RoHS PC ABS +50° 0°

MATERIALE
Policarbonato rinforzato con ABS, autoestinguente.

ESECUZIONI STANDARD
- **UC-RF ETHERNET/IP**: unità di controllo con interfaccia Ethernet/IP.
- **UC-RF PROFINET IO**: unità di controllo con interfaccia Profinet IO.
- **UC-RF MODBUS TCP**: unità di controllo con interfaccia Modbus TCP.

Ogni unità di controllo UC-RF può controllare fino a 36 indicatori di posizione DD52R-E-RF (vedi pag. -).
Compatibile per il montaggio su DIN RAIL. Sono presenti due LED di segnalazione (verde e rosso) per una corretta diagnostica.

CARATTERISTICHE E APPLICAZIONI
L'unità di controllo UC-RF, collegata direttamente al PLC, riceve le posizioni target e le invia agli indicatori di posizione elettronici DD52R-E-RF, ricevendo dagli indicatori la loro posizione reale (Fig.1).
Questo sistema è particolarmente adatto ad applicazioni che richiedono frequenti cambi di formato, facilitando la corretta regolazione della posizione target/reale degli organi di macchina, rappresentando anche un sistema di sicurezza.
Infatti, se anche un solo indicatore DD52R-E-RF non dovesse essere nella posizione target, il PLC non consentirebbe l'avvio del ciclo produttivo della macchina, evitando così di iniziare produzioni errate.

ESECUZIONI SPECIALI A RICHIESTA
Unità di controllo con interfaccia seriale Profibus, RS485 o RS232.
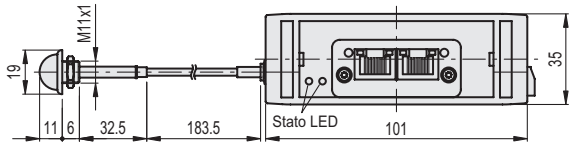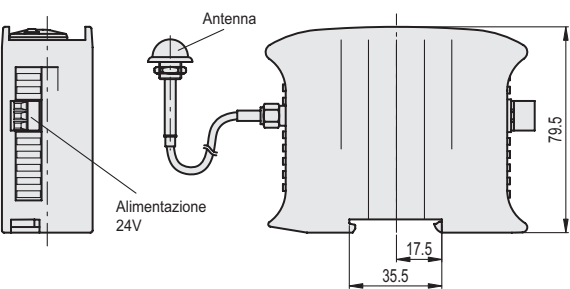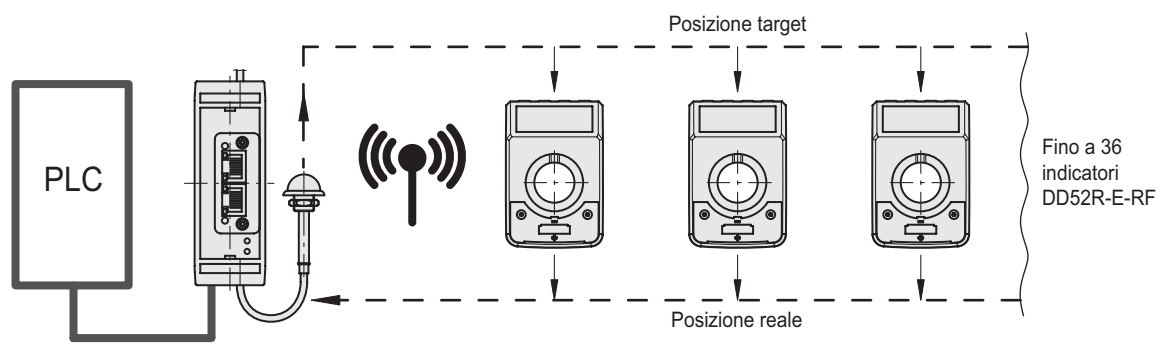
ACCESSORI A RICHIESTA
FC-UC: prolunghe per antenna con connettore SMA.

ELESA Original design

EtherNet/IP   PROFINET®   Modbus

Fig.1

Posizione target

Fino a 36 indicatori DD52R-E-RF

PLC

Posizione reale

Antenna

Alimentazione 24V

79.5

17.5

35.5

M11x1

19

35

11 6   32.5   183.5   Stato LED   101

Codice	Descrizione	⚖
CE.99225	UC-RF ETHERNET/IP	50
CE.99231	UC-RF PROFINET IO	50
CE.99229	UC-RF MODBUS TCP	50

OPERATING INSTRUCTIONS

CONTROL UNIT FOR

DD51-E-RF
DD52R-E-RF
MPI-R10-RF

UC-RF
(GN 9150)

*(Product series valid only for Germany)

Contents

1. Safety Instructions

The product has been designed and manufactured in accordance with the current regulations.
The product leaves the factory ready for use and complies with the safety standards.
To maintain the product in this state, it is necessary that it is assembled and used properly, in the closest compliance with this instruction manual and with the following specific safety precautions.
Before installing and using the UC-RF read carefully this manual.
This manual is intended as an indispensable supplement to the existing documentation (catalogues, data sheets and assembly instructions).
In addition to this instruction manual, all the rules of law must be observed, in regard to accident prevention and environmental protection.

> The use without complying with the descriptions/specific para , in combination with systems/machines/processes to be controlled, can lead to a malfunction of the product, causing:
> • health hazards,
> • environmental hazards,
> • damage to the product and its proper functionality

The device must not be used:
- in explosion hazard areas;
- in medical/life support areas and equipment.
Do not open the equipment and do not tamper with it! Any tampering might have a negative impact on reliability of the device and might be dangerous. Do not attempt any repair. Return any defective equipment to the manufacturer! Any violation of the integrity of the device as delivered will cause the warranty loss.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Setup/Commissioning

In case of any malfunction (even in case of change in operating conditions), the device must be switched off immediately. Switch off power supply during any installation work at the equipment. Installation and commissioning are allowed by trained and authorised staff only. After correct setup and commissioning, the device is ready for operation.

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Maintenance/repair

Switch off the power supply of the equipment before any action. Maintenance should be performed by trained and authorised staff only.
Do not open or modify the case of the indicator. Tampering with this product may endanger the correctness and accuracy of its operation.
In case of malfunction, do not attempt any repair to the units and contact Elesa sales office.

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.

2. Description

The control unit allows the communication between the RF electronic position indicators and measuring system to a PLC.

Connected to an UC-RF, the PLC can read the current position of each indicator and transmit a target position to all devices. This allows the PLC and consequently the operator to know the exact situation and position of the command shaft and/or of the components of the machine.

The control unit (UC-RF) is a standard DIN rail module. This unit is provided with a socket for connection to a power source, a standard industrial bus interface connector for the communication with the PLC and an antenna output for the RF communication with the RF electronic position indicator and measuring system (to be ordered separately).

2.1. Compatible devices

The UC-RF allows RF communication with the following Elesa products:

DD51-E-RF
DD52R-E-RF
MPI-R10-RF

2.2. Avaliable bus interfaces to the PLC

The standard interfaces available for the UC-RF are:

Ethernet/IP
Profinet
Modbus/TCP

Other interfaces (Profibus, Canbus, RS 232, RS 485 etc.) can be evaluated on request.

2.3. RF communication

The data exchange uses ISM SRD range of 2.400-2.480GHz.
The communication between the remote devices and the UC-RF follows a proprietary ELESA protocol.

2.3.1. Security

Since the communication between the indicators and the UC-RF follows a proprietary ELESA protocol and the control unit cannot process anything different from the expected data, it is not possible to have direct access to the PLC via the UC-RF. For this reason, the radiofrequency connection is protected against system alteration or industrial espionage.

WARNING

The presence of interferences (various WI-FIs, BLUETOOTHs, etc.) will not affect the correct functioning of the system but could increase the scan time due to discarded transmission packet.
*Placing the UC-RF close to power elements (contactors, inverters, motors, etc.) should be avoided or, if impossible, a minimum safety distance and/or shielding must be provided.*

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3. Connection and mounting

The UC-RF can be mounted on a DIN Rail thanks to a snap on connector on the rear of the device.

3.1. Power supply

The UC-RF control unit must be connected to a 24VDC +/-5% power supply with minimum current capacity of 60mA. Even if the UC-RF power supply input is protected from the polarity inversion it's mandatory to pay attention to the polarities as printed near the power supply input on the plastic box
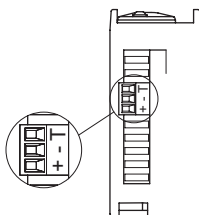

of the UC-RF; see the drawing below.

WARNING: The power supply line of the UC-RF has to be protected by a 100mA F type fuse.

The plug for the power supply connector is supplied with the UC-RF.

3.2. Connection to the PLC

The UC-RF must be connected to the PLC via an Ethernet RJ45 cable by using one of the two ports on the front of it (see drawing below). Both ports are equivalent. In case two PLCs (or PLC+PC) are connected, make sure that conflicts are avoided. For further specifications, refer to the specific communication bus requirements.
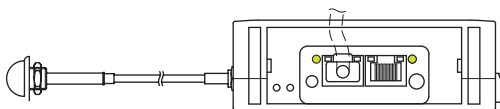
3.3. Antenna

The antenna is supplied with the control unit. The antenna is suitable for mounting in applications where the counterpoise will not be shielded from the antenna. The antenna must not be mounted inside a metal cabinet; non-conductive or open metal enclosures or fixings must be used.

If the counterpoise is within a shielded enclosure it will affect the antenna performance.

The antenna must be placed in the middle of the area where the remote devices are mounted. Ideally where it is possible to avoid any metallic shielding in between. If necessary, extension cables can be used. RG 174/U coaxial cable (fitted with SMA male/female connectors) must be used, see on the Elesa catalogue the available connection cables.

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However, the best solution is to keep the antenna directly connected to the UC-RF and install it where it's more convenient, following the hints above.

WARNING

The range of the radio link is up to 30m in line of sight. However, in industrial environments the real range depends on many factors - presence of walls, machine parts, metal obstacles, etc.
An accurate choice of antenna position avoids communication issues.

4. System configuration

The Elesa wireless network consists in up to 100 sub networks identified by a NetId number from 0 to 99. Each subnet can address up to 36 remote devices, each transmitting on a different channel (Net CH).

The purpose of the subnets is to allow different machines to work near to each other with the same device configuration (as the communication channel) without interference.

Even though it is possible to switch a UC-RF to work on different subnets (different NetID), it is strongly recommended to dedicate one UC-RF for each subnet.

Before starting the UC-RF, please fix the parameter of the desired network by choosing NetId and Net_CH for each remote device. Refer to the remote device user manual for their configuration and setting.

WARNINGS

▶ NetID 3 must be avoided because it is reserved for special uses
▶ Pay attention to the following compatibility notes:

Remote device sw release	UC-RF Sw release	0F3EXXXX - 0F3AXXXX			0F051120 (from 12/2020)
		PROFINET	**ETH/IP**	**MODBUS**	**ALL BUSES**
F3.X_XX - F4.0_00 (before 06/2020) or earlier		UC-RF and the remote devices communicate on the same channels. CH1 on UC-RF => CH1 on remote device. CH2 on UC-RF => CH2 on remote device.			UC-RF communication channels are shifted 3 positions ahead with respect to the channels used by the remote devices. CH1 to CH3 on remote device: NOT usable. CH1 on UC-RF => CH4 on remote device. CH2 on UC-RF => CH5 on remote device. CH33 to CH36 on UC-RF: NOT usable.

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Remote device sw release	UC-RF Sw release	0F3EXXXX - 0F3AXXXX			0F051120 (from 12/2020)
		PROFINET	**ETH/IP**	**MODBUS**	**ALL BUSES**
F5.2 (from 06/2020) **F5.3** (from 06/2020 only for MPI-R10)		NOT COMPATIBLE		The same as for devices with sw release F5.4	UC-RF and the remote devices communicate on the same channels. CH1 on UC-RF => CH1 on remote device. CH2 on UC-RF => CH2 on remote device.
F5.4 (from 12/2020)		Remote device communication channels are shifted 3 positions ahead with respect to the channels used by the UC-RF. CH1 to CH3 on UC-RF Not usable. CH4 on UC-RF => CH1 on remote device. CH5 on UC-RF => Ch2 on remote device. CH33 to CH36 on remote device NOT usable.			

▶ In systems using UC-RF with software release 0F 3E 10 18, avoid channels lower than CH 04.

▶ The UC-RF will not start the network scan until it receives a valid networkID from the PLC after power-on.

▶ The parameter config code can be left =1; the UC-RF will check continuously the networkID coming from the PLC and will change it immediately.

▶ UC-RF uses little endian number format. The quote/target is signed four bytes number presenting always 0.01 mm counts.

Ex. 64 00 00 00 == 1.00 mm

     1.00 mm = 100 · 0.01 mm

     100 → 00 00 00 64 → 64

               Hex   little 00

                   Endian 00

                       00

4.1. IP address

MODBUS/TCP, Profinet and Ethernet/IP protocol identify the interfaces with an IP address.
The UC-RF is factory set with the following parameters:

    IP: 192-168.1.10 static

    SN Mask: 255.255.255.0

A different IP/subnet can be assigned by the PLC, or using IPConfig utility downloadable from:

https://www.anybus.com/support/file-doc-downloads/compactcom-30-series-specific/?ordercode=AB6224

It is possible to enalble the DHCP function too.

5. UC-RF status LEDs

If the connection to a channel is successful, the GREEN LED flashes.

If the connection is lost/transmission packet discarded, the RED LED flashes.

During normal operation, occasional RED LED flash can be observed. This is not an indication of failure.

If the control unit does not establish a connection to a channel after several consecutive connection attempts, it will set the "off-air" flag for that channel.

In power, on the RED and GREEN LEDs flash for a few seconds. If the RED LED and the GREEN LED keep flashing alternatively, please check the connection to the PLC and/or the IP address configuration.

If RED LED and GREEN LED stay ON, the UC-RF is waiting for the NEtId to be set. If RED LED stays ON, please, contact Elesa customer service.

GREEN LED —   — RED LED
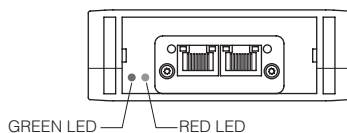
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6. BUS VARIANTS

6.1. ETHERNET/IP (CE.99225)

The module uses Class 1 (explicit) messaging.
For configuration the EDS file is available at the following link:
https://www.anybus.com/support/file-doc-downloads/compactcom-30-series-specific/?ordercode=AB6224
If the link is not reachable, please contact the Elesa customer service.
The EDS allows the PLC to recognize the UC-RF on the Ethernet/IP bus. Then it is needed to configure all the I/O instances as described below (refer to Appendix A for status and command word definition).

Input assembly UC-RF → PLC

Instance 0x64h (100 DEC), 224 bytes transfer as follows:
• offset 0x00 - channel 1 - 4 bytes actual quote, followed by 2 bytes status word
• offset 0x06 - channel 2 - 4 bytes actual quote, followed by 2 bytes status word
• ...
• offset 0xD2 - channel 36 - 4 bytes actual quote, followed by 2 bytes status word
• offset 0xD8 - current network ID
• offset 0xD9 - UC-RF status
    • =0 - UC-RF waiting for networkID
    • =1 - networkID initialized, scanning enabled channels in progress
    • =2 to 255 reserved
• offset 0xDA - reserved
• offset 0xDB - reserved
• offset 0xDC - 4 bytes software release

Output assembly PLC → UC-RF

Instance 0x96 (150 DEC), 224 bytes transfer as follows:
• offset 0x00 - channel 1 - 4 bytes target, followed by 2 bytes command word
• offset 0x06 - channel 2 - 4 bytes target, followed by 2 bytes command word
• ...
• offset 0xD2 - channel 36 - 4 bytes target, followed by 2 bytes command word
• offset 0xD8 - config byte
• offset 0xD9 - config byte content
    • 0x00 - invalid config byte
    • 0x01 - config byte contains network ID
    • 0x02 to 0xFF reserved
• offset 0xDA - reserved
• offset 0xDB - reserved
• offset 0xDC - reserved
• offset 0xDD - reserved
• offset 0xDE - reserved
• offset 0xDF – reserved

Status LEDs

Network Status LED

LED State	Description
Off	No power or no IP address
Green	Online, one or more connections established (CIP Class 1 or 3)
Green, flashing	Online, no connection established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

Module Status LED

LED State	Description
Off	No power
Green	Controlled by Scanner in Run state
Green, flashing	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Red, flashing	Recoverable fault(s)

Ambient conditions

LED State	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

6.2. ProfiNET (CE.99231)

The GSD file is available at the following link:

https://www.anybus.com/support/file-doc-downloads/compactcom-30-series-specific/?ordercode=AB6221

If the link is not reachable, please contact the Elesa customer service.

The GSD file allow the PLC to recognize the UC-RF on the Profinet bus. Then it is needed to configure 56 8bits long slots as follows:

- Slot 0 to Slot 27 - output (PLC to UC)
- Slot 28 to Slot 55 - input (UC to PLC)

Each data block length is 224 bytes.

Input assembly UC-RF → PLC

• offset 0x00 - channel 1 - 4 bytes actual quote, followed by 2 bytes status word
• offset 0x06 - channel 2 - 4 bytes actual quote, followed by 2 bytes status word
• ...
• offset 0xD2 - channel 36 - 4 bytes actual quote, followed by 2 bytes status word
• offset 0xD9 - UC-RF status
    =0 - UC-RF waiting for networkID
    =1 - networkID initialized, scanning enabled channels in progress
    =2 to 255 reserved
• offset 0xDA - reserved
• offset 0xDB - reserved
• offset 0xDC - 4 bytes software release

Output assembly PLC → UC-RF

• offset 0x00 - channel 1 - 4 bytes target, followed by 2 bytes command word
• offset 0x06 - channel 2 - 4 bytes target, followed by 2 bytes command word
• ...
• offset 0xD2 - channel 36 - 4 bytes target, followed by 2 bytes command word
• offset 0xD8 - config byte
• offset 0xD9 - config byte content
    • 0x00 - invalid config byte
    • 0x01 - config byte contains network ID
    • 0x02 to 0xFF reserved
• offset 0xDA - reserved
• offset 0xDB - reserved
• offset 0xDC - reserved
• offset 0xDD - reserved
• offset 0xDE - reserved
• offset 0xDF - reserved

Status LEDs

Network Status LED		
LED State	*Description*	*Comments*
Off	Offline	- No power - No connection with IO Controller
Green	Online (RUN)	- Connection with IO Controller established - IO Controller in RUN state
Green, 1 flash	Online (STOP)	- Connection with IO Controller established - IO Controller in STOP state or IO data bad - IRT synchronization not finished
Green, blinking	Blink	Used by engineering tools to identify the node on the network
Red	Fatal event	Major internal error (this indication is combined with a red module status LED)
Red, 1 flash	Station Name error	Station Name not set
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Configuration error	Expected identification differs from Real Identification

Module Status LED		
LED State	*Description*	*Comments*
Off	Not Inizialized	No power OR Module in SETUP or NW_INIT state.
Green	Normal Operation	Module has shifted from the NW_INIT state.
Green, 1 flash	Diagnostic Event(s)	Diagnostic event(s) present
Red	Exception error	Device in state EXCEPTION
	Fatal event	Major internal error (this indication is combined with a red network status LED)
Alternating Red/Green	Firmware update	Do NOT power off the module. During this phase turning the module off could cause permanent damage.

LINK/Activity LED		
LED State	*Description*	*Comments*
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

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6.3. MODBUS/TCP (CE.99229)

The memory of the UC-RF is organised as follows (refer to Appendix A for command and status word). Each location is 2 Bytes (16bits) long. Use function code 3 (Read/write multiple registers).

READ/WRITE - updated by the PLC

• 0x00, 0x01 - channel 1 - 4 bytes target
• 0x02, 0x03 - channel 2 - 4 bytes target
• ...
• 0x46, 0x47 - channel 36 - 4 bytes target
• 0x48 - channel 1 – command
• 0x49 – channel 2 - command
• ...
• 0x6B - channel 36 - command
• 0x6C - configuration
    • LSB - config byte
    • MSB - config byte content
            • 0 - config byte not valid
            • 1 - config byte contains network ID
            • 0x02 to 0xFF reserved
• 0x6D - reserved
• 0x6E - reserved
• 0x6F - reserved

READ only - updated by the UC-RF

• 0x100, 0x101 - channel 1 - 4 bytes position
• 0x102, 0x103 - channel 2 - 4 bytes position
• ...
• 0x146, 0x147 - channel 36 - 4 bytes position
• 0x148 - channel 1 status word
• 0x149 - channel2 status word
• ...
• 0x16B - channel 36 status word
• 0x16C – Configuration status
    • LSB - current network ID
    • MSB - reserved
• 0x16D – reserved
• 0x16E-0x16F - 4 bytes software release

Status LEDs

Network Status LED	
LED State	*Description*
Off	No power or no IP address
Green	Module is in Process Active or Idle state
Green, flashing	Waiting for connection
Red	Duplicate IP address, or FATAL error
Red, flashing	Process Active Timeout

Module Status LED	
LED State	*Description*
Off	No power
Green	Normal operation
Red	Major fault; module is in state EXCEPTION (or FATAL event)
Red, flashing	Minor fault in diagnostic object IP conflict

LINK/ACTIVITY LEDS	
LED State	*Description*
Off	No link, no activity
Green	Link established, 100 Mbit/s
Green, flickering	Activity, 100 Mbit/s
Yellow	Link established, 10 Mbit/s
Yellow, flickering	Activity, 10 Mbit/s

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Appendix A – Status and command word

Status word:

bit0-bit5   - reserved.

bit6-bit9   - units. These bits indicate the actual unit of measurement of the channel. Source – remote device.

0000 - 0.01mm	0101 - 0.1 inch
0001 - 0.1mm	0110 - 1 inch
0010 - 1mm	0111 - 0.01 deg
0011 - 0.001 inch	1000 - 0.1 deg
0100 - 0.01 inch	1001 - 1 deg

bit10   - speed error: indicates rotation speed larger than programmed. The error is displayed on the remote device. Source – remote device.

bit11   - in position: set when the target is reached within the programmed tolerance. Cleared, when the target is outside the programmed tolerance. Source - DD52R-E-RF.

bit12   - positioning: set when the target is outside the programmed tolerance. Cleared, when the target is reached within the programmed tolerance.

bit13   - reserved.

bit14   - battery low: set when the battery voltage is low. Source - DD52R-E-RF.

bit15   - channel off-air: If set, this bit indicates that the connection with the corresponding channel has been lost. Possible reasons:
- DD52R-E-RF is off
- channel disabled
- Net_id not set correctly
- excessive distance to UC-RF

Source - UC-RF.

Command word:

bit0   - enable channel. Set to enable the corresponding channel. Clear to disable. When disabled, the UC-RF will ignore it.
In case a quick connection with a single channel is needed, it is recommended to disable momentarily the other channels - then the UC-RF will communicate only with the channel enabled.

bit1-bit14   - reserved

bit15   - Set to indicate the target field contains a valid target. If cleared, no target will be transmitted to the remote device. Once a valid target is set, this bit can be left on and the target is transmitted continuously to the remote device.
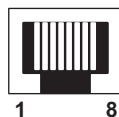
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Appendix B – Bus interface connector

The ethernet interface supports 10/100Mbit, full or half duplex operation.

#	Item
1	Network Status LED
2	Module Status LED
3	Link/Activity LED (port 1)
4	Link/Activity LED (port 2)
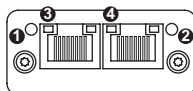
Pin n.	DESCRIPTION
1, 2, 3, 4	Connected to chassis ground over serial RC circuit
5	RD-
6	RD+
7	TC-
8	TC+
Housing	Cable Shield

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Appendix C – Technical data

Electrical data	
Supply voltage	24 VDC ±5 %
Power consumption	50 mA
Reverse polarity	Protected
Voltage transitions	Protected
Frequency range	2.400-2.480GHz
Interface options	Ethernet/IP Profinet IO Modbus/TCP
Antenna connector	SMA RP female
Power supply connector	3-way terminal block 3.81 mm pitch

Mechanical data	
Mounting	DIN RAIL
Weight	≈50 g
Housing material	white-gray ABS reinforced polycarbonate, self-extinguishing
Dimensions	79x101x35 mm

Ambient conditions	
Operating temperature	0 ÷ +50°C
Storage temperature	-20 ÷ +70°C
Relative humidity	max. 80 %, not condensing
Environment	indoor use
Altitude	up to 2000 m
Ratings	protection class II overvoltage category II pollution degree 2

EU DECLARATION OF CONFORMITY (DOC)

WE

COMPANY NAME: Elesa S.p.a.
POSTAL ADDRESS: Via Pompei 29
POSTCODE AND CITY: 20900 Monza
TELEPHONE NUMBER: +39 039 28111
E-MAIL ADDRESS: info@elesa.com

Declare that the DoC is issued under our sole responsibility and belongs to the following product:

PRODUCT: Control unit for DD51-E-RF DD52R-E-RF MPI-R10-RF
APPARATUS MODEL: UC-RF
TRADE MARK: Elesa

The object of the Declaration described above is in conformity with the relevant Union harmonization legislation:

2014/30/EU(EMC): Radio Equipment Directive
2011/65/UE (RoHS): Restriction of the use of certain Hazardous Substances in electrical and electronic equipment

The following harmonized standards and technical specifications have been applied:

EN 61326-1:2013

Notified Body:

Not Involved (Annex II - Conformity Assessment Module A)

Additional information:

Software Version: 5.1 or higher

PLACE, DATE OF ISSUE: CARLO BERTANI
Monza – Italy   MANAGING DIRECTOR
18/05/2020   GENERAL MANAGER

Elesa S.p.A., Monza, January 2021

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