



FEATURES

- FLOW A: UNIVERSAL INPUT, 5 kHz, CAN POWER THE SENSOR. NO NEED OF AMPLIFIER FOR THE COIL
- FLOW B: NPN OPEN DRAIN/COLLECTOR, WAVES, LOGICAL SIGNALS, REED SWITCHES, DRY CONTACTS
- THREE 7 DIGIT FLOW RATES WITH PROGRAMMABLE DECIMAL PLACES
- THREE, UP TO 9 DIGITS TOTALS, WITH PROGRAMMABLE DECIMAL PLACES. BOTH TOTAL A AND B RESETTABLE
- TWO KFACTORS FROM 0.00001 TO 9,999,999
- SEPARATE RATE AND TOTAL VOLUME UNITS
- 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. PROGRAMMABLE FOR RATE A, B, A+B, OR A-B
- ISOLATED NO POLARITY 100V/100mA DC/AC OUTPUT THAT CAN BE PROGRAMMED TO BE:
 - RATE ALARM, HIGH OR LOW, FOR RATE A, B, A+B OR A-B
 - PULSE OUTPUT, HIGH OR LOW FREQUENCY, FOR TOTAL A, B, A+B OR A-B
- PROGRAMMABLE FILTER (DAMPING) FOR EACH INPUT
- PROGRAMMABLE FLOW RATE CUT-OFF FOR EACH INPUT
- 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

- DIESEL ENGINES FUEL MEASURING
- FLOW RATE AND TOTAL MEASUREMENT AND CONTROL
- METERING PUMPS PRECISE CONTROL FOR DOSING APPLICATIONS
- SCADA

1. DESCRIPTION

GFC111A-B is a two input flow computer / totalizer that can be used to measure diesel engines fuel and many others that require measuring the sum or the difference of the two flow rates and totals. Input A is universal, input B accepts a variety of flow sensors. Input A provides regulated and filtered 10 VDC power for the sensors.

GFC111A-B has an isolated no polarity 100V/100mA DC/AC output that can be programmed to work as a rate alarm or pulse output.

The alarm can be programmed to be high or low and to compare against rate A, rate B, A+B or A-B.

The pulse output can be programmed for low or high frequency and to represent total A, total B, A+B or A-B.

GFC111A-B also has one isolated analog 4-20 mA output that can be programmed to represent rate A, rate B, A+B or A-B.

A programmable filter (damping) for each input helps having a stable flow rate reading.

A programmable flow rate cut-off for each input can cut the reading when the liquid jitters.

GFC111A-B has a version in one inch wider enclosure – GFC111E-A-B.

GFC111A-B is the perfect solution for low cost diesel fuel flow measurement and control applications that require high accuracy and reliability, high isolation, multi-functionality, small size, industrial grade performance and low maintenance.



2. ABSOLUTE MAXIMUM RATINGS *

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

*** 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 A					
Voltage for the sensors	-20 °C to +70 °C, max 20 mA, Note 1		10		V DC
Threshold, low	Wave or logical signal (CMOS, TTL etc.)		1.2		V DC
Threshold, high	Wave or logical signal (CMOS, TTL etc.)		1.6		V DC
Coil voltage	Symmetrical signal from the coil (sine, triangle, saw etc)	20			mVpp
NAMUR, low threshold	-20 °C to +70 °C, Powered by GFC111A-B, Note 2		1		mA DC
NAMUR, high threshold	-20 °C to +70 °C, Powered by GFC111A-B, Note 2		2.1		mA DC
Reed switch current	-20 °C to +70 °C, Powered by GFC111A-B, Note 2			3.5	mA DC
Frequency	Note 7		5 000		Hz
Input B					
Threshold, low	Wave or logical signal (CMOS, TTL etc.)		1		V DC
Threshold, high	Wave or logical signal (CMOS, TTL etc.)		4		V DC
Analog Output					
Power supply	-20 °C to +70 °C, Note 3	7.2		36	V DC
Resolution	-20 °C to +70 °C, 7.2 – 36 V		4		uA
Error	250 ohm load, 24 V, 25 °C, Note 4			0.05	% FS
Power supply error	7.2 - 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
Digital Output					
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	Max 8 Hz, Note 5			480	p/min
'Low', pulse duration	Note 5		62.5		ms
'Low', pause duration	Note 5	62.5			ms
'High', pulse rate	Max 1100 Hz, Note 6			66000	p/min

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 GFC111A-B.

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

Note 3: The minimum voltage for the 4-20 mA output to operate is $V = 7.2 + R \text{ load [ohm]} * 0.020$ [V DC]



For a GFC111A-B with a load of 250 ohm, the minimum voltage would be 12.2 V DC.

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

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.

Note 7: The values are for reference only. The maximum frequency strongly depends on the duty cycle of the signal and the type of the sensor.

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
- Additional button functions:

There are two types of buttons accepted by the GFC111A-B 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

GFC111A-B has two inputs:

- Pulse input A 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 10 V DC (max 20 mA) power for the sensors. There is no need to use external amplifiers for the coils if they provide more than 20 mVpp signal.
- Pulse input B from a flow sensor such as wave, logical signal, npn open drain/collector, reed switches and dry contacts. The computer / totalizer has all pull-up/down, current limiting and signal conditioning circuits built-in.

3.3. OUTPUTS

GFC111A-B 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. It can be programmed to represent rate A, rate B, A+B or A-B. In the **SET20** menu can be programmed the flow rate (in **rate volume units per time units**) at which the output will be 20 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. The alarm can be programmed to compare against rate



A, rate B, A+B or A-B.

Example: If the alarm is programmed at 100.00 G/M and to be **high** the output will turn on when the flow rate exceeds 101.00 G/M and will turn off when it drops below 99.00 G/M.

With **low** alarm the action will be reversed.

- Pulse output. It can be programmed for low or high frequency and can also be programmed to represent total A, total B A+B or A-B. It is intended to be used 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 (8Hz) for use with metering/dosing pumps.
- When the pulse output has been programmed for **high** rate it can provide up to 66,000 pulses per minute (1100 Hz) with equal duration of the pulse and the pause.

3.4. DISPLAY

The liquid crystal display (LCD) has 7 digits with 5 decimal places and many icons. It shows rate, total and all the variables and options that can be set or programmed. The rate and the totals have programmable auto, none, 1, 2, 3, 4 or 5 decimal places.

When the display shows rate, a “**RATE**” icon is displayed. Rate A, B or C can be displayed.

If it shows total a “**TOTAL**” icon will be displayed. Total A, B or C can be displayed.

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

When the digital output is ON an icon for cause will be displayed (**alarm** or **pulse**)

If total A or B is on the LCD and it 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 (**M³**) and acre feet (**AF**) per second (**S**), minute (**M**), hour (**H**) and day (**D**) are available. GFC111A-B has separate volume units for rate and total.

3.4.2. Normal mode

Automatically after turning the power on or exiting a menu, GFC111A-B enters the normal mode.

Normal mode displays:

- Rate A, B or C. Rate C can be programmed to be A+B or A-B.
- Total A, B or C. Total C can be programmed to be A+B or A-B.

NOTE: Total C will never go negative.

Total A and total B reset can be enabled or disabled. Both are stored in a non-volatile memory every 50 seconds or immediately when cleared.

If a total is allowed to be reset and it is on the display, the **RESET** icon is shown. Reset it with long **RIGHT** button.

- To switch between rate A, rate B, rate C, total A, total B and total C, use short **UP** button.



3.4.3. Menus

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

- In the “total volume units” (**TOTAL vU**) menu, use **UP** to choose among **mL**, **L**, **G**, **CF**, **M³** and **AF**. Press short **SET** to move to next menu. While in this menu all the settings can be locked/unlocked. Use long **SET** then **UP** to lock/unlock the settings. Use short **SET** to go back to total volume units menu. If the settings are locked, they can be viewed, but not changed. Press short **SET** for next menu.
- In the “rate volume units” (**RATE vU**) menu, use **UP** to choose among **mL**, **L**, **G**, **CF**, **M³** and **AF**. Press short **SET** to move to the “time unit menu.”
- In the “time unit” (**tU**) menu, use **UP** to choose the time units among **S**, **M**, **H** and **D**. Press short **SET** to move to the next menu.
- **KFACTOR** and **A** icons along with a blinking decimal point and KFACTOR A are shown. The decimal places for it can be programmed using **UP** button. KFACTORs ranging from 0.00001 to 9,999,999 can be entered this way. To move away from the blinking decimal point and start entering the KFACTOR digits use the **RIGHT** button. The KFACTOR for the particular flow meter connected to input A should be entered. This is how many **pulses** input A will receive **per total volume unit**. Use short **SET** to enter the next menu.

NOTE: the computer will not accept zero for KFACTOR A.

- **KFACTOR** and **B** icons along with a blinking decimal point and KFACTOR B are shown. The KFACTOR for the particular flow meter connected to input B should be entered. This is how many **pulses** input B will receive **per total volume unit**. Use short **SET** to enter the next menu.

NOTE: the computer will not accept zero for KFACTOR B.

- In the **flow rate C configuration** menu, rate C can be programmed to be A+B (APB) or A-B. Use short **SET** to enter the next menu.
- In the **total C configuration** menu, total C can be programmed to be A+B (APB) or A-B. Use short **SET** to enter the next menu.
- In the **digital output configuration** menu it can be programmed to represent A, B or C.
 - If the digital output is programmed to be alarm, then it will be rate A, rate B or rate C, with rate C configured above to equal A+B or A-B.
 - If the digital output is programmed to be a pulse output, then it will be total A, total B or total C, with total C configured above to equal A+B or A-B
 Use short **SET** to enter the next menu.
- In the **analog output configuration** menu it can be programmed to represent rate A, rate B or rate C, with rate C configured above to equal A+B or A-B. Use short **SET** to enter the next menu.
- In the **SET20** menu, set the flow rate (in **rate volume units per time unit**) at which you want the analog output to be 20.00 mA. Analog output will be 4.00 mA at 0.0 flow rate. If **SET20** = 0.0 the analog output will stay about 3.85 mA and will not change with the rate. Use short **SET** to enter the next menu.
- In the **Filter A** menu adjust the filtering (damping) allowing you to read a stable flow rate A. Zero means an automatic filtering. One through seven are manual and the damping increases with the number. So



does the response time. Use short **SET** to enter the next menu.

- In the **Filter B** menu adjust the filtering (damping) allowing you to read a stable flow rate B. Use short **SET** to enter the next menu.
- In this menu enter the **flow rate cut-off** for input **A** in **rate volume units per time unit**. Use short **SET** to enter the next menu.
- In this menu enter the **flow rate cut-off** for input **B** in **rate volume units per time unit**. Use short **SET** to enter the next menu.
- In the **output type** menu, use **UP** to program the digital output to be **alarm** or **pulse**. Press short **SET** to move to the next 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 **pulse** 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 (8Hz). Use **high** pulse output to connect to a PLC, SCADA or other device that can accept up to 66 000 pulses per minute (1100 Hz). Use short **SET** to move to **SETP** menu.

- In the **output value** menu:
 - The value of the **alarm** must be in **rate volume units per time unit**
 - The value for **SETP** must be in **total volume units 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, 3, 4 or 5 decimal places for the rate can be programmed.
- Press short **SET** to move to the “Total **decimal Places**” menu where (using short **UP**) auto, none, 1, 2, 3, 4 or 5 decimal places for all totals can be programmed.
If **AUTO** has been chosen GFC111A-B will use the icons “**x10**” and “**x100**”. When the total reaches 9 999 999 it will not clear but the icon **x10** will be used. When it reaches again 9 999 999, it will not clear but the icon **x100** will be used. This way the total extends to 9 digits and will clear after it reaches 999 999 999 (one billion).
- 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 GFC111A-B is in normal mode displaying total A, the **RESET** icon will also be displayed and long **RIGHT** will clear total A.
- Press short **SET** to move to the **Total B Reset enable/disable** menu. In this menu using **UP** button the total B reset can be enabled or disabled. If enabled and GFC111A-B is in normal mode displaying total B, the **RESET** icon will also be displayed and long **RIGHT** will clear total B.

Because this is the last menu, pressing 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 B Reset enable** menu. General practice would be to unlock the settings at the first menu. Settings can be changed and locked again before exiting at the last menu. Press short **SET** to exit. After a couple of seconds during which all the settings are checked, validated and stored into the non-volatile memory, the computer will return to the normal mode.



NOTE: The software time out feature 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 B Reset enable menu by pressing short SET.

3.5. Checking the LCD

All the icons of the LCD can be checked by pressing and holding the **RIGHT** button while powering on or after exiting the last menu. Releasing the button will return the computer to normal mode.

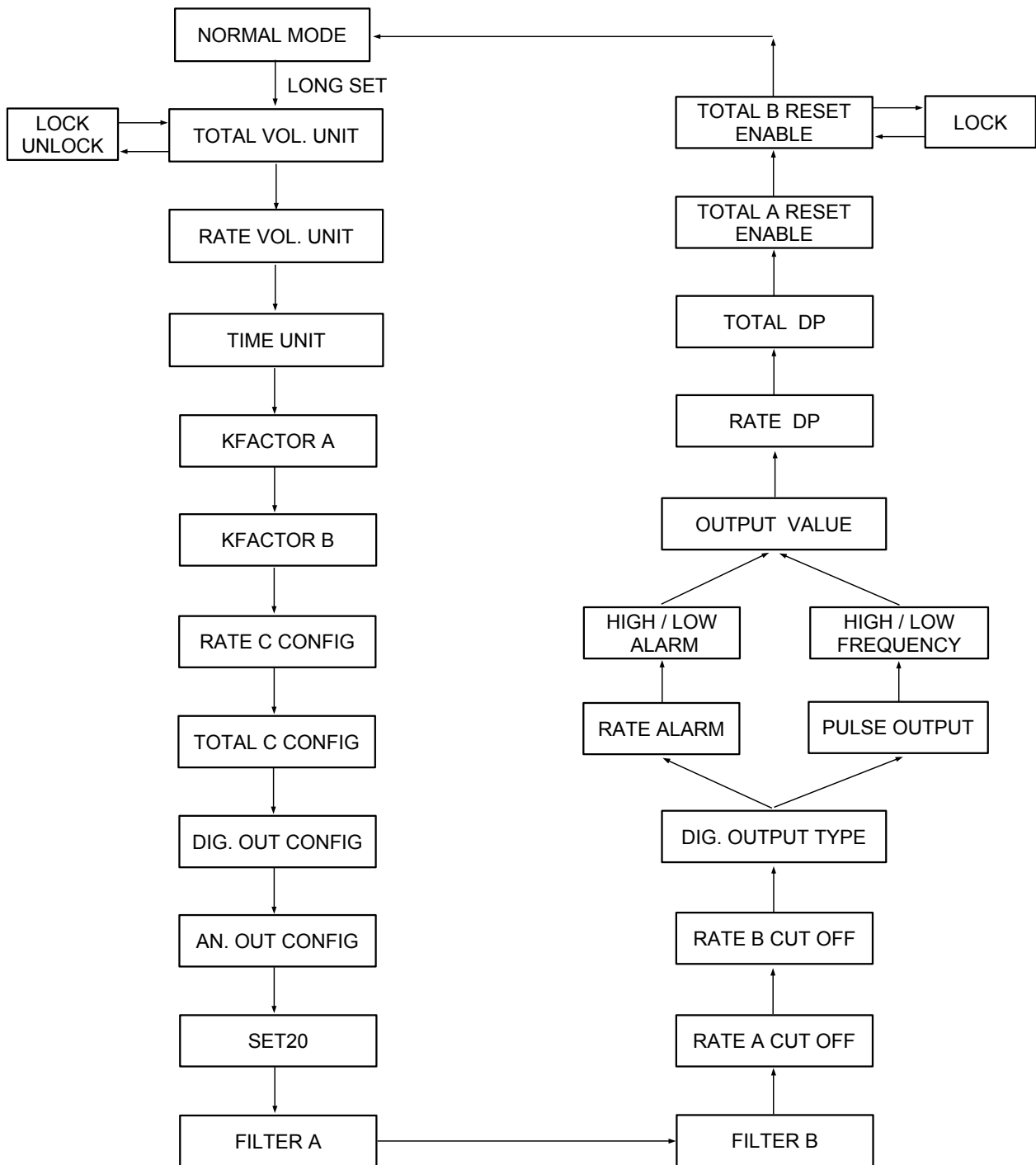
3.6. Removing the power

Total A and total B are stored in the non-volatile memory every 50 seconds.

Before removing the power make sure that there was no flow for the last minute.



4. MENU DIAGRAM



5. APPLICATION

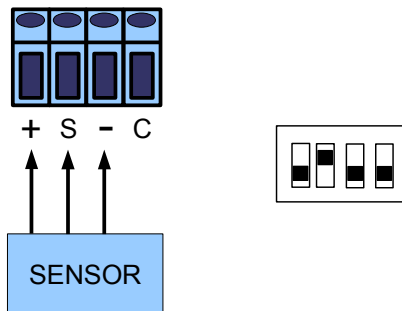
5.1. ELECTRICAL

NOTE: There is no isolation between the sensor inputs, the power supply and the push button input. The analog output and the digital output are isolated.

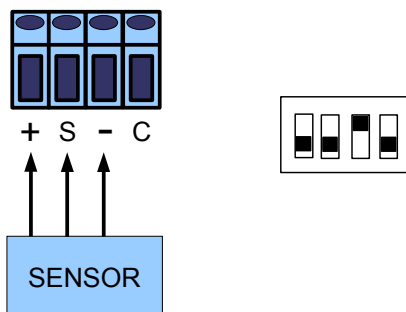
5.1.1. Wiring sensor A

Flow input A of GFC111A-B accepts a variety of sensors. See below for wiring specifications and their particular wiring is shown below:

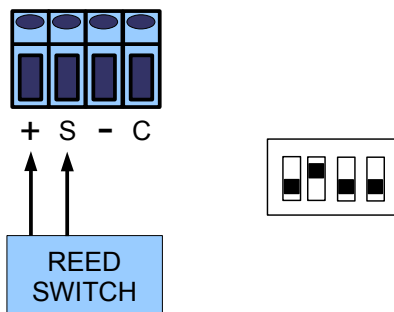
5.1.1.1. NPN Open Drain, Open Collector



5.1.1.2. PNP Open Drain, Open Collector

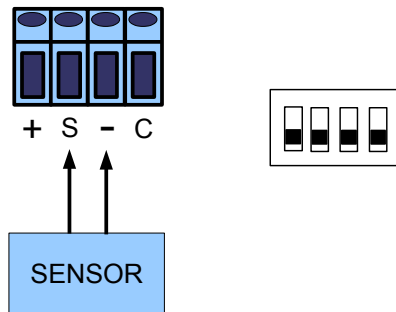


5.1.1.3. Reed Switch, Dry Contact

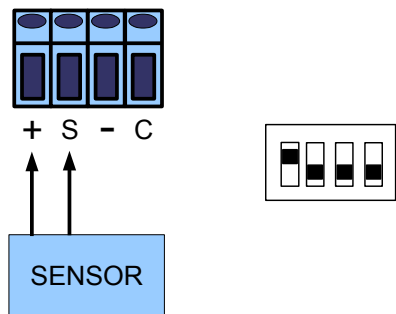


NOTE: Different reed switches and dry contacts have different bouncing time. Test and evaluate carefully to determine the right DIP switch setting.

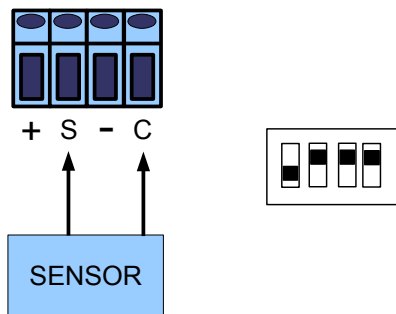
5.1.1.4. Wave (square, sine, triangle, saw etc.), Logical Signal (CMOS, TTL etc.)



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 all other equipment or electrical connections.

5.1.2. Wiring sensor B

Connect the npn open drain / collector (“+”) to terminal “+” of flow input B. Connect the common (“-”) of the flow meter output to terminal “-” of flow input B.

Reed switches and dry contacts have no polarity, so you just connect both wires to both terminals of flow input B.

5.2. VERSIONS



WALL MOUNT GFC111A-B



WALL MOUNT GFC111E-A-B

6. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>Our PN</i>
GFC111A-B flow computer, no power supply (external isolated 12 – 36 V DC needed)	30110
GFC111A-B flow computer with GPS115 (115 VAC power supply)	30166
GFC111A-B flow computer with GPS220 (220 VAC power supply)	30340
GFC111A-B flow computer with GPS122 (85-264 VAC power supply)	30341
GFC111E-A-B flow computer, no power supply (external isolated 12 – 36 V DC needed)	30342
GFC111E-A-B flow computer, no power supply, no cable glands	30346
GFC111E-A-B flow computer with GPS115E (115 VAC power supply)	30343
GFC111E-A-B flow computer with GPS220E (220 VAC power supply)	30344
GFC111E-A-B flow computer with GPS122E (85-264 VAC power supply)	30345



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