



FEATURES

- STABLE READING WITH PULSES DOWN TO ONE PULSE EVERY 5 MINUTES
- PULSE FLOW INPUT UP TO 100 Hz, CAN POWER THE SENSOR
- WORKS WITH OPTO-COUPLER FLOW METERS
- SEVEN DIGIT RATE WITH PROGRAMMABLE DECIMAL PLACES
- THREE UP TO NINE DIGIT TOTALS WITH PROGRAMMABLE DECIMAL PLACES. ONE NON-RESETTABLE, TWO RESETTABLE
- KFACTORS FROM 0.00001 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 FOR RATE
- ISOLATED NO POLARITY 100V/100mA DC/AC OUTPUT THAT CAN BE PROGRAMMED TO BE:
 - RATE ALARM, HIGH OR LOW
 - PULSE OUTPUT, UP TO 480 PULSES PER MINUTE (METERING PUMPS)
 - PULSE OUTPUT, UP TO 1000 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
- METERING PUMPS PRECISE CONTROL FOR DOSING APPLICATIONS
- SCADA
- IRRIGATION

1. DESCRIPTION

NFC110 is a low power flow computer / totalizer with a flow pulse input up to 100 Hz and a variety of outputs. It provides power for the flow sensor (through a 330 ohm resistor in series) and accepts optocouplers, reed switches, open drains/collectors npn, dry contacts, waves and logical signals to measure flow rate and total. NFC110 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, or pulse output.

NFC110 also has an isolated 12 bit analog 4-20 mA passive output that can be connected to SCADA, PLC or another control device.

NFC110 stores up to 64 totals for each 24 hours that can be easily viewed on the liquid crystal display.

The device has a version in one inch wider enclosure – NFC110E and another version in DIN 72x72 panel mount enclosure - NFCP110.

It also has the same versions above for 25 VAC power – NFC110-AC, NFC110E-AC and NFCP110-AC. All three can also work with DC power.

The NFC110 software implements a special design for register and optocoupler flow meters which produce very low frequency pulses. Special proprietary algorithms allow NFC110 to accept low frequency pulses like one pulse every 5 minutes and still have a stable reading and stable analog output. In the same time the flow reading can be cleared in half second by external “no flow” switch.

NFC110 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 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
Digital output current	100 mA DC/AC
Digital output voltage	100 V DC, 70V AC

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

3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
Power supply voltage	NFC110 , -20 °C to +70 °C	8		36	V DC
Power supply voltage	NFC110-AC , -20 °C to +70 °C		25		V AC
Input					
Input frequency				100	Hz
Voltage for the sensor	Note 1		5		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
Analog Output					
Power Supply	-20 °C to +70 °C, Note 2	7.5		36	V DC
Resolution	-20 °C to +70 °C, 7.5 – 36 V DC		4		uA
Error	250 ohm load, 24 V, 25 °C, Note 3			0.05	% FS
Power supply error	7.5 - 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
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	Note 4			480	p/min
'Low', pulse duration	Note 4		62.5		ms
'Low', pause duration	Note 4	62.5			ms
'High', pulse rate	Max 1000 Hz, Note 5			60000	p/min

Note 1: There is a 330 ohm resistor in series inside the computer / totalizer for short / over-current protection and to limit the current through the optocoupler LED. NFC110P has no resistor.

Note 2: The minimum voltage for the 4-20 mA output to operate is $V = 7.5 + R \text{ load [ohm]} * 0.020$ [V DC]
For NFC110 with a load of 250 ohm connected the minimum voltage would be 12.5 V DC.

Note 3: The parameter includes all errors except temperature error

Note 4: Pulse output has been programmed to be 'low' – low pulse rate for metering pumps applications. Pulse and pause widths are fixed.

Note 5: 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 NFC110 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

NFC110 has two inputs:

- Pulse input from a flow sensor such as optocoupler, reed switch, wave, logical signals, open drain/collector, npn, 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. The standard version NFC110 has a 330 ohm resistor in series with the power supply for the sensor. Depending on the consumption of the sensor the voltage will drop.

NFC110P has no resistor and provides stable regulated voltage to power the sensor.

- “NO FLOW” switch input. This input is used to immediately clear the rate reading and the analog output. It can, for an instance, be connected to a pressure switch in the pipe or to a pump's pressure switch which closes when the pump stops and its pressure drops.

3.3. OUTPUTS

NFC110 has two isolated outputs:

3.3.1. Analog output

The isolated analog output is 4-20 mA loop power, 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 GPM) 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.

- 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 60 000 pulses per minute (1000 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, 3, 4 or 5 decimal places and many icons. It shows rate, total and all the variables and options that can be set or programmed.

NFC110 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.

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**” (NFC110 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** 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

- NFC110 flow computer 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**). It has separate volume units for rate and total, so for an instance the rate can be in GPM, but the total in AF.

3.4.2. Normal mode

Automatically after turning the power on or exiting a menu NFC110 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.

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:

- In the “**Total volume units**” (**vU**) menu, use **UP** to choose the volume units for the total among **mL**, **L**, **G**, **CF**, **M3** and **AF**. While in this menu all the settings can be locked/unlocked. Use long **SET** to go to lock/unlock menu.
 - Then use short **UP** to lock/unlock the settings. Then 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** to move to the “**rate volume unit menu**.”
- In the “**Rate volume units**” (**vU**) menu, use **UP** to choose the volume units for the flow rate among **mL**, **L**, **G**, **CF**, **M³** and **AF**. Press short **SET** to move to the “**time unit**” menu.
- Use **UP** to choose among **S**, **M**, **H** and **D**. Press short **SET** to move to the next menu.
- **KFACTOR** icon along with a blinking decimal point and the KFACTOR number is shown. The decimal places for the KFACTOR can be programmed using **UP** button. KFACTORs ranging from 0.001 to 9,999,999 can be entered this way. To move from the blinking decimal point away and start entering the KFACTOR digits use the **RIGHT** button. The main **KFACTOR** for the particular flow meter connected to the NFC101 can be entered. This is how many **pulses** the flow computer will receive **per total volume unit**.

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

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 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.
- Press short **SET** to move to the “**delay**” menu and program the delay that will keep the display showing stable flow rate at the very low frequency of the input pulses. Generally the delay should be higher than the highest interval between two input pulses, expected.
- 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 NFC110 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 next menu.
- In the **SET20** menu, set the flow rate at which you want the analog output to be 20.00 mA. Analog output will be 4.00 mA at no flow. 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 “**OUT Type**” menu.
- In the output type menu, use **UP** to choose the type of the output between **alarm** or **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 **pulse** has just been chosen, the next menu will be the “**pulse type**” menu where using **UP** button **high** or **low** pulse can be chosen. Press short **SET** to move to the **SETP** menu.

- The value of the **alarm** must be in **rate volume units per time unit**
- The value for **SETP** must be in **total volume unit per pulse**

Because the **output value** 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 the **output value** menu. General practice would be the settings to be unlocked at the first menu, then changed and locked again before exiting at this 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 output value 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 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. The totals for up to 64 previous days are available.

The 24 hour total begins in two ways: upon power up or after a **DATALOG INIT**.

Example: Powering up the device at 11 a.m. will start the 24 hour clock, which will cycle at 11 a.m. the next day, etc. The **DTALOG INIT** menu can change the clock setting.

- Press short **SET** to move the computer to the **DATALOG RESET** menu. Choose **YES** or **NO** using **UP** button. Choosing **YES** will reset the data log to zero for all the 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** was pressed. After the short **SET**, the computer will return to the **OUTput TYPE** menu.

3.5. Checking the LCD

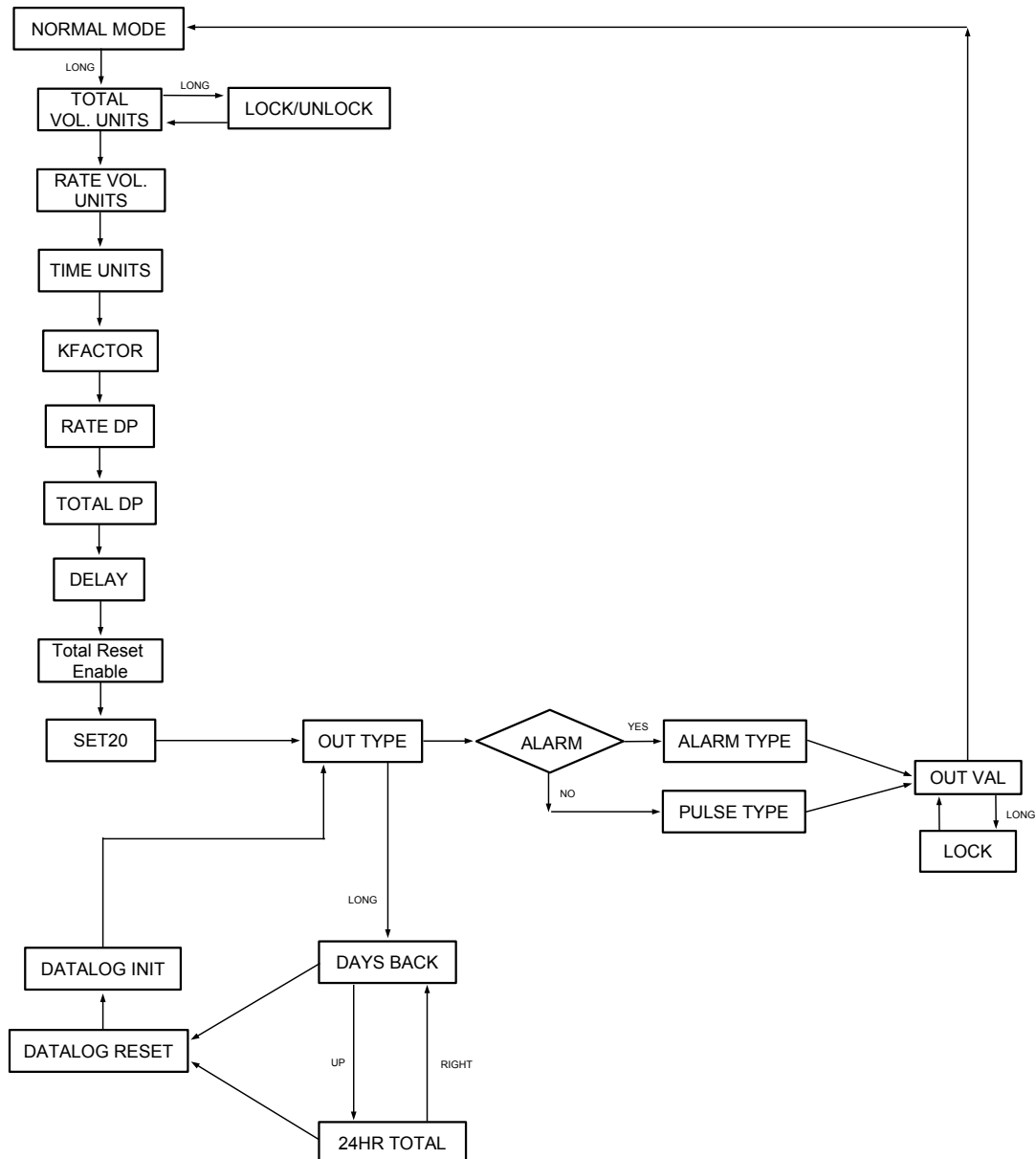
All the icons of the LCD can be checked by pressing and holding the **RIGHT** button during turning the power up or after exiting the last menu. Releasing the button will allow the computer to continue to normal mode.

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 NFC110 flow computer / totalizer is shown below.



5. APPLICATION

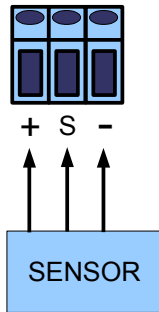
5.1. ELECTRICAL

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

5.1.1. Wiring the flow sensor

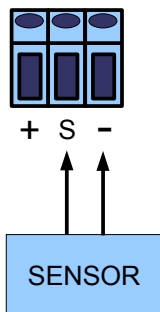
NFC110 accepts a variety of sensors. See below for wiring specifications.

5.1.1.1. NPN Open Drain, Open Collector



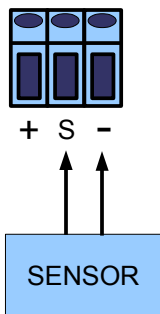
The "+" terminal has a current limiting resistor in series. Optocoupler flow meters connect directly as of the diagram on the left.

5.1.1.2. Reed Switch, Dry Contact



NOTE: A small capacitor in parallel may be needed. Different reed switches and dry contacts have different bouncing time. Test and evaluate carefully to determine the right capacitor.

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



5.2. VERSIONS



b.
WALL MOUNT NFC110,
NFC110-AC



WALL MOUNT NFC110E,
NFC110E-AC



PANEL MOUNT
NF110,
NF110-AC

6. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>G Instruments PN</i>
NFC110 flow computer without power supply (external 8 – 36 V DC required)	30380
NFC110 flow computer with GPS115 (115 VAC power supply)	30381
NFC110 flow computer with GPS220 (220 VAC power supply)	30382
NFC110 flow computer with GPS122 (85 - 264 VAC, 5W power supply)	30383
NFC110-AC flow computer for 25 VAC power	30387
NFC110E flow computer without power supply (external 8 – 36 V DC required)	30384
NFC110E flow computer with GPS115E (115 VAC power supply)	30385
NFC110E flow computer with GPS220E (220 VAC power supply)	30386
NFC110E flow computer with GPS122E (85 - 264 VAC, 5W power supply)	30389
NFC110E-AC flow computer for 25 VAC power	30399
NF110 flow computer without power supply (external 8 – 36 V DC required)	30527
NF110-AC flow computer for 25 VAC power	30388

NOTE: The standard version NFC110 has a 390 ohm resistor in series with the power supply for the sensor. Depending on the consumption of the sensor the voltage will drop. It is designed to power the LED of an optocoupler flow meter.



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.