

# Technical Documentation

for metraTec QuasarLR HF RFID Reader



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# 1 General Information / Security Advice

## 1.1 Notes on the use of this documentation

This user manual and integration guide uses different symbols to point out potentially dangerous situations. The following signs and symbols are used throughout the document.



### ATTENTION

Declares a potentially hazardous situation. If this is not avoided, the product or something in its surrounding could be damaged.



### NOTE

Declares notes for the user as well as other useful information, where no harmful or dangerous situations can be expected.

## 1.2 Security Advice

The QuasarLR HF RFID Reader was not designed for use in dangerous environments. Using this product in applications where a failure could directly result in severe injuries or death ("high risk activities") is not permitted. This includes but is not limited to applications in nuclear facilities, flight control systems, life support systems or weapon systems. The manufacturer denies the suitability of this device for such scenarios.

## 1.3 Export Restrictions

The QuasarLR HF RFID Reader contains components that underlie US Export restrictions. It is therefore forbidden to export the product to countries that are on the US trade embargo list. The same applies to any countries that are on the EU embargo list.

## 1.4 Further Documents

While this documentation explains the electrical and mechanical characteristics of the QuasarLR RFID Reader, it might be useful to also read the [metraTec Protocol Guide](#), which explains the ASCII protocols used to control the reader in full detail.

We also offer general information about how to set up the connection of the reader to the antenna for optimum system performance in our [HF Antenna Integration Guide](#).

All further documents can be either found at the metraTec's product web page or are listed at: <http://www.metrtec.com/en/support/downloads/documentation.html>.

## 2 Product Description

The QuasarLR is an HF RFID reader/writer for demanding industrial applications, where high reading reliability, speed and extensive special tag features are needed.

Highlights include a reading rate of up to 100 tag-IDs/sec and reading and writing data on tags without needing to address them individually. This allows applications directly at conveyor belts, in production machinery and in electric control cabinets.

### 2.1 Intended Use

RFID Reader/Writer for wireless communication with RFID transponders according to ISO 15693. It is intended to be used in **commercial or industrial applications** only, e.g. on a factory conveyor belt, as part of a RFID gate for forklifts or inside a manufacturing machine. This hardware is only sold via our authorized resellers or directly to qualified installers.



#### ATTENTION

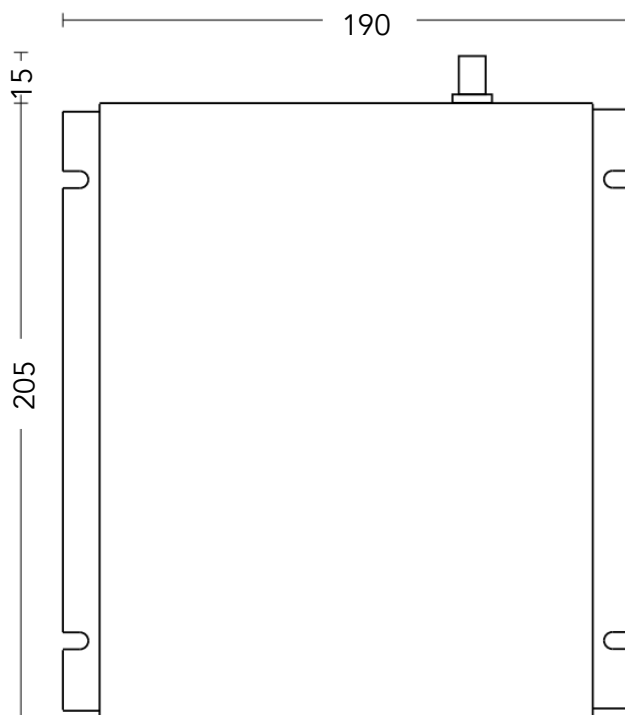
Changes or modifications made to this equipment not expressly approved by metraTec GmbH may void the FCC authorization to operate this equipment. For further information on installation see chapter 5.

### 2.2 Technical Specification

Operating Voltage	24 V DC
Digital Inputs/Outputs	optically isolated 24V DC Inputs (2x), 24 V DC Outputs (4x), 24 V DC Out (1x)
Operating Frequency	13.56 MHz
System Impedance	50 Ohm, BNC Output
RF Output	4000 mW max.
Power Consumption	500 mA
Operating Temperature	0°C bis +50°C
Dimensions	190 x 205 x 65 mm
Protection	IP 40

Conformity	CE, e.g. EN 60950-1, ETSI 300 330

## 2.3 Product Drawing



*Fig. 1: Dimensions of QuasarLR RFID Reader (in mm)*

## 2.4 Scope of Delivery

The QuasarLR RFID Reader comes with the following parts:

- QuasarLR RFID Reader
- 24 V DC power supply
- Documentation, Drivers and Demo Software are available via download from metraTec's website

## 2.5 Accessories

The following accessories and modules are available to extend and evaluate the functionality of the QuasarLR HF RFID Module:

- Multiplexer (4x, 8x and 16x)
- Various HF antennas
- Coaxial cable

### 3 Power Supply and Electrical Specification

The QuasarLR is powered using 24 V DC which are connected at the front of the device. If you do not use a power supply supplied by metraTec, please make sure that your own PSU provides a supply voltage of high quality. If possible, use a PSU with high precision/high speed linear regulator. If you use a switching PSU, please make sure that the switching frequency is  $> 500$  kHz.

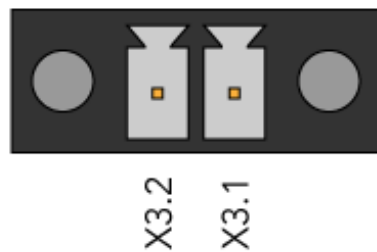


Fig. 2: Power Connector Description (ref. Tab. 1)

Connector	Description
X3.1	GND
X3.2	24 V DC

Tab. 1: Description of Power Connector

Operating Voltage	24 V DC
Power Consumption, RF on	500 mA
Power Consumption, RF off	150 mA
Power Consumption, Sleep	110 mA
Voltage Inputs/Outputs	24 V

Tab. 2: Maximum Rating and Electrical Limits

## 4 Communication

The QuasarLR offers two main options as a host interface – USB and optionally an Ethernet connection. The main advantage of the optional Ethernet interface lies in the very long cable length that Ethernet allows between the host computer or network switch and the reader in the field. Additionally, versions with WiFi and ZigBee are available on special request.

### 4.1 USB Driver Installation

The basic option for connecting the QuasarLR with your host PC is using the USB connection every reader has.

1. Connect the reader with a 24 V DC power source as described before.
2. Connect the reader with a PC using a USB cable.
3. Install the USB driver. metraTec offers the needed driver including Installation Guides for Windows XP and Windows 7 (as downloads from metraTec's website).

### 4.2 Ethernet

Communication of the QuasarLR goes via the Ethernet connection to a host for data evaluation.

Factory IP address of the QuasarLR is **192.168.2.239**

For changing the address, access the above IP address via web browser. You will be asked for a password. Default password is „tucadmin“. You can now change the IP address via the web mask.

In case the changed address got lost, the „TUC Config Manager“ software from metraTec can be used to search for the device and assign another IP address. Software and more documentation can be found here:

<http://www.metrattec.com/en/support/downloads/software.html>



## 5 Antenna Installation

To send and receive data to and from the tags an appropriate HF RFID antenna (13.56 MHz, 50 Ohm) has to be connected to the reader. This is done via the BNC connector on the reader.

To connect the antenna to the reader or multiplexer the devices are equipped with BNC jacks and the cables are equipped with BNC plugs at both ends. When connecting antennas with multiplexers or readers please keep in mind that the cable has a signal dampening effect reducing the RF power reaching the antenna. If long cables are to be used in connection with one or more multiplexers the reading range can be reduced measurably. Using higher quality cables can reduce the power loss in cases in which this is important. Recommended cables with different lengths can be ordered from metraTec as accessories.



### ATTENTION

Always connect a 50 Ohm antenna as described above first, before powering the device. Powering the reader without an appropriate 50 Ohm load for a longer time could damage the reader permanently.

### 5.1 FCC / ISED Compliance / Professional Installation

Installing a correct RFID system is a complex task. Besides a safe electrical installation it is also import to install the antenna in a correct manner to ensure nominal operation. The system can be influenced by the environment surrounding the antenna, the cables used as well as other devices in the vicinity of the system. Therefore, this system should only be installed by professional installers that have the necessary equipment to make sure the reader and antenna work as intended.

Only the following antennas are approved to be used with the QuasarLR by the FCC according to FCC Part 15 and ISED Canada according to RS210:

- metraTec MaxiPCB HF Antenna, Article-No.: 2200 0027
- metraTec MidiPCB HF Antenna, Article-No.: 2200 0086



### **ATTENTION – FCC/ISED Compliance**

To comply with FCC Part 15 rules in the United States / with ISED Rules in Canada, the device must be installed by a professional installer to ensure full compliance. The operator of the device and the installer are responsible to ensure that only certified systems are deployed in the United States / Canada.

## 6 Digital Input/Outputs

The QuasarLR has 2 digital input pins and 4 digital output pins which can be read or set via the reader. The input pins are optically isolated 24 V DC inputs as common in automation technology in general. Up to 25 mA are needed to set the input to "high".

The output pins are 24 V high side switch DC outputs with a maximum current of 250 mA per pin. These can be used to directly power e.g. signal towers. In total a maximum current of 1000 mA for all pins is allowed. Outputs are equipped with internal overcurrent and overtemperature shutdown.

The pins X2.1 and X2.2 are connected directly to the power supply input, i.e. the applied voltage is 24 V DC. This can be used for power supply of e.g. sensors, etc. The power of these pins is only limited by the power of the power supply used.

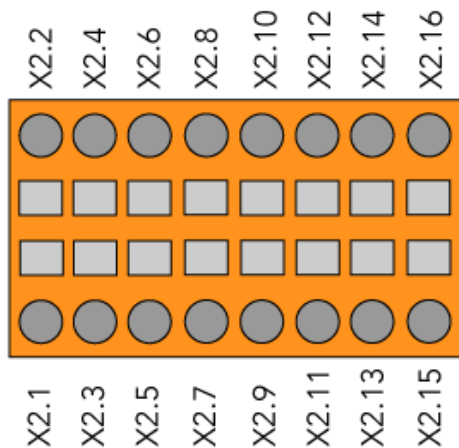


Fig. 3: Connector description of QuasarLR

Connector	Description
X2.1	GND
X2.2	24 V DC Out
X2.3	Out 1 -
X2.4	Out 1 +
X2.5	Out 2 -
X2.6	Out 2 +

X2.7	Out 3 -
X2.8	Out 3 +
X2.9	Out 4 -
X2.10	Out 4 +
X2.11	In 1 -
X2.12	In 1 +
X2.13	In 2 -
X2.14	In 2 +
X2.15	GND
X2.16	24 V DC

*Tab. 3: Pin Description for digital IOs. Note: All "Out X -" are connected to ground internally!*

## 7 External Status LEDs

The reader features 3 external status LEDs indicated the operating state.

The LEDs are listed from left (24 V power connector) to right (USB connector).

Status LEDs	Farbe	Status
LED E1	green*	24 V Power OK
LED E2	green*	RF Output on
LED E3	blue	Transponder detected

*Tab. 4: Meaning of the external LEDs*

\* Revisions up to 1.1 have red LEDs instead of green ones.

## 8 Internal Status LEDs

Internally, the reader is equipped with 2 LED bars for status display which might be useful for the advanced system integrator for setting up and analyzing the system's status. The LEDs can be reached by opening the upper housing half after removing the upper two screws. The LEDs are labeled on the circuit board.

The LEDs of the status bar signals the status of the reader as listed in Tab. 5.

Status LEDs	Color	Status
LED S1	green	Transponder detected
LED S2	green	RFU
LED S3	green	RFU
LED S4	green	RFU
LED S5	green	Application processor detected
LED S6	red	Short circuit at the antenna port. This is not just a bad voltage standing wave ratio, but a short circuit at the antenna port: Turn off the reader and replace the antenna
LED S7	red	Collision detected. Indicates either a collision of the transponder, or data error due to disturbances, or a badly tuned antenna
LED S8	red	Overtemperature. Turn off reader and let it cool down

Tab. 5: Meaning of the internal Status LEDs

The VSWR LED bar signals the tuning of the antenna. The standing wave ratio should be better than 1:2, and there should be only green or at least orange LED lights active. Tab. 6 lists the LED colors.

VSWR LEDs	Color	Value (VSWR)	Quality of Standing Wave Ratio
LED V1	green	1	optimal
LED V2	green	1,2	very good
LED V3	orange	1,5	good
LED V4	orange	1,7	still acceptable
LED V5	red	2	poor, reading efficiency reduced. Antenna needs to be tuned
LED V6	red	2,5	poor, reading efficiency reduced. Antenna needs to be tuned
LED V7	red	3	poor, reading efficiency reduced. Antenna needs to be tuned
LED V8	red	INF	poor, reading efficiency reduced. Antenna needs to be tuned

Tab. 6: VSWR LED Bar

## 9 Further Notes

### 9.1 Environmental

Electronic devices like the QuasarLR are covered by the (German) ElektroG (electronic waste law) as well as the European WEEE directive and as such may not be disposed of by way of the normal household trash. Instead they have to be recycled properly. For you as our customer this is no additional burden, however, as you can send the device back to us for proper recycling. We assure you that the devices received back will be recycled properly and in an environmentally friendly way. Our WEEE Registration ID is DE 56060482.

When selecting electronic components we additionally made sure that all components are free of heavy metals and other harmful substances as required by the RoHS Directive for many industries. Hence, our products are produced in the most environmentally friendly way possible.



### 9.2 Declaration of Conformity EU

The QuasarLR complies with all directives and regulations applicable in the European Union for this kind of device. This especially includes all laws regarding use of spectrum and EMC. The product therefore bears the CE sign, as required by Directive 1999/5/EC (Radio & Telecommunication Terminal Equipment Directive).



The product is currently not registered for use in the US or Canada. However, metraTec is registered as a manufacturer of electronics at the FCC and IC. A certification of this product is therefore possible, if required. Please ask us or your system integrator for further information.



### 9.3 Regulatory Information FCC / ISED (USA / Canada)



#### 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.



This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s) and part 15 of the FCC rules. 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.



L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## 10 Version Control

<i>Version</i>	<i>Change</i>	<i>by</i>	<i>Date</i>
1.0	created	TM	17.02.2015
1.1	Chapter 8 (Internal Status LEDs) integrated	TM	17.03.2015
1.2	added reference to Antenna Integration Guide; description of USB driver installation externalized, product drawing added, scope of delivery and temperature range corrected, minor changes	CS	21.04.2015
1.3	Chapter on external LEDs added	TM	5.10.2015
1.4	insert 4.2 Ethernet, update address	KS	28.11.2016
1.5	Regulatory Information added	KD	21.10.2019
1.6	Added more FCC requirements	KD	29.01.2020

## Contact

metraTec GmbH  
Niels-Bohr-Str. 5  
39106 Magdeburg, Germany

Tel.: +49 (0)391 251906-00

Fax: +49 (0)391 251906-01

Email: [support@metratec.com](mailto:support@metratec.com)

Web: <http://www.metratec.com>

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