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# 730 Sample Changer and 759 Swing Head

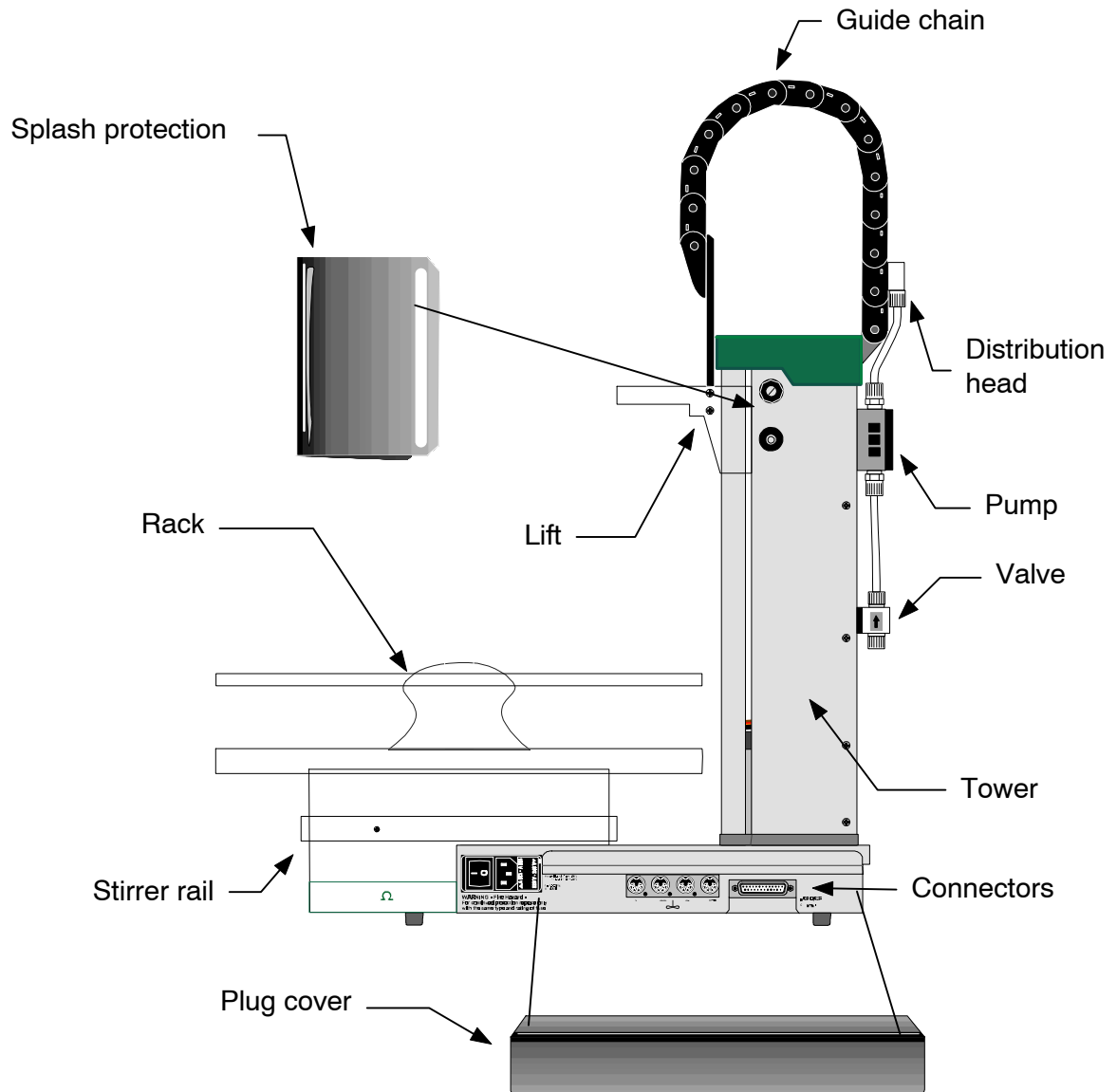
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## **A Short Introduction and Tutorial**

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# 1 Overview

## 1.1 Side View

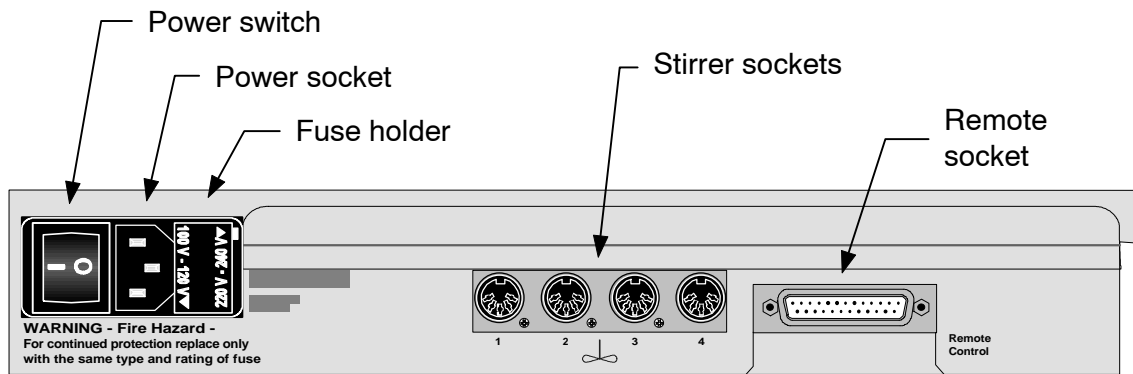


**Safety note:**

Do not operate the 730 Sample Changer without splash protection and plug cover being mounted.

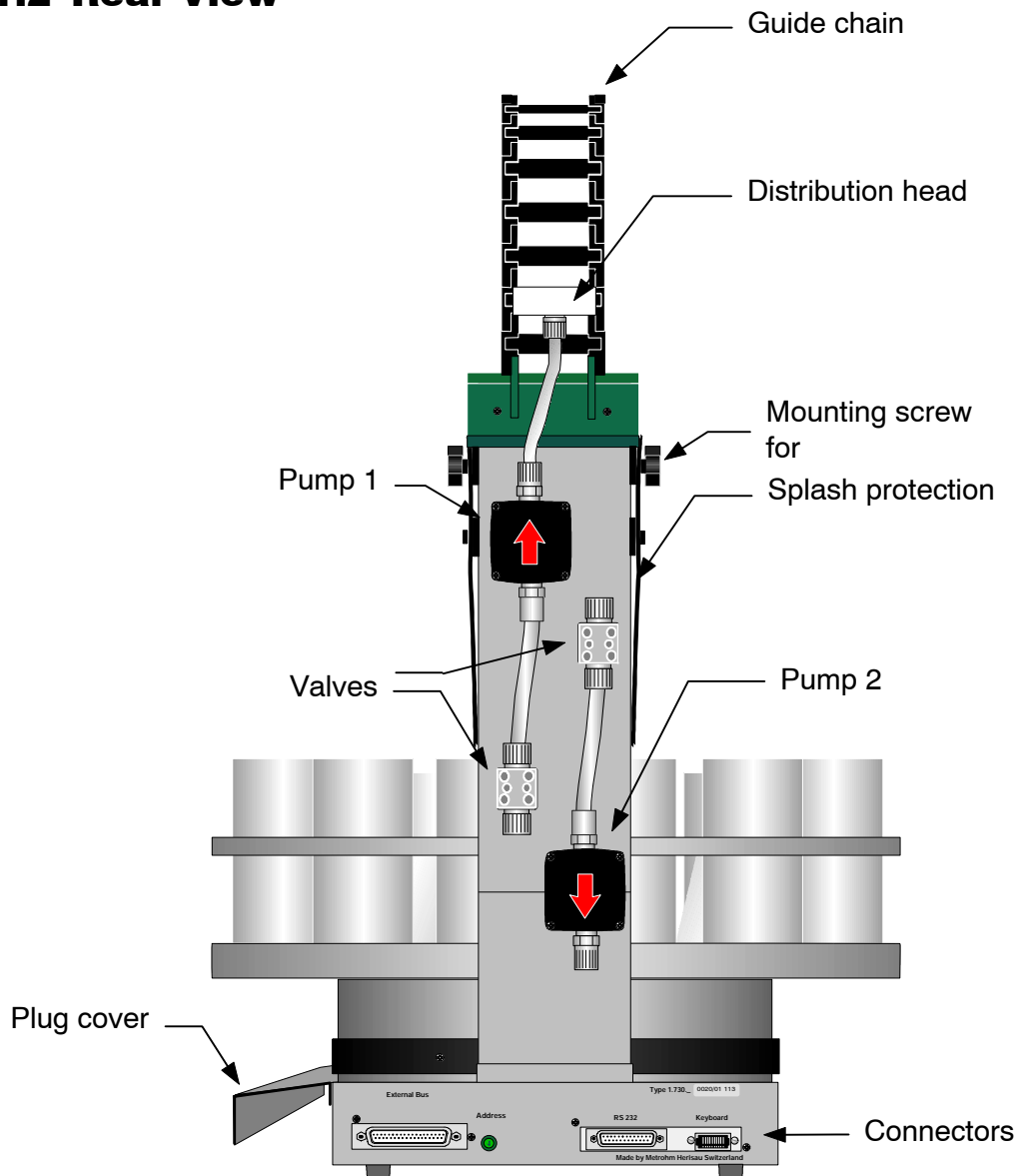
The plug cover prevents any contamination of the connectors, caused by spilled solvents or chemicals.

**The Connectors (side view):**

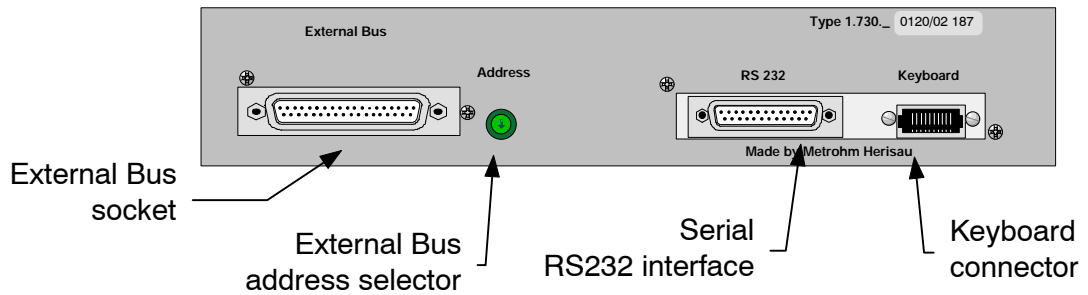


The remote socket serves the connection of Metrohm- or other measuring instruments that communicate via a serial cable.

**1.2 Rear View**



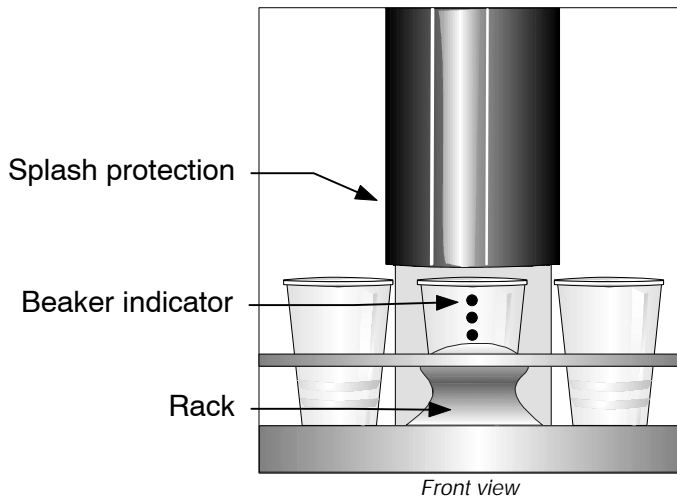
**The Connectors (rear):**



The External Bus address selector must be set to 0 (zero).

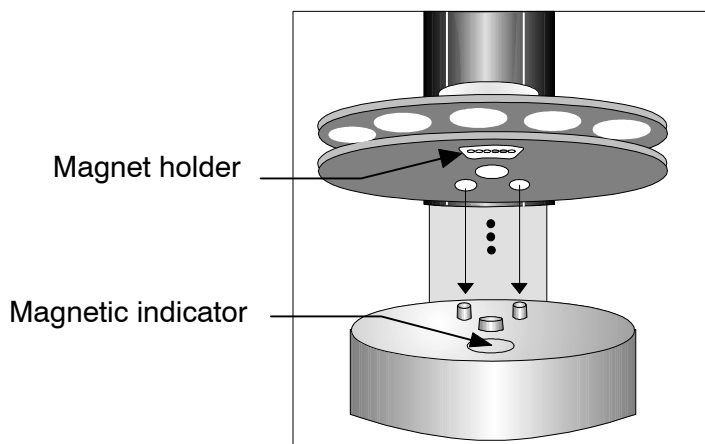
**1.3 Sensors**

**Beaker test**



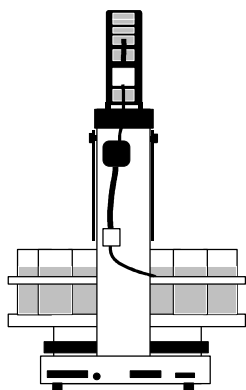
Each tower of the 730 Sample Changer is equipped with a beaker indicator to detect the presence of a beaker in front of the particular tower. This infrared sensor detects many different materials, if any object is placed in correct position. This beaker test is carried out after each MOVE operation.

**Magnetic rack code indicator**

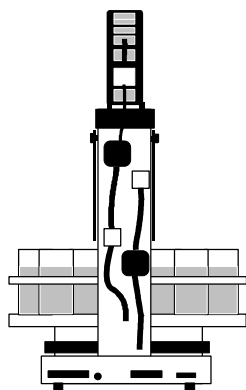


The magnetic sensor to detect the individual rack codes is mounted below the sample changer's turntable. The magnetic binary code of the racks can only be read, if the rack is in initial position and therefore the magnet holder is in accurate position right above the rack code indicator. For this reason the 730 Sample Changer should be initialized right after every rack change by pressing the <RESET> key or <ENDSEQ> + <ENTER>.

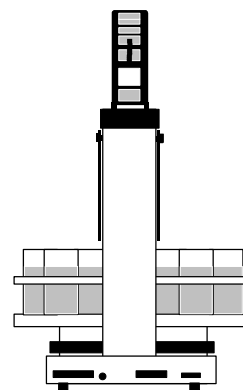
## 1.4 The Sample Changer Models



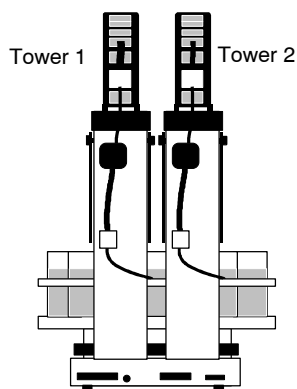
Model 2.730.0010  
1 tower, 1 pump  
2 stirrer connections



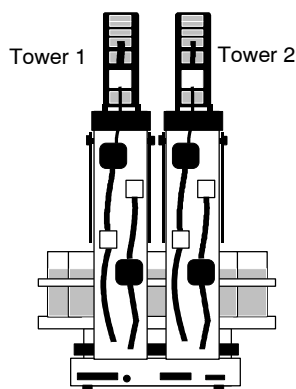
Model 2.730.0020  
1 tower, 2 pumps  
2 stirrer connections



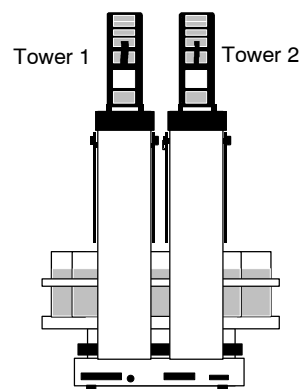
Model 2.730.0030  
1 tower, no pumps  
2 stirrer connections



Model 2.730.0110  
2 towers, 2 pumps  
4 stirrer connections



Model 2.730.0120  
2 towers, 4 pumps  
4 stirrer connections



Model 2.730.0130  
2 towers, no pumps  
4 stirrer connections

## 1.5 The Swing Head

In order to increase the number of samples, the 759 Swing Head with a titration head (2.759.0020) or a transfer head (2.759.0010) can be installed in place of a normal titration head. In this way, the titration head can be moved very accurately to the individual vessels located in several rows on the sample rack. You will find a more detailed description in chapter 7 "Swing Head", page 40.

## 2 Installation

---

### 2.1 Setting up the Instrument

#### Packaging

The 730 Sample Changer is supplied with the accessories in separate special packages designed to ensure maximum protection. These contain shock-absorbing foam linings. As only these special packages guarantee damage-free transport of the instrument, it is essential you store them in a safe place.

#### Control

Immediately following delivery, check that the consignment is complete and undamaged (compare with delivery note and accessories list in the Instructions for Use, page 183). In case of damage see "Warranty" on page 178.

#### Setting up

The 730 Sample Changer is a rugged instrument and may be used in rough environments such as laboratories and manufacturing plants. It must not be exposed to a corrosive atmosphere. If the sample changer is operated in a rough environment, regular maintenance is strongly recommended.

### 2.2 Power Supply




---

Follow these instructions to connect the 730 Sample Changer to the power supply. Ensure that the instrument is never operated with incorrect voltage ratings and/or with fuses of an incorrect rating, otherwise there is a fire hazard!

---

#### Setting the instrument supply voltage

Before switching on the 730 Sample Changer for the first time, check that the line voltage set on the instrument (see next page) matches the local power supply voltage. If this is **not** the case, change the voltage setting as follows:

- **Disconnect line cable**  
Unplug the 730 Sample Changer.
- **Remove fuse holder**  
Using a screw driver, loosen the fuse holder and pull it out.

- **Checking and replacing fuse**

Carefully remove the built-in fuse and check its specifications.  
(The position of the fuse in the fuse holder is marked by the white arrow printed next to the supply voltage):

100¼ 120 V 0.5 A (slow) ord. no. U.600.0014

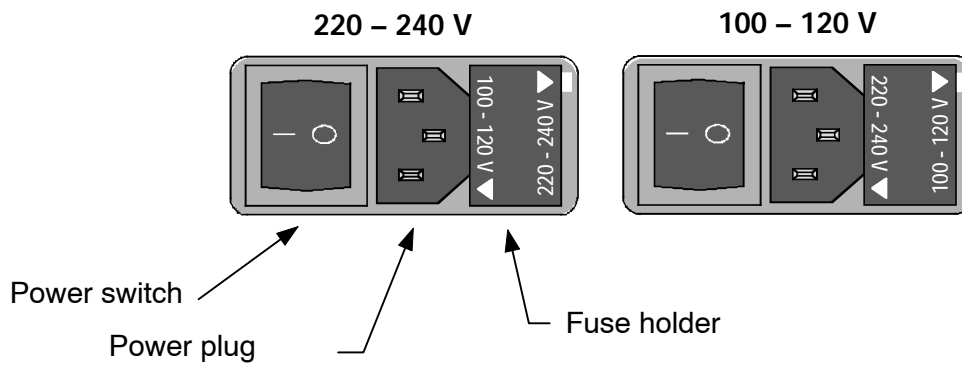
220¼ 240 V 0.25 A (slow) ord. no. U.600.0011

- **Replace fuse**

Replace fuse if necessary and reinsert it into the fuse holder.

- **Insert the fuse holder**

Insert the fuse holder according to the appropriate supply voltage. The white arrow besides the desired voltage has to point towards the white block mark printed on the fuse holder's panel (see below).



## 2.3 Safety Considerations

If failure or malfunctioning occurs during operation of the 730 Sample Changer, it is recommended to first search for the cause with the help of the diagnostic functions (see Instructions for Use, page 167). If this is of no help in rectifying the disorder or the cause of the malfunction cannot be identified, the Metrohm Service Department should be consulted.

If opening the instrument is unavoidable, the following safety precautions are to be strictly adhered to:



---

**Before opening the instrument disconnect it from all electrical sources. Make sure that the power plug has been pulled out.**

---

Only in exceptional cases should the instrument be opened while it is switched on. Because parts that conduct current are exposed in this case, this should only be undertaken by an expert who is acquainted with the associated dangers.

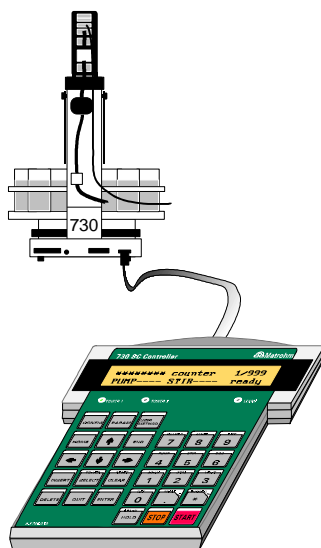
Electronic components are sensitive to static electricity and can be destroyed by discharge. Before touching any components inside the instrument, both the person and his tools should be grounded by grasping a grounded object (for example: a metallic part of the casing of the instrument or a radiator) in order to eliminate any static electricity.

When peripheral instruments are connected to the 730 Sample Changer, the sample changer and the instruments to be connected have to be switched off, otherwise all instruments could suffer damage.

If it becomes apparent that the instrument can no longer be operated safely, it must be put out of operation.

## 3 Arranging the Accessories

### 3.1 Connecting the Keyboard



The keyboard is to be connected to the keyboard socket on the rear side of the sample changer. To disconnect press the plug together slightly on both sides.

### 3.2 Setting up the Rinsing Equipment

To mount the PTFE tubings to the pump inlets or outlets enlarge it carefully using a pen or another appropriate tool. A piece of sand paper facilitates grasping of the tubing.

The arrangement of the tubing depends on the rinsing equipment.

#### Rotating nozzle

Using a changer model with one pump per tower only, the rotating nozzle (6.2740.000) is recommended for rinsing. The Teflon tubing is then directly connected to the rinsing pump (pump 1). The distribution head may be dismantled in this case.

Place the rotating nozzle vertically in the titration head with the aid of a SGJ14/12 mm sleeve.

### Spray nozzles

When using a changer model with two pumps per tower, spray nozzles (6.2740.020) may be used in combination with an aspiration tip M8 (6.1543.170). Insert the spray nozzles into the sloped borings of the titration head. Use Teflon tubings to connect them to the distribution head. Each of the four outlets of the distribution head must be plugged. Plug unused outlets with an M6 thread stopper (6.1446.040) to avoid splashing of liquid during rinsing.

Fix the tubings in the guide chain. Chain links may be removed if necessary (see below).

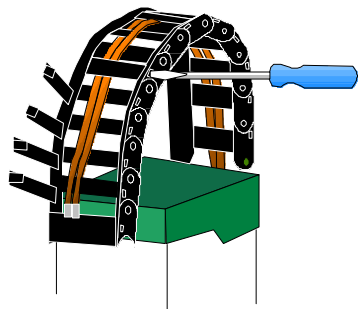
Insert the aspiration tip vertically into a boring (SGJ9) of the Macro Titration Head. The Micro Titration Head offers also a vertical boring for the placement of the aspiration tip. Connect the tip with the Teflon 4/6 tubing (6.1805.510) and a screw connector 4/6 mm (6.1820.030) to pump 2 (valve marked with '↓'). During the rinsing procedure, first the sample is sucked off then the electrode is rinsed in the empty vessel.

The pump heads of the diaphragm pump, the fittings and the coupling rings are made of PVDF. PVDF is resistant to many chemicals. Acetone, acetanhydride or dimethylformamide (DMF) should **not** be used. The diaphragm, and the inner parts of the valves consist of PTFE and are resistant to most chemicals.

If your samples contain solids (e.g., silver chloride) or sticking substances, you should use the 772 Peristaltic Pump Unit in combination with the 731 Relay Box instead of the diaphragm pump integrated into the changer.

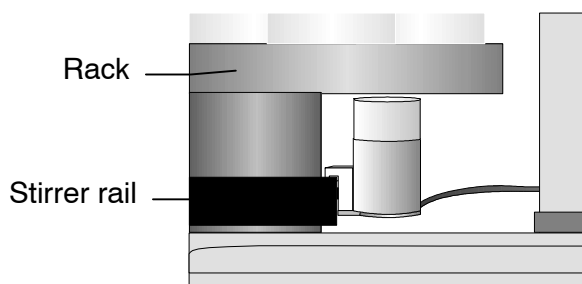
The PE canisters (6.1621.000) are suitable for aqueous solutions.

### 3.3 Tubing Fixation



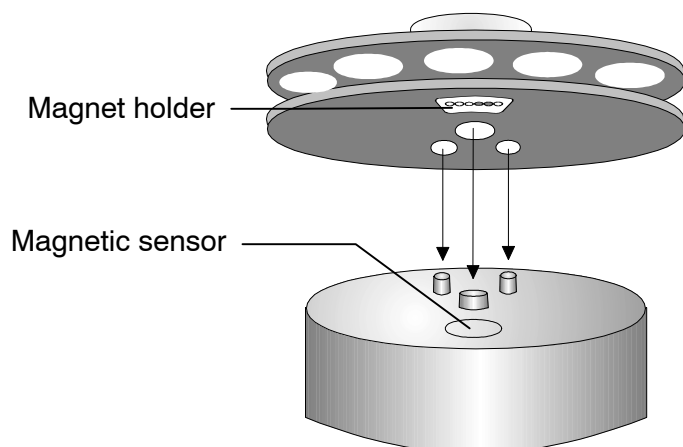
In order to fix the tubing in the guide chain any chain link may be opened with a screw driver or another appropriate tool.

### 3.4 Magnetic Stirrers



Magnetic stirrers 2.741.0010 may be placed in any position on the stirrer rail beneath the rack.

### 3.5 Sample Racks



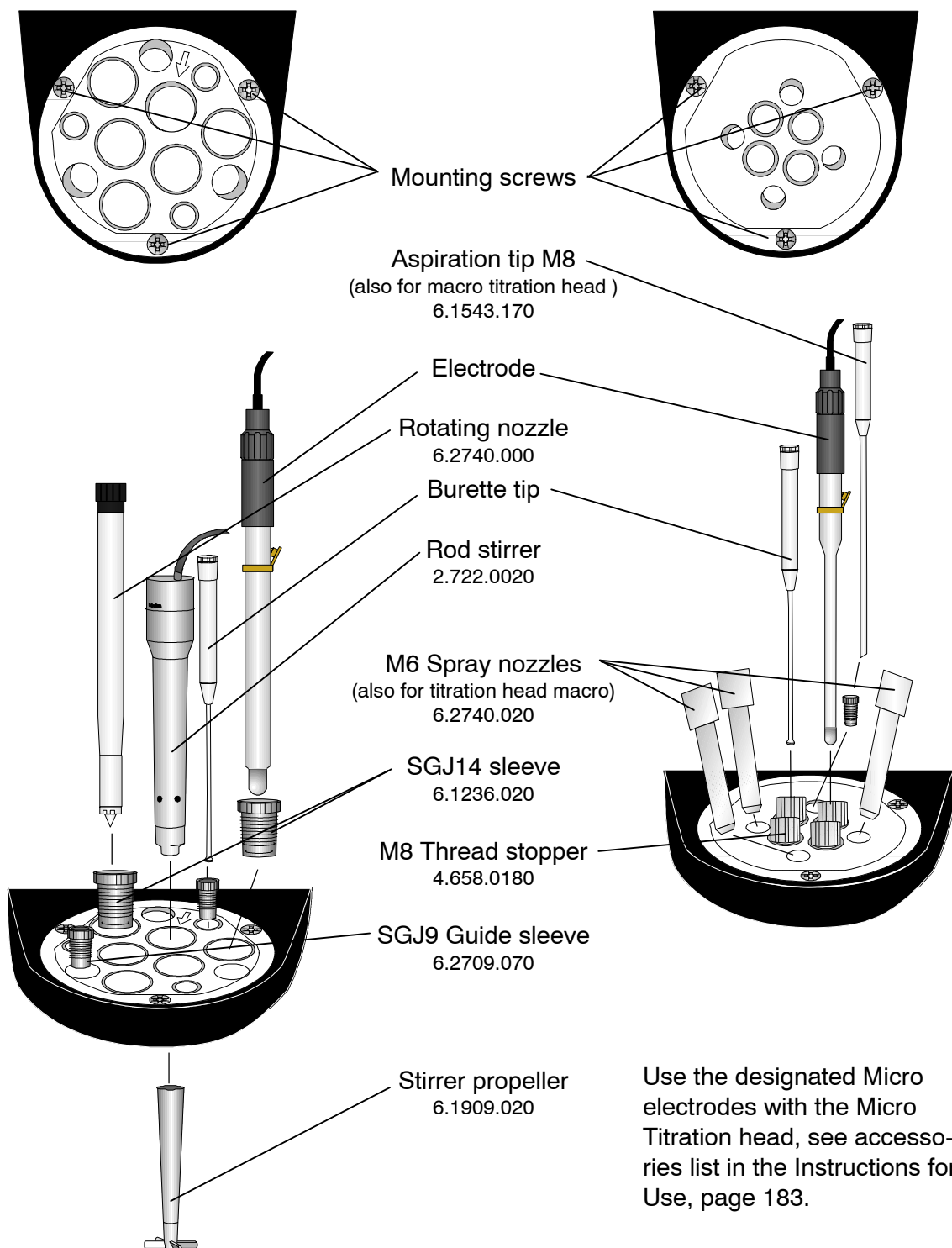
After placing the rack on the turntable, the sample changer must be initialized by pressing the <RESET> key to enable the safe reading of the magnetic rack code.

This can only be done if rack position 1 is directed to tower 1.

### 3.6 Mounting and Setting up the Titration Heads

Macro Titration head  
6.1458.010

Micro Titration head  
6.1458.020

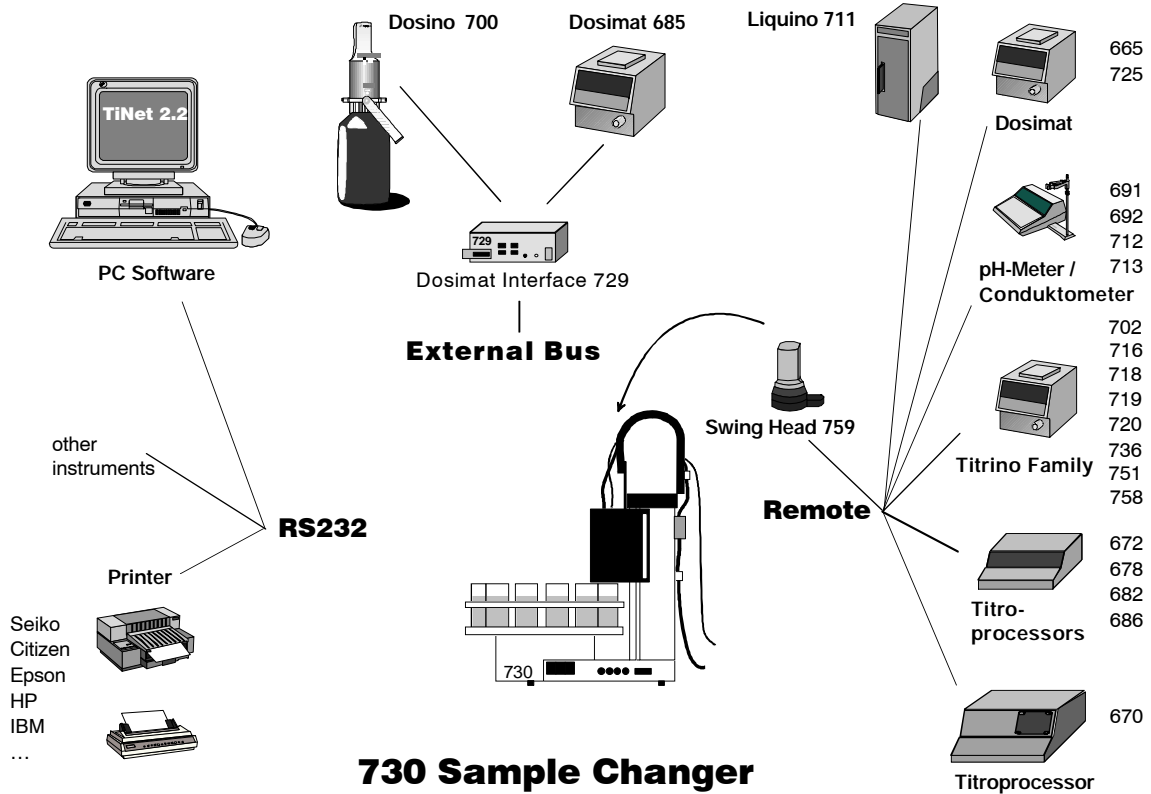


**Note on Macro Titration head**

The arrow sign marks the slightly sloped SGJ boring, which enables to center a rod stirrer or an electrode in a narrow titration vessel.

# 4 Integration

## 4.1 The 730 Automation System



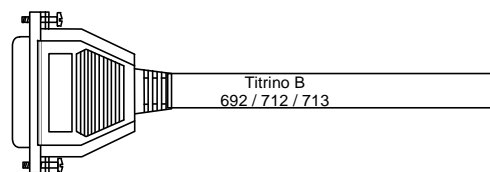
### Cables

Connecting peripheral instruments to the 730 Sample Changer requires Metrohm cables. Otherwise a safe data transmission may not be guaranteed.

### Remark:

Metrohm cables are labeled with the type of the instrument which they may be connected with and optionally with the particular socket. Mind the cable ends.

For example:



All instruments have to be switched off, before they are connected. Otherwise the instruments could suffer from damage.

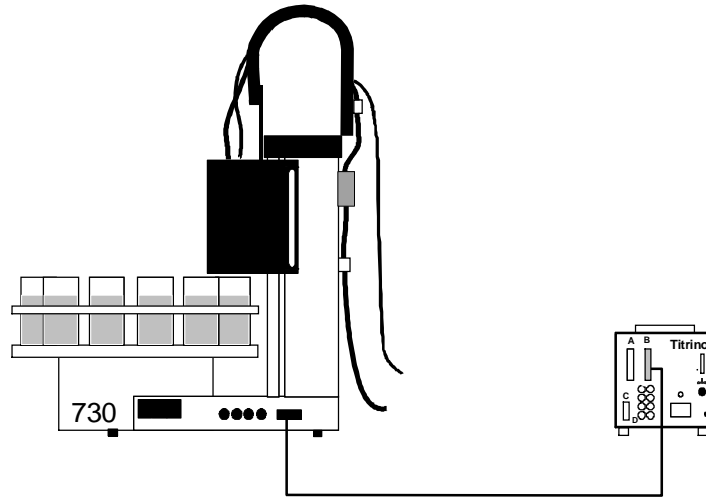
## 4.2 Remote Connections

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### 730 Sample Changer — Titrimo

---

with standard cable



Cable 6.2141.020

#### Remote control commands:

```
CTL:Rm : START device1  starts Titrimo
CTL:Rm : *****1      "
```

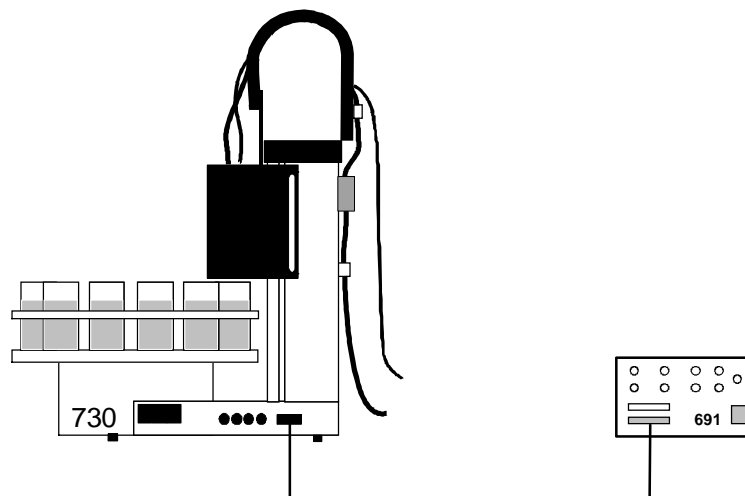
#### Scan commands:

```
SCN:Rm :          end1  awaits end of titration
SCN:Rm :          ****1***  "
SCN:Rm :          ready1  awaits readiness of Titrimo
SCN:Rm :          *****1  "
```

---

### 730 Sample Changer — 691 pH-Meter

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Cable 6.2141.060

Remote control commands:

```

CTL:Rm : START device1  starts measuring instrument
CTL:Rm : *****1      "
CTL:Rm : METER mode pH  change mode to pH measurement
CTL:Rm : *****0001*  "
CTL:Rm : METER mode T   change mode to temp. measurement
CTL:Rm : *****0010*  "
CTL:Rm : METER mode U   change mode to mV measurement
CTL:Rm : *****0011*  "

```

Scan commands:

```

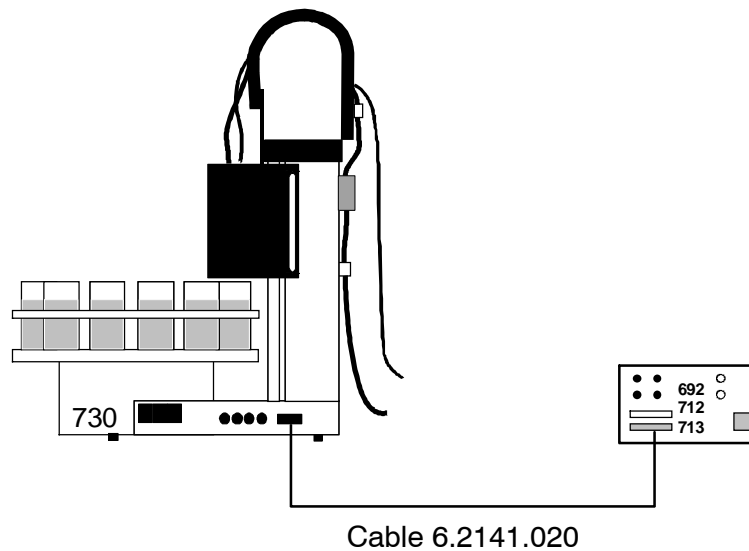
SCN:Rm :          End1  awaits end of measurement
SCN:Rm :          ****1***  "

```

---

**730 Sample Changer — pH- / Ion- / Conductometer  
(692/712/713)**


---

Remote control commands:

```

CTL:Rm : START device1  starts measuring instrument
CTL:Rm : *****1      "
CTL:Rm : METER mode pH  change mode to pH measurement
CTL:Rm : *****0001*  " (not appl. with 712)
CTL:Rm : METER mode T   change mode temp. measurement
CTL:Rm : *****0010*  " (not appl. with 712)
CTL:Rm : METER mode U   change mode to mV measurement
CTL:Rm : *****0011*  " (not appl. with 712)
CTL:Rm : METER mode I   change mode to Ipol (mV meas.)
CTL:Rm : *****0100*  " (not appl. with 712)
CTL:Rm : METER mode C   change mode to conc measurement
CTL:Rm : *****1000*  " (only appl. with 692)
CTL:Rm : METER cal pH  change mode to pH calibration
CTL:Rm : *****0101*  " (not appl. with 712)
CTL:Rm : METER cal C   change mode to conc calibration
CTL:Rm : *****1001*  " (only appl. with 692)
CTL:Rm : METER enter   simulates <ENTER> key
CTL:Rm : *****1111*  " (not appl. with 712)

```

Scan commands:

```

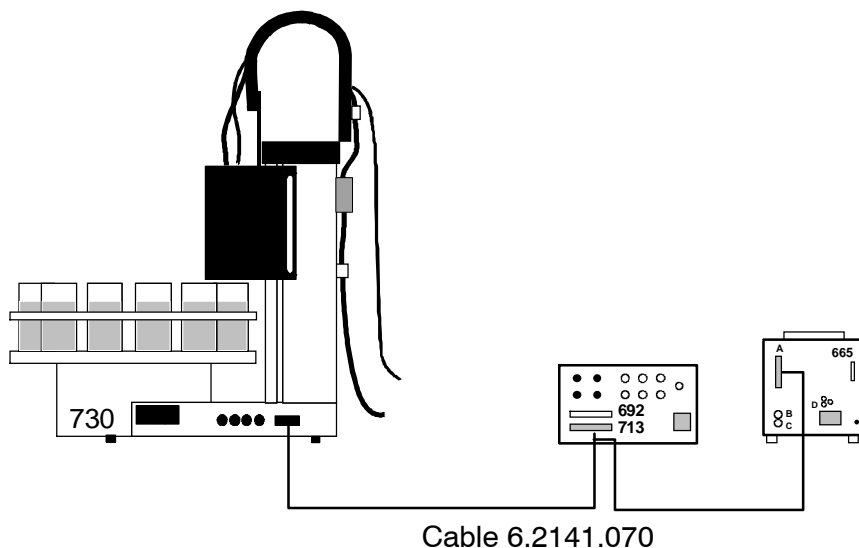
SCN:Rm :          end1  awaits end of determination
SCN:Rm :          ****1***  "

```

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**730 Sample Changer — 713 / 692 pH/Ionmeter — 665 Dosimat**  
for automatic calibration including standard addition.

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The 692 pH/Ion Meter takes control of stirrer 1 connected to the 730 Sample Changer.

Remote control commands:

The same commands are applicable as above.

Scan commands:

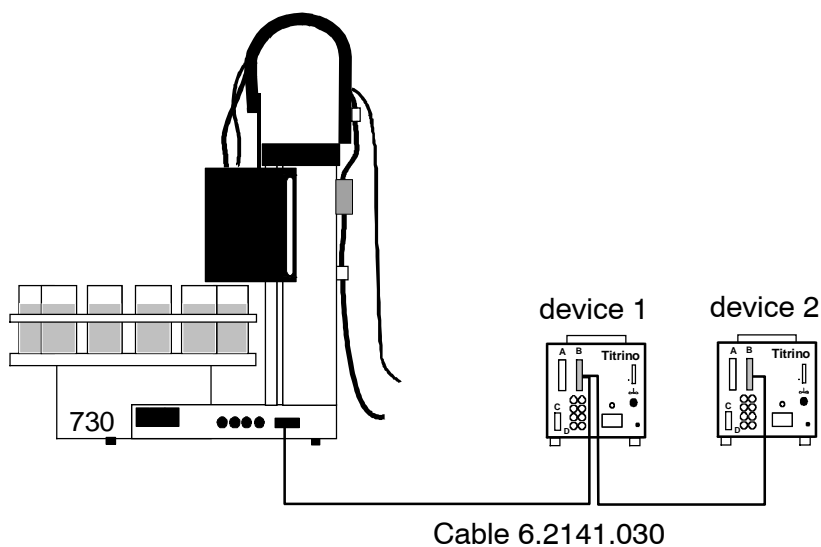
The same commands are applicable as above, but also:

```
SCN:Rm :      endmeter  awaits end pulses from 692 Ion Meter
SCN:Rm :      ***11***    "
```

---

**730 Sample Changer — 2 x Titrimo**

---



Remote control commands:

```

CTL:Rm : START device1  starts Titrimo 1
CTL:Rm : *****1      "
CTL:Rm : START device2  starts Titrimo 2
CTL:Rm : *****1*****
CTL:Rm : START device*  starts both Titrimos at the same time
CTL:Rm : *****1*****

```

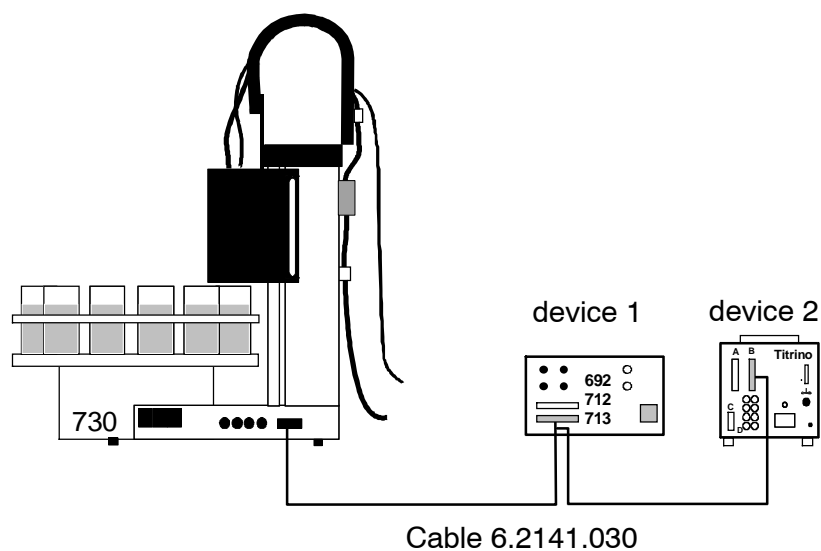
Scan commands:

```

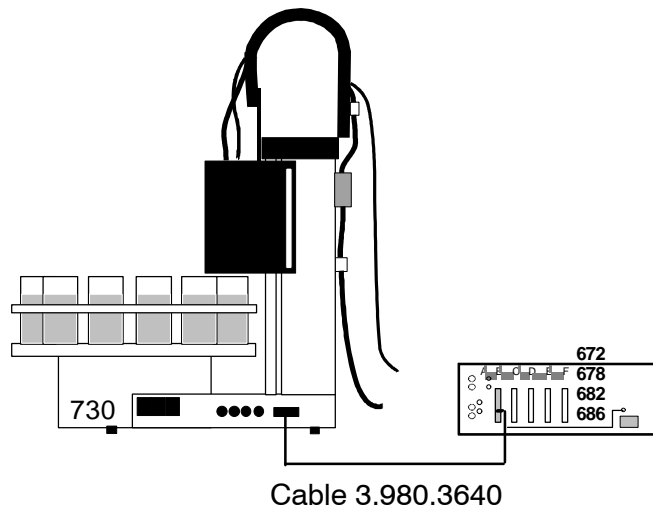
SCN:Rm :          end1  awaits end of titration of Titrimo 1
SCN:Rm :          ****1***
SCN:Rm :          end2  awaits end of titration of Titrimo 2
SCN:Rm :          *1*****
SCN:Rm :          ready1 awaits readiness of Titrimo 1
SCN:Rm :          *****1
SCN:Rm :          ready2 awaits readiness of Titrimo 2
SCN:Rm :          **1*****
SCN:Rm :          ready* awaits readiness of both Titrimos
SCN:Rm :          **1*****1

```

Operating Titrimos and pH meters at the same time is also possible in the same manner.



**730 Sample Changer — 678 / 682 / 686 Titroprocessor**



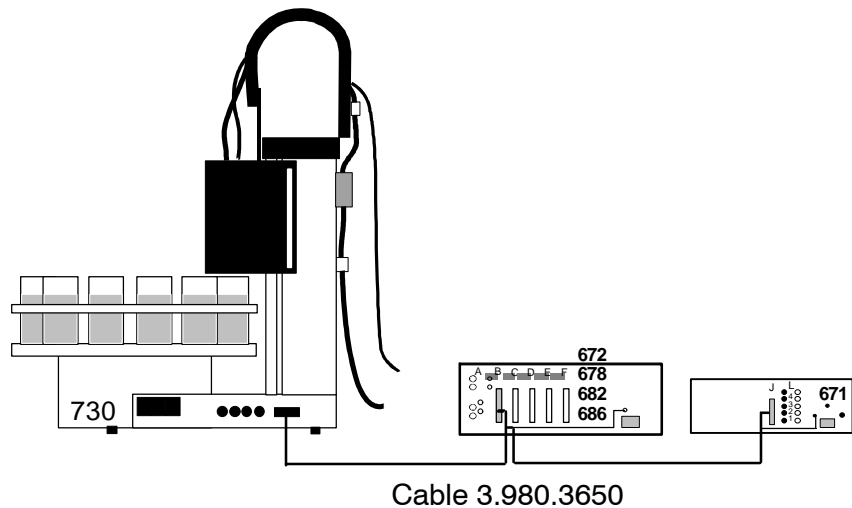
Remote control commands:

```
CTL:Rm : START device1  starts Titroprocessor
CTL:Rm : *****1      "
```

Scan commands:

```
SCN:Rm :          End1  awaits end of titration
SCN:Rm :          ****1*** "
```

**730 Sample Changer — 678 / 682 / 686 Titroprocessor — 671 Switch Box**



Remote control commands:

```
CTL:Rm : START device1  starts Titroprocessor
CTL:Rm : *****1      "
```

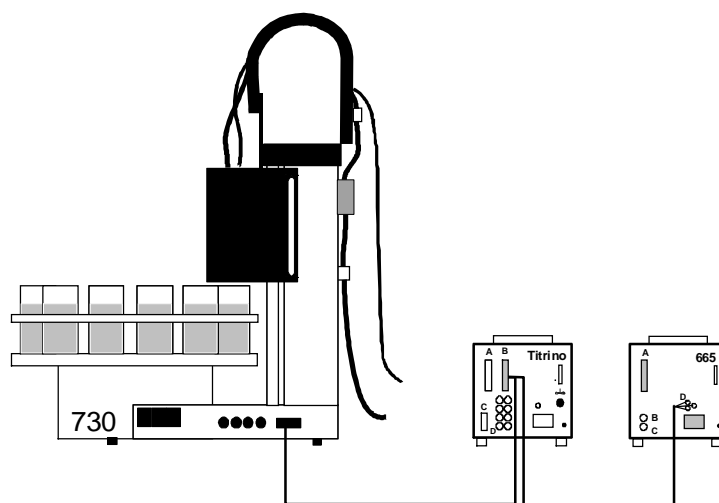
Scan commands:

```
SCN:Rm :          end1  awaits end of titration
SCN:Rm :          ****1*** "
```

---

**730 Sample Changer — Titrino / pH-Meter — 665/725 Dosimat**


---



Cable 6.2141.040

Remote control commands:

```

CTL:Rm : START device1  starts Titrino
CTL:Rm : *****1      "
CTL:Rm :   START dos1   starts Dosimat 1
CTL:Rm : *****1***** "

```

Scan commands:

```

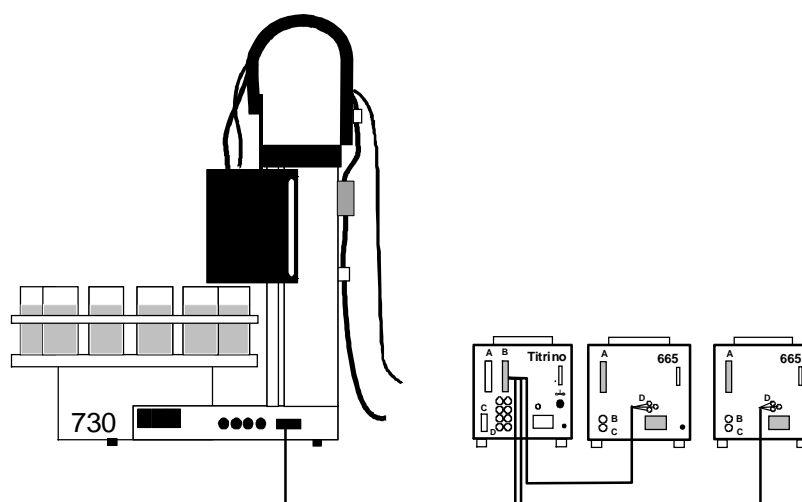
SCN:Rm :   end1        awaits end of titration
SCN:Rm :   ****1***   "
SCN:Rm :   ready1     awaits readiness of Titrino
SCN:Rm :   *****1  "

```

---

**730 Sample Changer — Titrino / pH-Meter — 2x 665/725 Dosimat**


---



Cable 6.2141.050

Remote control commands:

```

CTL:Rm : START device1  starts Titrimo
CTL:Rm : *****1      "
CTL:Rm : START dos1     starts Dosimat 1
CTL:Rm : *****1*****
CTL:Rm : START dos2     starts Dosimat 2
CTL:Rm : *****1*****
CTL:Rm : START dos*     starts Dosimat 1 and 2
CTL:Rm : *****1*1*****
    
```

Scan commands:

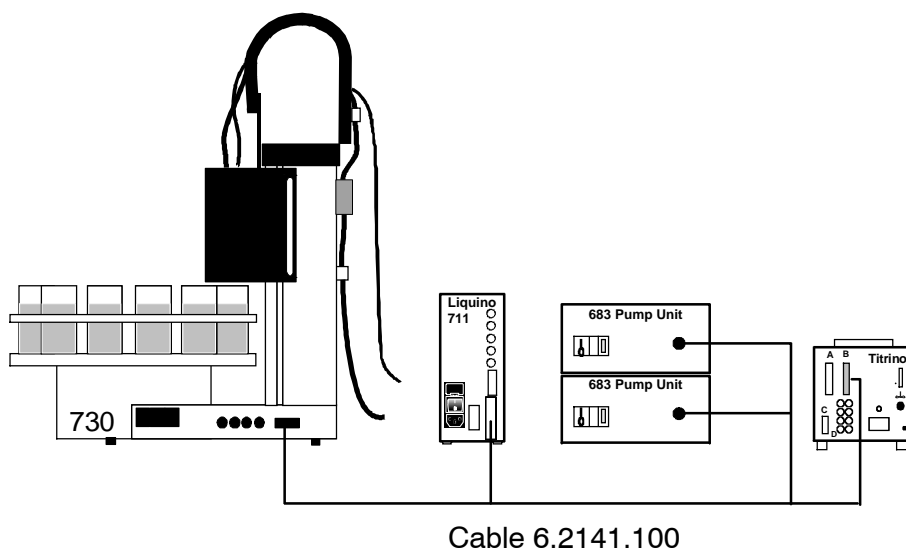
```

SCN:Rm : end1           awaits end of titration
SCN:Rm : *****1****
SCN:Rm : ready1        awaits readiness of Titrimo
SCN:Rm : *****1
    
```

---

**730 Sample Changer — 711 Liquino — 683 Pump — Titrimo**

---

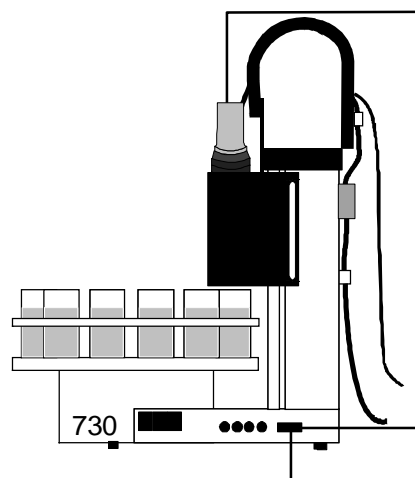


If you run the 730 Sample Changer together with the 711 Liquino, the Sample Changer should be controlled by the Liquino. For detailed informations see the Instructions for Use of the Liquino.

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**730 Sample Changer with 759 Swing Head**

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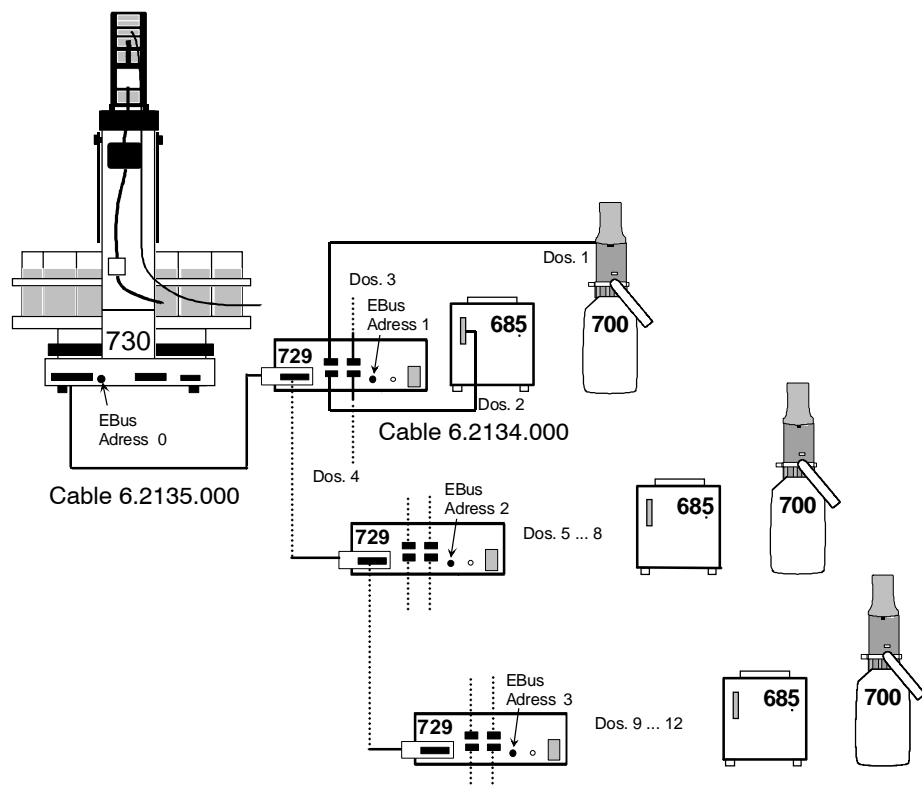
Connection of further  
instruments via the  
remote interface

The 759 Swing Head is connected via the remote interface with a special cable. Using the remote cables for the 730 Sample Changer, additional instruments can be connected (see page 13), while four lines (Input 7 and Output 11–13, see Instructions for Use, page 119) are occupied by the swing head. These four lines are ignored when the swing head is switched on in the configuration, they are not continued in the plug.

### 4.3 External Bus Connections

Four dosing instruments may be connected to the "External Bus" interface using a 729 Dosimat Interface. Up to three Dosimat Interfaces may be connected in line (daisy chaining) and be assembled with dosing instruments. Each interface must be addressed correctly.

Thus it is possible to operate 12 dosing units using the DOS command of the 730 Sample Changer.



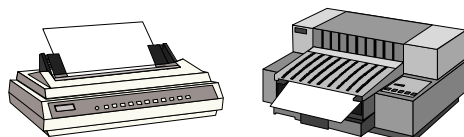
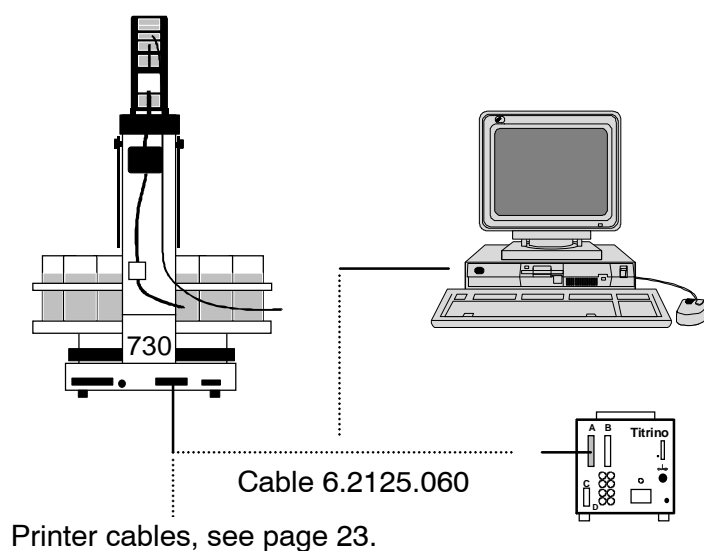
Addresses:

	"External Bus"- Address	Dosing Unit
Sample Changer	0	
1. Interface	1	Dos. 1 ... Dos. 4
2. Interface	2	Dos. 5 ... Dos. 8
3. Interface	3	Dos. 9 ... Dos. 12

## 4.4 Serial Connections (RS232)

Many different instruments may be connected via the serial RS232 interface.

In addition to all Metrohm instruments that support the Metrohm remote control language (see Instructions for Use, page 125) any printer with serial interface (or parallel interface and parallel/serial converter) or a personal computer (PC) may be connected. Any other measuring instrument may be controlled via RS232 interface, as long as it supports serial data transmission.



In order to guarantee safe data transmission, it is important to set the same RS232 interface parameters correctly for both instruments connected (see page 23).

### Control commands (examples):

CTL:RS :	&M;\$G	starts a Metrohm instrument
CTL:Rs :	&M;\$S	stops a Metrohm instrument
PRINT:	config	prints a configuration report to a printer or PC

### Scanning input data (example):

SCN:RS :	*R"	waiting for readiness of a Metrohm instrument
----------	-----	---

## 4.5 Connecting a Printer

Printers with the following drivers can be installed:

- IBM IBM Proprinter and printer with IBM-Emulation
- Epson EPSON printer and printer with EPSON-Emulation
- Seiko Seiko printer DPU-411
- Citizen Citizen printer IDP560 RS
- HP HP printer and printer with HP PCL3-Emulation



If you connect a printer not listed in the following table, be sure that it is able to emulate Epson or IBM Proprinter mode. Use the 6.2125.050 cable for connecting a printer with built-in serial interface. Printers with parallel interface require the serial/parallel converter 2.145.0300 and cable. 6.2125.020



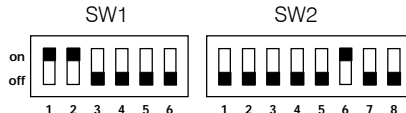
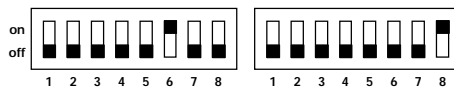


Before you connect a printer to the RS232 interface the Sample Changer has to be switched off !

The parameters for the RS232 interface are given in the configuration menu '>RS232 settings'.

The settings for connecting a printer are listed in the table below.

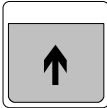
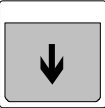
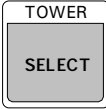
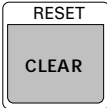
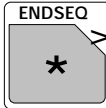
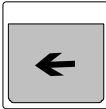
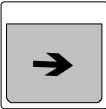
Printer type	Cable	RS232 Settings	Settings on Printer
IBM Proprinter	6.2125.050	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: IBM	see printer manual
Seiko DPU-411	6.2125.020	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: Seiko	DIP switch settings: <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>DIP01</p>  <p>1 2 3 4 5 6 7 8</p> </div> <div style="text-align: center;"> <p>DIP02</p>  <p>1 2 3 4 5 6</p> </div> </div> <p>The 7-bit ASCII character is set automatically to the specific national character set according to the selected dialog language.</p>

Printer type	Cable	RS232 Settings	Settings on Printer															
Citizen IDP560-RS	6.2125.050	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: Citizen	DIP switch settings:  The 7-bit ASCII character is altered to the specific national character set by setting the jumpers J1 and J2 as follows: <table border="0"> <tr> <td><b>J1</b></td> <td><b>J2</b></td> <td><b>character set</b></td> </tr> <tr> <td>open</td> <td>open</td> <td>USA</td> </tr> <tr> <td>closed</td> <td>closed</td> <td>Great Britain</td> </tr> <tr> <td>closed.</td> <td>open</td> <td>France</td> </tr> <tr> <td>open</td> <td>closed</td> <td>Germany</td> </tr> </table> No spanish character set available (French may be best).	<b>J1</b>	<b>J2</b>	<b>character set</b>	open	open	USA	closed	closed	Great Britain	closed.	open	France	open	closed	Germany
<b>J1</b>	<b>J2</b>	<b>character set</b>																
open	open	USA																
closed	closed	Great Britain																
closed.	open	France																
open	closed	Germany																
Epson with 6-pole round plug	6.2125.040	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: Epson	DIP switch settings: 															
Epson with additional serial interface #8148	6.2125.050	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: Epson	DIP switch settings on the <u>Interface</u> : 															
Epson LX-300	6.2125.050	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: Epson	see printer manual															
HP Deskjet with built-in serial interface	6.2125.050 or cable 25-pole neg. / 9-pole pos. (z.B. HP C2933A)	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: HP	DIP switch settings : 															
HP Laserjet with built-in serial interface	cable 25-pole neg. / 9-pole pos. (z.B. HP C2933A)	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: HP	see printer manual															
HP Deskjet / Laserjet with parallel interface	6.2125.020 + serial/parallel-converter 2.145.0300	baud rate: 9600 data bit: 8 stop bit: 1 parity: none handshake: HWS character set: HP	see printer manual															

## 5 Tutorial

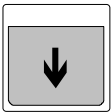


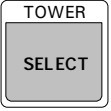
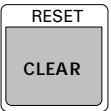
In order to become acquainted with the 730 Sample Changer and its mode of operation, it is helpful to work through the short Operating Tutorial. The basic operating steps that are required to prepare the first sample series and run it with a given method are described here.

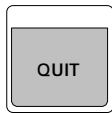

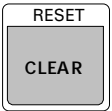
### 5.1 Prerequisites / Preparations



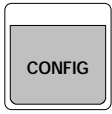
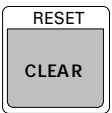
- This operating tutorial can be carried out with all changer variations (1-tower or 2-tower models). Only tower 1 will be used in this case. If a swing head is installed, see chapter 7 "Swing Head", page 40).
- It is assumed that the changer is fully installed.
- Connect a Metrohm titration instrument (a Titrino model is a good choice) to the remote socket (cable 6.2141.020). This tutorial can also be executed as a "dry run", i.e. without a titration instrument.
- Choose a simple titration method that you have saved in the titration instrument or create a new simple method.
- Mount the necessary tubing, an electrode and the rotating nozzle or spray nozzles on the titration head on tower 1. Do not forget to mount the splash protection and the plug cover.
- The <↓> and <↑> keys can be used to move the lift up or down for this purpose.
- With the 2-tower model, the <TOWER/SELECT> key changes the active tower.
- Install the sample rack. Press the <RESET> or <ENDSEQ> (+<ENTER>) key. The changer is initialized in this way with each lift placed in the rest position and the rack is turned until the rack position 1 is positioned in front of tower 1. In this position the magnetic rack code can be read so that the internally stored rack data (position table, etc.) can be loaded.  
**This should be done after every rack change.**
- Insert some titration beakers into the sample rack. One should be put in the highest possible rack position as rinse and conditioning beaker. The rest of the beakers are placed in ascending order, beginning with position 1. Using the keys <←> and <→> the rack can be turned for this purpose.

## 5.2 Basic Configuration

	<ul style="list-style-type: none"> <li>Move the lift downwards carefully with the &lt;↓&gt; key so that the electrode being used almost touches the bottom of the titration beaker or the titration head almost touches the edge of the beaker.</li> </ul>
    4x <↓>  <ENTER>  <0>, <1> or <2> <ENTER> <SELECT> <ENTER>  <SELECT> <ENTER>	<ul style="list-style-type: none"> <li>The dialog language can be set in the configuration menu. Press &lt;CONFIG&gt; <p style="text-align: center;"><b>Display:            configuration</b> <b>                         &gt;auxiliaries</b></p> </li> <li>and then &lt;ENTER&gt;. <p style="text-align: center;"><b>Display:            &gt;auxiliaries</b> <b>                         dialog:            english</b></p> </li> <li>This menu item has a colon, indicating that here the parameters can be selected from a list. Press &lt;SELECT&gt; several times in order to view the various selections and get used to this type of dialog. <p style="text-align: center;"><b>Display:            &gt;auxiliaries</b> <b>                         dialog:            deutsch</b> <b>                         dialog:            francais</b> <b>                         ...                            ...</b></p> </li> <li>With &lt;ENTER&gt; you can accept the suggestion 'dialog: english'. <p style="text-align: center;"><b>Display:            &gt;auxiliaries</b> <b>                         display contrast:    3</b></p> </li> <li>By pressing &lt;↓&gt; 4 times you reach the menu selection 'max. lift way'. <p style="text-align: center;"><b>Display:            max. lift way        235 mm</b></p> </li> <li>Here the lowest allowable lift position for automatic and manual operation can be set. This is a limit that can prevent damage to an electrode or a titration beaker in case of careless lift manipulation. Accept the present lift position by pressing &lt;CLEAR&gt; followed by &lt;ENTER&gt;. <p style="text-align: center;"><b>Display:            pumps on tower 1    1</b></p> </li> <li>Next you must indicate the number of pumps that are mounted on the towers (or on the single tower). <p style="text-align: center;"><b>Display:            swing head:           OFF</b></p> </li> <li>If you have installed a swing head instead of a titration head at tower 1, you need to select 'swing head: ON' using the &lt;SELECT&gt;-key to be able to use it. <p style="text-align: center;"><b>Display:            beaker sensor:        ON</b></p> </li> <li>With standard racks with one and two rows it is reasonable to switch on the beaker sensor. With this sensor, it is checked whether the sample vessels are in the right position in front of the tower. For racks with three rows the baker sensor should be switched off.</li> </ul>

 <p style="text-align: center;">OR</p>   	<ul style="list-style-type: none"> <li>In order to put the sample changer back into the initial position, press &lt;QUIT&gt; twice or &lt;STOP&gt; once.</li> </ul> <p style="text-align: center;"><b>Display:</b>           ***** Counter 1/12                           PUMP---- STIR---- ready</p> <ul style="list-style-type: none"> <li>In the normal state, the method name and the sample counter reading are displayed in the first line. The second line serves as status line which displays the pump status, the stirrer status and the changer status.</li> <li>At the end of this basic configuration the sample changer must be turned off and on again or re-initialized by pressing &lt;CLEAR&gt; to make the latest settings effective.</li> <li>All data entered up to this point however, are retained. The same is true for any method that may have been saved.</li> </ul>
--	---

### 5.3 Rack Configuration

 	<ul style="list-style-type: none"> <li>Using the keys &lt;↓&gt; and &lt;↑&gt; you can run the lift to the desired work position.</li> </ul>
 <p style="text-align: center;">&lt;↓&gt;</p> <p style="text-align: center;">&lt;ENTER&gt;</p> <p style="text-align: center;">&lt;ENTER&gt;</p> <p style="text-align: center;">&lt;↓&gt;</p>   <p style="text-align: center;">&lt;ENTER&gt;</p>	<ul style="list-style-type: none"> <li>Now open the configuration menu with &lt;CONFIG&gt; and move the cursor key &lt;↓&gt; until you reach the submenu '&gt;rack definitions'. Press &lt;ENTER&gt; to open this submenu where you can define the rack configuration.</li> </ul> <p style="text-align: center;"><b>Display:</b>           &gt;rack definitions       1                           rack number</p> <ul style="list-style-type: none"> <li>The rack number of the engaged rack will be displayed as soon as the sample rack has been correctly identified. By confirming with &lt;ENTER&gt; you access the rack data. (By entering another rack number you can also edit the data of a sample rack that is not engaged.)</li> <li>You can skip the first entries with the cursor. Now you can enter the work position of the lift.</li> </ul> <p style="text-align: center;"><b>Display:</b>           &gt;rack definitions       1                           work position        0 mm</p> <ul style="list-style-type: none"> <li>Because you have already positioned the lift at the desired height, you can accept the current lift position directly by pressing &lt;CLEAR&gt;. Of course the work position can be entered manually or the value that has automatically been accepted can be modified later. Lift positions are given in millimeters (0–325 mm), measured from the uppermost limit (rest position) of the lift.</li> </ul> <p style="text-align: center;"><b>Display:</b>           &gt;rack definitions       1                           work position        150 mm</p> <ul style="list-style-type: none"> <li>In any case do not forget to confirm the value with &lt;ENTER&gt;.</li> </ul>

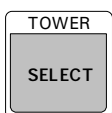
	<b>Display:</b>	>rack definitions      1	
		rinse position        0 mm	
...			<ul style="list-style-type: none"> <li>The next menu item 'rinse position' defines the height at which the lift must be when the electrode is rinsed. As for the work position, the value here can also be entered manually or automatically accepted. For the latter, the configuration menu must be exited by pressing &lt;QUIT&gt; twice and the lift newly positioned.</li> </ul>
<ENTER>	<b>Display:</b>	>rack definitions      1	
		rinse position        130 mm	
	<b>Display:</b>	>rack definitions      1	
		shift position        0 mm	
...			<ul style="list-style-type: none"> <li>The menu item 'shift position' defines the height of the lift when the sample rack is rotated. For the entry proceed as for the work position. Make sure that the electrode, the titrating tip and the rod stirrer do not bump against the vessels when the rack rotates.</li> </ul>
<ENTER>	<b>Display:</b>	>rack definitions      1	
		shift position        20 mm	
	<b>Display:</b>	>rack definitions      1	
		special position      0 mm	
...			<ul style="list-style-type: none"> <li>The 'special position' defines a further height of the lift. It can be used for pipetting with the swing head. For the entry proceed as for the work position.</li> </ul>
<ENTER>	<b>Display:</b>	>rack definitions      1	
		special position      140 mm	
			<ul style="list-style-type: none"> <li>The final entry in the rack configuration is the definition of the position of the special beakers.</li> </ul>
<ENTER>	<b>Display:</b>	>rack definitions      1	
		>>special positions	
<ENTER>			<ul style="list-style-type: none"> <li>In the submenu '&gt;&gt;special positions' under 'special beaker 1' enter the position at which you have placed the corresponding beaker (see rack overview in the Instructions for Use, page 104).</li> </ul>
			<ul style="list-style-type: none"> <li>The configuration can now be exited with &lt;STOP&gt; or by pressing &lt;QUIT&gt; three times. The rack data entered are now available at all times and must not be re-defined every time.</li> </ul>



## 5.4 The Method



<ENTER>



<ENTER>

- Now open the user method menu.

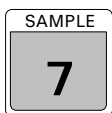
**Display:**            **methods**  
                                 **>recall method**

- Press <ENTER> to load a predefined method.

**Display:**            **method:**                    **\*\*\*\*\***

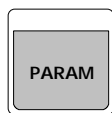
- Choose "Titrino" with the <SELECT> key. This is the most universal of the predefined methods from which you can learn the basic sample changer commands.
- After you have confirmed loading the method with <ENTER>, the name of the method appears in the upper left corner of the display. You can now use the TRACE function to run the method in steps to understand how it works. See below.

### Tracing



<2>

<ENTER>



<3>

<ENTER>

- Before you begin tracing, set the position of the first sample with the SAMPLE command. Press <SAMPLE>.

**Display:**            **SAMPLE:**            =            **1**

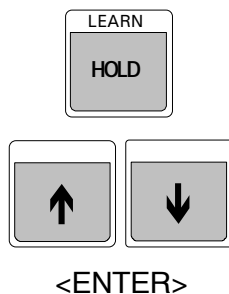
- Press <2> and <ENTER>.

- Now press <PARAM> to open the parameter menu. All parameters and sequences that are stored with methods can be found here.

**Display:**            **parameter**  
                                 **number of samples:    rack**

- The first menu entry defines the number of sample beakers (without the special beakers) that are to be treated in a series. Here you can choose between 'rack' (= a sample rack that is partially or completely filled, only positions with a sample beaker are counted) and '\*' (= infinite number of samples) with <SELECT>. However for this learning sequence, enter '3' on the keyboard. Like for other parameters, it is possible to enter data manually or to use the "select" choice here.

<p>&lt;ENTER&gt;</p>	<p style="text-align: center;"><b>Display:        parameter</b> <b>                 &gt;start sequence</b></p> <ul style="list-style-type: none"> <li>In the submenu '&lt;start sequence&gt;' the commands that are executed at the start of a sample series are found.</li> </ul> <p style="text-align: center;"><b>Display:        &gt;start sequence</b> <b>                 1 CTL: Rm                INIT</b></p> <ul style="list-style-type: none"> <li>Only the CTL command is involved in the initialization of the remote interface in the "Titrino" method. This command should be used in the start sequence of every method. Do not change anything here. Leave this submenu with &lt;QUIT&gt;.</li> </ul>
<p>&lt;↓&gt;</p> <p>&lt;ENTER&gt;</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">START</div> <p>&lt;START&gt;</p> <p>&lt;START&gt;</p> <p>&lt;START&gt;</p> <p>&lt;START&gt;</p>	<ul style="list-style-type: none"> <li>In the submenu '&gt;sample sequence' you find the command sequences that are executed for every sample. It is recommended to test out this procedure line by line with the TRACE function.</li> </ul> <p style="text-align: center;"><b>Display:        &gt;sample sequence</b> <b>                 1 MOVE 1        :    sample</b></p> <ul style="list-style-type: none"> <li>If you press the &lt;START&gt; key at this point, the MOVE command is executed. The sample beaker in the position predefined as sample position 2 is placed in front of tower 1.</li> </ul> <p style="text-align: center;"><b>Display:        2 LIFT: 1        :    work mm</b></p> <ul style="list-style-type: none"> <li>On the next line press &lt;START&gt; again to move the titration head on tower 1 into the work position you previously defined for this rack.</li> </ul> <p style="text-align: center;"><b>Display:        3 STIR: 1        :    on s</b></p> <ul style="list-style-type: none"> <li>Stirrer 1 is turned on in this line.</li> </ul> <p style="text-align: center;"><b>Display:        4 CTL: Rm    START device1</b></p> <ul style="list-style-type: none"> <li>In this line the Titrino that is connected via the remote interface is started.</li> </ul> <p style="text-align: center;"><b>Display:        5 SCN: Rm        :    end1</b></p> <ul style="list-style-type: none"> <li>In this line the SCAN command is used to anticipate the end of the titration. The Titrino sends a signal (EOD) at the end of the titration. Afterwards the sample changer will complete the sample sequence.</li> <li>After you have started the command you can interrupt it with &lt;STOP&gt; in case you do not want to wait for the completion of the titration. Otherwise wait for device1 to send the EOD-Pulse. Tracing may be continued without pressing the &lt;STOP&gt; key.</li> </ul> <p style="text-align: center;"><b>Display:        6 STIR: 1        :    off s</b></p> <ul style="list-style-type: none"> <li>In this line stirrer 1 is turned off.</li> </ul>



**Display: 7 LIFT: 1 : rinse mm**

- In this line the lift on tower 1 is moved into the rinsing position.
- With this command you can become acquainted with the LEARN mode. It allows the user to manually set the parameters of a command on a trial basis.
- Press <LEARN> to access the LEARN mode. The blinking LEARN-LED indicates that the 730 Sample Changer is ready to execute the command.
- Now move the lift into the desired position with the <↓> and <↑> keys. You will notice that the current lift position is always indicated "live". During execution of the command the LEARN-LED is lit continuously. Accept the lift position that has been set by pressing <ENTER> and thereby exit the LEARN mode. The LEARN LED goes off again.

**Display: 8 PUMP 1.1 : 2 s**

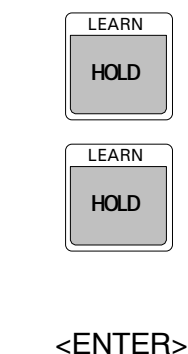
- In this line pump 1 on tower 1 is switched on to rinse the electrode and titrating tip for 2 seconds.
- Here, you can use the LEARN mode to optimize the rinsing time too.
- In this case, as with the other "teachable" commands (the LIFT command is an exception), pressing the LEARN key causes immediate execution of the corresponding command. The elapsed time is also displayed here "live". By pressing the <LEARN> key again the command can be interrupted.
- The blinking LED indicates that the sample changer is still in the LEARN mode. If you now switch the pump back on with the <LEARN> key, you will see that the "live" value (rinsing time) is now added to the existing value.
- Now optimize the rinse time in this way. Accept the total time with <ENTER> and exit the LEARN mode in this way.

**Display 9 WAIT 5 s**

- In this line a waiting time is defined that is used here as drip time.
- The LEARN mode can also be used with the WAIT command.

**Display: 10 NOP**

- An empty line with a 'NOP' entry (no operation) always forms the end of a sequence.
- Exit the sample series with <QUIT> and go to the final sequence.


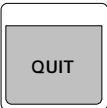





<ENTER>

<QUIT>



<ENTER>

 <p>&lt;START&gt;</p> 	<ul style="list-style-type: none"> <li>• After all sample beakers have been processed, the end sequence is executed.           <p style="text-align: center;"><b>Display:</b>        &gt;end sequence                          1 MOVE 1        : spec. 1</p> </li> <li>• In this line the special beaker 1 (as conditioning beaker) is put in front of tower 1. Press &lt;START&gt;.           <p style="text-align: center;"><b>Display:</b>        2 LIFT: 1    : work mm</p> </li> <li>• In this line lift 1 is put into the operating position with the electrode immersed in the conditioning solution.</li> <li>• Press &lt;START&gt;.           <p style="text-align: center;"><b>Display:</b>        3 NOP</p> </li> <li>• Now you have reached the end of the end sequence and have completed the entire run of a sample series.</li> <li>• By pressing &lt;QUIT&gt; twice you return to the normal state.</li> </ul>
  	<ul style="list-style-type: none"> <li>• Now prepare some sample beakers and fill the special beaker with a conditioning solution or water. Place all titrating vessels on the rack and prepare the Titrino for titration.</li> <li>• Enter the number of samples to be processed (&lt;PARAM&gt;) and define the position of the first sample (SAMPLE =1).</li> <li>• Now you can start your first sample series with &lt;START&gt;.</li> </ul>

## 6 Configuration

Before using the 730 Sample Changer for the first time, it must be correctly configured. This includes not only the basic settings which vary slightly from one model to the other, but also the configuration of the sample racks used and the peripheral instruments that are connected. All of these settings can be accessed via the configuration menu, which can be opened with the <CONFIG> key. It is divided into 4 submenus according to topic. Navigating in the menu (selecting the individual settings) is accomplished simply using the cursor keys (<↓>, <↑>), <HOME>, <END> and the <ENTER> key. Submenus and main menu can be exited with the <QUIT> key. Many menu entries allow selection of the desired entry from a number of preset selections with the <SELECT> key. These menu items are marked with a colon (:).

If you changed the configuration, you should RESET the sample changer using the <CLEAR> key or switch it off and on again to secure that all changes become effective.

### 6.1 Basic Settings

The following are some of the basic settings which can be set in the submenu '> auxiliaries':

- Dialog language
- Display contrast
- Acoustic signal for warnings on/off
- Device label (Instrument name or identification)
- Program version
- Maximum lift height or way
- Number of pumps on tower 1 and 2 (depending on the model)
- Swing head on/off
- Beaker sensor on/off

#### Dialog language

The dialog language can be chosen from the preset selections 'english, deutsch, français, español'.

#### Display contrast

The display contrast can be set on a scale from 0 (low contrast) to 7 (high contrast).

#### Beeper on/off

A warning signal sounds when error messages are displayed or if an entry is not confirmed with <ENTER> (and is therefore not accepted). This warning signal can be turned off.

### Device label

To make every laboratory instrument unique (a requirement of GLP) the sample changer can be assigned an alphanumeric 8-place identification consisting of letters and/or digits. This instrument name appears on every report printed. The entry of the text is explained in detail in the Instructions for Use, page 79.

### Program version

The program version (instrument software) cannot be altered. The version is indicated for your information in the configuration menu.

### Max. lift way

The maximum lift way is an important safety entry. If the entry is correct, you can be sure that the lift with the titration head cannot be run too low, which could lead to damage to electrodes or sample vessels. Here the lowest possible lift position (measured from the upper limit) can be entered in mm.

An easy method for determining this position is to first set the desired height manually (normal state) using the <↓> and <↑> keys. Afterwards the configuration menu can be opened and the current lift position taken over in the display by pressing the <CLEAR> key at the menu entry 'max. lift way'.

**Important:** The value entered only becomes valid after the instrument is switched off and on again.

### Number of pumps tower 1 and 2

Here the number of pumps installed on every tower present must be indicated. This entry also becomes effective only after the changer is switched off and on again.

### Swing head

When a 759 Swing Head is installed to increase the number of samples, the swing head is switched on here. Otherwise the default entry 'swing head: OFF' is retained. The swing head is switched on or off only after RESET or after the instrument is switched off and on again.

### Beaker sensor

Each tower of the 730 Swing Head is equipped with an infrared sensor, which detects the presence of a beaker in front of the particular tower. If the beaker sensor is switched on, the test is performed after each MOVE-command. When triple-row sample racks in combination with the swing head are used, the beaker sensor has to be switched off. For the use of special racks, it has to be checked in each case whether the beaker sensor should be used.

## 6.2 Rack Definition

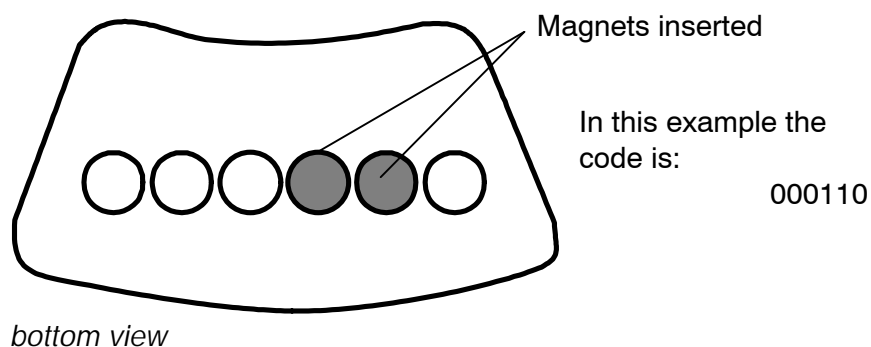
Every sample rack used must be configured to guarantee automatic rack recognition and assure that the rack positions are approached properly. The rack types available from Metrohm are already predefined and can easily be supplemented or altered. If racks of the same type are to be configured differently, each rack must be assigned a different code and the rod magnets on the bottom of the sample rack must be arranged accordingly. In this way a sample rack can be predefined for various applications and the use of the wrong rack can be avoided.

### Rack number

Up to 16 different rack configurations can be stored in the sample changer.

### Rack code

The rack code is used for automatic rack recognition. A code can be assigned only once. The standard racks that are supplied by Metrohm already have a predefined code (see Instructions for Use, page 104). The rack code is a 6-place binary pattern with the digits 0 and 1 that has to correspond to the order of the rod magnets. The digit 1 stands for a magnet which is inserted and 0 signifies that no magnet is inserted. 63 different codes are possible (000001 to 111111).



### Rack type

The rack type or the rack name points to an internal position table in which the positions of the individual beakers on the rack are defined. Metrohm racks have the following scheme for the type definition:

MXX-Y (XX = Number of beakers, Y = special code, 0 for single-row, 1 for double-row and 2 for triple-row standard racks)

For example: M12-0 indicates a single-row normal Metrohm rack with 12 beaker positions.

### Work position

Correctly setting the work position is very important. This is the lift height at which the corresponding sample rack will be processed. It should be chosen so that the electrodes, burette tips and stirrer are in the optimal position. The work position is indicated in mm (from upper limit). In the 2-tower version of the changer this is valid for both lifts.

An easy method for determining this position is to first set the desired height manually (normal state) using the <↓> and <↑> keys. Afterwards the configuration menu can be opened and the current lift position taken over in the display by pressing the <CLEAR> key at the menu entry 'operating position'.

### Rinse position

The rinse position defines the height, at which the lift is during the rinsing of the electrode. As for the working position the rinse position can be entered manually or taken over automatically. In the 2-tower model the shift position is valid for both lifts.

### Shift position

In principle, the sample rack can only be turned when the lift (or lifts) is/are higher or at the same height as the shift position. The shift position should therefore be chosen so that safe turning of the sample rack is possible, i.e. make sure that when the rack is turning, there is no risk of breaking an electrode, etc. As for the working position the shift position can be entered manually or taken over automatically. In the 2-tower model the shift position is valid for both lifts.

### Special position

The special position defines another lift height. E.g., for pipetting with the swing head, this additional lift position can be chosen in a way that the pipetting tip just dips into the sample solution. As for the working position the special position can be entered manually or taken over automatically. In the 2-tower model the shift position is valid for both lifts.

There are no commands combined with the lift positions. Thus, they can be used in principal for any lift position that should be stored.

**Special beakers**

For every sample rack up to 8 special beaker positions can be defined that are not considered to be sample beaker positions during the normal course of a method. Special beakers can be specifically accessed at any time. They can serve as rinsing or conditioning beakers or be defined in a start sequence as the beaker positions of the various buffer solutions for the calibration of an electrode. If the sample is transferred from the sample vessel to the titration vessel using the swing head, the titration vessel is defined as special beaker too.

The special beakers 'spec.1' to 'spec.8' can also be assigned a beaker position from 1 up to the number of sample positions. Position 0 stands for "not defined". It is advantageous to put the special beakers at the rack positions carrying high numbers so that the sample series can begin at position 1.

**6.3 Dosing Units**

To automate the addition of auxiliary solutions, it is possible to connect up to 12 dosing instruments with the sample changer. For this purpose, the 685 Dosimat and the 700 Dosino are available. The maximum dosing and filling rate as well as the dimensions of the tubing can be defined for every dosing unit.

**Dosing unit**

Dosing unit, for which the parameters are entered (1–12, see page 21).

**Max. rate**

This value stands for the maximum allowed dosing and filling rate of the dosing unit. The viscosity of the medium to be dosed should be considered and this value should be chosen so that the dosing is as fast as possible yet the filling of the burette can proceed without a problem and without air bubbles. The max. rate represents an absolute limit that cannot be exceeded even during manual dosing.

**Tubing length and diameter**

These values are only valid for the 700 Dosino. Because this instrument is capable of automatic preparation of the tubing system for dosing, i.e. rinsing the tubing and filling with dosing solution, the actual tubing lengths and inner diameter must be given. The rinsing volume required is then automatically calculated.

The settings mentioned above must be carried out for all 4 ports (inlets and outlets 1–4) of each 700 Dosino.

## 6.4 RS232 Interface

Either a printer (for protocolling the changer settings and methods) or a personal computer (for controlling the changer) can be connected to the RS232 Interface. Furthermore, other Metrohm instruments (via Metrohm remote control language) and possibly other foreign instruments can be accessed via this interface. The transfer parameters required, which must be adjusted according to the instrument that is being connected, are the following:

Baud Rate, Data Bit, Stop Bit, Parity and Handshake

For data communication with PCs, Metrohm and foreign instruments, the parameter 'send to: IBM' must be set. The remaining parameters should keep the standard value or be adapted to the settings of the peripheral instrument used.

Connecting a printer, see page 23.

With 'RS control: ON' the reception of data can be switched on and off. If the remote control is switched off, data cannot be received any more, but reports can still be printed.

## 6.5 Locking Keyboard Functions

Certain domains of the user dialog can be made inaccessible to the novice user by locking particular keys. For example, the inadvertent overwriting of a method or even the changing of parameters can be prevented in this way.

The menu '**keyboard options**' for the corresponding functions is opened by holding down the <CONFIG> key while turning on the changer. Alternatively, a reset can be executed by pressing <CLEAR> and then the <CONFIG> key within 0.4 seconds. This menu is also accessible when the entire keyboard has been locked.

The individual key domains that can be locked are the following:

**Locking the entire keyboard**

If, during routine use, only one particular method is to be used, it may be desirable to block manual manipulations on the changer. All the keys on the keyboard can be locked for this purpose. The <START>, <STOP> and <CLEAR/RESET> keys however, remain operable so that it is still possible to start and stop a method. This can also be beneficial when using the sample changer with a PC-software (for example, TiNet or Workcell). For this application the keyboard may be disconnected.

**' Lock keyboard:**            **ON'** locks all the keys on the keyboard (for exceptions, see above).

**Locking the configuration**

The basic configuration of the changer can be protected from overwriting. All settings of the configuration menu are no longer accessible at this point.

**' Lock config:**            **ON'** locks the <CONFIG> key.

**Locking parameters**

If user methods are generally used, it might be wise to protect the stored method parameters from alteration. The parameter menu can then be made inaccessible.

**' Lock parameters:**        **ON'** locks the <PARAM> key.

**Locking the method storage function**

It makes sense to prevent the inadvertent deletion of stored methods. Method deletion should only be made possible by consciously turning off the locking function.

**' >user methods' + <ENTER>** opens the submenu for locking method storage functions.

**' Lock method recall:**    **ON'** blocks the loading of methods.

**' Lock method store:**    **ON'** blocks the storage of methods.

**' Lock method delete:**   **ON'** blocks the deletion of methods.

**Switching off the display**

If the sample changer is to be operated exclusively by an external control software (see above) the display for manual operation can be switched off.

**' Lock display:**            **ON'** switches off the display.

## 7 Swing Head

To ensure that the individual vessels are approached with precision even when using multiple-row sample racks, a 759 swing head can be installed instead of the normal titration head. The swing head is fitted with either a titration head (2.759.0020) or a transfer head (2.759.0010) for pipetting the sample from the sample vessel into a bigger titrating vessel.

### 7.1 Prerequisites

If a swing head is to be used, program version 730.0013 or higher needs to be installed on the sample changer. The 759 swing head can be used in combination with the following racks:

	Sample rack	759 model	Number of towers
Titration	48 x 75 mL for direct titration Article No. 6.2041.350	Article No. 2.759.0020	1, 2
Pipetting	126 x 15 mL and 2 x 150 mL for pipetting Article No. 6.2041.400	Article No. 2.759.0010	2

If the two-row sample rack with 48 beakers is used on the 2-tower model for direct titration, sample beakers cannot be approached with tower 2. If the rack is used for transferring samples from 126 test tubes into two central measuring/rinsing vessels (special beakers), all the positions can be approached with tower 1, whereas tower 2 can only approach the two special beakers. The swing head cannot be used in combination with other standard rack types.

### 7.2 Installing the Swing Head

The best procedure for installing the swing head is described below. The swing head will normally be installed by our service personnel.



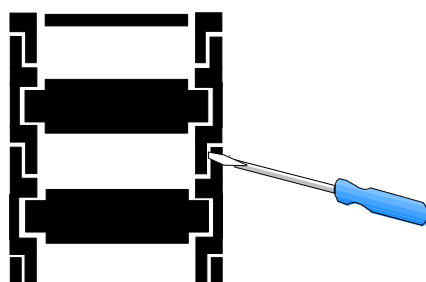
If a 2-tower sample changer is used, the swing head must always be connected to **tower 1** (see page 6)!

With 2-tower sample changers, tower 1 is first moved into a central lift position and tower 2 is moved into the rest position.

**Turn off mains power switch.**

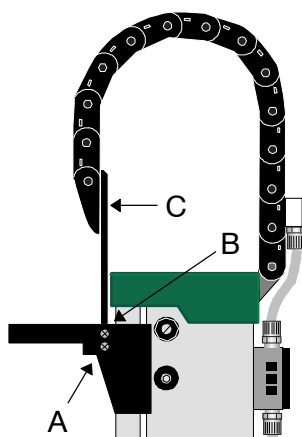
Install the new titration head (6.1462.020) or transfer head (6.1462.010) on the underside of the swing head.

Disengage the guide chain



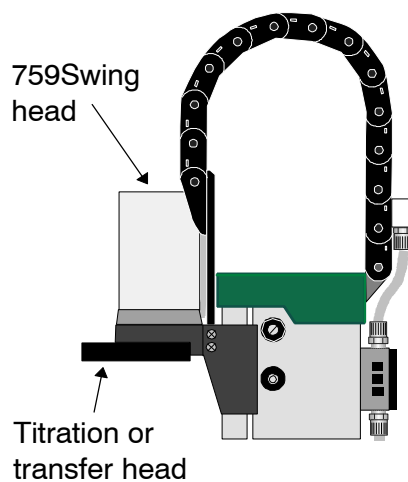
Use a screwdriver to open the guide chain inbetween two links to facilitate the process of disassembling the titration head and installing the swing head.

Connect the swing head to Tower 1



Loosen screws A on both sides and remove the titration head together with the mounting plate and the lowest link. Use an angled screwdriver for recessed-head screws for 2-tower sample changers. Then loosen screws B and C and connect the new mounting plate for the swing head (6.2058.000) to the bottom link (screws C).

Before fixing the swing head to tower 1, rotate screws A a few times in the appropriate holes to cut a thread into the plastic.



The swing head can now be installed on the mounting plate (screws B). Ensure that the lead runs in the guide chain. After screwing the swing head and mounting plate into place on the tower, the bottom link is re-engaged

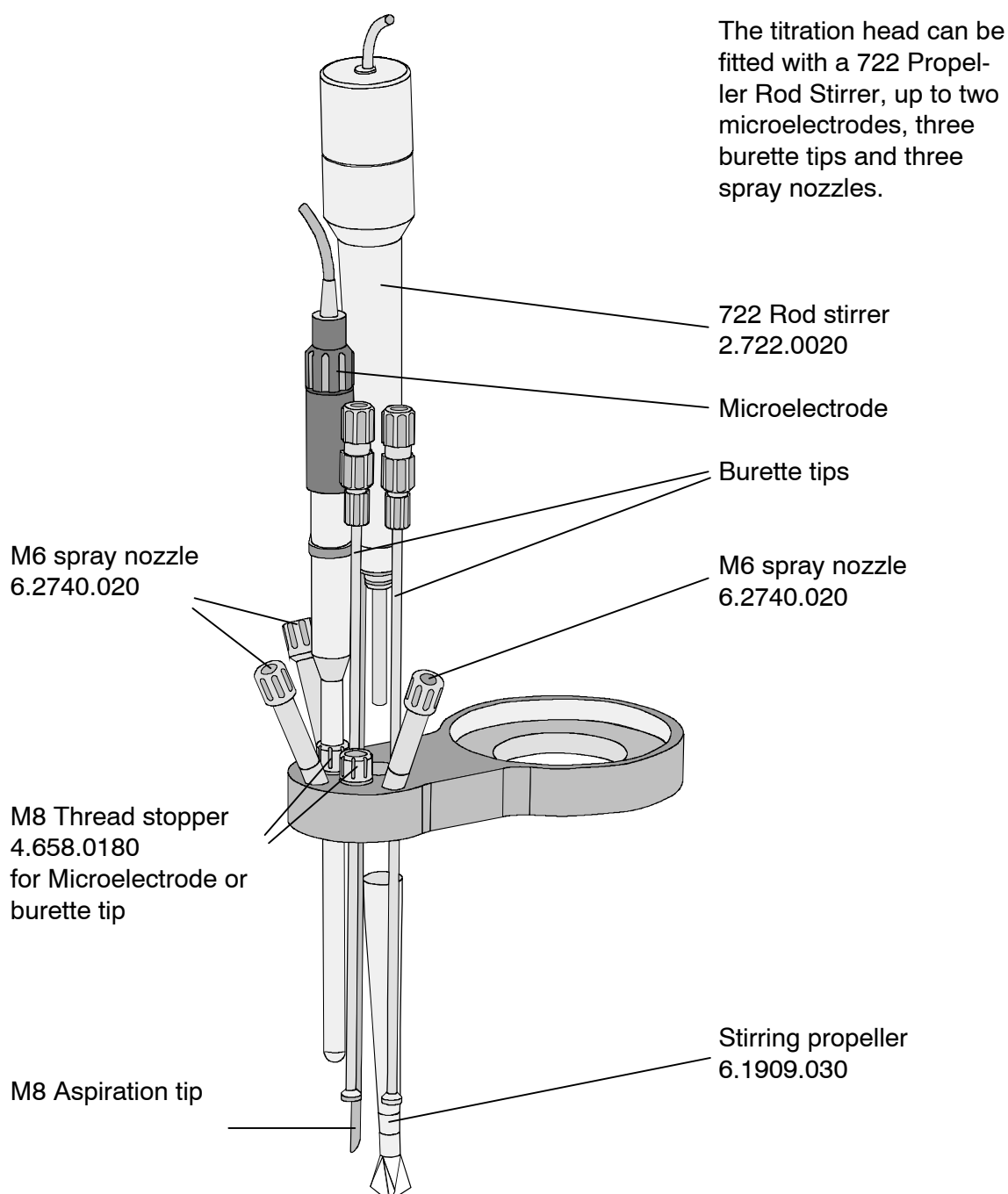
The splash protection supplied with the pipetting swing head (2.759.0010) is connected to tower 2. The splash shield supplied with the titration swing head (2.759.0020) is connected to tower 1 when used with the 2-tower model.

The 759 swing head can now be connected to the remote socket of the sample changer (see page 22) and the sample changer can be turned on again.

### Configuration

In the configuration menu, select '>Auxiliaries' and then 'Swing head: ON'. Switch the beaker sensor off when using three-row racks.

## 7.3 Accessories for the Titration Head



The titration head can be fitted with a 722 Propeller Rod Stirrer, up to two microelectrodes, three burette tips and three spray nozzles.

### **Aligning the titration/transfer head**

The swing head executes a shift movement as it approaches the sample vessels. It can adopt any of four fixed positions, depending on which row is targeted, or whether the lift is in the shift position. The titration or transfer head should be aligned in order to guarantee that the individual positions are approached with precision.

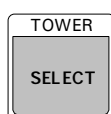
Place the sample rack that you wish to use on the sampler changer and insert a few sample vessels. Approach one sample position. Slightly loosen the three screws securing the titration head to the underside of the swing head and align the titration head so that electrodes, stirrer, burette tip and tubes are centred in the sample vessel. Retighten the screws. Proceed in exactly the same way for the transfer head.

## 8 Manual Operation

By way of introduction, we list here only the basic functions for manual operation that are necessary to prepare the sample changer for the processing of a sample series. They can be executed with just a few keystrokes.

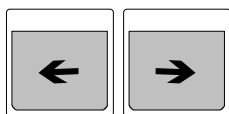
For further commands and details see quick reference manual.

### Selecting a tower (only with the 2-tower model)



Most of the functions for manual operation are specific and valid for only one tower at a time. With <SELECT/TOWER> you can switch between the towers. The tower that is currently active is indicated by the LEDs TOWER 1 and TOWER 2. The following commands or keys refer to the tower that is currently active: MOVE (←, →), LIFT (↑, ↓, HOME, END), PUMP.

### Turning the sample rack / Positioning the samples



Using the <←> and <→> keys the sample rack can be turned one position to the left (in the counterclockwise direction) or right (clockwise). The beaker positions are then directed to the active lift. Special attention should be given to sample racks whose angle of rotation for the beaker positions does not correspond to the arrangement of both towers (for example, 16 or 14-place racks, irregularly arranged rack positions).



With the MOVE command, a particular (sample) beaker can be placed under the active lift. With <SELECT> the numerical rack position as well as the predefined current sample (SAMPLE command) or the special beakers 1–8 can be chosen.

Example:

```
MOVE :      sample   <ENTER>
MOVE :      spec. 1  <ENTER>
MOVE :           5   <ENTER>
```

### Important:



For security reasons turning the sample rack is only possible when the lift (or both lifts) are in or above the shift position.

### Moving the Lift



The keys <↑> and <↓> allow upward and downward movement of the lift on the tower that is currently active. The lowest possible lift position is defined by the configuration parameter 'max. lift way'.



The <HOME> key runs the lift of the currently active tower to the rest position (0 mm), i.e. to the upper limit. <END> runs the lift to the predefined work position.

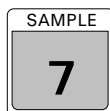


With the LIFT command, the lift of the active tower can be run to a given position. In addition to selecting an exact position in mm (0–325 mm), the <SELECT> key can select a predefined position (shift position, work position, rest position = 0 mm).

Example:

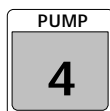
```
LIFT :      work   <ENTER>
LIFT :      shift  <ENTER>
LIFT :      150 mm <ENTER>
```

### Setting the sample position



The <SAMPLE> command serves to set the current sample position. It defines the first sample beaker for the subsequent sample series.

### Pumps



The PUMP command controls the one or two pumps that are accessible on the active tower – for rinsing the titration head and for aspiration of sample or rinsing solution. Maximum two pumps can be operated simultaneously. The pump command switches the selected pump on or off, according to the current state. The current state of the pumps is shown directly in the display.

Example (Tower 1):

```
PUMP on/off  no. ? <2>  Display: PUMP -+- (=on)
PUMP on/off  no. ? <2>  Display: PUMP ---- (==off)
```

Pump 2 on tower 1 is turned on and off.

## Stirrer



The STIR command controls the stirrers. It switches the selected stirrer on or off, according to the current state. The current state of the stirrers is shown directly in the display.

Example:

```
STIR on/off no. ? <3> Display : STIR +---
STIR on/off no. ? <3> Display : STIR ----
```

Stirrer No. 3 is turned on and off.

## Dosing units



The DOS command controls the connected dosing instruments. Positive and negative volumes can be dosed. Negative volumes are used to fill the pipetting tube during pipetting and are entered as `<*xx ml>`. In addition to entering the volume that is to be aliquoted, `<SELECT>` also accesses additional functions of the current dosing instrument:

- filling the burette (fill),
- initializing the change of the dosing unit (release),
- preparing the tubing system (prepar.),
- emptying the tubing system and the burette (empty),
- ejecting the contents of the burette (eject),
- compensating the play between the piston and the spindle before sucking in and filling the cylinder respectively (adjust),
- compensating the play between the piston and the spindle before dosing (level).

The first parameter of the DOS command stands for the number of the dosing instrument (1–12) and the second parameter stands for the function, that is, the volume to be aliquoted.

Example:

```
DOS: 2 <ENTER> 4.51 ml
DOS: 2 <ENTER> <SELECT> ... fill
```

# 9 Methods and Sequences

## 9.1 Composition of a Method

A method consists of the following parts:

- Number of samples to be processed
- Process sequences (start, sample and end sequence)
- Definition of the various instrument settings (changer settings, stirrer speed, definition of the dosing units, manual stop options)

For details about the instrument settings see the Instructions for Use, page 87.

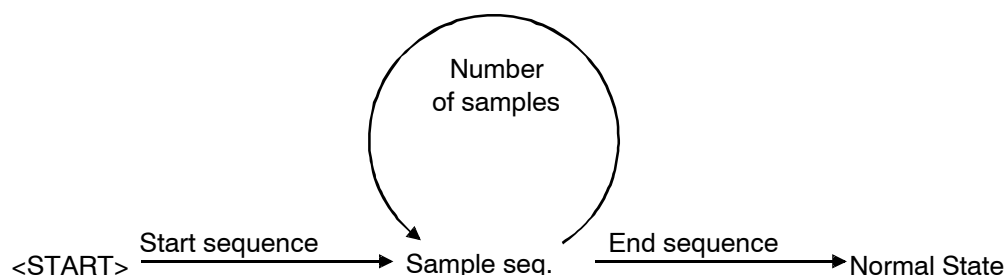
### Sequences

A sequence is a succession of commands that are carried out in the order specified during automatic processing of a sample series. There are functions for controlling up to four stirrers, four pumps, (rinsing and aspiration), two lift stations (towers) and for moving the turntable (racks). External instruments such as titration instruments, pH Meters, Ion Meters, Dosimats, etc. can be controlled using the corresponding commands. Furthermore, the settings for the individual instrument components and dosing units (700 Dosino or 685 Dosimat) can be defined within a sequence.

Processing a sample series is accomplished in three phases. These are:

- |                  |  |
|------------------|--|
| Start Sequence:  | Sequence of commands that is executed once at the beginning of a series. |
| Sample Sequence: | Sequence of commands used for each sample.                               |
| End Sequence:    | Sequence of commands that is executed once at the end of a series.       |

### Course of a method



The creation of sequences is done in the submenus '>start sequence', '>sample sequence' and '>end sequence', which are accessible via the main menu '>parameters' (Press <PARAM>).

A sequence is organized in lines. When a command is entered, a new line with the corresponding command is added after the command that is displayed at the moment. The line number is visible in the display. 99 lines per sequence are possible.

Deletion of a line is done by pressing <DELETE>. The lines that follow are shifted upwards.

A new line can be added later. This is accomplished with <INSERT> whereby an empty line is inserted before the current line. The lines that follow are shifted downwards.

In a command sequence, the commands that are on the numerical keypad as alternate functions can be used. For the most part these are the same commands that are used for manual operation. However, in a sequence these can exhibit different or more extensive selection possibilities.

During the course of a method it is possible to change all entries in the menus "configuration" and "parameters". These changes have an immediate effect on the course of the method (with few exceptions, see chapter 6.1 "Basic Settings").



Care should be taken when editing process sequences. These can be edited "live" (including insertion or deletion of a command line). The TRACE and LEARN functions however, are not available in this case. Testing of the edited function is therefore not possible. Illogical command sequences could easily result, which would cause an error condition and force the interruption of a sample series.

## 9.2 LEARN Mode and TRACE Function

When editing a method, the parameters of a command are most easily determined experimentally, i.e. by manual execution, and it is for this reason that certain commands are "teachable". The LEARN function makes the manual execution of particular changer commands possible during the editing of a sequence. The resulting parameters (for example, the lift position or the status of the input lines) can be taken over in the current command line. The LEARN function can be used repetitively. When times or volumes are "learned", the repetitive values are added up. This is especially useful for the establishment of the pump time where the optimal length of the rinsing process can be interactively determined in this way.

**Procedure for creating a method:**

- Enter a command or select an existing command line
- Press the <LEARN / HOLD> key
  - Function is started, "LEARN" LED lights up
  - Press the <LEARN / HOLD> key
  - Function is stopped, "LEARN" LED blinks
  - With the <ENTER> key, accept the value (or re-start the LEARN function)
- "LEARN" LED goes out, edit next command line

The LEARN function can be used with the following commands:

Command	"Teachable" Parameter	Mode of function
LIFT	Lift position in mm	absolute
PUMP	Pump time in sec	additive
STIR	Stirring time in sec	additive
WAIT	Waiting time in sec	additive
DOS	Dosing volume in mL	additive
SCN Rm	Status of the 8 remote lines	"live" value
SCN RS	Character sequence received	"live" value

**TRACE function**

The "TRACE" function is a valuable aid for operating through an entire sequence or method (or parts thereof) for test purposes. Every command line in a sequence can be executed directly by pressing the <START> key. Upon completion of the action the next command line is displayed.

Tracing can be executed immediately after entry of a sequence line or at any time after opening the parameter menu and selecting a sequence.

**9.3 Process Control**

With <START> a method is started from the normal state. If there is no manual intervention or unexpected errors, the sample series is correctly processed and closed with the end sequence. The sample sequence is executed repeatedly according to the entry under 'number of samples', beginning with the sample beaker that is defined as 'SAMPLE'.

If the sample series is interrupted with <STOP>, the sample changer returns immediately to the normal state. Samples that have not been processed are ignored and the end sequence is not executed. If settings for such instances have been activated under 'manual stop options', the corresponding actions or commands

are also executed via the interfaces to stop instruments that are connected or to initiate other actions.

With <HOLD> the processing of a method can be interrupted. The command that is active at this point is immediately interrupted as a result. <START> continues the active sequence beginning with the command immediately following the one interrupted. Any peripheral instrument connected is **not** stopped with the <HOLD> key.

<CLEAR> interrupts a sample series at the end of a currently active sequence (soft break). The sample currently being processed will be completed.

<QUIT> interrupts the command currently being executed and starts the next command line in the sequence.

If errors occur during the sample series, the corresponding **error message** is displayed and must be acknowledged with <QUIT>. The changer then goes into the HOLD status (see above). After remedying the error, <START> resumes the sequence or <STOP> halts it entirely.

## 9.4 POWERUP Method

When the sample changer is switched on, the sample rack and the titration heads are brought into the rest position. Thus, electrodes are moved out of the conditioning vessel eventually. To bring them back into the conditioning vessel, the "POWERUP" method can be used. This method is started automatically, when the sample changer is switched on.

Create a method that contains the command sequence which should be worked off, when the sample changer is switched on. Store this method under the name "POWERUP" (see Instructions for Use, page 93).

## 10 User Methods

The following pages contain the listing of user methods included with the instrument with explanations of the important commands. A prerequisite for the use of these methods is a correct configuration. In particular, for each sample rack used, the work position, rinse position, shift position, special position, rack code and type as well as a special beaker must be defined.

The specific titration or measurement method must be set in each case on the appropriate instrument. The correct cable connections can be found in the instruction manual. For these examples it is assumed that the measuring instruments are connected to the remote control socket.

It is recommended to work through every new method step-by-step with the TRACE function, making adjustments where necessary, before starting the method for the first time.

The methods 760\_1 to 760\_4 can be deleted, if additional memory is required (see Instructions for Use, page 93).

Method: **Titrimo**

This is the most universal method for titrating with a Titrimo and the 730 Sample Changer. It may serve as a model for additional methods.

<pre>'pa 730 Sample Changer 0120/02 187 730.0013 parameters   method          Titrimo   number of samples: rack &gt;start sequence   1 CTL:Rm:        INIT &gt;sample sequence   1 MOVE 1 :       sample   2 LIFT: 1 :      work mm   3 STIR: 1 :      ON s   4 CTL:Rm:        START device1   5 SCN:Rm :       End1   6 STIR: 1 :      OFF s   7 LIFT: 1 :      rinse mm   8 PUMP 1.1 :     2 s   9 WAIT          5 s &gt;final sequence   1 MOVE 1 :       spec.1   2 LIFT: 1 :      work mm &gt;changer settings   rack number      0   lift rate 1     25 mm/s   lift rate 2     25 mm/s   shift rate      20   shift direction: auto.   beaker test mode: single   on beaker error: MOVE &gt;stirring rates   stirrer 1       3   stirrer 2       3   stirrer 3       3   stirrer 4       3 &gt;dosing unit def. &gt;manual stop   CTL Rmt:        STOP device1   CTL RS232:   -----</pre>	<ul style="list-style-type: none"> <li>- report header with instrument identification and program version</li> <li>- method name</li> <li>- number of samples to be processed (entire sample rack)</li> <li>- initialize remote interface</li> <li>- place first sample under lift 1</li> <li>- place titration head at work position</li> <li>- switch on stirrer 1</li> <li>- start e.g. Titrimo</li> <li>- wait for end of titration</li> <li>- switch off stirrer 1</li> <li>- place titration head at rinse position</li> <li>- rinse electrode for 2 sec</li> <li>- let drip for 5 sec</li> <li>- place conditioning beaker under lift 1</li> <li>- immerse electrode</li> <li>----- Settings for changer functions -----</li> <li>- if a sample beaker is missing, the next one is automatically selected</li> <li>----- Stirring speeds -----</li> <li>----- Settings for dosing instruments ----- (none)</li> <li>----- Reaction to manual stop -----</li> <li>- stop device 1</li> </ul>
---	--

Method: **parallel**

This is a method for titrating with two Titrinos simultaneously on two towers (parallel titration). Prerequisite for this is a 2-tower sample changer, the 6.2141.030 remote control cable and a 12 or 24 place sample rack, since the rack positions must be accessible to both towers simultaneously. The rotating nozzle is employed for rinsing the electrode.

```
'pa
730 Sample Changer 0120/02 187 730.0013
parameters
  method           parallel
  number of samples: *
>start sequence
  1 CTL:Rm:         INIT
>sample sequence
  1 MOVE 2          :      sample
  2 LIFT: *         :      work mm
  3 STIR: *         :      ON s
  4 CTL:Rm:         START device*
  5 SCN:Rm          :      Ready*
  6 STIR: *         :      OFF s
  7 LIFT: *         :      rinse mm
  8 PUMP 1.1        :      ON s
  9 PUMP 2.1        :      3 s
  10 PUMP 1.1       :      OFF s
  11 WAIT           :      5 s
  12 SAMPLE:        +      2
>final sequence
  1 MOVE 2          :      spec.2
  2 LIFT: *         :      work mm
>changer settings
  rack number       0
  lift rate 1       25 mm/s
  lift rate 2       25 mm/s
  shift rate        20
  shift direction:  auto.
  beaker test mode: both
  on beaker error: display
>stirring rates
  stirrer 1         3
  stirrer 2         3
  stirrer 3         3
  stirrer 4         3
>dosing unit def.
>manual stop
  CTL Rmt:          STOP device*
  CTL RS232:
  -----
```

- infinite number of samples (until <STOP>), must be modified (--> number of samples / 2).

- place first sample in front of tower 2 (second sample in front of tower 1)

- both lifts to the work position

- start both Titrinos

- wait for end of both titrations, static "ready" signal from both Titrinos

- both lifts in rinsing position

- switch on rotating nozzle on tower 1

- switch on rotating nozzle on tower 2 for 3 seconds

- stop rinsing process on tower 1

- let drip for 5 sec

- raise sample beaker position by 2 positions

- direct conditioning beaker to tower 2

- both lifts in work position, immerse electrodes

- test for missing beakers on both towers

- If sample beaker is missing, interrupt, display an error message

- stop both Titrinos if a manual stop occurs

Method: pH cal

This method serves to complete an automatic series of pH measurements preceded by electrode calibration. It can be used with the Metrohm 713 and 692 pH Meters. Special beakers must be defined for this in the first rack positions during rack configuration (spec.1 = 1<sup>st</sup> buffer solution, spec.2 = 2<sup>nd</sup> buffer solution, spec.3 = rinsing beaker). This method shows the mode of operation when using spray nozzles combined with suction of the rinsing fluid.

<pre>'pa 730 Sample Changer 0120/02 187 730.0013 parameters method          pH cal number of samples: rack &gt;start sequence 1 CTL:Rm:        INIT 2 MOVE 1 :       spec.3 3 LIFT: 1 :      work mm 4 PUMP 1.* :     4 s 5 MOVE 1 :       spec.1 6 LIFT: 1 :      work mm 7 STIR: 1 :      10 s 8 CTL:Rm:        METER cal pH 9 SCN:Rm:        : End1 10 MOVE 1 :      spec.3 11 LIFT: 1 :     work mm 12 PUMP 1.* :    4 s 13 MOVE 1 :      spec.2 14 LIFT: 1 :     work mm 15 STIR: 1 :     10 s 16 CTL:Rm:        METER enter 17 SCN:Rm:        : End1 18 MOVE 1 :      spec.3 19 LIFT: 1 :     work mm 20 PUMP 1.* :    4 s &gt;sample sequence 1 SHIFTRATE:    + 20 2 MOVE 1 :      sample 3 LIFT: 1 :     work mm 4 STIR: 1 :     10 s 5 CTL:Rm:        METER mode pH 6 CTL:Rm:        START device1 7 SCN:Rm:        : End1 8 SHIFTRATE:    - 20 9 MOVE 1 :      spec.3 10 LIFT: 1 :    work mm 11 PUMP 1.* :   4 s &gt;final sequence 1 MOVE 1 :      spec.3 2 LIFT: 1 :    work mm &gt;changer settings rack number      0 lift rate 1     25 mm/s lift rate 2     25 mm/s shift rate      20 shift direction: auto. beaker test mode: single on beaker error: MOVE ...</pre>	<ul style="list-style-type: none"> <li>- number of samples (entire rack, only positions where a beaker is placed are counted)</li> <li>- rinsing beaker in front of tower 1</li> <li>- rinse electrode</li> <li>- first buffer solution in front of tower 1</li> <li>- immerse electrode</li> <li>- stir for 10 seconds</li> <li>- start pH meter calibration</li> <li>- wait for measurement of the first buffer (EOD pulse)</li> <li>- rinsing beaker in front of tower 1</li> <li>- rinse electrode</li> <li>- second buffer solution in front of tower 1</li> <li>- immerse electrode</li> <li>- stir for 10 seconds</li> <li>- start measurement in second buffer</li> <li>- wait for end of measurement (EOD pulse)</li> <li>- rinsing beaker in front of tower 1</li> <li>- rinse electrode</li> <li>- turning direction of the rack (ascending)</li> <li>- sample beaker in front of tower 1</li> <li>- immerse electrode</li> <li>- stir for 10 seconds</li> <li>- switch pH meter to pH measurement</li> <li>- start pH measurement</li> <li>- wait for end of measurement (EOD pulse)</li> <li>- turning direction of rack (descending)</li> <li>- rinsing beaker in front of tower 1</li> <li>- rinse electrode, suck off rinsing liquid</li> <li>- turning direction of the rack at the beginning (calibration) automatic</li> </ul>
---	---

**Remark:** The turning direction of the rack is altered during method processing to prevent the electrode, during rack rotation, from dripping into samples that have not yet been analyzed.

Method: **prepare**

This method shows the operating process when an auxiliary solution is to be added to several samples before the titration. A Titrino and a 665 or 725 Dosimat are required for this. Both are to be connected with the sample changer using the 6.2141.040 cable. The volume to be added must be set on the Dosimat.

```
'pa
730 Sample Changer 0120/02 187 730.0013
parameters
  method          prepare
  number of samples: 9
>start sequence
  1 CTL:Rm:        INIT
  2 MOVE 1         : sample
  3 LIFT: 1        : rinse mm
  4 CTL:Rm:        START dos1
  5 WAIT           4 s
  6 SAMPLE: +      1
  7 MOVE 1         : sample
  8 LIFT: 1        : rinse mm
  9 CTL:Rm:        START dos1
 10 WAIT           4 s
 11 SAMPLE: -      1
 12 MOVE 1         : sample
 13 LIFT: 1        : work mm
 14 STIR: *        : ON s
 15 WAIT           40 s
 16 CTL:Rm:        START device1
 17 SCN:Rm         : Ready1
 18 STIR: *        : OFF s
 19 LIFT: 1        : rinse mm
 20 PUMP 1.1       : 3 s
 21 WAIT           5 s
>sample sequence
  1 SAMPLE: +      1
  2 MOVE 1         : sample
  3 SAMPLE: +      1
  4 MOVE 1         : sample
  5 LIFT: 1        : rinse mm
  6 CTL:Rm:        START dos1
  7 WAIT           4 s
  8 SAMPLE: -      1
  9 MOVE 1         : sample
 10 LIFT: 1        : work mm
 11 STIR: *        : ON s
 12 CTL:Rm:        START device1
 13 SCN:Rm         : Ready1
 14 STIR: *        : OFF s
 15 LIFT: 1        : rinse mm
 16 PUMP 1.1       : 3 s
 17 WAIT           5 s
>final sequence
  1 SAMPLE: +      1
  2 MOVE 1         : sample
  3 LIFT: 1        : work mm
  4 STIR: 1        : ON s
  5 CTL:Rm:        START device1
  6 SCN:Rm         : Ready1
  7 STIR: 1        : OFF s
  8 LIFT: 1        : rinse mm
  9 PUMP 1.1       : 3 s
 10 WAIT           4 s
 11 MOVE 1         : spec.1
 12 LIFT: 1        : work mm
>changer settings
...
```

- 9 samples, effective number of samples – 2 (here using the 12-place rack and 1 special beaker)
- first sample in front of tower 1
- lift in rinse position
- start dosing
- waiting time for Dos. must be adjusted (LEARN!)
- raise sample position by 1
- next sample in front of tower 1
- dosing
- waiting time
- lower sample position by 1
- first sample in front of tower 1
- lift in work position
- stirrer on
- waiting time
- start titration
- wait for end of titration (static 'ready'-line)
- switch off stirrer
- rinse electrode
- raise sample position by 1
- next sample in front of tower 1
- raise sample position by 1
- next sample in front of tower 1
- lift in work position
- start dosing
- waiting time for dosing
- lower sample position by 1
- next sample in front of tower 1
- ...
- start titration
- wait for end of titration
- ...
- process last sample ————
- ...
- place conditioning beaker
- immerse electrode
- see method "Titrino"

**Remark:** The first and last samples must be specially treated in the start and end sequences, respectively.

Method: **std add**

This method accomplishes the automatic measurement of a sample series with a 692 Metrohm pH / Ion Meter, including standard addition using a 665 or 725 Dosimat. A 6.2141.070 cable is required for this. The 692 Ion meter controls the Dosimat and stirrer 1.

```
'pa
730 Sample Changer 0120/02 187 730.0013
parameters
  method          std add
  number of samples:  rack
>start sequence
  1 CTL:Rm:        INIT
>sample sequence
  1 MOVE 1         :   sample
  2 LIFT: 1        :   work mm
  3 CTL:Rm:        METER mode C
  4 CTL:Rm:        START device1
  5 SCN:Rm:        :   EndMeter
  6 LIFT: 1        :   rinse mm
  7 PUMP 1.1      :   2 s
  8 WAIT          :   5 s
>final sequence
  1 MOVE 1         :   spec.1
  2 LIFT: 1        :   work mm
>changer settings
  rack number      0
  lift rate 1     25 mm/s
  lift rate 2     25 mm/s
  shift rate      20
  shift direction: auto.
  beaker test mode: single
  on beaker error: MOVE
>stirring rates
  stirrer 1       3
  stirrer 2       3
  stirrer 3       3
  stirrer 4       3
>dosing unit def.
>manual stop
  CTL Rmt:        STOP device1
  CTL RS232:
  -----
```

- set mode conc
- start measurement, stirrer 1 is controlled by 692
- wait for end of measurement (EOD pulse)
- rinse electrode

Method: tower1+2

This method allows titration of each sample using two different titration methods, one after the other, with the 2-tower model of the 730 Sample Changer (with 2x2 pumps) and 2 Titrimos. An auxiliary solution can also be added according to the titration method used. A 685 Dosimat or a 700 Dosino can be connected via the External Bus interface (and 729 Dosimat Interface) for this purpose. A 12 or 24-position rack is required for parallel titration. At tower 1 the electrode is rinsed after the titration. At tower 2 the sample solution will be aspirated after the titration.

```
'pa
730 Sample Changer 0120/02 187 730.0013
parameters
  method          tower1+2
  number of samples: rack
>start sequence
  1 CTL:Rm:      INIT
  2 MOVE 1      : sample
  3 LIFT: 1     : work mm
  4 STIR: 1     : ON s
  5 CTL:Rm:      START device1
  6 SCN:Rm      : Ready1
  7 STIR: 1     : OFF s
  8 LIFT: 1     : rinse mm
  9 PUMP 1.1    : 2 s
  10 WAIT      : 5 s
>sample sequence
  1 MOVE 2      : sample
  2 LIFT: *     : work mm
  3 STIR: *     : ON s
  4 DOS: 1     : 15 ml
  5 WAIT      : 5 s
  6 CTL:Rm:      START device*
  7 SCN:Rm      : Ready*
  8 STIR: *     : OFF s
  9 LIFT: 1     : rinse mm
  10 PUMP 1.1   : 2 s
  11 PUMP 2.2   : 15 s
  12 PUMP 2.*   : 4 s
>final sequence
  1 MOVE 2      : sample
  2 LIFT: 2     : work mm
  3 STIR: 2     : ON s
  4 DOS: 1     : 15 ml
  5 WAIT      : 5 s
  6 CTL:Rm:      START device2
  7 SCN:Rm      : Ready2
  8 STIR: 2     : OFF s
  9 PUMP 2.2    : 15 s
  10 PUMP 2.*   : 4 s
  11 MOVE 1     : spec.1
  12 LIFT: *    : work mm
>changer settings
  rack number      0
  lift rate 1     25 mm/s
  lift rate 2     25 mm/s
  shift rate      20
  shift direction: +
  beaker test mode: both
  on beaker error: display
>stirring rates
  stirrer 1       3
  stirrer 2       3
  stirrer 3       3
  stirrer 4       3
>dosing unit def.
>manual stop
...
```

———— titrate first sample at tower 1 ————

- start first titration
- wait for end of titration (static 'ready'-Signal)
- rinse with rotating nozzle

— parallel titr. of 2 samples at 2 towers simultaneously —

- sample in front of tower 2 (next sample at tower 1)
- both lifts in work position
- switch on all stirrers
- aliquot aux. solution (according to tubing arrangement on tower 1 or 2)
- both Titrimos start titration
- wait for end of titration at both Titrimos (static 'ready'-signal)
- rinse with rotating nozzle on tower 1
- suck off sample solution at tower 2
- rinsing and suction (with rinse nozzles) at tower 2

———— treat last sample separately ————

- immerse electrodes in conditioning beakers spec.1 and spec.2
- turning direction of the rack is always ascending
- test for missing beakers at both towers
- if a sample beaker is missing, issue a message

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