

OPUS C-Series

Operating Manual
Hardware Description



MAN000950
Classification: Public

Versions

Example

OPUSC07EN1CAN000

OPUSC07

E

N

1

CAN

000

model

E=ECO

N= Neutral

1. Generation

CAN= Projektor/C++

customer specific identification

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Operating Manual OPUS C-Series

Order number: OPUSBA00C

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

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Errors and technical changes excepted.

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1 Preliminary Notes

This document is valid for the OPUS C-Series:

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



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 C-Series 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 Instruction 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:

	<p>Hazard!</p> <p>Very Important information Malfunction or Failure possible if non-compliance</p>
	<p>Caution!</p> <p>Severe bodily injury or property damage can occur if the respective precautionary measures are not taken.</p>
	<p>Note</p> <p>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.</p>

2 Safety instructions, guarantee and liability

2.1 Common

Read this operating manual before commissioning the OPUS C-Series. Keep this operating manual where it is accessible to all users at any time. Every person who is assigned to commission or operate the OPUS C-Series 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 C-Series 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 and Projektor Tool training by Topcon needs to be attended.
- are familiar with the safety concepts of automation technology, either as project design personnel
- or 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 C-Series 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 C-Series is designed for 12 V and for 24 Volt battery systems. The operating voltage range is 9-36 VDC, overvoltage resistance 48V for 5 minutes, inverse-polarity protection up to -48 VDC for 5 minutes.

2.4 Interventions in the device

The OPUS C-Series 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 can 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 C-Series



Dangerous high voltage

Never attempt to repair or modify OPUS C-Series yourself. Disassembling OPUS C-Series may cause damage that is not covered under the warranty and cause hazardous conditions by the high-voltage components inside of the unit.

OPUS C-Series does not contain any user-serviceable parts. Service should only be provided by a Topcon Electronics GmbH.



Hazardous situations due to device failure

Do not use the OPUS C-Series 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 C-Series cannot cause a hazardous situation for operating personnel.

Ensure that incorrect inputs via the OPUS C-Series, 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 C-Series.

Emergency-Stop devices must remain effective in all operating modes.



Unintentional operation

Operating states can be called due to unintentional operation of the OPUS C-Series that are not appropriate for the situation.

OPUS C-Series 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 C-Series function.

If a further usage of the OPUS C-Series will cause danger, the device and if necessary the system needs to be switched off and be secured against unintended 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 C-Series 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 II).

For service purposes additional interfaces like RS232 and USB are available. Together with Embedded Linux operating system they form a universal platform for the communication with other CAN devices, networks or PCs.

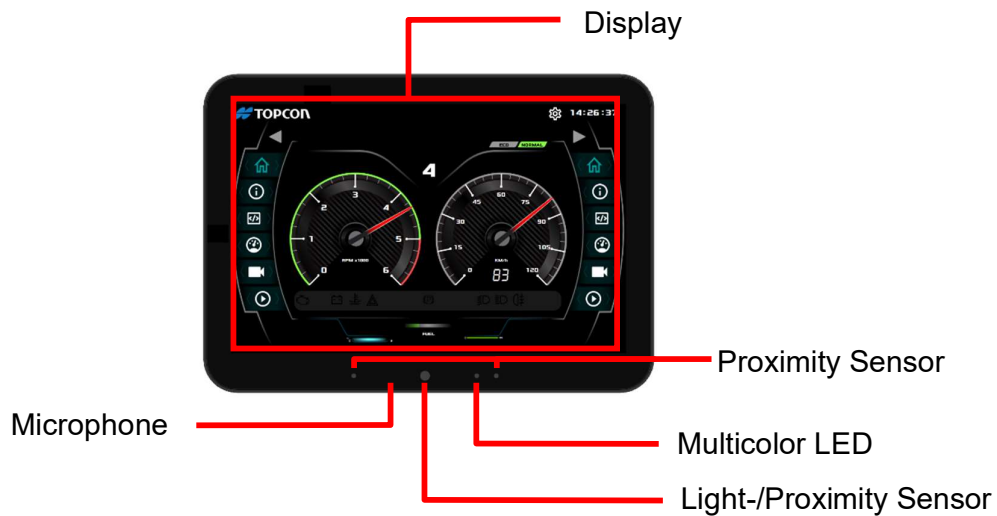
	<p>The operator panel OPUS C-Series is not admitted for security-relevant duties for personal protection purposes.</p>
	<p>Vehicles, machines, and equipment surrounding the OPUS C-Series must be combined in such a manner that the OPUS C-Series will be warmed up equally from all sides.</p>

3.1 Example of Use



3.2 Device Description

3.2.1 OPUS C-Series



Schematic diagram of the OPUS C-Series

Display:

OPUSC07: 7" (800 x 480 px) TFT color graphic LCD display with capacitive touch.
 OPUSC10: 10.1" (1280 x 800 px) TFT color graphic LCD display with capacitive touch.
 OPUSC12: 12.1" (1280 x 800 px) TFT color graphic LCD display with capacitive touch.

Light Sensor:

The light sensor can be used for an automatic adaption of display-backlight to the ambient light intensity.

Proximity Sensor:

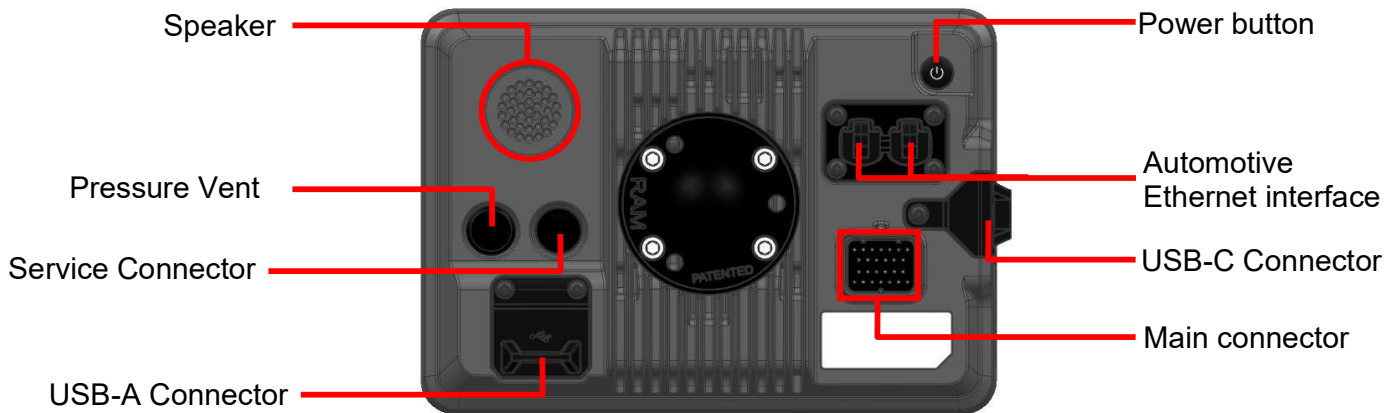
The proximity sensor is able to detect the presence of nearby objects without any physical contact.

Microphone:

There is a Microphone available.

Multicolor Status LED:

There is one multicolor status LED available.



Schematic diagram of OPUS C-Series backside

Speaker

Up to 90 dB @ 10 cm distance (max. @ ~3kHz)

Pressure Vent

Pressure vents provide rapid pressure equalization and minimize the pressure differences that can weaken the seals in a device, distort the transducer and affect acoustic performance.

Service interface:

On OPUS C-Series there is a service interface available. This interface serves Topcon internal service use only.

Please do not remove the protection cap of service interface!

OPUS C-Series may only be used with factory closed protection cap. Otherwise Topcon Electronics GmbH is no liable for any damage or malfunction.

USB C / A Connector:

OPUS C-Series offers a USB-C Connector on side and a USB-A Connector on back to be used for software update and data transfer.

Power button:

The OPUS C-Series has a separate power button. This button may be programmable within the application running on OPUS C-Series (see Projektor Tool Online Help). Per default the display will be switched on press and switch off on long press (> 4 seconds).

Power-on/off behavior:

OPUS C-Series can be switch on/off by the power supply directly.

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 timeframe, 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 7"	≤ 1000 mA	≤ 550 mA
On 10.1"	≤ 1300 mA	≤ 700 mA
On 12.1"	≤ 2000 mA	≤ 1100 mA
Low-power	480 mA, depending on configuration	Typ. 260 mA, depending on
Sleep	≤ 180 mA	≤ 95 mA
Off	≤ 8 mA	≤ 7 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**.

Automotive Ethernet interface

The OPUS C-Series has two automotive ethernet interfaces.

2x 100Base-T1 Automotive ethernet

Supply output at each Ethernet channel 500mA @

12VDC guaranteed

Main connector:

The following interfaces are available:

- Power supply and ignition input
- 3 x CAN-Interfaces according to ISO/DIS 11898
- 2x RS232-Interface
- Wake Input
- Frequency out
- 4x digital/frequency in
- 3x digital out low side
- 1x digital power out
- 1x analog voltage in

3.3 Features Overview for OPUS C-Series

- Encapsulated aluminium housing (powder coated) to be mounted in landscape or portrait mode or standalone
- 7" TFT color display for automotive with resolution 800 x 480 pixels
- 10.1"/12.1" TFT color display for automotive with resolution 1280 x 800 pixels
- Capacitive touch screen
- Powerful Freescale I.MX8® QuadPlus 1600Mhz CPU
- 64 bit processor with embedded Linux operating system (Linux kernel 6.1.22)
- Three CAN interface (ISO 11898) using CANopen® and SAE J1939 protocols. Layer II is supported
- Speaker
- 2x RS232 interface for serial console
- USB Type C Super Speed on side and USB Type A High Speed on back
- Automotive Ethernet
- 5 analog/digital inputs
- 4 digital outputs
- Power button

The OPUS C-Series is particularly characterized by its robust construction, 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 C-Series and make it an integrated part of its application.

1. OPUS Projektor:

This powerful development environment provided by Topcon Electronics GmbH enables the quick and effective creation of an application for the OPUS C-Series 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.

For further information please refer to the ***OPUS Projektor Online Manual***.

2. C-Programming:

OPUS C-Series 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***.



The operator panel OPUS C-Series generation may only be handled due to the according operation manual.

3.5 Development Kit

For programming the graphical user interface of the OPUS C-Series some different development kits are provided.

Topcon Toolchain with OPUS Projektor
Order number: OPEPC0CAN

Description	Order Number	Qty
Main connecting cable	OPKAC3CAN15	1
Ethernet cable		1
WE Toolchain download: <ul style="list-style-type: none"> - Projektor Tool - PClient - Documentation 		1
Basic Projektor-Tool training at a Topcon facility		1
Projektor Tool license		2
12-month technical support		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 (opus-support@topcon.com).

4.2 Mounting

The unit is delivered without mounting accessories.

Depending on mounting type the following mounting accessories are available.

OPUSBERM001

mounting system includes:

1 x RAM standard arm (RAM-201U)

2 x RAM 1,5 " balls (RAM-202U)



Attention!

Using too long screws can damage the unit!

Accepted mounting torque with mounting cover is 4,3 Nm

Please secure the screws with the thread locker medium strength (e.g. Loctite 243).

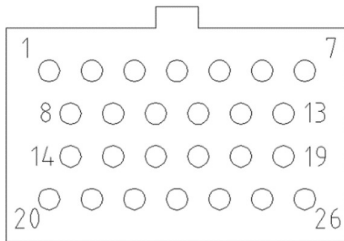
5 Electrical installation OPUS C-Series

Below you find the pin out diagram of the OPUS C-Series. The connectors are drawn as seen from the back side of the unit.

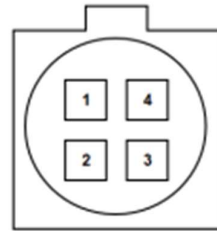
Please be aware that the existing pins and connectors depend on the hardware option you ordered.

Please note that the OPUS C-Series 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.

Main Connector



Automotive Ethernet Connector



Ethernet connector pinout

100Base-T1 Rosenberger HSD, Z-Coded, 4pin	
1	D+
2	12V Power supply
3	D-
4	Power GND

Main connector pinout (in full option)

pin no.	assignment	description
1	KL30	Supply voltage +; terminal 30
2	KL15	ignition input; terminal 15
3	KL31	supply voltage -; terminal 31
4	Wake_In	Wake Input, "Doorswitch"
5	Freq_Out	Frequency Output
6	D_IN_4	Digital Input 4 / Frequency Input 4
7	D_OUT_H	Digital Highside Output
8	CAN1H	CAN 1 high
9	CAN1L	CAN 1 low
10	CAN2H	CAN 2 high
11	CAN2L	CAN 2 low
12	CAN3H	CAN 3 high
13	CAN3L	CAN 3 low
14	RS232_RxD2	RS232-2 – Receive Data input
15	RS232_TxD2	RS232-2 – Transmit Data output
16	RS232_RxD1	RS232-1 – Receive Data input
17	RS232_TxD1	RS232-1 – Transmit Data output
18	RS232_GND	RS232 GND
19	D_IN_1	Digital Input 1 / Frequency Input 1
20	A_IN	Analog Input
21	D_OUT_L1	Digital Output Lowside 1
22	D_OUT_L2	Digital Output Lowside 2
23	SERV_EN	Service enable
24	D_OUT_L3	Digital Output Lowside 3
25	D_IN_2	Digital Input 2 / Frequency Input 2
26	D_IN_3	Digital Input 3 / Frequency Input 3

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 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.
- Pin 1 and Pin 3 shall be used with 1.25 mm crimping contact and appropriate wire gauge to support higher operating currents
- Ethernet cable shall use star-quad topology cable with or without shielding (i.e. Leonie Dacar 625-3) depending on the required use case.

The OPUS C-Series 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.

5.1 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.

5.2 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.

5.3 First steps

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

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

The boot up takes about a few seconds and will then call the application according to the start scripts on the unit (start scripts for Projektor Tool application already installed by delivery).

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

5.4 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 C-Series operator panels. Only use soft clothes with a little soap and water or mild dish washing liquid.

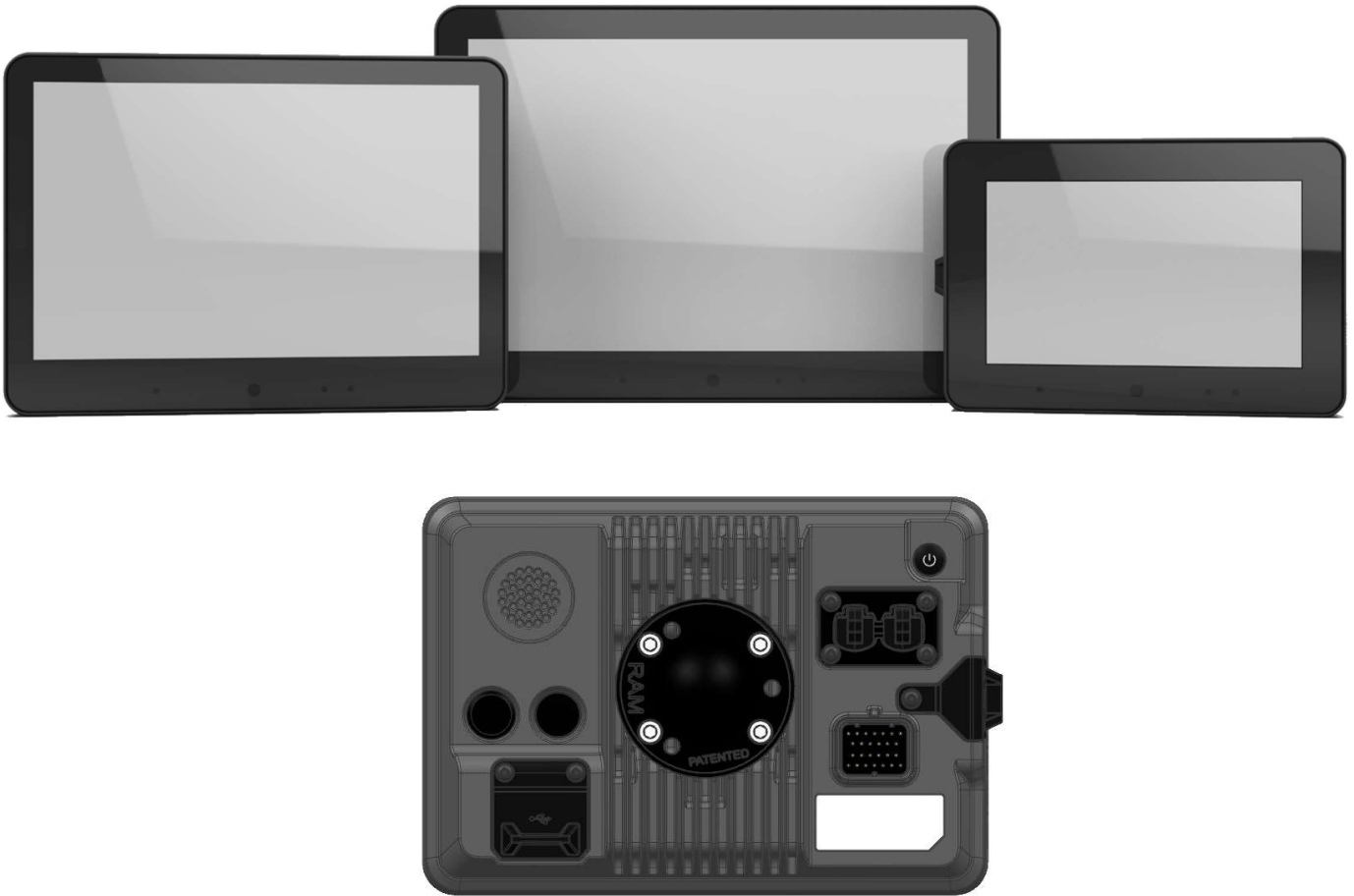
The OPUS C-Series does not have any parts that require service by the user. Repairs can only be performed by Topcon Electronics GmbH.

Pressurized air must not be used to clean the device to prevent damage of the internal microphone.

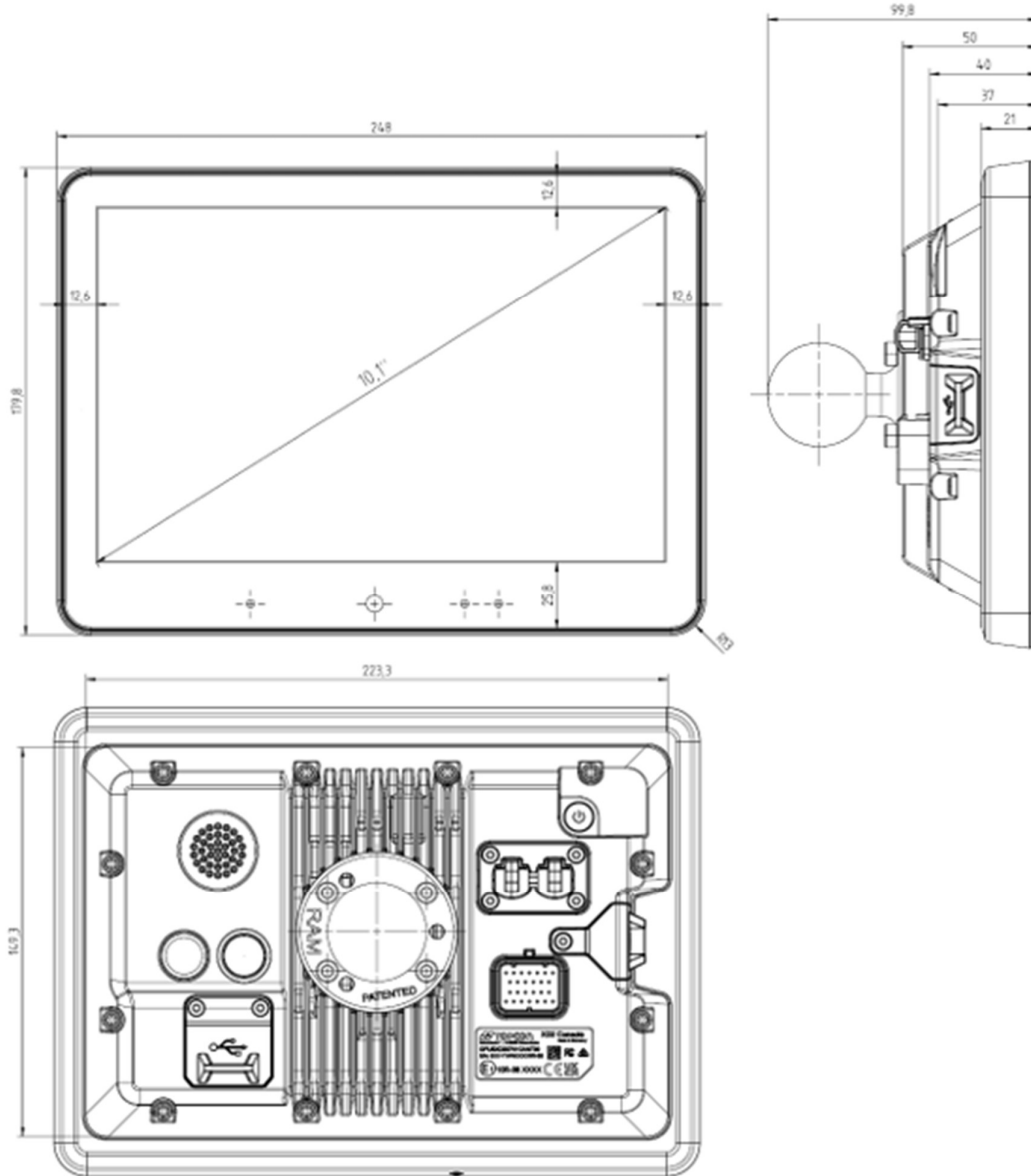
6 Technical Documentation

The OPUS C-Series is available in one housing version for each size.

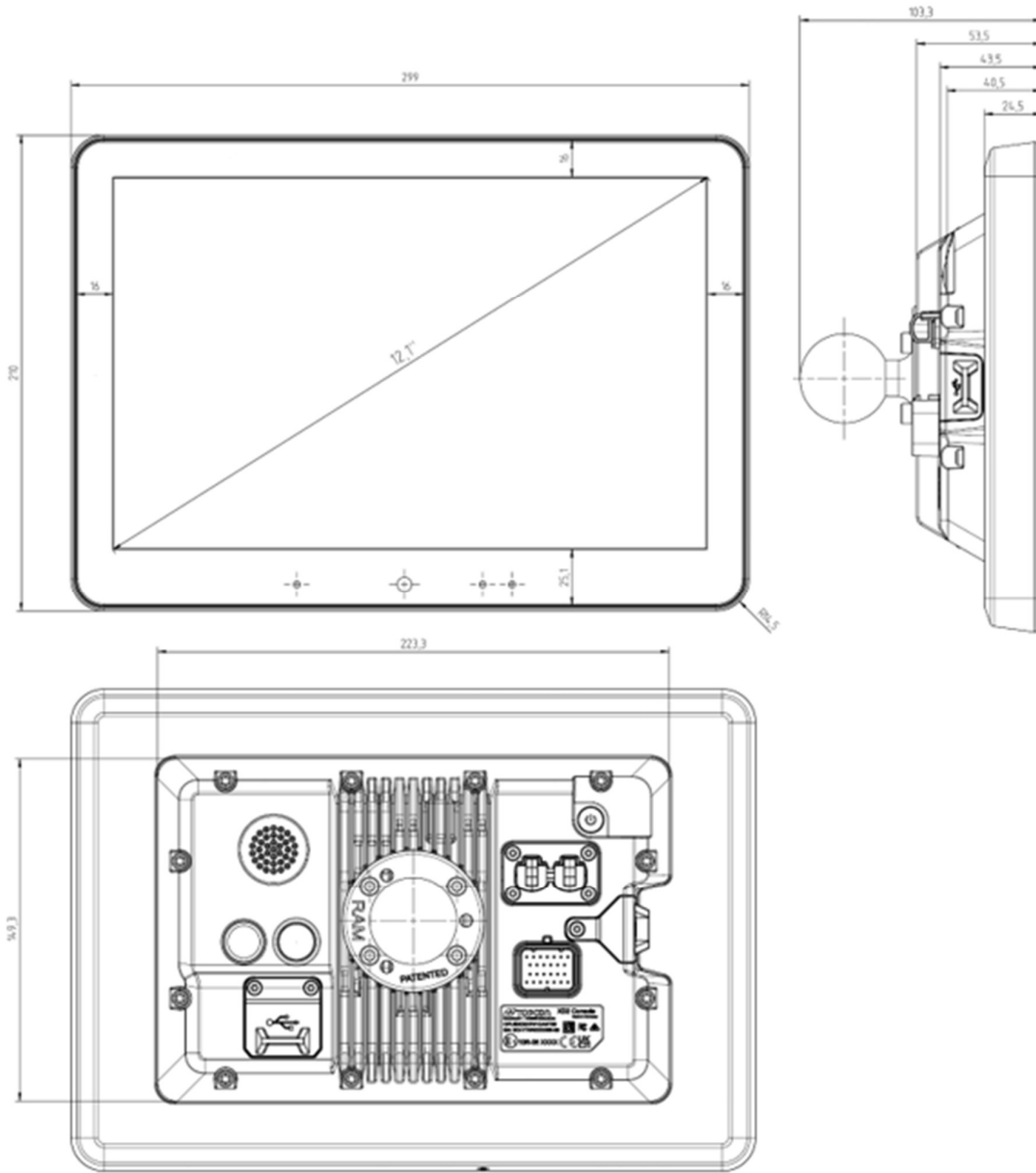
OPUS C-Series:



OPUS C10



OPUS C12



6.2 Specification

	OPUS C-Series		
	7"	10"	12"
Dimensions (mm)	H137,6 x W200,6 x D91,3	H179,8 x W248 x D99,8	H210 x W299 x D103,3
Display size	800 x 480 pixels	1280 x 800 pixels	1280 x 800 pixels
Touchscreen	X	X	X
LED	1	1	1
Speaker	X	X	X
Processor Speed	1.600 MHz I.MX8 QuadPlus	1.600 MHz I.MX8 QuadPlus	1.600 MHz I.MX8 QuadPlus
RAM	4 GB	4 GB	4 GB
Mass Storage	10,6 GB	10,6 GB	10,6 GB
EEPROM	1 kB serial	1 kB serial	1 kB serial
CAN bus	3	3	3
RS232	2	2	2
USB Typ C	1	1	1
USB Typ A	1	1	1
Automotive Ethernet	2	2	2
Real time clock	X	X	X
Light Sensor	X	X	X
Proximity Sensor	X	X	X

6.3 Declaration of Conformity

FCC:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.