

874 Oven Sample Processor



Manual

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Table of contents

1	Introduction	1
1.1	Instrument description	1
1.1.1	Instrument versions	1
1.1.2	Instrument components	2
1.1.3	Intended use	2
1.2	About the documentation	3
1.2.1	Symbols and conventions	3
1.3	Safety instructions	4
1.3.1	General notes on safety	4
1.3.2	Electrical safety	4
1.3.3	Tubing and capillary connections	5
1.3.4	Personnel safety	5
1.3.5	Flammable solvents and chemicals	6
1.3.6	Recycling and disposal	7
2	Overview of the instrument	8
3	Installation	11
3.1	Setting up the instrument	11
3.1.1	Packaging	11
3.1.2	Checks	11
3.1.3	Location	11
3.2	Connecting the instrument to the power grid	11
3.3	Mounting the sample holder	12
3.4	Mounting needles	13
3.5	Mounting the heating tubing	16
3.6	Mounting the drying flask	17
3.7	Mounting the dust filter	19
3.8	Mounting the air/nitrogen connector	19
3.9	Mounting the safety shield	21
3.10	Mounting the KF titration cell	22
3.11	Inserting the heating tube into the KF titration cell	23
3.12	Attaching a sample rack	26
3.13	Adjusting the guide rod	27
3.14	Connecting a computer	27
3.15	Connecting MSB devices	29
3.15.1	Connecting a dosing device	31



3.15.2	Connecting a stirrer or titration stand	32
3.15.3	Connecting a Remote Box	33
3.16	Connecting USB devices	34
3.16.1	Connecting a barcode reader	34
4	Processing a sample series	36
5	Operation and maintenance	37
5.1	General notes	37
5.2	Care	37
6	Troubleshooting	38
6.1	Problems and their solutions	38
7	Appendix	39
7.1	Remote interface	39
7.1.1	Pin assignment of the remote interfaces	39
7.2	Stirring rate	41
8	Technical specifications	42
8.1	Lift and turntable	42
8.2	Oven	42
8.3	Gas flow	42
8.4	Outlet heater	43
8.5	Interfaces	43
8.6	Ambient conditions	43
8.7	Energy supply	43
8.8	Reference conditions	44
8.9	Dimensions	44
9	Accessories	45
	Index	46

Table of figures

Figure 1	Front 874 Oven Sample Processor	8
Figure 2	874 Oven Sample Processor rear	9
Figure 3	Sample rack 6.2041.720	10
Figure 4	Mounting the sample holder	12
Figure 5	Mounting the needles	14
Figure 6	Mounting the tubing	15
Figure 7	Mounting the heating tubing	16
Figure 8	Preparing the drying flasks	17
Figure 9	Mounting the tubings	18
Figure 10	Mounting the dust filter	19
Figure 11	External gas connector	20
Figure 12	Mounting the safety shield	21
Figure 13	Coulometric KF titration cell	24
Figure 14	Volumetric KF titration cell	25
Figure 15	Attaching rack	26
Figure 16	Adjusting the guide rod	27
Figure 17	Connecting the computer	28
Figure 18	MSB connections	30
Figure 19	Connecting a dosing device	31
Figure 20	Connecting an MSB stirrer	32
Figure 21	Connecting the rod stirrer to the titration stand	32
Figure 22	Connecting the Remote Box	33
Figure 23	USB connectors	34
Figure 24	Connectors of the Remote Box	39
Figure 25	Pin assignment of remote socket and remote plug	39
Figure 26	Rotational speed depending on the stirring rate	41

1 Introduction

1.1 Instrument description

The 874 Oven Sample Processor is used wherever the heating of a sample and/or the thermal expulsion of moisture in solids or liquids is required. In combination with a coulometric or volumetric KF titrator, the 874 Oven Sample Processor is the ideal analysis system for water content determination in samples that contain disruptive components or from which moisture can be removed only with difficulty.

One of its decisive advantages is reducing sample preparation to a minimum. Thanks to the use of hermetically sealed sample vessels ("headspace vials"), samples can be filled directly on-site. The PTFE-coated septa guarantee a constant, unaltered water content, even after prolonged holding times.

The sample heated in the oven module releases its moisture in the form of water vapor, which is conveyed into a measuring cell with the aid of a gas flow. An air pump is installed to generate the gas flow. An inlet valve is available for nitrogen or other inert gases. The moisture can be determined in the measuring cell either coulometrically or volumetrically using Karl Fischer titration.

The 874 Oven Sample Processor is operated and controlled via the **tiamo** computer software. This enables convenient programming of method runs, ranging from the simple to the complex. The integration of the 874 Oven Sample Processor together with other instruments, e.g. with a coulometer, within one user interface does not only allow for simple operation, but also for evaluation and storage of the measurement data from all of the connected instruments in a single database.

1.1.1 Instrument versions

The 874 Oven Sample Processor is available in two versions with different accessories.

- **Version 2.874.0010** with accessories for the use of standard vials (volume 6 mL).
- **Version 2.874.0020** without accessories for the use of standard vials. Appropriate accessories can be ordered for specific vessel sizes.



1.1.2 Instrument components

The 874 Oven Sample Processor has the following components:

- **Oven**
Oven module made of aluminum with software-operated temperature control for heating the sample vessel.
- **Fan**
Propeller fan for cooling the oven module.
- **Inlet valve**
Valve for switching over the source of the gas flow.
- **Air pump**
Pump for generating the gas flow.
- **Outlet heater**
Heating tubing for preventing the condensation of moisture.
- **Lift with rods**
Guidance device with needle adapter and tubing for the gas flow.
- **Turntable**
For the standard sample rack with a capacity of 36 sample vials (6 mL) or the special sample rack with a capacity of 25 sample vials ($\varnothing = 16 - 32$ mm).

1.1.3 Intended use

The 874 Oven Sample Processor is designed for usage as an auxiliary device for automated sample preparation in analytical laboratories. Its main area of application is water content determination using Karl Fischer titration (coulometric or volumetric). The 874 Oven Sample Processor enables the application of thermal gas extraction technology.

This instrument is suitable for processing chemicals and flammable samples. Therefore, the use of the 874 Oven Sample Processor requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge regarding the application of fire prevention measures prescribed for laboratories is also mandatory.

1.2 About the documentation



CAUTION

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.2.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

(5-12)

Cross-reference to figure legend

The first number refers to the figure number, the second to the instrument part in the figure.

1

Instruction step

Carry out these steps in the sequence shown.

Method

Dialog text, parameter in the software

File ▶ New

Menu or menu item

[Next]

Button or key



WARNING

This symbol draws attention to a possible life-threatening hazard or risk of injury.



WARNING

This symbol draws attention to a possible hazard due to electrical current.



WARNING

This symbol draws attention to a possible hazard due to heat or hot instrument parts.



WARNING

This symbol draws attention to a possible biological hazard.



CAUTION

This symbol draws attention to possible damage to instruments or instrument parts.

Protection against electrostatic charges



WARNING

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

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

1.3.3 Tubing and capillary connections



CAUTION

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.

1.3.4 Personnel safety



WARNING

Wear protective goggles and working clothes suitable for laboratory work while operating the 874 Oven Sample Processor. It is also advisable to wear gloves when caustic liquids are used or in situations where glass vessels could break.



WARNING

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

The 874 Oven Sample Processor may not be operated without a safety shield!

**WARNING**

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

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

**WARNING**

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

**WARNING**

The 874 Oven Sample Processor is **not** suitable for utilization in biochemical, biological or medical environments in its basic equipment version.

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

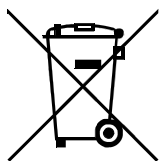
1.3.5 Flammable solvents and chemicals

**WARNING**

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

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

1.3.6 Recycling and disposal



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

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

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

2 Overview of the instrument

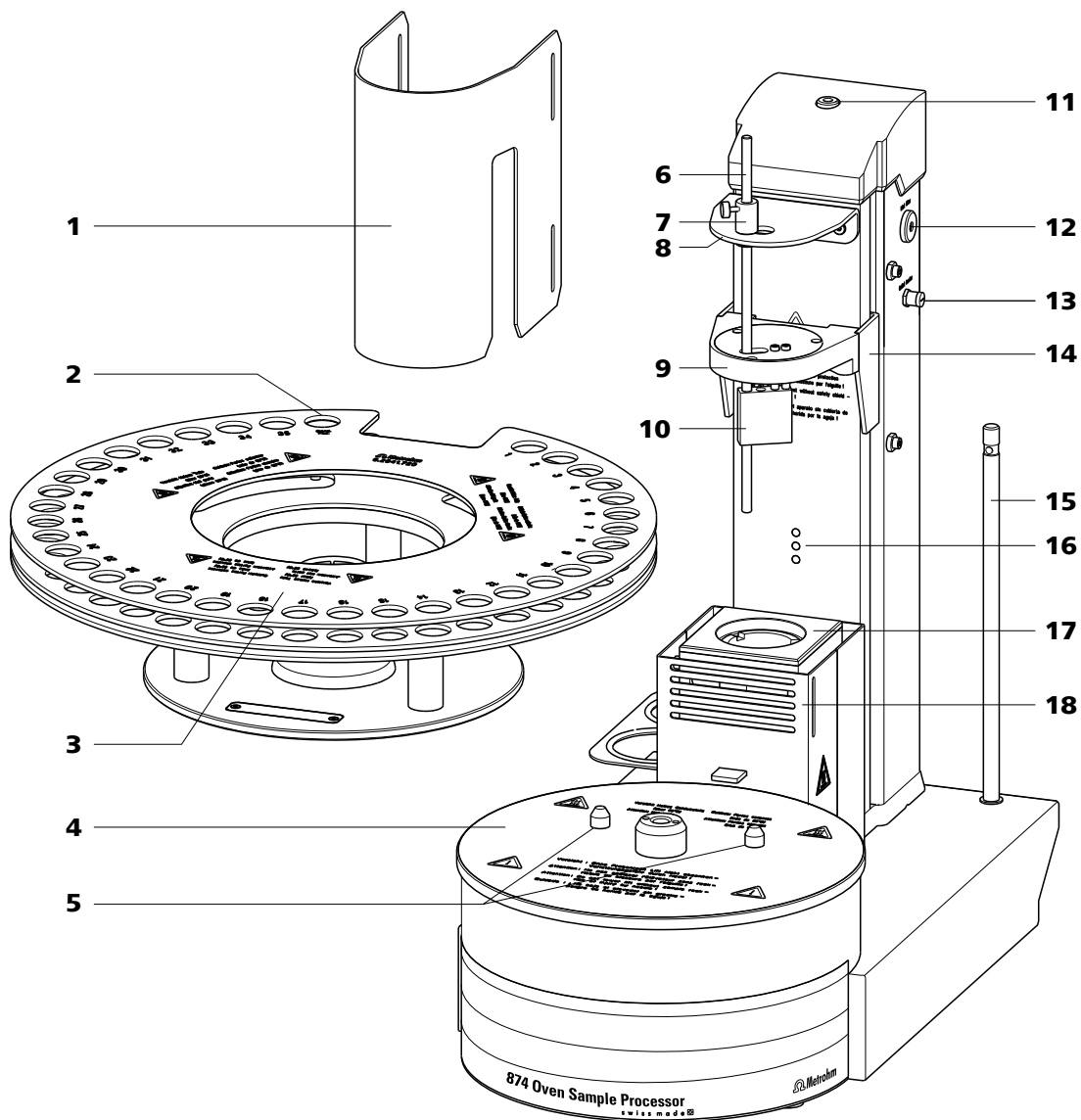


Figure 1 Front 874 Oven Sample Processor

<p>1 Safety shield (6.2751.140)</p>	<p>2 Conditioning position For the conditioning vessel.</p>
<p>3 Sample rack (6.2041.720) For 36 sample vials (6 mL).</p>	<p>4 Turntable</p>
<p>5 Guide bolts For the sample rack.</p>	<p>6 Guide rod For stripping the sample vessel.</p>

7 Rod holder With knurled screw.	8 Guide head
9 Working head	10 Distributor
11 Gas outlet With M6 thread.	12 Air pump inlet For the 6.2724.010 dust filter.
13 Heating tubing connector	14 Lift
15 Support rod (6.2016.030) For fixing the titration cell.	16 Beaker sensor
17 Oven module With PTFE covering.	18 Oven housing With ventilation slits.

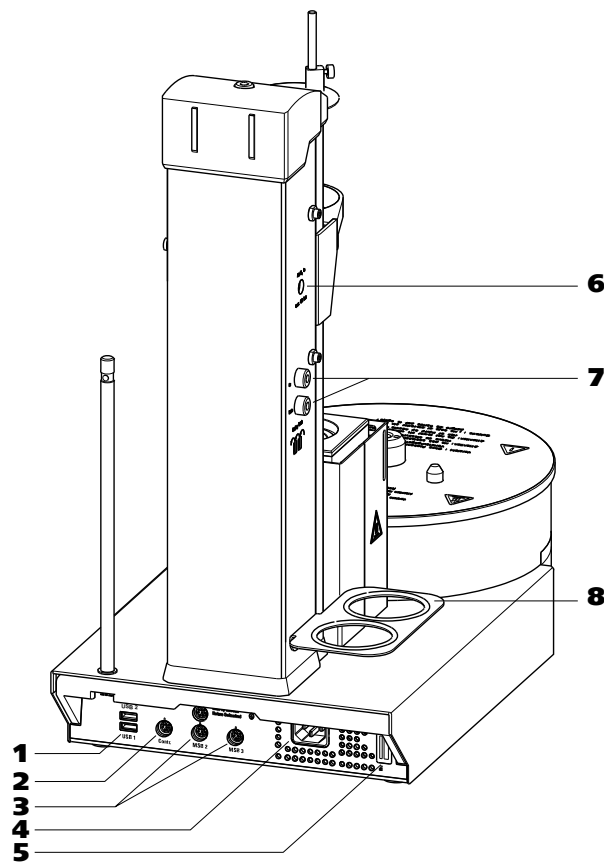


Figure 2 874 Oven Sample Processor rear

1 USB connector (USB 1 and USB 2) USB ports (type A) for connecting a printer, USB hub, Titrandos, additional USB devices etc.	2 Controller connector For connecting a computer with installed computer software.
--	--



- | | |
|---|---|
| 3 MSB connector (MSB 1 to MSB 3)
Metrohm Serial Bus. For connecting external dosing devices, stirrers or Remote Boxes. Mini DIN, 9-pin. | 4 Power socket |
| 5 Type plate
Contains specifications concerning supply voltage, instrument type and serial number. | 6 Air/nitrogen connector
With M6 inner thread. Inlet for external gasing. |
| 7 Gas inlet and outlet
For connecting drying flasks, with M6 inner thread. | 8 Drying flask holder |

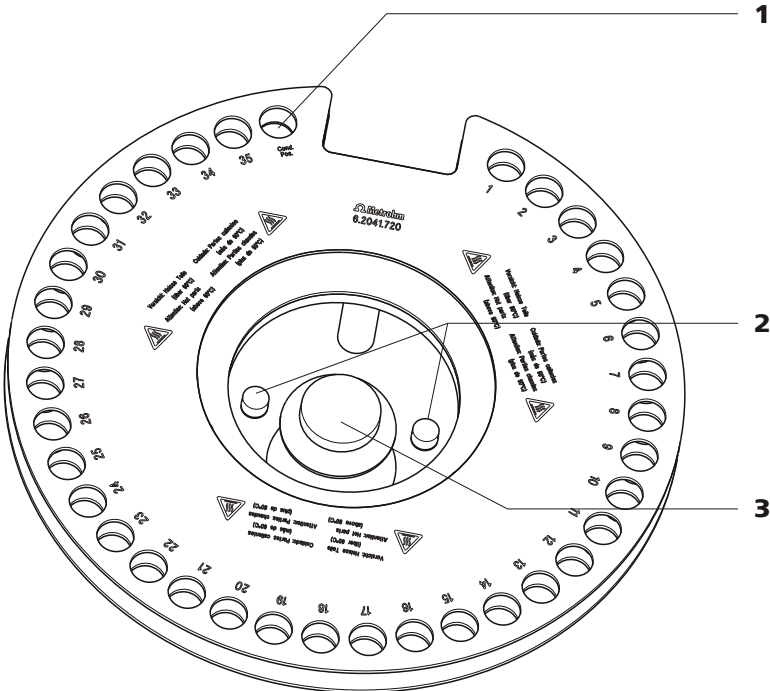


Figure 3 Sample rack 6.2041.720

- | | |
|--|----------------------|
| 1 Conditioning position
For the conditioning vessel. | 2 Guide bolts |
| 3 Handle
With fixing screw. | |

3 Installation

3.1 Setting up the instrument

3.1.1 Packaging

The instrument is supplied in protective packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.1.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation and free of vibrations and which provides protection against corrosive atmosphere and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight.

3.2 Connecting the instrument to the power grid



WARNING

Electric shock from electrical potential

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

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



Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 0.75 mm² / 18 AWG
- Power plug:
 - according to customer requirement (6.2122.XX0)
 - min. 10 A



NOTICE

Do not use a not permitted power cord!

1 Plugging in the power cord

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

3.3 Mounting the sample holder

The dimensions of the supplied sample holder are optimized for the use of **6.2419.007 6-mL sample vials** by Metrohm. This ensures the best possible transfer of heat between oven and sample.

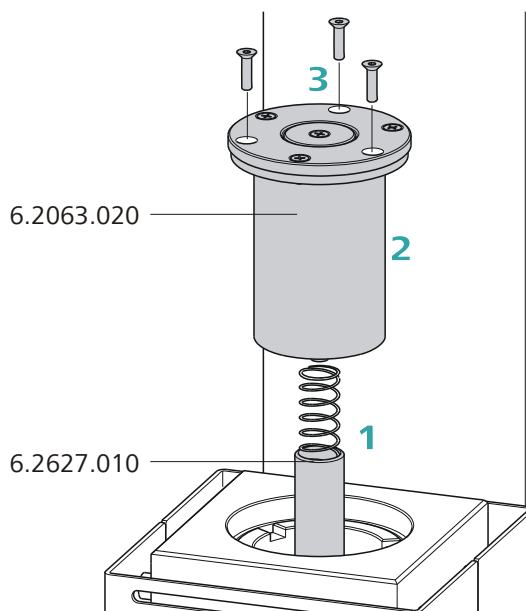


Figure 4 Mounting the sample holder

**NOTICE**

The sample holder may not be inserted or removed unless it has cooled down.

Proceed as follows:

- 1** Insert the **6.2627.010 oven insert** with the spring in place into the oven from above and slide it all the way to the bottom.
- 2** Place the **sample holder 6.2063.020** into the oven from above.
- 3** Tighten the sample holder with the supplied hex screws. The required hex key is part of the accessories.

**NOTICE**

If vessels with other dimensions are to be used, then individually modified sample holders can be ordered. **The precise vessel dimensions (including tolerances)** will be required when ordering. Non-standard sample vessels may only have dimensions within the following limit values:

- Diameter 10.0 - 32.0 mm
- Immersion depth 20.0 - 45.0 mm

3.4 Mounting needles

Two different types of needle holders are available for mounting needles. The length of the needle holder defines how deep the needle for the gas inlet enters the sample vessel. The **6.2049.040 needle holder** with a length of 58 mm ensures that the needle penetrates the liquid or powdery sample. The carrier gas flows through the sample and efficiently removes the contained moisture.

If there is a risk that the heated sample may block the needle, use the **6.2049.050 needle holder** with a length of 73 mm. In this case, the needle for the gas inlet enters the sample vessel slightly more than the outlet needle and it does not have any contact with the sample.

Needle holders with the dimensions required for situations calling for special sample vessels can be supplied by Metrohm upon request.



Mounting the piercing and exhaust air needle

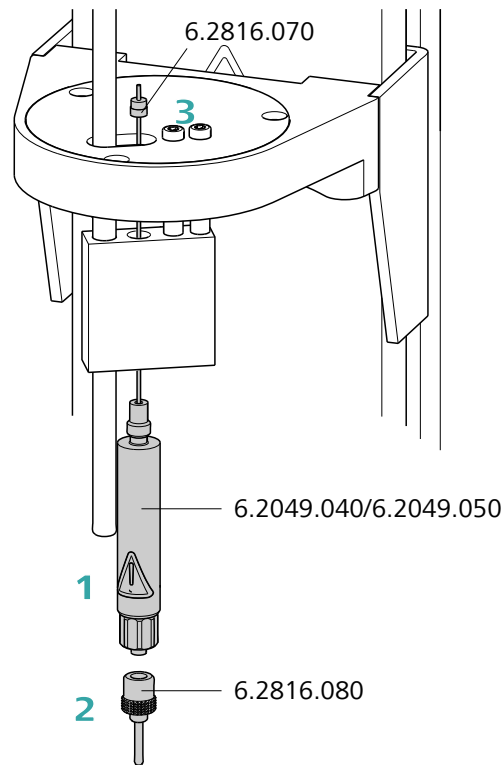


Figure 5 Mounting the needles

Mount the needles as follows:

- 1 Screw the needle holder (6.2049.040 or 6.2049.050) into the distributor on the guide head.
- 2 Screw the **6.2816.080 outlet needle** onto the Luer connector of the needle holder.
- 3 Carefully guide the **6.2816.070 needle for gas inlet** into the opening of the distributor from above and allow it to drop down.



NOTICE

Ensure that the white PTFE seal sits firmly on the needle.

- 4 Screw the **FEP tubing 6.1805.470** onto the opening of the distributor by hand. Screw the other end of the tube into the opening of the gas outlet on the upper side of the tower.

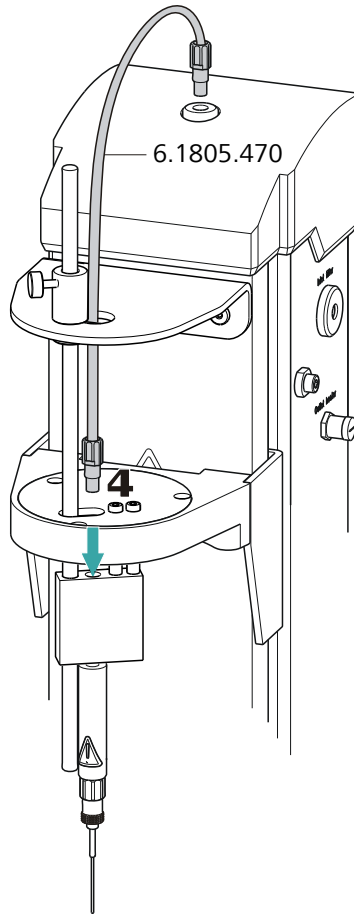
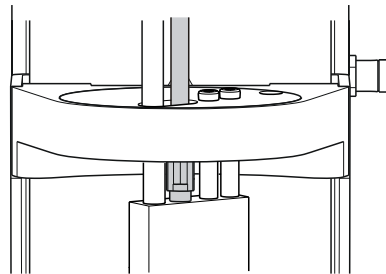


Figure 6 Mounting the tubing





3.5 Mounting the heating tubing

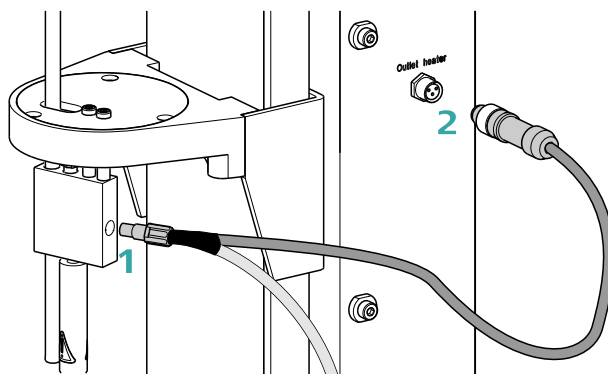


Figure 7 Mounting the heating tubing

Proceed as follows:

- 1 Screw the M6 connector of the **6.1830.030 heating tubing** into the lateral opening of the distributor on the guide head.
- 2 Connect the heating tubing cable to the **outlet heater** connector on the right-hand side of the tower.

Rotate the plug in such a way that the three contact pins correspond to the sequence of the corresponding socket openings. Press the plug towards the socket and rotate the front knurled screw clockwise.



NOTICE

The heating jacket of the heating tubing is heated up to approx. 40 to 50 °C as soon as the instrument is switched on. This prevents condensation of moisture in the tubing when it is removed from the sample and transferred to a KF titration cell with a carrier gas.

3.6 Mounting the drying flask

Two drying flasks with desiccant are integrated into the gas flow to dry the supplied gas. A filter tube prevents dust (e.g. from the desiccant) from finding its way into the sample vessel.

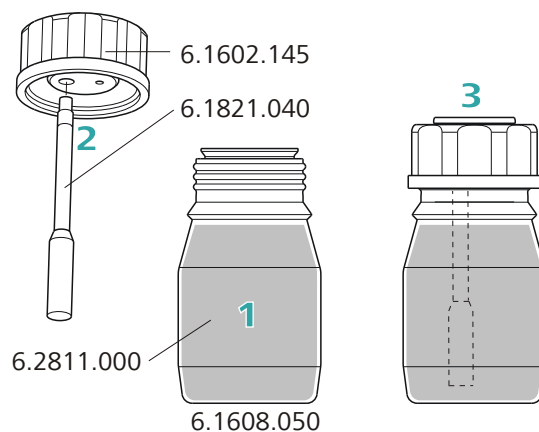


Figure 8 Preparing the drying flasks

Prepare the two drying flasks as follows:

- 1** Fill both **6.1608.050 drying flasks** with **6.2811.000 molecular sieve**.
- 2** Screw one **6.1821.040 filter tube** into each of the **6.1602.145 drying flask caps** from below. Tighten the filter tubes by hand.
- 3** Screw the two drying flask caps with the filter tubes onto the drying flasks. Tighten the caps by hand.



NOTICE

If drying flask caps or filter tubes are not tightened well, the gas flow may not be precise and regular. An error message displaying an erroneous gas flow usually appears when there are leaks in the threaded connections.

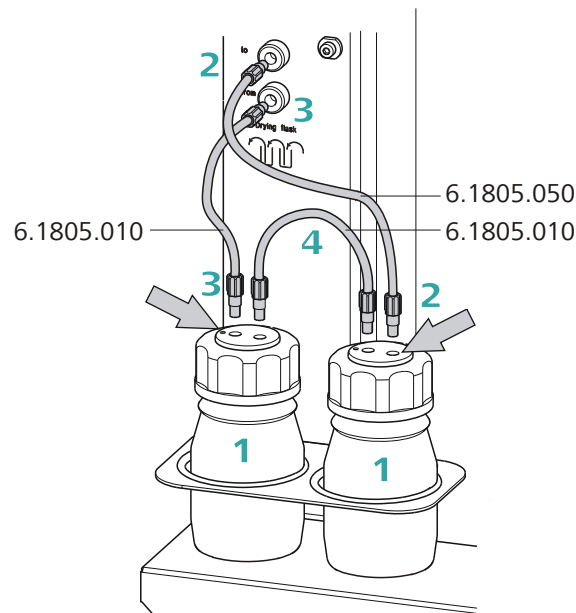


Figure 9 Mounting the tubings

Mount the FEP tubings as follows:

- 1 Insert the two drying flasks that have been prepared into the holders, see previous illustration.
- 2 Screw one **6.1805.050 FEP tubing** (18 cm length) to the gas outlet (left-hand side of the tower, labeled **to**). Screw the other tubing end on the front drying flask to the M6 connector **without** point marking (see right-hand arrow).
- 3 Screw one **6.1805.010 FEP tubing** (13 cm length) to the gas inlet (left-hand side of the tower, labeled **from**). Screw the other tubing end on the rear drying flask to the M6 connector **with** point marking (see left-hand arrow).
- 4 Screw the second **6.1805.010 FEP tubing** (13 cm length) tightly onto the remaining M6 connectors of the drying flasks.

The marking **Drying flask** on the left-hand side of the tower displays the diagram for the tubing.



NOTICE

Tighten the screw connections well by hand.

3.7 Mounting the dust filter

The installed air pump must be protected from dust. A **6.2724.010 dust filter** must be placed on the air inlet (**Inlet filter**) on the right-hand side of the tower for this reason.

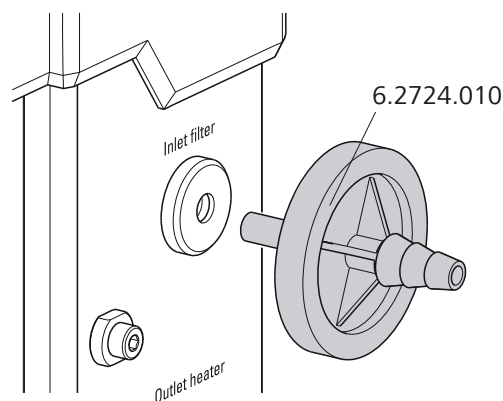


Figure 10 Mounting the dust filter



NOTICE

The dust filter should be replaced once a year.

3.8 Mounting the air/nitrogen connector

If compressed air, nitrogen or another gas is to be used for transferring the expelled moisture, then a separate connector is available.

A tube with M6 thread can be connected directly to the connector **Air/N₂ in** on the left-hand side of the tower. Enclosed with the instrument is the **6.1808.040 M6/M8 thread adapter** for a tubing with an M8 thread. The **6.1808.050 tubing adapter olive** can additionally be put in place in order to connect a simple tubing.

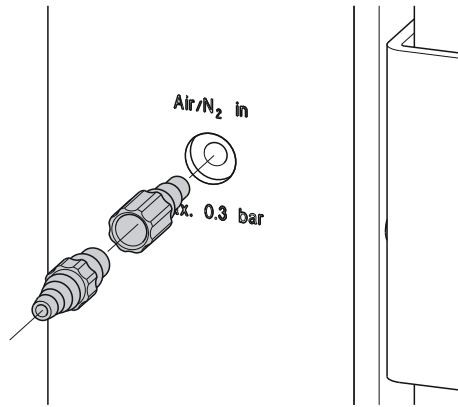


Figure 11 External gas connector



WARNING

If gas is fed from a pressure line or a pressure vessel, a pressure reduction valve must be activated. The input pressure must be set with the valve closed and must not exceed 0.3 bar of overpressure.

3.9 Mounting the safety shield

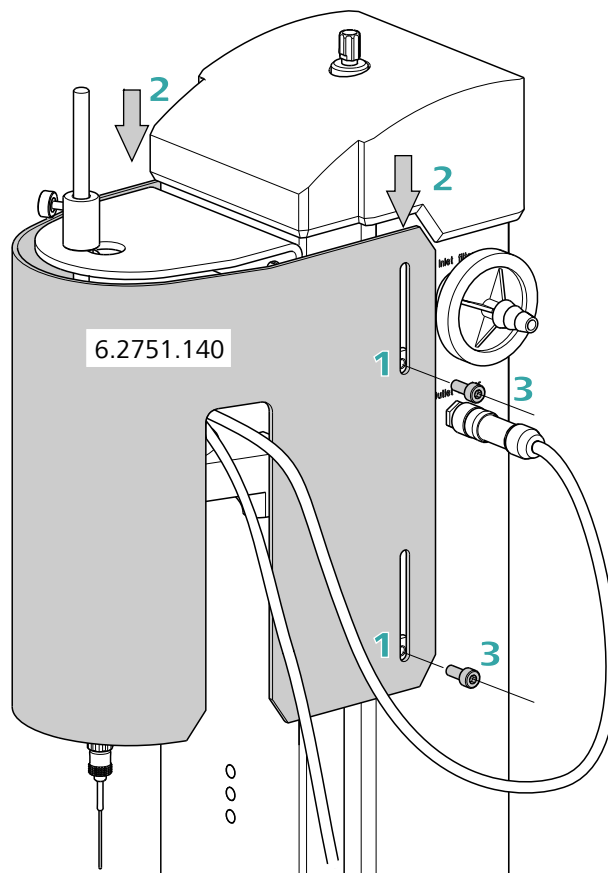


Figure 12 Mounting the safety shield



WARNING

The safety shield must be installed before the 874 Oven Sample Processor is used for the first time. The device may not be operated without a safety shield.

Proceed as follows:

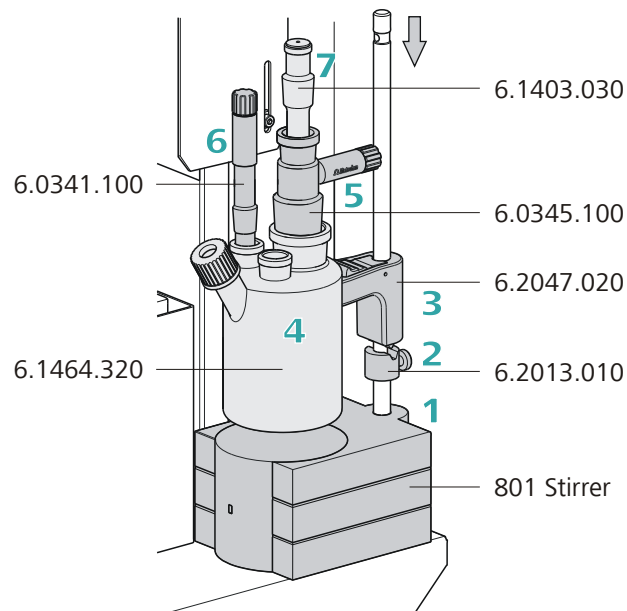
- 1 Undo the hex screws on the sides of the tower with the accompanying hex key.
- 2 Move the **6.2751.140 safety shield** into position, starting from the top. Refer to the corresponding illustration.
- 3 Fix the safety shield in place with the hex screws.

**NOTICE**

You can adjust the vertical position of the safety shield at any time by loosening the screws. Take care to ensure that it is not possible to reach into the working area of the needles while the instrument is in operation.

3.10 Mounting the KF titration cell

The following description is provided as an example for the mounting of a coulometric KF titration cell. The necessary accessory parts are, with the exception of the 6.2013.010 clamping ring, **not** included in the scope of delivery of the 874 Oven Sample Processor.



Proceed as follows:

- 1** Place the magnetic stirrer **801 Stirrer** from above onto the support rod at the right-hand side of the tower. Connect the cable to the coulometer.
- 2** Screw the **6.2013.010 clamping ring** tightly to the support rod, with the indent facing upward.
- 3** Fix the **6.2047.020 titration vessel holder** to the support rod. Operate the locking lever of the holder while doing so.

- 4 Fasten the **6.1464.320 coulometric KF titration cell** to the titration vessel holder. Hook the metal clip of the titration cell to the holder.

The height of the titration vessel holder can now be adjusted in such a way that the titration vessel hangs slightly above the magnetic stirrer. Use the clamping ring to fix the position of the holder. If the locking lever of the holder is now pressed, then the titration cell can be raised slightly and swiveled. The correct positioning of the titration cell continues to be maintained by the clamping ring.

- 5 Insert the **6.0345.100 generator electrode** (or 6.0344.100) into the titration cell and connect a **6.2104.120 electrode cable** to it.

- 6 Insert the **6.0341.100 indicator electrode** into the titration cell and connect a **6.2104.020 electrode cable** to it.

- 7 Fill a **6.1403.030 adsorber tube** with **6.2811.000 molecular sieve**. Place a small piece of absorbent cotton underneath and above the molecular sieve to serve as a dust filter. Insert the filled adsorber tube into the titration cell.

- 8 Place a **6.1903.030 stirring bar** into the titration cell.

3.11 Inserting the heating tube into the KF titration cell

The 874 Oven Sample Processor can be used in combination with a KF coulometer or a volumetric KF titrator. The mounting of the tip of the heating tube is accomplished in different ways for the respective KF titration cells.

Coulometric KF titration cell

- Remove the protective cover from the tip of the heating tube and the E.3010.032 O-ring.
- Disassemble the accompanying **6.1446.170 heating tube stopper** into three parts.

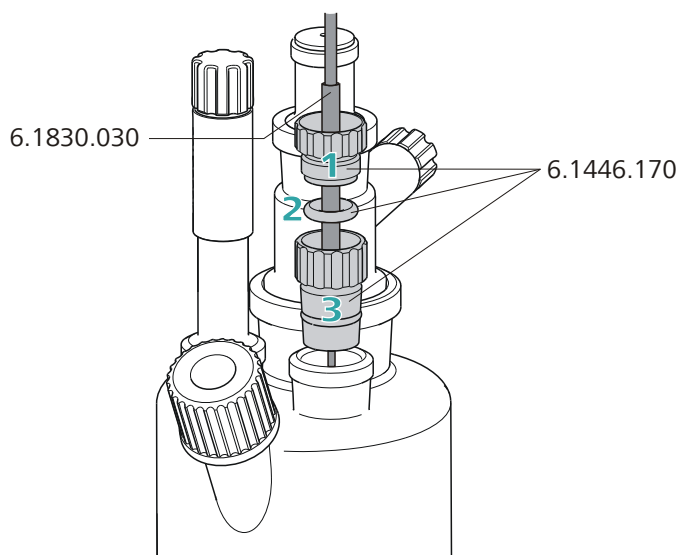


Figure 13 Coulometric KF titration cell

Proceed as follows:

- 1 Guide the upper part of the heating tube stopper over the tip of the **6.1830.030 heating tube** as shown in the illustration.
- 2 Guide the O-ring of the heating tube stopper over the heating tube.
- 3 Guide the lower part of the heating tube stopper over the heating tube and screw the three parts together (not too tightly).
- 4 Insert the stopper with the tip of the heating tube into one of the two SGJ openings of the KF titration cell
- 5 Shift the tip vertically in such a way that the outlet opening of the tubing is immersed as deeply as possible. The tip must not however be permitted to get in the way of the stirring bar in the KF titration cell. Afterwards give the heating tube stopper its final tightening.

Volumetric KF titration cell

- Remove the protective cover from the tip of the heating tube and the E.3010.032 O-ring. The latter you will still need.
- A **6.2730.020 septum stopper** is enclosed with every KF titrator made by Metrohm. Disassemble this septum stopper into three parts and remove the septum. It will not be required.

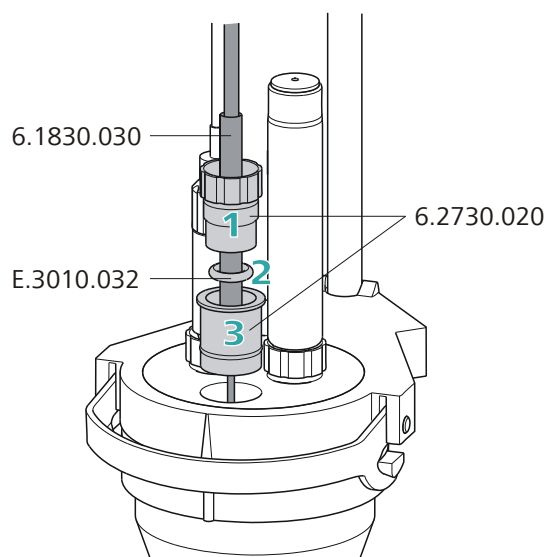


Figure 14 Volumetric KF titration cell

Proceed as follows:

- 1 Guide the upper part of the septum stopper over the tip of the **6.1830.030 heating tube** as shown in the illustration.
- 2 Guide the **E.3010.032** O-ring over the heating tube.
This O-ring is also part of the 6.1244.040 set of seals that is enclosed with each KF titrator. It cannot be reordered individually.
- 3 Guide the lower part of the septum stopper over the heating tube and screw the three parts together (not too tightly).
- 4 Insert the stopper with the tip of the heating tube into the front opening of the KF titration cell
- 5 Shift the height of the tip of the heating tube vertically in such a way that the outlet opening of the tubing is immersed as deeply as possible. The tip must not however be permitted to get in the way of the stirring bar in the KF titration cell. Afterwards give the septum stopper its final tightening.



3.12 Attaching a sample rack

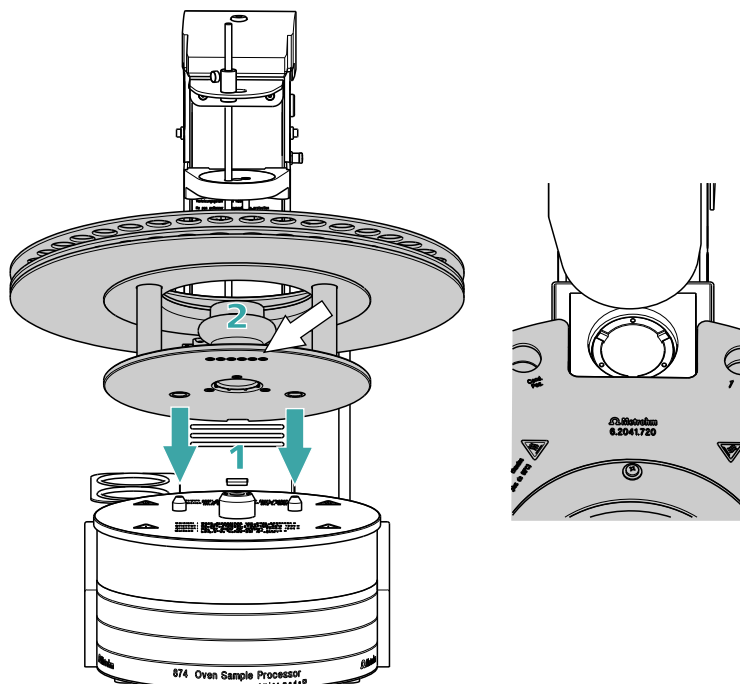


Figure 15 Attaching rack

The turntable of the 874 Oven Sample Processor must be in starting position before the sample rack can be removed or put it into place. To accomplish this, carry out the **[Rack Reset]** function in the manual control of the control software.

Put the rack into place as follows:

- 1 Carefully center the rack on the turntable. The guide bolts on the turntable must engage with the openings in the bottom of the rack.



NOTICE

Hold the rack in such a way that the printed Metrohm logo is legible horizontally.

- 2 Carry out the **[Rack reset]** or **[Initialize rack]** function in the manual control of the control software.

The rack is moved into starting position. The magnet code of the rack is read out by the instrument during this process. The white arrow in *Figure 15* indicates the position of the magnet holder. The six-digit magnet code is used to identify the rack type. The sample posi-

tions and any special positions on the rack are defined along with the rack type.

3.13 Adjusting the guide rod

The needle is pulled out of the sample vial by the upward movement of the lift. The sample vial is not permitted to remain hanging on the needle during this procedure. The rod that is fixed to the guide head with a knurled screw is used for stripping the vial. The vertical positioning of the guide rod must be adjusted, depending on the height of the sample vial. The guide rod must not obstruct the sample vial when the rack is rotated.

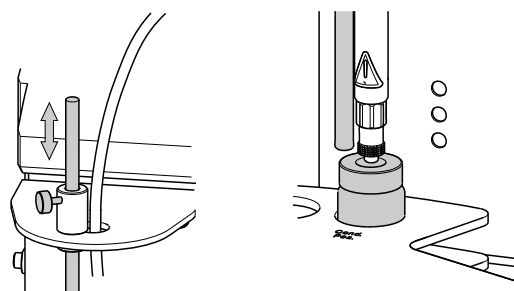


Figure 16 Adjusting the guide rod

Undo the red knurled screw on the guide head and adjust the height of the guide rod.

3.14 Connecting a computer

The 874 Oven Sample Processor requires a USB connection to a computer in order to be able to be controlled by a computer software. Using a 6.2151.000 controller cable, the instrument can be connected directly, either to a USB socket on a computer, to a connected USB hub or to a different Metrohm control instrument.

You need administrator rights for the installation of driver software and control software on your computer.

Cable connection and driver installation

A driver installation is required in order to ensure that the 874 Oven Sample Processor is recognized by the computer software. To accomplish this, you must comply with the procedures specified. The following steps are necessary:

1 Install the software

- Insert the computer software installation CD and carry out the installation program directions.



- Exit the program if you have started it after the installation.

2 Establishing the cable connections

- Connect all peripheral devices to the instrument, *see chapter 3.15, page 29*.
- Connect the instrument to the power grid if you have not already done this (*see chapter 3.2, page 11*).
- Connect the instrument to a USB connector (type A) of your computer (*see manual of your computer*). The 6.2151.000 cable is used for this purpose.

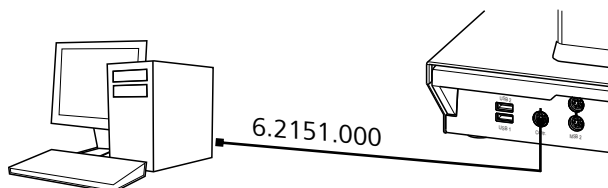


Figure 17 Connecting the computer

The instrument is recognized. Depending on the version of the Windows operating system used, the driver installation proceeds differently afterwards. Either the necessary driver software is installed automatically or an installation wizard is started.

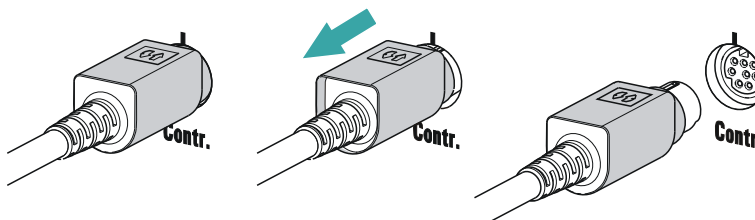
3 Follow the instructions of the installation wizard.

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



NOTICE

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



Registering and configuring the instrument in the computer software

The instrument must be registered in the configuration of your computer software. Once that has been done, you can then configure it according to your requirements. Proceed as follows:

1 Setting up the instrument

- Start the computer software.
The instrument is automatically recognized. The configuration dialog for the instrument is displayed.
- Make configuration settings for the instrument and its connectors.

More detailed information concerning the configuration of the instrument can be found in the documentation for the respective computer software.

3.15 Connecting MSB devices

In order to connect MSB devices, e.g. stirrers or dosing devices, Metrohm instruments are equipped with up to a maximum of four connectors on what is referred to as the *Metrohm Serial Bus* (MSB). Various kinds of peripheral devices can be connected in sequence (in series, as a "Daisy Chain") at a single MSB connector (8-pin Mini DIN socket) and controlled simultaneously by the respective control instrument. In addition to the connection cable, stirrers and the Remote Box are each equipped with their own MSB socket for this purpose.

The following figure provides an overview of the instruments that can be connected to an MSB socket, along with a number of different cabling variations.

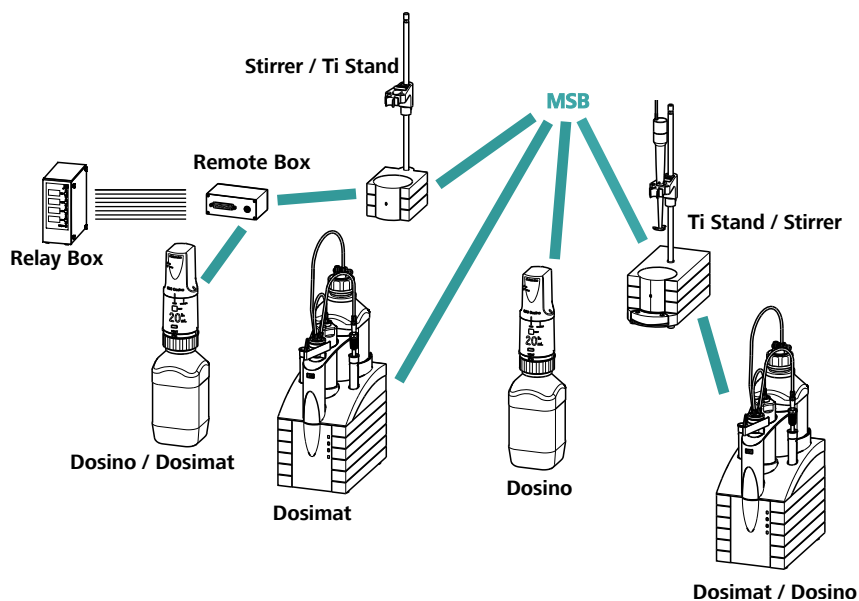


Figure 18 MSB connections

The control instrument determines which peripheral devices are supported.



NOTICE

When connecting MSB devices together, the following must be observed:

- Only one device of the same type can be used at a single MSB connector at one time.
- Dosing devices of the 700 Dosino and 685 Dosimat plus type cannot be connected together with other MSB devices on a shared connector. These dosing devices must be connected separately.



CAUTION

Exit the control software before you plug in MSB devices. When it is switched on, the control instrument automatically recognizes which device is connected to which MSB connector. The operating unit or the control software enters the connected MSB devices into the system configuration (device manager).

MSB connections can be extended with the 6.2151.010 cable. The maximum connection length permitted is 15 m.

3.15.1 Connecting a dosing device

Three dosing devices can be connected to the instrument.

The types of dosing devices that are supported are:

- 800 Dosino
- 700 Dosino
- 805 Dosimat
- 685 Dosimat plus



WARNING

If a Dosino is connected to the 874 Oven Sample Processor, then the connection cable must be equipped with a T.2400.102 ferrite core. The ferrite core diminishes any interference voltages and thus ensures compliance with the strict EMC standards in accordance with the applicable technical standards, see EU declaration of conformity of the instrument.

Proceed as follows:

1 Mounting the ferrite core

- Fasten a T.2400.102 ferrite core to the Dosino connection cable close to the plug.

2 Connecting a dosing device

- Exit the control software.
- Connect the connection cable of the dosing device to one of the sockets marked with **MSB** on the rear of the control device.
- Start the control software.

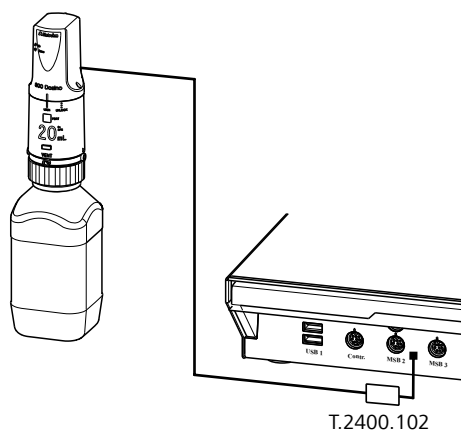


Figure 19 Connecting a dosing device



3.15.2 Connecting a stirrer or titration stand

You can use the following instruments:

These devices have a built-in magnetic stirrer (stirring "from below"):

- 801 Stirrer
- 803 Ti Stand

This device has no built-in magnetic stirrer (stirring "from above"):

- 804 Ti Stand with rod stirrer 802 Stirrer

Connect a stirrer or a titration stand as follows:

1 Connecting the stirrer or titration stand

- Exit the control software.
- Connect the connection cable of the magnetic stirrer or of the titration stand to one of the sockets marked with **MSB** on the rear of the control instrument.
- 804 Ti Stand only: Connect the rod stirrer to the stirrer connector (socket with stirrer symbol) of the titration stand.
- Start the control software.

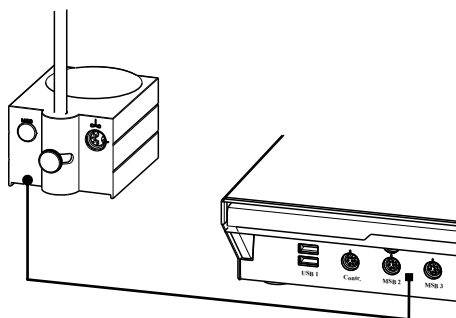


Figure 20 Connecting an MSB stirrer

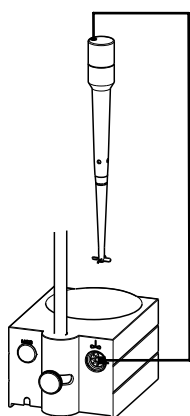


Figure 21 Connecting the rod stirrer to the titration stand

3.15.3 Connecting a Remote Box

Instruments that are controlled via remote lines and/or that send control signals via remote lines can be connected via the 6.2148.010 Remote Box. In addition to Metrohm, other instrument manufacturers also use similar connectors that make it possible to connect different instruments together. These interfaces are also frequently given the designations "TTL Logic", "I/O Control" or "Relay Control" and they generally have a signal level of 5 volts.

Control signals are understood to be electrical line statuses or electrical pulses (> 200 ms) which display the operating status of an instrument or which trigger or report an event. Sequences on a variety of instruments can thus be coordinated in a single complex automation system. However, no exchange of data is possible.

Proceed as follows:

1 Connecting the Remote Box

- Exit the control software.
- Connect the Remote Box connection cable to one of the sockets marked with **MSB** on the rear of the control instrument.
- Start the control software.

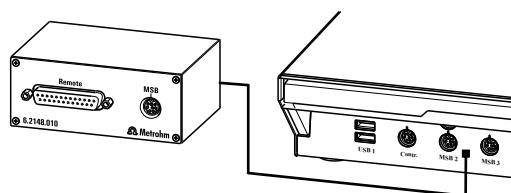


Figure 22 Connecting the Remote Box

You can connect the following instruments to the remote connector, among others:

- 849 Level Control (fill level monitoring in a canister)
- 731 Relay Box (switch box for 230/110 volt alternating current sockets and low-voltage direct current outlets)
- 843 Pump Station (for complex sample preparations or for rinsing external titration vessels)

The Remote Box also has an MSB socket at which a further MSB device, e.g. a dosing device or a stirrer, can be connected.

You will find precise information concerning the pin assignment of the interface on the Remote Box in the *appendix*.



3.16 Connecting USB devices

Two USB connectors (type A sockets) are available for connecting instruments with an USB interface. The 874 Oven Sample Processor then functions as USB hub (distributor). If you wish to connect more than two USB devices, you can also use an additional, commercially available USB hub.



NOTICE

When connecting an USB device, the control instrument automatically recognizes which device is connected. The control software enters a connected USB device automatically into the system configuration (device manager).

3.16.1 Connecting a barcode reader

A barcode reader is used as an aid for text and numerical input. You can connect a barcode reader with USB interface.

Connect the barcode reader as follows:

1 Connecting the cables

- Insert the USB plug (type A) of the barcode reader into one of the USB sockets on the rear of the instrument.

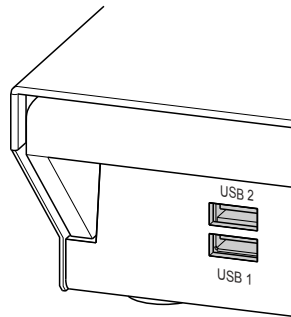


Figure 23 USB connectors

2 Configuring the barcode reader in the control software

- Configure the barcode reader in the configuration of the control software, as described in the online help of the software.

Setting the barcode reader

The barcode reader requires certain basic settings. You can find instructions on how to program the barcode reader in the manual for the bar-

code reader. Set the barcode reader into program mode and configure the following settings:

- 1**
 - Specify the keyboard layout for the desired country (USA, Germany, France, Spain, German-speaking Switzerland). This setting must match the setting in the control software.
 - Make sure that the Ctrl characters (ASCII 00 to 31) can be sent.
 - Set the "Preamble" (introduction) or "Prefix Code" for the ASCII character 02 (STX or Ctrl B) to be sent as the first character.
 - Set the "Postamble", "Record Suffix" or "Postfix Code" for the ASCII character 04 (EOT or Ctrl D) to be sent as the last character.
 - Close programming mode.



4 Processing a sample series

Moisture determinations according to the heating method require the conditioning of the entire tubing system and of the KF titration cell before a determination can be carried out. Because the sample vials and the septum seals may contain small amounts of moisture, three to five blank value determinations must be carried out with sealed, empty vessels. For conditioning, blank value and sample determinations, example methods for *tiamo*TM are to be found in the installation directory of the software.

Preparing

Weigh solid or liquid samples into sample vials and seal these securely with the septum crimping tongs. We recommend the use of the 6.2419.007 sample vial with the 6.1448.057 septum seals. The silicone septum of the aluminum cap is resistant to temperatures of up to 250 °C and has shown itself to be exceptionally reliable. In addition to the sample vials, you will also require for a sample series an empty, tightly sealed vial as a conditioning vessel, in addition to three to five vials (which are also empty and tightly sealed) as blank samples.

Place an empty, sealed vial as **conditioning vessel** at the **Cond. Pos.** position on the sample rack of the 874 Oven Sample Processor. The empty **blank samples** are placed on **Positions 1 to 3** (or 5) on the sample rack. Place the vials filled with samples on the following positions.

In the sample table of *tiamo*TM one line must be filled out with the associated method and sample data for each vial on the sample rack. Observe in this connection the explanations contained in the Application note for the individual methods. The vials must be processed in the correct sequence. It is for this reason that the sample table must be filled out as follows:

- **Line 1:** conditioning method
- **Lines 2 to 4 (6, resp.):** method for blank value determination
- **Lines 5 (7, resp.) to x:** method for water content determination

Observe the following during conditioning:

- In the KF titration cell, the shaft of the heating tube should not be immersed in the working medium.
- Align the tip of the heating tube against the vessel wall.
- Set the stirring rate to high. The carrier gas should emerge from the tip of the heating tube into the working medium as tiny bubbles and be spun there forcefully. It is advantageous for air bubbles to be stirred into the working medium and forcefully broken up in the process. The air in the KF titration cell must also be dried.

5 Operation and maintenance

5.1 General notes

The 874 Oven Sample Processor requires appropriate care. Excess contamination of the instrument may result in malfunctions and a reduction in the service life of the sturdy mechanical and electronic components.

Severe contamination can also have an influence on the measured results. Regular cleaning of exposed parts can prevent this to a large extent.

Spilled chemicals and solvents must be removed immediately. In particular, the power plug should be protected from contamination.

5.2 Care

- Replace exhausted molecular sieve promptly. You should replace the molecular sieve as soon as increased drift values appear in the Karl Fischer cell.
- Check all tubing connections regularly for leaks.
- Rinse the tubing connections from time to time. Carefully dry the tubing afterward. The tubing must be replaced after prolonged usage.
- Clean the sample holder regularly with a damp cloth.
- Replace the dust filter once a year.



6 Troubleshooting

6.1 Problems and their solutions

Problem	Cause	Remedy
The drift is very high during conditioning.	<i>Molecular sieve of drying flasks and/or the titration cell exhausted.</i>	Replace the molecular sieve.
	<i>The titration cell is leaking.</i>	Check seals. If necessary, replace.
The titration time is too long.	<i>The sample is nonhomogeneous.</i>	Pulverize the sample or homogenize it before weighing in.
	<i>Moisture not fully expelled.</i>	Select more stringent switch-off criteria on the KF titrator: lower stop drift, higher switch-off delay time.
	<i>Tubing connections leaking.</i>	Inspect tubing and replace as necessary.
The results are spread widely.	<i>Molecular sieve of drying flasks exhausted.</i>	Replace the molecular sieve.
	<i>Condensate in the heating tubing.</i>	<ul style="list-style-type: none"> ▪ Dry the tubing. ▪ Reduce the gas flow. ▪ Perhaps lower the oven temperature.
	<i>Gas flow too high.</i>	Reduce the gas flow.
	<i>The sample is nonhomogeneous</i>	Pulverize the sample or homogenize it before weighing in.
Selected gas flow is not achieved.	<i>The system is leaking.</i>	Check all tubing connections and drying flasks for leaks.
	<i>Pressure from external gas supply either too low or too high.</i>	Set the input pressure with the valve closed to not more than 0.3 bar of overpressure.
	<i>Pump defective.</i>	Contact a service engineer.

7 Appendix

7.1 Remote interface

The 6.2148.010 Remote Box allows devices to be controlled which cannot be connected directly to the MSB interface of the Sample Processor.

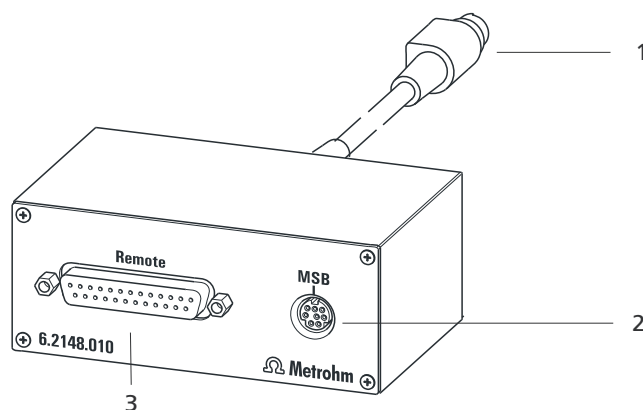


Figure 24 Connectors of the Remote Box

1 Cables

For connecting to an MSB connector of the Sample Processor.

2 MSB connector

Metrohm Serial Bus. For connecting external dosing devices or stirrers.

3 Remote connector

For connecting instruments with a remote interface.

7.1.1 Pin assignment of the remote interfaces

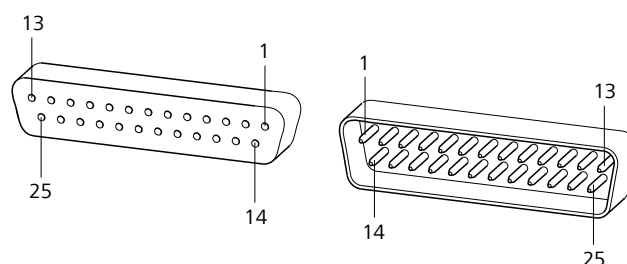
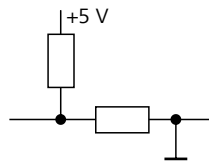


Figure 25 Pin assignment of remote socket and remote plug

The above figure of the pin assignment of a Metrohm remote interface does not only apply for the Remote Box, but also for all Metrohm devices with 25-pin D-Sub remote connectors.



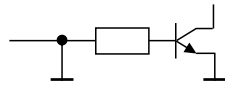
Inputs



approx. 50 kΩ Pull-up
 $t_p > 20$ ms
 active = low, inactive = high

The input lines can be scanned with the **SCAN** command.

Outputs



Open Collector
 $t_p > 200$ ms
 active = low, inactive = high
 $I_C = 20$ mA, $V_{CE0} = 40$ V
 +5 V: maximum load = 20 mA

The output lines can be set with the **CTRL** command.

Table 1 Inputs and outputs of the remote interface

Assignment	Pin no.	Assignment	Pin no.
Input 0	21	Output 0	5
Input 1	9	Output 1	18
Input 2	22	Output 2	4
Input 3	10	Output 3	17
Input 4	23	Output 4	3
Input 5	11	Output 5	16
Input 6	24	Output 6	1
Input 7	12	Output 7	2
0 volts / GND	14	Output 8	6
+5 volt	15	Output 9	7
0 volts / GND	25	Output 10	8
		Output 11	13
		Output 12	19
		Output 13	20

7.2 Stirring rate

The stirring rate can be adjusted in steps from -15 to +15.

The approximate rotational speed for the internal magnetic stirrer (depends on the product version) can be calculated with the following formula:

$$\text{Rotational speed/min (r/min)} = 125 \cdot \text{Stirring rate}$$

Example:

Configured stirring rate: 8

Rotational speed in revolutions per minutes = $125 \cdot 8 = 1,000$

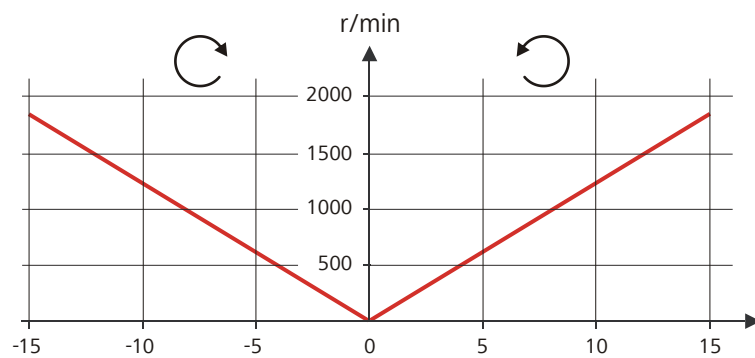


Figure 26 Rotational speed depending on the stirring rate

The information on the separately connectable 802 propeller stirrer can be found in the "802 Stirrer" manual.



8 Technical specifications

8.1 Lift and turntable

<i>Stroke path</i>	154 mm
<i>Maximum lift load</i>	approx. 30 N
<i>Lift rate</i>	adjustable, 5 - 25 mm/s
<i>Turntable speed</i>	adjustable, 3 - 20°/s

8.2 Oven

<i>Temperature range</i>	50 - 250 °C
<i>Accuracy</i>	±3 °C
<i>Correction range</i>	-10 - +10 °C
<i>Heating cartridges performance</i>	Typically 165 W (at 230 V) Dependent on supply voltage
<i>Heating rate</i>	Typically 15 °C/min (at 80 - 180 °C, 230 V) Dependent on temperature, supply voltage, sample amount and vessel dimensions
<i>Cooling rate</i>	Typically 9 °C/min (at 80 - 180 °C) Dependent on temperature, sample amount and vessel dimensions

8.3 Gas flow

<i>Flow range</i>	10 - 150 mL/min Under normal conditions
-------------------	--

8.4 Outlet heater

Socket connection $U = 16 \text{ V } (\pm 1 \text{ V})$
 $I \leq 0.8 \text{ A}$

Typical tubing temperature approx. $50 \text{ }^\circ\text{C}$

8.5 Interfaces

Controller connector USB upstream port (9-pin Mini DIN socket) for connecting a computer for controlling the 874 Oven Sample Processor.

MSB connectors Three 9-pin Mini DIN sockets for connecting dosing devices (Dosino/Dosimat), stirrers, etc.

USB connectors Two USB downstream ports (type A sockets), each 500 mA, for connecting Metrohm instruments or USB peripheral devices of other manufacturers.

8.6 Ambient conditions

Nominal function range $+5 \text{ }^\circ\text{C} - +45 \text{ }^\circ\text{C}$, at max. 80% humidity, non-condensing

Storage $+5 - +45 \text{ }^\circ\text{C}$

Altitude / Pressure range Max. 2,000 m.a.s.l. / min. 700 mbar

Pollution degree 2

8.7 Energy supply

Nominal voltage range 100 - 120 / 220 - 240 V ($\pm 10\%$)

Nominal frequency 50 / 60 Hz

Power consumption 200 W

Protection 2 ATH

Overvoltage category II



8.8 Reference conditions

<i>Ambient temperature</i>	+25 °C (± 3 °C)
<i>Relative humidity</i>	$\leq 60\%$
<i>Supply voltage</i>	230 V

8.9 Dimensions

<i>Width</i>	0.28 m
<i>Height</i>	0.55 m
<i>Depth</i>	0.49 m
<i>Weight (without accessories)</i>	15.50 kg
<i>Material (housing)</i>	Metal housing, surface-treated Oven covering: PTFE

9 Accessories

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

Downloading the accessories list

- 1** Enter <https://www.metrohm.com/> into your Internet browser.
- 2** Enter the article number (e.g. **874**) into the search field.
The search result is displayed.
- 3** Click on the product.
Detailed information regarding the product is shown on various tabs.
- 4** On the **Included parts** tab, click on **Download the PDF**.
The PDF file with the accessories data is created.



NOTICE

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



Index

6.2151.000 controller cable	27
685 Dosimat plus	31
700 Dosino	31
800 Dosino	31
801 Stirrer	32
803 Ti Stand	32
804 Ti Stand	32
805 Dosimat	31

A

Adsorber tube	23
Air inlet	19

B

Barcode reader	
Connect	34

C

Clamping ring	22
Computer	
Connect	27
Connect	
Barcode reader	34
Computer	27
Dosing device	31
MSB devices	29
Power grid	11
Remote Box	33
Stirrer	32
Titration stand	32
USB devices	34
Connector	
Air/nitrogen	10
Controller	9
MSB	10
USB	9
Coulometric KF titration cell	22

D

Dosing device	
Connect	31
Driver software	
Install	27
Drying flask	17, 18
Dust filter	9, 19

E

Electrode	23
Electrostatic charge	5

Error message	
Gas flow	17
External gas connector	20

F

Ferrite core	
Mount	31
Filter tube	17

G

Generator electrode	23
Guide rod	27

H

Heating tube	23
Heating tubing	16

I

Indicator electrode	23
Inert gas	19
Injection needle	14
Inlet	
Air pump	9
Inlet filter	19
Installation	
Driver software	27
Instrument type	10

K

KF titration cell	22, 23
Coulometric	23
Volumetric	24

M

Magnetic stirrer	22
Maintenance	37
Metrohm Serial Bus MSB, see also "MSB"	29
Molecular sieve	17, 23
Mount	
Drying flask	17
Dust filter	19
Heating tubing	16
KF titration cell	22
Magnetic stirrer	22
Nitrogen connector	19
Oven insert	13
Safety shield	21
Sample holder	12
Tubing	18

Mounting

KF titration cell	23
Needle	13
Needle holder	13
MSB	
Connect devices	29

N

Needle	13
Needle holder	14
Nitrogen connector	19

O

Outlet heater	16
Outlet needle	14
Oven insert	13

P

Pins	39
Power connection	10, 11, 12

R

Remote	
Input	40
Interface	39
Output	40
Remote Box	
Connect	33
Pin assignment	39

S

Safety instructions	4
Safety shield	21
Sample holder	12
Sample vessel	13
Sample vial	12
Screw connections	18
Serial number	10
Service	4
Stirrer	
Connect	32
Stirring rate	41
Supply voltage	4
Support rod	22

T

Titration cell	22
Titration stand	
Connect	32
Transfer tubing	16



Tubing 18

U

USB devices
 Connect 34

V

Vessel 13