

**PROGRAMMING USER DEFINED FLOW RATE UNITS ON THE GC52 DIFFERENTIALPRESSURE TRANSMITTER**

PIP #: TR-PI-102

Applicable to:  
GC52

The GC52 differential pressure transmitter is compact and flexible instrument often used in flow measurements and volume applications. It can be easily programmed with user defined units to display flow rate in Gallons Per Minute (GPM) and volume in gallons.



Figure 1 – GC52 Differential Pressure Transducer

**Water Flow Rate and Volume Application:**

This example demonstrates the use of GC52 differential pressure transmitter to measure and control flow rate in GPM. Also, to switch from flow rate reading to volume, automatic or manual. Although, the GC52 differential pressure transmitter can be purchase with several ranges, for this application a transmitter with 0 to 40 IWC pressure range has been selected. As well, an orifice plate with 2.40” bore, an eight-inch line diameter pipe and a variable frequency water pump. The transmitter shall provide the analog output to the variable frequency water pump. The variable frequency water pump uses the 4-20mA input to control the amount of energy sent to the pump to slow down or speed up the pump to maintain a constant flow of 65 GPM.

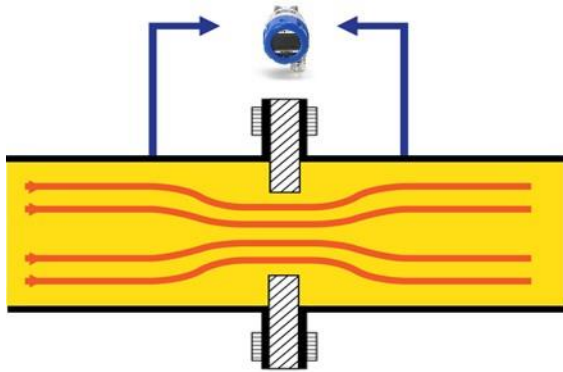


Figure 2 - GC52 Flow Rate Diagram Example



Figure 3 - GC52 Installation Example

**Installation:**

Remove the lid from the transmitter by turning it counter clockwise to expose electrical terminal block. Wire transmitter per manual instructions, and see diagram below for reference.

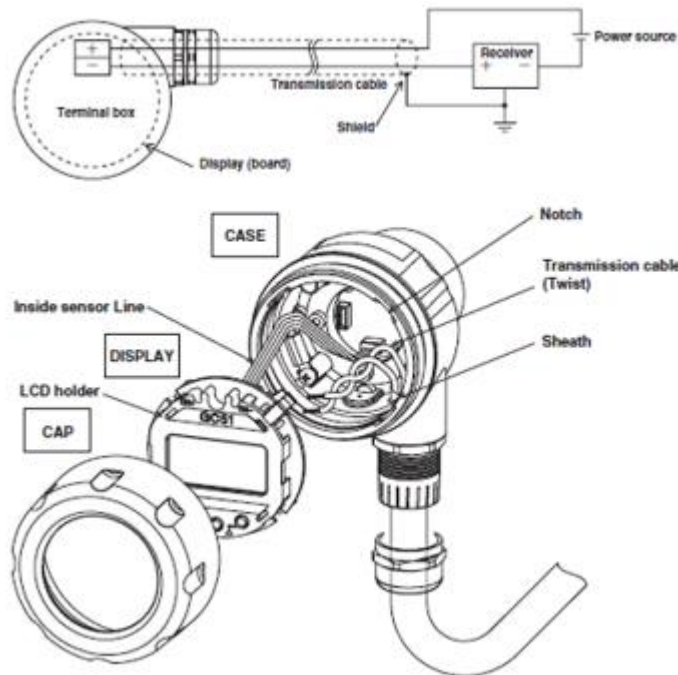


Figure 4 - GC52 Wiring Diagram

**Principles of Operation and Program Instructions:**

Flow rate is calculated by using Bernoulli’s equation below by measuring the differential pressure across an orifice plate. The GC52 will be using the orifice plate manufacturer’s data of maximum flow rate with corresponding differential pressure drop.

$$Q = K \sqrt{\frac{\Delta P}{\rho}}$$

*K = coefficient*

*ΔP = Differential Pressure*

*ρ = Density*

*Q = Flow rate*

Manufacturer orifice plate specifications:


*Line Size = 8" diameter*






*Bore = 2.4" bore*

*Maximum Flow = 88 GPM @ 20 IWC*






**GC52 Differential Pressure Transducer Flow and integrated Volume Program Guidelines:**



Below is an illustration to program the transmitter in GPM and integrated volume in gallons as the arbitrary units. Proceed to scale down the transducer range from 40 IWC to 20 IWC. That, is the maximum differential pressure equivalent to 88 GPM of water (20 mA). Follow the steps below to rescale and program the transmitter from 0 to 20 IWC of water equivalent to the arbitrary units of 0 to 88 GPM.

<p>Remove Access Cover to Expose MODE, UP and DOWN Buttons</p> <ul style="list-style-type: none"> <li>• Press and hold M button for more than three seconds to get into program mode.</li> <li>• Press UP or Down arrow to make changes.</li> <li>• Press and release M button to select changes and to walk through the menu.</li> <li>• Continue to step-1 after power-on message.</li> <li>• Press and hold M button anytime for more than three seconds to return to measuring mode.</li> </ul>	 <p>The diagram shows the GC52 transmitter with its access cover removed. The cover is hinged at the top and is shown in an open position. The transmitter has a digital display showing '888888'. Below the display are three buttons: 'M', 'UP', and 'DOWN'. The 'M' button is on the left, and the 'UP' and 'DOWN' buttons are on the right. The transmitter is labeled 'GC52' at the top and 'ASHCROFT' at the bottom. There are also labels for 'CH+' and 'CH-' at the top and 'In H<sub>2</sub>O' near the display.</p>
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	<ul style="list-style-type: none"> <li>• <b>F 0</b> To enter filter selection (selections of 0,2,4,8, and 16 times).</li> <li>• The filter function is used when pressure fluctuates to improve analog output and difficult to read display.</li> <li>• Select the factory default filter F0. Since pressure fluctuation is not expected.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 2</p>	<ul style="list-style-type: none"> <li>• <b>n rot</b> To enter configuration mode. There are three pressure modes, linear, non-linear, and square root function.</li> <li>• Select square root function to convert pressure into flow rate and to use arbitrary units.</li> <li>• Press UP or Down arrow to display “n rot”.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 3</p>	<ul style="list-style-type: none"> <li>• <b>P 20.0</b> To enter the maximum differential pressure corresponding to the maximum flow rate (88 GPM).</li> <li>• This is the orifice plate specification value.</li> <li>• Press Up or Down arrow until 20.0 is displayed. That, is the maximum differential pressure corresponding to 88 GPM of water.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 4</p>	<ul style="list-style-type: none"> <li>• <b>d 1</b> To select the decimal point position. There are four decimal point selections (0,1, 2, and 3 digits).</li> <li>• Press Up or Down arrow until 1 is display. For this application one digit after decimal point shall be used.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 5</p>	<ul style="list-style-type: none"> <li>• <b>d 88.0</b> To enter the maximum arbitrary units 88 GPM of water corresponding to differential pressure of 20 IWC.</li> <li>• Press Up or Down arrow until 88.0 is selected. That, is the 88 GPM of water corresponding to 20 IWC.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	




<p>Step 6</p>	<ul style="list-style-type: none"> <li>• <b>L 0.0</b> To enter low-cut to flow rate. It forces display to zero and analog output to 4 mA.</li> <li>• Low-cut shall not be used on this application, constant flow rate shall be maintained.</li> <li>• Press Up or Down arrow until 0.0 is selected.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 7</p>	<ul style="list-style-type: none"> <li>• <b>A 0.0</b> To enter analog output zero reference corresponding to 4 mA.</li> <li>• The operational range is from 0 to 88 GPM of water. Therefore, select 0% FS or 4mA analog output.</li> <li>• Press Up or Down arrow until 0.0 is displayed. That, is the analog output at 0% FS (4mA at 0 GPM of water).</li> <li>• Press and release M button to select and move to the next step</li> </ul>	
<p>Step 8</p>	<p>----</p> <ul style="list-style-type: none"> <li>• <b>A 100.0</b> To enter span analog output reference corresponding to 20 mA.</li> <li>• The operational range is from 0 to 88 GPM of water. Therefore, 100% full span is selected as the span or 20 mA analog output.</li> <li>• Press UP or Down arrow until 100.0 is displayed. That, is the analog output at 100% FS (20mA at 88 GPM).</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 9</p>	<ul style="list-style-type: none"> <li>• <b>U n in</b> To enter time factor. When flow rate is GPM, minutes shall be selected as the same time factor.</li> <li>• Press UP or Down arrow until “n in” is displayed. That, is the time factor corresponding to minutes.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 10</p>	<ul style="list-style-type: none"> <li>• <b>U _ _ 1</b> To enter Flow rate volume factor. When flow rate is GPM, 1 shall be selected to match flow factor units of gallons X1.</li> <li>• Selectable options 1,10, 100 and 1000.</li> <li>• 1 shall be selected since the arbitrary units are in gallons.</li> <li>• Press UP or Down arrow until “1” is displayed. That, is the unit factor corresponding to gallons.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	

<p>Step 11</p>	<ul style="list-style-type: none"> <li>• <b>S bt</b> To enter switch mode of momentary flow rate and integrated volume. There is manual mode (bt) or automatic mode (ti).</li> <li>• For this application manual switch mode shall be selected.</li> <li>• It only displays integrated volume when cover is removed and M button is pressed. Otherwise it only displays flow rate.</li> <li>• Automatic setting time is selectable from 1 to 10 seconds cycle.</li> <li>• Press UP or Down arrow until “bt” is displayed.</li> <li>• Press and release M button to select and move to the next step.</li> </ul>	
<p>Step 12</p>	<ul style="list-style-type: none"> <li>• <b>C 0.0</b> Loop check mode allows program and analog output verification with the transmitter pressurized or non-pressurized. It simulates the process and allows for troubleshooting.</li> <li>• Press Up or Down arrow to change within transmitter range (0 to 88 GPM of water).</li> <li>• Press and release M button to return to the begin of program</li> <li>• After verification press and hold M button for more three seconds to return to measuring mode.</li> </ul>	

**Function Verification:**

The GC52 **loop-check** allows to verify program and analog output with the transmitter pressurized or non-pressurized.

<ul style="list-style-type: none"> <li>• Once Step-11 is reached, the unit is in Loop-check mode. The system can be verified by increasing or decreasing the flow rate value (0 to 88 GPM of water).</li> <li>• Use the Up or down arrow and observe the display segments get brighter as the flow rate value increases. That, is an indication that the analog output and wiring are reacting properly.</li> </ul>	
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**Analog output terminal check:**

When the front cover is removed, the analog output check terminals CH+ and CH- are visible at the upper part of the display. The analog output can be checked during measurement mode or loop check (see figure 4 below for reference).

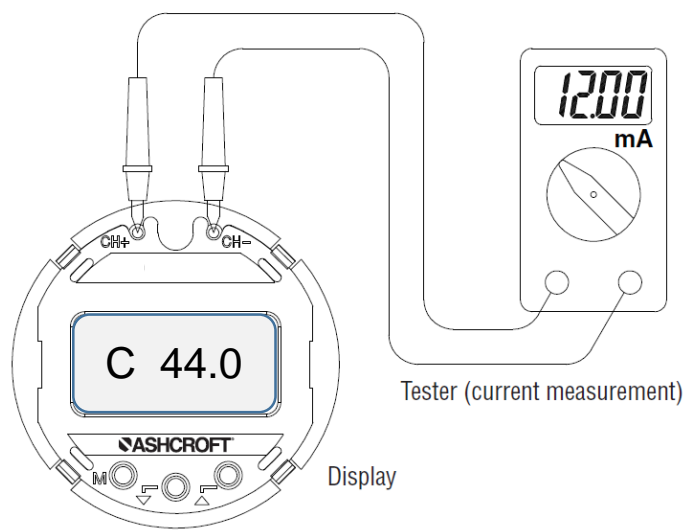






Figure 4 - Analog Output Verification

**Analog output check:**

Similarly, analog output can be verified by placing an amp-meter in series with the transmitter output and power supply (see manual wiring instructions for reference). As well, during measurement mode or loop check (see results below for reference).

<ul style="list-style-type: none"> <li>• Connect amp meter per manual instructions or figure above.</li> <li>• Press the Down arrow until 0.0 GPM is displayed or apply 0 IWC.</li> <li>• Verify amp meter reading (4.00 mA).</li> <li>• 0.0 GPM of water corresponds to 0% FS (4 mA at 0.0 GPM of water).</li> </ul>		
<ul style="list-style-type: none"> <li>• Press the Up or Down arrow until 44.0 GPM is displayed or apply 10 IWC.</li> <li>• Verify amp meter reading (12.00 mA).</li> <li>• 44.0 GPM of water corresponds to 50% FS (12 mA at 44.0 GPM of water).</li> </ul>		
<ul style="list-style-type: none"> <li>• Press the Up arrow until 88.0 GPM is displayed or apply 20.0 IWC.</li> <li>• Verify amp meter reading (20.0 mA).</li> <li>• 88.0 GPM of water corresponds to 100% FS (20 mA at 88.0 GPM of water).</li> </ul>	