

Analog Outputs

The MFT B-Series can support up to two analog output (AO) channels, AO1 and AO2. Either analog output channel can report Flow Rate, Temperature, Velocity, or PID Flow Controller and both are active during the Zero-Mid-Span Drift Check. HART versions of the sensor control board only have one AO channel.

Assignment of the Analog Output Function

The AOs support four functions as shown below. The process measurement is the most common. Some configurations will use one of the AO channels for the position signal on a valve or damper to control the Flow Rate (or Velocity).

4-20 mA Output Assignments

<i>Process Measurement</i>	<i>PID Flow Controller</i>
Flow Rate	Control Valve Position or Damper Position or Motor Controller Speed
Temperature	
Velocity	

The drift check and NE-43 alarms are temporary overrides to the analog output signals.

Temporary 4-20 mA override of Process Measurements

	Drift Check	NE-43 Alarms
Trigger	Internal Timer	Error Event Bits
Trigger	DI2 Input	

Detailed Electrical Description of 4-20 mA interface:

The positive output terminal is diode protected against reverse voltage. The output may be self-powered in the non-isolated mode by jumpering from the +24V terminal to the AO1+ or AO2+ terminal. Then the 4-20 mA output would be taken from the AO1- or AO2- terminal to ground. To use it in this mode, the receiving current should be sensed with an isolated input to avoid ground loop currents. This isolated input is often just a differential mode receiver. The 4-20 mA circuit has a 11V to 40V compliance. With higher voltage supplies, you have correspondingly higher load resistance available. As a loop-powered 4-20 mA output and a 24 V power supply, you can drive 600 Ω . Do not exceed 40 VDC on the loop-powered interface or you may have leakage current from the protective Metal Oxide Varistors (MOV), causing an error in the measurement. In summary,

a loop-powered configuration places a customer provided DC power source, the MFT B- Series output and load resistance(s) all in series.

Analog Output Setup

The analog output channels are setup in *Program Mode* using the Analog Output Setup menu. The menu guides the user through selecting the process variable to be output and the signal range for the process variable. The receiving device will need to be programmed for the same range.

Enter *Program Mode* by pressing **P**, the **access code** (654321), and **E**. Press **2** to invoke the *Quick Jump* option entry method and select **Option #5** or **#6**, for the Analog Out 1 or Analog Out 2 setup menu, respectively.

The following example shows the meter prompts to setup Analog Output #1 when Option #5 is selected at the *Program Mode* Option Entry menu.

The meter will prompt for a function to assign to the analog output. Use the **^** or **v** key to scroll through the valid selections, then press **E** to accept the selected function. As indicated in the Table above, the analog outputs can be assigned the following functions: FLOW RATE / VELOCITY / TEMPERATURE / PID.

```
ANALOG OUT 1
>FLOW RATE      ^v
```

The example shows the selection of the FLOW RATE process variable for analog output channel 1 of the meter. The meter will next prompt for the analog output signal at 4mA.

```
AO1 at 4mA
>0.00000000 SCFM
```

Use the numeric keys to enter the minimum flow rate that corresponds to 4mA and press **E** to accept the entry.

The meter will next prompt for the analog output signal at 20mA.

```
AO1 at 20mA
>12000.0000 SCFM
```

Use the numeric keys to enter the maximum flow rate that corresponds to 20mA and press **E** to accept the entry.

After all the parameters for the analog output setup have been entered the meter will return to the *Program Mode* Option entry menu. If the meter is configured with a second analog output channel, the second channel can be configured by selecting **Option #6** and following the steps outlined above.

PID Flow Control

The Analog Outputs can be part of an automatic flow controller. The Analog Output can control a valve, damper, or motor controller. The MFT B-Series will regulate the flow based on an internal set point value stored in the flow meter's memory or an external analog input signal which specifies the desired flow rate. The internal set point for the PID control can be set manually at the keypad or through a Modbus command. The external analog input set point is read from the analog input channel, if this option is installed on the board. There is a detailed description of the PID under [Flow Controller Setup](#).

Zero-Mid-Span Drift Check

The Zero-Mid-Span Drift Check is an automatic calibration mode where both 4-20 mA Analog Output channels report standard zero, mid, and high values for checking the calibration of the device and its data recording signal chain. There is a detailed description of the Drift Check under [Zero-Span Drift Check](#).

NE-43 Alarms

The NAMUR-Recommendations, specification NE-43, for alarm support on the 4-20 mA signal are included in the MFT B-Series meters. This means that for normal operation, the analog output signal is clipped between 3.8 and 20.5 mA. If any bit is set in the meter's Event Code, an NE-43 alarm will trigger.

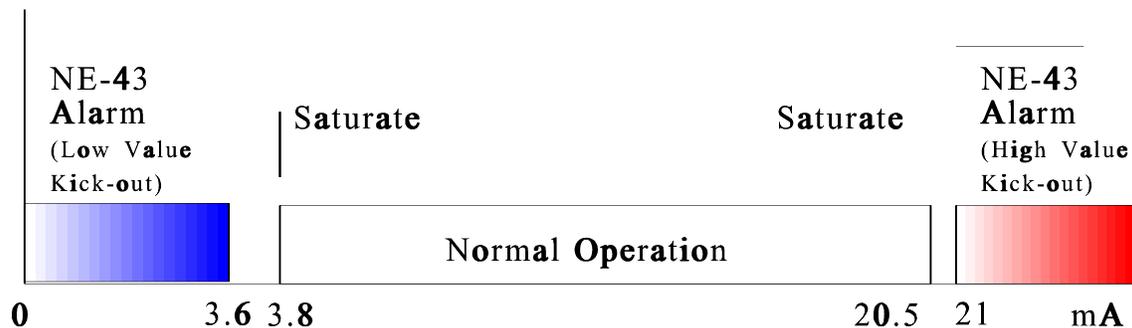


Figure F-1 4-20 mA operation with the NE-43 alarm.

The following flow meter error events cause a NE-43 alarm:

1. Unable to write configuration file to EEPROM
2. Abnormal sensor node voltages
3. Sensor type does not match configuration
4. Sensor over-voltage crowbar engaged
5. Sensor control drive stopped responding
6. ADC failed to convert measurement
7. High sensor or wire leakage
8. Rps Sensor Lead Open Circuit
9. Wire loop resistance above high limit
10. Rtc resistance below low limit
11. Rtc resistance above high limit
12. Rp resistance below low limit
13. Rp resistance above high limit

The type of alarm can be programmed under the NE-43 ALARM setup menu in *Program Mode*. Enter *Program Mode* by pressing **P**, the **access code** (654321), and **E**. Press **2** to invoke the *Quick Jump* option entry method and select **Option #10**.

The meter will prompt for an alarm type for the NE-43 Alarm. The choices in the selection list are LOW OUTPUT and HIGH OUTPUT. If LOW OUTPUT is selected, the meter will drive the 4-20mA output to 3.6mA when a meter fault occurs. Similarly, if HIGH OUTPUT is selected, the meter will drive the 4-20mA output to 21mA when a meter fault occurs.

```
NE-43 ALARM TYPE
>HIGH OUTPUT    ^v
```

Use the **^** or **v** key to select between LOW OUTPUT or HIGH OUTPUT, then press **E** to accept the selection or **P** to skip over the value and exit from the NE-43 Alarm Setup menu.