



FEATURES

- UNIVERSAL INPUT
- SEVEN DIGIT AUTORANGE RATE
- 7 DIGIT TOTAL WITH PROGRAMMABLE DECIMAL PLACES
- RANGE FOR THE KFACTORS 0.001- 99999.99
- SINGLE KFACTOR OR 10 POINTS CURVE FOR FIELD CALIBRATION
- MILLILITERS, LITERS, GALLONS, CUBIC FEET, CUBIC METERS, ACRE FEET
- PER SECOND, MINUTE, HOUR, DAY
- ISOLATED 12 BIT 0-5V FAST ANALOG OUTPUT
 - LESS THAN 10 ms RESPONSE
 - 0.05% FS
- 64 DAYS DATALOGGER (TOTAL FOR EACH 24 HOURS)
- ALL SETTINGS STORED IN A NON-VOLATILE MEMORY
- SETTINGS LOCK/UNLOCK FOR SECURITY
- PROVIDES POWER FOR THE SENSOR
- HIGH CONTRAST IN THE ENTIRE TEMPERATURE RANGE
- SIMPLE PROGRAMMING, SMALL SIZE



1. DESCRIPTION

GFC113 is a low power flow computer / totalizer with an universal input that provides power for many types of sensors and accept their signal to measure flow rate and total. GFC113 also has an isolated 12 bit analog 0-5 V / 10 ms output that can be connected to SCADA, PLC or another control device.

GFC113 stores up to 64 totals for each 24 hours that can be easily viewed on the liquid crystal display.

For a better accuracy and wider turn down ratio GFC113 provides capabilities for using calibration tables of up to 10 points. After entering the calibration table at any time in a few seconds the operator can switch between a single KFACTOR and the curve of up to 10 points.

The software of GFC113 implements unique algorithms to measure a wide range of input frequencies and provide a very fast response of the analog output.

GFC113 is the perfect solution for flow tests, experiments, research, measurement and control applications that require high accuracy and reliability, very fast response, high isolation, multi-functionality, small size, industrial grade performance and long time without service.

APPLICATIONS

- FLOW RATE AND TOTAL RESEARCH, MEASUREMENT AND CONTROL
- SCADA



2. ABSOLUTE MAXIMUM RATINGS *

Operating temperature	-20 °C to +70 °C The electronics is industrial (-40 °C to +85 °C) and higher grade . The Liquid Crystal Display (LCD) is limiting the temperature range.
Power supply voltage	40 VDC
Voltage for the analog output	40 VDC
Sensor consumption	10 mA DC

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

3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
Power supply	-20 °C to +70 °C	12		36	V DC
Input					
Voltage for the sensor	-20 °C to +70 °C, max 10 mA, Note 1		10		V DC
Threshold, low	Wave or logical signal (CMOS, TTL etc.)		1		V DC
Threshold, high	Wave or logical signal (CMOS, TTL etc.)		1.4		V DC
Coil voltage	Symmetrical signal from the coil (sine, triangle, saw etc)	20			mVpp
Reed switch current	-20 °C to +70 °C, Powered by GFC 113, Note 2			3.5	mA DC
Frequency, HF	Note 3		5 000		Hz
Frequency, MF	Note 3		1 000		Hz
Frequency, LF	Note 3		200		Hz
Analog Output					
Power Supply	-20 °C to +70 °C	9.5		36	V DC
Resolution	-20 °C to +70 °C, 9.5 – 36 V		1.25		mV
Error	100k load, 24 V, 25 °C, Note 4			0.05	% FS
Temperature coefficient	-20 °C to +70 °C, 24 V		50		ppm/ °C
Current consumption	100k load, 24 V DC supply, 25 °C			4	mA
Response	Input Frequency > 200 Hz, Note 5, Note 6			10	ms

Note 1: When powering a 3 wire sensor like open drain/collector pnp/npn sensor. For 2 wire sensors the current is automatically limited when powered by GFC113.

Note 2: If the 2 wire sensor uses external power the external voltage must be 10 V DC or less.

Note 3: The values are for reference only. The maximum frequency strongly depends on the duty cycle of the signal and the type of the sensor.

Note 4: The parameter includes all errors, non-linearity and noise at constant voltage and temperature

Note 5: For lower than 100 Hz frequencies the response time equals one period of the input signal.

Note 6: Even shorter response times available by special order

3.1. BUTTONS

There are three buttons: **SET** , **UP**  and **RIGHT**  :

- **SET** is used to enter and exit menus and confirm options chosen
 - **UP** is used to change the data
 - **RIGHT** is used to move the cursor (blinking digit or icon) to the right
- The buttons have some other special functions that are mentioned below.

There are two types of buttons accepted by the GFC113 FLOW computer / totalizer:

- Short is when the button is pressed and released in less than 0.5 second
- Long is when it is kept pressed for more than 5 seconds
- All other durations are ignored

NOTE: The UP button will not change the value if the settings are locked.

3.2. INPUTS

GFC113 has two inputs:

- Pulse input from a FLOW sensor such as wave, logical signal, open drain/collector, npn/pnp, reed switches, dry contact, proximity/NAMUR sensors, Data Industrial 2 wire flow meters, turbine meters coils and others. The computer / totalizer has all pull-up/down, current limiting and signal conditioning circuits built-in. The input also provides power for all types of sensors.

There is no need to use external amplifiers, linearizers or frequency to voltage converters for the coils if they provide more than 20 mVpp signal.

- Start/stop input. This input is used to start and stop the accumulation of the total. Shorting the terminals stops accumulating the total and the reading does not change until it has been reset or the stop button has been released.

3.3. OUTPUTS

GFC113 has one isolated output:

3.3.1. Analog output

The isolated analog output is 0 - 5V, 12 bit, with reverse polarity and surge protection, high accuracy and reliability. Its response time is less than 10 ms for frequencies above 200 Hz and increases to one period only for all other frequencies below 100 Hz.

Using the **SET20** menu it can be programmed to represent the flow rate.

SET20 parameter means at what flow rate the output will be 5.000V.

3.4. DISPLAY

The liquid crystal display (LCD) has 7 digits with 1, 2 or 3 decimal places and many icons. It shows rate, total and all the variables and options that can be set or programmed. The rate is auto-ranged which means that the FLOW computer controls automatically how many decimal places to display in order to have the best accuracy and resolution.



The total can have none, 1, 2 or 3 programmable decimal places.

GFC113 software implements unique algorithms for very fast measurement and response. It provides the flow rate and total calculations and updating the analog output in less than 10 ms (200Hz and up) and updates the display 4 times a second.

A “**FLOW**” icon will always be displayed.

When the display shows rate a “**RATE**” icon is displayed. If it shows total a “**TOTAL**” icon will be displayed.

When input pulses are present an “**INP**” (input) icon will be displayed.
If the total reset is enabled a “**RESET**” icon will be displayed.

3.4.1. Volume and time units

- GFC113 has milliliters (**mL**), liters (**L**), gallons (**G**), cubic feet (**CF**), cubic meters (**M³**) and acre feet (**AF**) per second (**S**), minute (**M**), hour (**H**) and day (**D**) available. They can be changed at any time and the computer stores them as any other settings in a non-volatile memory.

3.4.2. Normal mode

Automatically after turning the power on or exiting a menu GFC113 enters the normal mode.
In this mode it can only display:

- The total reset can be enabled or disabled. If enabled the **RESET** icon is shown. Resetting the total is by using long **RIGHT** button. The total will not accumulate if the digital input is shorted by a ON/OFF switch or a push button.
- Switching between rate and total is by using short **UP**.

3.4.3. Menus

To enter the menus use long **SET** button in normal mode. About 5 seconds after pressing (and holding pressed) the **SET** button the first menu will appear on the LCD:

- **KFACTOR** icon along with **Lo** or **Hi** icon is shown and using **UP** button the range of all KFACTORs can be selected (single KFACTOR and all KFACTORs in the calibration table).
 - When **Lo** all KFACTORs will be in the format XXXX.XXX
 - When **Hi** all KFACTORs will be in the format XXXXX.XX

Use short SET to move to the next menu.

- **KFACTOR** icon is shown and using **UP** and **RIGHT** the main **KFACTOR** for the particular FLOW meter connected to GFC113 can be entered. This is how many pulses the flow computer will receive per gallon.

While in this menu all the settings can be locked/unlocked. Use **RIGHT** button to move the cursor to the right most digit and then use long **SET**.

- Using short **UP** lock/unlock the settings. Then use short **SET** to go back to **KFACTOR** menu



- If the settings are locked then they can only be viewed but not changed.

From the **KFACTOR** menu use short **SET** to enter the **CURVE** menu. NOTE that computer will not accept zero for the **KFACTOR**.

- In the **CURVE** menu use short **UP** to change between blinking **CURvE** and blinking **KFACTOR**. Depending on the choice made the flow computer will use for calculations either the single **KFACTOR** or the calibration **CURvE** of up to 10 points. The points have to be entered before using the calibration curve. The factory default is 1.0 for the **KFACTOR** of each point. The curve is stored in a non-volatile memory and the points can be entered in any order. The computer will order and validate them.
 - Entering the calibration data mode is by using long **SET** in the **CURVE** menu regardless of the fact which one (**CURvE** or **KFACTOR**) is blinking.
 - “**CAL Crv**” will appear on the LCD and “**NO**” icon will be blinking. To continue choose **YES** and press short **SET**. To leave calibration curve data mode and leave the previous calibration data untouched choose **NO** and press short **SET** to go back to the **CURVE** menu.

This feature is very useful for flow meters that have a calibration sheet provided by the manufacturer or the calibration laboratory. Each point consists of a input frequency and a **KFACTOR** for that frequency.

Once you enter the calibration curve data menu you have to go to the last point (point 9). If you have data for less points enter 0.0 for the frequency for all unused points. The GFC113 will not accept 0.0 for any KFACTOR.

If **YES** has been chosen “**Point 0**” will appear on the LCD. Press short **SET** and enter the input frequency in Hz for point 0. Press short **SET** and then enter the **KFACTOR** for that input frequency. Press short **SET** to do the same for the next point.

Repeat the above for up to 9 more points and after entering the last point number 9 the flow computer will automatically return to the **CURVE** menu. If you do not have 10 points on the calibration sheet enter 0.0 for the frequency for all unused points. GFC113 will not accept 0.0 for any **KFACTOR**.

There is no need to enter the frequency at each point in a special (ascending/descending) order. The computer will automatically sort and validate the data and calculate all the parameters.

In the **CURVE** menu press short **SET** to move to the “**volume units menu**”

- In the “volume units” (**vU**) menu use **UP** to choose the volume units among **mL**, **L**, **G**, **CF**, **M³** and **AF**. Use short **SET** to move to the “**time units**” menu.
- In the “time units” (**tU**) menu use **UP** to choose the time units among **S**, **M**, **H** and **D**. Use short **SET** to move to the “**SET20**” menu.
- In the **SET20** menu set the flow rate at which you want the analog output to be 5.000V. Analog output will be 0.0V at no flow rate.
- Press short **SET** to move to the “**decimal Places**” menu where using short **UP** none, 1, 2, or 3 decimal places for the total can be programmed. The rate will be auto-ranged and will not be affected by this setting.



- Press short **SET** to move to the **Total Reset enable/disable** menu or use long **SET** to enter the **DATALOG** menu.
- In **Total Reset enable/disable** menu using **UP** button the total reset can be enabled or disabled. If enabled and GFC113 is in normal mode displaying total the **RESET** icon will also be displayed and long **RIGHT** will clear the total.

Because this menu is the last one pressing a long **SET** will move the computer to the **LOCK/UNLOCK** menu. Use **UP** to lock the settings and press short **SET** to go back to **Total Reset enable** menu. General practice would be the settings to be unlocked at the **KFACTOR** menu, then changed and locked again before exiting at the last menu. Press short **SET** to exit the last menu. After a couple of seconds during which all the settings are being checked, validated and stored into the non-volatile memory, the computer will move to the normal mode.

NOTE: There is a time out built-in the software that will reset the computer and force it to the normal mode WITHOUT saving any changes made in any of the menus. The changes will only be saved after exiting the Total Reset enable menu by pressing short SET.

NOTE: During menus the computer continues to measure and calculate rate and total and control the output so nothing will be lost. But changing for an instance the KFACTOR will invalidate the total accumulated. So it would be the user's responsibility to take appropriate actions after changing the settings like resetting the total or leaving it as it was, for an instance.

- If a long **SET** has been pressed in the **output type** menu the computer will move to the **DATALOG** menu.

"DAYS back 00" will appear on the LCD. Pressing **UP** will display the total after the last full 24 hours. Pressing **RIGHT** will bring back the **DAYS back XX** menu. Pressing **RIGHT** again will increment the **days back** number. This way the totals for up to 64 days back can be viewed.
- Pressing short **SET** will move the computer to the **DATALOG RESET** menu. Choose **YES** or **NO** using **UP** button. Choosing **YES** will reset the data log placing zeros in all totals (1 to 64 days back).
- Press short **SET** to move to the **DTALOG INIT** menu. Choosing **YES** will initialize the data log – all the totals for all days back will remain untouched but the time for completing 24 hours total will change to the moment at which the short **SET** after **YES** has been pressed. After the short **SET** the computer will return to the **OUTput TYPE** menu.

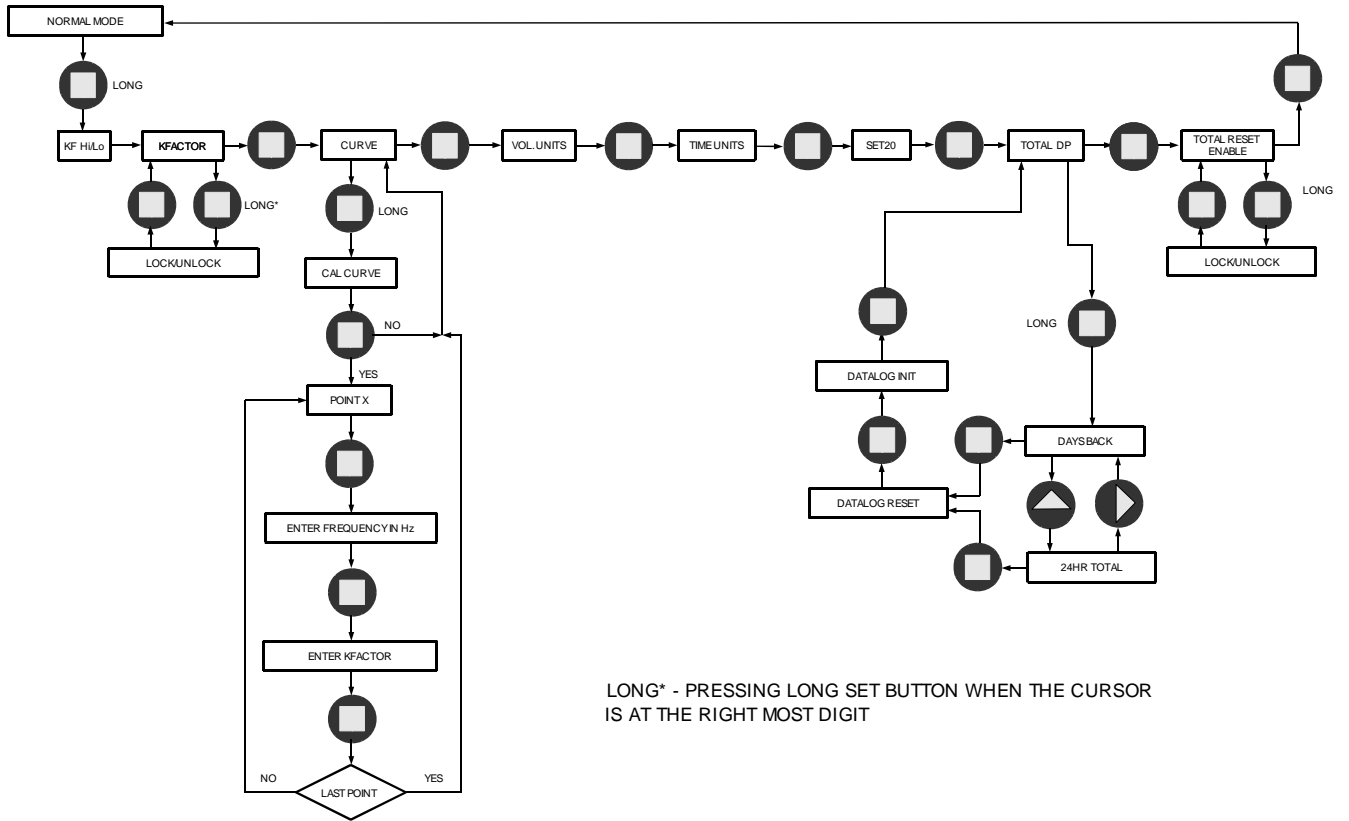
Example: The owner did a **DATALOG INIT** at 11 o'clock. Exactly at the same time each day the total for the last 24 hours will be stored and a new cycle will begin.

3.5. Checking the LCD

All the icons of the LCD can be checked by pressing and holding the **RIGHT** button during turning the power supply on or after exiting the last menu. Releasing the button will allow the computer to go to normal mode.

4. MENU DIAGRAM

The menu diagram for GFC113 is shown below.



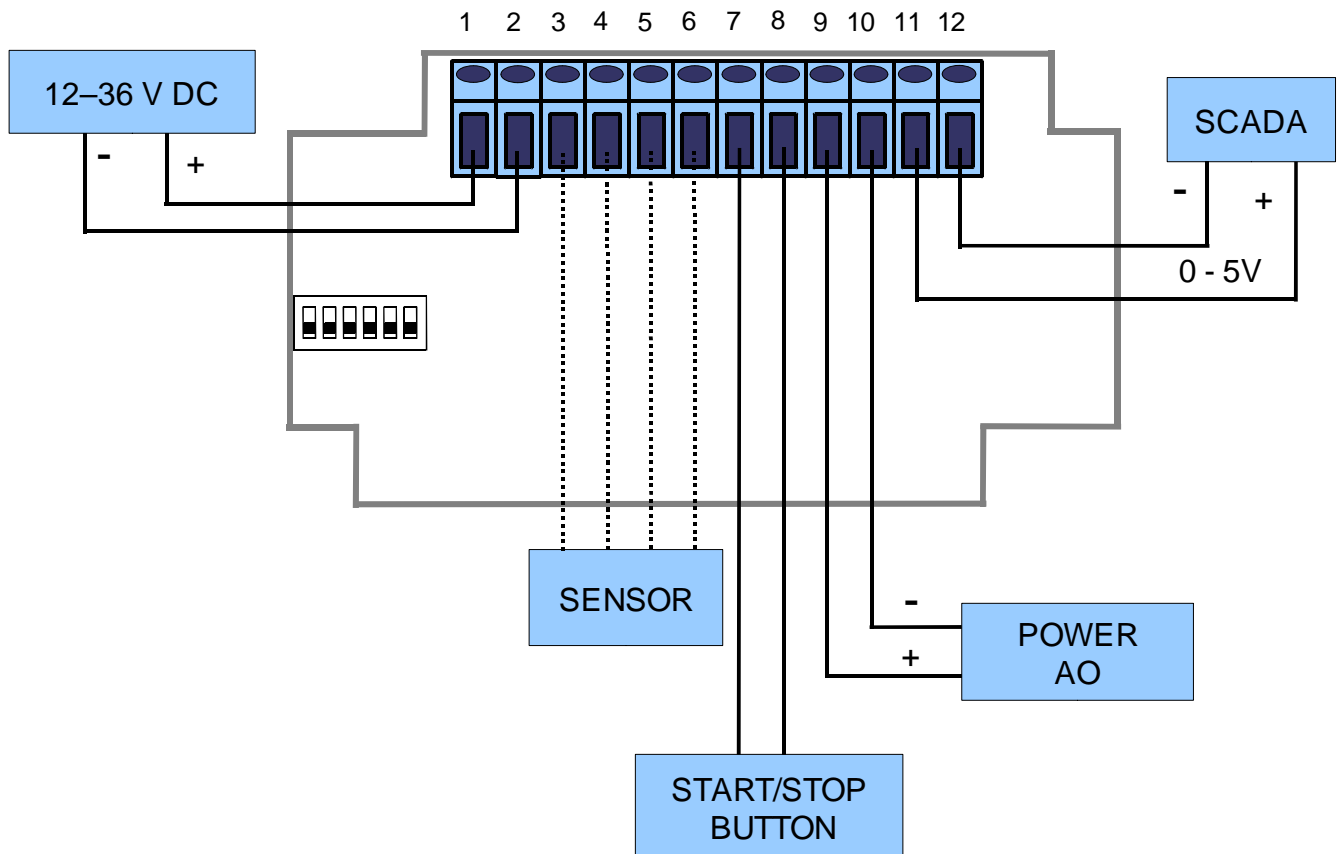
5. APPLICATION

5.1. ELECTRICAL

The wiring diagram is shown below.

NOTE: There is no isolation between the sensor input, the power supply and the push button input. Terminals 2, 5 and 8 are shorted inside the device. It is the user's responsibility to consider this fact and implement appropriate wiring in the particular user's application.

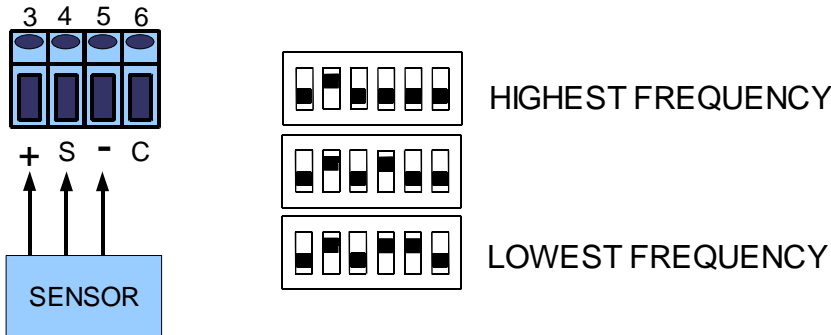
- 1 – Power supply, plus
- 2 – Power supply, minus
- 3 – Power for the sensor, plus
- 4 – Signal/Coil
- 5 – Power for the sensor, minus
- 6 – Coil, only
- 7 – Push button, plus
- 8 – Push button, minus
- 9 – Power for the analog output, plus
- 10 – Power for the analog output, minus
- 11 – Analog output, plus
- 12 – Analog output, minus. Terminal 12 and terminal 10 are shorted inside the device.



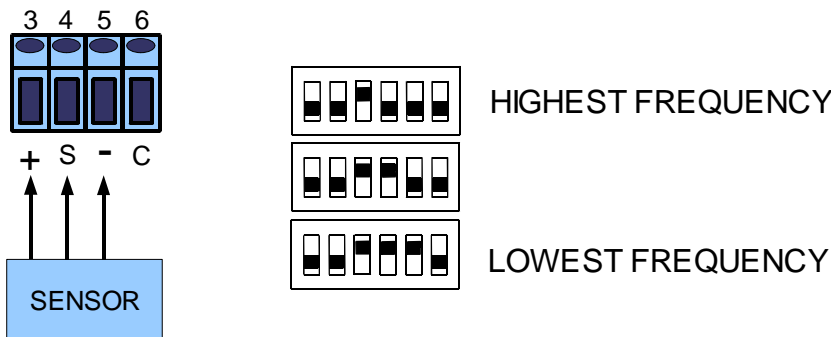
5.1.1. Wiring the sensor

GFC113 accepts a variety of sensors and their particular wiring is shown below:

5.1.1.1. NPN Open Drain, Open Collector



5.1.1.2. PNP Open Drain, Open Collector

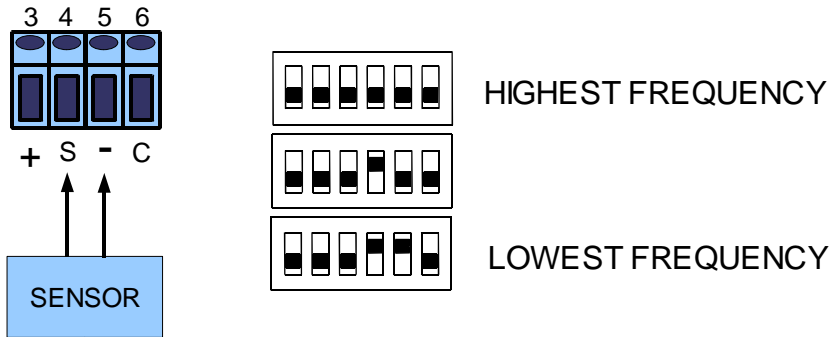


5.1.1.3. Reed Switch, Dry Contact

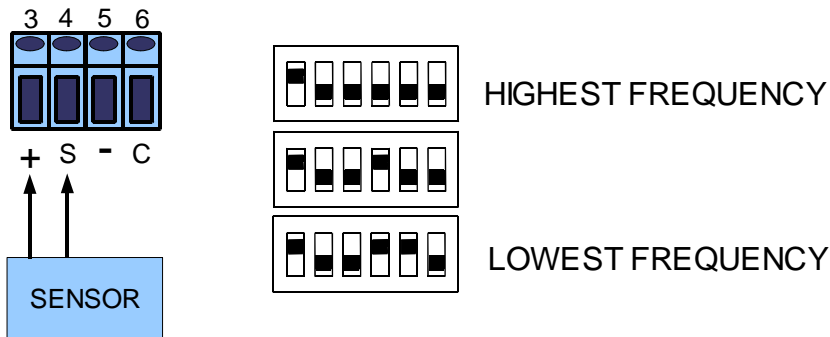


NOTE: Different reed switches and dry contacts have different bouncing time. Test and evaluate carefully which DIP switch setting to use.

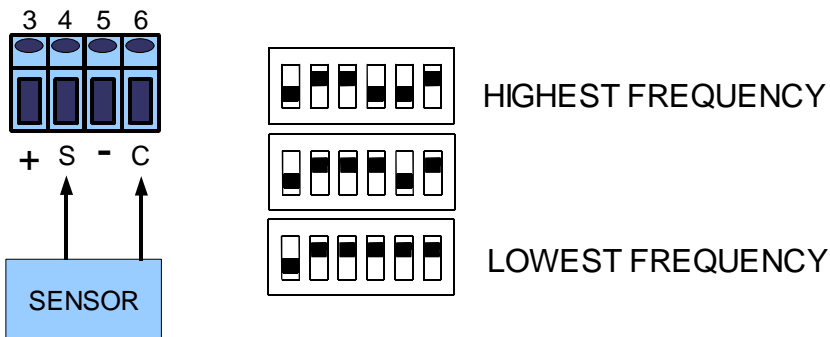
5.1.1.4. Wave (square, sine, triangle, saw etc.), Logical Signal (CMOS, TTL etc.)



5.1.1.5. NAMUR Sensors, Data Industrial Two Wire Flow Meters



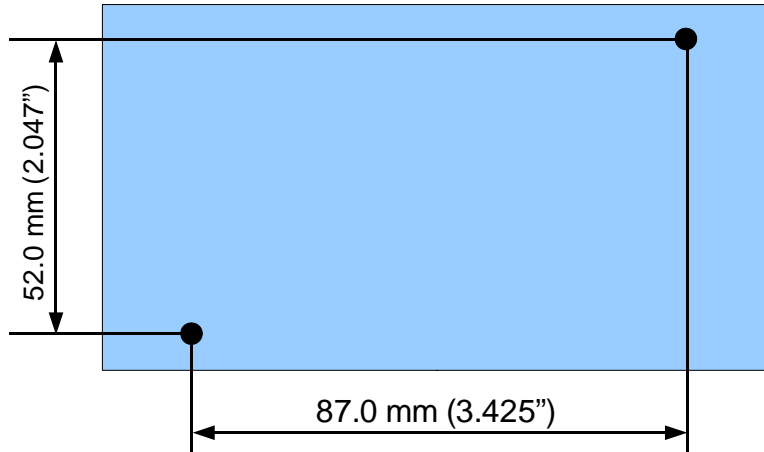
5.1.1.6. Coils



NOTE: If the cable to the coil is shielded connect the shield to “-” (terminal 5) ONLY. Do not connect the shield to anything at the other (coil) end of the cable. The shield has to be isolated from earth ground and every other equipment or electrical connections.

5.2. MECHANICAL

Mounting GFC113 on a wall requires an area of 120 x 65 mm (4.73 x 2.56 inch) and two screws:



NOTE: The cable grips and the cables need additional space

6. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>G Instruments PN</i>
GFC113 flow computer without power supply (external isolated 12 – 36 V DC needed)	30117
GFC113 flow computer with GPS115 (115 VAC power supply)	30118
GFC113 flow computer with GPS220 (220 VAC power supply)	30119



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