

Analog Outputs

The MFT B-Series supports two Analog Outputs, A01 and A02. The 4-20 mA linear output is a loop powered, isolated signal. Either Analog Output can report Flow Rate, Temperature, or PID Flow Controller and both are activated during the Zero-Mid-Span Drift Check.

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 channel for the position signal on a valve or damper.

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 process measurement.

Temporary 4-20 mA override of Process Measurements

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

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 A01+ or A02+ terminal. Then the 4-20 mA output would be taken from the A01- or A02- 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 Range.

The analog output (AO) range (4.00 mA = yy flow, 20.00 mA = zz flow) can be programmed using the keypad. A 4 mA current output will represent the minimum flow rate yy value. A 20 mA current output will represent the maximum flow rate zz value. You will need to program your receiving device for the same range.

Enter *Program Mode* by pressing **P**, then enter the **access code** (654321), then press **E**.

**ENTER ACCESS
CODE: *******

Advance through the major menus using the **P** key, press **E** when you see:

**PRESS E TO SET
ANALOG OUTPUTS**

Then select the output channel by pressing the **^ v** keys, then press **E**.

**PRESS ENTER FOR
ANALOG OUT 1**

Select **METER** by pressing the **^ v** keys, then press **E**.

**ANALOG OUT 1 ^v
ASSIGN TO METER**

Assign the meter # you want to this output channel by pressing the **^ v** keys then press **E**.

**ANALOG OUT 1
ENTER METER #1**

For the MFT B-Series #1 meter is the flow rate or velocity and #2 is the temperature. Next you select **FLOW RATE** by pressing the **^ v** keys then press **E**.

**OUT#1 NEXT TYPE
^v FLOW RATE**

Enter the minimum flow rate that reports 4 mA. Enter the number followed by the **E** key. If the value is changed a “new value accepted” message will be displayed.

```
LO=0.00000 SCFM
AT 4.000 mA
```

Enter the maximum flow rate that reports 20 mA. Again enter the new value followed by **E** to make a change.

```
HI=1200.00 SCFM
AT 20.000 mA
```

The next analog output channel will come up and you can select this with the **E** or escape using the **C** key multiple times.

```
PRESS E FOR
ANALOG OUT 2
```

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 a set point register or analog input for the set point. The set-point register for the PID control can be set manually through the keyboard, or by the Modbus protocol. The analog input comes from the AI 1 connection if this option is installed on the board. There is a detailed description of the PID under [Flow Controller Setup](#).

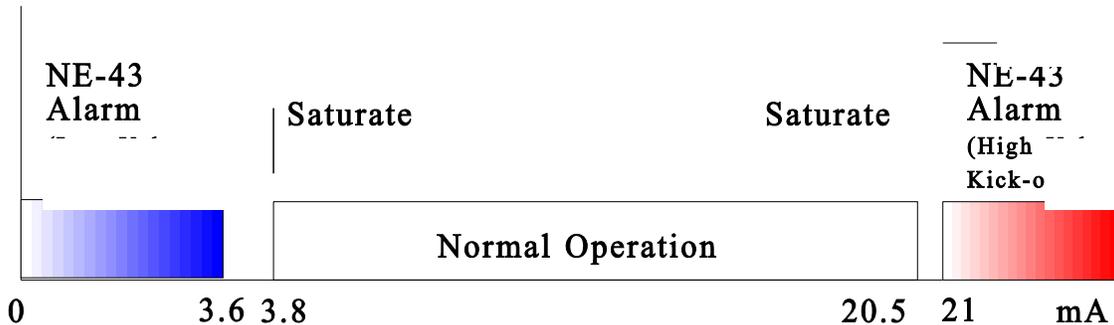
Zero-Mid-Span Drift Check

The Zero-Mid-Span Drift Check is an automatic calibration mode where both 4-20 mA Analog Outputs 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 normal operation analog output is clipped between 3.8 and 20.5 mA. If any bit is set in the Fault Index Register, an

NE-43 alarm will trigger. The type of alarm can be programmed under the SET ALARMS menu to cause a low output of 3.6 mA or less, or a high output of 21 mA or more. Figure



F-1 shows the operation of this alarm type.

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

The following system 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 following programmable events cause a NE-43 alarm:

1. Meter Kick-Out low
2. Meter Kick-Out high

The following example sets the NE-43 alarm to output high signal when triggered.

Enter Program Mode by pressing **P**. enter the **access code** (654321), and then press **E**.

ENTER ACCESS
CODE: *****

Advance thru the major menus using the **P**, press **E** when you see:

**PRESS E TO SET
ALARMS**

Advance thru the ALARMS menu using the **P** key until you see:

**PRESS ENTER TO
SET ALARM 2**

Press the **^** or **v** key until alarm 2 is shown, next press **E** to accept.
Continue through menus with the **P** key until you see:

**NE-43 ALARM ^v
LOW OUTPUT**

Press the **^** key to set the NE-43 alarm trigger HIGH OUTPUT.

**NE-43 ALARM ^v
HIGH OUTPUT**

Press **E** to accept. Escape this menu area using the **C** key multiple times.

The Meter Kick-Out is a programmable high and low limit that will set the NE-43 alarms. The following example sets the NE-43 alarm to output when triggered by a high flow Meter Kick-Out.

Enter Program Mode by pressing **P**. Enter the **access code** (654321), and then press **E**.

**ENTER ACCESS
CODE: *******

Advance thru the major menu using **P**, press **E** when you see:

**PRESS E TO SET
METER #1, FLOW**

Advance thru the METER #1 menu using the **P** key until you see:

**HIGH KICK-OUT
AT XX.XXX FUNIT**

Use the number keys to enter the highest flow, save the number with the **E** key.

Now turn ON the Kick-Out Advance thru the METER #1 menus using the **P** key until you see:

KICK-OUT IS OFF
^=ON v=OFF

Now press the **^** key to turn this on followed by **E** key. Escape using the **C** key multiple times.

Now if the flow rate goes above the number entered, the 4-20 mA output will trip to the programmed NE-43 alarm state.