



# OPTIMAL USE OF THE 4000/4100 SERIES ANALOG OUT CAPABILITY

APPLICATION NOTE FLOW-011 (A4)

## Introduction

TSI® Incorporated's 4000/4100 series flow meters have a feature that allows the user to determine the flow rate based on a 0-10 Volt Analog out signal. This feature has programmable options that can improve its use accuracy.

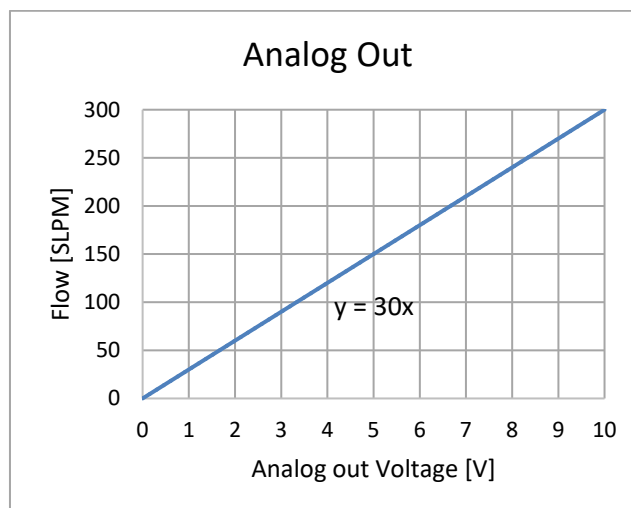
## Function of the Analog Out Feature

The 4000/4100 series meter has an analog out circuit that outputs a voltage signal that is linearly proportional to the flow measurement displayed on the front screen. The voltage signal has a 0-10 volt range. This output is configurable so the user can change the voltage output at zero flow and at the span flow.

The factory defaults for the analog out are as follows:

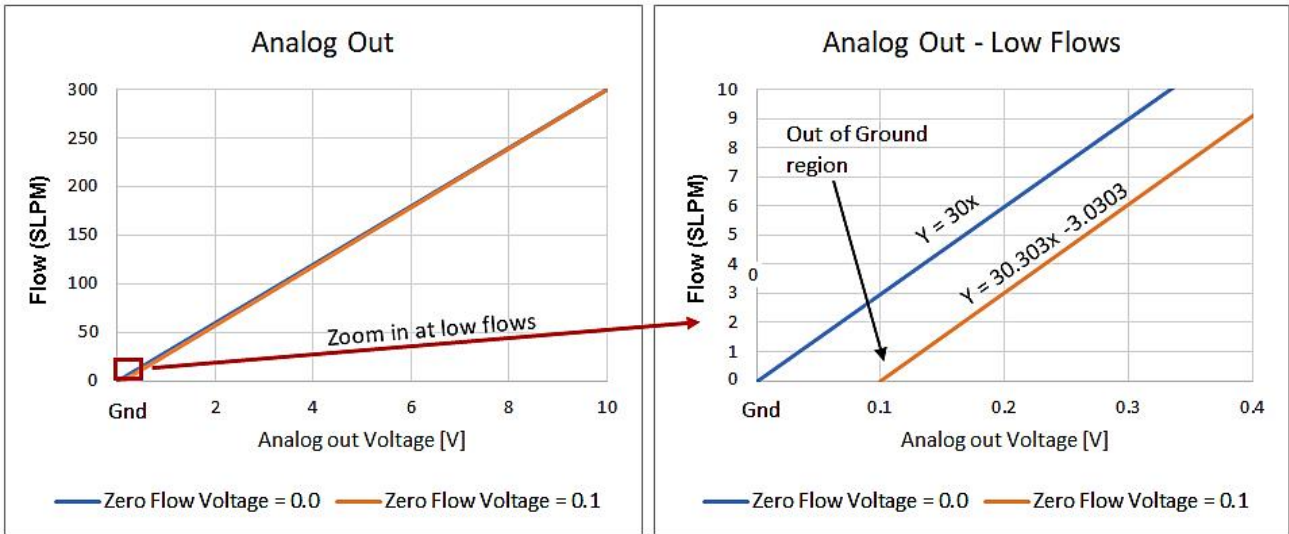
- 0 volts at zero flow
- 10 volts at span flow (300 SLPM for 4000 Series meters, 20 SLPM for 4100 Series meters)

The graph below shows the factor default relationship. This relationship results in an easy conversion from voltage to flow.



## Considerations When Needing to Read Zero and Low Flow Accurately

If the application requires accurate flow measurement at or near zero flows then it is recommended that the zero flow voltage be changed from its factory default of 0 volts to 100 mV. This is due to noise and slight offset of the ground voltage that could be interpreted as a low-level flow. By setting 100 mV (0.1 V) to be the zero-flow voltage, this gets out of the region around 0 volts (ground) where noise and a slight offset can shift the reading. The graphic below shows the change in zero voltage to move out of the ground region.

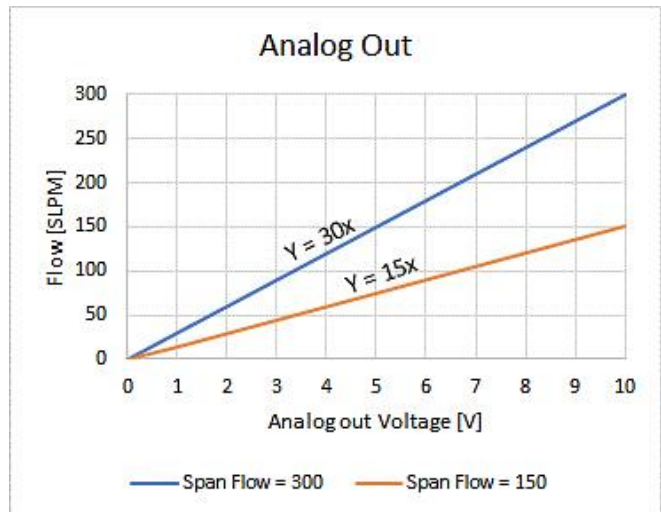


**NOTE:** The conversion equation changes if the zero is change to 100 mV.

## Considerations for Setting the Span Flow Voltage

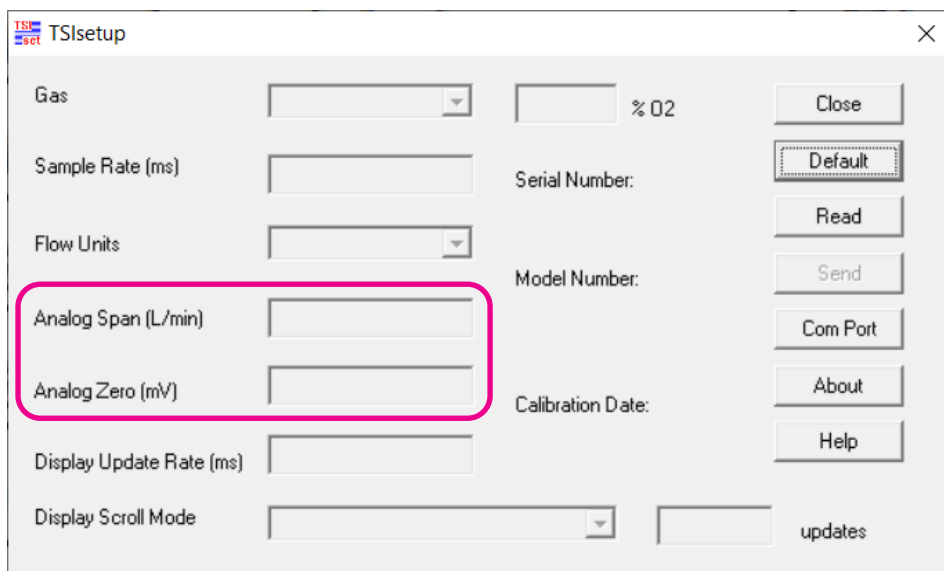
If the application does not require the flow meter to read up to its span flow then it is recommended that the analog span be set to the maximum limit that is required by the application. This will make for a better voltage to flow conversion due to more resolution per change in measured flow. The graphic compares examples with a span flow set to 300 SLPM (factory default for 4000 Series meters) and a 150 SLPM example.

For the factor default settings, each 1 SLPM change in flow will cause a 0.0333 change in voltage. If the application allows for the setting of 150 SLPM span, then for each 1 SLPM change in flow will cause a 0.0666 change in voltage. This will allow the voltage measurement device employed by the customer to be less precise.



## Process for Changing the Analog Zero and Span

The TSI setup program, provided free of charge, makes changing the analog zero and span easy. The graphic below shows where to enter the analog zero and span in the TSI setup program.



Reference the instrument manual for more details on how to use the TSI setup program.



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