Hardware Manual for

cRIO GXXX 3G Mobile Series

Operation Instructions and Safety Guidelines

- cRIO GXXX 3G MOBILE HSPA
- cRIO GXXX 3G MOBILE HSDPA
- cRIO GXXX 3G MOBILE HSDPA SB*)
- cRIO GXXX 3G MOBILE HSDPA NTT*)
- cRIO GXXX 3G MOBILE CDMA SP**)
- cRIO GXXX 3G MOBILE CDMA VE**)

*) Japanese Versions:SB=Softbank SIM Lock, NTT = NTT DoCoMo SIM Lock
**) US Versions: SP=SPRINT, VE=Verizon SIM Lock

S·E·A Science & Engineering Applications Datentechnik GmbH

Overview

These operating instructions describe how to use the S.E.A. cRIO GXXX 3G Mobile module (later also referenced as module) with respect to the hardware.

Please read this manual carefully. If there are any questions about operating the module or if any term or description in this manual is not understood, please contact S.E.A. Datentechnik GmbH **before** using the module, see S.E.A. Datentechnik GmbH Contact Information.

Related Documentation:

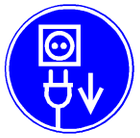
- For information about *National Instruments™* hardware please refer to the appropriate *National Instruments™* manual.
- For information about installation, configuration, programming or operation of the cRIO GXXX 3G Mobile module, please refer to the cRIO GXXX 3G software manual.

Safety Guidelines

The user has to read this (hardware) manual as well as cRIO GXXX 3G software manual before operating the device. Operate the cRIO GXXX 3G Mobile modules only as described in these manuals.

Hot or Cold Surface Denotes that the component may be hot or cold. Touching may result in bodily injury.

Dangerous electrical voltage.



Do not remove modules or disconnect I/O – wires or connectors unless power has been switched completely off or the area is known to be non hazardous.

Guarantee void if seal is broken!

Important notes; these warnings can be specified by the addition *Caution! Attention! Warning!* or *Danger!*

Hint or recommendation

Safety Restrictions for Hazardous Locations

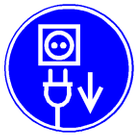
The cRIO GXXX 3G Mobile modules are suitable for use in non hazardous locations only. Please note:

- Do not use for medical applications.
- Do not use for navigation and/or control of any vehicle (e.g. planes, cars, trains, boats etc.).
- Do not use in safety critical applications.

Safety Guidelines for Hazardous Voltages

Hazardous voltages **must not** be connected to the cRIO GXXX 3G Mobile module. A hazardous voltage is a voltage greater than 33 V_{peak} AC or DC to earth ground.

cRIO GXXX 3G Mobile Module Installation



The cRIO GXXX 3G Mobile module **must not** be powered during insertion into a chassis, insertion of a SIM card, or during connection with antennas and cables etc. Make sure working in an ESD safe environment.

It is strictly recommended, to use the cRIO GXXX 3G Mobile module only in combination with accessories provided by S.E.A. The usage with other accessories as antennas, cabling etc. not listed in the accessories list is not supported, and can lead to a loss of

warranty.

The cRIO GXXX 3G Mobile module is primarily foreseen for use within the CompactRIO™ chassis, but may also be used with:

- the NI R-Series Expansion chassis
- the S.E.A. RST Gateway USB adapter
- the S.E.A. cRIO-3G Mobile Mounting Kit

None of those chassis are included with the module and have to be bought separately if needed. The operation of the cRIO GXXX 3G Mobile in other chassis as listed above is not allowed.

The cRIO GXXX 3G Mobile module have a front side power supply connector, a GSM antenna connector, a GPS antenna connector and a SIM card slot.

The input voltage range of the module's power connector is 7 V to 30 V.

Check the polarity of the wires before powering the system. Please note that the module's voltage range may possibly differ from the actual CompactRIO™ controller voltage range.

After disconnecting the power supply or activating the sleep mode please wait at least 5 seconds before reconnecting the power supply again or awake from sleep mode. In other case the module can show unexpected behaviour.

The SIM card slot has a slide-lock mechanism. Use slight force inserting the card.

Refer to the scheme on the module cover for proper orientation of the SIM card.

When using the module in rough environments the SIM card slot can be closed with a plastic plate.

Fig. 1: Wiring of cRIO GXXX 3G Mobile Module

Installation steps:

- Insert a SIM card into the SIM card slot (7) until the slide-lock mechanism is locked. It is recommended to use a small screw-driver or tweezers
- Insert the module in a slot of CompactRIO™ chassis. It is recommended to use slot 1 due to the length of the Ethernet Bridge cable, see step 3.
- Connect the module's Ethernet connector (8) with the CompactRIO™ controller network connector with the included Ethernet Bridge cable.
- Connect GPS antenna with the module's GPS antenna connector(4).
- Connect GSM/UMTS/CDMA antenna with the GSM antenna connector (3). Make sure Antenna is more than 1 m away from the system

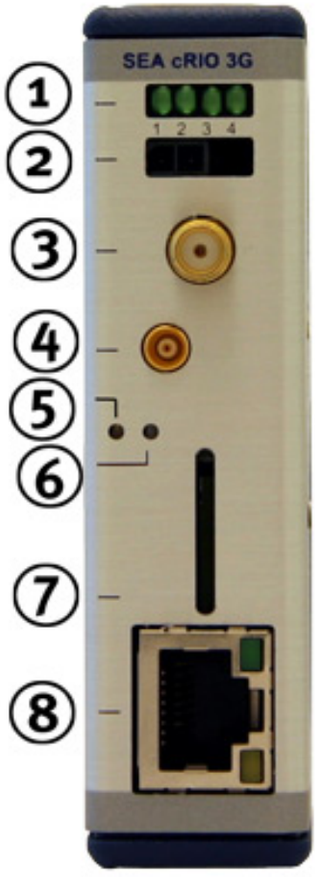


Fig. 2: Connector Side

- Connect the power supply with the module's power connector (2) using the included power cable. Check polarity and supply voltage of power supply. The supplied power cable has a special label describing + and – wires.

- Finally refer to the instructions on antenna installation in chapters Transmitter Operation and GSM Antenna Installation and GPS Antenna Installation.

Fig. 3: Wiring the cRIO Gxxx 3G Mobile Module - Details

For the actual list of the accessories please refer to

www.sea-gmbh.com/crio.

Transmitter Operation and GSM Antenna Installation

In this chapter the word transmitter is used interchangeably with the word cRIO GXXX 3G Mobile module, and means the RF-transmitter or RF-receiver part of the cRIO GXXX 3G Mobile module.

The GSM antenna connector is a SMA antenna connector. Connect only antennas which are proven to work with these modules. Refer to www.sea-gmbh.com/crio for matching antenna types.

The antenna has to be properly mounted at the desired location.

If a roof antenna is used, the antenna has to be dismounted when lightning strikes are likely. The transmitter and any antenna or cabling is NOT protected against lightning strikes or any over-voltage. Do NOT operate the transmitter or antenna during thunderstorms, and keep the antenna away from any kind of elevation. Keep the system away from hazardous locations, explosive- or high voltage areas.

Protect your system from thunderstorm and lightning strikes.

To minimize the radio frequency exposure to humans, the following rules have to be attended:

- When operating the transmitter, cabling and antennas, it is mandatory to keep a distance of at least 1 m/3,3 ft to persons.

- Use only antenna types, which are designed for the use with the transmitter. If unsure ask the module supplier.
- Do not operate the transmitter and antenna near other RF systems.
- Use only antenna cables and connectors made for GSM systems and frequencies. Do not bend the antenna cabling less than the bending radius of 30 mm.
- Do not open or disassemble the cRIO GXXX 3G Mobile module, antenna or other hardware parts.

To protect persons against any harm, at least the following rules have to be followed:

- Do not operate the cRIO GXXX 3G Mobile module in bath areas, kitchens etc. where water or vapour can be in contact with the module, cables or antennas. Use any part or the complete system only in dry areas.
- Use only isolated power supply with a nominal voltage of 12 V, which is made for use with CompactRIO™ systems.
- It is not allowed to use the system for any kind of medical applications or apparatus.
- The module shall not be operated in explosive areas.

GPS Antenna Installation

The GPS antenna connector is a MCX antenna connector. Connect only antennas which are proven to work with these modules. Refer to www.sea-gmbh.com website for matching antenna types.

The GPS antenna connector is used in conjunction with active GPS antennas with a supply voltage of 3.3 V and a maximum current of 40 mA. Antennas with differing specifications will destroy the module.

The cRIO GXXX 3G Mobile module LED Indicators

The LED indicators on the front side of the module indicate different states according to the following table:

LED 1	Power ON (steady)
LED 2	GPS ON (steady), GPS reception (flashing with PPS freq.)
LED 3	GSM/UMTS/CDMA Network (steady)
LED 4	GSM/UMTS/CDMA Data Link (steady)

The fifth LED (5) is located next to the the SIM card slot.

LED 5	Ready for operation (steady), Booting (flashing slow, ca. 1 Hz), Factory Reset (flashing fast, ca. 4 Hz)

The cRIO GXXX 3G Mobile module Switches

The switch(es) on the front side of the module provide functionality according to the following table:

SW 1	◆ Press (› 3 sec), when module in operation to reboot. ◆ Hold pressed, when module is powered up to reset the module to factory settings.

Sleep Mode

The sleep mode can be enabled for the CompactRIO™ system by software. In sleep mode typically there is no communication with the module. Power consumption is minimized. The system thermal dissipation may decrease.

Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

Specifications[1]

Model Name		cRIO GXXX 3G MOBILE HSPA	cRIO GXXX 3G MOBILE HSDPA SB	cRIO GXXX 3G MOBILE HSDPA NTT	cRIO GXXX 3G MOBILE HSDPA
Part-No.:		60000037	60000050	60000060	60000054
Data Communication Functions					
Frequency Bands [MHz]	GSM,GPRS,EDGE	850, 900, 1800, 1900	850, 900, 1800, 1900	850, 900, 1800, 1900	850, 900, 1800, 1900
	UMTS,HSPA	850, 1900,2100	850, 1900,2100	850, 1900,2100	850, 1900,2100
Maximum Data Bandwidth (DL=Downlink, UL=Uplink)	GPRS	85.6kBit/s(DL) 42.8kBit/s(UL)	85.6kBit/s(DL) 42.8kBit/s(UL)	85.6kBit/s(DL) 42.8kBit/s(UL)	85.6kBit/s(DL) 42.8kBit/s(UL)
	EDGE	236.8kBit/s(DL) 118kBit/s(UL)	236.8kBit/s(DL) 118kBit/s(UL)	236.8kBit/s(DL) 118kBit/s(UL)	236.8kBit/s(DL) 118kBit/s(UL)
	UMTS	384kBit/s(DL,UL)	384kBit/s(DL,UL)	384kBit/s(DL,UL)	384kBit/s(DL,UL)
	HSDPA HSUPA	7.2MBit/s (DL) 2MBit/s(UL)	3.6MBit/s (DL) 384kBit/s(UL)	3.6MBit/s (DL) 384kBit/s(UL)	3.6MBit/s (DL) 384kBit/s(UL)
SIM card reader		•	•	•	•
GPS Functions					
Data rate time telegram [Hz]		2	2	2	2
PPS Pulse Output via BP		•	•	•	•
Technical Data					

Tab. 1: UMTS Modules

The cRIO GXXX 3G Mobile HSDPA SB and cRIO GXXX 3G Mobile HSDPA NTT modules require special SIM cards, which can be operated only with the specific mobile operator network (SB or NTT).

1 Specifications are typical for the temperature range of -30 ..+60 °C unless otherwise noted.

Model Name		cRIO GXXX 3G MOBILE CDMA SP	cRIO GXXX 3G MOBILE CDMA VE
Part-No.:		60000036	60000056
Data Communication Functions			
Frequency Bands [Mhz]	CDMA	800, 1900	800, 1900
Maximum Data Bandwidth (DL=Downlink, UL=Uplink)	CDMA IS-856-A	1.8MBit/s(UL) 3.1MBit/s(DL)	1.8MBit/s(UL) 3.1MBit/s(DL)
	CDMA IS-856	153.6kBit/s(UL) 2.4MBit/s(DL)	153.6kBit/s(UL) 2.4MBit/s(DL)
	CDMA IS-2000	153.6kBit/s(UL) 153.6kBit/s(DL)	153.6kBit/s(UL) 153.6kBit/s(DL)
SIM card reader		•	•
GPS Functions			
Data rate time telegram [Hz]		2	2
PPS Pulse Output via BP		•	•
Technical Data			
Power Supply Voltage [V]		7 ... 30	7 ... 30
Average Current (12V) RMS [mA]		0.2 ... 0.3	0.2 ... 0.3
Maximum Operating Temperature [deg C]		-30 ... +60	-30 ... +60

Tab. 2: CDMA Modules

Power Requirements

The cRIO GXXX 3G Mobile modules are powered via the power connector. The module can be operated outside the CompactRIO™ chassis. In this case the GPS synch pulse output (PPS) signal (backplane) is not available in the FPGA.

The following table lists the operating voltage and current ranges:

Power Supply	Voltage [V] [A_{RMS*}] *) GSM active		
	Minimum	**Nominal**	Abs. Maximum
Front Panel Connector	7	**12** **0.23**	30

Tab. 3: Power Requirements

The operating currents via the front power connector are dependent on the active communication standard as well as used communication bandwidth. Hereafter follows a typical current plot during UMTS transmission.

The operating current via the front power connector during Sleep Mode is 1.2 mA at 12 V supply voltage.

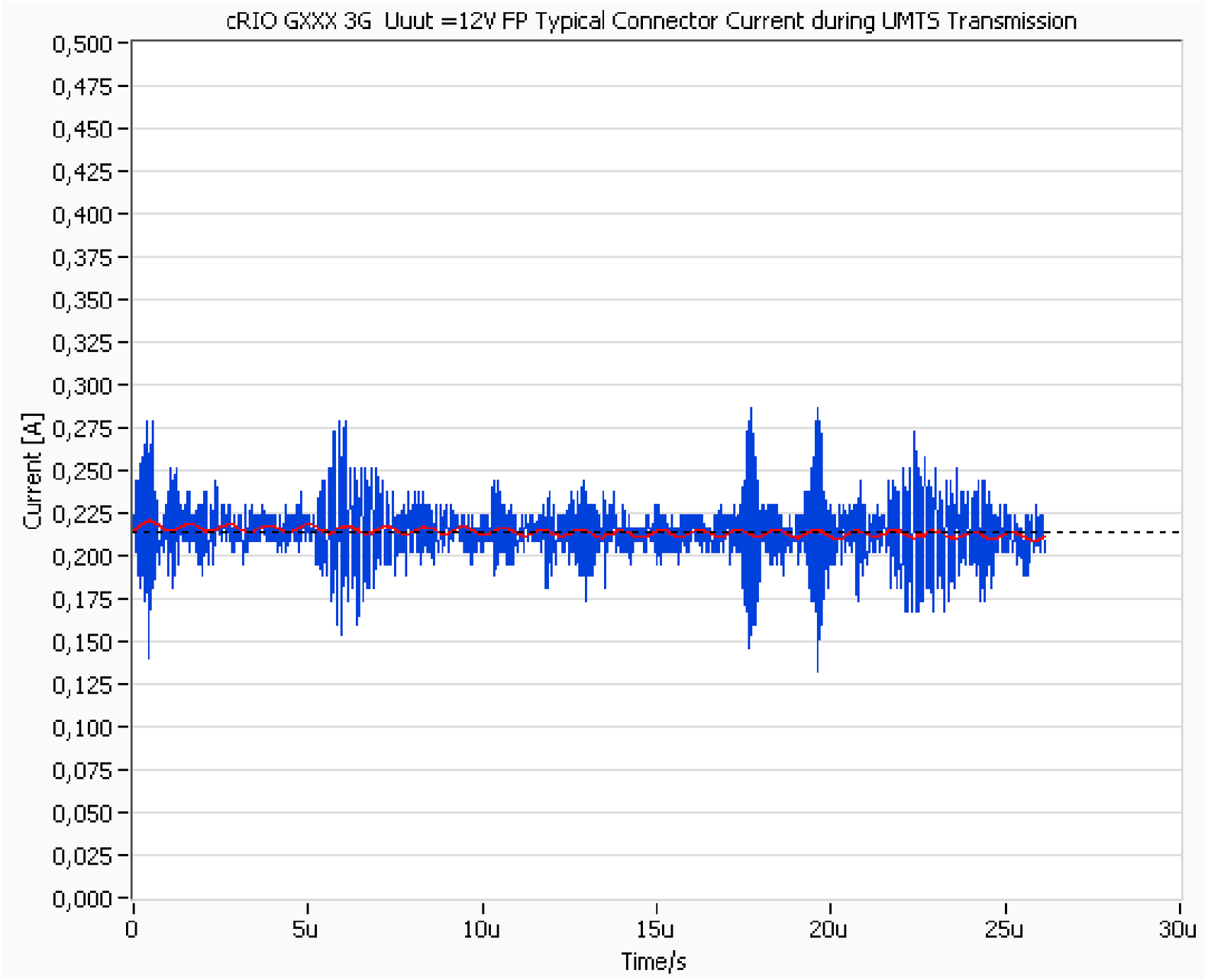


Fig. 4: Typical Connector Current during UMTS Transmission

Physical Characteristics

Weight	190-200 g
Size	70 x 23 x 87 mm

Maintenance

The module should only be wiped with a dry towel. It is not water resistant, and should not be operated in humid environments.

The module does not contain components, which have to be maintained. The opening of the module will destroy the heat conductors and will void warranty.

Electromagnetic Compatibility

For EMC compliance, it is only allowed to operate the cRIO GXXX 3G Mobile modules with original and shielded antenna cabling only. For further information about antennas and cabling please refer to our website: www.sea-gmbh.com

This cRIO GXXX 3G Mobile module meets the essential requirements of the following US directives:

- Use of RF Spectrum. Standards: FCC 47 Part 24
- EMC (Electromagnetic Compatibility).
- The product complies with the FCC Standard 47 Part 15
- 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, pursuant 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 in ac-

cordance with 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 receiver.
- Connect the equipment into 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.

Changes or modifications could void the user's authority to operate the equipment.

This cRIO GXXX 3G Mobile module meets the requirements of the Industry of Canada Rules, and is registered under the corresponding IC.

PTCRB Approval

The cRIO GXXX 3G Mobile modules are also tested to comply with PTCRB standards. PTCRB is a global organization created by Mobile Network Operators to provide an independent evaluation process where GSM /

UMTS type certification can take place.

For more information see http://www.ptcrb.com.

CE

This product is conform with the following European Union Directives:

- R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments) including
  - Directive 89/336/EEC for conformity for EMC
  - Directive 73/23/EWG (High Voltage Directive)

In order to satisfy the essential requisite of the R&TTE 99/5/EC directive, the cRIO GXXX 3G Mobile module is compliant with the following standards:

- GSM Standard: EN 301 511 and 3 v9.0.2 (Radio spectrum)
- EMC Standards: EN 301 489-1 v1.8.1 and EN 301 489-7 v1.3.1 (Electromagnetic Compatibility)
- Health Standard: EN 62311:2008
- Safety Standard: EN 60950-1:2006

Note: The R&TTE compliance is partly covered by the integrated radio module.

To meet the RF exposure rules and regulations above:

- The antennas used for this transmitter have to be installed to provide a separation distance of at least 1 m /3,3 ft from persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The antennas used for this module must not exceed 7 dBi for mobile and fixed or mobile operating configurations.
- Users and installers have to follow the transmitter operating and antenna installation instructions for satisfying RF exposure compliance, please refer to the user manual of the antenna.

FCC, IC and CE marks are printed on the module aluminium case or on a special sign plate attached to the aluminium case. For an overview the following table shows all current applicable IDs and signs for the complete series. The model can be determined by the part or model number which is unique.

Part-No:	Module Type	Module Id		Contains Engine ID	
		FCC ID	IC	FCC ID	IC
60000037	cRIO GXXX 3G MOBILE HSPA	XJW3G8790	8606A-8790	XJW8790	8606A-8790
60000036	cRIO GXXX 3G MOBILE CDMA SP	XJW3G5728V	8606A-5728V	XJW5728V	8606A-5728V
60000056	cRIO GXXX 3G MOBILE CDMA VE	XJW3G5728V	8606A-5728V	XJW5728V	8606A-5728V
60000050	cRIO GXXX 3G MOBILE HSDPA SB	n.a.	n.a.	n.a.	n.a.
60000060	cRIO GXXX 3G MOBILE HSDPA NTT	n.a.	n.a.	n.a.	n.a.
60000054	CRIO GXXX 3G MOBILE HSDPA	XJW3GHC25	8606A-HC25	XJWHC25	8606A-HC25

Tab. 4: Electromagnetic Compatibility

CE Declaration of Conformity

S·E·a Science & Engineering Applications Datentechnik GmbH

Manufacturers Name:	S.E.A. Datentechnik GmbH
Manufacturers Address:	Linder Höhe D-51147 Köln Germany
declares that the **product:**	cRIO Gxxx 3G Mobile Module HSDPA / HSPA

conforms with the following European directives:

The product herewith complies with the requirements of the R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipment) and carries the CE marking accordingly. This includes the requirements of the High Voltage Directive 73/23/EWG and the EMC Directive 89/336/EWG (including 93/68/EEC).

This declaration of conformity loses validity, if the system is rebuild or modified.

Cologne,	01/12/09	
Location	Date	Wolfram Koerver CEO

For further information please contact:

S.E.A. Datentechnik GmbH
Linder Höhe, D-51147 Köln
Phone: +49 2203 98007 - 0
Fax: +49 2203 98007 - 14
service@sea-gmbh.com

Environmental

cRIO GXXX 3G Mobile modules are intended for indoor use only. For outdoor use, mount the CompactRIO™ system in a suitable rated enclosure. Refer to the installation instructions for the CompactRIO™ chassis used for more information about meeting these specifications.

Operating temperature	-20 to 65°C
Ingress protection	IP 30 (with connected power cable)
Operating humidity	5 to 90 % relative humidity, non condensing
Maximum altitude	2000 m

Shock and Vibration

To meet these specifications, the CompactRIO™ system has to be panel mounted and the antenna connectors have to be screwed.

It is recommended to use the SIM card cover plate in dirty environment; this has to be mounted and fixed with the screws correctly.

Operation vibration,

random (IEC 60068-2-64)	5 g_{rms} , 10 to 575 Hz
	Operation vibration,
sinusodial (IEC 60068-2-6)	5 g , 10 to 575 Hz
	Operation shock,
(IEC 60068-2-27)	15 g, 11 ms half sine,
	30 g, 11 ms half sine,
	50 g, 3 ms half sine,
	(10 shocks at 6 orientations)

S.E.A. Datentechnik GmbH Contact Information

S.E.A. Datentechnik GmbH is located at

Linder Höhe

51147 Köln

Germany

For support check the S.E.A. Datentechnik GmbH website:

www.sea-gmbh.com/crio

or use:

email: crio@sea-gmbh.com

telephone: + 49 2203 98007 - 0

fax: + 49 2203 98007 – 14

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