# RF30 Series RS-485 RFID User Manual


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# Preface

## 1. Scope of this manual:

This manual applies to the ELCO RF30 series RS-485 RFID.
The information in this manual enables you to run the RS-485 RFID on Master as a distributed device.

## 2. Basic knowledge requirements

This manual presumes a general knowledge in the field of automation engineering and describes the components based on the data valid at the time of its release. ELCO reserves the right of including a product information for each new component, and for each component of a later version.

## 3. Guide:

This manual describes the hardware of the RF30 series RS-485 RFID module.
Covered topics are:

- Installation and wiring
- Commissioning and diagnostics
- Components
- Article numbers
- Technical specifications

## 4. Technical support:

Please contact your local ELCO representative or dial 400-608-4005 if you have any questions about the products described in this manual.
Additional information about ELCO products is available:
https://www.elcoautomation.com/

## 5. Disclaimer of liability:

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

# 1. Product overview

## 1.1 RF30 Series Introduction

The high-frequency RFID module with RS-485 functionality represents an innovative identification system featuring an IP67 protection rating. This product series employs a fully encapsulated design structure, enabling direct installation in industrial environments—including harsh working conditions where liquids, dust, and vibrations may be present.

## 1.2 Product Introduction

ELCO has newly launched high-frequency RFID products with RS-485 communication function. Used as an RS-485 slave station, the products can achieve high-efficiency communication with RS-485 master station devices through traditional shielded industrial cables.

The RF30 series RFID products adopt read-write tags attached to the objects to be identified as mobile data storage carriers. The read-write heads utilize 13.56MHz high-frequency RF technology to conduct two-way data exchange with the read-write tags. The collected data is stored in the RFID module and transmitted to the main controller through the standard ModbusRTU protocol, so as to realize the identification and tracking of objects. It is an industrial-grade identification system solution.

## 1.3 Functional features

- Up to IP67 protection class
- Compliant with standard Modbus RTU protocol for communication
- Supports multiple baud rates: 9600 - 115200 bps
- Interface Type: M12 A-Code
- LED Status Display

## 1.4 Product Model List

| Num | Product Model | Description | Picture |
|---|---|---|---|
| 1 | RF30-WR-C40H | 13.56 MHz, ISO 15693,<br>9600 - 115200 bps, IP67,<br>40 × 40 × 66 mm,<br>Operating distance 0...80 mm |  |
| 2 | RF30-WR-Q95H | 13.56 MHz, ISO 15693,<br>9600 - 115200 bps, IP67,<br>94 × 80 × 34 mm,<br>Operating distance 0…120 mm |  |
| 3 | RF30-WR-M30H | 13.56 MHz, ISO 15693,<br>9600 - 115200 bps, IP67,<br>Ø30 × 46 mm, Non-flush,<br>Operating distance 0…70 mm |  |

| Num | Product Model | Description | Picture |
|---|---|---|---|
| 4 | RF30-WR-MF30H | 13.56 MHz, ISO 15693,<br>9600 - 115200 bps, IP67,<br>Ø30 × 46 mm, Flush,<br>Operating distance 0…60 mm |  |
| 5 | RF30-TGH-ER30 | EEPROM, 2528 bits, Ø30 × 3 mm,<br>Black, PPS, Non-resistant metal |  |
| 6 | RF30-TGH-ER30/16K | FRAM, 16000 bits, Ø30 × 3 mm,<br>Black, PPS, Non-resistant metal | |
| 7 | RF30-TGH-MR30 | EEPROM, 2528 bits, Ø30 × 3 mm,<br>Black, PPS, Metal-resistant | |
| 8 | RF30-TGH-ER50 | EEPROM, 2528 bits, Ø50 × 3 mm,<br>Black, PPS, Non-resistant metal |  |
| 9 | RF30-TGH-ER50/16K | FRAM, 16000 bits, Ø50 × 3 mm,<br>Black, PPS, Non-resistant metal | |
| 10 | RF30-TGH-MR50 | EEPROM, 2528 bits, Ø50 × 3 mm,<br>Black, PPS, Metal-resistant | |

## 2. Technical Characteristics

### 2.1 Read-Write Header Technical Characteristics


The RF30 series high-frequency RS-485 RFID readers can be used as RS-485 slave stations to connect with ELCO PLCs or RS-485 master stations of other brands. They support the standard Modbus RTU message protocol and multiple communication baud rates ranging from 9600 to 115200 bps.

ELCO's high-frequency RFID products with RS-485 protocol support a maximum cable transmission distance of 100

meters, covering common deployment scenarios such as logistics production lines and workshop workstations. Compatible with short-range electronic tags complying with the ISO/IEC 15693 standard and rated at IP67 protection grade, the products feature strong environmental adaptability. They can stably identify tag data in humid, dusty and other harsh logistics line environments, and become an optimal solution for their excellent stability and high accuracy.

## 2.2 Hardware Parameters

### 2.2.1 RF30-WR-C40H Parameters

### ELECTRICAL DATA

| | | | |
|---|---|---|---|
| **SUPPLY VOLTAGE** | 18 ... 30 V DC | **CONNECTION TYPE** | M12x1, Male, 4 pin, A-coded |
| **CURRENT CONSUMPTION** | Max. 80 mA | **POWER CONSUMPTION** | Max. 2 W |
| **RF STANDARDS** | ISO 15693 | **OPERATING FREQUENCY** | 13.56 MHz |
| **ANTENNA TYPE** | Integrated antenna | **EMITTED POWER** | 23 dBm |
| **OPERATING DISTANCE** | 0 - 80 mm (depends on the environment) | **DYNAMIC MODELS** | Not supported |
| **COMMUNICATION RATES** | 9600 ... 115200 Baud | **DIAGNOSIS** | LED indicaton |

**FUNCTION INDICATOR**

| | |
|---|---|
| • Power (PW) | Green LED |
| • Communication (LK) | Green flickering LED |
| • Tag Present (TAG) | Orange LED |
| • Command (RW) | Green flickering LED |

### FUNCTIONAL SAFETY

| | |
|---|---|
| **MTTF** | 416 years |

### GENERAL DATA

| | | | |
|---|---|---|---|
| **HOUSING MATERIAL** | PA66 | **OPERATING TEMPERATURE** | -25 ... +70 °C |
| **PROTECTION** | IP67 | **STORAGE TEMPERATURE** | -40 ... +85 °C |
| **INSTALLATION** | Metal-free (clear zone) | **DIMENSIONS** | 40 × 40 × 66 mm |
| **WEIGHT** | 102 g | **SHOCK RESISTANCE** | IEC 60068-2-27 |
| **VIBRATION RESISTANCE** | IEC 60068-2-6 | | |

2.2.2 RF30-WR-Q95H Parameters


## ELECTRICAL DATA

| | | | |
|---|---|---|---|
| **SUPPLY VOLTAGE** | 18 ... 30 V DC | **CONNECTION TYPE** | M12x1, Male, 5 pin, A-coded |
| **CURRENT CONSUMPTION** | Max. 80 mA | **POWER CONSUMPTION** | Max. 2 W |
| **RF STANDARDS** | ISO 15693 | **OPERATING FREQUENCY** | 13.56 MHz |
| **ANTENNA TYPE** | Integrated antenna | **EMITTED POWER** | 23 dBm |
| **OPERATING DISTANCE** | 0 ... 120 mm (depends on the environment) | **DYNAMIC MODELS** | Not supported |
| **COMMUNICATION RATES** | 9600 ... 115200 Baud | **DIAGNOSIS** | LED indicaton |

**FUNCTION INDICATOR**

- Power (PW) — Green LED
- Communication (LK) — Green flickering LED
- Tag Present (TAG) — Orange LED
- Command (RW) — Green flickering LED

## FUNCTIONAL SAFETY

| | |
|---|---|
| **MTTF** | 216 years |

## GENERAL DATA

| | | | |
|---|---|---|---|
| **HOUSING MATERIAL** | PC + PBT | **OPERATING TEMPERATURE** | -25 ... +70 °C |
| **PROTECTION** | IP67 | **STORAGE TEMPERATURE** | -40 ... +85 °C |
| **INSTALLATION** | Metal-free (clear zone) | **DIMENSIONS** | 94 × 80 × 34 mm |
| **WEIGHT** | 141 g | **SHOCK RESISTANCE** | IEC 60068-2-27 |
| **VIBRATION RESISTANCE** | IEC 60068-2-6 | | |

2.2.3 RF30-WR-M30H Parameters

## ELECTRICAL DATA

| | | | |
|---|---|---|---|
| **SUPPLY VOLTAGE** | 18 ... 30 V DC | **CONNECTION TYPE** | M12x1, Male, 4 pin, A-coded |
| **CURRENT CONSUMPTION** | Max. 80 mA | **POWER CONSUMPTION** | Max. 2 W |
| **RF STANDARDS** | ISO 15693 | **OPERATING FREQUENCY** | 13.56 MHz |
| **ANTENNA TYPE** | Integrated antenna | **EMITTED POWER** | 23 dBm |
| **OPERATING DISTANCE** | 0 ... 70 mm (depends on the environment) | **DYNAMIC MODELS** | Not supported |
| **COMMUNICATION RATES** | 9600 ... 115200 Baud | **DIAGNOSIS** | LED indicaton |

**FUNCTION INDICATOR**

- Power (PW) — Green LED
- Communication (LK) — Green flickering LED
- Tag Present (TAG) — Orange LED

## FUNCTIONAL SAFETY

| | |
|---|---|
| **MTTF** | 266 years |

## GENERAL DATA

| | | | |
|---|---|---|---|
| **HOUSING MATERIAL** | Nickel-plated brass + PBT | **OPERATING TEMPERATURE** | -25 ... +70 °C |
| **PROTECTION** | IP67 | **STORAGE TEMPERATURE** | -40 ... +85 °C |
| **INSTALLATION** | Metal-free (clear zone)<br>On metal | **DIMENSIONS** | Ø 30 × 46 mm |
| **WEIGHT** | 95 g | **SHOCK RESISTANCE** | IEC 60068-2-27 |
| **VIBRATION RESISTANCE** | IEC 60068-2-6 | | |

2.2.4 RF30-WR-MF30H Parameters

## ELECTRICAL DATA

| | | | |
|---|---|---|---|
| **SUPPLY VOLTAGE** | 18 ... 30 V DC | **CONNECTION TYPE** | M12x1, Male, 4 pin, A-coded |
| **CURRENT CONSUMPTION** | Max. 80 mA | **POWER CONSUMPTION** | Max. 2 W |
| **RF STANDARDS** | ISO 15693 | **OPERATING FREQUENCY** | 13.56 MHz |
| **ANTENNA TYPE** | Integrated antenna | **EMITTED POWER** | 23 dBm |
| **OPERATING DISTANCE** | 0... 60 mm (depends on the environment) | **DYNAMIC MODELS** | Not supported |
| **COMMUNICATION RATES** | 9600 ... 115200 Baud | **DIAGNOSIS** | LED indicaton |

**FUNCTION INDICATOR**

- Power (PW) — Green LED
- Communication (LK) — Green flickering LED
- Tag Present (TAG) — Orange LED

## FUNCTIONAL SAFETY

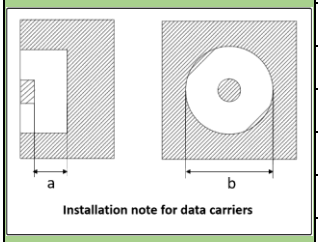
| | |
|---|---|
| **MTTF** | 266 years |

## GENERAL DATA

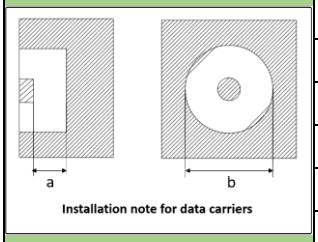
| | | | |
|---|---|---|---|
| **HOUSING MATERIAL** | Nickel-plated brass + PBT | **OPERATING TEMPERATURE** | -25 ... +70 °C |
| **PROTECTION** | IP67 | **STORAGE TEMPERATURE** | -40 ... +85 °C |
| **INSTALLATION** | Metal-free(clear zone)<br>Flush in metal | **DIMENSIONS** | Ø 30 × 46 mm |
| **WEIGHT** | 103 g | **SHOCK RESISTANCE** | IEC 60068-2-27 |
| **VIBRATION RESISTANCE** | IEC 60068-2-6 | | |

## 2.3 Clear zone data & offset value

### 2.3.1 RF30-WR-C40H/LK & RF30-WR-C40

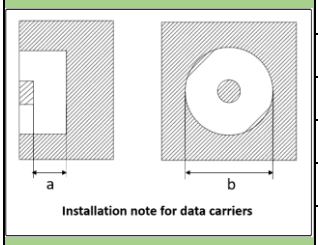
| Data carriers Model | | RF30-TGH-MR30 | | | RF30-TGH-ER30 | | | RF30-TGH-ER30/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 28 | 0-35 | 0-35 | 0 - 72 | | | 0 - 66 | | |
| Offset in mm at distance | 0 | ±21 | ±44 | ±39 | ±70 | | | ±65 | | |
| | 10 | ±20 | ±24 | ±19 | ±30 | | | ±33 | | |
|  | 20 | ±16 | ±24 | ±18 | ±35 | | | ±40 | | |
| | 28 | ±4 | ±18 | ±8 | ±40 | | | ±41 | | |
| | 35 | | ±10 | ±2 | ±40 | | | ±43 | | |
| | 50 | | | | ±35 | | | ±38 | | |
| | 60 | | | | ±35 | | | ±23 | | |
| | 68 | | | | ±14 | | | ±2 | | |
| | 72 | | | | ±11 | | | | | |
| | 110 | | | | | | | | | |
| | 120 | | | | | | | | | |


Installation note for data carriers

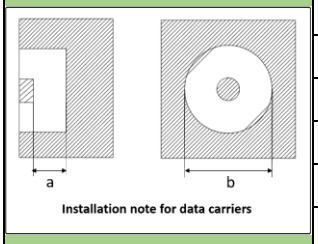
| Data carriers Model | | RF30-TGH-MR50 | | | RF30-TGH-ER50 | | | RF30-TGH-ER50/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 35 | 0 - 53 | 0 - 39 | 0 - 98 | | | 0 - 92 | | |
| Offset in mm at distance | 0 | ±42 | ±50 | ±45 | ±87 | | | ±80 | | |
| | 10 | ±27 | ±19 | ±45 | ±83 | | | ±75 | | |
|  | 20 | ±25 | ±21 | ±17 | ±70 | | | ±39 | | |
| | 30 | ±15 | ±21 | ±13 | ±45 | | | ±44 | | |
| | 35 | ±4 | ±19 | ±3 | ±47 | | | ±46 | | |
| | 39 | | ±18 | ±1 | ±49 | | | ±46 | | |
| | 53 | | ±2 | | ±49 | | | ±46 | | |
| | 80 | | | | ±40 | | | ±31 | | |
| | 92 | | | | ±24 | | | ±2 | | |
| | 98 | | | | ±4 | | | | | |
| | 120 | | | | | | | | | |


Installation note for data carriers

### 2.3.2 RF30-WR-Q95H/LK & RF30-WR-Q95H

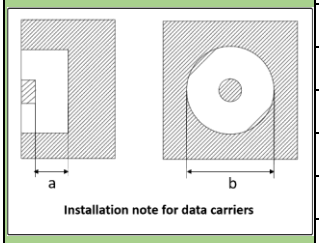
| Data carriers Model | | RF30-TGH-MR30 | | | RF30-TGH-ER30 | | | RF30-TGH-ER30/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 37 | 0 - 42 | 3 - 42 | 0 - 100 | | | 0 - 95 | | |
| Offset in mm at distance | 0 | ±53 | ±57 | | ±92 | | | ±92 | | |
| | 3 | ±50 | ±59 | ±60 | ±90 | | | ±90 | | |
|  | 10 | ±30 | ±59 | ±60 | ±89 | | | ±90 | | |
| | 20 | ±26 | ±31 | ±32 | ±42 | | | ±85 | | |
| | 30 | ±18 | ±31 | ±30 | ±49 | | | ±49 | | |
| | 37 | ±4 | ±18 | ±15 | ±54 | | | ±49 | | |
| | 42 | | ±15 | ±11 | ±52 | | | ±51 | | |
| | 70 | | | | ±50 | | | ±51 | | |
| | 95 | | | | ±8 | | | ±16 | | |
| | 100 | | | | ±3 | | | | | |
| | 120 | | | | | | | | | |

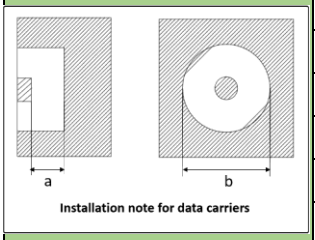

Installation note for data carriers

| Data carriers Model | | RF30-TGH-MR50 | | | RF30-TGH-ER50 | | | RF30-TGH-ER50/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 45 | 0 - 70 | 0 - 55 | 0 - 134 | | | 0 - 125 | | |
| Offset in mm at distance | 0 | ±70 | ±66 | ±60 | ±121 | | | ±112 | | |
| | 10 | ±42 | ±72 | ±65 | ±118 | | | ±112 | | |
|  | 20 | ±40 | ±67 | ±30 | ±116 | | | ±114 | | |
| | 30 | ±42 | ±35 | ±30 | ±59 | | | ±53 | | |
| | 40 | ±25 | ±35 | ±25 | ±65 | | | ±58 | | |
| | 45 | ±33 | ±31 | ±5 | ±66 | | | ±61 | | |
| | 55 | | ±29 | ±3 | ±70 | | | ±64 | | |
| | 70 | | ±7 | | ±72 | | | ±64 | | |
| | 100 | | | | ±65 | | | ±53 | | |
| | 125 | | | | ±34 | | | ±14 | | |
| | 134 | | | | ±9 | | | | | |

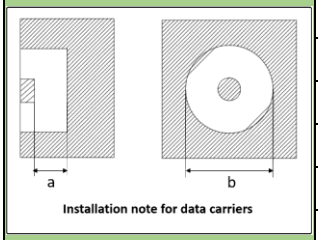

Installation note for data carriers

### 2.3.3 RF30-WR-MF30H/LK & RF30-WR-MF30H

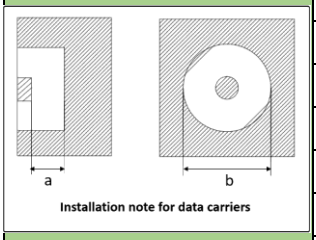
| Data carriers Model | | RF30-TGH-MR30 | | | RF30-TGH-ER30 | | | RF30-TGH-ER30/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 15 | 0 - 30 | 0 - 30 | 0 - 45 | | | 0 - 45 | | |
| Offset in m at distance | 0 | ±15 | ±26 | ±27 | ±42 | | | ±38 | | |
| | 10 | ±12 | ±14 | ±12 | ±20 | | | ±18 | | |
|   Installation note for data carriers | 15 | ±5 | ±13 | ±12 | ±21 | | | ±21 | | |
| | 20 | | ±13 | ±12 | ±24 | | | ±21 | | |
| | 30 | | ±2 | ±3 | ±23 | | | ±19 | | |
| | 45 | | | | ±4 | | | ±4 | | |
| | 60 | | | | | | | | | |
| | 80 | | | | | | | | | |
| | 100 | | | | | | | | | |
| | 110 | | | | | | | | | |
| | 120 | | | | | | | | | |

| Data carriers Model | | RF30-TGH-MR50 | | | RF30-TGH-ER50 | | | RF30-TGH-ER50/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 21 | 0 - 36 | 0 - 31 | 0 - 60 | | | 0 - 56 | | |
| Offset in mm at distance | 0 | ±21 | ±34 | ±17 | ±50 | | | ±47 | | |
| | 10 | ±16 | ±17 | ±19 | ±50 | | | ±46 | | |
|   Installation note for data carriers | 21 | ±2 | ±16 | ±16 | ±26 | | | ±26 | | |
| | 31 | | ±12 | ±3 | ±28 | | | ±28 | | |
| | 36 | | ±3 | | ±29 | | | ±26 | | |
| | 50 | | | | ±24 | | | ±19 | | |
| | 56 | | | | ±18 | | | ±7 | | |
| | 60 | | | | ±7 | | | | | |
| | 100 | | | | | | | | | |
| | 110 | | | | | | | | | |
| | 120 | | | | | | | | | |

### 2.3.4 RF30-WR-M30H/LK & RF30-WR-M30H

| Data carriers Model | | RF30-TGH-MR30 | | | RF30-TGH-ER30 | | | RF30-TGH-ER30/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 30 | 0 - 37 | 0 - 38 | 0 - 65 | | | 0 - 62 | | |
| Offset in m at distance | 0 | ±31 | ±27 | ±27 | ±55 | | | ±56 | | |
| | 10 | ±21 | ±15 | ±15 | ±25 | | | ±19 | | |
|  | 20 | ±19 | ±16 | ±16 | ±30 | | | ±24 | | |
| | 30 | ±3 | ±13 | ±13 | ±35 | | | ±26 | | |
| | 38 | | ±3 | ±2 | ±35 | | | ±26 | | |
| | 50 | | | | ±30 | | | ±22 | | |
| | 60 | | | | ±16 | | | ±8 | | |
| | 62 | | | | ±12 | | | ±2 | | |
| | 65 | | | | ±3 | | | | | |
| | 110 | | | | | | | | | |
| | 120 | | | | | | | | | |


Installation note for data carriers

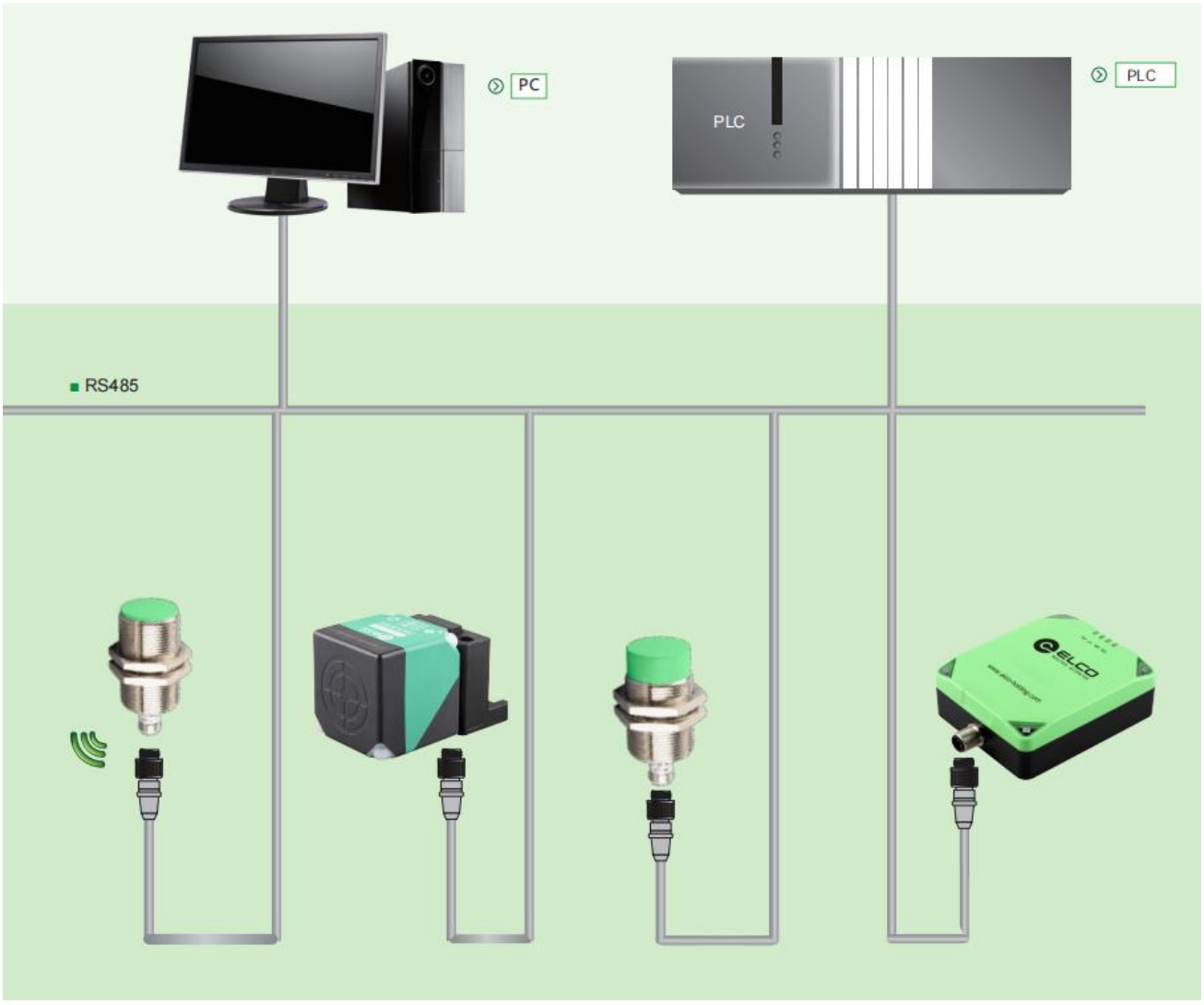
| Data carriers Model | | RF30-TGH-MR50 | | | RF30-TGH-ER50 | | | RF30-TGH-ER50/16K | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Data carriers distance to metal in mm (a) | | >50 | >0 | >0 | >50 | >0 | >0 | >50 | >0 | >0 |
| Data carriers clear zone in mm (b) | | >200 | >200 | >0 | >200 | >200 | >0 | >200 | >200 | >0 |
| Read-write distance | | 0 - 36 | 0 - 51 | 0 -38 | 0 - 86 | | | 0 - 79 | | |
| Offset in mm at distance | 0 | ±29 | ±41 | ±19 | ±74 | | | ±64 | | |
| | 10 | ±26 | ±49 | ±20 | ±71 | | | ±61 | | |
|  | 20 | ±24 | ±24 | ±18 | ±33 | | | ±29 | | |
| | 30 | ±21 | ±24 | ±14 | ±40 | | | ±33 | | |
| | 36 | ±10 | ±22 | ±1 | ±44 | | | ±35 | | |
| | 38 | | ±6 | | ±43 | | | ±35 | | |
| | 50 | | | | ±43 | | | ±35 | | |
| | 60 | | | | ±41 | | | ±30 | | |
| | 70 | | | | ±36 | | | ±25 | | |
| | 79 | | | | ±30 | | | ±4 | | |
| | 86 | | | | ±10 | | | | | |


Installation note for data carriers

## 2.4 LED Indication

| | | |
|---|---|---|
| RF30-WR-C40H<br>RF30-WR-Q95H | PW | Power Indicator Light |
| | LK | Message Communication Indicator |
| | TAG | Tag Detection Position Indicator Light |
| | RW | Read/Write Command Indicator Light |
| RF30-WR-M30H<br>RF30-WR-MF30H | GREEN | Normal Power Supply |
| | YELLOW | Tag Detected in Position |
| | GREEN FLICKERING | Message Communication Active |

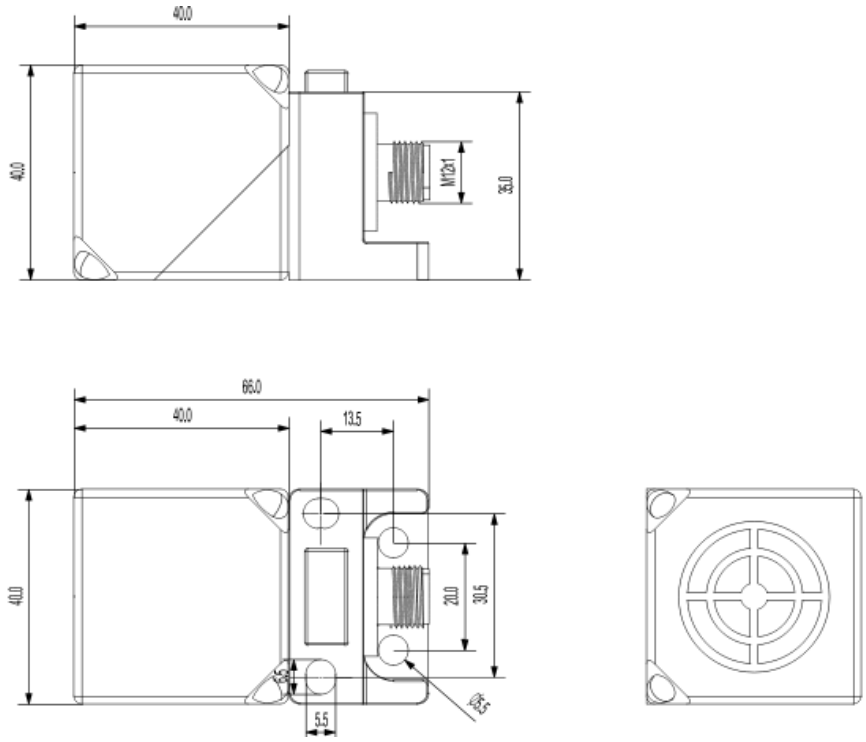
## 2.5 Conventional System Layout Diagram



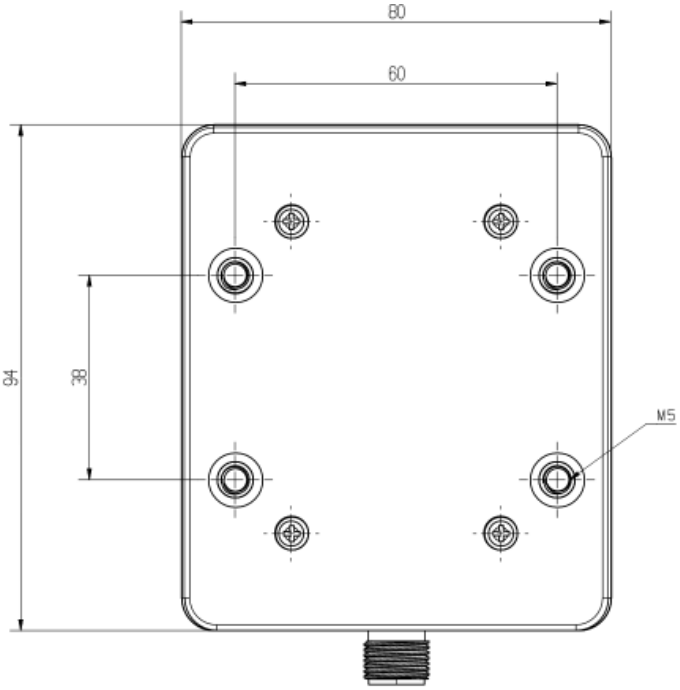
# 3. Installation and Wiring

## 3.1 Installation Dimension Drawing

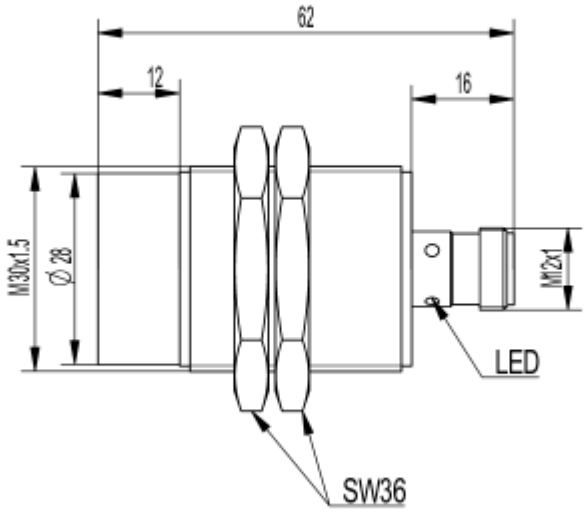
### 3.3.1 RF30-WR-C40H Dimension Drawing



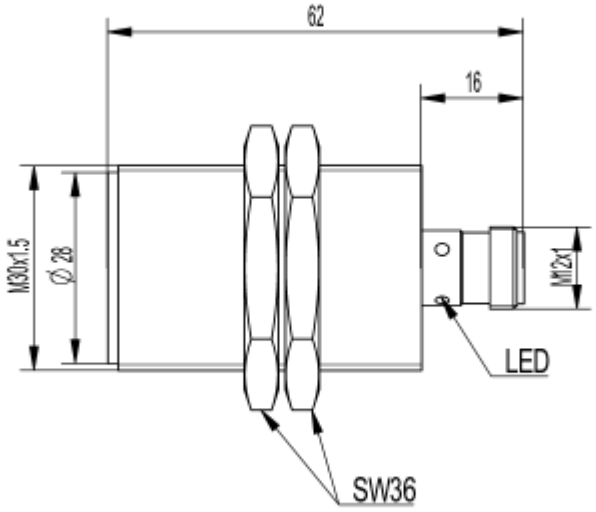

### 3.3.2 RF30-WR-Q95H Dimension Drawing



### 3.3.3 RF30-WR-M30H Dimension Drawing




### 3.3.4 RF30-WR-MF30H Dimension Drawing

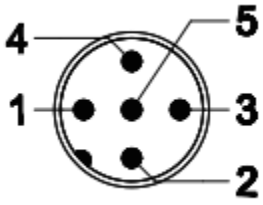


## 3.2 RFID Wiring Guide

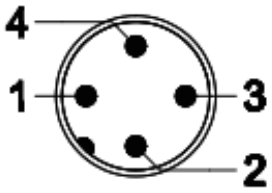
Please perform connection operations in accordance with basic electrical specifications. For the safety of personnel and equipment, we recommend disconnecting the power supply before conducting wiring operations.

All RS-485 protocol RFID devices are connected via standard 5-pin M12 or 4-pin M12 connectors.

1） Interface Connector View(M12,Male)




M12,5-PIN,Male




M12,4-PIN,Male

2） Interface Connector View(M12,Male)

| InterfacePortNumber | 5-PIN | 4-PIN |
|---|---|---|
| 1 | Power Supply 24V+ | Power Supply 24V+ |
| 2 | A (RS-485) | A (RS-485) |
| 3 | Power Supply GND | Power Supply GND |
| 4 | B (RS-485) | B (RS-485) |
| 5 | PE | - |

# 4.Communication Protocol

## 4.1 Protocol format

Message transmission is asynchronous, using hexadecimal for communication and message frame format:

| Address code | Function code | Data zone | Crc |
|---|---|---|---|
| 1 byte | 1 byte | N bytes | 2 bytes |

### 4.1.1 Address code

Address code is the first byte of each communication information frame, generally support 1 to 247, some devices also support 0 address, used to receive the host's broadcast data, each slave in the bus address must be unique, only with the host to send the address code match the slave can respond to return data.

### 4.1.2 Function code

The function code is the second byte of each communication message frame.The host sends, by means of the function code, to inform the slave device what action should be performed.

| Function code | Define | Operation |
|---|---|---|
| 0x01 | Read Coil Status | Used to read the current status of one or more coils |
| 0x05 | Write Single Coil | Used to set the status of individual coils |
| 0x0F | Write Multiple Coils | Used to set the state of a group of coils |
| 0x02 | Read Discrete Inputs | Used to read the state of one or more discrete inputs |
| 0x04 | Read Input Registers | Used to read the contents of one or more input registers |
| 0x03 | Read Holding Registers | Used to read the contents of one or more holding registers |
| 0x06 | Write Single Register | Used to write to a single holding register |
| 0x10 | Write Multiple Registers | Used to write the value of a set of holding registers |

### 4.1.3 Data zone

The data area varies according to the function code and the direction of the data, which can be different combinations of “register first address + number of read registers”, “register address + operation data”, “register first address + operation registers Number of registers + data length + data” and other combinations.

### 4.1.4 Modbus CRC

The Modbus RTU protocol is commonly used inindustrial siteswhere the stability and correctness of data transmission is highly required, and the correctness and integrity of data transmission is ensured by CRC checksums.

## 4.2 Error Feedback

Address and CRC checksum errors do not receive data feedback from the slave, other errors will return an error code to the host.The second bit of the data frame plus 0X80 indicates that an error occurred in the request (illegal function code, illegal data value, etc.) The error data frame is as follows:

| Address code | Function code | Error code | Crc |
|---|---|---|---|
| 1 byte | 1 byte | 1 byte | 2 bytes |

Common error codes are as follows：

| Error code | Clarification |
|---|---|
| 0x01 | Function codes are not supported |
| 0x02 | Accessing registers not supported by the device |
| 0x03 | Write unsupported parameter values |
| 0x04 | Write unsupported parameter values |

When a communication command is sent from the host to a slave, the slave that matches the address code sent by the host receives the communication command, performs the corresponding operation if the CRC check is correct, and then returns the result of the execution (data) to the host.The return message contains the address code, function code, data after execution, and CRC check code.If the address does not match or the CRC check is wrong, no information is returned.

## 4.3 Function Code Analysis

### 4.3.1 Function code 03H： Read Holding Register

For example, if the master wants to read the data of 2 holding registers with slave address 01H and start register address 05H, the master sends:

| Host sends | | Send data（HEX） |
|---|---|---|
| Address code | | 01 |
| Function code | | 03 |
| Start Register Address | high byte | 00 |
| | low byte | 05 |
| Number of registers | high byte | 00 |
| | low byte | 02 |
| CRC | high byte | D4 |
| | low byte | 0A |

If the slave holds the data in registers 05H and 06H as 1122H and 3344H, the slave returns:

| Slave Return | | Send data（HEX） |
|---|---|---|
| Address code | | 01 |
| Function code | | 03 |
| Number of bytes | | 04 |
| Register 05H Data | high byte | 11 |
| | low byte | 22 |
| Register 06H Data | high byte | 33 |
| | low byte | 44 |
| CRC | high byte | 4B |
| | low byte | C6 |

4.3.2 Function code 10H: write multiple holding registers

For example, the host wants to save the data 0005H and 2233H into 2 registers with slave address 01H and start register address 0020H, and the host sends them:

| Host sends | | Send data（HEX） |
|---|---|---|
| Address code | | 01 |
| Function code | | 10 |
| Start Register Address | high byte | 00 |
| | low byte | 20 |
| Number of registers | high byte | 00 |
| | low byte | 02 |
| Number of bytes written | | 04 |
| 0020H register to be written | high byte | 00 |
| | low byte | 05 |
| 0021H register to be written | high byte | 22 |
| | low byte | 33 |
| CRC | CRC16 hi | B9 |
| | CRC16 lo | 03 |

Function code 10H operates and the slave returns:

| Slave Return | | Send data（HEX） |
|---|---|---|
| Address code | | 01 |
| Function code | | 10 |
| Start Register Address | high byte | 00 |
| | low byte | 20 |
| Number of registers | high byte | 00 |
| | low byte | 02 |
| CRC | high byte | 40 |
| | low byte | 02 |

## 4.4 Read and write Tag instruction example

### 4.4.1 Read Tag UID

Unique identifier, typically 8bytes

Send：01 03 00 1C 00 04 85 CF*(greenfont is the starting register address,bluefont is the number of registers)*

Receive：01 03 08 E0 04 01 50 AC E3 47 5C FC ED*(Tag UID in red)*

### 4.4.2 Read tag data area Block0

Generally tag 1 Block is 4 bytes, so 2 registers are needed for data

Send：01 03 00 20 00 02 C5 C1*(greenfont is the starting register address,bluefont is the number of registers)*

Receive：01 03 04 12 64 56 45 40 C7*(Data for Tag Block0 in red)*

### 4.4.3 Write tag data area Block0

Send：01 10 00 20 00 02 04 01 02 03 04 50 B8*(greentext is the starting register address,bluetext is the number of registers, and red text is the data to be written)*

Receive：01 10 00 20 00 02 40 02*(greenfont is the starting register address,bluefont is the number of registers)*

### 4.4.4 Read tag data area Block0-Block1

Send：01 03 00 20 00 04 45 C3*(greenfont is the starting register address,bluefont is the number of registers)*

Receive：01 03 08 01 02 03 04 00 00 00 00 86 28*(Red font shows data for label Block0, orange font shows data for Tag Block1)*

### 4.4.5 Write tag data area Block0-Block1

Send：01 10 00 20 00 04 08 11 22 33 44 55 66 77 88 D6 8E*(greentext is the starting register address,bluetext is the number of registers, and red text is the data to be written)*

Receive：01 10 00 20 00 04 C0 00*(greenfont is the starting register address,bluefont is the number of registers)*

### 4.4.6 Read tag data area Block1-Block2

Send：01 03 00 22 00 04 E4 03*(Greenfont is the starting register address,Bluefont is the number of registers)*

Receive：01 03 08 55 66 77 88 00 00 00 00 BC 4A*(Red font shows data for label Block0, orange font shows data for Tag Block1)*

### 4.4.7 Write tag data area Block1-Block2

Send：01 10 00 22 00 04 08 12 34 56 78 AA BB CC DD 53 8C*(greentext is the starting register address,bluetext is the number of registers, and red text is the data to be written)*

Receive：01 10 00 22 00 04 61 C0*(greenfont is the starting register address,bluefont is the number of registers)*

### 4.4.8 Read tag one register

Minimum operation tag unit is 1 register

Send：01 03 00 20 00 01 85 C0*(greenfont is the starting register address,bluefont is the number of registers)*

Receive：01 03 02 11 22 34 0D*(Red text shows one byte of data for Tag Block0)*

### 4.4.9 Write tag one register

Send：01 10 00 20 00 01 02 01 03 E0 A1*(greentext is the starting register address,bluetext is the number of registers, and red text is the data to be written)*

Receive：01 10 00 20 00 01 00 03*(greenfont is the starting register address,bluefont is the number of registers)*

## 4.5 Modify Read/Write Header Parameter Commands

Send：01 10 00 00 00 05 0A 01 04 01 00 05 00 00 20 00 04 A3 6D

| | |
|---|---|
| 01 | Current device address (default 01) |
| 10 | Write Register Instructions |
| 00 00 | Register Starting Address |
| 00 05 | Register Length |
| 0A | data length |
| 01 | device address to be changed |
| 04 | baud（00:9600;01:19200;02:38400;03:57600;04:115200） |
| 01 | Auto read UID function, 00 off, 01 on |
| 00 | Automatic data reading, 00 off, 01 on |
| 05 | Automatic reading period, *5ms (05 represents a period of 5*5=25ms) |
| 00 | reserve |
| 00 20 | Register start address for automatic data reading |
| 00 04 | Automatically reads the register length of the data |
| A3 6D | CRC |

# 5 Configuration Tool

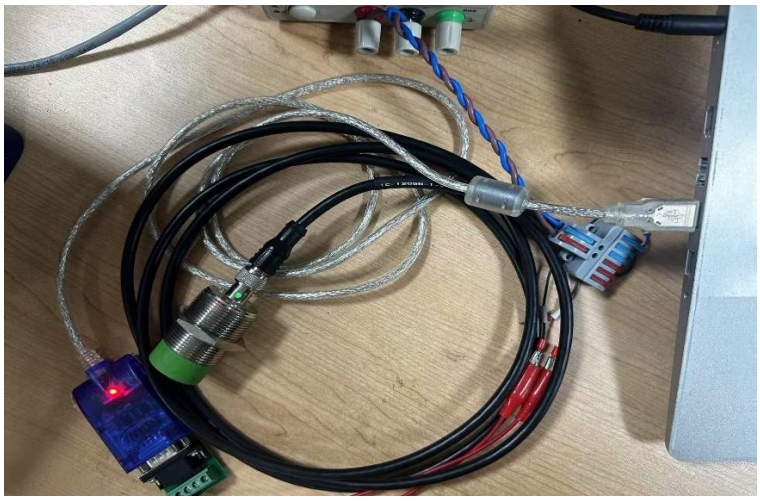
The ELCO RF30 series RS-485 protocol RFID products can modify register parameters not only via Modbus RTU message commands, but also through the configuration tool. The following content demonstrates the operation of the configuration tool with illustrations and instructions.

Tools to be prepared in advance:

- A debugging PC
- Install the RFID-TOOL software (download Software_RFID_RS485_V1.0_CN from the official website)
- USB to RS-485 serial cable (with relevant drivers installed)
- 24 V power supply
- RFID connection cable (single-ended pre-molded M12 A-Code)

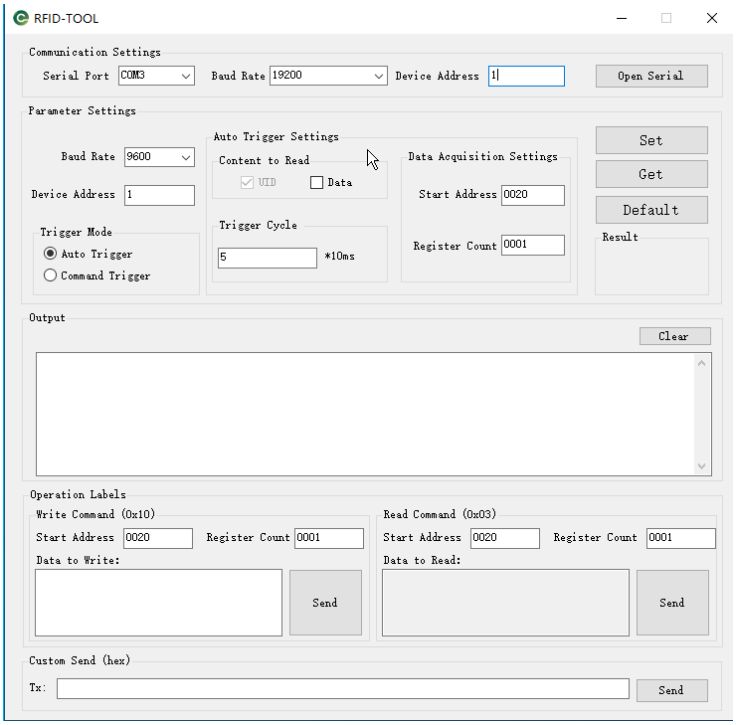
## 5.1 Serial Cable Connection

The serial cable shall be connected to a 24V switching power supply for power supply, and the other two communication wires need to be connected to the corresponding A and B terminals of the serial port.



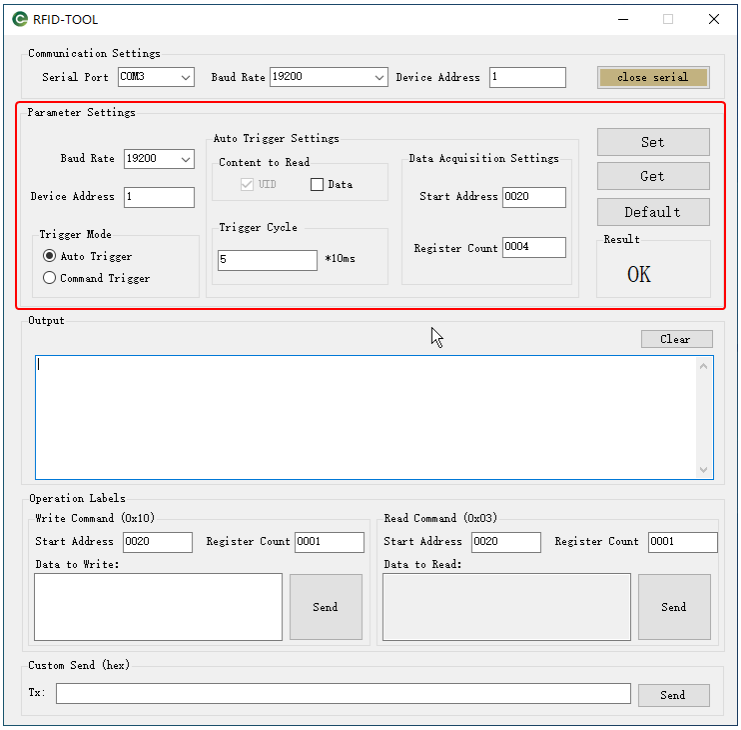
## 5.2 Configure and Debug Tool Parameters

Select the corresponding serial port number, baud rate and address in the debugging tool, then click Open Serial Port. (Factory default: baud rate 19200, address 1)




## 5.3 Modify Parameter Items

Configure the corresponding parameter items in the Parameter Settings section and click Set Parameters. (A restart is required for the settings to take effect after successful configuration.)



## 5.4 Read and Write Message Test

The configuration tool is capable of testing the read and write functions. You can select quick write and read in the Tag Operation section, or customize and send message commands. All received results will be displayed in the upper window.