



## FEATURES

- MULTIPLE INPUTS, CAN POWER THE SENSOR
- NO NEED OF LINEARIZERS
- SEVEN DIGIT RATE WITH PROGRAMMABLE DECIMAL PLACES
- THREE SEVEN DIGIT TOTALS WITH PROGRAMMABLE DECIMAL PLACES. ONE NON-RESETTABLE, TWO RESETTABLE
- SINGLE KFACTOR OR 10 POINT CALIBRATION CURVE
- KFACTORS FROM 0.001 TO 9,999,999
- MILLILITERS, LITERS, GALLONS, CUBIC FEET, CUBIC METERS, ACRE FEET
- PER SECOND, PER MINUTE, PER HOUR, PER DAY
- ISOLATED 12 BIT ANALOG 4-20 mA PASSIVE OUTPUT
- ISOLATED NO POLARITY 100V/100mA DC/AC OUTPUT THAT CAN BE PROGRAMMED TO BE:
  - RATE ALARM, HIGH OR LOW
  - BATCH OUTPUT WITH A START INPUT
  - TOTAL LIMIT FOR 1 TO 64 DAYS WITH A RESUME INPUT
  - PULSE OUTPUT, UP TO 480 PULSES PER MINUTE (METERING PUMPS)
  - PULSE OUTPUT, UP TO 500 Hz
- 64 DAYS DATALOGGER (TOTAL FOR EACH 24 HOURS)
- ALL SETTINGS STORED IN A NON-VOLATILE MEMORY
- SETTINGS LOCK/UNLOCK FOR SECURITY
- HIGH CONTRAST IN THE ENTIRE TEMPERATURE RANGE
- SIMPLE PROGRAMMING, SMALL SIZE

## APPLICATIONS

- FLOW RATE AND TOTAL MEASUREMENT AND CONTROL
- BATCH APPLICATIONS
- LIMITING THE TOTAL IN ANY ROLLING PERIOD OF 1 TO 64 DAYS, PROGRAMMABLE
- METERING PUMPS PRECISE CONTROL FOR DOSING APPLICATIONS
- SCADA



## 1. DESCRIPTION

GFC110 is a low power flow computer / totalizer with multiple inputs and a variety of outputs. It provides power for the sensor and accept its pulses to measure flow rate and total. GFC110 has an isolated no polarity 100V/100mA DC/AC output that can be programmed to work as a rate alarm, high or low, with +/- 1 % hysteresis, batch, limit or pulse output. GFC110 also has an isolated 12 bit analog 4-20 mA passive output that can be connected to SCADA, PLC or another control device.

Regardless of the type of the output chosen GFC110 stores up to 64 totals for each 24 hours that can be easily viewed on the liquid crystal display.

For a better accuracy GFC110 provides calibration curve capabilities for up to 10 points. After the calibration table has been programmed 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 GFC110 implements a version of our proprietary predictive/adaptive self-adjusting digital filtering which provides extremely stable reading at any input frequency and still very fast response to any change in the flow.

GFC110 is the perfect solution for flow measurement and control applications that require high accuracy and reliability, high isolation, multi-functionality, small size, industrial grade performance and long time without service.



## 2. ABSOLUTE MAXIMUM RATINGS \*

Operating temperature	-20 °C to +70 °C <b>The electronics is industrial (-40 °C to +85 °C) and higher grade . The Liquid Crystal Display (LCD) is limiting the temperature range.</b>
Power supply voltage	40 VDC
Voltage for the analog output	40 VDC
Digital output current	100 mA DC/AC. Alarm, batch, limit or pulse output
Digital output voltage	100 V DC, 70V AC. Alarm, batch, limit or pulse output

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

## 3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
<b>Power supply voltage</b>	-20 °C to +70 °C	8		36	V DC
<b>Input</b>					
Input frequency	<a href="#">GMS400</a> , Note 1	0		1000	Hz
Voltage for the sensor	<a href="#">GMS300</a> , Note 2		5		V DC
<b>Analog Output</b>					
Power Supply	-20 °C to +70 °C, Note 3	9.5		36	V DC
Resolution	-20 °C to +70 °C, 9.5 – 36 V DC		4		uA
Error	250 ohm load, 24 V, 25 °C, Note 4			0.05	% FS
Power supply error	9.5-36V, no load, output disabled, 25 °C			0.5	uA/V
Temperature coefficient	-20 °C to +70 °C, 24 V		35		ppm/ °C
Current, output disabled	SET20 = 0.0, 24 V DC supply, 25 °C		3.85		mA
<b>Digital Output</b>					
Output ON resistance	-20 °C to +70 °C, 100 mA			8	ohm
Output OFF leakage	-20 °C to +70 °C, 100 V DC			5	nA
'Low', pulse rate	Note 5			480	p/min
'Low', pulse duration	Note 5		62.5		ms
'Low', pause duration	Note 5	62.5			ms
'High', pulse rate	Note 6			30,000	p/min

**Note 1:** Special versions for 0 – 10 kHz available by special order

**Note 2:** There is a 390 ohm resistor in series inside the computer / totalizer for short and over current protection. GFC110P has no resistor.

**Note 3:** The minimum voltage for the 4-20 mA output to operate is  $V = 9.5 + R \text{ load [ohm]} * 0.020$  [V DC]  
For GFC110 with a load of 250 ohm connected the minimum voltage would be 14.5 V DC.

**Note 4:** The parameter includes all errors except temperature error

**Note 5:** Pulse output has been programmed to be 'low' – low pulse rate for metering pumps applications. Pulse and pause widths are fixed.

**Note 6:** Pulse output has been programmed to be 'high' – high pulse rate for SCADA, PLCs etc. Pulse and pause have equal widths.



## 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 GFC110 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

GFC110 has two inputs:

- Pulse input from a flow sensor such as wave, logical signals, open drain/collector, npn, reed switches, dry contact and others. The computer / totalizer has all pull-up, current limiting and signal conditioning circuits built-in. The input also provides power for the sensor. There is no need to use external linearizers for the sensor. The standard version GFC110 has a 390 ohm resistor in series with the power supply for the sensor (terminal 7). Depending on the consumption of the sensor the voltage will drop.

GFC110P has no resistor and provides stable regulated voltage to power the sensor.

- Start/pause/resume input. This input is used for batch and limit applications with the output of GFC110 programmed as batch or limit. The intended use of this input is to connect to it a normal open push button, dry contact or an open drain sinking output. If the output of GFC110 is programmed as alarm or pulse then this input is ignored.

## 3.3. OUTPUTS

GFC110 has two isolated outputs:

### 3.3.1. Analog output

The isolated analog output is 4-20 mA, two wire, passive, 12 bit, with reverse polarity and surge protection, high accuracy and reliability. Using the **SET20** menu it can be programmed to represent the flow rate.

**SET20** parameter means at what flow rate (in G/M) the output will be 20.00 mA.

### 3.3.2. Digital output

The isolated digital output has no polarity, can work with 100V/100mA and can be programmed to be:

- Rate alarm, high or low, with +/- 1% hysteresis.  
**Example:** If the alarm is programmed at 100.00 GPM and to be **high** the output will turn on when the flow rate exceeds 101.00 GPM and will turn off when it drops below 99.00 GPM  
With **low** alarm the action will be reversed.



- Batch total  
**Example:** The batch amount is programmed at 1000.0 G. The **total B** shows the batch amount accumulated and is not resettable. When **total B** reaches or exceeds 1000.0 G the digital output turns ON and **total B** stops increasing. Pressing the push button for more than 0.5 second will clear **total B**, turn the digital output OFF and **total B** will start accumulating next batch amount. Pressing the push button before reaching 1000.0 G will pause the batch (**total B** not accumulating, output ON). Pressing it again will resume the batch (output OFF, **total B** accumulating).
- Limit total. This feature can limit the total for any rolling number of days programmed.  
**Example:** You want to limit the total of water used to 200 gallons a week. You program the limit to 200 gallons and the DAYS to 7. If the total in any rolling 7 days exceeds 200 gallons the output will turn on and can shut the master valve off or do something else. The output will stay on until the resume input (connected to a push button, switch etc.) is shorted. The total used is checked against the limit once a day exactly at completing 24 hours after the previous check.
- Pulse output. This feature is intended for use with metering/dosing pumps, SCADA, PLCs and other devices.

The pulse output can be programmed for **low** or **high** pulse rate.

- When **low** it provides pulses with duration of 62.5 ms and pause longer than 62 ms. The output pulse rate is limited to about 480 pulses per minute for use with metering/dosing pumps.
- When the pulse output has been programmed for **high** rate it can provide up to 30 000 pulses per minute (500 Hz) with equal duration of the pulse and the pause.

**Example:** You are adding chlorine or fertilizer to the water and have connected the control input of a pump to this pulse output. You program the “**SETP**” factor at 3.762 Gallons per pulse. The pump will produce one pulse every 3.762 gallons and add the chlorine or the fertilizer in an exact proportion to the water.

### 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 and all totals have programmable auto, none, 1, 2 or 3 decimal places.

GFC110 software implements our latest proprietary algorithms for predictive / adaptive self-adjusting digital filtering of the rate. It provides exceptionally stable reading at any input frequency but in the same time very fast response to any change in the flow.

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 along with “**A**”, “**B**” or “**C**” (GFC110 has three totals).

When input pulses are present an “**INP**” (input) icon will be displayed.

Whenever the digital output is ON an icon for the cause will be displayed (**alarm, batch, limit, or pulse**) If the total on the LCD is allowed to be reset a “**RESET**” icon will be displayed.



### 3.4.1. Volume and time units

- Milliliters (**mL**), liters (**L**), gallons (**G**), cubic feet (**CF**), cubic meters (**M<sup>3</sup>**) and acre feet (**AF**) per second (**S**), minute (**M**), hour (**H**) and day (**D**) are available.

### 3.4.2. Normal mode

Automatically after turning the power on or exiting a menu GFC110 enters the normal mode. In this mode it can only display:

- Rate
- Total A, B or C. Total A reset can be enabled or disabled and it is stored in a non-volatile memory every 50 seconds or immediately when cleared. Total B in batch mode for the output is non-resettable and it is the total that is compared against the batch volume preprogrammed. If a total is allowed to be reset the **RESET** icon is shown. Resetting a total is by using long **RIGHT** button.
- Switching between rate, total A, B or C is by using short **UP** button.

### 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 **dP 1234** is shown and using **UP** button the decimal places for all KFACTORs (single KFACTOR and all KFACTORs in the calibration table) can be programmed. This way KFACTORs in the range from 0.001 to 9,999,999 can be entered.

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 the GFC110 can be entered. This is how many pulses the flow computer will receive for one 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 next menu. NOTE that the 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 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 an input frequency and a KFACTOR (in pulses per gallon) 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. GFC110 will not accept zero 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.

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 **SET20** menu.

- In the **SET20** menu program the flow rate in G/M at which you want the analog output to be 20.00 mA. Analog output will be 4.00 mA at 0.0 G/M. If **SET20** = 0.0 the analog output will stay about 3.85 mA and will not change with the rate. 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, M<sup>3</sup>** and **AF**. Press short **SET** to move to the "**time unit menu**"
- In the "time units" (**tU**) menu use **UP** to choose the time units among **S, M, H** and **D**. Press short **SET** to move to the "**OUT Type**" menu.
- In the output type menu use **UP** to choose the type of the output among **alarm, batch, limit** and **pulse**. Press short **SET** to move to the next menu or press long **SET** to enter the **DATALOG** menu.

\* If **alarm** has just been chosen the next menu will be the "**alarm type**" menu where using **UP** button **high** or **low** alarm can be chosen. Press short **SET** to move to the **alarm value** menu.

\* If the **limit** output has been chosen the next menu will be **DAYS** menu where the rolling number of days for the limit can be entered.

\* If the **pulse** menu has been chosen the next menu will be **Pulse Type** (high/low). Use **low** pulse output for metering/dosing pumps with up to 480 strokes per minute. Use **high** pulse output to connect to a PLC, SCADA or other device that can accept up to 30 000 pulses per minute (500 Hz).

Use short **SET** to move to **SETP** decimal places menu. **SETP** icon along with **dP 1234** will appear and using **UP** button the decimal places for **SETP** can be programmed. Use short **SET** to move to **SETP** menu.

- In the **output value** menu:
  - The value for the **alarm** must be in **G/M**
  - The value for the **batch** must be in **GALLONS** and it will compare to the **total B**



- The value for the **limit** must be in **GALLONS**
- The value for **SETP** must be in **GALLONS PER PULSE**

**Note that the computer will not accept zero for those settings.**

- Press short **SET** to move to the “Rate **decimal Places**” menu where using short **UP** auto, none, 1, 2, or 3 decimal places for the flow rate can be programmed.
- Press short **SET** to move to the “Total **decimal Places**” menu where using short **UP** auto, none, 1, 2, or 3 decimal places for all totals can be programmed.
- Press short **SET** to move to the **Total A Reset enable/disable** menu. In this menu using **UP** button the total A reset can be enabled or disabled.  
If enabled and GFC110 is in normal mode displaying total A the **RESET** icon will also be displayed and long **RIGHT** will clear total A.

Because this menu is the last one pressing a long **SET** will move the computer to the **LOCK** menu. Use **UP** to lock the settings and press short **SET** to go back to **Total A Reset enable** menu. General practice would be the settings to be unlocked at the first (**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 A 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 no total 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 totals or leaving them as they were, 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. This feature can be useful for an instance with the limit output. The owner can check the total water used per day and find out when the limit has been exceeded.
- 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 start.

**3.5. Checking the LCD**

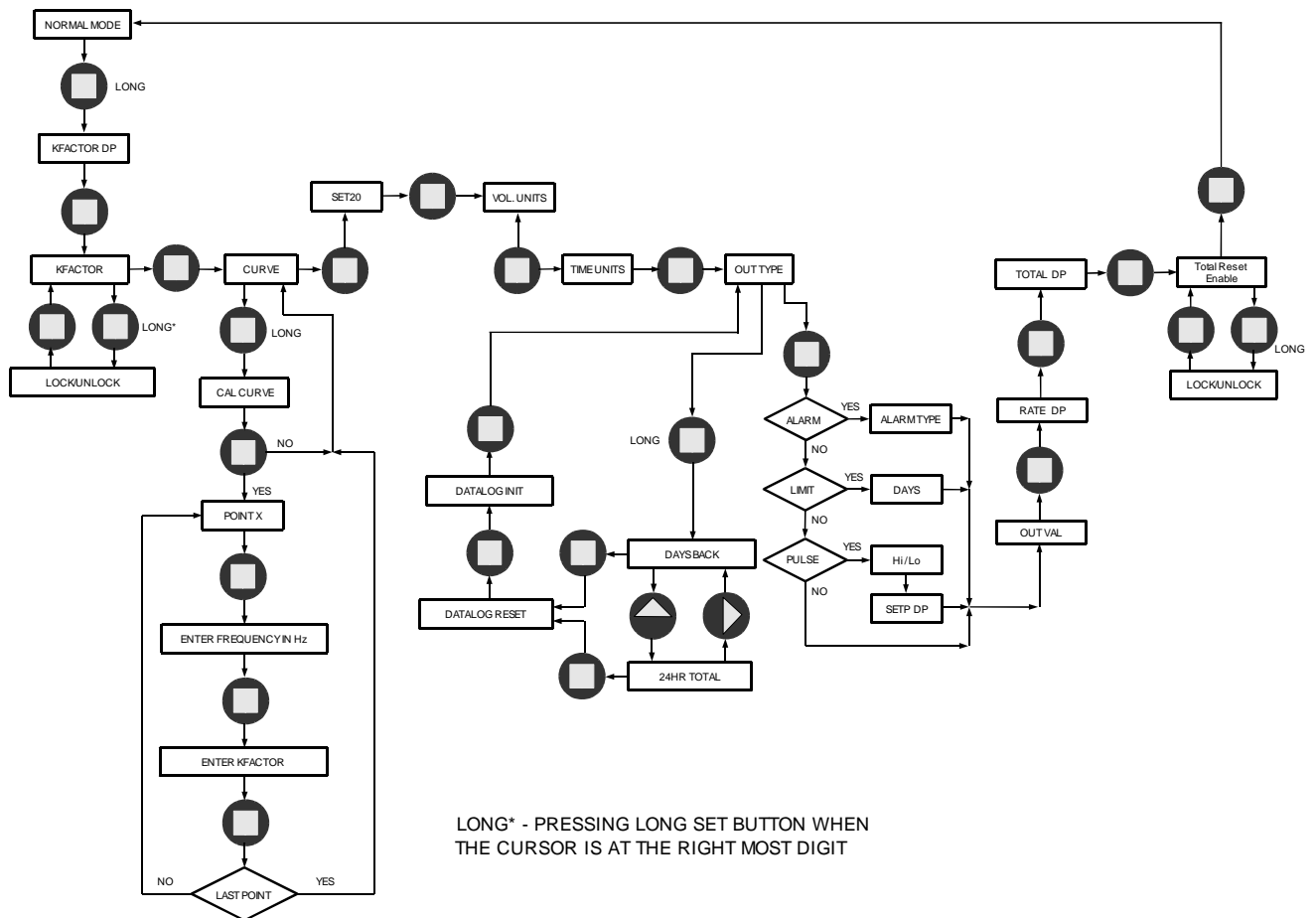
All the icons of the LCD can be checked by pressing and holding the **RIGHT** button during turning the power supply on or after exiting the last menu. Releasing the button will allow the computer to go to normal mode.

**3.6. Removing the power**

Total A is stored in the non-volatile memory every 50 second.  
Before removing the power make sure that there was no flow for the last minute.

**4. MENU DIAGRAM**

The menu diagram for GFC110 flow computer / totalizer is shown below.



## 5. APPLICATION

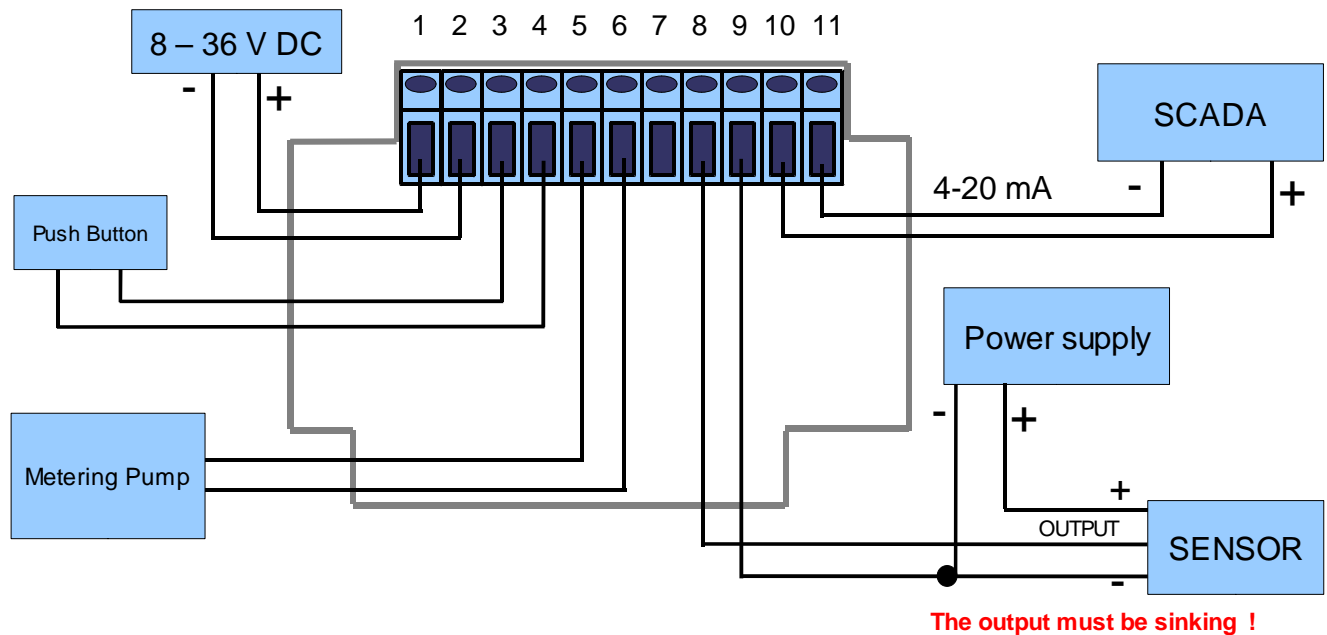
### 5.1. ELECTRICAL

The wiring diagram is shown below.

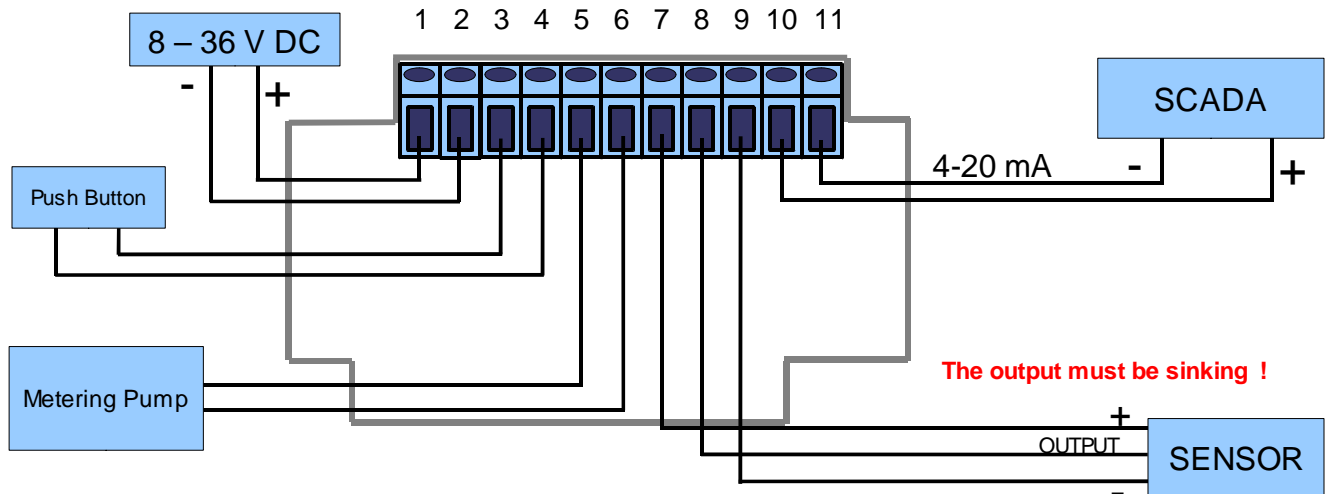
**NOTE: There is no isolation between the sensor input, the power supply and the push button input. Terminals 2, 4 and 9 are shorted inside the device. It is the user's responsibility to consider this fact and implement appropriate wiring in the particular user's application.**

- 1 – Power supply plus
- 2 – Power supply minus
- 3 – Push button plus
- 4 – Push button minus
- 5, 6 – Digital output, no polarity
- 7 – Sensor plus
- 8 – Sensor output. The sensor output must be sinking (open drain, open collector, reed switch etc.)
- 9 – Sensor minus
- 10 – Analog output plus
- 11 – Analog output minus

When the sensor has its own power supply:

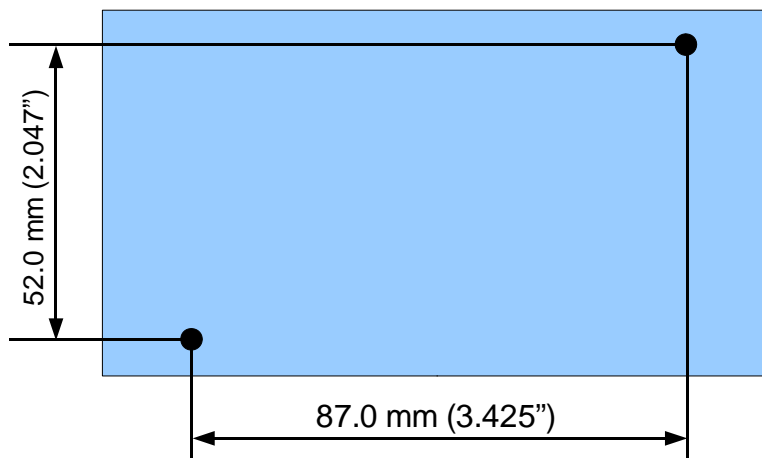


In case of powering a micro/low power sensor from GFC110 the suggested wiring would be:



## 5.2. MECHANICAL

Mounting GFC110 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>
GFC110 flow computer without power supply (external 8 – 36 V DC required)	30115
GFC110 flow computer with GPS115 (115 VAC power supply)	30066
GFC110 flow computer with GPS220 (220 VAC power supply)	30072
GFC110 flow computer with GPS122 (85-264 VAC power supply)	30228
GFC110P flow computer without power supply (external 8 – 36 V DC required)	30242
GFC110P flow computer with GPS115 (115 VAC power supply)	30243
GFC110P flow computer with GPS220 (220 VAC power supply)	30244
GFC110P flow computer with GPS122 (85-264 VAC power supply)	30245

**NOTE: The standard version GFC110 has a 390 ohm resistor in series with the power supply for the sensor (terminal 7). Depending on the consumption of the sensor the voltage will drop.**

GFC110P has no resistor and provides stable regulated voltage to power the sensor.



### **IMPORTANT NOTICE**

G Instruments reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products at any time without notice.

Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

G Instruments does not assume any liability arising from the use of any device or circuit described herein, nor does it convey any license under its patent rights or the rights of others.

Customers are responsible for their products and applications using G Instruments devices. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

G Instruments products are not authorized for use as critical components in life support devices or systems without express written approval of G Instruments.

Trademarks and registered trademarks are the property of their respective owners.