User Manual

Easy Control Box

ECB

METTLER TOLEDO

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1 Introduction

Congratulations to your purchase of the Easy Control Box (named ECB in the following chapters). This device can enhance the sensor and control capabilities of the METTLER TOLEDO thermostats.

The following main devices support the Easy Control Box:

- EasyMax 402 (Basic / Basic Plus / Advanced)
- EasyMax 102 (Basic / Basic Plus / Advanced)
- OptiMax 1001
- RX-10

The ECB can perform the following tasks:

- Support different sensors
- Enable gravimetric dosing
- Enable volumetric dosing (third-party pumps supporting the TTL interface)
- Measuring pH with the additional SevenExcellence™ pH module

One Easy Control Box can be connected to one main device and controlled via the touchscreen. The Easy Control Box can also be used together with iControl or iC Data Center software.

1.1 Scope of delivery

The following items are included in the ECB set (Order number: 30212440)

Number	Order Number	Amount	Designation
1	30303439	1	ECB
2	51191988	1	CAN cable 1m
3	30281496	1	Lab Bar Holder
4	30251384	1	User Manual
	30034475	2	Blank SevenExellence™ module

If an item is missing, please contact your local support.

1.2 Check on arrival

Check the following things once the package has arrived:

- The package is in good condition.
- The content shows no signs of damage (e.g. broken covers, scratches etc.)
- The content is complete (see Scope of delivery).

If one condition is not fulfilled, please contact your local support.

2 Safety Information

The ECB has been tested for the applications and intended purposes documented in this operating instructions. However, this does not absolve you from the responsibility of performing your own tests of the product supplied by METTLER TOLEDO regarding its suitability for the methods and purposes you intend to use it for. You should therefore observe the safety measures for your protection and for operation.

2.1 Definition of signal warnings and symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

Signal words

DANGER	for an imminent danger with high risk, resulting in severe injuries or death if not avoided.
WARNING	for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.
CAUTION	for a hazardous situation with low risk, resulting minor or medium injuries if not avoided.
NOTICE	for a hazardous situation with low risk, resulting in damage to the device or the property or in loss of data.
Note	(no symbol) for useful information about the product.

Meaning of safety symbols

General hazard

Notice

Explosion

2.2 Intended use

The ECB is a control box which is used together with a METTLER TOLEDO thermostat. It supports analog third-party sensors and enables volumetric and gravimetric dosing.

Always operate and use your device in accordance with the instructions contained in this manual. Do only use it together with equipment specified in this documentation.

Any other type of use and operation beyond the limits of technical specifications without the written consent from Mettler-Toledo GmbH, is considered as not intended.

2.3 Product specific safety

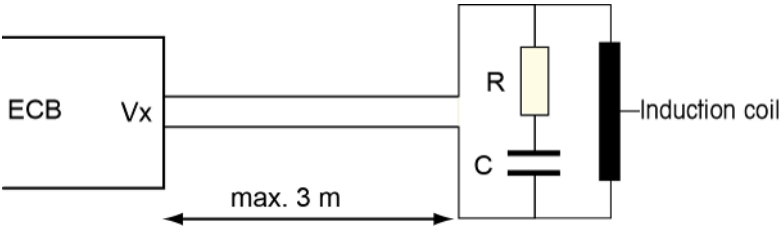
⚠ WARNING

Control of valves

Implement suitable measures if you use valves which are not supplied by METTLER TOLEDO! If electromagnets are attached, the output circuits of the valve outputs can start to oscillate. The valves then remain open which could lead to a hazardous situation with certain applications.

– Do connect a resistor-capacitor element next to the valve.

⇨ Use the schematics below on how to connect a resistor-capacitor element (RC element).



Operational safety

For every instrument configuration used, you are responsible for ensuring that the entire system is safe if a power failure occurs and that the reaction currently in progress cannot get out of control.

Site requirements

The instrument has been developed for indoor operation in a well-ventilated area. Avoid the following environmental influences:

- Conditions outside of the ambient conditions specified in the technical data
- Powerful vibrations
- Direct sunlight
- Corrosive gas atmosphere
- Explosive atmosphere of gases, steam, fog, dust and flammable dust
- Powerful electric or magnetic fields

Note Gas Emission

The product does not emit any gases that could harm a person or damage the product.

3 Overview

1	4x SmartConnect Sensor Ports	2	4x SmartConnect Control Ports
3	2x RS232 for METTLER TOLEDO balances	4	CAN Bus OUT
5	Port for optional AC power adapter	6	CAN Bus IN
7	Slot for SevenExcellence™ pH modules	8	Statuslight™

4 Mount ECB on Lab Bar

This step is optional you can also place the ECB on any even surface.

1 Screw the lab bar holder to the lab bar.

2 Screw the ECB onto the lab bar holder.

5 Set up ECB

Connect to main device

– Connect the CAN cable to the CAN IN port of the ECB and connect the other end of the cable to a main device or any other CAN device connected to a main device.

Connecting AC power adapter to the ECB

A message is shown on the touchscreen in case the connected CAN devices require more power than provided by the main device.

Proceed as follows to connect the AC power adapter to the ECB.

1 Connect the AC power adapter to the ECB on the rear.

2 Make sure the arrow on the plug is facing upwards.

3 Connect the country-specific plug to the mains.

See [Disconnecting the AC power adapter ▸ 21] for proper disconnection.

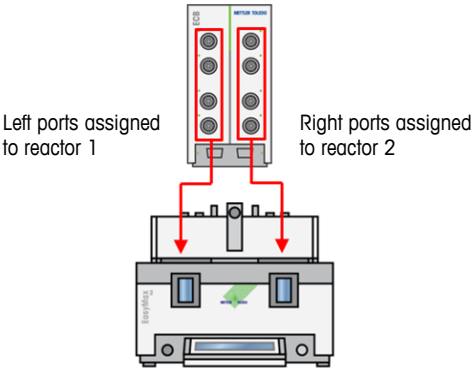
Download Firmware

The firmware is automatically transmitted from the main device to the ECB. The ECB Statuslight is white during this transmission.

See also

Disconnecting the AC power adapter [▸ 21]

6 EasyMax port assignment



For the EasyMax the ECB is divided. This happens automatically when you connect it to the EasyMax.

7 SmartConnect Sensor ports

The sensor ports are used to connect third-party analog sensors to the ECB. The ECB has four sensor ports. The following signals can be read by the ECB:

- Temperature (Pt100)
- Current (mA)
- Voltage (V)

Ready-to-use cables are available. Technical aspects such as configuration and soldering of the cables are described in the SmartConnect Cables User Manual (30260711).

Available SmartConnect sensor cables

Order No.	Product Description	Supported signal types
30267163	SmartConnect Pt100 cable with loose ends	Pt100
30267165	SmartConnect generic sensor cable with loose ends	Pt100, Current, Voltage
30254779	SmartConnect LEO3 / EV-120 pressure sensor cable	Pressure via Current

⚠ WARNING

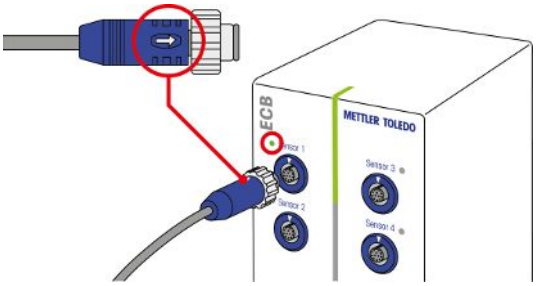
Default data for Leo3 / EV-120 cable (order no.: 30254779)

The default data for LEO or EV-120 cable is based on a 300 bar sensor. Reconfigure your cable if needed, see [Adjust pressure sensors ▸ 11].

1 If you use a pressure sensor with different limits, please reconfigure your cable according to the pressure range.

2 Check if the value on the touchscreen and the sensor are the same, if not reconfigure the cable.

7.1 Connecting cable to SmartConnect port



Note: There are dedicated ports for sensors (blue) and final control elements (green). Make sure the color of the cable plug corresponds with the color of the port.

1 To fit the plug into the socket, the arrow on the plug needs to be at the top.

2 The status LED (only available on ECB) turns green once the sensor or final control element is ready to use.

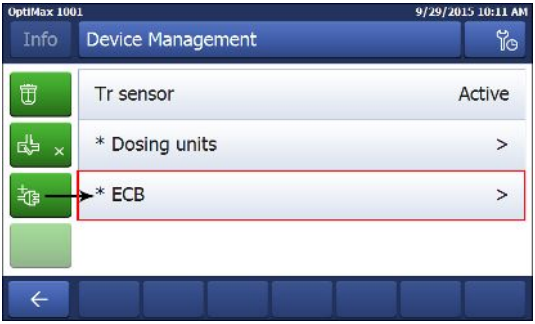
7.2 Adjust pressure sensors

The default values for pressure sensors are based on a 300 bar sensor. This means connecting a LEO3, 300 bar will not need any adjustment. For other sensors do the following:

- Sensor must be connected to cable that will be configured.

1 Tap on main screen.

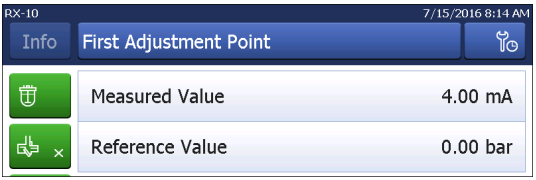
2 Tap on *ECB.



3 Tap on the SmartConnect sensor port where the pressure sensor is connected.

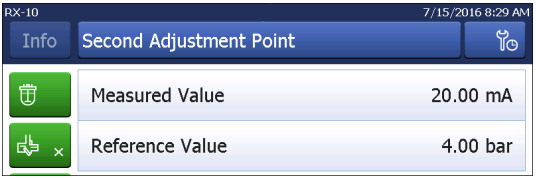
4 Tap on **Adjust sensor** to reconfigure your pressure sensor.

5 For the **Measured Value** enter the **lower limit** of the measuring range (current) e.g. 4.00 mA. For the **Reference Value** enter the pressure value that corresponds with the lower limit e.g. 0.00 bar.



6 Tap **Next**.

7 For the **Measured Value** enter the **upper limit** of the measuring range (current) e.g. 20.00 mA. For the **Reference Value** enter the pressure value that corresponds with the upper limit e.g. 4.00 bar.



8 Tap **Apply** to save the data.

⇨ The pressure value is now visible on the touchscreen.

8 pH Module

Mount the pH Module

It is possible to use SevenExcellence™ pH/mV module (30034472) or SevenExcellence™ pH/Ion (30034471). The modules must be ordered separately. ECB is delivered with two blank modules.

Note: Only analog pH electrodes can be connected.

To install the SevenExcellence™ pH modules proceed as follows:

- Make sure the ECB is not powered at the time a SevenExcellence pH module is added or removed.

1 Loosen the screw on the plate on the rear of the ECB until you can slide down the plate.

2 Remove the blank module.

3 Insert the SevenExcellence™ pH/mV or SevenExcellence™ pH/Ion module.

4 Slide the plate up and tighten the screw on the plate back .

5 Switch the main device back on.

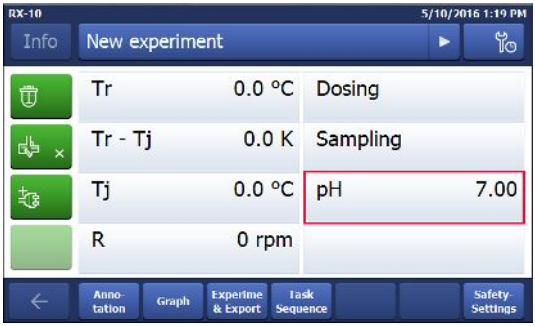
⇨ The ECB can now measure pH. **NOTICE A pH value is displayed even if no pH probe is connected.**

Adjust a pH sensor

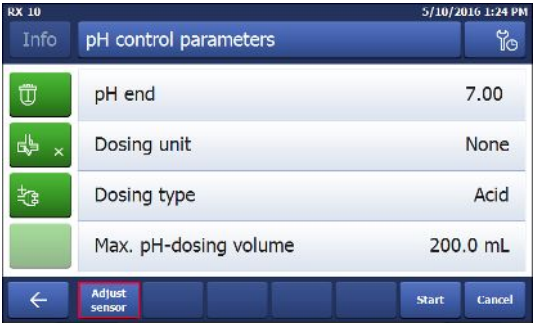
pH sensors connected to the ECB can be adjusted with a 2-point adjustment.

- 2 Buffer solutions at room temperature (25 °C) are needed: Choose the pH range according to your experiment.

1 Tap on pH on the main screen.



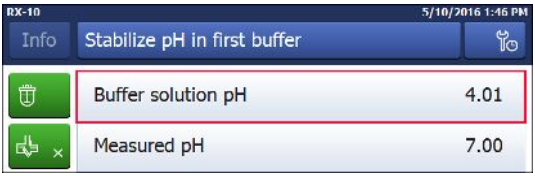
2 Tap on **Adjust sensor**.



3 Place the probe into the first buffer solution with the **low pH**.

4 Confirm the message on the touchscreen by tapping **ok**.

5 If necessary correct the **Buffer solution pH** value so it corresponds to the value of the buffer solution the sensor is in.



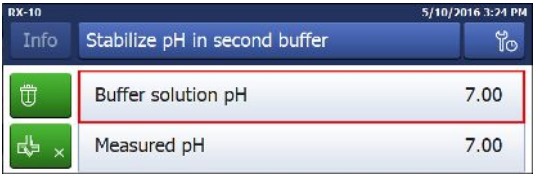
6 Wait until the value **Measured pH** is stable and tap **Apply**.

7 Take out the pH sensor from the first buffer solution and clean the sensor carefully.

8 Place the sensor into the second buffer solution with the **higher pH**.

9 Confirm the message on the touchscreen by tapping **ok**.

10 If necessary correct **Buffer solution pH** value so it corresponds to the value of the buffer solution the sensor is in.



11 Wait until the value **Measured pH** is stable and tap **Apply**.

⇨ The 2-point adjustment is finished.

Measure pH with the main device

Note Temperature compensation for pH is per default done with Tr. If there is no Tr available, Tj will be used. Values from temperature probes integrated into the pH sensor are not considered for the calculation of pH.

– Connect an analog pH sensor to the BNC port of the SevenExcellence™ pH module.
  ⇨ pH is displayed on the touchscreen of the connected main device.

9 Gravimetric Dosing

Gravimetric dosing refers to a technique where the dosing pump is controlled based on a balance signal. The amount to be dosed can be specified in grams.

Supported pumps for gravimetric dosing

Support for any third-party dosing pump with analog control interface for:

- Current (0…20 mA)
- Voltage (-10…10 V)
- Frequency (0…3 Hz)
- Pulse width modulation (24 V)

For some dosing pumps there are ready-to-use cables. Others have to use the SmartConnect control cable with loose ends. See list below:

NOTICE

Use of SmartConnect cables with Watson-Marlow 120U

Watson-Marlow 120U peristaltic pumps are not protected against ground loops.

– Do NOT use a SmartConnect control cable with loose ends (order no.: 30267164). Order the specific control cable for Watson-Marlow 120U (order no.: 30254806), which has a built-in galvanic isolation

Order No.	Designation
30267164	SmartConnect control cable with loose ends
30254805	SmartConnect KNF SIMDos control cable
30254804	SmartConnect ProMinent control cable
30254806	SmartConnect WatsonMarlow control cable

Technical aspects such as configuration and soldering of the cables are described in the Smart-Connect Cables User Manual (30260711).

Set up for gravimetric Dosing

Note: Control cable and the RS232 cable have to be connected on the same side of the ECB, otherwise the dosing will not work.

- A supported pump is available.
- A METTLER TOLEDO balance is available.
- ECB is connected to the main device.

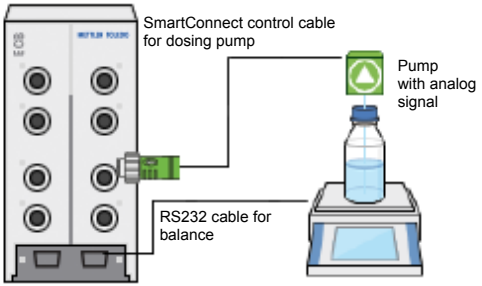
1 Connect the pump to a control port on the ECB with a suitable SmartConnect control cable. **NOTICE If you have a Watson-Marlow pump, make sure the pump is turned off when connecting the cable.**

2 Connect the balance to the RS232 port.

3 Configure the balance according to the specifications in [Set up configuration settings on METTLER TOLEDO balances ▸ 17].

4 Put the substance to be dosed on the balance and connect the tube to the pump.

⇨ The ECB is now ready to do gravimetric dosing.

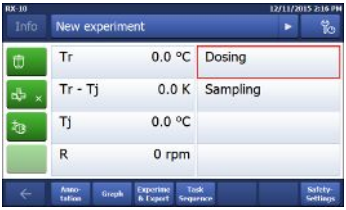


RS232 For METTLER TOLEDO balances	METTLER TOLEDO balances with MT-SICS protocol interface. See [Set up configuration settings on METTLER TOLEDO balances ▸ 17] for the communication settings to be set on the balance.

Gravimetric dosing on the thermostat

- A supported pump and balance is connected.

1 Tap **Dosing** on the main screen.



⇨ All connected Dosing Units and ECBs are displayed.

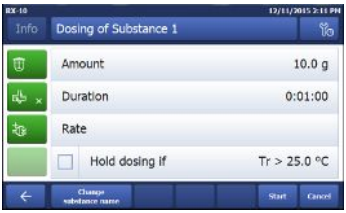
2 Select the dosing device that you have prepared.

3 Tap and hold **Prime tubes** to fill the tubes.

⇨ The pump is dosing with 50 % of maximum dosing rate.

4 Tap **Dosing of Substance 1** to enter the name of the chemical that is dosed.

5 Enter the **Amount** and **Duration** or **Rate** according to your experiment setting.



6 You can activate **Hold dosing if** to pause the dosing once the defined Tr value is exceeded.

⇨ The dosing will automatically continue once Tr falls below the defined threshold.

7 Tap **Start** to start the dosing.

⇨ The dosing starts immediately.

9.1 Set up configuration settings on METTLER TOLEDO balances

Please refer to the Operating Instructions of the balances on how to change these settings.

Balance type	Parameters
Excellence Series XA / XS / XP/ XPE 	• Host = RS232 built-in • Baud rate = 9600 • Bit/Parity = 8/No • Stop bit = 1 • Handshake = Xon / Xoff • End of Line = <CR><LF> • Character set = ANSI/Win • Continous mode = off
MS / ML  	• RS232 = Host / SEND.OFF • Baudrate = 9600 • Bit/Par. = 8/No • HD.Shake = XON / XOFF • RS E.O.L. = <CR><LF> • RS Char = ANSI/WIN • USB = SEND.OFF
PL-S 	• Function = F none • Weighing mode = Std • Weighing unit1/2: mg, g, or kg • Autozero = no A.Zero • Auto shut off = A.OFF – • Peripheral unit = HoSt • Send mode = S. oFF • Send format = S.SICS • Baud rate = bd 9600 • Bit / Parity = 8b-no • Handshake = HS Soft

PB-S/FACT, PB-L  	• Adjustment = CAL int (PB-S only) • FACT = FACt oFF (PB-S only) • Function = F none • Weighing mode = Std • Weighing unit1/2: mg, g, or kg • Autozero = no A2Zero • Peripheral unit = HoSt • Send format = SICS • Send mode = S. oFF • Baud rate = bd 9600 • Bit / Parity = 8b-no • Handshake = HS Soft
PB-G 	• Adjusment = oFF • Function = F none • Vibration adapter = 2 • Weighing proc. ad.: 2 • Repeatability = Good • Weighing unit1/2: mg, g, or kg • Autozero = AZ.oFF • Autom. Shutdown = A.oFF – • Power up mode = 9z.StArt • Icons = on • Peripheral unit = HoSt • Data transfer mode = S. oFF • Baud rate = bd 9600 • Bit / Parity = 8b-no • Handshake = HS Soft • Settings = List

10 Volumetric Dosing

Volumetric dosing refers to a technique where a syringe pump is used. The amount to be dosed can be specified in milliliters.

Supported pumps for volumetric dosing

Support for selected KDS/Harvard syringe pumps with 9 or 15 pin TTL interface.

For some syringe pumps there are ready-to-use cables. See list below:

Order No.	Designation
30254800	SmartConnect KDS/Harvard TTL cable (15 pin)
30254801	SmartConnect KDS/Harvard TTL cable (Legacy 9 pin)

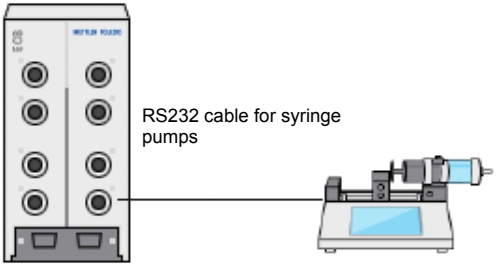
Set up for volumetric Dosing

If only one dosing is connected to the main device it will be displayed automatically.

- A supported syringe pump is available and prepared.
- ECB is connected to main device.

– Connect the pump to a control port on the ECB with a control cable.

⇨ The dosing is now available on the touchscreen of the main device.



Volumetric dosing on the main device

Note: Syringe pumps are controlled through a so-called TTL (Transistor to Transistor Logic). The ECB can only trigger the start and stop of a pre-programmed ramp on the syringe pump. The dosing is controlled by the syringe pump. To capture the dosed amount you have to enter the same rate on the ECB (see step 3). The captured amount may not be fully accurate so if necessary correct it in the experiment data in iControl.

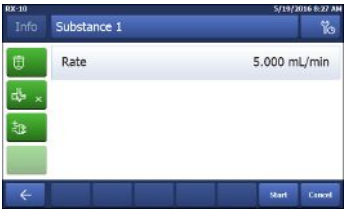
- A supported and pre-programmed syringe pump is connected.

1 Tap **Dosing** on the main screen.

⇨ All connected Dosing Units and the ECB are displayed.

2 Select the syringe pump that you have prepared.

3 Optionally enter the **Rate** to capture the dosed amount. Enter the same dosing rate as pre-programmed on the syringe pump.



4 Tap **Start** to start the dosing.

⇨ The dosing starts immediately.

11 Maintenance

11.1 Cleaning and Decontaminating

Clean the outside of the housing with a cloth moistened with ethanol.

The device can only be cleaned on the outside. In case chemicals contaminate the inside of the box, the box has to be disposed.

11.2 Calibration and Adjustment

Keep in mind that the ports of your device need regular calibration and adjustment to generate the most accurate data. Please contact a Field Service Engineer to perform a calibration and an adjustment.

11.3 Disconnecting the AC power adapter

NOTICE

Do not disconnect the cables by pulling on the cable

This could damage the connectors. Only pull out the cable at the end using the plug.

To disconnect the AC power adapter proceed as follows:

- The main device is turned off.

1 Pull back the movable part of the plug.

2 Use gentle force to disconnect the AC power adapter from the device.

11.4 Disposal

In conformance with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

12 Technical data

12.1 General

AC power adapter rating (optional)	Line voltage	100…240 VAC
	Input frequency	50/60 Hz
	Input current	1.8 A
	Output voltage	24 VDC
	Output current	5 A
	Mains supply voltage fluctuations	Up to ± 10 % of the nominal voltage

Instrument rating	Input voltage	24 VDC supplied via CAN Bus
	Max. power	120 W

Dimensions (WxDxH)	110 mm x 152 mm x 215 mm (4.33″ x 5.98″ x 8.47″)
Weight	2.5 kg
Number of ECBs connected to one main device	Max. 1

Humidity	Max. relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C
Altitude	Up to 2000 m
Overvoltage category	II
Pollution degree	2
Ambient temperature	5 °C…40 °C
Usage	For indoor use only

12.2 Interface specifications

SmartConnect Sensor port	**Signal**	**Measuring Range**	**Resolution**	**Accuracy**	**Supports**
(4x)	Pt100 (Temperature)	-120…400 °C	0.01 K	-50…300 °C: ±0.2 K	4 or 2-wire temperature sensors
	Current (mA)	0/4…20 mA with 100 Ω impedance	0.002 mA	0.005 mA	Any sensor / transmitter with Current (mA) output
	Voltage (V)	±10 V over 1 G Ω	0.001 V	0.005 V	Any sensor / transmitter with Voltage (V) output

SmartConnect Control Port (4x)	Signal	Control Range	Resolution	Accuracy	Supports
	Current (mA)	0/4…20 mA with max 500 Ω	0.005 mA	0.01 mA	Dosing pumps
	Voltage (V)	0…10 V with I_{max} = 10 mA	0.0025 V	0.01 V	Dosing pumps
	PWM (Pulse width modulation)	0…100 % of one second 24 V with 33 Ω min. (I_{max} = 0.7 A)	0.01 s	0.02 s	Dosing valves
	Frequency	0…3 Hz with 20 ms pulse with 20 mA max load	0.008 Hz	0.008 Hz	Dosing pumps
	TTL (Transistor to transistor logic) In/Out	Triggering start of preprogrammed dosing ramp		n/a	Syringe pumps

pH Module (2x)	Port	Measuring Range	Resolution	Accuracy	Supports
	BNC	0…14 pH	0.001	±0.05	Analog electrodes

RS232 For METTLER TOLEDO balances	METTLER TOLEDO balances with MT-SICS protocol interface. See [Set up configuration settings on METTLER TOLEDO balances ▸ 17] for the communication settings to be set on the balance.

13 CE Certification

13.1 ECB Declaration of conformity 20160006

METTLER TOLEDO

EU Declaration of Conformity / EU-Konformitätserklärung / Déclaration de conformité européenne / Declaración de conformidad UE / Certificazione di conformità UE / ЕС декларация за съответствие / EU Prohlášení o shodě / EU-overensstemmelseserklæring / Δήλωση συμμόρφωσης Ε.Ε. / ELi vastavusdeklaratsioon / EU-vaatimustenmukaisuusvakuutus / Dearbhú Comhréireachta AE / EU izjava o sukladnosti / EU Megfelelőségi nyilatkozat / EU 適合宣言 / EU 적합성 선언 / ES atitikties deklaracija / ES atbilstības deklarācija / Dikjarazzjoni ta' Konformità tal-UE / EU-conformiteitsverklaring / Deklaracja zgodności UE / Declaração de Conformidade da UE / Declarație de conformitate UE / Декларация о соответствии требованиям ЕС / EÚ Vyhlásenie o zhode / Izjava o skladnosti EU / EU-försäkran om överensstämmelse / EU 一致性声明

Product / Produkt / **Produit** / Producto / **Prodotto** / Продукт / **Výrobek** / Produkt / **Προϊόν** / Toode / **Tuote** / Täitge / **Proizvod** / Termék / **製品名** / 제품 / **Gaminys** / Izstrādājums / **Produtt** / Product / **Produkt** / Produto / **Produs** / Продукция / **Produkt** / Izdelek / **Produkt** / อันรับ / **产品**	**Control Unit** **Easy Control Box (ECB)**
Manufacturer / Hersteller / **Fabricant** / Fabricante / **Produttore** / Производител / **Výrobce** / Producent / **Κατασκευαστής** / Tootja / **Valmistaja** / Deantúsóir / **Proizvođač** / Gyártó / **メーカー** / 제조업체 / **Gamintojas** / Ražotājs / **Manifattur** / Producent / **Producent** / Fabricante / **Producător** / Производителя / **Výrobca** / Proizvajalec / **Tillverkare** / ผู้ผลิต / **制造商**	**Mettler-Toledo GmbH** Im Langacher 44 8606 Greifensee SWITZERLAND

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EC - DECLARATION OF CONFORMITY

KD No.: Document No.: 20160006

The undersigned, representing the following manufacturer

Mettler-Toledo GmbH
Im Langacher 44
8606 Greifensee, SWITZERLAND

CE

herewith declares that the product

Control Unit
Easy Control Box (ECB)
For additional types, see page *Type code*

certified model: --

is in conformity with the provisions of the following EC directives (incl. amendments)

2006/95/EC; 2014/35/EC *)** Low voltage (LVD)
2004/108/EC; 2014/30/EC *)** Electromagnetic compatibility (EMC)

and that the standards have been applied. ***) valid after 20.04.2016

Last two digits of the year in which the CE marking was affixed: **16**

8606 Greifensee
21.04.2016

Roel Terwerda
General Manager AutoChem

Francis van der Eycken
Head SPC RXE

References of standards for this declaration of conformity, or parts thereof:
Harmonized standards of Europe and Switzerland:

Safety standards:
IEC/EN61010-1:2010

EMC standards (* Emission; ** Immunity):
IEC61326-1:2012 / EN61326-1:2013 (class B *)
IEC61326-1:2012 / EN61326-1:2013 (Industrial requirements **)

Metrological standards:
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IP standards:
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Standards for Canada, USA and Australia:
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