GFC300 Dual Channel Flow Computer

FEATURES

- **A SINGLE, TWO INDEPENDENT OR A DUAL FLOW COMPUTER**
- **FOR VOLUME, COMPENSATED VOLUME AND MASS OF LIQUIDS AND GASES**
- **VOLUME AND MASS OF STEAM, SATURATED OR SUPERHEATED. ENTHALPY, HEAT RATE, NET HEAT, DELTA HEAT AND HEAT TOTAL**
- **PER CHANNEL:**
  - **FLOW INPUT – UNIVERSAL PULSE WITH 24VDC / 20 mA POWER FOR THE SENSOR, OR 4-20 mA LOOP POWER, 0.01% FS**
  - **30 POINTS LINEARIZATION FOR THE PULSE INPUT**
  - **TEMPERATURE (DENSITY), INPUT LOOP POWER 4-20 mA, 0.01% FS**
  - **PRESSURE (SECOND TEMPERATURE) INPUT, LOOP POWER 4-20 mA, 0.01% FS**
  - **ISOLATED ANALOG OUTPUT 0.05% FS, 4-20 mA, 0-5V OR 0-10V FOR RATE, RATE A+B, PRESSURE, TEMPERATURE AND OTHERS**
  - **ISOLATED PULSE OUTPUT UP TO 10 kHz OPEN DRAIN OR 5V SQUARE WAVE, FOR TOTAL, TOTAL A–B OR TOTAL A+B, AND OTHERS**
  - **250VAC / 5 A ALARM RELAY WITH PROGRAMMABLE HYSTERESIS FOR RATE, RATE A+B, PRESSURE, TEMPERATURE OR BATCH**
  - **BATCH START / RESUME / STOP INPUT**
  - **SEVEN DIGIT RATE, EIGHT DIGIT TOTAL**
  - **SEPARATE UNITS FOR RATE AND TOTAL**
  - **MANY PRESET LIQUIDS AND GASES**
  - **PROGRAMMABLE DECIMAL PLACES**
- **85-250 VAC, OR 12VDC OR 24 VDC, ALL WITH HIGH ISOLATION, SURGE, REVERSE POLARITY, UNDER-VOLTAGE, OVER-CURRENT AND SHORT CIRCUIT PROTECTION**
- **BRIGHT TRANSMISSIVE COLOR GRAPHIC DISPLAY WITH A WHITE BACKLIGHT**
- **FULLY COMPLIANT, PROGRAMMABLE RS485, 1/8 LOAD, MODBUS RTU FOR BAUD RATES UP TO 115 200**
- **SCROLL DROP LIST MENUS, SIMPLE TO USE**
- **MULTILEVEL MENUS, THE FIRST CAN BE LOCKED**
- **DIN 72 X144 mm PANEL MOUNT ENCLOSURE**
- **ALL SOFTWARE OPTIONS CAN BE ENABLED ON THE FIELD WITH PASSWORDS**
- **VERY EASY TO PROGRAM AND USE**

APPLICATIONS

- **FLOW RATE AND TOTAL MEASUREMENT AND CONTROL OF LIQUIDS, GASES AND / OR STEAM**
- **FUEL USAGE MEASUREMENT**
- **COMBINED FLOW DELIVERY MEASUREMENT**
- **BATCH APPLICATIONS**
- **METERING PUMPS PRECISE CONTROL FOR DOSING APPLICATIONS**

1. DESCRIPTION

GFC300 is a flow computer that can be ordered as a single channel, dual channel or just with a dual hardware and be field upgraded later with passwords to the full dual functionality. Both channels can work independently measuring different fluids or they can be related and measure rate A+B, total A-B or total A+B and control the outputs with them.

Each channel can measure volume, compensated volume or mass of liquids, gases or steam independently. Each channel has one universal flow, one temperature and one pressure input.

The flow signal can be pulse open drain / collector, npn, pnp, reed switch, waves, dry contact, logical signals and coils without an external preamplifier. The flow signal can also be analog linear to the flow rate or a differential pressure signal that needs a square root extraction.

The temperature and pressure can be set manually if no sensors are being used.

The density of liquids and gases can be set manually, calculated or taken from a density meter connected to the temperature analog input.

The steam density is very accurately calculated in a very large temperature and pressure range. Enthalpy, heat rate, net heat, delta heat and heat total are calculated and displayed.

Separate volume or mass units can be chosen for rate and total, each channel.

Using the fast RS485 MODBUS communication rate and total for each channel as well as rate A+B, total A-B, total A+B and many other parameters can be read remotely many times a second.

Many liquids, gases and temperature sensors are preset which simplifies the programming.

A variety of isolated high accuracy programmable outputs can connect GFC300 to any device.

Drop list color menus that you scroll are very intuitive and easy to use.

Icons for disconnected analog input, alarm, pulse output or communication are displayed along with a horizontal bar representing the analog output. Flow signal (frequency, current or delta P), temperature, pressure, density and Z factor are also displayed.

There is a special test menu where very easily all inputs and outputs can be checked and precisely tested.

2. ABSOLUTE MAXIMUM RATINGS *

Operating temperature	-20 °C to +70 °C
Power:	
AC version	264 VAC, 47-400 Hz
12 VDC version	18 VDC
24 VDC version	36 VDC
Alarm relay current	5 A / 250 VAC , 5A / 30 VDC
Pulse output current, open drain	100 mA DC
Pulse output voltage, open drain	100 V
Voltage for the an. output, 4-20 mA loop power	42 VDC
Current for the pulse input sensor	20 mA DC

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

3. CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Power Supply	**High isolation, surge, over-voltage/current protected**				
AC voltage option	47 – 400 Hz	85		250	VAC
Isolated 12 VDC option	Reverse polarity protected	9	12	18	VDC
Isolated 24 VDC option	Reverse polarity protected	18	24	36	VDC
Power Consumption	**Efficiency over 77%**				
85-250 VAC version	115 VAC, 60 Hz, dual hardware, all 6 inputs at 20 mA			5	VA
Pulse Input					
Voltage for the sensor	Regulated, filtered and protected, max 20 mA		24		V DC
Input threshold, high	Rectangular wave 3.3 V, 50 % duty cycle		1.86		V
Input threshold, low	Rectangular wave 3.3 V, 50 % duty cycle		1.44		V
Coil voltage	Symmetrical signal from the coil (sine, triangle, saw etc)	20			mVpp
Input frequency range	Rectangular wave 3.3 V, 50 % duty cycle	0 - 10			kHz
Analog inputs					
Voltage for the loop	Regulated, filtered and protected		24		VDC
Input resistance	25 °C		157		ohm
Full scale error	25 °C, 4 – 20 mA		0.01	0.03	% FS
Temperature coefficient	-20 °C to +70 °C			25	ppm/°C
Output 4-20 mA option	**High isolation, loop power, 2 wire**				
Power supply	-20 °C to +70 °C, Note 1	7		36	V DC
Resolution	-20 °C to +70 °C, 9.5 – 36 V		1		uA
Error	250 ohm load, 24 V, 25 °C, Note 2			0.05	% FS
Power supply error	9.5 - 36V, 4.000 mA, 25 °C			0.02	uA/V
Temperature coefficient	-20 °C to +70 °C, 24 V		35		ppm/°C
Output 0–5/10 V option	**High isolation, no external power required, 2 wire**				
Resolution			0.3/0.6		mV
Error	100 kohm load, 24 V, 25 °C, Note 2			0.05	% FS
Temperature coefficient	-20 °C to +70 °C, 24 V		35		ppm/°C
Pulse Output, open drain	**High isolation, reverse polarity to 100 mA protected, 2 wire**				
Output ON resistance	-20 °C to +70 °C, 100 mA			1.5	ohm
Output OFF leakage	-20 °C to +70 °C, 100 V DC			1	uA
Maximum frequency	The durations of the pulse and the pause are equal	10	11.1		kHz

Pulse Output, wave	**High isolation, 5 V square wave, 2 wire**				
Protection resistor	Built-in resistor in series, to protect the output		510		ohm
Relay contact	**Normal open**				
Current	30 VDC or 250 VAC, resistive load			5	A
RS485	**2 wire**				
Load	1/8 of the standard RS485 driver load		1/8		
Enclosure	**Panel mount, DIN 72x144 mm, Self-extinguishing PPO, black**				

Note 1: The minimum voltage for the 4-20 mA output to operate is V = 7.0 + R load [ohm] * 0.020 [V DC]
For a GFC300 with a load of 250 ohm, the minimum voltage would be 12.0 V DC.
Note 2: The parameter includes all errors, non-linearity and noise at constant voltage and temperature

3.1. BUTTONS

There are four buttons: **SET** , **UP**, **LEFT** and **DOWN** arrows**.**

- **SET** is used to enter and exit menus and confirm options chosen
- **UP** is used to scroll up or increment
- **DOWN** is used to scroll down or decrement
- **LEFT** is used to move the cursor (blinking digit or icon) to the left or return to a previous menu

There are two types of buttons accepted by the GFC300 flow computer:

- 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 and DOWN buttons will not change the digit at the cursor if the settings are locked.

3.2. INPUTS AND CHANNELS

GFC300 can be ordered with a single channel hardware or a dual channel hardware. Ordering with a dual hardware will allow for a lower price at the time of order but make possible the field upgrade later.

Example: You need a single flow computer now but you think you may need another one or dual functionality later. You order a lower cost GFC300 with a dual hardware and single functionality. Later you need a second flow computer and/or dual functionality. Just by calling or e-mailing G Instruments you receive special passwords. You enter these passwords in a special menu and the second flow computer and / or the dual functionality is enabled in a couple of minutes without any interruption of your application.

Both channels can have the same or different hardware: for an instance channel A can have a 4-20 mA analog output while channel B can have a 0-5 V or 0-10V output, or other combinations.

All outputs are isolated each other, from the inputs and from the power. The inputs are not isolated each other.

Each channel has one universal flow input that can be switched to accepts pulses or 4-20 mA loop power signal linear to the flow rate (in flow rate units) or coming from a differential pressure sensor (in delta P units) needing a square root extraction to get the flow rate.

The flow signal must be proportional to the volume (in volume units).

- Pulse input from flow sensors in volume units. This input can power the sensor with 24 VDC and accept open drain/collector npn/pnp sensors, reed switches, dry contacts, different types of waves, logical signals and coils. There is no need for external amplifiers for the coils or linearizers. This input can be linearized with a curve (calibration table) of up to 30 points.

- Using the DIP switches next to the terminals of GFC300 the same input can be switched to accept analog 4-20 mA signal that can be linear to the volume flow rate or a differential pressure signal that needs square root extraction to calculate the volume flow rate.

  The "flow input type" menu must be properly set for the input chosen above. Each channel also has one analog 4-20 mA loop power input for temperature and one more for pressure.

  When measuring liquid mass of a generic liquid a density meter can be used instead of a temperature sensor. It must be connected to the temperature input and the density source in the "**sources**" menu must be switched to "**analog input**".

  When measuring saturated steam mass and delta heat equation has been chosen, the pressure input will automatically become a second temperature input, TEMP2. The temperature values for 4 mA and 20 mA for TEMP2 input must be programmed in the working conditions menu. The failsafe temperature for this input can also be programmed there.

  Each channel also has one input for a push button or a dry contact. It is used by the batch control to start, resume and stop the batch process.

3.3. OUTPUTS

Each channel of GFC300 has one isolated analog, one isolated pulse and one relay output.

3.3.1. Isolated Analog output

It can be 4-20 mA loop power or 0 – 5 V, or 0 – 10 V. The voltage options do not need external power and use two wires. It can be programmed to represent the flow rate of its own channel, rate A+B, temperature, pressure and others. **SET4** is the rate (temperature, pressure, density ...) at 4 mA (0V for voltage output). **SET20** is the rate at 20 mA (5V or 10V).

Example: You program **SET4** = 1000 GPM and **SET20** = 320 GPM. Then the analog output will be inverse and change from 20 mA down to 4 mA when the flow rate changes from 320 to 1000 GPM.

3.3.2. Isolated Pulse output

The pulse output can be ordered as open drain 100V / 100 mA, sinking (npn) with reverse polarity for up to 100 mA protection. It can also be ordered as 5V square wave output.

SETP parameter means how many gallons (other volume or mass units) have to pass through the flow meter in order GFC300 output to produce one pulse. This output can represent its own channel, A-B or A+B.

Example: If **SETP** = 10.0, the output will produce one pulse at every 10 gallons (lbs, CF, tons etc) **SETP** has to be set in a way ensuring the frequency of the pulses will not exceed 10 kHz. Otherwise the frequency will be limited by GFC300 and some pulses may be lost.

3.3.3. Alarm / Batch Relay output

3.3.3.1 Alarm

It can represent the rate of its own channel, rate A+B, temperature, pressure or others. The **ALARM** setting needs to be set. The alarm can be set to be **HIGH** or **LOW** with a **HYSTERESIS** in percents.

Example: The **ALARM** = 100 GPM, alarm type is **HIGH**, the **HYSTERESIS** is 20%. The relay contact will close when the flow rate reaches 110 GPM and will open when it falls bellow 90 GPM. Hysteresis of 20 % means 10 % above and 10 % below the **ALARM** setting.

3.3.3.2 Batch

In the menu **RELAY SOURCES** there is a **BATCH** option. Choosing that option will assign the relay to the batch controller. The relay contact will stay closed initially and between the batches. On the second screen bottom the display will show **RESET** and 0.0 for the batch amount accumulated. Pressing the push button connected to the special terminals will open the relay contact, will start the batch process, the display message will change to **RUN** and the display will show the batch amount accumulating. If the button is pressed during **RUN** the batch process will stop. The relay contact will close, the accumulated batch amount will freeze and the display message will change to **PAUSE.** Pressing the button again will resume the batch process. The display message will change again to **RUN,** the relay contact will open and the batch amount on the display will continue increasing until it reaches the batch set point.

The batch process can be canceled at any time by pressing the **LEFT** arrow button on the front panel of GFC300 and holding it for 5 seconds. This will change the message on the display to **RESET,** the relay contact will close and the display will show 0.0 for the accumulated batch amount.

The **BATCH** set point can be changed at any time in the first level menu.

NOTE: To be functioning the batch controller needs the option A enabled.

3.4. DISPLAY

It is a bright color graphic transmissive display with a white back light. There are 2 screens per channel – A0, A1, B0 and B1.

The first screen (A0 / B0) shows rate and total, the equation chosen and icons for the analog inputs and all outputs. It also shows a horizontal bar graph for the analog output. Rate is 7 digits, the total is 8 digits.

On the second screen (A1 / B1) the display shows the flow input, temperature, pressure, uncorrected flow rate, density, Z factor, enthalpy, heat rate, net heat, delta heat, total heat and others, depending on the equation chosen. If the flow input is analog the display will show mA or differential pressure. If the flow input is pulse the display will show frequency in Hz.

All values on all screens are updated twice a second.

If the flow computer has a dual hardware and it is enabled as dual there will be a 5th screen showing most important data for both channels. Switching between the screens is by pressing **UP** or **DOWN** arrow.

3.4.1. Menus

There are a few levels of menus. The first level is designed to be used by the end user or not skilled personnel. All important settings are hidden in the upper level menus. The first level menu can be locked. Then the user can only see but not change the settings in that menu.

3.4.1.1. First Level Menu

Entering the first level menu is by pressing and holding for 5 seconds the **SET** button. If the flow computer is dual a small menu to choose the channel will appear. If it is single the first menu for channel A will appear.

Using **UP** and **DOWN** buttons choose the setting you want to see or change and press **SET**. The current value of that setting will appear and the decimal point will be blinking. You can increase or decrease the decimal places by pressing **UP** or **DOWN** while the decimal point is blinking. Pressing **LEFT** will move the cursor to the left. When finished press **SET**.

NOTE: The software will not accept zero for KFACTOR , SETP, or **BATCH.**

If **ABOUT** is chosen a new screen will appear and show the version, the serial number of GFC300, all software options enabled and if the hardware is single or dual. Press any button to go back to the first menu.

Test menu can not be entered at all if the first level menu is locked. If it is not locked the test menu will appear and all inputs and outputs can be tested. To enter the test menu you need to press **SET** and hold it for 5 seconds.

TEST
RELAY A ON
RELAY A OFF
RELAY B ON
RELAY B OFF
1000 PULSES A
1000 PULSES B
AN. OUTPUT A
AN. OUTPUT B
SHOW INPUTS

Choosing 1000 pulses item will produce exactly 1000 pulses on the pulse output A or B with a frequency of 100 Hz.
Choosing **SHOW INPUTS** will show the flow inputs (current or frequency) and the current of the analog inputs for temperature / density and pressure.
To test the analog output choose **AN. OUTPUT**. A new menu will appear.

AN. OUTPUT A
0 %
25 %
50 %
75 %
100 %

When finished press **LEFT** to return to the first menu and press **LEFT** one more time to exit this first level menu and return to the normal mode. GFC300 will store all settings automatically.

NOTE: There is a time out which will reset the flow computer and all changes will be lost. They will be stored only when you exit all the menus (by pressing LEFT) and return to the normal mode.

3.4.1.2. Hidden Menus

Enter the first level menu as described in **3.4.1.1.** Scroll down to **SETP**. Press and hold for 5 seconds the **LEFT** button. Then there will be a time slot of 3 seconds to release **LEFT**, press shortly **SET** and **LEFT** again.

The first hidden menu (**second level**) will appear:

Pressing **SET** on **CHANNEL A** will enter **the third level** menu for all settings related to channel A. If GFC300 has a dual hardware and it is enabled to be dual pressing **SET** on **CHANNEL B** will do the same for channel B.

RS485 communication protocol is MODBUS RTU. The **MODBUS address**, the baud rate and the parity can be easily programmed.

The **MATH** menu can be entered only if having dual hardware and dual computer. No math (independent channels), rate A+B, total A-B or total A+B can be chosen. In these cases the display will show:

rate A+B, total A and total B
or rate A, rate B and total A-B
or rate A, rate B and total A+B

NOTE: In any of the cases above both channels must have the same units for total and rate. It is the user's responsibility to make sure both channels have the same units for their rates and the same units for their totals.

NOTE: Total A - B will never go negative.

Using the **SINGLE / DUAL** menu GFC300 can be programmed to work in a dual mode **only if it has a dual hardware and the "D" option enabled.**

The options that you purchased later can be enabled using the menu **OPTIONS EN**. The software will not allow you to enter a password for an option that you already have. For the newly purchased options you have to enter the passwords that you received from G Instruments. There is a separate password for each option.

OPTIONS

The options that can be enabled at the time of order at the factory or by passwords later in the field are:
P = PULSE OUTPUT
A = ALARM / BATCH RELAY
C = PULSE CURVE
O = ANALOG OUTPUT
G = GAS EQUATIONS
D = DUAL COMPUTER
B = MODBUS COMM.
M = MATH. CALC.
S = STEAM EQUATIONS

Each channel will have full hardware for all of the above options but the software for them will be enabled or disabled. If ordered at the time of the purchase of GFC300, they will be enabled by the factory. If you want to purchase some option(s) later, contact G Instruments to receive a special password for each option which will allow you to upgrade in a couple of minutes without interrupting the work of your equipment and without the need to disconnect, uninstall and ship your GFC300 to the factory.

MODBUS communication can be enabled on either single or dual flow computer. But math calculations can not be enabled on a single hardware or a single computer. For math, **a dual hardware and a dual computer (option D enabled)** are needed.

Third level menu

If you pressed **SET** on "CHANNEL A" (or B) on the **second level** (SETTINGS) menu, the third level will appear:

CHANNEL A
UNITS
REF. CONDITIONS
WORK CONDITIONS
ANALOG INPUTS
EQUATION TYPE
FLUID TYPE
FLOW INPUT
FR DEC PLACES
TOT DEC PLACES
SOURCES
CLEAR TOTAL
ALARM TYPE
CURVE POINTS
FILTER/RESPONSE

A variety of volume, mass, time, temperature, pressure, differential pressure and density units can be chosen in the **UNITS** menu.

In **REFERENCE CONDITIONS** menu reference temperature, pressure, density and Z factor have to be entered.

In **WORK CONDITIONS** menu manual temperature, manual pressure, thermal volume expansion coefficient, Z factor at average working conditions, atmospheric pressure,and failsafe values for

temperature, pressure, flow rate and density can be entered. The quality (dryness) of saturated steam can also be entered.

TIP: ***All analog inputs have a failsafe value. It will be used automatically if the signal of that analog input gets below about 3.8 mA (disconnected or bad sensor). Always program those failsafe values.***

MANUAL TEMPERATURE and / or PRESSURE can be used if you do not want to use a sensor for them.

The **THERMAL VOLUME EXPANSION COEFFICIENT** is used for measuring liquid compensated volume or liquid mass.

Z FACTOR is used for measuring gas compensated volume or gas mass.

ATMOSPHERIC PRESSURE is needed for measuring gases and superheated steam if the pressure sensor is for gauge pressure.

The **FAILSAFE VALUES** will be automatically used in case the analog input for flow, temperature, pressure or density is disconnected or bad.

STEAM QUALITY (DRYNESS) is used for measuring mass of saturated (wet) steam. Dry steam has 1.0 quality, liquid phase only has 0.0 quality. A typical value in practice can be around 0.95 .

ANALOG INPUTS menu is the place where you need to enter the temperature, pressure, density, flow rate and the differential pressure at 4 mA and at 20 mA. A cut-off in percents for the analog flow input can also be entered in this menu.

EQUATION TYPE menu will give the following choices:
EQUATION A
LIQUID VOLUME
LIQ COMP. VOL
LIQUID MASS
GAS VOLUME
GAS COMP. VOL
GAS MASS
STEAM VOLUME
STEAM MASS
STEAM NET HEAT
STEAM DELTA HEAT

The **LIQUID VOLUME, GAS VOLUME** and **STEAM VOLUME** equations will just calculate the volume rate and total. These equations do not need temperature or pressure but sensors can be used to monitor the temperature and/or the pressure.

The **LIQUID COMPENSATED VOLUME** equation needs the liquid temperature, reference temperature, and thermal volume expansion coefficient of the liquid in order to compensate for the thermal expansion of the liquid.

The **LIQUID MASS** equation needs:

- temperature of the liquid, reference temperature, reference density (at reference temperature) and the volume thermal expansion coefficient of that liquid

OR

- a 4-20 mA signal proportional and linear to the density of the liquid, connected to the temperature input

The thermal volume expansion coefficient of the liquid must be entered in 10 of power -6 units.

Example: The liquid volume expansion coefficient is 0.003200 per degree. You need to enter 3200.

NOTE: All of the above is valid if a generic liquid has been chosen in the FLUID TYPE menu. If a liquid from the list has been chosen the software will not need reference density and expansion coefficient because they are preprogrammed for that specific liquid.

The **GAS COMPENSATED VOLUME** equation needs temperature, pressure, reference temperature, reference pressure, reference Z factor and a Z factor for the current temperature and the pressure of the gas.

The **GAS MASS** equation needs the same plus a density at reference temperature and pressure. The Z factor at working conditions must be entered manually in the **WORK CONDITIONS** menu if a generic gas is chosen in the **FLUID TYPE** menu.

If a gas from the list has been chosen GFC300 will very accurately calculate the Z factor at the measured temperature and pressure in a very large temperature and pressure range and provide more accurate flow rate and total readings.

STEAM VOLUME will calculate the volume only of the steam without any corrections.
Saturated steam mass:

- **MASS** and **NET HEAT of saturated steam** equations need temperature and quality of the steam. **DELTA HEAT** needs a second temperature – the temperature of the condensed steam (water) after the heat exchanger. When this equation is chosen the pressure input will automatically become an input for this second temperature. GFC300 will very accurately calculate the density, the mass of the steam, its enthalpy, net heat (delta heat) rate and will accumulate it in the heat total.

Superheated steam mass:

- **MASS** and **NET HEAT** equations need both **temperature and pressure** of the steam. GFC300 will not allow you to choose superheated steam if **DELTA HEAT** equation has been chosen. It will very accurately calculate the density, the mass of the steam, its enthalpy, net heat rate and will accumulate it in the heat total.

In the **FLUID TYPE** menu the choices are:

- Liquids: generic, gasoline, diesel, kerosene, propane LPG, anh. ammonia, benzene, acetone and ethanol

- Gases: generic, dry air, argon, carbon dioxide, carbon monoxide, hydrogen, methane, nitrogen and oxygen

- Steam: saturated or superheated

More liquids and gases will be added in the next versions of the software.

The choices for **FLOW INPUT** are:

- pulse with a **KFACTOR**. A valid **KFACTOR** must be entered in the first level menu.
- pulse with a calibration curve (table) of up to 30 points. The software will allow this choice only if the option **C** is enabled. In this case a valid calibration curve must be entered prior to using the

channel.

- analog 4-20 mA linear to flow rate, in flow rate units. Neither KFACTOR nor curve data is needed.
- analog 4-20 mA coming from a differential pressure sensor (in delta P units) that needs a square root extraction in order to get the flow rate.
  The KFACTOR will be used to calculate the flow rate according to the equation

  Flow Rate = KFACTOR * square_root(differential pressure)

In the **SOURCES** menu:

- The **TEMPERATURE SOURCE** can be a manually entered temperature or a temperature transmitter connected to the analog input. It must be 4-20 mA loop power and linear to temperature. If a generic temp. transmitter has been chosen temperatures at 4 mA and at 20 mA must be entered in the **ANALOG INPUTS** menu. If a temp. transmitter from the list is chosen, the software will not need them because they are pre-programmed.

- The density source (f**or generic liquids**) can be a manually entered **REFERENCE DENSITY** (at **REFERENCE TEMPERATURE**) or a signal from a density meter connected to the temperature input. It must be 4-20 mA loop power and linear to density. Densities at 4 and at 20 mA have to be entered in the **ANALOG INPUTS** menu.

  For generic gases GFC300 will use the density at reference temperature and pressure (**REFERENCE DENSITY**).

- The **PRESSURE SOURCE** can be a manually entered pressure or a signal from a pressure sensor. It must be 4-20 mA loop power and linear to pressure. Pressures at 4 and at 20 mA have to be entered in the **ANALOG INPUTS** menu.

To **CLEAR A TOTAL** press **SET** button and hold it for 5 seconds while on that line of the menu.

The **ALARM TYPE** can be high or low. High means the relay contact will close when the variable is above the alarm setting plus half of the hysteresis. The contact will open when the variable is lower than the alarm set point minus half of the hysteresis. For low alarm the action is reversed.

In the **CURVE POINTS** menu a calibration table for the flow meter can be entered. This way the flow meter linearity, accuracy and turn down ratio can be greatly improved. Each point consists of a frequency in [Hz] and a KFACTOR for the flow meter at that frequency. If all 30 points are entered the software will automatically return to the previous menu. If the points are less than 30, enter zero for both the frequency and the KFACTOR to indicate that no more points will be entered. The software will sort the points and validate them.

NOTE: The software will not accept zero for a KFACTOR unless the frequency entered before it is also zero.

In the **FILTER/RESPONSE** menu a digital filter (damping) can be programmed. The least damping corresponds to the fastest response and the highest filtering – to the slowest response. There is also an **AUTO** setting that will provide both high filtering and fast response.

NOTE: There is a time out which will reset the flow computer and all changes will be lost. They will be stored only when you exit all the menus (by pressing LEFT) and return to the normal mode.

NOTE: All totals are stored in the non-volatile memory every 50 seconds. Before powering down the flow computer make sure that there was no flow for the last minute. All important settings are stored in a non-volatile memory and will not be lost.

3.5. COMMUNICATION

GFC300 has a RS485 two wire communication port with high surge and transients protection. The communication protocol is MODBUS RTU. The MODBUS address, the baud rate and the parity are programmable. Stop bits are programmable only if the parity is none.

MODBUS standard requires 2 stop bits with no parity and 1 stop bit with even or odd parity.

Shorting the termination jumper next to the terminals connects a 120 ohm 0.5W resistor between A (D+) and B (D-). This is needed only if GFC300 is at the very end of the buss and/or far from the MODBUS master. For better quality of communication and achieving higher baud rates a shielded twisted pair (STP) should be used.

The RS485 port is not isolated from the inputs of GFC300, but it is isolated from the power and all outputs.

The MODBUS software of GFC300 supports functions 0x03 (read holding registers) and 0x04 (read input registers). Exceptions 1, 2, 3 and 6 are handled.

Register Address	***Register Type***	***Read/Write***	***Description***	***Format***
80	Input	R	Rate volume unit for channel A	NOTE 2
81	Input	R	Total volume unit for channel A	NOTE 2
82	Input	R	Time unit for channel A	NOTE 5
83	Input	R	Mass rate unit for channel A	NOTE 3
84	Input	R	Mass total unit for channel A	NOTE 4
85	Input	R	Temperature unit for channel A	NOTE 8
86	Input	R	Pressure unit for channel A	NOTE 9
87	Input	R	Density unit for channel A	NOTE 10
88	Input	R	Differential pressure unit for channel A	NOTE 11
89	Input	R	Heat Rate unit for channel A	NOTE 12
90	Input	R	Heat Total unit for channel A	NOTE 13
91	Input	R	Equation for channel A	NOTE 6
92	Input	R	Liquid type for channel A	NOTE 14
93	Input	R	Gas type for channel A	NOTE 15
94	Input	R	Steam type for channel A	NOTE 16
120	Input	R	Uncorrected Flow Rate A, High.	IEEE-754 floating point
121	Input	R	Uncorrected Flow Rate A, Low.	NOTE 1
122	Input	R	Uncorrected Total A, High.	IEEE-754 floating point
123	Input	R	Uncorrected Total A, Low.	NOTE 1
124	Input	R	Temperature A, High.	IEEE-754 floating point
125	Input	R	Temperature A, Low.	NOTE 1
126	Input	R	Pressure / TEMP2 A, High.	IEEE-754 floating point

127	Input	R	Pressure/ TEMP2 A, Low.	NOTE 1
128	Input	R	Corrected Flow Rate A, High.	IEEE-754 floating point
129	Input	R	Corrected Flow Rate A, Low.	NOTE 1
130	Input	R	Corrected Total A, High.	IEEE-754 floating point
131	Input	R	Corrected Total A, Low.	NOTE 1
132	Input	R	Density A, High.	IEEE-754 floating point
133	Input	R	Density A, Low.	NOTE 1
134	Input	R	Mass Flow Rate A, High.	IEEE-754 floating point
135	Input	R	Mass Flow Rate A, Low.	NOTE 1
136	Input	R	Mass Total A, High.	IEEE-754 floating point
137	Input	R	Mass Total A, Low.	NOTE 1
138	Input	R	Enthalpy A, High.	IEEE-754 floating point
139	Input	R	Enthalpy A, Low.	NOTE 1
140	Input	R	Heat Rate A, High.	IEEE-754 floating point
141	Input	R	Heat Rate A, Low.	NOTE 1
142	Input	R	Heat Total A, High.	IEEE-754 floating point
143	Input	R	Heat Total A, Low.	NOTE 1
180	Input	R	Rate volume unit for channel B	NOTE 2
181	Input	R	Total volume unit for channel B	NOTE 2
182	Input	R	Time unit for channel B	NOTE 5
183	Input	R	Mass rate unit for channel B	NOTE 3
184	Input	R	Mass total unit for channel B	NOTE 4
185	Input	R	Temperature unit for channel B	NOTE 8
186	Input	R	Pressure unit for channel B	NOTE 9
187	Input	R	Density unit for channel B	NOTE 10
188	Input	R	Differential pressure unit for channel B	NOTE 11
189	Input	R	Heat Rate unit for channel B	NOTE 12
190	Input	R	Heat Total unit for channel B	NOTE 13
191	Input	R	Equation for channel B	NOTE 6
192	Input	R	Liquid type for channel B	NOTE 14
193	Input	R	Gas type for channel B	NOTE 15
194	Input	R	Steam type for channel B	NOTE 16
220	Input	R	Uncorrected Flow Rate B, High.	IEEE-754 floating point
221	Input	R	Uncorrected Flow Rate B, Low.	NOTE 1
222	Input	R	Uncorrected Total B, High.	IEEE-754 floating point
223	Input	R	Uncorrected Total B, Low.	NOTE 1
224	Input	R	Temperature B, High.	IEEE-754 floating point
225	Input	R	Temperature B, Low.	NOTE 1
226	Input	R	Pressure / TEMP2 B, High.	IEEE-754 floating point
227	Input	R	Pressure / TEMP2 B, Low.	NOTE 1
228	Input	R	Corrected Flow Rate B, High.	IEEE-754 floating point
229	Input	R	Corrected Flow Rate B, Low.	NOTE 1

230	Input	R	Corrected Total B, High.	IEEE-754 floating point
231	Input	R	Corrected Total B, Low.	NOTE 1
232	Input	R	Density B, High.	IEEE-754 floating point
233	Input	R	Density B, Low.	NOTE 1
234	Input	R	Mass Flow Rate B, High.	IEEE-754 floating point
235	Input	R	Mass Flow Rate B, Low.	NOTE 1
236	Input	R	Mass Total B, High.	IEEE-754 floating point
237	Input	R	Mass Total B, Low.	NOTE 1
238	Input	R	Enthalpy B, High.	IEEE-754 floating point
239	Input	R	Enthalpy B, Low.	NOTE 1
240	Input	R	Heat Rate B, High.	IEEE-754 floating point
241	Input	R	Heat Rate B, Low.	NOTE 1
242	Input	R	Heat Energy Total B, High.	IEEE-754 floating point
243	Input	R	Heat Energy Total B, Low.	NOTE 1
280	Input	R	Math type	NOTE 7
281	Input	R	AxB Flow Rate A, High.	IEEE-754 floating point
282	Input	R	AxB Flow Rate A, Low.	NOTE 1
283	Input	R	AxB Total A, High.	IEEE-754 floating point
284	Input	R	AxB Total A, Low.	NOTE 1

Note 1: This is a IEEE-754 floating point number. High word contains the exponent and the most significant byte of the mantissa. The low word contains the middle and the least significant byte of the mantissa. Both high and low must be read, merged and used like a IEEE-754 floating point number.

Note 2: 0 = gal, 1 = igal, 2 = ft^3, 3 = SCF, 4 = hL, 5 = m^3, 6 = MCF, 7 = AF, 8 = SCC, 9 = L, 10 = qts, 11 = bbl 31.0 gal, 12 = bbl 31.5 gal, 13 = bbl 36.0 gal, 14 = bbl 40.0 gal, 15 = bbl 42.0 gal, 16 = bbl 55.0 gal

Note 3: 0 = lb, 1 = kg, 2 = g, 3 = t, 4 = ts, 5 = tl (ton, ton short and ton long)

Note 4: 0 = lb, 1 = kg, 2 = g, 3 = t, 4 = ts, 5 = tl, 6 = hlb, 7 = klb, 8 = Mlb (hecto_lb, kilo_lb, mega_lb)

Note 5: 0 = per second, 1 = per minute, 2 = per hour, 3 = per day

Note 6: 0 = liquid volume, 1 = liq compensated volume, 2 = liq mass, 3 = gas volume, 4 = gas comp. volume, 5 = gas mass, 6 = steam volume, 7 = steam mass, 8 = steam net heat, 9 = steam delta heat

Note 7: 0 = no math, 1 = rate A+B, 2 = total A-B, 3 = total A+B

Note 8: 0 = ^{O}C 1 = ^{O}F, 2 = ^{O}K, 3 = ^{O}R

Note 9: 0 = bara, 1 = kPaa, 2 = Mpaa, 3 = psia, 4 = atma, 5 = barg, 6 = kPag, 7 = MPag, 8 = psig, 9 = atmg

Note 10: 0 = kg/m^3, 1 = kg/dm^3, 2 = lb/gal, 3 = lb/ft^3

Note 11: 0 = inch, 1 = mbar

Note 12: 0 = kJ/h, 1 = MJ/h, 2 = GJ/h, 3 = kW, 4 = MW, 5 = Btu/h, 6 = kBtu/h, 7 = Mbtu/h, 8 = Gbtu/h, 9 = kCal/h, 10 = Mcal/h, 11 = Gcal/h

Note 13: 0 = kJ, 1 = MJ, 2 = GJ, 3 = kWh, 4 = MWh, 5 = Btu, 6 = kBtu, 7 = Mbtu, 8 = Gbtu, 9 = kCal, 10 = Mcal, 11 = Gcal

Note 14: 0 = generic, 1 = gasoline, 2 = diesel, 3 = kerosene, 4 = LPG, 5 = NH3, 6 = benzene, 9 = acetone, 10 = ethanol

Note 15: 0 = generic, 1 = air, 2 = argon, 3 = CO_2, 4 = CO, 5 = hydrogen, 6 = methane, 7 = nitrogen, 8 = oxygen

Note 16: 0 = saturated, 1 = superheated

4. APPLICATION

4.1. Liquid volume

4.1.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.1.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.

Option **C** must be enabled. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.1.3. Analog input linear to flow rate, in flow rate units

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.1.4. Differential pressure sensor in delta P units, needing a square root extraction

Connect the analog signal to the flow input and set the DIP switch for analog input. Enter a **KFACTOR**.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.2. Liquid compensated volume

4.2.1. Pulse input with a KFACTOR

Connect the flow signal to the pulse input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.2.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.2.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switches for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.2.4. Differential pressure sensor

Connect the analog differential pressure signal to the flow input and set the DIP switches for analog input. Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.3. Liquid mass

4.3.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu
  Enter a reference density in the **REF. CONDITIONS** menu and set density source to manual

  OR

- **Generic liquid:** connect a density meter to the temperature input, switch the density source to analog input and enter density for 4 and 20 mA

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and

accordingly set the temperature source in the **SOURCES** menu.
Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.3.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu
  Enter a reference density in the **REF. CONDITIONS** menu and set density source to manual

OR

- **Generic liquid:** connect a density meter to the temperature input, switch the density source to analog input and enter density for 4 and 20 mA

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.3.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switches for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu
  Enter a reference density in the **REF. CONDITIONS** menu and set density source to manual

OR

- **Generic liquid:** connect a density meter to the temperature input, switch the density source to analog input and enter density for 4 and 20 mA

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.

A pressure sensor can be connected but it is not needed for the calculations.

4.3.4. Differential pressure sensor

Connect the analog differential pressure signal to the flow input and set the DIP switches for analog input. Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**

- **Generic liquid:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu
  Enter a thermal volume expansion coefficient for the reference temperature in the **WORK CONDITIONS** menu
  Enter a reference density in the **REF. CONDITIONS** menu and set density source to manual

  OR

- **Generic liquid:** connect a density meter to the temperature input, switch the density source to analog input and enter density for 4 and 20 mA

- **Liquid from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter a reference temperature in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
A pressure sensor can be connected but it is not needed for the calculations.

4.4. Gas volume

4.4.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.4.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit. Option **C** must be enabled. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.4.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.4.4. Differential pressure sensor

Connect the analog signal to the flow input and set the DIP switch for analog input. Enter a **KFACTOR**.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.5. Gas compensated volume

4.5.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.5.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.5.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.

Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
Enter a reference temperature, a reference pressure and a reference Z factor.
Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.5.4. Differential pressure sensor

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter a reference temperature, a reference pressure and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.6. Gas mass

4.6.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS**

menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.6.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.6.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.

Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
Enter reference temperature, reference pressure, reference density and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.6.4. Differential pressure sensor

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**.

- **Generic gas:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor.
  Enter a Z factor for the average working temperature and pressure in the **WORK CONDITIONS** menu

- **Gas from the list:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.
  Enter reference temperature, reference pressure, reference density and a reference Z factor in the **REF. CONDITIONS** menu

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.7. Steam volume

4.7.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.7.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled. You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.7.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.7.4. Differential pressure sensor

Connect the analog signal to the flow input and set the DIP switch for analog input. Enter a **KFACTOR**.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu.
You can connect a temperature sensor and / or pressure sensor but they are not needed for the calculations.

4.8. Steam mass and steam net heat

4.8.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.8.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.8.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.8.4. Differential pressure sensor

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu.
  Connect a pressure sensor or enter a manual pressure and accordingly set the pressure source in the **SOURCES** menu.

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter pressure for 4 and 20 mA in the **ANALOG INPUTS** menu if analog input has been chosen for pressure source.

4.9. Steam delta heat

4.9.1. Pulse input with a KFACTOR

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a **KFACTOR** in pulses per total volume unit.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu. This sensor must measure the steam temperature. Connect a second temperature sensor to the pressure (now TEMP2) input. Program a failsafe temperature TEMP2 as well. This second (TEMP2) temperature sensor must measure the condensed steam (water) temperature after the heat exchanger.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** delta heat is not available for superheated steam

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu for TEMP2 input.

4.9.2. Pulse input with a calibration curve (table)

Connect the pulse signal to the flow input and set the DIP switches according to the wiring diagrams in paragraph **4.10.1.** Enter a calibration table. All **KFACTOR**s must be in pulses per total volume unit.
Option **C** must be enabled.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and

accordingly set the temperature source in the **SOURCES** menu. This sensor must measure the steam temperature. Connect a second temperature sensor to the pressure (now TEMP2) input. Program a failsafe temperature TEMP2 as well. This second (TEMP2) temperature sensor must measure the condensed steam (water) temperature after the heat exchanger.
Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** delta heat is not available for superheated steam

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu for TEMP2 input.

4.9.3. Analog input linear to flow rate

Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter flow rate for 4 and for 20 mA in the **ANALOG INPUTS** menu.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu. This sensor must measure the steam temperature. Connect a second temperature sensor to the pressure (now TEMP2) input. Program a failsafe temperature TEMP2 as well. This second (TEMP2) temperature sensor must measure the condensed steam (water) temperature after the heat exchanger.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** delta heat is not available for superheated steam

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu for TEMP2 input.

4.9.4. Differential pressure sensor

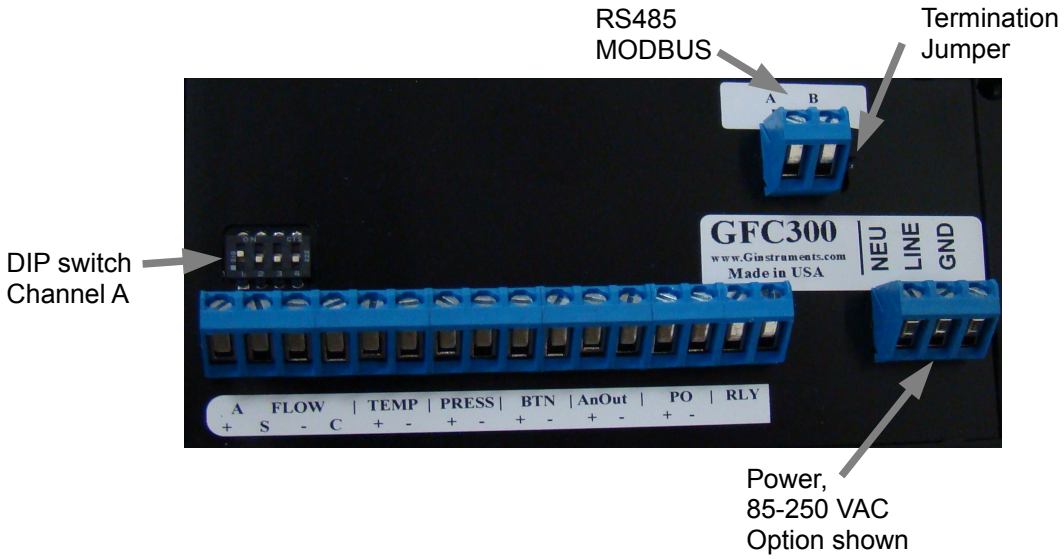
Connect the analog signal to the flow input and set the DIP switch for analog input.
Enter differential pressure for 4 and for 20 mA in the **ANALOG INPUTS** menu. Enter a **KFACTOR**.

- **Saturated steam:** Connect a temperature sensor or enter a manual temperature and accordingly set the temperature source in the **SOURCES** menu. This sensor must measure the steam temperature. Connect a second temperature sensor to the pressure (now TEMP2) input. Program a failsafe temperature TEMP2 as well. This second (TEMP2) temperature sensor must measure the condensed steam (water) temperature after the heat exchanger.
  Enter the steam quality in the **WORK CONDITIONS** menu

- **Superheated steam:** delta heat is not available for superheated steam

Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu if a generic temperature sensor has been chosen for temperature source.
Enter temperature for 4 and 20 mA in the **ANALOG INPUTS** menu for TEMP2 input.

4.10. ELECTRICAL



GFC300 has (per channel) one flow input, two analog 4-20 mA loop power inputs, one analog output, one normal open relay contact output, one push button input for batch and one pulse output.
The flow input can be switched to accept pulses or 4-20 mA loop power signal.
In addition GFC300 has a RS485 two wire communication port.
The power supply options are 85-264VAC using three terminals, 12VDC and 24VDC using two terminals.

NOTE: Double check which power supply option you have against the wiring before applying the power. Applying higher voltage than allowed for the option you have will damage the device.

TERMINALS, CHANNEL A

	LOWER ROW, left to right
"+"	Flow sensor power +24V, 20 mA max
"S"	Flow sensor signal
"-"	Flow Sensor ground
"C"	Flow sensor, coils only
"+"	Temperature / density sensor loop power, +24V
"-"	Temperature / density sensor signal
"+"	Pressure / TEMP2 sensor loop power, +24V
"-"	Pressure / TEMP2 sensor signal
"+"	Push button for batch
"-"	Push button for batch
"+"	Analog output
"-"	Analog output
"+"	Pulse output
"-"	Pulse output
	Relay, normal open contact
	Relay
A	RS485 MODBUS port, line A (D+)
B	RS485 MODBUS port, line B (D-)

TERMINALS, CHANNEL B

UPPER ROW, same as channel A

TERMINALS FOR AC POWER

LIN line
NEU neutral
GND earth ground

TERMINALS FOR DC POWER

"+" DC power supply “+”
"-" DC power supply “-”

4.10.1. Wiring the flow input

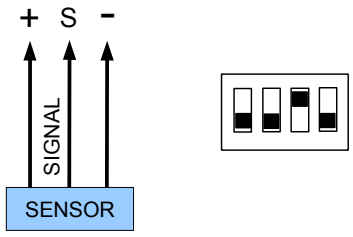
The flow input can be switched to accept pulses from open drain / collector, npn, pnp, reed switch, dry contact, waves, logical signals and coils. It has four terminals and provides power for the flow sensor, if needed. The power is 24 VDC regulated, filtered and protected, maximum current is 20 mA.

If you would like to power your pulse flow sensor from the GFC300, double check if the sensor can work with 24 VDC / max 20 mA.

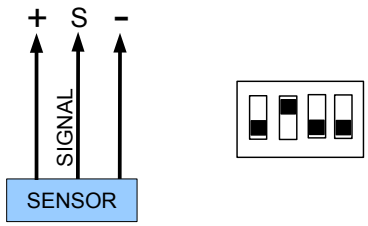
The flow input can also be switched to accept analog 4-20 mA loop power signal.

NOTE: There is no isolation between the pulse input and the analog inputs.
There is no isolation between the inputs of both channels.
All inputs are isolated from all outputs and from the power.

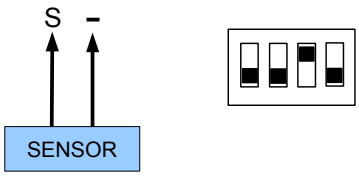
4.10.1.1. NPN Open drain / collector



4.10.1.2. PNP Open drain / collector

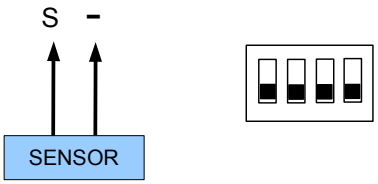


4.10.1.3. Reed switch, dry contact

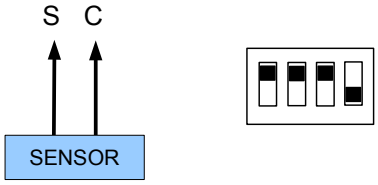


NOTE: A small capacitor in parallel may be needed. Different reed switches and dry contacts have different bouncing time. Test and evaluate carefully to determine the right capacitor.

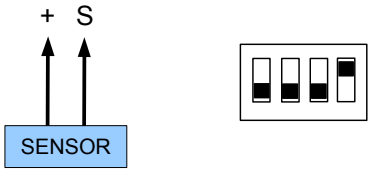
4.10.1.4. Wave (square, sine, triangle, saw etc.), Logical Signal (CMOS, TTL etc.)



4.10.1.5. Coils



4.10.1.6. Analog 4-20 mA loop power for flow rate or differential pressure



4.10.2. Wiring the temperature and pressure inputs

Each channel has two more analog 4-20 mA loop power inputs. The power is supplied by GFC300 so you need to use only two wires. The power is 24VDC, regulated, filtered and protected.

4.10.3. Wiring the analog output

The analog output can be loop power 4-20 mA, 0 – 5 V or 0 -10V.

Double check which one you have before making the connections.

- The **4-20 mA** loop power is passive and needs the other device or an external isolated power supply to provide the power to the loop. The voltage must be higher than 7.0 V plus the voltage drop on the receiving device.

- Both (**0-5V and 0-10V**) voltage options are two wire and do not need external power.

4.10.4. Wiring the pulse output

The pulse output can be open drain, sinking (npn) or a 5V square wave.

- **Open drain**
  The device that will receive the pulses must have a pull-up resistor built-in or added externally to the terminals.

- **5V square wave**
  The signal is a 5V square wave and does not need neither a pull-up, nor a pull-down at the receiving devices. Neither it needs external power. The output has a built-in series resistor of 510 ohm for protection.

4.10.5. Wiring the RS485 communication port

For best performance use twisted pair, preferably shielded twisted pair (STP). If GFC300 is at the very end of the RS485 buss a termination of the line may be needed. If that is the case short the jumper next to terminal "**B**" on the right. Not more than one device at each end of the buss should have a termination.

The RS485 port is not isolated from the pulse and the analog inputs, but it is isolated from the power and all outputs.

4.10.6. Wiring the power

NOTE: Double check which power supply option you have against the wiring before applying the power. Applying higher voltage than allowed for the option you have will damage the device.

- 12 VDC – needs 2 wires for this option. We strongly recommend the **minus** to be connected to earth ground, if the application allows.
- 24 VDC - needs 2 wires for this option. We strongly recommend the **minus** to be connected to earth ground, if the application allows.
- 85 – 264 VAC, 47-400 Hz - needs 3 wires in this case. The **line** (115VAC or 220 VAC line) wire **must** be connected to **LIN** terminal.
  The **neutral** wire **must** be connected to the **NEU** terminal.
  The **earth ground** wire **must** be connected to the **GND** terminal.

  Always use and properly connect earth ground wire when having the 85-264 VAC option.
  Always disconnect the high voltage before doing any work on GFC300.

4.11. MECHANICAL

GFC300 is a panel mount device. Its front has dimensions 144 x 72 mm (5.67" x 2.84").
It requires a cut out on the panel with dimensions 138 x 68 mm (5.43" x 2.68"). The cut out should not exceed 139 x 68.7 mm (5.57" x 2.7").
The depth needed behind the panel is 153 mm (6").

The front panel is not weather proof. For a weather proof (front only) option IP65 contact G Instruments. This would be a special order and a minimum quantity and longer lead time will apply.

5. ORDERING

- At the time of order you need to specify if you want single or dual hardware, what power supply option, the types of the analog and the pulse output of each channel.
- Then you need to specify what software options (features) you need.
- Single hardware will have the full hardware for channel A and RS485 port.
- Dual hardware will have the full hardware for both channels and RS485 port.
- The power options are: isolated 12VDC (9 – 18 VDC) or isolated 24 VDC (18 – 36VDC) or isolated 85 -264 VAC.
- The analog output options are: isolated 4-20 mA loop power (passive) or isolated 0 – 5V or isolated 0 – 10 V
- The pulse output options are: open drain, sinking (npn) 100V / 100 mA with reverse polarity protection for up to 100 mA OR 5V square wave

For ordering please use the following G Instruments part numbers:

Description	***G Instruments PN***
GFC300 single hardware, 4-20 mA output, open drain pulse, AC power	30250
GFC300 single hardware, 4-20 mA output, open drain pulse, 12 VDC power	30251
GFC300 single hardware, 4-20 mA output, open drain pulse, 24 VDC power	30252
GFC300 single hardware, 4-20 mA output, square wave pulse, AC power	30257
GFC300 single hardware, 4-20 mA output, square wave pulse, 12 VDC power	30258
GFC300 single hardware, 4-20 mA output, square wave pulse, 24 VDC power	30259
GFC300 single hardware, 0 – 5 V output, open drain pulse, AC power	30260
GFC300 single hardware, 0 – 5 V output, open drain pulse, 12 VDC power	30261
GFC300 single hardware, 0 – 5 V output, open drain pulse, 24 VDC power	30262
GFC300 single hardware, 0 – 5 V output, square wave pulse, AC power	30263
GFC300 single hardware, 0 – 5 V output, square wave pulse, 12 VDC power	30264
GFC300 single hardware, 0 – 5 V output, square wave pulse, 24 VDC power	30265
GFC300 single hardware, 0 – 10 V output, open drain pulse, AC power	30270
GFC300 single hardware, 0 – 10 V output, open drain pulse, 12 VDC power	30271
GFC300 single hardware, 0 – 10 V output, open drain pulse, 24 VDC power	30272
GFC300 single hardware, 0 – 10 V output, square wave pulse, AC power	30266
GFC300 single hardware, 0 – 10 V output, square wave pulse, 12 VDC power	30267
GFC300 single hardware, 0 – 10 V output, square wave pulse, 24 VDC power	30268
GFC300 dual hardware, 4-20 mA output, open drain pulse, AC power	30280

GFC300 dual hardware, 4-20 mA output, open drain pulse, 12 VDC power	30281
GFC300 dual hardware, 4-20 mA output, open drain pulse, 24 VDC power	30282
GFC300 dual hardware, 4-20 mA output, square wave pulse, AC power	30283
GFC300 dual hardware, 4-20 mA output, square wave pulse, 12 VDC power	30284
GFC300 dual hardware, 4-20 mA output, square wave pulse, 24 VDC power	30285
GFC300 dual hardware, 0 – 5 V output, open drain pulse, AC power	30290
GFC300 dual hardware, 0 – 5 V output, open drain pulse, 12 VDC power	30291
GFC300 dual hardware, 0 – 5 V output, open drain pulse, 24 VDC power	30292
GFC300 dual hardware, 0 – 5 V output, square wave pulse, AC power	30286
GFC300 dual hardware, 0 – 5 V output, square wave pulse, 12 VDC power	30287
GFC300 dual hardware, 0 – 5 V output, square wave pulse, 24 VDC power	30288
GFC300 dual hardware, 0 – 10 V output, open drain pulse, AC power	30300
GFC300 dual hardware, 0 – 10 V output, open drain pulse, 12 VDC power	30301
GFC300 dual hardware, 0 – 10 V output, open drain pulse, 24 VDC power	30302
GFC300 dual hardware, 0 – 10 V output, square wave pulse, AC power	30273
GFC300 dual hardware, 0 – 10 V output, square wave pulse, 12 VDC power	30274
GFC300 dual hardware, 0 – 10 V output, square wave pulse, 24 VDC power	30275

Example: By ordering 30291-PAODM you will receive

- GFC300 with dual hardware:
  - two universal flow inputs
  - two inputs for temperature or density
  - two inputs for pressure
  - two inputs for batch control
  - two isolated 0-5 V analog outputs
  - two isolated open drain pulse outputs
  - two relay outputs
- isolated 12 VDC power
- RS485 port
- enabled pulse outputs
- enabled alarm / batch relays
- enabled analog outputs
- enabled dual functionality
- enabled math calculations

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