885 Compact Oven SC

Manual

Ω Metrohm

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Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g. conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

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1 Introduction

1.1 Device description

The 885 Compact Oven SC 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 885 Compact Oven SC 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.

Thanks to the combination of a sample changer with an oven module, automated processing of several samples is possible in a single sample series. This ensures that only the smallest possible amount of work is required.

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.

1.1.1 Device components

The 885 Compact Oven SC has the following components:

- **Turntable**
  Permanently mounted sample rack with 17 positions for sample vials and 1 position for a conditioning vial.
- **Lift with working head**
  Working head with needle adapter and tubing for the gas flow.
- **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.
- **Operating unit**
  Monochrome LCD display and keyboard.

1.2   Displaying accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1   Searching for a product on the website

- Go to *https://www.metrohm.com*.
- Click on 🔍.
- Enter the article number of the product (e.g. **2.1001.0010**) into the search field and press **[Enter]**.

The search result is displayed.

2   Displaying product information

- To display the products matching the search term, click on **Product models**.
- Click on the desired product.

Detailed information regarding the product is displayed.

3   Displaying accessories and downloading the accessories list

- To display the accessories, scroll down to **Accessories and more**.
  - The **scope of delivery** is displayed.
  - Click on **[Optional parts]** for the optional accessories.
- To download the accessories list, click on **[Download accessories PDF]** under **Accessories and more**.

> ℹ️ **NOTE**
>
> Metrohm recommends keeping the accessories list for reference purposes.

1.3 About the documentation

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

1.3.1 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend**
	The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step**
	Perform the steps one after the other.
Method	**Dialog text**, **parameter** in the software
File ▶ New	Menu or menu item
[Continue]	**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.
☀	**WARNING**
	Warning of optical radiation

CAUTION

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

NOTICE

This symbol highlights additional information and tips.

2 Safety

> ⚠️ **WARNING**
>
> Operate this instrument only according to the information contained in this documentation.

This instrument exhibited no flaws in terms of technical safety at the time it left the factory. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

2.1 Intended use

The 885 Compact Oven SC 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 885 Compact Oven SC enables the application of thermal gas extraction technology.

This device is suitable for processing chemicals and flammable samples. Therefore, the use of the 885 Compact Oven SC 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.

2.2 Responsibility of the operator

The operator must ensure that basic regulations on occupational safety and accident prevention in chemical laboratories are observed. The operator has the following responsibilities:

- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train staff on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. protective glasses, gloves).
- Provide suitable tools and equipment to carry out the work safely.

The product may be used only when it is in perfect condition. The following measures are required to ensure the safe operation of the product:

- Check the condition of the product before use.

- Remedy defects and malfunctions immediately.
- Maintain and clean the product regularly.

2.3 Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention for chemical laboratories are known and complied with.
- Knowledge of handling hazardous chemicals is present. Personnel have the ability to recognize and avoid potential dangers.
- Knowledge regarding the application of fire prevention measures for laboratories is available.
- Safety-relevant information is communicated and understood. The personnel can operate the product safely.
- The user documentation has been read and understood. The personnel operate the product according to the instructions in the user documentation.

2.4 Electrical safety

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

⚠	**WARNING**

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

⚠	**WARNING**

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

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

Supply voltage

⚠️ **WARNING**

An incorrect supply voltage can damage the instrument.

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

Protection against electrostatic charges

⚠️ **WARNING**

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

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

2.5 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.

2.6   Personnel safety

⚠️ **WARNING**

Wear protective glasses and working clothes suitable for laboratory work while operating the 885 Compact Oven SC. It is also advisable to wear gloves when caustic liquids are used or in situations where glass vessels could break.

⚠️ **WARNING**

The oven module can exhibit temperatures of up to 250 °C. Sample vessels and components of the sample rack can also become so hot (<60 °C), that the skin could suffer burns in the event of contact.

Never touch the rack, sample vessels or oven when the heating is turned on. Be aware of the current value on the temperature display.

Wear working gloves.

Do not fail to switch off the device before attempting to clean it and wait until the oven has cooled down.

⚠️ **WARNING**

Always install the safety shield supplied with the equipment before using the instrument for the first time. Never remove the pre-installed safety shields.

The 885 Compact Oven SC may not be operated without a safety shield!

⚠️ **WARNING**

Personnel may not 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 jamming 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 instrument is switched on. Jamming can only be cleared when the instrument is in a de-energized state; this action is generally associated with a **considerable risk of injury**.

WARNING

The 885 Compact Oven SC is **not** suitable for usage 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.

2.7 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.

2.8 Danger from biological substances

If the instrument is used for biological hazardous substances, it must be marked in accordance with regulations.

In case of a return shipment to Metrohm or a Metrohm Service partner, the instrument or component has to be decontaminated and the hazard symbol for biological hazardous substances must be removed. A declaration of decontamination must be enclosed.

> **WARNING**
>
> Danger of infection and poisoning from biological hazardous substances
>
> Poisoning from toxins and/or infections from samples contaminated with microorganisms.
>
> - Wear protective equipment.
> - Use exhaust equipment when working with vaporizing hazardous substances.
> - Dispose of biologically contaminated substances properly.

2.9 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.

3 Overview of the device
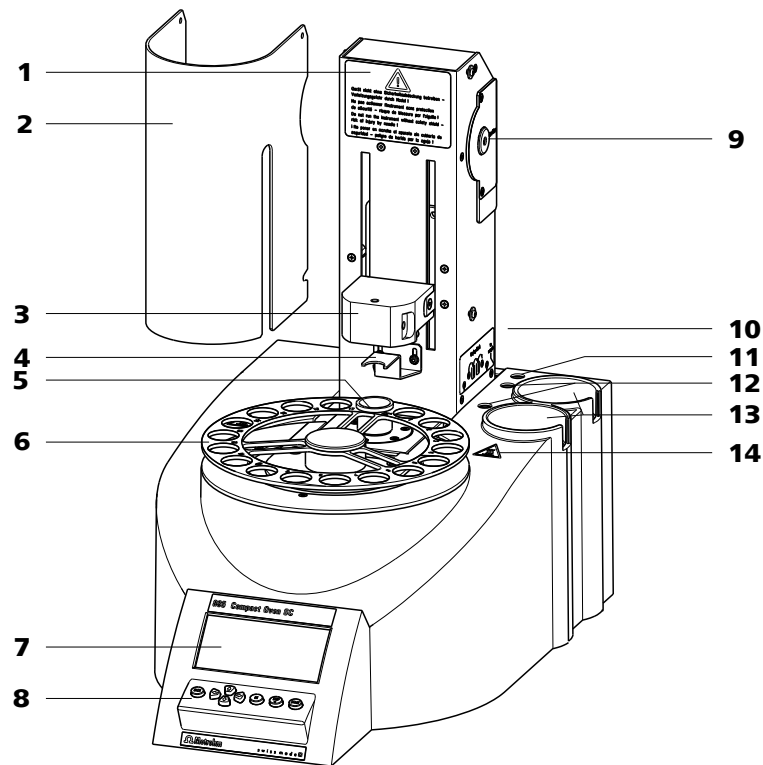
1	**Warning instruction**	2	**Safety shield (6.2751.170)**
3	**Lift with distributor**	4	**Deflector sheet** For deflecting the vials while the lift is traveling upwards.
5	**Conditioning position** For a conditioning vial.	6	**Sample rack** For 17 samples.
7	**Display**	8	**Keypad**
9	**Air pump inlet** With 6.2724.010 dust filter.	10	**Instruction sign** Displays the tubing of the drying flasks.
11	**Gas outlet** For the tubing for testing. With M6 thread.	12	**Gas connections** For the drying flasks. With M6 thread.
13	**Recesses in the housing** For the drying flasks.	14	**Warning symbol** Warns against hot surfaces.
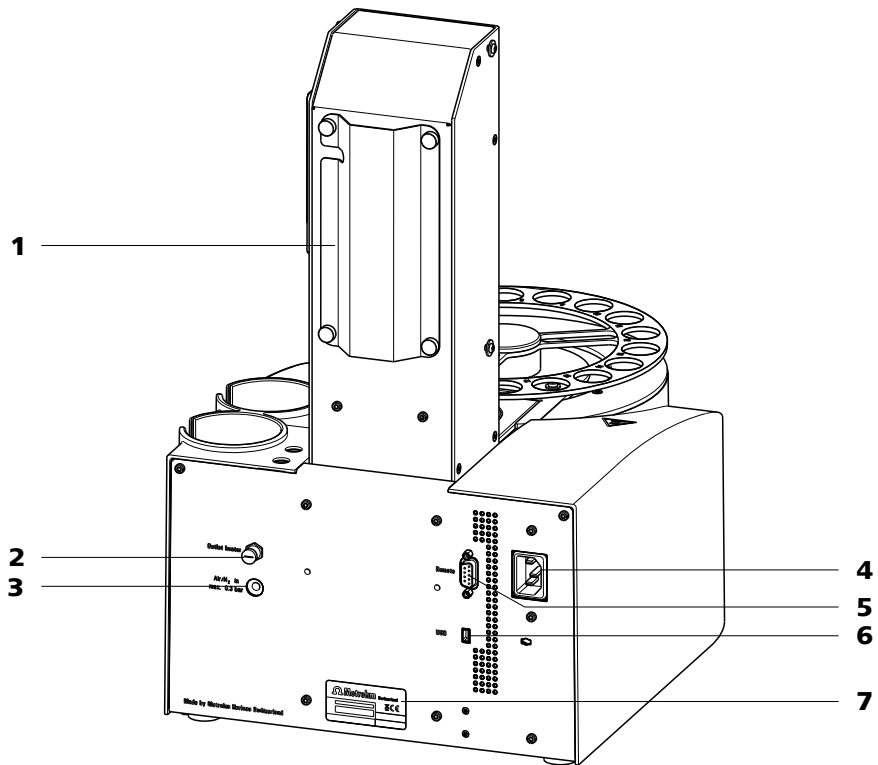
1	**Tubing and cable guide**	**2**	**Outlet heater connection** For the heating tubing.
3	**Air/nitrogen connector** With M6 inner thread. Inlet for external gassing.	**4**	**Power socket**
5	**Remote connector** For connecting instruments with a remote interface. D-sub, 9-pin.	**6**	**USB (OTG) connector** For connecting printers, USB flash drives, USB hubs, etc. From program version 5.885.0013: 900 Touch Control, 915 KF Ti-Touch, 917 Coulometer
7	**Type label** Contains specifications concerning supply voltage and serial number		

4 Installation

4.1 Setting up the instrument

4.1.1 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.

4.1.2 Checks

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

4.1.3 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.

4.2 Mounting the stand plate

The titration cell must be placed as close as possible to the instrument. Two stand plates (6.2001.050 and 6.2001.060) with support rods are available for this purpose, each of which is supplied with a KF titrator.
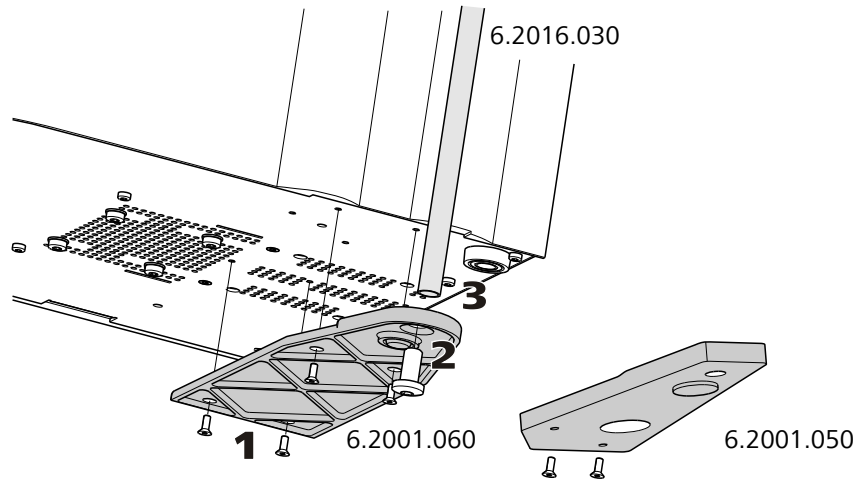
Figure 1   Mounting the stand plate

Proceed as follows:

1 Screw the stand plate to the base of the 885 Compact Oven SC with the screws provided, see figure.

2 Guide the large cylinder screw into the opening of the stand plate from the bottom.

3 Screw the 6.2016.030 support rod tightly to the cylinder screw. Fasten in place with a hex key.

4.3   Removing the safety shield
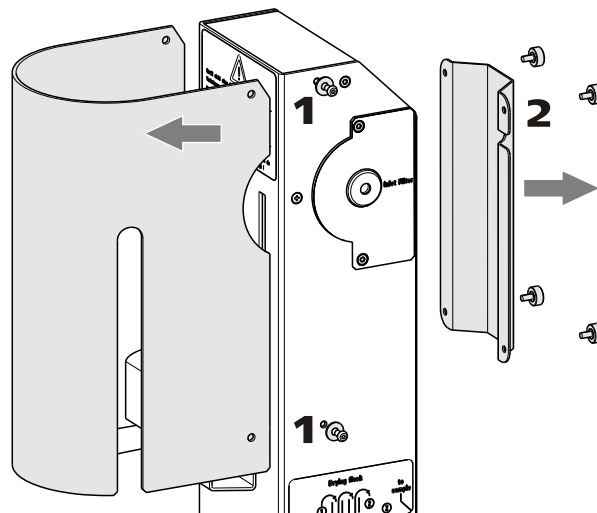
Figure 2   Removing shields

The installation of the accessories is easier to carry out if you remove the safety shield beforehand. Proceed as follows:

1 Loosen the hex screws on the sides of the tower and remove the safety shield.

2 Loosen the knurled screws on the rear of the tower and remove the cable guide.

Do not forget to refasten the safety shields after the installation of the accessories.

4.4   Mounting the needles

The length of the needle holder defines how deep the needle for the gas inlet enters the sample vessel.

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.

> **! CAUTION**
>
> Movement with the 6.2049.050 needle holder may not extend more deeply than up to **Lift position 78 mm**.

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. The 6.2049.040 needle holder can be ordered at Metrohm if required.
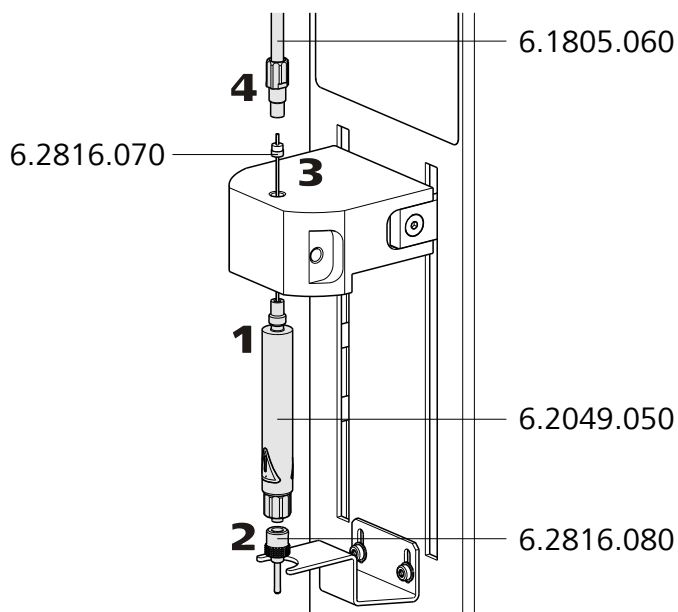
Figure 3   Mounting the needles

Mount the needles as follows:

1 Screw the **6.2049.050 needle holder** 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.

> **ℹ** **NOTE**
>
> Ensure that the white PTFE seal sits firmly on the needle.

4 Screw the **6.1805.060 FEP tubing** onto the opening of the distributor by hand.

5 Screw the other end of the tubing to the gas outlet (labeled **to sample**) next to the tower, see figure.
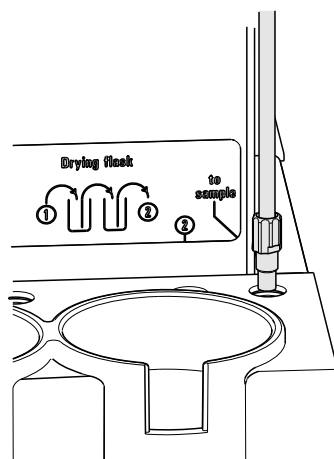
Figure 4   Connecting tubing to the gas outlet

4.5   Assembling drying flasks

Two drying flasks with desiccant are integrated into the gas flow to dry the supplied gas. Dust (e.g. from the desiccant) must be prevented from finding its way into the sample vessel.
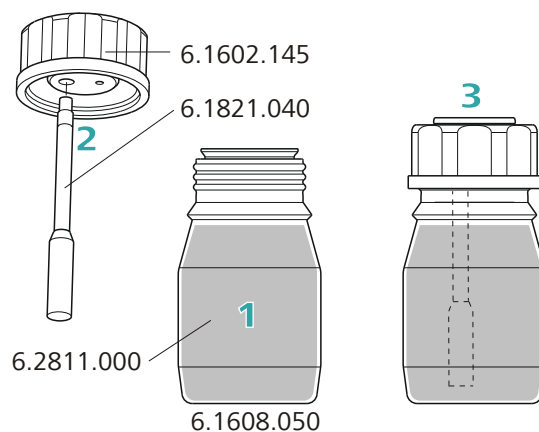
Figure 5   Preparing the drying flasks

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.

> **ℹ NOTE**
>
> If drying flask caps or filter tubes are not tightened well, the gas flow may not be precise and regular. The error message "Flow rate error" usually occurs when screw connections are not tight.
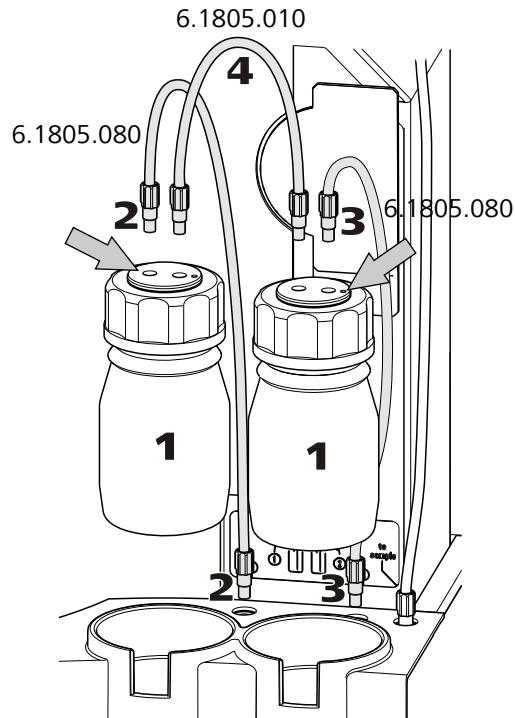
Figure 6   Mounting the drying flasks and tubings

Mount the FEP tubings as follows:

1   Insert the two drying flasks that have been prepared into the holders, see figure.

2   Screw one 6.1805.080 FEP tubing (25 cm length) to the gas outlet (at the front left, labeled **1**). Screw the other tubing end on the front drying flask to the M6 connector **without** point marking (see left-hand arrow).

3   Screw the second 6.1805.080 FEP tubing (25 cm length) to the gas inlet (at the rear right, labeled **2**). Screw the other tubing end on the rear drying flask to the M6 connector **with** point marking (see right-hand arrow).

4 Screw the 6.1805.010 FEP tubing (13 cm length) tightly onto the remaining M6 connectors of the drying flasks.

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

> ℹ️ **NOTE**
>
> Tighten the screw connections well by hand.

You can fix the drying flasks with the 6.2043.005 holding clamps, see figure.
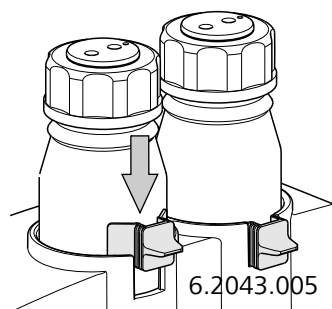
4.6 Mounting the heating tubing
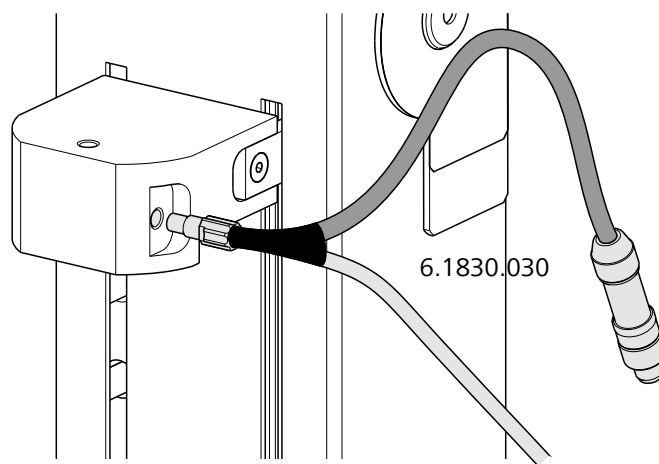
Figure 7   Mounting the heating tubing

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 rear of the instrument.
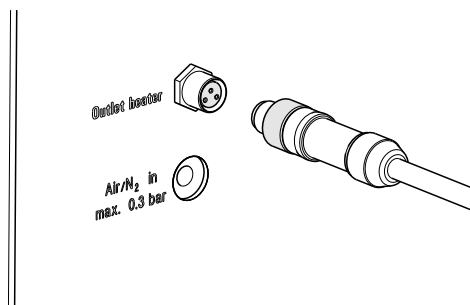
Figure 8   Connecting the heating tubing

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.

> **ℹ** **NOTE**
>
> The heating jacket of the heating tubing is heated up to approx. 40–50 °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.

4.7   Mounting the safety shield

Now you can mount the safety shield again. Proceed as follows:
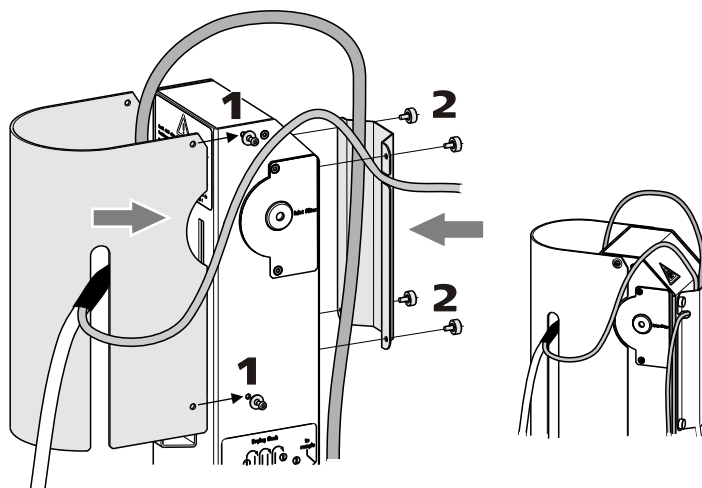
Figure 9   Mounting shields

1 Fasten the safety shield with the four hex screws to the sides of the tower. The heating tubing and its connection cable must be routed through the slot in the cover.

2 Fasten the cable cover to the rear of the tower with the four knurled screws. The gas supply tubing must be routed under the cover. The connection cable of the heating tubing must be guided through the recess in the side of the cover, see figure.

⚠️ **WARNING**

The 885 Compact Oven SC may not be operated without a safety shield!

4.8   Mounting the dust filter

The installed air pump must be protected from dust. For this reason, a **6.2724.010 dust filter** must be placed on the air inlet (**Inlet filter**) on the right-hand side of the housing..
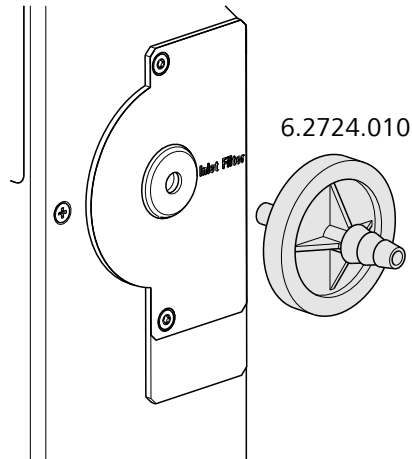
Figure 10   Mounting the dust filter

ℹ️	**NOTE**
	The dust filter should be replaced once a year.

4.9   Assembling 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 at the rear of the instrument.

A tube with M6 thread can be connected directly to the **Air/N₂ in** connector. Enclosed with the instrument is the **6.1808.040 M6/M8 tubing adapter** for a tubing with an M8 thread. The **6.1808.050 M8/tubing olive** can additionally be put in place in order to connect a simple tubing.
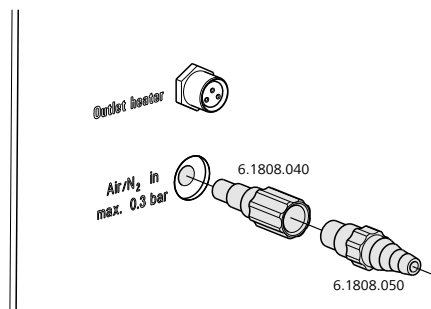
Figure 11   External gas inlet

⚠️	**WARNING**
	If gas is fed from a pressure line or a pressure vessel, a pressure reduction valve must be activated. The gas pressure must not exceed 0.3 bar of overpressure.

4.10   Inserting the heating tube into the KF titration cell

The 885 Compact Oven SC 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.
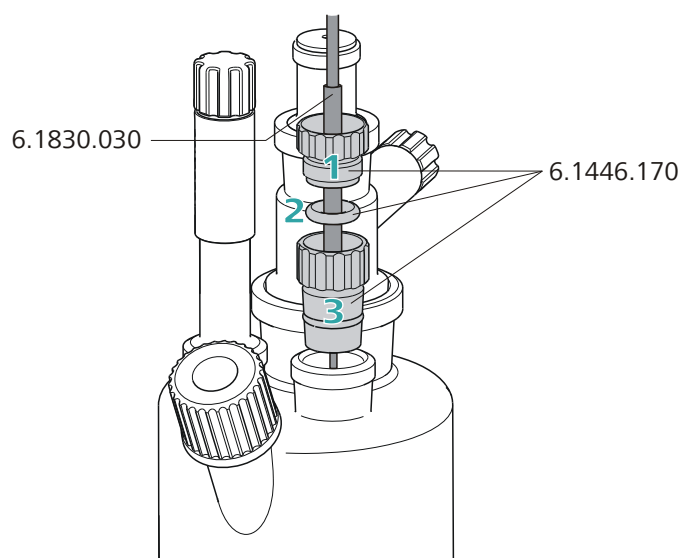
Figure 12   Coulometric KF titration cell

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 13   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.

4.11 Remote connections

The 885 Compact Oven SC can be used as a control device for a simple automation system with a large variety of different instruments. Even older Metrohm instruments can thus be integrated into an automated analysis system.

4.11.1 Remote cable

The following connecting cable can be used with the 885 Compact Oven SC:

6.2141.340 (9-pin/25-pin)
- For connections with a 756/831 coulometer, a 7xx Titrino or a Titrando by means of a Remote Box 6.2148.010.

The cable transmits start and stop signals from the 885 Compact Oven SC to the connected titrator and status signals (Cond OK, EOD) from the titrator to the 885 Compact Oven SC.

4.11.2 Example systems

The following illustrations show typical automation systems with different instrument combinations.

885 — 756/831 Coulometer/7xx Titrino

The standard combination for water determinations with a 7xx Coulometer or a 7xx KF Titrino.
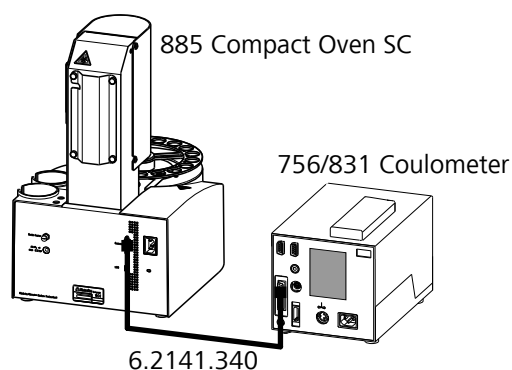
Figure 14   Remote connection 885 Compact Oven SC - Coulometer or 7xx KF Titrino

The titrator is operated in the KFC or KF mode. The sample series is started on the 885 Compact Oven SC

885 — 851 Titrando

The standard combination for water determinations with a Titrando and a Touch Control.
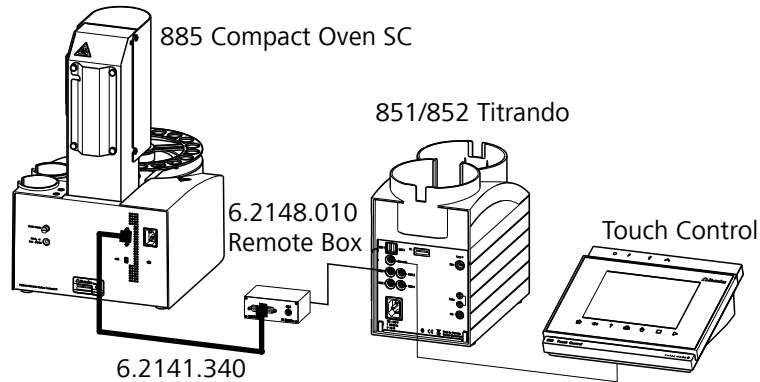
Figure 15   Remote connection 885 Compact Oven SC - Remote Box - 851/852 Titrando

The Titrando is operated in KFC mode. The sample series is started on the 885 Compact Oven SC.

4.12   Connecting a keyboard, printer and other USB devices

The 885 Compact Oven SC has a USB (OTG) connector. Use the provided 6.2151.100 adapter USB MINI (OTG) - USB A for connecting USB devices as e.g. printers, keyboards or USB sticks, see the following figure.
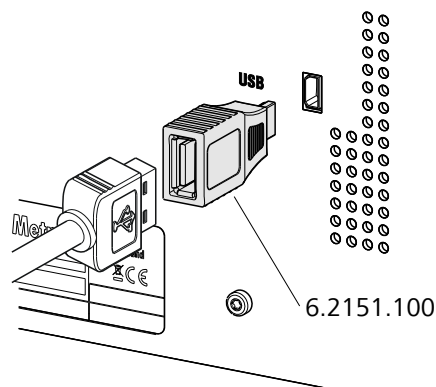
Figure 16   Connecting USB devices

> ## ℹ NOTE
>
> **Up to and including program version 5.885.0013:**
>
> Switch the device off before connecting or removing a USB device or a USB flash drive.
>
> The 885 Compact Oven SC can only recognize the device immediately after switching on.
>
> **Starting with program version 5.885.0030:**
>
> USB flash drives and printers can be connected or removed at any time.
>
> A double beep is heard when connecting and removing a USB stick.

The following devices can be operated **directly on the USB connector with the 6.2151.100 adapter**:

- USB flash drives (for the backup or storing of methods)
- 6.2147.000 numerical USB keypad
  The **6.2147.000 numerical USB keypad** is used for convenient numerical input and for navigating in the dialog. In addition, it provides two USB connectors. Connect additional USB devices to the keyboard.
- USB hub (with or without its own power supply)

> ## ℹ NOTE
>
> Most of the USB devices need a so-called hub in order to work correctly.
>
> A USB hub is a distributor to which several USB devices can be connected. USB hubs are available in specialty stores in a number of different models.
>
> The USB (OTG) connector of the 885 Compact Oven SC has no such hub. The 6.2147.000 numerical USB keypad has a USB hub and two USB connectors.

The following devices can **only be connected to a 6.2147.000 numerical keypad or to a USB hub**:

- Printer (with USB connector, use the 6.2151.020 connecting cable)
- Barcode scanner (with USB cable)
- Mouse (PC mouse with USB cable, for navigating in the dialog)

The following devices can **only be connected to a USB hub**:

- PC keyboard (with USB cable, for the comfortable input of letters and numbers)
- Keypad with numerical keypad (with USB cable)

If you wish to connect **several different instruments without own power supply**, then you must possibly use a USB hub with own power supply (*self powered*). The USB (OTG) connector of the 885 Compact Oven SC is not designed for supplying power to several devices with elevated electricity requirements.

Examples:
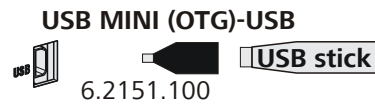
Figure 17   Connecting the USB flash drive
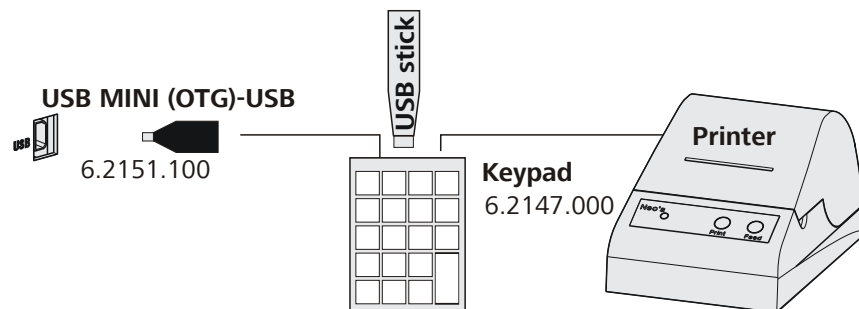
Figure 18   Connecting the 6.2147.000 USB keyboard with USB flash drive and printer

4.13 Connecting the touch devices

4.13.1 Connecting the 900 Touch Control via USB connector

> **ℹ NOTE**
>
> In order for the 885 Compact Oven SC to be controlled with the 900 Touch Control, at least the following program versions must be installed on the devices *(see chapter 7.6.1, page 56)*:
>
> - 5.900.0045 900 Touch Control
> - 5.885.0013 885 Compact Oven SC

The 885 Compact Oven SC is connected via the USB interface. The 6.2151.110 USB cable is required for this.
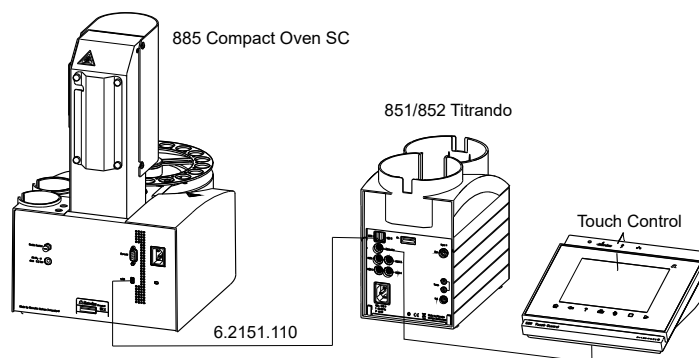
Figure 19   USB connection 885 Compact Oven SC – 851/852 Titrando

Connect the 900 Touch Control as follows:

1 Connect the 885 Compact Oven SC to the Titrando with the USB cable.

2 Connect the 885 Compact Oven SC and the Titrando to the power grid.

3 Switch on the 885 Compact Oven SC.

4 Switch on the 900 Touch-Control.

If the 900 Touch Control detects the 885 Compact Oven SC at the USB interface during start-up, the 885 Compact Oven SC is displayed in the device manager and its operating keys are locked (with the exception of the ON/OFF key). The text **Device is Remote Controlled** is shown on the display of the 885 Compact Oven SC.

NOTE

For direct control of the 885 Compact Oven SC with the 900 Touch Control, it is imperative that the switch-on sequence of the devices is observed.

4.13.2 Connecting the 917 Coulometer/915 KF Ti-Touch via USB connector

> **NOTE**
>
> In order for the 885 Compact Oven SC to be controlled with the 917 Coulometer oder dem 915 KF Ti-Touch, at least the following program versions must be installed on the devices *(see chapter 7.6.1, page 56)*:
>
> - 5.917.0045 917 Coulometer
> - 5.915.0045 915 KF Ti-Touch
> - 5.885.0013 885 Compact Oven SC

The 885 Compact Oven SC is connected via the USB interface. The 6.2151.110 USB cable is required for this.
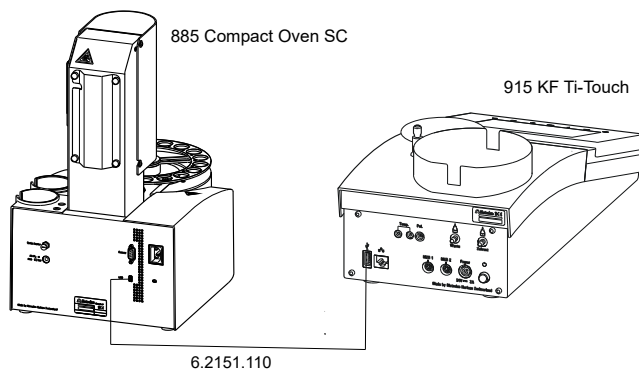
Figure 20   USB connection 885 Compact Oven SC – 915 KF Ti-Touch

If the USB interface on the 917 Coulometer or on the 915 KF Ti-Touch is also needed for other USB devices (USB stick, USB keyboard, USB/RS-232 adapter for balance), use a USB hub with its own power supply.

Connect the instruments as follows:

1 Connect the 885 Compact Oven SC to the 917 Coulometer or the 915 KF Ti-Touch with the USB cable.

2 Connect the instruments to the power grid.

3 Switch on the 885 Compact Oven SC.

4 Switch on the 917 Coulometer or 915 KF Ti-Touch.

If the 917 Coulometer or 915 KF Ti-Touch detects the 885 Compact Oven SC at the USB interface during start-up, the 885 Compact Oven SC will be displayed in the device manager and its control keys will

be locked (except for the ON/OFF key). The text **Device is Remote Controlled** is shown on the display of the 885 Compact Oven SC.

> **ℹ NOTE**
>
> For direct control of the 885 Compact Oven SC with the 917 Coulometer or 915 KF Ti-Touch, the switch-on sequence of the devices must be strictly observed.

4.14 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. 1.0 mm^2 / 18 AWG
- Power plug:
  - according to customer requirement (6.2122.XX0)
  - min. 10 A

> **i** | **NOTE**
> --- | ---
> | 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.

5   Automation run

5.1   Execution sequences

This automation run consists of three sequences:

- Start sequence
- Sample sequence
- End sequence

These sequences cannot be modified. However, the parameters important for a determination can be set to match specific methods *(see chapter 8.1, page 59)*.

Start sequence

This command sequence is run one time after the method has been started. It is used for conditioning the entire system.

The oven is heated to the set temperature. The tubing system is flushed with the carrier gas until all moisture has been expelled. The moisture is titrated in the titration cell.

The titrator is connected with the 885 Compact Oven SC using a remote cable. The instrument starts conditioning at the titrator through the remote cable control line. Once the titration cell is conditioned, the titrator switches a signal line to active. This signal line is monitored by the 885 Compact Oven SC.

The following steps are carried out in sequence:

- Move to the conditioning beaker
- Lower lift, pierce vial
- Switch on the gas flow
- Start conditioning at the titrator
- Heat the oven to the configured temperature
- Wait until conditioning is complete
  The signal line **Cond OK** must be active for 60 s.

Sample sequence

This command sequence is executed for every sample (or blank). It is repeated for each sample.

The total number of samples (or repetitions) and the rack position of the first sample (or blank) are entered when the method is started.

The following steps are carried out in sequence:

- Scan the **Cond OK** signal of the titrator
- Start the titration at the titrator

- Switch off the gas flow
- Move to the sample beaker
- Lower lift, pierce vial, move vial into oven
- Switch on the gas flow
- Record temperature and gas flow, wait for end of titration (**EOD** signal)
- Print out the report (optional)
- Switch off the gas flow
- Move to the conditioning beaker
- Lower lift, pierce vial
- Switch on the gas flow
- Wait until conditioning is complete
  The signal line **Cond OK** must be active for 60 s.

End sequence

This command sequence is run one time after the last sample sequence. The parameter **End of series** can be used to control a slightly variant behavior.

The following steps are carried out in sequence:

- Switch off the gas flow
- Move to the conditioning beaker, do not lower the lift
- Stop titrator (only with **End of series** = **Stop**)
  The titrator is not stopped with **End of series** = **Conditioning**, i.e. the titration cell continues to be conditioned.
- Switch off the oven heating

5.2 Oven heating

The target temperature of the oven is set as quickly as possible by a high-power heater and controlled by a reliable regulator. The oven temperature is continuously corrected and kept at the set value as accurately as possible.

> **i** **NOTE**
>
> The display always shows the oven temperature, not the temperature of the sample in the vessel. This can deviate from the oven temperature by several °C, because the flowing carrier gas cools the sample.

The heating is switched on automatically when the instrument is switched on. The oven is heated to the temperature defined in the method currently loaded .

6 Operation

6.1 Switching the instrument on and off

Switching on the instrument

Proceed as follows:

1 ▪ Press the red **[STOP]** key.
The instrument is initialized and a system test performed. This process takes some time.

The main dialog is displayed:

Switching off the instrument

The instrument is switched off with the **[STOP]** key. The fact that the key needs to be pressed down for an extended time prevents accidental switch off.

Proceed as follows:

1 ▪ Keep the red **[STOP]** key pressed down for at least 3 s.

A progress bar is displayed. If the key is released during this time, then the instrument will not be switched off.

6.2 Fundamentals of operation

6.2.1 The keypad
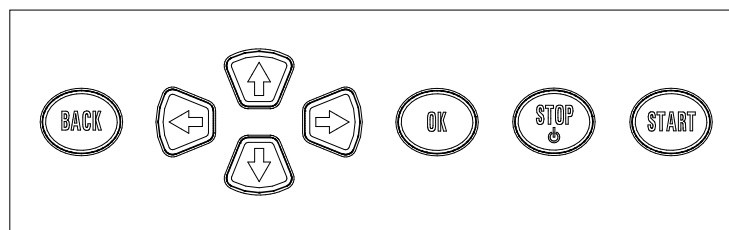
Figure 21   Keypad 885 Compact Oven SC

BACK   Apply the input and exit the dialog.

⇧ ⇩   Move the selection bar either up or down by one line at a time. Select the character to be entered in the text editor.

⇦ ⇨	Select the character to be entered in the text and number editor. Select the individual functions in the function bar.
OK	Confirm the selection.
STOP	Stop an ongoing method run or a manual function. Switch the instrument on or off.
START	Start method runs.

6.2.2 Structure of the dialog windows

The current dialog title is displayed on the left-hand side of the title bar. The current status of the system is displayed in the upper right-hand corner:

ready	The instrument is in normal status.
busy	A method has been started.
hold	A method has been paused.

Some dialogs have a so-called function bar on the bottom line. The functions contained therein can be selected with the arrow keys **[⇦]** or **[⇨]** and executed with **[OK]**.

6.2.3 Navigating in the dialog

The selection bar is displayed in inverted style. Use the arrow keys **[⇧]** and **[⇩]** to move the selection bar upward or downward one line at a time. If a dialog text is marked with "＞", then additional settings are available in a subordinate dialog. Use **[OK]** to access this dialog.

Example: System settings

Use the **[BACK]** key to return to the next higher level.

6.2.4 Entering text and numbers

```
Name

████████████████████████

ⒶBCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789,-µ°! #$&'()*+./
ÄÅÆÍÑÖöÜûåàåçèéëïîÑÒóôÜÛ
Accept Cancel Clear [+-]
+-| |-+
```
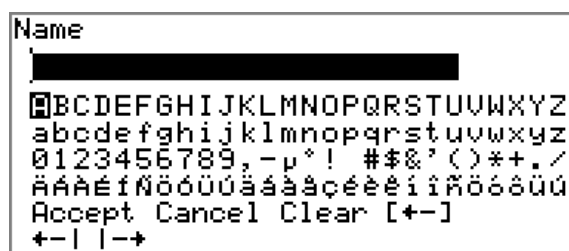
In the editing dialog for text input or numerical input, select the individual characters with the arrow keys. Use **[OK]** to apply the character in the input field. The following functions are available:

Editing function	Description
Accept	The modification is applied and the editing dialog is exited.
Cancel	The editing dialog is exited without applying the modification.
Clear	The content of the input field is deleted completely.
[◂—]	The character left of the cursor is deleted (backspace).
◂—❘	Text editor only The cursor within the input field is shifted to the left by one character each time that **[OK]** is pressed.
❘—▸	Text editor only The cursor within the input field is shifted to the right by one character each time that **[OK]** is pressed.
[BACK]	The modification is applied and the editing dialog is exited.

The **[BACK]** key has the same function as **Accept**.

6.3 Methods

The 885 Compact Oven SC operates with a specified process method. Various settings can be parameterized individually in the process method, depending on application. An optimized method run can be saved as a reusable method.

NOTE

Methods which were created on a program version starting with **5.885.0030** are not reverse-compatible with program versions **5.885.0013** and earlier.

6.3.1   Creating a new method

Proceed as follows to create a new method:

1 Open the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table opens:

```
┌────────────────────────────────────┐
│Method table            ready       │
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│Load New Store Delete Export        │
└────────────────────────────────────┘
```

2 Load an empty method template

- Use the arrow keys to select **New** and press **[OK]**.

The method template is now loaded and is displayed in the main dialog under **Method**.

If a new method has been created, then the individual parameters can be modified under **Menu ▶ Parameters**.

6.3.2   Saving a method

If you modify method parameters, then you can save these as your own method. A maximum of 100 methods can be saved.

To save a method, proceed as follows:

1 Opening the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table opens:

```
┌────────────────────────────────────┐
│Method table            ready       │
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│                                    │
│Load New Store Delete Export        │
└────────────────────────────────────┘
```

2 Modifying/applying the method name

- In the function bar, select **Store** and press **[OK]**.
  A method name will be suggested for new methods. If the
  method has already been saved once, then the method name will
  be displayed:

```
Store method            ready
 Name                  Me2115
```

Applying the name:

- Press **[BACK]**.

The method will be saved and the method table is displayed.

Entering a new name:

- Press **[OK]**.
  The text editor opens.
- Enter a method name (max. 12 characters) and apply with
  Accept or **[BACK]**.
- Press **[BACK]**.

The method will be saved and the method table is displayed.

6.3.3   Loading a method

To load a method, proceed as follows:

1 Open the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table with the stored methods opens:

```
Method table            ready
 Me2115
 Me3901
 Me4155
 Me4612

Load New Store Delete Export
```

2 Select a method

- Select the desired method.

3   Load the method

- In the function bar, select **Load** and press **[OK]**.

The method is now loaded and is displayed in the main dialog under **Method**.

6.3.4   Exporting a method

The methods can be exported to a connected USB flash drive.

┌───┐
│ ┌───┐   **NOTE**   │
│ │ **i** │ ─── │
│ └───┘   │
│   │
│ This function is possible only if a USB flash drive is connected as an │
│ external storage medium.   │
└───┘

To export a method, proceed as follows:

1   Opening the method table

- In the main dialog, select **Method** and press **[OK]**.

The method table with the stored methods opens:

```
Method table              ready
 Me2115
 Me3901
 Me4155
 Me4612


Load New Store Delete Export
```

2   Selecting the method

- Select the desired method.

3   Exporting the method

- In the function bar, select **Export** and press **[OK]**.

The method is being exported. The directory structure on the USB flash drive is listed in *chapter 7.2, page 51*.

The method is being exported. The directory structure on the USB flash drive is described in the more detailed manual.

6.4   Performing a sample series

Blanks should always be at the first sample position so that the blank values determined are available with every sample processing.

6.4.1   Starting the sample series

Starting a sample series

A suitable method must be loaded before a sample series is started *(see chapter 6.3.3, page 39)*. The necessary parameters) can then be modified.

1 Defining a sample series

Press the **[START]** key.

You can now enter the quantity and the first rack position of the samples to be processed.

2 Entering the number of samples

- **Number of samples** and press **[OK]**.
- Enter the number of samples (including blanks).
- Close the input dialog with **[BACK]** or **Accept**.

> **NOTE**
>
> Take care to ensure that the number of samples matches the number of sample data entered in the titrator.

3 Entering the rack position of the first sample

- **Next sample pos.** and press **[OK]**.
- Enter the starting position of the sample series.
- Close the input dialog with **[BACK]** or **Accept**.

The value for the number of samples remains stored for the next sample series. The position of the first sample is increased with each method run.

You can still cancel the start of the sample series at this time with **[BACK]** or **[STOP]**.

4 Closing the sample series dialog

Close the dialog with the **[BACK]** key.

Stopping a sample series

A sample series can be canceled at any time.

1 Press the **[STOP]** key.

The method run is stopped. The sample series cannot be resumed.

6.4.2 Stopping and continuing the sample series

Pausing a sample series

A method run of the 885 Compact Oven SC can be paused and then continued again. The connected devices are, however, **not** stopped.

> **NOTE**
>
> Interruption of the method run is not possible during the execution of commands during which the 885 Compact Oven SC waits for a signal from the connected titrator. This is the case during the conditioning of the titration cell and the execution of the KF titration.

A function bar with the entry "**Hold**" is displayed during the run of a sample series in the so-called "Live" dialog.

1 Press the **[OK]** key.

The method run is interrupted. However, currently running movements of the sample rack or the lift will be finished.

Instead of the "**Hold**" function, "**Continue**" is displayed in the function bar.

Continuing a sample series

If a method run is paused, then the "**Hold**" status is displayed in the title bar, see previous figure. The sequence can be continued with the "**Continue**" function.

In "**Hold**" status, a method run, and thus the entire sample series, can be canceled in its entirety, by pressing the **[STOP]** key.

1 Press the **[OK]** key.

As is also the case at the start of a sample series, a request dialog appears here in which the number of samples to be processed can

still be changed. It is thus possible to shorten a sample series or to extend it, without canceling it.

```
Sample series          hold
 Number of samples        99


 Press [START] key to continue

```

2 Press the **[OK]** key and enter the number of samples that still need to be processed. The current sample must be included at this time.

3 Press the **[START]** key.

The sample series continues.

6.5 Printing a report manually

Menu ▶ Print reports

Proceed as follows to print a report manually:

1 Opening the main menu

- In the main dialog, select **Menu** and press **[OK]**.

```
Menu                  ready
 >Manual control
 >Results
 >Parameters
 >System
 >Print reports

```

2 Opening the print dialog

- Select the menu item **Print reports** and press **[OK]**.

The dialog window with the available reports opens:

```
Print reports         ready
 Results
 Parameters
 System
 PC/LIMS
 Report as in method

```

3 Selecting the report

  ▪ Select the desired report and press **[OK]**.

The report is printed out.

The following reports can be printed out manually:

Results	Result report with temperatures and gas flows, etc.
Parameters	Report with all method parameters of the loaded method.
System	System report with system settings, solution list, external devices, etc.
PC/LIMS	Machine-readable report with all of the data for a determination. This report can be saved as a TXT file to a connected USB flash drive or sent to a terminal program or a LIMS via an RS-232 interface. The definition is made in the system settings *(see "PC/LIMS report", page 54)*.
Report as in method	The reports that are defined in the method will be printed out.

6.6 Manual control

Menu ▶ Manual control

The following functions are available in the manual control:

  ▪ Rotating the sample rack (**Rack position**)
  ▪ Moving the lift (**Lift position**)
  ▪ Switching the oven on/off (**Oven**)
  ▪ Setting the temperature (**Temperature**)
  ▪ Switching the gas flow on/off (**Gas flow**)
  ▪ Setting the flow rate (**Flow rate**)

The available subfunctions are listed for each function in the function bar.

6.6.1 Rotating the sample rack

```
Manual control            ready
Rack position                18
Lift position         shift pos.
Oven                         on
Temperature             110 °C
Gas flow                    off
Flow rate           50 mL/min
Next Previous Reset
```

If the **Rack position** line is selected, then the arrow keys **[⇒]** and **[⇐]** can be used to select one of the following functions, which can then be run by pressing **[OK]**:

Next
: The lift is moved upward and the next highest rack position is placed in front of the lift.

  If the **[OK]** key remains pressed, the rack automatically moves to the next position.

Previous
: The lift is moved upward and the next lowest rack position is placed in front of the lift.

  If the **[OK]** key remains pressed, the rack automatically moves to the next position.

Reset
: The rack is being initialized. The lift is moved upward and the sample rack is rotated to the starting position. At the same time, the starting position is reset (**Next sample pos.**) to **1** for the start of the next sample series.

The rack position display is always updated as soon as the rack is in the new position.

6.6.2 Moving the lift

```
Manual control              ready
 Rack position                 18
 Lift position          shift pos.
 Oven                          on
 Temperature              110 °C
 Gas flow                     off
 Flow rate            50 mL/min
Work pos.
```

If the **Lift position** line is selected, then the lift can be moved to the position suggested in the function bar by pressing **[OK]**. Only two positions are possible:

Work pos.
: The working height. It can be set under **Menu ▶ System ▶ Lift** .

Shift pos.
: The rotation height. The lift moves all the way to the top.

The current lift position is displayed. Each other possible position is provided in the function bar.

6.6.3 Switching the oven on/off

```
Manual control          ready
 Rack position             18
 Lift position      shift pos.
 Oven                       on
 Temperature          110 °C
 Gas flow                  off
 Flow rate       50 mL/min
Off
```

If the line **Oven** is selected, then oven heating can be switched off and back on with the **[OK]** key.

6.6.4 Entering the oven temperature

```
Manual control          ready
 Rack position             18
 Lift position      shift pos.
 Oven                       on
 Temperature          110 °C
 Gas flow                  off
 Flow rate       50 mL/min
```

If the **Temperature** line is selected, a temperature value can be specified by pressing **[OK]**.

Temperature

Setpoint value for the oven heating.

Input range	**50 to 250 °C** (Increment: **1**)
Default value	**100 °C**

6.6.5 Switching the gas flow on/off

```
Manual control          ready
 Rack position             18
 Lift position      shift pos.
 Oven                       on
 Temperature          110 °C
 Gas flow                  off
 Flow rate       50 mL/min
On
```

If the line **Gas flow** is selected, then the gas flow can be switched on and back off with the **[OK]** key.

The question of whether the installed pump or the valve for the gas supply connection (Air/N_2 in) is switched on depends on whether, under **Parameters** (method-specific), the **Gas supply** is set to **pump** or **valve**.

6.6.6   Entering the flow rate

```
┌─────────────────────────────────────┐
│Manual control            ready       │
│ Rack position               18       │
│ Lift position       shift pos.       │
│ Oven                        on       │
│ Temperature            110 °C        │
│ Gas flow                   off       │
│ Flow rate          50 mL/min         │
└─────────────────────────────────────┘
```

If the **Gas flow** line is selected, a value for the flow rate of the gas can be specified by pressing **[OK]**.

Gas flow

Specified value for the gas flow.

Input range	**10 to 150 mL/min** (Increment: **1**)
Default value	**50 mL/min**

7 System settings

7.1 Basic settings

Menu ▶ System ▶ Settings

This chapter contains a description of general instrument settings.

User name

A user name can be entered here for the report. This parameter will only be printed if a user has been defined.

Entry	**max. 12 characters**
Default value	**Empty**

Instrument name

An instrument name can be entered here for the report. This parameter will only be printed if a designation has been defined.

Entry	**max. 10 characters**
Default value	**Empty**

Serial number

Serial number of the device. This is printed as a part of the instrument identification in the report header.

Program version

Version number of the instrument software. This is printed as a part of the instrument identification in the report header.

Time

Current time. Only numbers that make sense can be entered.

Format: hh:mm:ss

Date

Current date. Only numbers that make sense can be entered.

Format: YYYY:MM:DD

Language

Set the dialog language.

Up to and including program version 5.885.0013:

One additional language can be selected besides English.

NOTE

In order to ensure that a second language can be selected, it must first be installed. This installation must be carried out by specialist personnel. In chapter *Loading program versions and language files, page 56*, you will find details regarding the installation of a second language.

Starting with program version 5.885.0030:

All available languages are installed on the device. No additional languages can be installed.

Dialog type

The user dialog can be limited for routine operations. One can operate normally with methods in the limited dialog. However, no settings can be made or methods deleted.

The resetting of the dialog will take effect as soon as you exit the main menu.

The limitation of the dialog results in the following:

- The menu items **System** and **Parameters** are not shown in the main menu.
- Methods can only be loaded, but not deleted, exported or created.

NOTE

If the limited dialog for routine operation is activated, then the expert dialog cannot be activated during ongoing operation. To change the dialog type, the 885 Compact Oven SC must be switched off and then back on again. The expert dialog can be forced as soon as the instrument is started up again. Then it is possible to enter whatever settings one wishes, e.g. the changing of the dialog type. If the instrument is switched off again without changing the dialog type, then the routine dialog will remain activated.

Forcing the expert dialog:

- Switch on the instrument.
- Wait for the display of the instrument logo with the lettering **easy, safe, precise**.
- Press the **[STOP]** key once again and hold it down while also briefly pressing the **[BACK]** key.
- Release both keys once again.

Selection	**Expert** | **Routine**
Default value	**Expert**

Expert
Complete dialog.

Routine
Limited dialog for routine operations.

Contrast

The contrast of the display can be adjusted with the arrow keys **[⇐]** and **[⇒]**.

- **[⇐]**: the contrast will be decreased by one step each time the key is pressed.
- **[⇒]**: the contrast will be increased by one step each time the key is pressed.

Input range	**150 to 240**
Default value	**212**

> **ℹ NOTE**
>
> Alternatively, the contrast can also be modified in the following manner:
>
> Keep the red **[STOP]** key pressed down. As soon as the progress bar appears, also press the arrow key **[⇓]** or **[⇑]** repeatedly.
>
> This method will, however, cause the contrast to be modified by several steps.

Beep

If this parameter is enabled, then a short beep will sound at the press of a key.

Selection	**on**	**off**
Default value	**on**

7.2   File management

Menu ► System ► File management

> **NOTE**
>
> This menu item is visible only if a USB flash drive has been connected as an external storage medium.

Methods can be imported and deleted from a USB flash drive in this dialog. Only methods located in the **Files** directory are displayed in the list *(see "Directory structure on the USB flash drive", page 51)*.

A backup of the system can be created (all data and settings). Also, an existing backup can be reloaded.

> **NOTE**
>
> Methods and backups which were created on a program version starting with **5.885.0030** are not reverse-compatible with program versions **5.885.0013** and earlier.

Import

Import the selected method.

Delete

Delete the selected method.

Backup

Create a backup of all data and settings on the USB flash drive.

> **NOTE**
>
> Only **one** backup can be created on the same USB flash drive.
>
> If a backup is already stored on the flash drive, then this will be overwritten as soon as the function is executed again.

Restore

Load the backup from a connected USB flash drive.

Directory structure on the USB flash drive

A directory with the instrument number will be created on the USB flash drive. The structure within this directory appears as follows:

Figure 22   Directory structure on the USB flash drive

Backup   All of the files of the backup are stored in this directory. The directory is created as soon as a backup is created for the first time.

Files   Exported methods are stored in this directory. The directory is created as soon as a method is exported for the first time.

                          Only methods located in this directory can be imported.

pc_lims_report   PC/LIMS reports are stored in this directory as TXT files. The directory is created as soon as a PC/LIMS report is printed for the first time.

7.3   Oven settings (heater)

Menu ▶ System ▶ Heater

Max. temperature

Maximum oven temperature. This setting can be used to limit the input range for the oven temperature.

Input range	**50 to 250 °C** (Increment: **1**)
Default value	**250 °C**

Temperature correction

The default value for the temperature control of the oven can be influenced with this correction value. A temperature difference between the oven module and the sample in the vessel can thus be brought into line as needed.

Input range	**-10 to 10 °C** (Increment: **1**)
Default value	**0 °C**

The determination of the necessary temperature correction can be accomplished with a special oven insert and should be performed by a service technician. Contact your responsible Metrohm supplier.

Serial number

Serial number of the oven module. It cannot be modified.

Program version

Version number of the oven modules' firmware. It cannot be modified.

7.4 Lift settings (Lift)

Menu ▶ System ▶ Lift

```
Lift                        ready
Work position                  mm
Conditioning position          mm
Initial lift pos.    shift pos.


Work pos. Up Down
```
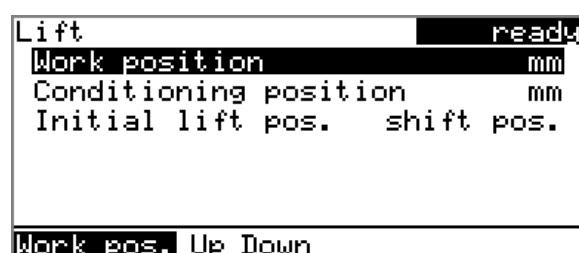
Work position

The working height of the lift (sample position) can be set to the desired value. This is carried out by directly operating the lift. To set this lift height, the sample rack must first be moved to any sample position (not the conditioning position).

Three functions can be selected from the function bar with **[⇐]** and **[⇒]** and then executed by pressing **[OK]**:

- **Work pos.** moves the lift to the current working height.
- **Up** moves the lift 6 mm upward.
- **Down** moves the lift 6 mm downward.

When this dialog page is closed, the respective current lift position will be applied as **Work position**.

> **NOTE**
>
> Recommended settings:
>
> With **6.2049.050 needle holder**: 78 mm (do not move lower)
>
> With **6.2049.040 needle holder**: 96 mm

Input range	**0 to 96 mm** (Increment: **6**)
Default value	**78 mm**

Conditioning position

The working height of the lift (on the conditioning position) can be set to the desired value. This is carried out by directly operating the lift. To set this lift height, the sample rack must first be moved to the conditioning position of the rack manually.

Three functions can be selected from the function bar with **[⇐]** and **[⇒]** and then executed by pressing **[OK]**:

- **Cond. pos.** moves the lift to the current working height.
- **Up** moves the lift 6 mm upward.
- **Down** moves the lift 6 mm downward.

When this dialog page is closed, the respective current lift position will be applied as **Cond. pos.**.

Input range	**0 to 96 mm** (Increment: **6**)
Default value	**36 mm**

7.5 Configuring external devices

Menu ▶ System ▶ External devices

PC/LIMS report

Specification of the storage location for the PC/LIMS report. The PC/LIMS report is a machine-readable report with all of the important data for a determination. It can be saved as follows:

- as a TXT file on a USB flash drive.
- to a LIMS via an RS-232 interface. The 6.2148.030 RS-232/USB Box is required for this purpose.

> **ℹ NOTE**
>
> There are 2 versions of the RS-232/USB Box 6.2148.030. Version 2.0 of the RS-232/USB Box is identified with a sticker accordingly.
>
> Starting with program version **5.885.0030**, **Version 2.0** of the RS-232/USB Box must be used.

Selection	**COM2	USB Stick**
Default value	**USB Stick**

COM2
The report is sent via the serial COM2 interface. The interface parameters set in the dialog **COM2 settings** are used *(see "Editing the COM2 settings", page 55)*.

USB Stick

The report will be saved as a TXT file on the USB flash drive in the folder **pc_lims_report**.

Printer

If a printer is connected, then the printer type needs to be defined here in order for the reports to be printed out correctly.

The printers that have the designation **ESC-POS** are so-called POS printers (point-of-sale printers), i.e. they print on continuous paper.

Selection	**Citizen (ESC-POS)** | **Custom (ESC-POS)** | **Epson** | **Epson (ESC-POS)** | **HP DeskJet** | **HP LaserJet** | **Seiko (ESC-POS)**
Default value	**HP DeskJet**

Keyboard layout

A commercially available USB keyboard can be connected to make it easier to enter text and numbers. Specify the country-specific keyboard layout.

Selection	**English US** | **French FR** | **German CH** | **German DE** | **Spanish ES**
Default value	**English US**

Editing the COM2 settings

Menu ▶ System ▶ External devices ▶ COM2 settings

Under **COM2 settings**, the interface parameters for devices connected to the **RS-232/2** connector of the RS-232/USB Box are set (e.g. PC). These settings are necessary, e.g. for the dispatching of a PC/LIMS report to a PC.

Baud rate

Transfer rate in characters per second.

Selection	**1,200** | **2,400** | **4,800** | **9,600** | **19,200** | **38,400** | **57,600** | **115,200**
Default value	**9,600**

Data bits

Number of data bits.

Selection	**7** | **8**
Default value	**8**

Stop bits

Number of stop bits.

Selection	**1	2**
Default value	**1**

Parity

Type of parity testing.

Selection	**even	none	odd**
Default value	**none**

Handshake

Type of data transfer protocol.

Selection	**hardware	software	none**
Default value	**hardware**

> ### NOTE
>
> If communications problems occur, set the parameter **Handshake** to **software**, and make another attempt.

7.6 Instrument diagnosis

7.6.1 Loading program versions and language files

Menu ▶ System ▶ Diagnosis

New program versions or language files can be loaded from a USB flash drive. The corresponding file must be saved on the USB flash drive in the following directory:

- Program file
    - Up to and including program version **5.885.0026**:
      Directory **885**
    - Starting with program version **5.885.0030:**
      Directory **885 ▶ SwUpdates**
- Language file
    - Up to and including program version **5.885.0026**:
      Directory **885**
    - Starting with program version **5.885.0030:**
      All available languages are installed on the device. No additional languages can be installed.

You can distinguish between language files and program files by noting how the file name is constructed.

Program files

Program files are device-specific. The file name has the following structure:

5XXXyyyy.bin where

XXX = Instrument type (e.g. 848 for the 848 Titrino plus)

yyyy = Program version

Language files

They can be recognized by means of the two-digit language code in the file name. The language file to be used is dependent on the program version used.

The following table shows the structure of the file name and the assignment between program version and language file.

Program version	Language file
5.885.0011	58481011YY.bin*
5.885.0012	58851012YY.bin*
5.885.0013	58851013YY.bin*

*where:

YY = Language, e.g. DE (German), FR (French), ES (Spanish)

Loading a file

Proceed as follows:

1 Connecting the USB flash drive

- Plug in the USB flash drive with the 6.2151.100 adapter (USB MINI (OTG) - USB A) at the instrument's USB port.
- Switch on the instrument.

2 Opening the update dialog

- Under **Menu ▶ System ▶ Diagnosis**, select the menu item **Software update**.
- Press **[OK]**.

```
Software update              ready
Program version          58480011

Press [START] key to continue


```

3 Opening the file selection

- Press **[OK]**.

The selection list with the program and language files present on the USB flash drive opens.

4 Selecting the file

- Use the arrow keys to select the required file.
- Press **[OK]**.

5 Starting the update

- Press **[START]**.

The update process is started, it runs automatically. At the end of the process, the instrument will be switched off automatically and switched back on again. No user intervention is required.

7.6.2 Diagnosis functions

The electronic and mechanical functional groups of Metrohm devices can and should be checked by specialist personnel from Metrohm as part of a regular maintenance schedule. Please ask your regional Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement.

8   Parameters

Menu ▶ Parameters

8.1   Automation

Temperature

Specified value for the oven temperature.

Input range	**50 to 250 °C** (Increment: **1**)
Default value	**100 °C**

Flow rate

Specified value for the gas flow.

Input range	**10 to 150 mL/min** (Increment: **1**)
Default value	**50 mL/min**

Gas supply

Selection of the gas supply.

Selection	**pump** | **valve**
Default value	**pump**

pump
Built-in air pump.

valve
Inlet valve for inert gas.

Gas type

Selection of the gas.

Selection	**air** | **nitrogen** | **other**
Default value	**air**

other
When selecting **other**, a measuring factor must be specified for the gas that is used. The measuring factor is used for the correct measurement of the flow rate.

Measuring factor

Measuring factor for measuring the flow rate of the gas. This setting is only possible if **other** was selected as the gas. For air and nitrogen, the corresponding measuring factor is inserted automatically.

Only when 'Gas type' = 'other'.

Input range	**0.001 to 2.000** (Increment: **0.001**)
Default value	**1.000**

End of series

Behavior of the instrument at the end of the sample series.

Selection	**Stop** | **Conditioning**
Default value	**Stop**

Stop
After the last sample, the entire system is conditioned one more time. Afterwards, the needle is moved out of the conditioning vial. The gas flow and the oven heating are switched off. The titrator is stopped.

Conditioning
After the last sample, the entire system is conditioned one more time. Afterwards, the needle is moved out of the conditioning vial. The gas flow and the oven heating are switched off. The titrator is kept in the conditioned status.

Conditioning timeout

This setting determines the maximum waiting time for conditioning. If no stable conditioning signal is received by the titrator for 60 seconds during this waiting time, an error message is displayed. Then, the sample series is canceled.

Input range	**2 to 120 min** (Increment: **1**)
Default value	**30 min**

8.2 Reports

Menu ▶ Parameters ▶ Reports

The reports that will be printed out automatically after a determination are defined under **Reports**.

Results

The result report includes specifications on the oven temperature and on the flow rate during the determination.

Selection	**on** | **off**
Default value	**off**

Parameters

All of the parameters of the current method are printed out in the parameter report.

Selection	**on** | **off**
Default value	**off**

PC/LIMS

The PC/LIMS report is a machine-readable report with all of the data important for a determination. The PC/LIMS report can be saved as a TXT file on a USB storage medium or sent via an RS-232 interface to a LIMS. The output location is defined in the system settings *(see "PC/LIMS report", page 54)*.

The file name of the TXT file is constructed as follows: *PC_LIMS_Report-ID1-YYYYMMDD-hhmmss.txt*.

Selection	**on** | **off**
Default value	**off**

9 Carrying out a determination

Moisture determinations according to the oven 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.

Solid or liquid samples are weighed in into sample vials, which are then sealed. We recommend that the 6.2420.007 sample vials be used with the 6.1448.067 septum seals (with screw cap). The silicone septum of the aluminum cap is resistant to temperatures of up to 250 °C and has proven itself to be exceptionally reliable.

9.1 Conditioning the system

The entire system must be conditioned prior to use, i. e. it must be absolutely water-free. The oven must be heated to the desired working temperature for this purpose. The needle must be inserted into a sealed sample vessel (conditioning vessel) in order to flush the entire tubing system with the carrier gas. The gas supply is thus connected with the heating tubing. This can all take place automatically in a normal method run.

9.1.1 Preparing the KF titration cell

Filling the KF titration cell

The KF titration cell must remain filled with conditioned working medium when not in use. The working medium must be replaced from time to time, even though the sample is not transferred into the working medium using the oven method.

Prepare the KF titration cell as follows:

1 Fill the KF titration cell with working medium. We recommend approximately 150 mL of working medium when using a coulometer cell and approximately 35 mL with a volumetric KF titration cell. The shaft of the heating tubing must, however, not be immersed.

2 Align the tip of the heating tubing against the vessel wall.

3 Switch on the stirrer. Set the stirring rate to high.

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.

Creating a sample table at the titrator

1 Create a sample table on the KF titrator. For each blank, insert a line which calls up a method for the determination of a blank.

You will find the necessary settings for the method in the KF titrator manual.

> **NOTE**
>
> It is imperative that an **Extraction time** of **at least 300 seconds** be set in the titration method for a determination using the oven method.
>
> The 885 Compact Oven SC is not equipped with a serial connection (RS232). Therefore, on the coulometer, switch the setting **Oven:** to **no** under **PARAM ▶ Preselect**.

2 Deactivate the autostart function of the titrator.

9.1.2 Preparing the 885 Compact Oven SC

Selecting a method

Proceed as follows:

1 Switch on the instrument.

2 Use the arrow keys to select the line **Method** and press **[OK]**.

3 Select the desired method and press **[OK]** again.

Inserting the conditioning vessel

1 Seal an empty sample vessel tightly with a septum seal.

2 Place the sealed vessel at the position **Cond. Pos** on the rack.

Preparing blanks

1 Seal 3 to 5 empty sample vessels tightly with a septum seal.

2 Place the blanks on the first positions on the rack.

Preparing samples

1 Weigh in the samples into empty sample vessels and seal the vessels tightly with a septum seal.

2 Place the sealed sample vessels on the rack in suitable sequence (after the blanks).

3 Enter the sample IDs and the sample sizes of the samples in the correct sequence in the sample table of the titrator. Specify the titration method for the samples in each line.

Starting the method

1 Press the **[START]** key on the 885 Compact Oven SC.

The sample rack is rotated. The lift moves downwards and the needle pierces the septum of the conditioning vessel.

The gas flow is switched on automatically.

The titrator is started by the 885 Compact Oven SC with an electrical signal. The conditioning of the titration cell begins.

> **ℹ NOTE**
>
> The carrier gas should emerge from the tip of the heating tubing into the working medium as tiny bubbles and be spun there forcefully. Modify the stirring rate if necessary. The tip of the tubing should be immersed until it reaches the bottom of the KF titration cell and be rotated against the vessel wall.

Swivel the KF titration cell now and again in order to remove the last traces of moisture.

If the required oven temperature has not yet been reached, then waiting continues until this is the case. Afterwards, the 885 Compact Oven SC

waits for a **Cond OK** signal from the titrator. If this signal remains stable for 60 s, then the sequence is resumed with the actual determination.

10 Operation and maintenance

The 885 Compact Oven SC requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the service life of the sturdy mechanics and electronics of the instrument.

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 plug connections (particularly the power plug) must be protected against contamination.

Check all tubing connections regularly for leaks.

11 Appendix

11.1 Practical notes

Carrier gas selection

If the hot sample is sensitive to air or oxygen (decomposition) and if it releases substances that disrupt the KF reaction, then nitrogen (N_2) should be used as the carrier gas.

Temperature setting

The temperature selected should be as high as the sample allows (high temperature = shorter analysis time). The sample may not, however, decompose. It must only release water and not any oxidizable substances.

The temperature displayed refers to the temperature in the heating block and not to the sample temperature. Depending on the vial size used, the gas flow and the temperature setting, the actual temperature of the sample can deviate up to 10%.

Gas flow

Once the needle is inserted into the sample vessel until it stops, the gas flow moves through the sample and then through the outlet needle into the titration vessel where the moisture is titrated. If the needle is not permitted to immerse into the sample, then a longer needle holder can be used.

The gas flow should be kept as low as possible. Particularly in the case of very moist samples, care must be taken to ensure that water is not released too quickly and in excessively large quantities into the titration vessel. In addition, there is the danger of condensate formation in the heating tubing. The working medium in the cell must be able to absorb the moisture that is expelled without delay. Normally, a flow rate of 40 to 60 mL/min is optimal.

The tolerances for gas flow measurement depend on the system: They depend on the pressure, temperature, measuring system and the gas itself, and a deviation of 20% is possible.

The gas flow measurement is calibrated with air; other gases deviate more or less strongly from that.

If required, the flow rate of the gas can be checked using a flow measuring instrument at the local pressure and current temperature. An individual measuring factor can be entered with the **Meas. factor** parameter so that the corrected gas flow is displayed. At the same time, however, **other** must be selected for the **Gas type** parameter.

Extraction time

An extraction time of min. 5 minutes should be set on the titrator in order to prevent the titration from being canceled before the sample has released its water.

Conditioning the system

The system must be conditioned with an empty, sealed sample vial (conditioning vial) before a determination is made.

11.2 Remote interface

11.2.1 Pin assignment of the remote interface

Figure 23   Pin assignment of remote socket and remote plug

The above figure of the pin assignment applies to all Metrohm instruments with 9-pin D-Sub remote connector.

Table 1   Inputs and outputs of the remote interface

Pin no.	Assignment	Function
1	Output 0	Sample Ready
2	Output 1	Temperature ok
3	Output 2	Flow on
4	Output 3	
5	Output 4	Error
6	0 volt (GND)	
7	+5 volt	
8	Input 0	Continue
9	Input 1	Cond ok

Inputs

+5 V

approx. 5 kΩ Pull-up

$t_P > 100$ ms

active = low, inactive = high

Outputs
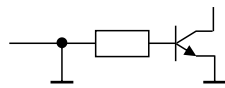
Open Collector

$t_P > 200$ ms

active = low, inactive = high

$I_C = 20$ mA, $V_{CEO} = 40$ V

+5 V: maximum load = 20 mA

11.2.2 Status diagram of the remote interface

[START]

Sample ready	Output 0
Temp ok	Output 1
Flow on	Output 2
	Output 3
Error/Stop	Output 4
Continue	Input 0
CondOK	Input 1

StartSeq   SampleSeq   EndSeq

Figure 24   Remote status diagram

11.3   System initialization

In very rare instances, a faulty file system (e.g. because of a program crash) may lead to an impairment of program functioning. The internal file system must be initialized in such cases.

> **⊘ CAUTION**
>
> ─────────────────────────────
>
> All user data (methods, solutions, etc.) are deleted if a system initialization is carried out. Afterwards, the instrument will have the factory settings again.
>
> We recommend creating a backup of the system at regular intervals in order to avoid data losses.

After a system initialization the program versions and language files do not have to be reloaded. Only the selection of the dialog language may have to be reset in the system settings.
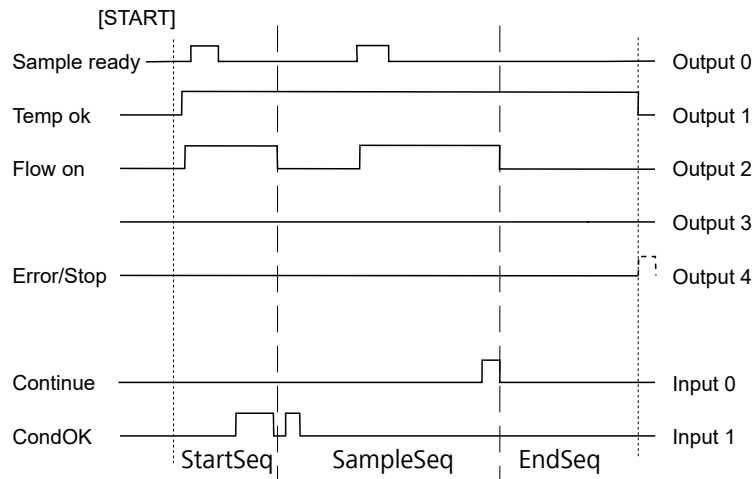
Proceed as follows for the system initialization:

1 Switching off the instrument

■ Keep the red **[STOP]** key pressed down for at least 3 s.

A progress bar is displayed. If the key is released during this time, then the instrument will not be switched off.

2 Switching on the instrument

■ Keep the red **[STOP]** key pressed down for approx. 10 s.

The dialog for confirmation of the initialization is displayed for 8 s. The initialization must be confirmed during this time.

```
System reset request detected.
>> Press [BACK] key twice
   to confirm !
>> Time remaining: 8 sec
```

3 **Confirming the initialization**

> **NOTE**
>
> If the request is not confirmed within 8 s, then the procedure will be canceled.

- Press **[BACK]** twice.

Initialization is started. The process takes approximately 80 s. The instrument will be automatically restarted after successful initialization.

11.4   Literature

- E. Scholz, *Hydranal® Manual*, Riedel-de Haën
- P. Bruttel, R. Schlink, *Water Determination by Karl Fischer Titration* Monograph, Metrohm, 2006, Order no. 8.026.5011

12 Troubleshooting

12.1   885 Compact Oven SC

Problem	Cause	Remedy
The drift is very high during conditioning.	*Molecular sieve of drying flasks and/or the titration cell exhausted.*	Replace the molecular sieve.
	The titration cell is leaking.	Check seals. If necessary, replace.
The titration time is too long.	*The sample is non-homogenous.*	Pulverize the sample or homogenize it before weighing in.
	Moisture not fully expelled.	Select more stringent switch-off criteria on the KF titrator: lower stop drift, higher switch-off delay time.
	Tubing connections leaking.	Inspect tubing and replace as necessary.
The results are spread widely.	*Molecular sieve of drying flasks exhausted.*	Replace the molecular sieve.
	Condensate in the heating tubing.	▪ Dry the tubing. ▪ Reduce the gas flow. ▪ Perhaps lower the oven temperature.
	Gas flow too high.	Reduce the gas flow.
	The sample is non-homogenous	Pulverize the sample or homogenize it before weighing in.
Selected gas flow is not achieved.	*The system is leaking.*	Check all tubing connections and drying flasks for leaks.
	Pressure from external gas supply either too low or too high.	Adjust the gas pressure (max. 0.3 bar).
	Pump defective.	Contact a service technician.

13 Technical specifications

13.1   Lift

Stroke path	96 mm
Maximum load	5 N
Lift rate	15 mm/s (typical)

13.2   Turntable

Rack positions	18
Maximum load	17 N
Turntable speed	13 degrees/s (typical)

13.3   Oven

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

13.4   Gas flow

Flow range   10–150 mL/min
                        Under normal conditions, calibrated with air at approx. +25 °C and 1013 mbar.
                        Deviations of gas amount per time unit of ±20% are possible.

13.5   Outlet heater

Socket connection   U = 16 ±1 V
                        I ≤ 0.8 A

Typical tubing   approx. 50 °C
temperature

13.6   Interfaces and connectors

USB (OTG) connec-   For connecting USB devices.
tor

Remote connector   For connecting instruments with a remote interface.

13.7   Power connection

Voltage   100–120 / 220–240 V (± 10%)

Frequency   50/60 Hz (± 3%)

Power consump-   200 W
tion

Fuse   2.0 ATH

13.8   Reference conditions

Ambient temp-erature	+25 °C (±3 °C)
Supply voltage	230 V
Relative moisture	≤ 60%
Device status	> 30 min into operation
Validity	After adjustment

13.9   Ambient conditions

Nominal function range	+5 to +45 °C at max. 80% relative humidity, non-condensing
Storage	+5 to +45 °C at max. 80% relative humidity, non-condensing
Altitude / Pressure range	Max. 2,000 m.a.s.l. sea level / min. 800 mbar
Overvoltage category	II
Pollution degree	2

13.10   Dimensions

Width	0.28 m
Height	0.45 m
Depth	0.44 m
Weight	12.03 kg (without accessories)
Material	
Housing	Upper part: PUR Rack, lift, base, rear: metal, surface-treated

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