DATEXEL

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Modbus
DAT3000 / DAT10000
User Guide

GENERAL DESCRIPTION

Modbus_DAT3000_DAT10000 is a software developed by Datexel srl, running under the operative system Windows® designed to program and visualize the measure of the I/O models of DAT3000 and DAT10000 series listed in the table below. To operate with Modbus_DAT3000_DAT10000 it is necessary to use an interface RS485 or RS232.

DEVICE DAT3000 SERIES	DEVICE DAT10000 SERIES	INTERFACE DAT3580MBTCP	INTERFACE DAT3580	INTERFACE DAT3580USB	INTERFACE DAT3580GW
DAT 3011	-----	✔	✔	✔	✔
DAT 3014	DAT 10014	✔	✔	✔	✔
DAT 3015-I		✔	✔	✔	✔
DAT 3015-V	DAT 10015	✔	✔	✔	✔
DAT 3016	DAT 10016	✔	✔	✔	✔
DAT 3017-I	DAT 10017-I	✔	✔	✔	✔
DAT 3017-V	DAT 10017-V	✔	✔	✔	✔
DAT 3018	-----	✔	✔	✔	✔
DAT 3018-P	DAT 10018	✔	✔	✔	✔
DAT 3019	DAT 10019	✔	✔	✔	✔
DAT 3022	-----	✔	✔	✔	✔
DAT 3024	-----	✔	✔	✔	✔
DAT 3024-ISO	DAT 10024	✔	✔	✔	✔
DAT 3028	-----	✔	✔	✔	✔
DAT 3130	DAT 10130	✔	✔	✔	✔
DAT 3148/8 & DAT 3148/12	DAT 10148	✔	✔	✔	✔
DAT 3188/4 & DAT 3188/8	DAT 10188	✔	✔	✔	✔
DAT 3138	-----	✔	✔	✔	✔
DAT 3116	-----	✔	✔	✔	✔

✔ = usable interface.

To connect devices and interfaces refer to the technical Data-sheets .

SYSTEM REQUIREMENTS	
Operative System	Windows® XP / Vista / 7 / 8.1 /10
Available Hard Disk space	5 MB
Framework version required	from 4.0

PROCEDURE OF INSTALLATION

• Close eventual active or background applications.
• Run the file setup.exe
• Follow the Installation Wizard.

RUN MODBUS DAT3000_DAT10000

Connect the interface RS485 to the PC, power supply and the terminals of RS485 of the device as shown in the device's data-sheet.
If the programming interface in use is the DAT3580USB it is necessary to install the USB drivers; after verify the Com port number assigned to it by Windows® during the installation (go to Control Panel – System and Maintenance - Device Manager).
If the programming interface in use is the DAT3580MBTCP or DAT3580GW, verify that the Ethernet parameters are compatible with those of the net in use and that the transmission of data over port 502 is allowed.

Power on the device to configure.
Be sure that the Com port or IP address selected is not used by other applications or programs.
Execute the program at the path "Start \ Programs \ **MODBUS DAT3000_DAT10000.exe**".
When the software is running, the default window appears (Picture 1).
Select the flag for language as English or Italian. The main window will be loaded (Picture 2).
The software is equipped with a function that reads the active serial ports on the PC
If the flag "Automatic detection COM port" is enabled, such ports will be visualized in the main window. Some operative systems with high security permission levels don't allow the reading of the available COM PORTs . Due to this it is possible to load a generic COM PORT list disabling this flag.
If there is the necessity to obtain information about the products it is possible to open the link to log to the Datexel web site.

Picture 1 – Introducing window
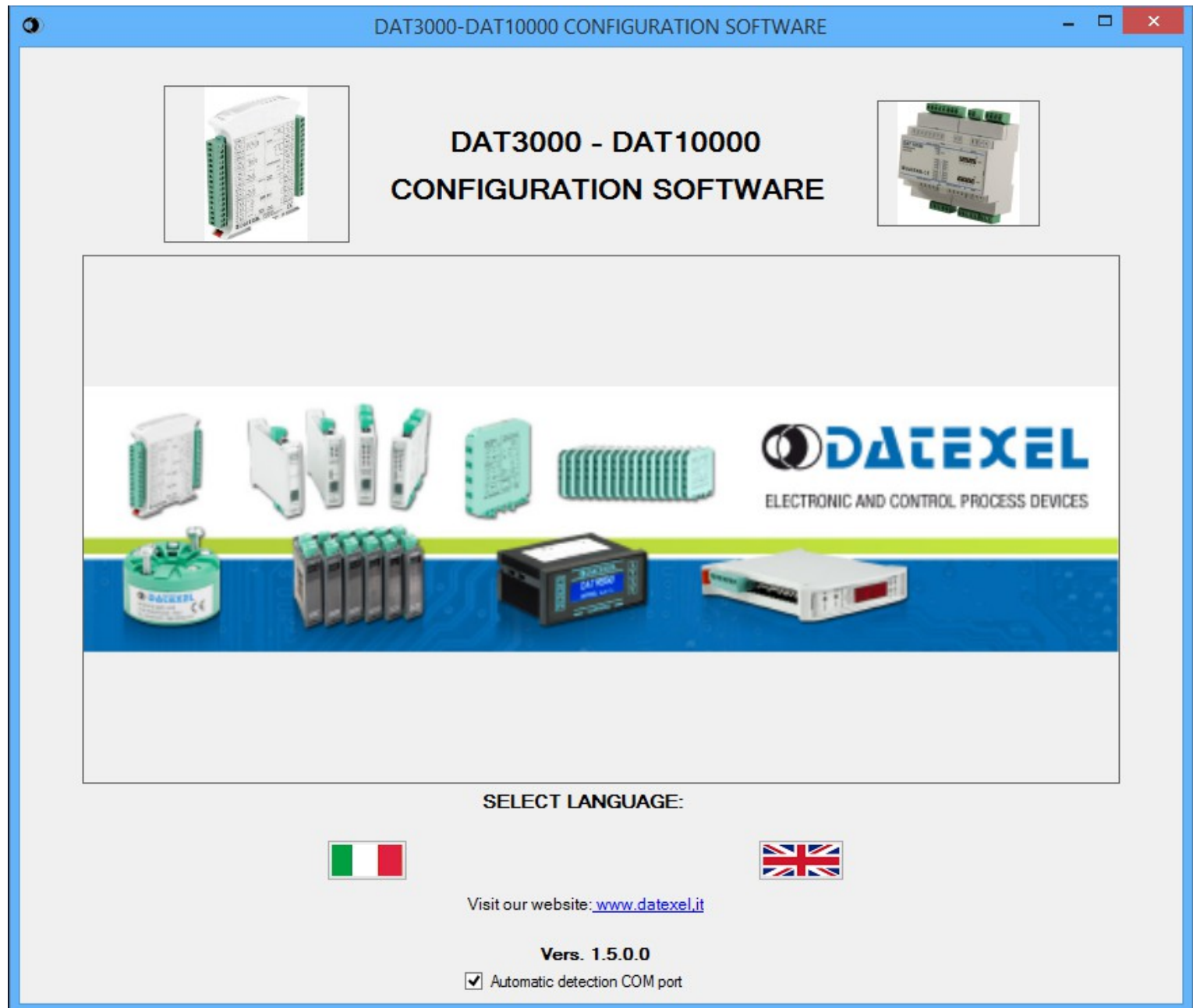
MAIN WINDOW

MENU BAR (Picture 2)

- *Menu "File"* : allows to exit from the software.
- *Menu "Tools"* : opens the tool Modbus Terminal .
- *Menu "Model"* : allows to select the device of a series.
- *Menu "Wizard"* : opens the tool Switch. Initially disabled, it appears only if a device of DAT10000 series has been selected .

OPEN THE COMMUNICATION CHANNEL

COM PORT (PICTURE 2)

When the software is running, it detects the available COM ports. If the COM port to be used doesn't appear under the list COM port, close the application that uses it and click on the button "Refresh COM port List" to view the available ports again.
The button "Refresh COM port List" works only when the COM port is closed.
If the interface connected works over COM port (RS232 or USB), select the COM port number to which the device is connected to and then set the proper Com port settings.
If the device is in INIT condition the default parameters are:
Baud rate: 9600, Mode: RTU, Data Bit: 8, Stop bit: 1, Parity: None.
When the setting is complete click the button "Open Com". If the procedure ends correctly, the indication "Port Open" will appear and the button "Port status" on side will become green .
To close the communication channel click the button "Close Com". If the procedure ends correctly, the indication "Port Closed" will appear and the button "Port status" on side will become grey.

TCP-IP (PICTURE 3)

To open a TCP socket, select under the list COM port the text "TCP-IP" and then set the proper TCP-IP settings writing the IP address of the gateway connected. Be sure that the Port 502 (dedicated to Modbus TCP-IP) is enabled in the system. Click the button "Open Socket". If the procedure ends correctly, the indication "Socket Open" will appear and the button "Port status" on side will become green .
To close the communication channel click the button "Close Socket". If the procedure ends correctly, the indication "Socket Closed" will appear and the button "Port status" on side will become grey .

Picture 2 – Main window - COM
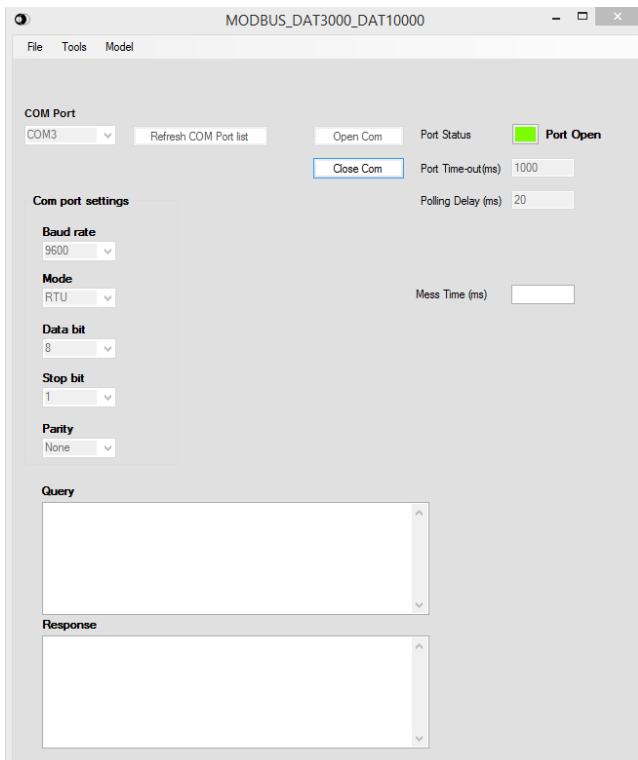
Picture 3 – Main window - Ethernet
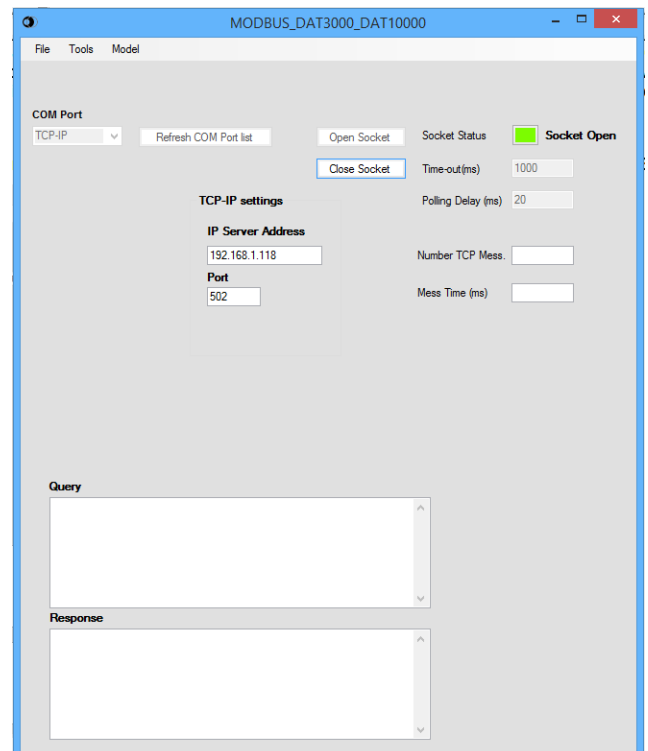
In both the modalities there are the parameters "Timeout" that defines the time of timeout, expressed in ms, for data receiving, the parameter "Polling Delay" that defines the delay between consecutive pollings and the parameter "Mess Time" that will be updated only when the data transmission is in progress and will report the time elapsed between the query and the reception of the command .
In the Ethernet modality there is the parameter "Number TCP Mess" that reports , only with transmission in progress, the number of TCP messages sent and received over the Ethernet.

Notes:
- when the window dedicated to the configuration of devices is enabled, with polling delay = 0, the software will send data every 500 ms.
- when the window of Modbus terminal is enabled, with polling delay = 0, the software will send data every 25 ms.

SELECT DEVICE (PICTURE 4 & 5)

If the device under configuration is a device of the DAT3000 series, click the menu "Model" -> "SERIE DAT3000" to open the list of the device available and click the code corresponding to the device under configuration (Picture 4).

If the device under configuration is a device of the DAT10000 series, click the menu "Model" -> "SERIE DAT10000" to open the list of the device available and click the code corresponding to the device under configuration (Picture 5). The menu Wizard will appear.

After the selection, it will appear the configuration window dedicated to the specific device.

Picture 4 – Selection of a DAT3000 device
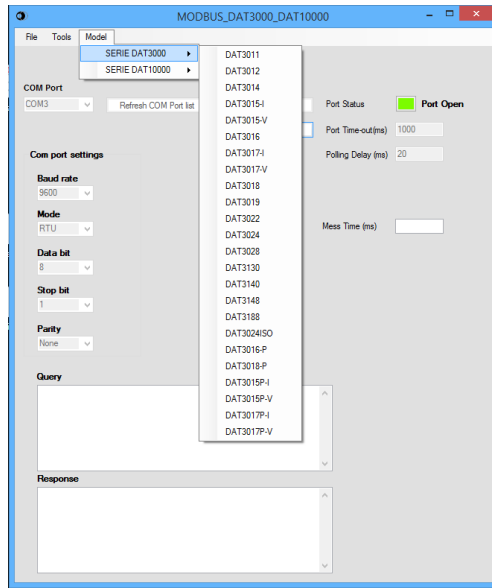
Picture 5 – Selection of a DAT10000 device
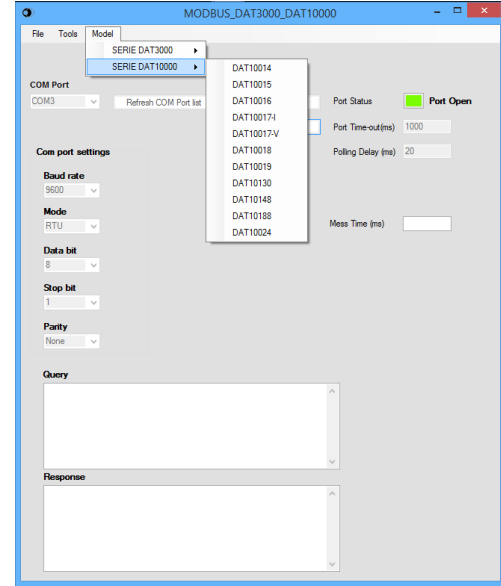
CONFIGURE THE DEVICE

When the device has been selected, it is possible to read and write data in the internal register of the device. When the software sends a command the frame "Query" in the main window is filled with the hexadecimal characters of the Modbus functions. At each query correspond a response that is shown in hexadecimal characters in the frame "Response" of the main window.

The window changes in function of the proprieties of device selected. The main features of each code are reminded on the top left corner of the window.

All the data can be read, while only those that have the button "Write" on side of the specific parameter can be written.

The common part to all the windows are:

"Address to connect": insert in this field the address of the slave device to connect to.

"Read data (Single poll)" sends a command of reading data.

"Continuous Read" starts a communication cycle of reading data. To stop it click the **"Stop"** button.

"Comm. Parameters" in the right side shows the actual configuration of the device. At least one read command to the slave device must be performed to fill correctly the following fields.

- **Address**: shows the actual address of the device connected (for the DAT10000 series this field is updated with the data set by dip-switch).
- **Baud rate**: shows the actual baud rate of the device connected (for the DAT10000 series this field is updated with the data set by dip-switch).
- **Parity**: shows the actual parity mode of the device connected (for the DAT10000 series this field is updated with the data set by dip-switch).
- **N°Bit** : shows the actual number of bit selection of the device connected (for the DAT10000 series this field is updated with the data set by dip- switch).
- **Mode** : shows the actual Modbus modality (RTU or ASCII) set for the device connected (for the DAT10000 series this field is updated with the data set by dip-switch).

"Name" shows the string read from the device of 4 ASCII characters used to name it.

"FW Vers" shows the firmware version read from the device.

"WTD (x0.5)" shows the watchdog time read from the device. It is expressed as step of 0.5 seconds.

"Delay (x1 ms)" shows the delay time between reception of a query and transmission of the response. It is expressed as step of 1 milliseconds.

Button **"Wdt_en"** shows if the bit to enable the watchdog time of the device has been set: red if the bit is set, grey if the bit is not set.

Button **"Wdt_ev"** shows if the watchdog time event is occurred: red if the event is occurred, grey if the event is not occurred. This condition is also signalled by the blinking of the led "PWR" of the device and the safe state of the digital outputs (where foreseen).

Button **"Pup_ev"** shows if the Power up event is occurred: red if the event is occurred, grey if the event is not occurred. This condition is also signalled by the the power up state of the digital outputs (where foreseen).

Button **"Out_alarm"** shows if a short circuit alarm on digital outputs is occurred: red if the event is occurred, grey if the event is not occurred.

The part dedicated to digital input and output are the following:

For inputs:

"Digital Inputs" shows the logic state of the digital input: red if the logic state is 1, grey if the logic state is 0.

"Digital Inputs Rise Latch" indicates if the logic state of the digital input changes from 0 to 1: red if the event is occurred, grey if the event is not occurred.

"Digital Inputs Fall Latch" indicates if the logic state of the digital input changes from 1 to 0: red if the event is occurred, grey if the event is not occurred.

The latches indicate only one change of state; once it is happened it is necessary to reset the bit clicking the button "Clear Rise Latch" or "Clear Fall Latch".

"Digital inputs Synchronism": where available, when the device is read the status of digital inputs read will be shown at the moment of the request of synchronism :red if the logic state was 1, grey if the logic state was 0.

"Sync": send a broadcast command of synchronism at the address 255.

"Counters": where available and for digital inputs version only, contain the values of the counters (if enabled) associated to the digital inputs.

"En": by this flag it is possible to enable the counters associated to the digital inputs.

"Auto_res": by this flag it is possible to enable the auto-reset of counters. Each counter is reset after it has been read.

Button **"Reset all counters"** sends a command to reset all the counters.

For outputs:

"Digital Outputs" shows the logic state of the digital output: red if the logic state is 1, grey if the logic state is 0. To drive the outputs click the related button.

"Power-up" shows the value to which the digital outputs will be driven in case of reset of a device. The value must be written as 2 digit hexadecimal values.

"Safe" shows the value to which the digital outputs will be driven in case of watchdog alarm. The value must be written as 2 digit hexadecimal values.

The part dedicated to analogue input and output are the following:

For inputs:

"Input type": allows to select the input sensor. The number of combo-box defines the functionality of a device. If there is only a combo-box it means that the configuration is the same for all the channels, while if there is one combo-box per channel it means that the device has programmable input channels.

Select the desired input type and write the data. In the fields "Measure", when the device is read the measures expressed as engineering units will be shown.

"Brk": for temperature sensor only, this indication dedicated per channel shows if the input value is over the full scale value (break); red if the break condition is verified, grey if the break condition is not verified.

Button **"Set ch ="**: for device with input channels configurable independently, it allows to set the input channels with the same input type of the first one.

"Channel enabled": for DAT3000 series only, it indicates the channel that are enabled. The value must be written as 2 digit hexadecimal values.

"CJC Measure": for thermocouple sensor only, it shows the measure of the internal CJC expressed as °C.

"CJC Offset": for thermocouple sensor only, it shows the offset for the internal CJC expressed as hundredths of °C. The value must be written as °C.

"Syncr.": when the device is read the measures read at the moment of the request of synchronism will be shown and are expressed as engineering unit.

Button **"Scale"**: for device with input channels configurable independently, allows to set different scaling for inputs. Refer to the window "Scaling" (Picture 8) .

For outputs:

"Output type", select the output type to program the channels by the proper combo-box and write the data; set the measure to which the outputs will be driven In the fields "Measure" of each channel. Click the button Write on side of each value to write it.

"Power-up/Safe" shows the value to which the analogue outputs will be driven in case of reset of a device (Power-up) or Watch-dog alarm (safe). The value must be written within the limits of the output type selected.

Picture 6 – CONFIGURATION OF DAT3000 SERIES

Picture 7 – CONFIGURATION OF DAT10000 SERIES
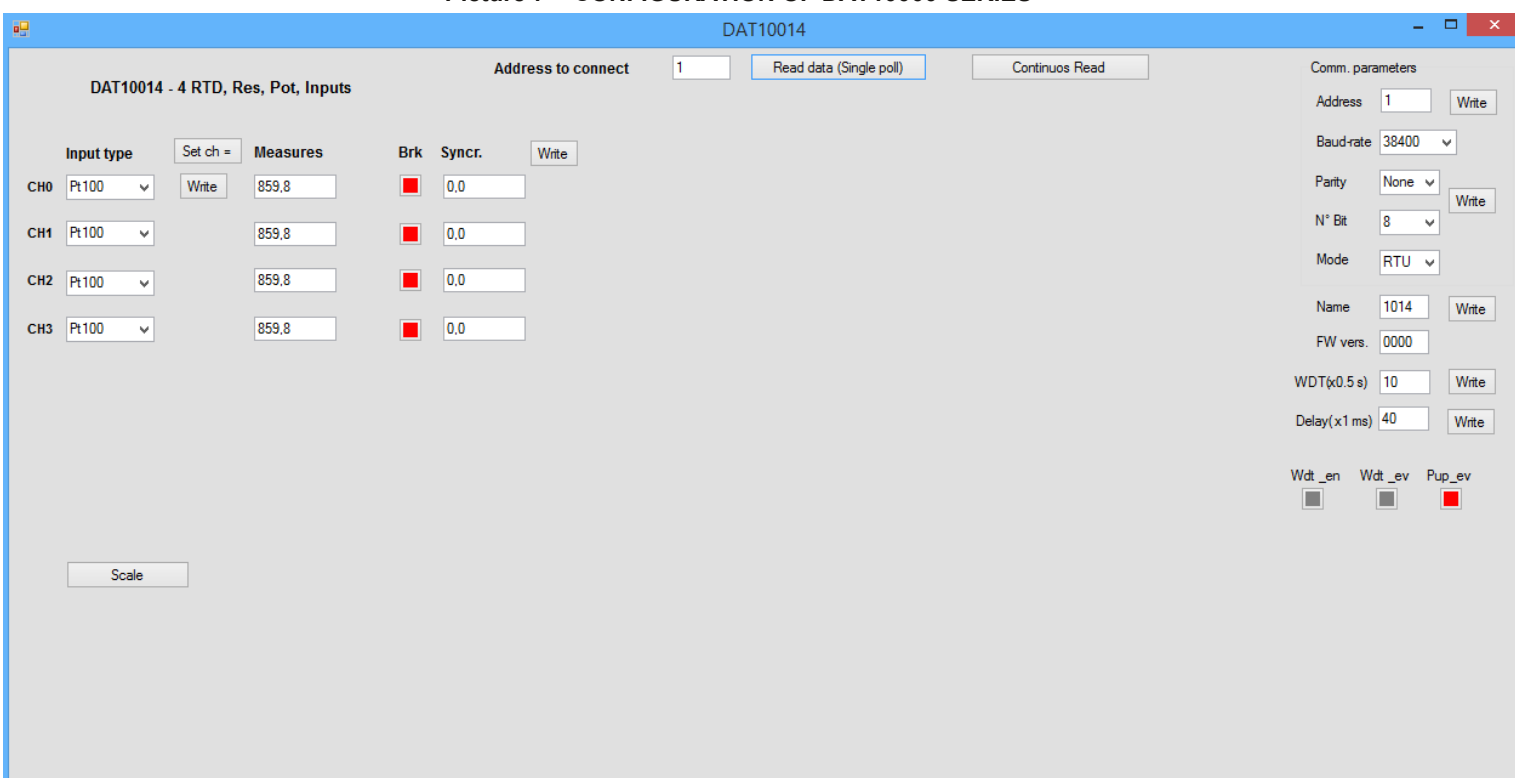
SCALING (PICTURE 8)

For the devices with programmable analogue input it is foreseen the possibility to scale the values expressed as engineering units in physical units. The measured input values are converted into the scaled value and then assigned to the registers related to the input measures.

Button **"Read Parameters"**: it allows to read the actual scaling parameters from the device.
For each line
"Offset": allows to introduce an offset on the input measure. This data must be expressed in same engineering units of the input measures.
Button **"Write Offset"**: allows to set the values of the input offset into the dedicated registers .
"Real Zero of Input": indicates the minimum value of the input scale per channel.
"Real Span of Input": indicates the maximum value of the input scale per channel.
"Scaled Physical Zero": indicates the minimum value of the scaled range per channel.
**"Scaled Physical Span"**: indicates the maximum value of the scaled per channel.
Buttons **"="**: allow to set the values to which are related with the same configuration.
Button **"Write Scale"**: allows to set the parameters of the scaling into the dedicated registers .
Button **"Back"**: allows to get back to the configuration window. The values set without writing won't be saved.

Picture 8 – SCALING
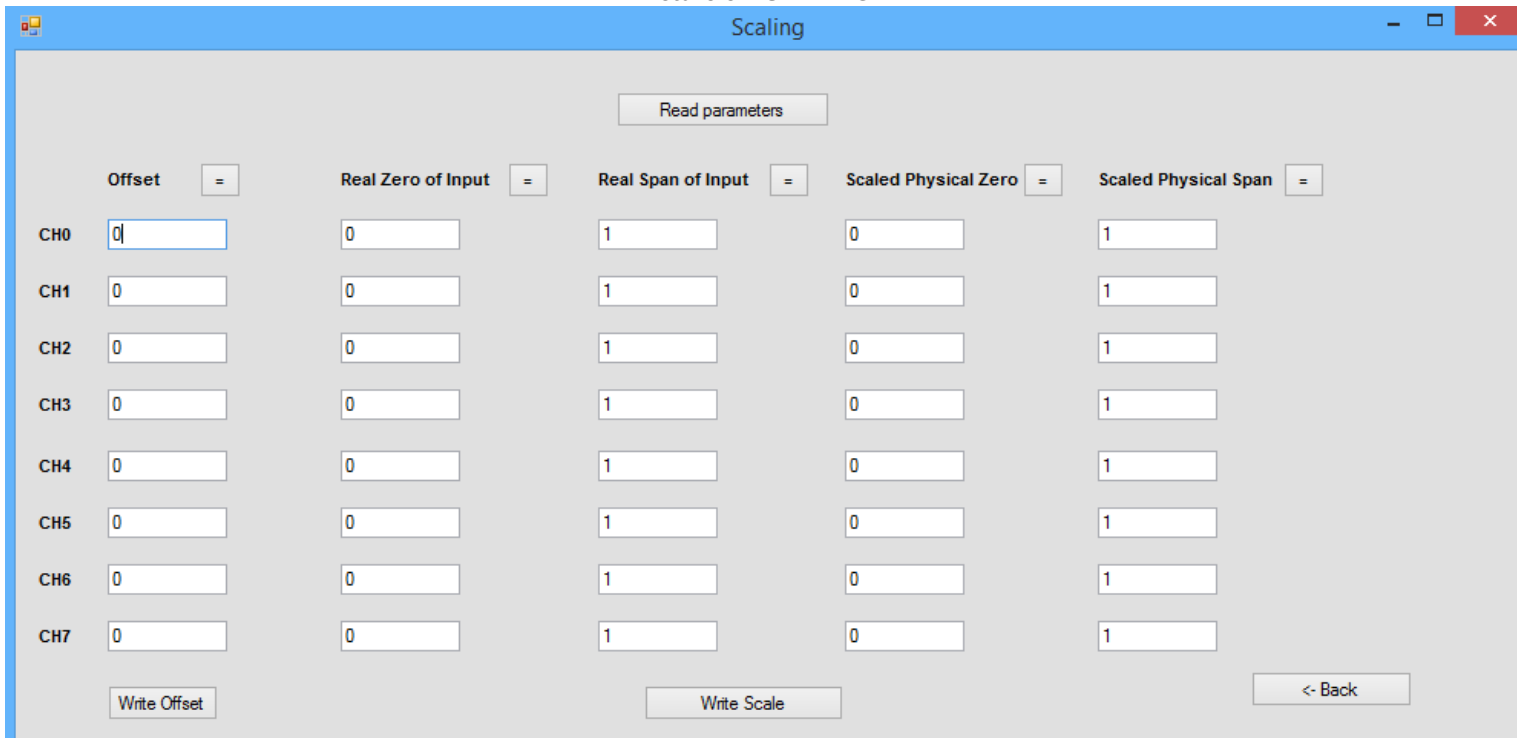
SWITCH (PICTURE 9)

For the devices of the DAT10000 series the wizard to configure the dip-switches is available (Picture 9).

"Address": in this field must be inserted the decimal value of the address that the user wants to configure.
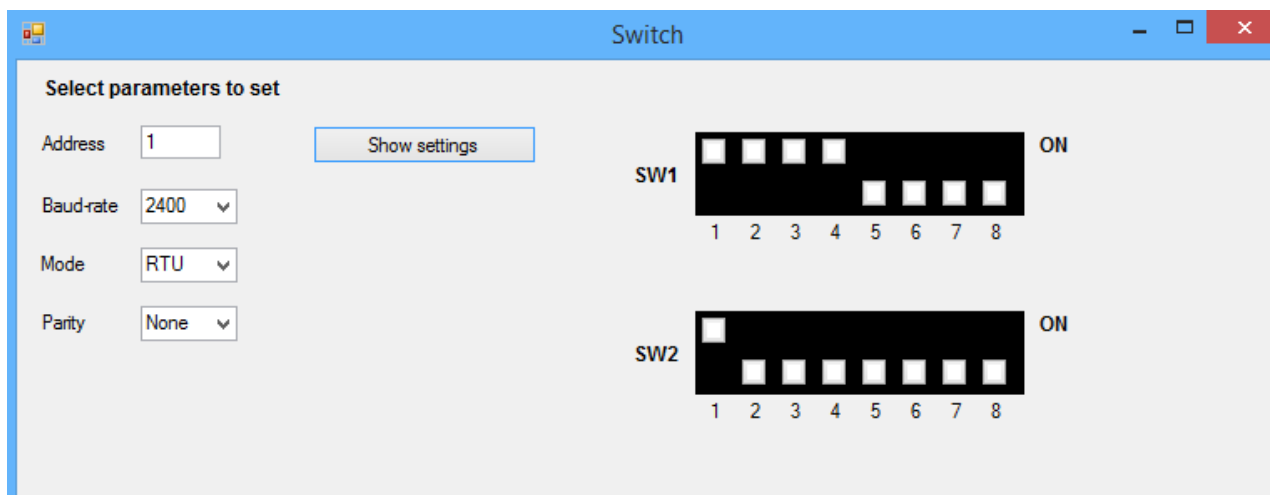**"Baud-rate"**: by this combo-box the user can select the baud-rate to be configured.
"Mode": by this combo-box the user can select the Modbus Mode to be configured.
"Parity": by this combo-box the user can select the Parity Mode to be configured.

Button **"Show settings"**: shows how to set the dip-switch in function of the previous parameters selected .

Picture 9 – SWITCH

MODBUS TERMINAL (PICTURE 10)

This window allows to create Modbus command.

In function of the mode of Modbus set in the Main window the command are sent in Modbus RTU (with error control CRC) or Modbus ASCII (with error control LRC)

The Modbus function supported are those of DATEXEL devices.

The supported functions are:

01 - Read coil status
02 - Read input status
03 - Read holding registers
04 - Read input register
05 - Write single coil
06 - Write single register
15 - Write multiple coil
16 - Write multiple registers

"Send": sends a command to the device.

"Start" starts a communication cycle. To stop it click the **"Stop"** button.

"**Address**": insert in this field the address of the slave device to which send commands.

"Function": allows to choose the Modbus function between those listed above.

"**Stop on Error**" if the flag is selected, in case of continuous transmission the process is interrupted when an error occurs.

Other parameters must be set referring to the Modbus function code selected. Refer to the Modbus standard about to how to set the data

Picture 10 – MODBUS TERMINAL

ERROR MESSAGES AND CONDITIONS OF ERROR

Information Messages
-*"Port not open":* this message is displayed when the user tries to establish a communication with a slave device and the COM port is not open.

Error messages

-*"Com Port Not available or used;connect an active Com port or close the software using the port, then click the button Refresh COM"*
This message is displayed at the software opening and there are not COM port available in the PC.
-*"Error: time-out must be greater of 100 ms"*
This message is displayed when the Time-out settings for the COM port is lower than 100 ms
-*"Error: The Polling Delay value must be greater of or equal to 0"*
This message is displayed when the setting for the Polling delay is lower than 0 ms
-*"Error: Com Port is already opened; close it and retry"*
This message is displayed when the user tries to establish a communication with a slave device and the COM port is already in use.
-*"Time-out error" (in red inside section "Response" in the main window)*
This message is displayed when the user tries to establish a communication with a slave device and a generic error occurs.
-*"Time-out error, no response" (in red inside section "Response" in the main window)*
This message is displayed when the user tries to establish a communication with a slave device and there is not response from the slave device.
-*"Function error: no CRC match" (in red inside section "Response" in the main window)*
This message is displayed when the user communicates via Modbus RTU with a slave device and the CRC bytes in the response don't correspond to the expected value .
-*"Function error: no function code match" (in red inside section "Response" in the main window)*
This message is displayed when the function code in the response differs from the one sent in the query .
-*"Function error: no LRC match" (in red inside section "Response" in the main window)*
This message is displayed when the user communicates via Modbus ASCII with a slave device and the LRC bytes in the response don't correspond to the expected value .
-*"Function error, exception occurred" (in red inside section "Response" in the main window)*
This message is displayed when the user communicates with a slave device and and it returns an exception error due to a query not allowed.
-*"Error: address must be from 1 up to 247"*
This message is displayed when the user tries to establish a communication with a slave device and the query is sent to an address not included in the range indicated .
-*"Error: watchdog timer must be from 1 up to 254 (0.5 to 127 seconds)"*
This message is displayed when the user tries to establish a communication with a slave device and the time is not included in the range indicated .
-*"Error: delay time must be from 1 up to 254 (1 to 254 milliseconds)"*
This message is displayed when the user tries to establish a communication with a slave device and the delay is not included in the range indicated .
-*"Error: the channels must be programmed as the same level:"*
This message followed by the electrical parameters is displayed when the user tries to set the channels of analogue inputs with sensors that involves different gains.
-*"IP address not correct":*
This message is displayed when the user tries to set an IP address not written correctly.
-*"Error: Socket is already opened; close it and retry":*
This message is displayed when the user tries to establish a communication with a slave device and the IP address is already in use and not more socket opening are allowed.

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