# 888 Titrando



c (HCl) = 0.1 mol/L

20 mL

Metrohm

888 Titrando

iTrode ready

Metrohm

801 Stirrer

Metrohm

Manual

8.888.8004EN

Ω Metrohm

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# 888 Titrando

# Manual

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# 1 Introduction

## 1.1 The Titrando system

The Titrando is the heart of the modular Titrando system. Operation is carried out either by Touch Control with a touch-sensitive screen ("stand-alone titrator") or by a computer with a corresponding software.

A Titrando system can contain numerous kinds of a variety of instruments. The following figure provides an overview of the peripheral devices you can connect to the 888 Titrando.
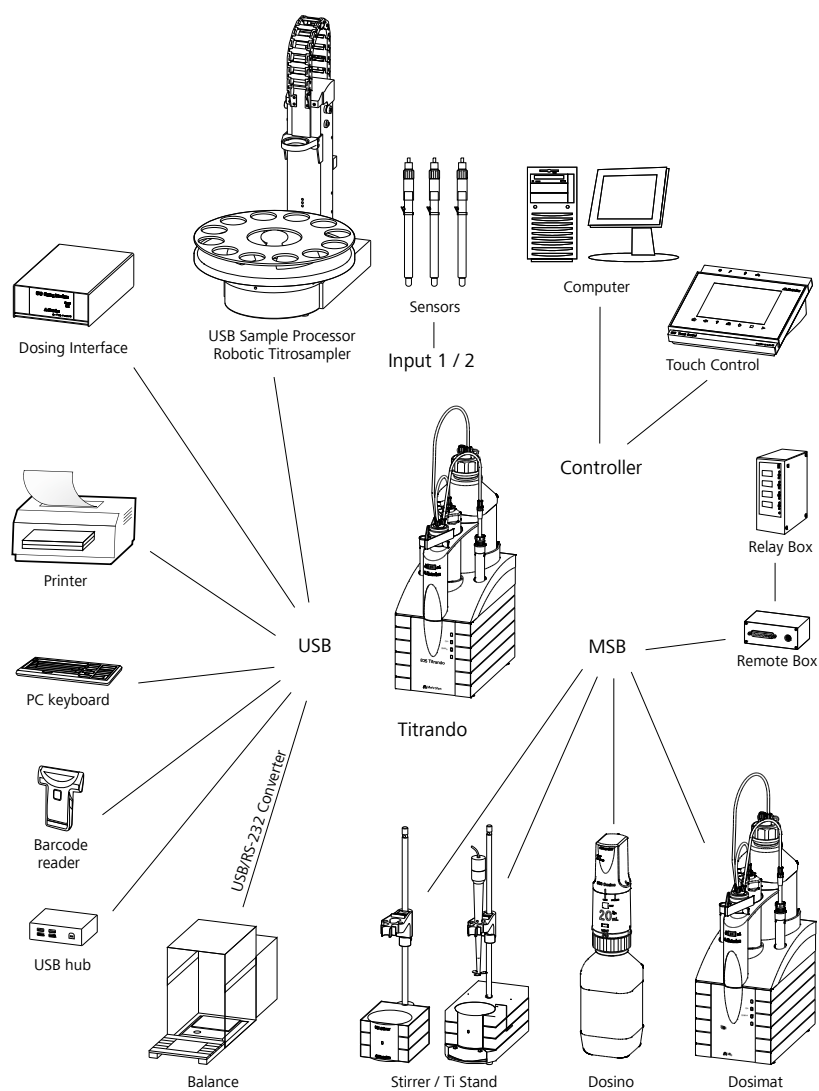


*Figure 1    The Titrando system*

Up to three control instruments (Titrando, Dosing Interface, USB Sample Processor, etc.) can be controlled via USB connection during operation with the 900 Touch Control.

You can request information on special applications in the "Application Bulletins" and "Application Notes", available free of charge through the responsible Metrohm representative. Various monographs on the subjects of titration techniques and electrodes are also available.

Updating the device software is described in the Help for the corresponding PC software.

## 1.2  Instrument description

The 888 Titrando has the following characteristics:

- **Operation**
  Operation is carried out by means of a touch-sensitive Touch Control or with high-performance PC software.
- **Dosing**
  An internal dosing drive for exchange units.
- **MSB connectors**
  Four MSB connectors (Metrohm Serial Bus) for connecting dosing devices (Dosimat with exchange unit or Dosino with dosing unit), stirrers, titration stands and Remote Boxes.
- **USB connectors**
  Two USB connectors, through which devices such as printers, PC keyboards, barcode readers or additional control instruments (USB Sample Processor, Titrando, Dosing Interface, etc.) can be connected.
- **Measuring interface**
  One measuring input each for:
  - a potentiometric electrode (pH, metal or ion-selective electrode)
  - a separate reference electrode
  - a temperature sensor (Pt1000 or NTC)
  - a polarizable electrode
  - an iConnect (measuring interface for electrodes with integrated data chip, so-called iTrodes)

## 1.3    Titration modes – Measuring modes – Dosing commands

The 888 Titrando supports the following titration modes, measuring modes and dosing commands:

- **DET**
  Dynamic equivalence point titration. The reagent addition is carried out in variable volume steps.
  Measuring modes:
    - **pH** (pH measurement)
    - **U** (potentiometric voltage measurement)
    - **Ipol** (voltametric measurement with selectable polarization current)
    - **Upol** (amperometric measurement with selectable polarization voltage)

- **MET**
  Monotonic equivalence point titration. The reagent addition is carried out in constant volume steps.
  Measuring modes:
    - **pH** (pH measurement)
    - **U** (potentiometric voltage measurement)
    - **Ipol** (voltametric measurement with selectable polarization current)
    - **Upol** (amperometric measurement with selectable polarization voltage)

- **SET**
  Endpoint titration at one or two specified endpoints.
  Measuring modes:
    - **pH** (pH measurement)
    - **U** (potentiometric voltage measurement)
    - **Ipol** (voltametric measurement with selectable polarization current)
    - **Upol** (amperometric measurement with selectable polarization voltage)

- **MEAS**
  The following measuring modes can be selected for measurements:
    - **pH** (pH measurement)
    - **U** (potentiometric voltage measurement)
    - **Ipol** (voltametric measurement with selectable polarization current)
    - **Upol** (amperometric measurement with selectable polarization voltage)
    - **T** (temperature measurement)

- **CAL**
  Electrode calibration.
  Measuring mode:
    - **pH** (calibration of pH electrodes)
- **Dosing commands**
  The following commands for dosing can be selected:
    - **PREP** (rinsing the cylinder and tubings of an exchange unit or dosing unit)
    - **EMPTY** (emptying the cylinder and tubings of a dosing unit)
    - **ADD** (dosing a specified volume)

# 1.4 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.

## 1.4.1 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. |
| ℹ | **NOTE** |
| | This symbol highlights additional information and tips. |

## 1.5    Safety instructions

### 1.5.1    General notes on safety

⚠ **WARNING**

This instrument may only be operated in accordance with the specifications in this documentation.

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

### 1.5.2    Electrical safety

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

⚠ **WARNING**

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

> **WARNING**
>
> Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.
>
> There are no parts inside the housing which can be serviced or replaced by the user.

**Mains voltage**

> **WARNING**
>
> An incorrect mains voltage can damage the instrument.
>
> Only operate this instrument with a mains 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 mains cable out of the mains connection socket before you set up or disconnect electrical plug connections at the rear of the instrument.

### 1.5.3 Working with liquids

> **CAUTION**
>
> Periodically check all system connections for leaks. Observe the relevant regulations in respect to working with flammable and/or toxic fluids and their disposal.

### 1.5.4    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.

### 1.5.5    Recycling and disposal
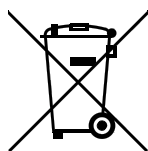
This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

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

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

# 2 Overview of the instrument



*Figure 2     Front 888 Titrando*

| **1** | **Guide openings** | **2** | **Piston rod** |
|---|---|---|---|
| | For centering the exchange unit. | | Moves the piston of the exchange unit up and down. |

| **3** | **Contact pins** | **4** | **Coupling** |
|---|---|---|---|
| | For the data chip. | | For switching the flat stopcock. |

| **5** | **"On" LED** | **6** | **"Status" LED** |
|---|---|---|---|
| | Lights up when the Titrando is ready for operation. | | Shows the current status of the internal dosing drive. |

*Figure 3    Rear 888 Titrando*

| 1 | **Type plate** Contains specifications concerning supply voltage, instrument type and serial number. | 2 | **USB connector (USB 1 and USB 2)** USB ports (type A) for connecting printer, keyboard, barcode reader, additional Titrandos, USB Sample Processor, etc. |
|---|---|---|---|
| 3 | **Connector (Controller)** For connecting a Touch Control or a PC with installed PC software. Mini DIN, 9-pin. | 4 | **MSB connector (MSB 1 to MSB 4)** Metrohm Serial Bus. For connecting external dosing devices, stirrers or Remote Boxes. Mini DIN, 9-pin. |
| 5 | **Power socket** | 6 | **Measuring interface 1 (Input 1)** |
| 7 | **Electrode connector (Ind.)** For connecting pH, metal or ion-selective electrodes with integrated or separated reference electrode. Socket F. | 8 | **Electrode connector (Ref.)** For connecting reference electrodes, e.g. Ag/AgCl reference electrode. Socket B, 4 mm. |
| 9 | **Temperature sensor connector (Temp.)** For connecting temperature sensors (Pt1000 or NTC). Two B sockets, 2 mm. | 10 | **Electrode connector (Pol.)** For connecting polarizable electrodes, e.g. double Pt wire electrodes. Socket F. |
| 11 | **Electrode connector (iConnect)** For connecting electrodes with integrated data chip (iTrodes). | | |

# 3   Installation

## 3.1   Setting up the instrument

### 3.1.1   Packaging

The instrument is supplied in highly protective special 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, free of vibrations, protected from corrosive atmosphere, and contamination by chemicals.

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

## 3.2   Connecting a controller

### 3.2.1   Operation

Two different versions are available for operating the 888 Titrando:

- A Touch Control with touch-sensitive screen. It forms a "stand-alone instrument" together with the 888 Titrando.
- A computer enables operation of the 888 Titrando with the help of a PC software, e.g. *tiamo*.

> ⓘ **CAUTION**
>
> Take care to ensure that the power supply cable is pulled out of the power socket before either setting up or disconnecting connections between the instruments.

### 3.2.1.1    Connecting a Touch Control

> **NOTE**
>
> The plug is protected against accidental disconnection of the cable by means of a pull-out protection feature. If you wish to pull out the plug, you will first need to pull back the outer plug sleeve marked with arrows.

Connect the Touch Control as follows:

**1** ▪ Insert the plug of the Touch Control connection cable into the **Controller** socket.
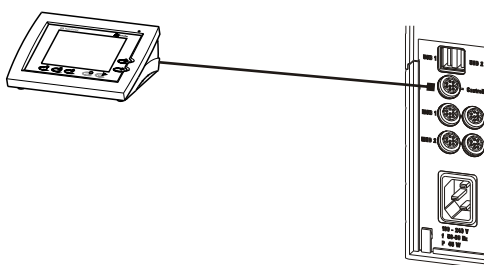


*Figure 4    Connecting the Touch Control*

**2** ▪ Connect the MSB devices *(see Chapter 3.3, page 14)*.
  ▪ Connect the USB devices *(see Chapter 3.4, page 18)*.

**3** ▪ Connect the Titrando to the power supply.

**4** ▪ Switch on the Touch Control.

The Touch Control power supply is supplied through the Titrando. Automatic system tests are performed on both instruments at the time of activation. The **On** LED on the front of the Titrando lights up when the system test has been completed and the instrument is ready for operation.

> ⓘ **CAUTION**
>
> The Touch Control must be shut down properly by deactivation with the power switch on the rear of the instrument before the power supply is interrupted. If this is not done, then there is a danger of data loss. Because of the fact that the power supply for the Touch Control is provided through the Titrando, you must never disconnect the Titrando from the power supply (e.g. by deactivating with a connector strip) before you have deactivated the Touch Control.

If you would prefer not to position the Touch Control directly next to the Titrando, then you can lengthen the connection with the 6.2151.010 cable. The maximum connection length permitted is 5 m.

### 3.2.1.2 Connecting a computer

The 888 Titrando requires a USB connection to a computer in order to be able to be controlled by a PC 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 device.

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 888 Titrando is recognized by the PC software. To accomplish this, you must comply with the procedures specified. The following steps are necessary:

**1 Installing the software**

- Insert the PC 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 3.3, page 14* and *see Chapter 3.4, page 18*.
- Connect the instrument to the power supply if you have not already done this.
  The "On" LED on the 888 Titrando is not yet illuminated!
- 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.
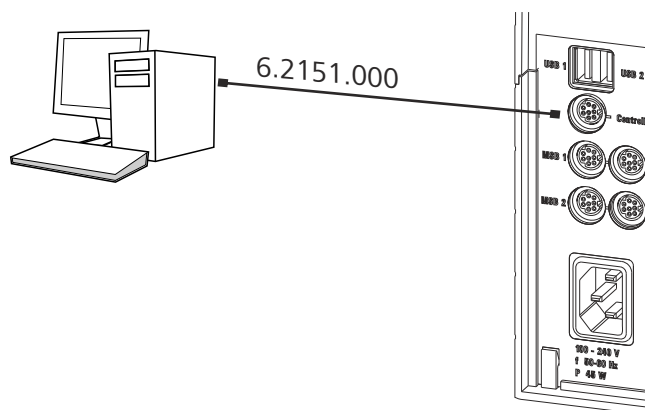
*Figure 5    Connecting the computer*

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.

The "On" LED on the 888 Titrando lights up when the driver installation has been completed and the instrument is ready for operation.

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

**NOTE**

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 will first need to pull back the outer plug sleeve marked with arrows.
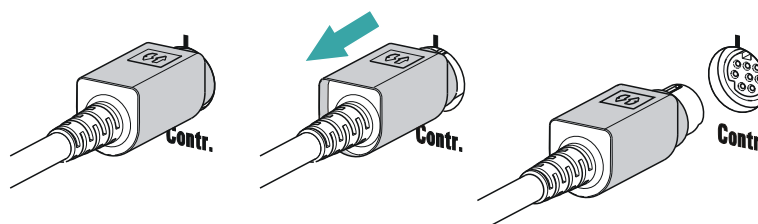


**Registering and configuring the instrument in the PC software**

The instrument must be registered in the configuration of your PC 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 PC 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 PC software.

## 3.3 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.
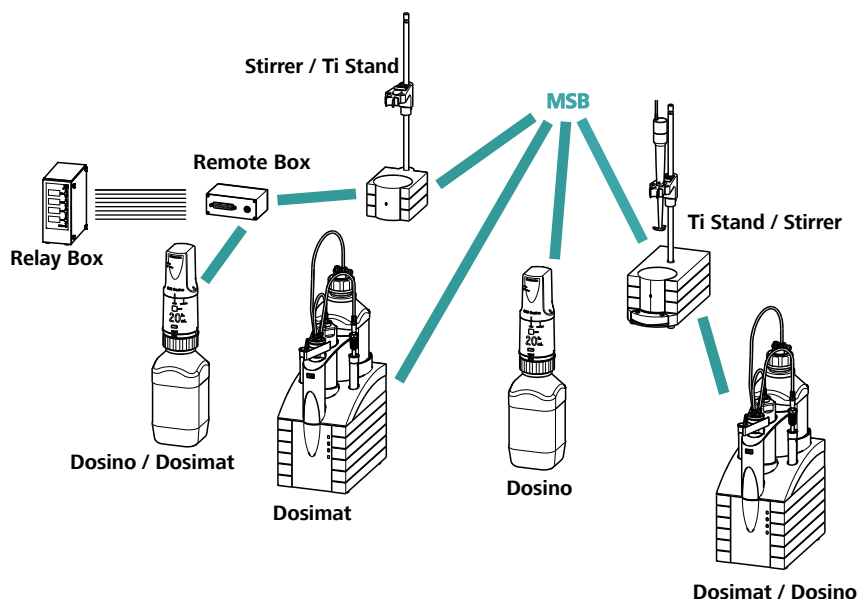


*Figure 6      MSB connections*

The control instrument determines which peripheral devices are supported.

**NOTE**

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.
- Type 700 Dosino and 685 Dosimat dosing devices cannot be connected together with other MSB instruments on a shared connector. These dosing devices must be connected separately.

**CAUTION**

Exit the control software before you plug in MSB instruments. 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.

### 3.3.1 Connecting a dosing device

Three dosing devices can be connected to the instrument (**MSB 2 to MSB 4**).

**NOTE**

The dosing device connected via MSB can be used only for simple volume additions, not for titrations.

The types of dosing devices that are supported are:

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

Proceed as follows:

**1 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 instrument.

■ Start the control software.
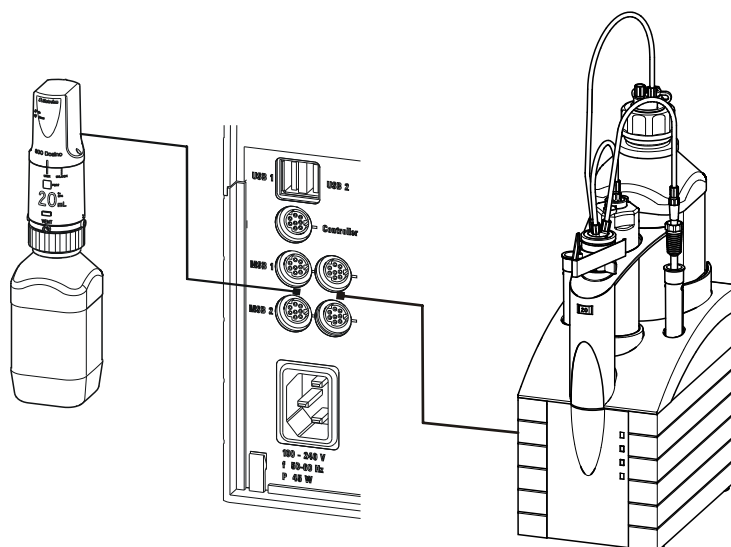


*Figure 7    Connecting a dosing device*

### 3.3.2    Connecting a stirrer or titration stand

You can use the following instruments:

■ With built-in magnetic stirrer (stirring "from below"):
  – 801 Stirrer
  – 803 Ti Stand
■ Without built-in magnetic stirrer (stirring "from above"):
  – 804 Ti Stand with propeller 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 propeller stirrer to the stirrer connector (socket with stirrer symbol) of the titration stand.
■ Start the control software.
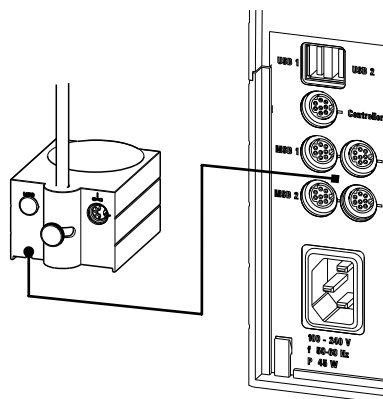
*Figure 8    Connecting an MSB stirrer*
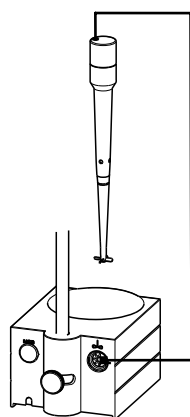


*Figure 9    Connecting the propeller stirrer to the titration stand*

### 3.3.3    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 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. No exchange of data is possible, however.

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.
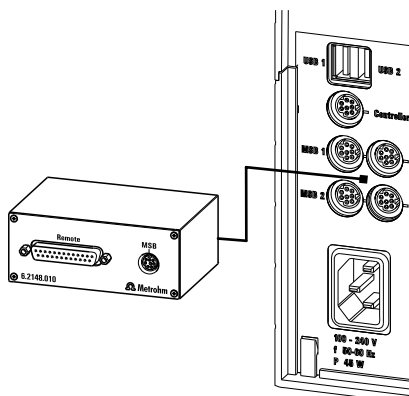


*Figure 10    Connecting the Remote Box*

You can, for example, connect an 849 Level Control (fill level monitoring in a canister) or a 731 Relay Box (switch box for 230/110 volt alternating current sockets and low-voltage direct current outlets). 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.

## 3.4    **Connecting USB devices**

### 3.4.1    **General**

The 888 Titrando has two USB connectors (type A sockets) for peripheral devices with USB interfaces. The Titrando functions as a USB hub (distributor) no matter how it is operated. If you wish to connect more than two devices to the USB, you can also use an additional, commercially available USB hub.

> **CAUTION**
>
> If you operate the 888 Titrando with the aid of the Touch Control, take care to ensure that the Touch Control is switched off when you set up or disconnect connections between the various instruments. If you use a PC software to control the 888 Titrando, you should exit the program before you set up or disconnect the USB connections.

## 3.4.2 Connecting a USB hub

If you wish to connect more than two devices to the USB connector of the 888 Titrando, you can also use an additional commercially available USB hub (distributor). If you operate the 888 Titrando with the help of the Touch Control, then you should use a USB hub with its own power supply.

Connect the USB hub as follows:

**1** Switch off the Touch Control and/or exit the PC software.

**2** With the aid of the 6.2151.020 cable, connect the USB connector of the 888 Titrando (type A) with the USB connector of the hub (type B, see manual for the hub).

**3** Switch on the Touch Control.

The USB hub is recognized automatically.

## 3.4.3 Connecting a printer

Printers that are connected to the 888 Titrando with Touch Control must meet the following requirements:

- Printer languages: HP-PCL (PCL 3 to 5, PCL 3GUI), Canon BJL Commands or Epson ESC P/2
- Printer resolution: 300 dots/inch or 360 dots/inch (Epson)
- Paper size: A4 or Letter, single-sheet feed.

Connect the printer as follows:

**1** Switch off the Touch Control.

**2** With the aid of the 6.2151.020 cable, connect the USB connector of the 888 Titrando (type A) with the USB connector of the printer (type B, see manual for the printer).

**3** Switch on the printer first, then the Touch Control.

**4** Configure the printer in the device manager of the Touch Control (see Touch Control manual).
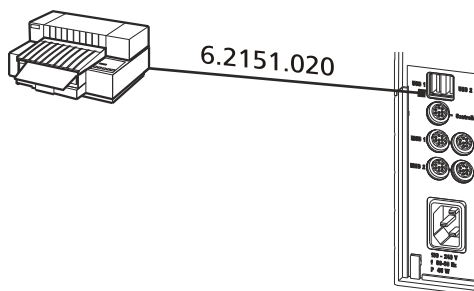
*Figure 11    Connecting a printer*

### 3.4.4    Connecting a balance

- ▪ Operation with a PC software:
  - – Connect the balance directly to the serial connector (COM) of the computer. This is usually 9-pin and marked with the symbol **IOIOI**.
- ▪ Operation with Touch Control:
  - – You will need the 6.2148.050 USB/RS-232 adapter to connect a balance.

The following table offers an overview of the balances that you can use together with the 888 Titrando and of which cable you will need for connection to the RS-232 interface:

| Balance | Cable |
|---|---|
| AND ER, FR, FX with RS-232 interface (OP-03) | 6.2125.020 + 6.2125.010 |
| Mettler AB, AG, PR (LC-RS9) | In the scope of delivery for the balance |
| Mettler AM, PM, PE with interface option 016 or Mettler AJ, PJ with interface option 018 | 6.2146.020 + 6.2125.010 Also from Mettler: ME 47473 adapter and either ME 42500 hand switch or ME 46278 foot switch |
| Mettler AT | 6.2146.020 + 6.2125.010 Also from Mettler: ME 42500 hand switch or ME 46278 foot switch |
| Mettler AX, MX, UMX, PG, AB-S, PB-S, XP, XS | 6.2134.120 |

| Balance | Cable |
|---|---|
| Mettler AE with interface option 011 or 012 | 6.2125.020 + 6.2125.010<br><br>Also from Mettler: ME 42500 hand switch or ME 46278 foot switch |
| Ohaus Voyager, Explorer, Analytical Plus | Cable AS017-09 from Ohaus |
| Precisa balances with RS-232-C interface | 6.2125.080 + 6.2125.010 |
| Sartorius MP8, MC, LA, Genius, Cubis | 6.2134.060 |
| Shimadzu BX, BW | 6.2125.080 + 6.2125.010 |

**Operation with Touch Control**

Connect the balance as follows:

**1** Plug in the USB plug of the USB/RS-232 adapter at the USB connector of the 888 Titrando.

**2** Connect the RS-232 interface of the USB/RS-232 adapter with the RS-232 interface of the balance (see table for cable).

**3** Switch on the Touch Control.

**4** Switch on the balance.

**5** Activate the RS-232 interface of the balance if necessary.

**6** Configure the RS-232 interface of the USB/RS-232 adapter in the device manager of the Touch Control (see Touch Control manual).

### 3.4.5 Connecting a PC keyboard (only for operation with Touch Control)

The PC keyboard is used as an aid for text and numerical input.

Connect the PC keyboard as follows:

**1** Insert the USB plug of the keyboard into one of the USB sockets of the 888 Titrando.

**2** Switch on the Touch Control.

The keyboard is recognized automatically and entered in the device manager.

**3** Configure the keyboard in the device manager of the Touch Control (see Touch Control manual).

### 3.4.6 Connecting a barcode reader

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

**Operation with Touch Control**

Connect the barcode reader as follows:

**1** Insert the USB plug of the barcode reader into one of the USB sockets of the 888 Titrando.

**2** Switch on the Touch Control.

The barcode reader is recognized automatically and entered in the device manager.

**3** Configure the barcode reader in the device manager of the Touch Control (see Touch Control manual).

**Settings on the barcode reader:**

Program the barcode reader as follows (see also the manual for the barcode reader):

**1** Switch the barcode reader to programming mode.

**2** Specify the desired layout for the keyboard (USA, Germany, France, Spain, German-speaking Switzerland).

This setting must match the setting in the device manager (see the Touch Control manual).

**3** Make sure that the barcode reader is set in such a way that Ctrl characters (ASCII 00 to 31) can be sent.

**4** Program the barcode reader in such a way that the ASCII character 02 (STX or Ctrl B) is sent as the first character. This first character is normally referred to as the "Preamble" or "Prefix Code".

**5** Program the barcode reader in such a way that the ASCII character 04 (EOT or Ctrl D) is sent as the last character. This last character is normally referred to as the "Postamble", "Record Suffix" or "Postfix Code".

**6** Exit the programming mode.

## 3.5 Connecting sensors

The measuring interface contains the following measuring inputs:

- **Ind.** for a potentiometric electrode (pH, metal or ion-selective electrode)
- **Ref.** for a separate reference electrode
- **Temp.** for a temperature sensor (Pt1000 or NTC)
- **Pol.** for a polarizable electrode
- **iConnect** for an iConnect (measuring interface for electrodes with integrated data chip, so-called iTrodes)

### 3.5.1 Connecting a pH, metal or ion-selective electrode

Connect the pH, metal or ion-selective electrode as follows:

**1** Plug the electrode plug into the **Ind.** socket of the 888 Titrando.



*Figure 12    Connecting a pH, metal or ion-selective electrode*

> **ℹ** **NOTE**
>
> The electrode cable is protected against accidental disconnection of the cable by means of a pull-out protection. If you wish to pull out the plug again, you will first need to pull back the outer plug sleeve.

### 3.5.2    Connecting a reference electrode

Connect the reference electrode as follows:

**1** Plug the electrode plug into the **Ref.** socket of the 888 Titrando.



*Figure 13    Connecting a reference electrode*

### 3.5.3    Connecting a polarizable electrode

Connect the polarizable electrode as follows:

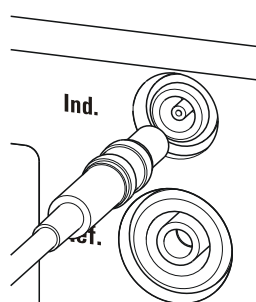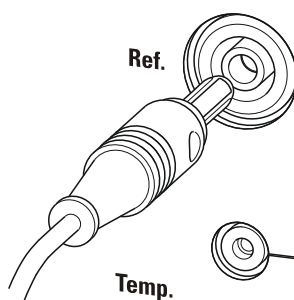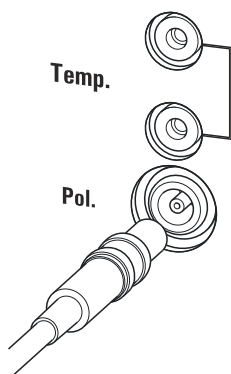**1** Plug the electrode plug into the **Pol.** socket of the 888 Titrando.



*Figure 14    Connecting a polarizable electrode*

> **NOTE**
>
> The electrode cable is protected against accidental disconnection of the cable by means of a pull-out protection. If you wish to pull out the plug again, you will first need to pull back the outer plug sleeve.

### 3.5.4 Connecting a temperature sensor or an electrode with integrated temperature sensor

A temperature sensor of the Pt1000 or NTC type can be connected to the **Temp.** connector.

Connect the temperature sensor or the electrode with integrated temperature sensor as follows:

**1** Insert the plugs of the temperature sensor into the **Temp.** sockets of the Titrando.
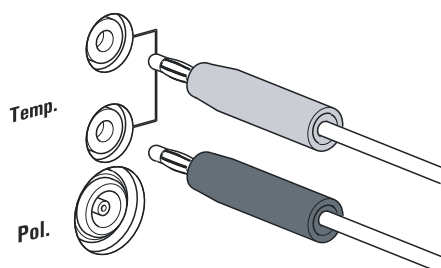


*Figure 15    Connecting a temperature sensor or an electrode with integrated temperature sensor*

> **NOTE**
>
> Always insert the red plug into the red socket. This is the only way that shielding against electrical interference can be ensured.

### 3.5.5 Connecting an iConnect

An external 854 iConnect measuring interface can be connected to the 888 Titrando.

Connect the iConnect as follows:

**1** Plug the iConnect plug into the **iConnect** socket of the 888 Titrando.

Take care to ensure that the marking on the plug matches the marking on the Titrando as shown in the figure.
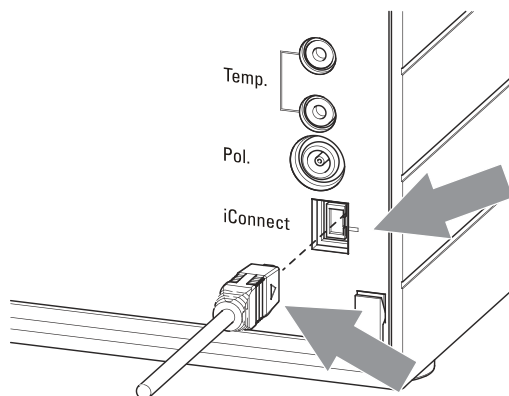


*Figure 16      Connecting the iConnect*

The iConnect is detected automatically and entered as measuring input into the device properties of the Titrando. If an electrode is connected to the iConnect that is not yet included in the list of sensors for the control software, then a corresponding message will be displayed.

The iConnect can be plugged in and unplugged while the Titrando is switched on.

An electrode with integrated data chip, referred to as iTrode, is connected to the iConnect.

Connect the electrode as follows:

**1**  Remove the protective caps on the iConnect and the electrode.

**2**  Plug in the electrode on the iConnect as illustrated below.
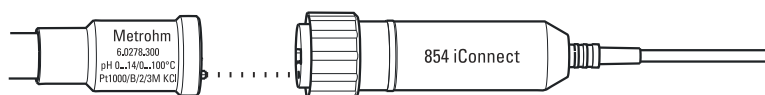


*Figure 17      Connecting an electrode to the iConnect*

The guide pin guarantees correct connection in such a way that the contact pins cannot be damaged.

**3**  Screw the iConnect tightly.

### 3.5.6      Differential potentiometry

Potentiometric measurements with high-ohm measuring chains can be disrupted by electrostatic and electromagnetic fields in media with low conductivity. Use our 6.0229.100 Solvotrode or other special electrodes for pH measurements in organic solvents. If no reliable measurements are possible with these, then a 6.5104.030 (230 V) or 6.5104.040 (115 V) differential amplifier can be used. The differential amplifier is connected to the high-ohm measuring input (**Ind.**).

# 4 Working with the exchange unit

The exchange unit (806 Exchange Unit) has an integrated data chip that makes it possible to store data about the exchange unit and for the reagent. The data is edited in the Touch Control or in the PC software. The start-up of the exchange unit is described in the manual for the exchange unit.
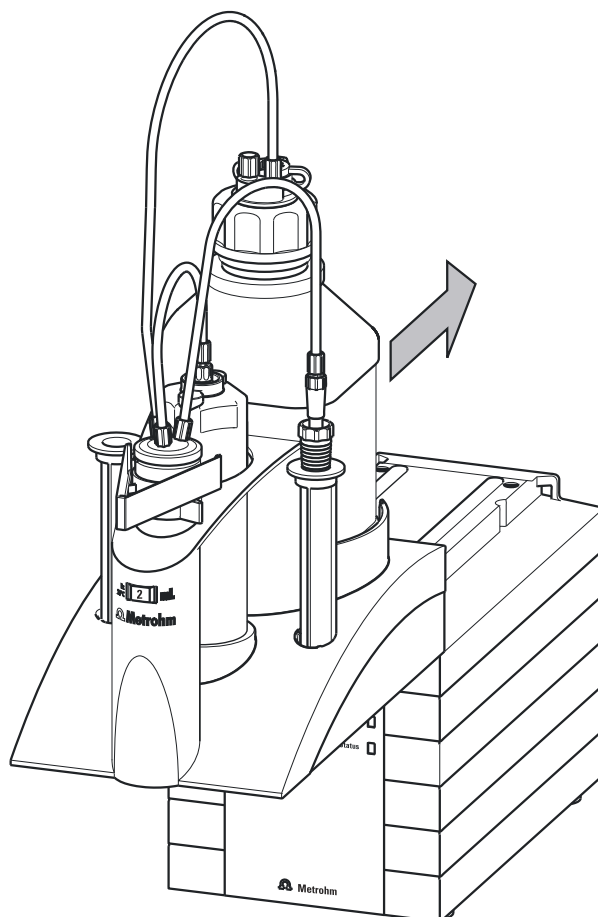


*Figure 18    Attaching the exchange unit*

Proceed as follows to attach the exchange unit:

**1** Attach the exchange unit from the front onto the 888 Titrando and push it all the way to the rear.

It must snap in audibly.

If the exchange unit is attached correctly, its initialization is activated by a microswitch which is triggered by the guide bolts of the exchange unit. The exchange unit is recognized and the data is read out automatically from the data chip. The 888 Titrando carries out an

automatic rotation of the flat stopcock and then returns it to the exchange position (dosing position). The **Status** LED will be continuously illuminated once this has been accomplished.

The following table contains a summary of which operating statuses of the internal dosing device are displayed by the **Status** LED:

| Status of the "Status" LED | Description |
|---|---|
| off | No exchange unit is attached. |
| constant illumination | The exchange unit has been correctly attached and recognized and can now be used for dosing and titration. The flat stopcock is in the exchange position, i.e. the exchange unit can be removed. |
| slow flashing | ■ The exchange unit is currently being used for dosing or filling.<br>■ An intelligent exchange unit has been attached and the data on the integrated data chip is currently either being read out or written. |
| rapid flashing | Error on the dosing drive, consult the "Troubleshooting" chapter. |

# 5 Operation and maintenance

## 5.1 General notes

### 5.1.1 Care

The 888 Titrando requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the lifetime of the otherwise sturdy mechanics and electronics.

Spilled chemicals and solvents should be removed immediately. Above all, the plug connections on the rear of the instrument (in particular the power socket) should be protected from contamination.

---

**CAUTION**

Although this is extensively prevented by design measures, the power plug should be unplugged immediately if aggressive media have penetrated the inside of the instrument, so as to avoid serious damage to the instrument electronics. In such cases, Metrohm Service must be informed.

---

### 5.1.2 Maintenance by Metrohm Service

Maintenance of the 888 Titrando is best carried out as part of an annual service, which is performed by specialist personnel of the Metrohm company. If working frequently with caustic and corrosive chemicals, a shorter maintenance interval could be necessary.

Metrohm Service offers every form of technical advice for maintenance and service of all Metrohm instruments.

## 5.2 Quality Management and qualification with Metrohm

**Quality management**

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software. Further information on this can be found in the brochure **"Metrohm Quality Management"** available from your local Metrohm representative.

**Qualification**

Please contact your local Metrohm representative for support in qualification of instruments and software. The **Installation Qualification** (IQ) and **Operational Qualification** (OQ) are offered by Metrohm representatives as a service. They are carried out by trained employees using standardized qualification documents and in accordance with the currently applicable requirements of the regulated industry. Further information on this can be found in the brochure **"Analytical Instrument Qualification – Confidence in quality with IQ/OQ"**.

**Maintenance**

The electronic and mechanical functional groups of Metrohm instruments can and should be checked by specialist personnel from Metrohm as part of a regular preventive maintenance schedule. Please ask your local Metrohm representative regarding the precise terms and conditions involved in concluding a corresponding maintenance agreement. Further information on this can be found in the brochure **"Metrohm Care Contracts – Protect your investment the smart way"** available from your local Metrohm representative.

# 6  Troubleshooting

## 6.1  General

| Problem | Cause | Remedy |
|---|---|---|
| **The "On" LED is not illuminated, even though the instrument is connected to the power supply.** | *The Touch Control or the computer has not been switched on yet or the plugs are not correctly plugged in.* | 1. Check the plug connections. <br> 2. Switch on the Touch Control or the computer. |
| **It is not possible to attach the exchange unit.** | *The flat stopcock of the exchange unit is not in the exchange position.* | Move the green switching lever to the right until it stops. |
| | *The piston rod in the exchange unit is not in the correct position.* | Move the piston rod into the correct position (see the manual for the exchange unit). |
| **The exchange unit can not be removed and the "Status" LED is flashing slowly.** | *The exchange unit is currently being used for dosing or filling.* | ■ Wait until the procedure has been completed. <br> ■ Cancel the procedure manually. |
| **Die "Status" LED does not light up, even though an exchange unit is attached.** | *The exchange unit has not been attached correctly.* | Remove the exchange unit and then attach it once again (it must snap in audibly). The LED flashes while data is read out from an intelligent exchange unit (806 Exchange Unit) and lights up constantly if the exchange unit has been recognized correctly. |
| **The "Status" LED flashes rapidly.** | *The dosing drive is overloaded because the flat stopcock is jammed.* | 1. Switch off the Touch Control or exit the PC software. <br> 2. Check whether the exchange unit can be removed. <br>    a. If not, move the green switching lever to the right until it stops. <br> 3. Attempt once more to remove the exchange unit; perform maintenance on it afterwards (see the manual for the exchange unit). |
| | *The dosing drive is overloaded because the piston is jammed.* | 1. Switch the control instrument off and then back on again. |

| Problem | Cause | Remedy |
|---|---|---|
| | | 2. Remove and clean the exchange unit (see the chapter in the manual for the exchange unit, "Care and upkeep"). |
| | | 3. Contact your local Metrohm Service department if necessary. |
| | *The data of the exchange unit can no longer be read. The data chip is damaged, either mechanically or by chemical action.* | ■ Contact your local Metrohm Service department to have the data chip replaced. |
| | | ■ If necessary, remove the data chip yourself so that the exchange unit can continue to be used in the meantime. |

## 6.2    SET titration

| Problem | Cause | Remedy |
|---|---|---|
| **The titration will not be finished.** | *The minimum dosing rate is too low.* | Select the user-defined titration rate and increase the minimum rate (see manual/help of the software used). |
| | *The stop criterion is unsuitable.* | Adjust the control parameters (see manual/ help of the software used): |
| | | ■ Increase the stop drift. |
| | | ■ Select a short delay time. |
| **The sample is over-titrated.** | *The control parameters are unsuitable.* | Adjust the control parameters (see manual/ help of the software used): |
| | | ■ Select Titration rate = **slow**. |
| | | ■ Select the user-defined titration rate and increase the control range. |
| | | ■ Select the user-defined titration rate and reduce the maximum rate. |
| | | ■ Select the user-defined titration rate and reduce the minimum rate. |
| | | ■ Stir faster. |
| | | ■ Arrange the electrode and buret tip to an optimum. |
| | *The electrode responds too slowly.* | Replace the electrode. |
| **The titration time is too long.** | *The control parameters are unsuitable.* | Adjust the control parameters (see manual/ help of the software used): |
| | | ■ Select Titration rate = **optimal** or **fast**. |

| Problem | Cause | Remedy |
|---|---|---|
| | | ■ Select the user-defined titration rate and decrease the control range.<br>■ Select the user-defined titration rate and increase the maximum rate.<br>■ Select the user-defined titration rate and increase the minimum rate. |
| **The results are spread widely.** | *The minimum dosing rate is too high.* | Select user-defined titration rate and decrease the minimum rate (see manual/help of the software used). |
| | *The electrode responds too slowly.* | Replace the electrode. |

# 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 Titrando.
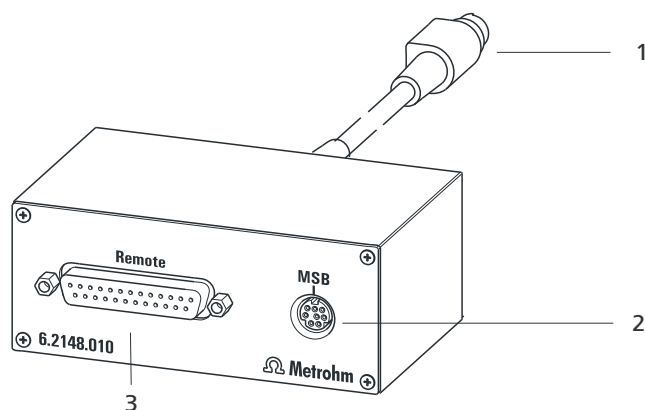


*Figure 19    Connectors of the Remote Box*

| **1** | **Cable** | **2** | **MSB connector** |
|---|---|---|---|
| | For connecting to the Titrando. | | Metrohm Serial Bus. For connecting external dosing devices or stirrers. |

| **3** | **Remote connector** |
|---|---|
| | For connecting instruments with a remote interface. |

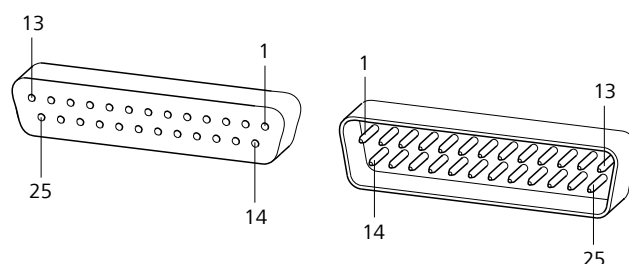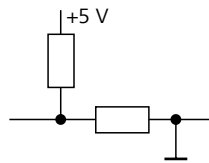### 7.1.1 Pin assignment of the remote interface



*Figure 20    Pin assignment of remote socket and remote plug*

The above figure of the pin assignment applies for all Metrohm instruments with 25-pin D-Sub remote connector.

**Inputs**



approx. 50 kΩ Pull-up

$t_p > 20$ ms

active = low, inactive = high

**Outputs**
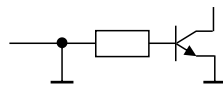


Open Collector

$t_p > 200$ ms

active = low, inactive = high

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

+5 V: maximum load = 20 mA

The following tables offer information concerning the assignment of the individual pins and their function:

*Table 1    Inputs and outputs of the remote interface*

| Assignment | Pin No. | Function[*] |
|---|---|---|
| Input 0 | 21 | **Start** |
| Input 1 | 9 | **Stop** |
| Input 2 | 22 | |
| Input 3 | 10 | **Quit** |
| Input 4 | 23 | **–** |
| Input 5 | 11 | |
| Input 6 | 24 | |
| Input 7 | 12 | |
| Output 0 | 5 | **Ready** |
| Output 1 | 18 | **Conditioning OK** |
| Output 2 | 4 | **Determination** |
| Output 3 | 17 | **EOD** |
| Output 4 | 3 | |
| Output 5 | 16 | **Error** |
| Output 6 | 1 | |
| Output 7 | 2 | **Warning** |

| Assignment | Pin No. | Function* |
|---|---|---|
| Output 8 | 6 | |
| Output 9 | 7 | |
| Output 10 | 8 | |
| Output 11 | 13 | |
| Output 12 | 19 | |
| Output 13 | 20 | |
| 0 volts / GND | 14 | |
| +5 volts | 15 | |
| 0 volts / GND | 25 | |

* Signal activated only for operation with Touch Control.

*Table 2    Explanation of the individual functions*

| Function | Explanation |
|---|---|
| **Start** | The current method is started at the time of activation.<br><br>$t_{pulse} > 100$ ms |
| **Stop** | The current method is canceled (Stop) at the time of activation.<br><br>$t_{pulse} > 100$ ms |
| **Quit** | The current command in the determination run will be canceled at the time of activation.<br><br>$t_{pulse} > 100$ ms |
| **Ready** | The instrument is ready to receive a start signal. |
| **Conditioning OK** | The line is set when Conditioning with SET titration and KFT titration is at OK. The line remains set until the determination is started with **[START]**. |
| **Determination** | The instrument performs a data-generating determination. |
| **EOD** | **E**nd **o**f **D**etermination.<br><br>Pulse ($t_{pulse} = 200$ ms) after a determination or after a buffer/standard solution during calibration using a Sample Processor. |
| **Error** | The line is set for error message display. |

Remote interface

| Function | Explanation |
|----------|-------------|
| **Warning** | The line is set for warning message display. |

# 8 Technical specifications

## 8.1 Measuring interface

The 888 Titrando has one galvanically isolated measuring interface.

The measuring cycle is 100 ms for all measuring modes.

### 8.1.1 Potentiometry

One high-ohm measuring input (**Ind.**) for pH, metal or ion-selective electrodes and one measuring input (**Ref.**) for separate reference electrodes.

| | |
|---|---|
| *Input resistance* | $> 1 \cdot 10^{12} \; \Omega$ |
| *Offset current* | $< 1 \cdot 10^{-12}$ A (under reference conditions) |
| *Measuring mode pH* | |
|   *Measuring range* | −13 - +20 pH |
|   *Resolution* | 0.001 pH |
|   *Measuring accuracy* | ±0.003 pH (±1 digit, without sensor error, under reference conditions) |
| *Measuring mode U* | |
|   *Measuring range* | −1,200 - +1,200 mV |
|   *Resolution* | 0.1 mV |
|   *Measuring accuracy* | ±0.2 mV (±1 digit, without sensor error, under reference conditions) |

### 8.1.2 Temperature

A measuring input (**Temp.**) for temperature sensors of the Pt1000 or NTC type with automatic temperature compensation.

R (25 °C) and B value can be configured for NTC sensors.

| | |
|---|---|
| *Measuring range* | |
|   *Pt1000* | −150 - +250 °C |
|   *NTC* | −5 - +250 °C (R (25 °C) = 30,000 $\Omega$ and B (25/50) = 4,100 K) |
| *Resolution* | |
|   *Pt1000* | 0.1 °C |

| *NTC* | 0.1 °C |
|---|---|

*Measuring accu-*
*racy*

| *Pt1000* | ±0.2 °C |
|---|---|
| | (Applies for measuring range −20 - +150 °C; ±1 digit; without sensor error, under reference conditions) |
| *NTC* | ±0.6 °C |
| | (Applies for measuring range +10 - +40 °C; ±1 digit; without sensor error, under reference conditions) |

### 8.1.3    Polarizer

One measuring input (**Pol.**) for polarizable electrodes.

| *Measuring mode* *Ipol* | Determination with adjustable polarization current |
|---|---|
| *Polarization* *current* | −122.5 - +122.5 µA (increment: 0.5 µA) −125.0 - +125.0 µA: non-guaranteed values, dependent on reference voltage +2.5 V |
| *Measuring* *range* | −1,200 - +1,200 mV |
| *Resolution* | 0.1 mV |
| *Measuring* *accuracy* | ±0.2 mV (±1 digit, without sensor error, under reference conditions) |
| *Measuring mode* *Upol* | Determination with adjustable polarization voltage |
| *Polarization* *voltage* | −1,225 - +1,225 mV (increment: 25 mV) −1,250 - +1,250 mV: non-guaranteed values, dependent on reference voltage +2.5 V |
| *Measuring* *range* | −120 - +120 µA |
| *Resolution* | 0.1 µA |

## 8.2 Internal dosing device

| | |
|---|---|
| *Cylinder volume of the exchange unit* | 1 mL, 5 mL, 10 mL, 20 mL or 50 mL |
| *Resolution* | 20,000 steps per cylinder volume |

## 8.3 Power connection

| | |
|---|---|
| *Supply voltage* | 100 - 240 V |
| *Frequency* | 50 - 60 Hz |
| *Power consumption* | Maximum 45 W |
| *Fuse* | Electronic overload protection |

## 8.4 Safety specifications

| | |
|---|---|
| *Design and testing* | ■ EN/IEC 61010-1<br>■ UL 61010-1<br>■ CSA-C22.2 No. 61010-1<br>■ Protection class I |
| *Safety instructions* | The documentation contains safety instructions which have to be followed by the user in order to ensure safe operation of the instrument. |

## 8.5 Electromagnetic compatibility (EMC)

| | |
|---|---|
| *Emission* | Standards fulfilled:<br>■ EN/IEC 61326-1<br>■ EN/IEC 61000-6-3<br>■ EN/IEC 61000-6-4<br>■ EN 55022 / CISPR 22 |
| *Immunity* | Standards fulfilled:<br>■ EN/IEC 61326-1<br>■ EN/IEC 61000-6-2<br>■ EN/IEC 61000-4-2<br>■ EN/IEC 61000-4-3<br>■ EN/IEC 61000-4-4<br>■ EN/IEC 61000-4-5<br>■ EN/IEC 61000-4-6<br>■ EN/IEC 61000-4-11<br>■ EN/IEC 61000-4-14<br>■ NAMUR |

## 8.6 Ambient temperature

| | |
|---|---|
| *Nominal function range* | +5 - +45 °C |
| *Storage* | −20 - +60 °C |
| *Transport* | −40 - +60 °C |

## 8.7 Reference conditions

| | |
|---|---|
| *Ambient temperature* | +25 °C (± 3 °C) |
| *Relative humidity* | ≤ 60% |
| *Instrument status* | Instrument in operation at least 30 min |
| *Validity of the data* | After adjustment |

## 8.8 Dimensions

| | |
|---|---|
| *Width* | 142 mm |
| *Height* | 227 mm |
| *Depth* | 231 mm |
| *Weight* | 2,817 g |
| *Material (housing)* | Poly(butylene terephthalate) (PBT) |

## 8.9 Interfaces

**USB connectors**

| | |
|---|---|
| *USB ports* | 2 USB downstream ports (type A sockets), 500 mA each, for connecting peripheral devices such as printers, keyboards, barcode readers or RS-232/USB boxes (Metrohm order no. 6.2148.020). |

**Connector "Controller"**

| | |
|---|---|
| *Controller port* | USB upstream port with auxiliary power supply (Mini DIN socket) for connecting Touch Control or computer for controlling the 888 Titrando. |
| *Touch Control* | With integrated Touch Control cable. |
| *Computer* | With 6.2151.000 cable. |

**MSB connectors (Metrohm Serial Bus)**

*Dosing device*    Connector for a maximum of three external dosing devices, models Dosimat or Dosino (MSB 2 to MSB 4). These dosing devices can be used only for simple volume additions, not for titrations.

*Stirrer*    Connector for a maximum of four stirrers.
Stirrer control: switching on/off manually or coordinated with the titration sequence.
Speed in 15 steps and shift direction can be selected.

*Remote Box*    Connector for a maximum of four Remote Boxes. Remote Boxes can be used to actuate and monitor external devices.

# 9  Warranty (guarantee)

Metrohm guarantees that the deliveries and services it provides are free of defects in materials, design or manufacturing.

The general warranty period is 36 months (exclusions below) from the date of delivery or 18 months in the event of continuous operation. The warranty remains valid on the condition that the servicing is provided by a service organization authorized by Metrohm at defined intervals and with a defined scope.

The warranty period for anion suppressors of the type "MSM" is 120 months from the date of delivery or 60 months in the case of continuous operation.

The warranty period for IC separation columns is 90 days after start-up.

For third-party components that are recognizable as such, the manufacturer's warranty regulations apply.

Consumables and materials with limited storage life and glass breakage in the case of electrodes or other glass parts are excluded from the warranty.

Warranty claims cannot be asserted if the ordering party has failed to meet its payment obligations according to schedule.

During the warranty period, Metrohm undertakes either to replace free of charge or to credit the purchaser for any modules or components that can be shown to be faulty. Any transport or customs fees that may apply are the ordering party's responsibility.

The precondition for this is that the ordering party has to specify the article number, the article designation, an adequate error description, the delivery date and (if applicable) the serial number or chip data in the Support Tracker. Metrohm then decides whether a replacement or a credit note is to be issued or whether the faulty part has to be returned using the Return Material Authorization (RMA). If a replacement or credit note is issued, the ordering party undertakes to store the faulty part for at least 24 months in accordance with the current storage directives (in compliance with ESD guidelines) and to hold it in readiness for onsite inspection or for return shipment to Metrohm. Metrohm reserves the right to invoice the ordering party for these articles, including retroactively, in the event of noncompliance with these preconditions.

The same warranty periods that are specified for a corresponding new part apply to parts that are replaced or repaired within the above-mentioned warranty periods. However, replacement or repair of a part does not extend the warranty period of the entire system.

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.

Metrohm also offers a 120 month spare parts availability guarantee and a 60 month PC software support warranty, calculated from the date on which the product is withdrawn from the market. The content of this warranty is the ability of the customer to obtain functioning spare parts or appropriate software support at market prices during the time of the warranty period.

If Metrohm AG is unable to meet this obligation due to circumstances beyond the control of Metrohm AG, then the ordering party shall be offered alternative solutions at preferential conditions.

# 10 Accessories

## 10.1 Scope of delivery

> **NOTE**
>
> Subject to change without notice.

### 10.1.1 888 Titrando with Touch Control 2.888.0110

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 1.888.0010 | **888 Titrando** |
| 1 | 1.801.0010 | **801 Stirrer** |
| | | Magnetic stirrer without stand. With pemanently attached cable for MSB (Metrohm Serial Bus). |
| 1 | 1.840.0100 | **840 Touch Control** |
| | | Operating element with touch-sensitive color display for Titrandos. Standard dialog languages English and German. One further language can be retrofitted. |
| 1 | 6.0262.100 | **Ecotrode Plus** |

Excellent durability in routine work at a fair price

| | |
|---|---|
| Measuring range: | 0...13 |
| Measuring unit: | pH |
| Temperature range (°C): | 0...80 |
| Diaphragm: | Fixed ground-joint diaphragm |
| Shaft length to head (mm): | 125 |
| Reference electrolyte type: | c(KCl) = 3 mol/L |
| Bridge electrolyte type: | c(KCl) = 3 mol/L |
| Temperature sensor: | None |

| Qty. | Order no. | Description |
|---|---|---|
| 1 | 6.1903.020 | **Stirring bar / 16 mm** |

Stirring bar with magnetic core, PTFE coated, length 16 mm

| | |
|---|---|
| Material: | PTFE |
| Outer diameter (mm): | 4 |
| Length (mm): | 16 |

| Qty. | Order no. | Description |
|---|---|---|
| 1 | 6.1903.030 | **Stirring bar / 25 mm** |

Stirring bar with magnetic core, PTFE coated, length 25 mm

| | |
|---|---|
| Material: | PTFE |
| Outer diameter (mm): | 5 |
| Length (mm): | 25 |

| Qty. | Order no. | Description |
|---|---|---|
| 1 | 6.2001.060 | **Base-plate without support rod** |

For mounting stirrers

| Qty. | Order no. | Description |
|---|---|---|
| 1 | 6.2013.010 | **Clamping ring** |

For stand rods of 10 mm diameter

| | |
|---|---|
| Material: | Metal |
| Width (mm): | 20 |
| Height (mm): | 16 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2016.070 | **Support rod / 400 mm** |

Material: Stainless steel 18/9
Outer diameter (mm): 10
Length (mm): 400

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2021.020 | **Electrode holder** |

Electrode holder for 4 electrodes and 2 buret tips
Material: Plastic

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2103.130 | **Adapter red 2 mm plug / 4 mm socket** |

For connecting plug B (4 mm) to 2 mm socket.

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2103.140 | **Adapter black 2 mm plug / B socket 4 mm** |

For connecting plug B (4 mm) to 2 mm socket.

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2104.020 | **Electrode cable / 1 m / F** |

For connecting electrodes with Metrohm plug-in head G to Metrohm instruments (socket F).

Length (m): 1

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2621.070 | **Hexagon key 5 mm** |

5 mm.

Length (mm): 80

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2621.130 | **Hexagon key 2 mm** |

2 mm

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2739.010 | **Wrench** |

For exchange units.

Length (mm): 190

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.3026.220 | **Exchange unit / 20 mL** |

Exchange unit with integrated data chip with 20 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, antidiffusion buret tip and standard amber glass reagent bottle.

    Volume (mL):                  20

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.6051.000 | **CompactFlash card with Titrando methods** |

Memory card with application methods

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2122.0x0 | **Mains cable with C13 line socket**<br>**IEC-60320-C13** |

Cable plug according to customer requirements.

| | | |
|--|--|--|
| Switzerland: | Type SEV 12 | |
| | 6.2122.020 | |
| Germany, …: | Type CEE(7), VII | |
| | 6.2122.040 | |
| USA, …: | Type NEMA/ASA | |
| | 6.2122.070 | |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 8.888.8004EN | **888 Titrando Manual** |

## 10.1.2 888 Titrando with tiamo light 2.888.0210

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 1.888.0010 | **888 Titrando** |
| 1 | 1.801.0010 | **801 Stirrer** |

Magnetic stirrer without stand. With pemanently attached cable for MSB (Metrohm Serial Bus).

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.0262.100 | **Ecotrode Plus** |

Excellent durability in routine work at a fair price

| | |
|---|---|
| Measuring range: | 0...13 |
| Measuring unit: | pH |
| Temperature range: | 0...80 |
| Diaphragm: | Fixed ground-joint diaphragm |
| Shaft length to head (mm): | 125 |
| Reference electrolyte type: | c(KCl) = 3 mol/L |
| Bridge electrolyte type: | c(KCl) = 3 mol/L |
| Temperature sensor: | None |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.1903.020 | **Stirring bar / 16 mm** |

Stirring Bar with magnetic core, PTFE coated, length 16 mm

| | |
|---|---|
| Material: | PTFE |
| Outer diameter (mm): | 4 |
| Length (mm): | 16 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.1903.030 | **Stirring bar / 25 mm** |

Stirring Bar with magnetic core, PTFE coated, length 25 mm

| | |
|---|---|
| Material: | PTFE |
| Outer diameter (mm): | 5 |
| Length (mm): | 25 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2001.060 | **Base-plate without support rod** |

For mounting stirrers

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2013.010 | **Clamping ring** |

For stand rods of 10 mm diameter
| Material: | Metal |
| Width (mm): | 20 |
| Height (mm): | 16 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2016.070 | **Support rod / 400 mm** |

| Material: | Stainless steel 18/9 |
| Outer diameter (mm): | 10 |
| Length (mm): | 400 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2021.020 | **Electrode holder** |

Electrode holder for 4 electrodes and 2 buret tips
| Material: | Plastic |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2103.130 | **Adapter red 2 mm plug / 4 mm socket** |

For connecting plug B (4 mm) to 2 mm socket.

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2103.140 | **Adapter black 2 mm plug / B socket 4 mm** |

For connecting plug B (4 mm) to 2 mm socket.

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2104.020 | **Electrode cable / 1 m / F** |

For connecting electrodes with Metrohm plug-in head G to Metrohm instruments (socket F).

Length (m): 1

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2151.000 | **Cable USB A - mini-DIN 8P** |

Cable connecting a Titrando, USB Sample Processors, Dosing Interface, Robotic Titrosampler to a PC (USB connection, type A) and for connecting further Titrandos. USB A - Controller.

Length (m): 1.8

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 6.2621.070 | **Hexagon key 5 mm** |

5 mm
Length (mm): 80

| 1 | 6.2621.130 | **Hexagon key 2 mm** |

2 mm

| 1 | 6.2739.010 | **Wrench** |

For exchange units.
Length (mm): 190

| 1 | 6.3026.220 | **Exchange unit / 20 mL** |

Exchange unit with integrated data chip with 20 mL glass cylinder and light protection. PCTFE/PTFE flat stopcock, FEP tubing connection, antidiffusion buret tip and standard amber glass reagent bottle.
Volume (mL): 20

| 1 | 6.6056.131 | **tiamo light CD: 1 Lizenz** |

| Qty. | Order no. | Description |
|------|-----------|-------------|
|      |           | tiamo light with additional driver for 888 Titrando |
| 1 | 6.2122.0x0 | **Mains cable with C13 line socket IEC-60320-C13** |

Cable plug according to customer requirements.

| | | |
|---|---|---|
| Switzerland: | | Type SEV 12 |
| | | 6.2122.020 |
| Germany, …: | | Type CEE(7), VII |
| | | 6.2122.040 |
| USA, …: | | Type NEMA/ASA |
| | | 6.2122.070 |

| Qty. | Order no. | Description |
|------|-----------|-------------|
| 1 | 8.888.8004EN | **888 Titrando Manual** |

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