

# **Topcon CL-20 Multiradio Module User Manual**

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**Topcon CL-20 Multiradio Module** 



#### **Product Information**

- The CL-20 adds cellular and Wi-Fi capability to X-Family consoles, providing access to the Topcon Agriculture Platform (TAP) and XTEND features in the Horizon console operating system.
- It is designed for use inside the cabin compartment of agricultural, construction, on-road, and off-road machines.
- The European market offers CL-20 3G, CL-20 LTE EU, and CL-20 GLOBAL variants. Refer to Electrical characteristics for detailed modem information.
- The CL-20 includes components such as GPS and WiFi antennas, modem antenna, LTE diversity antenna (for LTE models), MIMO antenna, LED windows, USB slots with rubber plugs, SIM card slot with cover, plastic front cover, and aluminum carrier & back housing.
- The plastic front cover protects the internal components of the CL-20.
- The total mass of CL-20 is 0.3 kg max including USB connection cable/plug and sealing caps. The box board dimensions are 103x80x28 mm with a harness connection cable length of 200 mm.
- The CL-20 can be fastened using two available versions for secure installation.
- Ensure proper operating temperature and humidity conditions within specified ranges.
- Install the CL-20 securely inside the cabin compartment of the machine using the provided fastening method.
- Connect any necessary cables and ensure all ports are sealed with their respective caps.
- For detailed modem information, refer to the Electrical Characteristics section.

### **FAQ**

- Q: What is the protection level of the CL-20?
- A: The CL-20, when properly installed and connected, meets the IP65 protection level.

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#### **Foreword**

The CL-20 adds cellular and Wi-Fi capability to the X-Family consoles. It allows access to the new Topcon Agriculture Platform (TAP), which is a cloud-based integrated agronomic management platform. It also provides access to the XTEND feature in the Horizon console operating system.

#### **General Information**

### **Description**

- The CL-20 is proposed as a USB-powered plug-and-play box hosted by a remote processor and with an internal smart Linux processor.
- It will provide 3G/LTE global, and WiFi 802/11 b,g,n communication capability to the host processor, along with a multimode positioning system (a-GPS and telephone cell geo-referencing).
- Furthermore, 1 high-speed USB port will be made available to the user.
- The CL-20 has 2 SIMs: an internal soldered SIM on the chip, not replaceable by the user, and a micro-SIM Socket, accessible from the outside, replaceable by the user.
- The IP65 plastic box, the industrial-grade working temperature range of the electronics, and the ruggedized mechanics allow the use of CL-20 inside the cabin compartment of any agricultural or construction machine and other on-road and off-road transportation means.

#### **CL-20 variants**

The CL-20 is available in different hardware versions with different modem characteristics:

- CL-20 3G
- CL-20 LTE EU
- CL-20 LTE VZW
- CL-20 LTE AUS
- CL-20 LTE JPN
- CL-20 GLOBAL

The versions for the European market are CL-20 3G, CL-20 LTE EU, and CL-20 GLOBAL. See "Electrical Characteristics" for details on every modem.

#### **Hardware**

### Mechanical characteristics

The Mechanical components of CL-20 are:

- Back housing/aluminum carrier
- · Plastic front cover with integrated LED windows

- Mainboard
- Antennas (external & internal)
- Supporting parts (gasket, screws, M8-harness, venting membrane, Label, ...)

#### **Accessories**

- CL-20 Power Harness connecting M8 to USB-Type A (host) and vehicle battery
- · Sim-card
- The CL20 has 3 RF antennas in the box:
- The CL20 GPS antenna is a patch antenna soldered on the board.
- The WiFi antenna is included in the WiFi module.
- The CL20 has a modem antenna (2G/3G or LTE Primary antenna) inside of the box. The LTE diversity antenna (not used with 3G Modem) is placed outside of the box.

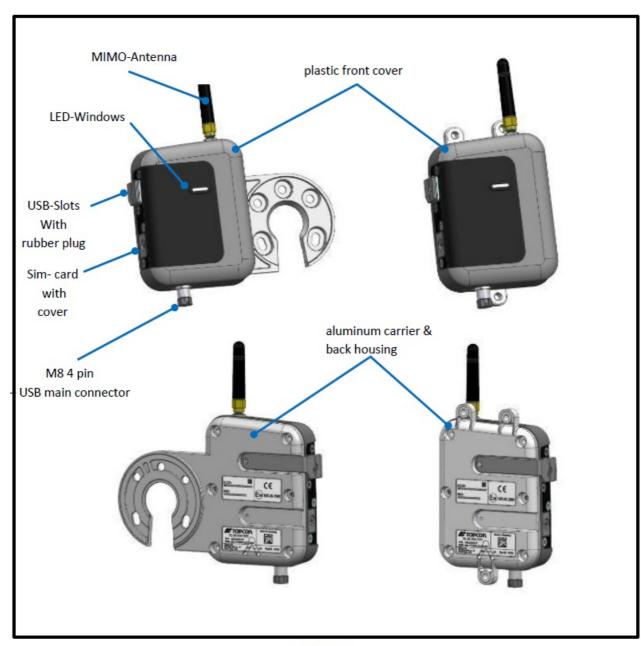


Figure 1



Figure 2



Figure 3

# **Cover Characteristics**

Back housing/aluminum carrier

- Aluminum die-cast
- Supporting the venting membrane and the label field
- Powder coating with structure, semigloss, RAL 9006

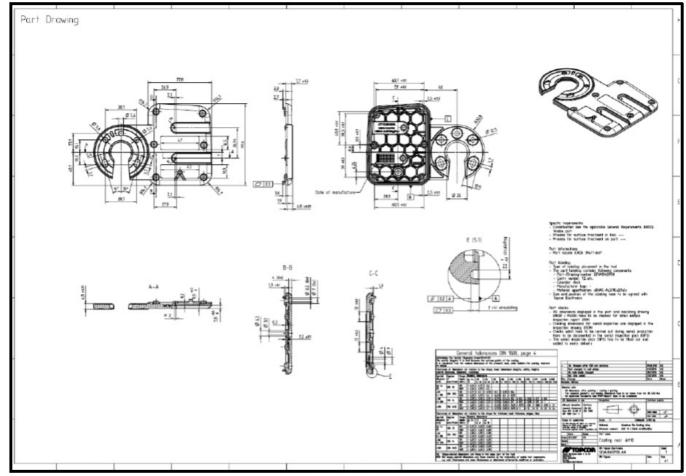


Figure 4

# **Plastic Front Cover**

- Plastic molded part, visible surfaces etched & polished, no painting.
- 1 over molded or assembled LED windows.
- Supporting the mainboard with 1 sealed Amphenol USB-Type A slot with related rubber plugs
- Supporting the internal antennas (self-sticking)
- Supporting the external MIMO Antenna (only LTE versions)
- Supporting the M8-USB Main connector
- Supporting the Sim-card
- Plastic material color 9005, black

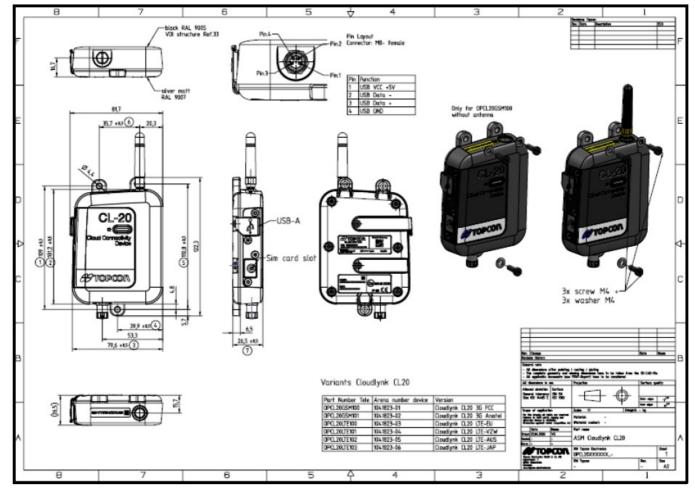


Figure 5

#### Mass

• The CL-20 total mass is 0,3 kg max including the USB connection cable/plug and the USB ports sealing caps.

### **Mechanical dimensions**

- The CL-20 box board can be contained into a prism having the following dimensions: 103x80x28 mm.
- The length of the harness connection cable is 200 mm including the plug. The USB port's rubber protection caps are considered pugged.

# **Fastening**

The fastening method of the CL-20 will be available in 2 Version:

· With mounting arm for RAM



Figure 6

• With flat backplate for mounting with screws



Figure 7

# **Technical Specifications**

# Thermal characteristics

# **Operating temperature**

• The CL-20 will be able to operate under the specification while exposed to a still-air environment at a temperature range of -25 °C < Top < +65 °C.

# Storage temperature

• The CL-20, not connected to the host device, will withstand an indefinite storage period in an environment at a

temperature range of -40° C < Ts < +85 °C.

#### **Altitude**

• The CL-20 meets the specification requirements if kept to an altitude up to 2500 m a.s.l.

#### Humidity

- The CL-20 will be able to operate under the specification while kept in an ambient of RH included in the range 5% – 85% non-condensing.
- A proper moisture coating could protect the CL-20 PCB; the type and extent of the coating, if any, will be
  defined after the prototype test.

# General environmental characteristics Protection degree

- The CL-20, properly installed and connected, will meet the IP65 protection level.
- The M8 on the CL-20 side is specified with IP65 so in combination with the appropriate host connector this
  connection is sealed to IP65.
- If CL-20 will work properly also in case of water drops or dust contamination (IP66 protection level), a proper
   PCB coating will be implemented.

#### Chemicals

The CL-20 will meet the chemical exposure requirements specified in the Test Plan specification, either in terms
of atmosphere or fluids.

# Weather and aging

 The CL-20 will meet the requirements specified in the Test Plan specification in terms of weather exposure and aging.

#### Vibration and shock

- The CL-20, properly mounted and connected, will be able to operate under the specification while exposed to a 10 – 300 Hz 50 m/s2 24 hours 1 octave/min along each geometrical axis.
- Special care must be taken to protect the connection cable and the USB plug from the vibration field.
- The CL-20 will survive the application of 3 impulses 300 m/s2 11mS along each geometrical axis.

#### **Electrical characteristics**

#### **Electrical architecture**

- The TABLE 1 lists the CL-20 Main hw characteristics.
- The TABLE 2 lists the CL-20 functional blocks.

 $\bullet\,$  The TABLE 3 shows the Processor block diagram.

**TABLE 1 Main hw characteristics** 

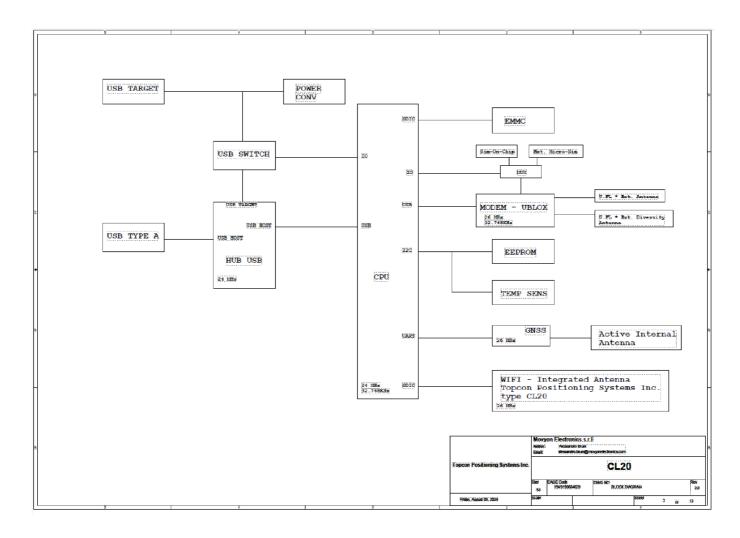
Features	Туре	Notes	
	SARA-U201(U-Blox) Global coverage	Bands:  Five Bands UMTS (WCDMA/FDD) Bands: 800, 850, 900, 1900 and 2100 MHz	
Modem <b>3G</b>	Approvals:  R&TTE  GCF  CE  FCC  PTCRB  Anatel(Brazil)  AT&T and other local approvals & provider certifications  RCM(Australia)  CCC (China)  IMPORTANT NOTICE:  The radio module identified as u-blox AG type SARA-U201 (FC C ID: XPY1CGM5NNN, IC: 8595A-1CGM5NNN)  implements  GG functionality only (2G is disable d).	<ul> <li>Quad-Band GSM Bands: 850, 900, 1800 a nd 1900 MHz</li> <li>3GPP Rel.7 Compliant Protocol Stack</li> <li>Data speed:         <ul> <li>HSDPA Cat.8 / HSUPA Cat.6 data rates DL: max. 7.2 Mbps, UL: max.</li> </ul> </li> <li>5.76 Mbps         <ul> <li>EDGE Class 12 data rates DL: max. 237 kbps, UL: max. 237 kbps</li> <li>GPRS Class 12 data rates DL: max.</li> </ul> </li> <li>85.6 kbps, UL: max. 85.6 kbps         <ul> <li>2 W (33 dBm ± 2dB) - Class 4 @ GSM 900</li> <li>1 W (30 dBm ± 2dB) - Class 1 @ DCS 180</li> </ul> </li> <li>0.5 W (27 dBm ± 3 dB) - Class E2 @ EDG E 900</li> <li>0.4 W (26 dBm +3/-4 dB) - Class E2 @ ED GE 1800</li> <li>0.25 W (24 dBm +1,7/-3,7 dB) - Class 3 @ WCDMA</li> </ul>	

	LARA-R204		
	(America/Verizon)	LTE (FDD) 3GPP Rel.9 Compliant  Bands:	
	LARA-R203		
	(America/AT&T, T- Mobile)		
	Approvals:	· Bands 4,13 (Verizon)	
Modem LTE Cat 1		Bands 2, 4, 12 (AT&T, T-Mobile)	
	· FCC	Data speed:	
	· GCF	Buttu Specu.	
	· ISED	LTE Cot 1 cingle layer DL MIMO DL/LIL may	
	· Verizon certification	LTE Cat. 1 single layer DL-MIMO DL/UL max     : 10.3Mbps / 5.2 Mbps	
	· RoHS		
		LTE (FDD) 3GPP Rel.9 Compliant Protocol Stack , RX-Diversity	
		Bands	
		EU -> Bands 3, 7, 20 (LTE), 900MHz, 1800 MHz (2G)	
		· AUS -> Bands 3, 8, 28 (LTE), 1 (UMTS)	
	LARA-R211 (EU) LARA-R280 (A US) LARA-R220 (JPN)	. JPN -> Bands 1, 19 (LTE)	
		Data speed	
		LTE Cat.1 DL: max. 10.2 Mbps, UL: max. 5 .2 Mbps	
	Approvals:  · CE	HSPA+ Cat.8 (ELS61-US) data rates DL: max. 7.2 Mbps, UL: max. 5.76 Mbps	
Modem LTE Cat 1	· R&TTE	· GPRS Class 12 (ELS61-E) DL: max.	
	· GCF	85.6 kbps, UL: max 85.6 kbps	
	· PTCRB	SMS text and PDU mode support	
	· IC	2 W (33 dBm ± 2dB) – Class 4 @ GSM 900	
	· AT&T	1 W (30 dBm ± 2dB) – Class 1 @ DCS 180	
		0 . 0.5 W (27 dBm ± 3 dB) – Class E2 @ EDG E 900	
		· 0.4 W (26 dBm +3/-4 dB) – Class E2 @ ED GE 1800	
		· 0.2 W (23 dBm ± 2,7 dB) – Class 3 @ E-U TRA LTE	

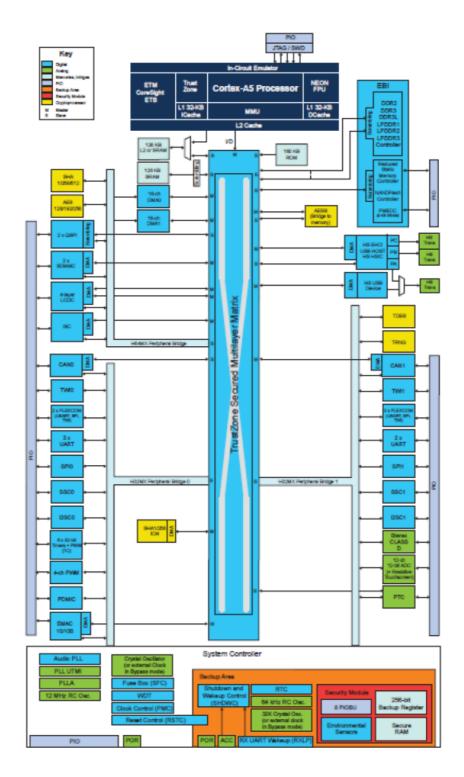
Bands			
: 12 (700 MHz) 28 (700			
MHz) 13 (700 MHz) 20 (800 MHz) 18 (850 MHz) 19 (850 MHz) 26			
		(850 MHz) 5 (850 MHz) 8 (900	
MHz) 4 (1700 MHz)			
3 (1800 MHz) 2 (1900 MHz) 1			
(2100 MHz) 7 (2600 MHz)			
Power Class 3 (23 dBm)			
: 39 (1900 MHz) 40 (2300			
MHz) 41 (2600 MHz) 38 (2600 MHz)			
23 dBm)			
5 (850 MHz) 8 (900			
IHz) 1 (2100 MHz)			
n)			
M 850 E-GSM 900 DCS 1800 PC			
GSM/GPRS (GMSK) Power Class			
<ul> <li>Class 4 (33 dBm) for 850/900 band</li> <li>Class 1 (30 dBm) for 1800/1900 band</li> <li>EDGE (8-PSK) Power Class</li> <li>Class E2 (27 dBm) for 850/900 band</li> </ul>			
		dBm) for 1800/1900 band	
		Lock on local provider possible	
T2-channel u-blox M8 engine GPS/QZSS L C/A, GLONASS L1OF, BeiDou B1I, Galileo E1B/C, SBAS L1C/A: WAAS, EGNOS, MSAS, GAGA  FA-GPS and SBAS-compliant PPS available			
;			

WiFi	CL20 Topcon Positioning Systems  Approval for the US (FCC), Canada (IC), and Japan (MIC)	<ul> <li>802.11 b/g/n compliant</li> <li>Output frequency: 2,4 GHz</li> <li>Channels: 1 – 13</li> <li>Station and micro access point operation (u p to 8 clients)</li> <li>802.11 PHY data rates up to 72 Mbps</li> <li>LTE coexistence BAW filter included</li> <li>19dBm EIRP</li> </ul>	
Processor	SAMA5D27C-D1G (Microchip)	ARM Cortex A5 core (see below the block diagra m) with integrated RAM	
Flash memory	8GBytes eMMC (Sandisk)		
RAM Memory	128MBytes DDR2	Embedded in the uP	
USB Hub	USB2512 (Microchip)	<ul> <li>1 upstream to 2 downstream USB Hub</li> <li>1 User available downstream ports</li> <li>Full Speed compliant (480 Mb/s)</li> <li>Port Speed autodetect capability</li> </ul>	
Power supply	5 Vdc from CL20 Power Harness	TBD	

**TABLE 2 Functional blocks** 



**TABLE 3 Processor block diagram** 



# Supply voltage

- The CL-20, properly connected, will be able to operate per the specification when the supply voltage is in the range of 4.5 5.5 Vdc\*.
- The nominal supply voltage will be 5.0 Vdc\* (USB standard)
- For continuous voltage indication, the symbol = = (IEC 60417-5031) is used on the label.

# **Current consumption**

The CL-20 current consumption will depend on the actual functional status. The table below reports the current consumption.

OP mode	Mode characteristics	Current consumption
Standby mode	uP running, USB host connected, GPS in acquisition mode, USB downstream ports ready	TBD
Wi-Fi active	uP running, USB host connected, WiFi module in data exch ange mode, GPS active, USB downstream ports ready	TBD
MODEM active	uP running, USB host connected, MODEM in data exchang e mode, GPS in standby mode. USB downstream ports rea dy	TBD

Being CL-20 powered by CL-20 Power Harness, the power lines are not protected against the polarity inversion. **Note:** Due to limited power availability from the upstream port, the USB user available downstream ports power lines DOES NOT COMPLY with USB standards in terms of current availability.

For this reason, a "CL-20 power harness" can be used: this special cable can be connected to an 8 – 36 VDC power source (a 12V / 24V vehicle battery for example) and then it generates a 5V 2A for CL-10. The power harness has a USB connection for the host also, see the following picture.



Figure 8

#### **Label Product**

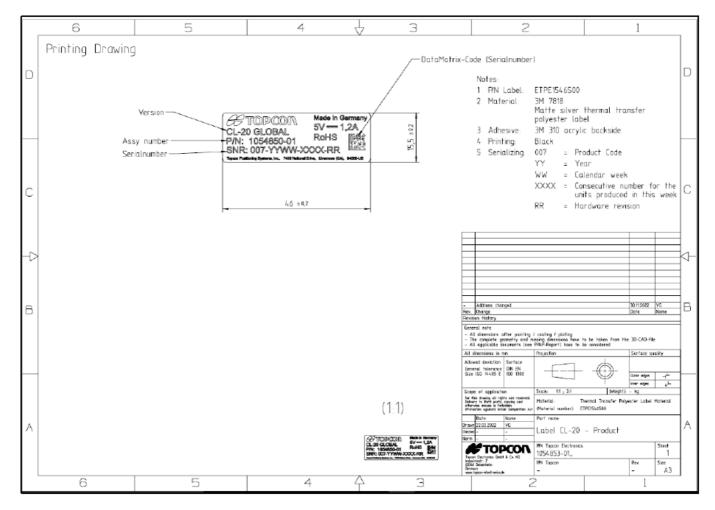
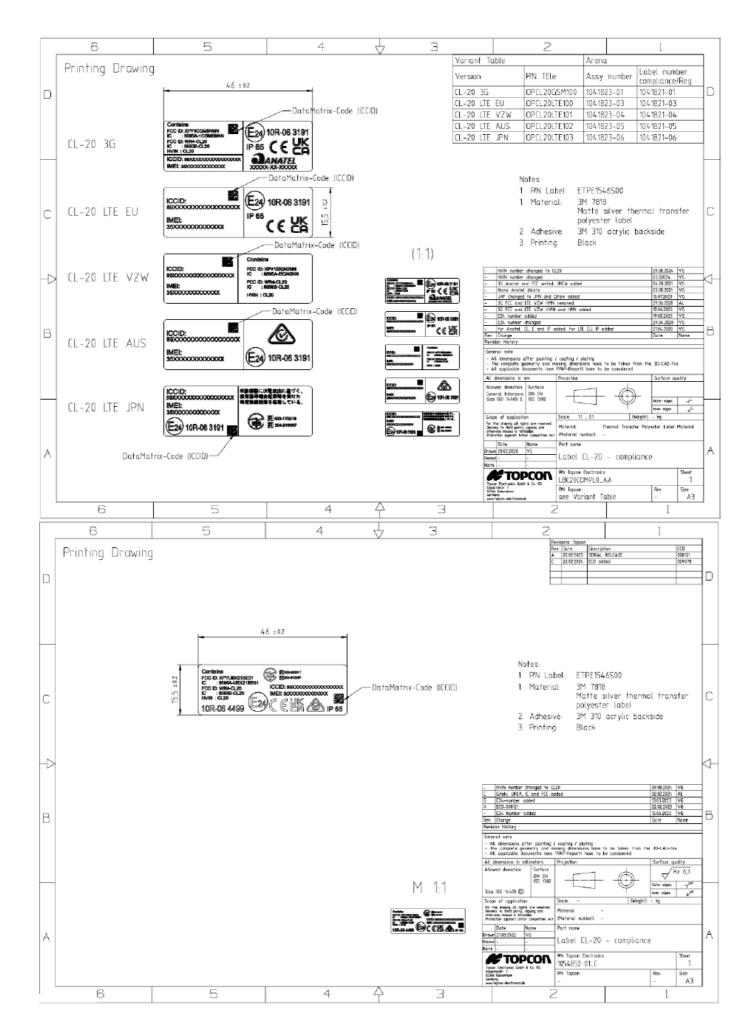


Figure 9

# **Label Compliance**



- The LEDs on the CL-20 are currently not used.
- The CL-20 has one double LED lamp mounted on the PCB for signaling and diagnostic purposes.
- The LEDs are visible from the outside through a transparent window placed on the CL-20 body (see F01 LED Windows).

# **Product Warranty**

- Topcon warrants that the electronic components shall be free of defects in materials and workmanship for a period of two years from the original date of shipment to the dealer.
- The warranty does not cover damages due to improper use of the device and/or non-compliance with the indications contained in this document.

# **Assistance and repair**

- For assistance and repair please contact:
- Topcon Precision Agriculture Europe S.L., Avenida de la Industria, 35, 28760 Tres Cantos, Madrid, Spain
- Email: tasupportemea@topcon.com

# Use restrictions and warnings UE (RED)

• The exposure limit set by the standard is respected for distances ≥ 20 cm from the device.

#### **FCC STATEMENT**

#### Use restrictions and warnings USA/CAN (FCC / ISED)

- 1. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- 2. Device model CL-20 3G:
  - CONTAINS FCC ID: WR4-CL20 IC: 6050B-CL20
  - CONTAINS: FCC ID: XPY1CGM5NNN IC: 8595A-1CGM5NNN
  - HVIN: CL20
  - Device model CL-20 LTE VZW:
  - CONTAINS FCC ID: WR4-CL20 IC: 6050B-CL20
  - CONTAINS: FCC ID: XPY1EIQN2NN IC: 8595A-1EIQN2NN
  - HVIN: CL20
  - Device model CL-20 GLOBAL:
  - CONTAINS FCC ID: WR4-CL20 IC: 6050B-CL20
  - CONTAINS: FCC ID: XPYUBX21BE01 IC: 8595A-UBX21BE01
  - HVIN: CL20
- 3. Responsible party's contact located in the United States:
  - · Company: Topcon Positioning Systems, Inc.
  - Address: 7400 NATIONAL DRIVE, LIVERMORE, CA, USA 94551
  - · Contact Name: Ferdinand Riodique

- · Contact's email: friodique@topcon.com
- Phone #: 925-245-8300

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, according to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used per the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- · Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

#### The responsible party's contact is located in Canada

- Company: Topcon Positioning Systems, Inc.
- Address: 855- 2 Street SW, Suite 3500, Calgary AB T2P 4J8, Canada
- Contact Name: Stephen Rosenegger
- Contact's email: <a href="mailto:srosenegger@topcon.com">srosenegger@topcon.com</a>
- Phone #: +1 403 450 4262

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

- 1. This device may not cause interference.
- 2. This device must accept any interference, including interference that may cause undesired operation of the device.

#### ICES-003 Class B Notice -Avis NMB-003 Classe B

This Class B digital device complies with Canadian ICES-003 Cet appareil numerique classe B est conforme à la norme Canadien NMB-003. CAN ICES-3(B) /NMB-3(B)

#### **RF Radiation Exposure Statement**

This product complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter except under FCC and ISED multi-transmitter product procedures.

This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted over Health Canada's requirement.

# Use restrictions and warnings UK (UKCA)

- LH Agro (UK) Ltd
- 56 Edison Road
- St. Ives (Cambs)
- PE27 3LF

# **United Kingdom**

The antenna should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

For frequency bands and RF power transmitted please see TABLE 1.

# **Declaration of conformity**



#### **EU Declaration of Conformity**

We,

Company Name: Topcon Positioning Systems, Inc.

Headquarter address: 7400 National Drive, Livermore (CA), 94550 - USA

Telephone: +1 925-245-8300

E-Mail Address:

#### declare under our sole responsibility that the products:

Type: Telecommunication device

Basic Models: CL-20 GLOBAL, CL-20 3G, CL-20 LTE EU

Intended use: USB-powered plug and play box for Agriculture application

#### are in conformity with the relevant European Union directives:

Directive RoHS: 2015/863/EU Directive RED: 2014/53/EU

### The following harmonized standards were applied:

### Safety & Health (Art. 3.1a Directive 2014/53/EU):

EN 62368-1:2014 + A11:2017

EN IEC 62368-1:2020 + A11:2020 (GLOBAL variant only)

EN 62311:2008

EN IEC 62311:2020 (GLOBAL variant only)

#### EMC (Art. 3.1b Directive 2014/53/EU):

ETSI EN 301 489-1 V2.2.3:2019

ETSI EN 301 489-17 V3.2.4:2020

ETSI EN 301 489-19 V2.2.0:2020

ETSI EN 301 489-52 V1.2.1:2021

#### Radio (Art.3.2 Directive 2014/53/EU):

ETSI EN 300 328 V2.2.2:2019

ETSI EN 301 511 V12.5.1:2017

ETSI EN 301 908-1 V13.1.1:2019

ETSI EN 301 908-1 V15.1.1:2021 (GLOBAL variant only)

ETSI EN 301 908-2 V13.1.1:2020

ETSI EN 301 908-13 V13.1.1:2019

ETSI EN 301 908-13 V13.2.1:2022 (GLOBAL variant only)

ETSI EN 303 413 V1.1.1:2017

# RoHS (Art. 4 Directive 2015/863/EU):

EN 63000:2018

The Notified Body Nemko S.p.A. performed the conformity assessment of the technical documentation according to the procedure of Annex III (Module B) of the Directive 2014/53/EU and issued the EUtype examination certificate no. 2051-RED-231101.

# EU Representative:

Name: Topcon Precision Agriculture Europe S.L.

Address: Avenida de la Industria, 35, 28760 - Tres Cantos, Madrid, Spain

Tel: +34 - 91 - 804 92 31

Livermore (CA), March 16th, 2023

Salvatore lacono Vice President Engineering

Solder 60

#### **CONTACT**

- Topcon Positioning Systems, Inc.
- 7400 National Drive, Livermore (CA), 94550 USA
- +1 <u>925-245-8300</u>
- tasupportemea@topcon.com

#### **Documents / Resources**



### References

- Anatel Agência Nacional de Telecomunicações
- Anatel Agência Nacional de Telecomunicações
- User Manual

#### Manuals+, Privacy Policy

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