# OPUS A8

## Operating Manual
## Hardware Description


## Versions

Example

OPUSA8EN1CANB000

| | |
|---|---|
| OPUSA8 | model |
| E | E=ECO; S= Standard |
| N | N=Neutral |
| 1 | 1st Generation |
| CAN | CAN=Projektor; CDS=CODESYS©; ISO=ISO-VT |
| B | B=Basic; F= Full |
| 000 | customer specific identification |



Operating Manual OPUS A8
Order number: OPUSBA00A8

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Supplements or a special operator manual may be required for customer-specific devices.

Version 2.0, July 2017

# Table of content

# 1 Preliminary Notes

This document is valid for the following OPUS A8 version:

- OPUSA8E - “ECO”
- OPUSA8S - “STANDARD”

This document is directed to the qualified personnel and contains all the important information to the correct use of the OPUS A8.

Please read this document before the first use and keep it during the operation.

In order to provide a better overview, this operating manual cannot present all details for handling the OPUS A8 in all conceivable application cases. Neither can all conceivable methods of setting up the device, operating the device, and servicing the device be discussed in this manual. In case more information or support is required please contact manufacturer technical support department.

## 1.1 Used Instructions Types

This operating manual contains instructions that must be complied with for your personal safety and in order to avoid damage to property.

The instructions are presented as follows listed by degree of hazard:

**Hazard!**

**Very Important information**
**Malfunction or Failure possible if non-compliance**

**Caution!**

**Severe bodily injury or property damage can occur if the respective precautionary measures are not taken**

**Note**

**Additional information about the product, the handling of the product or the respective part of the operating manual to which particular attention should be paid.**

# 2 Safety instructions, guarantee and liability

## 2.1 Common

Read this operating manual before commissioning the OPUS A8. Keep this operating manual where it is accessible to all users at anytime. Every person who is assigned to commission or operate the OPUS A8 must have read and understood the operating manual and the safety instructions in particular!

This operating manual contains instructions that must be complied with for your personal safety and in order to avoid damage to property. Failure to follow these safety instructions could result in fire, electric shock, or other injury or damage to OPUS A8 or other property.

## 2.2 Qualified Personnel

This operating manual is intended for technically qualified personnel, who have the appropriate skills in the area of measurement, control, and regulating technology.

Precise knowledge of all safety instructions and warnings contained in this operating manual, as well as problem-free technical implementation of these instructions and warnings are the prerequisites for hazard-free installation, commissioning, safe operation, and maintenance, of the operator panel. Consequently, it is strictly required that all measures be performed by qualified personnel.

Qualified personnel, in accordance with the safety and warning instructions contained in this operating manual are personnel, who

- are familiar with CANbus systems, related protocols and network designs that fulfill all legal requirements of the intended application, so that they are able to program the OPUS operator panel accordingly
- have gained knowledge of the programming related concepts by education or trainings. Using the Projektor Tool a Projektor Tool training by Topcon needs to be attended. Using CODESYS© a CODESYS©-training needs to be attended, either held by Topcon or 3S.
- are familiar with the safety concepts of automation technology, either as project design personnel
- or as operating personnel who have been instructed in how to handle the automation technology, and who are familiar with the section of this manual which deals with operation.
- or who, as commissioning, and service personnel have been trained to repair this type of automation technology, or who are authorized to commission, ground, and label electrical circuits and devices, or systems, in accordance with technical safety standards.

All persons who are involved in project planning, installation and operating the OPUS A8 must be familiar with automation technology safety concepts, and they must be qualified in accordance with the guidelines listed above.

Serious bodily injury and property damage can occur in the event of unqualified interventions in the device, or the system, or failure to heed the warning instructions specified in this operating manual.

Consequently, only personnel who are appropriately qualified may undertake interventions on this device, or on the associated system.

## 2.3 Power Supply

OPUS A8 is designed for 12 V and for 24 Volt battery systems. The operating voltage range is 9-36 VDC, overvoltage resistance 48V for 2 minutes, inverse-polarity protection up to -48 VDC for 5 minutes.

## 2.4 Interventions in the device

The OPUS A8 has been developed, manufactured, and tested in compliance with applicable standards. When the handling guidelines and safety-related instructions described here are complied with for project design, mounting, intended use, and maintenance, normally the product poses no hazards relative to property damage or to personal health. Nevertheless, the device can cause residual hazards if it is used or operated improperly by personnel who have not been trained.

In case of malfunctions or lacks please get in contact with the manufacturer. Any interventions in the device are able to cause serious interferences of the security for people and machines. They are not allowed and lead to disclaimer of liability and guarantee exclusion.

**TOPCON is not liable for damage that occurs due to improper misuse of the delivered components, or through failure to heed the instructions in the operating manual, including the safety instructions.**

**TOPCON is not liable for damage that occurs due to unintended or intended changes of the TOPCON board support package or any other parts of the operating system.**

**TOPCON is not liable for damage that occurs due to improper programming and/or testing of the created application that runs on the OPUS operator panels.**

**TOPCON is not liable for damage or malfunctions occurs using pirated or illegal software on the OPUS operator panel.**

**TOPCON is not liable for injuries to third party licenses for the contents used on OPUS panel by the end customer.**

Moreover, we expressly declare that all obligations on the part of Topcon are exclusively derived from the respective purchase contract, in which the guarantee is conclusively stipulated.

## 2.5 Safety Instructions for the OPUS A8

**Dangerous high-voltage**
**Never attempt to repair or modify OPUS A8 yourself. Disassembling OPUS A8 may cause damage that is not covered under the warranty and cause hazardous conditions by the high-voltage components inside of the unit.**
**OPUS A8 does not contain any user-serviceable parts. Service should only be provided by a Topcon Electronics GmbH & Co KG.**

**Hazardous situations due to device failure**
**Do not use the OPUS A8 as the sole means of preventing hazardous conditions on vehicles, machines and equipment. Vehicles, machines and equipment must be constructed in such a manner that defective conditions associated with the OPUS A8 cannot cause a hazardous situation for operating personnel.**
**Ensure that incorrect inputs via the OPUS A8, its malfunction, or its failure cannot lead to major property damage, or to a hazard for operating personnel**.

**Missing safety devices if used improperly**
**Precautions for the safety of a system should not be rendered inoperable through the use of the OPUS A8.**
**Emergency-Stop devices must remain effective in all operating modes.**

**Unintentional operation**
**Operating states can be called due to unintentional operation of the OPUS A8 that are not appropriate for the situation.**
**OPUS A8 devices should be installed in such a manner that the possibility of unintentional operation is adequately excluded.**

**Undefined operating states**
**Undefined operating states can cause personal injury or property damage.**
**To prevent supply line and signal line interruptions from causing undefined or hazardous operating conditions, appropriate hardware and software safety precautions must be maintained.**

**Supply lines and signal lines must be installed in such a manner that noise (such as inductive or capacitive interference) cannot impair OPUS A8 function.**

**If a further usage of the OPUS A8 will cause danger, the device and if necessary the system needs to be switched off and be secured against unintented activation. This particularly applies:**

- **If the device shows visible signs of damage**
- **If the device is no longer functional**
- **If parts of the device are disconnected or loose**
- **if the connection lines show visible damage**

**Using Connectors and Ports:**
**Never force a connector into a port. Check for mechanical obstructions on the port. If the connector and port don't join with reasonable ease, they probably do not match. Make sure that the connector matches the port and that you have positioned the connector correctly in relation to the port.**

# 3 Intended Use

The operator panel OPUS A8 is a programmable graphical display used to operate and monitor vehicles and working machines.

The communication with other system components, as for example decentralised I/O module, occurs over the CAN interfaces with the supported protocols: CANopen, J1939 and CANfreestyle (layer 2).

For service purposes additional interfaces like Ethernet, RS232, USB and analog/digital inputs/outputs (optional) are available. Together with Embedded Linux operating system they form a universal platform for the communication with other CAN devices, networks or PCs.

**The operator panel OPUS A8 is not admitted for security-relevant duties for personal protection purposes.**

**Vehicles, machines, and equipment surrounding the OPUS A8 must be combined in such a manner that the OPUS A8 will be warmed up equally from all sides.**
**Increased warming of the OPUS from the back side may cause temporary fogging of the front glass or touch screen.**

## 3.1 Example of Use


**Control Unit 1**
Controlling of the actuation

**Control Unit 2**
Data logging from sensors/switches

**Control Unit 3**
Controlling of movement

**Sensor 1**
Sensor for CAN-Bus

## 3.2 Device Description

### 3.2.1 OPUS A8 ECO

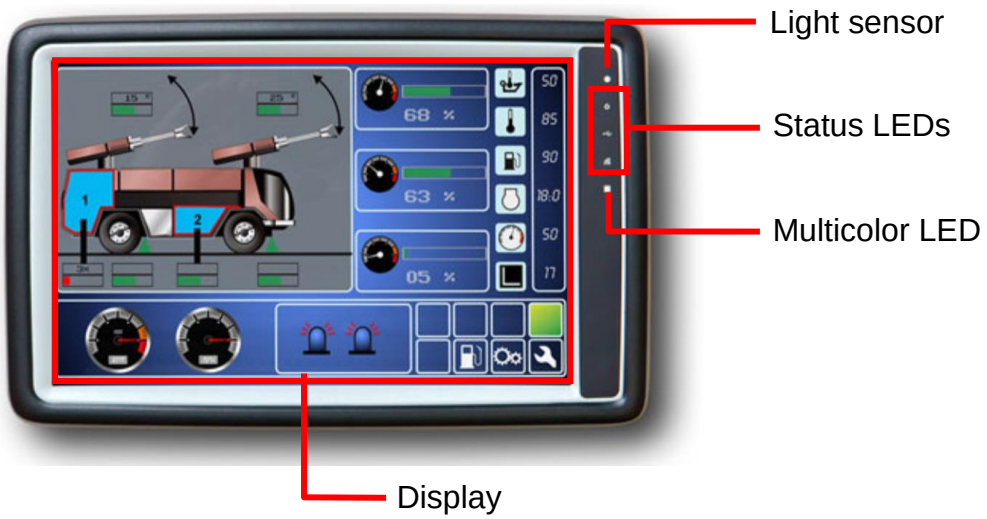
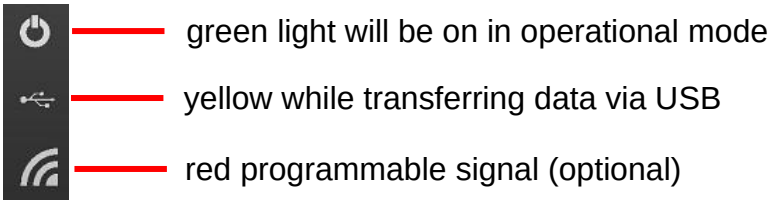



Fig. 3.1: Front view of the OPUS A8 ECO

Display:
12.1” (1280 x 800 px) TFT color graphic LCD display with LED backlight and PCT

Light Sensor:
The light sensor can be used for an automatic adaption of display-backlight and key-backlight to the ambient light intensity.

Status LEDs:
There are 3 different status LEDs available:




Multicolor LED:
Multicolor-LED is embedded in keypad and can be free programmable. This LED is able to show PWM-controlled RGB colours, 16 bit each.

## 3.2.2 OPUS A8 STANDARD

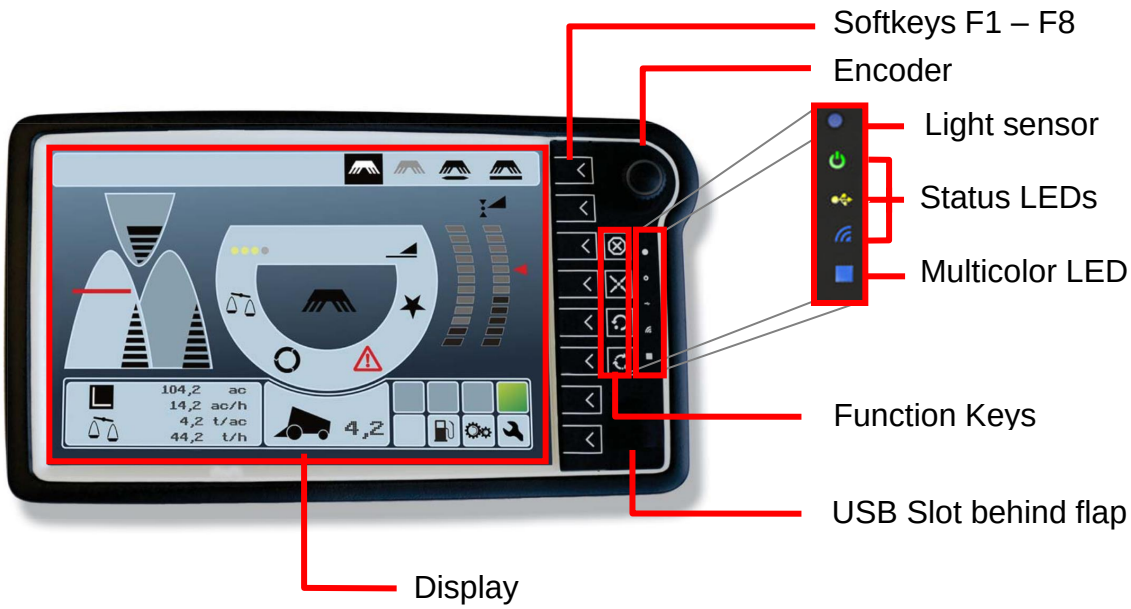



Fig. 3.2: Front view of the OPUS A8 STANDARD Landscape

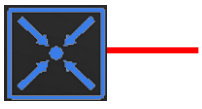
Display:
12.1” (1280 x 800 px) TFT color graphic LCD display with LED backlight and PCT

Softkeys F1 to F8:
All softkeys can be assigned to the function defined in the customer specific application. Please see the ***Operational Manual*** of the application tools for more information.

The Function Keys:
The function keys serve as global keys and do not change the function with a screen change.

Using CODESYS© all these keys are free programmable.

Using Projektor Tool only STOP key is programmable. Three-arrow-key is per default reserved for windows management, but could get programmed additional function. Both other keys have fix function:



HOME key is used to change the display page to the start page of the application

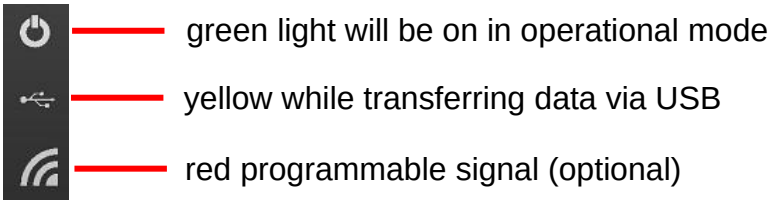
ESC key is used to deselect the selected value, to cancel the entered value or to acknowledge the raised alarm

The Encoder:

Encoder is used for the navigation between the objects in customer specific application. It is possible to select graphical objects on the screen and change their value rotating the encoder. An entry function can be generated directly on rotating or by pressing the encoder.

Light Sensor:
The light sensor can be used for an automatic adaption of display-backlight and key-backlight to the ambient light intensity.

Status LEDs:
There are 3 different status LEDs available:




Multicolor LED:
Multicolor-LED is embedded in keypad and can be free programmable. This LED is able to show PWM-controlled RGB colors, 16 bit each.

USB slot on the front on OPUS A8 STANDARD Full:
The high speed USB interface can be used for updating and data exchange.

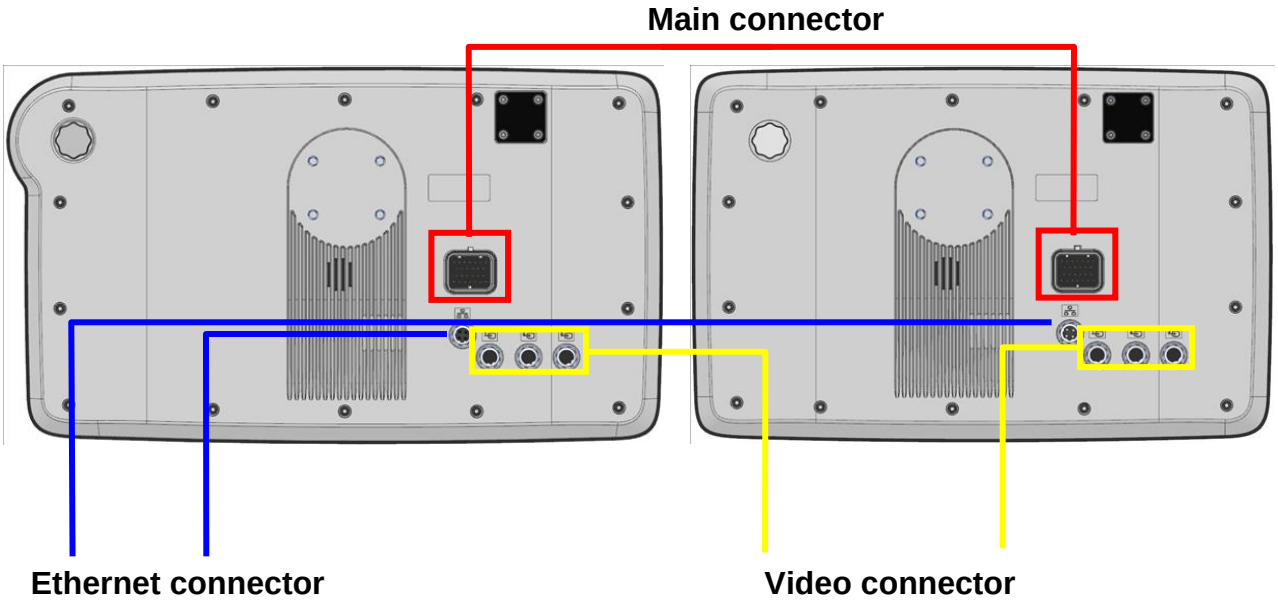



Fig. 3.4: View on both OPUS A8 types backside

Main connector:
The following interfaces are available:

- Power supply and ignition input
- 2 x CAN-Interfaces according to ISO/DIS 11898
- RS232-Interface
- USB full speed
- 4 configurable analogue/digital inputs (optional), where input 1 work with frequency 1-10 kHz and may also be used as frequency input, inputs 2-4 works with max signal frequency of 50Hz
- 3 digital outputs (option)
- Audio-Out (option)

Video:
This interface is used for the analog Video-Input including protected camera power supply as well as a digital camera control output (open drain). There is 1 video interface available on the basic option unit and 3 video interfaces available on the full option unit.

Ethernet:
There is an Ethernet interface (10/100 Mbit/s Base T) available on the unit. This interface may only be used for data transfer.

Power-on/off behavior:
The OPUS A8 does not have a separate on/off key. As soon as the device is supplied with the necessary voltage via terminal 30 (battery plus), terminal 31 (battery GND) and terminal 15 (ignition), it will start to boot. In order to decrease boot time the device supports power modes with which you can put the device in a sleep mode before it powers down.

When ignition voltage is removed, the device will switch to low-power-mode (see ***C/C++ Developer Guide***). After a time frame that can be configured (default time is 60 sec) the device will move one more step down to sleep-mode. After another 60 seconds (default time) the unit will fully switch off. As soon as terminal 15 is switched on again the unit will go back to on-mode in full operation.

| Power Mode | current at 13.5 V DC | current at 27 V |
|---|---|---|
| **On** | ≤ 3000 mA | ≤ 1300 mA |
| **Low-power** | Depending on configation | Depending on configation |
| **Sleep** | ≤ 200 mA | ≤ 80 mA |
| **Off** | ≤ 2 mA | ≤ 3 mA |

**Do not unplug clamp 30 from power supply on running unit. Power supply interruption on clamp 30 may cause data corruption and loss.**

For more information please refer to the ***C/C++ Developer Guide***.

## 3.3 Features Overview for OPUS A8

- Encapsulated plastic front housing to be mounted in landscape or portrait mode, standalone with aluminium back-housing
- 12,1” TFT automotive color display with a resolution of 1280 x 800 pixels
  Projective capacitive touch screen in full version
- Programmable keys with backlight on STANDARD variant
- Powerful Freescale I.MX6® single core 800MHz CPU in basic version
  Powerful Freescale I.MX6® quad core 1GHz CPU in full version
- 32bit processor with embedded Linux operating system (Linux kernel 3.0.35)
- Two CAN interfaces (ISO 11898) using CANopen® and SAE J1939 protocols. Layer II is also supported
- Four analogue / digital inputs (input 1 may also be used as frequency input) and three digital outputs (option)
- Speaker (80 dB @ 1 kHz in 1 m distance) and Light sensor
- RS232 interface for serial console and full-speed USB on main connector
- High speed USB on the front on STANDARD variant

The OPUS A8 is particularly characterized by its robust design, and it has been developed especially for harsh use conditions in mobile work machines.

## 3.4 Application Development

There are three possible ways to program the OPUS A8 and make it an integrated part of its application.

**1. Projektor-Tool:**
This powerful development environment provided by Topcon Electronics GmbH & Co KG enables the quick and effective creation of an application for the OPUS A8 operator terminal. Use the Projektor to conveniently design the user interface on the computer, which can be easily displayed on the device. Additionally, this tool includes features to work with CANopen®, J1939 and CANfreestyle protocols for CAN communication.

**2. CODESYS© 3.x:**
CODESYS© is a programming tool and system developed by the German company 3S according to IEC 61131-3 standard. It supports different means of programming such as FUP (continuous function chart; CFC) or structured text. It can be used to program the OPUS A8 and CODESYS© compatible ECUs. CODESYS© includes the functionality to configure the CANopen® protocol for communication over CAN bus.

**3. C-Programming:**
OPUS A8 with its embedded Linux operating system can be fully programmed using C or C++ as programming language.
For further information and function-call list please refer to the ***C/C++ Developer Guide.***

**4. ISO-UT:**
OPUS A8 can be used as an ISO-UT slave in accordance with the ISO-11783 standard and DLG conformity.

**5. Topcon Board Support Package (BSP):**
Based on the operating system the Topcon BSP provides all the necessary interfaces to control the internal functionality of the unit (e.g. activation of the display backlight, processing key activation, etc.).
This software is ready installed on all OPUS A8 delivered together with the operation system. For further information please refer to the ***C/C++ Developer Guide.***

**6. Universal Downloader:**
To download software from the PC to the terminal the Universal Downloader 4 is provided. It supports a download via USB stick and Ethernet. The Universal Downloader 4 also stores the software, installs it and restarts the application on the terminal.

**The operator panel OPUS A8 may only be handled due to the according operation manual.**

Please take notice of the following recommendation and prerequisites for the computer used to the application design and /or programming:

- Using Projektor Tool and CODESYS© for the development it is recommended to use the PC with Windows XP (or higher) operational system (for CODESYS© it may by younger), at least 2 GB free hard disk capacity and 2 GB RAM. Serial port is recommended.
- Programming with C/C++ Linux operational system is prerequisite.

## 3.5 Development Kit

For programming the graphical user interface of the OPUS A8 some different development kits are provided.

**Topcon Toolchain with Projektor Tool**
**Order number: OPEP00A8CAN**

| Description | Order Number | Qty |
|---|---|---|
| **Main connecting cable** | OPKAA8CAN15 | 1 |
| **Ethernet cable** | | 1 |
| **Topcon Toolchain download:**<br>- **Projektor Tool**<br>- **PClient**<br>- **Documentation** | | 1 |
| **Basic Projektor-Tool training at a Topcon Electronics facility** | | 1 |
| **Projektor Tool license** | | 2 |
| **12 month technical support** | | 1 |

**CODESYS© 3.x**
**Order number: OPEP00A8CDS**

| Description | Order Number | Qty |
|---|---|---|
| **Main connecting cable** | OPKAA8CAN15 | 1 |
| **Ethernet cable** | | 1 |
| **CODESYS© Software downlaod:**<br>- **Development Tool**<br>- **Application**<br>- **Target files**<br>- **Documentation** | | 1 |
| **Basic CODESYS© training at a Topcon Electronics facility** | | 1 |
| **12 month technical support** | | 1 |

**ISO-UT with Projektor Tool**
**Order number: OPEP00A8ISO**

| Description | Order Number | Qty |
|---|---|---|
| **Main connecting cable** | OPKAA8CAN15 | 1 |
| **Ethernet cable** | | 1 |
| **ISO-UT download:**<br>- **Projektor Tool**<br>- **PClient**<br>- **ISO-UT**<br>- **Documentation** | | 1 |
| **Basic Projektor-Tool training at a Topcon Electronics facility** | | 1 |
| **Projektor Tool license** | | 2 |
| **12 month technical support** | | 1 |

**Accessories not part of the Developer's kit:**

| Description | Order Number | Qty |
|---|---|---|
| **Video Cable OPUS A8** | OPKAA8VID010 | 1 |
| **Etherner-to-USB adapter** | | 1 |

# 4 Getting Started

## 4.1 Check the delivered parts

Please check whether all parts described in the scope of delivery have been delivered correctly. For question or reclamation please contact the support team of Topcon Electronics GmbH & Co KG (opus-support@topcon.com).

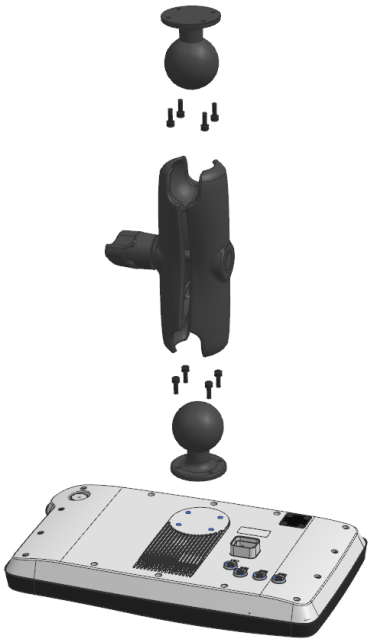
## 4.2 Mounting

The unit is delivered without mounting accessories.

Depending on mounting type the following mounting accessories are available.

**Standalone Mounting Kit with Standard Length Socket Arm**
(Order number OPUSBERM010)

Mounting kit contains the following parts:
2 x RAM® 3,68‘‘ diameter round base (2,25‘‘ ball)
1 x RAM® Standard Length Double Socket Arm (overall length: 8.375" or 212,7 mm)
4 x Cylinder head bolt M5 x 12 DIN 912



**Standalone Mounting Kit with Short Socket Arm**
(Order number OPUSBERM011)

Mounting kit contains the following parts:
2 x RAM® 3,68‘‘ diameter round base (2,25‘‘ ball)
1 x RAM® Short Length Double Socket Arm (overall length: 5.0625" or 128,6 mm)
4 x Cylinder head bolt M5 x 12 DIN 912

**Attention!**
**Using too long screws can damage the unit!**
**Accepted mounting torque is 4,3 ± 10% Nm**
**Please secure the screws with the thread locker medium strength (e.g. Loctite 243).**

The back side of the unit is ready prepared for standalone mounting. Both portrait and landscape positions are supported for mounting.

For mounting please follow the instruction provided in the according drawing.

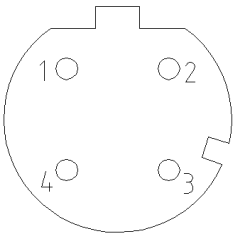
## 4.3 Electrical installation OPUS A8

Below you find the pin out diagram of the OPUS A8. The connectors (see fig.) are drawn as seen from the back side of the unit.

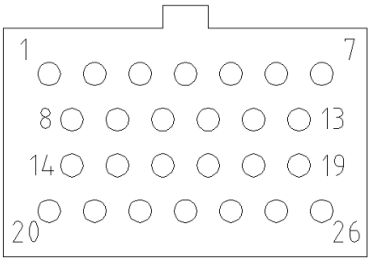
Please be aware that the existing pins and connectors depend on the hardware option you ordered.

Please note that the OPUS A8 only represents one part of the entire CAN network. Set-up and dimensioning of the network must be executed by specialized personnel, and the information in this regard cannot be a component of this operating manual.

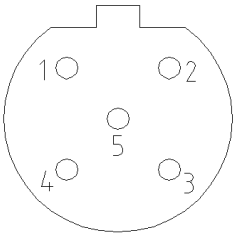
Ethernet Connector, M12, female, 4 pins, d-coded




Main Connector




Video-Connector, M12, female, 5 pins, b-coded




**Ethernet connector pinout**

| Ethernet | Round Connector, 4 pins, M12, acc. To IEC 61076-2-101 |
|---|---|
| 1 | TD+ |
| 2 | RD+ |
| 3 | TD- |
| 4 | RD- |

**Video connector pinout**

| Video | Round Connector, 5 pins, M12 |
|---|---|
| 1 | VidSig+ |
| 2 | Mirror |
| 3 | Camera+ |
| 4 | Camera - |
| 5 | VidSig GND |

**Main connector pinout (in full option)**

| pin no. | assignment | description |
|---|---|---|
| 1 | $V_{CC}$ | supply voltage +; terminal 30 |
| 2 | Ignition Input | ignition input; terminal 15 |
| 3 | GND | supply voltage - ;terminal 31 |
| 4 | CarGND | car ground |
| 5 | AUDIO_L | Audio left |
| 6 | AUDIO_R | Audio rigth |
| 7 | AUDIO_GND | Audio GND |
| 8 | CAN1H | CAN bus 1 high signal |
| 9 | CAN1L | CAN bus 1 low signal |
| 10 | CAN2H | CAN bus 2 high signal |
| 11 | CAN2L | CAN bus 2 low signal |
| 12 | USB_$V_{CC}$ | full speed USB, + 5 V DC |
| 13 | USB_GND | full speed USB, 0 V |
| 14 | USB_D- | full speed USB, data line (-) |
| 15 | USB_ D+ | full speed USB, data line (+) |
| 16 | RS232: RxD | RS232: RxD |
| 17 | RS232: TxD | RS232: TxD |
| 18 | RS232: GND | RS232: GND |
| 19 | A/DI3 | analog/digital input 3 |
| 20 | A/DI1 | analog/digital input 1, full frequency |
| 21 | A/DI2 | analog/digital input 2 |
| 22 | A/DI4 or WoI | analog/digital input 4 or wake up over input |
| 23 | SERV_EN | service enable; to be connected while power-on for updating |
| 24 | DO3 | digital output 3 |
| 25 | DO1 | digital output 1 |
| 26 | DO2 | digital output 2 |

Please observe the following guidelines for set-up:

- Power supply lines should only be passed in pairs as close together as possible.
- Sensitive signal lines should be shielded to achieve highest possible damping, and under this shielding they should be still be passed twisted.
- Metal plug connections should be used for shielded lines.
- Cable bundles should be distributed in accordance with their purpose (e.g. HF, LG, and power supply); the groups thus formed should not be routed in parallel to the extent possible, and they should be routed with clearance.

The OPUS A8 relies on a connection to an ECU that controls the functions and features of the target vehicle/machine.

**The ECU must be the component in charge of all safety related functions.**

Please keep all the connectors separated. All connection should be done on the shortest distance to the unit.

**Wrong connection may cause damage of the unit.**

### 4.3.1 Unused plugs

**Penetrating humidity by unused and unprotected plugs may cause damage of the unit. Please protect unused plugs with the special blind inserts that have been supplied with the units.**

### 4.3.2 Power Supply

The unit may be used with the 12 V and for 24 Volt battery systems, operating voltage range of 9-36 VDC. The overvoltage resistance is about 48V for 5 minutes. Inverse-polarity protection is up to -48 V DC.

## 4.4 First steps

Plug in the main connector into the OPUS A8. Then connect the clamps 15 and 30 for the plus voltage, as well as clamps for GND and CarGND to ground. Switch on the Power supply.

The boot-logo image will be displayed on the screen while starting-up. This may be exchanged with the customer specific image (please refer to **C/C++ Developer Guide** for more information).

The boot-up will call the application according to the start scripts on the unit (start scripts for Projektor Tool and CODESYS© application already installed by delivery).

The application displays the information of the required application software version. CODESYS© application also contains a simple function test. Each newly downloaded application will replace the old one automatically.

## 4.5 Cleaning/ service / maintenance

Cleaning agents which have an abrasive or dissolving effect on the coated glass pane, the foil of the touch screen or the plastic of the encoder or the housing should not be used to clean OPUS A8 operator panels. Only use soft clothes with a little soap and water or mild dish washing liquid.

The OPUS A8 does not have any parts that require service by the user. Repairs can only be performed by Topcon Electronics GmbH & Co KG.

## 4.6 Disposal

Dispose of the device in accordance with the national environmental regulations

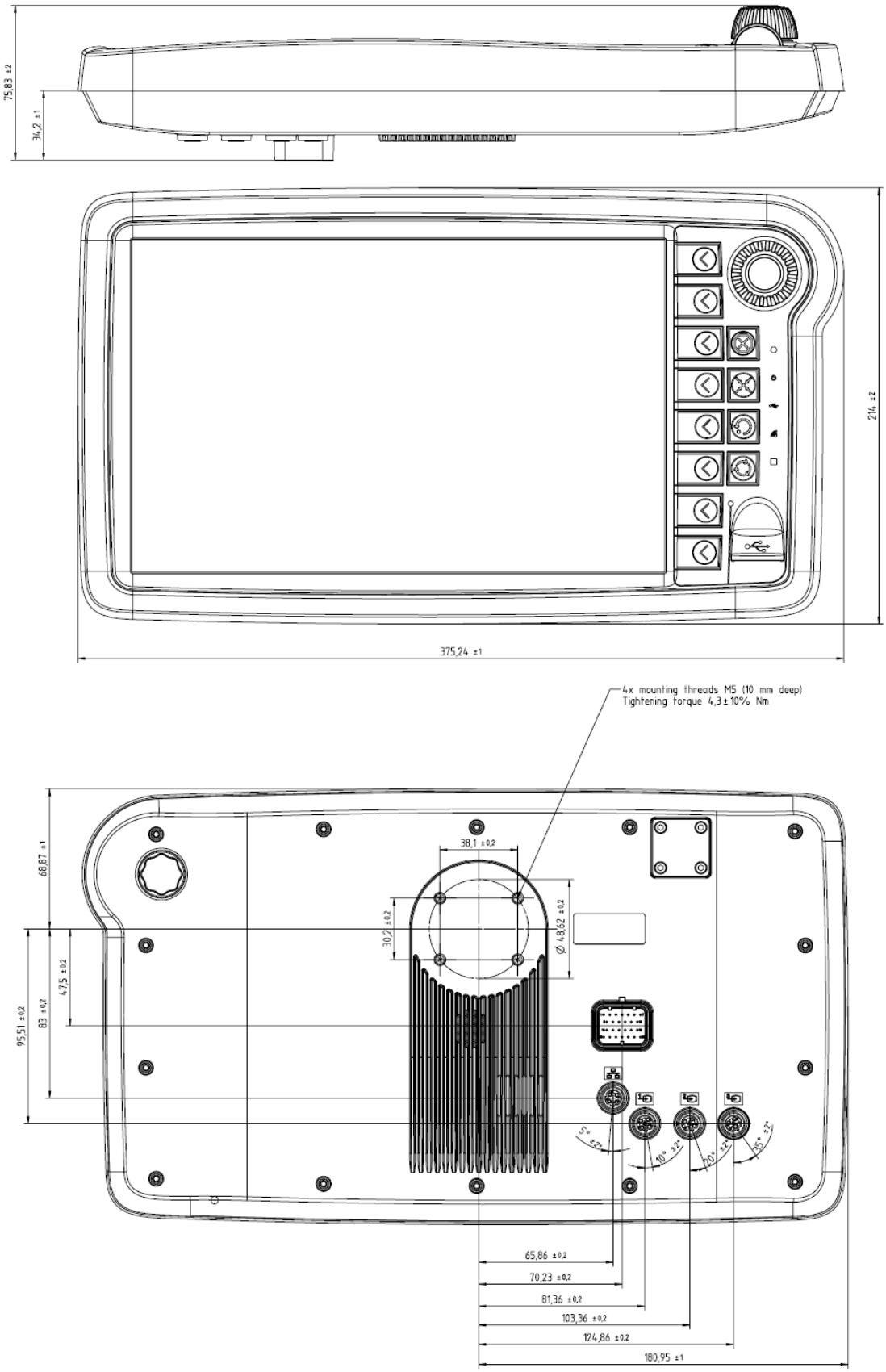
# 5 Technical Documentation

The OPUS A8 is available in two housing versions.

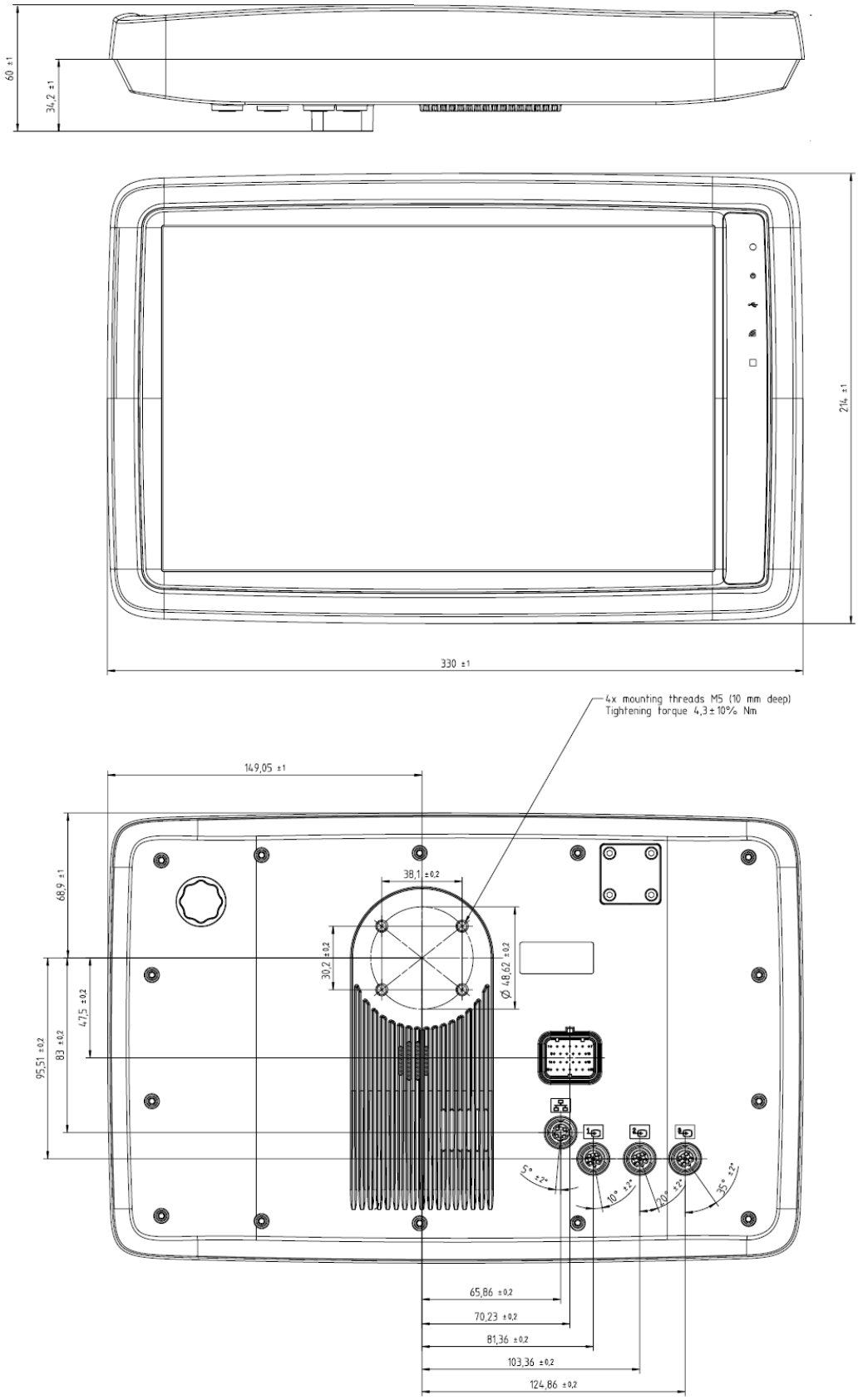
OPUS A8 STANDARD:

OPUS A8 ECO:

## 5.1 Dimensional Drawings - OPUS A8 STANDARD



## 5.2 Dimensional Drawings - OPUS A8 ECO



## 5.3 Specification

| | OPUS A8 ECO | | OPUS A8 STANDARD | |
|---|---|---|---|---|
| | **Basic** | **Full** | **Basic** | **Full** |
| Dimensions (mm) | H145 x W224 x D56 | H145 x W224 x D56 | H145 x W267 x D70 | H145 x W267 x D70 |
| Display resolution | 1280x800 pixels | 1280x800 pixels | 1280x800 pixels | 1280x800 pixels |
| Touchscreen(PCT) | ▬ | ▬ | ▬ | ▬ |
| Keys Soft / Hard | | | 8 / 4 | 8 / 4 |
| Key backlight | | | ▬ | ▬ |
| Encoder with Click | | | ▬ | ▬ |
| Optical Signal | 4 | 4 | 4 | 4 |
| Speaker | ▬ | ▬ | ▬ | ▬ |
| Processor Speed | 800 MHz I.MX6 | 1 GHz I.MX6 | 800 MHz I.MX6 | 1 GHz I.MX6 |
| RAM | 512 MB | 1024 MB | 512 MB | 1024 MB |
| Mass Storage | 4 GB | 8 GB | 4 GB | 8 GB |
| EEPROM | 32 kB serial | 32 kB serial | 32 kB serial | 32 kB serial |
| CAN bus | 2 | 2 | 2 | 2 |
| RS232 | 1 | 1 | 1 | 1 |
| USB 2.0 full speed | ▬ | ▬ | ▬ | ▬ |
| USB 2.0 high speed | | | | ▬ |
| Ethernet | ▬ | ▬ | ▬ | ▬ |
| Video in | 1 | 3 | 1 | 3 |
| Analog/digital input | 2 | 4 | 2 | 4 |
| Digital Output | 1 | 3 | 1 | 3 |
| Real time clock | ▬ | ▬ | ▬ | ▬ |
| Light Sensor | ▬ | ▬ | ▬ | ▬ |
| Headphone-Out | | ▬ | | ▬ |

## 5.4 Environmental compatibility

### 5.4.1 CE-Compliance

EU Directive 2014/30/EC (EMC) according to

- EN 12895: Industrial Trucks – Electromagnetic compatibility
- EN 13309: Construction machinery – Electromagnetic compatibility of machines with internal electrical power supply
- EN ISO 14982: Agricultural and forestry machinery - Electromagnetic compatibility - Test methods and acceptance criteria

### 5.4.2 Protection Level (IP Code)

IP 65 and IP 66 according to ISO 20653: Road Vehicles – Degrees of protection (IP-Code) – Protection of electrical equipment against foreign objects, water and access

### 5.4.3 Electrical Capability

12 and 24V-Systems according to:

- ISO 16750-2: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Electrical loads
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

### 5.4.4 Mechanical Capability

According to ISO 16750-3: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Mechanical loads, Code L

ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

- Mechanical Shock: Level 2
- Random Vibration: Level 2
- Sinusoidal Vibration: Level 2

### 5.4.5 Climate Capability

- According to ISO 16750-4: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Climatic Loads
  - Operating Temperature Range: Code E: -30 … +65°C
  - Storage Temperature Range: -40 … +85°C
  - Climatic Loads: Code C
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

### 5.4.6 Chemical Capability

- According to ISO 16750-5: Road Vehicles – Environmental conditions and testing for electrical and electronic equipment – Chemical Loads
  Mounting Location: B
- ISO 15003: Agricultural Engineering – Electrical and electronic equipment – Testing resistance to environmental conditions

## 5.5 Declaration of Conformity

### 5.5.1 Declaration of Conformity for OPUS A8

TOPCON

**EU–Konformitätserklärung**
*EU Declaration of Conformity*

**für die Produktfamilie:** **OPUS A8**
*for the product family:*

**bestehend aus folgenden Modellen:**
*consisting of the following models:*
**OPUSA8SN1CANB000, OPUSA8SN1CDSB000, OPUSA8SN1CANF000, OPUSA8SN1CDSF000, OPUSA8SN1CDSFK15, OPUSA8SN1UTSF000, OPUSA8SN1UTMF000, OPUSA8SN1UTLF000, OPUSA8SN1CWVB000, OPUSA8SN1CWVF000, OPUSA8EN1CANB000, OPUSA8EN1CDSB000, OPUSA8EN1CANF000, OPUSA8EN1CDSF000, OPUSA8EN1UTSF000, OPUSA8EN1UTMF000, OPUSA8EN1UTLF000, OPUSA8EN1CWVB000, OPUSA8EN1CWVF000, OPUSA8EN1CANBC52, OPUSA8SN1CANBKxx, OPUSA8SN1CDSBKxx, OPUSA8SN1CANFKxx, OPUSA8SN1CDSFKxx, OPUSA8SN1UTSFKxx, OPUSA8SN1UTMFKxx, OPUSA8SN1UTLFKxx, OPUSA8SN1CWVBKxx, OPUSA8SN1CWVFKxx, OPUSA8EN1CANBKxx, OPUSA8EN1CDSBKxx, OPUSA8EN1CANFKxx, OPUSA8EN1CDSFKxx, OPUSA8EN1UTSFKxx, OPUSA8EN1UTMFKxx, OPUSA8EN1UTLFKxx, OPUSA8EN1CWVBKxx, OPUSA8EN1CWVFKxx**

**Für die oben bezeichnete Produktfamilie wird hiermit erklärt, dass diese den wesentlichen Schutzanforderungen entspricht, die in den nachfolgend bezeichneten Richtlinien festgelegt sind:**
*The indicated product family is in conformance with the regulations of the following European Directives:*

- **2014/30/EU (EMV-Richtlinie)**
  **RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit**
  *DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility*
  - **Die Konformität wird in Bezug auf folgende angewandte harmonisierte Europäische Normen erklärt:**
    *Conformity is declared with reference to the following harmonized European standards:*
    - **EN ISO 13766-1 2019**
    - **EN ISO 14982 2009**
- **2011/65/EU (RoHS-Richtlinie)**
  **RICHTLINIE 2011/65/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten**
  *DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment*

**Dipl.-Ing. (FH) Stefan Hickmann, Development Team Manager** **08.06.2020**
Titel, Name, Position, Unterschrift / *Name, Title, Position, Signature* Datum / *Date*

**Dipl.-Wirtsch.-Ing. (FH) Thilo Nagel, General Manager** **08.06.2020**
Titel, Name, Position, Unterschrift / *Name, Title, Position, Signature* Datum / *Date*

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General Terms and conditions (AGB) are available here: www.topcon-electronics.com