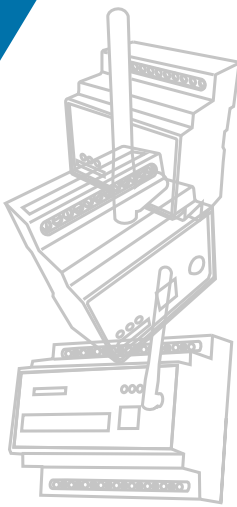# exemys

GRD-XF-4G Family

Telemetry Device with 4G+3G+2G Cellular / Satellite communication andProgrammable Logic

About Us

www.exemys.com

Av. Juan B. Justo 4054
C1416DJU
Ciudad Autónoma de Buenos Aires
Argentina
Tel: (+5411) 4585-7585
Fax: (+5411) 4585-7278
E-mail: info@exemys.com

- Argentine company founded in 1998
- ISO9001:2008 quality Certification
- Approval of the National Communication Commission
- Software law certification
- Exports products worldwide
- Own designs and know-how

MANAGEMENT SYSTEM ISO 9001:2015

IRAM
CERTIFIED MANAGEMENT SYSTEM
IQNet

GESTION DE LA CALIDAD
RI-9000-6174
Acreditado por OAA

APPROVED PRODUCTS

CNC
COMISION NACIONAL DE COMUNICACIONES

SOFTWARE LAW CERTIFIED

ArgenTIna

Modbus MEMBER

Device for monitoring and controlling with 4G Cellular / Satellite communication and Programmable Logic

GRD - XF - 4G

exemys
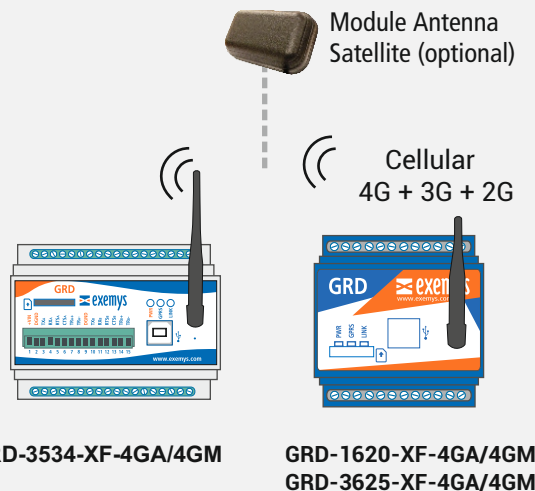
Using the GRD-4G allows for remote monitoring and control of sensors, transducers, and intelligent devices from your own control system or through our Web Server for Telemetry applications

The GRD family of products helps control and supervise any kind of equipment from distance, be it a control system or process system facilitating the implementation of the remote telemetry systems. Additionally it includes the possibility to load a text script to perform internal logics.

★ GENERAL FEATURES

- 4G+3G+2G Cellular Communication
- American and Europena Bands
- Satellite communication (optional)
- 4-20mA and 0-10V Inputs
- Digital Inputs
- Pulse Counter Inputs
- Digital Outputs
- Serial Ports

Module Antenna Satellite (optional)

Cellular 4G + 3G + 2G

GRD-3534-XF-4GA/4GM

GRD-1620-XF-4GA/4GM
GRD-3625-XF-4GA/4GM

Internal Programming Logic

The GRDs incorporate programming logic and calculation by loading a simple text script.

Programming logic + GRD = GRD with Scripts

- Mathematical Operations
- Binary Logic Operations
- Date and Time Operations
- Operations with timers
- Reading of Analog Variables
- Records of Variables
- Turning on and off digital pins of I/O
- Sending and Receiving SMS text messages
- Interpretation of data from the serial port
- Sending of data through the serial port

✔ FUNCIONALITY

- Remote Serial Port (Modbus or wireless)
- Modbus Master protocol in port RS232/485 for I/O expansion
- Modbus Slave protocol for local access to I/O
- Logic programming with Scripts
- Alarms and capability to control by SMS text messages
- Record Logs
- Automatic reconnection by shear link
- Display of data through:
- SCADA Software
- Your own software
- Exemys provided web page

TECHNICAL SPECIFICATIONS

Frequency:
- Model 4GA (Latin America and Australia)
  - GPRS: B2/B5 eGPRS: B3/B8
  - 3G: B1/B2/B5/B8
  - LTE Cat 1:B1/B2/B3/B4/B5/B7/B8/B28
- Model 4GM (Global):
  - GPRS: B2/B5, eGPRS: B3/B8
  - 3G: B1/B2/B4/B5/B6/B8/B19
  - L- TE Cat 1:B1/B2/B3/B4/B5/B7/B8/B12
                B13/B18/B19/B20/B25/B26/B28
- MICRO SIM Card: Supports all providers
- Antenna: 0dBi SMA Connector (other antennas, optional)

General
- Led Lights: GSM / GPRS / Link a datos
- Enclosure: Industrial, DIN Rail
- Dimensions: 70 x 90 x 65 mm / 150 x 90 x 65 mm
(width x high x Depth) Depending on model.
- Operation Temperature : -20°C a +65ºC
- Warranty: 1 year

Power
- Power Input: +10Vdc min. a +30 Vdc max.
- Average Consumption: 150mA at 12Vdc, 100mA at 24Vdc

Communications
- Serial Port: 2 ports. 1x RS232 and 1x Rs485
  2 ports Rs232/485 (Depending on model)

- Protocols: Modbus Master, NMEA, Modbus Slave, ITAS Iridium Satellite
  and others by scripts programming.
- USB port: 1 Port for configuration.
- Configuration: Local by USB or remote by GPRS
- Data Encryption: Propietary encryption.

Inputs and Outputs
- Analog Inputs: 0-10V, 4-20mA (Software configuration)
  - Analog Inputs 0-1Vdc: Precision 0,1mV
  - Analog Inputs 0-10Vdc: Precision 1mV
  - Analog Inputs 4-20mA: Precision 1uA, Surge protected input
- Digital Inputs and Outputs:
  - Inputs:
    - Up to 16 to Transistor (Depending on model)
  - Outputs:
   - Up to 8 to Transistor Open collector (Depending on model)

Counting and Recording of Events
- Counting Input:
  - Frequency Input: 45Hz / 1 Khz (Depending on model)
  - Pulse Input: 10ms min. / 0.5ms min (Depending on model)
- Recording Events:
  - With Real Time Clock (RTC)
  - Can register without Cell Signal (Offline)

AVAILABLE MODELS

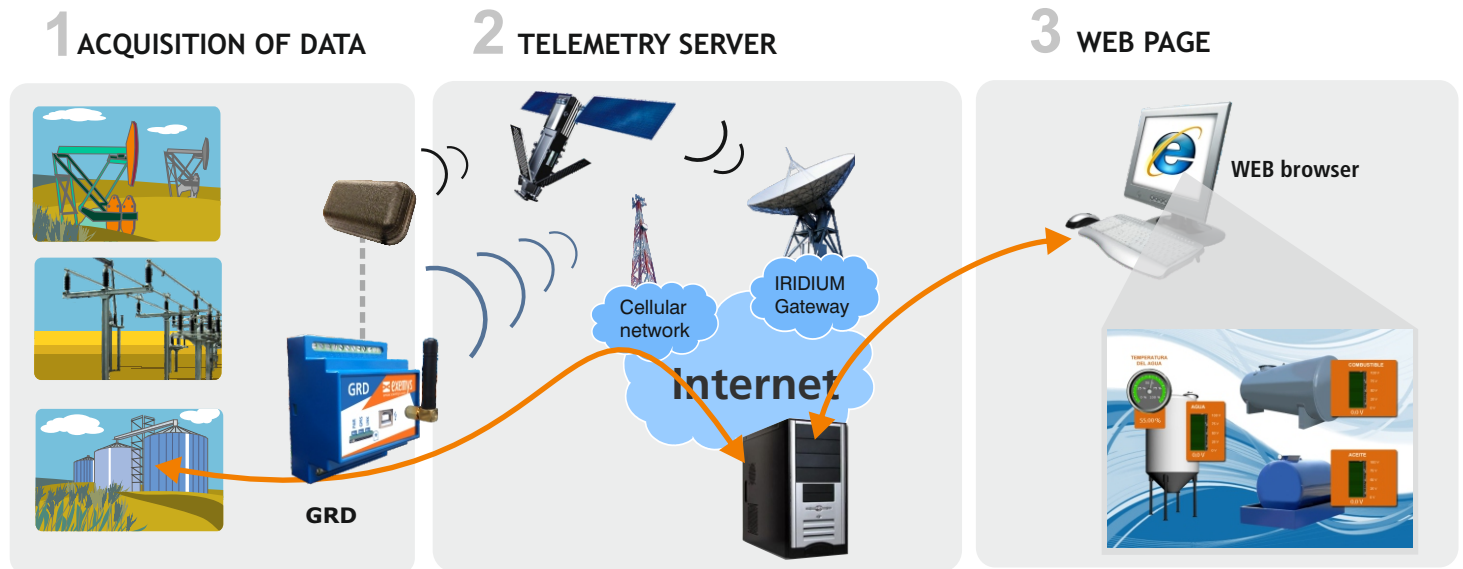| MODEL	Serial Port	Analog Inputs	Digital Input	Digital Output
GRD1620-XF-4GA/4GM	**1** RS232/RS485	---	---	---
GRD3621-XF-4GA/4GM	---	**2** 0-1V/0-10V/4-20mA Configurables of Software (1 PT100 input)	**4** (4 for pulses up to 45Hz) Configurables of Software	
GRD3625-XF-4GA/4GM	**1** RS232/RS485	**4** 0-1V/0-10V/4-20mA Configurables of Software	**6** (6 for pulses up to 45Hz) Configurables of Software	
GRD3534-XF-4GA/4GM	**2** RS232/RS485	**8** Configurables 0-1V/0-10V/4-20mA	**16** (8 for pulses up to 1KHz)	**8**

GENERAL SCHEME OF OPERATION
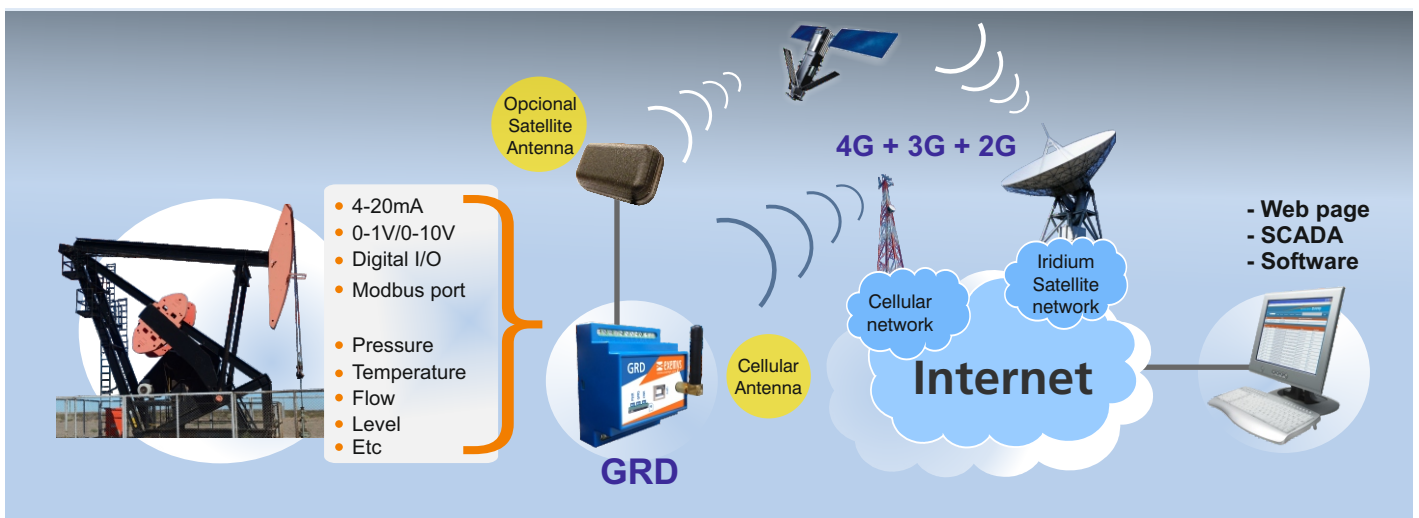
✔ **DIFFERENT WAYS OF USE**
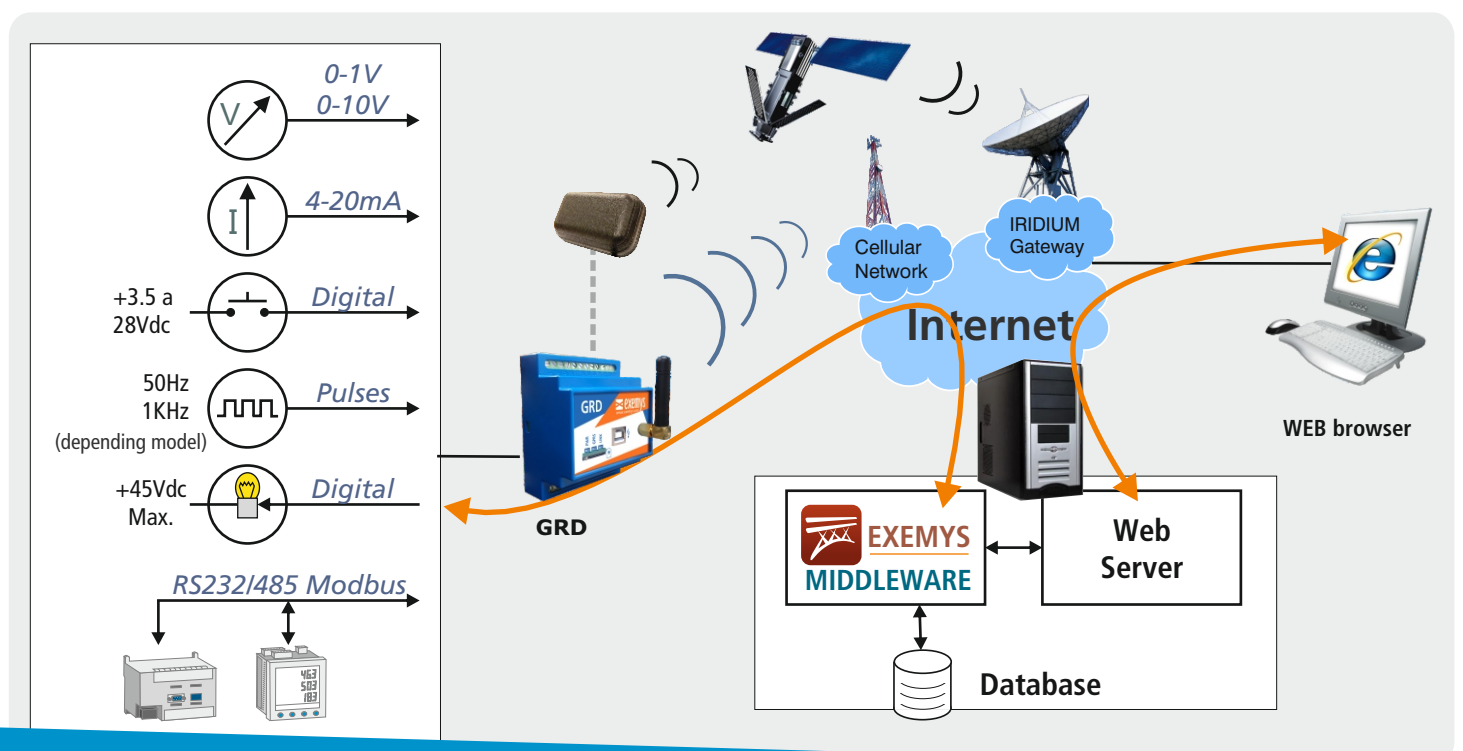
1) Through a Web page

In this way of use, the client simply enters a set web page that we will sent them and there the customer puts in username and password and will be able to view all of the information on his or her remote GRD devices. The web site is hosted by the Telemetry Server developed by Exemys and is available for any user of the GRD products.

1 ACQUISITION OF DATA   **2** TELEMETRY SERVER   **3** WEB PAGE

WEB browser

Cellular network

IRIDIUM Gateway

Internet

GRD

How does it work?

In the Telemetry Server are installed two simple software applications:

1) Middleware: The software in charge of communicating with all of the remote GRD devices.
2) Web Server: The software in charge of taking the data from the Middleware and publishing it on the web page, which the customer can access by entering their username and password.

0-1V
0-10V

4-20mA

+3.5 a
28Vdc   Digital

50Hz
1KHz   Pulses
(depending model)

+45Vdc
Max.   Digital

RS232/485 Modbus

GRD

Cellular Network

IRIDIUM Gateway

Internet

WEB browser

EXEMYS
MIDDLEWARE

Web Server

Database

2) Database

In this way of use all of the information obtained by the GRD devices is store in a MySQL type database. This kind of database can be accessed by a few different ways, for example:
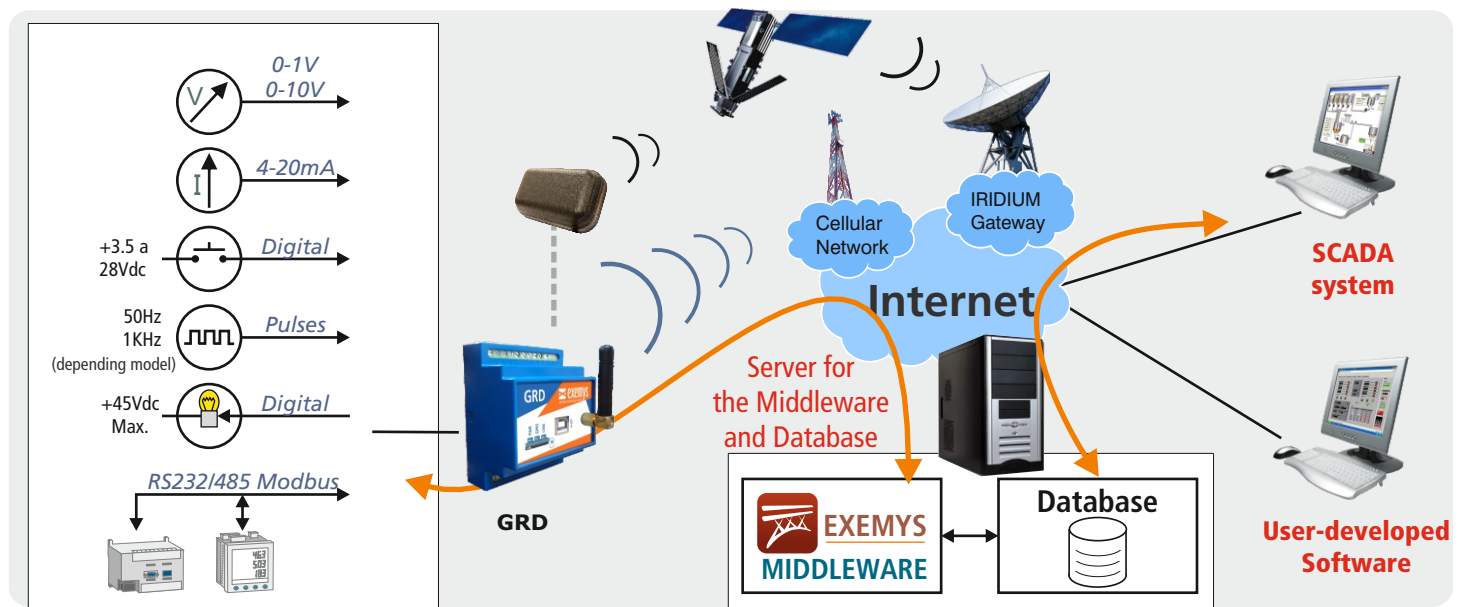
- SCADA system that takes the information in the database and displays it in its own ways.
- Software system developed by the client itself that can obtain the information from the database.
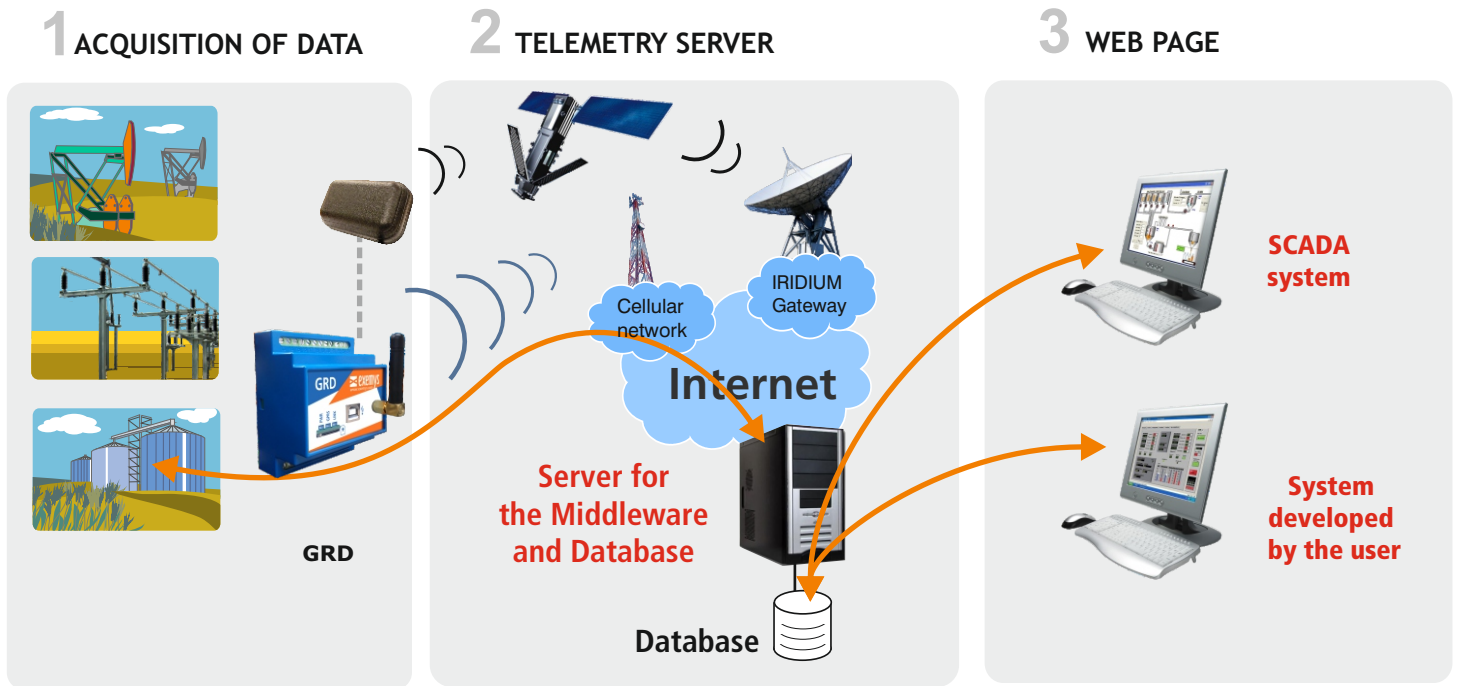
1 ACQUISITION OF DATA   **2** TELEMETRY SERVER   **3** WEB PAGE

GRD

IRIDIUM Gateway
Cellular network
Internet
Server for the Middleware and Database
Database

SCADA system

System developed by the user

How does it work?

In the Telemetry Server are installed two simple software applications:

1) Middleware: The software in charge of communicating with all of the remote GRD devices..
2) Database: The Middleware then deposits all of the information from the GRDs in the database.
   Then the different software programs depend on the database to obtain the information from the GRDs.

0-1V
0-10V

4-20mA

+3.5 a
28Vdc   Digital

50Hz
1KHz
(depending model)   Pulses

+45Vdc
Max.   Digital

RS232/485 Modbus

GRD

Cellular Network
IRIDIUM Gateway
Internet
Server for the Middleware and Database

EXEMYS MIDDLEWARE   Database

SCADA system

User-developed Software

# GRD - XF - 4G

3) SCADA system

Exemys´ Cellular telemetry system has been developed to be compatible with any kind of SCADA system and under different ways of use. The SCADA System can access the information of the remote GRD devices in any of the following forms:

SCADA Database: Obtains the information from the database on whichever of the remote GRD devices. The SCADA systems should posses the function, Data Mining
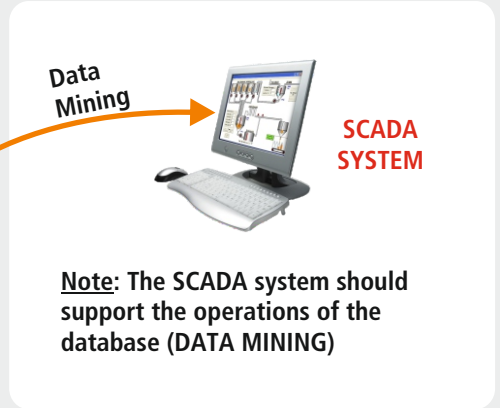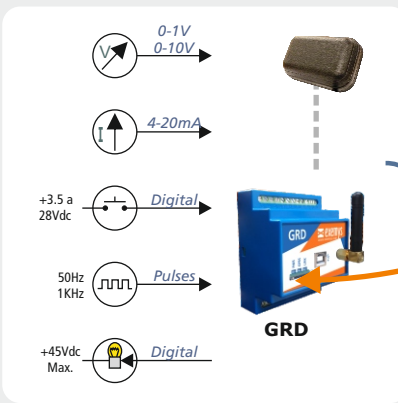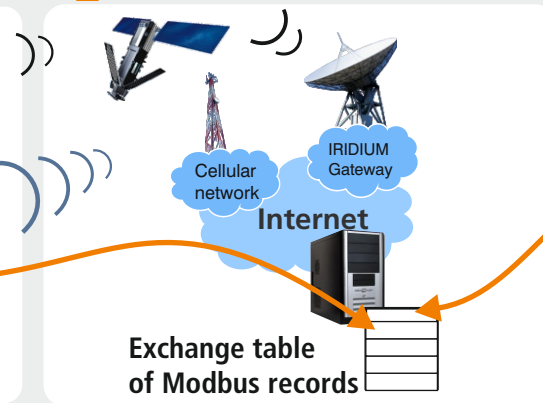
1 ACQUISITION OF DATA **2** MIDDLEWARE SERVER **3** SCADA SYSTEM

Note: The SCADA system should support the operations of the database (DATA MINING)
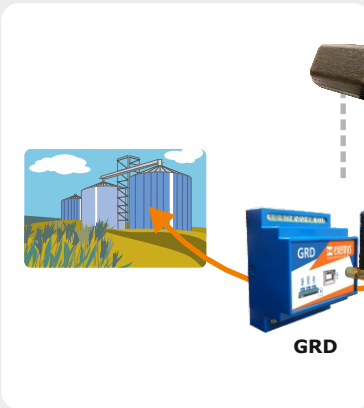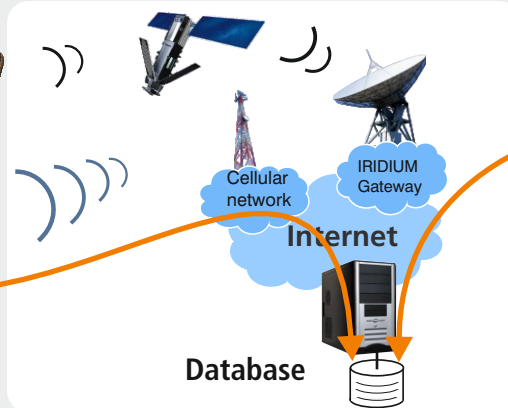
SCADA I/O: The SCADA System consults directly, in Modbus protocol, for the records of the GRD devices; consulting about the state of the inputs and outputs.

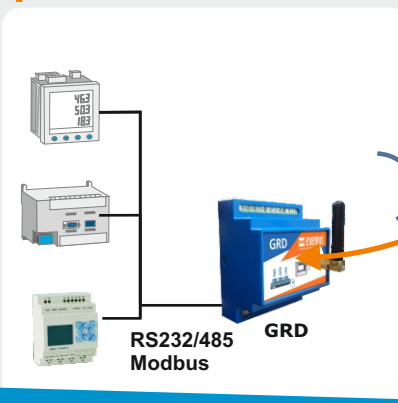**1** ACQUISITION OF DATA **2** MIDDLEWARE SERVER **3** SCADA SYSTEM
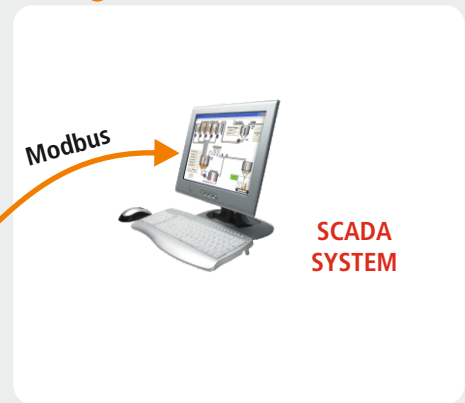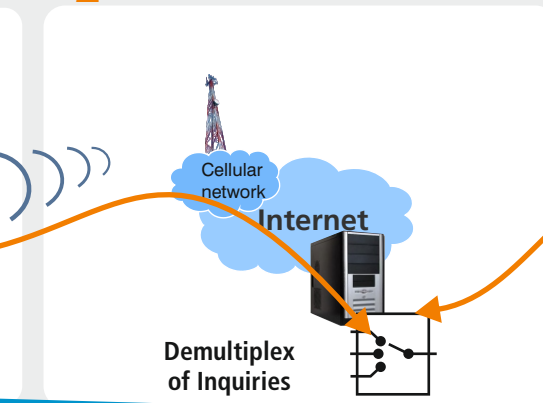

SCADA Serial port: This form consults, in Modbus, DNP3, or IEC101 protocol, the devices connected through the serial port of the GRDs. In this way the devices´ demultiplexing feature can be used.
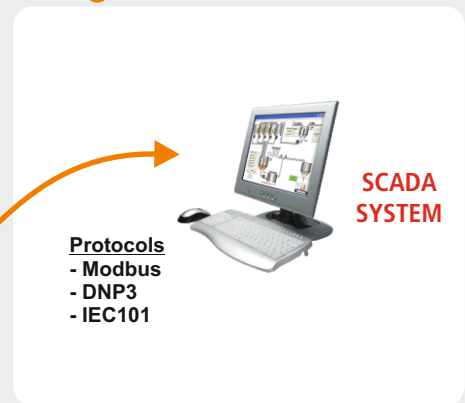
1 ACQUISITION OF DATA **2** MIDDLEWARE SERVER **3** SCADA SYSTEM
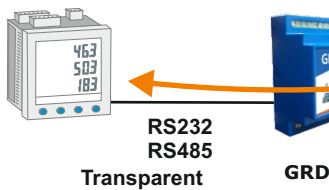

Protocols
- Modbus
- DNP3
- IEC101

4) Remote and Wireless Serial Port (not available fro satellite module)

In this mode, any software application that uses a serial port to communicate with a device locally may be adapted to communicate with multiple remote devices, using a GRD as a means of communication to reach others. A wireless communication channel is established through which the data travels from the GRD to the remote device in question.
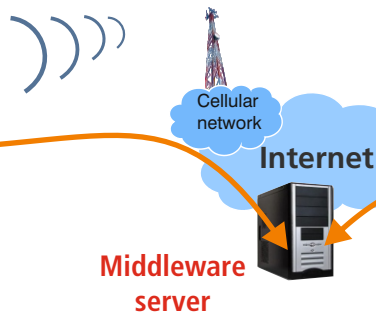
There are 2 ways of doing this:

Virtual COM mode: On the computer where the device's software is hosted, a Virtual Redirector is hosted with COM and TCP/IP ports. Thus, all the information previously circulated through a serial port is now circulated within a package of TCP / IP data thanks to the redirector. This package processes the Middleware and sends it to the corresponding GRD, which is responsible for decompressing and going back to a pattern of serial communication.
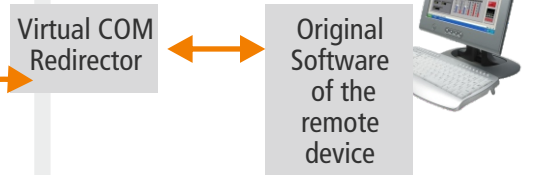
1 ACQUISITION OF DATA   **2** MIDDLEWARE SERVER   **3** SOFTWARE of the remote device

RS232
RS485
Transparent   **GRD**

Cellular
network

Internet

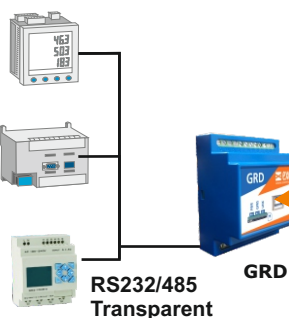**Middleware
server**

Virtual COM
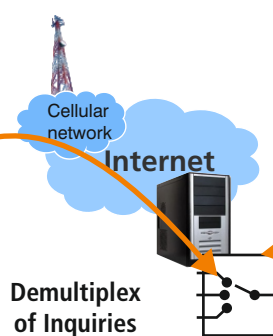Redirector

Original
Software
of the
remote
device

SCADA Seral port mode: Consults are made in Modbus, DNP3, or IEC101 protocols, between the devices connected through the serial ports of the GRDs. This mode uses the Demultiplexing feature.

1 ACQUISITION OF DATA   **2** MIDDLEWARE SERVER   **3** SCADA SYSTEM

RS232/485
Transparent   **GRD**

Cellular
network

Internet

**Demultiplex
of Inquiries**

**Protocols
- Modbus
- DNP3
- IEC101**

**SCADA
SYSTEM**

✔ INTERNAL LOGIC PROGRAMMING THROUGH SCRIPTS

What is a Script?

A Script is a file with orders that once loaded on to the GRD, is interpreted and executed.

Operations performed by a Script:
The Script describes what operations should be executed by the device, for example:

- Mathematical Operations
- Logic and Binary Operations
- Operations with Timers
- Reader of Analog Variables
- Control of digital pins of I/O
- Sending and Receiving of SMS text messages
- Interpretation of data from the serial port
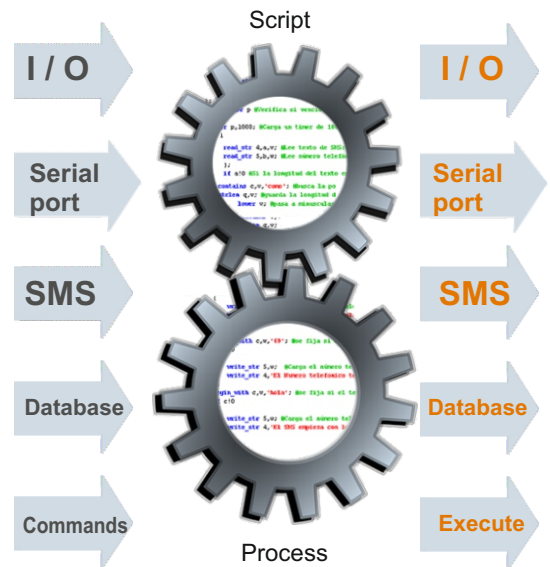
Example of a Script

Below is a simple example which turns on and off a digital outputs in a predetermined time:

```
start
{   b=0;
    timer a,10000;
};
check_timer a
{   timer a,10000;
    neg b,b;
    write_io 1,1,b;
};
end;
```


How are the Scripts loaded?

The script is programmed with a simple software, which lets you write in an orderly manner, the commands are executed within the GRD

The scripts are loaded to the GRD through a USB port or remotely by Middleware.

Once the scripts are loaded, the GRD is ready to execute the logics

Examples of application

Calculation of Flow:
Calculates flow by measuring the differential pressure

Alternating of 2 Pumps:
Alternates the use of 2 pumps using a timer

Detection of faults in the Dosing Machine:
Stops the dispenser through its digital outputs based on measurements of two temperatures and a digital signal.

Remote Turning On an Off:
Using an SMS text message or a button on the telemetry website server, the outputs of the GRD can be activated temporarily to control the equipment by turning it on or off
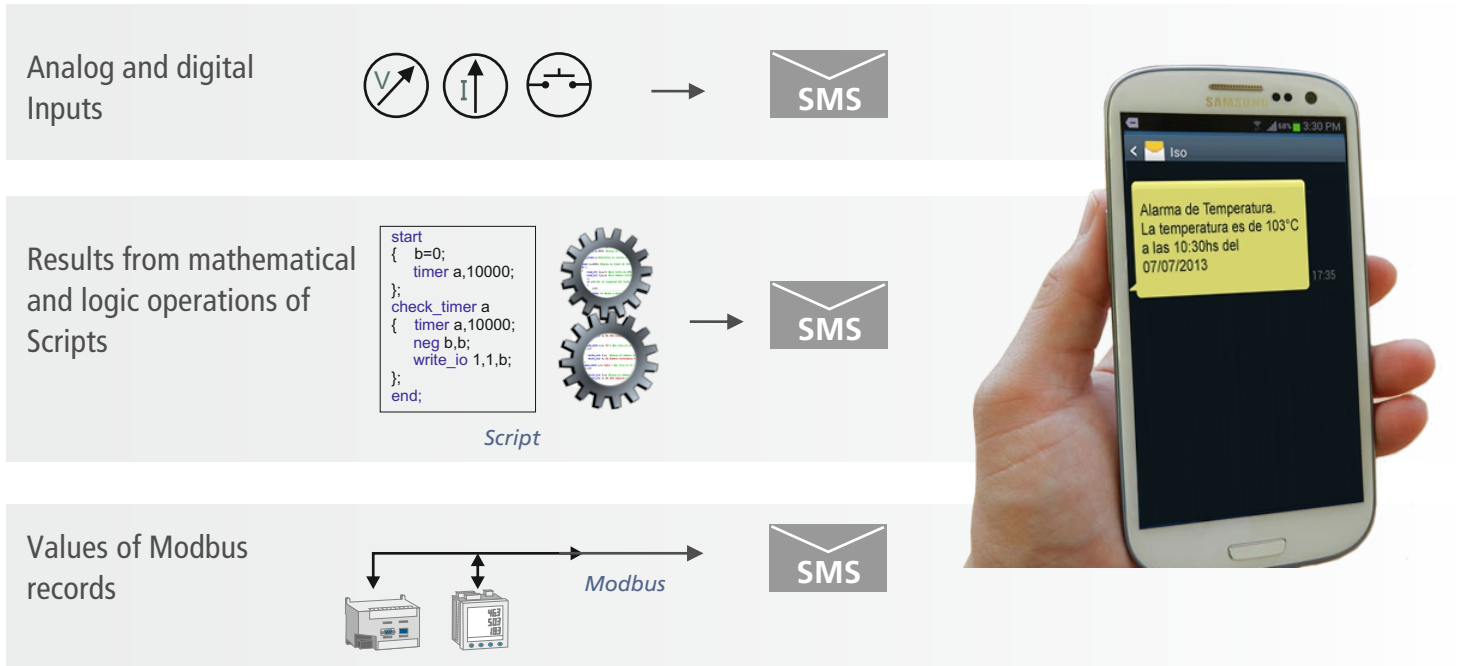
Automatic Turning On or Off:
A temporary logic can turn on or off a system

✔ ALARMS AND ALERTS BY SMS

The GRD devices can operate in the form of SMS text messages

Outgoing SMS text messages

The GRD can be configured to send text messages when predetermined values on a sensor are reached. Such as:

Analog and digital Inputs → **SMS**

Results from mathematical and logic operations of Scripts

```
start
{    b=0;
     timer a,10000;
};
check_timer a
{    timer a,10000;
     neg b,b;
     write_io 1,1,b;
};
end;
```
Script

→ **SMS**

Values of Modbus records

Modbus → **SMS**

Alarma de Temperatura. La temperatura es de 103°C a las 10:30hs del 07/07/2013

Incoming SMS text messages

The GRD can receive text messages and report values from its Modbus records or the state of its inputs and outputs. In turn it can trigger a process or operation of a Script.
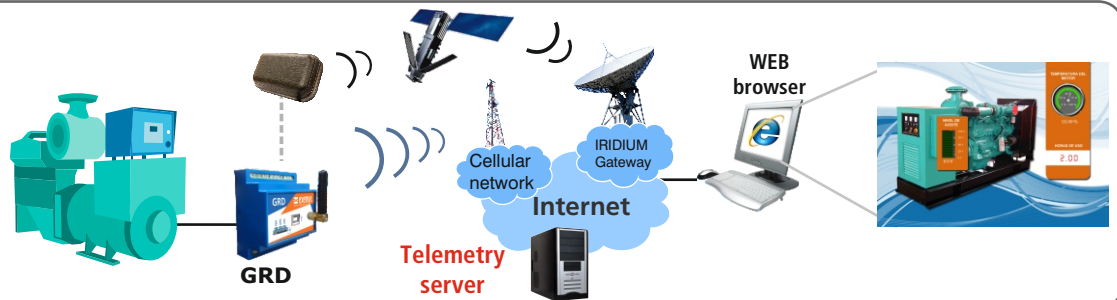
Values of
- Modbus register
- Inputs and outputs

← **SMS**

→ **SMS**

Estado A1

La presión de la entrada A1 es de 10 Bares a las 15:30hs del 07/07/2013

Execution of SCRIPTS ← ← **SMS**

GRD - XF - 4G

✔ EXAMPLES OF APPLICATION

Power Generator
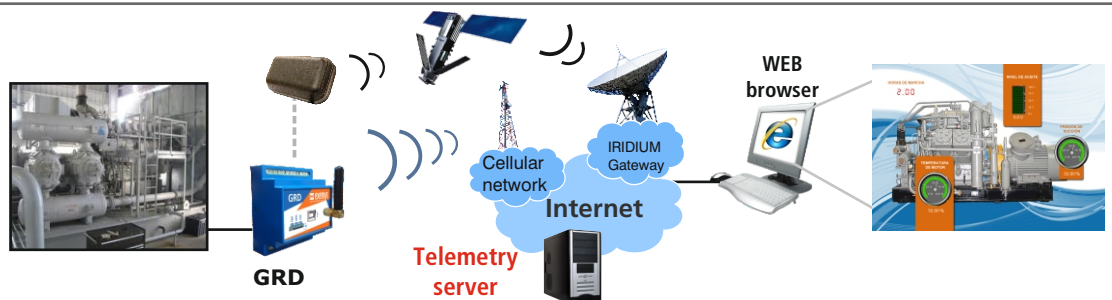
Measurements

- Hours of Usage
- Combustion Level
- Motor Temperature
- Battery Voltage
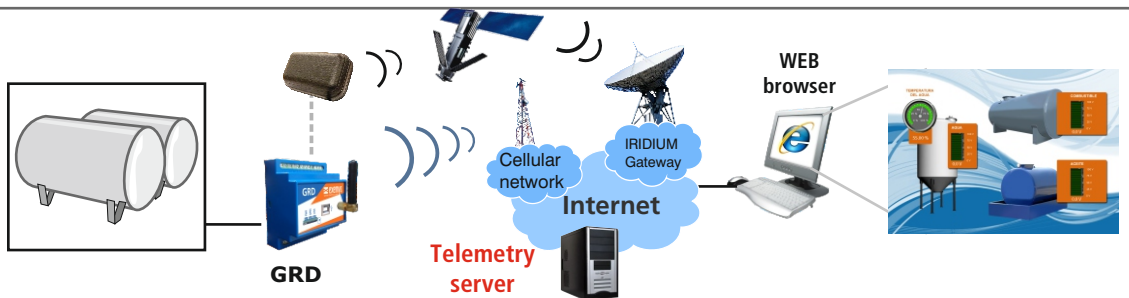- Electric Parameters-

Compressor Gas

Measurements

- Water Pressure
- Gas Pressure
- Oil Pressure
- Combustion Level
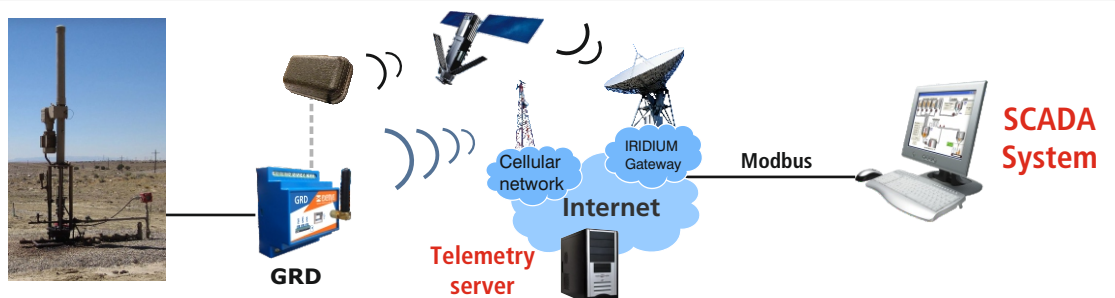- Electric Parameters

Tank Levels

Measurements

- Level of storage tanks
- Pump Activation
- Temperatures

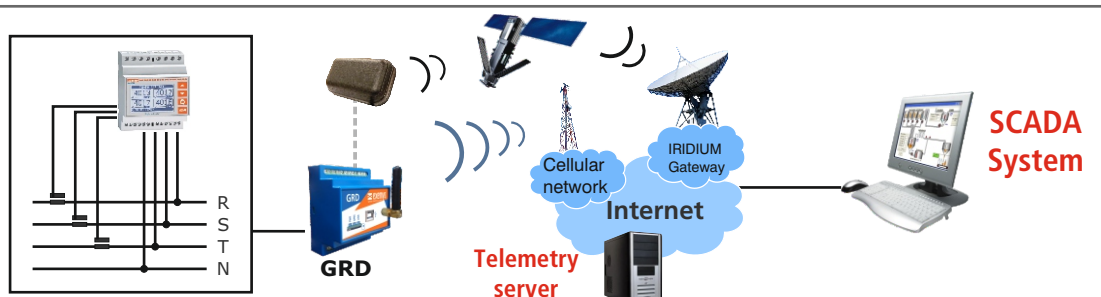### Extraction Oil

Measurements

- Parameters of the Controller of the well

Power Meters

Measurements

- Measured Electrical Parameters by the Power Meter

✖ DIFFERENCES WITH A GSM MODEM

What is a GSM modem?

A GSM modem is a device for point to point communication, which utilizes cellular phones as means of transporting data.

What is the difference between the GRD-4G and a simple GSM modem?

The GRD is a part of a complete wireless Telemetry system, which is different from a GSM modem, as further detailed

GRD -4G	GSM Modem
✔ Point to Multipoint Links	✖ Point to point only
✔ All GRD devices are Online	✖ Must be "dalled" each modem at a time
✔ Has own inputs and outputs (Digital and Analog)	✖ It has not inputs or outputs
✔ Acts as Modbus Master	✖ It has not own protocol
✔ Communicates with other smart devices by Modbus protocol	✖ It has not own protocol
✔ Acts as registrar, storing data in a database	✖ It cannot act as register
✔ Uses the GPRS data channel **(payment necessary for data)**	✖ Use the CSD channel **(payment for connectiosn time)**
✔ Faced with loss of cell signal, it stores data in its memory buffer and transmits it when back online	✖ It does not offer option to send SMS text messages
✔ Delivers alarms and alerts through SMS text messages	✖ It does not offer option to send SMS text messages

✖ **exemys**

www.exemys.com

R 2014-10-30