



## FEATURES

- ACCEPTS 0-20 mA, 4-20 mA, 0-5V, 0-10V, 1-5V, 2-10V, PROGRAMMABLE
- ACCEPTS LOAD CELLS, PROVIDES 10.000 V DC
- ACCEPTS PASSIVE AND ACTIVE DEVICES
- THE INPUT IS OVER CURRENT AND OVER VOLTAGE PROTECTED
- TOTAL ERROR LESS THAN 0.01% FS, TYPICAL UNDER 0.005% FS
- SIX 14.2 mm (0.56") HIGH DIGITS, BRIGHT RED LED DISPLAY
- POWERS THE SENSOR (IF PASSIVE) WITH 24VDC REGULATED, SHORT CIRCUIT AND OVER CURRENT PROTECTED
- PROGRAMMABLE DIGITAL FILTER
- PROGRAMMABLE NUMBER TO BE DISPLAYED FOR 0% AND FOR 100% INPUT IN THE RANGE FROM -199,999 TO 999,999
- PROGRAMMABLE DECIMAL PLACES
- POWER SUPPLY 15-40VDC, 1.7VA WITH SURGE, TRANSIENTS AND REVERSE POLARITY PROTECTION, ISOLATED (OPTION)
- PROGRAMMABLE THROUGH RS232 MODBUS RTU
- TWO WIRE ONLY CONNECTION TO ALL OF OUR FLOW COMPUTERS AND MANY OTHERS
- WEIGHT LESS THAN 145 g (5.1 oz)
- DIN 43700 PANEL MOUNT 48x96 mm ENCLOSURE. SELF-EXTINGUISHING PPO

## APPLICATIONS

- TO POWER, MEASURE AND DISPLAY ANALOG SIGNALS FROM VARIOUS SENSORS AND DEVICES
- DISPLAY FLOW RATE SIGNAL FROM ALL OF OUR FLOW COMPUTERS AND MAGMETERS
- PROCESS INDICATORS
- TEMPERATURE DISPLAYS
- PRESSURE DISPLAYS
- 6 DIGIT VOLTMETERS
- 6 DIGIT mA METERS



## 1. DESCRIPTION

GRD101 is the analog input version of our remote displays series. It can accept passive or active signals from any sensor or device, scale and display them on a bright red 6 digit display. The input signal is filtered and conditioned, then accurately measured. After that our special proprietary algorithms further process the signal and provide programmable digital filter to the user. Our proprietary adaptive/predictive self-adjusting digital filter or a few others can be chosen.

GRD101 also accepts resistive bridges, load cells, or just differential mV signals.

Both numbers for 0% and 100% input are programmable in a range from -199,999 to 999,999. Also programmable are the decimal places from none to 5 thus offering the ability to display very small to very big numbers both positive and negative.

All the programming is done by a very simple and easy to use software that saves you time and effort offering you the comfort of using a computer keyboard, monitor and mouse instead of 2 - 3 buttons on the front panel and menus with 2 or 3 letters. After entering all numbers a "save" button does it all. Using a laptop the programming can be done on the field to already installed and working remote displays.

The communication with GRD101 displays is a RS232 MODBUS RTU, so a computer, a PLC or another equipment can also be used to program or read data from GRD101.

If an external RS232 to RS485 converter is used the display can be connected to a two wire MODBUS network.



## 2. ABSOLUTE MAXIMUM RATINGS \*

Operating temperature	0 °C to +70 °C
Continuous input voltage, DIP switches for a voltage input	150 V DC
Continuous input current, DIP switches for a current input	30 mA DC
Sensor consumption	30 mA DC
Power supply voltage	40 V DC

\* **NOTICE: Stresses above those ratings may cause permanent damage to the device.**

## 3. CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
<b>Power Supply</b>					
Voltage	25 ° C, non-isolated power version	15		36	V DC
Voltage	25 ° C, isolated power version	18		36	V DC
Power Consumption	25 ° C, 24 VDC, display at '888888', sensor consumption 20 mA			1.7	VA
<b>Input</b>					
Input resistance	Input 0-20 mA or 4-20 mA, 25 ° C		255		ohm
Input resistance	Input 0 – 5V or 1 – 5V	100			kohm
Input resistance	Input 0 – 10V or 2 – 10V	200			kohm
<b>Sensor Power</b>					
Voltage	25 ° C, non-isolated power version, NOTE 1	15		36	V DC
Voltage	25 ° C, isolated power version, NOTE 2		24		V DC
Voltage, bridge only			10.000		V DC
<b>Accuracy</b>					
Error	Input 0 – 20 mA, 24 V, 25 ° C, NOTE 3		0.005	0.01	% FS
Temperature coefficient	Input 0 - 5V, 0 ° C to +70 ° C, 24 V DC		25		ppm/°C
<b>RS232</b>					
TxD voltage levels	0 ° C to +70 ° C, receiver input resistance 5 kohm		+/-5.5		V DC

**Note 1:** When the power of GRD101 is not isolated the voltage to the sensor equals the power supply voltage

**Note 2:** When the power of GRD101 is isolated the voltage to the sensor is 24 VDC regulated, regardless of the power supply voltage

**Note 3:** The parameter includes all errors, non-linearity and noise at constant voltage and temperature

## 4. PROGRAMMING

All the programming can be done using G Instruments' GRD Master software or using a PLC, terminal, computer or another equipment that has MODBUS RTU capabilities over RS232.

### 4.1. Programming using GRD Master software

**4.1.1.** Connect your GRD101 remote display to the serial port of your computer or lap top using a DB9M to DB9F extension cable. If your computer does not have a serial port use a USB to serial converter and connect the extension cable to it. You may need to install the driver(s) for that converter.

**4.1.2.** Start the “GRD Master” software, choose the serial port where the display is connected to and

click on the “**Connect**” button. The software will automatically recognize the hardware options of the connected GRD101 remote display and show all choices on the screen.

4.1.3. Choose the type of the input you want to use on your remote display.

**NOTE: There can be a DIP switch on the rear panel of the display that must be set accordingly as well.**

4.1.4. Enter the number for 0% input, the number for 100% input and the decimal places to be displayed.

4.1.5. A digital filter setting can be chosen among 'auto' and one through seven, one meaning the lowest (fastest) filtering.

4.1.6. Program the cut off.

For a stand alone remote display that would be all programming.

4.1.7. There is one more parameter to program only if the device is intended to work on a MODBUS network. This is the MODBUS address. If the device will not be working on a MODBUS network leave this parameter to its default setting:

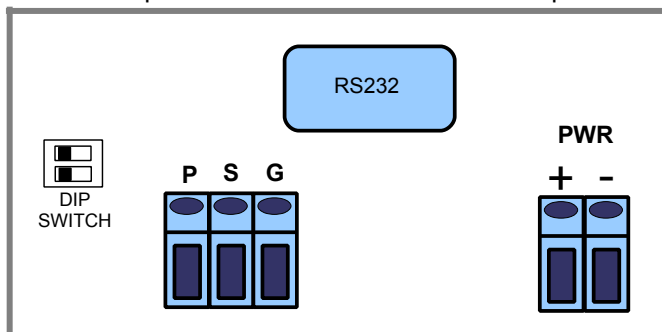
MODBUS address = 1

4.1.8. Clicking on the “**Write**” button will finish the programming process. A few seconds later the cable can be removed and the remote display will be ready to work.

## 5. APPLICATION

### 5.1. ELECTRICAL

On the rear panel there are 2 terminals for the power and 3 terminals for the sensor.



P – sensor power

S – signal from the sensor

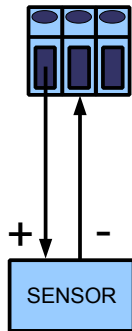
G – sensor ground

**NOTE 1: On the non-isolated version there is no isolation between “-” of the power supply and sensor ground.**

**NOTE 2: Current only version GRD101-0 does not have DIP switch on the rear panel**

## 5.1.1. Wiring

### 5.1.1.1. Current input, passive sensor, loop power

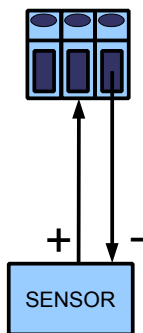


GRD101 powers the sensor and measure its current using 2 wires.

(GFC1xx series flow computer)

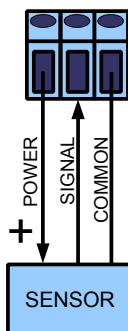
**NOTE: Use this diagram to connect all of our flow computers to GRD101 remote displays.**

### 5.1.1.2. Current or voltage input, active sensor



The sensor has its own power and GRD101 only measures its signal (current or voltage).

### 5.1.1.3. Three wire connection



GRD101 powers the sensor and measures its signal (current or voltage). If the signal is current the sensor must be sourcing current out of "signal".

## 5.1.2. DIP Switches

There are 2 DIP switches on the rear panel if the version of the display is for both voltage and current. The upper switch chooses between current and voltage input. The lower switch chooses between 5V and 10 V for a voltage input.

**NOTE: The input type must be programmed accordingly through the serial port. Look at the table below.**

### 5.1.2.1. Current 0-20 mA



Program the input type to be 0.

### 5.1.2.2. Current 4-20 mA



Program the input type to be 1.

### 5.1.2.3. Voltage 0-5V



Program the input type to be 2.

### 5.1.2.4. Voltage 0-10V



Program the input type to be 3.

### 5.1.2.5. Voltage 1-5V



Program the input type to be 4.

### 5.1.2.6. Voltage 2-10V



Program the input type to be 5.

## 5.2. MECHANICAL

### 5.2.1. Dimensions

The front panel has dimensions 48 x 96 mm (1.89" x 3.78"). The maximum length/depth including rear panel terminals is 100 mm (3.94").

### 5.2.2. Cut out

The cut out dimensions are:

- width 92 mm, max 92.8 mm (3.622", max 3.654")
- height 45 mm, max 45.6 mm (1.772", max 1.795")



## 6. COMMUNICATION

GRD101 communication port is a 3 wire RS232 – TxD, RxD and common. The connector is DB9 female. Pin 5 is the common, pin 3 is in-coming data from the master (PC) to GRD101, pin 2 is out-going data from GRD101 to the master.

The serial port settings are: baud rate 19 200, 8 bit character, 1 stop bit, even parity, no handshaking.

The communication protocol is MODBUS RTU. Functions 0x03 (read holding registers), 0x04 (read input registers) and 0x06 (write a single holding register) are implemented. The remote display handles exceptions 1, 2, 3 and 6.

Here are the registers implemented:

<b>Register address</b>	<b>Register Type</b>	<b>Read/Write</b>	<b>Description</b>	<b>Format</b>
21	Input	R	Returns the input signal in percents	0 – 10000 = 0.00% – 100.00%
1000	Holding	R/W	MODBUS slave address	1 - 247, default is 1
1001	Holding	R/W	Digital filter	0 – 7, default is 0 = auto
1007	Holding	R/W	Cut OFF	0-50 = 0.0 – 5.0 %, default is 1
1018	Holding	R/W	Value for 0% signal, high, <b>NOTE 1</b>	Default is 0
1019	Holding	R/W	Value for 0% signal, low, <b>NOTE 1</b>	Default is 0
1020	Holding	R/W	Decimal places of the value for 0% signal, <b>NOTE 1</b>	0 – 5, default is 0
1021	Holding	R/W	Value for 100% signal, high, <b>NOTE 1</b>	Default is 0
1022	Holding	R/W	Value for 100% signal, low, <b>NOTE 1</b>	Default is 100
1023	Holding	R/W	Decimal places of the value for 100% signal, <b>NOTE 1</b>	0 – 5, default is 0
1024	Holding	R/W	Input type, <b>NOTE 2</b>	Default is 4-20 mA
1025	Holding	R/W	Decimal places to display	0 – 6, default is 6 = auto

**NOTE 1:** This is a 4 byte signed long integer.

**Example:** In order to set the display value for 0 % signal to -12.44 the master software has to send -1244 (signed long integer) and 2 for the decimal places:

high = 0xFFFF  
low = 0xFB24  
decimal places = 2

The GRD101 software will validate if the value is within the range of **-199,999 to 999,999** and will reply with exception 3 if it is not.

**NOTE 2:** The input type that can be programmed depends on the hardware version of the remote display. For **GRD101-0 and GRD101-0-ISO** the input type can only be 0 (0 – 20 mA) or 1 (4-20 mA).

For **GRD101-1 and GRD101-1-ISO** the input type can be programmed to be:

0 = 0-20 mA  
1 = 4-20 mA  
2 = 0-5V  
3 = 0-10V  
4 = 1-5V  
5 = 2-10V

**NOTE that the DIP switches on the rear panel must be set accordingly. Look at 5.1.2. above.**



## 7. VERSIONS OF GRD101

### 7.1. Current input only

This version has no DIP switches on the rear panel. It can be with or without isolation on the power supply.

GRD101-0

is the non-isolated version. This is the lowest cost version of GRD101. Because the 4-20 mA output of all of our flow computers is isolated this version is an excellent choice to remotely display flow rate from GFC1xx series flow computers. It requires 15-36 VDC and the same voltage powers the sensor.

GRD101-0-ISO

is the isolated version. It is recommended for applications where the sensor is not well known, it is not a GFC1xx series flow computer or there are a few devices connected together and to GRD101. The isolation will prevent from ground loops and reduce the noise. It requires 18-36VDC power. The voltage for the sensor is always 24VDC regulated and it is isolated from the power supply.

### 7.2. Current and voltage input

This version accepts current and voltage signals. There are 2 DIP switches on the rear panel to control the input type.

GRD101-1

is the non-isolated version. It is a good choice if the sensor is well known and there are no other devices connected to the sensor or to GRD101.

GRD101-1-ISO

is the isolated version. It is recommended for all other cases.

### 7.3. Bridge, load cells, differential signals

This version accepts a differential millivolt signal that can come from a bridge, load cell or other devices. GRD101 provides very accurate and stable 10.000 V DC to power the bridge (load cell).

GRD101-BR

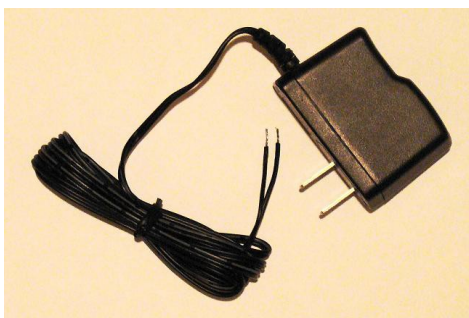
is the non-isolated version. It is a good choice if the power supply to GRD101 is isolated, not used for anything else and the bridge is also isolated from everything else.

GRD101-BR-ISO

is the isolated version. It is recommended for all other cases.

## 8. POWER SUPPLY

GRD101 can be powered by any DC adapter for 18 – 36VDC or by another device. An excellent choice for a power supply is the adapter GPS124 on the picture below that we offer. It provides 24VDC / 250 mA regulated and filtered. It also has high isolation, protection and small size.





## 9. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>G Instruments PN</i>
GRD101-0 remote display, current only, non-isolated	30139
GRD101-0-ISO remote display, current only, isolated	30141
GRD101-1 remote display, voltage and current, non-isolated	30140
GRD101-1-ISO remote display, voltage and current, isolated	30142
GRD101-BR remote display, bridge , load cell, non-isolated	30507
GRD101-BR-ISO remote display, bridge, load cell, isolated	30508
GPS124 power supply, 115VAC to 24VDC/0.25A, regulated	30138
RS232 extension cable, DB9M to DB9F, 6' long	30175
GRD Master programming software	30176





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