

DUCATI SISTEMI

DLC - Ethernet

MANUALE UTENTE

USER'S MANUAL



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1. Introduction

DUCATI Sistemi s.p.a., pursuing a program of increasing participation in the energy measurements and energy saving field, has developed a data converter **Ethernet - RS485** which can be used with all DUCATI analyzers provided with RS485 line interface. This converter allow connecting a single instrument or a group of instruments (all of them connected each other through the RS485 line) to an Ethernet port of a LAN, by **TCP/IP protocol**.

The RS485 serial line that links the **DLC-Ethernet** with the DUCATI instrument can be up to 1000 meters length or connect up to 31 instruments max. To obtain this performance the cable should be a Belden 9841 type shielded two-wire cable. To overtake these limits, a "*Signal Repeater*" DUCATI-SRD (article code 468001021) can be used: this allow to connect another 31 instruments group or 1000 meters of cable.

The Ethernet interface is a standard 10BaseT and can be connected to every standard plug of a LAN, provided a check on the IP address. Every device on the network must have a unique IP address and more devices can be connected to the LAN provided they have all different addresses each other.

The main characteristics of the **DLC-Ethernet** converter are the following:

- complete transparency to the user's software
- bi-directional data flow
- programmable baud rate on RS485 line, preset to the standard value of 9600 bps no Parity
- suppression of transient disturbances from the RS485 serial line
- integrated Line Terminator resistor for RS485
- coverage up to about 1000 meters or 31 instruments on RS485 line
- 10BaseT Ethernet connection
- Host connection via TCP/IP Protocol
- Leds for Ethernet *link* and *activity* indication
- Web interface for setup parameters programming
- Password and Username for setup data protection
- Total integration with DUCATI "*WarpNet*" Software (article code 468001078) where you just need to setup the IP address of the converter / converters installed.

2. Converter Description

The **DLC-Ethernet** signal converter can easily be placed and connected to any Ethernet network and used in a network for analyzers data collection (LAN cable not included). It is housed in a sturdy black ABS container as illustrated in the figure below:



Figure 1: DLC-Ethernet Ducati appearance

Device description:

- On the right side there are two LEDs; one for signaling the Ethernet network *Link* and the other for signaling Ethernet network *Activity*
- Still on the right side it is available the Ethernet RJ45 plug (see **Figure 2**).
- On the same side there is the jack for power supply (AC-Adapter 230Vac-9Vdc – included) (see **Figure 3**)
- Beside the power supply jack, it is accessible a small button for DHCP feature. It is suggested not to use this function, but for more information on this feature please contact our customer service at "[supporto_analizzatori @ ducatisistemi.com](mailto:supporto_analizzatori@ducatisistemi.com)".
- On the left side is accessible the DB-9 shell connector for connecting the RS485 line to the Ducati analyzers (see **Figure 5**). Included in the package is an interface D-shell connector with some cable, for easy accessing the A,G,B wires for RS485.

2.1 Ethernet connector

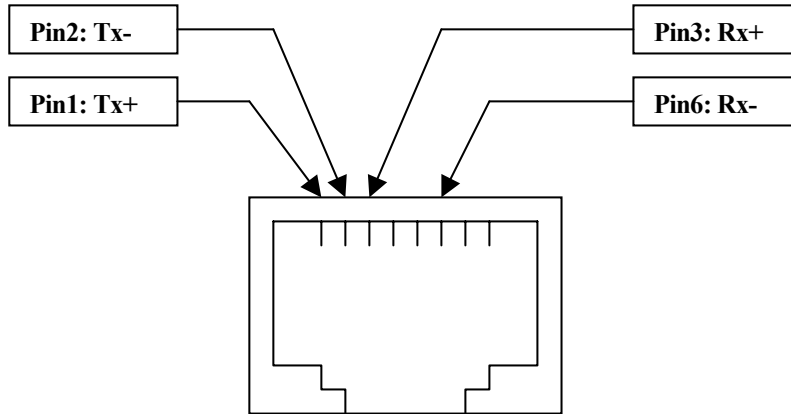


Figure 2: RJ45 connector– front view

2.2 Power supply connector

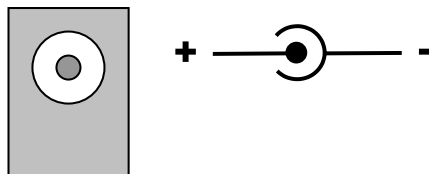


Figure 3: PSU supply connector

The positive pin (+) is connected with the internal contact, and the negative (-) is connect with the external contact.

Power supply	
Voltage	+ 7,5 ÷ + 9,0 Vdc
Max Consumption	145 mA
Connector type	5,5 x 2,1 mm

Figure 4: Power supply table

2.3 Serial Rs485 connector

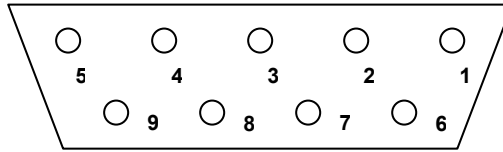


Figure 5: RS485 connector, DB9 – Male

Pin 1	A (+)	Noninverting Receiver Input and Noninverting Driver Output
Pin 2	n.c.	
Pin 3	n.c.	
Pin 4	n.c.	
Pin 5	GND	Ground
Pin 6	B (-)	Inverting Receiver Input and Inverting Driver Output
Pin 7	n.c.	
Pin 8	n.c.	
Pin 9	n.c.	

Figure 6: RS485 connector pins table

NOTE: in the package it is included a pre-assembled cable with a connector DB9 female for easy RS485 connection.

3. Device Setup and configuration

3.1 Factory default

When purchased, if there aren't any particular requests, the device will have the following default setting.

Factory default	
Password:	“ducati” (all in lower case)
Username	(none / blank)
IP address	192.168.5.245
Subnet mask	255.255.255.0
Host port	2000
Serial Rs485	9600 bps, no parity, 1 start bit, 1 stop bit
Last character	03h (etx)

Figure 7: Factory default configuration table

3.2 How to modify the configuration

Any LAN is characterized by a range of IP address that will be used. Our **DLC-Ethernet** is preset with the IP address =192.168.5.245. If on the network is present another device with the same IP, this one should be changed to avoid conflicts, otherwise you may modify the **DLC-Ethernet** configuration in the following way.

Before starting with the setup, you need to configure a PC with *IP address* = 192.168.5.xxx with xxx different from 245 and *Subnet Mask* = 255.255.255.0.

Now is possible to connect the **DLC-Ethernet** directly to the PC using a *crossed* network cable (LAN cables not included) or it is possible (better) to use a HUB with a *direct* network cable (LAN cables not included).

After the cable connection, the device can be programmed using a browser (*Internet Explorer*) at 192.168.5.245 (<http://192.168.5.245>). A page will be visualized and the password requested: use blank as **Username** and “ducati” (in lowercase) as **Password**. Follow the on-screen instructionsⁱ in the English language.

ⁱ For particular cases it is possible to request a custom preset at the order.

WARNING: in case the password is forgotten and the IP address is lost, the device can not be reset to the factory default configuration by the user, and should be sent back to DUCATI for service. However in order to recover the IP address it is possible to reconfigure the device with a DHCP (for more information in DHCP usage please contact our customer service at the e-mail address "*supporto_analizzatori@ducatisistemi.com*").

NOTE: if there are more than one device on the same LAN, every **DLC-Ethernet** should be connected and programmed in sequence one after the other, programming each one with a different IP address at every new connection.

4. DUCATI analyzers network applications

The **DLC-Ethernet** allows to connect a single analyzer or an analyzers group connected in a RS485 network, to a PC through a LAN. It's even possible to connect more **DLC-Ethernet** devices in the same LAN. For example if in a shed there are one or more group of instruments, you may connect them via RS485 in groups, and use one **DLC-Ethernet** for each group; finally connect each **DLC-Ethernet** to the LAN, just taking care to use a different IP for each converter.

4.1 Elements in a DUCATI Network

The next two figures show networks of DUCATI analyzers connected to a personal computer by an Ethernet LAN. The former (see **Figure 8**) is with up to 31 instruments, while the latter (see **Figure 9**) is the architecture with more units, which prescribes the use of "*Signal Repeaters*" (SRDs) on the RS485 line to amplify and re-generate the signal after 31 instruments or after 1000 meters of cable.

Note that such a configuration can be reproduced for each **DLC-Ethernet** on the net.

The elements that constitute the network are the following:

- a shielded two-wire Belden 9841 cable (to be installed by the user) which includes wire A, illustrated in the figures below, connected to clamp A of the serial port of the Ducati analyzers and pin A of the **DLC-Ethernet** converter (and, of course, the same for wire B);
- a 120 ohm resistor used as Line Terminator, as show in the figures below in the frame "*Dettaglio*" (detail);
- one or more DUCATI analyzers, all connected via the above mentioned Belden cable, up to a maximum of 98 units (for each converter), if the Ducati-ASCII protocol is used, or up to 247 units if the MODBUS-RTU protocol is used;
- one or more SRD *Signal Repeaters* (available from Ducati Sistemi SpA with order code 468001021) to be installed in the RS485 network after each group of 31 analyzers or 1000 mt of cable;

- the *WapNet* Software V2.6 or above. (available from Ducati Sistemi SpA with order code 468001078)ⁱⁱ. For this software it is required a Personal Computer P III a 400 MHz or higher, Memory 128 Mb ram, Drive 20 GB, and Microsoft operating system.

4.2 DUCATI Network cabling

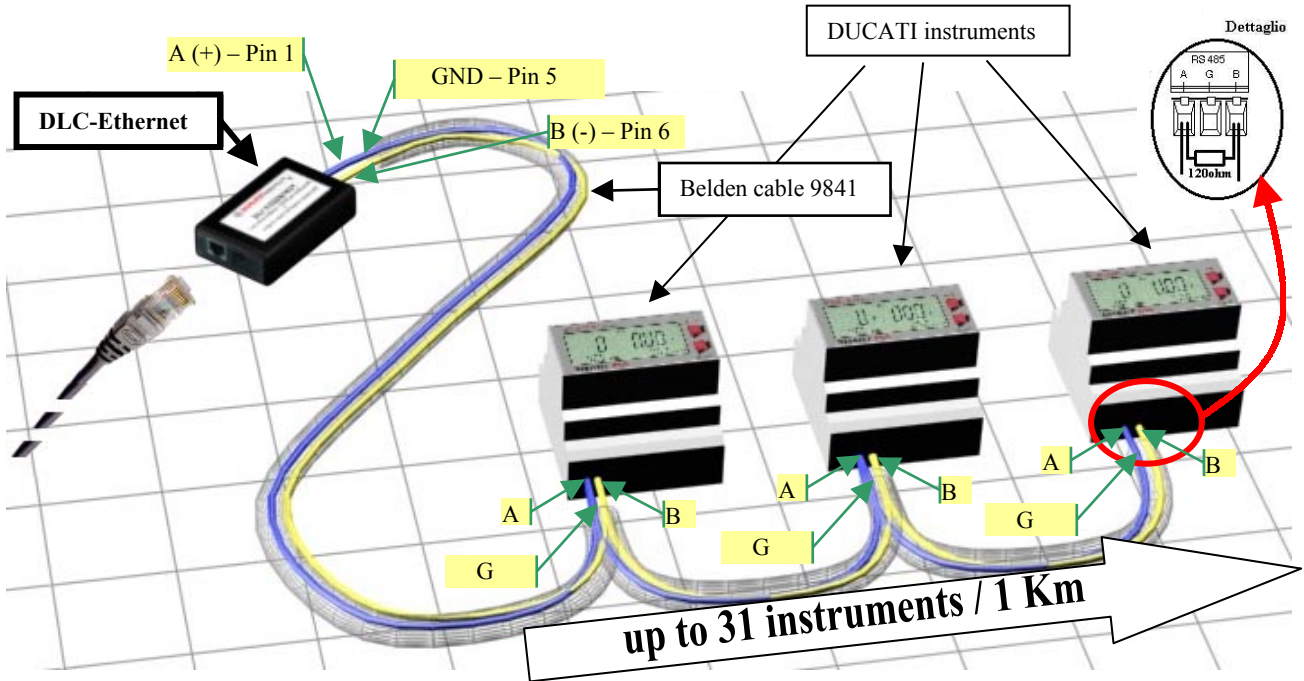


Figure 8: RS485 Network up to 31 instruments

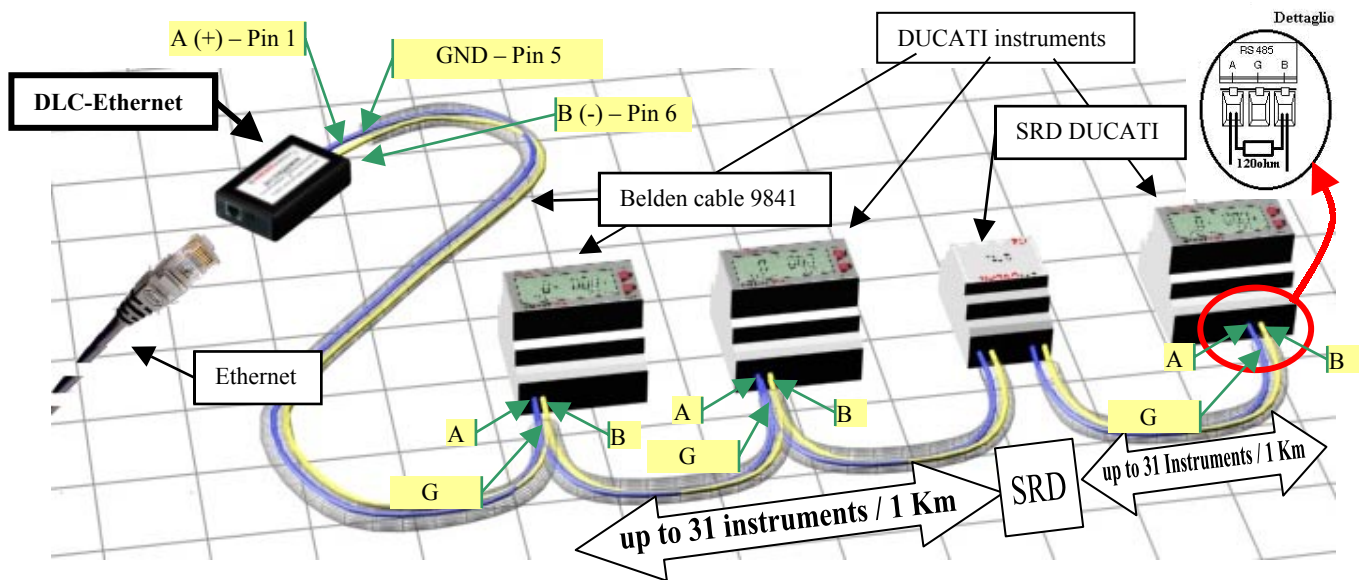


Figure 9: RS485 Network with more than 31 instruments

ⁱⁱ The *WarpNet* software uses the ASCII-Ducati protocol, so allowing a maximum of 98 instruments each DLC-Ethernet converter. For information, the software supports a mix of DLC-RS232 and DLC-Ethernet converters installed at the same time.

For a correct connection, follow the hints below; please note there is no limit on how many **DLC-Ethernet** devices can be installed on the same LAN, a part from the limit on the total device the LAN itself can handle. For more information refer to the NOTE at section 3.2 - "*How to modify the configuration*".

The **DLC-Ethernet** connection to the LAN is possible either directly to the PC, using a *crossed* network cable (LAN cable not included), or using a HUB with a *direct* network cable (LAN cable not included).

For the connection between the converter RS485 D-shell connector and the Belden cable of the analyzers net, you can use the included prepared cable.

The RS485 network connection is of *multi-drop* type, so every instrument must be connected in cascade each other ("in-out" mode), **avoiding any "star" connection**, paying attention to the correct polarity: all Pins "A" must be connected together and connected to the Pin "A" of the converter, as well as for the Pin "B".

To complete the network, insert the Line Terminator, i.e. a 120ohm resistor (not included) at the end of the RS485 line, between terminal A and terminal B of the last instrument, as shown in the previous figures, in the frame "*Dettaglio*" (detail).

The instrument's terminal G is connected to the electronic ground of each one through a resistor. The connection of all the G terminals and the **DLC-Ethernet** signal ground (Pin 5) through the cable's shield, can be used for keeping equilibrated all the reference potentials. In this case avoid earth connections.

Normally the shield is instead connected only to the Ground Earth (without connecting the signal grounds) to get a shielding effect, and this connection should be made **ONLY IN ONE POINT**.

NOTE: the RS485 serial line that links the **DLC-Ethernet** to the Ducati instruments can be up to 1000 meters length or connect up to 31 instruments max. For longer lines or to connect more instruments, a *Signal Repeater* (amplifier) SRD (available from Ducati) should be used, as shown in **Figure 9**.

5. TECHNICAL CHARACTERISTICS

5.1 Power Supply

- External Power Supply with voltage 7,5 ÷ 9Vdc / 145mA
- Power consumption: less than 2 VA
- AC-adapter 230Vac to 9Vdc included in the package

5.2 Operating Conditions

- Operating temperature: from 5°C to 55°C
- Relative humidity: 90% max (non-condensing)

- Protection Class IP20
- Mechanical resistance EN/IEC 61131-2
- Humidity Class F DIN 40040

5.3 Weight and dimension

- Module 98 x 24 x 57 mm
- Weigh 67g

5.4 Connectors

- Ethernet: IEEE 802.3 10BaseT RJ45
- Rs485: DB9 male (adapting cable included)
- Power supply: PSU Plug 5,5 x 2,1 mm

5.5 Reference Standards

- Compliant to the following EC directive:



- Electro Magnetic Compatibility - EC directive EMC 89/336/CEE
- Emission EN50022
- Immunity EN61000-6-2
- Electrical safety EN60950

DUCATI Sistemi S. p. A. denies any responsibility for damage or personal injury caused by the improper or erroneous use of this equipment.

This documentation may be subject to modification without prior notice.

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DUCATI **S I S T E M I**

Via Ronzani 47, - 40033 Casalecchio di Reno (Bologna) - Italy

Tel.: +39- 051 6116.611 - Fax: +39-051 6116.690

WEB: www.ducatisistemi.com

e-mail (Commerc.) = info@ducatisistemi.com // e-mail (Technical) = supporto_analizzatori@ducatisistemi.com