Indice

SCIENCE GATE Your Automation Partner

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Introduction to the GRD-MQ

Purpose of this manual

The purpose of this manual is to provide the instructions to quickly and easily install and operate the GRD-MQ equipment (3G models)

The installation of the GRD-MQ also implies the installation of middleware and eventually any other application depending on the intended use for the system.

Telemetry solutions GPRS with GRD-MQ

The GRD-MQ has multiple uses. These are the most common uses that will guide you to read this manual.

- **GPRS RTU/Datalogger to MQTT broker**
  - Physical inputs/outputs
  - Modbus inputs/outputs (embedded Modbus master)
  - Serial port data (using script programming)
  - Local input/output control (using script programming)
  - *Publish current values (reports) and timestamped values (historics) using MQTT*
  - *Receive commands/order from the MQTT broker using subscription*
- **GPRS RTU accessible by Modbus**
  - Physical inputs/outputs
  - Serial port data (using script programming)
  - *Modbus protocol to read input/outputs remotely*
- **Remote Access to serial port**
  - Remote serial port via MQTT broker
- **SMS alarms/control**
  - Physical inputs/outputs
  - Modbus inputs/outputs (embedded Modbus master)
  - Serial port data (using script programming)
  - Local input/output control (using script programming)

GPRS RTU/Datalogger to MQTT broker

There are hundreds of types of sensors that can be contacted directly to the GRD-MQ inputs to measure different types of variables. Depending on the GRD-MQ model, sensors could be used to deliver signals in 0-10V, 4-20mA or pulses, or simply connect different devices to their inputs/outputs. The GRD-MQ can also be configured as Modbus master and queries can be made to different slaves to expand its inputs/outputs.

The GRD works as a datalogger, creating records with timestamp with the value of the built-in or external I/Os and publish them to the broker

The GRD can also be used to do a local control over its inputs/outputs using the script programming feature.

Nota: Exemys does not provide the *MQTT broker*

For this type of solution the following procedure must be followed:

- Have an MQTT broker available
- Install the GRD.
- Install the configuration software (“GRD Config”), this application will allow us to configure all GRD

parameters locally or remotely.
- Enable the SIM card and configure the APN of your telephone network
- Establish a connection between the GRD-MQ and the broker
- Configure the inputs/outputs in the GRD according to their use:
  - Physical inputs/outputs
  - External Modbus inputs/outputs.
    - Configure the GRD-MQ serial port.
    - Configure the “Embedded Modbus master" and the queries we want it to make.
- Configure the topics and formats to publish an enable **reports** and **historicals** to publish

Remote serial port

This procedure will allow you to send and receive data to and from the serial port (RS232/RS485) using publish and subscribe.

For this type of solution the following procedure must be followed:

- Install the GRD.
- Install the configuration software (“GRD Config”) V9.1+, this application will allow us to configure all GRD parameters locally or remotely.
- Enable the SIM card and configure the APN of your telephone network
- Establish a connection between the GRD-MQ and the broker
- Configure the serial port in Remote mode
- Configure the serial ports publish and subscribe topics

SMS alarms / control

The GRD-MQ can send SMS alarms to up to 8 recipients based on the value of its inputs.

You can also send and SMS to the GRD-MQ to ask for the value of a particular input/output or to activate an output.

This inputs/outputs can be physical or Modbus signals.

The SMS feature can be used together with GPRS solutions.

Script programming can also be used for customized solutions where the standard criteria to send SMS alarms is not enough.

For this type of solution the procedure below must be followed:

- Install the GRD-MQ
- Install the configuration software via USB (“GRD Config”), this application will allow us to configure all GRD-MQ parameters locally or remotely.
- Enable the SIM card
- Configure the inputs/outputs in the GRD-MQ according to their utilization:
  - Physical Inputs/Outputs
  - External Modbus Inputs/Outputs.
    - Configure the GRD-MQ serial port.
    - Configure the “Embedded Modbus master" and the desired queries.

- Configure the possible recipients
- Configure the possible conditions to send an SMS alarm and the text that will be sent

2020-11-20

	***MQ** models share the electrical specifications with **XF** models*

GRD Models – Installation

Selection table

Depending on the application you will be able to choose from the following models:

Model	Serial port	Modbus master	Digital Inputs	Digital Outputs	Analog Inputs	Pulse count	Mobile Data	SMS alarms	Script programming	Power supply
GRD1620-XF-3G	1 x RS232/1 x RS485	Yes	-	-	-	-	2G/2.5G/3G	Yes	Yes	External 10 to 30Vcc
GRD3621-XF-3G	-	Yes	4(1)	4(1)	2 (4)	4 (2)	2G/2.5G/3G	Yes	Yes	External 10 to 30Vcc
GRD3625-XF-3G	1 x RS232/1 x RS485	Yes	6(1)	6(1)	4	6 (2)	2G/2.5G/3G	Yes	Yes	External 10 to 30Vcc
GRD3534-XF-3G	2 x RS232/RS485	Yes	16	8	8	8 (3)	2G/2.5G/3G	Yes	Yes	External 10 to 30Vcc

(1) Digital Inputs/Outputs are configurable and share the same terminals.

(2) Digital inputs can be use as pulse inputs.

(3) Some digital inputs can be use as pulse inputs.

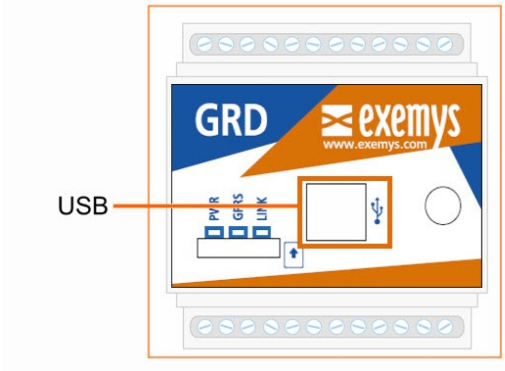
(4) A PT100 temperature sensor can be connected to AI1

Wiring – USB configuration port

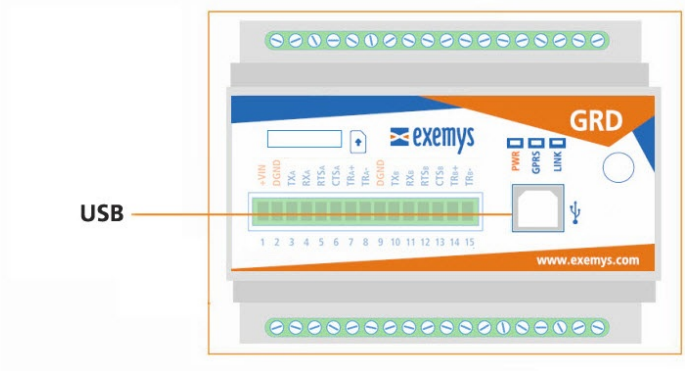
All GRD models have a USB communication port. This port is used to configure the GRD.

For the connection with the PC a type “B” USB standard cable is used.

GRD1620-XF-3G / GRD3621-XF-3G / GRD3625-XF-3G



GRD3534-XF-3G



LED Indicators

The GRD has 3 LEDs indicators.

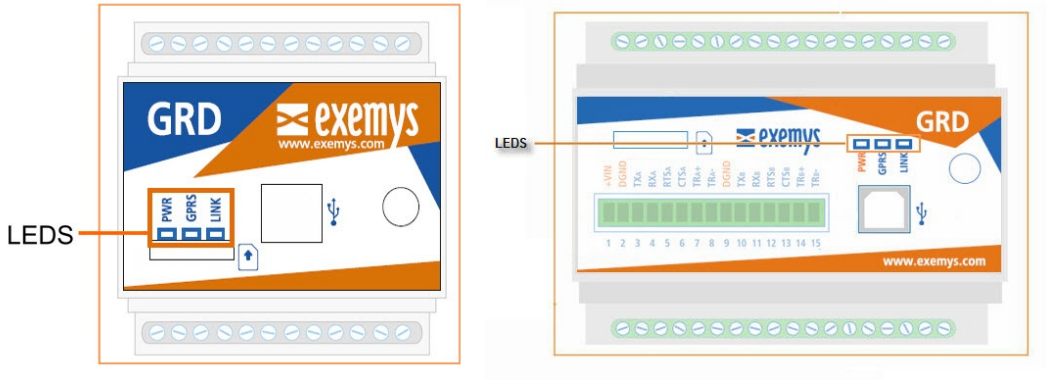
PWR: Power applied to the GRD

GPRS: State of registration of the GRD in the GPRS network (GPRS, EDGE, 3G)

LINK: State of the connection between the GRD and the Middleware

GRD1620-XF-3G / GRD3621-XF-3G / GRD3625-XF-3G

GRD3534-XF-3G



We find below the detail of the indication of each LED independently and in combination.

PWR LED	GPRS LED	LINK LED	Description
Fast blinking	-	-	Connecting to the GSM network.
On	-	-	Connected to the GSM network if blinked previously otherwise SIM disabled.
On	Fast blinking		Connecting to GPRS/3G
On		-	Connected to GPRS/3G
On		Fast blinking	Connecting to the MW
On			Connected to the MW
Fast blinking			SIM card missing
On	One blink	-	Sending or receiving a SMS
On		One blink	Sending or receiving data via GPRS/3G
Sequencial blinking from left to right			Power on process
On	Slow blinking	-	Failure in connection to the GPRS/3G retrying in a few seconds
Blinking together with the LINK LED	Alternate blinking with the PWR and LINK LEDs	Linking together with PWR LED	Low signal level
On		Slow blinking	Failure in connection with MW retrying in a few seconds

Installation of the SIM card

Requirements

For the correct operation of the equipment the Micro SIM card must meet the following requirements:

A subscription to GSM and **GPRS/3G** services

It must be **cleared** to be installed in any equipment (some SIM cards can only be installed in the equipment where they were purchased).

Verify the **telephone number** assigned to the SIM Card.

You must know the data to access the **GPRS/3G network** of the telephone operator corresponding to the SIM card (APN, user, password). These data are preloaded in the GRD for Movistar Argentina, Telecom Personal Argentina and Claro Argentina. If you use another operator please contact support@exemys.com.

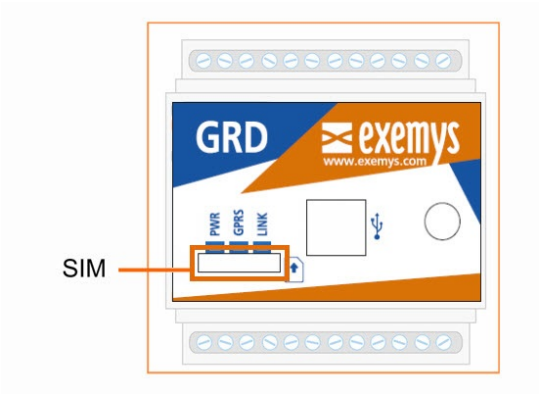
If the **PIN** (security code) of the SIM Card is activated you must enter it into the GRD when requested.

How to place the SIM card in the GRD

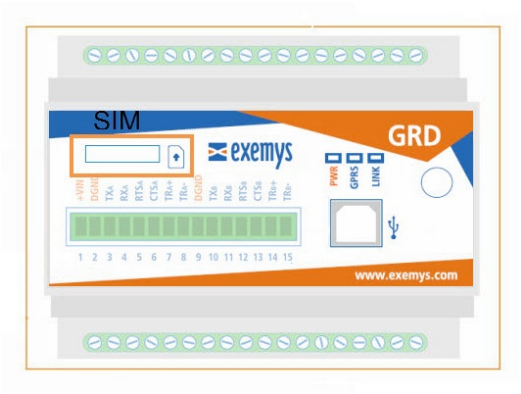
Place the SIM inside the GRD as shown in the figure or press it to remove

⚠	***Do not insert o remove the SIM card while the GRD is powered on***

GRD1620-XF-3G / GRD3621-XF-3G / GRD3625-XF-3G



GRD3534-XF-3G



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GRD-MQ configuration software – GRDconfig

GRDconfig is the application program used to configure the GRD equipment.

This application was developed with an easy-to-use feature in mind to configure and monitor GRD-MQ equipment.

The Configurator is supported on the following platforms: Windows 2003, XP, Vista, 2008, 7, 8 and 10 (32 and 64 bits).

Java Runtime Environment 1.8 (**32 bit version**) must be installed (available free in www.java.com).

Installation

For installation follow these steps:

- Run the installation software (download it from here www.exemys.com/grdconfig)
- A welcome screen will be displayed, then follow the instructions of the Installation program which will request the necessary information to complete the installation. Click on “Next” to continue.
- Destination folder: Select the folder for the installation of the application program.
- Wait for the installation program to copy all necessary files onto the hard disk, and press “Finish” to end the installation process.

Once installed you will see in the Programs menu a folder called Exemys. Inside the folder you will find another folder called *GRDconfig*; this folder contains the *GRDconfig* and *Uninstall* icons.

USB Driver Installation

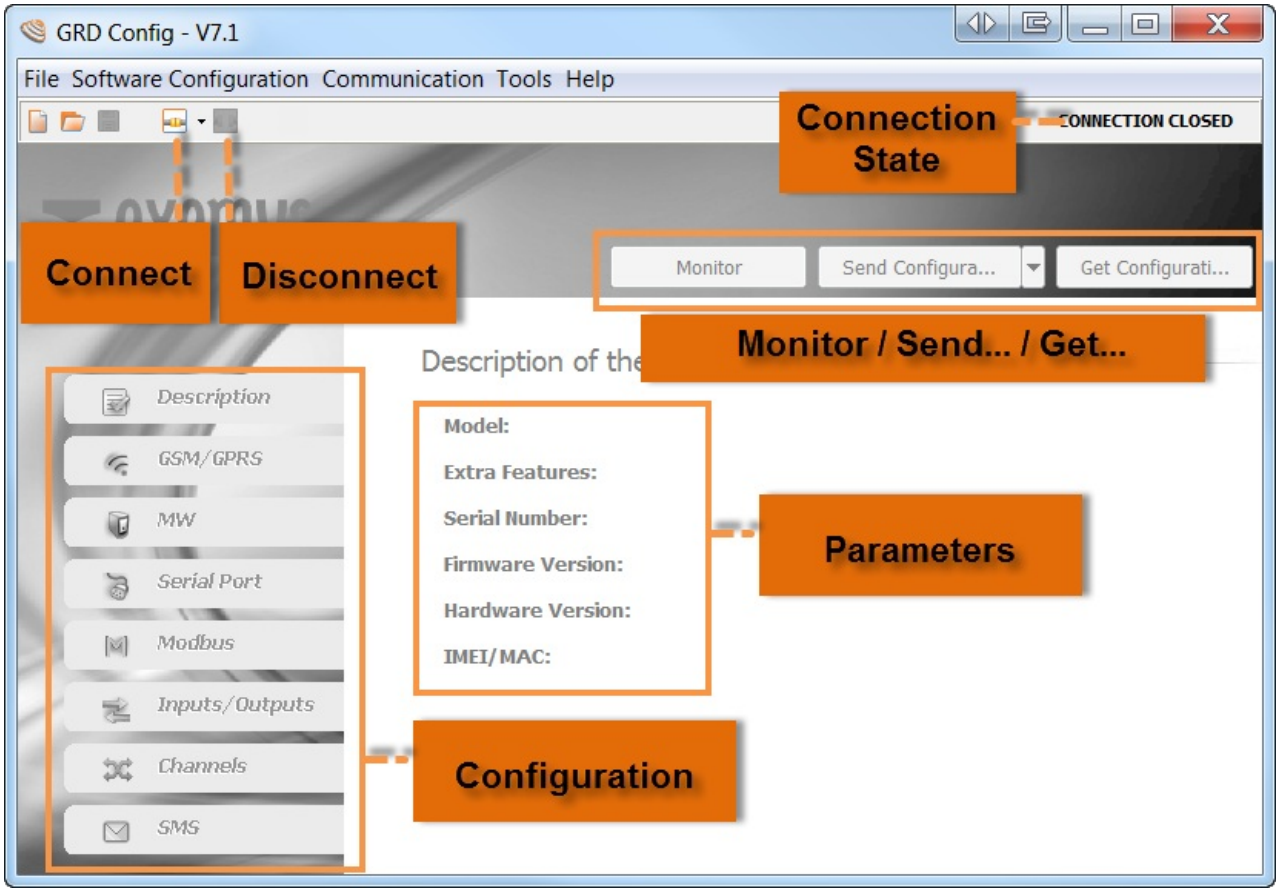
After intalling GRDconfig all drivers will be automatically installed. In case you still have problems you can manually install the drivers from here:

“C:\Program Files\Exemys\GRDconfig\DriverFTDI\InstallDriver.exe"

If you don't install the drivers you won't be able to configure the GRD-MQ and will get this message:

General description of the Configurator

The following figure shows the main screen of the Configurator.



Configuration of the USB port

Once the software is installed you won't have to configure any parameter of the USB port since this port recognizes automatically the COM in which the GRD is connected.

⚠	*You can only connect up two GRDs to the PC at the same time.*

Establishing the connection with the GRD

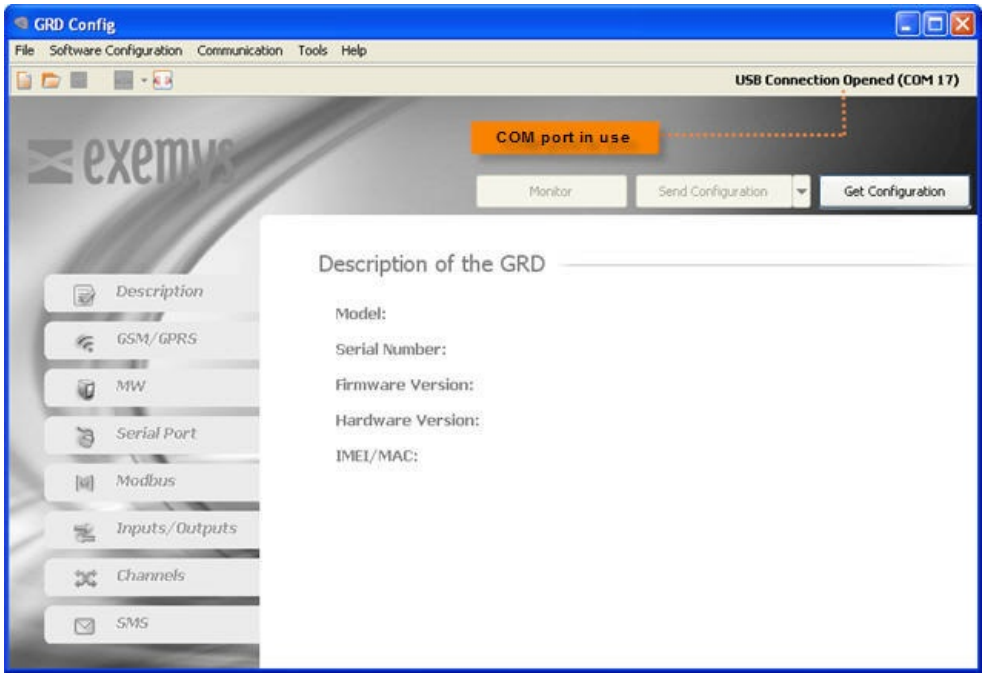
To connect to the GRD-MQ you must have the PC connected to the GRD-MQ using the cable described in "GRD models – Installation".

To establish the connection select the menu option "Communication -> Open Local Connection" or press the button.

If the communication fails verify that:

- The cable connecting the PC to the GRD is the correct one.
- The GRD is on.
- The driver is installed correctly.

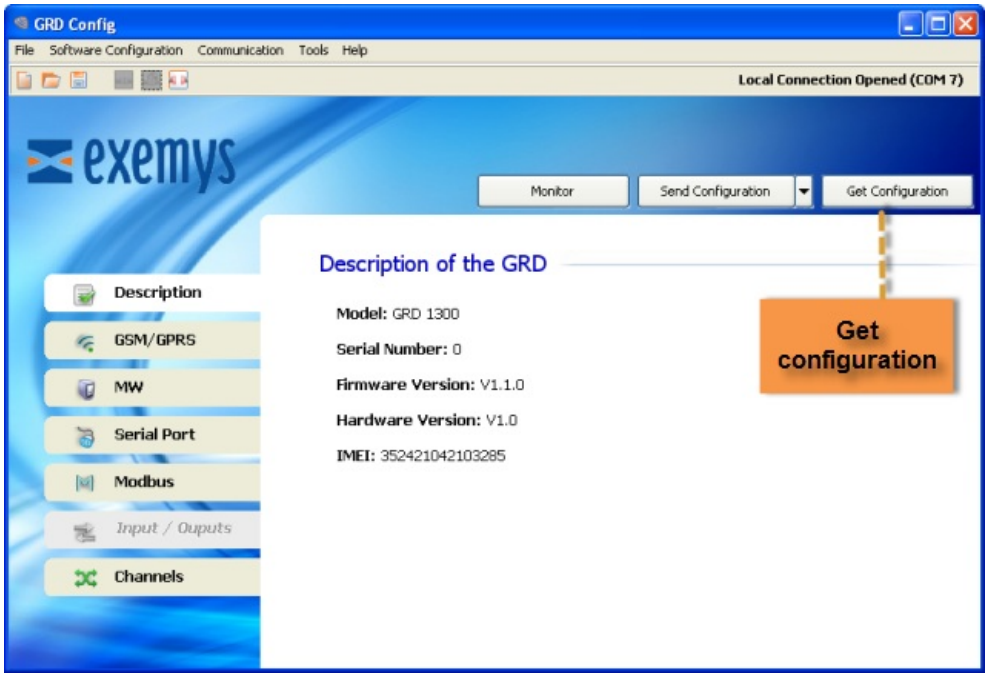
After a few moments you will be able to see that the state of the connection changes to connected and will also indicate the COM port of the connection.



Getting GRD parameters

To obtain the parameters of the equipment you will have to press the “Get Configuration” button and all the GRD parameters will be displayed indicating on the first screen, the model, IMEI, etc.

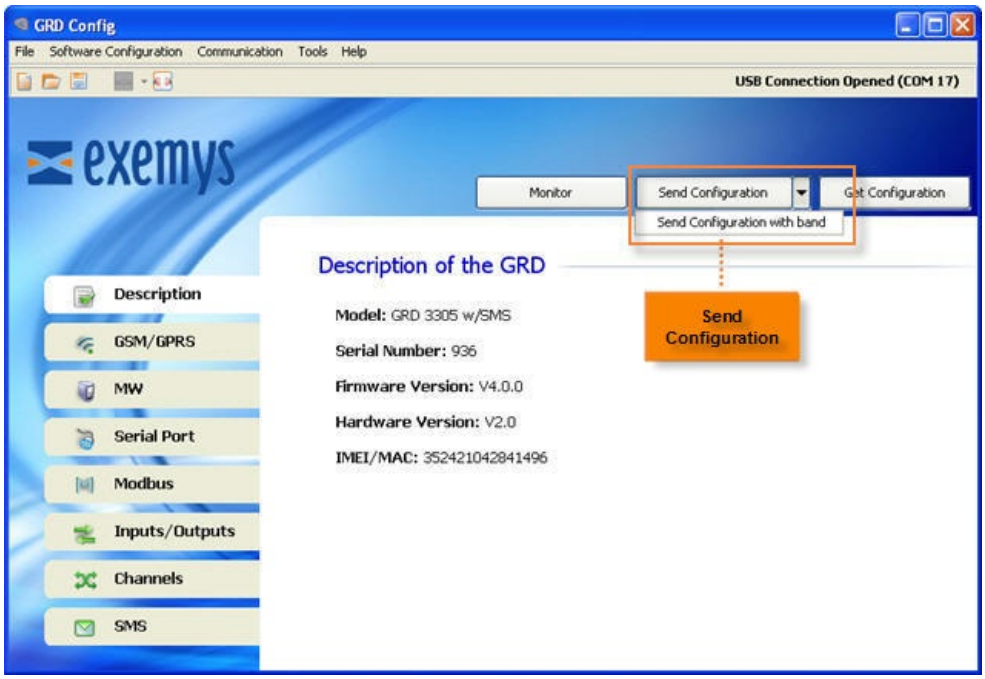
You will always have to read the GRD parameters to be able to modify the parameters or for monitoring purposes.



⚠	*If the Configurator finds an unknown model it will not enable any of the screens. Download the latest GRDconfig release from* here: http://www.exemys.com/GRDconfig

Sending parameters to the GRD

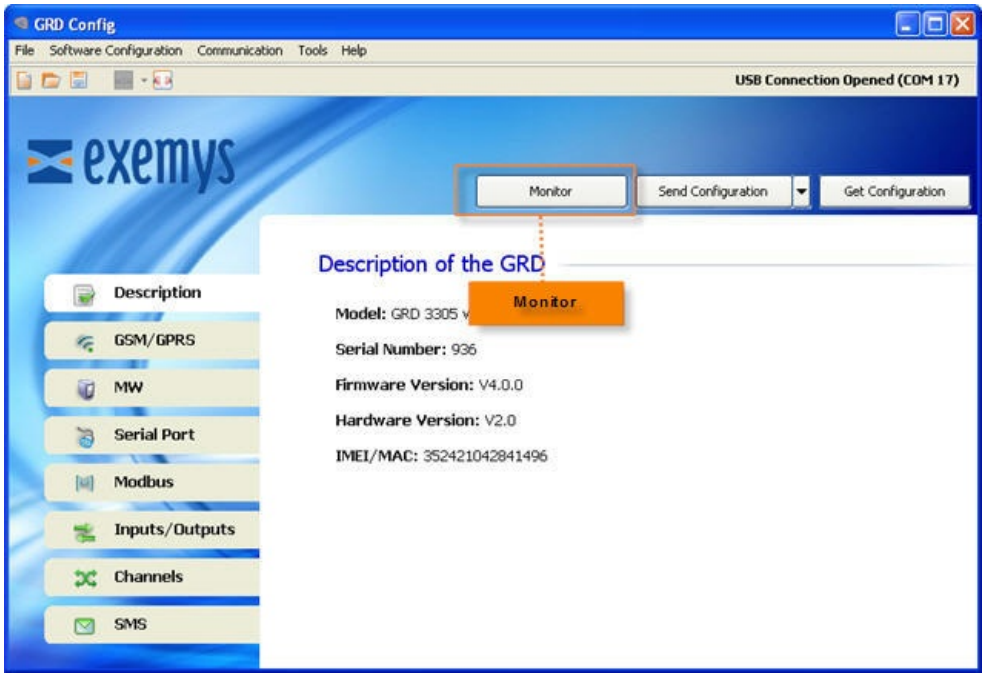
If you want to send to the GRD any change in the configuration press the “Send Configuration” button, please note that to the right of the button we have a combo that when displayed allows us to send the standard configuration plus the change of GSM band in case of necessity, this is because this parameter is not sent by default.



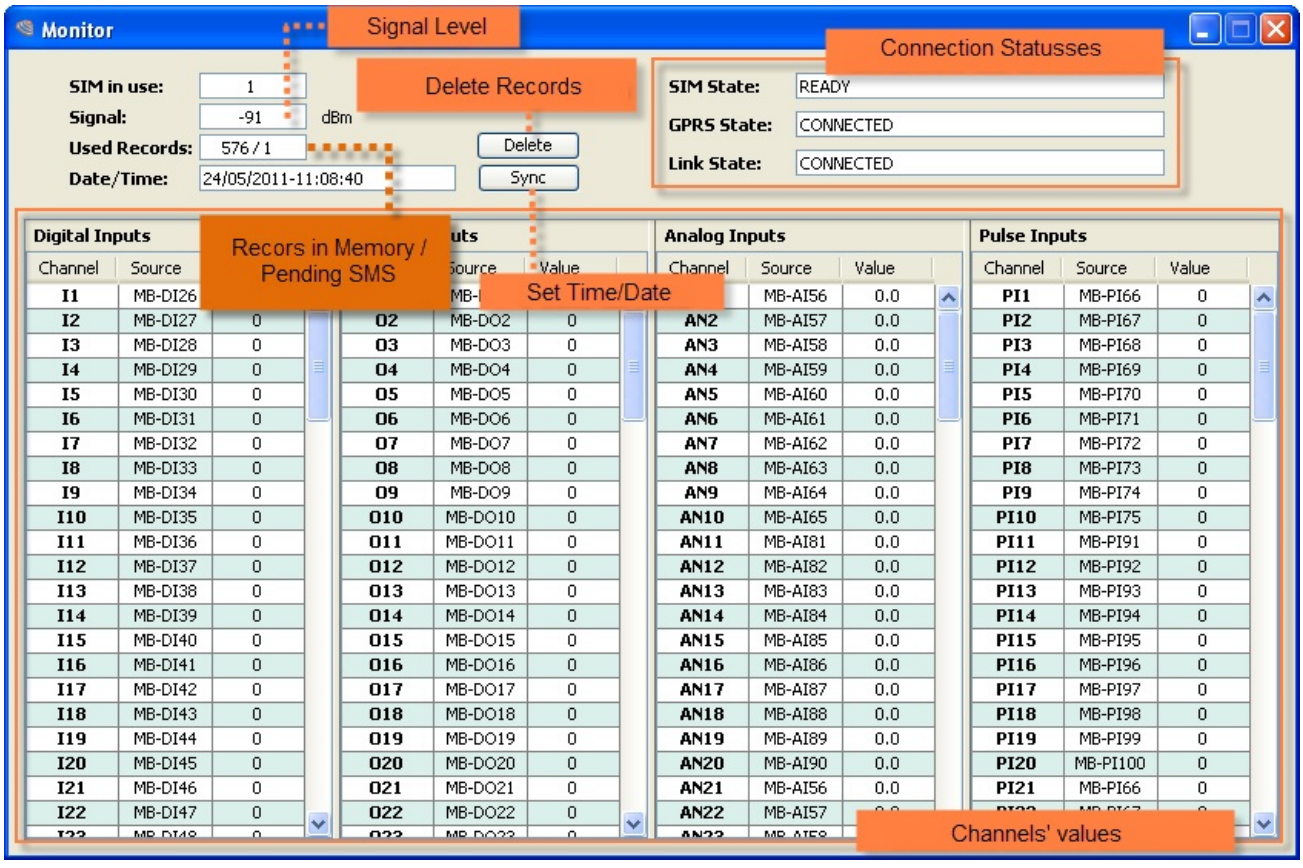
⚠	*It is very important to take into account that the GSM band in which the GRD will operate has to be configured according to the geographical area.*

Monitoring

To access the monitoring area where all the GRD parameters can be seen, you should press the “Monitor” button.

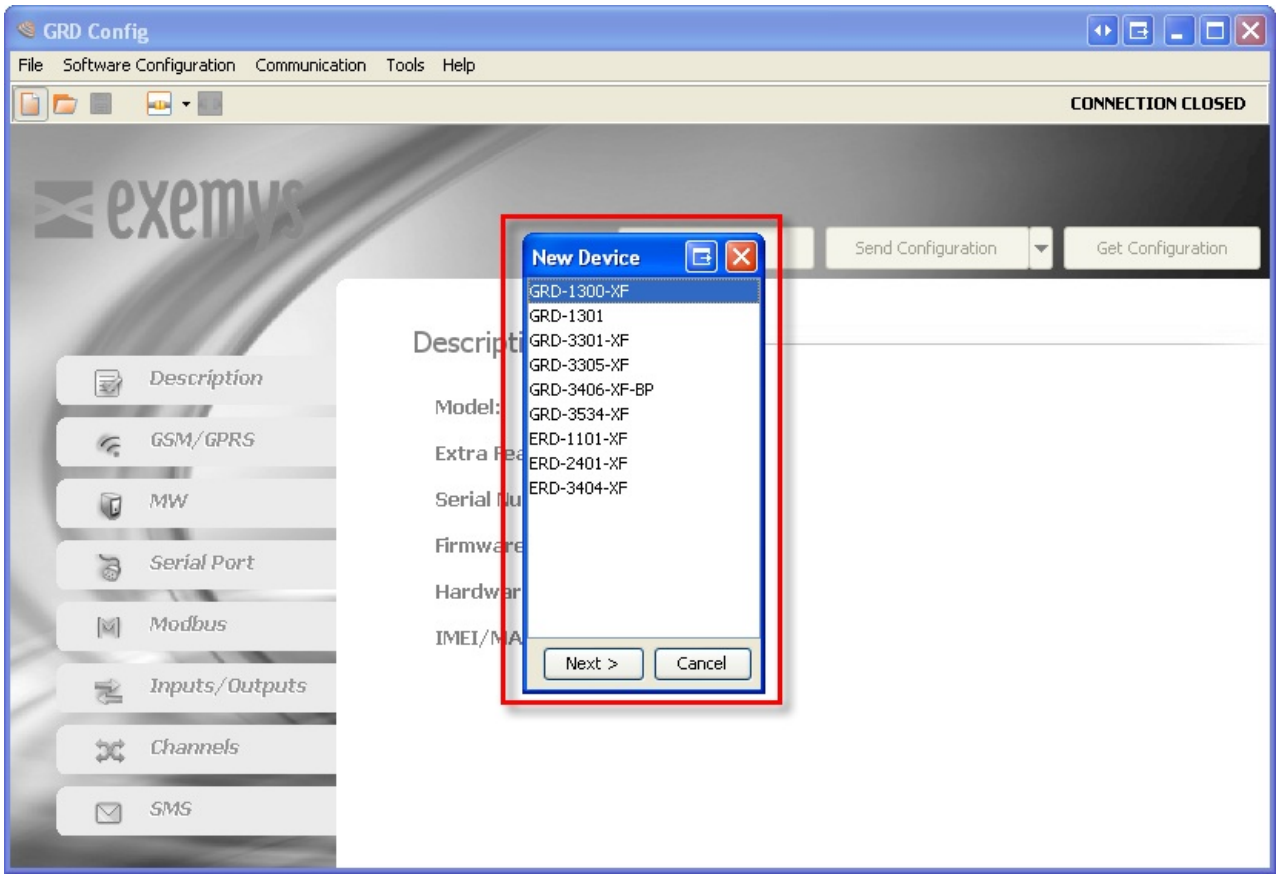


Once we enter monitoring the following screen will be displayed, in which we will be able to see the values of the input/output channels, the time, quantity of accumulated Historicals, the SIM in use and the states of connection of the equipment.



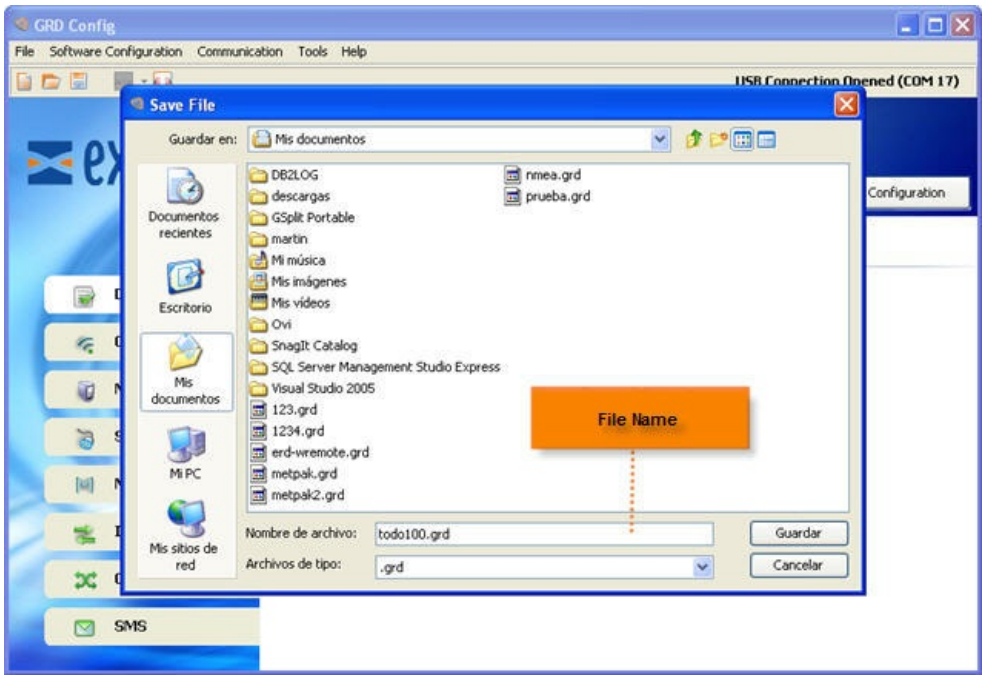
Saving configurations

"GRDconfig" allows us to save the GRDconfiguration so if we have to configure many equipments the same way, we won't have to load again the parameters one by one, the only thing to take into account is that the GRD ID number will have to be changed and avoiding to have a duplicate.
To create and save a configuration we don't need to have a GRD connected, only clicking in *"File -> New" or on the icon a list of the models will be displayed from which we make the selection.*



We then configure the parameters with *"File -> Save As"* or with the icon to load them later when the GRD is connected.

Once the configuration is saved, we can open it and load to multiple GRDs entering *"File -> Open"* or with the icon.



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GSM and GPRS services configuration

GSM Service

Enabling SIM / GSM

We first have to verify that the SIM has been selected and that it is within the corresponding GSM band. This is done in the following tab: GSM/GPRS -> General Configuration.

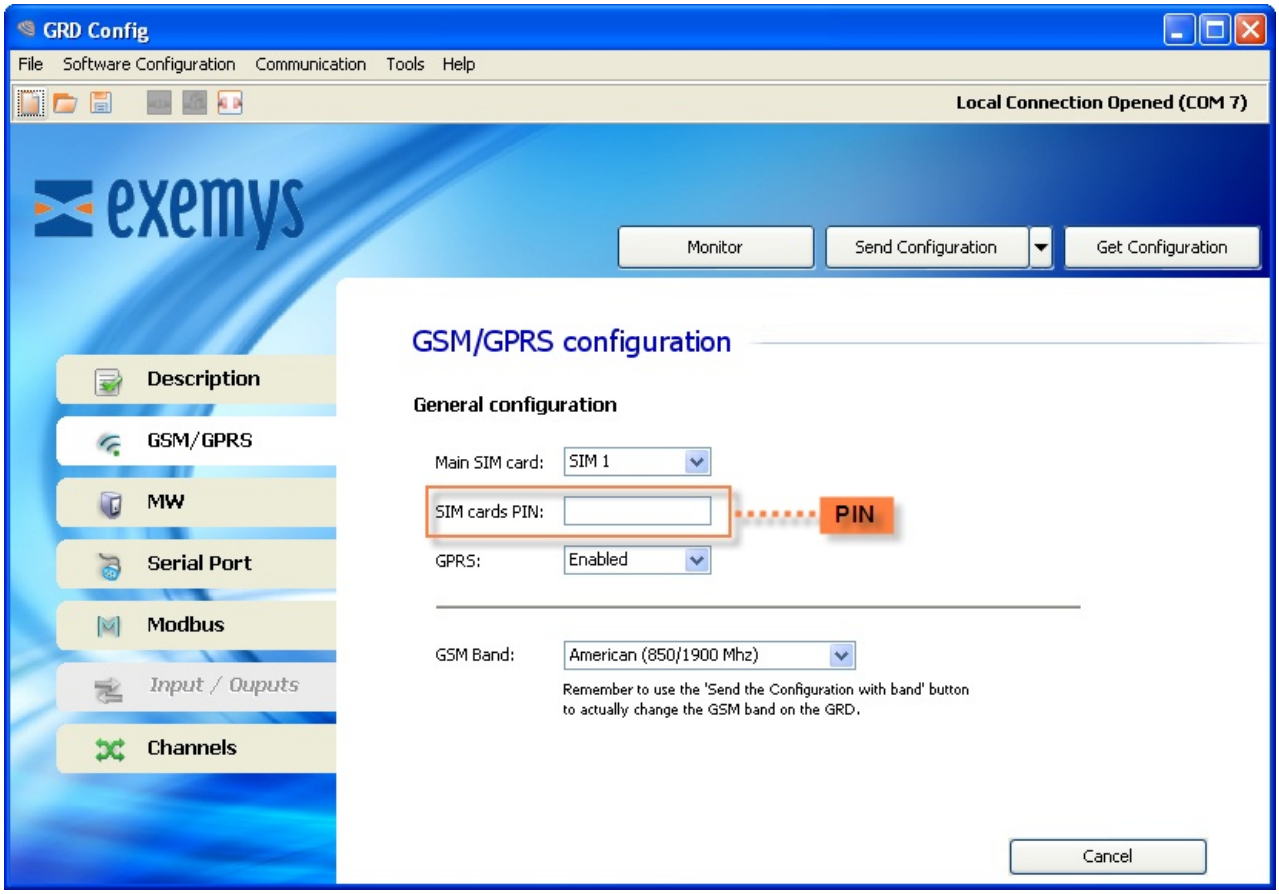
Configuring the PIN on the SIM card

If you place a SIM card with and activated PIN (security code), it must be configured in the GRD in order to have access.

⚠	Remember that if you enter a wrong PIN three consecutive times, the SIM card will block. To unblock it, you will have to enter the PUK of the SIM card. For more information check with the cell phone operator.

To load the PIN go to the “GSM/GPRS -> General Configuration” tab.

And then load it in the corresponding field.



When the new configuration is applied, the GRD will try to unblock the SIM Card with the entered PIN. If this is the correct one, the registration process will be initiated.

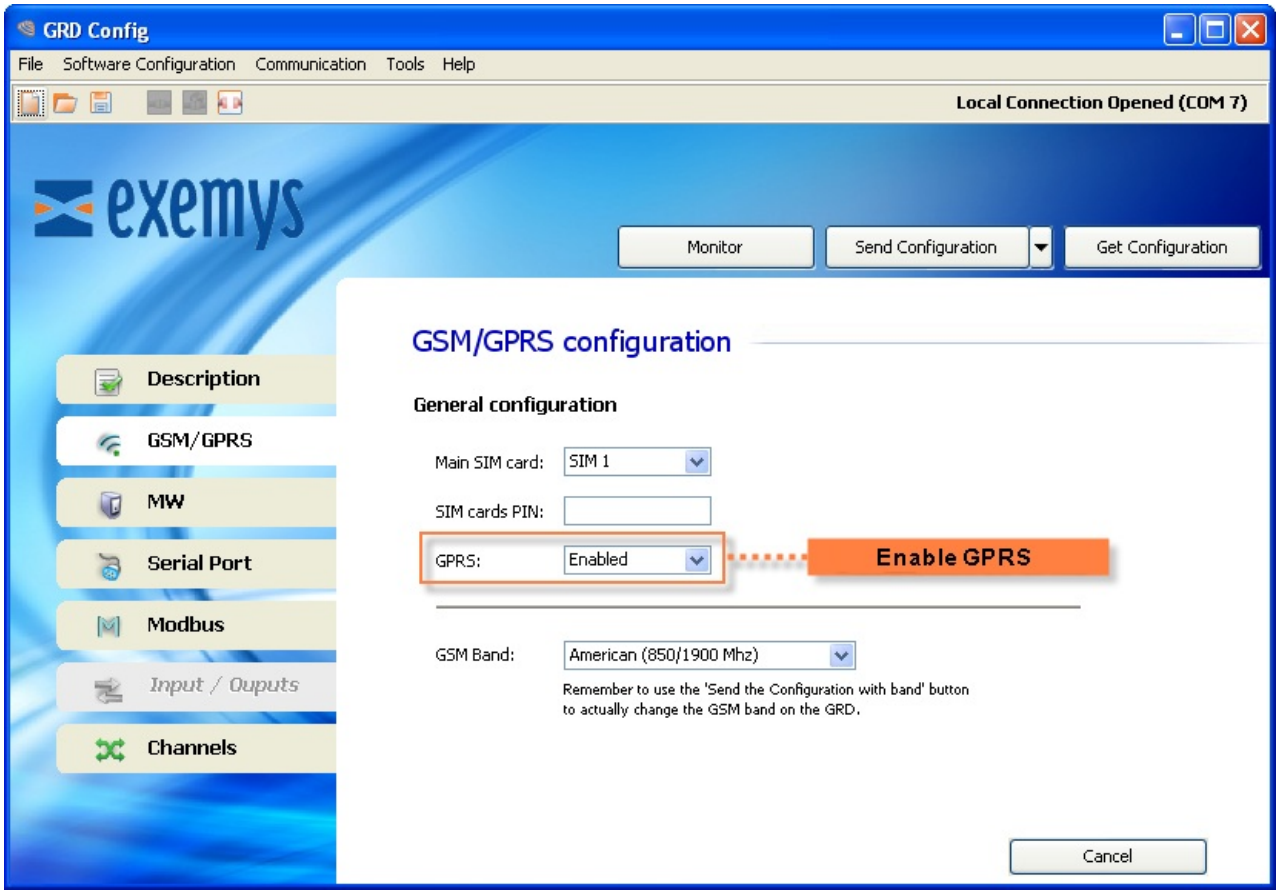
To verify if the SIM card that has been placed is blocked or if the configured PIN is correct, check the SIM status in the monitoring option.

GPRS service

Enabling the connection with the GPRS.

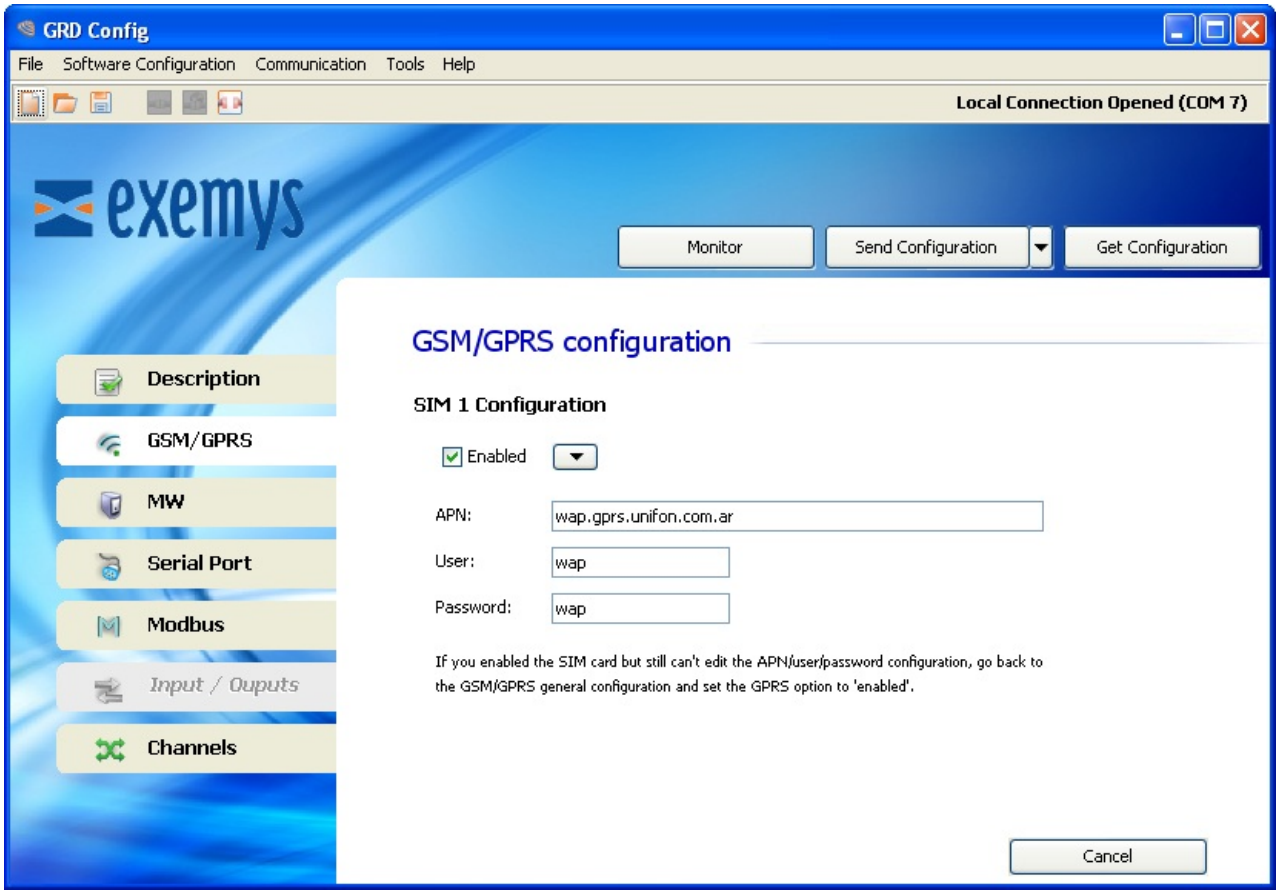
The enabled option of the GPRS must be verified in the “GSM/GPRS -> General Configuration” tab.

⚠	GPRS is only used if the GRD needs to be connected to the MW. If you are only planning to send SMS you can disable GPRS.

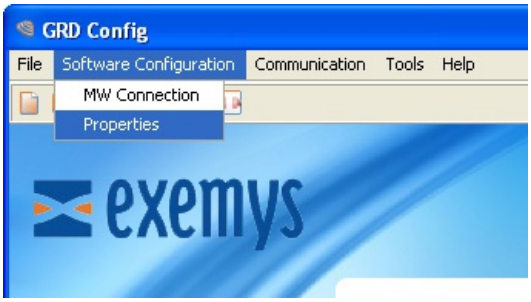


Configuring the cell phone operator

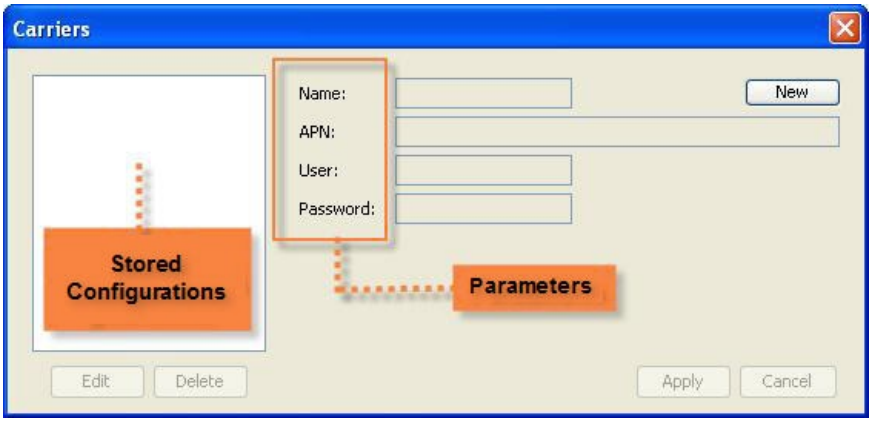
The following step is the correct configuration of the GPRS service. For this, you have to tell the equipment the corresponding operator of the installed SIM card or the APN parameters, user and password. These parameters are found in the “GSM/GPRS -> SIM x” tab (Where x is the SIM number, since it can be dual depending on the model).



The GPRS parameters can be saved so they won't have to be entered every time the GRD is used with the same cell phone operator. To do this you have to go to "Software Configuration -> Properties".



A window will be displayed on which we will be able to enter a name to recognize the configuration, APN, user and password.



2017-06-02

Connection between GRD-MQ and the broker

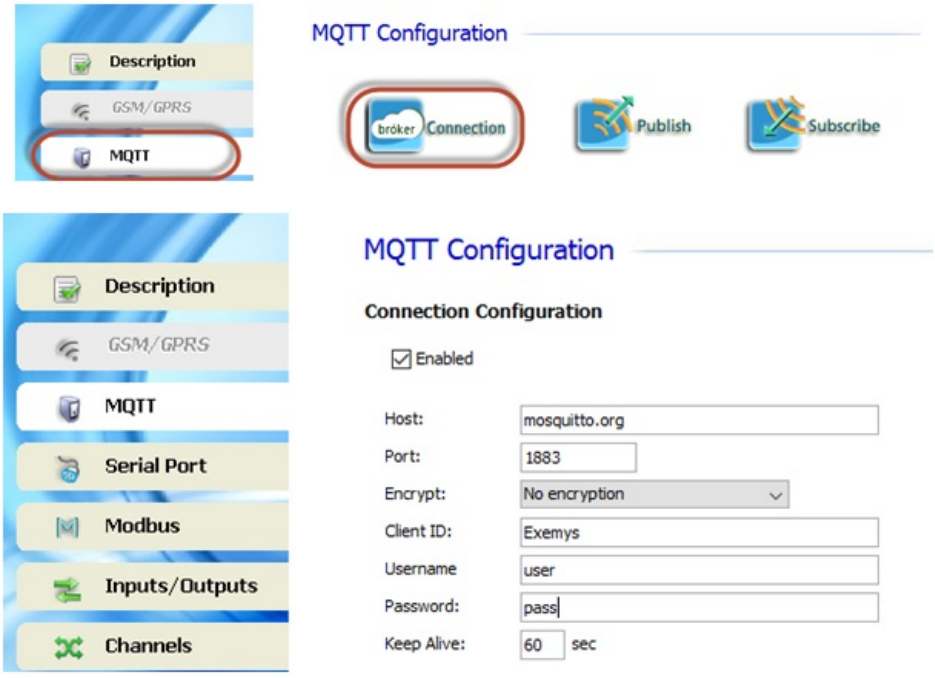
Configuration of the GRD-MQ to broker connection

Communication with the broker uses a TCP/GPRS connection. To be able to establish the connection it is necessary to:

- Place the antenna correctly and ensure GPRS coverage.
- Place the SIM card, and, if necessary configure PIN.
- Configure correctly the cell phone operator for the establishment of the GPRS connection.
- Configure the MQTT connection parameters
- Have a MQTT broker server ready and running
-

Configuring the broker connection

The broker's address and port are configured on the MQTT tab



Enabling the connection with the broker

When this option is enabled, we tell the cLAN-MQ to establish connection with the specified configuration. If this option is disabled the cLAN-MQ will not establish outgoing connections.

Host - Port

The IP address or URL of the server where the broker is running must be entered here. The cLAN-MQ can resolve URLs using DNS.

Unencrypted connections default port is 1883. Encrypted port is tipically 8883.

Encrypt

The cLAN-MQ can establish the link without encription ("No encryption") or using TLS 1.2 and TLS 1.0

CA signed server certificate: No cerfificate required.

CA certificate only: You must upload the CA certificate for validation

Self signed certificates: You must upload CA certificate, client certificate and client key

⚠	For GRD-MQ to be able to use "CA certificate only" and "Self signed certificates" the GRDs clock must be setted properly. You can do this from "Monitor" in the configuration software.

Client ID, Username y Password

This parameters must match the ones configured on the broker.

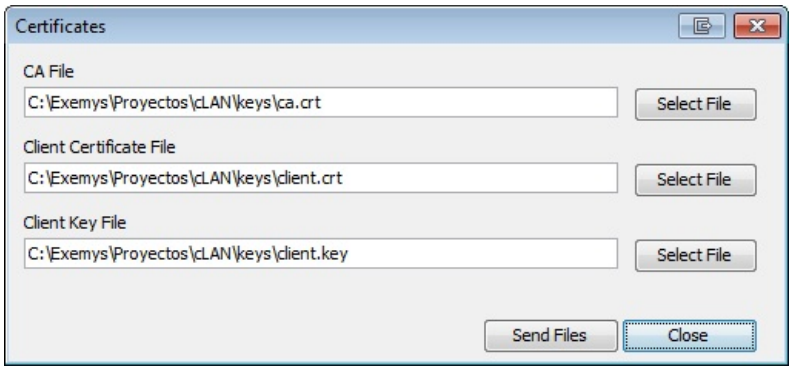
Keep Alive

Time in seconds to send the MQTT keep alive message (to keep the link alive in case there's no other MQTT message)

Certificates upload:

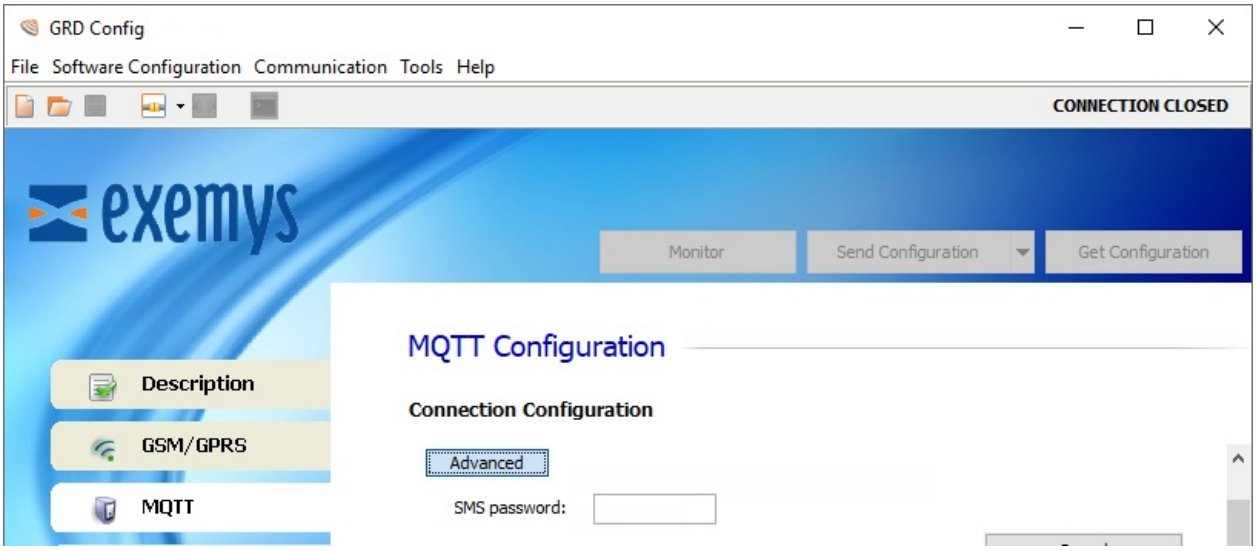
⚠	You must be connected to the cLAN to upload the certificates. They are not included in the configuration

After pressing the "Certificates" this window will pop up.



File format must be PEM

Advanced



SMS password

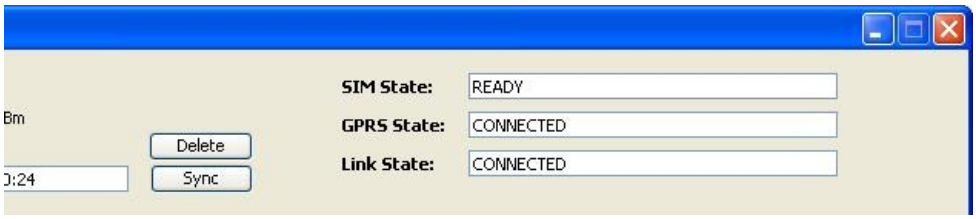
This password can be used to protect remote SMS configuration

Monitoring the GRD-MQ to broker connection

Monitoring the connection in the GRD-MQ

To verify whether the entered configuration into the GRD-MQ is the correct one we have the possibility of monitoring the status of the connections and the signal.

To access the monitoring screen of the configurator click on the “Monitor” button. Then, the following screen will be displayed:

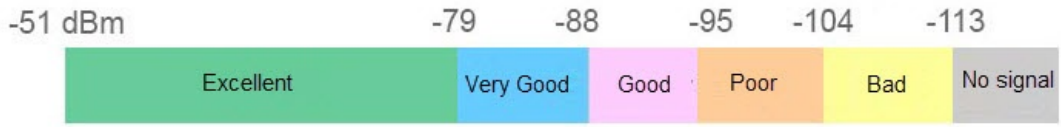


From here, the following parameters related to the connection are of interest: “Signal, SIM State, GPRS State and Link State”.

Signal level

It indicates the signal level in dBm, the minimum value is -113 dBm, data transmission is impossible at this value.

Use this chart as reference for signal qualtity.



SIM State

- ***Disabled:*** The SIM (Chip) is disabled from the GRD-MQ configuration.
- ***Attaching:*** It is being registered in the GSM network.

- ***Selected but not resent:*** In models with SIM detection it indicates that the SIM is not placed.
- ***Pin Required:*** This message appears when a SIM card requires a PIN.
- ***PIN Error:*** This message shows that the PIN entered is incorrect.

	If a PIN is entered incorrectly 3 consecutive times, the SIM card will block. To unblock it, you would need to enter its PUK. For more information contact your cell phone operator.

- ***SIM Blocked:*** The SIM card is blocked, to be able to enable it you must enter its PUK. This operation is not possible using a GRD, and you will need a cell phone or another device to release the card.

	If the PUK is entered erroneously too many times (the number of times depends on the telephone operator) you should change the SIM card. For additional information please contact you cell phone operator.

- ***Low Signal:*** The signal level is insufficient.
- ***Ready:*** It is registered in the network.

GPRS State

The following are the possible states of the GPRS connection.

- ***Disabled:*** The GPRS connection is disabled in the GRD configuration.
- ***Waiting SIM Ready:*** The GPRS connection is disabled but is waiting for the equipment to register a GSM.
- ***Connecting:*** Is in the process of connection.
- ***Connected:*** Successful connection to GPRS.
- ***Error:*** Error in the connection to GPRS, it will retry in 30 seconds.

Link State

The TCP connection state can also be monitored. Remember that to be able to establish such a connection, you must count first on a GPRS service.
Once the GPRS connection is established, the possible TCP connection states are:

- ***Disabled:*** The TCP connection has net been enabled. In this state the Link LED is off.
- ***Waiting GPRS Ready:*** The connection to the broker is enabled but is waiting for the equipment to connect to the GPRS to initiate it.
- ***Connecting:*** The GRD is attempting to establish a connection to the indicated IP address and port. If the GRD is not able to establish the connection, the length of time in this state might be an indication of a failure. If it remains in this state for a few seconds (less than 10), it might be trying a connection to a closed port. If it maintains the state during a minute or more it might be attempting to connect to a port and/or IP behind a firewall and is being filtered.
- ***Connection Failed, Host Unreachable and Connection Refused:*** The 3 states imply that the connection to the broker was not possible, but individually, they indicate the reason why they occurred.

In general, each one has a specific motive although it depends on the connection on the server side for the indication to be correct, even so, any of the these 3 errors indicate a problem in the connection.

  - ***Connection Failed:*** This error appears when a connection to the configured IP is not possible.
  - ***Host Unreachable:*** This happens when a connection to the IP is possible the port is open, through the router or firewall, but there is nothing connected to that port.
  - ***Connection Refused:*** In this case the connection cannot be established because the configured port is closed, this could happen because a router or firewall are blocking it.

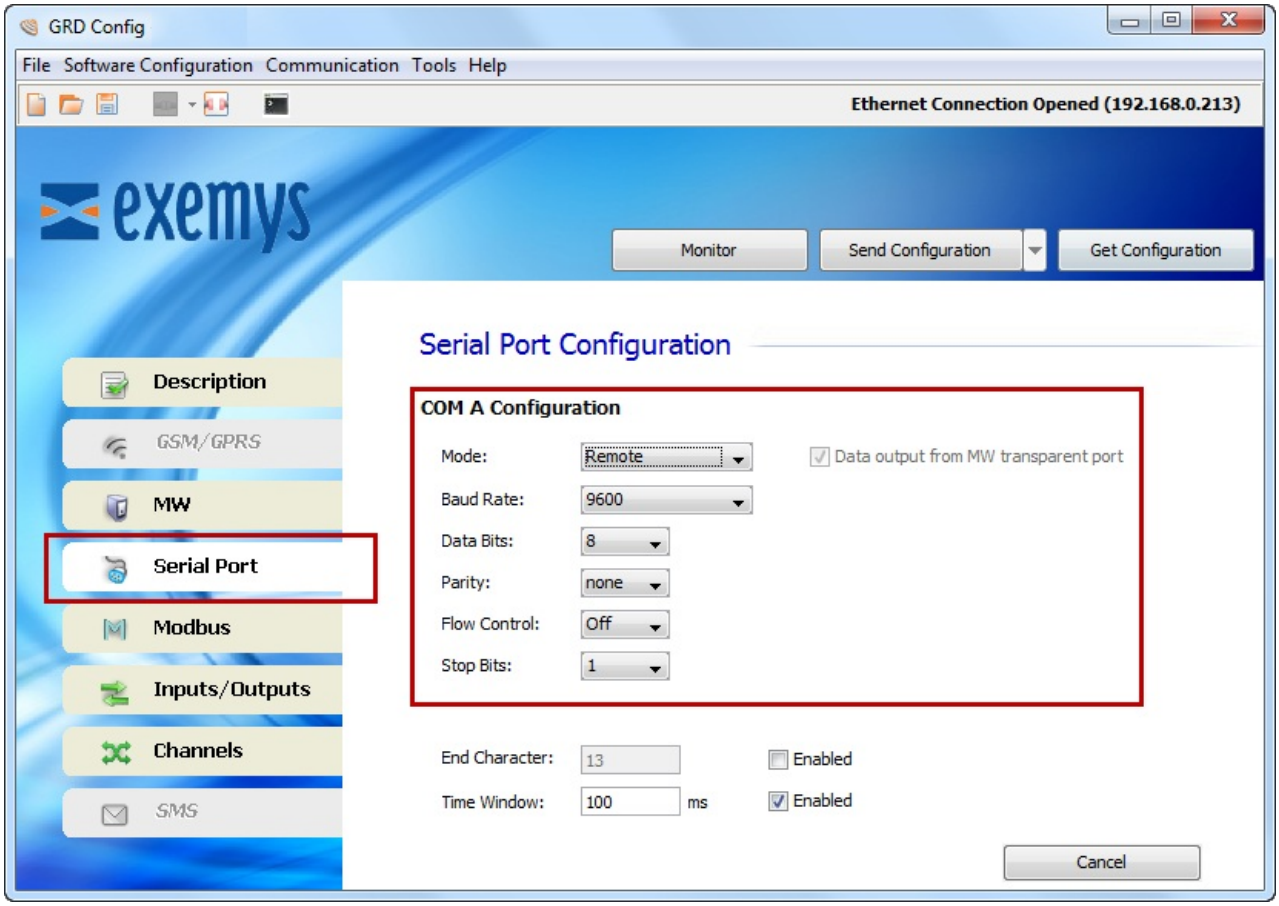
- ***Host Closed Connection:*** This is an event that happens when the server closes the connection. This could be because the broker service has stopped, the server turned off, the connection to Internet dropped or any motive by which the server loses connectivity.
- ***Logging in :*** The connection has been established, and the GRD is going through the authentication process.
- ***Connected:***The connection has been established and stable.
- ***DNS Failure :*** The GRD can't convert the URL into an IP address. Check if the IP address is OK.
- ***Error:*** The event occurs if the connection was not completed after a certain time and no other type of failure was reported.

2020-11-19

Serial Port Modes

- Embedded "Modbus Master" (for I/O extension)
- Embedded "Modbus Slave" (to read I/Os from an external Modbus master)
- "Remote" mode
- Data parsing from "Scripts"

Serial Port Configuration



In GRD with two serial ports you will be able to configure them individually. **Notice that the two serial ports cannot be configured on the same mode**.

***Mode*:** Depending on how you are planning to use the GRD/cLAN you will choose on of these modes

- *Modbus Master:* To use the Embedded Modbus master to expand the I/Os
- *Script*: To parse incomming data or send data from the script (only on devices with script programming support)
- *Modbus Slave:* To use the Embedded Modbus slave to read/write the device channels (Physical, Modbus or script)
- *Remote*: to access the serial remotely port using publish/subscript

***Data output from MW transparent port* :** It allows you to configure which serial port can be reached remotely from the broker. Configuring a serial port will force this option to on.

***Baud Rate*:** Serial Port speed (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)

***Data bits*:** Can be 7 or 8 bits

***Parity*:** Error checking (none, even, odd)

***Flow control*:** Allows automatic control of communication traffic according to the network availability. It is generally used for massive data transfer to avoid loss of information.

Stop bits: Allows to define the number of stop bits.

Time window and End character

In the "Remote" serial port mode, the device will attempt to group several data before sending the packet through the network; this makes a better use of the bandwidth and reduces communication costs. The implemented criteria for the packet end are the following:

- Time window (0…1000ms): once data are received, the device will wait in silence during this period before sending the packet through the network. These criteria incorporate a delay in the transmission of the communication, so care must be taken depending on the serial communication protocol being used.
- End character (0…255): It is the end character of a serial stream before sending the data.

	*If the end character criteria is enabled and the time window is disabled, the device will store the received data for an indefinite time until the configured character is received or the 1000 characters are accumulated.*

If both criteria are used, whichever is the earliest will cause data to be sent.

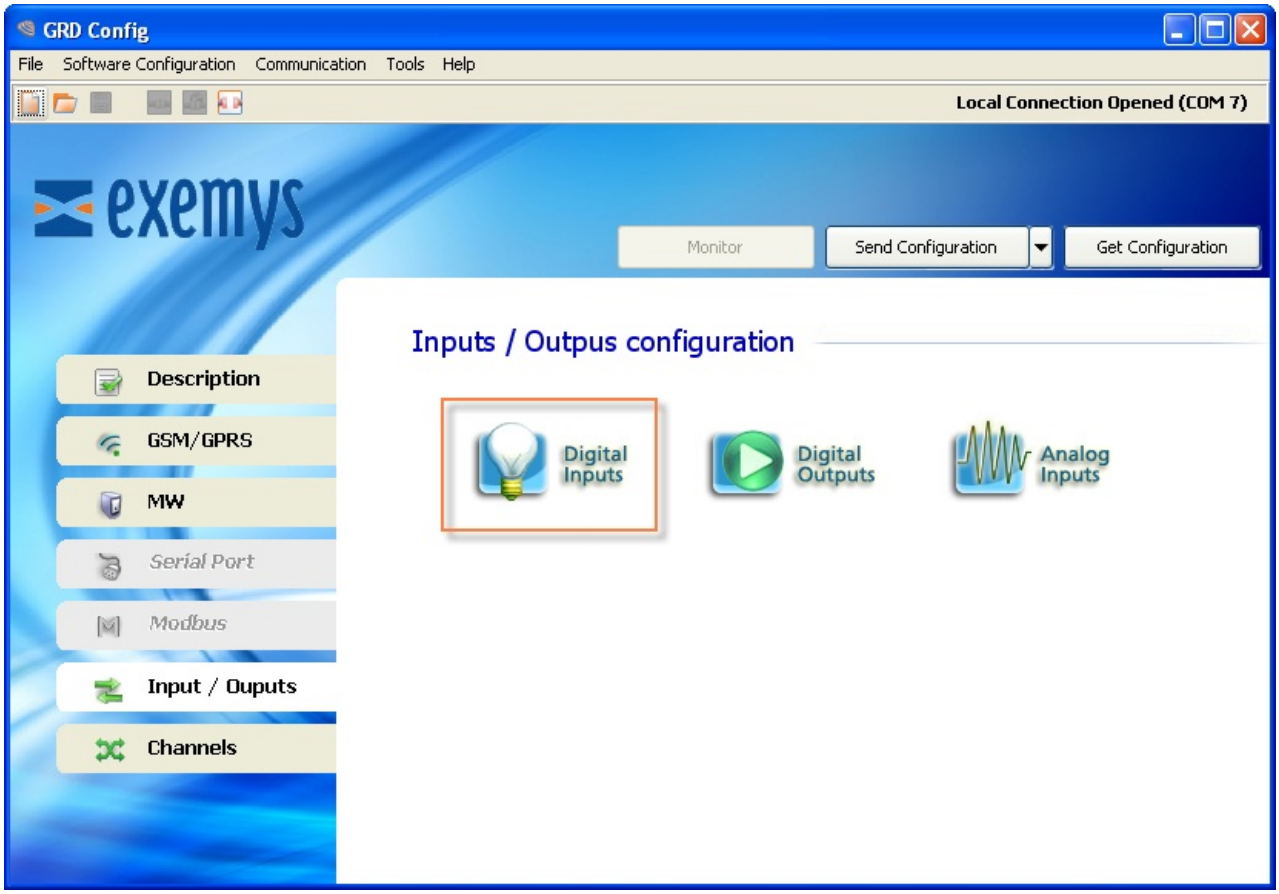
2020-11-20

Physical Inputs/Outputs

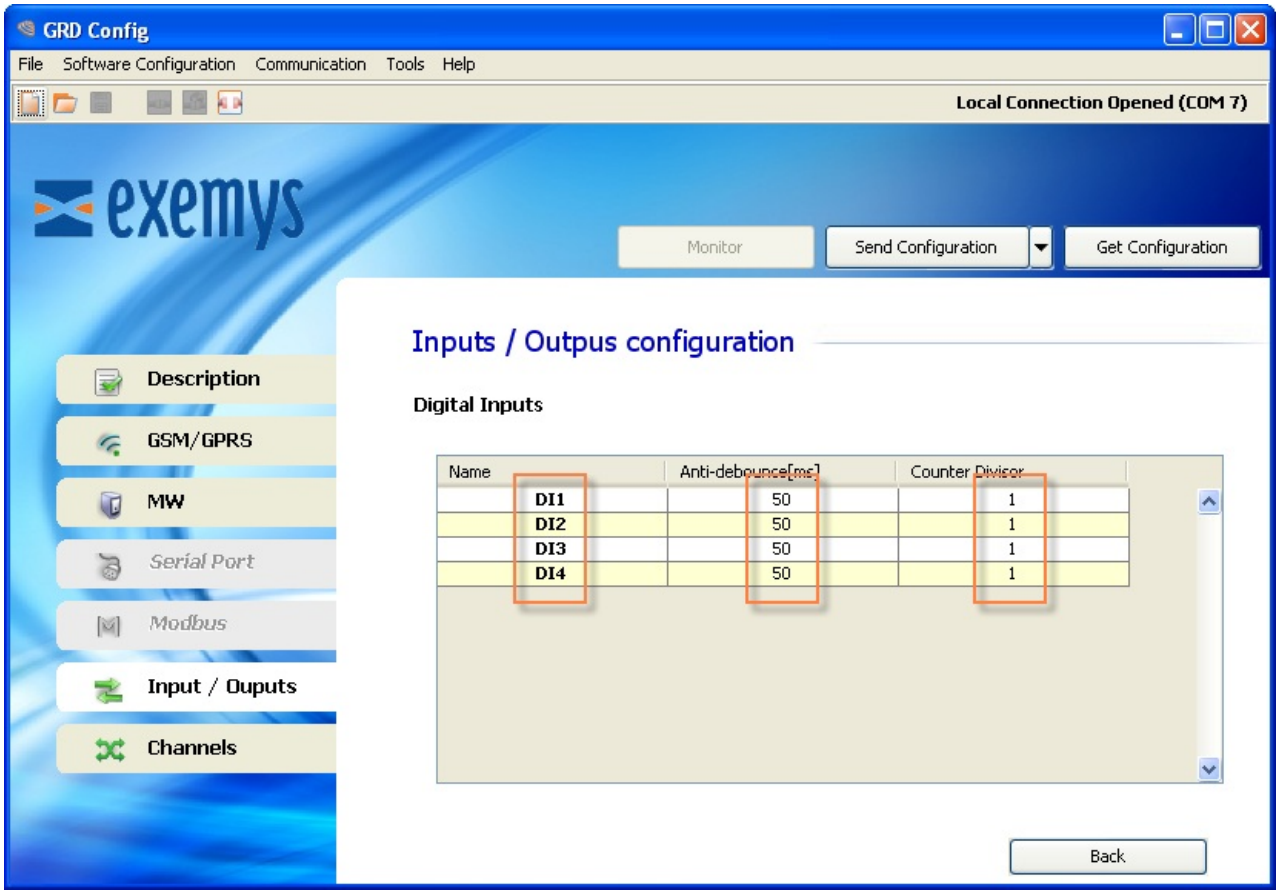
Depending on the model, the GRD/cLAN can have or not physical inputs/outputs.
We will now see the types of inputs/outputs that we can have and which parameters we can configure of each one.
It is important to point out that this configuration is applicable only to physical inputs and not to inputs from the Modbus queries.
For the configuration of the parameters you will have to enter the “Inputs / Outputs” menu and then select the type of input / output which are:

- Digital inputs
- Digital outputs
- Analog inputs

Digital inputs



When we enter the configuration of a digital input we will see that we can configure 2 parameters one is the anti-rebound to avoid noise and the counting splitter in case of use as pulse input.

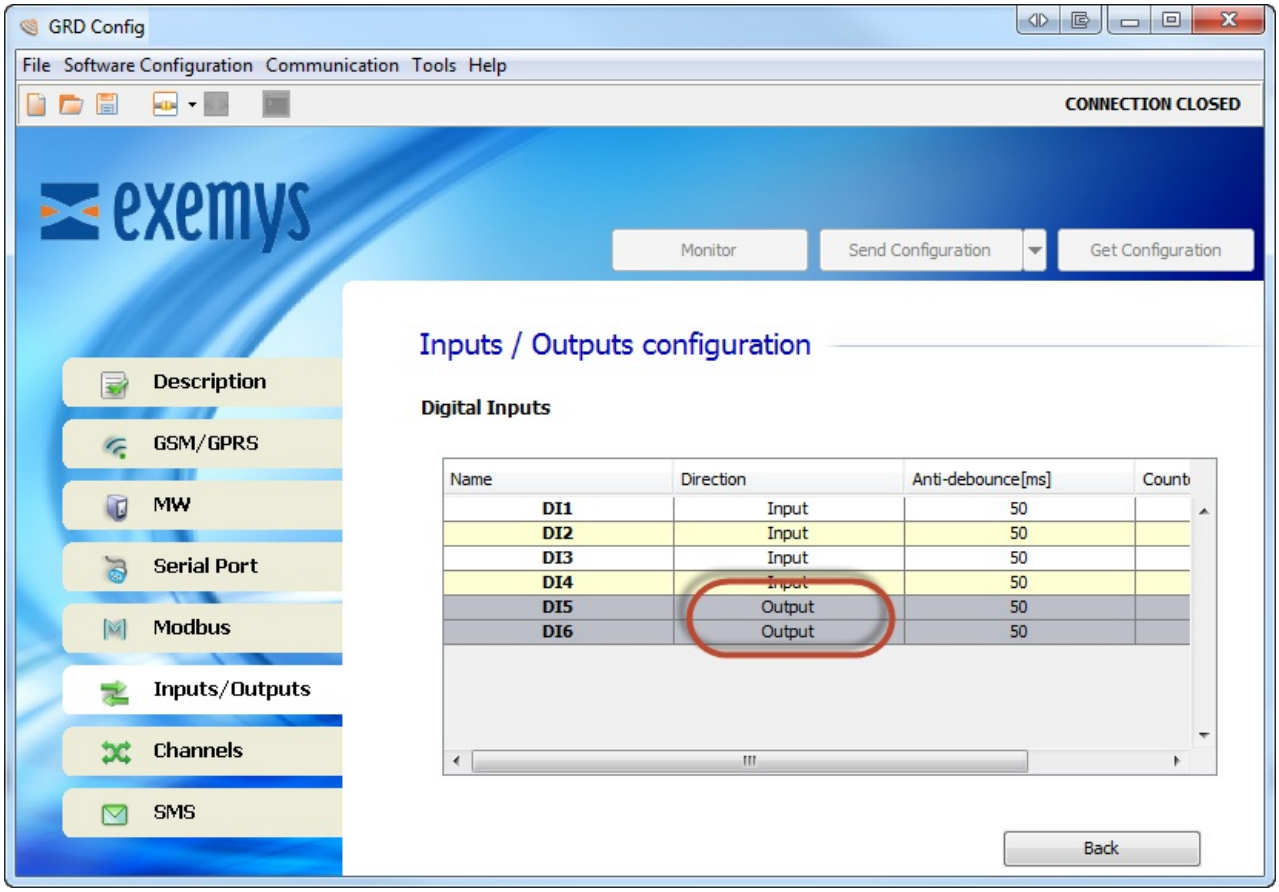


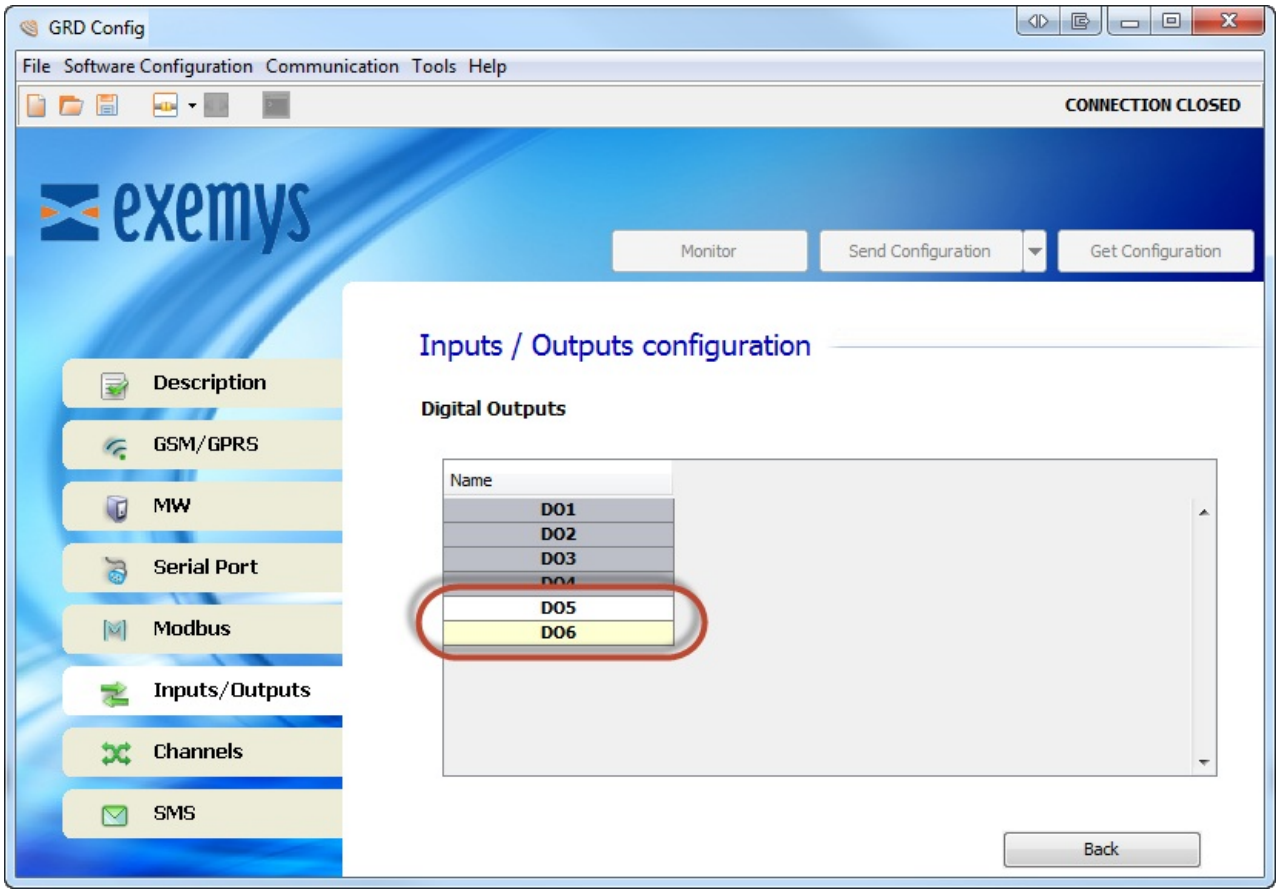
The value of the anti-debounce can be configured between 1 and 250 ms. On devices with more than 8 digital inputs, inputs higher than 8 will have an anti-debounce time fixed at 250 ms.

The counting divisor can take a value between 1 and 1000.

On the cLAN2205-XF, cLAN2205-MQ, GRD3621-XF-3G, GRD3621-MQ-3G, GRD3625-XF-3G and GRD3625-MQ-3G you must configure wether a IO terminal will work as an input or as an output

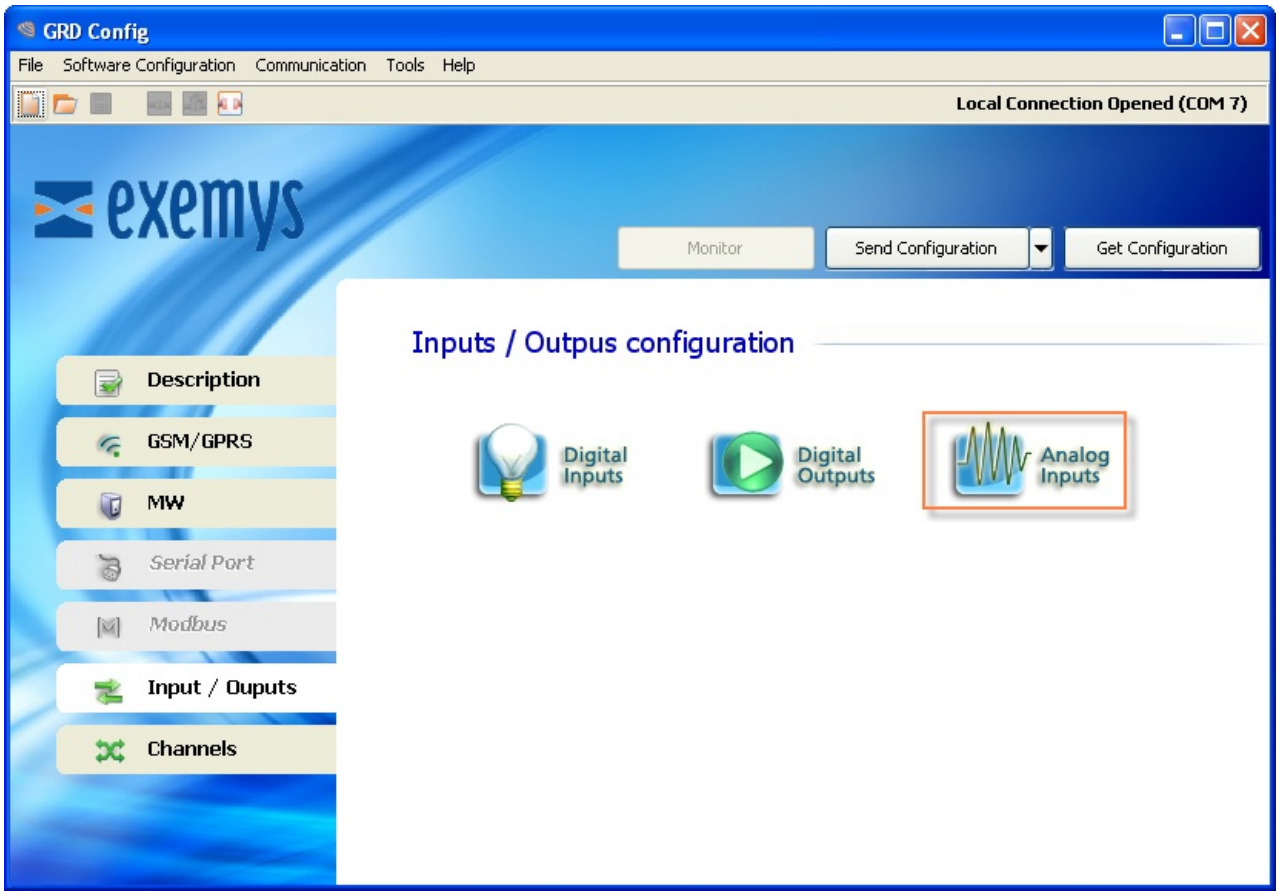
Take special care not to apply direct voltage to a terminal configured as an output and in ON state.



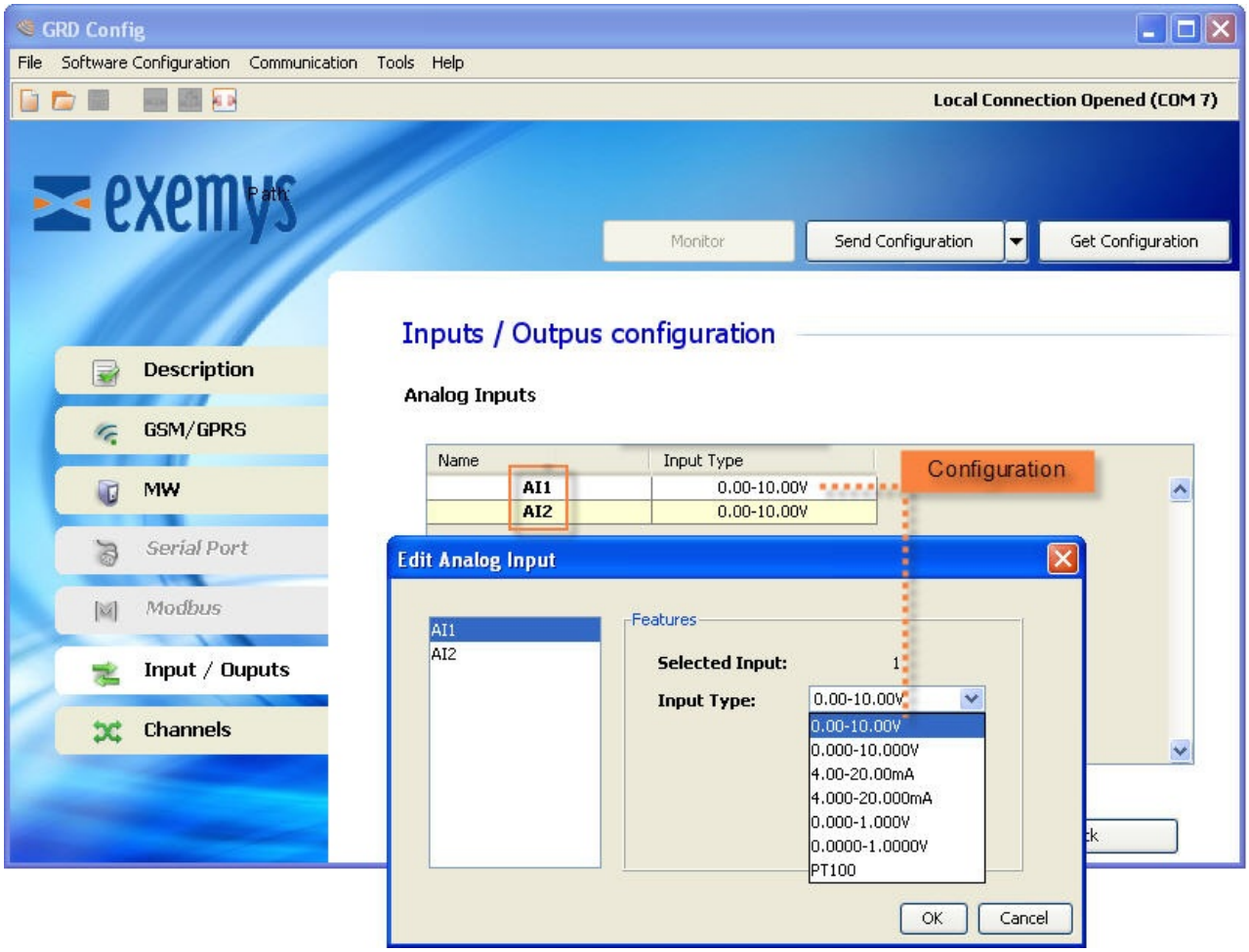


Analog inputs

In the configuration of analog inputs we can select the operational mode depending on the GRD/cLAN model, this refers to whether we are going to measure voltage or current and its resolution.



The analog inputs can be configured as follows:



⚠	*To use AI1 in PT100 mode you must also set internal jumpers on the GRD-3301-XF, GRD-3621-XF-3G* and the *GRD-3621-MQ-3G*

- **Voltage:**
  - 0 to 1V with 3 decimal digits
  - 0 to 1V with 4 decimal digits
  - 0 to 10V with 2 decimal digits
  - 0 to 10V with 3 decimal digits
- **Current:**
  - 4 to 20mA with 2 decimal digits
  - 4 to 20mA with 3 decimal digits
- **Temperature (PT100, GRD-3621-XF-3G and GRD-3621-MQ-3G only):**
  - -199 to 849 ºC with decimal digit

2020-10-05

	*For GRD-3G* only

Power supply and inputs / outputs

Below you will find the minimum and maximum admissible values of digital inputs and outputs as well as analog voltage and current inputs, and also GRD consumption and power supply.

Power supply

Parameter	Condition	Minimum	Maximum	Units
Input voltage		10	30	Vdc
Average consumption	GRD at 24 Vdc GRD at 12 Vdc		100 150	mA
Maximum consumption	GRD at 24 Vdc GRD at 12 Vdc		1 1	A

Digital inputs

To activate the digital inputs a continuous voltage must be applied externally. This source of power has to share the GND terminal with the power supply of the equipment. If necessary the same power supply that feeds the GRD can be used. The input is of a Sinking type. It accepts sensor or PNP Sourcing type devices.

GRD3621-XF-3G / GRD3625-XF-3G and GRD3621-MQ-3G / GRD3625-MQ-3G

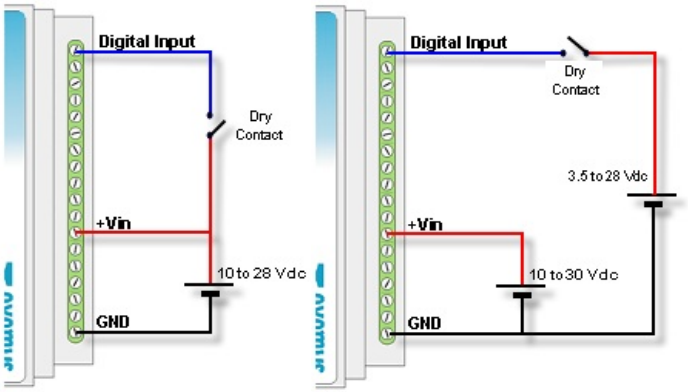
Parameter	Minimum	Maximum	Units
Activated input	7	50	Vdc
Input impedance	280		KΩ
Count frequency		45	Hz

GRD3534-XF-3G and GRD3534-MQ-3G

Parameter	Minimum	Maximum	Units
Activated input	3.5	25	Vdc

Input impedance	2		KΩ
Count frequency	0	1	Khz

We now show two examples of how to connect an input, directly from the same source feeding the equipment and from an external source where we can clearly see that they must share the common Terminal.



Digital outputs

Digital outputs are of the open collector type. The load to be connected must be fed with an external power supply and they have to share the GND Terminal with the equipment power supply. If necessary, the same power supply used to feed the equipment can be used.

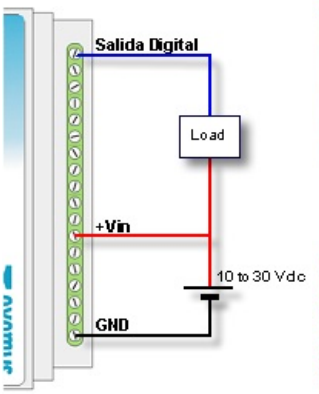
The output type is NPN Sourcing type (Open collector).

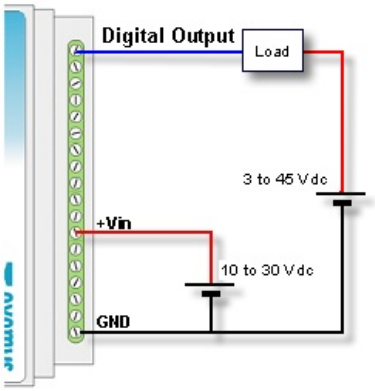
GRD3621-XF-3G / GRD3625-XF-3G and GRD3621-MQ-3G / GRD3625-MQ-3G

Parameter	Maximum	Units
Withstand voltage	50	Vdc
Current	200	mA

GRD3534-XF-3G and GRD3534-MQ-3G

Parameter	Maximum	Units
Withstand voltage	45	Vdc
Current	50	mA

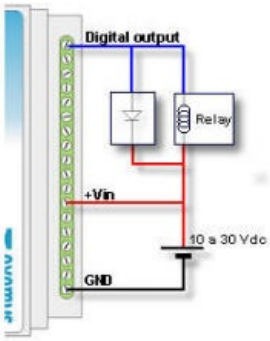


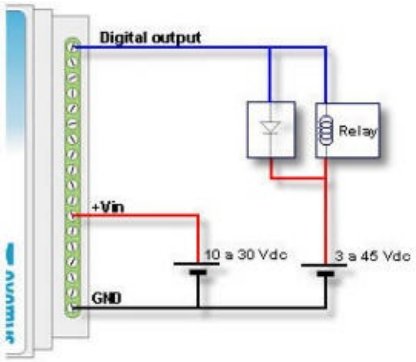


Digital outputs to actuate a Relay

When the digital output is used to actuate a relay coil a protection diode must be added to the connection to avoid damage to the output of the equipment. This must be connected in reverse, that is the anode to the output terminal of the equipment and the cathode to the positive terminal feeding the relay. The relay must be fed using an external power supply, sharing the GND terminal with the power supply of the equipment, or if necessary the same power supply feeding the GRD can be used.

The following graph shows how to connect a relay to a digital output of the equipment.





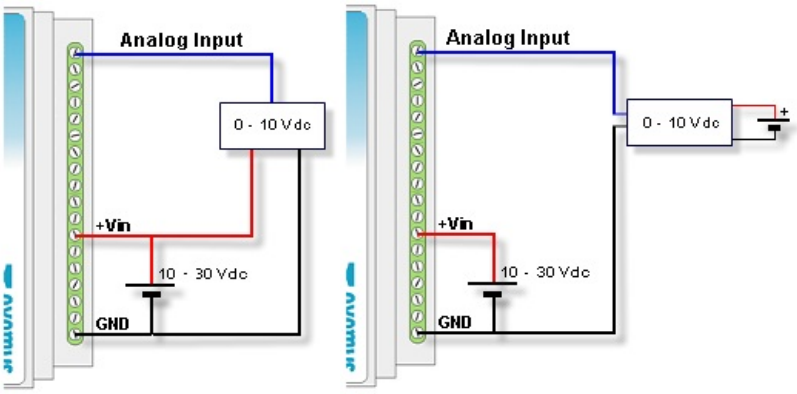
Analog Inputs

Analog inputs refer to the GND Terminal of the equipment, consequently, the power supply used to feed the sensor must share the GND terminal with the equipment.

Voltage inputs (0-10V / 0-1V)

Parameter	Value	Units
Full scale	10 / 1	Vdc
Precision	1 / 0.1	mV
Input impedance	11.4	KΩ

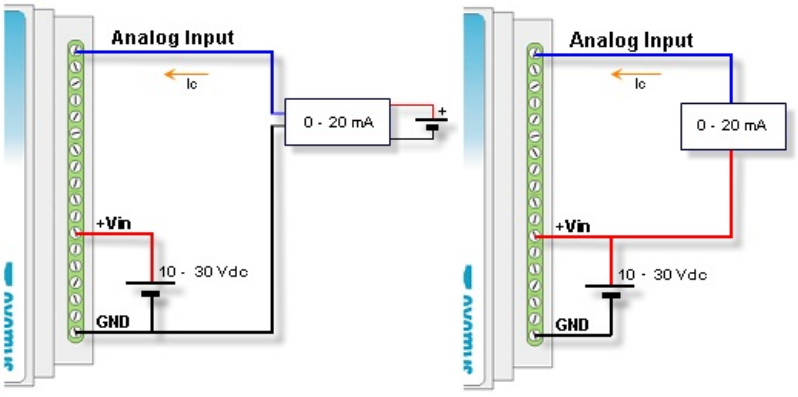
The following two examples show how to connect and analog voltage input for a single power supply or for independent power supplies.



Current inputs (4-20mA)

Parameter	Value	Units
Full scale	20	mA
Precision	10 / 1	uA
Shunt resistance	100	Ω

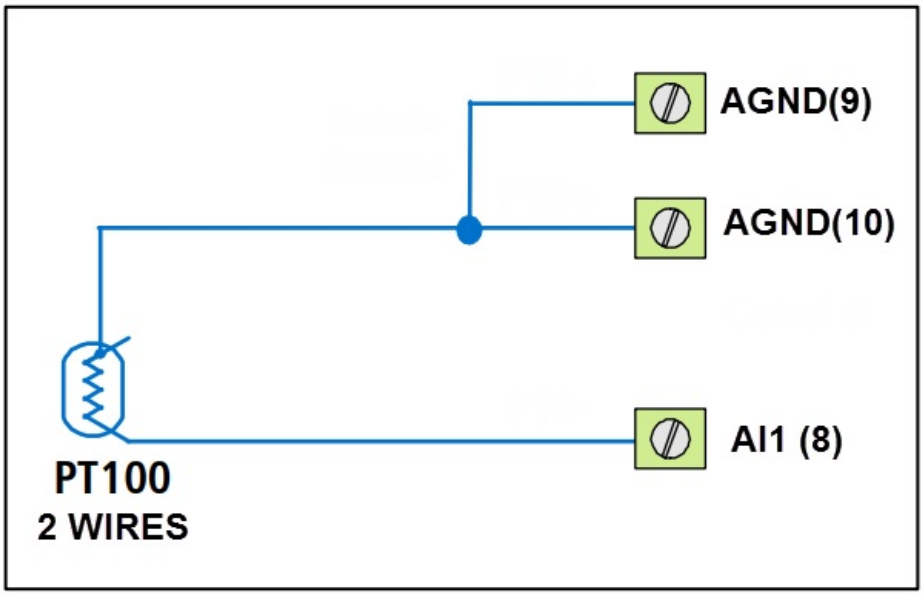
The following two examples show the connection of a 4 – 20 mA sensor sharing the power supply with the equipment for passive sensors or for active sensors with independent power supply.

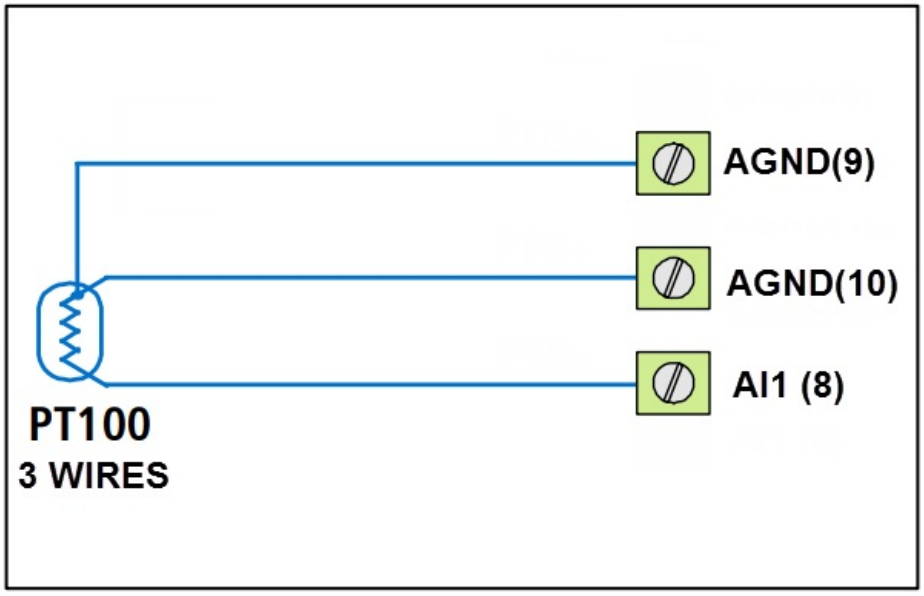


PT100 inputs (GRD-3621-XF-3G and GRD-3621-MQ-3G only)

Parameter	Value	Units
Full scale	-199 to 849	ºC
Precision	0.1	ºC

In the following diagrams you can see how to connect 2 and 3 wires PT100 sensors.


AGND(9)
AGND(10)
AI1 (8)
PT100
2 WIRES


AGND(9)
AGND(10)
AI1 (8)
PT100
3 WIRES

2020-09-28

⚠	*For GRD-3G, GRD-MQ, cLAN-MQ and cLAN-XF V2.0 +*

Embedded Modbus master (Input/Output extension)

Depending on the GRD/cLAN model, it can have an internal Modbus master, which will allow you to increase the number of inputs/outputs of the device. We will now see the configuration and utilization.

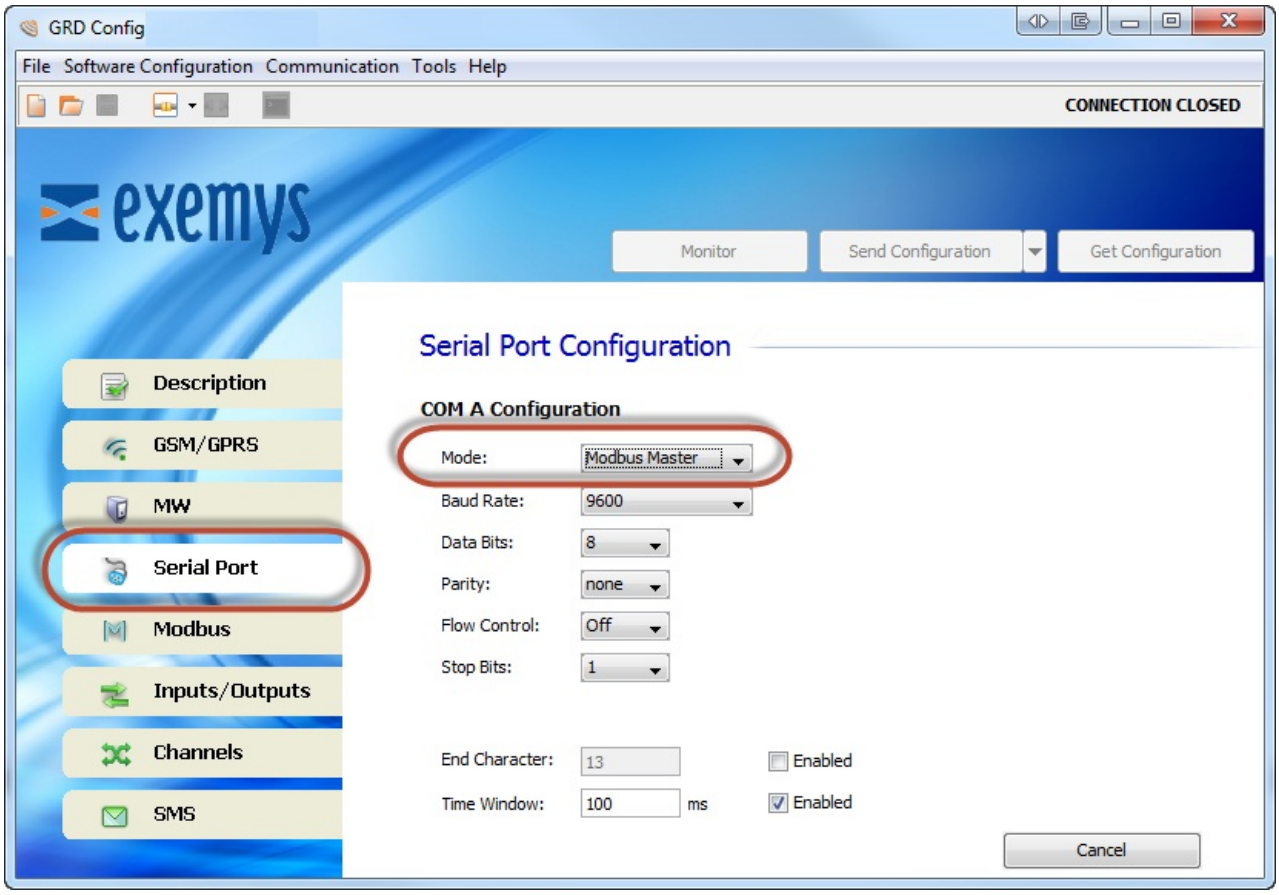
This master will let you load a maximum of 100 Modbus queries to which will be able to configure certain parameters. Each one of the queries can be mapped as an input/output channel, and be able to configure the generation of Historicals and reports.

In “GRD Config” you will find a tab called “Modbus” where you can configure the general characteristics of the Modbus master and Queries.

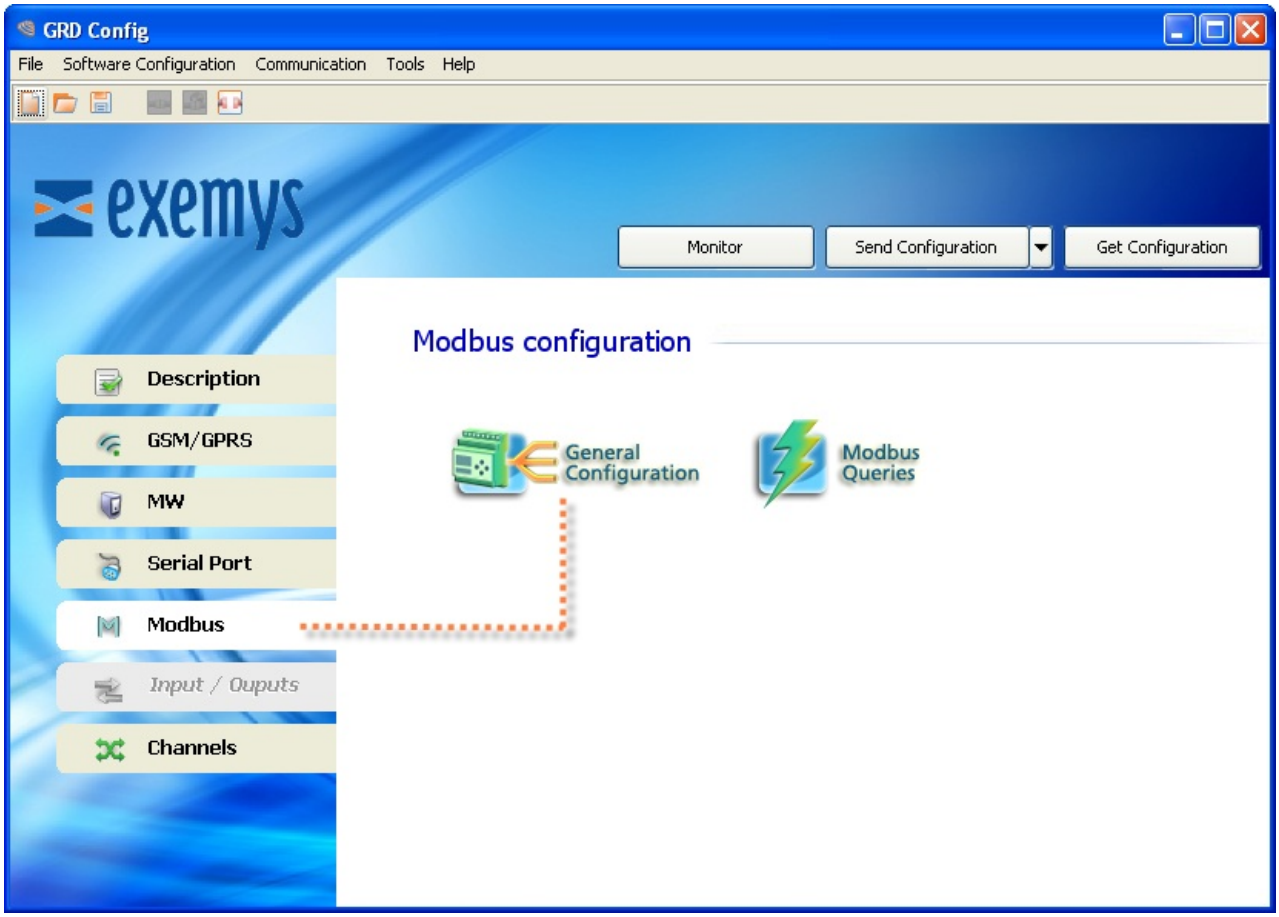
To use the Modbus master set the serial port in "Modbus Master" mode

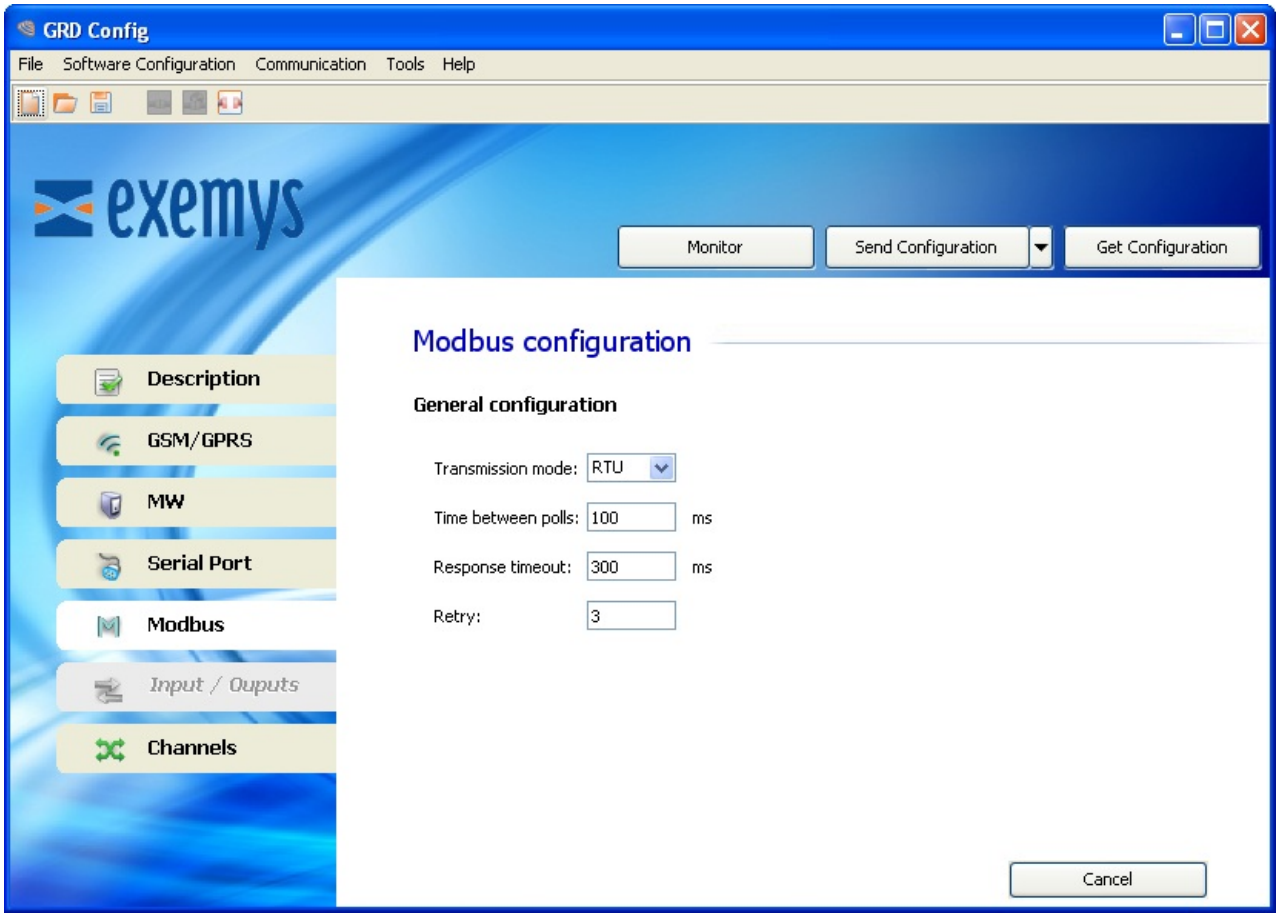
Configuration of the Modbus master

Configure one serial port in "Modbus Master" mode



Inside the “Modbus” tab enter the “General Configuration” menu, where you can configure the Modbus master.





Transmission mode

It refers to the Modbus protocol to be used, being RTU or ASCII.

Time between polls

This is the time the equipment will wait before sending a query after having received the response to another query.

Timeout

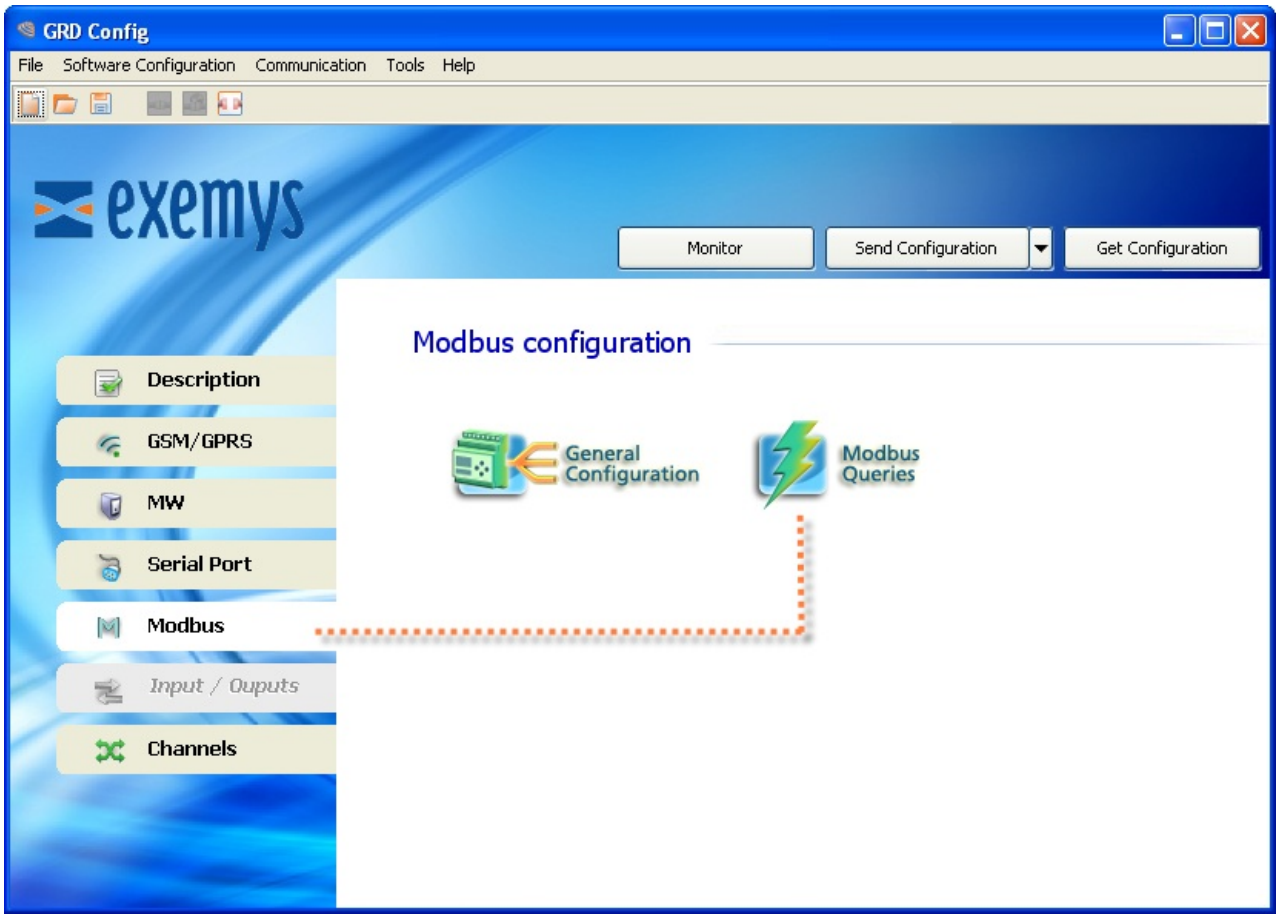
This is the time the GRD/cLAN waits for the arrival of a response from the slave.

Retry

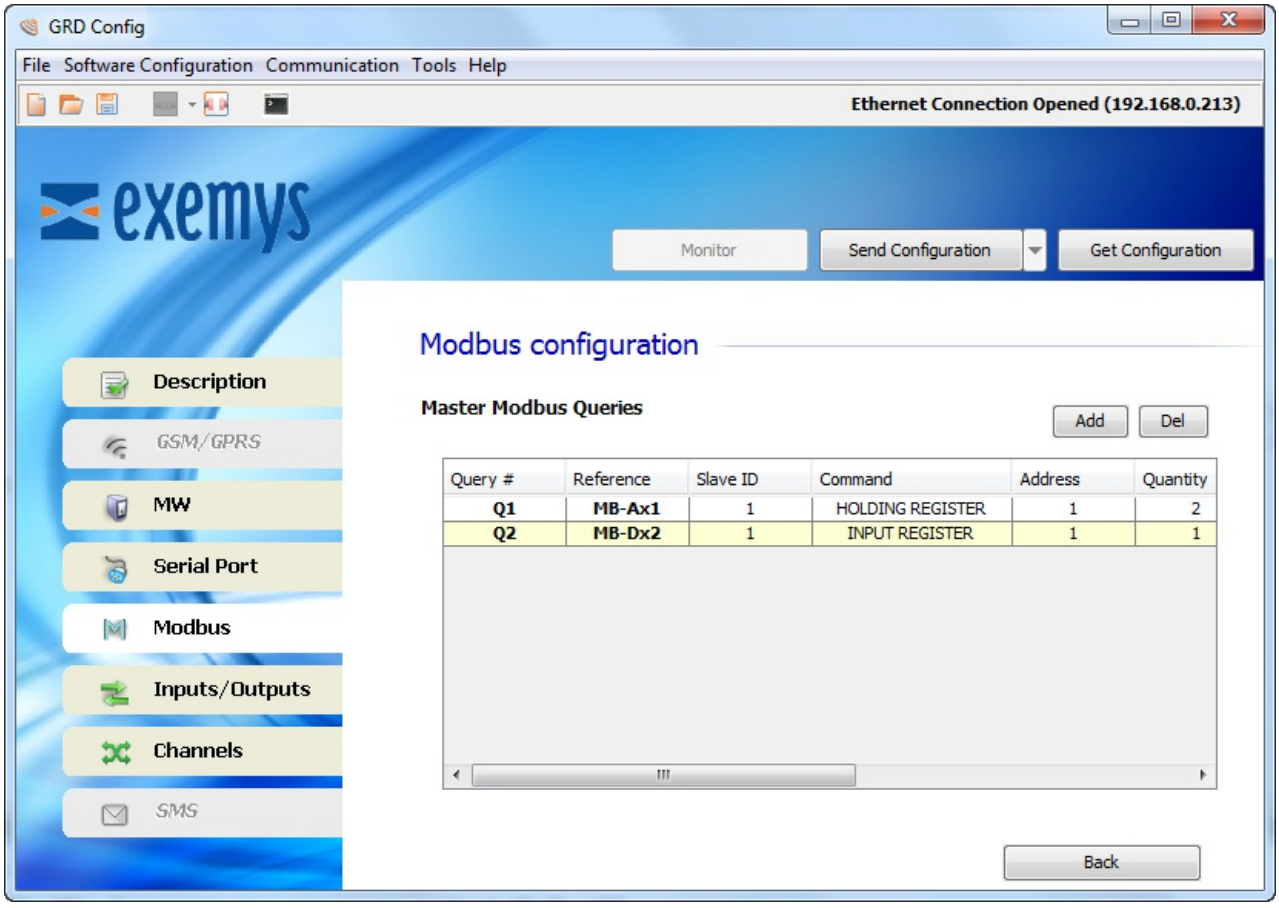
The retries are the number of times that the master will send the query if we don't have a valid response, before considering the value of the query as 0, while the quantity of retries is not met, the master will maintain the previous value.

Configuration of the Modbus queries

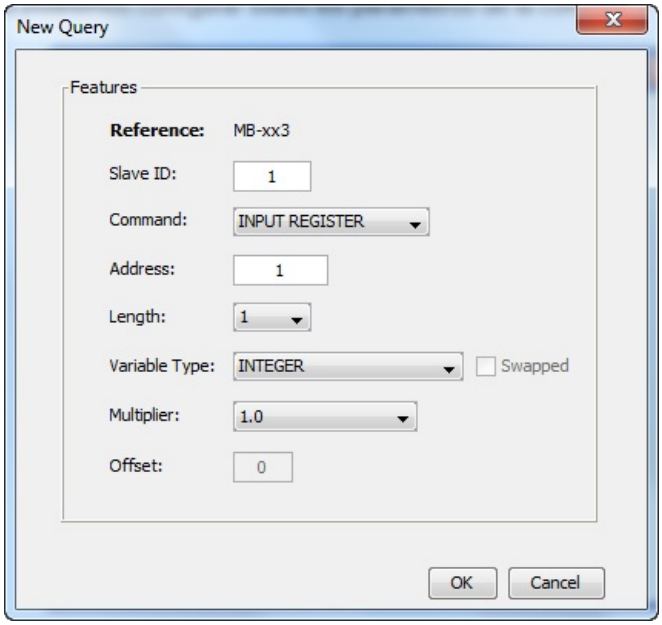
Once the master is configured we can add the desired queries entering the "Modbus Queries" menu and inside "Modbus".



Inside the "Modbus Queries" a list will show us all the added queries and their parameters, which we will be able to modify. To add a query we click on "Add" or "Del" to erase it.



If we click on “Add” a screen will be displayed in which we will be able to configure all the parameters of the query



Slave ID

It is the address of the slave we wish to query.

Command

Here we can configure the type of register to be queried:

- **INPUT REGISTER**

- **INPUT STATUS**
- **HOLDING REGISTER**
- **INPUT REGISTER**

Address

In this parameter we load the address of the query, the value can be between 1 – 65536.

Length

With this parameter we will be able to define the number of registers we want to query, this length can be 1 or 2 according to the type of query.

If the query is of the “Input Status” of “Coil Status” type, the length will necessarily be 1, that is, no modification will be allowed.

If the query is of the “Input Register” or “Holding Register” type, the length can be 1 or 2, implying that as a result of the query we will have 16 or 32 bits respectively.

Variable Type

This parameter is very important since it defines how the GRD/cLAN is going to store data received from a query. The types of variable that we will select depend on the type of queried register and its length.

The types are:

- **BIT**
- **BIT WORD**
- **INTEGER**
- **INTEGER SIGNED**
- **INTEGER 32 BIT SIGNED** (Address 40001 will get registers 40002:40001)
- **FLOAT 32 BITS** (Address 40001 will get registers 40002:40001)
- **INTEGER 64 BITS** (Address 40001 will get registers 40004:40001)
- **FLOAT 64 BITS** (Address 40001 will get registers 40004:40001)

Swapped

Registers will be ordered in a diferent way in querys with register length greater than one.

- **INTEGER 32 BIT SIGNED** (Address 40001 will get registers 40001:40002)
- **FLOAT 32 BITS** (Address 40001 will get registers 40001:40002)
- **INTEGER 64 BITS** (Address 40001 will get registers 40001:40004)
- **FLOAT 64 BITS** (Address 40001 will get registers 40001:40004)

Offset

The offset can only be selected when we define the type of variable as “BIT WORD” this means that from a Modbus query that returns 16 bits we can keep the result of 1 bit. The value of this parameter goes from 0 to 15, being 0 the LSB and 15 the MSB.

Types of queries

We will now see the types of queries we can create and according to its parameters to which channel we will be able to add them.

Register type	Length	Data type	Offset	Channel
Input Status	1	BIT	-	I or O

Coil Status	1	BIT	-	I or O
Holding Register	1	BIT WORD	0 to 15	I or O
		INTEGER	-	AN or PI
		INTEGER SIGNED	-	AN or PI
	2	INTEGER 32 BITS SIGNED	-	AN or PI
		FLOAT 32 BITS	-	AN or PI
	4	INTEGER 64 BITS		
		FLOAT 64 BITS	-	AN or PI
Input Register	1	BIT WORD	0 to 15	I or O
		INTEGER	-	AN or PI
		INTEGER SIGNED	-	AN or PI
	2	INTEGER 32 BITS SIGNED	-	AN or PI
		FLOAT 32 BITS	-	AN or PI
	4	INTEGER 64 BITS		
		FLOAT 64 BITS	-	AN or PI

2020-11-20

Channels

Channels are the media through which information about inputs/outputs of the MW (or broker) equipment are sent or received.
These channels can be linked to physical entry points of the equipment like MODBUS queries according to their compatibility with the channel.
The GRD/cLAN have 4 types of channels::

- Digital inputs channels
- Digital outputs channels
- Analog inputs channels
- Pulse inputs channels

The most common option is to link them in the following manner:

Channel	Input/Output
I1..n	DI1..n
O1..n	DO1..n
AN1..n	AI1..n
PI1..n	DI1..n

Where:

Ix: is a digital input channel.
DIx: is a physical digital input.
Ox: is a digital output channel.
DOx: is a physical digital output.
ANx: is an analog input channel.
AIx: is a physical analog input.
PIx: is a pulse input channel

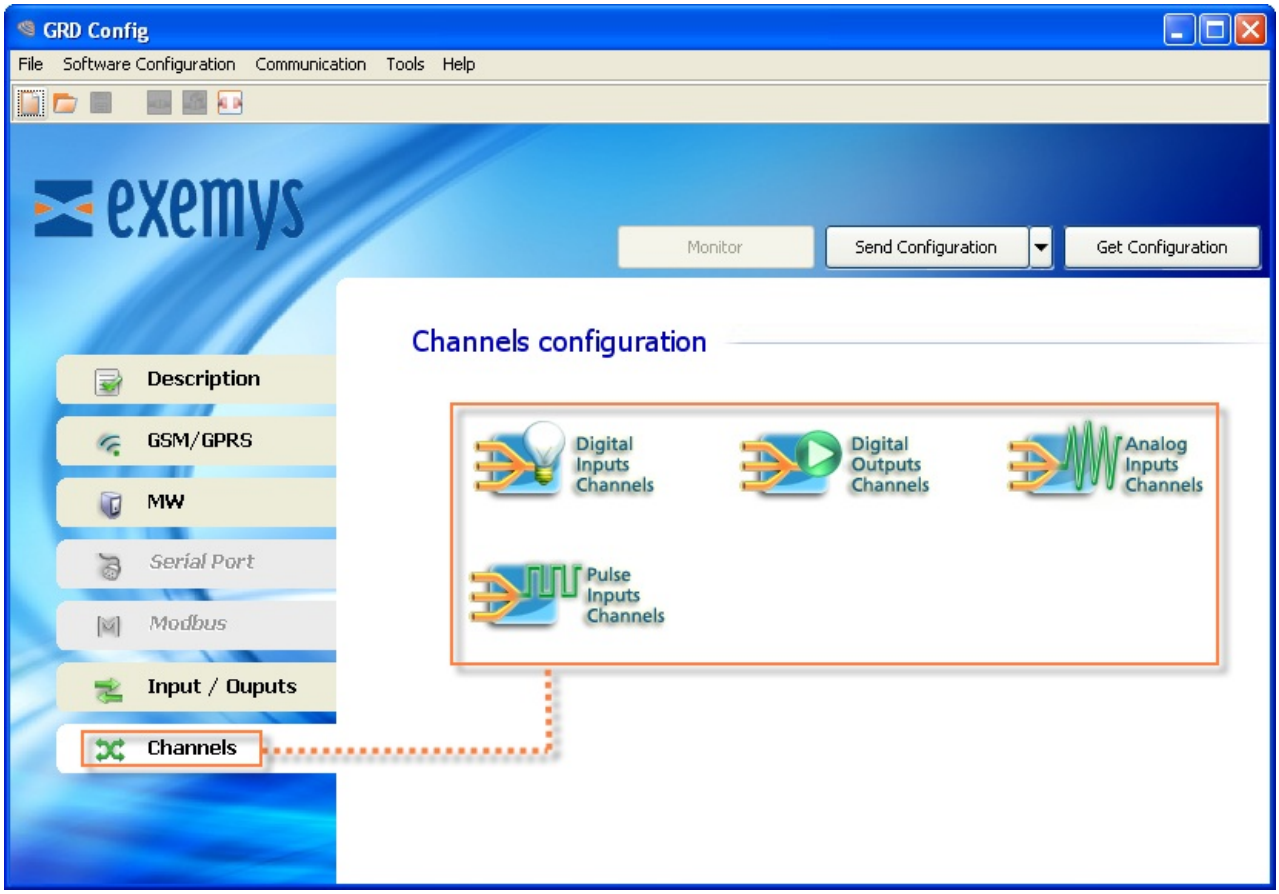
Beyond the most common way to link the channels like the previous example, it can be done in a disordered manner or repeating them. This means that you could create a channel I5 linked with the DI13 input and a channel I6 that is also linked to the DI13 input.

On GRD/cLAN with serial port, I/O channels can be linked to Modbus queries if you use the embedded Modbus master feature. If you do it, the queries will be shown on the "source" combo box (MB-DIx, MB-DOx, MB-AIx or MB-PIx)

On GRD/cLAN with script programming support you can link script variables to any channel. The channel will take variable value to send reports and when creating historical records. You can also change the variable channel remotely if you link it with a digital output channel.

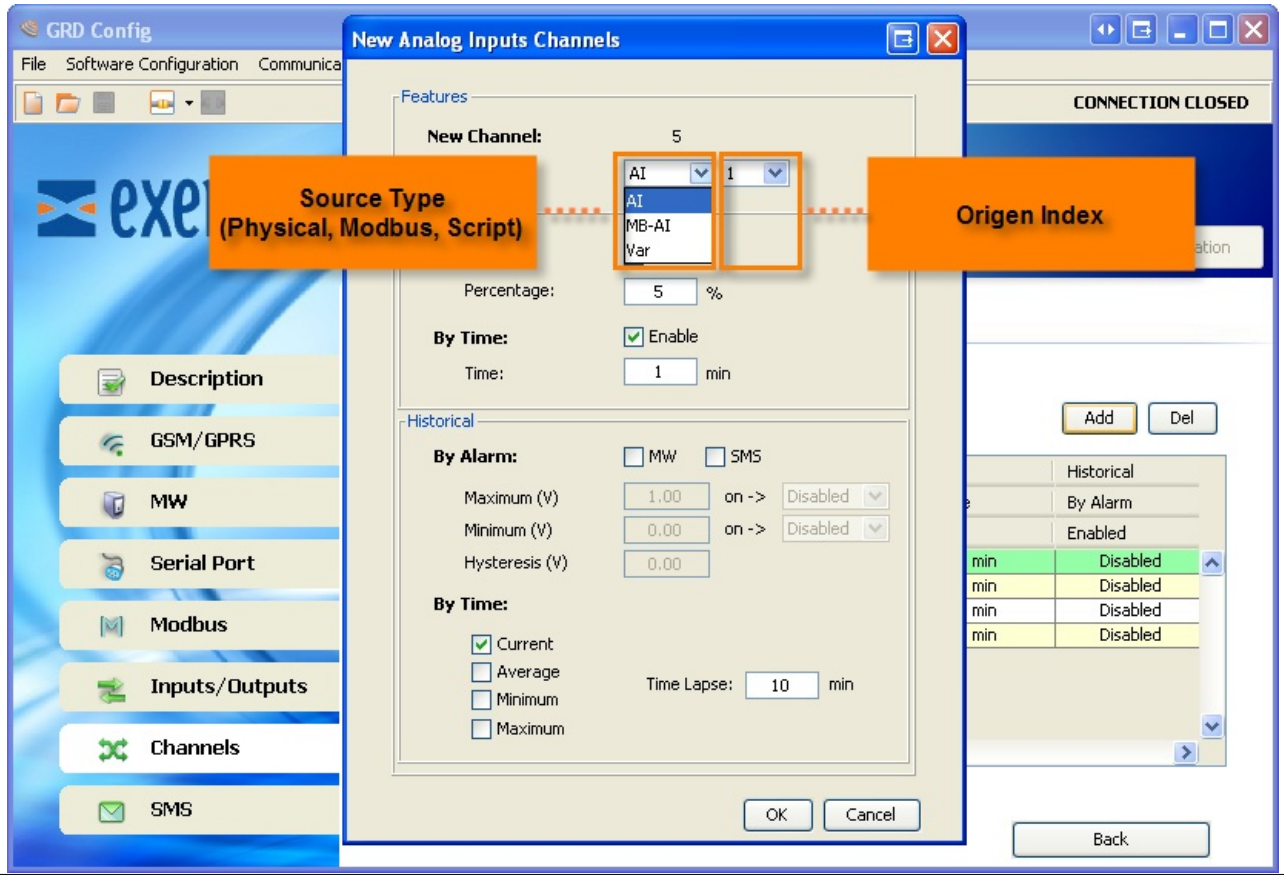
Adding Channels

To add channels in the “Configurator” you must enter the menu “Channels -> Type of desired channel”.



After selecting the desired channel and among any of the 4 you'll have the option to add or remove, it is important to point out that within each channel only inputs and outputs compatible with that channel will appear.

You will now see an example of how to add a digital input channel.



To erase a channel you only have to click on the “Del” button of the channel previously selected.

	Since firmware GRD-3G 1.9+ and cLAN 2.8+ and new channel source called "Mem" is added This source is linked to a 100 position volatile memori that can be read and wrote from the *script* using `read_io 305` and `write_io 305`

	The signal level can be configured as analog channel source in GRD-XF-2G with firmware 4.0.0 or higher. This feature is available in all GRD-3G

2020-10-29

Reports and Historical records - MQTT publish

There are 2 types of information that the GRD-MQ/cLAN-MQ can send. On one side, we have the reports that contain the real values of inputs and outputs updated according to the criteria configured in the device. We can select the values we want to have updated and under which conditions and only when there is a connection with the broker. On the other hand, and independently, we have the Historicals, which are made of registers of events and time (logs) that are stored in the GRD-MQ and are sent to the broker. If there is no connection the registers remain in the equipment until they are recovered.

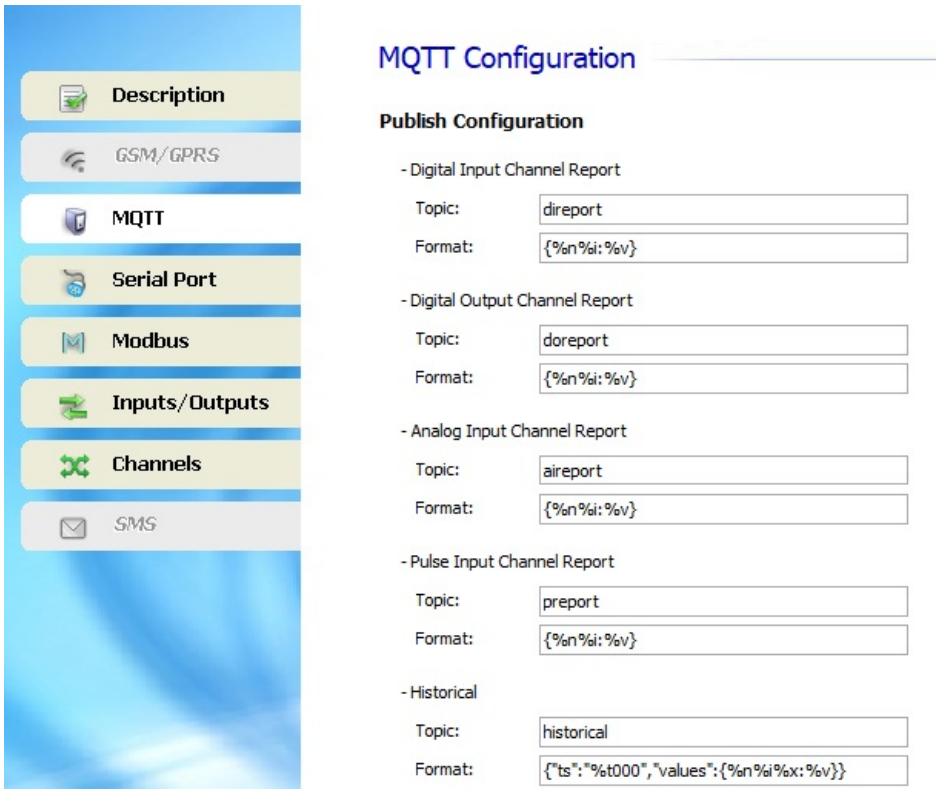
Topics and formats to publish reports and historical records are configured on the MQTT tab..

Historicals and reports are configured on the channels.

Reports and historical records topics and formats

You can configure a different topic/format for reports for each channel type. There's a single topic/format for historical records.

If the topic/format for historical records is no configured, the records will be deleted as soon as they are created.



For sending multiple records in a single message you must configure how to limit each record

Payload format - Format wildcards

Used both for reports an historical records

%n Channel type (I, O, AN, PI)
%i I/O channel number
%v I/O channel value in numeric format
%b /O channel value in boolean format (true - false)

For historical records only

%t Seconds since 1970
%d Day
%M Month
%y Year
%h Hour
%m Minutes
%s Seconds
%x Historical record type
R: General report
HC: By change
HT: By time - current value
MIN-AL: By low value
N_AL: Normal value
MAX-AL: By high value
HTMIN: By time - minimum value
HTMAX: By time - maximum value
HTAV: By time - average value

Publish example

Here are some examples following the configuration on the previous snapshots.

Analog input channels 1, 2, 3 and 4:

[{A1:893},{A2:41},{A3:312},{A4:1933}]

Historical record for analog input channel 2, at Feb21 2020 08:02:20pm with value 41

[{"ts":"1582315320000","values":{A2HT:41}}]

Digital output channel 2 with value 1

Historical record for digital output channel 2, at Feb21 2020 08:05:34pm with value 1

[{"ts":"1582315534000","values":{O2HC:1}}]

Reports

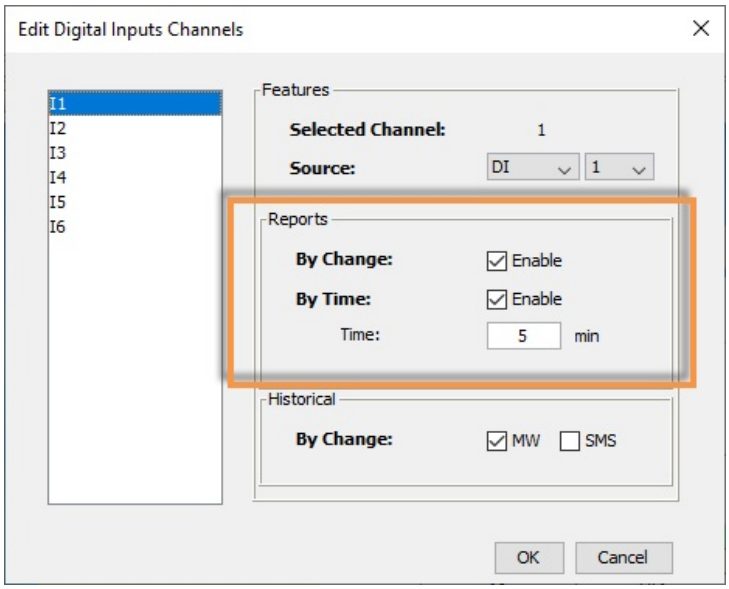
We will now see the types of reports and how to configure them. The reports are configured individually in each channel, to access the report configuration screen go to the Configurator, the “Channels” menu and here select the type of channel and channel number by double clicking on it. A configuration screen will be displayed where you have the available configurations for that channel.

It is important to be aware that when the GRD-MQ losses connection with the broker and recovers it or is

the first time it is connected, it sends a message with all configured reports.

Digital inputs channels reports:

The following figure shows the configuration screen of the digital inputs reports:



Report by change

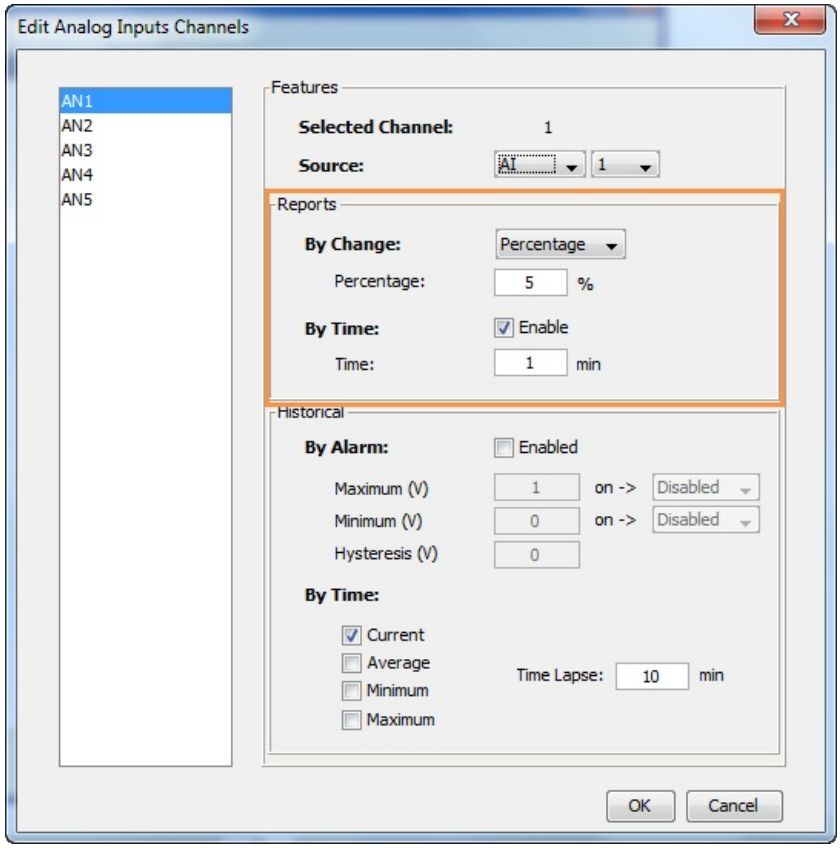
If a report by change of a digital input cannel is enabled, a change of value will generate a message that will be sent to the broker. This way, only the events of interest at the moment they occur, are reported, if one of the inputs with a disabled report changes value it will not be reported.

Report by time

It defines the time in minutes which determines how often a report message is generated. Let's suppose that we are interested in updating an input channel every five minutes independently of the changes that occur, the only thing we need to do is to enable the report by time and configure in 5 minutes, this will force the report message that will update the input value in the broker every 5 minutes.

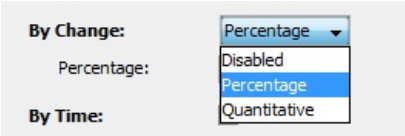
Analog inputs channels reports:

The following screen shows the configuration screen of the analog inputs report. The analog inputs have 2 types of reports, on one side reports by percentage change and the other one temporary report.



Report by change

The report by change is enabled in the channels we want to be updated in the broker every time that the signal changes



The "percentage" report will report if the input changes a percentage from full scale. The full scale value will depend on the input type.

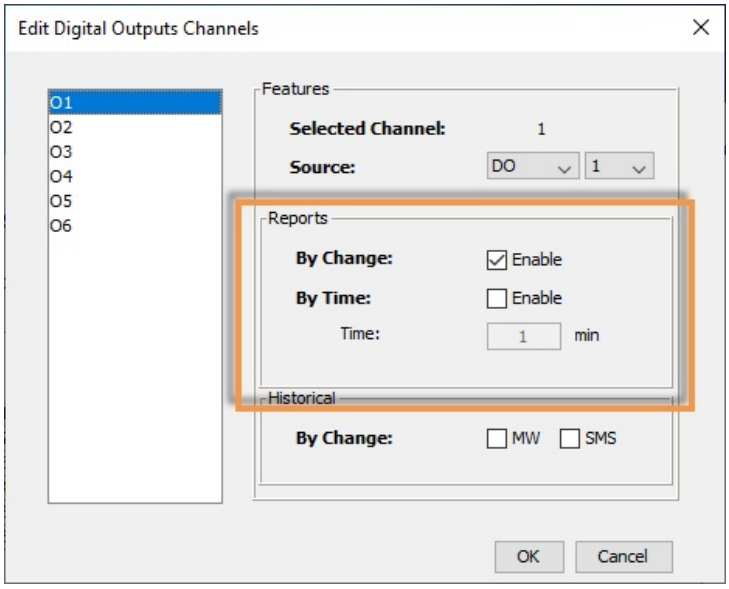
The "quantitative" report will report if the input changes a configured absolute value. .

Report by time

It defines a time in minutes which determines how often a report message is generated.

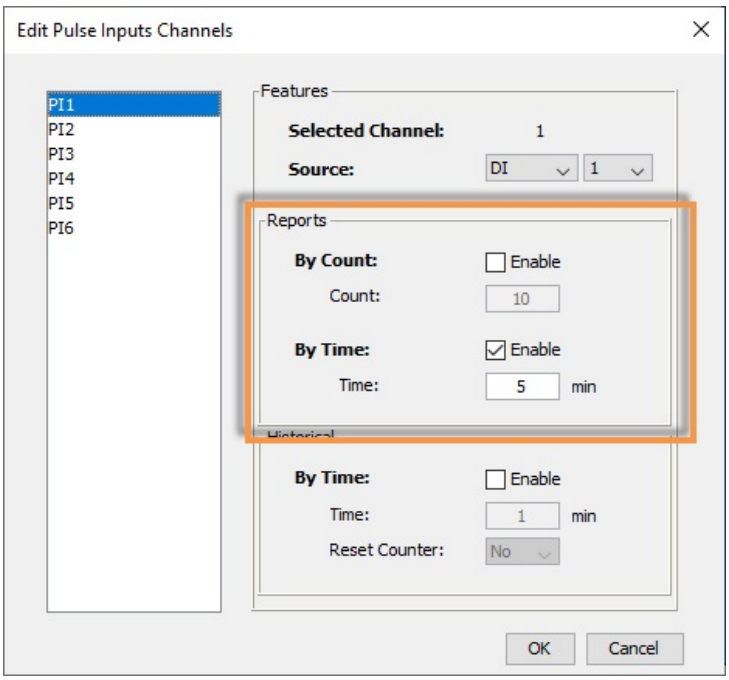
Digital outputs channels reports:

In this case we only count on a temporary report, the change report is always enabled, this means that when a change occurs in one of the outputs, it will be immediately reported. The purpose of having the change report permanently enabled, is because the report can be used as verification of a remote activation.



Pulse inputs channels reports:

The pulse channels have 2 types of reports. On one side the reports by performed count and on the other the temporary report.



Report by count

In the counts number report the device sends a message to the broker each time the desired input counts a number of pulses from the last report of this channel, by counts or by time.

Report by time

It defines time in minutes which determines how often a report message is generated.

Historical records

Historicals allow the device to store the events as changes in inputs or outputs being either on-line or off-line and then transmit them to the broker for further visualization and analysis. These Historicals will let you know the value and number, of an input or an output that has been modified and the date and time

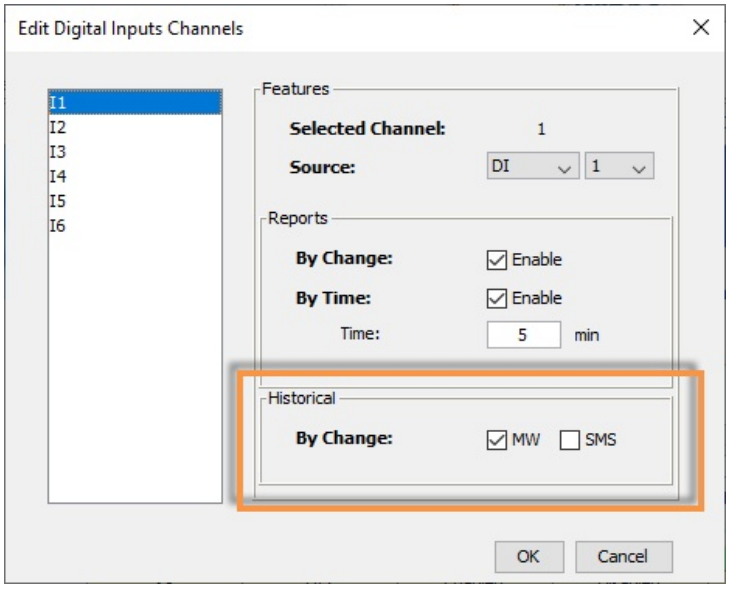
the event took place.

	The GRD and the cLAN have the capability of storing up to 100000 events in off-line mode.

Para acceder a la pantalla de configuración de históricos debe ir en el Configurador al menú “Channels” allí seleccionar el tipo de canal y luego el número de canal haciendo doble clic sobre él de esta manera accederá a una pantalla de configuración donde tendrá las configuraciones disponibles para dicho canal.

Digital input channels historical records

In this case the digital input channels have Historicals by change, this means that a register is generated for every change of this input. The following figure shows the screen to enable these Historicals.



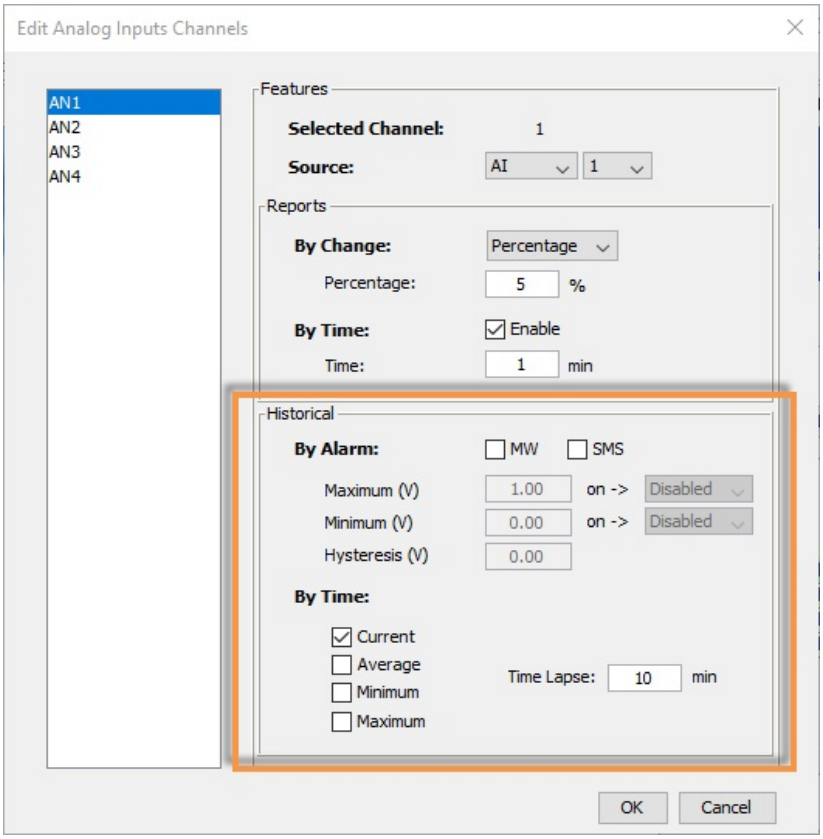
Analog input channels historical records

Just as in digital inputs it is possible to keep a Historical of analog inputs under two clearly defined criteria.

On one side we have an alarm type register of Historicals that allows monitoring the limits of tensions with a determined value of hysteresis.

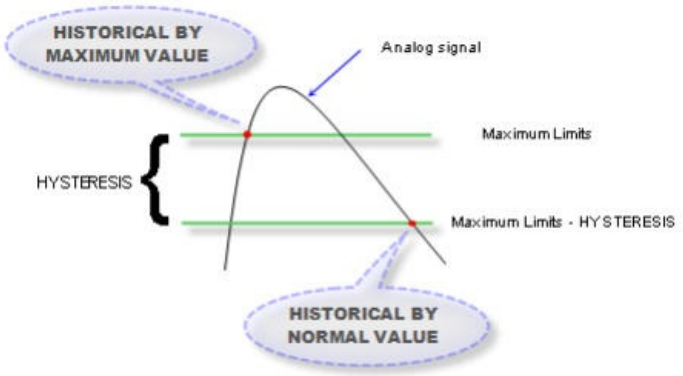
On the other side, we can create a register of Historicals by time, that is, sample the analog inputs and store its value every specific time, this type of Historical, in turn, is subdivided into 4 since we can store the real value, the minimum value, the maximum value or the average in the configured time period.

Once stored in the device's memory, it is transmitted whenever possible, but is never lost under any circumstance.

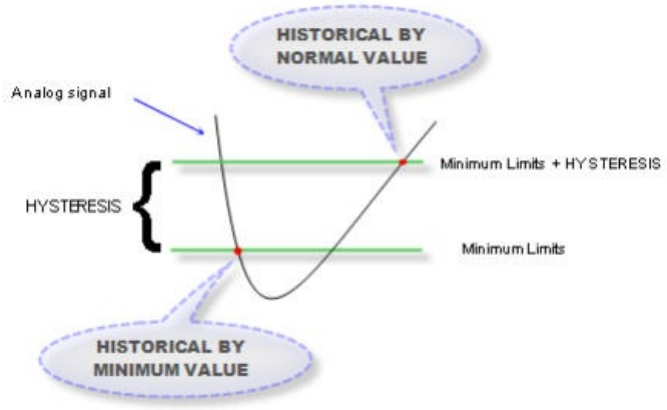


By alarm

This criterion defines an operational band through a maximum and minimum. When the analog input exceeds the maximum value a Historical is generated by maximum, when the analog input is lower than the minimum a Historical by minimum is generated and when the analog input passes from a maximum value or from a minimum value to a normal value between both a Historical by normal value is generated. In this manner we can follow the evolution of the input when it fluctuates between the specified limits. In addition to the maximums and minimums a value of hysteresis must be defined to avoid continuous generation of Historicals when the analog signal oscillates above a threshold value. In the following figure we can see how the hysteresis mechanism works for the maximum.



The same happens for minimum values but in an exactly opposite manner.



It is not possible to configure a value of hysteresis greater than the difference between the maximum and minimum, and also a maximum smaller than a minimum. We can also associate a digital output channel to the alarm event by maximum and another one of alarm by minimum, this means that when the analog input in the maximum range will activate an output and in the minimum another one.

By time

In this case the Historical by time has 4 sub-types.

- Current Historical by time:

This type of Historical makes a unique capture of the value of the analog channel at the moment the configured time is due and generates the register.

- Maximum Historical by time:

In this case captures are made from the last Historical until the register time is due, when this happens a Historical is generated with the maximum value measured in this period.

- Minimum Historical by time:

This Historical is similar to the maximum but only registers the minimum value in the time period.

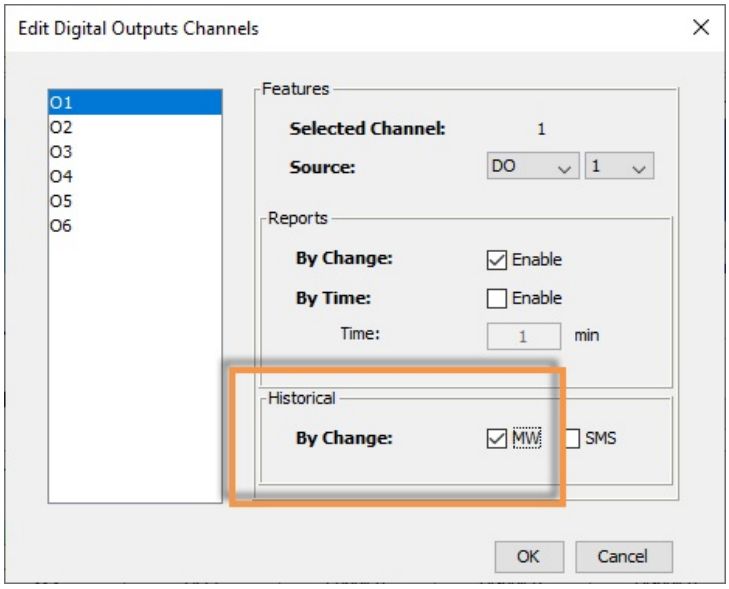
- Average Historical by time:

The concept is the same as in the previous ones but in this case it calculates an average of the value of the channel in the time period.

The device is prepared to register by cardinal time, this means that if we configure the time in 60 minutes at 8:38 it will register for the first time at 9:00 hrs, then at 10:00 hrs and so on.

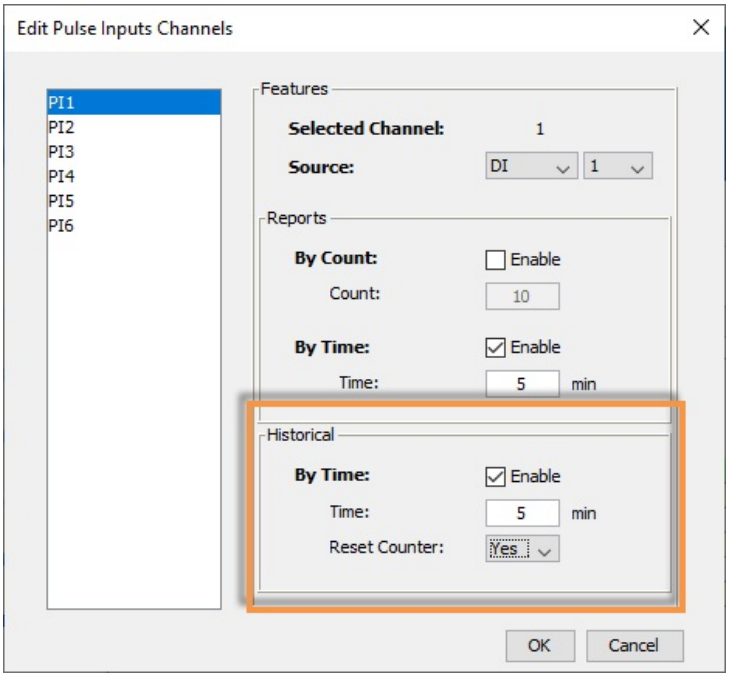
Digital outputs channels historical records

Just as the inputs a Historical by change of the output channels can be made. Take into account that modifying one of the outputs remotely depends on the availability of the communication with the MW at that moment



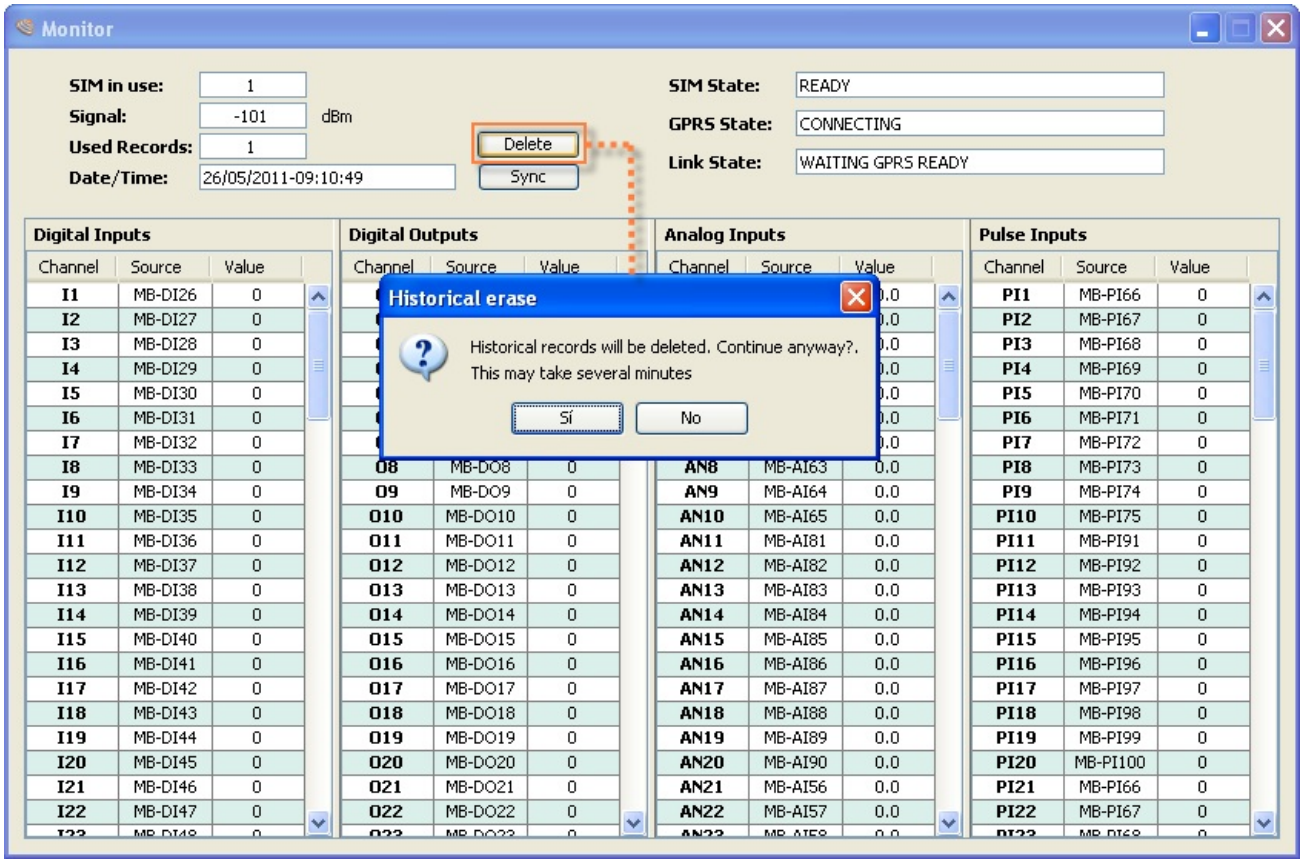
Pulse input channels historical records

The pulse channels can also generate Historicals in a specific time that can be configured the same way as in the other channels, as it is shown in the following figure. We can also decide if once the Historical is generated, we want the counter reset to 0 or not.



Delete Historicals

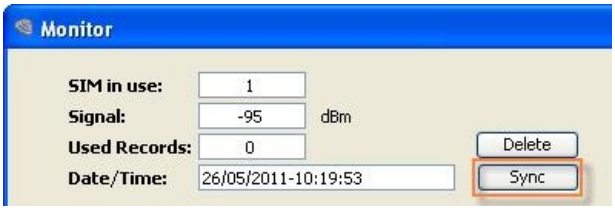
In the need of erasing Historical registers, this can be done by means of the “GRD Config” in the monitor window with the “Delete” button located next to the indicator of stored Historicals.



This operation can take a considerable time.

Configuring time

The time can be updated on the monitoring screen by clicking on the “Sync” button. The time is synchronized with the PC time to which is connected.



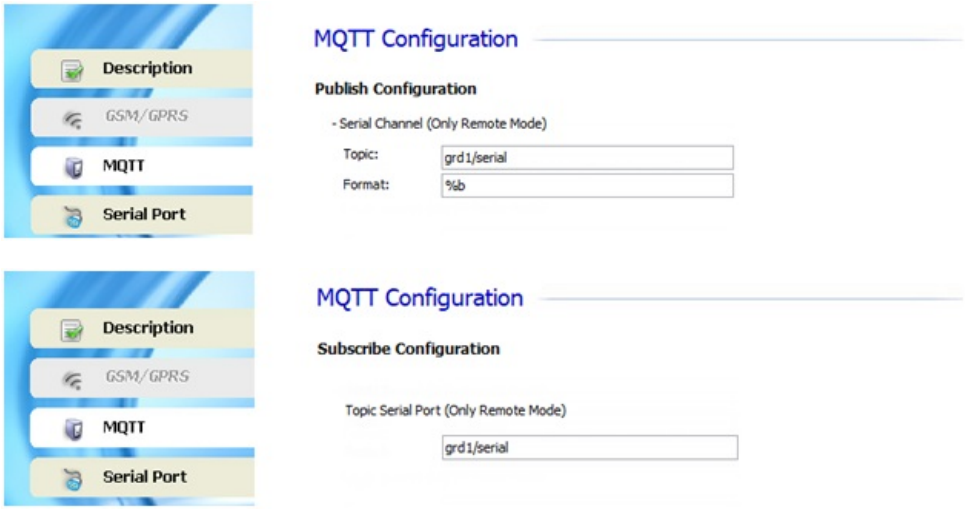
⚠	*It is important to disable the Windows option “**Automatic time change according to daylight savings time”.** In case of being in a region with no daylight savings time change the time zone and in an area with daylight savings time change the time zone to a region with it and disable it, then return to your time zone.*

2020-11-20

Remote serial port using MQTT

This procedure will allow you to send and receive data to and from the serial port (RS232/RS485) using publish and subscribe.

You must configure the serial ports publish and subscribe topics and the format the payload will have



Payload format

%b	Binary data as received. No data is filtered nor codified
%s	Non printable ASCII values are filtered out. ASCII < 32 and ASCII >126
%h	String HEX ASCII

Note. If the serial port is configured in script mode publish/subscribed data can still be access using *read_str 25* and *write_str 25* from the script

2020-11-20

GRD-MQ y cLAN-MQ remote configuration

This devices can be configured remotely using a MQTT broker to gain acceso the the device.

You have to configure a configuration topic to publish and receive (subscribe) the configuration.

The GRDconfig software will use the same topic to configure the device.

Device configuration

Topic configuration. The device will add a text to the topic as explained later.

Configuration topic - Identifying the device

The device will add the ClientID to the base configuration topic.

Example

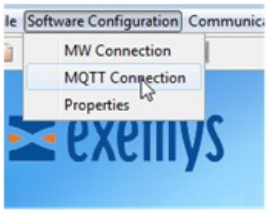
Subscribe -> *grdconfig/enlace/1/clientID*

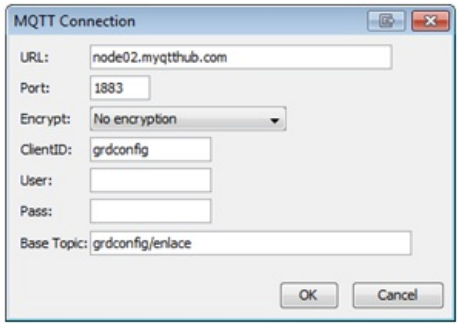
Publish -> *grdconfig/enlace/0/clientID*

Configuring the GRDconfig for remote MQTT configuration

You must configure the broker access and the base configuration topic

Go to *"Software Configuration -> MQTT Connection"*



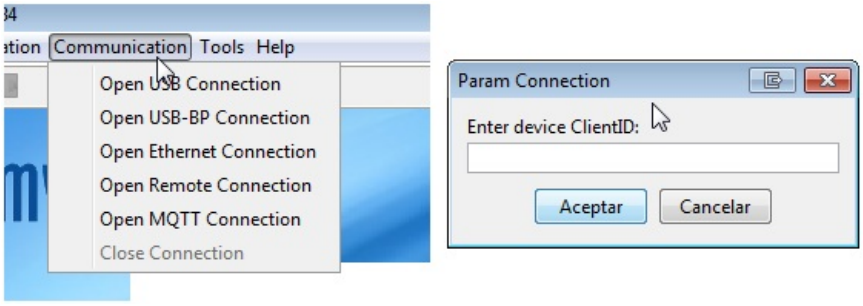


This *base topic* must match the one configure on the device.

Remote configuration

Go to *"Communication -> Open MQTT Connection "*

And type the ClientID of the device you want to configure.



Once the link is established use the "Monitor", "Get Configuration" and "Send Configuration" buttons.

⚠	MQTT connection parameters (and GPRS on GRD) can't be modified remotely

2020-11-19

SMS - Monitoring and Configuration for GRD-MQ

The status and configuration of GRD-MQ equipment can be verified using SMS. It is also possible to modify the configuration with the same system.

The SMS commands supported by the GRDs are detailed below. Every time that the equipment recognizes the command as valid it will respond with another message to the telephone number that sent it. When a configuration command is sent it will respond either that it was applied successfully or that an error occurred.

	Before starting you must know the password allowing the modification of the configuration of the equipment. The factory configuration disables the password, then this field will be left empty unless it is enabled.

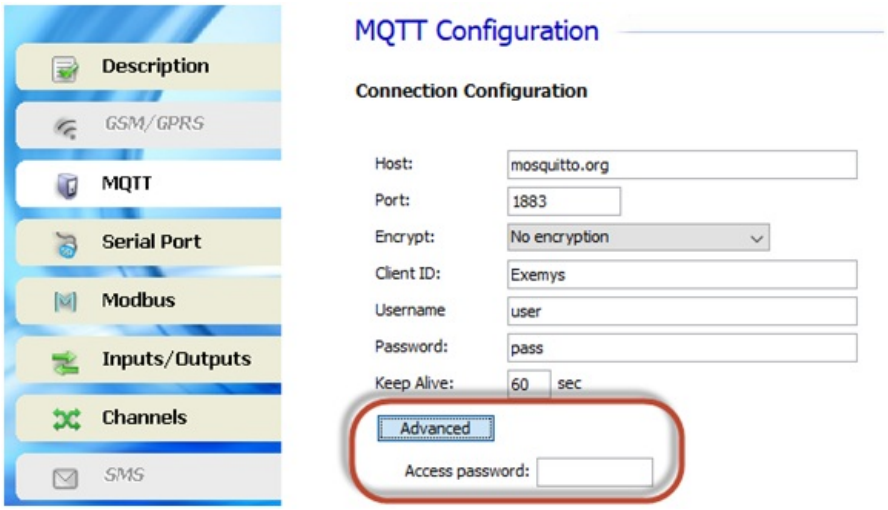
All commands are not case sensitive.

	In all messages the separation between words must be exactly one space.

Protection Password

Configuration SMS can be password protected. This password must be added at the end of all the configuration messages.

You can set it and edit it on the "Advanced" section of the MQTT/Connection tab.



Verification of the status of the equipment

Status of GSM/GPRS/LINK

Command	Description

STATE o ?	Returns the status of GRDs communications

Note: This command does not require a password.

Returns the current configuration

Command	Description
LIST	Returns the basic equipment configuration, the model and serial number.

Example of a response:

MODEL: GRD3625-MQ-3G / SN: 124 / GPRS: apn/user/password

Note: This command does not require a password.

Signal level

Command	Description
SIGNAL	Signal level

The signal level can vary between -113 dbm and -51 dbm

Note: This command does not require a password.

Versions and IMEI

Command	Description
VERSION	Returns the versions of Hardware, Software and IMEI

Example of a response:

FIRbrokerARE: 1.0 HARDWARE: 1.0 IMEI 123456789123456

Note: This command does not require a password.

GRD-MQ configuration

Modify GPRS parameters

Using this command you can configure the apn, user and password of the GPRS. This command will also enable GPRS if it was disabled

Command	Description
GPRS apn user password *[password]*	Configures the GPRS service

If the configuration was successful the GRD-MQ will respond “GPRS OK”.

Command	Description
GPRSOFF *[password]*	Disable GPRS service

If the configuration was successful the GRD-MQ will respond “GPRSOFF OK”.

Modify the MQTT connection configuration

With this command you can change the URL or IP address and the connection port to the broker.

Command	Description
CON *URLorIP port [password]*	Configures the URL or IP and the connection port to the broker

Where:

Parametro	Description	Value
URLorIP	URL or IP where the broker is located	xxx.xxx.xxx.xxx
port	TCP port in which the broker expects the GRD-MQ connections	[1…65535]

Example: CON 200.89.185.59 1026 password

If the configuration was successful the GRD-MQ will respond “CON OK”.

Client ID, User, Password:

Command	Description
MQTTID *cid*	*cid* is the Client ID
MQTTUSR *usr*	*usr* is the MQTT user's name
MQTTPSS *pss*	*psss* the MQTT password

The two following commands can be used it the user name or password are to long to fit in a single SMS. The text configured on this messages will be attached to the previous ones.

Command	Description
MQTTUSRX *usrx*	*usrx* MQTT user's name continuation

MQTTPSSX *pssx*	*pssx* MQTT password continuation

Disconnecting the GRD

Command	Description
DISC *[password]*	This command disconnects the GRD-MQ from the broker preventing a reconnection until the connection is reconfigured.

Modifying the password

Command	Description
PASSW *newpassword [password]*	Modifies the password used by the GRDs for SMS and the connection to the broker

The password can have a maximum of 8 characters and is not case sensitive.

Configuring a new password if you did not have any:

PASSW *newpassword*

Configuring a new password if you already have one:

PASSW *newpassword previouspassword*

Erasing the password:

To leave the equipment without a password you must send a message leaving 2 spaces between the command and the previous password.
PASSW previous*password*

Rebooting the GRD-MQ

Command	Description
RESET *[password]*	Reboots the GRD-MQ

Reading Inputs and Outputs

It's possible to read the value of the channels by SMS

Digital Inputs:

Command	Description
GETI *[I channel]* *	Reads channel I. (Read note*)
GETI *[first I channel]…[last I channel]*	Read several I channels

GETI	Reads all I channels (Max. 50 channels in on SMS).

Digital Outputs:

Command	Description
GETO *[O channel]* *	Reads channel O. (Read note*)
GETO *[first O channel]…[last O channel]*	Read several O channels
GETO	Reads all O channels (Max. 50 channels in on SMS).

Analog Inputs:

Command	Description
GETAN *[AN channel]* *	Reads channel *AN*. (Read note*)
GETAN *[first AN channel] …[last AN channel]*	Read several *AN* channels
GETAN	Reads all *AN* channels (Max. 15 channels in on SMS).

Pulse Inputs:

Command	Description
GETPI *[PI channel]* *	Reads channel *PI*.
GETPI *[first PI channel]…[last PI channel]*	Read several *PI* channels
GETPI	Reads all *PI* channels (Max. 15 channels in on SMS).

If you receive three point (...) ending the SMS, it means that more information will be sent on another SMS.

*Note: If you configured an SMS alarm for this channel you will receive the full text you configured. The text will change depending on the state of the I/O. Please read SMS alarms section for further information.

Setting outputs and pulses

You can set an output or pulse channel by sending an SMS to the GRD.

This commands can only be sent from the phone numbers added to the GRD-MQ "Phone book". Please read SMS alarms section for further information.

Command	Description
SETO *[O channel] [state]*	The O channel will be set to "state"

State can be "ON" or "OFF"

Command	Description
SETAN *[AN channel] [value]*	The AN channel will be set to "value"

Only applies to analog channels mapped to script variables or Modbus queries

Command	Description
SETPI *[P channel] [value]*	The P channel will be set to "value"

The value can be between 0 and 1.000.000.000

Script control

Command	Description
STARTSCRIPT *[password]*	Script interpreter will set to 'run' mode

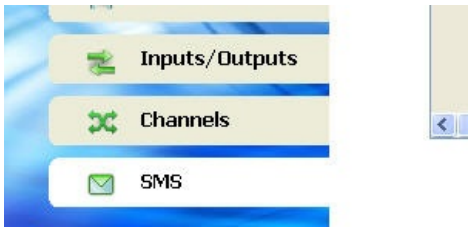
Command	Description
STOPSCRIPT *[password]*	Script interpreter will set to 'stop' mode

2020-11-20

SMS alarms

GRDs w/SMS can send SMS alarms to the configured recipients when and analog inputs goes out of range or a digital input changes.

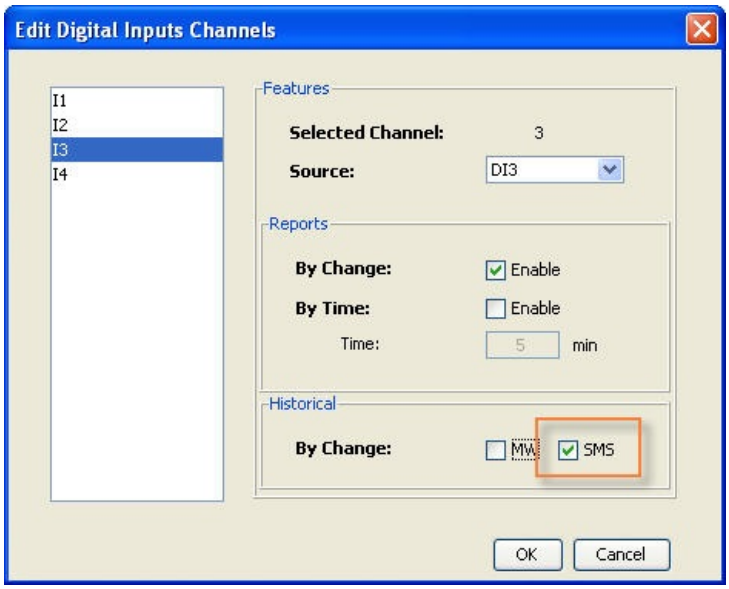
You will find the tab "SMS" enabled on the GRD Config software when working with these GRDs.



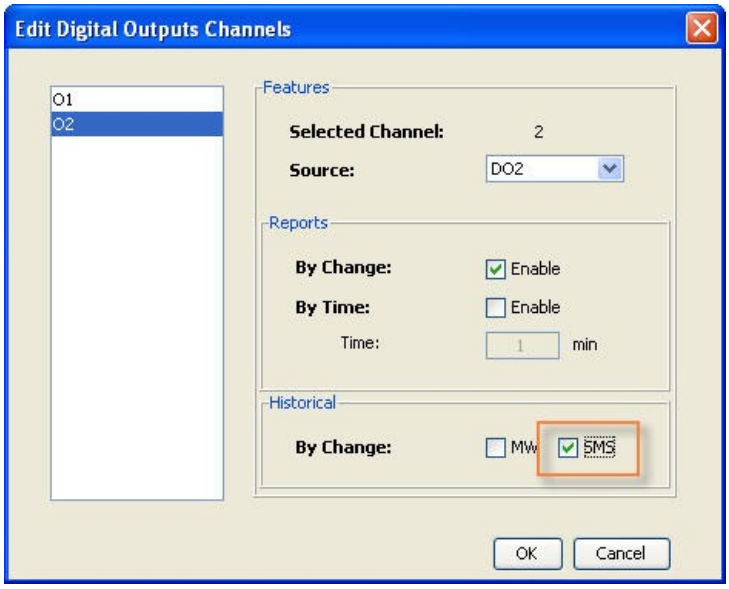
Enabling SMS alarms

You need to enable which channel will send and SMS alarms. Once you do it this channel will be listed on the SMS configuration.

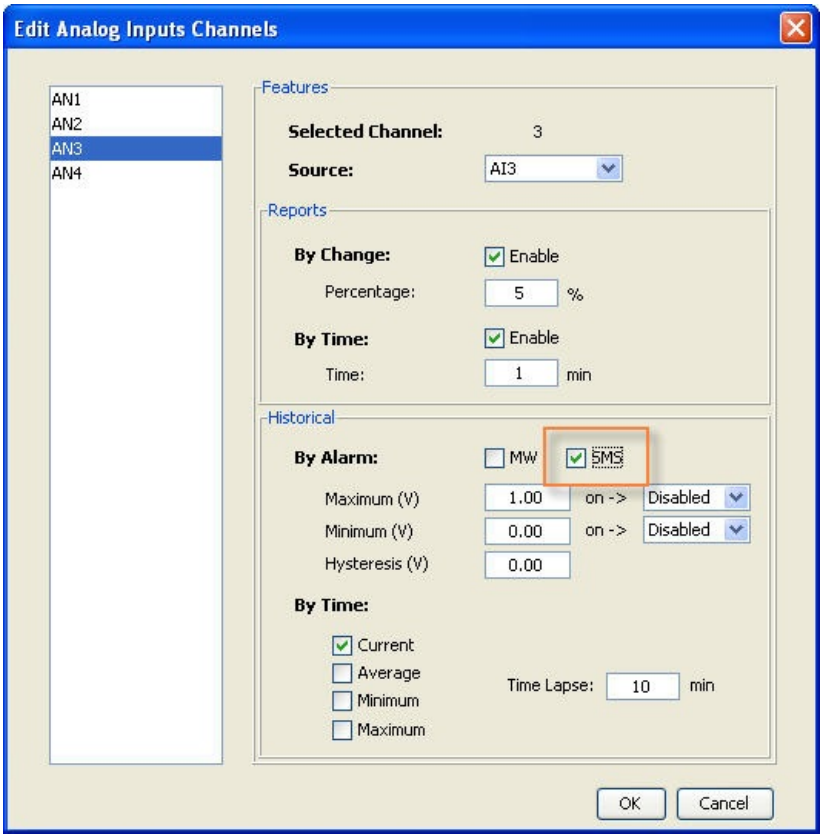
On digital inputs channels you must enable the SMS by change option



On digital outputs channels you must enable the SMS by change option



On analog inputs channels you must enable the SMS by alarm option

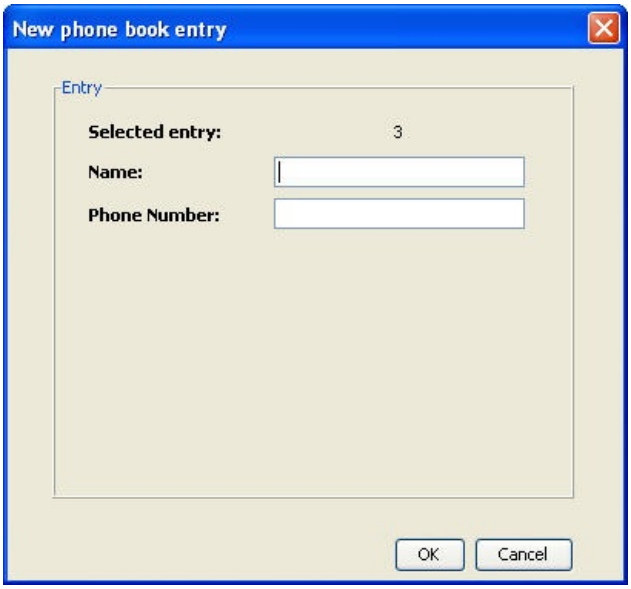


	Limits should be configured later depending on the SMS scaling

Phone Book

To access it go to the SMS tab and then to press the "Phone Book" icon.

To create a new entry press the "Add" button. This window will be displayed.



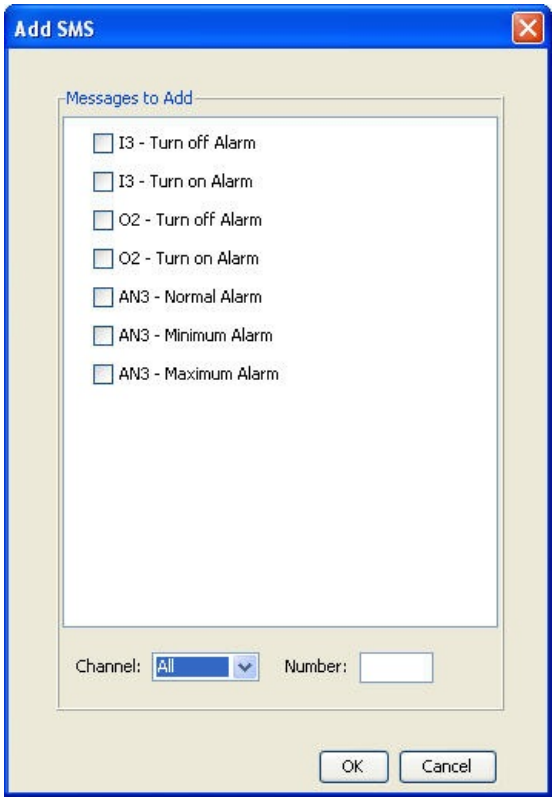
The "Name" is only used as a reference.

SMS selection

After enabling the channels that will send SMS you can configured the text and scaling of each one. Goto to the SMS tab and press the "Message Configuration" icon,

The press the "Add / Remove" button.

The enable the SMSs alarm you will use.



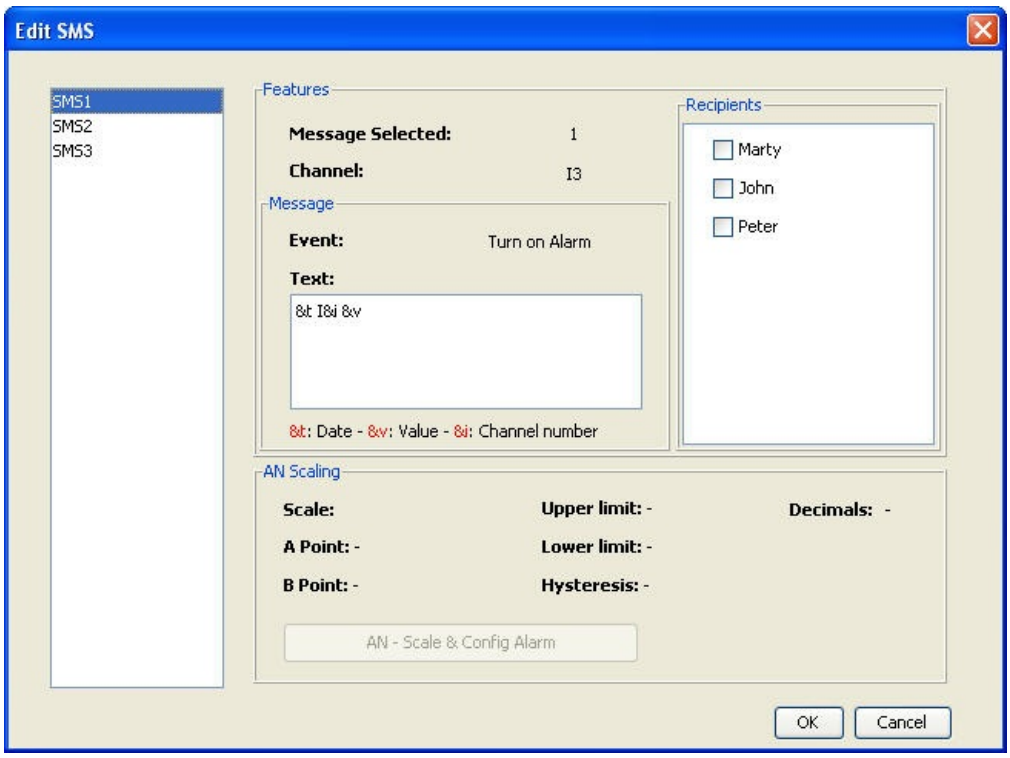
You can enable single events per channel. As an example, you can send an SMS only when input 3 goes on but not when it goes off.

	You can add up to 50 SMSs.

After selecting the messages you will see the default Message. Where &t is the timestamp, &i the channel number and &v the value. Since firmware version 1.5 &q will be the timestamp in american date format (month/day/year).

To modify the you must double click the corresponding line.

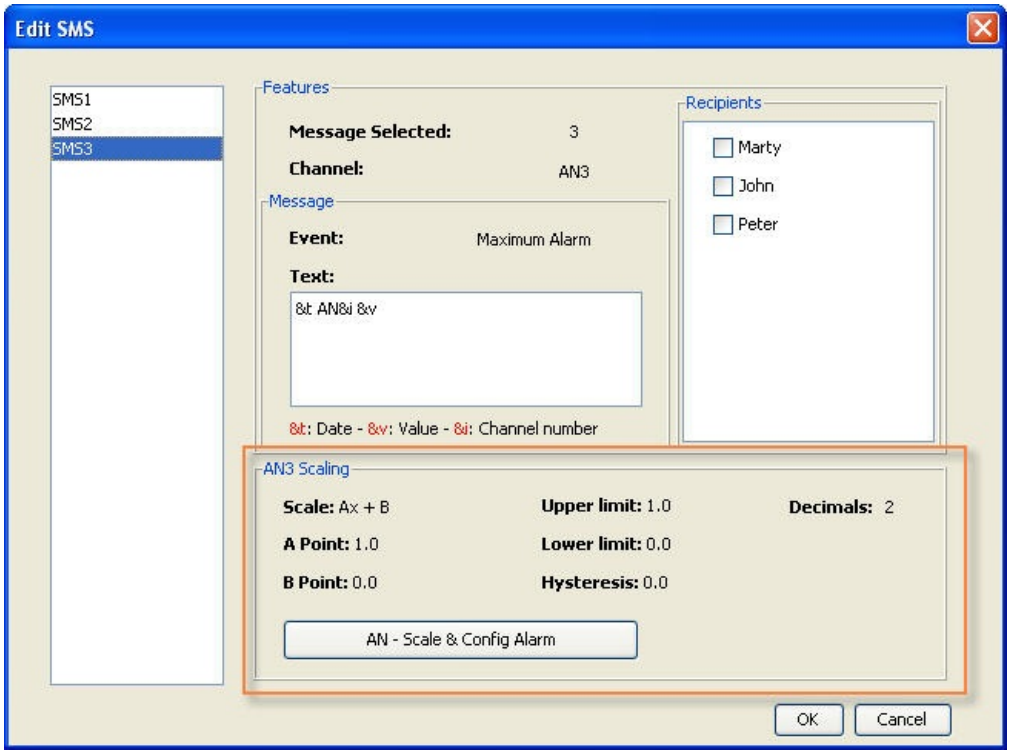
Editing the SMS text



You can select here which recipient will receive this particular SMS.

The maximum text length is 60 characters. Using &t, &v and &i you can add the date, value and channel number to the SMS text.

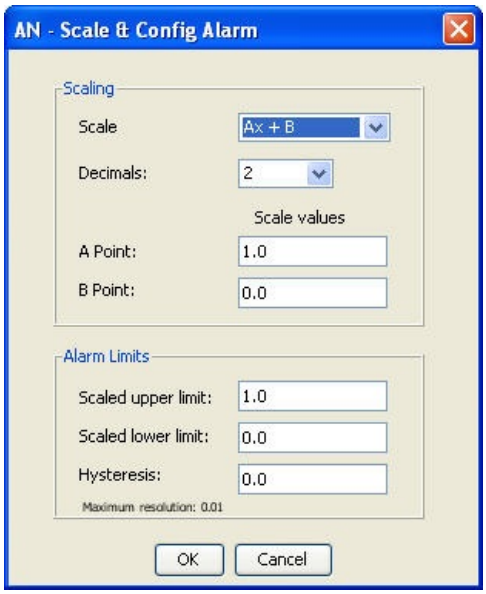
If the SMS is related to an analog input the "AN scaling" section will be enabled.



This scaling will only be applied to the SMS of that analog channel.

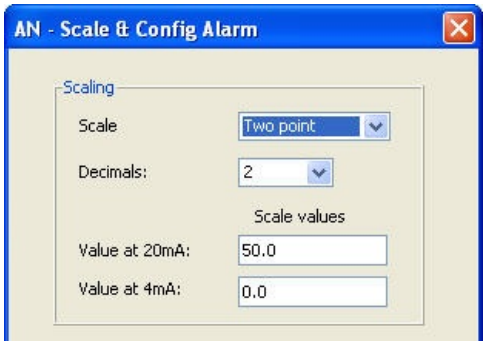
Analog input scaling

If you press the "AN - Scale & Config Alarm" button this window will be shown

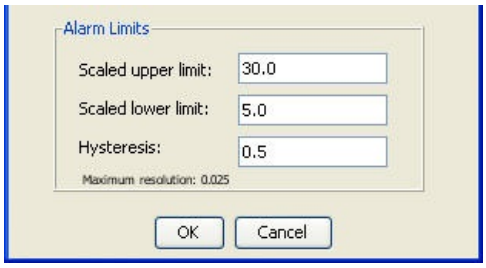


On the top part (Scaling) you can select which scale type will be applied fo this input, how many decimal digits will be used and the A & B scaling values.

You can choose between linear scaling (A x + B) or "Two points" scaling. If the analog channels is related to a physical input you will usually use "Two Points" scaling.



On the botton part (Alarm Limits) you can re define the "Historical By Alarm" limits but using the scaled values.



	Editing the scaling will affect all the SMS related to the same analog channel.

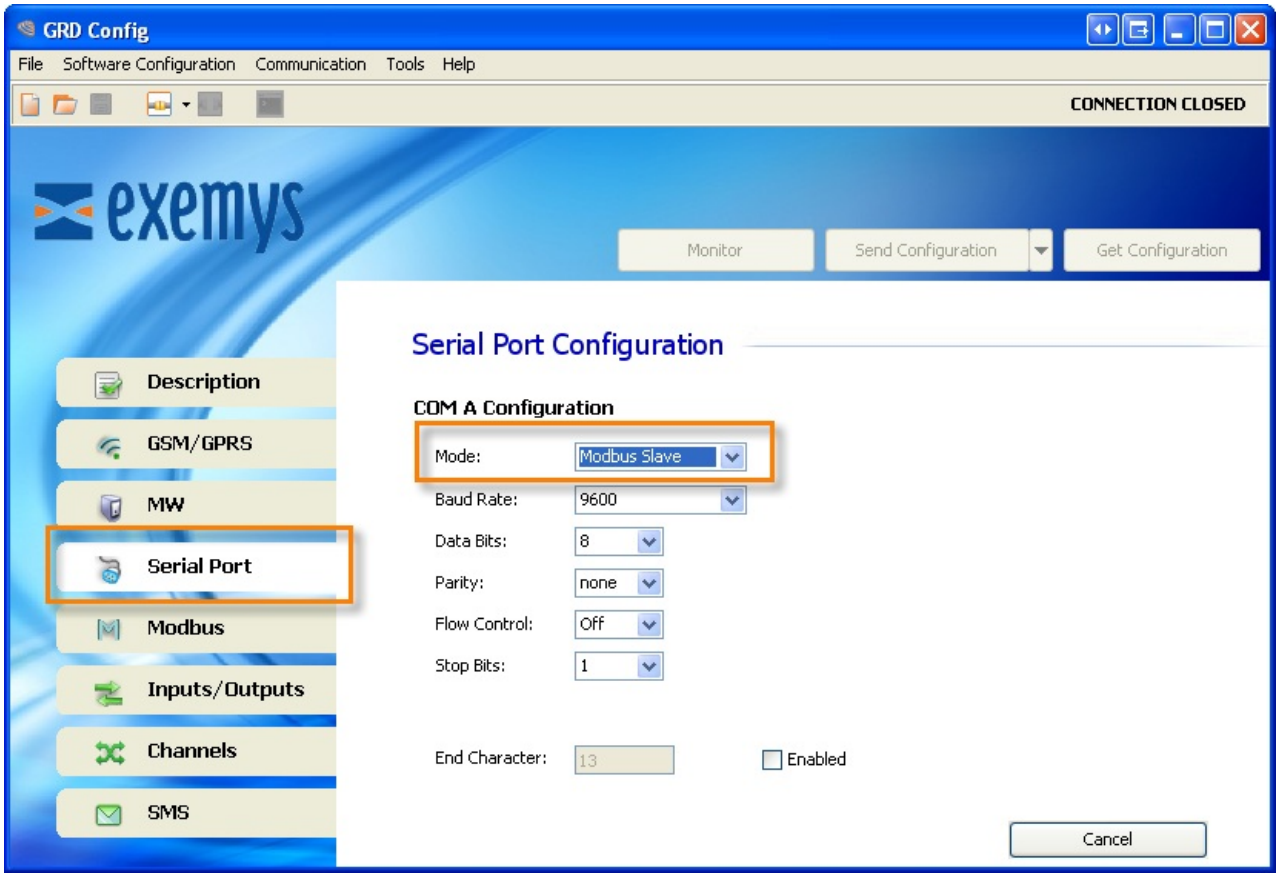
2019-11-28

⚠	*For GRD-3G only*

GRD Modbus Slave

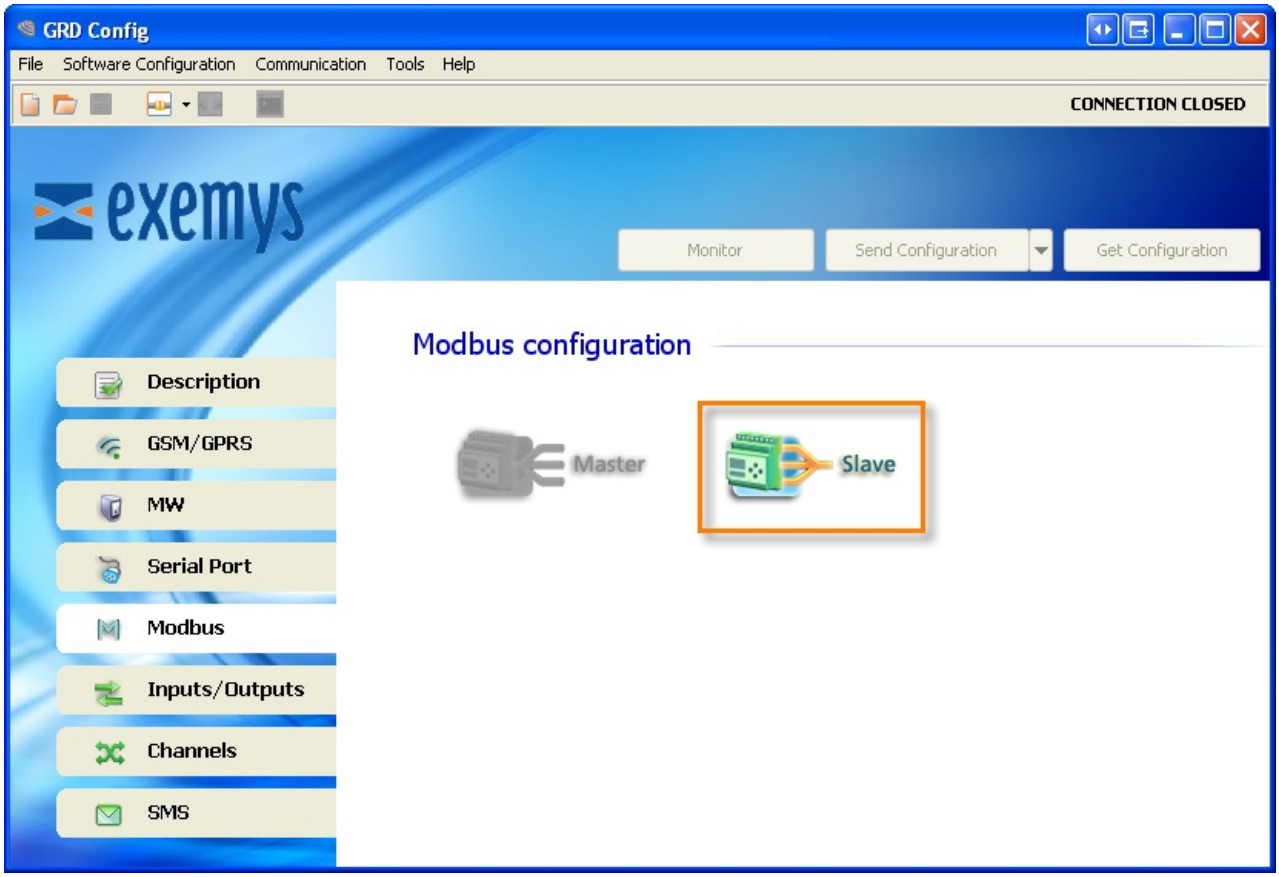
GRD's serial port can be configured in Modbus slave mode. This mode will allow you to read and write all GRD channels (physical, Modbus or script)

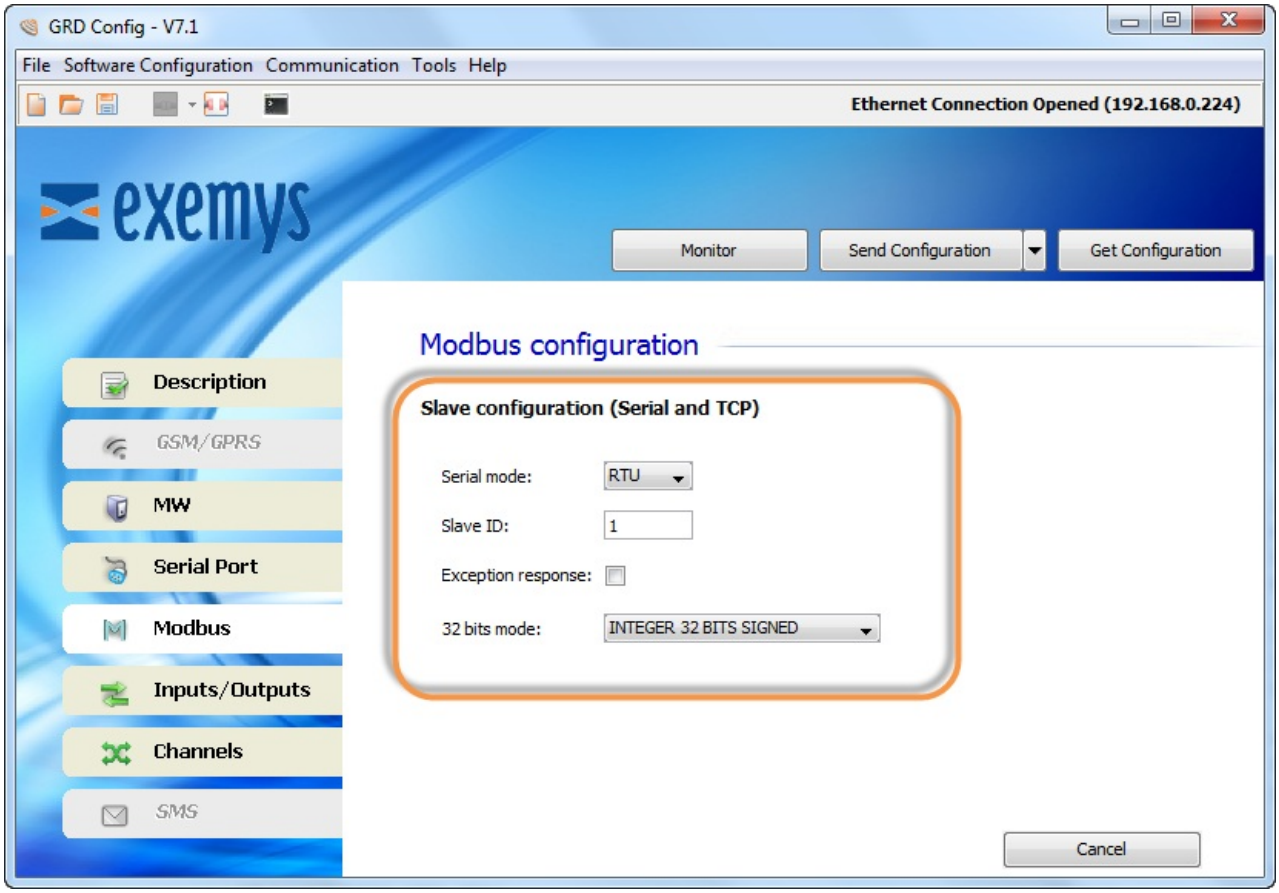
To use the Modbus slave configure one serial port in "Modbus Slave" mode



Modbus slave configuration

Go to the “Modbus” tab and select “Modbus Slave”





Serial mode

It refers to the Modbus protocol to be used, being RTU or ASCII.

Slave ID

The GRD will answer when it receives a Modbus query to this Modbus slave ID

Exceptions

If enabled the GRD will answer with an exception to a query sent with an invalid command, address range or value.

32 bits mode

AN an P channels are mapped in 32 bit registers. Here you can configure if the most significant word is mapped in the first or the second register

Channels mapping

This is how GRD channels are mapped

Start Address	End Address	GRD Channel	Format
10001	10100	I1 a I100	Bit
00001	00100	O1 a O100	Bit
40001	40200	AN1 a AN100	32 Bits integer
40201	40400	PI1 a PI100	32 Bits integer

Example. On a GRD3625-XF-3G or MQ with the default configuration the physical I/Os are mapped like this

Start Address	End Address	GRD Channel
10001	10006	I1 to I6
00001	00006	O1 to O6
40001	40008	AN1 to AN4
40201	40212	PI1 to PI6

2020-10-05

Script Programming

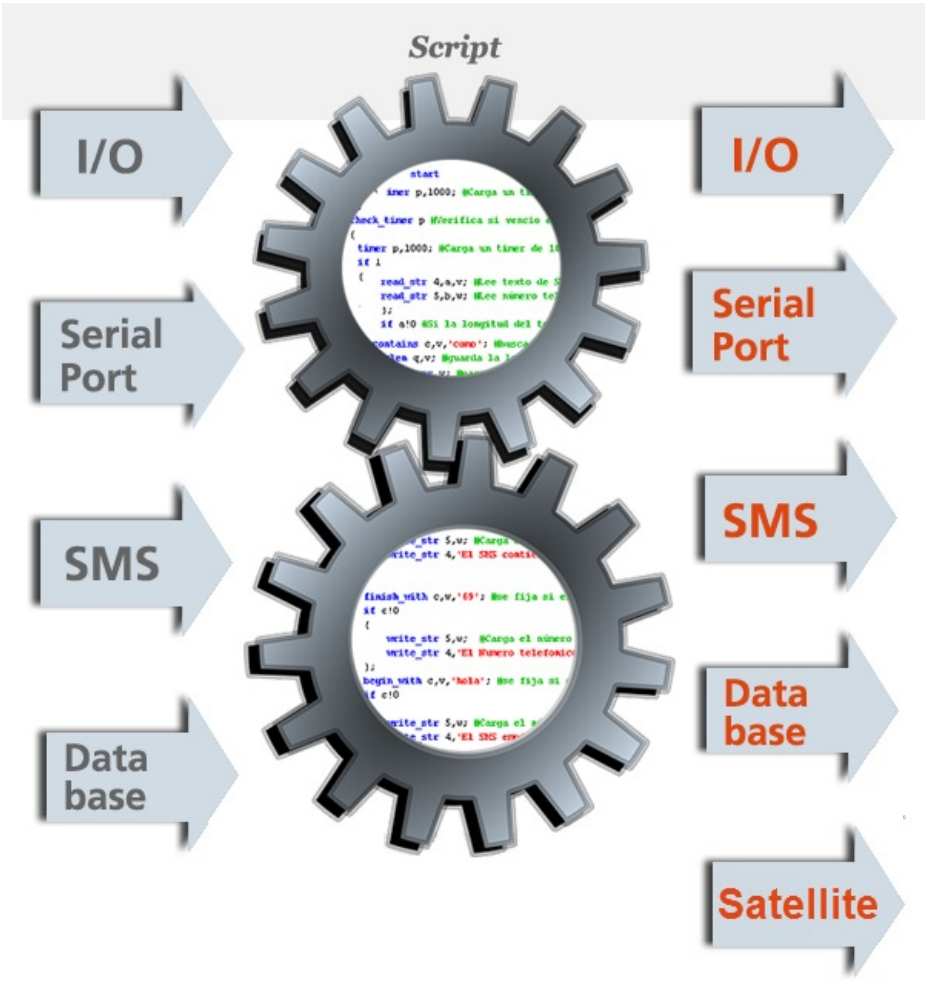
Description

The GRD/cLAN with script programming support allows you to run user written scripts on the device, making it more powerful and flexible.

The GRD/cLAN will continue working normally while the script is running.

Script Features

- **Math** operations
- **Logic** operations
- **Timing** functions
- Physical and Modbus channels readings
- Digital outputs control
- **SMS** sending and receiving (GRD only)
- **Serial port** data parsing
- Sending and receiving data using external **Satellite** modem (XF models only)
- Publish/subscribe **MQTT** data (MQ models only)



2020-11-20

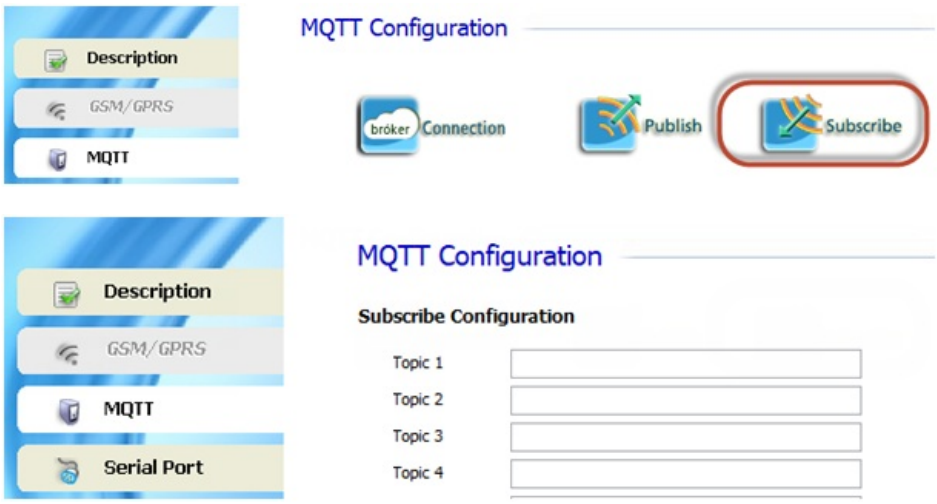
MQTT publish/suscript from Script

Script programming can be used to get data from subscribed topics of publish extra topics.

	Please go to the script programming manual for more information.

Script - Suscription

You can subscribe to up to 10 topics



The use read_io 1000 to get the messages on the script

```
read_io 1000,b,0;
```

b how may messages are queued waiting to be read

To get the first message in the queue use read_str 1000

```
read_str 1000,c,z;
```

z message text

Script - Publish

You public message straight from the script code

Go to the script programming manual for more information.

Before publishing it's suggest it to check if the broker connection is established

read_io 1001,h,0;

h=1 connection established

Then set the topic to publish

```
write_str 1001,'v1/devices/me/telemetry';
```

And finally set the payload. This operation will also publish the message.

```
write_str 1002,'{A1:52}';
```

2020-11-20

GRD1620-XF-3G / GRD1620-MQ-3G

Hardware features

- SIMs: 1
- USB: 1 (For configuration)
- 2G, 2.5G (GSM GPRS/EDGE - 850/900/1800/1900MHz) and 3G (UMTS WCDMA / 800MHZ-B19, 850MHz-B5/B6, 900MHz-B8, 1900MHz-B2, 2100MHz-B1) - Automatic switch between American and European Bands
- Serial ports: 2 (one RS232, one RS485)
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 70 x 90 x 65 mm
- Operating Temperature: -20ºC to +65ºC

Data Acquisition

- Physical inputs/outputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming (Version 2)

Operating modes:

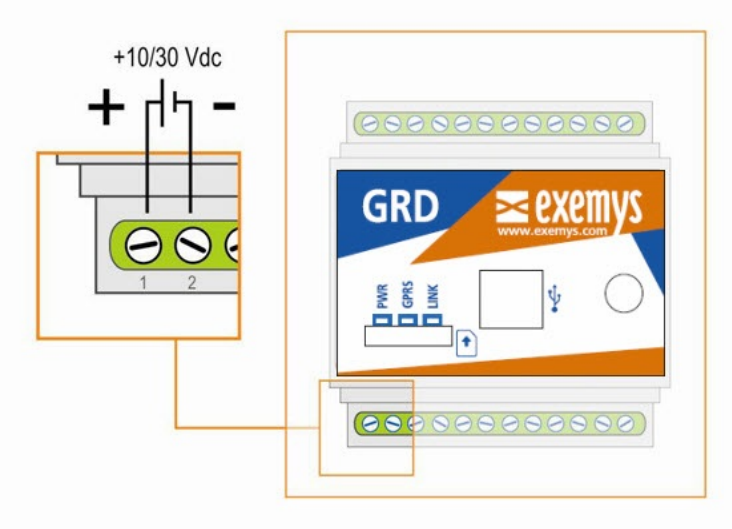
- XF model: Monitoring by WEB page / Database(GPRS datalogger)
- MQ model: MQTT client
- Monitoring from SCADA
- Remote access to serial port
- SMS alarms/control
- Local control using script programming (timing, logic, math, I/O control)

Server link :

- GSM / GPRS (2G/2.5G/3G)
- Satellital (with external satellite modem, XF model only)

Wiring

Wiring – Power supply

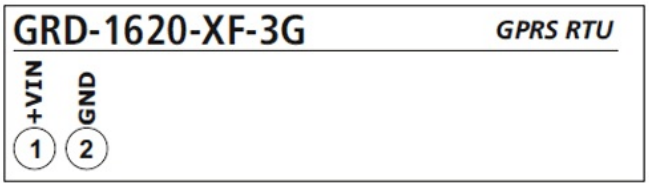


Wiring – RS232 port – RS485 port

Port A is an **RS232** port of the 5-wire DTE type (TXA, RXA, RTSA, CTSA, GND) and has a terminal board for its connections.

Port B is an **RS485** port is of the 2-wire type (TRB+ and TRB-) and has a terminal board for its connections.

Wiring – Terminal Blocks



2020-10-05

GRD3621-XF-3G / GRD3621-MQ-3G

Hardware features

- SIMs: 1
- USB: 1 (For configuration)
- 2G, 2.5G (GSM GPRS/EDGE - 850/900/1800/1900MHz) and 3G (UMTS WCDMA / 800MHZ-B19, 850MHz-B5/B6, 900MHz-B8, 1900MHz-B2, 2100MHz-B1) - Automatic switch between American and European Bands
- Digital Inputs/Outputs: 4 Configurable
  - As inputs: voltage activated (They can count pulses of up to 45 Hz)
  - As outputs: open collector type
- Analog Inputs:
  - 1 configurable as 0-1V / 0-10V / 4-20mA / PT100 (Software + Hardware configurable)
  - 1 configurable as 0-1V / 0-10V / 4-20mA (Software)
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 70 x 90 x 65 mm
- Operating Temperature: -20ºC to +65ºC

Data Acquisition

- Physical inputs/outputs

Operating modes:

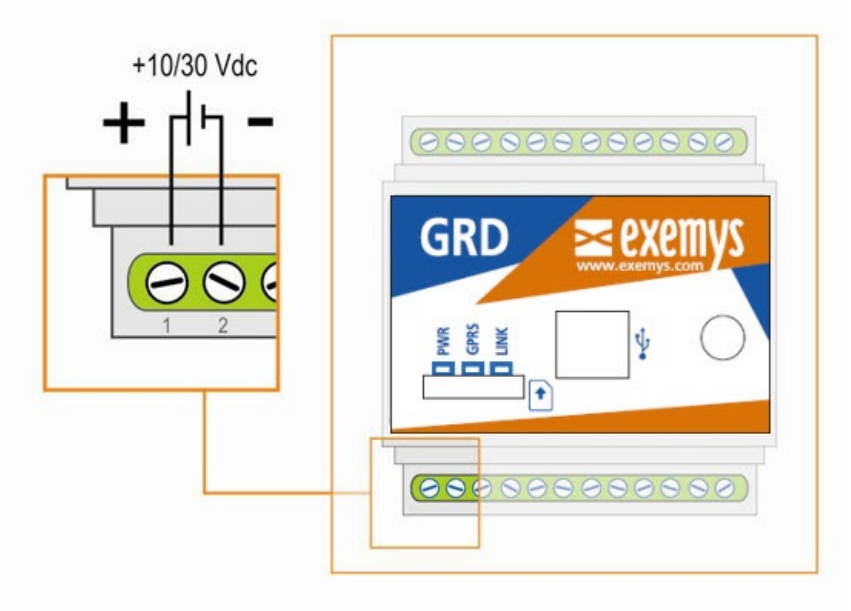
- XF model: Monitoring by WEB page / Database(GPRS datalogger)
- MQ model: MQTT client
- Monitoring from SCADA
- SMS alarms/control
- Local control using script programming (timing, logic, math, I/O control)

Server link :

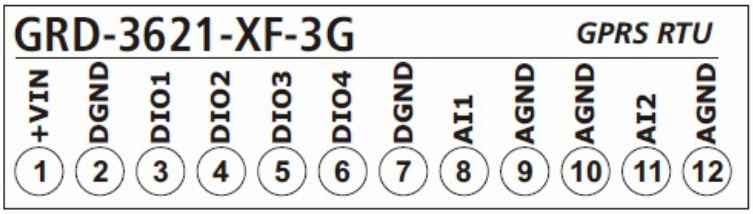
- GSM / GPRS (2G/2.5G/3G)

Wiring

Wiring – Power supply



Wiring – Terminal Blocks



Wiring - Internal jumpers for AI1

AI1 input can be configured to measure current, voltage or temperature using a PT100 sensor

It must be configured on the configuration software and with two internal jumpers.

To measure current or voltage set both jumpers to the *VI* position. To connect a PT100 sensor set them at the *PT* position.

Disassemble the GRD carefully to reach the jumpers.

2020-10-05

GRD3625-XF-3G / GRD3625-MQ-3G

Hardware features

- SIMs: 1
- USB: 1 (For configuration)
- 2G, 2.5G (GSM GPRS/EDGE - 850/900/1800/1900MHz) and 3G (UMTS WCDMA / 800MHZ-B19, 850MHz-B5/B6, 900MHz-B8, 1900MHz-B2, 2100MHz-B1) - Automatic switch between American and European Bands
- Serial ports: 2 (one RS232, one RS485)
- Digital Inputs/Outputs: 6 Configurable
  - As inputs: voltage activated (They can count pulses of up to 45 Hz)
  - As outputs: open collector type
- Analog Inputs: 4 configurable as 0-1V / 0-10V / 4-20mA
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 70 x 90 x 65 mm
- Operating Temperature: -20ºC to +65ºC

Data Acquisition

- Physical inputs/outputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming (Version 2)

Operating modes:

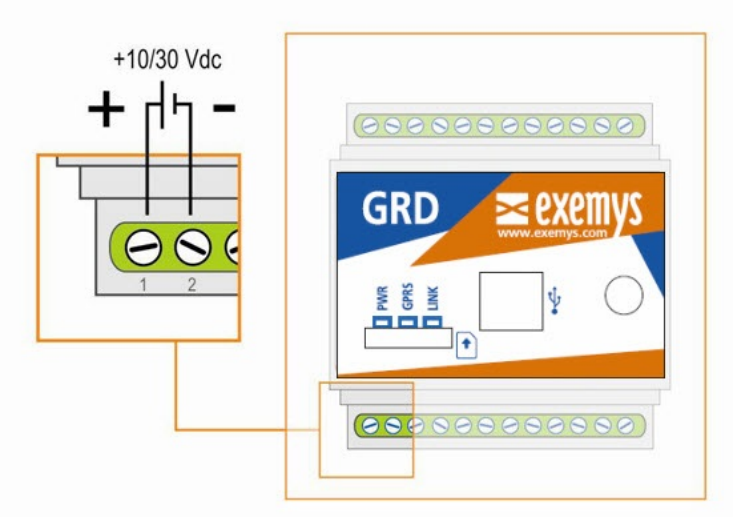
- XF model: Monitoring by WEB page / Database(GPRS datalogger)
- MQ model: MQTT client
- Monitoring from SCADA
- Remote access to serial port
- SMS alarms/control
- Local control using script programming (timing, logic, math, I/O control)

Server link :

- GSM / GPRS (2G/2.5G/3G)
- Satellital (with external satellite modem, XF model only)

Wiring

Wiring – Power supply



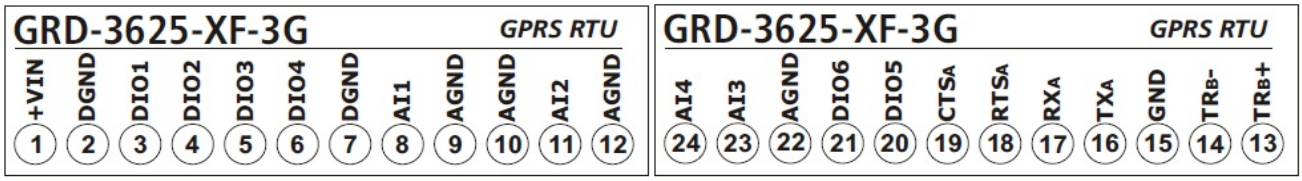
Wiring – RS232 port – RS485 port

Port A is an **RS232** port of the 5-wire DTE type (TXA, RXA, RTSA, CTSA, GND) and has a terminal

board for its connections.

Port B is an **RS485** port is of the 2-wire type (TRB+ and TRB-) and has a terminal board for its connections.

Wiring – Terminal Blocks



2020-10-05

GRD3534-XF-3G / GRD3534-MQ-3G

Hardware features

- SIMs: 1
- USB: 1 (For configuration)
- 2G, 2.5G (GSM GPRS/EDGE - 850/900/1800/1900MHz) and 3G (UMTS WCDMA / 800MHZ-B19, 850MHz-B5/B6, 900MHz-B8, 1900MHz-B2, 2100MHz-B1) - Automatic switch between American and European Bands
- Serial ports: 2 (Both are RS232 and RS485)
- Digital Inputs : 16 voltage activated (8 of them can count pulses of up to 1 Khz)
- Analog Inputs: 8 configurable as 0-1V / 0-10V / 4-20mA
- Digital Outputs: 8 open collector type
- Power supply requirements: 10 to 30 Vdc
- Dimensions: 150 x 90 x 65 mm
- Operating Temperature: -20ºC to +65ºC

Data Acquisition

- Physical inputs/outputs
- Modbus inputs/outputs (embedded Modbus master)
- Embedded Modbus slave
- Other protocols using script programming (Version 2)

Operating modes:

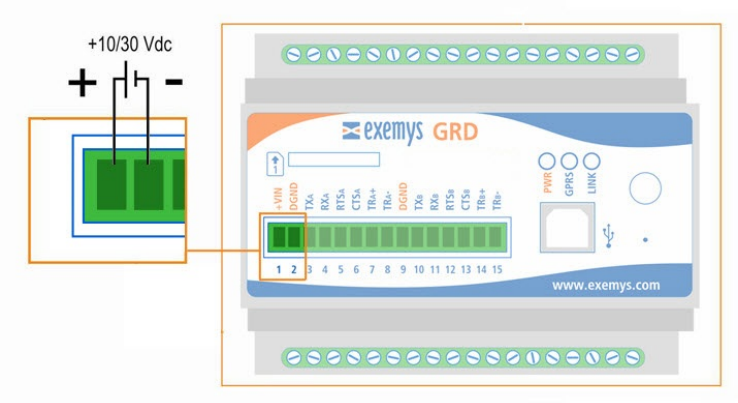
- XF model: Monitoring by WEB page / Database(GPRS datalogger)
- MQ model: MQTT client
- Monitoring from SCADA
- Remote access to serial port
- SMS alarms/control
- Local control using script programming (timing, logic, math, I/O control)

Server link :

- GSM / GPRS (2G/2.5G/3G)
- Satellital (with external satellite modem, XF model only)

Wiring

Wiring – Power supply

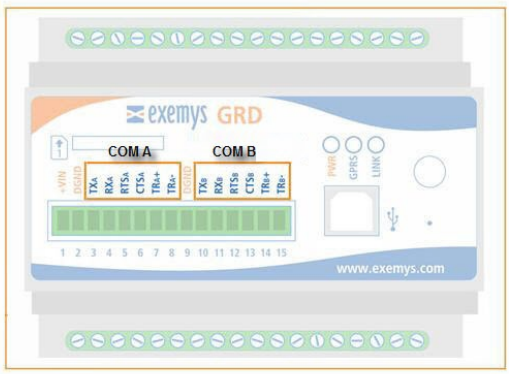


Wiring – RS232 port – RS485 port

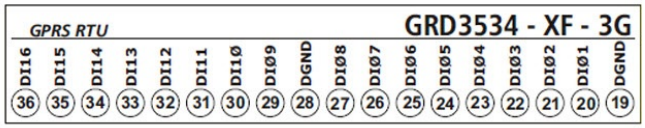
The **RS232** ports are of the 5-wire DTE type (TX, RX, RTS, CTS, GND) and has a terminal board for its connections.

The **RS485** ports are of the 2-wire type (TR+ and TR-) and has a terminal board for its connections.

There's no need to configure whether you are going to use the port RS232 or RS485. Just connect the wires to the corresponding terminals.



Wiring – Terminal Blocks



2020-10-05

Signal, SMS, GPRS and broker link Troubleshooting

- **The GRD does not respond to SMS messages.**
  - **If "GRD Config" shows a very low signal level "Ex: -113dB" or SIM status shows "LOW SIGNAL")**.
    - The GRD has no signal. Verify:
      - That the antenna is correctly connected.
      - That the GRD is within the coverage area of your cell phone operator.
  - **The SIM card status indicates failure.**
    - The GRD is not accepting the SIM.
      - If "GRD Config" shows "PIN Required": the SIM card has the PIN activated (security code), configure the PIN.
      - If "GRD Config" shows "Blocked card (PUK)": the SIM card is blocked by PUK.
  - **If there is no indication of error.**
    - Verify that the SIM card placed in the GRD has credit.
    - Verify that the SIM card has a subscription or account that allows to send SMS messages.
    - Check that the phone number you are sending the message to, matches with the one on the SIM Card of the GRD.
    - Be sure that the message sent is one of the supported ones by the GRD. If the message begins with a word the GRD cannot interpret, it will not answer. The same thing happens if the message begins with a space.
- **The GPRS connection cannot be established**
  - Verify the status with "GRD Config" or send a SMS message requesting the connection status ('***state***' *command*)
  - If the status**shows "ERROR".** Verify that the configured Operator (GPRS APN/user/password) corresponds to the one on the SIM Card. (You can verify this value sending the SMS message ***'list'***).
  - If the status shows **"CONNECTING"** for a long time, it simply means there are delays in the network. Wait until the GRD establishes the connection.
- **The broker connection cannot be established**.
  - The status shows **"WAITING FOR GPRS CONNECTION",** the GPRSservice is not available (or is not correctly configured). It won't be able to establish a broker connection until a GPRS connection is available..
  - The status shows **"DISABLED"** (the Link LED is off): there is no configured connection or the GRD is waiting for the next try.
  - The status shows **"Connecting…"** (The Link LED blinks rapidly).
    - If the LED blinks rapidly during several seconds (a minute or more) verify:
      - That the equipment to which you are trying to connect is not behind a firewall which is filtering the connection.
      - You might not have configured the broker's public IP address and/or forgot to open the TCP port in you router.
      - That the quality of the GPRS service is acceptable. For example: attempt to access a page with a web browser of any cell phone having the service available and verify that it can be done without problems.

- If the LED blinks rapidly a few seconds (2 or 3) and then blinks slowly verify:
  - That the IP address and port to which the GRD is attempting to connect are the correct ones.
  - That there is no reason why the server is rejecting the connection request (ex. That is requesting identification or authentication).

- **A connection is established and then it closes**
  - Verify that there is no reason why the server is rejecting the connection request (ex. That is requesting identification or authentication).

- **The connection is established but the communication fails**
  - If the Link LED remains constantly on and it does not blink, is indicating that there is no data reception or transmission. If the Link LED blinks sporadically, it is indicating that data are being sent and/or received. In any case verify:
    - That the established broker connection was made to the correct IP address and port (through SMS with the '***state***' command).

For more information on troubleshooting problems please contact support@exemys.com

2020-09-28