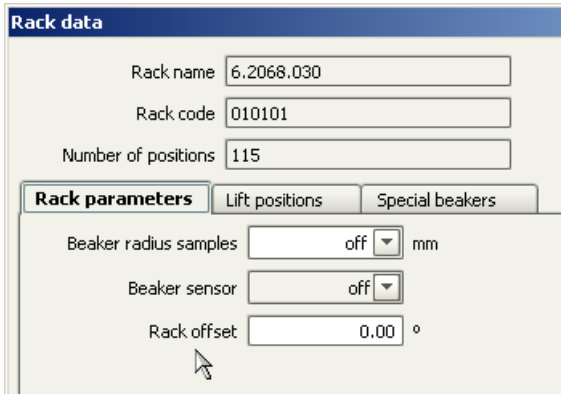
- Swing position = **29 mm**
- External position 1, Angle [°] = **119.6**
- External position 1, Work position [mm] = **157**



2.1.6 Defining rack positions

Rack 6.2068.030

1 Switch over to the **Rack** tab and click on **[Rack data]** to open the rack parameter settings.



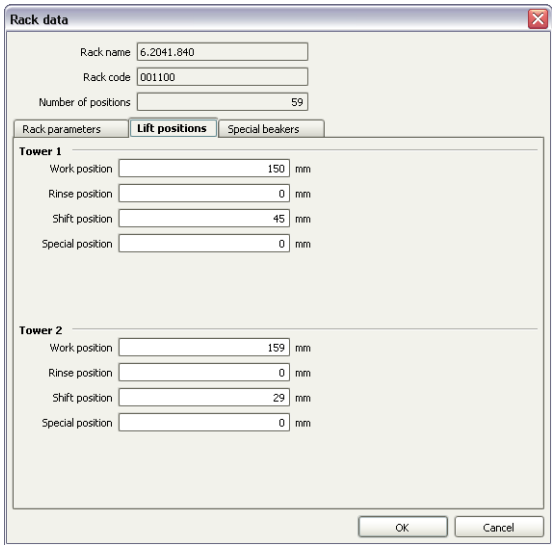
2 Switch to the **Lift position** tab.

3 Under **Tower 1**, enter the value **150 mm** as Work position.

4 Under **Tower 1**, enter the value **45 mm** as Shift position.

5 Under **Tower 2**, enter the value **159 mm** as Work position.

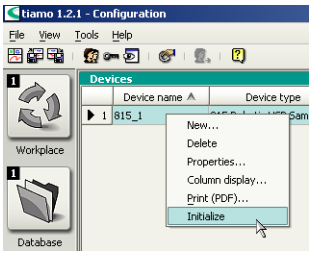
6 Under **Tower 2**, enter the value **29 mm** as Shift position.



7 Save the **Rack data** by clicking **[OK]**.

8 Click **[OK]** on the tab.

9 Right-click on the instrument name **815_1** in the **Devices** window and click on Initialize.



The Sample Processor is initialized. The settings made are now activated.

2.1.7 Mounting the Swing Heads

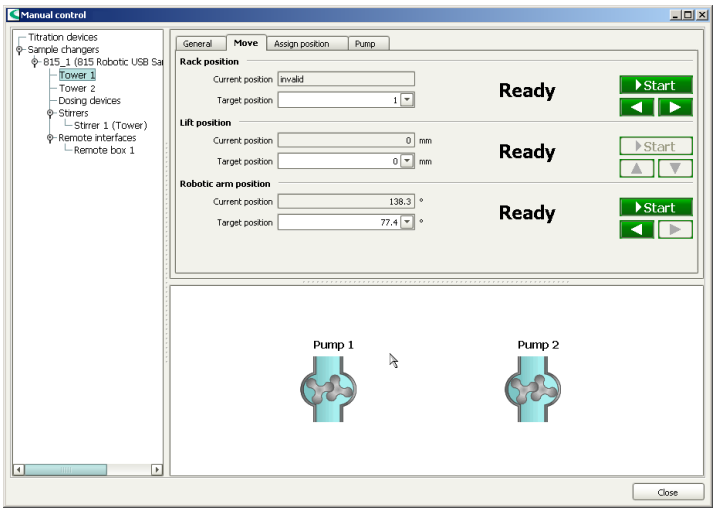
Preparing the towers

Both lifts must be moved to a suitable position for the mounting of the Swing Head and robotic arms to be comfortable.

1 **Opening the manual control**

In the toolbar of *tiamo*, click on the hand symbol or select **Tools** ▸ **Manual control** in the main menu.

2 In the left-hand window, under **815_1 (815 Robotic …**, click on the item **Tower 1** and then select the **Move** tab.



3 **Moving the lift to position**

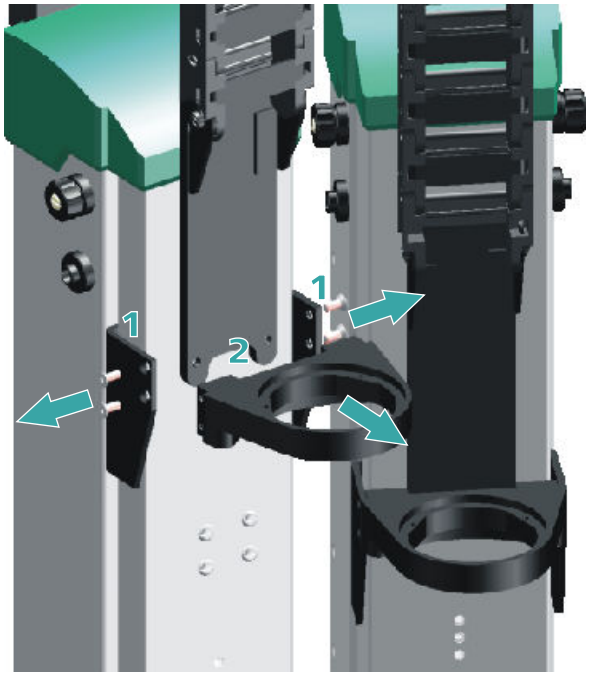
Under **Rack position**, click on a green arrow key (left or right).

The sample rack moves to a defined position. Only now, the lift can be moved.

4 Under **Lift position**, click on the green arrow key "down" until the lift 1 has moved approx. 180 mm downwards.

Both lifts are now in a suitable position so that all screws for mounting the Swing Heads can be reached easily.

Dismounting the titration head holder



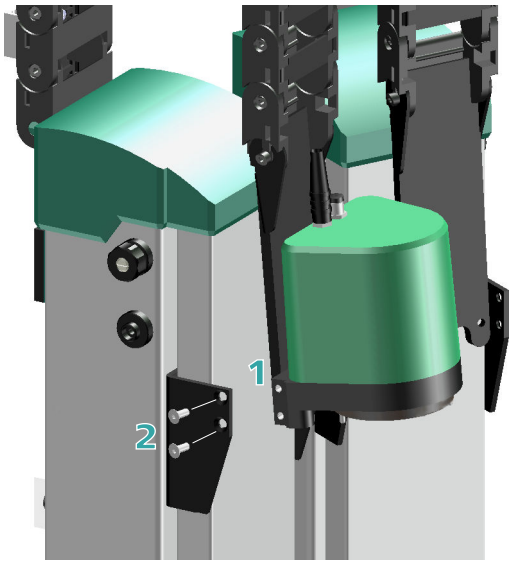
1 Unscrew the screws on the outside and inside of the holder on tower 2 (left).

2 Unscrew and remove the holder from the holder plate of the guide chain.

3 Remove the holder also on tower 1.

Use the supplied hex key. Set the screws aside for later use.

Mounting the Swing Heads



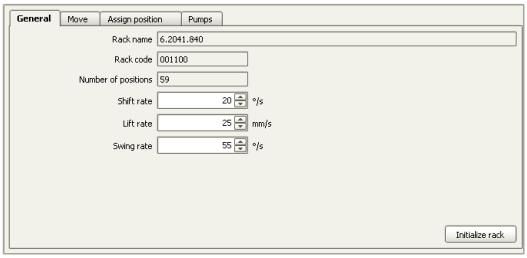
1 Mount one Swing Head to the holder plate on tower 2.

2 Clamp the Swing Head between the guide jaws and screw it tight.

3 Mount the second Swing Head on tower 1.

Initializing the rack and Swing Heads

Both Swing Heads must be moved to the starting position for the mounting of the robotic arms.



1 On the **General** tab, click on **[Initialize rack]**.

Both lifts are moved upwards. The Swing Heads are now in the starting position.

2.1.8 Placing tubing and cables in the guide chain

Tubing and cables can be placed in the guide chain.

The guide chain contains a firmly installed clip on each chain link.

CAUTION

When mounting tubing and cables, make sure that there is no traction on the drives while moving the lift or swinging the robotic arm. Traction on the drive can overload and damage the drive.

If a robotic arm is used, we recommend placing the tubing and cables only above the third chain link in the guide chain to prevent traction on the drives.

Do **not** or only partially place rigid tubings, as for example aspiration tubings made of PTFE, into the guide chain.

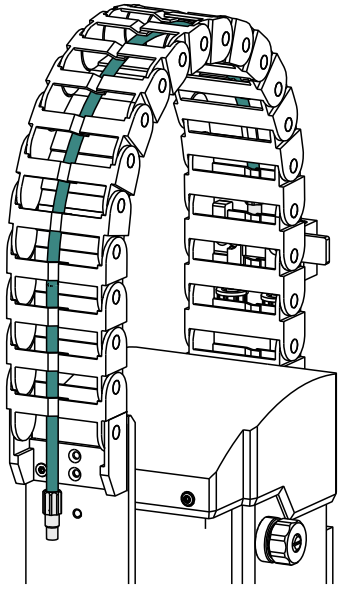
NOTICE

Make sure that tubing and cables do not kink.

Inserting and removing the tubing and cables requires no tools.

1 Placing tubing and cables

- Press one side of the clip downwards and place tubing or cables in the guide chain.



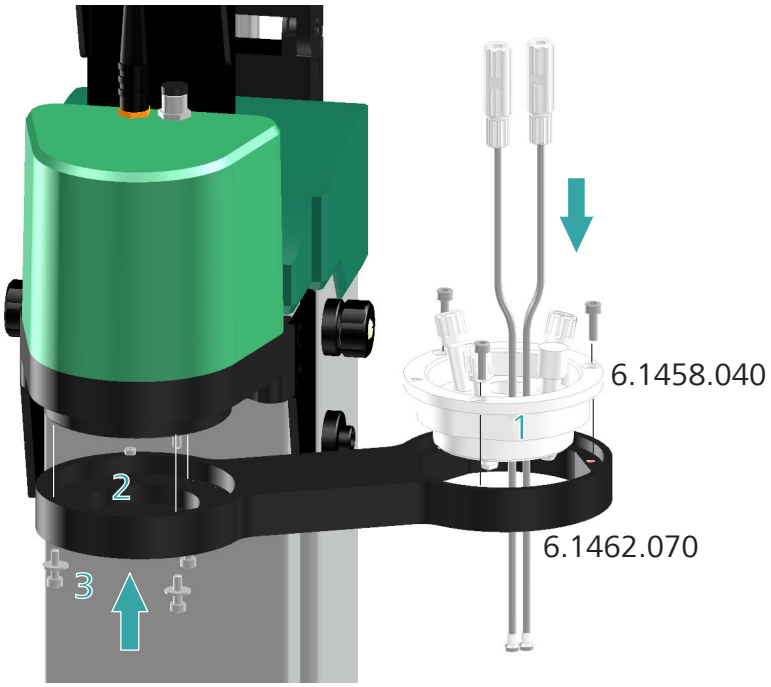
2 Removing tubing and cables

- Press one side of the clip downwards and remove tubing or cables from the guide chain.

2.1.9 Mounting the titration robotic arm

Mounting the robotic arm

After the initialization, the drive disk of the Swing Head is positioned as though the robotic arm were located in the outermost position.



Mount the 6.1462.070 robotic arm to tower 1 as follows:

1 Place the 6.1458.040 titration head insert in the opening of the robotic arm and screw tight with the provided screws.

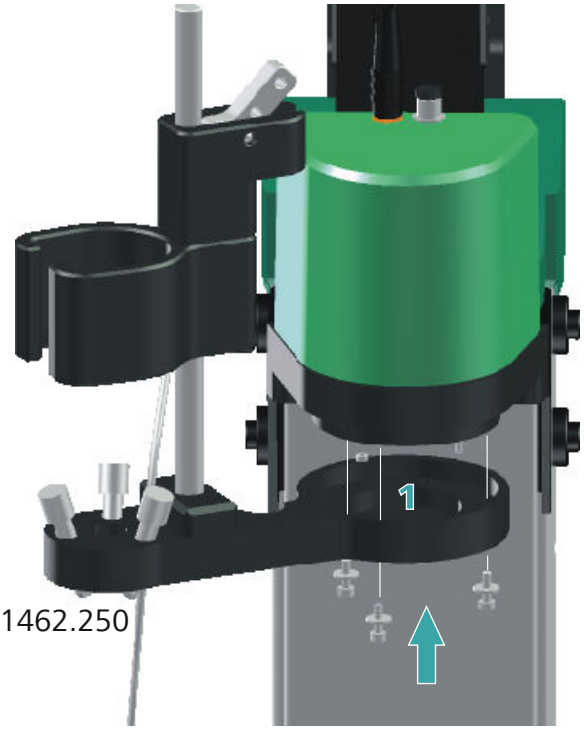
2 Hold the robotic arm in such a way that the opening faces right and slip it over the guide pins of the drive disk from below. While doing so, rotate the robotic arm outwards as far as possible, i.e. towards the tower - see above.

NOTICE

Take care not to twist the drive disk and thereby put strain on the drive.

3 Tighten the robotic arm to the Swing Head with the screws and washers supplied.

2.1.10 Mounting the Polytron robotic arm



6.1462.250

Mount the 6.1462.070 robotic arm to tower 2 as follows:

1 Hold the robotic arm in such a way that the holder faces to the left and and slip it over the guide pins of the drive disc from below. While doing so, let the robotic arm point outwards as far as possible, i.e. towards the tower - see above.

NOTICE

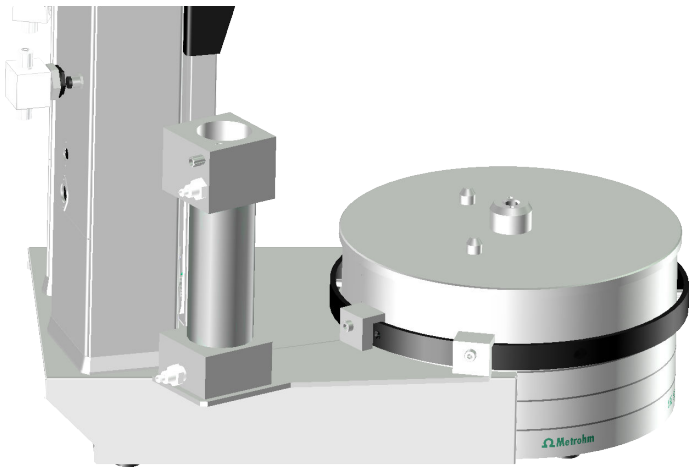
Take care to ensure that you do not twist the drive disc, thus causing pressure against the drive.

2 Screw the robotic arm to the Swing Head tightly with the screws and washers provided.

2.1.11 Washing station and drip pan

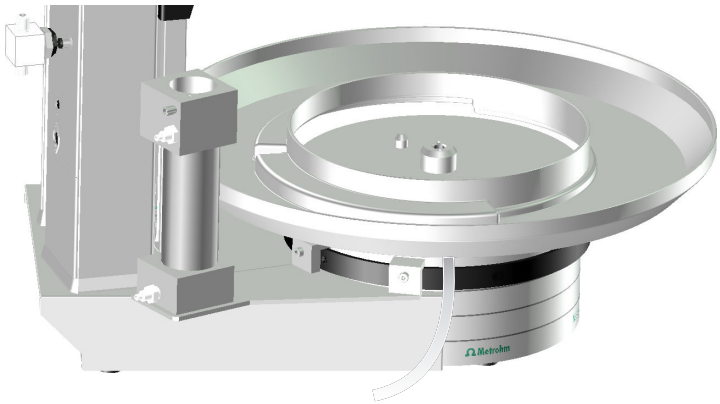
To mount the washing station and the drip pan, remove the sample rack. Now proceed as follows:

1 Mount the washing station to the left next to tower 2 on the assembly rail and screw it tightly.



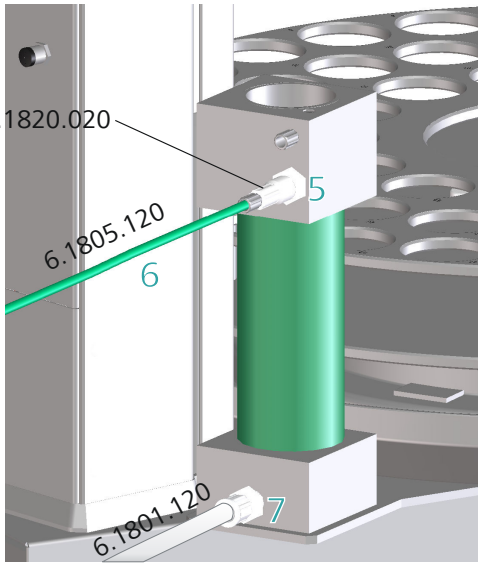
2 Fasten the enclosed tubing to the drainage nipple on the drip pan and guide the free end of the tubing into a drain or a waste container.

3 Place the drip pan over the stirrer rail. The correct alignment of the drip pan can be seen from the following illustration. Correct the position of the washing station slightly as needed.



4 Reattach the sample rack.

5 Fasten the 6.1820.020 screw connector with the M6 connector to the upper, larger tubing connector of the washing station.



6 Connect the green 6.1805.120 FEP tubing (1 m length) to the screw connector. This is the feed line of the washing station. Connect the other end of the tubing to the distributor of tower 2.

7 Fasten a 6.1812.000 PTFE tubing to the lower tubing connector of the washing station. This is the outlet of the washing station.

- Shorten the tubing to a suitable length, so that it can be connected to a peristaltic pump (772 Pump Unit).
- Remove the union nut of lower tubing connector and guide it over the end of a **6.1812.000 PTFE tubing**. You may have to extend the tubing end in order to be able to better mount the tubing, see the following note.
- Pull the end of the tubing over the connection nipple of the distributor and fasten in place with the union nut.

NOTICE

The opening of the tubing may need to be widened with a sharp object (e.g. with a Phillips screwdriver).

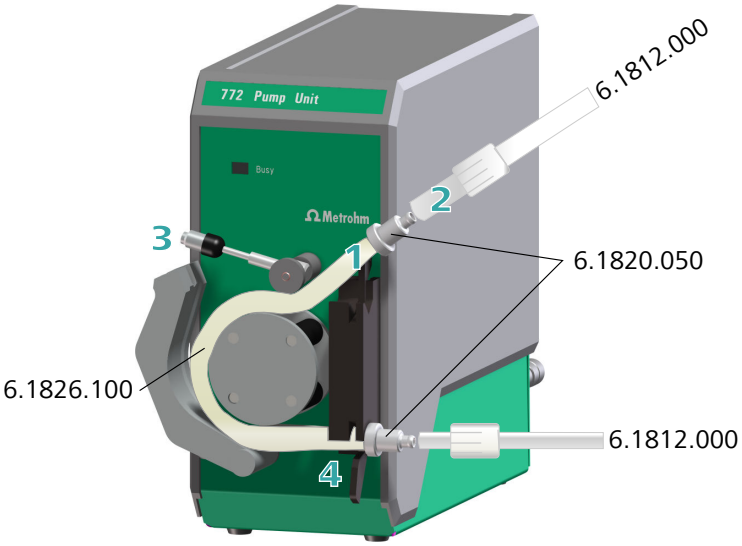
A piece of sandpaper may be used to get a better grip on the tubing.

Do not extend the tubing end before having slid the union nut onto the tubing.

2.1.12 Connecting and setting up the peristaltic pumps

The two peristaltic pumps 772 Pump Unit are used to aspirate the titration vessels and the rinsing station.

772 Pump Unit for the rinsing station

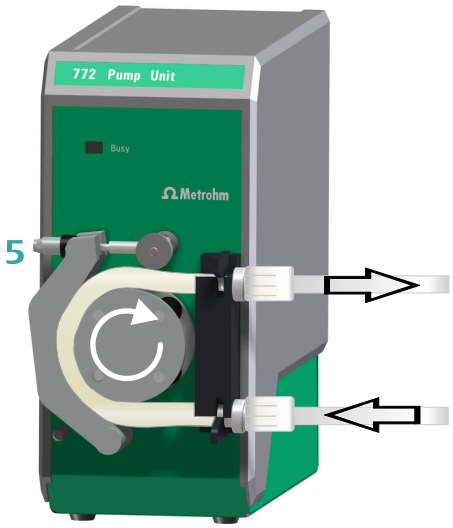


1 Cut a 6.1826.100 pump tubing to approx. 17 cm and mount a 6.1820.050 tubing olive on both ends.

2 Fasten a piece of 6.1812.000 PTFE tubing leading to a waste container to one of the tubing olives. Attach the 6.1812.000 PTFE tubing that is connected to the rinsing station as a drain connection to the other olive connector.

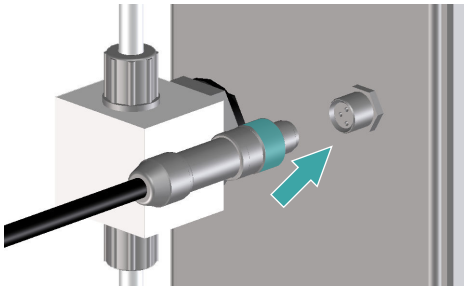
3 Loosen the locking lever by rotating the clamping screw and open the pressure clamp.

4 Place the pump tubing around the rotor and fix it in place using the tubing clamps. The rotor rotates clockwise. Therefore, the inlet tubing must be inserted below and the outlet tubing above.



5 Apply pressure to the pressure clamp and clamp tightly with the locking lever. Tighten the clamping screw so that the pump tubing cannot slip. The flow rate of the pump can be regulated during operation using the clamping screw.

6 Connect the connection cable of the pump to tower 2.



- Plug the threaded plug of the connection cable into the connection socket **Ext. Pump 2** on the rear of the tower.
  Pay attention to the orientation of the 3 contact pins.
- Tighten the knurled screw at the front end of the plug by hand in clockwise direction. This secures the plug.

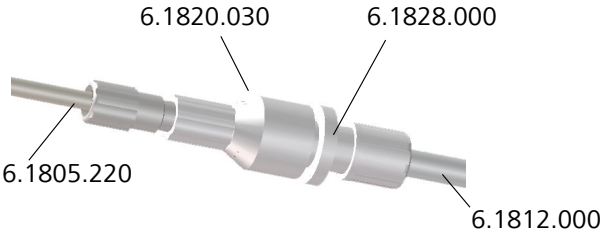
Peristaltic pump for aspirating the titration vessels

Proceed as follows for connecting and placing the tubing:

See previous section for illustrations.

1 Cut a 6.1826.100 pump tubing to approx. 17 cm and mount a 6.1820.050 tubing olive on both ends.

2 Fasten a piece of 6.1812.000 PTFE tubing leading to a waste container to one of the tubing olives. Attach a piece of 6.1812.000 PTFE tubing approx. 1 m long to the other olive connector. Connect the 6.1805.220 aspiration tubing to the other end of the tubing with the aid of the 6.1820.030 M8 tubing adapter and a 6.1828.000 connection nipple.



3 Loosen the locking lever by rotating the clamping screw and open the pressure clamp.

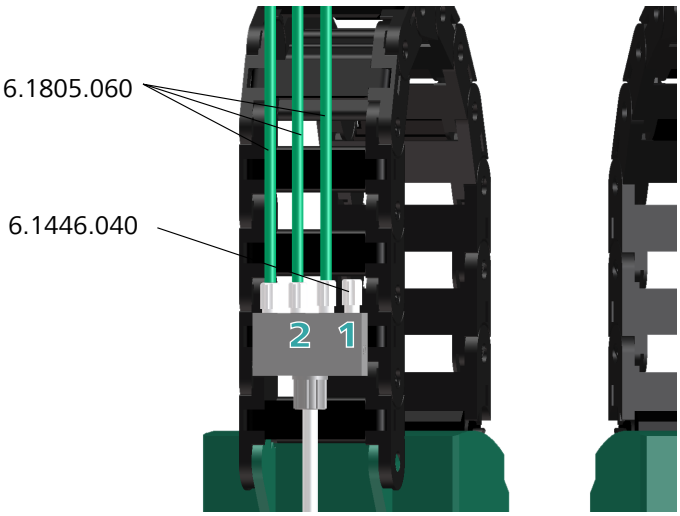
4 Place the pump tubing around the rotor and fix it in place using the tubing clamps. The rotor rotates clockwise. Therefore, the inlet tubing must be inserted below and the outlet tubing above.

5 Apply pressure to the pressure clamp and clamp tightly with the locking lever. Tighten the clamping screw so that the pump tubing cannot slip. The flow rate of the pump can be regulated during operation using the clamping screw.

6 Connect the connection cable of the pump to tower 1.

2.1.13 Installing the rinsing tubing

Tower 1

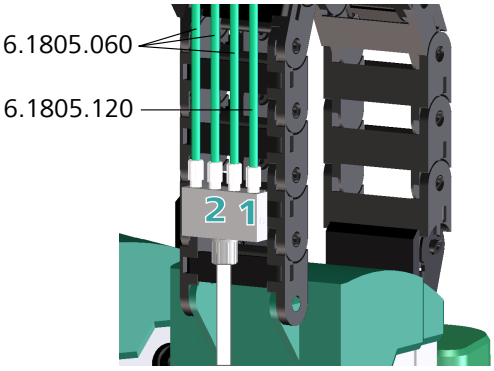


Install the tubings for rinsing as follows:

1. Seal an opening on the distributor of tower 1 with the 6.1446.040 screw nipple.

2. Connect three 6.1805.060 tubings (60 cm) to the remaining M6 connectors of the distributor.

Tower 2



Install the tubings for rinsing as follows:

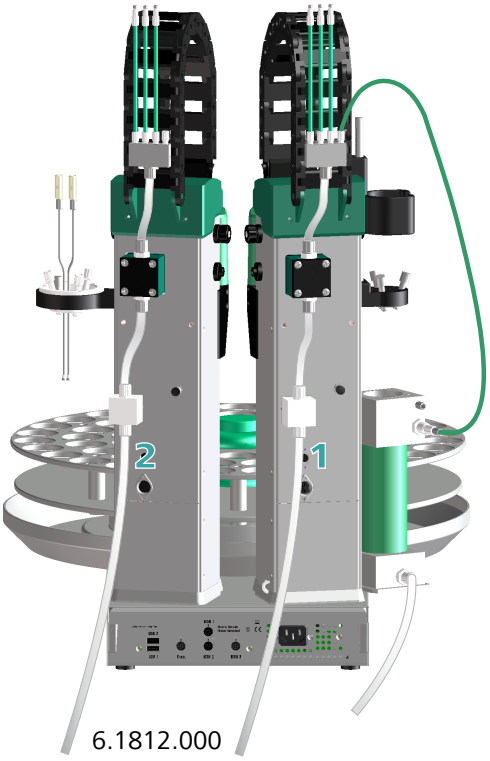
1. Connect the green inlet tubing (6.1805.120) of the rinsing station to one of the four connectors on the tower 2 distributor.

2 Connect three pieces of 6.1805.060 tubing (60 cm) to the tower 2 distributor.

Install the inlet tubings as follows:

1 Connect a 6.1812.000 PTFE tubing to the tower 1 valve. Connect the other end of the tubing to a canister with rinsing liquid (e.g. water).

2 Connect a 6.1812.000 PTFE tubing to the tower 2 valve. Connect the other end of the tubing to a canister with rinsing liquid (e.g. water).

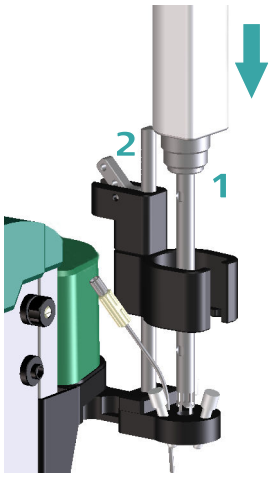


6.1812.000

2.1.14 Assembling and mounting the Polytron® drive

Please consult the Polytron user manual for details how to mount the aggregate to the **Polytron PT 1300 D**.

Mounting the Polytron



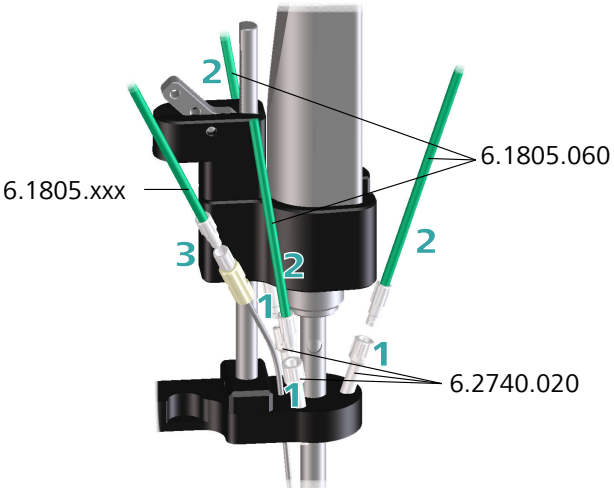
Mount the Polytron as follows:

1 Insert the Polytron with the aggregate already mounted into the robotic arm holder on tower 2 from above.

2 Readjust the position of the holder if necessary. Press down the fixing lever of the holder to accomplish this.

2.1.15 Mounting the rinsing tubings for the Polytron®

For rinsing the Polytron aggregate rinsing nozzles must be mounted on the robotic arm. Proceed as follows:



1 Replace the three stoppers on the Polytron robotic arm with 6.2740.020 rinsing nozzles.

2 Connect the three rinsing tubings that are connected to the tower 2 distributor to the rinsing nozzles.

3 The preinstalled tubing of the robotic arm can be used to add solvent to the sample.

2.1.16 Connecting the Polytron®

The **Polytron® PT 1300 D** is comprised of a control module and a dispersion drive with dispersion aggregate for mixing and shredding solid samples. The control device is directed by a PC software, e.g. ***tiamo™***, via a serial RS-232 connector.

Please refer to the operating instructions of the Polytron for details regarding connecting. The Polytron is connected as follows:

1
- Connect the connecting cable of the dispersion device to the front of the control module.

2
- Check the set supply voltage on the connection socket on the rear side of the control module.
- Switch off the instrument.
- Plug in the power supply cable and connect to a socket.

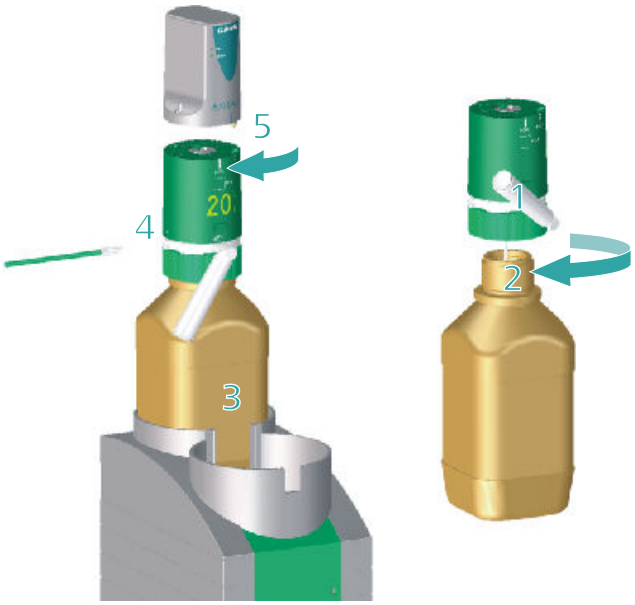
3
- Connect the 6.2134.110 RS-232 connection cable to the 9-pin connection socket on the rear side of the control module.
- Plug in the other end of the cable to the COM1 or COM2 port on the PC. The port on the PC is usually marked with **IOIOI**.
  If the PC has no serial interface, then a USB port on the PC can be used with the aid of an RS-232/USB converter (e.g. the 2.145.0320 Edgeport).

NOTICE

The Polytron must be registered manually in ***tiamo™*** as an RS-232 device.

2.1.17 Installing the titrator with titrant and auxiliary solutions

A Titrando or Titrino can be used as a titrator for determining the samples. Instructions on how to install a titrant and/or an auxiliary solution on a 836 Titrando are given as an example:



1 Screw a filled adsorber tube onto the **Vent** connector of a dosing unit.

2 Equip the dosing unit with a filling tubing (Port 2 on the underside of the dosing unit) and screw it onto a reagent bottle.

3 Attach the reagent bottle with the dosing unit onto the Titrando.

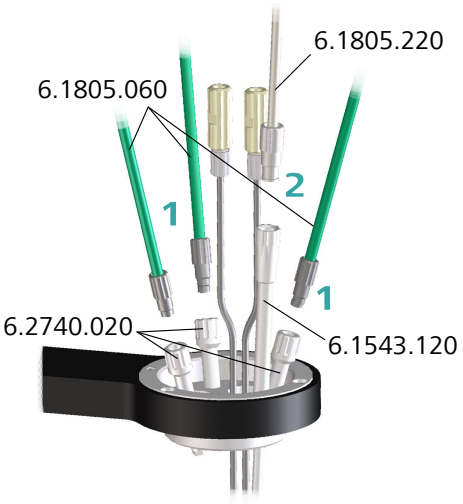
4 Connect a dosing tubing (e.g. 6.1805.130) to port 3. This tubing pumps the titrant to the titration head on tower 1.

5 Attach a Dosino (dosing drive) onto the dosing unit. Connect the connection cable of the Dosino to a MSB connector of the Titrando.

2.1.18 Equipping the titration head

Mounting the rinsing and aspiration tubing

Proceed as follows:



1 Connect the three rinsing tubings that are already connected to the distributor on tower 1 to the preinstalled rinsing nozzles on the titration head.

2 Connect the 6.1543.120 aspiration tip to the white aspiration tubing with M8 thread. The aspiration tubing is already connected to a peristaltic pump, *(see "Peristaltic pump for aspirating the titration vessels", page 25)*.

Connecting the dosing tubing, attaching the electrode and stirrer

The equipment of the titration head is completed as follows:

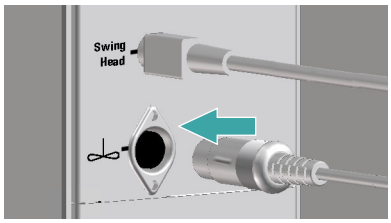
1 Connect the dosing tubing of the titrator (titrant and auxiliary solution) to the pre-mounted dosing tips on the titration head.

2 Insert an electrode with a 6.1236.020 SGJ sleeve into the titration head.

3 Insert a **802 Stirrer** rod stirrer.

4 Fasten a 6.1909.050 stirring propeller to the rod stirrer from below.

Plugging in the stirrer



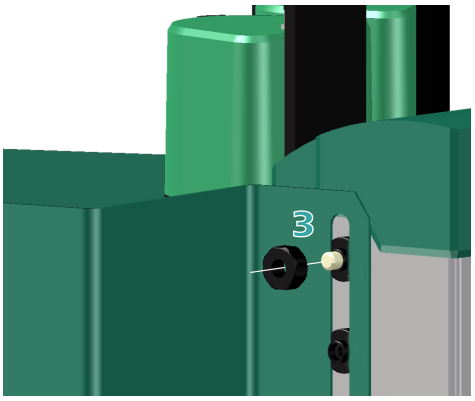
The connector for the rod stirrer is located on the rear side of the tower.

Mounting the safety shield

1 Unscrew the black nuts on both sides of tower 1.

2 Pull the green 6.2751.100 safety shield over tower 1.

3 Screw tight the safety shield with the two nuts according to the following figure.



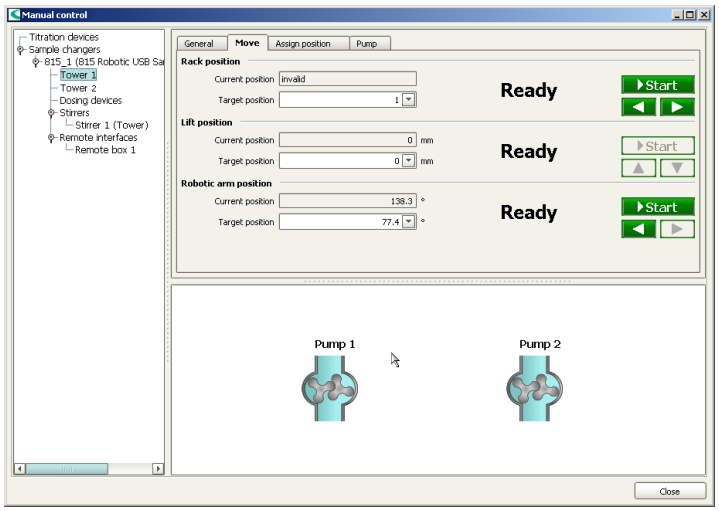
2.2 Setting lift positions

Some lift positions must be adjusted precisely in order to ensure a perfect automation sequence. Use the manual control in ***tiamo*™** for this purpose. The following section describes how you can approach the individual positions and adjust them as needed.

1 **Opening the manual control**

Click on the hand symbol in the ***tiamo*™** toolbar or select **Tools** ▸ **Manual control** in the main menu.

2 In the left-hand window, click on the **Tower 1** item under **815_1 (815 Robotic …** and then select the **Move** tab.



Work height for sample beakers

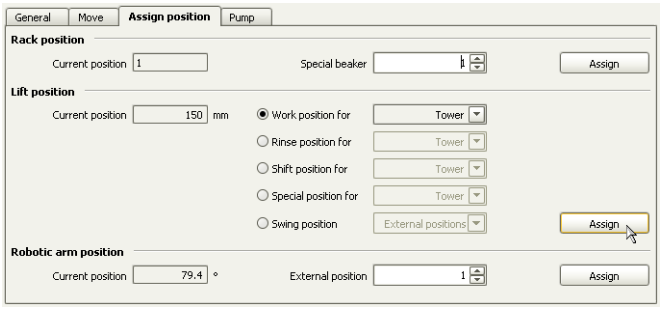
The titration head should be fully equipped with electrode, dosing tips and rinsing nozzles.

1 Move to sample position 1. Under **Rack position**, enter the **Target position** = **1** and click on **[Start]**.

2 Place a sample beaker on the established position.

3 Move the lift downward until the titration head is at a suitable height for carrying out a titration. Under **Lift position**, click on the arrow key **[Arrow down]** and also (if required) **[Arrow up]** in order to set a suitable position.

4 Switch to the **Assign position** tab.



5 Under **Lift position**, select the **Work position for** = **Tower**, if this is not yet selected.

6 Click on the associated **[Assign]** button. Observe the illustration above.

7 Switch back to the **Move** tab.

Lift position for the Polytron

1 In the manual control in the left-hand window, click on the **Tower 2** item under **815_1 (815 Robotic …)** and then select the **Move** tab.

2 Under **Rack position**, select the **Target position** = **1** and click on **[Start]**.

3 Move the lift to the **Target position** = **Work position**.

The Polytron must be at a suitable height for sample dispersion. Correct the lift position if necessary.

4 If the position has had to be corrected, switch to the **Assign position** tab.

5 Under **Lift position**, select the **Work position for** = **Tower**, if this is not yet selected.

6 Click on the associated **[Assign]** button.

7 Switch back to the **Move** tab.

Lift position for the washing station

These settings apply to tower 2.

1 Under **Robotic arm position**, select **Target position** = **External 1** and click on **[Start]**.

2 If the Polytron is not positioned over the washing station, correct the position of the robotic arm using the arrow keys **[Arrow left]** and **[Arrow right]** as necessary.

3 If the position has had to be corrected, switch to the **Assign position** tab.

4 Under **Robotic arm position**, select **External 1** and click on the associated **[Assign]** button.

5 Switch back to the **Move** tab.

6 Under **Robotic arm position**, select **External 1** and click on **[Start]**.

7 Move the lift to the **Target position** = **Work position**. Correct the lift position if necessary.

The Polytron must be positioned at the suitable height for rinsing.

If the Polytron does not fit in the middle of the washing station, the latter can be shifted laterally.

8 If the position has had to be corrected, switch to the **Assign position** tab.

9 Under **Lift position**, select the **Work position for** = **External 1**.

10 Click on the associated **[Assign]** button.

11 Switch to the **General** tab.

12 Click on **[Initialize rack]**.

3 Robotic Flexible Soliprep (2.815.2110)

3.1 Installation

These installation instructions assume that the required adjustment of turntable and Swing Heads was already performed for the concerned Robotic Sample Processor.

3.1.1 Preparing the Sample Processor

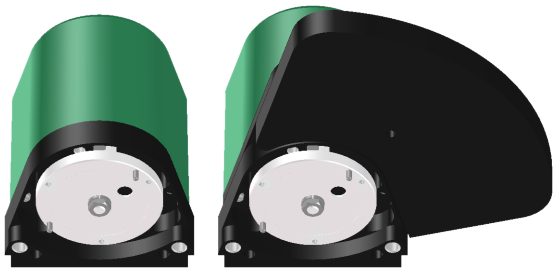
Connecting the Swing Heads

NOTICE

The necessary settings must first be made in the control software (*tiamo*) before the robotic arms can be mounted on the Swing Heads. For this purpose, the two Swing Heads are connected but the robotic arms are not yet mounted.

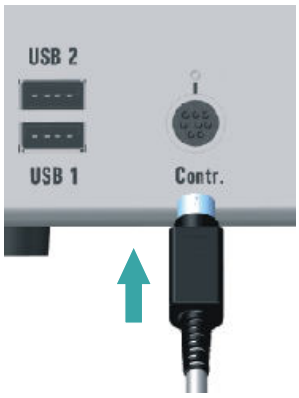
1 Connect both Swing Heads to one tower.

The connector is located in each case on the rear side of a tower.



The Swing Heads can be laid down flatly, but not with the drive disk downwards.

Connecting the controller cable

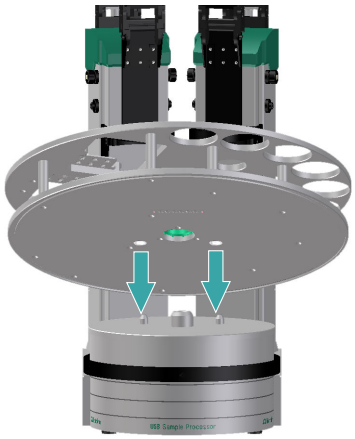


1 Connect the controller cable 6.2151.000 to the rear of the instrument.

NOTICE

The plug on the instrument end of the 6.2151.000 controller cable is protected against accidental disconnection by means of a pull-out protection feature. If you wish to pull out the plug, you first need to pull back the outer plug sleeve marked with arrows.

Attaching the sample rack



1 Attach the sample rack in such a way that both openings in the bottom of the rack engage in the guide bolts of the turntable.

2 Screw tight the handles of the sample rack.

3.1.2 Connecting the instrument to the power grid

WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 0.75 mm^2 / 18 AWG
- Power plug:
  - according to customer requirement (6.2122.XX0)
  - min. 10 A

NOTICE

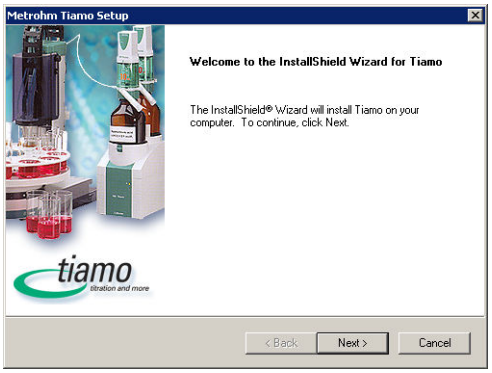
Do not use a not permitted power cord!

1 **Plugging in the power cord**

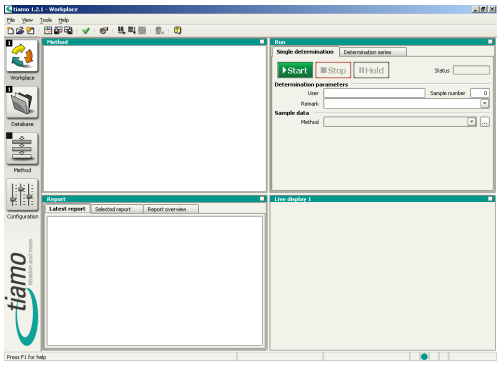
- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

3.1.3 Installing tiamo™

Installing tiamo



1 Insert the *tiamo* CD into the CD drive of the PC and carry out the installation following the instructions. Then start *tiamo*.



3.1.4 Configuring the Swing Heads

Connecting the controller cable on the computer

1 Connect the controller cable to a USB connector of the computer.

The instrument is recognized. Depending on the version of the Windows operating system used, the driver installation proceeds differently afterwards.

Either the necessary driver software is installed automatically or an installation wizard is started.

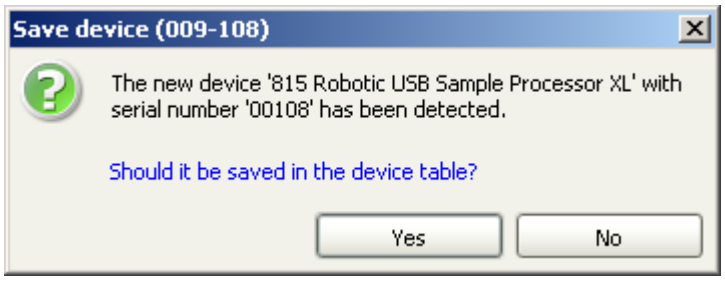
2 Follow the instructions of the installation wizard.

If problems should occur during installation, contact your company's IT support team.

Instrument registration

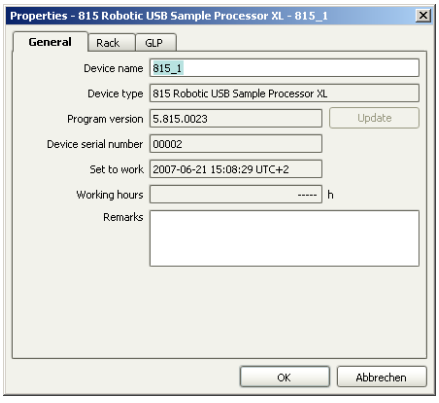
Start *tiamo*.

The USB Sample Processor is automatically recognized by *tiamo*.



1 Confirm with **[Yes]**.

The properties window for configuring the instrument is displayed.

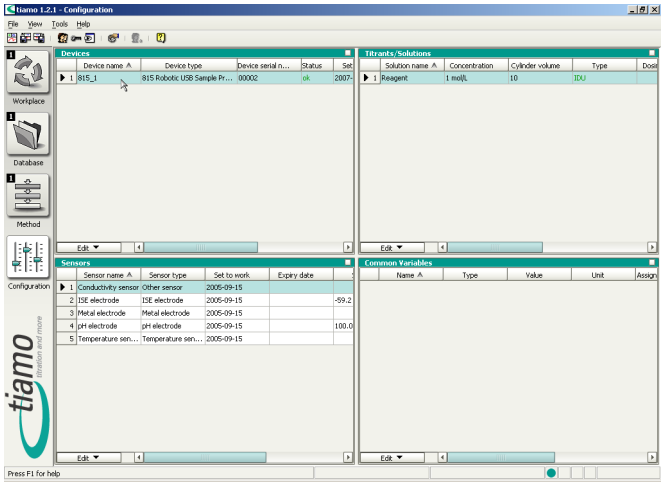


2 Confirm with **[OK]**.

Configuring the Swing Heads

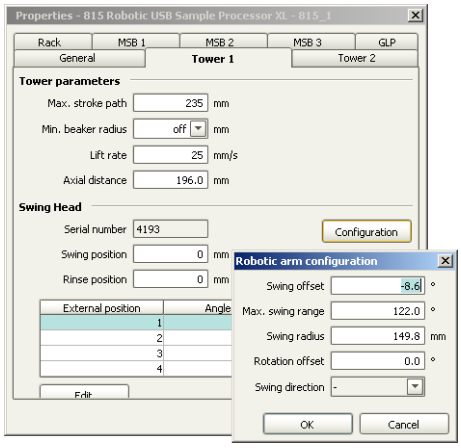
Configure the robotic arms for both towers.

1 Click on the **Configuration** symbol.



2 Double-click on the instrument name **815_1** in the **Devices** window.

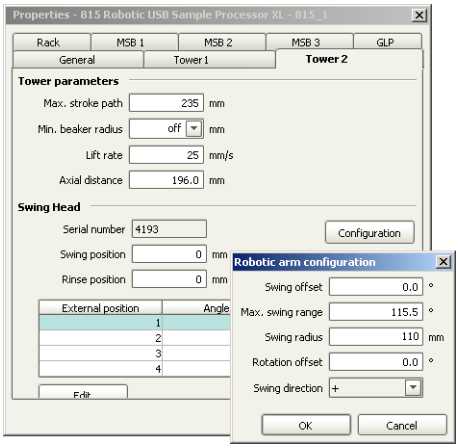
3 Click the **Tower 1** tab and then **Configuration**.



Enter the following settings:

- Swing offset = **–8.6°**
- Max. swing range = **122°**
- Swing radius = **149.8 mm**
- Rotation offset = **0.0°**
- Swing direction = **–**

4 Click the **Tower 2** tab and then **Configuration**.



Enter the following settings:

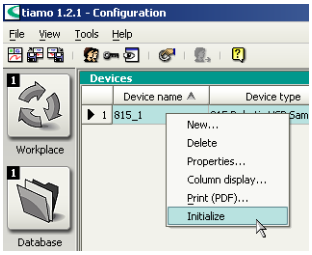
- Swing offset = **0.0°**
- Max. swing range = **115.5°**
- Swing radius = **110 mm**
- Rotation offset = **0.0°**
- Swing direction = **+**

5 Confirm the settings with **[OK]**.

For the settings to take effect, the instrument must be reinitialized.

6 Click **[OK]** on the tab.

7 Right-click on the instrument name **815_1** in the **Devices** window and click on **Initialize**.



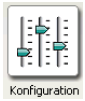
The Sample Processor is initialized. The settings of the Swing Heads and robotic arms are now activated.

3.1.5 Configuring the towers

Different lift positions must be set for lift 1 and lift 2 before process methods are generated for the 815 Robotic Soliprep.

Tower 1

Configure the position for tower 1:

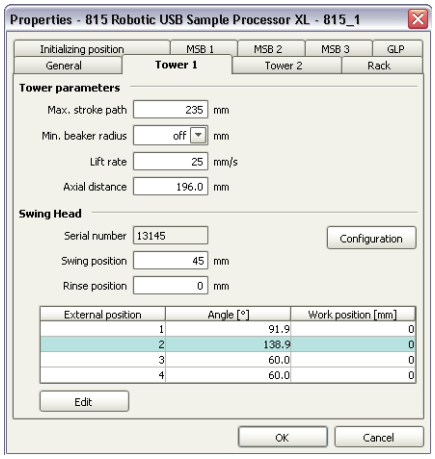


1 Double-click on the instrument name **815_1** in the **Devices** window.

2 Click the **Tower 1** tab.

3 Enter the following settings:

- Swing position = **45 mm**
- External position 1, Angle = **91.9°**
- External position 1, Work position = **0 mm**
- External position 2, Angle = **138.9°**
- External position 2, Work position = **0 mm**



Tower 2

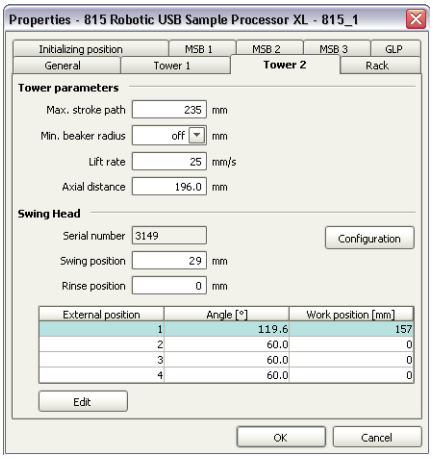
Configure the positions for tower 2:

1 Click the **Tower 2** tab.

2 Enter the following settings:

- Swing position = **29 mm**
- External position 1, Angle = **119.6°**

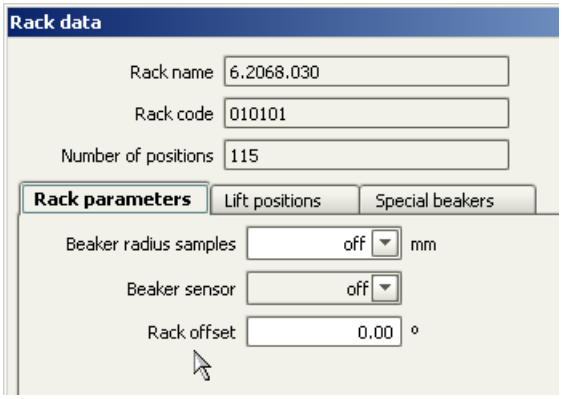
- External position 1, Work position = **157 mm**



3.1.6 Defining rack positions

Rack 6.2068.030

1 Switch over to the **Rack** tab and click on **[Rack data]** to open the rack parameter settings.

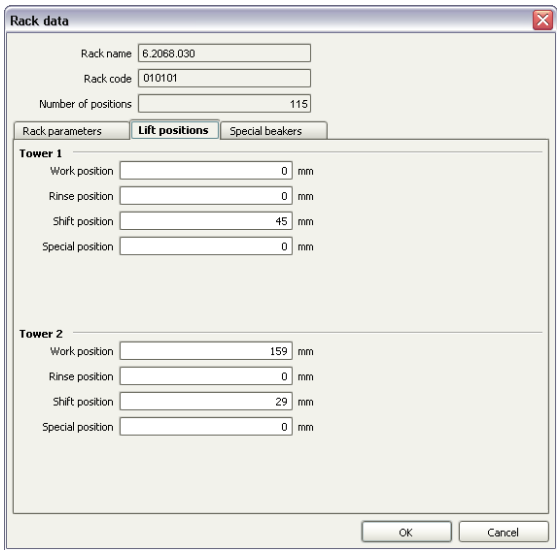


2 Switch to the **Lift positions** tab.

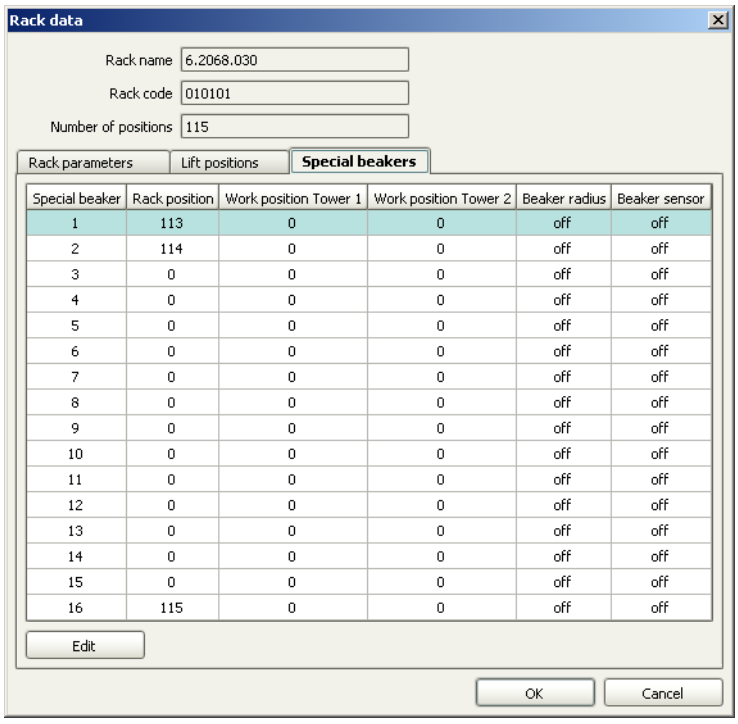
3 Under **Tower 1**, enter the value **45 mm** as Shift position.

4 Under **Tower 2**, enter the value **159 mm** as Work position.

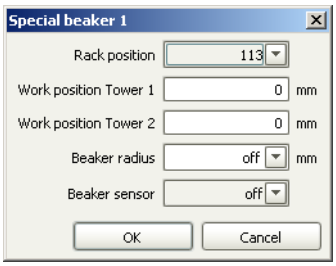
5 Under **Tower 2**, enter the value **29 mm** as Shift position.



6 Select the **Special beakers** tab.



7 Select the first line (**Special beaker1**) and click on **[Edit]**.



8 Select **113** under **Rack position** and enter the height **126 mm** under **Work position Tower 1**. Confirm with **[OK]**.

9 Select the second line (**Work position Tower 2**) and click on **[Edit]**.

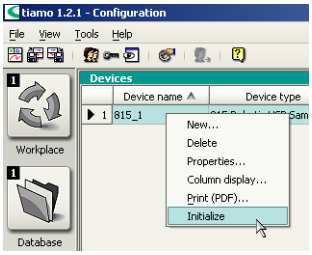
10 Select **114** under **Rack position** and enter the height **100 mm** under **Work position Tower 2**. Confirm with **[OK]**.

11 The last position of the sample rack is conceived as an **Adjusting position**. Assign rack position **115** to **Special beakers 16**.

12 Save the Rack data by clicking **[OK]**.

13 Click **[OK]** on the tab.

14 Right-click on the instrument name **815_1** in the **Devices** window and click on Initialize.



The Sample Processor is initialized. The settings made are now activated.

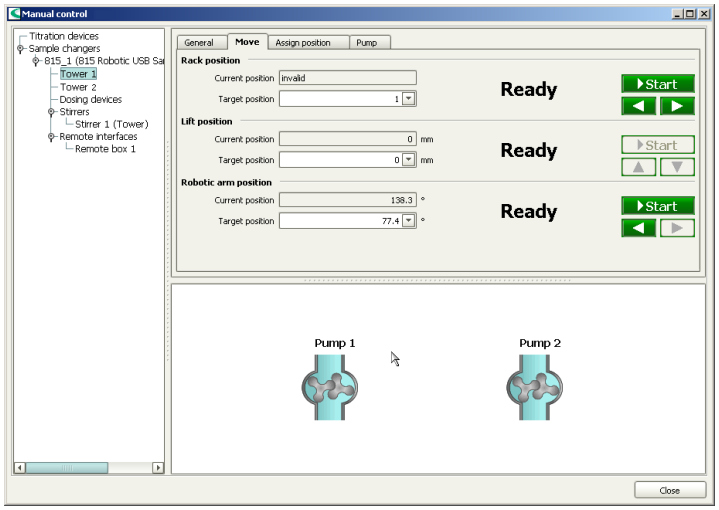
3.1.7 Mounting the Swing Heads

Preparing the towers

Both lifts must be moved to a suitable position for the mounting of the Swing Head and robotic arms to be comfortable.

1 In the toolbar of *tiamo*, click on the hand symbol or select **Tools ▸ Manual control** in the main menu.

2 In the left-hand window, under **815_1 (815 Robotic …**, click on the item **Tower 1** and then select the **Move** tab.

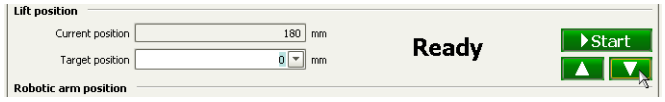


3 **Moving the lift to position**

Under **Rack position**, click on a green arrow key (left or right).

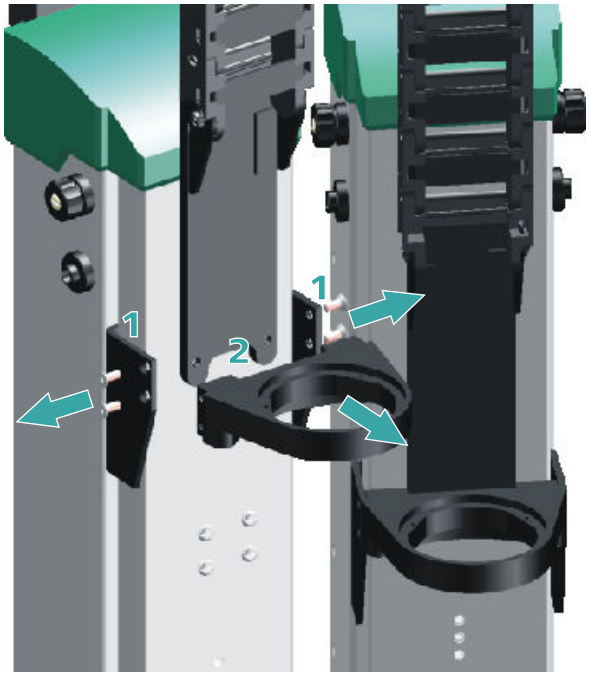
The sample rack moves to a defined position. Only now, the lift can be moved.

4 Under **Lift position**, click on the green arrow key "down" until the lift 1 has moved approx. 180 mm downwards.



Both lifts are now in a suitable position so that all screws for mounting the Swing Heads can be reached easily.

Dismounting the titration head holder



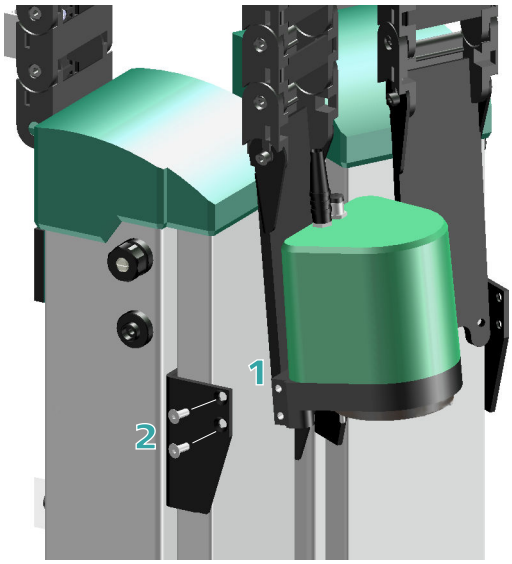
1 Unscrew the screws on the outside and inside of the holder on tower 2 (left).

2 Unscrew and remove the holder from the holder plate of the guide chain.

3 Remove the holder also on tower 1.

Use the supplied hex key. Set the screws aside for later use.

Mounting the Swing Heads

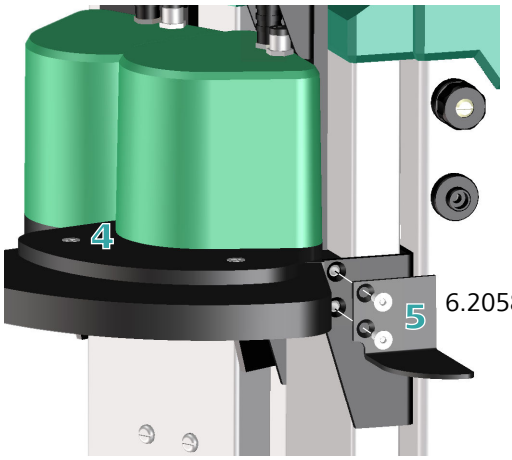


1 Screw the Swing Head without reinforcement tightly to the holder plate of the guide chain on tower 2.

2 Clamp the Swing Head between the guide jaws and screw it tight.

3 Screw the second Swing Head (with reinforcement) tightly to the holder plate of the guide chain on tower 1.

4 Clamp the Swing Head between the guide jaws and screw the two screws on the left side tight.

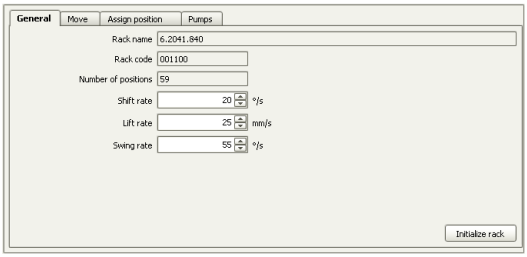


6.2058.040

5 Mount the 6.2058.040 robotic arm reinforcement on the right side fixing the Swing Head at the same time. Use the two screws provided with the robotic arm reinforcement. These are longer than the screws used previously.

Initializing the rack and Swing Heads

Both Swing Heads must be moved to the starting position for the mounting of the robotic arms.



1 On the **General** tab, click on **[Initialize rack]**.

Both lifts are moved upwards. The Swing Heads are now in the starting position.

3.1.8 Placing tubing and cables in the guide chain

Tubing and cables can be placed in the guide chain.

The guide chain contains a firmly installed clip on each chain link.

CAUTION

When mounting tubing and cables, make sure that there is no traction on the drives while moving the lift or swinging the robotic arm. Traction on the drive can overload and damage the drive.

If a robotic arm is used, we recommend placing the tubing and cables only above the third chain link in the guide chain to prevent traction on the drives.

Do **not** or only partially place rigid tubings, as for example aspiration tubings made of PTFE, into the guide chain.

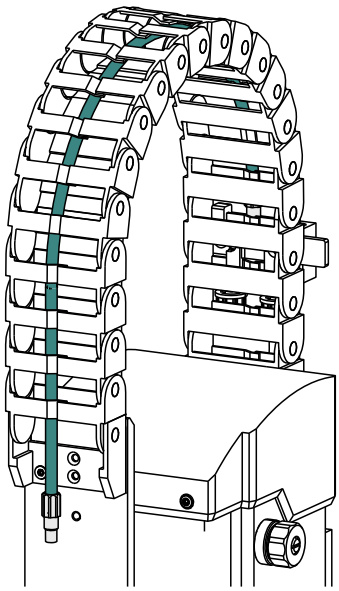
NOTICE

Make sure that tubing and cables do not kink.

Inserting and removing the tubing and cables requires no tools.

1 Placing tubing and cables

- Press one side of the clip downwards and place tubing or cables in the guide chain.



2 Removing tubing and cables

- Press one side of the clip downwards and remove tubing or cables from the guide chain.

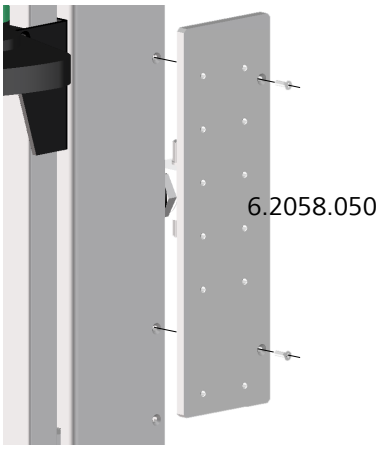
3.1.9 Mounting the deflector and the collection container

When injection needles and disposable filters are used, these need to be stripped off the robotic arm again afterwards. A deflector has been mounted for this purpose. Proceed as follows:

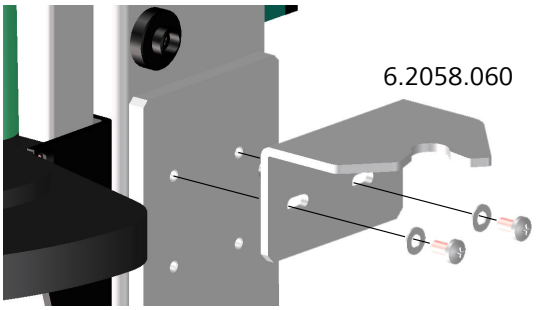
Mounting the deflector

1 Loosen the uppermost two screws on the right-hand side of tower 1.

2 Screw the 6.2058.050 fastening plate tightly with the aid of the screws supplied.

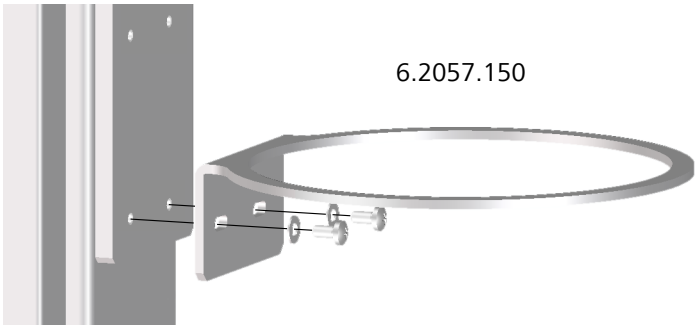


3 Screw the deflector tightly to the fastening plate with the screws and washers supplied. It is recommended that the highest position be selected. The deflector can be shifted laterally as required.

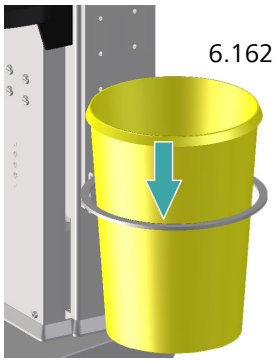


Mounting the collection container

1 Screw the 6.2057.150 holder for the collection container to the fastening plate tightly with the aid of the screws and washers supplied. It is recommended that the lowest position be selected.



2 Guide the 6.1625.010 collection container without cover into the holder.



3.1.10 Mounting the transfer robotic arm

Preparing the Swing Head

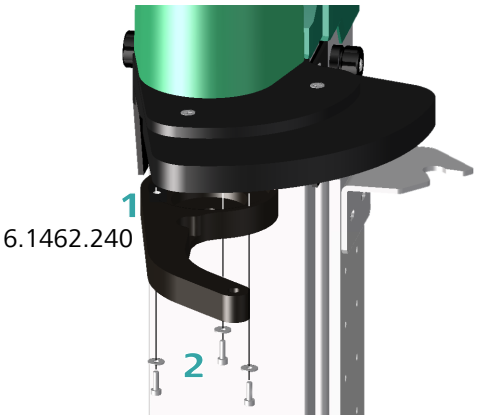
After the initialization, the drive disk of the Swing Head is positioned as though the robotic arm were located in the outermost position. In order to be able to mount the robotic arm in a favorable position, rotate the drive disk with **Manual control** in *tiamo* as follows:

1 In the sidebar of *tiamo*, click on the hand symbol.

2 In the left-hand window, under **815_1 (815 Robotic …**, click on the item **Tower 1** and then select the **Move** tab.

3 Click on the green arrow key **[Arrow left]** under **Robotic arm position** until the drive disk is no longer moving.

Mounting the robotic arm



Mount the 6.1462.240 robotic arm to tower 1 as follows:

1 Align the robotic arm parallel to the left-hand edge of the Swing Head reinforcement and graze it across the guide bolts of the drive disk of the Swing Head from below. The correct position of the arm can be found in the previous illustration.

NOTICE

Take care not to twist the drive disk and thereby put strain on the drive.

2 Tighten the robotic arm to the Swing Head with the screws and washers supplied.

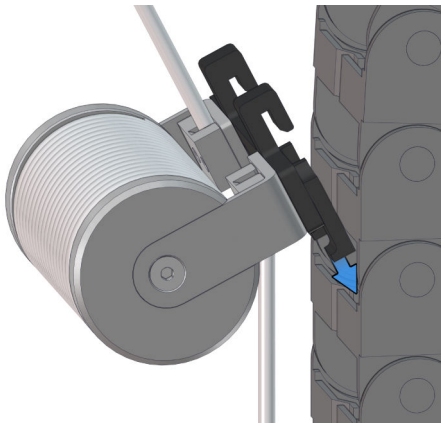
Installing the transfer tubing

The transfer tubing needs to be long enough to aspirate or eject samples. The 6.1562.130 transfer tubing holds 10-mL volumes and is installed on a holder on the guide chain of tower 1.

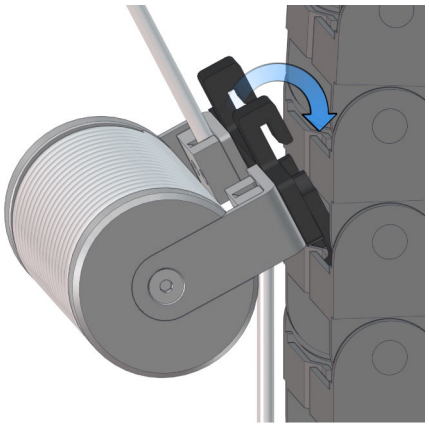
Proceed as follows to install the transfer tubing on the guide chain:

1 Attaching the holder with transfer tubing

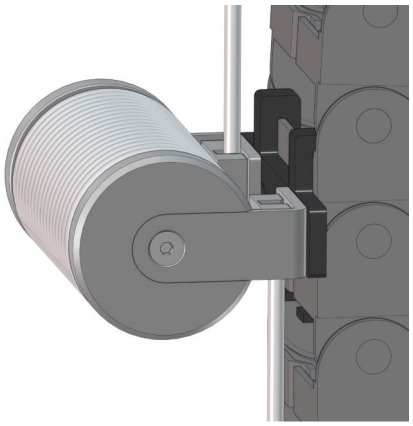
- Insert the bottom part of the holder with transfer tubing between two clips of the chain links.



- Insert the upper hook of the holder in the upper clip.

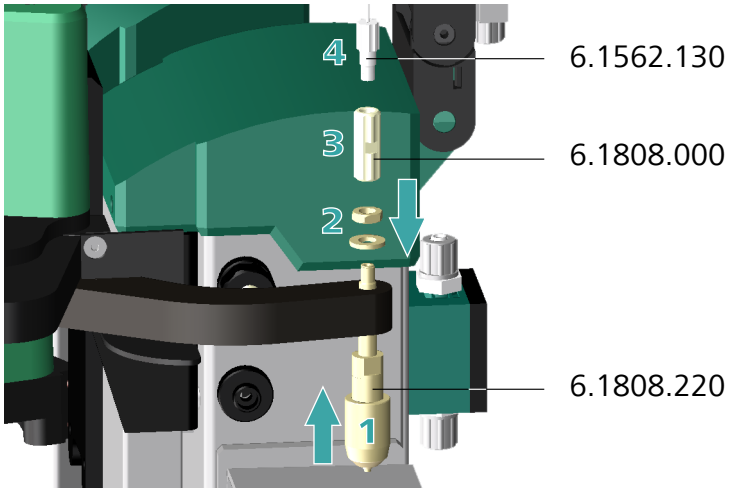


- Let the bottom part of the holder snap in the bottom clip.



Mounting the Luer adapter

The transfer robotic arm is used to pick up filters or injection needles. For this, the 6.1808.220 adapter is employed. Mount it as follows:



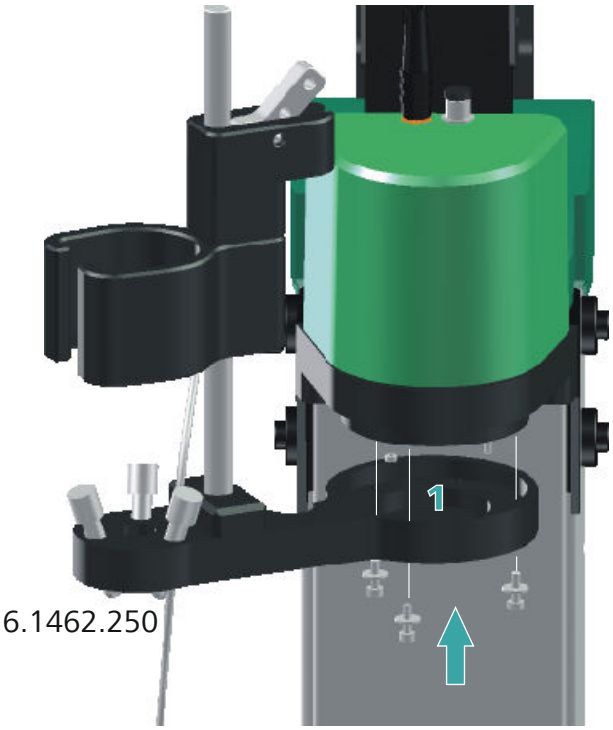
1 Unscrew the screw and washer of the adapter and insert the adapter in the robotic arm head from below.

2 Screw tight the adapter with the screw and the washer. Carefully tighten the screw with a wrench, if needed.

3 Screw the tubing adapter (with 2x M6 inner thread, supplied with the adapter) tightly onto the adapter.

4 Fasten the previously mounted 6.1562.130 transfer tubing to the 6.1808.000 tubing adapter.

3.1.11 Mounting the Polytron robotic arm



Mount the 6.1462.070 robotic arm to tower 2 as follows:

1 Hold the robotic arm in such a way that the holder faces to the left and and slip it over the guide pins of the drive disc from below. While doing so, let the robotic arm point outwards as far as possible, i.e. towards the tower - see above.

NOTICE

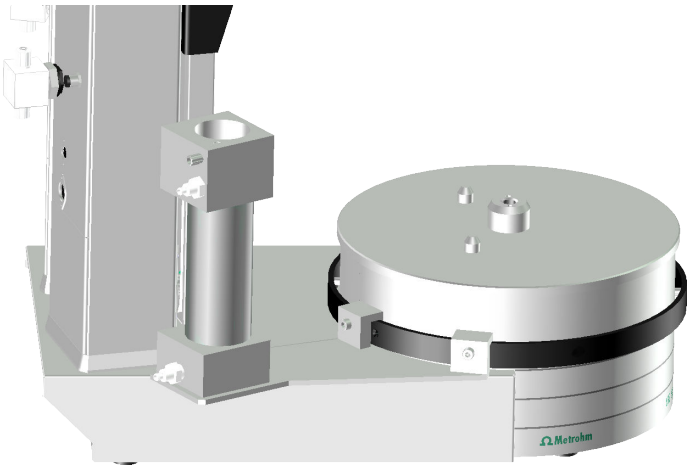
Take care to ensure that you do not twist the drive disc, thus causing pressure against the drive.

2 Screw the robotic arm to the Swing Head tightly with the screws and washers provided.

3.1.12 Washing station and drip pan

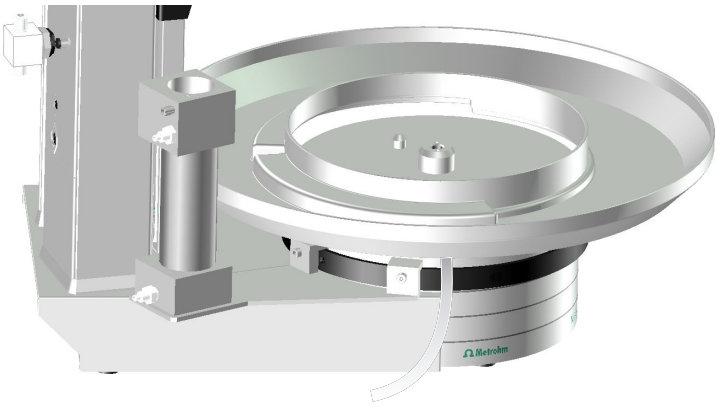
To mount the washing station and the drip pan, remove the sample rack. Now proceed as follows:

1 Mount the washing station to the left next to tower 2 on the assembly rail and screw it tightly.



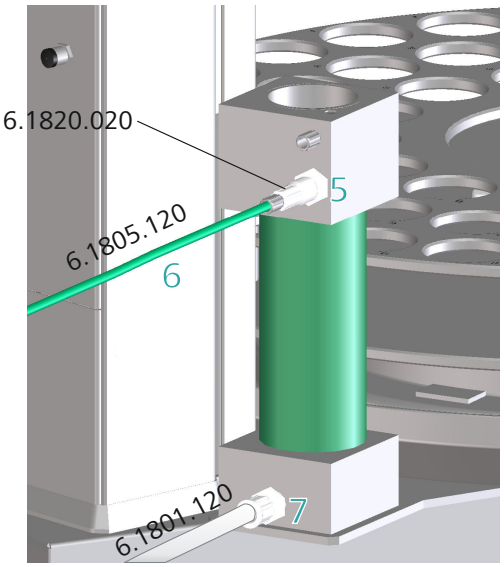
2 Fasten the enclosed tubing to the drainage nipple on the drip pan and guide the free end of the tubing into a drain or a waste container.

3 Place the drip pan over the stirrer rail. The correct alignment of the drip pan can be seen from the following illustration. Correct the position of the washing station slightly as needed.



4 Reattach the sample rack.

5 Fasten the 6.1820.020 screw connector with the M6 connector to the upper, larger tubing connector of the washing station.



6 Connect the green 6.1805.120 FEP tubing (1 m length) to the screw connector. This is the feed line of the washing station. Connect the other end of the tubing to the distributor of tower 2.

7 Fasten a 6.1812.000 PTFE tubing to the lower tubing connector of the washing station. This is the outlet of the washing station.

- Shorten the tubing to a suitable length, so that it can be connected to a peristaltic pump (772 Pump Unit).
- Remove the union nut of lower tubing connector and guide it over the end of a **6.1812.000 PTFE tubing**. You may have to extend the tubing end in order to be able to better mount the tubing, see the following note.
- Pull the end of the tubing over the connection nipple of the distributor and fasten in place with the union nut.

NOTICE

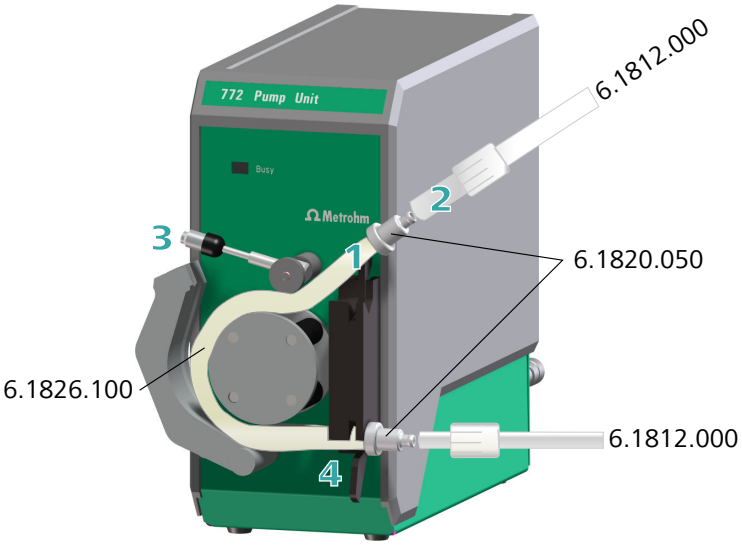
The opening of the tubing may need to be widened with a sharp object (e.g. with a Phillips screwdriver).

A piece of sandpaper may be used to get a better grip on the tubing.

Do not extend the tubing end before having slid the union nut onto the tubing.

3.1.13 Connecting and setting up the peristaltic pump

A peristaltic pump 772 Pump Unit is used for aspirating the rinsing station at tower 2.

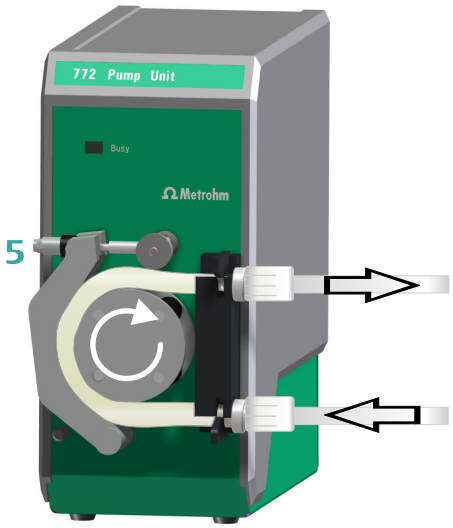


1 Cut one piece of 6.1826.100 pump tubing down to a length of approx. 17 cm and attach a 6.1820.050 tubing olive at both ends.

2 Fasten a piece of 6.1812.000 PTFE tubing leading to a waste container to one of the tubing olives. Attach the 6.1812.000 PTFE tubing that is connected to the rinsing station as a drain connection to the other tubing olive.

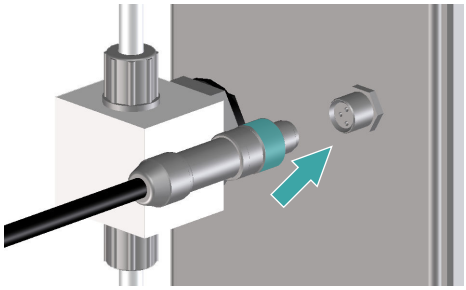
3 Release the locking lever by rotating the clamping screw and open the pressure clamp.

4 Loop the pump tubing around the rotor and fasten with the tubing clamps. The rotor turns in clockwise direction. The inlet tubing must therefore be clamped below, the outlet tube above.



5 Press on the pressure clamp and clamp tightly with the locking lever. Tighten the clamping screw until the pump tubing cannot shift position. The flow rate of the pump can be adjusted later with the clamping screw while the pump is running.

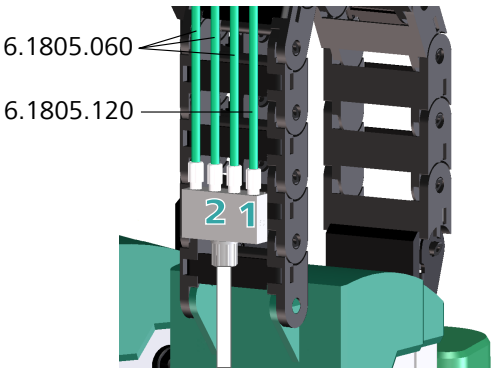
6 Connect the connection cable of the pump to tower 2.



- Plug the threaded plug of the connection cable into the connection socket **Ext. Pump 2** on the rear of the tower.
  Correct alignment of the 3 contact pins must be observed.
- Tighten the knurled screw at the front end of the plug by hand in clockwise direction. This will secure the plug.

3.1.14 Setting up the rinsing tubing

Rinsing tubing at tower 2



Install the tubing for rinsing the rinsing station as follows:

1 Connect the green inlet tubing (6.1805.120) of the rinsing station to one of the four connectors on the tower 2 distributor.

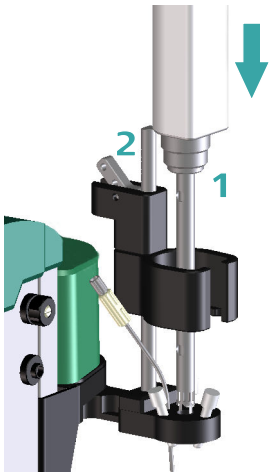
2 Connect three pieces of 6.1805.060 tubing (60 cm) to the tower 2 distributor.

3 Connect a 6.1812.000 PTFE tubing to the tower 2 valve. Connect the other end of the tubing to a canister with rinsing liquid (e.g. water).

3.1.15 Assembling and mounting the Polytron® drive

Please consult the Polytron user manual for details how to mount the aggregate to the **Polytron PT 1300 D**.

Mounting the Polytron



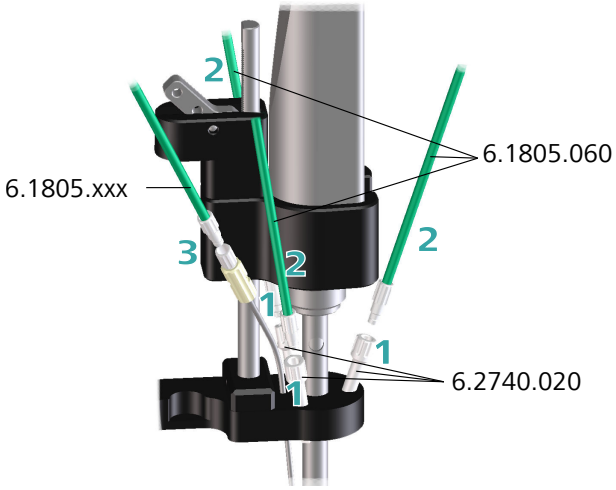
Mount the Polytron as follows:

1 Insert the Polytron with the aggregate already mounted into the robotic arm holder on tower 2 from above.

2 Readjust the position of the holder if necessary. Press down the fixing lever of the holder to accomplish this.

3.1.16 Mounting the rinsing tubings for the Polytron®

For rinsing the Polytron aggregate rinsing nozzles must be mounted on the robotic arm. Proceed as follows:



1 Replace the three stoppers on the Polytron robotic arm with 6.2740.020 rinsing nozzles.

2 Connect the three rinsing tubings that are connected to the tower 2 distributor to the rinsing nozzles.

3 The preinstalled tubing of the robotic arm can be used to add solvent to the sample.

3.1.17 Connecting the Polytron®

The **Polytron® PT 1300 D** is comprised of a control module and a dispersion drive with dispersion aggregate for mixing and shredding solid samples. The control device is directed by a PC software, e.g. ***tiamo™***, via a serial RS-232 connector.

Please refer to the operating instructions of the Polytron for details regarding connecting. The Polytron is connected as follows:

1 ▪ Connect the connecting cable of the dispersion device to the front of the control module.

2 ▪ Check the set supply voltage on the connection socket on the rear side of the control module.
▪ Switch off the instrument.
▪ Plug in the power supply cable and connect to a socket.

3 ▪ Connect the 6.2134.110 RS-232 connection cable to the 9-pin connection socket on the rear side of the control module.
▪ Plug in the other end of the cable to the COM1 or COM2 port on the PC. The port on the PC is usually marked with **IOIOI**.
If the PC has no serial interface, then a USB port on the PC can be used with the aid of an RS-232/USB converter (e.g. the 2.145.0320 Edgeport).

NOTICE

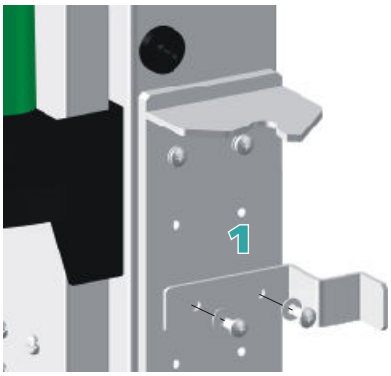
The Polytron must be registered manually in ***tiamo*™** as an RS-232 device.

3.1.18 Mounting the safety shield

Safety shield 6.2751.150

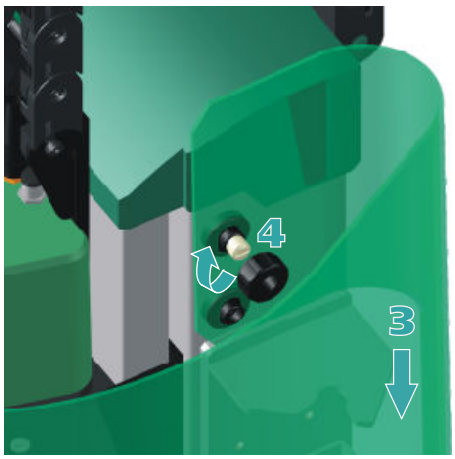
The 815 Robotic Soliprep may not be operated without a safety shield. Install it as follows:

1 Mounting the spacer for the safety shield with the screws supplied to tower 1 according to the following figure.



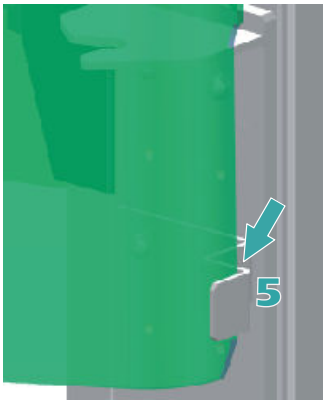
2 Unscrew the black nuts on both sides of tower 1.

3 Pull the green 6.2751.150 safety shield over tower 1, starting from the top.



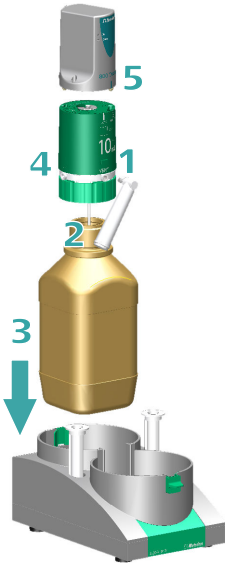
4 Screw the safety shield tightly with the two nuts as shown in the following illustration.

5 Adjust the safety shield on the spacer, see the following figure.



3.1.19 Installing the Dosino

A Dosino with a 10 mL dosing unit is used for transferring the sample. It is installed as follows:



1 Screw an adsorber tube filled with cotton to the **Vent** connector on the dosing unit.

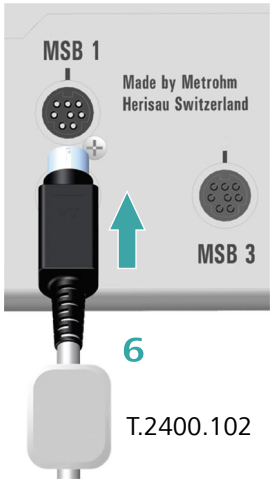
2 Equip the 10 mL dosing unit with a filling tube (Port 2 on the underside of the dosing unit) and screw it onto the 6.1608.023 amber glass bottle (with GL 45 thread). The bottle should be filled with the solvent (water or an organic solvent) which is also used for sample dispersion.

3 Place the bottle with the dosing unit into the 6.2061.010 bottle holder.

4 Connect the transfer tubing to tower 1 with the end that is still free to Port 1 on the dosing unit.

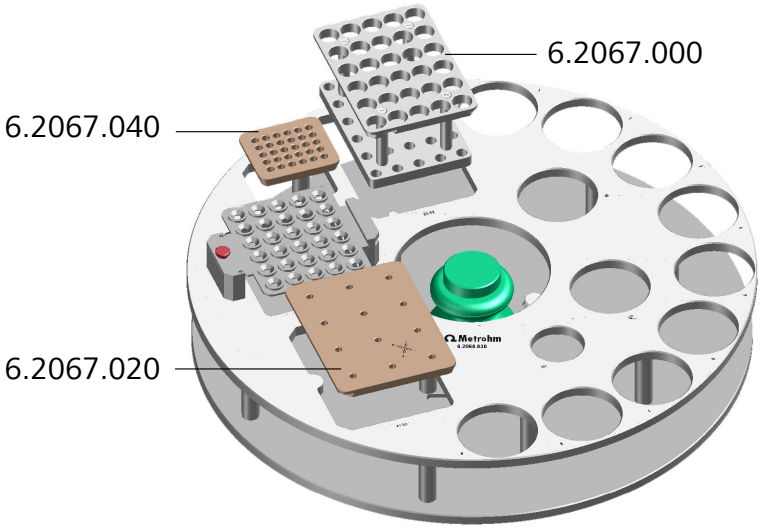
5 Attach the Dosino (dosing drive) onto the dosing unit.

6 Equip the connection cable of the Dosino with an anti-interference adapter made of ferrite (T.2400.102) (see figure) and connect it to the **MSB 1** connector on the rear of the Sample Processor.



3.1.20 Equipping the rack

In addition to sample vessels, the sample rack can also be equipped with various **Inserts**, which can act as receptacles for various utensils.

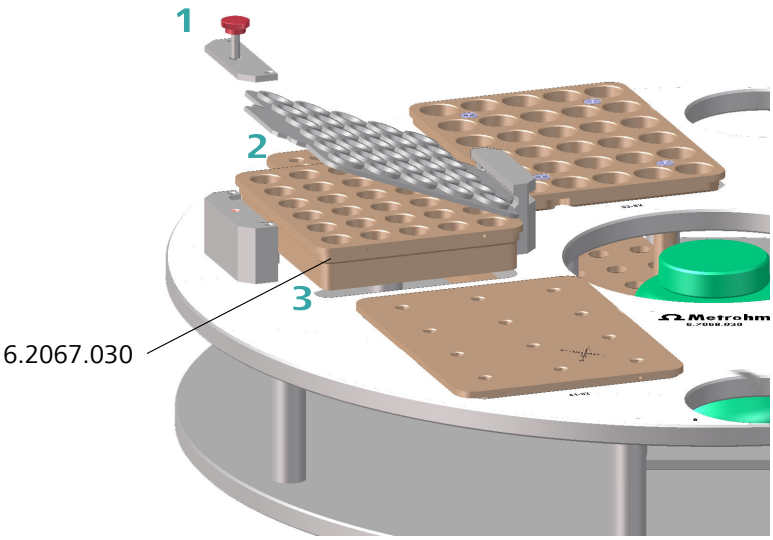


The inserts shown above are:

- 6.2067.000 - Insert for 6.2743.050 sample vessel (11 mL)
- 6.2067.040 - Insert for injection needles with Luer connector (maximum length 50 mm)
- 6.2067.020 - Insert for disposable membrane filters with Luer connector (maximum diameter 30 mm). This insert has a positioning reticle for adjusting the rack and the robotic arm.

Each insert is provided with a recess that prevents it from being inserted with the incorrect alignment.

An insert is provided for sample vials which can be fixed in place with a retaining plate and centering aids for injection needles.



The insert for sample vials (Type ND11, for 1.5 mL volumes) is installed as follows:

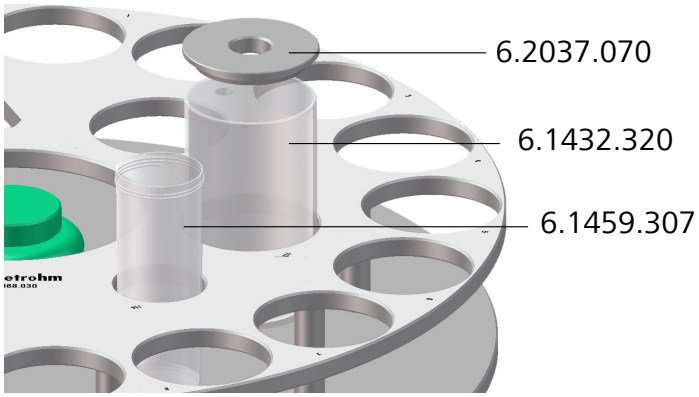
1 Loosen the red knurled screw and the fixing platelet.

2 Raise the retaining plate with the centering aid on the left-hand side and pull it out of the holder.

3 Place the insert 6.2067.030 in the opening. Observe the recess while doing so.

The retaining plate can then be guided back into the holder and fastened with the fixing platelet and the knurled screw.

Two positions on the sample rack are reserved for rinsing and waste beakers.



The lid with the hole belongs on the waste beaker, into which a preliminary filtrate of the sample solution is to be disposed of when membrane filters are used. The filter can be placed on the hole in the lid with the

robotic arm and pressure can be applied to force the sample solution through the filter.

3.2 Adjusting rack and robotic arm

The Luer adapter on the robotic arm must be positioned precisely for picking up membrane filters or syringe needles. In order to ensure this, it is necessary to align the sample rack and the robotic arm precisely in relation to one another.

The *tiamo* control software allows the user to enter a so-called "offset" in the configuration of a robotic arm or a sample rack (rack table). This allows fine-tuning to be performed.

The adjustment needs to be made when sample racks with inserts for membrane filters (e.g. 6.2068.020 and 6.2068.030) are used. These inserts feature a "positioning reticule". This is the adjusting position.

Preparing the Sample Processor

Proceed as follows:

1. Put the sample rack in place.

   The insert (or the inserts) for membrane filters must be in place.

2. Start *tiamo*.

3. Open the manual control with a click on the corresponding symbol in the toolbar.

4. Select **Tower 1** under **Sample changer ▸ 815_1**.

5. Click on **[Initialize rack]**.

   The sample rack moves into starting position. The rack code is read and the rack table is loaded.

Moving to the positioning reticle

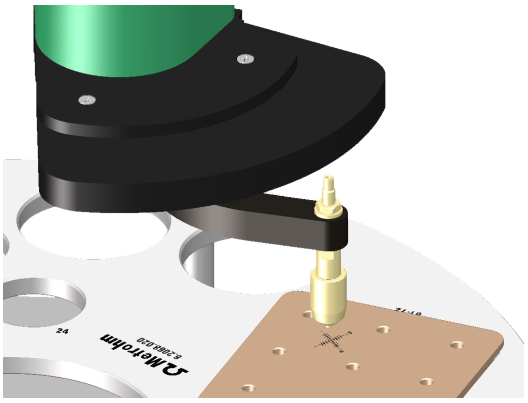
Proceed as follows:

1. In the **Manual control** in *tiamo*, switch to the **Move** tab.

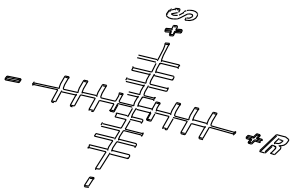
2 Under **Rack position**, select the target position **Special beaker 16** and click on **[Start]**.

It is also possible to specify the target position as absolute rack position. For the **6.2068.020** sample rack, the adjusting position no. is **105**; for the **6.2068.030** sample rack the adjusting position no. is **115**.

3 Enter **160 mm** as target position under **Lift position** and click on **[Start]**. Afterwards, move the lift further downward, one millimeter at a time, until the robotic arm with the Luer adapter is located precisely above the positioning reticle.



The positioning reticle



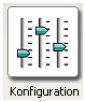
The positioning reticle shows the directions of movement for the rack (**R**) and the Swing Head (**S**). The tick marks stand for approx. 0.5° rotation angle or swivelling angle deviation.

Determine the deviation of the adapter tip from the middle of the positioning reticle.

You can make the corresponding corrections in the *tiamo* configuration afterwards.

Correcting the swing offset

If there is a deviation on the **S line**, then proceed as follows:

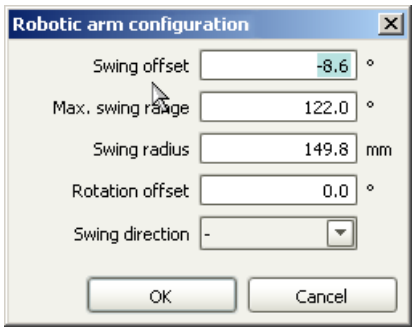


1 Select **Configuration** in *tiamo*.

2 Double-click on the instrument name **815_1**.

3 Switch over to the **Tower 1** tab and open the robotic arm settings with a click on **[Configuration]**.

Confirm the safety prompt with **[Yes]**.



4 Correct the value for **Swing offset** according to the observed deviation from the positioning reticle. One tick mark corresponds to approx. 0.5°.

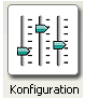
5 Close both the robotic arm configuration and the properties dialog of the Sample Processor with **[OK]**.

6 In the manual control, select the same rack position again and lower the lift down to the positioning reticle.

Now the adapter tip should point to the middle of the positioning reticle. If this is not the case, then an additional correction must be made and/or the rack offset needs to be corrected.

Correcting the rack offset

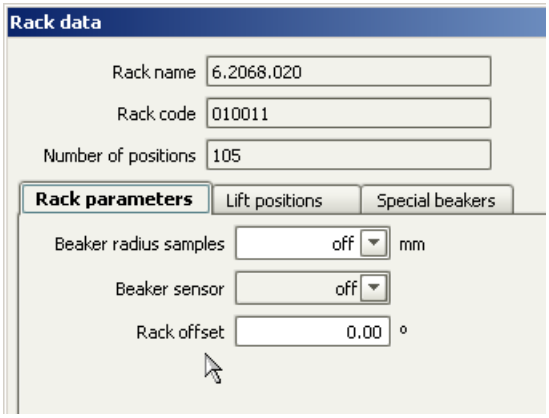
If there is a deviation on the **R Line**, proceed as follows:



1 Select **Configuration** in *tiamo*.

2 Double-click on the instrument name **815_1**.

3 Switch over to the **Rack** tab and open the rack parameter settings with a click on **[Rack data]**.



4 Correct the value for **Rack offset** according to the observed deviation from the positioning reticle. One tick mark corresponds to approx. 0.5°.

5 Close both the rack data configuration and the properties dialog of the Sample Processor with **[OK]**.

6 In the manual control, select the same rack position again and lower the lift down to the positioning reticle.

Now the adapter tip should point to the middle of the positioning reticle. If this is not the case, then an additional correction must be made.

3.3 Setting lift positions

Some lift positions must be adjusted precisely in order to ensure a perfect automation sequence. Use the manual control in ***tiamo***™ for this purpose. The following section describes how you can approach the individual positions and adjust them as needed.

The sample rack must be charged with all of the inserts.

Lift positions as method variables

The required lift positions that have not been determined in the 815 Robotic Soliprep configuration *(see chapter 3.1.5, page 45)* are defined as method variables in the method **815 Robotic Flexible Soliprep - standard method**.

This applies to the following positions:

Variable name	Position in mm
take needle	180
aspirate sample	150
take filter	167
put filter	127
waste tool	33
aspirate filtered	138
needle in vial	128
aspirate pressure	115

To find the method variables, proceed as follows:

1 Click on the **Method** symbol in the ***tiamo*™** sidebar.

2 Click on **Open...** in the **File** menu.

3 Select **815 Robotic Flexible Soliprep - standard method** from the list of available methods and click on **[Open]**.

4 Double-click on the **START - Main track** symbol.

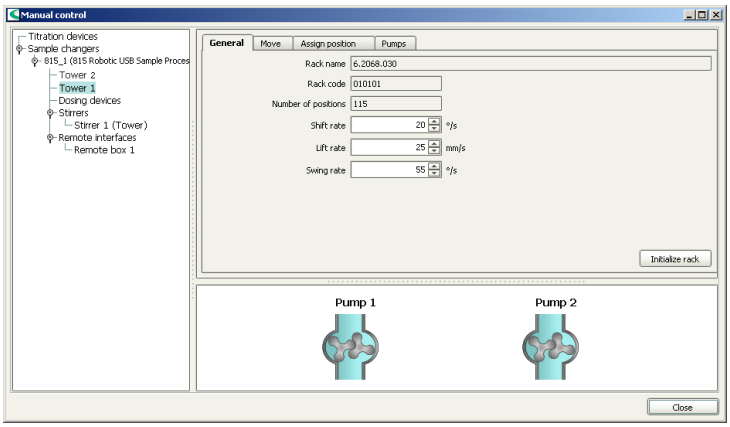
5 Click on the **Method variables** tab.

The values of the variables can be changed in this table as necessary.

Opening the manual control

1 Click on the hand symbol in the ***tiamo*™** sidebar.

2 In the left-hand window, click on the **Tower 1** item under **815_1 (815 Robotic ...)** and then select the **Move** tab.



Work height for sample beakers

1. Move to sample position 1. Under **Rack position**, enter the **Target position** = **1** and click on **[Start]**.

2. Fasten a syringe needle to the Luer adapter of the transfer robotic arm.

3. Move the lift to the appropriate height for aspirating the dispersed sample. Under **Lift position**, enter the **Target position** = **150 mm** and click on **[Start]**.

   If the needle is not in a suitable position afterwards, correct the value for the **aspirate sample** method variable in the method. Repeat this step.

4. Remove the needle from the Luer adapter.

Lift position for picking up needles and filters

1. Under **Rack position**, enter the **Target position** = **11** and click on **[Start]**.

2. Place a syringe needle in the established position in the insert.

3. Under **Lift position**, enter the **Target position** = **180 mm** and click on **[Start]**. The Luer adapter must grasp the needle and secure it in place.

4 If the needle does not sit flush on the adapter, move the lift one millimeter at a time using the arrow key **[Arrow down]** (or **[Arrow up]**). The lift must not, however, be lowered too far, because otherwise the lift drive could become overloaded and suffer damage.

If necessary, correct the value of the **take needle** method variable in the method.

5 Move the lift upward and remove the needle.

6 Under **Rack position**, enter the **Target position** = **41** and click on **[Start]**.

7 Place a membrane filter on the established position in the insert.

8 Move the lift to the **Target position** = **167 mm**. The Luer adapter must grasp the filter and secure it in place.

9 If the filter does not sit flush on the adapter, move the lift one millimeter at a time using the arrow key **[Arrow down]** (or **[Arrow up]**). The lift must not, however, be lowered too far, because otherwise the lift drive could become overloaded and suffer damage.

If necessary, correct the value of the **take filter** method variable in the method.

10 Move the lift upward and remove the filter.

Lift positions for sample vials

1 Under **Rack position**, enter the **Target position** = **53** and click on **[Start]**.

2 Place a sample vial in the established position in the insert.

3 Fasten a syringe needle to the Luer adapter of the transfer robotic arm.

4 Move the lift to the **Target position 138 mm**. The needle must be at a suitable height for aspirating the filtered sample.

5 Correct the lift position and the respective **aspirate filtered** method variable if necessary.

6 Move the lift upward and remove the needle.

7 Fasten a membrane filter to the Luer adapter of the transfer robotic arm.

8 Move the lift to the **Target position** = **127 mm**. The filter must rest on the sample vial.

9 Correct the lift position and the respective **put filter** method variable if necessary.

10 Move the lift upward and remove the filter.

Lift position for vials

1 Under **Rack position**, enter the **Target position** = **83** and click on **[Start]**.

2 Place a sealed sample vial in the established position in the insert.

3 Fasten a syringe needle to the Luer adapter of the transfer robotic arm.

4 Move the lift to the **Target position** = **128 mm**.

The needle must perforate the vial and be at a suitable height for releasing the filtered sample.

5 Correct the lift position and the respective **needle in vial** method variable if necessary.

6 Move the lift to the **Target position** = **115 mm**.

The needle tip must be located above the sample liquid in the vial.

7 Correct the lift position and the respective **aspirate pressure** method variable if necessary.

8 Move the lift upward and remove the needle.

Lift positions for special beakers

1 Under **Rack position**, enter the **Target position** = **Special beaker 1** and click on **[Start]**.

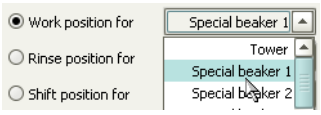
2 Place a sample beaker on the established position. Lay the cover with the hole on the sample beaker.

3 Fasten a membrane filter to the Luer adapter of the transfer robotic arm.

4 Move the lift to the **Target position** = **Work position**. The filter must rest on the cover of the sample beaker. Correct the lift position if necessary.

5 If the position has had to be corrected, switch to the **Assign position** tab.

6 Select the **Work position for** = **Special beaker 1** in the **Lift position** field.



7 Click on the associated **[Assign]** button.

8 Switch back to the **Move** tab.

9 In the manual control in the left-hand window, click on the **Tower 2** item under **815_1 (815 Robotic ...)** and then select the **Move** tab.

10 Under **Rack position**, enter the **Target position** = **Special beaker 2** and click on **[Start]**.

11 Place a suitable sample beaker on the established position and fill it with a sponge or a crushed absorbent paper towel. This is to be used to dab off the moist Polytron aggregate.

12 Move the lift to the **Target position** = **Work position**. The Polytron aggregate must sufficiently come into contact with the absorbent material. Correct the lift position if necessary.

13 If the position has had to be corrected, switch to the **Assign position** tab.

14 Select the **Work position for** = **Special beaker 2** in the **Lift position** field.

15 Click on the associated **[Assign]** button.

16 Switch back to the **Move** tab.

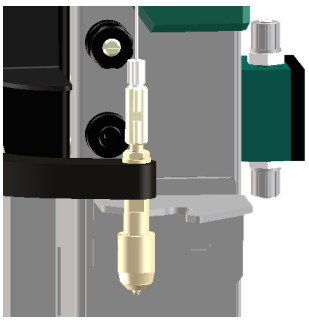
Lift positions for stripping needles and filters

1 In the manual control in the left-hand window, click on the **Tower 1** item under **815_1 (815 Robotic …)** and then select the **Move** tab.

2 Fasten a syringe needle or a membrane filter to the Luer adapter of the transfer robotic arm.

3 Under **Robotic arm position**, select the **Target position** = **External 1** and click on **[Start]**.

4 Move the lift downward until the thick sleeve of the Luer adapter is approx. 1 cm underneath the deflector. Under **Lift position**, click on the arrow key **[Arrow down]** and also (if required) **[Arrow up]** in order to set a suitable position.



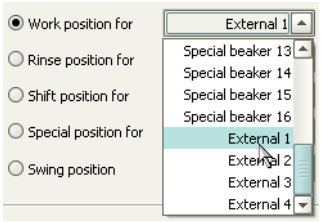
The Luer adapter must be positioned at a distance of approx. 2 cm from the deflector. Its thick sleeve must be positioned approx. 1 cm

beneath the deflector in order for the adapter to move into the opening of the deflector.

5 To correct the position of the Luer adapter, correct the lift position with the arrow keys **[Arrow down]** and **[Arrow up]** first. Then correct the position of the robotic arm using the arrow keys **[Arrow left]** and **[Arrow right]**.

6 Switch to the **Assign position** tab.

7 Select the **Work position for** = **External 1** in the **Lift position** field.



8 Click on the associated **[Assign]** button.

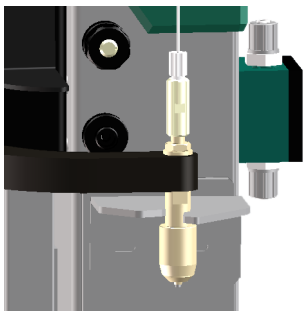
9 If the position of the robotic arm has been changed, select **External 1** under **Robotic arm position**.

10 Click on the associated **[Assign]** button.

11 Switch back to the **Assign position** tab.

12 Under **Robotic arm position**, select **External 2** as **Target position** and click on **[Start]**.

The Luer adapter should now be located in the opening of the deflector and touch it on the right.



13 Correct the position of the robotic arm as necessary using the arrow keys **[Arrow left]** and **[Arrow right]**.

14 If the position has had to be corrected, switch to the **Assign position** tab.

15 Under **Robotic arm position**, select the **External position** = **2** and click on the associated **[Assign]** button.

16 Switch back to the **Move** tab.

17 Under **Robotic arm position**, select the **Target position** = **External 2** and click on **[Start]**.

18 Move the lift upward (arrow key **[Arrow up]**) until the needle or the filter is stripped off and falls into the collection container. Do not move the lift too far upward.

19 Switch to the **Assign position** tab.

20 Under **Lift position**, select the **Work position for** = **External 2**.

21 Click on the associated **[Assign]** button.

22 Switch back to the **Move** tab.

23 Move the lift approx. 1 cm downward.

24 Under **Robotic arm position**, select **External 1** as **Target position** and click on **[Start]**.

Lift position for the Polytron

1 In the manual control in the left-hand window, click on the **Tower 2** item under **815_1 (815 Robotic …)** and then select the **Move** tab.

2 Under **Rack position**, select the **Target position** = **1** and click on **[Start]**.

3 Move the lift to the **Target position** = **Work position**.

The Polytron must be at a suitable height for sample dispersion. Correct the lift position if necessary.

4 If the position has had to be corrected, switch to the **Assign position** tab.

5 Under **Lift position**, select the **Work position for** = **Tower**, if this is not yet selected.

6 Click on the associated **[Assign]** button.

7 Switch back to the **Move** tab.

Lift position for the washing station

These settings apply to tower 2.

1 Under **Robotic arm position**, select **Target position** = **External 1** and click on **[Start]**.

2 If the Polytron is not positioned over the washing station, correct the position of the robotic arm using the arrow keys **[Arrow left]** and **[Arrow right]** as necessary.

3 If the position has had to be corrected, switch to the **Assign position** tab.

4 Under **Robotic arm position**, select **External 1** and click on the associated **[Assign]** button.

5 Switch back to the **Move** tab.

6 Under **Robotic arm position**, select **External 1** and click on **[Start]**.

7 Move the lift to the **Target position** = **Work position**. Correct the lift position if necessary.

The Polytron must be positioned at the suitable height for rinsing.

If the Polytron does not fit in the middle of the washing station, the latter can be shifted laterally.

8 If the position has had to be corrected, switch to the **Assign position** tab.

9 Under **Lift position**, select the **Work position for** = **External 1**.

10 Click on the associated **[Assign]** button.

11 Switch to the **General** tab.

12 Click on **[Initialize rack]**.

4 Robotic Filtration Soliprep 2.815.3110

4.1 Installation

These installation instructions assume that the required adjustment of turntable and Swing Heads was already performed for the concerned Robotic Sample Processor.

4.1.1 Preparing the Sample Processor

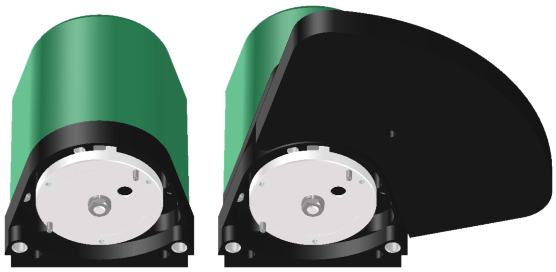
Connecting the Swing Heads

NOTICE

The necessary settings must first be made in the control software (*tiamo*) before the robotic arms can be mounted on the Swing Heads. For this purpose, the two Swing Heads are connected but the robotic arms are not yet mounted.

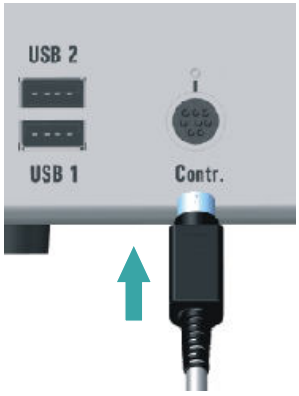
1 Connect both Swing Heads to one tower.

The connector is located in each case on the rear side of a tower.



The Swing Heads can be laid down flatly, but not with the drive disk downwards.

Connecting the controller cable

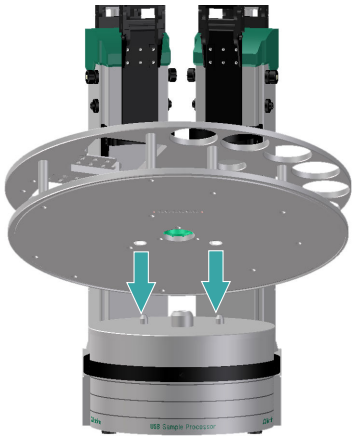


1 Connect the controller cable 6.2151.000 to the rear of the instrument.

NOTICE

The plug on the instrument end of the 6.2151.000 controller cable is protected against accidental disconnection by means of a pull-out protection feature. If you wish to pull out the plug, you first need to pull back the outer plug sleeve marked with arrows.

Attaching the sample rack



1 Attach the sample rack in such a way that both openings in the bottom of the rack engage in the guide bolts of the turntable.

2 Screw tight the handles of the sample rack.

4.1.2 Connecting the instrument to the power grid

WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 0.75 mm^2 / 18 AWG
- Power plug:
  - according to customer requirement (6.2122.XX0)
  - min. 10 A

NOTICE

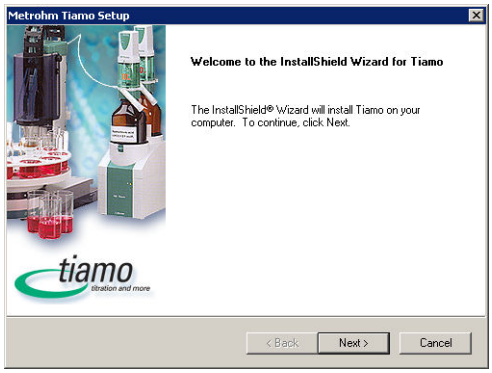
Do not use a not permitted power cord!

1 Plugging in the power cord

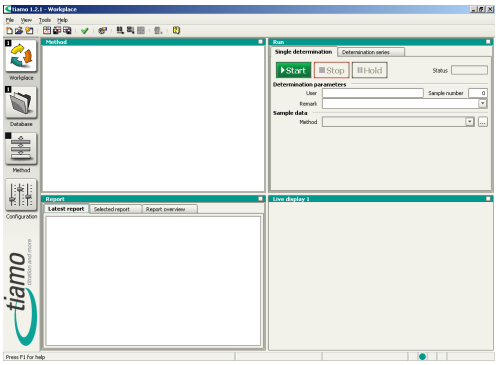
- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

4.1.3 Installing tiamo™

Installing tiamo



1 Insert the *tiamo* CD into the CD drive of the PC and carry out the installation following the instructions. Then start *tiamo*.



4.1.4 Configuring the Swing Heads

Connecting the controller cable on the computer

1 Connect the controller cable to a USB connector of the computer.

The instrument is recognized. Depending on the version of the Windows operating system used, the driver installation proceeds differently afterwards.

Either the necessary driver software is installed automatically or an installation wizard is started.

2 Follow the instructions of the installation wizard.

If problems should occur during installation, contact your company's IT support team.

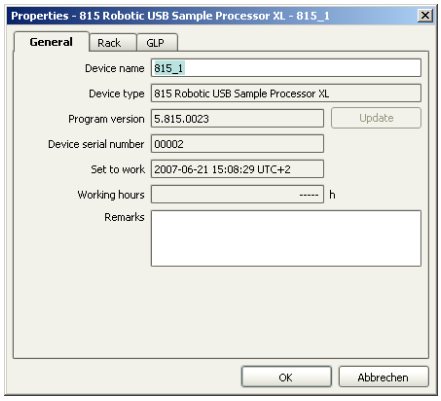
Instrument registration

Start *tiamo*.

The USB Sample Processor is automatically recognized by *tiamo*.

1 Confirm with **[Yes]**.

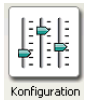
The properties window for configuring the instrument is displayed.



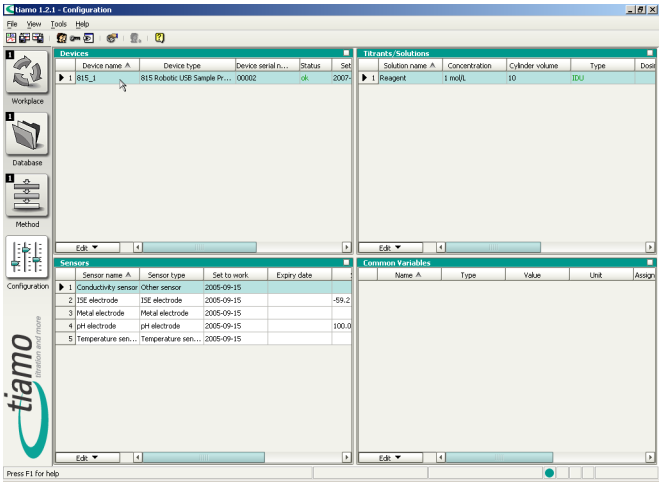
2 Confirm with **[OK]**.

Configuring the Swing Heads

Configure the robotic arms for both towers.

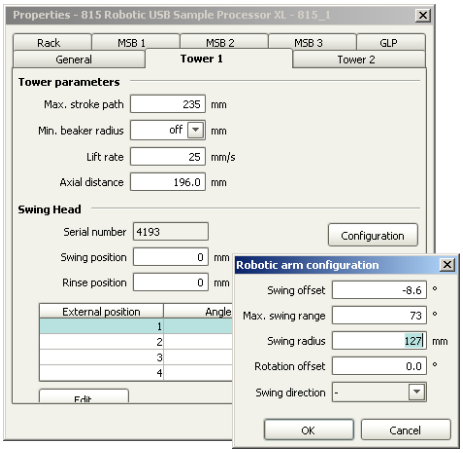


1 Click on the **Configuration** symbol.



2 Double-click on the instrument name **815_1** in the **Devices** window.

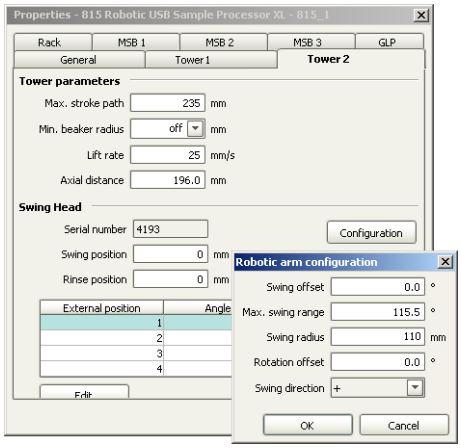
3 Click the **Tower 1** tab and then **Configuration**.



Enter the following settings:

- Swing offset = **–8.6°**
- Max. swing range = **122°**
- Swing radius = **149.8 mm**
- Rotation offset = **0.0°**
- Swing direction = **–**

4 Click the **Tower 2** tab and then **Configuration**.



Enter the following settings:

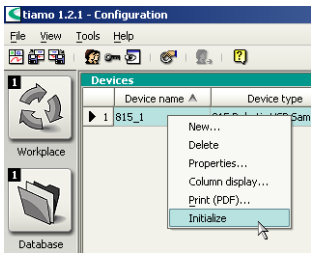
- Swing offset = **0.0°**
- Max. swing range = **115.5°**
- Swing radius = **110 mm**
- Rotation offset = **0.0°**
- Swing direction = **+**

5 Confirm the settings with **[OK]**.

For the settings to take effect, the instrument must be reinitialized.

6 Click **[OK]** on the tab.

7 Right-click on the instrument name **815_1** in the **Devices** window and click on **Initialize**.



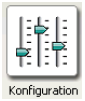
The Sample Processor is initialized. The settings of the Swing Heads and robotic arms are now activated.

4.1.5 Configuring the towers

Different lift positions must be set for lift 1 and lift 2 before process methods are generated for the 815 Robotic Soliprep.

Tower 1

Configure the position for tower 1:

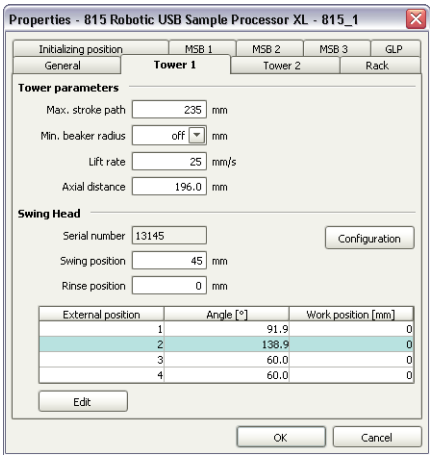


1 Double-click on the instrument name **815_1** in the **Devices** window.

2 Click the **Tower 1** tab.

3 Enter the following settings:

- Swing position = **45 mm**
- External position 1, Angle = **91.9°**
- External position 1, Work position = **0 mm**
- External position 2, Angle [°] = **138.9°**
- External position 2, Work position = **0 mm**



Tower 2

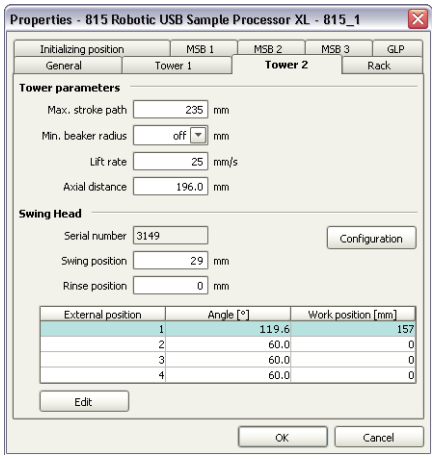
Configure the positions for tower 2:

1 Click the **Tower 2** tab.

2 Enter the following settings:

- Swing position = **29 mm**
- External position 1, Angle = **119.6°**

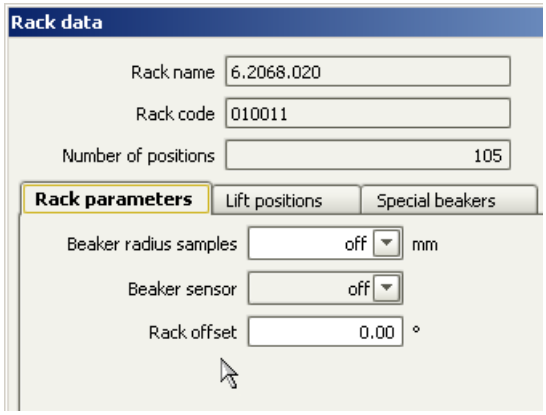
- External position 1, Work position = **157 mm**



4.1.6 Defining rack positions

Rack 6.2068.020

1 Switch over to the **Rack** tab and click on **[Rack data]** to open the rack parameter settings.

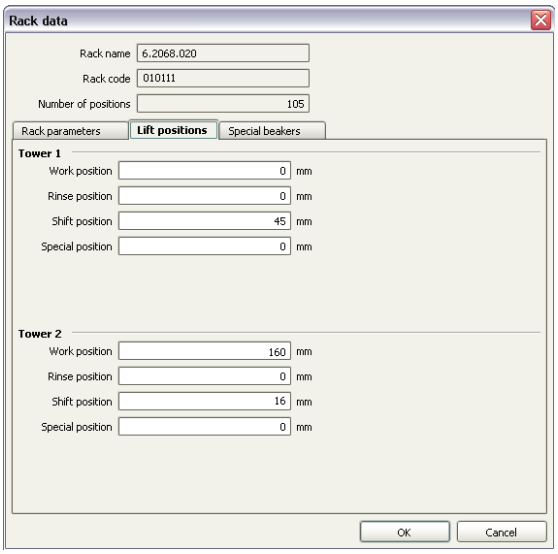


2 Switch to the **Lift positions** tab.

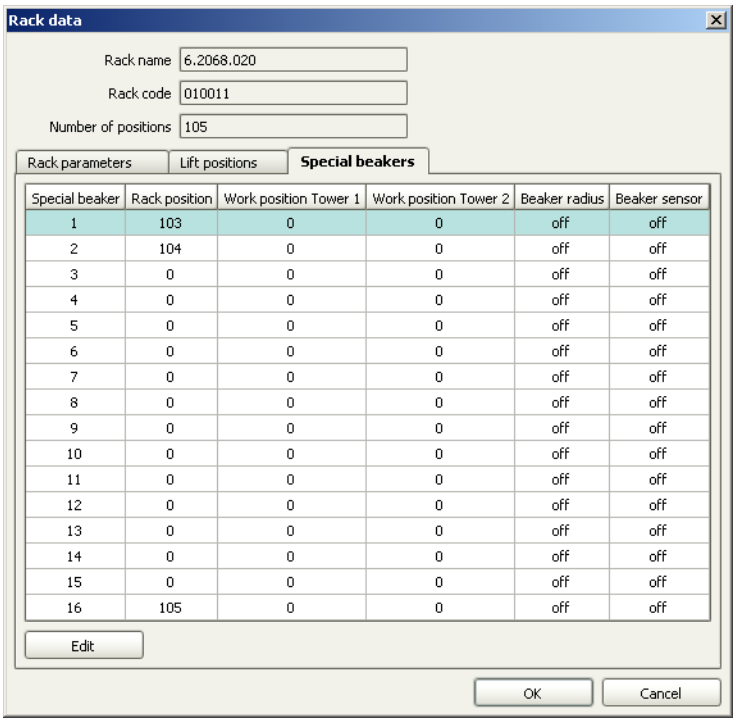
3 Under **Tower 1**, enter the value **45 mm** as Shift position.

4 Under **Tower 2**, enter the value **160 mm** as Work position.

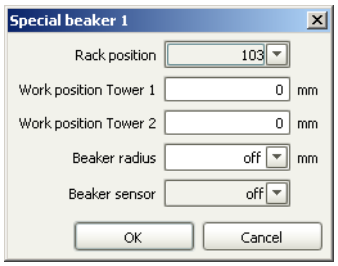
5 Under **Tower 2**, enter the value **16 mm** as Shift position.



6 Select the **Special beakers** tab.



7 Select the first line (**Special beakers1**) and click on **[Edit]**.



8 Select **103** under **Rack position** and enter the height **126 mm** under **Work position Tower 1**. Confirm with **[OK]**.

9 Select the second line (**Special beakers2**) and click on **[Edit]**.

10 Select **24** under **Rack position** and enter the height **100 mm** under **Work position Tower 2**. Confirm with **[OK]**.

11 Select the third line (**Special beakers 3**) and click on **[Edit]**.

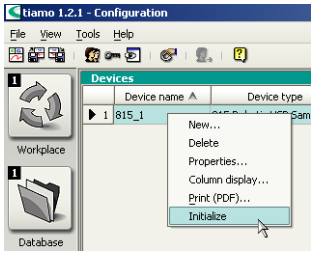
12 Select **104** under **Rack position** and enter the height **130 mm** under **Work position Tower 1**. Confirm with **[OK]**.

13 The last position of the sample rack is conceived as an **Adjusting position**. Assign rack position **105** to **Special beakers 16**.

14 Save the Rack data by clicking **[OK]**.

15 Click **[OK]** on the tab.

16 Right-click on the instrument name **815_1** in the **Devices** window and click on Initialize.



The Sample Processor is initialized. The settings made are now activated.

4.1.7 Mounting the Swing Heads

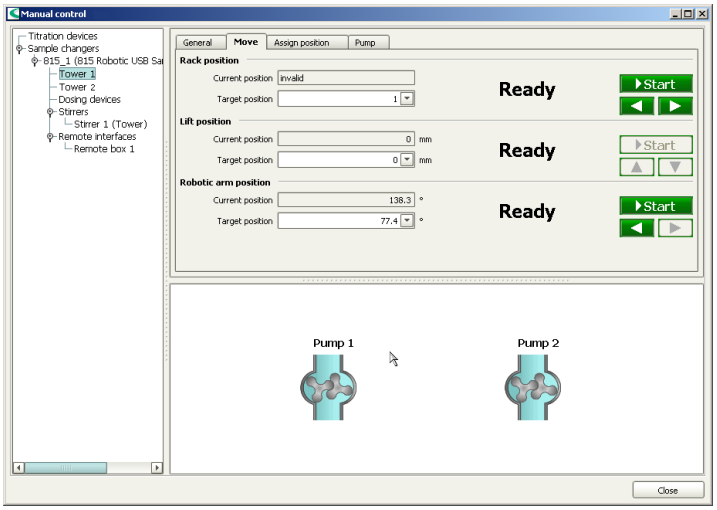
Preparing the towers

Both lifts must be moved to a suitable position for the mounting of the Swing Head and robotic arms to be comfortable.

1 **Opening the manual control**

In the toolbar of *tiamo*, click on the hand symbol or select **Tools** ▸ **Manual control** in the main menu.

2 In the left-hand window, under **815_1 (815 Robotic …**, click on the item **Tower 1** and then select the **Move** tab.



3 **Moving the lift to position**

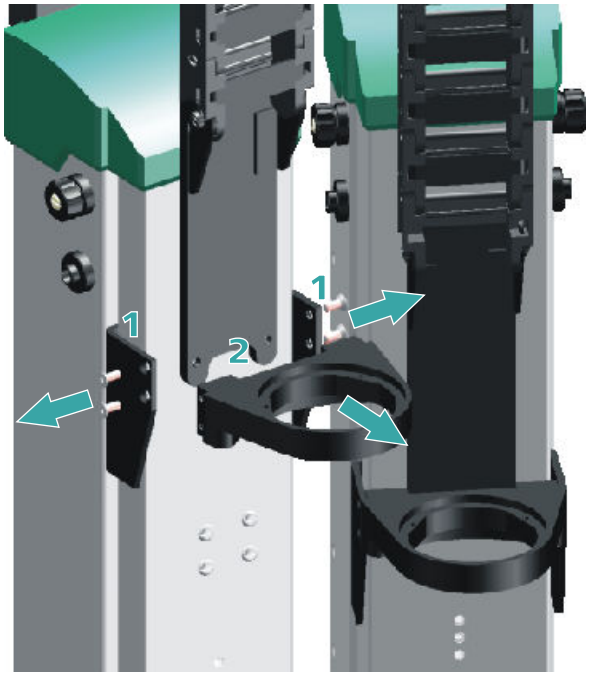
Under **Rack position**, click on a green arrow key (left or right).

The sample rack moves to a defined position. Only now, the lift can be moved.

4 Under **Lift position**, click on the green arrow key "down" until the lift 1 has moved approx. 180 mm downwards.

Both lifts are now in a suitable position so that all screws for mounting the Swing Heads can be reached easily.

Dismounting the titration head holder



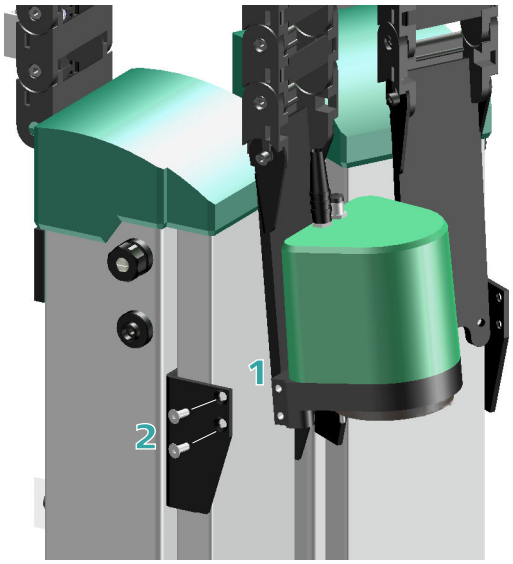
1 Unscrew the screws on the outside and inside of the holder on tower 2 (left).

2 Unscrew and remove the holder from the holder plate of the guide chain.

3 Remove the holder also on tower 1.

Use the supplied hex key. Set the screws aside for later use.

Mounting the Swing Heads

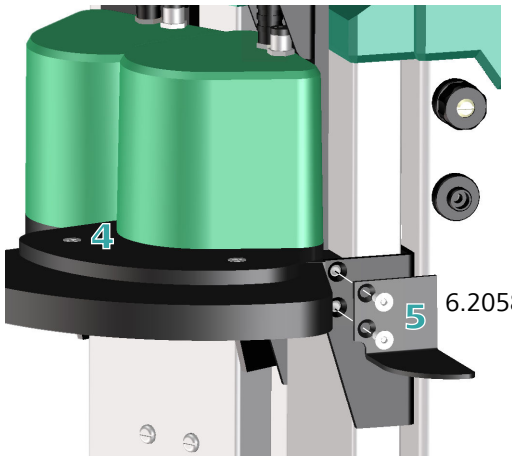


1 Screw the Swing Head without reinforcement tightly to the holder plate of the guide chain on tower 2.

2 Clamp the Swing Head between the guide jaws and screw it tight.

3 Screw the second Swing Head (with reinforcement) tightly to the holder plate of the guide chain on tower 1.

4 Clamp the Swing Head between the guide jaws and screw the two screws on the left side tight.

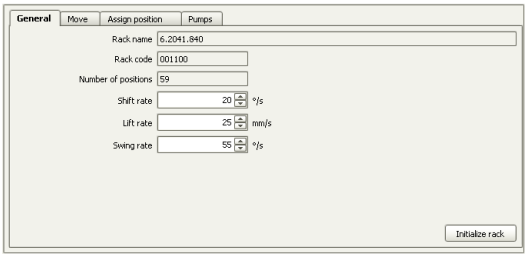


6.2058.040

5 Mount the 6.2058.040 robotic arm reinforcement on the right side fixing the Swing Head at the same time. Use the two screws provided with the robotic arm reinforcement. These are longer than the screws used previously.

Initializing the rack and Swing Heads

Both Swing Heads must be moved to the starting position for the mounting of the robotic arms.



1 On the **General** tab, click on **[Initialize rack]**.

Both lifts are moved upwards. The Swing Heads are now in the starting position.

4.1.8 Placing tubing and cables in the guide chain

Tubing and cables can be placed in the guide chain.

The guide chain contains a firmly installed clip on each chain link.

CAUTION

When mounting tubing and cables, make sure that there is no traction on the drives while moving the lift or swinging the robotic arm. Traction on the drive can overload and damage the drive.

If a robotic arm is used, we recommend placing the tubing and cables only above the third chain link in the guide chain to prevent traction on the drives.

Do **not** or only partially place rigid tubings, as for example aspiration tubings made of PTFE, into the guide chain.

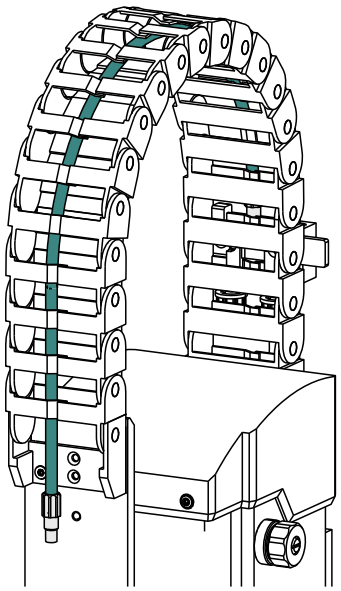
NOTICE

Make sure that tubing and cables do not kink.

Inserting and removing the tubing and cables requires no tools.

1 Placing tubing and cables

- Press one side of the clip downwards and place tubing or cables in the guide chain.



2 Removing tubing and cables

- Press one side of the clip downwards and remove tubing or cables from the guide chain.

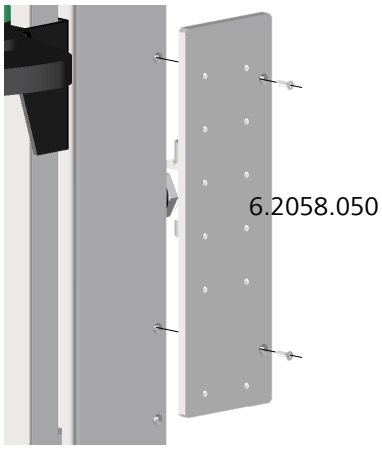
4.1.9 Mounting the deflector and the collection container

When injection needles and disposable filters are used, these need to be stripped off the robotic arm again afterwards. A deflector has been mounted for this purpose. Proceed as follows:

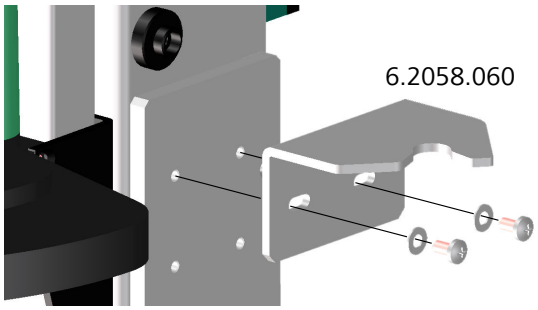
Mounting the deflector

1 Loosen the uppermost two screws on the right-hand side of tower 1.

2 Screw the 6.2058.050 fastening plate tightly with the aid of the screws supplied.

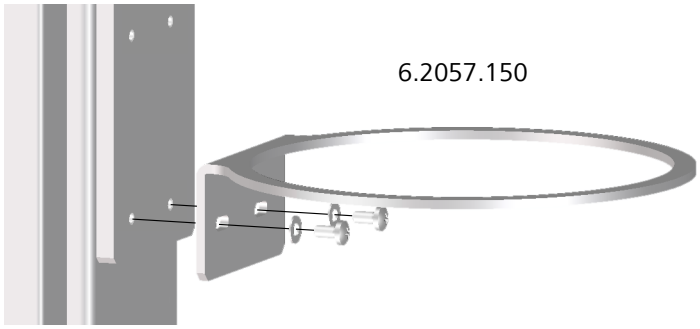


3 Screw the deflector tightly to the fastening plate with the screws and washers supplied. It is recommended that the highest position be selected. The deflector can be shifted laterally as required.

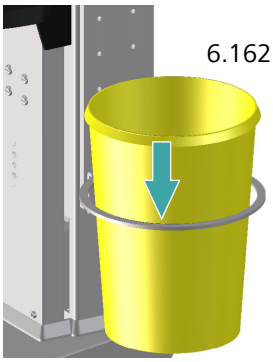


Mounting the collection container

1 Screw the 6.2057.150 holder for the collection container to the fastening plate tightly with the aid of the screws and washers supplied. It is recommended that the lowest position be selected.



2 Guide the 6.1625.010 collection container without cover into the holder.



6.1625.010

4.1.10 Mounting the transfer robotic arm

Preparing the Swing Head

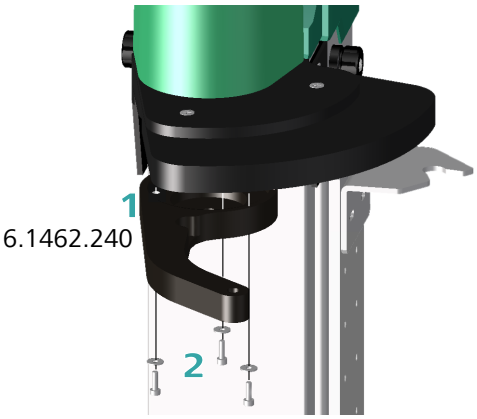
After the initialization, the drive disk of the Swing Head is positioned as though the robotic arm were located in the outermost position. In order to be able to mount the robotic arm in a favorable position, rotate the drive disk with **Manual control** in *tiamo* as follows:

1 In the sidebar of *tiamo*, click on the hand symbol.

2 In the left-hand window, under **815_1 (815 Robotic …**, click on the item **Tower 1** and then select the **Move** tab.

3 Click on the green arrow key **[Arrow left]** under **Robotic arm position** until the drive disk is no longer moving.

Mounting the robotic arm



Mount the 6.1462.240 robotic arm to tower 1 as follows:

1 Align the robotic arm parallel to the left-hand edge of the Swing Head reinforcement and graze it across the guide bolts of the drive disk of the Swing Head from below. The correct position of the arm can be found in the previous illustration.

NOTICE

Take care not to twist the drive disk and thereby put strain on the drive.

2 Tighten the robotic arm to the Swing Head with the screws and washers supplied.

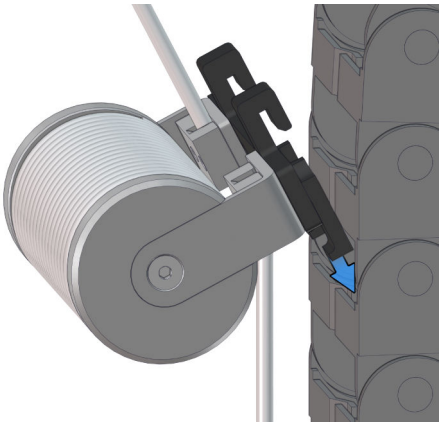
Installing the transfer tubing

The transfer tubing needs to be long enough to aspirate or eject samples. The 6.1562.130 transfer tubing holds 10-mL volumes and is installed on a holder on the guide chain of tower 1.

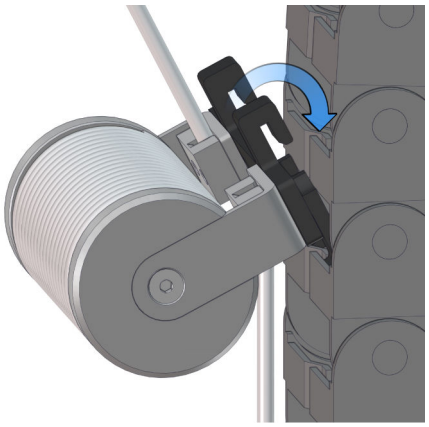
Proceed as follows to install the transfer tubing on the guide chain:

1 Attaching the holder with transfer tubing

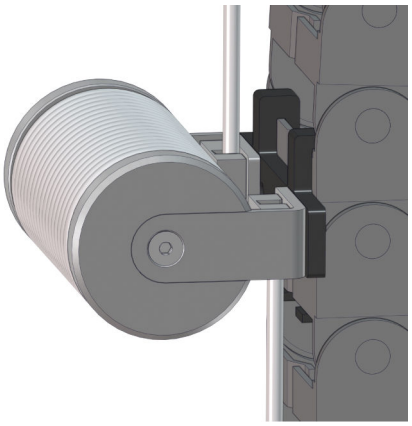
- Insert the bottom part of the holder with transfer tubing between two clips of the chain links.



- Insert the upper hook of the holder in the upper clip.

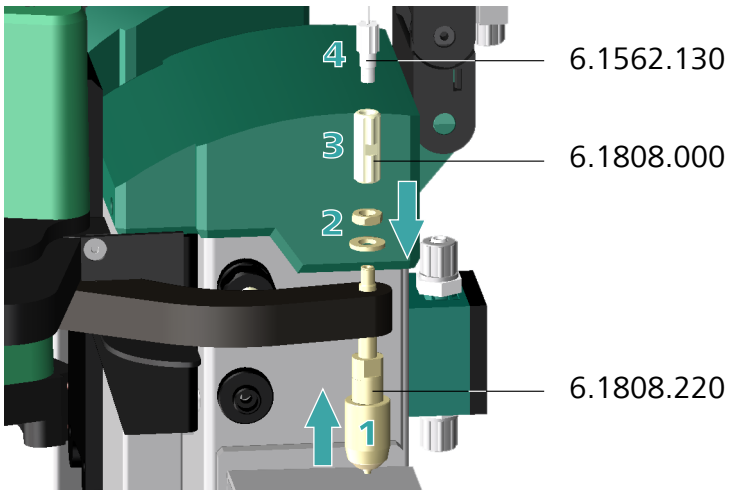


- Let the bottom part of the holder snap in the bottom clip.



Mounting the Luer adapter

The transfer robotic arm is used to pick up filters or injection needles. For this, the 6.1808.220 adapter is employed. Mount it as follows:



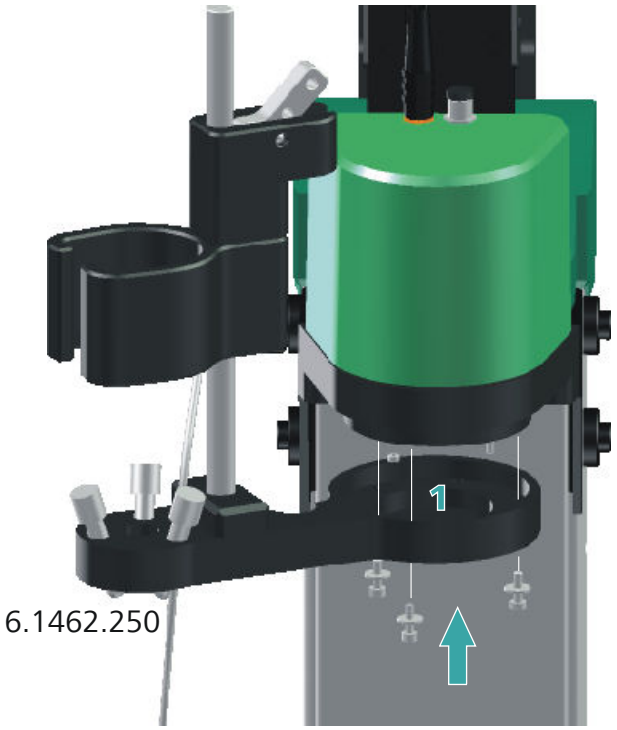
1 Unscrew the screw and washer of the adapter and insert the adapter in the robotic arm head from below.

2 Screw tight the adapter with the screw and the washer. Carefully tighten the screw with a wrench, if needed.

3 Screw the tubing adapter (with 2x M6 inner thread, supplied with the adapter) tightly onto the adapter.

4 Fasten the previously mounted 6.1562.130 transfer tubing to the 6.1808.000 tubing adapter.

4.1.11 Mounting the Polytron robotic arm



Mount the 6.1462.070 robotic arm to tower 2 as follows:

1 Hold the robotic arm in such a way that the holder faces to the left and and slip it over the guide pins of the drive disc from below. While doing so, let the robotic arm point outwards as far as possible, i.e. towards the tower - see above.

NOTICE

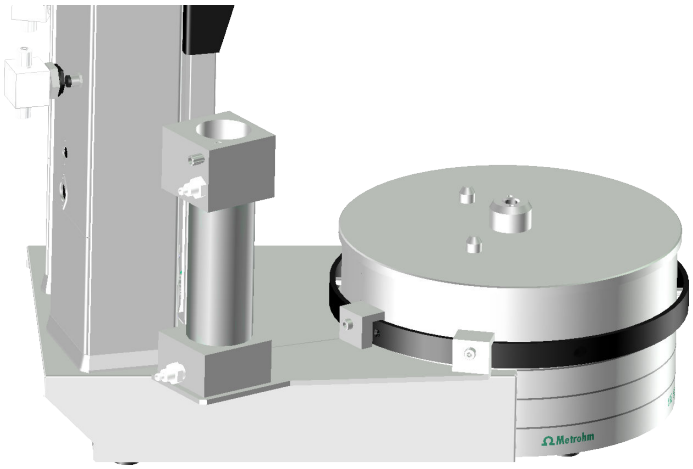
Take care to ensure that you do not twist the drive disc, thus causing pressure against the drive.

2 Screw the robotic arm to the Swing Head tightly with the screws and washers provided.

4.1.12 Washing station and drip pan

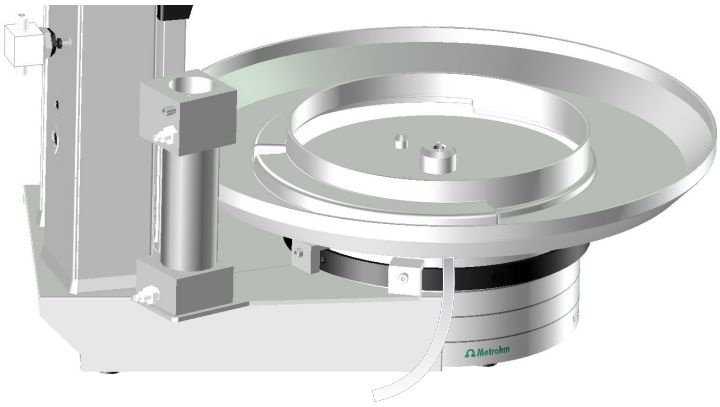
To mount the washing station and the drip pan, remove the sample rack. Now proceed as follows:

1 Mount the washing station to the left next to tower 2 on the assembly rail and screw it tightly.



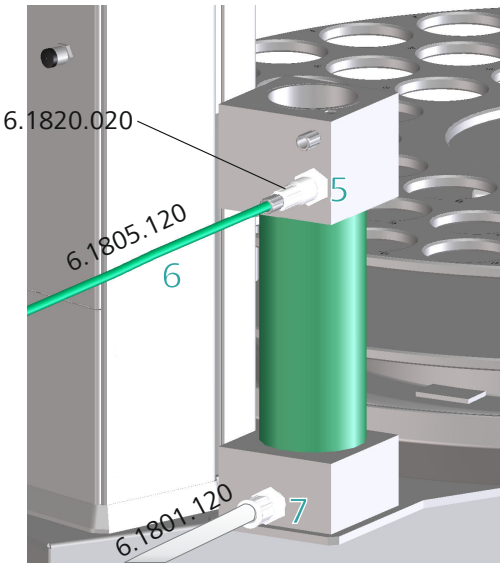
2 Fasten the enclosed tubing to the drainage nipple on the drip pan and guide the free end of the tubing into a drain or a waste container.

3 Place the drip pan over the stirrer rail. The correct alignment of the drip pan can be seen from the following illustration. Correct the position of the washing station slightly as needed.



4 Reattach the sample rack.

5 Fasten the 6.1820.020 screw connector with the M6 connector to the upper, larger tubing connector of the washing station.



6 Connect the green 6.1805.120 FEP tubing (1 m length) to the screw connector. This is the feed line of the washing station. Connect the other end of the tubing to the distributor of tower 2.

7 Fasten a 6.1812.000 PTFE tubing to the lower tubing connector of the washing station. This is the outlet of the washing station.

- Shorten the tubing to a suitable length, so that it can be connected to a peristaltic pump (772 Pump Unit).
- Remove the union nut of lower tubing connector and guide it over the end of a **6.1812.000 PTFE tubing**. You may have to extend the tubing end in order to be able to better mount the tubing, see the following note.
- Pull the end of the tubing over the connection nipple of the distributor and fasten in place with the union nut.

NOTICE

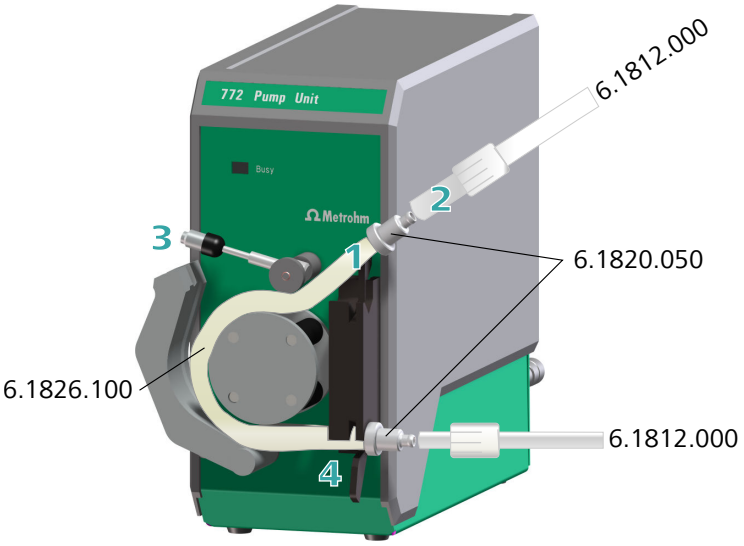
The opening of the tubing may need to be widened with a sharp object (e.g. with a Phillips screwdriver).

A piece of sandpaper may be used to get a better grip on the tubing.

Do not extend the tubing end before having slid the union nut onto the tubing.

4.1.13 Connecting and setting up the peristaltic pump

A peristaltic pump 772 Pump Unit is used for aspirating the rinsing station at tower 2.

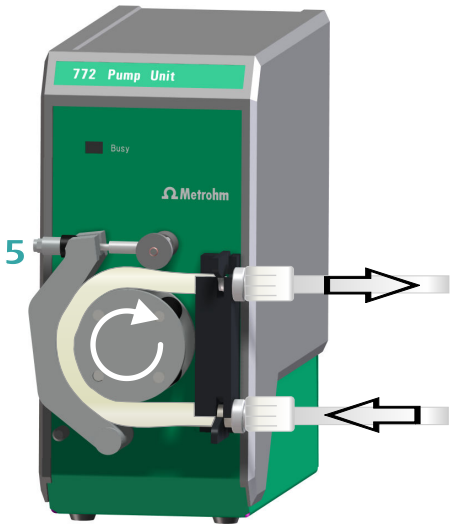


1 Cut one piece of 6.1826.100 pump tubing down to a length of approx. 17 cm and attach a 6.1820.050 tubing olive at both ends.

2 Fasten a piece of 6.1812.000 PTFE tubing leading to a waste container to one of the tubing olives. Attach the 6.1812.000 PTFE tubing that is connected to the rinsing station as a drain connection to the other tubing olive.

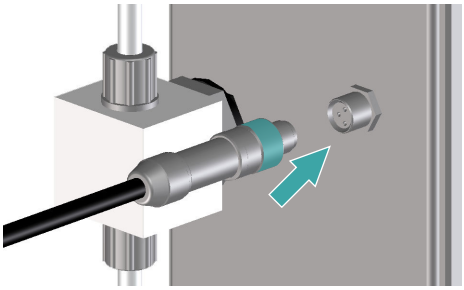
3 Release the locking lever by rotating the clamping screw and open the pressure clamp.

4 Loop the pump tubing around the rotor and fasten with the tubing clamps. The rotor turns in clockwise direction. The inlet tubing must therefore be clamped below, the outlet tube above.



5 Press on the pressure clamp and clamp tightly with the locking lever. Tighten the clamping screw until the pump tubing cannot shift position. The flow rate of the pump can be adjusted later with the clamping screw while the pump is running.

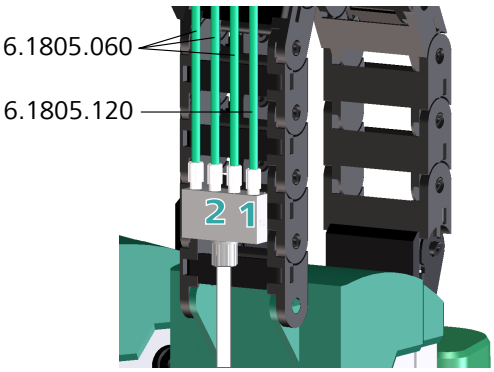
6 Connect the connection cable of the pump to tower 2.



- Plug the threaded plug of the connection cable into the connection socket **Ext. Pump 2** on the rear of the tower.
  Correct alignment of the 3 contact pins must be observed.
- Tighten the knurled screw at the front end of the plug by hand in clockwise direction. This will secure the plug.

4.1.14 Setting up the rinsing tubing

Rinsing tubing at tower 2



Install the tubing for rinsing the rinsing station as follows:

1 Connect the green inlet tubing (6.1805.120) of the rinsing station to one of the four connectors on the tower 2 distributor.

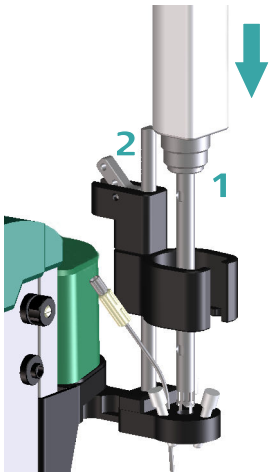
2 Connect three pieces of 6.1805.060 tubing (60 cm) to the tower 2 distributor.

3 Connect a 6.1812.000 PTFE tubing to the tower 2 valve. Connect the other end of the tubing to a canister with rinsing liquid (e.g. water).

4.1.15 Assembling and mounting the Polytron® drive

Please consult the Polytron user manual for details how to mount the aggregate to the **Polytron PT 1300 D**.

Mounting the Polytron



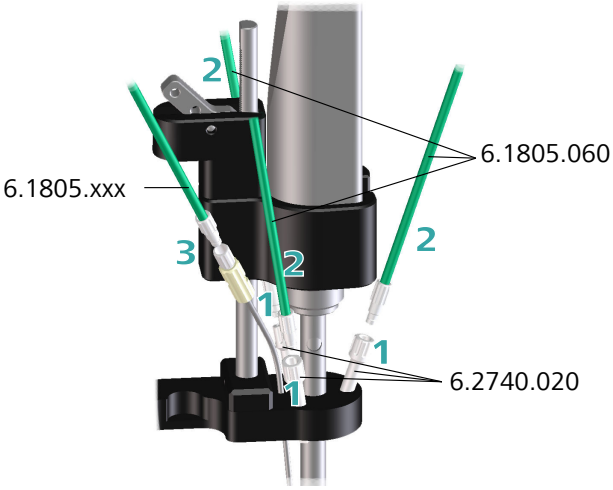
Mount the Polytron as follows:

1 Insert the Polytron with the aggregate already mounted into the robotic arm holder on tower 2 from above.

2 Readjust the position of the holder if necessary. Press down the fixing lever of the holder to accomplish this.

4.1.16 Mounting the rinsing tubings for the Polytron®

For rinsing the Polytron aggregate rinsing nozzles must be mounted on the robotic arm. Proceed as follows:



1 Replace the three stoppers on the Polytron robotic arm with 6.2740.020 rinsing nozzles.

2 Connect the three rinsing tubings that are connected to the tower 2 distributor to the rinsing nozzles.

3 The preinstalled tubing of the robotic arm can be used to add solvent to the sample.

4.1.17 Connecting the Polytron®

The **Polytron® PT 1300 D** is comprised of a control module and a dispersion drive with dispersion aggregate for mixing and shredding solid samples. The control device is directed by a PC software, e.g. ***tiamo™***, via a serial RS-232 connector.

Please refer to the operating instructions of the Polytron for details regarding connecting. The Polytron is connected as follows:

1 ▪ Connect the connecting cable of the dispersion device to the front of the control module.

2 ▪ Check the set supply voltage on the connection socket on the rear side of the control module.
▪ Switch off the instrument.
▪ Plug in the power supply cable and connect to a socket.

3 ▪ Connect the 6.2134.110 RS-232 connection cable to the 9-pin connection socket on the rear side of the control module.
▪ Plug in the other end of the cable to the COM1 or COM2 port on the PC. The port on the PC is usually marked with **IOIOI**.
If the PC has no serial interface, then a USB port on the PC can be used with the aid of an RS-232/USB converter (e.g. the 2.145.0320 Edgeport).

NOTICE

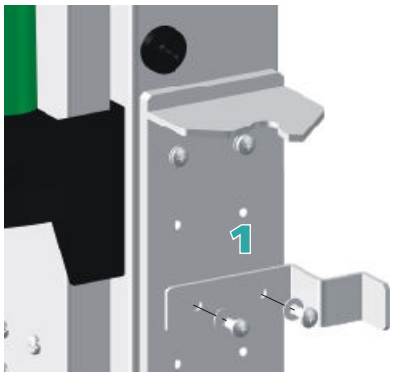
The Polytron must be registered manually in ***tiamo*™** as an RS-232 device.

4.1.18 Mounting the safety shield

Safety shield 6.2751.150

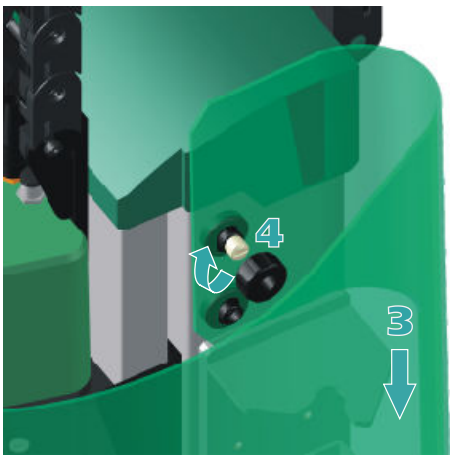
The 815 Robotic Soliprep may not be operated without a safety shield. Install it as follows:

1 Mounting the spacer for the safety shield with the screws supplied to tower 1 according to the following figure.



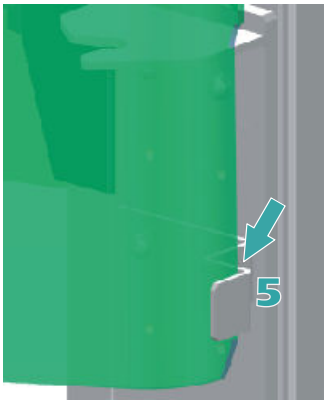
2 Unscrew the black nuts on both sides of tower 1.

3 Pull the green 6.2751.150 safety shield over tower 1, starting from the top.



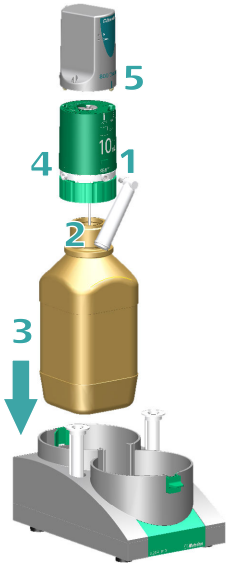
4 Screw the safety shield tightly with the two nuts as shown in the following illustration.

5 Adjust the safety shield on the spacer, see the following figure.



4.1.19 Installing the Dosino

A Dosino with a 10 mL dosing unit is used for transferring the sample. It is installed as follows:



1 Screw an adsorber tube filled with cotton to the **Vent** connector on the dosing unit.

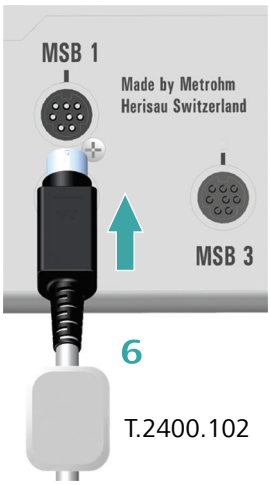
2 Equip the 10 mL dosing unit with a filling tube (Port 2 on the underside of the dosing unit) and screw it onto the 6.1608.023 amber glass bottle (with GL 45 thread). The bottle should be filled with the solvent (water or an organic solvent) which is also used for sample dispersion.

3 Place the bottle with the dosing unit into the 6.2061.010 bottle holder.

4 Connect the transfer tubing to tower 1 with the end that is still free to Port 1 on the dosing unit.

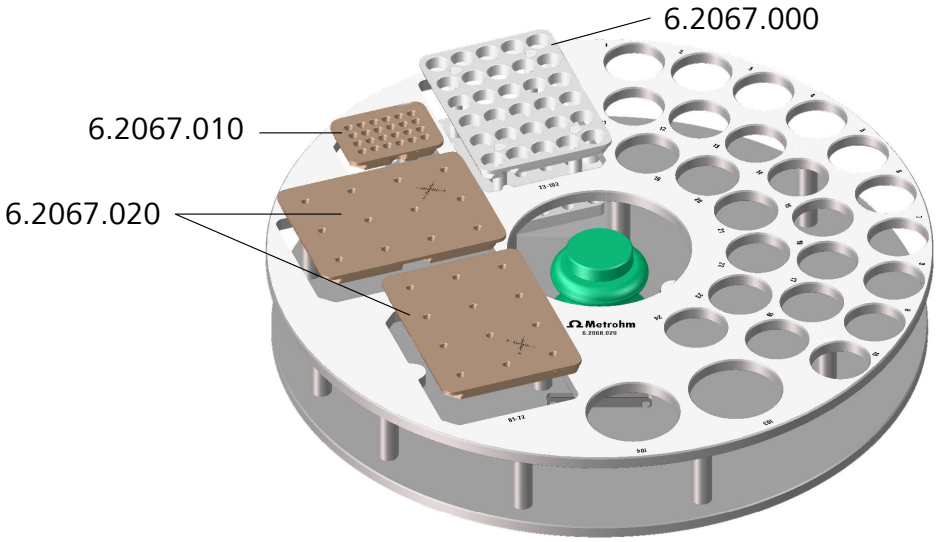
5 Attach the Dosino (dosing drive) onto the dosing unit.

6 Equip the connection cable of the Dosino with an anti-interference adapter made of ferrite (T.2400.102) (see figure) and connect it to the **MSB 1** connector on the rear of the Sample Processor.



4.1.20 Equipping the rack

In addition to sample vessels, the sample rack can also be equipped with various so-called **Inserts**, which can act as receptacles for various utensils.

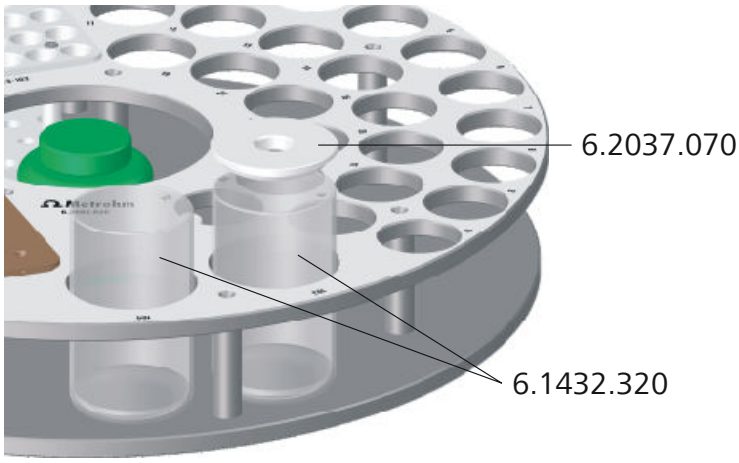


The inserts illustrated above are:

- 6.2067.000 - Insert for 6.2743.050 sample tubes (11 mL)
- 6.2067.010 - Insert for injection needles with Luer connector (maximum length 50 mm)
- 6.2067.020 - Insert for disposable membrane filters with Luer connector (maximum diameter 30 mm). This insert has a positioning reticle for adjusting the rack and the robotic arm.

Each insert is provided with a recess that prevents it from being inserted with the incorrect alignment.

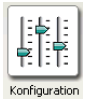
Two positions on the sample rack are reserved for rinsing and waste beakers.



The lid with the hole belongs on the waste beaker (position 103) into which a preliminary filtrate of the sample solution is to be disposed of when membrane filters are used. The filter can be placed on the hole in the lid with the robotic arm and pressure can be applied to force the sample solution through the filter.

The sample beaker can be defined as a special beaker for the purpose of dabbing off the Polytron aggregate if required.

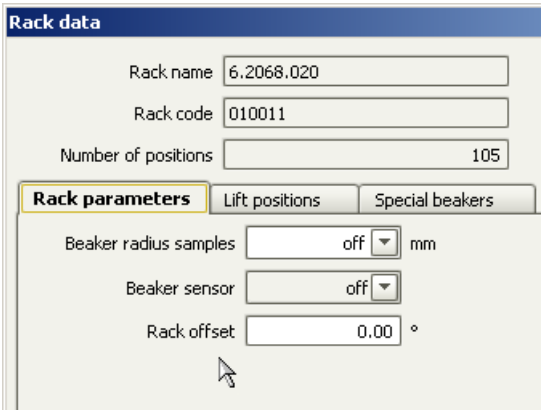
4.2 Defining rack positions



1 In *tiamo*, select **Configuration**.

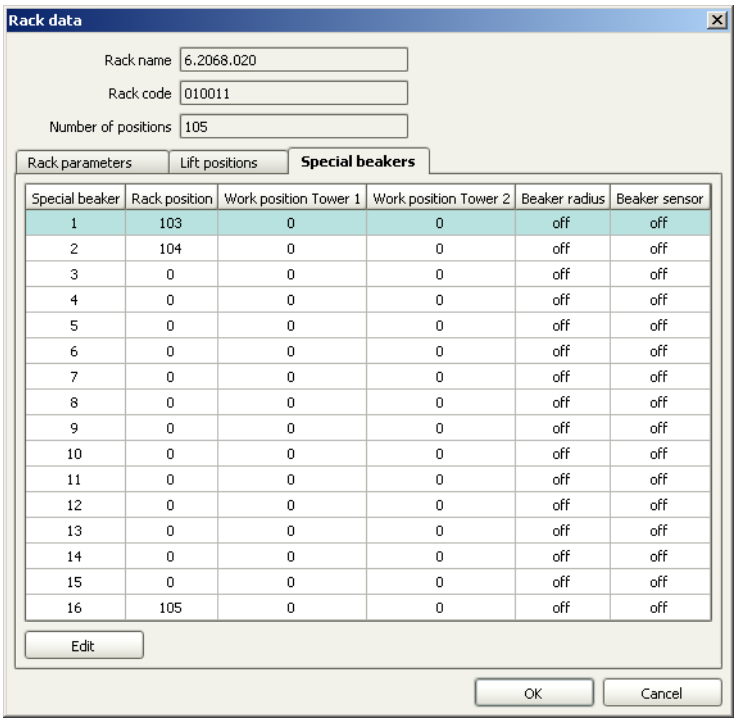
2 Double-click on the device name **815_1**.

3 Switch over to the tab **Rack** and click on **[Rack data]** to open the rack parameter settings.

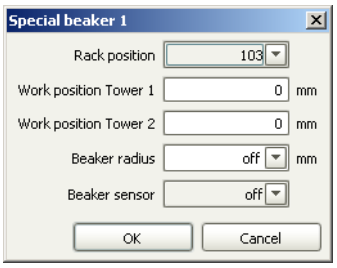


4 Select the tab **Special beaker**.

Special beaker on the sample rack 6.2068.020



1 Select the 1st line (**Special beaker 1**) and click on **[Edit]**.



2 Under **Rack position** select **103**.

3 Close the dialog window with **[OK]**.

4 Assign the rack position **104** to **Special beaker 2**, as described above.

5 The last position of the sample rack is conceived as **Adjusting position**. Assign rack position **105** to **Special beaker 16**.

6 Close the rack data table with **[OK]**.

4.3 Adjusting rack and robotic arm

The Luer adapter on the robotic arm must be positioned precisely for picking up membrane filters or syringe needles. In order to ensure this, it is necessary to align the sample rack and the robotic arm precisely in relation to one another.

The *tiamo* control software allows the user to enter a so-called "offset" in the configuration of a robotic arm or a sample rack (rack table). This allows fine-tuning to be performed.

The adjustment needs to be made when sample racks with inserts for membrane filters (e.g. 6.2068.020 and 6.2068.030) are used. These inserts feature a "positioning reticule". This is the adjusting position.

Preparing the Sample Processor

Proceed as follows:

1. Put the sample rack in place.

   The insert (or the inserts) for membrane filters must be in place.

2. Start *tiamo*.

3. Open the manual control with a click on the corresponding symbol in the toolbar.

4. Select **Tower 1** under **Sample changer ▸ 815_1**.

5. Click on **[Initialize rack]**.

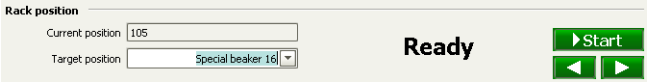
   The sample rack moves into starting position. The rack code is read and the rack table is loaded.

Moving to the positioning reticle

Proceed as follows:

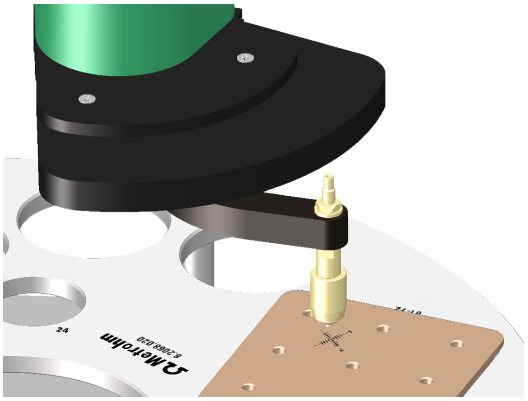
1. In the **Manual control** in *tiamo*, switch to the **Move** tab.

2. Under **Rack position**, select the target position **Special beaker 16** and click on **[Start]**.

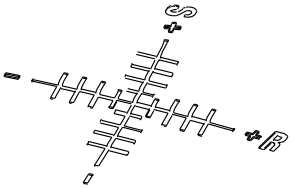


It is also possible to specify the target position as absolute rack position. For the **6.2068.020** sample rack, the adjusting position no. is **105**; for the **6.2068.030** sample rack the adjusting position no. is **115**.

3 Enter **160 mm** as target position under **Lift position** and click on **[Start]**. Afterwards, move the lift further downward, one millimeter at a time, until the robotic arm with the Luer adapter is located precisely above the positioning reticle.



The positioning reticle



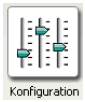
The positioning reticle shows the directions of movement for the rack (**R**) and the Swing Head (**S**). The tick marks stand for approx. 0.5° rotation angle or swivelling angle deviation.

Determine the deviation of the adapter tip from the middle of the positioning reticle.

You can make the corresponding corrections in the *tiamo* configuration afterwards.

Correcting the swing offset

If there is a deviation on the **S line**, then proceed as follows:

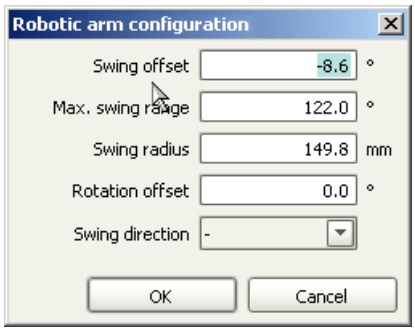


1 Select **Configuration** in *tiamo*.

2 Double-click on the instrument name **815_1**.

3 Switch over to the **Tower 1** tab and open the robotic arm settings with a click on **[Configuration]**.

Confirm the safety prompt with **[Yes]**.



4 Correct the value for **Swing offset** according to the observed deviation from the positioning reticle. One tick mark corresponds to approx. 0.5°.

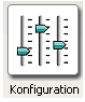
5 Close both the robotic arm configuration and the properties dialog of the Sample Processor with **[OK]**.

6 In the manual control, select the same rack position again and lower the lift down to the positioning reticle.

Now the adapter tip should point to the middle of the positioning reticle. If this is not the case, then an additional correction must be made and/or the rack offset needs to be corrected.

Correcting the rack offset

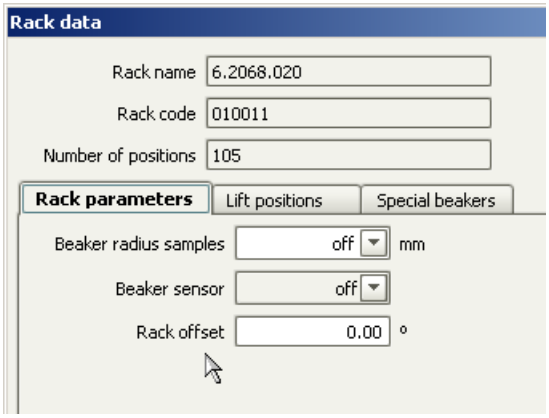
If there is a deviation on the **R Line**, proceed as follows:



1 Select **Configuration** in *tiamo*.

2 Double-click on the instrument name **815_1**.

3 Switch over to the **Rack** tab and open the rack parameter settings with a click on **[Rack data]**.



4 Correct the value for **Rack offset** according to the observed deviation from the positioning reticle. One tick mark corresponds to approx. 0.5°.

5 Close both the rack data configuration and the properties dialog of the Sample Processor with **[OK]**.

6 In the manual control, select the same rack position again and lower the lift down to the positioning reticle.

Now the adapter tip should point to the middle of the positioning reticle. If this is not the case, then an additional correction must be made.

4.4 Setting lift positions

Some lift positions must be adjusted precisely in order to ensure a perfect automation sequence. Use the manual control in ***tiamo***™ for this purpose. The following section describes how you can approach the individual positions and adjust them as needed.

The sample rack must be charged with all of the inserts.

Lift positions as method variables

The required lift positions that have not been determined in the 815 Robotic Soliprep configuration *(see chapter 4.1.5, page 92)* are defined as method variables in the method **815 Robotic Filtration Soliprep - standard method**.

This applies to the following positions:

Variable name	Position in mm
take needle	180
aspirate sample	170
take filter	167
put filter	127
waste tool	33

To find the method variables, proceed as follows:

1 Click on the **Method** symbol in the ***tiamo*™** sidebar.

2 Click on **Open...** in the **File** menu.

3 Select **815 Robotic Filtration Soliprep - standard method** from the list of available methods and click on **[Open]**.

4 Double-click on the **START - Main track** symbol.

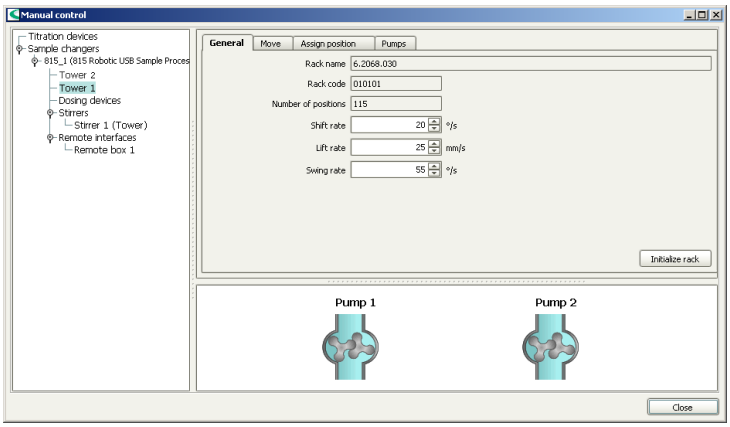
5 Click on the **Method variables** tab.

The values of the variables can be changed in this table as necessary.

Opening the manual control

1 Click on the hand symbol in the ***tiamo*™** sidebar.

2 In the left-hand window, click on the **Tower 1** item under **815_1 (815 Robotic ...)** and then select the **Move** tab.



Work height for sample beakers

1. Move to sample position 1. Under **Rack position**, enter the **Target position** = **1** and click on **[Start]**.

2. Fasten a syringe needle to the Luer adapter of the transfer robotic arm.

3. Move the lift to the appropriate height for aspirating the dispersed sample. Under **Lift position**, enter the **Target position** = **170 mm** and click on **[Start]**.

   If the needle is not in a suitable position afterwards, correct the value for the **aspirate sample** method variable in the method. Repeat this step.

4. Remove the needle from the Luer adapter.

Lift position for picking up needles and filters

1. Under **Rack position**, enter the **Target position** = **25** and click on **[Start]**.

2. Place a syringe needle in the established position in the insert.

3. Under **Lift position**, enter the **Target position** = **170 mm** and click on **[Start]**. The Luer adapter must grasp the needle and secure it in place.

4 If the needle does not sit flush on the adapter, move the lift one millimeter at a time using the arrow key **[Arrow down]** (or **[Arrow up]**). The lift must not, however, be lowered too far, because otherwise the lift drive could become overloaded and suffer damage.

If necessary, correct the value of the **take needle** method variable in the method.

5 Move the lift upward and remove the needle.

6 Under **Rack position**, enter the **Target position** = **49** and click on **[Start]**.

7 Place a membrane filter on the established position in the insert.

8 Move the lift to the **Target position** = **170 mm**. The Luer adapter must grasp the filter and secure it in place.

9 If the filter does not sit flush on the adapter, move the lift one millimeter at a time using the arrow key **[Arrow down]** (or **[Arrow up]**). The lift must not, however, be lowered too far, because otherwise the lift drive could become overloaded and suffer damage.

If necessary, correct the value of the **take filter** method variable in the method.

10 Move the lift upward and remove the filter.

Lift positions for special beakers

1 Under **Rack position**, enter the **Target position** = **Special beaker 1** and click on **[Start]**.

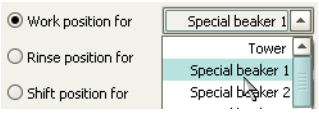
2 Place a sample beaker on the established position. Lay the cover with the hole on the sample beaker.

3 Fasten a membrane filter to the Luer adapter of the transfer robotic arm.

4 Move the lift to the **Target position** = **Work position**. The filter must rest on the cover of the sample beaker. Correct the lift position if necessary.

5 If the position has had to be corrected, switch to the **Assign position** tab.

6 Select the **Work position for** = **Special beaker 1** in the **Lift position** field.



7 Click on the associated **[Assign]** button.

8 Switch back to the **Move** tab.

9 Move the lift upward and remove the membrane filter.

10 In the manual control in the left-hand window, click on the **Tower 2** item under **815_1 (815 Robotic …)** and then select the **Move** tab.

11 Under **Rack position**, enter the **Target position** = **Special beaker 2** and click on **[Start]**.

12 Place a sample beaker on the established position.

13 Move the lift to the **Target position** = **Work position**. The Luer adapter must be at a suitable position for rinsing the transfer tubing. Correct the lift position if necessary.

14 If the position has had to be corrected, switch to the **Assign position** tab.

15 Select the **Work position for** = **Special beaker 2** in the **Lift position** field.

16 Click on the associated **[Assign]** button.

17 Switch back to the **Move** tab.

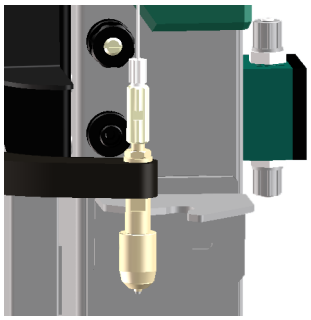
Lift positions for stripping needles and filters

1 In the manual control in the left-hand window, click on the **Tower 1** item under **815_1 (815 Robotic ...)** and then select the **Move** tab.

2 Fasten a syringe needle or a membrane filter to the Luer adapter of the transfer robotic arm.

3 Under **Robotic arm position**, select the **Target position** = **External 1** and click on **[Start]**.

4 Move the lift downward until the thick sleeve of the Luer adapter is approx. 1 cm underneath the deflector. Under **Lift position**, click on the arrow key **[Arrow down]** and also (if required) **[Arrow up]** in order to set a suitable position.

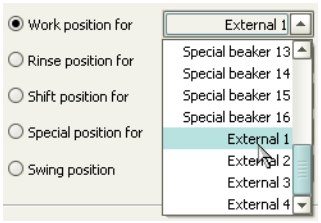


The Luer adapter must be positioned at a distance of approx. 2 cm from the deflector. Its thick sleeve must be positioned approx. 1 cm beneath the deflector in order for the adapter to move into the opening of the deflector.

5 To correct the position of the Luer adapter, correct the lift position with the arrow keys **[Arrow down]** and **[Arrow up]** first. Then correct the position of the robotic arm using the arrow keys **[Arrow left]** and **[Arrow right]**.

6 Switch to the **Assign position** tab.

7 Select the **Work position for** = **External 1** in the **Lift position** field.



8 Click on the associated **[Assign]** button.

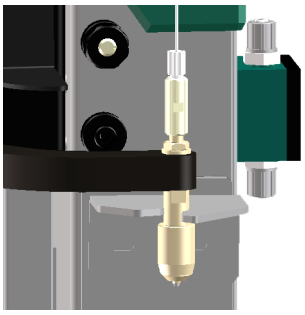
9 If the position of the robotic arm has been changed, select **External 1** under **Robotic arm position**.

10 Click on the associated **[Assign]** button.

11 Switch back to the **Move** tab.

12 Under **Robotic arm position**, select **External 2** as **Target position** and click on **[Start]**.

The Luer adapter should now be located in the opening of the deflector and touch it on the right.



13 Correct the position of the robotic arm as necessary using the arrow keys **[Arrow left]** and **[Arrow right]**.

14 If the position has had to be corrected, switch to the **Assign position** tab.

15 Under **Robotic arm position**, select the **External 2** and click on the associated **[Assign]** button.

16 Switch back to the **Move** tab.

17 Under **Robotic arm position**, select the **Target position** = **External 2** and click on **[Start]**.

18 Move the lift upward (arrow key **[Arrow up]**) until the needle or the filter is stripped off and falls into the collection container. Do not move the lift too far upward.

19 Switch to the **Assign position** tab.

20 Under **Lift position**, select the **Work position for** = **Special beaker 2**.

21 Click on the associated **[Assign]** button.

22 Switch back to the **Move** tab.

23 Move the lift approx. 1 cm downward.

24 Under **Robotic arm position**, select **External 1** as **Target position** and click on **[Start]**.

Lift position for the Polytron

1 In the manual control in the left-hand window, click on the **Tower 2** item under **815_1 (815 Robotic ...)** and then select the **Move** tab.

2 Under **Rack position**, select the **Target position** = **1** and click on **[Start]**.

3 Move the lift to the **Target position** = **Work position**.

The Polytron must be at a suitable height for sample dispersion. Correct the lift position if necessary.

4 If the position has had to be corrected, switch to the **Assign position** tab.

5 Under **Lift position**, select the **Work position for** = **Tower**, if this is not yet selected.

6 Click on the associated **[Assign]** button.

7 Switch back to the **Move** tab.

Lift position for the washing station

These settings apply to tower 2.

1 Under **Robotic arm position**, select **Target position** = **External 1** and click on **[Start]**.

2 If the Polytron is not positioned over the washing station, correct the position of the robotic arm using the arrow keys **[Arrow left]** and **[Arrow right]** as necessary.

3 If the position has had to be corrected, switch to the **Assign position** tab.

4 Under **Robotic arm position**, select **External 1** and click on the associated **[Assign]** button.

5 Switch back to the **Move** tab.

6 Under **Robotic arm position**, select **External 1** and click on **[Start]**.

7 Move the lift to the **Target position** = **Work position**. Correct the lift position if necessary.

The Polytron must be positioned at the suitable height for rinsing.

If the Polytron does not fit in the middle of the washing station, the latter can be shifted laterally.

8 If the position has had to be corrected, switch to the **Assign position** tab.

9 Under **Robotic arm position**, select **External position 1**.

10 Click on the associated **[Assign]** button.

11 Switch back to the **Move** tab.

12 Under **Lift position**, select the **Work position for** = **External 1**.

13 Click on the associated **[Assign]** button.

14 Switch to the **General** tab.

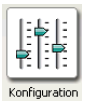
15 Click on **[Initialize rack]**.

5 Controlling the Polytron®

Configuration

Once the Polytron has been set up, it can be configured in *tiamo*.

Configuring the Polytron

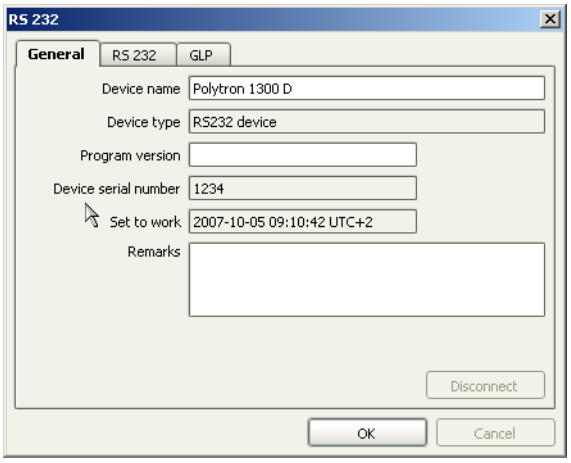


1 Click on the **Configuration** symbol.

2 Click on **[Edit]** in the **Devices** window.

3 Select the entry **New...** in the pull-down menu and then set up a new **RS 232 device** in the device selection under **Miscellaneous**.

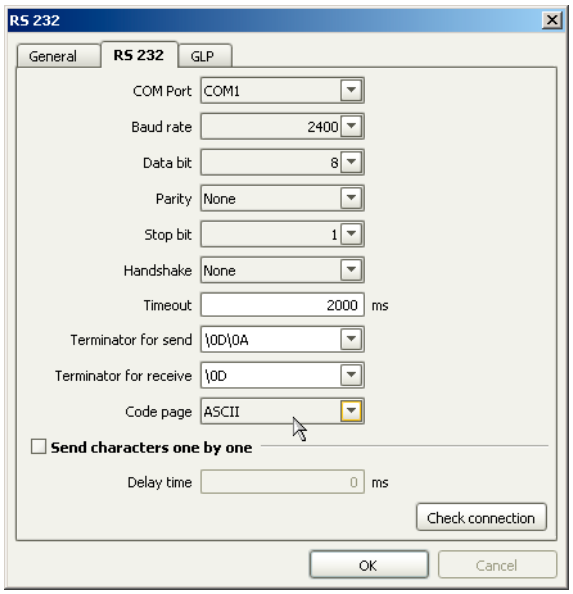
4 Enter a device name and the device serial number of the Polytron under General.



5 Enter the following settings in the **RS 232** dialog window:

- COM Port = **COM1** (i.e. the interface on the PC to which you have connected the Polytron)
- Baud rate = **2400**
- Data bit = **8**
- Parity = **none**
- Stop bit = **1**
- Handshake = **none**
- Timeout = **2000** ms
- Terminator for send = **\0D\0A** (= CR LF)

- Terminator for receive = **\0D** (= CR)
- Code page = **ASCII**



6 Click on **[Connect]**.

In the dialog window of the connection test, you can check the data transfer to the Polytron by sending a command to the device. A list of possible commands can be found below, *see page 134*.

7 Close the window with **[OK]** and then quit the configuration dialog with **[OK]**.

Control

The Polytron can be switched on and off with the communications command **TRANSFER**. Subsequently, the rotational speed of the aggregate can also be set (in revolutions per minute).

The control commands for the Polytron are comprised of a three-digit numerical code.

A TRANSFER command for switching on the device could look as follows:

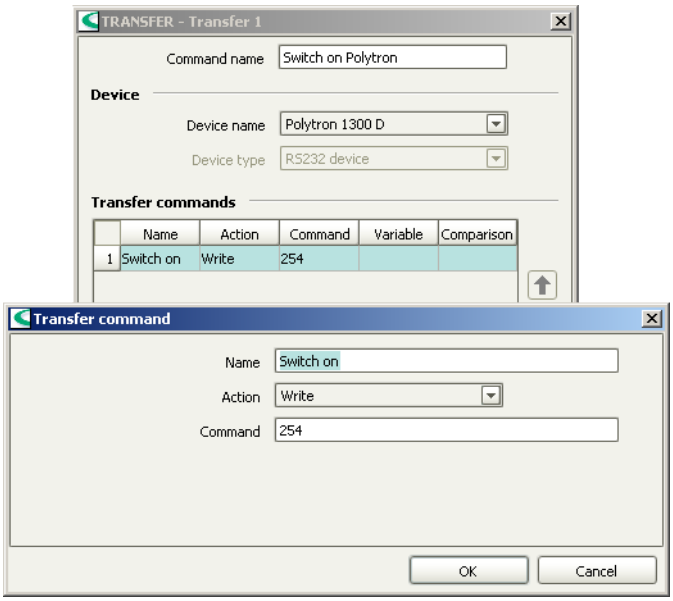


Table 1 Switching the Polytron 1300 D on and off

Command no.	Function
254	On
253	Off

After having received the command '254', the Polytron starts rotating at the speed that was last set. When the device is switched off, the currently set value is is saved as setpoint value.

Table 2 Setting the setpoint value

Command no.	Setpoint value
000	2,000 rpm
001	2,200 rpm
002	2,400 rpm
003	2,600 rpm
004	2,800 rpm
005	3,000 rpm
006	3,200 rpm
015	5,000 rpm
040	10,000 rpm
065	15,000 rpm
090	20,000 rpm

Command no.	Setpoint value
115	25,000 rpm
140	30,000 rpm

The current rotational speed of the Polytron can be queried with a command. The Polytron then sends a response code representing the averaged actual value. The **Read** option must be enabled in the TRANSFER command. The response code of the Polytron must be assigned to a previously defined method variable.

Table 3 Querying the current rotational speed

Command no.	Function
252	Querying the actual value.

Table 4 Conversion table for the actual value

Response code		Actual value
0	corresponds to	2,000 rpm
1	…	2,200 rpm
2	…	2,400 rpm
…		…
140	…	30,000 rpm
141	…	< 2,000 rpm
142	…	> 30,000 rpm

Table 5 Querying the current status

Command no.	Function
143	Querying the status.

Table 6 Status table

Response code		Status
150	corresponds to	Motor off
151	…	Motor on
152	…	Motor overloaded
153	…	Motor overheated

Response code		Status
154	…	Amplifier not ready
155	…	Device overheated
156	…	Wrong operating voltage
157	…	Other error

Table 7 Query whether setpoint speed has been achieved

Command no.	Function
144	Speed achieved

Table 8 Status table

Response code		Status
170	corresponds to	No
171	…	Yes

6 Accessories

Up-to-date information on the scope of delivery and optional accessories for your product can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1. Enter *https://www.metrohm.com/* into your Internet browser.
2. Enter the article number (e.g. **2.815.1110 / 2.815.2110 / 2.815.3110**) into the search field.

   The search result is displayed.
3. Click on the product.

   Detailed information regarding the product is shown on various tabs.
4. On the **Included parts** tab, click on **Download the PDF**.

   The PDF file with the accessories data is created.

NOTICE

Once you have received your new product, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

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