Malema Dispense Meter

MDM-3000

(Covered by U.S. Patent nos. 6055868 & 5974897 Other Patents Pending)

Operating Instructions
and
Quick-Start Guide

www.malema.com

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Introduction

The Malema MDM-3000 Dispense Verification Meter is the first high-purity instrument to provide real-time, direct volume measurement of critical process fluids with greater speed and accuracy than possible from traditional flow meter totalizers, weight scales or graduated cylinders.

Using a special software algorithm (patent pending) and a proven non-invasive ultrasonic transducer that easily integrates into your existing dispense system, the MDM-3000 provides instant verification of each dispense and warns the user of out-of-tolerance dispenses caused by anomalies such as entrained bubbles, fluid contamination or faulty dispense hardware (filters, valves or pumps).

Using a MDM-3000 you can measure and validate every dispense, increasing productivity and quality, while optimizing your process eliminating wasteful chemical use.

Storage and Handling

Storage conditions

Store the product under packed condition in an anti-static bag. The storage place shall be free from moisture, mechanical shock and vibration. The ambient temperature shall be between 0°C and 60°C and the humidity between 5% and 80% R.H. without condensation.

Unpacking and Product Inspection

On delivery, check the product for damage. Confirm that the model code on the label matches the specification in the purchase order.

Confirm that you have the following items:

- Transducer
- Converter
- Input/output/power cable assembly
- Trigger interface kit (optional)
- This operating manual

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Installation Instructions

Preliminary Checks:

1) Verify that the power supply is between 12 V DC and 36 V DC. Power consumption is 4.5 watts maximum, and the current requirement depends on the supplied voltage. At 12 volts DC the meter draws about 300 mA; at 36 volts DC it is about 100 mA. Allow for an initial current of double the operating current (for about 1 second).
2) Verify that the 'Sensor cable' connector is properly mated (locked) into the mating connector on the Controller.
3) Verify that the 'Interface cable' connector is properly connected to the High Density D-Sub connector (Refer to Pg.10 for 'I/O Cable' details)
4) Ensure that the Sensor and Controller serial numbers match.

Procedure:

1) Install the transducer in-line to where you want to measure or validate the dispensed volume. The sensor can be installed in either a vertical or horizontal direction. The preferred orientation is vertical, with the fluid entering at the bottom. The 'flow direction' arrow on the Sensor should point in the same direction as the actual flow direction.

2) Verify that the flow tube is full of stationary liquid.

3) When the power is turned on, the instrument will cycle through a series of start-up messages on the LCD screen while it does a self diagnostic check.

4) Allow about 5 minutes of warm up time, then momentarily press the 'ZERO' switch on the front panel. The flow meter performs a 'Zero Calibration'.
The 'Zero Calibration' process takes around 20 sec to complete with a sequence of LCD messages showing the actual operation progress in terms of % of task completed. Wait for 100% completion indication on the LCD display. The instrument is now ready for making valid measurements.
Attention: To read valid dispenses,' ZERO calibration' needs to be done whenever the fluid properties change or the installation set-up is different than the one used for the previous 'ZERO Calibration'. Differences include chemical concentration, media or ambient temperatures, liquid viscosity and chemistry.

5) The MDM-3000 provides digital data output over a serial communication link. Any standard terminal program (e.g. Windows HyperTerminal Program) can be used to set up the serial communication with the flow meter.

Set-up the Serial communication properties for the Host Computer as follows:

- Baud rate - 57600
- Data bits - 8
- Stop Bit - 1
- Parity – None
- Flow control – None

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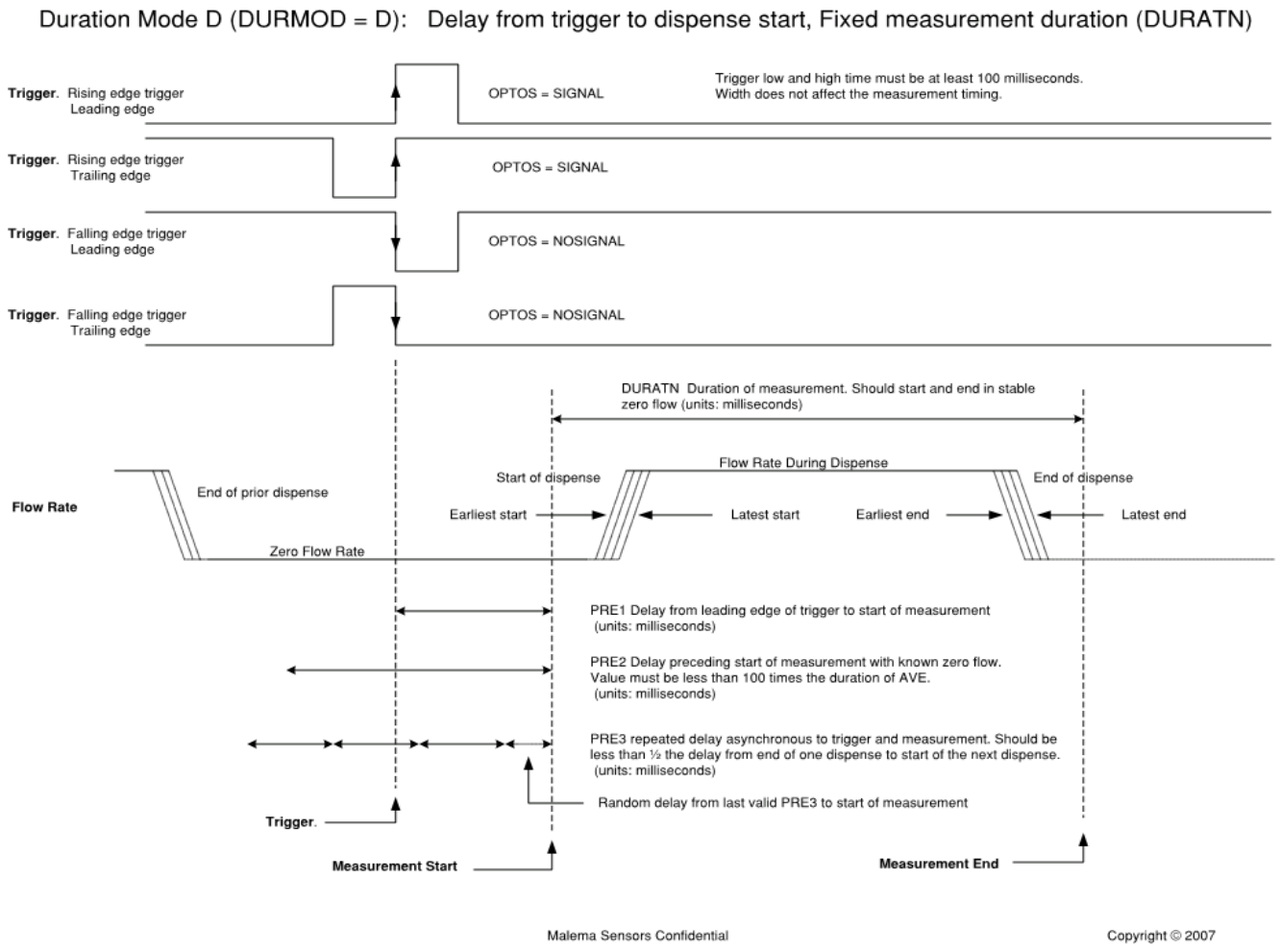
Setting-up Your Dispense Verification Meter

The MDM-3000 requires, as an input, a trigger signal that just proceeds the start of the dispense to indicate the beginning of a dispense cycle. Typically this trigger signal comes as a call for a dispense from a dispense pump or valve. There are 4 possible trigger signal configurations, shown below, and the MDM-3000 can be properly configured to accept any of them.

In order for the MDM-3000 to capture that flow profile and provide a precise report of the actual volume dispensed, you must describe the flow profile so the MDM-3000 knows what to look for. In order to accomplish the initial setup you must know the following:



Each dispense produces a flow profile similar to the flow proflile shown above. In order for the MDM-3000 to capture that flow profile and provide a precise report on the actual volume dispensed, you must describe the flow profile so the MDM-3000 knows what to look for. In order to accomplish the initial setup, you must know the following:

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Description	Command	Value
Trigger Signal	OPTOS	SIGNAL or NOSIGNAL
Duration of Dispense	DURATN	Estimated value in milliseconds
Dead time between trigger and dispense start	PRE1	Estimated value in milliseconds

When using the trigger interface kit (refer to pg #12), a valid trigger signal is, any electrical signal between 4 and 40 VDC that consistently arrives prior to the start of the dispense cycle.

The trigger interface cable is a non-standard accessory and should be ordered separately.

If not using the trigger interface kit, a valid trigger signal is any electrical signal between 4 & 24 VDC limited to 2 to 10 mA. Please refer to Appendix A.

The trigger signal can be either a positive voltage or negative voltage lasting at least 100mS.

With this information and your calibration kit (master meter, weigh scale, beaker, stop watch, etc.) in hand, proceed as follows:

1. Install the MDM-3000 transducer in the location where you want dispense verification
2. Ensure flow direction is vertical (upwards, preferred) or horizontal
3. Check for and correct any leaks
4. Connect the MDM-3000 controller to suitable power (12 to 36 VDC, 4.5 Watts) and interface points
5. Connect the MDM-3000 controller to its transducer
6. Ensure the transducer tube is filled with the dispense media and
    a. There are no bubbles in the transducer tube
    b. There is no flow
7. Power up the MDM-3000 controller, wait 5 minutes
8. Press the “Zero” button on the MDM-3000 controller front panel, wait for 30 seconds
9. Connect your terminal emulator program to the MDM-3000 controller via the supplied cable and a serial communications port on your laptop/desktop computer
10. Enter Command Mode by typing a “c”.
11. Start a Log File (very helpful if something goes wrong!)
12. Type PDUMP
13. Set OPTOS to SIGNAL or NOSIGNAL depending on the Trigger Signal provided
14. Set KCOEF to 1.000
15. Set DURATN to a time period (in milliseconds) that is longer than the expected dispense cycle
16. Set PRE1 to 10
17. Set PRN3 to “P”
    a. MDM3000>PRN3[ABCDEFGHIJKLNMOP]=P
    b. MDM3000>[----------P---------]
18. Type Quit
19. Initiate a Dispense Cycle
20. The MDM-3000 produces a dispense flow profile (similar to the Duration Mode D diagram above)

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21. After reviewing the flow profile:
    a. Enter console mode by typing “c”
    b. Set PRE1 to a value insuring MEASUREMENT START occurs just prior to the fluid start of every dispense cycle
    c. Set PRE2 so that it captures the available dead time between every dispense cycle (max value is 100 times AVE value)
    d. Set PRE3 such that it is between ¼ & ½ of PRE2
    e. Set DURATN such that it captures the entire dispense cycle in every case
22. Initiate a few (several) more dispense cycles verifying the flow profiles meet the criteria set forth above every time. This is critical. Adjust the parameters until each condition is consistently achieved.
23. When you are satisfied with the timing arrangements reset PRN3 to its initial value [usually [ABCDEFG------N--------]
24. Calibrate KCOEF:
    Dispense ten(10) dispenses into you beaker
    Total the dispense volumes reported by the MDM-3000
    Compute the new value for KCOEF using the formula:

$$KCOEF_{new} = \frac{Measured_{Dispense}}{Reported_{Dispense}} * KCOEF_{current}$$

25. Set KCOEF to the new value
26. Verify calibration:
    Dispense ten(10) dispenses into your beaker
    Total the dispense volumes reported by the MDM-3000
    Confirm that the volume in the beaker is the same or at least very close to the totalized dispense volume of each reported by MDM-3000.
27. Set your process acceptable limits. You can use symmetrical or asymmetrical targeting with the MDM-3000. Any dispensed volume outside of these limits generates a “Volume Out-of-Range” Alarm signal
    a. Set ALMMIN to your process Minimum Acceptable Volume [essentially 8.0 mA output on the 4 to 20 mA loop.]
    b. Set ALMMAX to your process Maximum Acceptable Volume [essentially 16.0 mA on the 4 to 20 mA loop.]

    Refer to Appendix C for Analog output profile

28. Set your process “Bubble Tolerance”. The MDM-3000 takes 1000 raw measurements every second. Some of these measurements fail due to any of several factors, mostly associated with the dispensed media, primarily, bubbles in the flow path. Observe the MDM-3000’s operation over several dispense cycles. The MDM-3000 reports how many raw measurements failed for each dispense. Select an error threshold (ERCTTH) somewhat larger than the typical value reported. Too high a threshold and you won’t catch any bubbles; too low and you’ll respond to numerous false alarms.
29. Type SAVE
30. Type QUIT
31. Your MDM-3000 is now ready to verify your dispense cycles one after another
32. From time to time (as described in your facility calibration process) you should:
    a. Re-zero the MDM-3000, particularly if there is a change in temperature, viscos ity, concentration or media.
    b. Recalibrate KCOEF

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Specifications

Performance Specification

Dispense Range*	10 µL to 100 mL
Accuracy**	2% ±2 µL

* Please contact the factory for special ranges
** Special calibration is available upon request while placing order

Functional Specification

Analog Output	Current	Isolated 4 - 20mA current output (Maximum load resistance of 500 Ω) (Under and over range capability 0 to 24mA)
Alarm Output		Configurable NO/NC, High/Low, Hysteresis
RS-232 Output		Many configurable options
Power Supply		12 VDC - to 36 VDC
Power Consumption		4.5 W continuous (600 mA max on start-up)
Ambient Temperature		32 - 115 °F (0 - 46 °C)
Fluid Temperature		50 - 140 °F (10 - 60 °C)

Sensor Materials Specification

Cable Material	PTFE covered cabling
Cable Length	2 meters (standard)
Non-wetted Parts	FEP, Peek, PP, PTFE, PVDF, Viton A
Wetted Parts	High Purity PFA

Controller Materials Specification

Enclosure Classification	IP20 (indoor use)
Mass	156 q (5.5 oz)
Materials	Anodized Aluminum, Plastic

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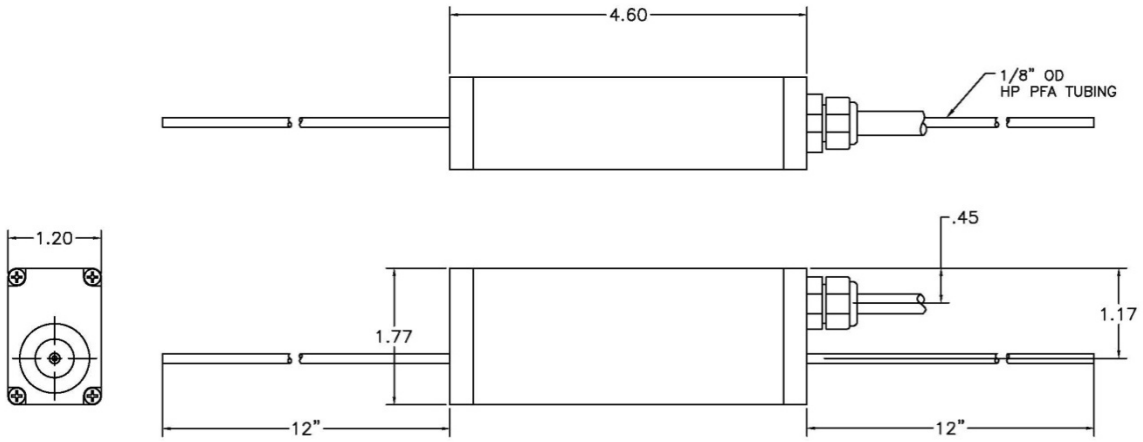
Dimensional drawings

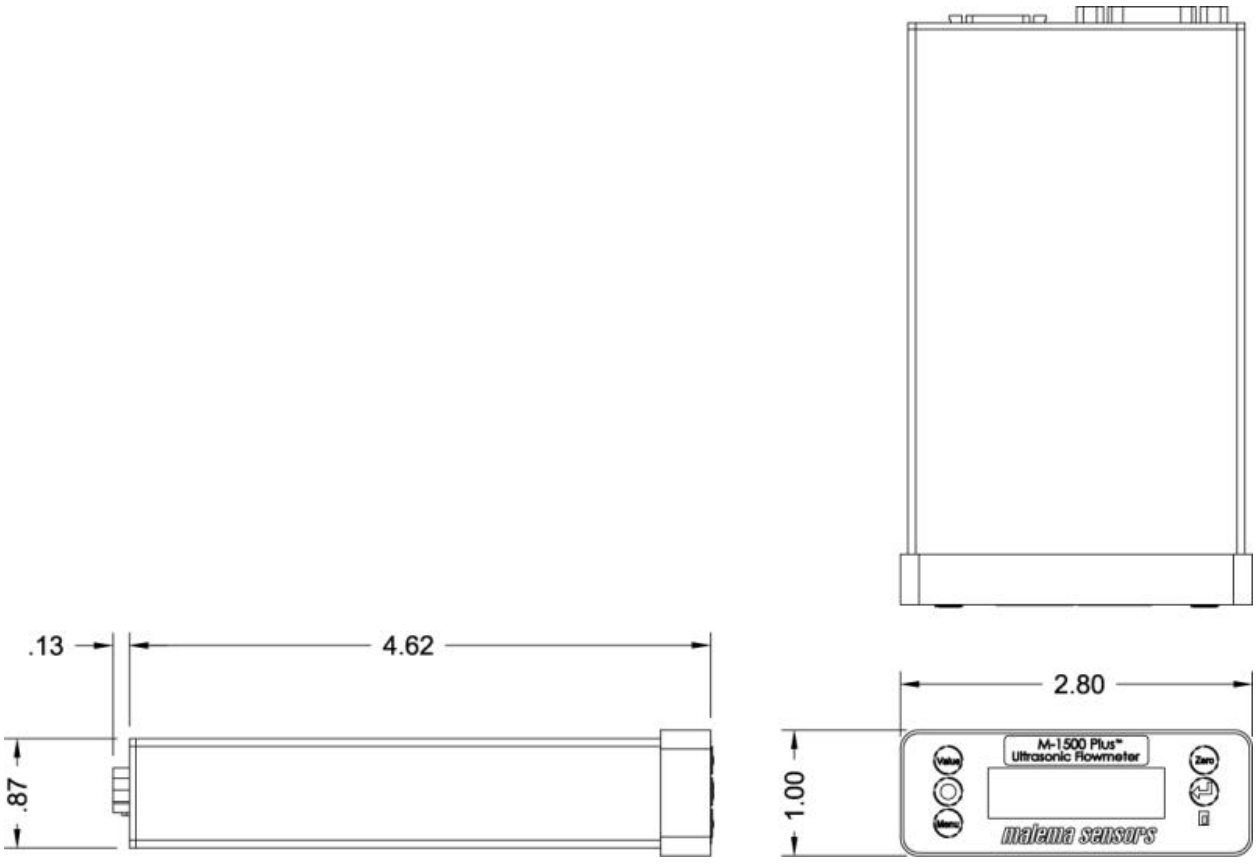
(All dimensions in inches)

Sensor Dimension **1/8”**



A smaller package is available. Consult factory for further information.

Controller Dimension



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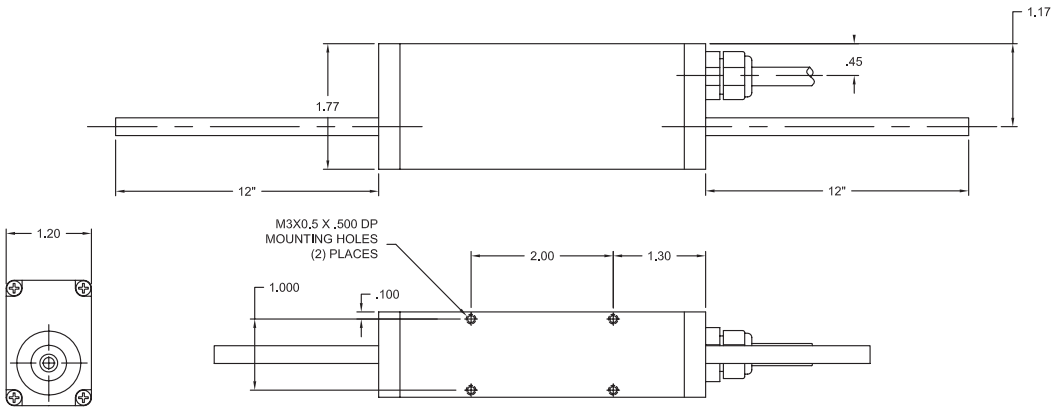
Dimensional drawings

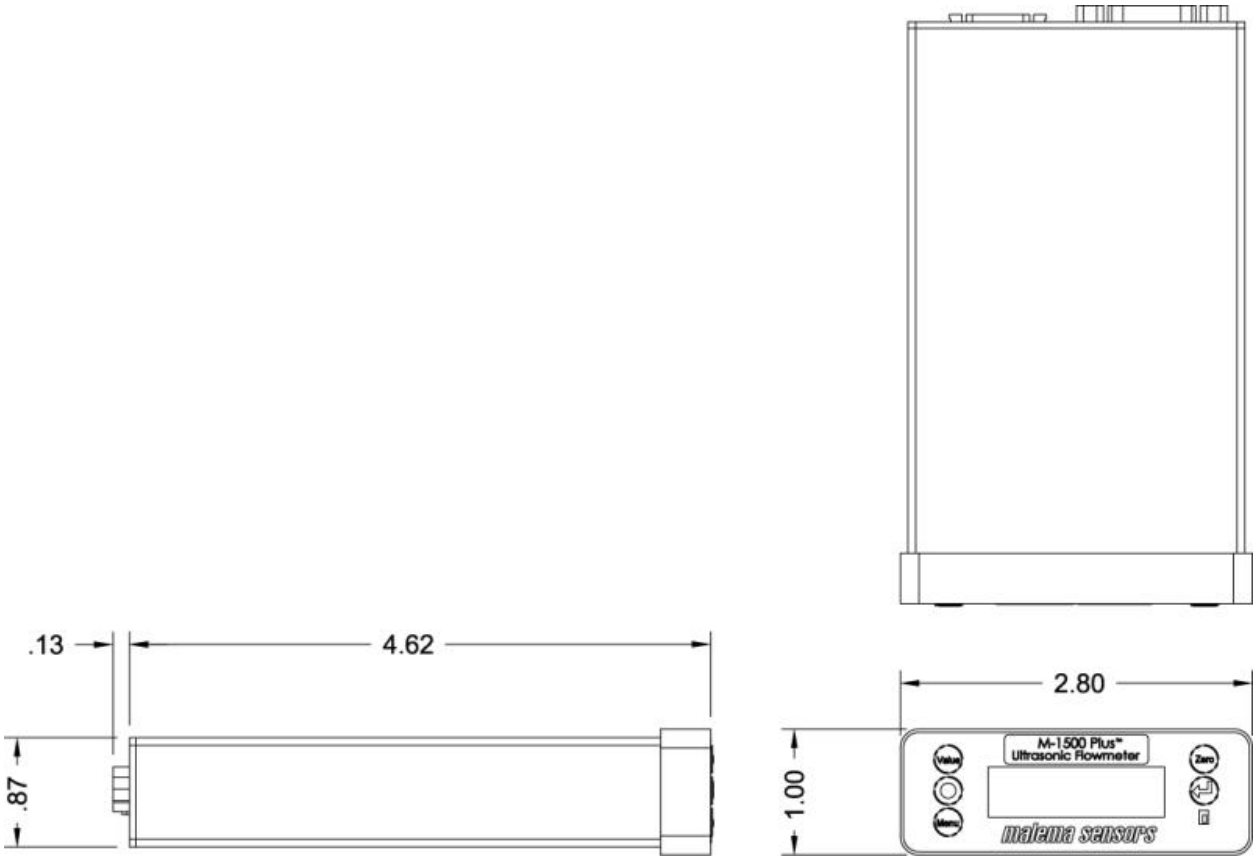
(All dimensions in inches)

Sensor Dimension 1/4”



A smaller package is available. Consult factory for further information.

Controller Dimension



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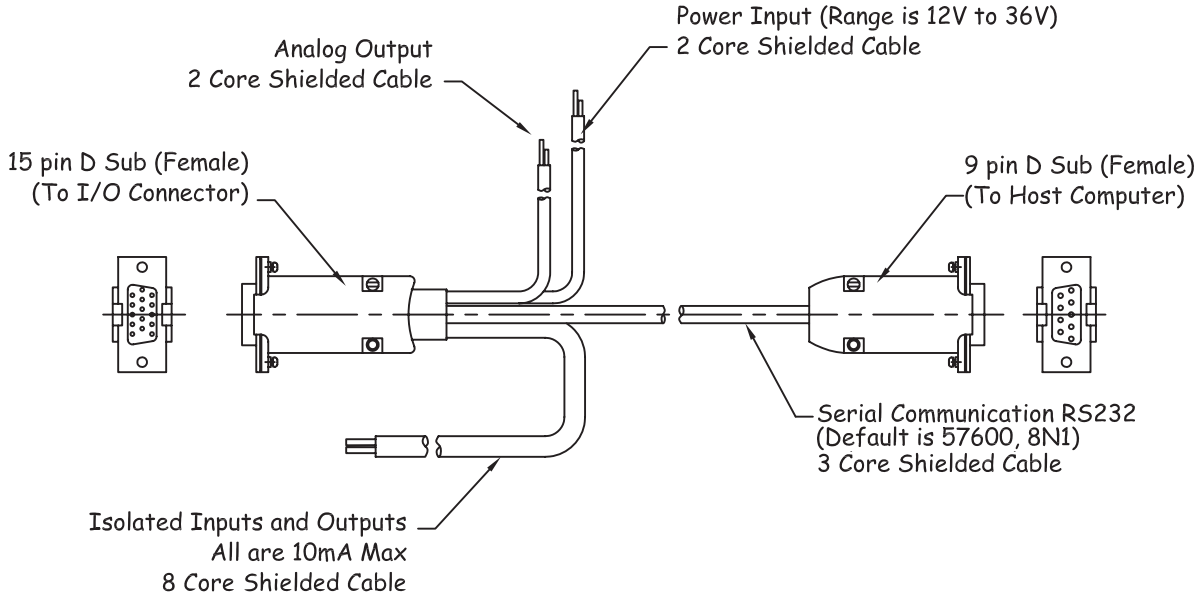
I/O Cable Details

MDM-3000 I/O Cable Harness Details

15 Pin D-Sub	Description	Wire Color	Remarks
5	Power In (+)	Red	Power
10	Power Return (-)	Black	
1	Disp Vol (+)	Clear	Analog Output
6	Disp Vol (-)	Black	
3	Measure [Alm 1] (+)	Orange	Miscellaneous I/O
8	Measure [Alm 1] (-)	White	
4	Dispense [Alm 0] (+)	Brown	
9	Dispense [Alm 0] (-)	Yellow	
2	Trigger Input (+)	Red	
7	Trigger Input (-)	Black	
11	Not connected	Blue	
12	Not connected	Green	
13	Serial Data (Gnd)	White	Communication
14	Serial Data (Rx)	Red	
15	Serial Data (Tx)	Black	



This cable harness is supplied as a standard accessory.

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2 Core Shielded Cable: ANALOG OUTPUT (0% to 120% of Full Scale range)

Color Code	Current Loop	Voltage 6V	Voltage 12 Vdc	15 Pin D-Sub
	Standard	Factory Option	Factory Option	
Clear	0 to 24 mA	0 to 6Vdc (+)	0 to 12VDC (+)	1
Black	Disp. Vol. Return (-)	Disp. Vol. Return (-)	Disp. Vol. Return (-)	6

2 Core Shielded Cable: POWER INPUT (Range is 12Vdc to 36Vdc)

Color Code	Description	15 Pin D-Sub
Red	24 (typ) Vdc(+)	5
Black	Power Return (-)	10

3 Core Shielded Cable: Serial Communications RS232 (Default is 57600, 8N1)

Color Code	Description	15 Pin D-Sub	9 Pin D-Sub
Black	Serial Data (Tx)	15	2
Red	Serial Data (Rx)	14	3
White	Serial Data (Gnd)	13	5

8 Core Shielded Cable: Isolated Inputs and Outputs. All are 10 mA Max

Color Code	Description	Polarity	Direction	15 Pin D-Sub
Red	Trigger Signal	+	Input	2
Black	Trigger Signal	-	Input	7
Orange	Measure[ALM 1] (+)	+	Output	3
White	Measure[ALM 1] (-)	-	Output	8
Brown	Dispense [Alm 0] (+)	+	Output	4
Yellow	Dispense [Alm 0] (-)	-	Output	9
Blue	Not connected	N/A	N/A	11
Green	Not connected	N/A	N/A	12

Note: All the shields are connected to the 15 Pin D-sub Shell EXCEPT for ANALOG OUTPUT cable

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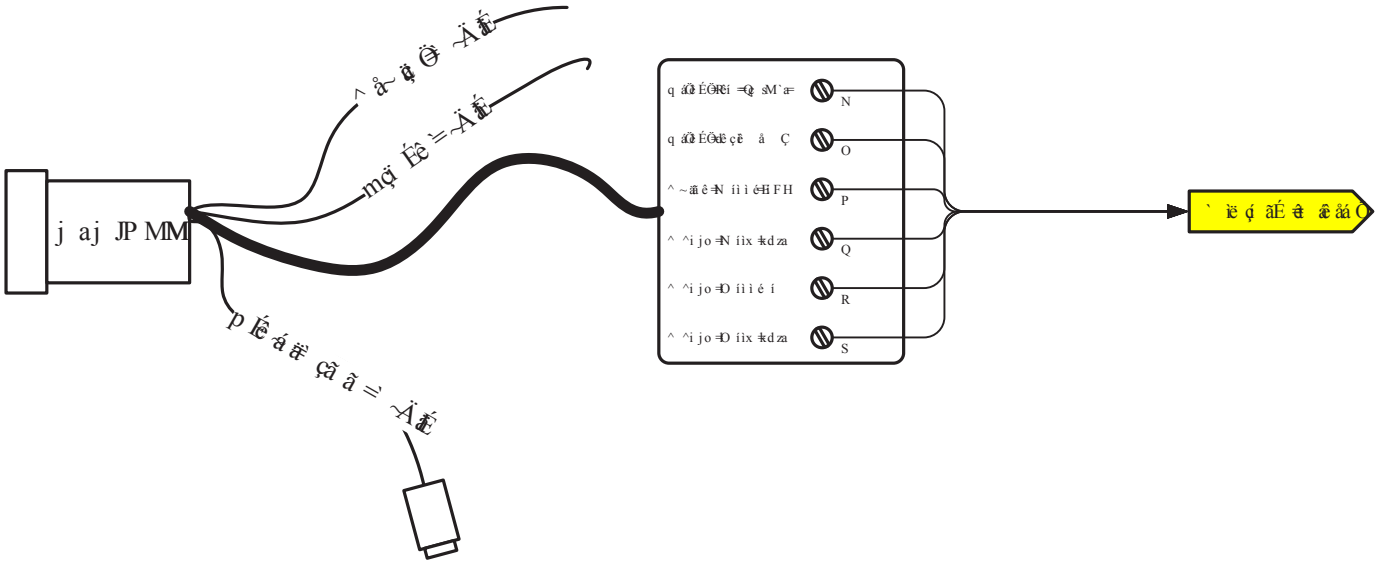
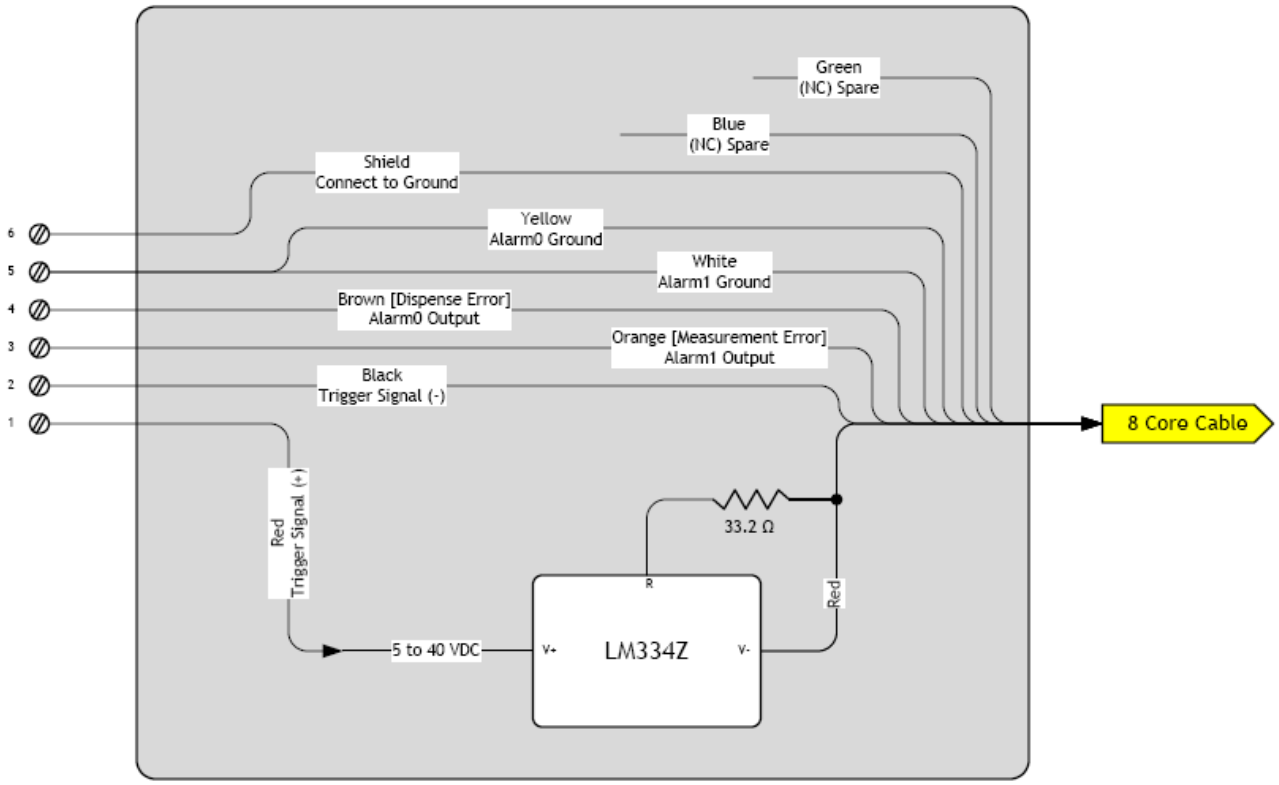
Trigger Interface Kit Details (Optional)



Any input signal between 5 and 40 Vdc can be used for the trigger signal with this interface box. The Interface Box provides a convenient method for connecting the MDM-3000 to a customers installation by furnishing screw terminals for the input & output signals and conditioning the customer's input signals.



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Console Interface Details

The main way to change the operational parameters of the MDM-3000 Dispense meter is through the console interface. To use the console interface of the MDM-3000, you must set up a terminal emulation program with the correct serial port number, baud rate and protocol.

The default serial protocol is commonly written as “57600, 8N1”, or:

- 57,600 Baud rate
- 1 Start bit
- 8 Data bits
- No Parity
- Flow Controls -- OFF

Use the RS232 cable supplied with the unit to connect to an RS232 PC port. If your computer has serial ports available, connect the MDM-3000 directly. If your computer does not have serial port(s) available, USB to Serial adapters are readily available from many sources.

Signal Name	MDM-3000 pin on back of controller (15 pin)	MDM-3000 pin on standard interface cable (9 pin)	Computer Serial Port	
			9 pin port	25 pin port
TX	15 (TX)	2 (TX)	2 (RX)	2 (RX)
RX	14 (RX)	3 (RX)	3 (TX)	3 (TX)
GND	13 (GND)	5 (GND)	5 (GND)	7 (GND)

The Terminal Emulation Program

To communicate with the MDM-3000 via the serial port (built in or USB) you need to run a terminal emulation program. Windows comes with such a program, named HyperTerm. In our experience, it is barely adequate. Three alternatives are suggested:

- TeraTerm which is free, and is available at
  - http://hp.vector.co.jp/authors/VA002416/teraterm.html
  - http://www.ayera.com/teraterm/
  - http://www.tucows.com/preview/195282

- CRT or SecureCRT from Van Dyke Software. A 30 day evaluation is available and it is not particularly expensive.
  - http://www.vandyke.com/products/crt/index.html

- Putty.exe which is free, and has no installation process.
  - http://www.chiark.greenend.org.uk/~sgtatham/putty

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Console Interface Details (continued)

Entering console mode:
If the serial port is connected to the MDM-3000, and the terminal emulation program is running and correctly configured, when the MDM-3000 is turned on, a startup message and copyright notice should be seen. If the MDM-3000 is already running, typing the letter “C” (for console mode) should place the MDM-3000 into console mode, and a prompt of “MDM3000>” should be seen.

Note:
1) The LCD of MDM-3000 controller will show: ‘No measurements’
‘Serial control’
2) The analog output will hold the last measurement value just before the user entered console mode or 4.0 on initial start-up of the device.

Do not proceed with the rest of this section until the “MDM3000>” is seen.

The console interface provides access to parameters and commands.

Each Parameter has a current value, a saved value and a default value (the factory default). If you want to see the current value of a parameter, then type the Parameter mnemonic and the “enter” key to return to the “MDM3000>” prompt. If you want to change the value of the parameter, type an “=” followed by the new value for the parameter. When you have finished typing the new value, type the “enter” key (↵). The MDM-3000 will respond by redisplaying the parameter name, and the updated value. Here is an example transaction, with the characters typed by the user in bold.

MDM3000>IIR [0.900] = 0.993 ↵

IIR[0.993]

Related item parameters are collections of related selections that make up a single parameter. These types of parameters are displayed as [----------] (no items selected) or [ABCDEFGHIJKLMNOP] (all items selected), or any combination of ‘-‘ and letters to indicate which items are selected (each letter represents a different item). When this type of parameter is changed, all the selections must be typed, even if you are only adding or removing 1 item.

Commands instruct the MDM-3000 to do something immediately, such as display the current list of parameter values, or save the current settings, or place the MDM-3000 into a diagnostic mode. If a command requires any extra information, the values are separated from the command by commas “,”. Some commands allow for the extra information to be optional.

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Remember:

1) Parameter and Command names may be entered in either lower or UPPER case. They will always display in UPPER case.
2) Each command sent to the Flow meter must be terminated by a carriage return (“ ↵ ”, CR = 0x0d).
3) After modifying the new operating parameter value, initiate the SAVE command to permanently store this new value. If the SAVE command is not initiated, the change to the operating parameter will be lost when the flow meter is turned OFF.
4) For most commands and parameters, the MDM-3000 comes with an “Auto com plete” feature which keeps track of the name as you type it, and if you have typed sufficient characters to uniquely identify the command or parameter name, it will automatically finish typing the name for you.
5) For many parameters, you can find out more about the parameter by typing a “?”, which will inform you of the allowable values for the parameter.

Command and Parameter Set Summary

Name	Type	Description
SAVE	Command	Saves parameter changes to flash memory.
RESTOR	Command	Restores all the parameters to their last saved value
DEFAUL	Command	Resets the factory default settings for all user settable pa-rameters
PDUMP	Command	Lists all current parameters with their values
QUIT	Command	Exits console mode
KCOEF	Parameter	Sets the media calibration constant of the flow meter
OUT0	Parameter	Sets contact type of Alarm0 (Opto 0)
OUT1	Parameter	Sets contact type of Alarm1 (Opto 1)
ALMMIN	Parameter	Sets process minimum acceptable limit
ALMMAX	Parameter	Sets process maximum acceptable limit
ERCTTH	Parameter	Sets Error Count Threshold

Note: Press ‘C’ or ‘c’ to enter the console mode.

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Command and Parameter Descriptions (condensed)

SAVE
This command saves all current parameter to internal Flash memory.
The saved parameters are used when power is turned on.

Note:
Caution If the user exits the console mode by executing the QUIT command and does not execute the SAVE command, any parameter changes since the last SAVE command will be lost when power is turned off. MDM-3000 will start up with the last saved parameters from the Flash.

Example:
To execute SAVE command.

MDM3000> SAVE<CR>
SAVING to FLASH
MDM3000>

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RESTOR
This command discards all parameter changes that have been made but not yet saved, and RESTORES all the parameters to their last saved value.

Example:
To restore parameters to their last saved value.

MDM3000> RESTOR<CR>
Parameters restored from Flash
MDM3000>

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DEFAUL
This command restores the factory default settings for all user settable parameters. Any parameter values that have been changed/saved by a user will be restored to factory default values.

Note:
Please consult factory before executing this command.
Warning: This command resets the KCOEF parameter that is unique to each sensor. This value was set at the factory, and by the user during the calibration setup. Before entering this command, note the current value of KCOEF, and after the default command is given, restore KCOEF to its previous value. Then enter the save command.

Example:
To restore the factory default parameters.

MDM3000> KCOEF [0.950] <CR>
MDM3000> DEFAUL<CR>
MDM3000> KCOEF [1.000]
MDM3000> KCOEF [1.000] = 0.950 <CR>
MDM3000> SAVE<CR>
SAVING to FLASH
MDM3000>

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PDUMP
This command displays all currently saved MDM-3000 parameters including the firmware versions and the serial numbers of the flow meter.

Example:
To display all the saved parameters.

```
MDM-3000> PDUMP
Controller Ver   FPGA Ver  Boot Ver       Alt Ver
V2.9.2A Dispense   13     Loader V4.0.2  Alt V2.11
Controller SN 0001100-097  Transducer SN 0001100-097

AVE     IIR     FR100   KCOEF   LFCUT   SECMT   DIREC
10      0.0000  100.0   1.0000  0.0     5       0

BAUD    CONTO
57600   300

HEADER  SERU    CURU    LCDU    PRN2 (Output columns)
0       0       10      200     [----------------]

IVMODE                  PRN1 (Headings)         OPTOS
4-20mA   0% to 100%     [-BCD-------LM---]     SIGNAL

 PRN3  (Dispense)       DURATN  ALMMIN  ALMMAX  DURMOD
[ABCDE--------N--]       1500   1.000   2.000       D

ERCTTH  OFFSET  TERRTH    PRE1    PRE2    PRE3
   10   0.000  10.000      10     200     100

S001    S007    S008    S010    S011    S013
  5      100      1      8000     10       20

S015    S016    S017    S027         S019
 7800    2000    20      50    [ABCDE-G---------]

                  Channel   No_Alarm    Alarm
Dispense Volume           0       Open     Closed
Measurement Difficulty    1       Open     Closed

      HWOPT             CTRLB             CTRLM
[----------------] [ABCDEFG---------] [ABC-EF----------]

Measured IV at 4 mA     Measured IV at 20 mA
       2.000                  10.000
MDM3000>
```


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QUIT

This command is executed to exit console mode. This command checks the current parameter values against acceptable value ranges.

If the parameters are valid, MDM-3000 exits the console mode (parameter setup mode) and returns to the measurement mode.

If the parameters are not valid, a message is displayed identifying parameter setting problems and the MDM-3000 remains in the console mode.

The user should identify and resolve the parameters setting errors and again execute this command so as to go back to the measurement mode.

Example:

To execute the QUIT command.

MDM-3000> QUIT <CR>

No problems with parameters

Cycle Number	Volume ml	Time	Tail Flow ml/min	Error Count	Trigger Early	Dispense Alarm	Measurement Alarm
1	1.468	1:31	-0.594	0	Trig ok	--	--
2	1.464	1:45	-0.164	0	Trig ok	--	--
3	1.466	1:52	-0.043	0	Trig ok	--	--
4	1.467	2:00	-0.445	0	Trig ok	--	--

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KCOEF (Linearizer set to default)
Two(2), mutually exclusive, methods are available for calibrating the MDM-3000; The Linearizer Table and the KCOEF parameter. The KCOEF is a linear scaling factor that is sensor and media specific. [The default utilizes the KCOEF. In order to utilize the Linearizer Table the KCOEF must be disabled or set to 1.000]

Parameter	Minimum Value	Maximum Value	Default Value
KCOEF	0.1000	10.0000	1.0000

Note:
To set this coefficient, the user needs to have an external reference method of checking the actual dispense volume such as a calibrated master meter, weigh scale (or graduated cylinder) and stop watch.

Please refer to the procedure described in page #7 for the procedure to determine KCOEF.

Example:

a. Set KCOEF to 1.000
b. Dispense ten(10) dispenses into your beaker
c. Total the dispense volumes reported by the MDM-3000
d. Compute the new value for KCOEF using the formula:

$$KCOEF_{new} = \frac{Measured\_Dispense}{Reported\_Dispense} * KCOEF_{current}$$

For example, the reference system shows 70.0 ml total dispense (sum of 10 dispense cycles) and the meter shows 64.995 ml total dispense (add the 10 reported values from the MDM3000 to get total).

Calculate the scaling correction coefficient as follows:

Substituting values in the equation we arrive at:

$$KCOEF_{new} = \frac{70.0\ mL}{64.995\ mL} * 1.000 = 1.077$$

MDM3000> KCOEF [1.0000]=
MDM3000> KCOEF [1.0000]=1.077<CR>
KCOEF [1.077]
MDM3000> SAVE

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OUT0,OUT1
When OPTO 0 or OPTO 1 outputs are configured as ‘ALARM’ outputs, the OUT0 or OUT1 parameters select between NORMALLY OPEN and NORMALLY CLOSED contacts.
The Letter ‘O’ is used for normally Open and the letter ‘C’ for normally Closed.

Parameter	Minimum Value	Maximum Value	Default Value
OUT0	0	C	0
OUT1	0	C	0

Note: 1)
The OPTO 0 and OPTO 1 outputs are ‘Open collector’ type outputs.
2) Refer to the Appendix B for the details on ‘Open collector’ output interfacing.

Example:
To SET OPTO 0 output contact to ‘Normally Closed’.

MDM3000> OUT0 [O]=
Letter ‘O’ for normally open, ‘C’ for normally closed
MDM3000> OUT0 [O]=C<CR>
OUT0 [C]
MDM3000> SAVE

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ALMMIN
This parameter sets your process minimum acceptable limits (essentially sets 8.0 mA output on the 4 to 20 mA loop). Any dispensed volume (in ml) outside of these limits generates a “Volume Out-of-Range” Alarm signal.

Example:
To set process minimum acceptable limit to 4 ml.

MDM-3000> ALMMIN [1.000]
Set lower limit for valid dispense volume (in ml)

MDM-3000> ALMMIN [1.000]=4
ALMMIN [4.000]
MDM-3000> SAVE

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ALMMAX
This parameter sets your process maximum acceptable limits (essentially sets 16.0 mA output on the 4 to 20 mA loop). Any dispensed volume (in ml) outside of these limits generates a "Volume Out-of-Range" Alarm signal.

Example:
To set process maximum acceptable limit to 6 ml.

MDM-3000> AMLMAX [2.000]
Set upper limit for valid dispense volume (in ml)

MDM-3000> ALMMAX [2.000]=6
ALMMAX [6.000]
MDM-3000> SAVE

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ERCTTH
This parameter sets your process maximum acceptable limits (essentially sets 16.0 mA output on the 4 to 20 mA loop). Any dispensed volume (in ml) outside of these limits generates a "Volume Out-of-Range" Alarm signal.

Example:
To set error count threshold to 100.

MDM-3000> ERCTTH [10]
Set Error Count Threshold. If the error count for a dispense exceeds this value, the error output is activated

MDM-3000> ERCTTH [10]=100
ERCTTH [100]
MDM-3000> SAVE

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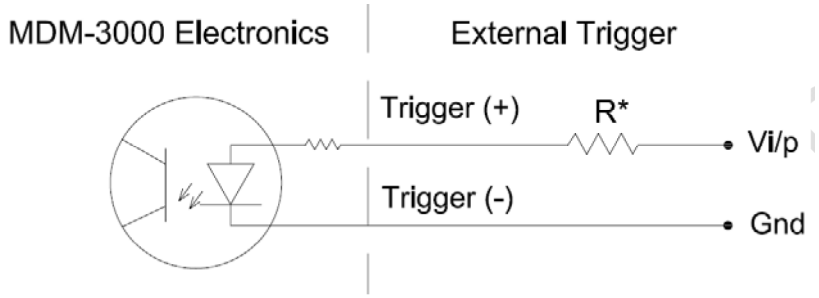
Appendix A

Wiring external trigger input



Where:

Vi/p range = 4 to 24 Vdc
* An external series resistor (R) should be used to limit the collector current below 10 mA.

R can be calculated as follows:
R Ohms = [(Vi/p volts -2) / 0.009] – 330

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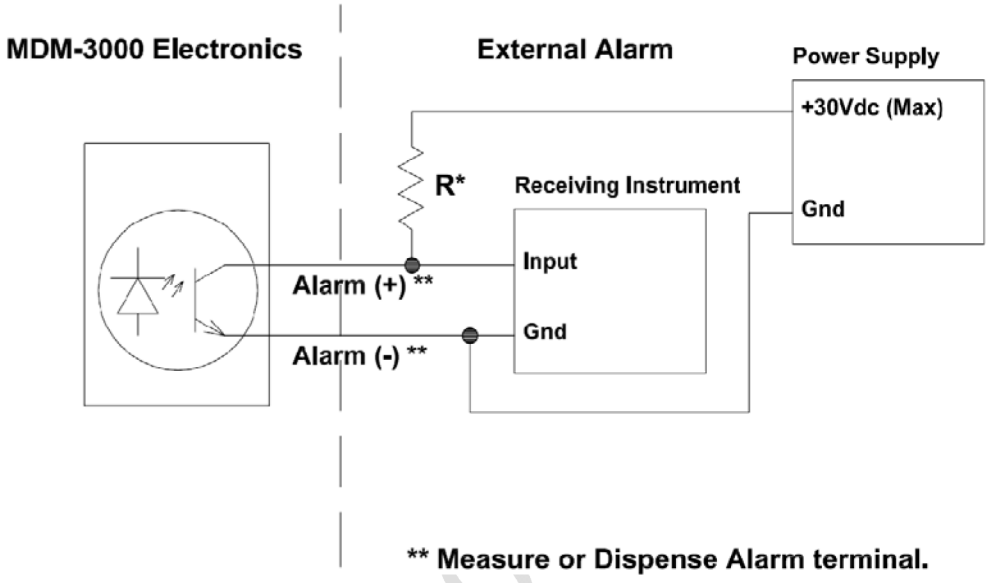
Appendix B

Wiring external alarm output



Where:

* An external series resistor (R) is recommended to limit the collector current below 10 mA.

R can be calculated as follows:
R Ohms = Vi/p at Alarm terminal / Max. Allowable collector current in Amps

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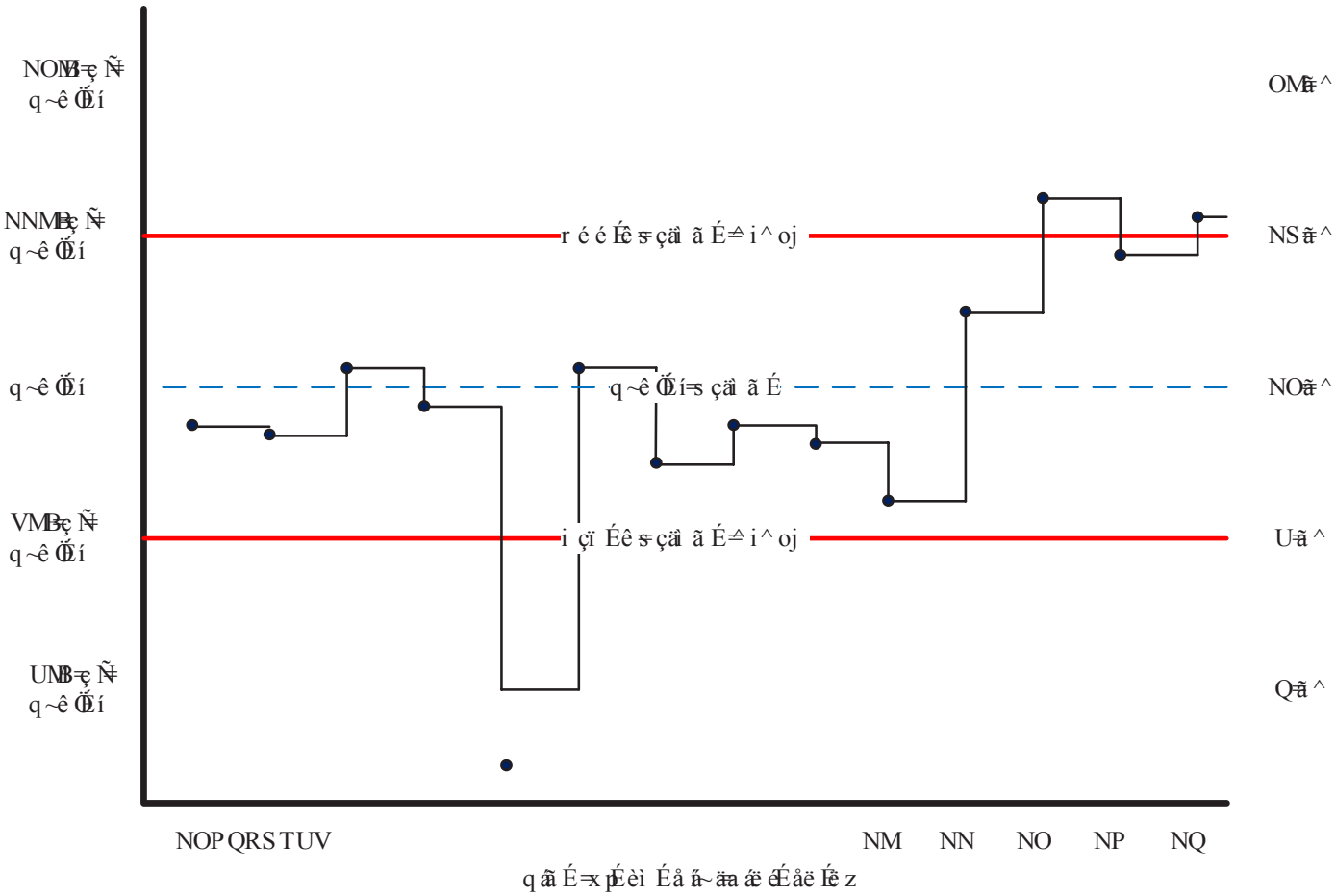
Appendix C

Analog Output Profile

Analog Output: The MDM-3000 holds the value of each dispense unit until the next dispense value is available. 50% of the available range [8 mA to 16 mA] monitors the acceptable range. 25% monitors the ranges just below and just above the acceptable range. Value beyond these ranges produce 4 mA or 20mA signals. This example utilizes 10% margins. Margins are user settable.



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Ordering Information

Model Code						Option
MDM-3000						
	-					
Material		T				PFA
Tube O.D.			1			1/8”
			2			1/4”
Connection Type				1		Tube Ends
					-	
						XXX

Warranty

Malema Sensors warrants to the buyer that its products are free from defects in materials and workmanship at the time of shipment and during the WARRANTY PERIOD. Malema Sensors obligation under this warranty is limited to the replacement of the product(s) by same product(s) manufactured by Malema Sensors or repair of the product(s) at the Malema Sensors facility. Malema Sensors products are sold with the understanding that the buyer has determined the applicability of the product(s) to its intended use. It is the responsibility of the buyer to verify acceptability of performance to the actual conditions of use. Performance may vary depending upon these actual conditions.

Warranty Period
This warranty is in effect for twelve (12) months from the date of shipment from Malema Sensors place of business.

Warranty Claim
If Malema Sensors products are found to be defective in materials or workmanship within twelve (12) months of the date of shipment, they will be repaired or replaced with same product at the discretion of Malema Sensors at its place of business at no charge to the buyer.

Return

To return the products, please obtain an RMA number for the product by contacting Malema Sensors (Corporate Office), Boca Raton at (800) 637-6418 or (561)995-0595.

All returns of equipment must go to the following address:
Malema Sensors,
1060 S Rogers Circle
Boca Raton, FL 33487, USA

NOTE: Specifications are subject to change without notice.

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