

# GMUX



## TECHNICAL INSTRUCTION

Acquisition Module  
for all types  
of analog instrumentation



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## TECHNICAL FEATURES

- Supply:	12 VDC. Optional 110/220 Vac or solar panel;			
- Current supply:	120mA, V input, No load; 95mA, mV/V input, No load; 125mA, 4/20mA 2 Wires input; 85mA, PT100 input; 70mA, NTC input; 83mA, VW input;			
- Current Standby:	0uA, Communication and supply through RS485 port; 320uA, Communication RS485 port, supply by local battery; 0uA, Communication RS485 port, supply by local battery through BSM; 30uA, Communication Radio port, supply by local battery.			
- Operating temperature:	From -20° to +70°C;			
- Protection:	Defined by the box type;			
- MUX channels nr:	4 + 4	8 + 8	12+12	16 + 16
- Dimensions mm:	48	72	97	122 x101 x119
- Weight:	277 g.	405 g.	533 g.	656 g.
- Measuring type:	V, mV/V, 4/20 mA, VW, Pt100, NTC;			
- N ° Multiplexer supported:	Up to 254 for RS485 port, max 508;			
- N ° Channels supported:	Up to 32 for MUX, max 16320;			
- Measurement resolution:	24 bit: V mV/V, 4/20 mA, Pt100, NTC; 0.1 Hz: vibrating wire;			
- Supply voltage	+ 20 V, + 12 V, +/-12 V, + 5 V;			
- MUX communication type	RS485, LoRa radio.			

## 1. GENERAL INFORMATION

GMUX is an acquisition module for analogue instrumentation, specifically designed to meet market requirements in the geotechnical, structural and environmental monitoring sector. The module was born as an accessory of Gei G801 - G802 products with which it communicates digitally through cable or radio connection. GMUX is able to read instruments with various types of signals according to the 4/20 mA, mV/V, V standards and vibrating wire instruments. It is also possible to acquire electrical values from thermistors such as Pt100, NTC, etc..

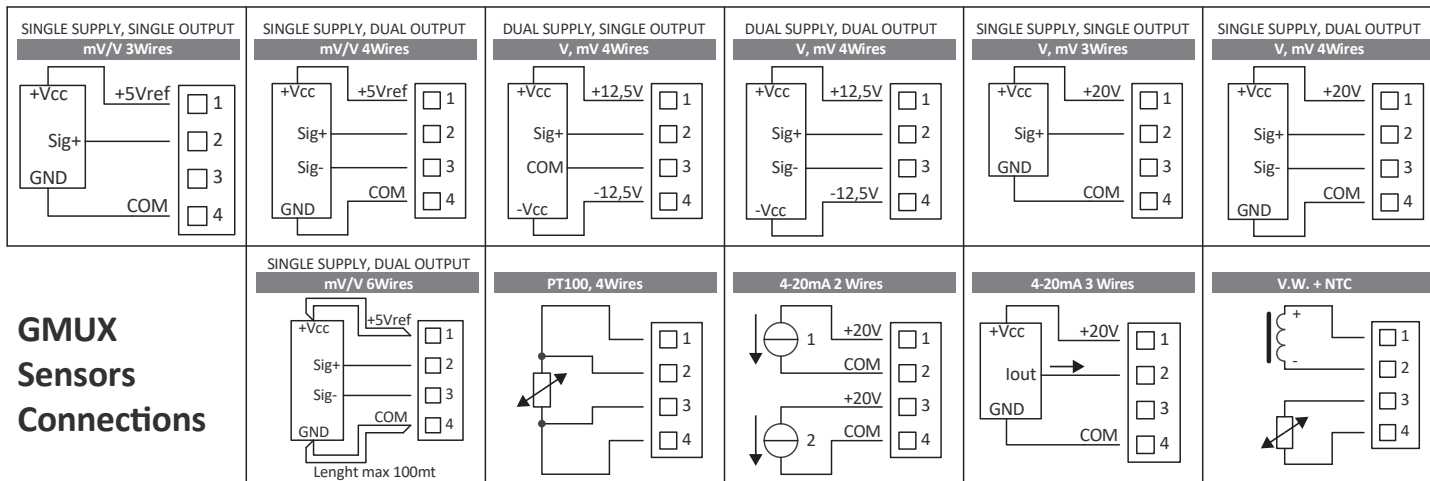
At the acquisition request on one of the digital input channels, coming from the modules G801 - G802, GMUX provides the correct power supply to the analog channel for which the reading has been requested and, after a variable and settable time, it performs the acquisition of the electrical value. The information is returned, always on the same digital channel, to the modules G801 - G802 that have requested it.

More than one GMUX can be present on the same digital communication channel and, for this reason, they must be identifiable through a unique peripheral code. The power supply of the product can be provided in different ways depending on the configuration of the monitoring system to be implemented and the type of digital channel

used for communication with the other system peripherals. If the peripheral devices are connected by cable and the maximum distance between the two most distant modules does not exceed a few tens of meters, it is possible to power the GMUX directly using the signal bus cable. In this case, the management of the power supply of the spheres is delegated to the loggers G801 - G802 present in the system. In case the signal cables are particularly long or when radio communication networks are used, the GMUX must be equipped with a local battery power supply system.

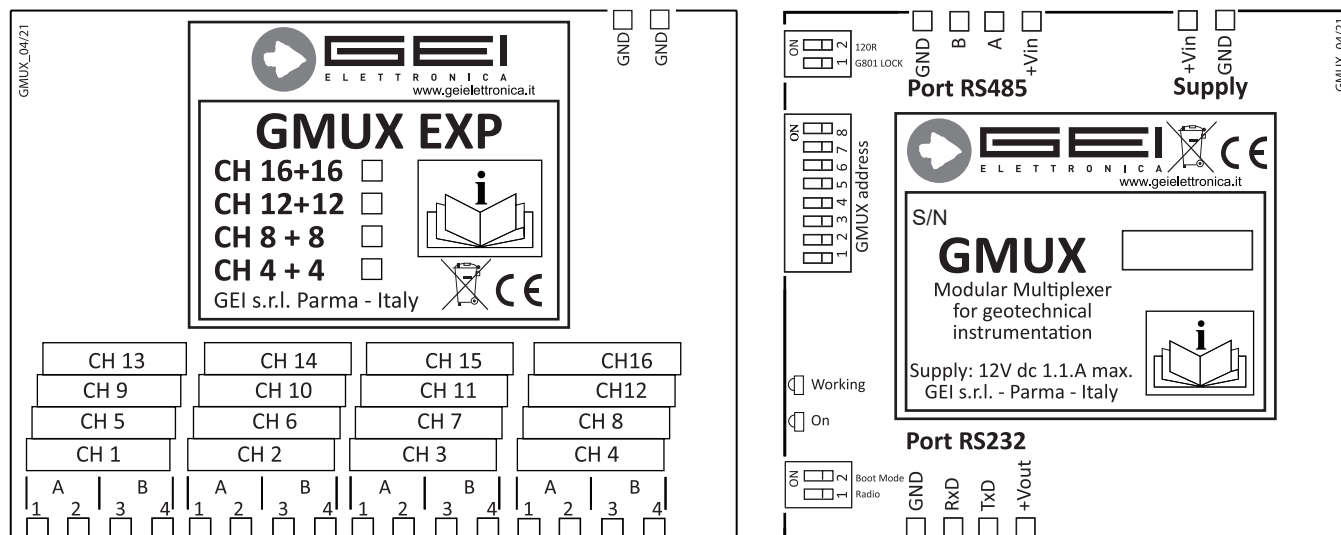
Depending on the configuration parameters of the system and the technical choices made, given the very low power consumption of the GMUX, a battery-only power supply can simply be provided. For heavier uses, the possibility of connection to the 110/220 Vac mains or the use of photovoltaic panels can be considered. GMUX is available in 4 versions, from the smallest with 4 channels to the largest with 16, passing through 8 and 12 channels.

Each channel is characterised by a four-pole terminal that is used to supply power to the transducer wired to it and receive analogue signals to be acquired. The function of the four poles varies with the type of instrument connected.

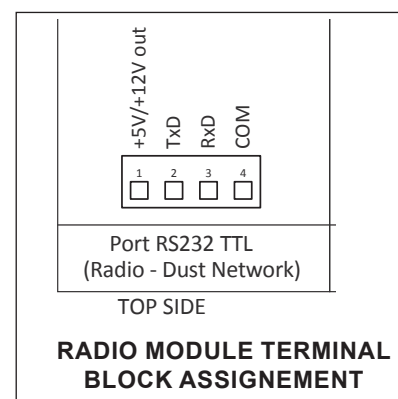
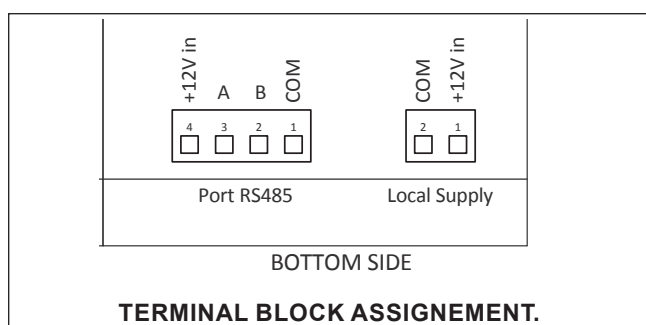


In cases where the instrument to be acquired is two-wire, such as some 4/20 mA, vibrating wire instruments and NTC thermistors, each individual channel can be configured to read two instruments. For example, a vibrating wire sensor and its associated temperature can both be read on the same channel.

In fact, each channel can also be considered dual and a 16-channel multiplexer can actually be used to read 32 sensors, if the types of sensor used allow it. This is why we speak of 4+4, 8+8, 12+12 and 16+16 channel GMUXes.



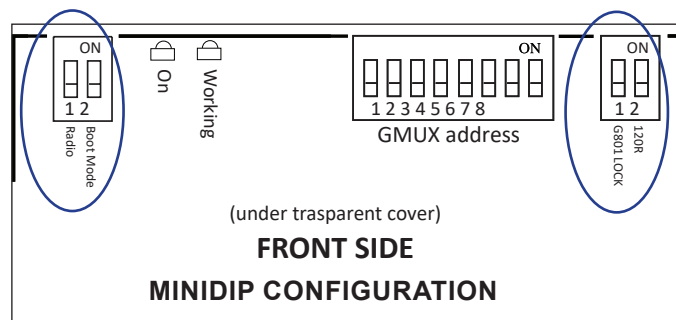
The distribution of the channels on the module and other indications on the wiring of the connectors can be found on the labels on the product.



The transparent front door provides access to a series of minidips used to configure the product, as shown in the figure below **Mini-dip Configuration**:

Starting from the left, the first switch selects the type of bus used in the connection to the G801 - G802 modules. In the **OFF** position the connection is made via RS485 bus cable; in the **ON** position the radio mode is enabled.

The second switch, in the first group of two, in **ON** position selects the firmware update mode.



Maintain the **OFF** position during normal product operation.

Refer to Section 5 for more details.

The group of eight central switches is used to set the product identification within the system.

Each individual GMUX connected to the same system must have different combinations of these diverters. The possible combinations are 255 (see paragraph 4), from zero (all in OFF position) to 254 (all in ON position except the eighth).

## NOTE:

The G801 - G802 loggers have their own identifier. During the first communication, the GMUX stores the identifier of G801 - G802 from which it was called. From then on it will only respond to the logger with that identifier. The combination 255 (all switches in ON position) at power on, clears the memory register that associates the GMUX to a specific identifier of the master

device G801 - G802 returning the product to the factory setting. This operation must be performed every time you want to change the identifier to the G801 - G802 loggers or when the GMUX is installed in a new system.

In the figure beside, in the group of the two right switches, the first one must always be kept in **OFF** position. If in **ON** position the GMUX responds to any logger G801 - G802 calls it. The second one, if set to ON position, inserts the 120  $\Omega$  terminator in the RS485 signal chain.

The first and last element of a RS485 line must have a terminator. If a GMUX is in the start or end position of the line, this minidip must be set to the ON position.

## FACTORY DEFAULT (see Paragr. 4)

0		9		18		27	
1		10		19		28	
2		11		20		29	
3		12		21		30	
4		13		22		31	
5		14		23		32	
6		15		24		...	...
7		16		25		254	
8		17		26		255	

Regarding numbers not shown in the table please use the calculator (Windows operating system) in PROGRAMMER mode or an on-line converter

## 2. RADIO MODE INSTALLATION

To initialise a radio system, switch on the G801 or G802 master module of the radio network you wish to configure, checking that the radio manager module connected to it is correctly wired and enabled. For further details see the technical manual of the G801 - G802 products.

Enter the menu:

**Configurations-->G801 - G802 logger setup-->**

**Advanced tools-->Expert menu-->Radio tools.**

Switch on the GMUX device that you want to insert in the radio network and check the visual indications of the two leds described in paragraph 3.2.

Once the GMUX device is connected to the radio network, enter the **Radio nodes list** menu to check that the new node is actually connected to the network.

Continue to press **OK** to obtain the basic information of all devices connected to the network. In particular, for each node the identification number in MAC address and the working status are provided.

## NOTE:

All the peripheral devices correctly connected to the radio network must display the status Operational.

The first node in the list must always be present and is the master connected to the G801 - G802 that manages the network.

The other nodes refer to all GMUX and any repeaters currently

connected to the network. When all the network peripherals are operative it is possible to verify the correct initialization of all the GMUX through the **Radio devices list menu**.

This function associates the peripheral identifiers, as configured in the bank of eight minidips, to the MAC address of the radio module connected to it. Check that the corresponding identifier exists for each GMUX configured in the network.

## 3. VISUAL INDICATION

The front panel of the GMUX product has two LEDs, one green and one red, which indicate the working status.

### 3.1. RS485 connection modes

- **Stand-by:** The device is in a very low consumption condition waiting to receive commands. Both LEDs are off.

- **Work:** The device is active and performing work operations. The green led is steady on.

- **Acquisition:** The device is active and performing acquisitions. The green LED is steady on.

- **Waiting:** The unit can receive a command not addressed to it but sent to another GMUX belonging to the network, in this case both leds are steady on. If no other command is received after 5 seconds, the module returns to stand-by and the two LEDs go out.

## 3.2. RADIO connection mode

- **First power on procedure:** When the unit is switched on, the two leds blink slowly alternately. The unit is requesting the connection to the RADIO network. After a few seconds the device goes in stand-by. Every time the network sends to the module some notifications related to the initialization procedure, the unit goes in working condition (green led steady) to return in stand-by after few seconds (fast alternating blinking followed by both leds off). After a few tens of seconds the GMUX is registered in the radio network. The two leds blink slowly together.

- **Switching from working mode to stand-by mode stand-by:** Fast alternating blinking followed by both leds off.

- **Stand-by:** The device is in a very low consumption condition waiting to receive commands. Both leds are off.

- **Work:** The device is active and performing work operations. The green led is steady on.

- **Acquisition:** The device is active and performing acquisitions. The green LED is steady on.

- **Transmission:** The green LED goes off and the red one flashes very fast.

## 4. SYSTEM SETTING CHANGE

To reset the system registers, start the device with all eight ID minidips in the ON position. The LEDs flash alternately slowly during the registers clearing phase. The flashing of the two LEDs in alternating fast mode indicates that the procedure has been successfully completed.

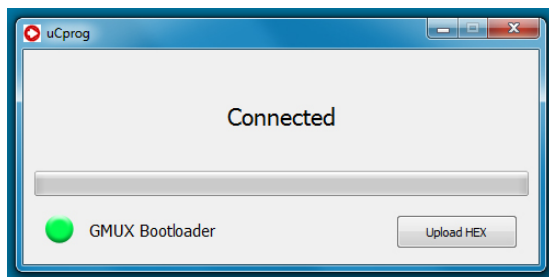
## 5. FIRMWARE UPDATE

In case of product firmware upgrades, use a G801 - G802 module connected to the GMUX by means of an RS485 cable, use a PC with an RS232 serial port on which the appropriate uCprog software has been installed. **Export the calibration parameters of the peripheral device to be updated.** See Section 6.1 for more details. Connect the PC serial port to the RS232b serial port of the G801 - G802 module using a standard serial cable. Launch the uCProg program. **Set the programming minidip of the GMUX (the second from the left) to ON position.**

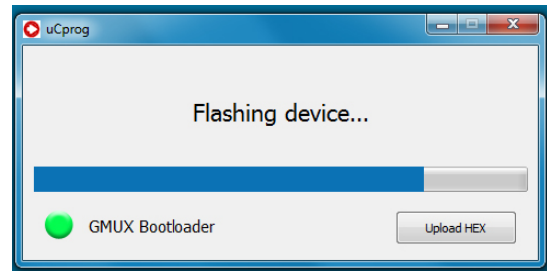
**Switch on the G801 - G802 module and enter the menu:**

**Configuration-->G801 - G802 logger setup-->Advanced tools -->Expert menu-->Mux FW upgrade.**

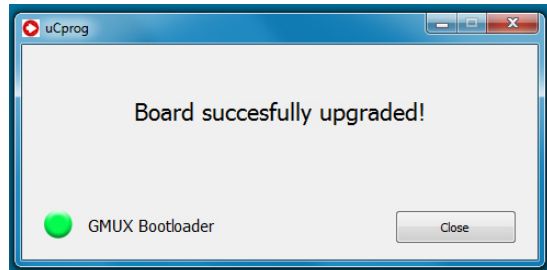
Set the identifier of the GMUX you want to upgrade, as configured in the bank of eight minidips. Select the RS485 port to which the GMUX to be upgraded is connected. The uCProg software connects automatically to the module G801 - G802. The two leds of the GMUX are both on steady.



Press the **Upload HEX button** to select the firmware file to upgrade. Pressing Ok the firmware writing procedure on the GMUX microcontroller starts and the leds blink alternatively. On the display of G801 - G802 module appear the progressives of the number of packets transmitted and received during the procedure. The bar on the software window shows the progress of the procedure.



At the end of the procedure a notification message appears to show if errors occurred or if the update was successful.



Press ESC key on the G801 - G802 module to close the firmware upgrade process and disconnect the GMUX. Return the programming minidip to the OFF position. If necessary, import the calibration parameters of the peripheral. See Section 6.2 for more details. Move the programming minidip in the OFF position. If necessary, import the GMUX module's calibration parameters. For more details, please, refer to Paragraph 6.2.

## 6. IMPORT EXPORT CALIBRATIONS

If it is necessary to import or export the calibration parameters contained in the non-volatile memory (EEPROM) of the GMUX, connect the peripheral device to a G801 - G802 module by means of an RS485 connection.

**Enter the menu:**

**Configuration-->G801 - G802 logger setup-->Advanced tools-->Expert menu--> --> Mux eeprom imp/exp and select the desired operation.**

### 6.1. Export

Choose from menu G801 - G802 the Read from device option to read the data contained in the GMUX memory and save them on the SDcard. Set the identifier of the GMUX to be read, as configured in the bank of eight minidips. Select the RS485 port to which the GMUX to be read is connected.

The green LED of the GMUX remains steady on and the number of the read re-gister is shown on the display of G801 - G802.

During the operation, possible errors are displayed or success is notified at the end of the procedure.

### 6.2. Import

Choose from menu G801 - G802 the Write to device option to write the data contained in a file on the SDcard in the GMUX memory. Set the identifier of the GMUX on which you intend to write, as configured in the bank of eight minidips. Select the RS485 port to which the GMUX to be read is connected. If the file related to the set identifier is present on the SDcard, the writing procedure starts automatically.

The green led of the GMUX remains steady on and the number of the register being written is shown on the display of G801 - G802. During the operation, eventual errors are displayed or the success is notified at the end of the procedure.



# Dichiarazione di Conformita'



## Declaration of Conformity

La società Gei S.r.l. (a S.U.), nella figura del Responsabile dell'Ufficio Tecnico, dopo aver verificato la corrispondenza alle disposizioni delle seguenti Direttive Comunitarie,

*Gei S.r.l. (a S.U.), as the Technical Officer, after having checked the correspondence to the provisions of the following Community Directives,*

2014/30/UE (Compatibilità Elettromagnetica - Electromagnetic Compatibility)

2011/65/CE (RoHS)

e delle norme armonizzate vigenti, con relative revisioni  
*and of the current harmonized standards, with relative revisions*

EN 61000-6-2, EN 61000-6-3

### Dichiara - States

che il prodotto modello GMUX risulta conforme alle specifiche imposte dalle norme in materia di Direttiva Compatibilità Elettromagnetica, Direttiva Bassa Tensione e Direttiva RoHS.

*that the GMUX model product complies with the specifications imposed by the regulations regarding the Electromagnetic Compatibility Directive, the Low Voltage Directive and the RoHS Directive.*

Parma, 15/10/2021

Il Responsabile Ufficio Tecnico  
*The Technical Officer*

Ing. Corrado Carini

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