

## Modbus RTU with Digital IO and micro SD Ram card

## DAT9000DL-IO-2.0

### FEATURES

- N.1 serial interface RS-485 Modbus RTU Client
- N.1 serial interface RS-485/uUSB Modbus RTU Server
- Interface Ethernet 10/100 Base-T, Modbus TCP Client/Server
- N.4 Digital Inputs + N.2 SPDT relays
- N.1 slot for SD card
- Client function both on RS-485 (Modbus RTU) and on Ethernet (Modbus TCP)
- Programming software with "flow chart" structure
- Remotely programmable
- Connection by removable screw-terminals
- Programmable without external sources via uUSB and optional cable CVPROG
- LED signaling for Link/Act Ethernet, serial RX-TX, power supply
- LED signaling for digital inputs and outputs status
- Galvanic Isolation on all the ways
- CE / UKCA mark
- In compliance to EN-50022 DIN rail mounting



### GENERAL DESCRIPTION

The DAT9000DL-IO device is an intelligent unit designed to control a network of Modbus RTU server devices connected via RS-485 Master or Modbus TCP through the Ethernet interface. It can read and write field values, perform necessary logical and mathematical functions, and manage up to eight recording tasks saved on the SD card memory. The device is equipped with four digital input channels, two relay outputs, and a 32-bit pulse counter for each digital input. Real-time reading and writing of internal register values are possible through the Ethernet interface, RS-485 "SLAVE" ports, or uUSB ports. The Ethernet interface also allows access to files saved on the SD card when the Data-Logger function is active. The CVPROG cable, which must be ordered separately, enables configuration and programming of the device without an external power supply. Additionally, you can program the control logic, monitor data, request data, and perform real-time programming of the Intelligent Unit through the Ethernet interface, RS-485 "SLAVE" ports, or uUSB ports. This also facilitates direct programming and data requests from slave devices connected to the RS-485 Master. The DAT9000DL-IO is configurable using the DEV9K 2.0 software (and later versions) developed by DATEXEL, which runs on Windows. The device provides full electrical isolation between lines, offering effective protection against ground loops common in industrial applications. LED indicators for Ethernet activity and data Rx-Tx flow on the serial line allow for direct monitoring of system functionality. Connections are made via removable screw terminals (for power supply and RS-485) and an RJ45 plug (for Ethernet). The device is housed in a rugged, self-extinguishing plastic enclosure with a slim profile of only 22.5 mm, allowing for high-density mounting on a standard EN-50022 DIN rail.

### SUPPORTED FUNCTION

The DAT9000 series devices support the standard Modbus write and read functions (see Device User Guide), mathematical operations, logic operations and calculation functions (Scaling, Average, root extraction, ...)

For the complete list of functions and their operation, refer to the Programming software User Guide.

### TECHNICAL SPECIFICATIONS (Typical @ 25 °C and in the nominal conditions)

| ETHERNET                                                                                                                              |                               | DIGITAL INPUTS (WET CONTACTS)                                                                                                  |                                                   | GENERAL SPECIFICATIONS              |                                                            |  |
|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------|------------------------------------------------------------|--|
| In compliance with standard Ethernet IEEE 802.3                                                                                       |                               | Channels                                                                                                                       | 4                                                 | DC power supply voltage             | 18 .. 30 Vdc                                               |  |
| Ethernet interface                                                                                                                    | Ethernet 10/100Base-T         | Input voltage (bipolar)                                                                                                        |                                                   | Reverse polarity protection         | 60 Vdc max                                                 |  |
| Ethernet connection                                                                                                                   | RJ-45                         | OFF state                                                                                                                      | 0 ÷ 3 V                                           | <b>Max. Current consumption</b>     | 100 mA                                                     |  |
| Protocol                                                                                                                              | Modbus TCP                    | ON state                                                                                                                       | 10 ÷ 30 V                                         | <b>ISOLATION (test time 1 min)</b>  |                                                            |  |
| TCP Port                                                                                                                              | 502 (Modbus TCP)<br>80 (HTTP) | Impedance                                                                                                                      | 4.7 KΩ                                            | Power supply / Ethernet             | 1500 Vac, 50 Hz                                            |  |
| <b>Number of sockets</b>                                                                                                              |                               | Number of counters                                                                                                             | 4                                                 | Power supply / RS485                | 1500 Vac, 50 Hz                                            |  |
|                                                                                                                                       |                               | Counters register bit-length                                                                                                   | 32 bit                                            | Ethernet / RS485                    | 1500 Vac, 50 Hz                                            |  |
|                                                                                                                                       |                               | Counters Type                                                                                                                  | Fast → In0, In1, In2<br>Slow → In0, In1, In2, In3 | Inputs / RS485                      | 1500 Vac, 50 Hz                                            |  |
| Modbus TCP                                                                                                                            | 16                            | <b>Input In3 is a slow counter only, other inputs can be both. The type of counters can be set from web interface.</b>         |                                                   | Inputs / Power supply               | 1500 Vac, 50 Hz                                            |  |
| HTTP                                                                                                                                  | 3                             | Max signal frequency                                                                                                           |                                                   | <b>ENVIRONMENTAL CONDITIONS</b>     |                                                            |  |
| <b>Modbus TCP Client function</b>                                                                                                     |                               | Fast Counters                                                                                                                  | 5kHz                                              | Operative temperature               | -20°C .. +60°C                                             |  |
| IP Table Size                                                                                                                         | max 8 devices (IP)            | Slow Counters                                                                                                                  | 300Hz                                             | Storage temperature                 | -40°C .. +85°C                                             |  |
| <b>DATA LOGGER</b>                                                                                                                    |                               | <b>The debounce function works on all the slow counters and it's the same for all. There is no debounce for fast counters.</b> |                                                   | Humidity (not condensing)           | 0 .. 90 %                                                  |  |
| N° Logging task                                                                                                                       | up to 8                       | <b>DIGITAL OUTPUTS</b>                                                                                                         |                                                   | Maximum Altitude                    | 2000 m slm                                                 |  |
| Min. schedule rate                                                                                                                    | 10 seconds                    | Channels                                                                                                                       | 2                                                 | Installation                        | Indoor                                                     |  |
| <b>Compatible devices</b>                                                                                                             |                               | Type                                                                                                                           | SPDT relay                                        | Category of Installation            | II                                                         |  |
|                                                                                                                                       |                               | Max. switching power with resistive load per contact                                                                           | 2 A @ 250 Vac<br>2 A @ 30 Vdc                     | Pollution Degree                    | 2                                                          |  |
|                                                                                                                                       |                               | Max. voltage:                                                                                                                  | 250Vac(50/60Hz)<br>30Vdc                          | <b>MECHANICAL SPECIFICATIONS</b>    |                                                            |  |
| <b>RS-485</b>                                                                                                                         |                               | <b>DIELECTRIC STRENGTH</b>                                                                                                     |                                                   | Material                            | Self-extinguish plastic                                    |  |
| <b>In compliance with standard RS485</b>                                                                                              |                               | Dielectric strength between contacts                                                                                           | 1000 Vac, 50 Hz, 1 min.                           | IP Code                             | IP20                                                       |  |
| Baud-rate                                                                                                                             | up to 115.2 Kbps              | Dielectric strength between coil and contacts                                                                                  | 4000 Vac, 50 Hz, 1 min.                           | Wiring                              | wires with diameter<br>0.8÷2.1 mm²<br>AWG 14-18            |  |
| Cable Length                                                                                                                          | 1200 m / 4000 ft max          | <b>CERTIFICATIONS</b>                                                                                                          |                                                   | Tightening Torque                   | 0.5 N m                                                    |  |
| The reachable maximum distance depends on the number of devices connected, on the type of cable used and its immunity against noises. |                               | <b>EMC ( for the Industrial Environments )</b>                                                                                 |                                                   | Mounting                            | in compliance with DIN rail standard EN-50022 about 160 g. |  |
| <b>Number of modules in multi-point</b>                                                                                               |                               | <b>Immunity</b>                                                                                                                |                                                   | <b>UKCA (ref S.I. 2016 N°1091 )</b> |                                                            |  |
| up to 32                                                                                                                              |                               | <b>Emission</b>                                                                                                                |                                                   | Immunity                            | BS EN 61000-6-2                                            |  |
| <b>Switching time TX/RX</b>                                                                                                           |                               | <b>Emission</b>                                                                                                                |                                                   | Emission                            | BS EN 61000-6-4                                            |  |
| 150 us.                                                                                                                               |                               | <b>OPTIONAL PROGRAMMING PORT</b>                                                                                               |                                                   |                                     |                                                            |  |
| <b>Connection</b>                                                                                                                     |                               | <b>Connection</b>                                                                                                              |                                                   |                                     |                                                            |  |
| removable screw terminals                                                                                                             |                               | uUSB micro-B (on front)                                                                                                        |                                                   |                                     |                                                            |  |
| <b>OPTIONAL PROGRAMMING PORT</b>                                                                                                      |                               |                                                                                                                                |                                                   |                                     |                                                            |  |
| <b>Connection</b>                                                                                                                     |                               |                                                                                                                                |                                                   |                                     |                                                            |  |
| uUSB micro-B (on front)                                                                                                               |                               |                                                                                                                                |                                                   |                                     |                                                            |  |
| It is requested the use of the dedicated cable CVPROG. It doesn't work with standard USB cables                                       |                               |                                                                                                                                |                                                   |                                     |                                                            |  |

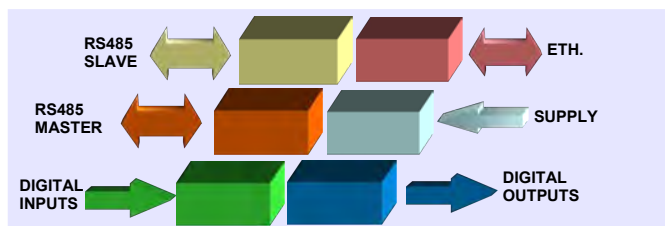
## INSTALLATION INSTRUCTIONS

The device is suitable for fitting to DIN rails in the vertical position. For optimum operation and long life follow these instructions:  
**When the devices are installed side by side it may be necessary to separate them by at least 5 mm in the following case:**  
 - If panel temperature exceeds 45°C and high power supply value ( > 27Vdc).  
 Make sure that sufficient air flow is provided for the device avoiding to place raceways or other objects which could obstruct the ventilation slits. Moreover it is suggested to avoid that devices are mounted above appliances generating heat; their ideal place should be in the lower part of the panel.  
 Install the device in a place without vibrations.  
 Moreover it is suggested to avoid routing conductors near power signal cables (motors, induction ovens, inverters, etc...) and to use shielded cable for connecting signals.

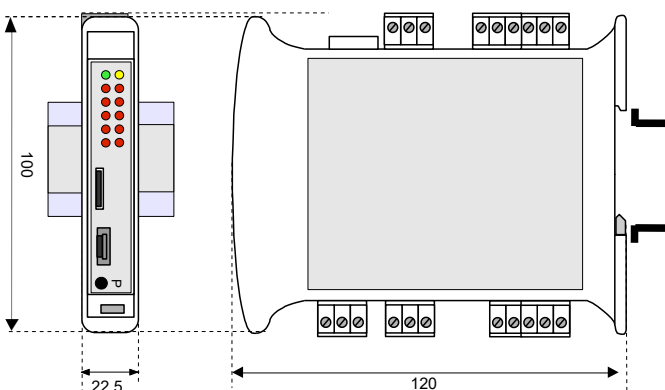
## LIGHT SIGNALING

| LED         | COLOR  | STATE | DESCRIPTION                                                                  |
|-------------|--------|-------|------------------------------------------------------------------------------|
| PWR         | GREEN  | ON    | Device powered                                                               |
|             |        | OFF   | Device not powered                                                           |
|             |        | BLINK | Watchdog Alarm                                                               |
| STS         | YELLOW | BLINK | DEBUG modality                                                               |
|             |        | OFF   | RELEASE modality                                                             |
| RX <i>n</i> | RED    | BLINK | PORT <i>n</i> – Data received ( the blink frequency depends on Baud-rate)    |
|             |        | OFF   | No reception in progress.                                                    |
| TX <i>n</i> | RED    | BLINK | PORT <i>n</i> – Data transmitted ( the blink frequency depends on Baud-rate) |
|             |        | OFF   | No reception in progress.                                                    |
| I <i>n</i>  | RED    | ON    | State 1 Digital Inputs.                                                      |
|             |        | OFF   | State 0 Digital Inputs.                                                      |
| O <i>n</i>  | RED    | ON    | State 1 Digital Outputs.                                                     |
|             |        | OFF   | State 0 Digital Outputs.                                                     |

## ISOLATIONS STRUCTURE



## MECHANICAL DIMENSIONS (mm)



## PUSH-BUTTON "P" FUNCTIONALITY

This button, located on the front of the device allow to load the following factory defaults in the following two modes:  
 A) With the device on, press the button until the green LED (PW) goes off; immediately after release it to load the factory default parameters (modbus parameters, default IP, login credentials to the web server).  
 B) Turn on the device by keeping the button pressed and keep the pressure until the green LED (PW) goes off; immediately after release it to load the factory firmware.

While the default parameters or the factory firmware are loaded, the yellow STS LED remains permanently switched on. At the end of the loading it switches off.

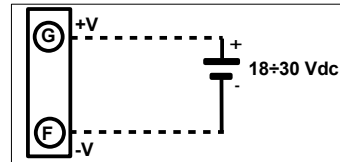
**ATTENTION: do not switch off the device during the loading phase!**



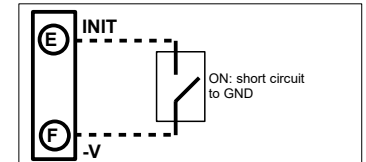
The symbol reported on the product indicates that the product itself must not be considered as a domestic waste. It must be brought to the authorized recycle plant for the recycling of electrical and electronic waste.  
 For more information contact the proper office in the user's city , the service for the waste treatment or the supplier from which the product has been purchased.

## WIRING

### POWER SUPPLY

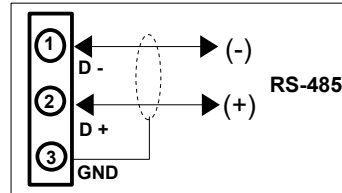


### INIT

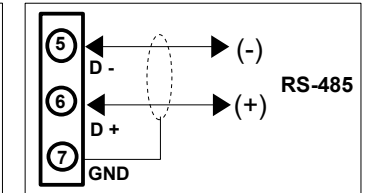


**Note: the device must be powered using a power supply unit classified NEC class 2 or SELV with limited energy**

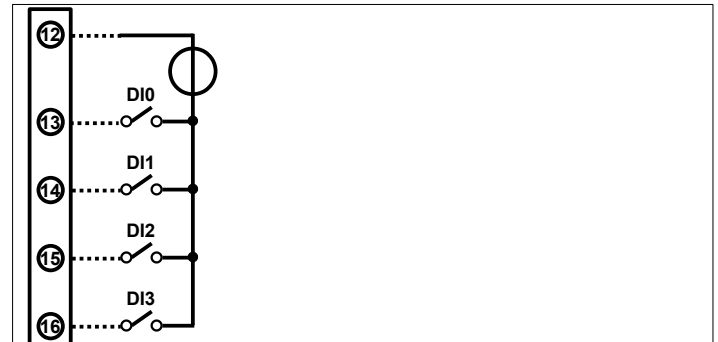
### RS-485 Slave (Port 0)



### RS-485 Master (Port 1)

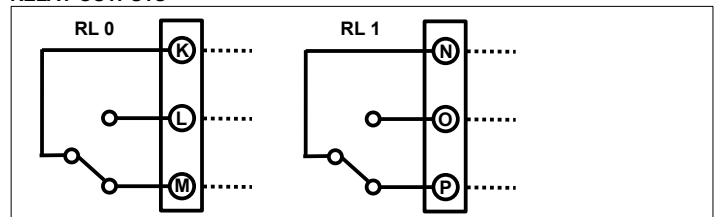


### DIGITAL INPUTS



**NOTE: the input channels are not isolated between them**

### RELAY OUTPUTS



## "CVPROG" INTERFACE CABLE

### Description

The CVPROG cable is an interface consisting of the physical cable, a uUSB port that must be connected to the DATEXEL device in use, a USB port that must be connected to the user PC and a chip to recognize the USB port as VCP (Virtual Com Port).

Due to this the CVPROG interface cable is not a simple uUSB-USB cable.

Through the CVPROG cable it is possible to communicate and program the DATEXEL devices without external power.

This allows a simple use of the device.

**WARNING: the uUSB port and the RS485 slave port (Port 0) cannot be used simultaneously and the communication parameters are common to both ports.**

When connecting the CVPROG cable to the PC, it could be necessary to install the drivers downloaded from the website [www.datexel.it](http://www.datexel.it)

### Verify of the generated COM port

When the CVPROG cable is inserted into the PC, a virtual COM port is automatically generated and it can be displayed in the "Device Management" window → Ports (COM and LPT) of the operating system in use.

## ACCESS TO THE INTEGRATED WEB SERVER "

To access the integrated web server, open a browser on your PC and type the IP address of the device in the address bar of the browser.

- **Factory IP Address:** 192.168.1.100

**WARNING: make sure that the PC is in the same subnet as the device in use (see user guide of the device).**

The factory / default login credentials that are requested on the "Login" page are:

- **Username:** Fact\_user

- **Password:** Fact\_pwd

Once you have logged in for the first time, you can change the credentials in the "Username and Password" section.

## HOW TO ORDER

**" DAT9000DL-IO-2.0 "**

Note: the device is provided with default configuration as:

IP address : 192.168.1.100

Modbus address: 10