EL-CELL®
electrochemical test equipment

User Manual

Release 1.3

PAT-Chamber-16 / PAT-Chamber-16 C

Temperature-controlled docking station

The information in this manual has been carefully checked and believed to be accurate; however, no responsibility is assumed for inaccuracies.

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Content

Included component manuals

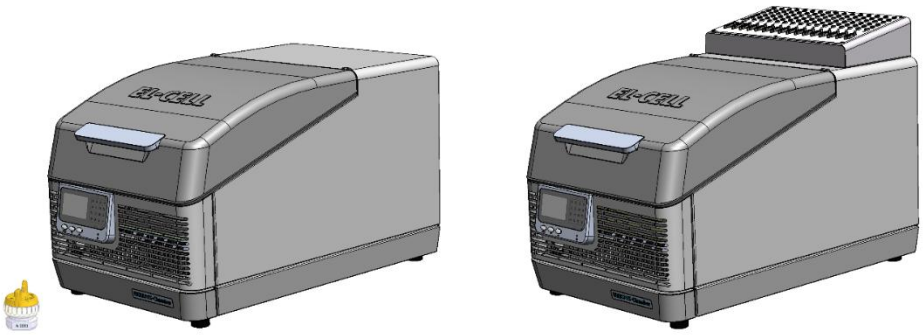
1 Product description

The PAT-Chamber-16 is a temperature-controlled docking station/cell chamber for up to 16 test cells of the PAT series. The temperature of the chamber can be precisely controlled using a Peltier device between 10 and 80°C. The PAT-Chamber-16 supports the PAT-Cell-Press for in-situ pressure monitoring of up to 16 test cells at the same time*.

The PAT-Chamber-16 is to be connected to a multi-channel potentiostat (like the Biologic MPG-2) or battery tester (like the Maccor 4000). Connecting the 16 cell positions to different potentiostats / battery testers is possible as well.

The PAT-Chamber-16 features a built-in data logger for recording all cell signals – cell current, cell voltage, and the two half cell voltages of each cell – along with the chamber temperature and the individual pressure signals, if used with the PAT-Cell-Press*.

The PAT-Cell, the PAT-Core, and the EC-Link data logger software are covered in detail by other manuals (http://el-cell.com/downloads/downloads-manuals).



PAT-Chamber-16 and PAT-Chamber-16 C (with integrated PAT-Connect adapter box)

Features

- Peltier temperature-controlled docking station, ready for connection to any potentiostat or battery tester.
- Temperature range 10 – 80°C
- Holds up to 16 PAT series test cells for 2- and 3-electrode measurements.
- Charge/discharge/EIS compatible with any PAT series test cell
- Supports up to 16 PAT-Cell-Press for additional pressure monitoring*
- Compatible with all of today's multi-channel potentiostats and battery testers.
- Integrated data logger hardware and software for recording of cell current, cell voltage, half cell voltages, global temperature, and individual cell pressure.
- Analog outputs available of the buffered half cell voltages (16 x V2R), sensor signals (16 x AOUT) and chamber temperature (VT). The analog outputs allow for easy interfacing with the external inputs of the connected battery tester/potentiostat.

*Digital sensor signals cannot be read. This also applies to the pressure sensor of the PAT-Cell-Press II.

2 Safety instructions

2.1. Intended Use

The PAT-Chamber-16 is an electrical laboratory device intended for professional use as explained in the product description.

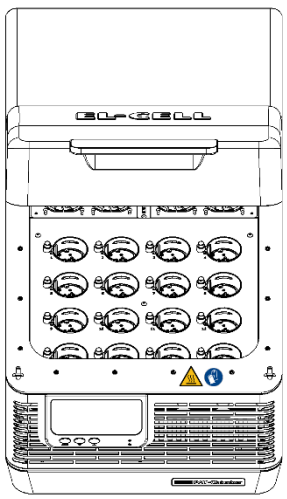
The PAT-Chamber-16 should only be operated by laboratory personnel especially trained for this purpose and familiar with all precautionary measures required for working in a laboratory. To avoid injuries and damage observe the safety instructions of this user manual.

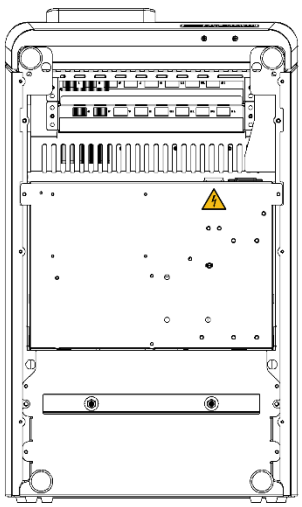
NOTE: The PAT-Chamber-16 must only be used with test cells of the PAT series. Don't place other goods inside the chamber.

2.2 Localization / position of safety labels on the PAT-Chamber-16

The following lables are located on the unit

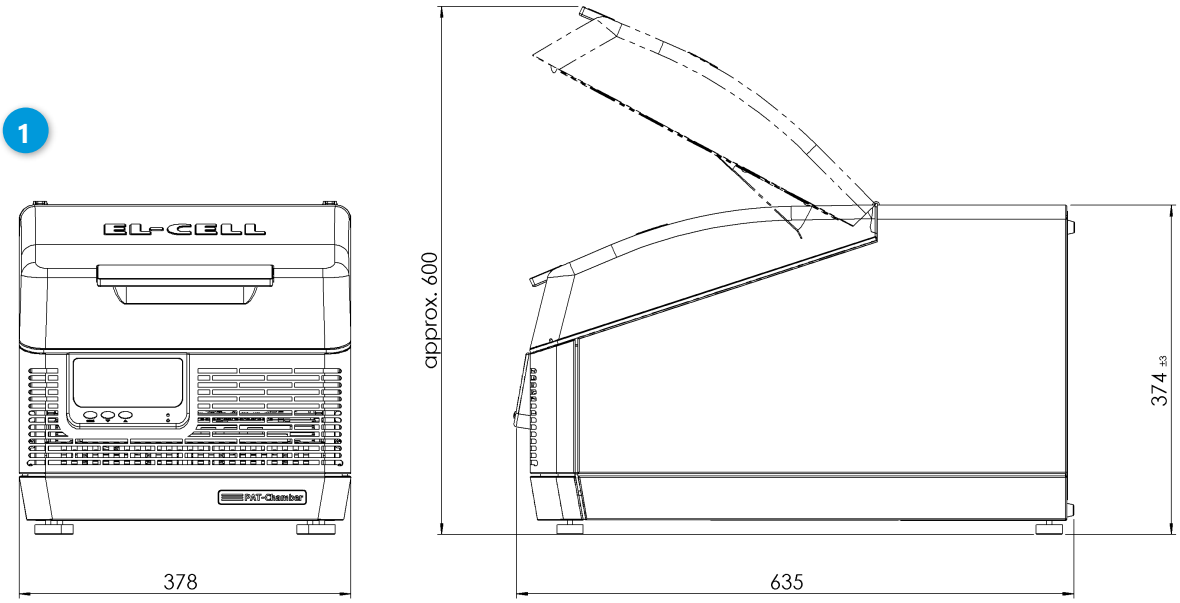
	**Electrical hazard!** After removing covers, live parts may be exposed. You may receive an electric shock if you touch these parts. Disconnect the mains plug before removing any covers. Only electrical technicians may work on the electrical equipment of the appliances.
	**Hot surface!** The parts of the inner chamber will become hot during operation. Danger of burning. Do not touch the inner surfaces during operation without protective gloves.
	**Wear protective gloves**





3 Technical data

1



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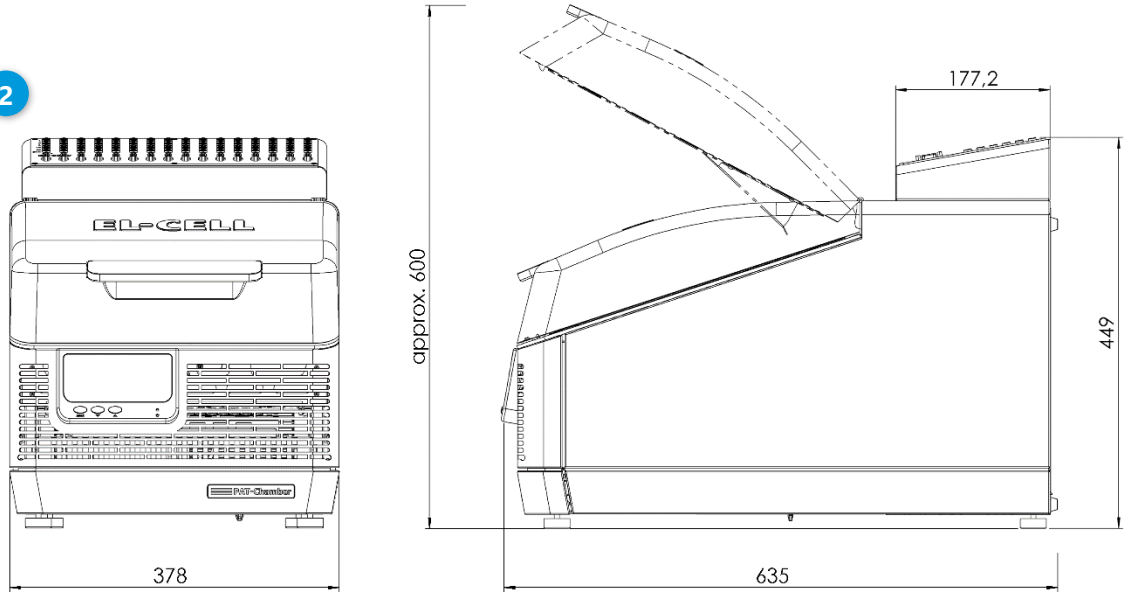
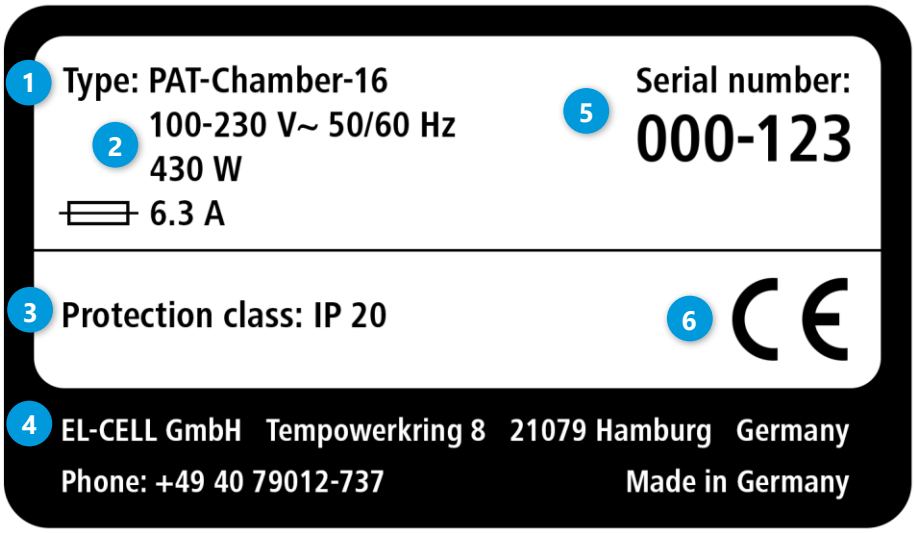


- 1 **Dimensions:**
  635 mm (width) x 378 mm (depth) x 374 mm (height)
- 2 **Dimensions with attached PAT-Connect-16 C:**
  635 mm (width) x 378 mm (depth) x 449 mm (height)
- Temperature: +10 to +80°C
- Weight: 24 kg (without PAT-Cells)

3.1 Designation (nameplate)

The nameplate provides information about the appliance model, manufacturer and technical data. It is attached to the back of the appliance.



1. Type designation
2. Operating voltage, Connection / power ratings
3. Protection class
4. Address of manufacturer
5. Serial number
6. CE conformity

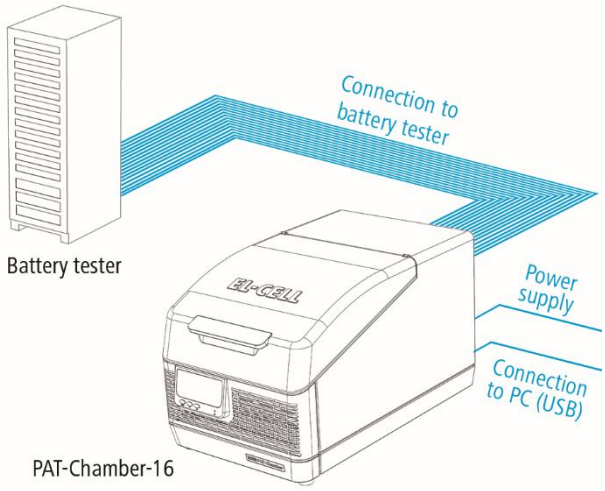
4 Installation

Place the PAT-Chamber-16 on a flat, horizontal surface. Do not place the instrument on a flammable surface. A 230 V or 115 V power connection must be available. The distance between the wall and the rear of the instrument must be at least 15 cm. The top clearance must not be less than 25 cm. Sufficient air circulation in the vicinity of the instrument must be guaranteed at all times.

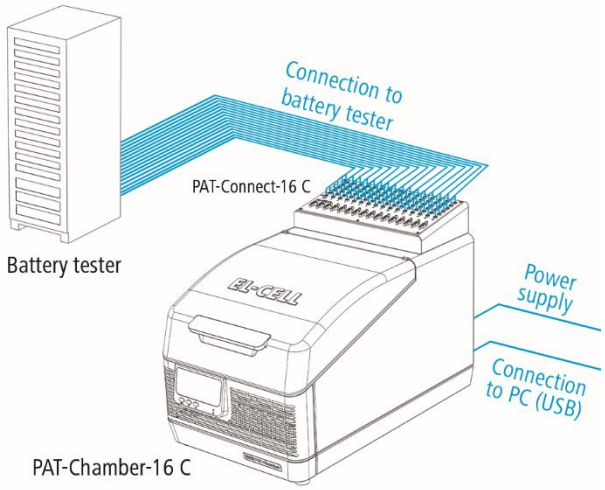
4.1 Connection to the external battery tester or potentiostat

Two versions of the PAT-Chamber-16 are available which differ in the way the connection to the external battery tester or potentiostat is being established.

1. **PAT-Chamber-16:**
   Direct connection with fixed assignment of WE, CE and RE for a given channel.



2. **PAT-Chamber-16 C:**
   Indirect connection via PAT-Connect-16 C with variable assignment of WE, CE and RE for a given channel.



4.2 Connection to the power supply

Caution:
Observe the country-specific regulations when making connections. Observe the connection and power ratings (see nameplate.). Make sure to establish a safe PE conductor connection.

Plug the provided power cable into the rear of the instrument. Lay the power cable so that it is always accessible and within reach so it can be disconnected quickly in the event of failure or emergencies.

Connect the other end of the power cable to the power supply (wall outlet). The instrument will immediately power up once connected. Note that the cells docked into the PAT-Chamber-16 will experience self-discharge (across a resistance of approx. 10 kOhm between WE and CE) in case the instrument is powered down.

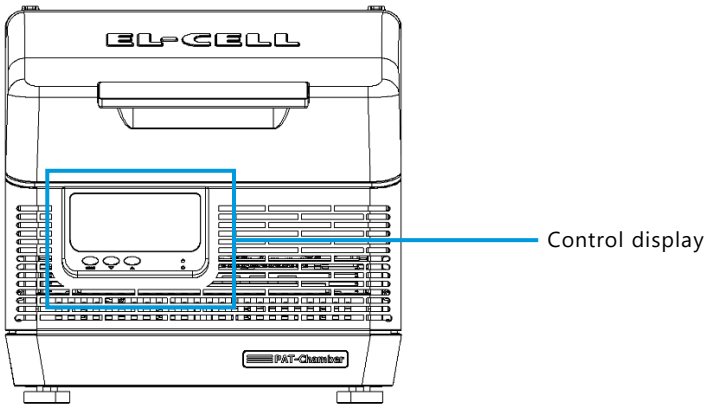
4.3 USB connection to the host PC

Plug one end of the provided USB cable into the USB socket at the rear of the PAT-Chamber-16, the other end into the USB socket of the Windows PC. From the provided CD, install the EC-Link software on the Windows PC and launch the EC-Link software.

For details of the software installation and operation, refer to the EC-Link software manual. Note that the USB data logger hardware of the PAT-Chamber-16 is powered from the host PC, and is galvanically isolated from the power supply of the PAT-Chamber.

5 Operation

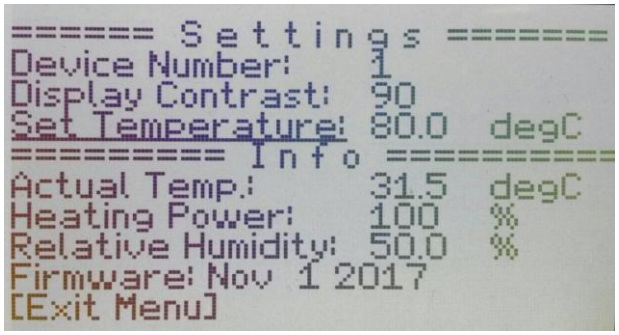
5.1 Control display, push buttons, and LED matrix



By default, the LC display at the front of the PAT-Chamber-16 shows the actual and the setpoint temperature. The 4x4 LED matrix on the right informs about whether the corresponding cell socket is free (LED off) or occupied (LED lit).

To change the setpoint temperature, press the select button, adjust the displayed setpoint with the arrow buttons, and confirm with the select button.

To change the device number or the display contrast, hold the select button for at least one second. A settings list shows up. From this list, select the device or contrast entry with the arrow buttons and change as required.



5.2 Workflow

This section gives a quick overview of how to run a test with a PAT-Cell docked into the PAT-Chamber and connected to an external battery tester. More details on the EC-Link software are given in a separate manual.

- Open the cover of the PAT-Chamber
- Insert a new PAT-Cell into a free socket, and close the cover.
- In EC-Link, a menu pops up, notifying that a new test cell has been inserted.
- Follow the instructions of the 'New cell detected' dialog. Data recording for the given cell will start.
- In the software application of the battery tester, start the test procedure of the corresponding channel.
- Once the test is completed, remove the PAT-Cell from the PAT-Chamber.
- In EC-Link, a menu pops up, notifying that the recording has been stopped.

6 EC-Link software

How to install and operate the EC-Link software is described in a separate manual.

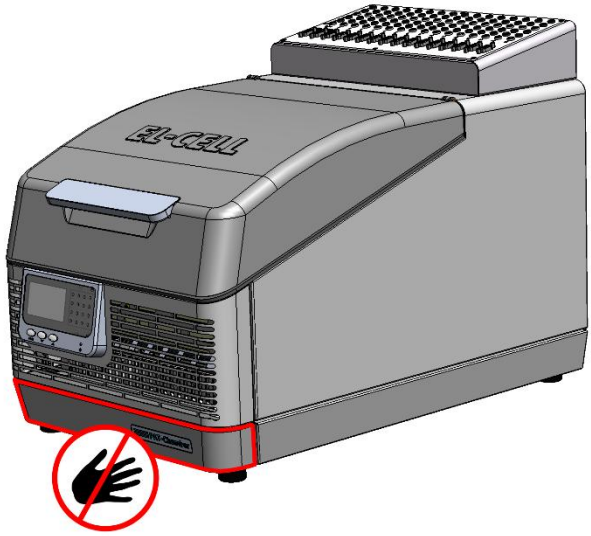
Please note that the EC-Link software is only required for the standard configuration of the PAT-Chamber-16, which contains a data logger. A passive version of the PAT-Chamber-16 without a data logger is available on request.

7 Cleaning

Wipe the PAT-Chamber-16 with a moist tissue. Do not use aggressive chemicals for cleaning. Protect the PAT-Chamber-16 from dust and splash water.

8 Safe lifting and transportation

Risk of injury by lifting heavy loads: Lift the device using transport straps or by lifting at the four lower corners with the aid of two people.



Note:

Do not lift the PAT-Chamber-16 by using the lower front cover or the main cover.

9 Unpacking

Check the contents of the packages against the list given below to verify that you have received all of the required components. Contact EL-CELL if anything is missing or damaged.
NOTE: Damaged shipments must remain within the original packaging for freight company inspection.

List of components

- PAT-Chamber-16 ECC1-03-0300-A
- optionally with PAT-Connect-16 C ECC1-03-0130-A
- Power cord ELT9412
- USB cable (Type A/B; 2,0m) ELT9167
- EC-Link installation CD ECE1-00-0052-A

NOTE: The cables for connection between PAT-Chamber-16 and the external battery tester must be ordered separately.

10 Troubleshooting

This list shows the error codes that may appear on the display of the PAT-Chamber-16. Please include the error code in your message to our technical support.

Error Code	**Error description**	**Consequences**
WD	*Watchdog Reset:* Indicates that the Mainboard and TempController have been reset due to CPU inactivity. Possible causes are electrical/ESD/EMC issues or firmware issues.	Temperature regulation restarts after reset.
Ovrtmp	*Over-temperature:* Chamber temperature is >90°C or TempController PCB temperature is >70°C. It can also be a sensor fault or an I^2C-bus fault.	TempController stops heating and cooling for the duration of the overtemperature state.
temp	Main temperature is not valid (either out of range or due to sensor / I^2C-bus fault)	TempController stops heating and cooling for the duration of the fault.
Si	I^2C-Bus: Main temperature sensor	TempController stops heating and cooling for the duration of the fault.
SA	I^2C-Bus: Peltier temperature/humidity sensor	
SB	I^2C-Bus: Environment temperature/humidity sensor	
TC	I^2C-Bus: TempController PCB: Board temperature sensor	
CY	I^2C-Bus: TempController PCB: PWM controller	
EMC	I^2C-Bus: TempController PCB: Fan controller	

(2020-10-12, Firmware Version 60)

11 Technical support

EL-Cell GmbH exclusively provides technical support for this product.

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12 Warranty

For a period of one year from the date of shipment, EL-Cell GmbH (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor, or, at the Seller's option, demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods.

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is void when repairs are performed by a non-authorized person or service center. At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall return the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of Germany.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supersedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.

13 EC declaration of conformity

EL-CELL®

electrochemical test equipment

EC Declaration of Conformity

Manufacturer's name and address:	EL-CELL GmbH Tempowerkring 8 20179 Hamburg Germany
Product:	PAT-Chamber-16 with optional PAT Cell Cable Set and optional PAT-Connect-16
Type:	PAT-Chamber

The designated products are in conformity with the European Low Voltage Directive

2014/35/EU

including amendments

Council Directive on the approximation of the laws of the Member States relating to Electrical equipment for use within certain voltage limits

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The designated products are in conformity with the European EMC Dicrective

2014/30/EU

including amendments

Council Directive of 03 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility

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The object described in the declaration above corresponds to the directive 2011/65/EC of the European Parliament and the Council of 8 June 2011on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Hamburg, 24.11.2017

Michael Hahn, CEO

This declaration certifies compliance with the above mentioned directives but does not include a property assurance. The safety note given in the product documentation which are part of the supply, must be observed.

The products described are in conformity with the following harmonized standards:

EN 61010-1:2010	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen (DIN EN 61010-1, VDE 0411-1:2011-07)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1:2010 + Cor. :2011)
EN 61010-2-201:2014	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 2-201: Besondere Anforderungen für Steuer- und Regelgeräte (DIN EN 61010-2-201:2014, VDE 0411-2-201:2014-01)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (IEC 61010-2-201:2013)
EN 61010-2-010:2015-05	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 2-010: Besondere Anforderungen an Laborgeräte für das Erhitzen von Stoffen (DIN EN 61010-2-010:2014; VDE 0411-2-010:2015-05)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (IEC 61010-2-201:2013)
EN 61326-1:2013	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen (DIN EN 61326-1:2013-07, VDE 0843-20-1:2013-07)
	EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning (IEC 61326-2-3:2012)

EN 61326-2-3:2013-07	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 2-3: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für Messgrößenumformer mit integrierter oder abgesetzter Signalaufbereitung (DIN EN 61326-2-3:2013-07, VDE 0843-20-2-3:2013-07)
	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning (IEC 61326-2-3:2012)
EN 50581: 2013-02	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe (DIN EN 50581; VDE 0042-12:2013-02)
	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances