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824 Easy Sample Changer

Program version 5.824.0010

Instructions for Use

8.824.1003 08.2002/ dm

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Although all the information given in these instructions has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please inform the author at the address given above.

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1 Introduction

The Metrohm 824 Easy Sample Changer is an instrument for numerous applications. It was specially developed for the industrial or analytical laboratory and therefore covers a wide spectrum of applications. It provides indispensable support when processing a large sample series throughout the whole titration sector, for various measurement jobs, or for other analytical purposes.

Due to the well-developed communication interfaces (parallel remote control and serial RS 232), not only can it communicate with the large range of Metrohm titration and dosing instruments but it can also control or be controlled by a personal computer. For this purpose Metrohm offers the versatile Tinet titration software. These capabilities predestine it for all conceivable automation jobs in a modern laboratory, even in conjunction with highly integrated laboratory data systems.

1.1 Instrument description

The greatest advantage of the 824 Easy Sample Changer lies in its very easy user operation. For carrying out simple applications the predefined standard methods may be used without any modifications being needed. The simple keyboard allows the use of all the functions used in the daily routine tasks of the 824 Easy Sample Changer.

1.1.1 Two versions

The 824 Easy Sample Changer is supplied in two different versions.

Macro-version
The 2.824.0010 version includes a complete set of accessories for working with the supplied macro-titration head to process large- to medium-size sample vessels.

Micro-version
The 2.824.0020 version includes a complete set of accessories for working with the supplied micro-titration head to process smaller sample vessels.

Both versions are supplied with a sample rack and suitable sample vessels as standard. A particularly suitable set of KFT equipment can be ordered for carrying out Karl Fischer titrations with the 824 Easy Sample Changer.

Pump control
For rinsing the electrodes and for aspiration of the sample solutions either one or two peristaltic pumps can be connected directly to the 824 Easy Sample Changer. The Metrohm 772 Pump Unit is also available in versions with accessories for aspiration or rinsing.

Standard sample racks

Exchangeable standard sample racks are available for a wide range of different sized vessels. Each rack has a predefined "special beaker" position. This is used for placing a rinsing or conditioning beaker on the rack. In this way, for example, it is possible to condition or rinse an electrode after each titration.

Standard methods

The predefined standard methods of the 824 Easy Sample Changer not only have an optimized sample processing sequence but also have both a start sequence and a final sequence which are carried out before and after a series of samples respectively.

759 Swing Head

For processing a larger number of samples the 759 Swing Head can be installed on the sample changer. This drive is used instead of the standard titration head and can, for example, be fitted with a titration head for direct titration in the sample vessels. By using the 759 Swing Head it is possible to use multi-row sample racks and therefore to process larger numbers of samples within a very short time.

The basis

The 824 Easy Sample Changer was developed on the basis of the time-proven Metrohm 730 Sample Changer and therefore offers the possibility of the free definition of run sequences, method parameters and rack data throughout a very wide range. This requires the use of the “6.21.42.010 SC Controller” Sample changer keypad.

1.2 Information about these Instructions for Use

Please read through these Instructions for Use before you start to use the 824 Easy Sample Changer.
The following notations and pictograms are used in these instructions:

35	**Operating element** The operating elements are explained on pages 4ff.
	**Danger** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components by electricity.
	**Danger/Warning** This symbol indicates a possible risk of death or injury to the user and possible damage to the instrument or its components.
	**Attention** This symbol indicates important information. Read the information provided before you continue.
	**Information** This symbol indicates additional information and tips which may be of particular use to you.

1.3 Parts and controls

1.3.1 The keypad

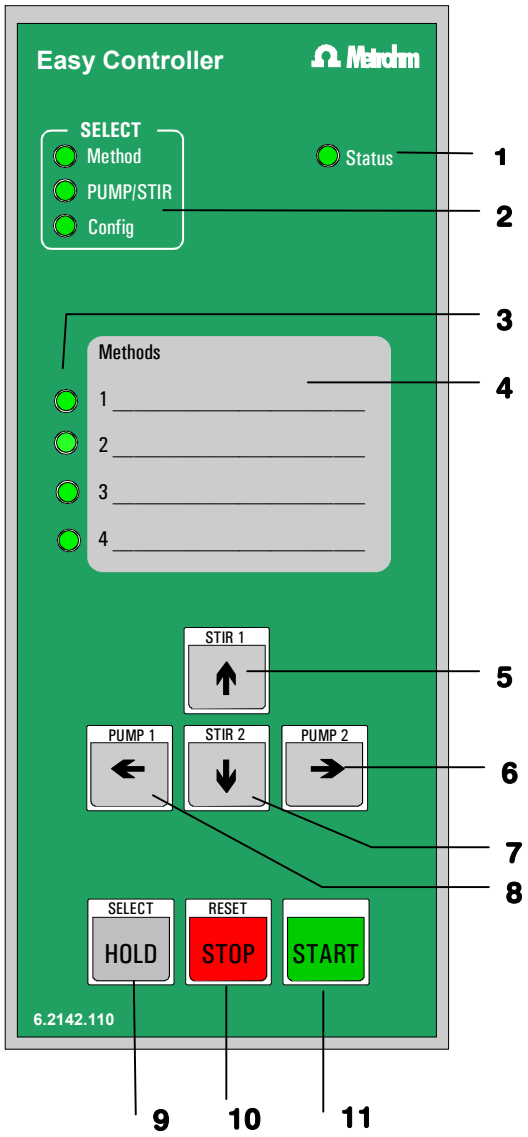


Fig. 1 Keypad

1	**Status LED**
2	**SELECT LEDs** Indicate the user mode
3	**LEDs 1 to 4** • Method selection • Stirrer/Pump status • Configuration steps • Error display
4	**Labeling field for methods**
5	**Arrow key up / Stirrer 1** • Lift up • Method selection • Stirrer 1 on/off • Sets lift position and stirrer rate
6	**Arrow key right / Pump 2** • Rotates rack clockwise • Pump 2 on/off • Next configuration step
7	**Arrow key down / Stirrer 2** • Lift down • Method selection • Stirrer 2 on/off • Sets lift position and stirrer rate
8	**Arrow key left / Pump 1** • Rotates rack counterclockwise • Pump 1 on/off • Previous configuration step
9	**User mode / Interrupt method / Acknowledge error message**
10	**Initialize changer / Cancel method**
11	**Start method / Continue method**

1.3.2 Individual parts and standard accessories

The 824 Easy Sample Changer must not be operated without the splash protector **13** and connections cover **17** in position.

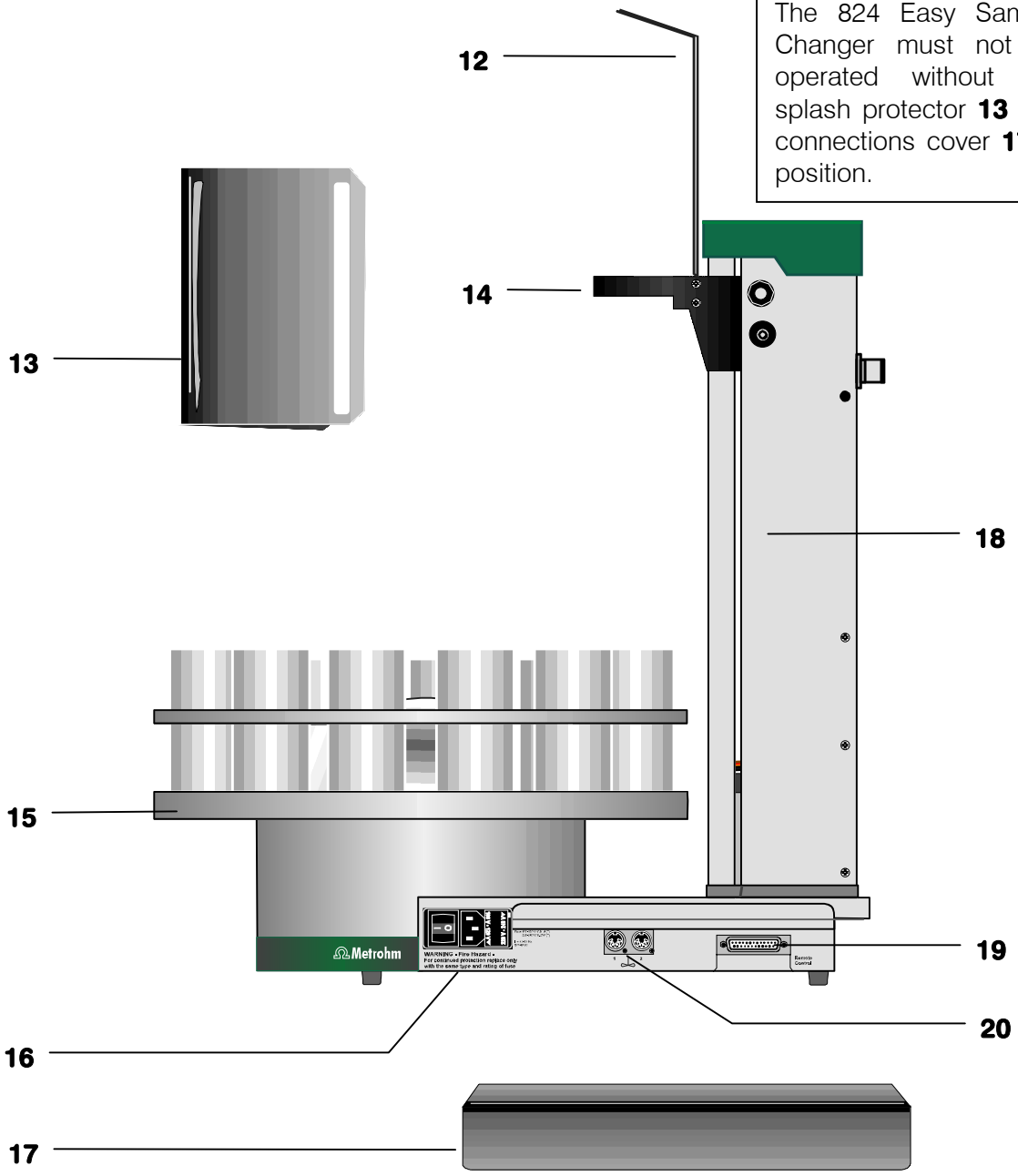


Fig. 2 Side view of 824 Easy Sample Changer

12	**Tubing guide**	**16**	**Mains switch and fuse holder**
13	**Splash protector** 6.2751.010	**17**	**Connections cover** 6.2752.010
14	**Lift**	**18**	**Tower**
15	**Sample rack** e. g. 6.2041.310	**19**	**Remote interface**
		20	**Stirrer connection**

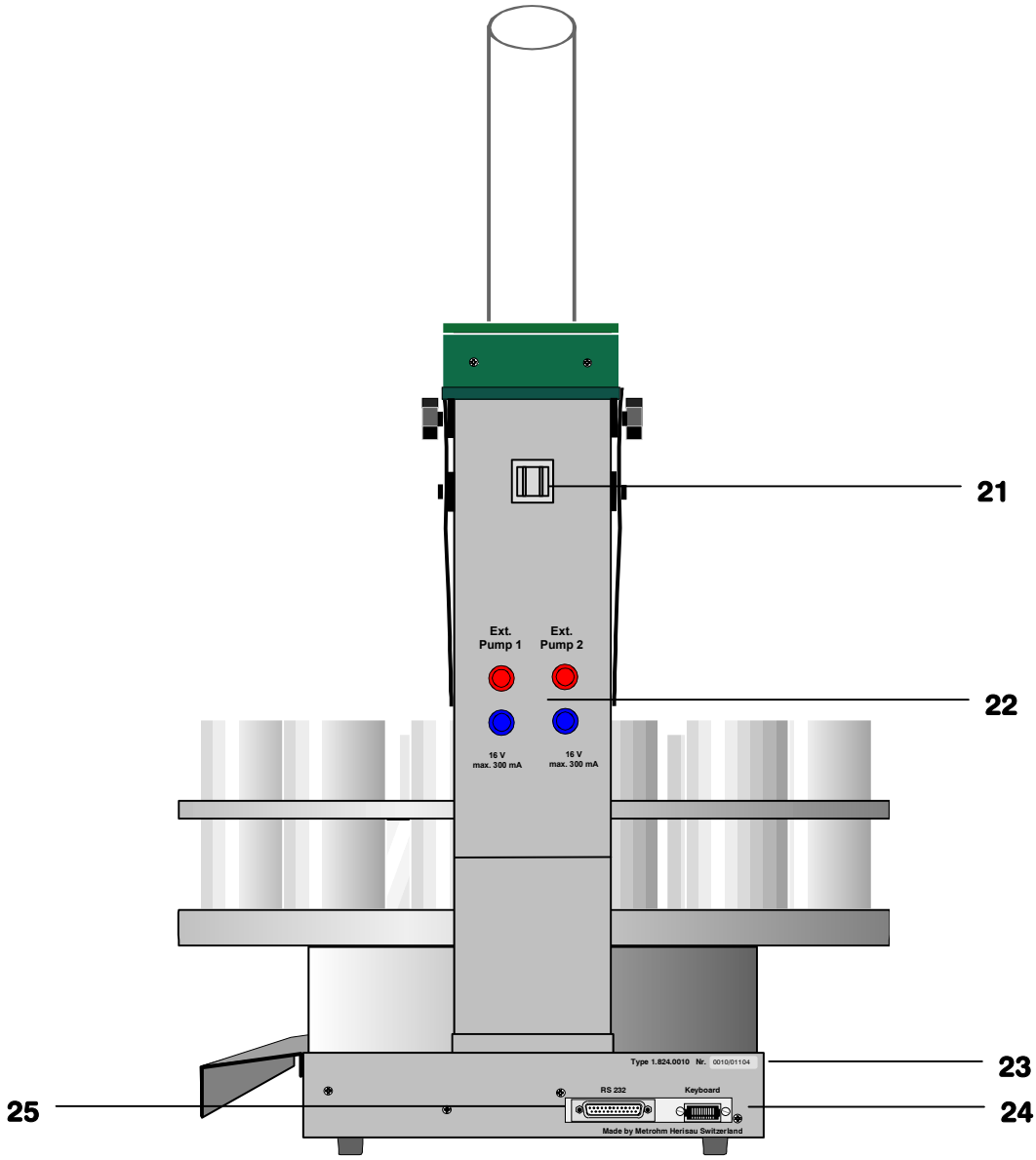


Fig. 3 Rear view

21	**Line sleeve**	**24**	**Keyboard connector**
22	**Pump connectors**	**25**	**RS232 connector**
23	**Manufacturing number**		

1.4 Safety information

Warning!
This instrument should only be used in accordance with the information given in these Instructions for Use.

1.4.1 General:

This instrument left our works in perfect condition from the point of view of its operational safety (see Technical data, safety specification). To keep it in this condition and to continue to operate safely the following information must be carefully observed.

1.4.2 Electrical safety

Please observe the following guidelines:

- Only qualified Metrohm personnel should carry out service work on electronic components.
- Do not open the instrument housing as this could damage the instrument. The housing contains no components which could be serviced or exchanged by the user.

Electrical safety when handling the instrument is guaranteed within the scope of Standard IEC 61010-1. However, please observe the following point:

Protection against electrostatic charges

Warning!
Electronic components are sensitive to electrostatic charges and can be destroyed by a discharge. Always remove the mains connection cable from socket **12** *before making or breaking electrical connections on the rear panel of the instrument.*

Connection to the electricity supply:
This instrument must only be operated at the specified mains voltage.

Repair and maintenance:
If faults or malfunctions occur while using the 824 Easy Sample Changer we recommended that you first check that the connection to the control instrument has been made correctly.

The instrument must not be opened. This is reserved exclusively for authorized service personnel.

2 Installation

This section describes the things you should pay attention to when unpacking and starting up the 824 Easy Sample Changer. It also tells you how a complete automation system is built up.
The following illustration provides an overview of the peripheral devices which can be attached to an 824 Easy Sample Changer:

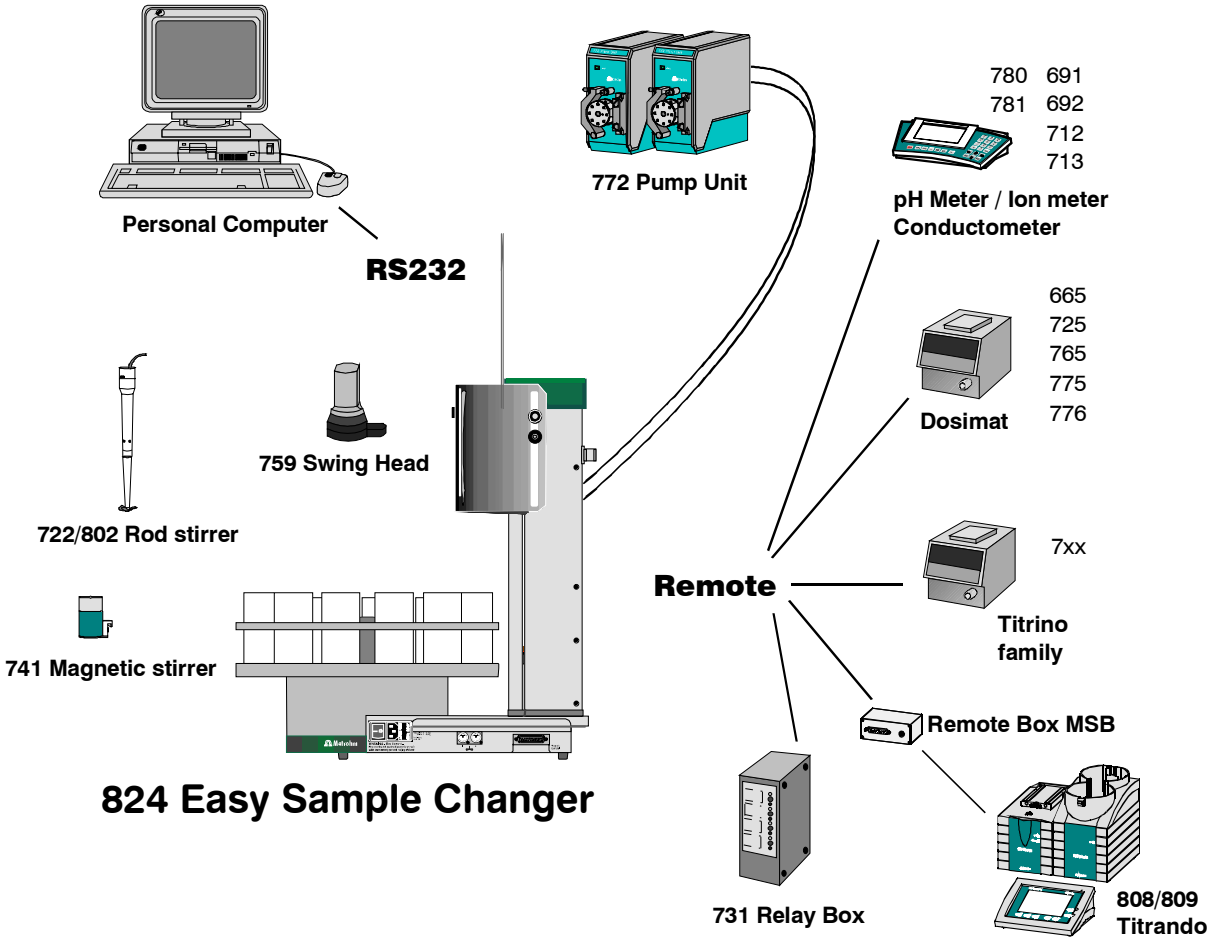


Fig. 4 824 Easy Sample Changer – peripheral devices

2.1 Instrument setup

2.1.1 Packaging

The 824 Easy Sample Changer and its specially packed accessories are supplied in very protective special packaging. Please store this packaging in a safe place; it is the only way in which the safe transport of the instrument can be guaranteed.

2.1.2 Checks

Please check that the delivery is complete and undamaged immediately on receipt (compare with delivery note and list of accessories given in Section 8.6). If transport damage is evident please refer to the information given in Section 8.8.1 "Warranty'.

2.1.3 Location

The 824 Easy Sample Changer has been developed for indoors use and must not be used in explosion-endangered surroundings.
Place the instrument on a suitable vibration-free laboratory bench, protected as much as possible from corrosive atmospheres and contamination by chemicals.
Select a location in which the ambient temperature is normally between +5 °C and +45 °C. The instrument should be protected against excessive variations in temperature and direct sunshine.

If an instrument which has been stored under cold conditions is brought into a warm room then the atmospheric humidity may condense inside the instrument and form water. In order to avoid damaging the instrument please wait for at least one hour before switching it on.

2.2 Mains connection

Please observe the following rules when connecting the instrument to the electricity supply. If the instrument is operated with an incorrectly set mains voltage and/or an incorrect mains fuse then it represents a fire hazard!

Setting the mains voltage

Before you switch on the 824 Easy Sample Changer for the first time please check that the mains voltage set on the instrument (see illustration on the following page) corresponds to your local mains voltage. If this is **not** the case then you must alter the mains voltage as follows:

- **Pull out mains cable**
  Remove the mains cable from the mains supply connection of the 824 Easy Sample Changer.
- **Remove the fuse holder**
  Use a screwdriver to loosen the fuse holder beside the mains supply connection and remove it completely.
- **Check the fuse and replace it**
  Carefully remove the built-in fuse for the intended voltage from the fuse holder and check its specifications (the position of the fuse in the fuse holder is indicated by the white arrow beside the voltage range):

100…120 V 0.5 A (slow blow)	Metrohm-No. U.600.0014
220…240 V 0.25 A (slow blow)	Metrohm No. U.600.0011

- **Insert fuse**
  Exchange the fuse if necessary and replace it in the fuse holder.
- **Insert fuse holder**
  Depending on the required mains voltage, insert the fuse holder so that the white arrow of the corresponding voltage range points to the white bar; this is to the right of the fuse holder (see below).

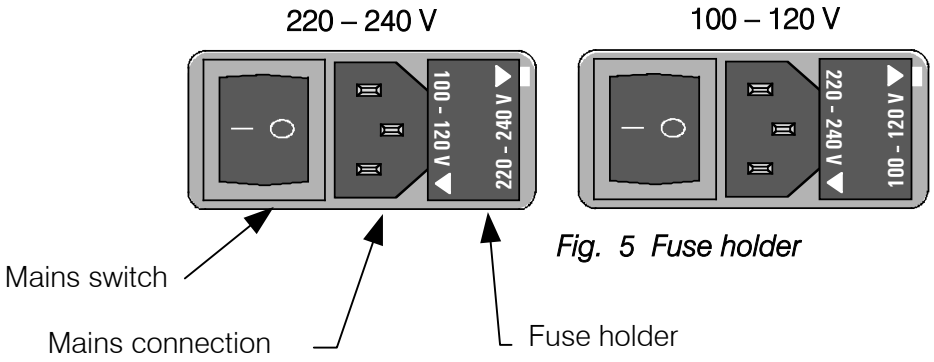
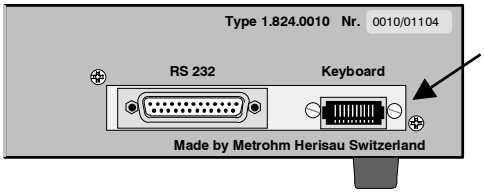


Fig. 5 Fuse holder

- **Attach connections cover**
  Position the connections cover in the guide rail above the connections strip. The connections cover protects the connections from spilt chemicals.

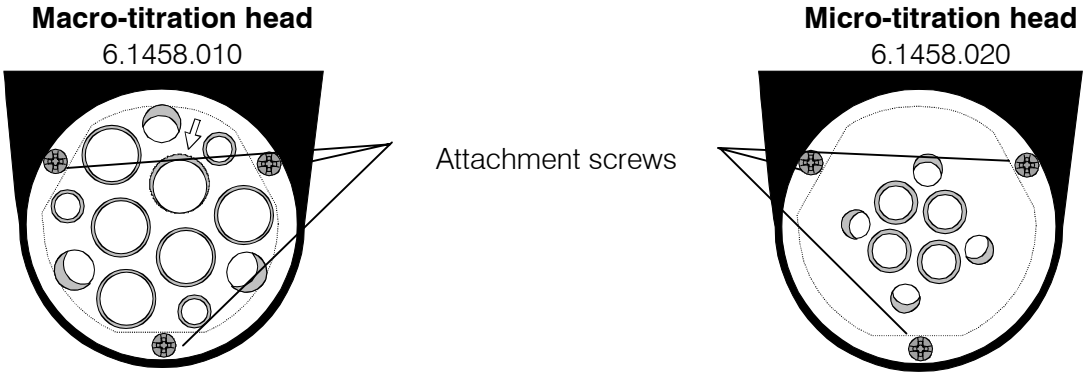
2.3 Keyboard connection



The keyboard is attached to the connection **24** provided for it on the rear panel of the instrument. To remove the connection press both sides of it together.

Fig. 6 Rear panel of instrument

2.4 Attaching and equipping a titration head



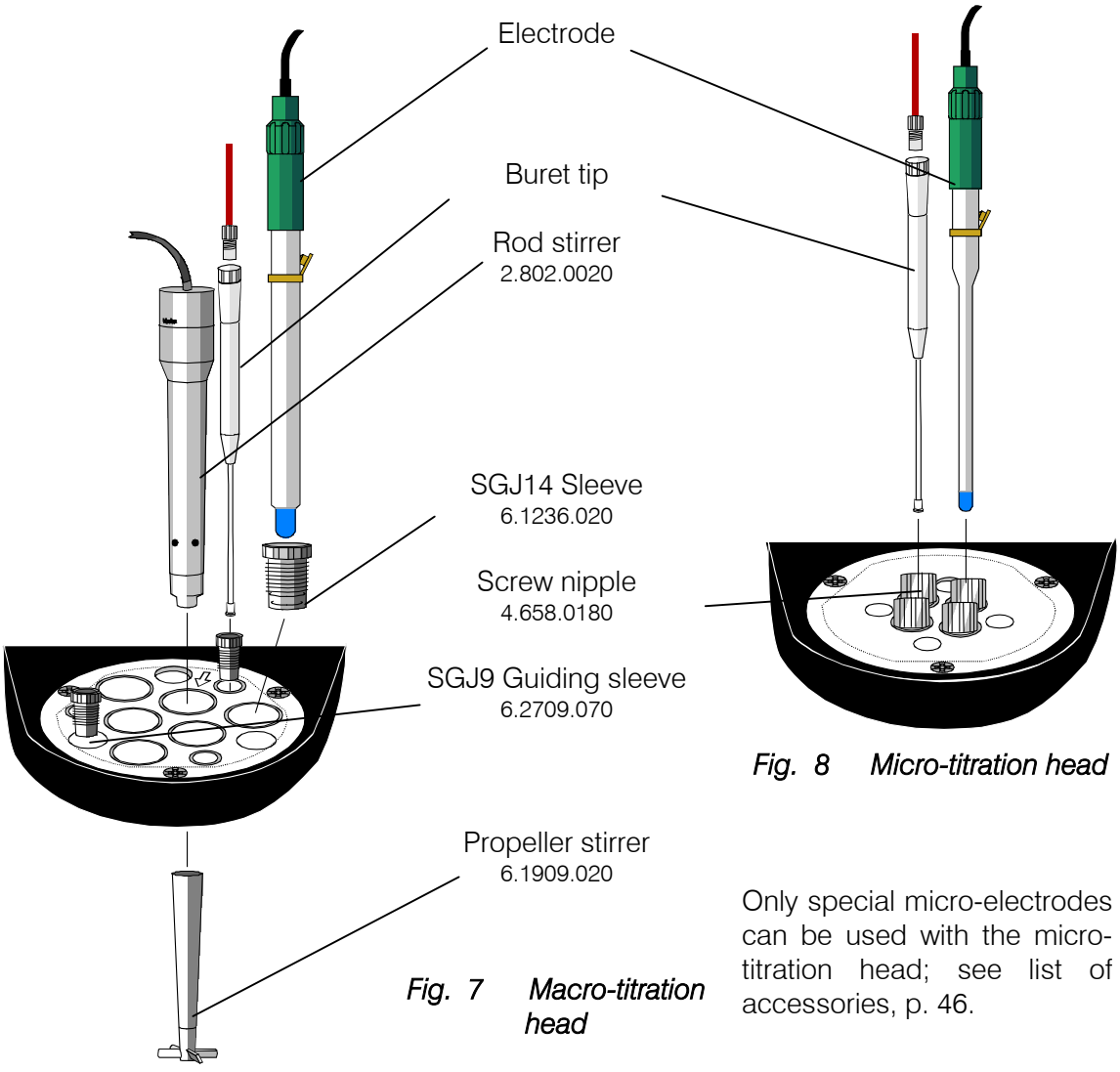


Fig. 7 Macro-titration head

Fig. 8 Micro-titration head

Only special micro-electrodes can be used with the micro-titration head; see list of accessories, p. 46.

Note about the Macro-titration head

The SGJ14 opening marked by an arrow is bored at a slight angle so that a rod stirrer or an electrode can be centered in narrow titration vessels.

2.4.1 Attaching and equipping the KF titration head

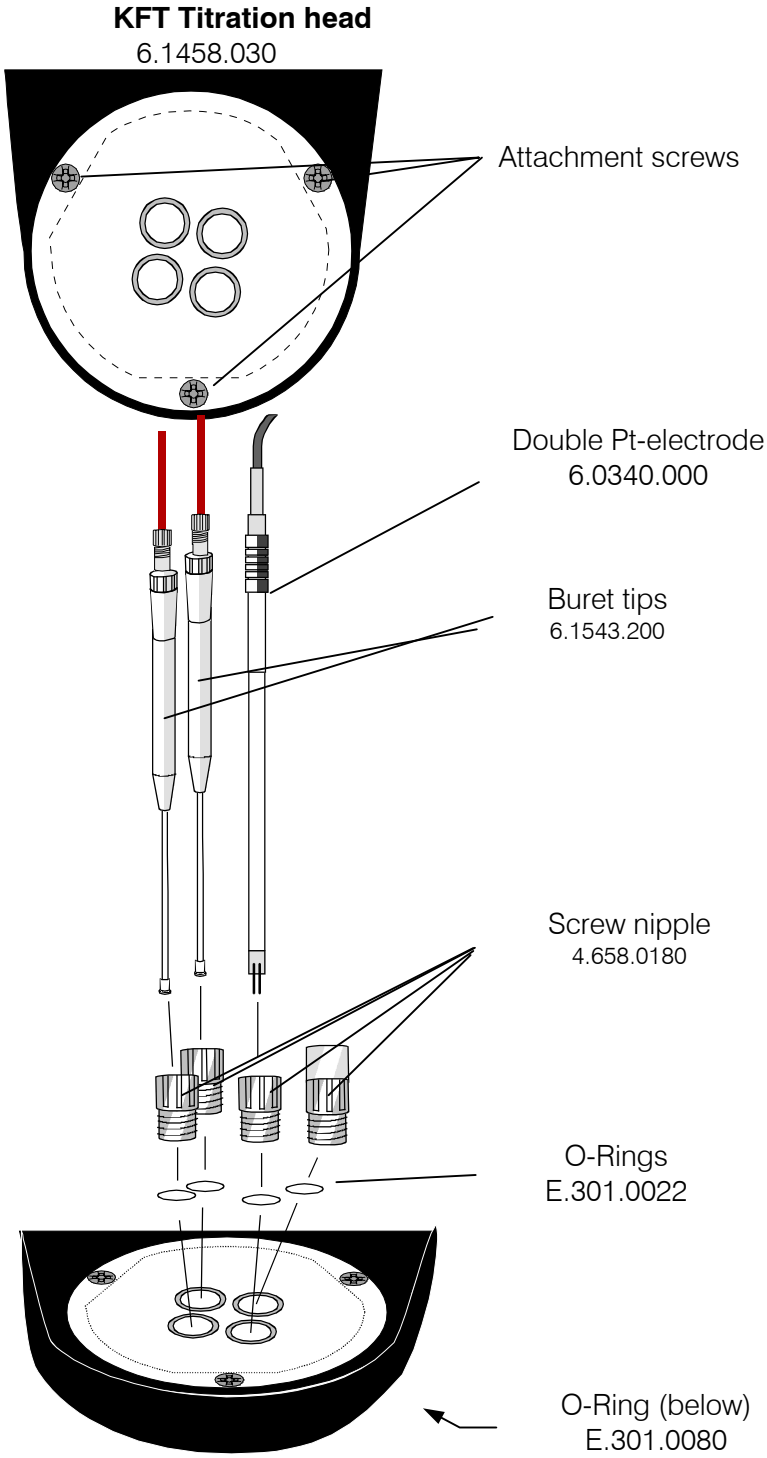


Fig. 9 KF Titration head

Note:

In order to ensure an optimal seal of the titration vessel the M10 threads should be inserted into the titration head together with the O-rings.

When attaching the tubing and cable connections these should be led from the titration head through the tubing guide in order not to restrict the range of movement of the lift. Take care that the tubing is long enough to accommodate the whole range of movement of the lift.

2.4.2 Attaching the splash protector

For safety reasons the 824 Easy Sample Changer should not be operated unless the splash protector is in its proper position.

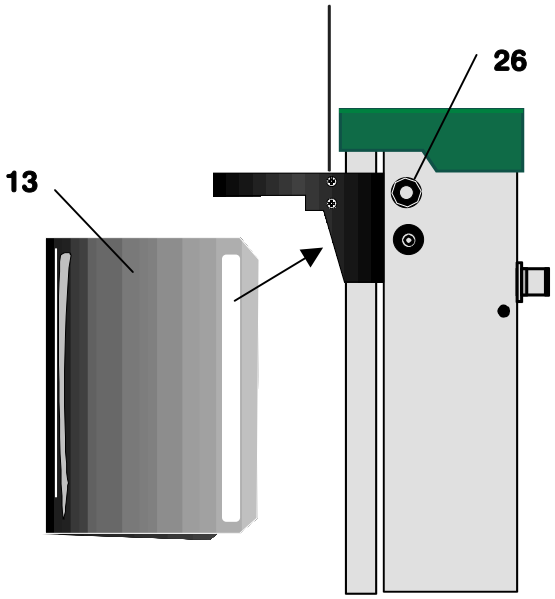


Fig. 10 Attaching the splash protector

- On both sides of the tower loosen knurled nuts **26**.
- Slip the slot-shaped openings of the splash protector **13** over the attachment screws and tighten up knurled nuts **26** again.
- If the knurled nuts **26** are loosened slightly it is easy to adjust the height of the splash protector **13**.

2.4.3 741 Magnetic Stirrer

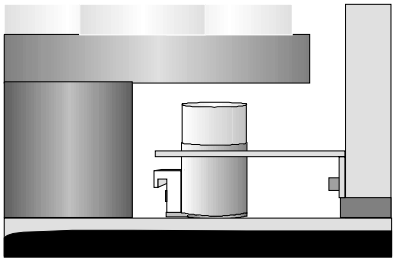


Fig. 11 Attaching the magnetic stirrer

Apart from the micro-titration head, the 2.824.020 version also includes a 741 Magnetic Stirrer.
The use of the 741 Magnetic Stirrer is particularly recommended for Karl Fischer titrations.
The 2.741.0010 Magnetic Stirrer can be attached to the tower by using the holder (6.2034.020) and supplied screws as shown in the drawing alongside.

2.5 Attaching the 759 Swing Head

In order to accurately move to the individual sample vessels when multi-row sample racks are used (see p. 19), the 759 Swing Head can be used instead of a normal titration head. It is equipped with either a titration head (Model 2.759.0020) or with a transfer head (Model 2.759.0010).
The 759 Swing Head with titration head can be used with the 2-row sample rack M48-1. The swing head version with the transfer head is intended for use with the 3-row sample racks M128-2, M129-2 and M142-2.

2.5.1 Procedure

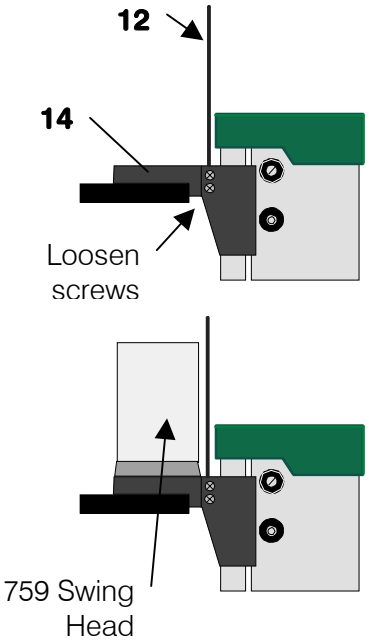


Fig. 12
Attaching the 759 Swing Head

- Switch off instrument.
- Remove the titration head **14** by loosening the four screws on both the outer sides of the lift.
- Screw off the tubing guide from the titration head **14**.
- Attach the new titration head (6.1462.020) or the transfer head (6.1462.010) to the bottom of the swing head by using the three screws provided.
- Screw the tubing guide **12** onto the new titration or transfer head.
- Attach new titration or transfer head to the lift and fasten it with the four screws.
- Connect the 759 Swing Head to the Remote socket **19** of the 824 Easy Sample Changer, see also p. 17.
- Place a multi-row sample rack on the turntable of the sample changer.
- Switch on instrument.
- If the swing head moves when the instrument is switched on then this means that it has been recognized by the 824 Easy Sample Changer and is ready for use.
- If the swing head does not move when the instrument is switched on then switch the instrument off and then on again.

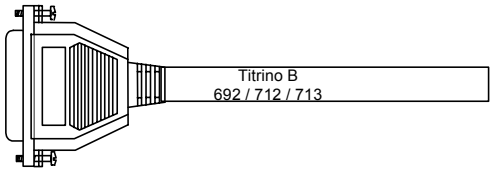
2.6 Connecting devices to the Remote socket

Connection cable

If the 824 Easy Sample Changer is to be connected to other devices then only Metrohm cables should be used as these are the only cables that guarantee perfect data transfer.

Note:
The Remote cable for the 824 Easy Sample Changer have a marking at each end which indicates the instrument for which the particular end is intended to be used and the connection to which it is to be connected.

Example (standard Remote cable):

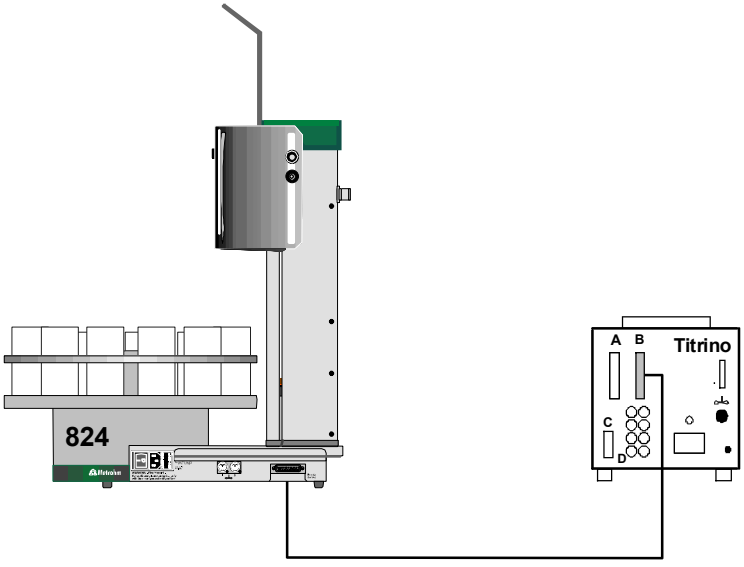


Before peripheral devices are connected the sample changer must be switched off as otherwise the instruments could be damaged.

2.6.1 Remote connections

Sample changer — Titrino

with standard cable



Cable 6.2141.020

Fig. 13 Connecting a 7xx Titrino

Sample changer — Titrando

with standard cable and 6.2148.010 Remote Box

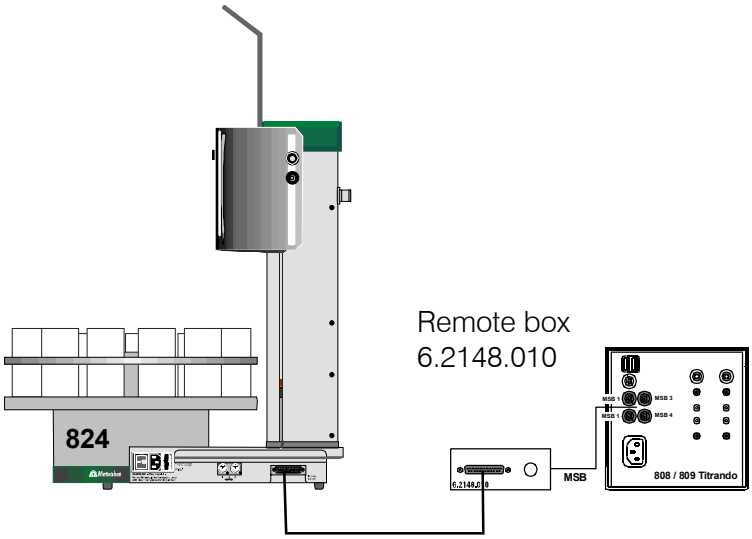


Fig. 14 Connecting an 8xx Titrando

Sample changer — Titrino — 765/776 Dosimat

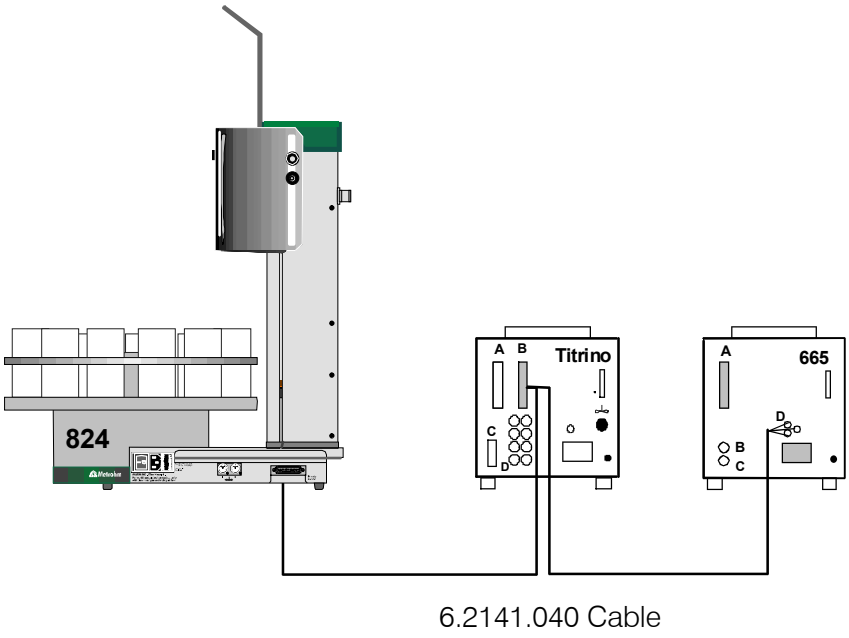


Fig. 15 Connecting a Titrino and Dosimat

Sample changer — 780/781 pH-Meter

with standard cable and 6.2148.010 Remote box

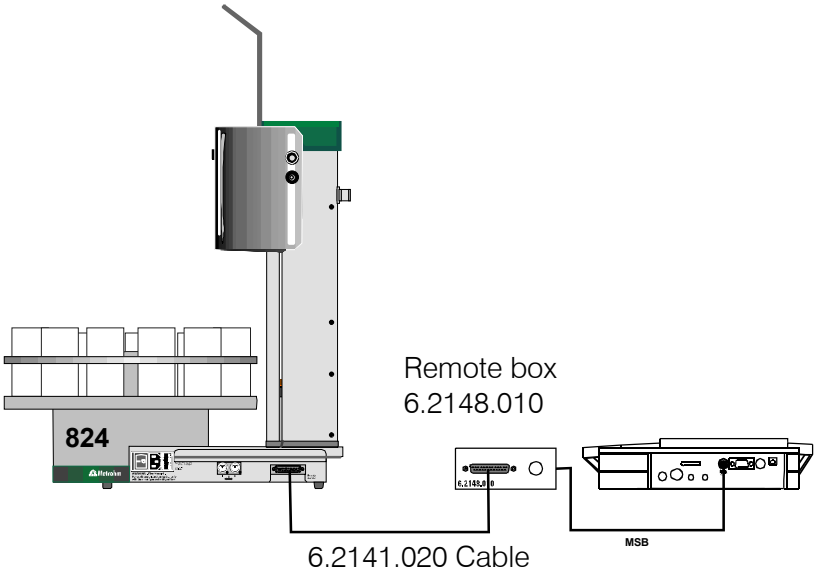


Fig. 16 Connecting a 780/781 pH Meter

Sample changer with 759 Swing Head

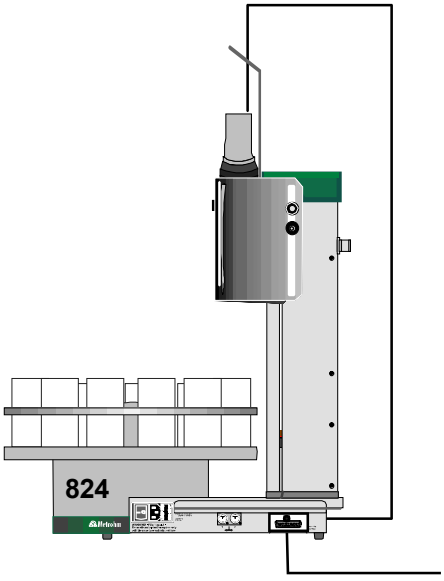
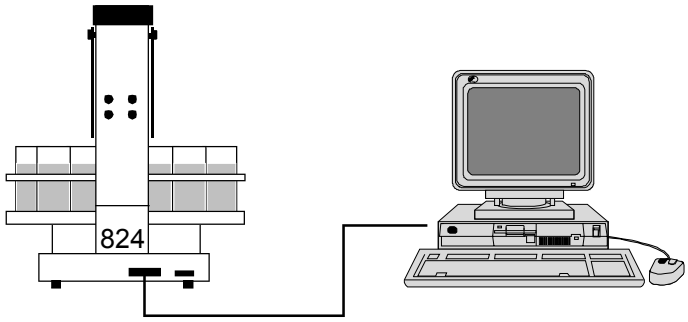


Fig. 17 Connecting the 759 Swing Head

The swing head is connected to the Remote interface of the 824 Easy Sample Changer. The connection of the 759 Swing Head allows the connection of further devices via Remote lines; 4 lines (Input 7 and Output 11–13) are occupied by the swing head. These four lines are not led any further through the connection.

2.7 Serial connection (RS232)

A personal computer can be connected to the serial RS232 interface **25**. In this way the 824 Easy Sample Changer can be remotely controlled (in the same way as the Metrohm 730 Sample Changer), provided that a suitable software such as Tinet 2.5 is installed.



Cable 6.2125.060 (25p/25p)
oder 6.2125.110 (25p/9p)

Fig. 18 Connecting a computer

A requirement for correct data transfer is that the transmission parameters are correctly set; these must correspond to the settings at the interface of the connected device.

The standard transmission parameters for the 824 Easy Sample Changer are:

Baud Rate:	9600 Baud
Data Bit.	8
Stop Bit:	1
Parity:	none
Handshake:	HWs

2.8 Sample racks

A sample rack is a turntable which accommodates sample vessels and which is placed on the sample changer. As in titrations or measurements various sizes of sample vessels are normal or necessary, different types of easily exchangeable sample racks can be used. The number of sample vessels which can be accommodated on a sample rack depends on their diameters.
When used with the 824 Easy Sample Changer the highest rack position is intended to be used for a special beaker for rinsing or conditioning/dipping.

Metrohm supplies the following standard sample racks:

Type	No. of samples	Type of sample vessel	Predefined magnet code	Ordering number.
M12-0	12	250 mL Metrohm titration beaker	000001	6.2041.310
M16-0	16	150 mL beaker	000010	6.2041.320
M24-0	24	75 mL Metrohm titration beaker	001000	6.2041.340
M12-0	12	150 mL beaker or 200 mL disposable beaker (Euro)	100000	6.2041.360
M14-0	14	200 mL disposable beaker (Euro)	000011	6.2041.370
M14-0	14	8 oz disposable beaker (US)	000101	6.2041.380
M16-0	16	120 mL disposable beaker (US)	100001	6.2041.390

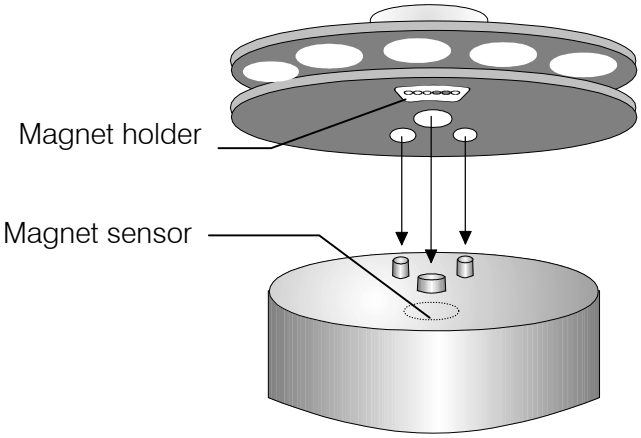
Sample racks for use with the 759 Swing Head:

M48-1	48 *	75 mL Metrohm titration beaker	010000	6.2041.350
M128-2	128	15 mL test tubes+ 2 x 250 mL titration beaker	000110	6.2041.400
M142-2	142	15 mL test tubes + 1 x 500 mL beaker	001010	6.2041.410
M129-2	129	11 mL test tubes + 2 x 300 mL beaker	010001	6.2041.430

*Special beaker at position 24

Each sample rack is unambiguously identified by a magnet code. Magnetic pins, attached to the base of the rack, provide a 6-place binary code. This means that the magnet sensor can automatically recognize the rack that is attached when the first beaker position is in front of the tower.

2.8.1 Positioning a sample rack



After a sample rack has been positioned the sample changer must be initialized with <RESET> so that the magnet code of the rack can be read in. This makes the unambiguous recognition of the rack possible and therefore the correct positioning of the beakers.

Fig. 19 Attaching a sample rack

3 Operation

This section contains the basic principles for using the 824 Easy Sample Changer.

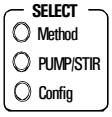
As well as processing a series of samples automatically, the 824 Easy Sample Changer can also be operated manually in order, for example, to rinse the electrode in a special beaker during the preparation of a series of samples.

In order to load methods or use functions which are not available in the normal operating status the **<SELECT>** key must be activated.

3.1 The <SELECT> key

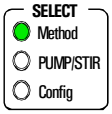
The **<SELECT>** key is used to switch between the different operating levels of the 824 Easy Sample Changer. Each pressure on the key switches from one mode to the next. The LEDs (see left) indicate the selected mode.

The individual modes and their functions are as follows:



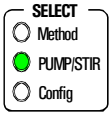
- **Normal operating mode**
  - Controls the lift and the sample rack.
  - Starts a method.

<SELECT>



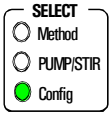
- **Method selection**
  - Selects one of four predefined basic methods or modified methods

<SELECT>



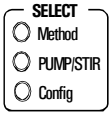
- **Pump and stirrer control**
  - Switches two external pumps on/off
  - Switches stirrer 1 and 2 on/off

<SELECT>



- **Sample changer settings**
  - Sets the lift working height
  - Sets the rinsing height of the lift
  - Sets the shifting position of the lift
  - Sets the stirring rate

<SELECT>



<SELECT> returns to the normal operating mode.

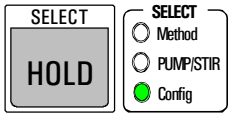
3.2 Settings

In order to be able to work comfortably with the 824 Easy Sample Changer a few settings must first be made.

- The various lift settings depend on the rack used; this means that they must be made for each sample rack according to the size of the sample vessels used.
- The stirrer rate is method-specific and is stored in the active method. If you use different methods then the stirrer speed must be optimized separately for each method.

Place a sample rack on the turntable and press **<STOP/RESET>**.
Place a filled sample beaker at the rack position in front of the lift in order to make the following settings.

3x



Press the **<SELECT>** key three times.

The SELECT LEDs show that the 824 Easy Sample Changer is now in the configuration mode.

You can now use the <🡐> and <🡒> keys to switch between the four possible settings in this mode.

3.2.1 Setting the working position of the lift

● 1
○ 2
○ 3
○ 4

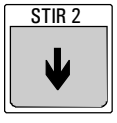
The lift with the titration head can be easily moved up and down with the **<🡑>** and **<🡓>** keys respectively.

Set the working height of the lift so that the electrode is immersed and the stirrer can work efficiently.

Accept/ continue with **<🡒>**.

3.2.2 Setting the rinsing position of the lift

○ 1
● 2
○ 3
○ 4



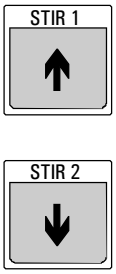
The lift with the titration head can be easily moved up and down with the **<🡑>** and **<🡓>** keys respectively.

If standard method 4 is used then the rinsing position of the lift is required for aspirating the used sample. Set the rinsing position of the lift so that the sample vessel can be emptied completely. A rinsing position which is lower than the working height can be selected. The mounting position of the aspiration tubing can be selected as required.

Accept/ continue with **<🡒>**.

3.2.3 Setting the shifting position of the lift

○ 1
○ 2
● 3
○ 4



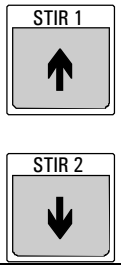
The lift with the titration head can be easily moved up and down with the **<↑>** and **<↓>** keys respectively.

Set the shift height of the lift so that the sample rack can rotate freely. The electrode must fully emerge from the sample beaker.

Accept/ continue with **<→>**.

3.2.4 Setting the stirrer rate

○ 1
○ 2
○ 3
● 4



The stirrer rate (applies to both stirrer outputs) can be easily increased or reduced in 15 steps with the **<↑>** and **<↓>** keys respectively.

The standard setting is step 3.

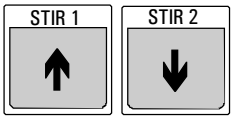
Accept/ continue with **<→>**.

3.3 Manual operation

When it has been switched on the 824 Easy Sample Changer is in the normal operating mode. The most important functions for manual operation can be carried out by pressing a key.

3.3.1 Moving the lift

In normal operating mode

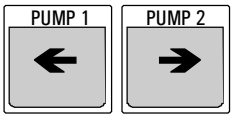


The lift with the titration head can be easily moved up and down with the **<↑>** and **<↓>** keys respectively.

Please note that the lift must be located above a valid rack position. If, because of a possible mechanical influence, the rack is no longer in its correct position then press the **<RESET/STOP>** key.

3.3.2 Rotating the sample rack

In normal operating mode

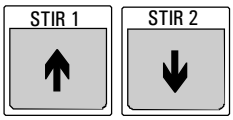


The sample rack can be rotated counterclockwise with the **<←>** key and clockwise with the **<→>** key.

For safety reasons the lift must be at or above the set rotating position when the rack is rotated, so first move the lift upward or press the **<RESET/STOP>** key.

3.3.3 Switching the stirrer on/off

2x **<SELECT>**

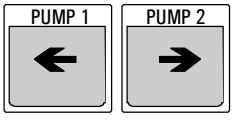


After the **<SELECT>** key has been pressed twice the **<STIR 1>** and **<STIR 2>** keys can be used to switch the stirrers on and off. The stirring rate of both stirrers can first be set under 'SELECT / Config', see below.

LEDs **LED 1** and **LED 2** show the status of stirrer connections 1 and 2 respectively (LED lit up = on).

3.3.4 Operating the pumps

2x **<SELECT>**



After the **<SELECT>** key has been pressed twice the pump connections 1 and 2 (each ±16 V) can be switched on and off with the **<PUMP 1>** and **<PUMP 2>** keys respectively.

LEDs **LED 3** and **LED 4** show the status of pump connections 1 and 2 respectively (LED lit up = on).

3.4 Automatic operation

3.4.1 Preparing a sample series

- Prepare all the samples to be processed. Select the sample vessel size according to your type of sample rack. The setting for the predefined lift position must be matched to the size of your sample vessels.

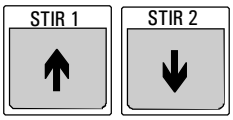
- Place the sample vessels on the rack. Start with rack position 1.

- Do not forget to place a rinsing/conditioning beaker at the highest rack position. Most sample changer methods require a special beaker, see method description p. 29ff.

In order to process a series of samples a suitable method must first be loaded, see below.

3.4.2 Method selection

1x **<SELECT>**



3x **<SELECT>**

After pressing the **<SELECT>** key a method can be selected by using the **<↓>** and **<↑>** keys. Four predefined simple standard methods are available (Methods 1,2,3 and 4).

LEDs **LED 1** to **4** show the selected method. The selected method is accepted with **<SELECT>**.

Return to the normal operating mode with 2x **<SELECT>**.

3.4.3 Starting a method

A method is started with the **<START>** key.

- When a method is started the sample changer is first initialized, i.e. the lift is moved upward as far as it will go and the sample rack is moved to the starting position. The magnet code of the rack is read in and the corresponding rack table, in which the beaker positions on the rack are defined, is loaded.

- While the method is running the status LED blinks slowly (once per second).

- After the start of the method the starting sequence is carried out once. This contains commands for preparing for a series of samples.

- When all rack positions have been processed the final sequence is carried out.

3.4.4 Interrupting a method run

Press the **<HOLD>** key to briefly interrupt a method run.

- In the HOLD condition the status LED blinks more quickly.
- The run can be continued from the same position by pressing the **<START>** key.

3.4.5 Canceling a method run

A method run is canceled with the **<STOP>** key.

- The sample changer switches back to the normal operating mode. The status LED lights up permanently.
- After the manual cancelation of a method the final sequence is **not** carried out.

3.5 Functions of the LEDs

The 824 Easy Sample Changer has several green LEDs (LED) which indicate the status of the instrument.

3.5.1 The Status LED

Status LED **1** shows the complete status of the sample changer.

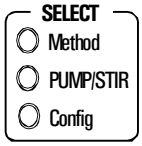
The LED lights up… when the 824 Easy Sample Changer is in the normal operating mode.

The LED does not light up… when a fault has occurred.

The LED blinks slowly… while a method is running.

The LED blinks quickly… when the 824 Easy Sample Changer is in the HOLD condition. An interrupted method can be continued with <START> or canceled with <STOP>.

3.5.2 The [SELECT] LEDs



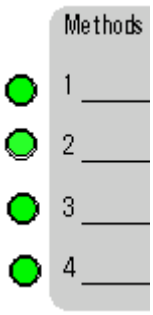
The LEDs in the **[SELECT]** field indicate the status when the settings are changed.

'Method' LED lights up… during the selection of a method.

'PUMP/STIR' LED lights up … when the external pumps and stirrers are being operated manually.

'Config' LED lights up … when setting the lift positions and the stirrer rate.

3.5.3 LEDs 1 to 4



Depending on the instrument mode, LEDs 1 to 4 have different functions.

In the normal operating mode
Shows the active method.

During method selection
Shows the method to be loaded from the method memory.

During manual operation
Shows the switching status of the pumps and stirrers.

LED 1 : lights up when Stirrer 1 is running
LED 2 : lights up when Stirrer 2 is running
LED 3 : lights up when Pump 1 is running
LED 4 : lights up when Pump 2 is running

During the configuration of the sample changer settings
Shows the possible settings.

LED 1 : lights up when setting the working position of the lift
LED 2 : lights up when setting the rinsing position of the lift
LED 3 : lights up when setting the shifting position of the lift
LED 4 : lights up when setting the stirrer rate

4 Standard methods

On delivery the 824 Easy Sample Changer already contains four optimized standard methods for processing series of samples. Simple titration tasks can be carried out with these methods without having to make complicated settings.

4.1 Information about the methods

The Metrohm sample changer methods consist of three different sequences for different purposes and a series of specific settings.
Sequences are made up of a series of individual commands with which the functions of the sample changer can be programmed. For example, the command 'LIFT 1 work' causes the Lift 1 of a sample changer to move to the predefined working height.

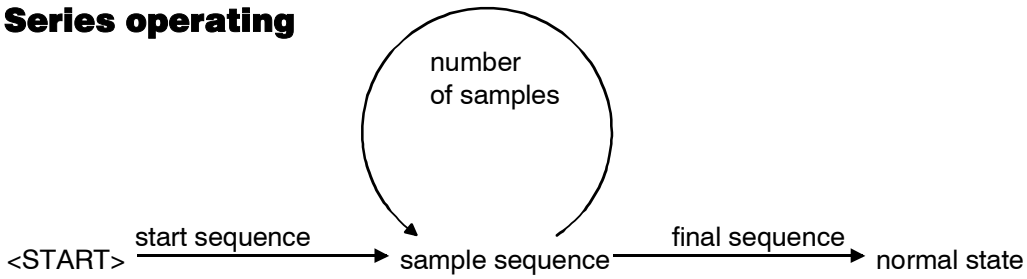
Metrohm sample changer methods differentiate between three different sequences:

- **Start sequence**
  The start sequence is carried out once at the start of a series of samples.

- **Sample sequence**
  The sample sequence is carried out once for each sample.

- **Final sequence**
  The final sequence is carried out once at the end of a series of samples.

Series operating



The **number of samples** is limited only by the capacity of the sample rack. In principle, in the standard methods of the 824 Easy Sample Changer all the positions of a sample rack are processed. Empty rack positions are automatically jumped over.

The standard methods of the 824 Easy Sample Changer can be used with all **Metrohm standard sample racks**. In all these methods the highest (last) rack position is used for a rinsing or conditioning beaker. Make sure that a sufficiently large vessel is always placed in this position.

4.2 Method labels

On the keyboard covering film you will find a gray marking field with 4 lines. You can enter a short description for each of the four sample changer methods.
Use a soft pencil or waterproof marker for the labels.
When choosing a marker make sure that the writing can easily be **wiped off with alcohol**. Pencil markings can be removed with a **soft** rubber.

A brief description of the standard methods of the 824 Easy Sample Changer is given below.

4.3 Method 1

Use:
For simple titrations (including KF titrations) or pH measurements (without calibration). The initial addition of auxiliary reagents or solvents is possible.

Required instruments:
- Metrohm titrator (Titrino or Titrando) or pH meter
- Metrohm Dosimat (optional)
- Metrohm 802 Rod Stirrer or 741 Magnetic Stirrer

Features:
No electrode rinsing after sample processing. The electrode is immersed in the conditioning beaker at the end of a series of samples.

Preparation:
Fill a sufficiently large conditioning vessel with a suitable solvent and place it in the highest rack position.

Procedure:
- (Start sequence) Initialize the sample changer
- Move to sample and lower lift to working position
- Switch on stirrer
- If a Dosimat is connected (optional): add auxiliary reagent or solvent and wait until addition is completed
- Start titration/measurement and wait until it is completed
- Switch off stirrer
- Move lift to rotating position and allow electrode to drip
- (Final sequence) Move to conditioning beaker and immerse electrode

4.4 Method 2

Use:
For simple titrations (including KF titrations) or pH measurements (without calibration). The initial addition of auxiliary reagents or solvents is possible.

Required instruments:
- Metrohm titrator (Titrino or Titrando) or pH meter
- Metrohm Dosimat (optional)
- Metrohm 802 Rod Stirrer or 741 Magnetic Stirrer

Features:
After each determination the electrode is briefly immersed in the conditioning beaker (dipping). The direction of the rack rotation is controlled so that samples which have not yet been processed are not contaminated by drops falling from the electrode.

Preparation:
Fill a sufficiently large conditioning vessel with a suitable solvent and place it in the highest rack position.

Procedure:
- (Start sequence) Initialize the sample changer
- Move to sample and lower lift to working position
- Switch on stirrer
- If a Dosimat is connected (optional): add auxiliary reagent or solvent and wait until addition is completed
- Start titration/measurement and wait until it is completed
- Switch off stirrer
- Move lift to rotating position and allow electrode to drip
- Move to conditioning beaker in front of the tower and immerse electrode
- Stir 5 seconds
- Move lift to rotating position and allow electrode to drip
- (Final sequence) Move to conditioning beaker and immerse electrode

4.5 Method 3

Use:
For simple titrations (including KF titrations) or pH measurements (without calibration). The initial addition of auxiliary reagents or solvents is possible.

Required instruments:
- Metrohm titrator (Titrino or Titrando) or pH meter
- Metrohm Dosimat (optional)
- Metrohm 802 Rod Stirrer or 741 Magnetic Stirrer
- External pump (e.g. Metrohm 772 Pump Unit)

Features:
After each determination the electrode is rinsed in the sample vessel using a pump and spray nozzle. A separate spraying height must be defined for the rack.

Preparation:
Fill a sufficiently large conditioning vessel with a suitable solvent and place it in the highest rack position.

Procedure:
- (Start sequence) Initialize the sample changer
- Move to sample and lower lift to working position
- Switch on stirrer
- If a Dosimat is connected (optional): add auxiliary reagent or solvent and wait until addition is completed
- Start titration/measurement and wait until it is completed
- Switch off stirrer
- Move lift to rinsing position and allow electrode to drip
- Rinse electrode for 3 seconds
- Move lift to rotating position and allow electrode to drip
- (Final sequence) Move to conditioning beaker and immerse electrode

4.6 Method 4

Use:
For simple titrations (including KF titrations) or pH measurements (without calibration). The initial addition of auxiliary reagents or solvents is possible.

Required instruments:
- Metrohm titrator (Titrino or Titrando) or pH meter
- Metrohm Dosimat (optional)
- Metrohm 722/802 Rod Stirrer or 741 Magnetic Stirrer
- 2 external pumps (e.g. Metrohm 772 Pump Unit; Pump 1 for rinsing, Pump 2 for aspirating

Features:
After each determination the sample vessel is emptied by Pump 1 and then the electrode is rinsed by Pump 2. The sample vessel is then emptied again by Pump 1.

Preparation:
Fill a sufficiently large conditioning vessel with a suitable solvent and place it in the highest rack position.

Procedure:
- (Start sequence) Initialize the sample changer
- Move to sample and lower lift to working position
- Switch on stirrer
- If a Dosimat is connected (optional): add auxiliary reagent or solvent and wait until addition is completed
- Start titration/measurement and wait until it is completed
- Switch off stirrer
- Move lift to rinsing position and empty sample vessel
- Rinse electrode and empty sample vessel again
- Move lift to rotating position and allow electrode to drip
- (Final sequence) Move to conditioning beaker and immerse electrode

4.6.1 Editing methods

The preinstalled standard methods of the 824 Easy Sample Changer are suitable for most simple measuring and titration tasks. The open method concept of this universal sample changer also allows adaptation of the standard methods, other methods to be loaded (e.g. Metrohm 730 Sample Changer methods) or completely new method sequences to be created.

Fig. 20 6.2142.010 Keypad for sample changer

By using the "6.2142.010 SC Controller" sample changer keypad, which has a 2-line display and 30 keys, it is possible to edit all the settings of the 824 Easy Sample Changer in detail and to create, edit and save methods in an easy way.
This keypad can be obtained from Metrohm under the Ordering No. 6.2142.010 and can be connected to the 824 Easy Sample Changer instead of the conventional keypad.

Information

How to create sample changer methods is described in the Instructions for Use of the Metrohm 730 Sample Changer (Ordering No. 8.730.1101).

Note

If edited methods are later to be loaded by using the conventional keypad of the 824 Easy Sample Changer then they must be saved under the method names 1, 2, 3 or 4.

5 Maintenance information

5.1 Maintenance / Service

The maintenance of the 824 Easy Sample Changer should take place within the framework of an annual service carried out by trained Metrohm technicians. If harsh and corrosive chemicals are frequently used then shorter maintenance intervals are necessary.
The Metrohm Service Department will provide competent advice about the care and maintenance of all Metrohm instruments.

5.2 Care / Maintenance

Not only highly sensitive measuring instruments but also sample changers need adequate care. Excessive contamination of the instrument could interfere with its functions and reduce the working life of the really robust mechanism and electronics of the sample changer.

Excessive contamination of the titration head can influence the results obtained. This can largely be prevented by cleaning the exposed parts regularly.

Spilt chemicals and solvents should be removed immediately. The connections strip (and the mains connection in particular) should be protected against contamination. Never use the sample changer without the connections cover and splash protector in position.

Although the design prevents liquid penetration to a great extent, if aggressive media should enter the housing then pull out the mains plug immediately, in order to prevent massive damage to the instrument's electronics. In such a case please contact your distributor's service department.

Warning

The instrument must not be opened by untrained personnel!

6 GLP validation

Each Metrohm instrument undergoes a rigorous quality control process before dispatch.

GLP (**G**ood **L**aboratory **P**ractice) requires, among other things, that the precision and correctness of analytical instruments is checked at regular intervals by using SOPs (**S**tandard **O**perating **P**rocedure, **SOP**).

As this instrument is not an analytical instrument as such, we recommend the user to include the 824 Easy Sample Changer as part of an analytical system in its all-embracing validation.
If the sample changer is primarily used for titrations then the validation of the titrator is best carried out by using the sample changer. In this way any interference (e.g. carryover of titrant or sample solution), which could influence the results obtained, in included within the framework of the evaluation of the complete titration system.

Checking the electronic and mechanical assemblies of Metrohm instruments can and should be undertaken within the framework of regular servicing by Metrohm technicians. All Metrohm instruments are equipped with start-up check routines which check that the relevant assemblies are functioning perfectly when the instrument is switched on. If no error message appears it can be assumed that the instrument is functioning properly. Metrohm also supplies the instruments with built-in diagnosis programs which allow the service technicians to check the functioning of particular assemblies should faults or malfunctions occur and to localize them.

Recommended literature

- Metrohm booklets "Quality management with Metrohm"; detailed information about the principles and methods of Good Laboratory Practice
- Metrohm Application Bulletin 252/1 "Validation of Metrohm titrators according to GLP/ISO 9001"

7 Troubleshooting

7.1 Error messages

<START>
or
<STOP>

If a fault or error occurs then LEDs 1 to 4 start to blink in particular combinations (binary error code). The status LED goes out.
Instrument error messages (blinking LEDs 1…4) must be acknowledged with the **<HOLD>** key. The 824 Easy Sample Changer then enters the **HOLD** mode.
When the fault has been remedied then the run can be continued with the **<START>** key or canceled with the **<STOP>** key.

LED 1…4		Description / Remedy
● 1 ○ 2 ○ 3 ○ 4	**Error 1:**	**Beaker missing** After a rack rotation no beaker is found at the moved-to position. **Remedy:** Press **<HOLD>**. Position beaker and press **<START>** or cancel sample series with **<STOP>**.
○ 1 ● 2 ○ 3 ○ 4	**Error 2:**	**Lift not in rotating position** The sample rack must be at or above the predefined rotating position before it can rotate. **Remedy:** Press **<HOLD>** and **<STOP>**. Move lift upward with <↑> and then rotate rack again with **<←>** or **<→>**.
● 1 ● 2 ○ 3 ○ 4	**Error 3:**	**Sample rack error** An incorrect or no sample rack at all is in position. Possibly the magnet code of the rack cannot be read or the instrument does not recognize the magnet code. Press **<HOLD>**. Position Metrohm standard sample rack. Press **<STOP>** or **<START>**.
○ 1 ○ 2 ● 3 ○ 4	**Error 4:**	**Invalid rack position** An attempt has been made to move to an invalid rack position (method error). **Remedy:** Press **<HOLD>** and **<STOP>**. Check method.
● 1 ○ 2 ● 3 ○ 4	**Error 5:**	**Sample changer not ready** The 824 Easy Sample Changer cannot carry out the command as it is busy doing something else. **Remedy:** Press **<HOLD>** and **<STOP>**. Wait and then repeat command.

○ 1 ● 2 ● 3 ○ 4	**Error 6:**	**Sample rack and swing head not compatible** The positioned sample rack cannot be used together with the swing head and vice versa. Multi-row sample racks must be used with the swing head, single row racks without the swing head. **Remedy:** Press **<HOLD>** and **<STOP>**. Change rack and press **<STOP/RESET>**.
○ 1 ● 2 ○ 3 ● 4	**Error 10:**	**Mains overload** The power supply cannot cope with the simultaneous use of all components (stirrers, pumps, lift). **Remedy:** Press **<HOLD>** and **<STOP>**. Switch off a stirrer or a pump. If necessary, switch the instrument off and on again.
● 1 ● 2 ○ 3 ● 4	**Error 11:**	**Method store full** The memory for the user-defined methods is full. **Remedy:** Switch the instrument off and on again. Delete any methods which are no longer required from the memory (via RS232 interface or with the "6.2142.010 SC Controller" keypad).
○ 1 ○ 2 ● 3 ● 4	**Error 12:**	**Sample changer overload** Load or resistance is too large to carry out the selected action. **Remedy:** Press **<HOLD>** and **<STOP>**. Remove the mechanical hindrance to the lift or sample rack.
● 1 ○ 2 ● 3 ● 4	**Error 13:**	**RS232 error, interface error** Error during data transfer or control by a PC. **Remedy:** Press **<HOLD>** and **<STOP>**. Observe the PC software display. Check the interface parameters. If necessary, consult the PC software manual.
○ 1 ● 2 ● 3 ● 4	**Error 14:**	**Exceptional instrument error** An exceptional fault has occurred in the 824 Easy Sample Changer hardware. **Remedy:** Switch the instrument off and on again. If the fault occurs again please contact the service department of your local Metrohm agency.
● 1 ● 2 ● 3 ● 4	**Error 15:**	**Program stopped (trap error)** An unexpected and non-recoverable program error has occurred. **Remedy:** Switch the instrument off and on again. If the fault occurs again please contact the service department of your local Metrohm agency.

8 Annex

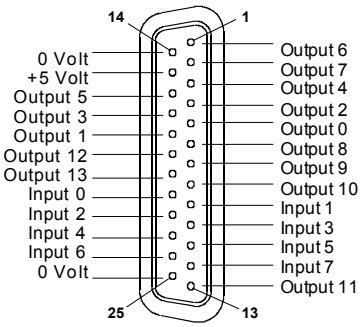
In this section you will find the most important technical data of the 824 Easy Sample Changer. Furthermore there are listings of the four standard methods, the standard and optional accessories as well as the declaration of conformity and warranty.

8.1 Technical data

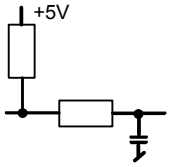
8.1.1 Interfaces

RS232 interface **25** — For the connection of computers

Remote Interface **19** — Universal parallel interface for synchronizing with external devices, 14 signal lines (8x input, 14x output), TTL-level

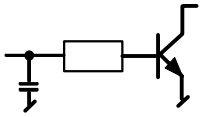


Input: t_p t_p >20 ms



active = low
inactive = high

Output: t_p t_p >200 ms
V_{CEO} = 40 V
I_C = 20 mA



active = low
inactive = high

+5 V: max. charge = 20 mA

8.1.2 Pump connections

Pump outputs — 2x ±16 VDC, max. 300 mA , for ground–free load

8.1.3 Lift

Max. lift stroke	approx. 235 mm
Max. load	approx. 10 N
Stroke speed	adjustable, 3...25 mm/s

8.1.4 Turntable

Turning speed — adjustable, 3...20 angular degrees/s

8.1.5 Stirrer

Stirring speed — adjustable in 15 steps
- magnetic stirrer 180/min...2600/min
- rod stirrer 180/min...3000/min

8.1.6 Power supply

Voltage	100...120 V, 220...240 V
Frequency	50...60 Hz
Power input	40 W
Fuses	0.5 AT (110 V), 0.25 AT (220 V)

8.1.7 Safety Specifications

Construction and testing	According to EN/IEC 61010-1, UL 3101-1
Safety instructions	The Instructions for Use contain safety information that must be observed by the user in order to ensure the safe operation of the instrument.

8.1.8 Electromagnetic compatibility (EMC)

Emission

Standards fulfilled:
- EN/IEC 61326-1
- EN 55022
- CISPR 22

Immunity

Standards fulfilled:
- EN/IEC 61326-1
- EN/IEC 61000-4-2
- EN/IEC 61000-4-3
- EN/IEC 61000-4-4
- EN/IEC 61000-4-5
- EN/IEC 61000-4-6
- EN/IEC 61000-4-8
- EN/IEC 61000-4-11
- EN/IEC 61000-4-14

8.1.9 Ambient temperature

Nominal working range	+5…+45 °C (at max. 85% relative humidity)
Storage	-20 °C…+60 °C
Transport	-40 °C…+60 °C

60 °C relative humidity <60%
50 °C " " <85%
40 °C " " <95%

8.1.10 Dimensions and materials

Height	74 cm
Width	28 cm
Depth	48 cm
Weight	12.5 kg (without accessories)
Materials	
- Housing	metal housing, surface refined
- Keyboard case	PBTP
- Keyboard film	PETP, resistant to chemicals
- Sample rack	PVC
- Splash protection	PMMA

8.2 Method listings

8.2.1 Method 1

```
824 Easy Sample Chan.      5.824.0010      ← Report header with program version
Parameters
  method                      1            ← Method name
  number of samples:      rack             ← No. of samples (whole sample rack)
>start sequence
   1 CTL:Rm:                INIT           ← Initialize remote interface
   2 SAMPLE:      -           1            ← Initialize sample
   3 SAMPLE:      +           1              position
>sample sequence
   1 MOVE  1      :      sample            ← Move next sample in front of tower
   2 LIFT: 1   :            work mm        ← Move lift to working position
   3 STIR: *      :           ON s         ← Switch on stirrer
   4 CTL:Rm:        START dos*              ← Start addition
   5 WAIT                     10 s         ← Waiting time
   6 CTL:Rm:     START device1              ← Start instrument/titrator
   7 SCN:Rm       :        End1            ← Wait for end of determination [EOD]
   8 STIR: *      :         OFF s          ← Switch off stirrer
   9 LIFT: 1   :           shift mm        ← Move lift to rotating position
  10 WAIT                      3 s         ← Waiting time: 3 s for drips
>final sequence
   1 MOVE  1      :      spec.1            ← Move conditioning beaker in front of tower
   2 LIFT: 1   :            work mm        ← Immerse electrode
>changer settings                          ------ Sample changer settings --------
  rack number                  0
  lift rate 1                 25 mm/s
  shift rate                  20
  shift direction:       auto.
  beaker test mode:     single             ← If sample beaker is missing then the
  on beaker error:        MOVE               next one will be moved to automatically
>stirring rates                            ------ Stirring rates ----------
  stirrer 1                    3
  stirrer 2                    3
>manual stop                               ------ Reaction to manual stop ----------
  CTL Rmt:        STOP device1             ← Stop instrument/titrator
  CTL RS232:
```

8.2.2 Method 2

```
824 Easy Sample Chan.      5.824.0010
Parameters
  method                       2
  number of samples:       rack
>start sequence
    1 CTL:Rm:                INIT
    2 SAMPLE:      -           1
    3 SAMPLE:      +           1
>sample sequence
    1 SHIFTRATE:       +       20
    2 MOVE  1      :      sample
    3 LIFT: 1  :            work mm
    4 STIR: *      :           ON s
    5 CTL:Rm:         START dos*
    6 WAIT                    10 s
    7 CTL:Rm:     START device1
    8 SCN:Rm       :        End1
    9 STIR: *      :         OFF s
   10 LIFT: 1  :           shift mm
   11 WAIT                     3 s
   12 SHIFTRATE:       -       20
   13 MOVE  1      :      spec.1
   14 LIFT: 1  :           work mm
   15 STIR: *      :           ON s
   16 WAIT                     5 s
   17 STIR: *      :         OFF s
   18 LIFT: 1  :           shift mm
   19 WAIT                     3 s
>final sequence
    1 MOVE  1      :      spec.1
    2 LIFT: 1  :            work mm
>changer settings
  rack number                  0
  lift rate 1                 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
>manual stop
  CTL Rmt:         STOP device1
  CTL RS232:
```

← Report header with program version
← Method name
← No. of samples (whole sample rack)
← Initialize remote interface
← Initialize the sample position
← Rack direction of rotation (clockwise)
← Move next sample in front of tower
← Move lift to working position
← Switch on stirrer
← Start addition
← Waiting time
← Start instrument/titrator
← Wait for end of determination [EOD]
← Switch off stirrer
← Move lift to rotating position
← Waiting time: 3 s for drips
← Rack direction of rotation (counterclockwise)
← Move conditioning beaker in front of tower
← Move lift to working position
← Switch on stirrer
← Waiting time
← Switch off stirrer
← Move lift to rotating position
← Waiting time: 3 s for drips
← Move conditioning beaker in front of tower
← Immerse electrode
------ Sample changer settings --------
← If sample beaker is missing then the next one will be moved to automatically
------ Stirring rates ----------
------ Reaction to manual stop ----------
← Stop instrument/titrator

8.2.3 Method 3

```
824 Easy Sample Chan.      5.824.0010          ← Report header with program version
parameters
  method                      3                ← Method name
  number of samples:      rack                 ← No. of samples (whole sample rack)
>start sequence
   1 CTL:Rm:                INIT               ← Initialize remote interface
   2 SAMPLE:      -           1                ← Initialize
   3 SAMPLE:      +           1                  sample position
>sample sequence
   1 SHIFTRATE:       +       20               ← Rack direction of rotation (clockwise)
   2 MOVE  1      :      sample                 ← Move next sample in front of tower
   3 LIFT: 1   :            work mm            ← Move lift to working position
   4 STIR: *      :           ON s             ← Switch on stirrer
   5 CTL:Rm:         START dos*                 ← Start addition
   6 WAIT                     10 s             ← Waiting time
   7 CTL:Rm:     START device1                  ← Start instrument/titrator
   8 SCN:Rm       :         End1               ← Wait for end of determination [EOD]
   9 STIR: *      :          OFF s             ← Switch off stirrer
  10 LIFT: 1   :           rinse mm            ← Move lift to rinsing position
  11 WAIT                     3 s              ← Waiting time: 3 s for drips
  12 PUMP  1.1   :            3 s              ← Switch on pump, 3 s for rinsing
  13 WAIT                     3 s              ← Waiting time: 3 s for drips
>final sequence
   1 MOVE  1      :      spec.1                 ← Move rinsing beaker in front of tower
   2 LIFT: 1   :            work mm            ← Immerse electrode
>changer settings                               ------ Sample changer settings --------
  rack number                 0
  lift rate 1                25 mm/s
  shift rate                 20
  shift direction:       auto.
  beaker test mode:     single                  ← If sample beaker is missing then the
  on beaker error:        MOVE                    next one will be moved to automatically
>stirring rates                                 ------ Stirring rates --------------------------
  stirrer 1                   3
  stirrer 2                   3
>manual stop                                    ------ Reaction to manual stop --------------
  CTL Rmt:        STOP device1                  ← Stop instrument/titrator
  CTL RS232:
```

8.2.4 Method 4

```
824 Easy Sample Chan.      5.824.0010
Parameters
  method                        4
  number of samples:       rack
>start sequence
    1 CTL:Rm:                INIT
    2 SAMPLE:       -           1
    3 SAMPLE:       +           1
>sample sequence
    1 MOVE  1       :      sample
    2 LIFT: 1   :            work mm
    3 STIR: *       :           ON s
    4 CTL:Rm:         START dos*
    5 WAIT                    10 s
    6 CTL:Rm:     START device1
    7 SCN:Rm        :         End1
    8 STIR: *       :          OFF s
    9 LIFT: 1   :           rinse mm
   10 PUMP  1.2     :          10 s
   11 PUMP  1.1     :           5 s
   12 PUMP  1.2     :           5 s
   13 LIFT: 1   :           shift mm
   14 WAIT                     3 s
>final sequence
    1 MOVE  1       :      spec.1
    2 LIFT: 1   :            work mm
>changer settings
  rack number                   0
  lift rate 1                  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
>manual stop
  CTL Rmt:         STOP device1
  CTL RS232:
```

← Report header with program version
← Method name
← No. of samples (whole sample rack)
← Initialize remote interface
← Initialize
sample position
← Move next sample in front of tower
← Move lift to working position
← Switch on stirrer
← Start addition
← Waiting time
← Start instrument/titrator
← Wait for end of determination [EOD]
← Switch off stirrer
← Move lift to rinsing position
← Switch on Pump 2, aspirate for 10 s
← Switch on Pump 1, rinse for 5 s
← Switch on Pump 2, aspirate for 5 s
← Move lift to rotating position
← Waiting time: 3 s for drips
← Move conditioning beaker in front of tower
← Immerse electrode
------ Sample changer settings --------
← If sample beaker is missing then the next one will be moved to automatically
------ Stirring rates ----------
------ Reaction to manual stop ----------
← Stop instrument/titrator

8.3 Connecting external pumps

Metrohm 772 Peristaltic Pumps can be used for rinsing the electrodes and aspirating the measured sample solutions. Various models are available:

2.772.0020 772 Pump Unit with aspiration equipment
(including pump tubing, PTFE tubing, aspiration tip, distributor, PE canister …)

2.772.0030 772 Pump Unit with rinsing equipment
(including pump tubing, PTFE tubing, 3 spray nozzles, PE canister …)

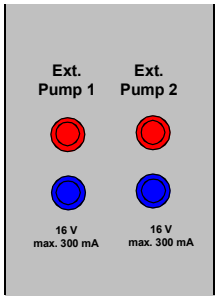


Fig. 21
Pump connections

External pumps may be connected directly to the pump connectors **22** on the rear side of the changer tower.

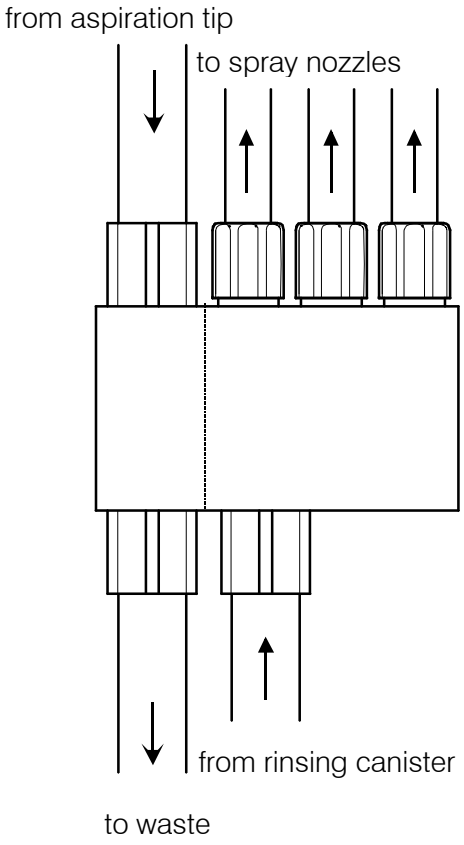
If you consider to connect other pumps than the Metrohm 772 Pump Unit, check the electrical requirements, as there are:

- 16 Volt voltage
- 300 mA max. load

8.4 Connecting rinsing and aspirating equipment

Depending on the model (see above) the Metrohm 772 Pump Unit is delivered with accessories needed for rinsing or aspirating.

8.4.1 Attaching the distributor and tubing



To use aspiration tubing and/or the spray nozzles the 6.1808.160 distributor must be attached.

With the screws provided attach the distributor on the rear side of the changer tower.

Connect the tubings of the spray nozzles and the aspiration tube according to the drawing on the left. The tubings are then led through the tubing guide **12**.

Fig. 22 Distributor

8.4.2 Spray nozzles

The M6 spray nozzles (6.2740.020) can be used for rinsing the electrode in combination with a pump (e.g. Metrohm 772 Pump Unit). Spray nozzles can be used with the macro- and micro-titration heads. The 3 spray nozzles are inserted into the slightly oblique openings of the titration head. These are connected to the distributor (6.1808.160) by using the FEP tubing supplied, see above. All three openings with M6 threads must be occupied.
The lengths of tubing are led through the tubing guide.
Polyethylene canisters (Metrohm Order. no. 6.1621.000) can be used as rinsing canisters for aqueous media.
If organic solvents are used for rinsing then the chemical resistance of the pump tubing must be taken into account.

Attaching the spray nozzles and aspiration tips

A = recommended opening for aspiration tip
S = openings provided for spray nozzles

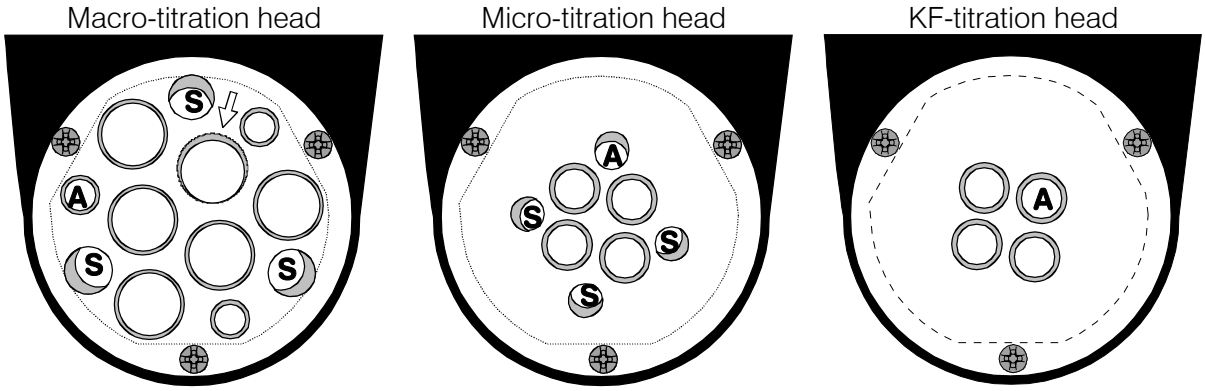


Fig. 23 Attaching the spray nozzles and the aspiration tip

Spray nozzles may be adjusted vertically to optain a most effective rinsing performance.

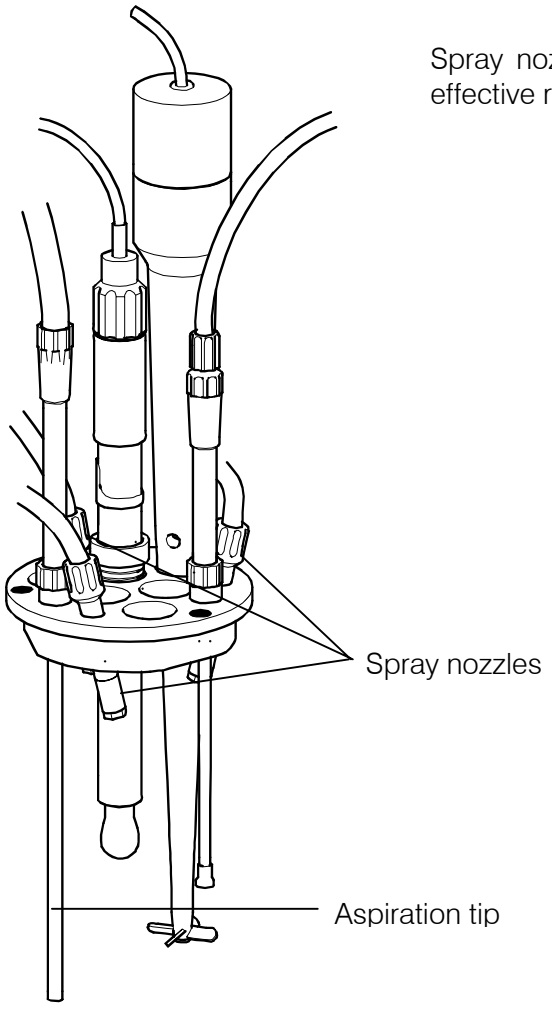


Fig. 24 Titration head with aspiration and rinsing equipment

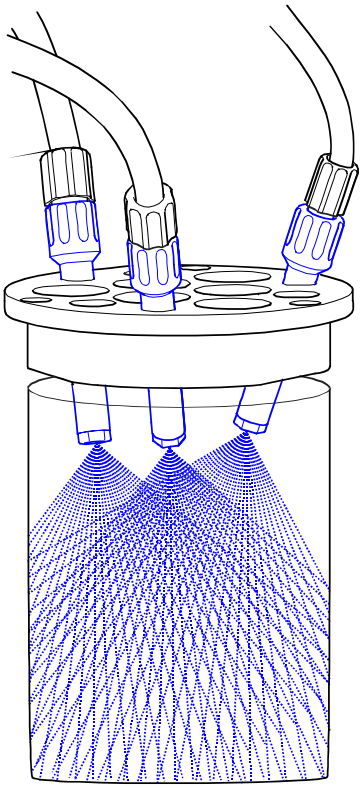


Fig. 25 Function of the spray nozzles

8.4.3 Aspiration tip

The Metrohm 772 Pump Unit with aspiration equipment can be used for aspirating used sample solutions without any problems. If the sample solutions contain solids, precipitates (e.g. silver chloride) or sticky substances then a peristaltic pump such as the Metrohm 772 Pump Unit must be used, as diaphragm pumps can easily be blocked up or stuck together by solids.

The 6.1543.170 Aspiration tips can be used with all titration heads with SGJ9 openings, see above drawing.
Take the chemical resistance of the tubing and connections into account.
Polyethylene canisters (Metrohm Order. no. 6.1621.000) can be used as waste canisters for aqueous media.
The 6.1821.000 Aspiration Tube is used with the KFT titration head. It should always be used as it ensures trouble-free penetration of the aluminum foil on the KF sample vessels.

8.5 Sample beakers for Karl Fischer titrations

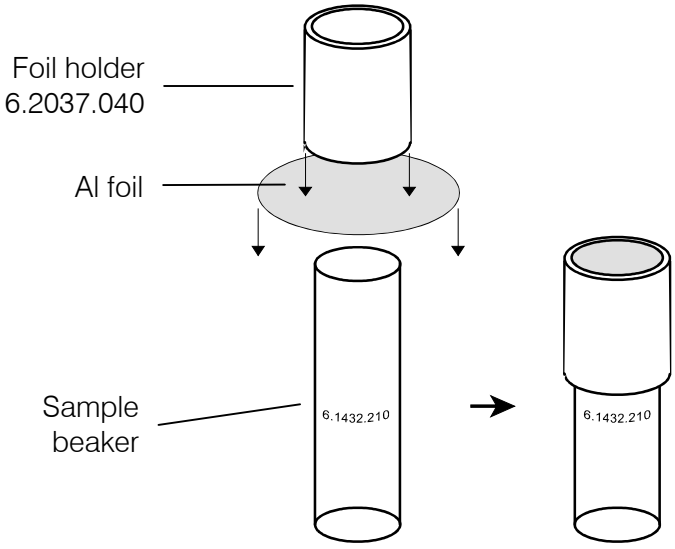


Fig. 26 Karl Fischer sample beaker

For Karl Fischer titrations the measured-out sample is placed in a 6.1432.210 Sample Beaker together with a 6.1903.010 Stirrer Bar. The beaker is then covered centrally with 6.2820.000 Aluminum foil which is kept in place by the foil holder.

During the method sequence the lift with the titration head is moved to the working position. The aspiration tube should be the first object to penetrate the Al foil.

Attention

Always attach the 6.1821.000 Aspiration Tube to the KFT titration head, even when you do not intend to aspirate sample solutions. The aspiration tube is used to penetrate the Al foil.

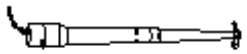
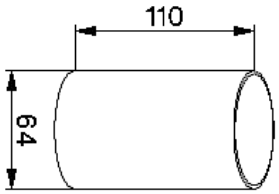
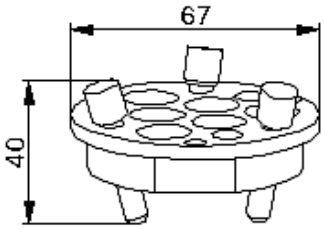
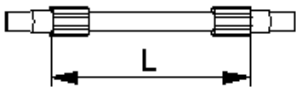
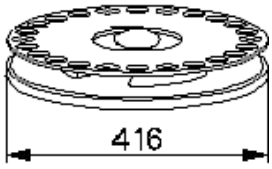
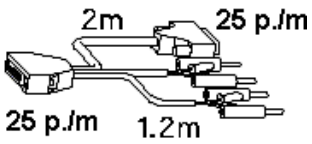
Use only 6.2820.000 Al Foil as this has a defined thickness (0.010 mm).

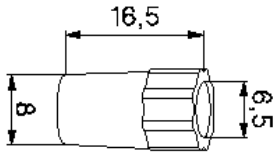
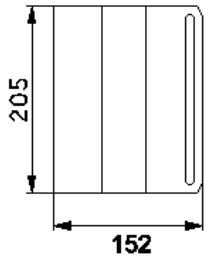
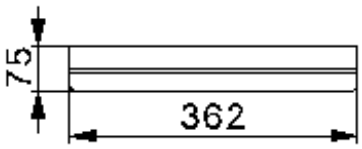
8.6 Standard equipment

On receipt of the instrument please check that the delivery is complete.

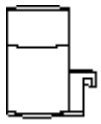
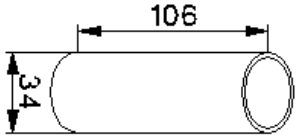
8.6.1 824 Easy Sample Changer

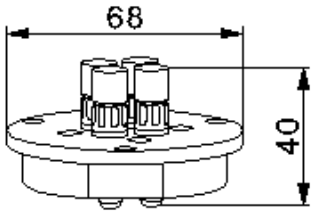
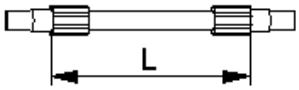
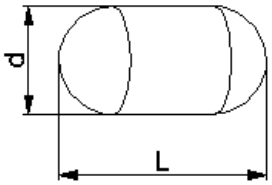
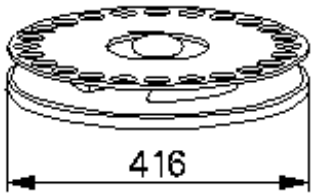
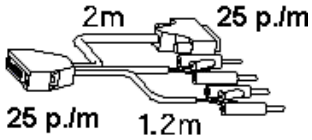
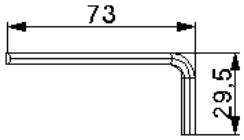
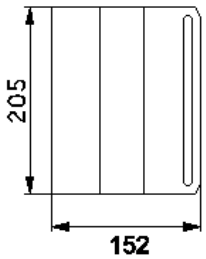
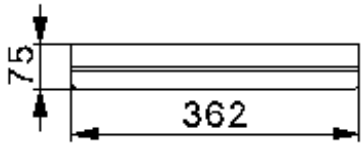
Ordering no. 2.824.0010 with macro-titration head

No.	*Order. no.*	*Description*
1	1.824.0010	**824 Easy Sample Changer** Sample changer with macro-titration head, rod stirrer, sample rack and sample beakers. The following accessories are included:
1	1.802.0010	802 Rod Stirrer 
12	6.1453.250	PP sample beakers, 250 mL for sample changers 
1	6.1458.010	Macro-titration head, PTFE for sample changers With 6 openings SGJ 14 and 3 opening SGJ 9 Suitable for rinsing and aspiration equipment. 
1	6.1805.110	FEP tubing with light- and kink-protection, with 2x M6 connections L = 80 cm 
1	6.1909.020	Propeller stirrer, PP for 802 Rod Stirrer L= 95 mm 
1	6.2041.310	Sample rack, PVC for Metrohm sample changers for 12 x 250 mL sample beakers 
1	6.2141.050	Remote cable for connecting: Sample changer — 1x Titrino/ Titrando, 2x Dosimat 

1	6.2142.120	Keypad for 824 Easy Sample Changer 
3	6.2709.070	Guiding sleeve, ETFE, for 6.1543.xxx, SGJ 9 
1	6.2751.010	Splash protector 
1	6.2752.010	Connections cover 
1	6.2122.xxx	Mains cable with type IEC 320/C13 connection Plug according to customer's requirements: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.824.1001	824 Easy Sample Changer Instructions for Use, English

Ordering no. 2.824.0020 with micro-titration head

No.	*Order. no.*	*Description*
1	1.824.0020	**824 Easy Sample Changer** Sample changer with micro-titration head, magnetic stirrer, sample rack and sample beakers. The following accessories are included:
1	1.741.0010	Magnetic stirrer for sample changer 
24	6.1432.210	Sample beaker, clear glass max. 75 mL for 6.2041.340 Sample Rack 

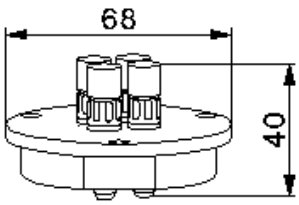
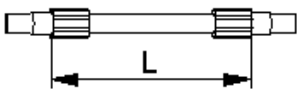
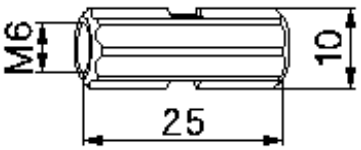
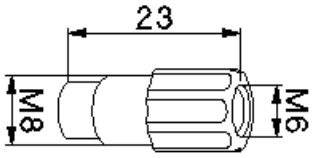
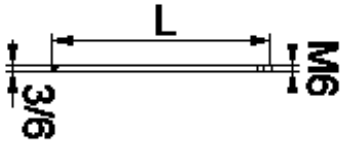
1	6.1458.020	Micro-titration head, PTFE With 4 M10 screw threads	
1	6.1805.110	FEP tubing with 2 M6 nipples, 2 mm i.d., with light- and kink-protection L = 80 cm	
24	6.1903.030	Teflon stirrer bars with magnetic core L = 25 mm, d = 5 mm	
1	6.2034.020	Attachment bracket for 741 Magnetic Stirrer	
1	6.2041.340	Sample rack, PVC for 24 x 6.1432.210 Sample Beakers (75 mL)	
1	6.2141.050	Remote cable for connecting: Sample changer — 1x Titrino/ Titrando, 2x Dosimat	
1	6.2142.120	Keypad for 824 Easy Sample Changer	
1	6.2621.140	Allen key 2.5 mm For mounting 6.2034.020 Attachment Bracket	
1	6.2751.010	Splash protector	
1	6.2752.010	Connections cover	

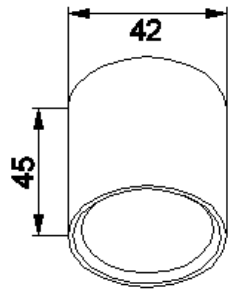
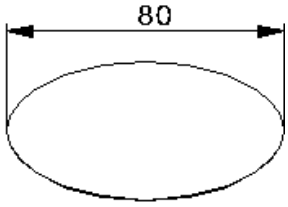
1	6.2122.xxx	Mains cable with type IEC 320/C13 connection Plug according to customer's requirements: - Type SEV 12 (Switzerland...) 6.2122.020 - Type CEE(7), VII (Germany...) 6.2122.040 - Type NEMA/ASA (USA...) 6.2122.070
1	8.824.1001	824 Easy Sample Changer Instructions for Use, English

8.7 Optional accessories

8.7.1 6.5610.020 KFT Equipment

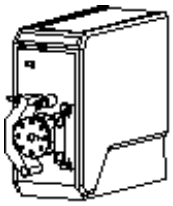
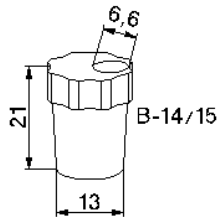
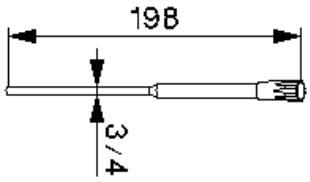
for Karl Fischer titrations with the 2.824.0020 Easy Sample Changer, Micro
Ordering no. 6.5610.020, containing the following accessories:

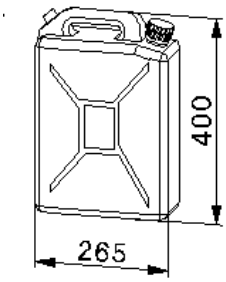
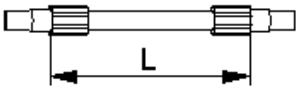
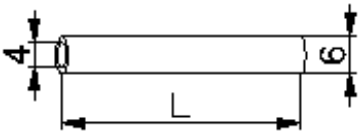
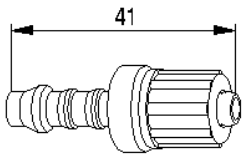
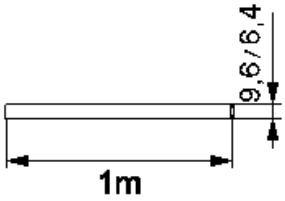
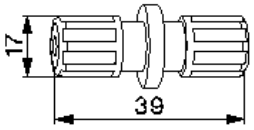
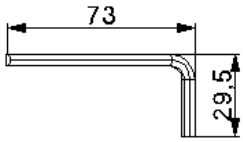
No.	*Order. no.*	*Description*
1	6.0340.000	Double Pt electrode for sample changers
1	6.1458.030	Sample changer titration head for Karl Fischer titrations 
1	6.1805.060	FEP tubing with 2 M6 nipples, 2 mm i.d., with light- and kink-protection L = 60 cm 
1	6.1808.000	Coupling bush, ETFE 3x M6 threads 
1	6.1808.090	Thread adapter, PVDF Outer thread M8 / inner thread M6 
1	6.1821.000	Aspiration tube, PTFE L = 178 mm 

24	6.2037.040	Foil holder for 6.1432.210 Sample Beaker for 6.2820.000 Al Foil	
1000	6.2820.000	Al foil 1000 rounds 80 mm dia. Thickness 0.010 mm	
4	E.301.0022	O-rings 5.28/1.78 mm	
4	E.301.0080	O-rings 28/5 mm	

8.7.2 772 Pump Unit (2.772.0020)

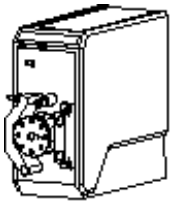
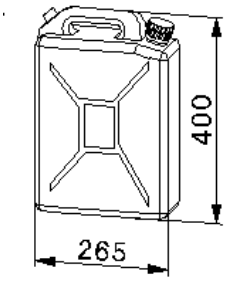
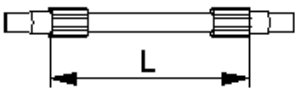
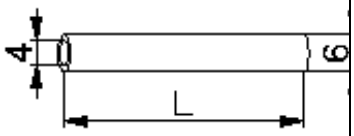
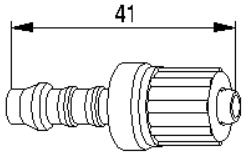
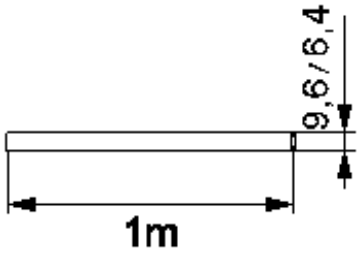
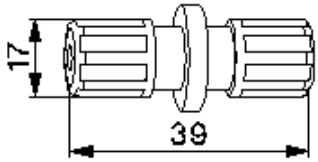
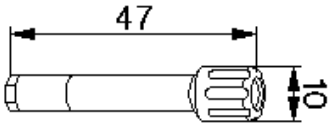
Peristaltic pump with aspiration equipment

No.	*Order. no.*	*Description*	
1	**1.772.0020**	**Pump Unit 772** Peristaltic pump with following accessories:	
1	6.1446.160	Stopper SGJ 14/6.6 mm PTFE For oblique insertion of objects in the titration head	
1	6.1543.170	Aspiration tip, PTFE with M8 thread	

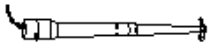
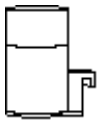
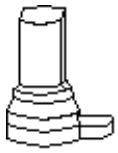
1	6.1621.000	PE canister 10 L For sample changer use as rinsing or waste container Not suitable for organic solvents.	
1	6.1805.510	PTFE tubing with kink-protection With 2 tubing nipples M8, L = 60 cm 3 mm i.d.	
1	6.1812.000	PTFE tubing L = 400 cm	
1	6.1808.160	Distributor for rinsing / aspirating, 3x M6, 1x M8	
2	6.1820.050	Screw connector for 6.1826.100 Pump Tubing 4/6 mm / nozzle	
1	6.1826.100	Pump tubing, PP PharMed© 6.4/1.6 mm (Norton), L = 1 m	
1	6.1828.000	Connecting nipple, PVDF, for 6.1621.000 Canister	
1	6.2621.140	Allen key 2.5 mm for assembling 6.1808.160 Distributor	

8.7.3 772 Pump Unit (2.772.0030)

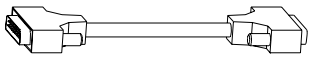
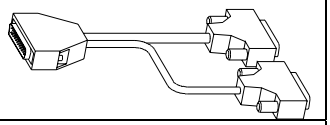
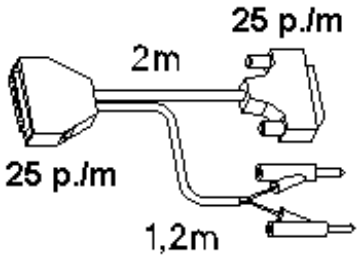
Peristaltic pump with rinsing equipment

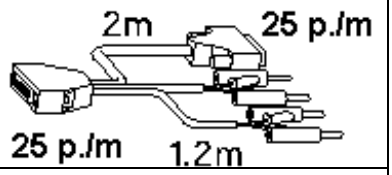
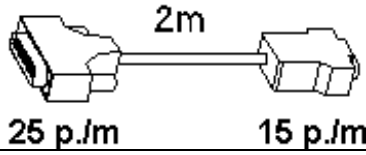
No.	*Order. no.*	*Description*
1	**1.772.0030**	**772 Pump Unit** Peristaltic pump with following accessories: 
1	6.1621.000	PE canister 10 L For sample changer use as rinsing or waste container Not suitable for organic solvents. 
3	6.1805.060	FEP tubing with 2 tubing nipples M6, 2 mm i.d., with light- and kink-protection L = 60 cm 
1	6.1812.000	PTFE tubing L = 400 cm 
2	6.1820.050	Screw connector for 6.1826.100 Pump Tubing 4/6 mm / nozzle 
1	6.1826.100	Pump tubing, PP PharMed© 6.4/1.6 mm (Norton), L = 1 m 
1	6.1828.000	Connecting nipple, PVDF, for 6.1621.000 Canister 
3	6.2740.020	Rinsing nozzle, ETFE With valve and M6 thread 

8.7.4 Optional accessories and instruments

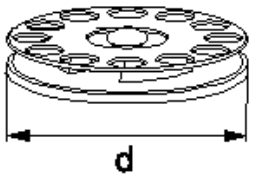
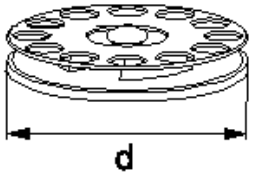
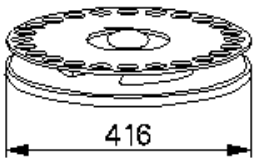
Order. no.	*Description*
2.802.0020	**802 Rod Stirrer** 
6.1909.020	with propeller stirrer, PP
2.741.0010	**741 Magnetic Stirrer** 
6.2034.020	with attachment bracket for mounting on 824 Easy Sample Changer
2.759.0020	**759 Swing Head** 
	with following accessories:
6.1462.020	Titration head
6.1909.030	Propeller stirrer, PP (104 mm) for 75 mL vessels
6.2042.030	Buret tip clips, 2 pcs.
6.2058.000	Mounting plate for swing head
6.2751.030	Splash protector for swing head
6.2142.010	**Sample changer keypad 'SC Controller'** for editing methods 
6.1808.160	**Distributor for rinsing / aspirating**, 3x M6, 1x M8

8.7.5 Connection cables

Order. no.	*Description*
6.2141.020	Remote Cable 824 — 692/712/713 Titrino/Titrando 
6.2141.030	Remote Cable 824 — 2x 692/712/713 Titrino/Titrando 
6.2141.040	Remote cable 824 — Titrino/Titrando — 665/725/765/776 Dosimat 

6.2141.050	Remote cable 824 — Titrino/Titrando — 2x 665/725/765/776 Dosimat 
6.2141.060	Remote cable 824 — 691 pH-Meter 
6.2142.070	Remote cable 824 — 692/780/781 pH-Meter— 665/725/765/776 Dosimat

8.7.6 Sample racks and sample beakers

Order. no.	*Description*
6.2041.310	**Sample Rack M12-0** (12 x 250 mL) for 
6.1432.320	Metrohm sample beakers glass, 250 mL
6.1453.220	Metrohm sample beakers PP, 200 mL
6.1453.250	Metrohm sample beakers PP, 250 mL
6.2041.360	**Sample Rack M12-0** (12 x 150 mL) for 
	150 mL standard beakers (tall form)
6.1459.310	200 mL disposable beakers (Euro) PP (1000 pcs.)
6.2041.370	**Sample Rack M14-0** (14 x 200 mL) for
6.1459.310	200 mL disposable beakers (Euro) PP
6.2041.380	**Sample Rack M14-0** (14 x 8 oz) for
	disposable beakers (US) PP 8 oz
6.2041.320	**Sample Rack M16-0** (16 x 150 mL) for
	standard beakers (tall form)
6.2041.390	**Sample Rack M16-0** (16 x 120 mL) for
	disposable beakers (US) 120 mL
6.2041.340	**Sample Rack M24-0** (24 x 75 mL) for 
6.1432.210	Metrohm sample beakers glass, 75 mL (Micro-titration head required)

For operation with 759 Swing Head:

Order. no.	*Description*
6.2041.350	**Sample Rack 48 x 75 mL** for direct titration
6.1432.210	Metrohm sample beakers glass, 75 mL
6.2041.400	**Sample Rack 126 x 15 mL and 2 x 250 mL** for pipetting
	for 15 mL test tubes and
6.1432.320	Metrohm sample beakers glass 250 mL or
6.1453.220	Metrohm sample beakers PP 200 mL or
6.1453.250	Metrohm sample beakers PP 250 mL

8.7.7 Electrodes for Sample Changers

For titrations with the Macro-titration head we recommend the use of Long-life electrodes (LL) or Titrodes (without glass SGJ) together with 6.1236.040 SGJ Sleeve made of silicone rubber.

Order. no.	*Description*
6.0232.100	**Ecotrode** 12,5 cm
6.0253.100	**Aquatrode** 12,5 cm
6.0258.000	**Unitrode** 12,5 cm
6.0431.100	**Ag-Titrode** 12,5 cm
6.0430.100	**Pt-Titrode** 12,5 cm

If the Micro-titration head or the 759 Swing Head are used for direct titrations then the following special micro-electrodes can be used.

Order. no.	*Description*	
6.0234.110	**Comb. Mikro pH electrode (LL)**	16 cm
6.0736.110	**Micro-reference electrode Ag/AgCl**	16 cm
6.0134.110	**Micro-glass electrode**	16 cm
6.0433.110	**Micro-Ag Titrode**	16 cm
6.0434.110	**Micro-Pt Titrode**	16 cm
6.0435.110	**Mikro-Au Titrode**	16 cm
6.1110.110	**Pt 1000 temperature sensor**	16 cm

Further accessories: please see Metrohm Accessory Catalog.

8.8 Warranty and conformity

8.8.1 Warranty

The warranty on our products is limited to defects that are traceable to material, construction or manufacturing error which occur within 12 months from the day of delivery. In this case, the defects will be rectified in our workshops free of charge. Transport costs are to be paid by the customer.

For day and night operation, the warranty is limited to 6 months.

Glass breakage in the case of electrodes or other parts is not covered by the warranty. Checks which are not a result of material or manufacturing faults are also charged during the warranty period. For parts of outside manufacture insofar as these constitute an appreciable part of our instrument, the warranty stipulations of the manufacturer in question apply.

With the regard to the guarantee of accuracy, the technical specifications in the instruction manual are authoritative.

Concerning defects in material, construction or design as well as the absence of guaranteed features, the orderer has no rights or claims except those mentioned above.

If damage of the packaging is evident on receipt of a consignment or if the goods show signs of transport damage after unpacking, the carrier must be informed immediately and a written damage report demanded. lack of an official damage report releases Metrohm from any liability to pay compensation.

If any instruments and parts have to be returned, the original packaging should be used if at all possible. This applies above all to instruments, electrodes, burette cylinders and PTFE pistons. Before embedment in wood shavings or similar material, the parts must be packed in a dust-proof package (for instruments, use of a plastic bag is imperative). If open assemblies are enclosed in the scope of delivery that are sensitive to electromagnetic voltages (e.g. data interfaces etc.) these must be returned in the associated original protective packaging (e.g. conductive protective bag). (Exception: assemblies with built-in voltage source belong in a non-conductive protective packaging).

No warranty responsibility whatsoever will be accepted by Metrohm for damage which arises as a result of non-compliance with these instructions.

8.8.2 EU Declaration of Conformity for 824 Easy Sample Changer

CE

EU Declaration of Conformity

The Metrohm Ltd. company, Herisau, Switzerland hereby certifies, that the instrument:

824 Easy Sample Changer

meets the requirements of EU Directives 89/336/EEC and 73/23/EEC.

Source of specifications:

EN 61326-1	Electromagnetic compatibility, basic specification Emitted Interference, Interference Immunity
EN 61010-1	Safety requirements for electrical laboratory measurement and control equipment

Description of the instrument:

Sample changer for the automation of batch processing of larger sample series, applying titration and measuring methods in laboratory and industry.

Herisau, July 7, 2002

Dr. J. Frank	Ch. Buchmann
Development Manager	Production and Quality Assurance Manager

8.8.3 Declaration of Conformity: 824 Easy Sample Changer

Certificate of Conformity and System Validation

This is to certify the conformity to the standard specifications for electrical appliances and accessories, as well as to the standard specifications for security and to system validation issued by the manufacturing company.

Name of commodity:	824 Easy Sample Changer
Manufacturer:	Metrohm Ltd., Herisau, Switzerland
Technical specifications:	Distribution voltage: 100…120, 220…240 V Frequency: 50…60 Hz

The instrument was manufactured and tested according to the following standards:

Electromagnetic compatibility:

Emission
IEC 61326-1, EN 55022, CISPR 22

Immunity
IEC 61326-1, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, IEC 61000-4-14

Security specifications

IEC 61010-1, UL 3101-1

It has also been certified by the Swiss Electrotechnical Association (SEV), which is member of the International Certification Body (CB/IEC).

The technical specifications are documented in the instruction manual.

Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.

Herisau, July 7, 2002

Dr. J. Frank	Ch. Buchmann
Development Manager	Production and Quality Assurance Manager

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