

RFU63x



RFID Interrogator (UHF)



Intended use

The RFU63x interrogator is an intelligent sensor for automatic, stationary identification and transfer of data from/to radio-based data carriers on mobile or stationary objects. As a compact read/write unit with an integrated antenna, the RFU63x will process all conventional transponders compatible with ISO/IEC-18000-6C in the frequency range 860 to 960 MHz, either as a stand-alone solution or as part of a group in a network. The RFU63x sends the read results to a higher-level computer for further processing via its host interface or receives corresponding commands for the processing of the data carriers (writing, reading etc.).

The purpose of these operating instructions is to allow you to take the RFU63x into operation quickly and easily and to achieve the first read results with transponders. It describes commissioning for an application with one RFU63x.

Further information concerning mechanical and electrical installation is available in the *Technical Information RFU63x*. Information concerning the configuration is available in the *online help of the configuration software SOPAS ET*. The information can be accessed on the enclosed data medium (DVD) or on the *web page for the product RFU63x* (www.mysick.com/en/rfu63x).

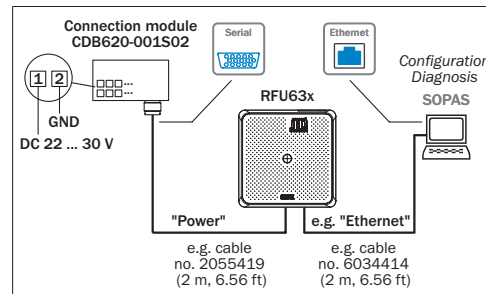
Safety information

- Read these instructions before commissioning the RFU63x to familiarize yourself with the device and its functions.
- For national-specific regulations when operating the RFU63x → see “Restrictions of RFU63x operation, page 4”.
- Connect or disconnect electrical linkages between the RFU63x and other devices only under de-energized conditions. Otherwise, the devices could suffer damage.
- Conducting cross sections of the supply cable from the customer’s power system should be designed in accordance with the applicable standards. If the voltage for the RFU63x is supplied via the CDB620-001S02 connection module, the usable voltage range (DC 22 to 30 V) is restricted by the use of the internal 1.25 A fuse. Otherwise, protect the RFU63x with DC 12 to 30 V using a separate slow-blow fuse (max. 2.5 A) in the supplying circuit at the beginning of the cable.
- Only use the RFU63x under permitted ambient conditions (e.g. designated region, temperature, ground potential) (→ see “Technical specifications, page 3”).
- Ensure that the radiated power of the antenna(s) used does/do not exceed maximum permissible values in each case (→ see “Continuing configuration, page 2”).
- Protect the RFU63x from moisture and dust whenever the USB socket/Micro SD card slot cover is open. The cover on the housing must be secured with screws in order to comply with enclosure rating IP 67. The same applies for protective caps/plugs on unused electrical connections.
- Opening the RFU63x housing locked by screws will invalidate any warranty claims against SICK AG.

Commissioning and configuration

Step 1: Electrical installation

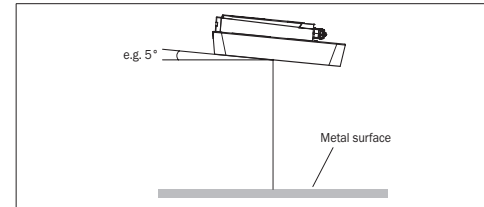
1. Connect the communication interface (e.g. Ethernet) of the RFU63x to the PC.
2. Where other external antennas are used (max. 3, e.g. RFA641-3440, part no. 6034316), connect these via suitable connecting cables (e.g. part no. 6034081, 2 m (6.56 ft)) to the antenna inputs of the RFU63x.



Electrical connections diagram for the RFU63x

Step 2: Installation and alignment

1. Optional: Attach any mounting accessories ordered separately (mounting kit 1,2 or 3) to the RFU63x; → see the chapter “Mounting” in the *Technical Information*.
2. Otherwise mount the RFU63x using three M5 screws or 4 M6 screws to a bracket (to be provided by customer). Screw the M6 screws (max. 12 mm/0.49 in) or M5 screws (max. 9 mm/0.35 in) into the blind hole threads (→ see “Device structure, page 2”).
3. Align the surface of the RFU63x’s integrated antenna (front) and any external antennas to the data carrier on the object. In doing so, take into account the shape, alignment and dimensions of the antenna lobes. Exclude any large metal surfaces present on the front where possible. If this is not possible, mount the antenna(s) so they are not plane-parallel to the surface.

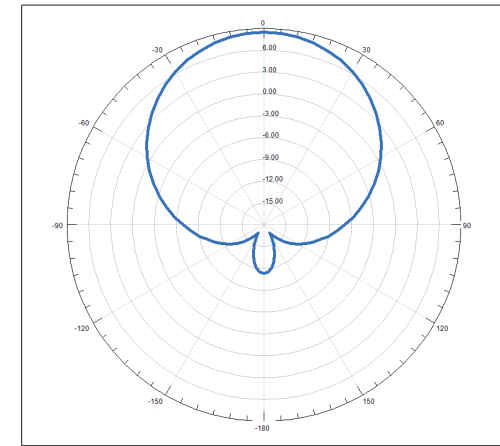


Choosing the adjustment angle for the RFU63x in case of a large metal front surface

4. Supply the RFU63x with voltage. Following successful initialization, the LED “Device Ready” will light up green. The power supply unit must be able to bridge a main power drop up to 20 ms during operation.
5. Ensure no objects (or persons) are situated between the RFU63x/antennas and the transponder during the read/write process. This will have a damping/reflecting effect on the UHF field generated, reducing the range and processing speed of the RFU63x.

RFU63x field of view/write range

The UHF field is influenced by its environment such that clear delineation of the range is not possible. Reflections due to the application can result both the range being exceeded and in read/write gaps. In addition to the read results, the RFU63x can also output diagnostics data that provides an indicator of reading/writing quality. This data can be used when setting up the system to attain optimal read results. Another, considerably more decisive factor is the quality of the transponder (antenna gain, integrated Transponder-IC and associated sensitivity, reflective energy) and the object itself (plastic, wood, metal). Below is an example of an antenna lobe that has been recorded in a reproducible environment (HF chamber) with a reference transponder (Dogbone, Monza4, on wood). This is therefore only significant for particular applications in certain conditions.



Radiation pattern for internal antenna

Step 3: Configuration with PC

Parameters of the RFU63x are adapted to the application and fault diagnostics is performed using the SOPAS ET configuration software as standard.

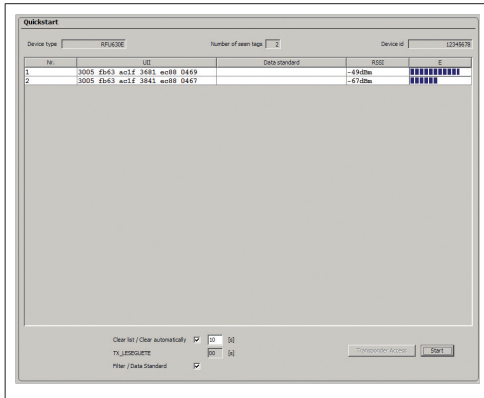
Installing and starting the SOPAS ET configuration software

1. Install the software on the enclosed “Software & Manuals Auto Ident” DVD onto the PC (alternatively, you can download it from the website www.sick.com/software and then install it). When doing this, choose the “complete” option, as suggested by the installer program. You may require administrative rights on your PC to install the software.
2. After installation, start the program option “SOPAS ET-ET”. Path: Start > Programs > SICK > SOPAS ET Engineering Tool > SOPAS.
3. Establish a connection between SOPAS ET and RFU63x using the wizard that opens automatically. To do this, select the RFU63x from the available devices depending on the connected data interface e.g. Ethernet. SOPAS ET will start communication with the RFU63x and load the relevant device description file for the RFU63x. The QUICK START tab will open up automatically.

Detecting the transponder

1. Place one or more standard compatible UHF transponders within the work area of the internal antenna/external antennas of the RFU63x. The UUI/EPC of the individual transponders must be different to enable several transponders to be detected.
2. In SOPAS ET on the QUICKSTART tab, select the START button. SOPAS ET will generate an automatic reading pulse (1 Hz) and list the transponders detected below one another in the Quickstart window (→ example see next page).

SOPAS ET program window



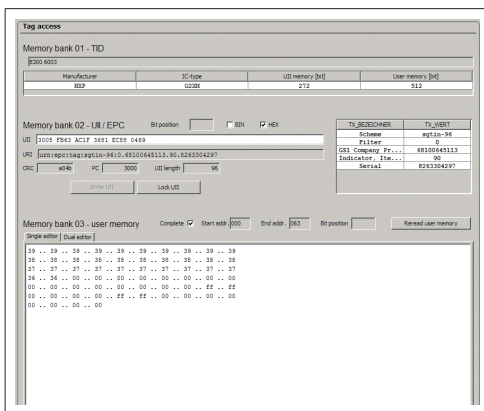
QUICKSTART window showing two transponders detected

The process feedback LED (⑧) in the center of the RFU63x's antenna hood will light up blue by default to indicate that a UHF field is available and a transponder has been detected.

Behavior of light (LED)	Meaning
Lights up with medium brightness	UHF field available
Flashes brightly and slowly	1 transponder in field
Flashes brightly and quickly	More than 1 transponder in field

Accessing transponder data

- To access a transponder's memory area in the RFU63x database (read/write), click the STOP button in the QUICKSTART menu.
- Select the desired transponder (click on it with the mouse).
- Click TAG ACCESS. The content of the selected transponder will now appear in the TAG ACCESS tab.



TAG ACCESS window

Important

The transponder's TIDs cannot be written to.

Continuing configuration

- In the navigation tree in the SOPAS ET, with the aid of the further entries under PARAMETERS, edit the required tab pages for the application (antenna configuration, selection mask for transponder, object trigger control, data processing and output, data output interface(s) and switching inputs and outputs)

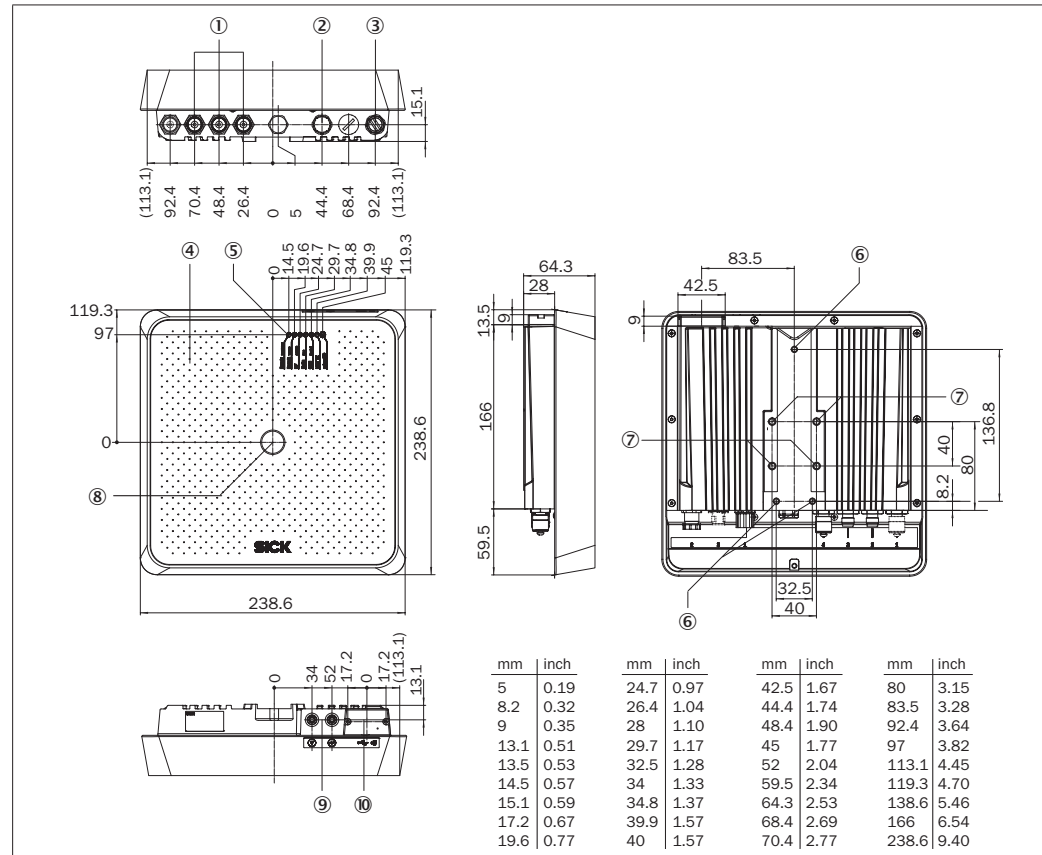
- On the ANTENNA CONFIGURATION tab, the transmit power for the internal and, where applicable, external antenna(s) are set using sliding controllers. For permissible values → see "Setting the transmit power, page 2"
- Test settings made during actual operation of the system and make modifications where applicable.

Completing configuration

- Save the entire configuration permanently: Parameter set in the RFU63x: Click the button. Configuration file (project) on the PC: Click the button.

Description of the device

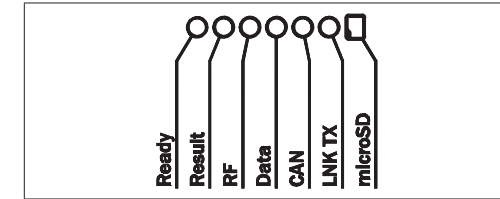
Device structure



- 3 x antenna input ("external", TNC plug, reverse)
- "Power/Serial Data/CAN/I/O" connection (17-pin M12 plug, A-coded)
- "Ethernet" connection (4-pin M12 socket, D-coded)
- Hood with integrated antenna
- 7 x LEDs (status indicators)
- 3 x M5 threaded mounting holes, 9 mm (0.35 in) deep

- 4 x M6 threaded mounting holes, 12 mm (0.47 in) deep
- 1 x LED multi-color (process feedback)
- Step ▾ and Enter ↵ function buttons
- Micro-USB socket and slot for Micro-SD card, behind screw-mounted cover

Status displays, functions



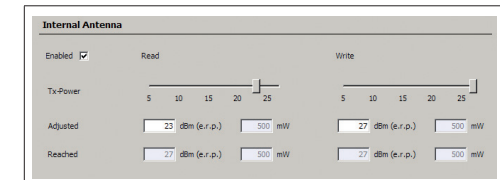
Status displays on the first display level

Display	LED	Color	Status
Ready		green	Device ready
		red	Hardware fault
Result		green	Read or write successful
RF		green	UHF field activated
Data		green	Data output via host interface
CAN		green	Data traffic via CAN bus
LNK TX		green	Data traffic via Ethernet
microSD		green	Micro-SD card inserted and operational

● = lit; ● = flashing

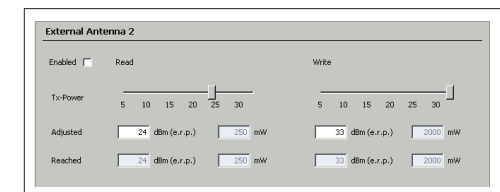
Setting the transmit power

Internal antenna



Configuration: Example of internal antenna settings (excerpt)

External antenna(s)



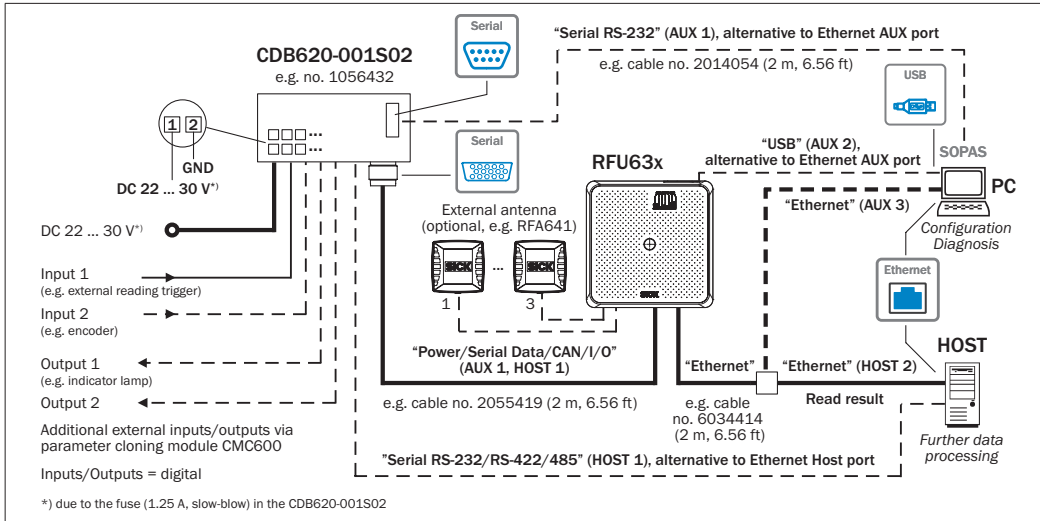
Configuration: Example of external antenna 2 settings (excerpt)

Enter also the power loss or gain for the relevant cable/antenna here.

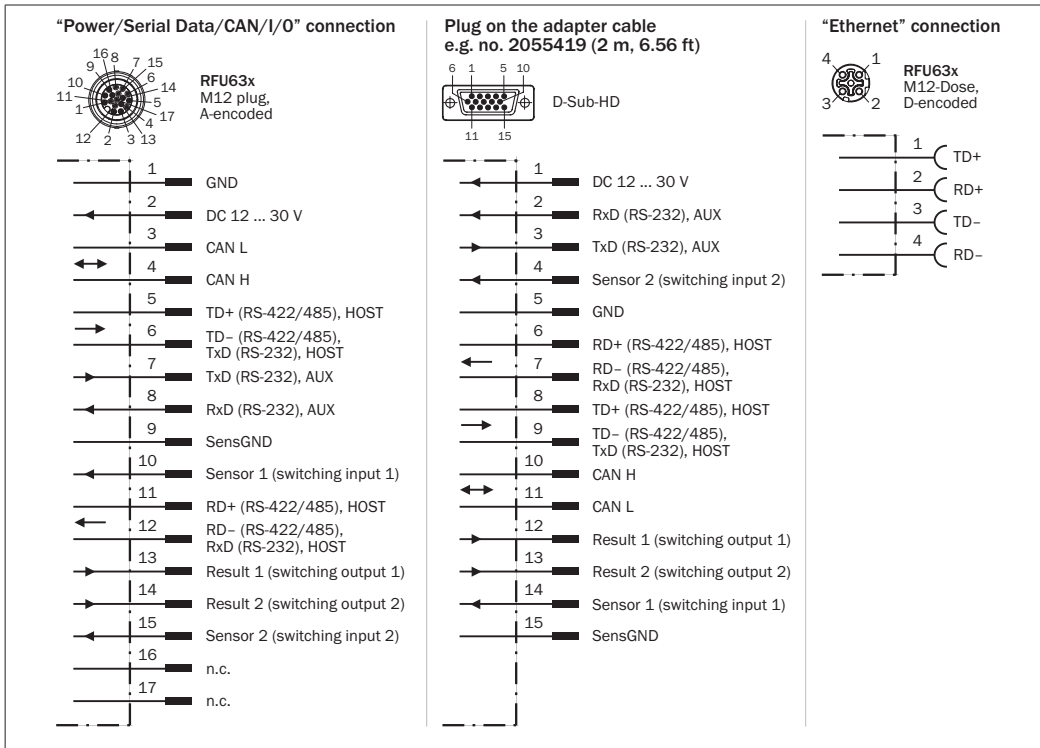
Default settings RFU63x

Parameter	Value
Transmit power	200 mW

Overview of all interfaces and connection options



Overview of pin assignment



Micro-SD memory card (optional accessory)

Function

On the plug-in memory card, the RFU63x can either additionally store externally its last parameter record to be modified (cloning) or else record diagnostics read data. The memory card is not included in the delivery.

Inserting the memory card

To ensure reliable functioning of the memory card, only use types that have been approved by SICK.

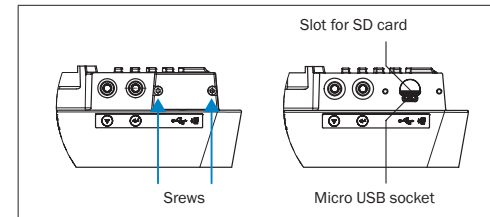
The card slot (→ see ⑩ in section “Device structure, page 2”) can be accessed on the RFU63x behind the aluminum cover.

NOTE

Risk of damage due to moisture and dust

Protect the RFU63x from moisture and dust whenever the cover is open. The cover must be screwed down securely to comply with IP 67 protection class.

- Only operate the RFU63x without the cover for short periods e.g. to insert the memory card or use the USB interface.



- To remove the cover, release the two hexagon socket screws (2 mm width across flat).

NOTE

Risk of data loss or irreparable damage to the memory card

A write process on the memory card by the RFU63x is indicated by the “micro-SD card” LED lighting up green (⑤).

- During the write process, do not remove the memory card or switch off the supply voltage.
- To remove the memory card safely, select the REMOVE CARD function under ANALYSIS TOOLS/MICROSD CARD in the configuration software SOPAS ET.

Technical specifications

Type	RFU630-13100 (part no. 1054396) RFU630-13101 (part no. 1054397)
Designated region	RFU630-13100: Europe RFU630-13101: USA/Canada
Firmware version	V1.1
Carrier frequency	Europe: 865.6 to 867.6 MHz USA/Canada: 902.75 to 927.25 MHz

Type	RFU630-13100 (part no. 1054396) RFU630-13101 (part no. 1054397)
Transmit power	1 internal antenna, adjustable: RFU630-13100: 2 W (ERP*) RFU630-13101: 4 W (EIRP**) 3 external antennas: each conducted power up to +30 dBm, adjustable
Internal antenna (typical values)	Circular polarization, 9 dBi gain, axial ratio < 2 dB, aperture angle 72°, front-to-back ratio > 17 dB
Air interface protocol	EPGlobal UHF Class 1 Generation 2 ISO/IEC 18000-6C
Range	Max. 3 m (9.84 ft), depending on transponder used and ambient conditions
Serial RS-232/422/485	HOST 1 (0.3 to 115.2 kBd) for data output
Serial RS-232	AUX 1 (57.2 kBd) for configuration
USB	AUX 2 (USB 2.0) for configuration
CAN	CAN (CANopen®), 20 KBit/s to 1MBit/s. Max. bus length 30 m (98.42 ft)
Ethernet	HOST 2 (TCP/IP) for data output AUX 3 (TCP/IP) for configuration 10/100 MBit/s Services: DHCP, NTP, HTTP, mDNS, DNS-SD
PROFIBUS DP	HOST via external CDF600-0120 module
ProfiNet I/O	HOST via external CDM425 module
Switching inputs	2 x IN (V _{in} = max. 32 V, I _{in} = max. 5 mA), opto-decoupled, adjustable debouncing time
Switching outputs	2 x OUT (in each case I _{out} ≤ 100 mA), not electrically isolated from the supply voltage, short-circuit proof/temperature-protected
Acoustic indicator	Beeper, function adjustable via SOPAS ET
Visual indicator	7 x LEDs (status indicators) on front at top. 1 x LED (process feedback) front center, function/color adjustable via SOPAS ET
Function buttons	2 x, for Auto setup, other functions adjustable via SOPAS ET
Fuse configuration data	Micro-SD card (optional) or externally via CMC600 module in CDB620-001S02 connection module
Supply voltage	DC 12 to 30 V, PELV as per EN 61140 (2002-03), DC 22 to 30 V when using CDB620-001S02 connection module
Power consumption	Typically < 20 W (switching outputs without load and at full transmit power)
Electrical connections	1 x 17-pin M12 circular plug 1 x 4-pin M12 circular socket 3 x TNC (rev), mono-static, impedance: 50 Ω
Housing/weight	Aluminum/approx. 3.5 kg (7 lb.)
Protection class	III, according to EN 61140: 2006-08
Enclosure rating	IP 65/67 (EN 60529: 1991-10/A2: 2000-02)
Radio equipment type approval	RFU630-13100: ETSI EN 302 208-2 V. 1.4.1 RFU630-13101: FCC Part 15.247
Electrical safety	Acc. to EN 60950-1:2006-04/A11:2009-03
Ambient temperature range	Operation: -20 °C to +50 °C (-4 to +122 °F) Storage: -30 °C to +70 °C (-22 to +158 °F)
Relative air humidity	0 to 90%, non-condensing
Clock	NTP-network-time protocol/none

*ERP = Effective Radiated Power
**EIRP = Equivalent Isotropic Radiated Power

For further technical specifications, see the *online data sheet* on the product web page (www.mysick.com/en/rfu63x).

Warnings

NOTE

Restrictions of RFU63x operation

On delivery, the RFU63x is configured such that its frequency band can be operated in the designated region (Europe) without interfering with any protected frequencies (e.g. cellular telephone networks). Operating the same RFU63x in other regions may interfere with protected frequencies however.

- Only use the RFU63x in the regions for which it was bought.
- When selling on the RFU63x, always inform the buyer about its designated region.

- France: operation not permitted in the near of 13 military zones (required distance of a radius of 20 km around).
- Lithuania: restrictions possible (information not available at present).
- Russia: a license is need for operation.
- USA: 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. To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.
- USA/Canada: This Class A digital apparatus complies with Canadian ICES-003. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- Canada: Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de

licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

⚠ WARNING

Danger of damage due to equipotential bonding currents

The RFU63x is designed to be operated in a system with proficient grounding of all connected devices and mounting surfaces at the same ground potential. If this condition is not met, equipotential bonding currents may flow along the cable shields, leading to the following dangers: dangerous contact voltage on the metal housing, incorrect function or irreparable damage to the RFU63x as well as heating up of the cables, even leading to spontaneous combustion.

- To find information about measures to safeguard against dangers, refer to the "Electrical installation" chapter in the *Technical Information* (PDF) on the accompanying DVD or on the product's web page (www.mysick.com/en/rfu63x).

Delivery

- RFU63x in the version ordered is equipped with protective caps/plugs on its electrical connections
- "Software & Manuals Auto Ident" DVD (part no. 2039442)
- Printed operating instructions in German and English and other languages where applicable in form of PDF on DVD.
- Any optionally ordered accessories

Maintenance and care

The RFU63x does not contain any components requiring maintenance.

- If the antenna hood (plastic) becomes soiled, clean it (e.g. the metal dust) using a soft, damp cloth (using a mild cleaning agent) to obtain the maximum read/write rate.

Sources for obtaining additional information

Additional information about the RFU63x and its optional accessories can be found in the following places:

"Software & Manuals Auto Ident" DVD (no. 2039442)

- RFU63x technical information (supplementary information on mounting, electrical installation etc. plus overview list and license texts for open source software)
- These operating instructions in English and German
- SOPAS ET configuration software with integrated online help
- Ordering information in the RFU63x product information
- Product catalog Identification Solutions
- Documents of the accessories

Product web page for the RFU63x (www.mysick.com/en/rfu63x)

- Adequate accessories
- Detailed technical specifications (online data sheet)

- Dimensional drawing and 3D CAD dimension models in various electronic formats
- Product catalog Identification Solutions
- RFU63x product information
- RFU63x operating instructions in English and German as well as in further languages if applicable
- EC Declaration of Conformity
- Overview of command strings
- Updates of the SOPAS ET configuration software
- All publications contained on the aforementioned DVD (via links)

Documents on request

- Overview of command strings for the RFU63x

Support is also available from your sales partner: www.sick.com/worldwide.

Copyright notices for open source programs

Exclusion from liability

The firmware of the RFU63x was developed using open source software.

The user is exclusively responsible for any modifications made to open source components. All warranty claims shall be invalidated in such cases.

The following exclusion from liability applies to the **GPL components** in relation to the rights holders:

This program is distributed in the hope that it will be of use, but with no guarantee of this; neither is there any implied guarantee of marketability or suitability for a particular purpose. For details, see the GNU General Public License.

With regard to the **other open source components**, we refer to the exclusions from liability of the rights holders in the license texts on the supplied "Software & Manuals Auto Ident" DVD.

List of software licenses and license texts

For the RFU63x product, SICK uses unmodified open source software and, as far as required and permitted in accordance with the relevant license conditions, modified open source software.

The firmware of the RFU63x is therefore subject to the copyrights listed below.

Please refer to the technical information for the RFU63x on the supplied DVD for the corresponding license conditions. Technical information can be downloaded free of charge from the following address: www.mysick.com/en/rfu63x.

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- 4.1 Import code in keyimport.c is modified from PuTTY's import.c, licensed as follows: PuTTY is copyright 1997-2003 Simon Tatham - Portions copyright Robert de Bath, Joris van Rantwijk, Delian Delchev, Andreas Schultz, Jeroen Massar, Wez Furlong, Nicolas Barry, Justin Bradford, and CORE SDI S.A.
5. OpenSSH - 5.1p1

- 5.1 Cryptographic attack detector for ssh - source code: Copyright (c) 1998 CORE SDI S.A., Buenos Aires, Argentina.
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- 6.9 porcps-3.2.8 (only ps used): Copyright (C) 1989, 1991 Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA
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- 9.2 darwin backend for libusb 1.0 Copyright (C) 2008-2009 Nathan Hjelm <njhjelm@users.sourceforge.net>

Source codes

The source codes licensed under GPL and LGPL can be ordered from the responsible SICK national agency. Contact details: www.sick.com/worldwide