



## INSTRUCTION MANUAL

# Vibration monitoring **HUB-VM102**

Document version 1.1

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# 1 Legal information

## Warning concept

This manual contains instructions that you must observe for your personal safety and to prevent damage to property. Depending on the hazard level, the warnings are presented in descending order as follows:



### **DANGER**

Indicates a direct hazard for humans. Irreversible injuries or death will result if not observed.



### **WARNING**

Indicates a recognizable hazard for humans. Irreversible injuries or death may result if not observed.



### **CAUTION**

Indicates a recognizable hazard for humans or possible damage to property. Can lead to reversible injuries or damage to property if not observed.

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### **ATTENTION**

Note on possible damage to property. May cause damage to property if not observed.

**NOTE:** Under Note you will find tips, recommendations, and useful information on specific action steps and facts.

If several hazard levels occur, the warning for the highest level is always used. If the triangle warning against personal injury is used in a warning, then a warning against property damage can also be added to the same hazard hint.

## Qualified personnel

The product associated with this documentation may only be handled by personnel who are qualified for the respective task. Furthermore, the product may only be handled in compliance with the associated documentation and the safety and warning instructions contained therein. Due to their training and experience, qualified personnel are equipped to recognize and avoid potential hazards when handling these products.

## Required basic knowledge

Knowledge of personal computers, operating systems, and programming is required. General knowledge in the field of automation technology is recommended.

## Safety information

Before commissioning the product, be sure to read this section carefully and observe the corresponding notes in the manual. Always keep the Instruction Manual within reach.

## Intended use

[in.hub](#) products may only be used for the applications specified in the corresponding technical documentation.

If third-party products and components are used, they must be recommended or approved by [in.hub](#).

Proper storage, installation, commissioning, and operation are essential for the correct and safe operation of the product.

The permissible environmental conditions must be complied with. Notes in the associated documentation must be observed.

## Trademarks

All names marked with the protective note “®” are registered trademarks. Other names in this document may be trademarks whose use by third parties for their own purposes may infringe the rights of the owners.

## Disclaimer

The content of this publication has been checked for conformity with the hardware described. Nevertheless, discrepancies cannot be ruled out, so we do not assume any liability for its completeness and correctness. The information in this publication is reviewed on a regular basis. Any corrections needed will be included in the following editions.

## 2 General information

This Instruction Manual contains all the information you need to install and commission the HUB-VM102 for the first time.

The manual is intended for installers, programmers, and testers who commission the device themselves and connect it to other units, as well as for service and maintenance technicians who install extensions or perform error analyses.

### 2.1 Scope of delivery

1 x HUB-VM102

1 x HUB-VM102 Instruction Manual (PDF)

### 2.2 Applicable documents

In addition to this Instruction Manual, please refer to the following documents. You can find them in the [in.hub](https://download.inhub.de) download portal <https://download.inhub.de>

- User Manual for the SIINEOS system software
- Instruction Manual for the respective master gateway (HUB-GM100 or HUB-GM200)

### 2.3 Open source

A list of the open-source software used for the HUB-VM102 can be found in the [in.hub](https://download.inhub.de) download portal at <https://download.inhub.de/vm102>.

### 2.4 General instructions for use

[in.hub](https://www.inhub.de) GmbH assumes no liability for malfunctions of the device resulting from improper handling, mechanical damage, incorrect application, and use other than for the intended purpose. Improper handling of the device can significantly reduce the service life of the product.

### 2.5 Intended use

The HUB-VM102 has been specially developed for the industrial sector for permanent vibration monitoring of machines and machine parts such as bearings, shafts, springs and dampers in order to detect both spontaneous failures and long-term wear.

The HUB-VM102 is not measuring equipment as defined by ISO 9001 and is therefore not subject to mandatory testing and the requirements for measuring equipment management.

## 2.6 Safety requirements

The product should be handled in accordance with the following DIN standards:

- DIN EN 61340-5-1:2017-07 Electrostatics - Part 5-1: Protection of electronic components against electrostatic phenomena - General requirements
- DIN EN 61010-1:2020-03 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
- DIN EN 60664-1:2008-01 Insulation coordination for electrical equipment in low-voltage systems - Part 1: Principles, requirements and tests

## 2.7 Disposal



The device must be disposed of properly. It does not belong in the normal household waste.

## 2.8 Service & Support

If you have any questions about specific use cases or about technical parameters, please contact us.

Community: <https://community.inhub.de/>

Mail: [service@inhub.de](mailto:service@inhub.de)

Tel: +49 371 335 655 00 (Technical Sales Staff)

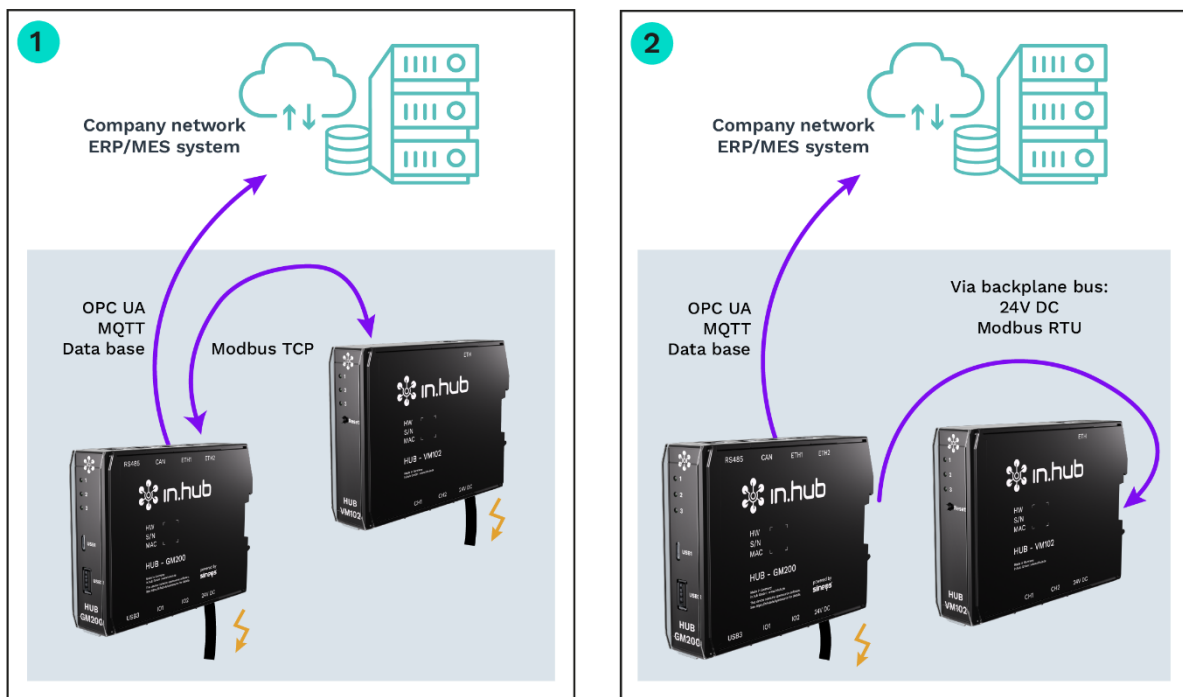
These contact details will connect you with the relevant contact persons.

### 3 Product information

The HUB-VM102 module is specially designed for the detection of up to 2 parallel vibration signals. It is also possible to limit the measured frequency range using various digital filters. At the same time, the ADC instantaneous values can be temporarily stored in the internal RAM. These values can be used to perform an FFT, for example.

The recorded and pre-processed data can be transferred to third-party systems via a network interface or directly to an [in.hub](#) gateway for data visualization and further processing.

There are two different application scenarios:



**Fig. 1: Application scenarios for the HUB-VM102**

#### 1 Individual device with its own power supply, but connected to an [in.hub](#) master gateway via Ethernet because it is physically separated

You can combine the HUB-VM102 with an [in.hub](#) gateway, even if the two devices are physically separated. The HUB-VM102 requires its own power supply for this; the data is collected by the master gateway via Ethernet. Data storage and processing takes place in the master gateway. This has the advantage that you can link the signals from the HUB-VM102 with signals from other devices or sensors individually and as required.

#### 2 As an extension of an [in.hub](#) master gateway connected via backplane bus and without its own power supply

If the HUB-VM102 is to be supplied with power via the [in.hub](#) master gateway, connect it to the backplane bus. The data is also transferred to the master gateway via Modbus RTU. Here too, data storage and processing takes place in the master gateway.

### 3.1 Use cases

The HUB-VM102 is ideal for:

- Long-term monitoring of conditions, generators, motors, gearboxes, turbines, pumps, fans, compressors, machines, bearings
- Vibration and impact testing, quality assurance and product testing

#### Special features

- Continuous measurement of effective value (RMS) and peak value
- Instantaneous value storage and processing (FFT)
- Configurable filters (low-pass, band-pass, high-pass)
- Monitoring functions in conjunction with an [in.hub](#) gateway: data logger, alarm messages when threshold values are exceeded
- Event-controlled measured value recording for data processing in the gateway through threshold value monitoring (RMS or peak value) and external digital pulse
- Sensor monitoring (cable break and short circuit)



### 3.2 Hardware - Structure and interfaces

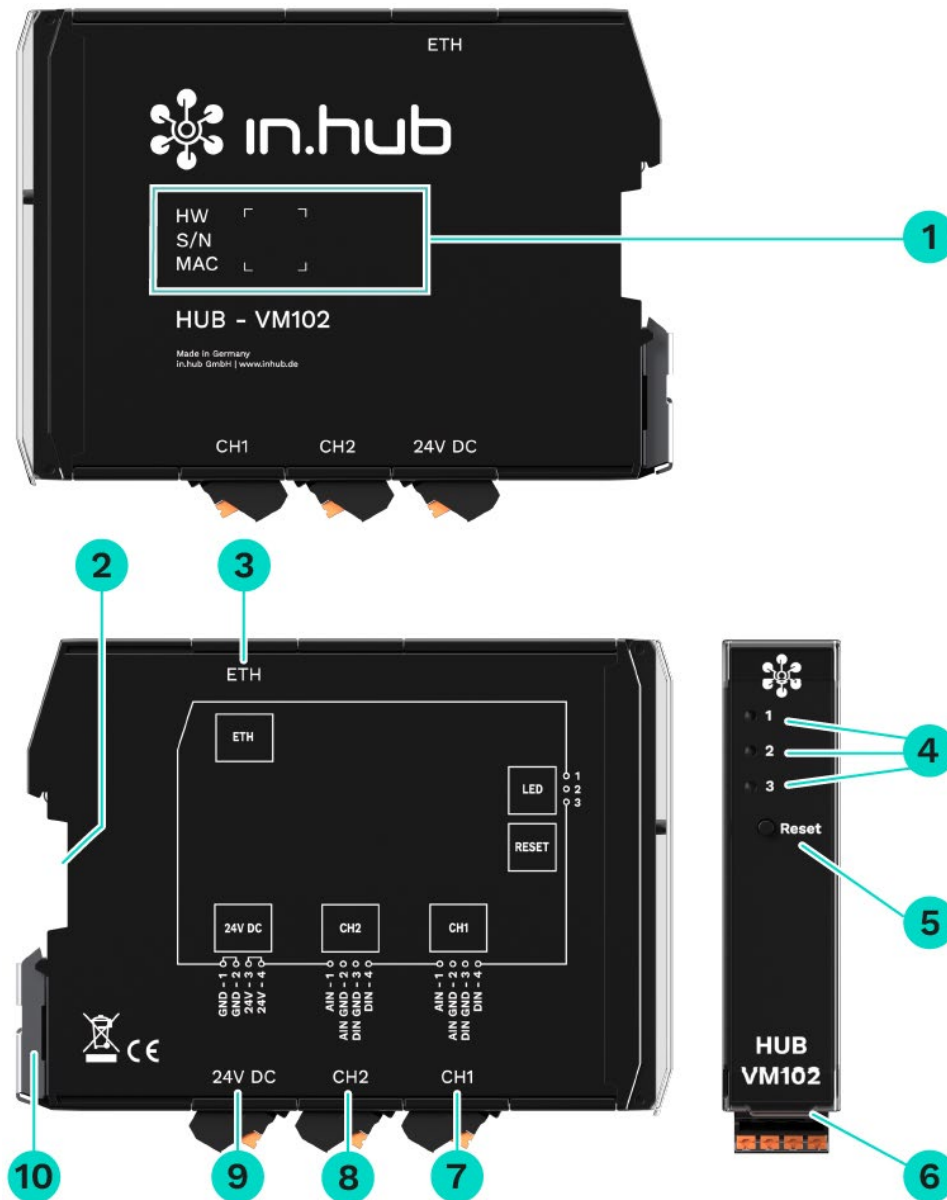


Fig. 2: Side views and front view of the HUB-VM102 incl. interfaces

1	Device-specific information that can be read with a QR code scanner HW: Hardware revision number S/N: in.hub-internal serial number MAC: Hardware address of the Ethernet network adapter
2	Backplane bus
3	Ethernet (ETH) Supports the MQTT and Modbus TCP protocols and is equipped with two LEDs.
4	LEDs for displaying the operating status

5	Reset button Resets all parameterizations that you have carried out independently on the device to the factory settings
6	Protective cap Can be folded upwards.
7	Digital input/analog input (CH1)
8	Digital input/analog input (CH2)
9	24V DC power supply
10	Clamping device for DIN rail installation

### 3.3 LED display

The three LEDs on the front of the device indicate the following states:

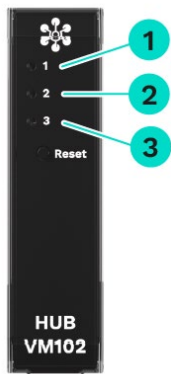


Fig. 3: LED status display on the front panel of the HUB-VM102

1	Device status
2	Operating status of the IEPE interface 1
3	Operating status of the IEPE interface 2

#### 3.3.1 LED 1: Device status

LED behavior	Color	Meaning
LED off	-	Device is out of service
Flashing in heartbeat mode	Green	Module ready for operation
Brief flashing	Red	Backplane bus active
Flashing	Red	Maintenance mode (e.g. for FLASH update, reset)

**3.3.2 LED 2 & 3: Operating status of the IEPE interface 1 and 2**

<b>LED behavior</b>	<b>Color</b>	<b>Meaning</b>
Permanent light	Green	Sensor ready for operation
Permanent light	Red	No sensor connected, defective sensor or cable (short circuit or open)

**3.3.3 LED on the ETH socket**

The LEDs can only be seen from above.

<b>LED behavior</b>	<b>Color</b>	<b>Meaning</b>
Flashing	Green	Data transmission
Permanent light	Yellow	Network communication established

## 4 Assembly

The HUB-VM102 is designed for mounting on a DIN rail compliant with DIN EN 60715 (35 mm).

Observe the applicable safety and accident prevention regulations for specific areas of application, e.g. the Machinery Directive.

- Always switch the power supply off.



**WARNING** Electric shock due to conductive contamination can cause physical injury!

- Avoid conductive contamination.
- Only install devices in a control cabinet of the appropriate protection class.

- 
- **RECOMMENDATION:** Maintain a minimum distance of 25 mm between the cable duct and the edge of the housing. This applies to both the top and bottom edges. This makes installation easier.

### 4.1 Mounting as a single device

1. Switch off the power supply.
2. Rotate the module so that the metal clamping device is facing downward.
3. Hold the module at an angle to the DIN rail.  
The recess on the back of the module is located above the clamping device.
4. Push the module onto the DIN rail until the clamping device audibly clicks into place.
5. After installation, check that the device is firmly fixed and straight on the DIN rail.

## 4.2 Mounting on the backplane bus

1. Switch off the power supply.
2. Plug the backplane bus connector into the backplane bus interface of the HUB-VM102.
3. Check that the connector is also attached to the master gateway or the previous module to which you want to connect the HUB-VM102.
4. Click the HUB-VM102 onto the DIN rail and slide it up to the gateway or module so that the pins of the two backplane bus connectors interlock.



Fig. 4: Master gateway HUB-GM200 with a HUB-VM102

## 4.3 Dismounting

1. Switch off the power supply.
2. Pull down the metal clamping device with a screwdriver and remove the module from the DIN rail.



Fig. 5: Removing the HUB-VM102 from the DIN rail

## 5 Commissioning

### 5.1 Interfaces of the HUB-VM102

The following chapter provides an overview of the interfaces of the HUB-VM102 and provides the information you need to connect these interfaces.

#### 5.1.1 LED display

- 3 x LED (red/green) on the front panel
- 2 x LED (monocolor) on the ETH interface

#### 5.1.2 Ethernet (ETH)

- Communication via the Modbus TCP and MQTT protocols

#### 5.1.3 CH1 and CH2

- Connection of one IEPE sensor per channel, data can be recorded synchronously
- Power supply for IEPE sensors = ~4 mA and monitoring of the IEPE voltage (short circuit, open line)
- Maximum AC input level = 6 V<sub>eff</sub>
- Bandwidth IEPE channel = 0.5...10,000 Hz
- ADC sampling frequency = 48,000 kHz
- ADC resolution = 24 bit



Fig. 6: Schematic drawing of the CH1 and CH2 interface

Pin assignment of interfaces CH1 and CH2		
1	AIN	Analog input
2	AIN GND	Ground / 0 V / V-
3	DIN GND	Ground / 0 V / V-
4	DIN	Digital input

**Specification digital input**

- EN61131-2 Type1/3 conform
- Switching threshold adjustable between 1...12 V, 0.5 V hysteresis
- Pull-down current ~2 mA
- Bandwidth = 10 kHz
- Input resistance = 1 MOhm, max. 30 V
- Dielectric strength according to EN61131-2 30V

**Specification analog input**

- Connection for IEPE-compliant sensors
- Constant current supply = 4 mA

**5.1.4 Power supply**

- 24 V DC  $\pm$  10 %
- Max. power consumption = 3.6 W (150 mA)

**5.1.5 Backplane bus**

- Max. number of modules on one master gateway: 10
- Voltage on the backplane bus of the master gateway = 24 V DC  $\pm$  10 %
- Communication via Modbus RTU

## 5.2 Establishing own power supply

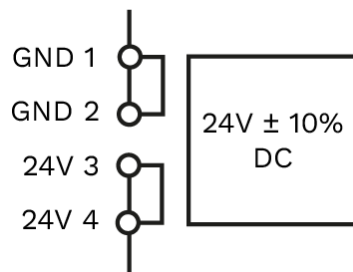
The HUB-VM102 requires its own power supply if it is NOT connected via the backplane bus of the master gateway. As soon as the HUB-VM102 is installed separately from the master gateway, you must supply it with power separately.



**WARNING** An incorrect power supply can cause irreparable damage to property!

- Make sure that the power supply meets the specification of  $24\text{ V} \pm 10\%$ .

1. For easier mounting, you can remove the connector with the terminal contacts from the **24V DC** interface.
2. Clamp the power connection cable into the connector as shown in the following diagram:



**Fig. 7: Schematic drawing of the power supply**

After the operating voltage is applied, the status LED starts to flash green a few seconds later.

## 5.3 Establishing power supply via backplane bus

The HUB-VM102 is automatically supplied with power as soon as it is connected to a master gateway via the backplane bus.



## 6 Further steps in SIINEOS of the master gateway

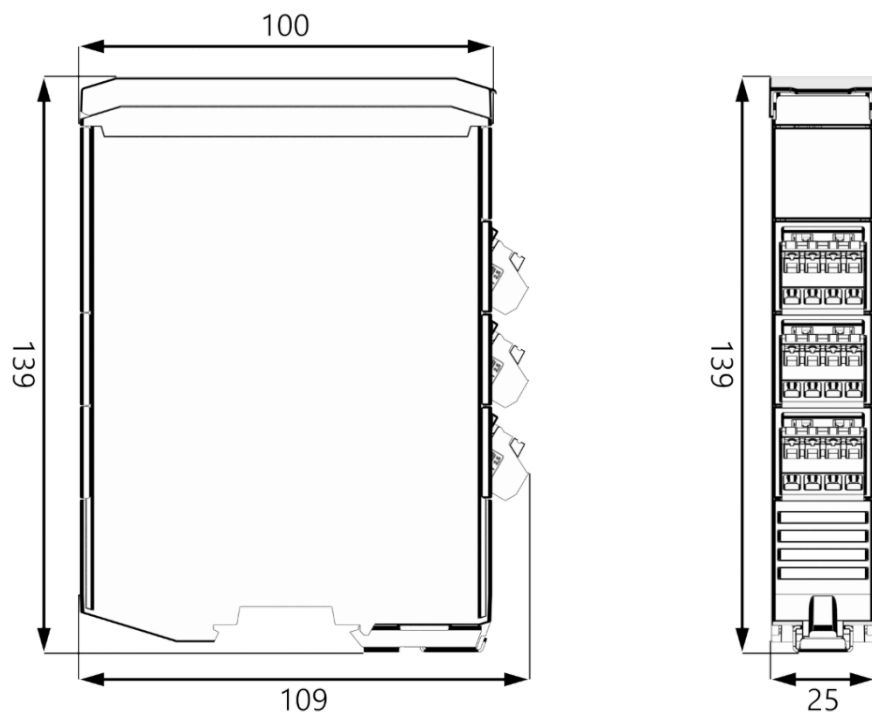
Now switch to the master gateway and log in to SIINEOS to create the HUB-VM102 as an I/O unit.

All steps required for working in SIINEOS and for configuring the interfaces, data pre-processing and displaying measured values are described in detail in the SIINEOS user manual. You can download this from the download portal:

<https://download.inhub.de/siineos/>

## 7 Technical data

Data	Values
Voltage range of the power supply	24 V DC $\pm$ 10 %   reverse polarity protected and overload protected
Power consumption	~130 mA
Microcontroller	166 MHz, 32 Bit ARM Cortex M7
Memory	Flash: Dualflash, 2 x 512 kB Internal RAM: 358 kB + 128 kB fast RAM External RAM: maximum available memory = 16 MB
Interfaces	1 x Ethernet, 2 x analog input (for IEPE vibration and acoustic sensors), 2 x digital input (30 V and 10 kHz), backplane bus
Protocols	MQTT, Modbus TCP/IP
Temperature range	Operation: 0 °C to 50 °C Storage: -40 °C to 85 °C
Humidity	Operation: 20 % to 90 % RH non-condensing Storage: 10 % to 95 % RH non-condensing
Housing	Plastic (polyamide), black UL 94 V0 flammability class
Protection class	IP20
Dimensions (L x H x W)	139 mm x 100 mm x 25 mm 5.47 in x 3.94 in x 0.98 in
Weight	142 g



**Fig. 8: Schematic drawing of the HUB-VM102 (dimensions in mm)**

## 8 EU Declaration of Conformity



### EU-Konformitätserklärung Nr. VM102-1

EU Declaration of Conformity No.:

Wir/ we

in.hub GmbH  
Technologie-Campus 1,  
09126 Chemnitz, Germany

erklären in alleiniger Verantwortung, dass die Produkte  
declare under our sole responsibility that the products

#### HUB-VM102

auf die sich die Erklärung bezieht, den Anforderungen der folgenden EU-Richtlinien durch Einhaltung der folgenden harmonisierten Normen genügen:

to which this declaration relates are in conformity with the requirements of the following EU-directives by compliance with the following harmonised standards:

#### Prüfverfahren/Test Specification

Störaussendung/*Emission* EN 61326-2-5:2013 (Klasse B, Gruppe 1)  
Störfestigkeit/*Susceptibility* EN 61326-2-5:2013 (Industriebereich)

#### Normen / Standards

IEC 61000-3-2:2005  
IEC 61000-3-3:2008  
IEC 61000-3-11:2000  
IEC 61000-3-12:2011  
IEC 61000-4-2:2008  
IEC 61000-4-3:2006



IEC 61000-4-4:2004  
 IEC 61000-4-5:2005  
 IEC 61000-4-6:2008  
 IEC 61000-4-8:2009  
 IEC 61000-4-11:2004  
 CISPR 11 (mod.):2009

**Weitere Normen, Bemerkungen**

additional standards, remarks

Das Produkt stimmt mit den Anforderungen der Richtlinie 2014/30/EU überein. Eine oder mehrere in der zugehörigen EG-Baumusterprüfbescheinigung genannten Normen wurden bereits durch neue Ausgaben ersetzt. Der Hersteller erklärt für das Produkt auch die Übereinstimmung mit den neuen Normenausgaben, da die veränderten Anforderungen der neuen Normenausgaben für dieses Produkt nicht relevant sind.

The product complies with the directive 2014/30/EU. One or more norms mentioned in the respective EC type examination certificate were already replaced by new ones. The manufacturer declares that the product complies with the new valid norms, as the changed requirements mentioned there are not relevant for the product.

Chemnitz, den 08.06.2021

Marco Neubert / Geschäftsführer

Ort und Datum der Ausstellung /

Name, Funktion und Unterschrift des Befugten /

Place and date of issue

Name, function and signature of authorized person

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