Safety Symbols And Warnings

Throughout this manual are safety warning and caution information boxes. Each warning and caution box will be identified by a large symbol indicating the type of information contained in the box. The symbols are explained below:

- **WARNING**
  - This symbol indicates important safety information. Failure to follow the instructions can result in serious injury or death.

- **IMPORTANT**
  - This symbol indicates important information. Failure to follow the instructions can result in permanent damage to the meter or installation site.

Safety Warnings

When installing, operating, and maintaining McCrometer equipment where hazards may be present, you must protect yourself by wearing Personal Protective Equipment (PPE) and be trained to enter confined spaces. Examples of confined spaces are manholes, pumping stations, pipelines, pits, septic tanks, sewage digesters, vaults, degreasers, storage tanks, boilers, and furnaces.

You must follow all state and local laws, as well as Occupational Safety and Health Administration (OSHA) regulations concerning Personal Protective Equipment and confined-space entry. Specific requirements can be found in the OSHA section of the Code of Federal Regulations: 29 CFR, 1910.132 - 1910.140, Personal Protective Equipment; and CFR Title 29, Part 1910.146, Permit-Required Confined-Spaces.

- **WARNING!**
  - **Incorrect installation or removal of meters can result in serious injury or death.** Read the instructions in this manual on the proper procedures carefully.

- **WARNING!**
  - **Never enter a confined space without testing the air at the top, middle, and bottom of the space.** The air may be toxic, oxygen deficient, or explosive. Do not trust your senses to determine if the air is safe. You cannot see or smell many toxic gases.

- **WARNING!**
  - **Never enter a confined space without the proper safety equipment.** You may need a respirator, gas detector, tripod, lifeline, and other safety equipment.

- **WARNING!**
  - **Never enter a confined space without standby/rescue personnel within earshot.** Standby/rescue personnel must know what action to take in case of an emergency.
1.0 INTRODUCTION

The Dura Mag flow meter combines the proven full bore magnetic flow sensor with a battery powered integrated electronic converter package to provide accurate flow measurement in tough, remote applications. The flanged end tube and wafer style designs permit use in a wide range of applications and are available for pipe sizes from 2 to 12 inches. The converter is powered by a lithium battery that can provide flow measurement for an estimated five years (covered by warranty for three years). The flow meter has optional pulse and 4-20mA outputs available. The 4-20mA output requires the optional DC power input which uses the battery as a backup power source. All Dura Mag flow meters have an internal datalogger standard, the optional datalogger software and cable is required to retrieve the stored data.

The Dura Mag flow meter uses Faraday’s Law of Electromagnetic Induction to measure water velocity. Faraday’s Law states: A conductor, moving through a magnetic field, produces a voltage.

Charge carriers in the fluid produce a voltage when passing through a magnetic field. The magnitude of the voltage is directly proportional to the velocity at which the fluid moves through the magnetic field. Electromagnetic coils inside the sensor produce magnetic fields, and electrodes on the sensor’s surface measure the voltage generated by the moving fluid.

2.0 PREPARING FOR A NEW INSTALLATION

2.1 Sensor Location

Adjoining pipe must be adequately supported, and the area around the sensor should provide sufficient drainage to prevent flooding the converter or conduits. The location chosen should provide room to read the display and be free from harsh electrical noise from adjacent equipment, cables, RFI, or EMI.

2.2 Pipe Run Requirements

Flow meters are velocity sensing devices and are vulnerable to certain upstream disturbances. Because of this, meters need certain lengths of straight pipe before and after the meter. These distances relate to the diameter of the pipe used. Obstructions can include elbows, valves, pumps, and changes in pipe diameter. The uneven flow created by these obstructions can vary with each system.

Both upstream and downstream distances are measured from the end of the flange as shown below (Figure 1).

<table>
<thead>
<tr>
<th>Meter size</th>
<th>Upstream</th>
<th>Downstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2” &amp; 3”</td>
<td>3D</td>
<td>1D</td>
</tr>
<tr>
<td>4” and above</td>
<td>2D</td>
<td>1D</td>
</tr>
</tbody>
</table>
2.3 Positioning and Orienting the Sensor

The following installation recommendations should be followed (see Figure 2 for installation diagrams):

**Horizontal installation**

In horizontal pipe runs, the meter should be installed so that the junction box is vertical insuring the electrodes are positioned to prevent coating by sediments or loss of electrode contact due to air bubbles.

**Vertical installation**

In vertical pipe runs, the flow should be upward. In slurry application, a vertical position ensures optimal distribution of solids under all flow conditions.

**Less than full pipes**

In pipes which may encounter less than a full pipe of fluid, the meter must be positioned in a trap to ensure that the sensor is always completely filled with liquid.

*Figure 2. Sensor orientation options*
3.0 INSTALLATION

3.1 Wafer Style Meter Installation
Install the Dura Mag between two flanged end pipes. Hardware and gaskets are provided, but customers must supply the flanged pipe ends. (Figure 3)
The flow meter may require grounding, depending on the environment they are being installed in. Refer to section 3.4 for a full description of grounding methods that are available.

3.2 Flanged Meter Installation
Install the Dura Mag flow meter inline between two flanged end pipes. The flow meter may require grounding, depending on the environment they are being installed in. Refer to section 3.4 for a full description of grounding methods that are available.

3.3 Grounding Considerations

3.3.1 Grounding And Electrical Interference
The sensor body must have electrical contact with the media. This is achieved via grounding rings. For best performance, McCrometer provides grounding rings for all sizes, and they should be installed.
Always ensure that the converter and the sensor are grounded (earthed) correctly. The grounding of the sensor and converter ensures that the equipment and liquid have an equal potential. For most installations the quality of grounding by the provided cabling assures the sensor is properly grounded and additional grounding of the sensor is not required. However, in instances where this is not the case, i.e. the equipment and fluid do not have an equal potential, such as where the installation location and/or media is subjected to electrical interference, additional grounding steps may be required. Consult an electrician experienced with instrumentation installations to determine if electrical interference is present.
3.4 Sensor Grounding

All Dura Mag flow meter installations require minimum grounding with a 12-gauge ground wire to an earth ground. Installation must conform to NEC requirements. Flanges on the Dura Mag sensor have a non-conductive coating and may not require grounding rings. For best performance, McCrometer can provide optional grounding rings for all sizes.

When installing into a PVC or plastic pipe system, grounding rings are recommended for all sizes.

---

**Information For Grounding Ring Installations**

- Gaskets must be used on either side of the grounding ring to provide a proper seal on the flanges. One gasket is used on flanges without a grounding ring.
- Rings & gaskets must align concentrically with the pipe so they do not obstruct or affect flow through the tube.
- The two grounding rings and four gaskets require an additional installation width of 0.5".

---

1. **Sensor grounding for meters with minimal ground noise**

Attach the provided 12 gauge wire, or equivalent, to the sensor ground lug. Then connect this sensor ground lug to an earth ground point. (Figure 4)

**NOTE:** The preferred method of installation is connecting the Dura Mag to its own isolated grounding rod. (Optional grounding kits are available. See Dura Mag price list, 30122-60.)
2. Sensor grounding for meters in an electrically noisy environment

If there is electrical noise in the fluid column or electrical current in the pipe, it can be minimized or eliminated using grounding rings or by grounding the pipeline.

a. Conductive uncoated pipe

Attach the provided 12 gauge wire, or equivalent, to the ground lug. Then connect the sensor ground lug to an earth ground point. (Figure 5)

Next, connect the two mating pipe sections with a 12 gauge wire or equivalent and connect them both to the earth ground. The Dura Mag should be electrically isolated from the pipeline.

b. Non-conductive or internally coated pipe

When pipes are non-conductive, such as PVC or internally coated pipe, you must substitute direct grounding with grounding rings.

Attach the provided 12 gauge wire or equivalent to the sensor ground lug. Then connect this sensor ground lug to an earth ground point; refer to NEC or local grounding regulations for wiring requirements in making this connection.

Next, connect the two mating grounding rings with a 12 gauge wire or equivalent, attached to the grounding ring lugs, and connect them both to the earth ground. The Dura Mag should be electrically isolated from the pipeline.
4.0 **OPERATION**

4.1 **General**

The flow meter comes pre-configured from the factory based on the installation parameters provided to McCrometer at the time of order. Other than activating the display, there is nothing required of the user for the basic operation of the flow meter.

4.2 **Activating the Display**

For the purpose of conserving power the display remains blank until activated. To activate the screen, press and hold the activation button for two seconds and then let it go. The screen will automatically deactivate after 60 seconds.

4.3 **Converter Boot**

The boot simply slips over the electronics enclosure. When installing the boot, insure the corners of the boot fit snugly over the lip of the enclosure. See Figure 8.

To remove the boot, grip two corners and pull them away from the lip of the enclosure and then pull upwards. See Figure 9.

**NOTE:**

It is HIGHLY recommended that converter is covered by the boot at all times when the meter is not being read. The boot adds protection to the converter.
4.4  Display Descriptions

a.  Active alarms

Figure 9 shows any active alarms. In the sample below, there is one alarm active for an empty pipe.

![Figure 10. Display cycle one](image1)

b.  Battery life

Figure 11 shows the battery life remaining for both battery packs and the flow totalizer. In the sample below, both battery packs are at 99% and total flow is 500 kilogallons.

![Figure 11. Display cycle two](image2)

c.  Flow rate and totalizer

Figure 12 shows the flow rate and the flow totalizer. In the sample below, flow rate is 15 gallons per minute and total flow is 500 kilogallons.

![Figure 12. Display cycle three](image3)

d.  Flow rate and percent of full scale

Figure 13 shows the flow rate and percent of full scale. In the sample below, the flow rate is 15 gallons per minute and the meter is running at 80% of full scale.

![Figure 13. Display cycle four](image4)
5.0 EXTERNAL CONNECTORS

10-32VDC Power/4-20mA Output And Pulse Output

The flow meter has one dedicated port and two optional ports on the back side of the electronics enclosure. (See Figure 14.) The dedicated port (center) is used to download data logger information or for meter service and troubleshooting. The two optional ports are for:

1. Optional 10-32 VDC power and 4-20mA output
2. Optional pulse outputs (flow volume and alarms)

The flow meter is configured at the Factory for the optional outputs and requested by the customer at the time of order. The external cables attach through a permanent cable gland (standard, Figure 14) or through a screw locking-type waterproof connector (quick connect option, Figure 15).

**IMPORTANT:**

When not in use, always keep the attached cap firmly screwed into the connector to insure a water-tight seal. Also, keep the contacts in the cable connector clean and dry during assembly.

---

**Figure 14. External connectors - standard cable gland**

**Figure 15. External connectors - quick connect options**
6.0 DC POWER CABLE (OPTIONAL)

The cable contains wiring for both the optional 10-32VDC power to the meter, and the 4-20mA output from the meter. (Figure 16 and Figure 17)

![Figure 16. DC Power And 4-20mA Cable Wiring Color Scheme (Optional)](image)

7.0 PULSE OUTPUT CABLE (OPTIONAL)

The cable contains wiring for both Pulse Output 1 and Pulse Output 2. (Figure 18)

![Figure 18. Pulse Output Cable Wiring Color Scheme (Optional)](image)
8.0 BATTERY REMOVAL AND REPLACEMENT

BEFORE YOU BEGIN:
Check supplies to ensure all parts are present.

**Materials Provided**

- One triple D battery pack
- One double A battery pack
- Replacement cover gasket
- Molykote lubricant
- Dry pack
- Zip tie
- Replacement screws
- Tamper proof wire seal
- Tamper proof stickers

**I. Removing the cover**

1. Remove the warranty stickers from the left and right sides of the cover rim.
   *NOTE: This step not required for battery installation in new meters.*

2. Cut off the tamper proof seal and remove the wire from the security screws.
   *NOTE: This step not required for battery installation in new meters.*

3. Remove screws holding the lid to the housing. Lift the lid up and remove the screws and lock washers. Set them aside and place the lid upside.

**If you are replacing batteries with fresh batteries, continue to step 4.**

**If you are installing batteries in a new meter that does not have batteries already installed, go to step 11.**
II. Shutting off the system

IMPORTANT! You must follow the next steps in this specific order to insure the unit does not reset the internal time clock. If you have the Data Logger Software and communication cable, disregard these next steps. The clock may be set with software once the unit is re-assembled.

Note: Leaving the unit powered down for an extended amount of time will cause a delay of the clock.

4. Watch the STATUS LED to make sure it is blinking at a fast pace.
5. Wait for the unit to go to sleep.
6. Watch for the STATUS LED to blink at a very slow pace (about every 15 seconds).

7. IMPORTANT! After the STATUS LED blinks one time, use a small flat head screw driver to turn off DIP switch number 2 (B1) FIRST. Then switch off DIP switch number 1 (B2).

III. Removing the batteries

8. Remove the screws opposite of the hinge of the LCD display / battery cover and flip open the battery cover.

Depending on the age of your meter and converter box, your batteries will be one of the two types shown below.

9. Unplug the batteries.

10. Remove the batteries. The older style has two large packs in the tray, while the newer style has one large pack in the tray and one small pack attached to the chassis with Velcro.
IV. Installing the batteries and restoring the power

11. If there is no strip of Velcro on the side of the chassis, remove the clear adhesive protective strip from the small battery pack and press the entire battery pack in place as shown in the picture at right.

12. Set the batteries in place, making sure the wires extend toward the battery connectors.

13. Plug the batteries into the circuit board.
   - The single battery pack goes to connector B1.
   - The double battery pack goes to connector B2.

14. Using a small flat head screwdriver, move DIP switch 2, labeled B1, to the ON position. Then move DIP switch 1, labeled B2 to the ON position.

   IMPORTANT! Make sure to move DIP switch 2, labeled B1 FIRST. An incorrect boot-up will occur if B1 is not powered first.

15. Set the hinged LCD/internal battery cover back in place to see the display. The unit will start to power up. You will see the start screen as it goes through a boot up mode. Ensure that the unit is powered normally and there are no alarms.

16. Replace the two screws that hold the LCD/battery cover.
Battery Installation and Replacement

V. Replacing the gasket
If you installed replacement batteries, we recommend that you replace the gasket. If you installed new batteries, you must set the gasket in place before replacing the cover and closing up the unit.

17. If your unit has a gasket, remove it.
18. Apply a light coating of Molykote to the replacement gasket.
19. Place the gasket in the groove and press it in.

VI. Replacing the cover
The dry pack must be set in place when new batteries are installed and replaced when batteries are replaced.

20. Remove the screw holding the dry pack and zip tie on the converter lid.
21. Wrap the new zip tie around the new dry pack. Cut the excess of the zip tie.
22. Install the new zip tie with dry pack onto the converter lid.
23. Place the converter lid onto the housing. Insert the screws, washers and lockwashers as shown at right and tighten them firmly.

Be sure the security screws (smaller screws with holes) are installed towards the back.

24. Guide the tamper proof seal through the holes in the screws as shown.
25. Connect the tamper proof wire as follows:
   (A) Run the wire up the back channel and down front channel of the plastic connector.
   (B) Snap the plastic connector lid into place.
## 9.0 METER SPECIFICATIONS

### Pipe Sizes
- 2", 3", 4", 6", 8", 10", 12"

### Accuracy*
- ± 1% or ± 0.075% of standard full scale

### Pipe Run Requirements
- **2” & 3”**: 3D upstream / 1D downstream
- **4” and larger**: 2D upstream / 1D downstream

### Display
- 2-Line LCD display (no backlight), 16 characters per line
  - Non-volatile memory
  - Anti-reverse totalizer (standard)
  - Total (to 9 digits of precision)
  - Flow Rate and Velocity (to 5 digits of precision)
  - Two alarms: low battery and empty pipe

  *Note: To preserve battery life a button on the front of the converter activates the display.*

### Power
- **Battery**: Standard: three 3.6V lithium-thionyl chloride (Li-SOCl₂) D size batteries. Batteries are field replaceable
- **DC Power**: Linear power supply 10-35VDC, 2.4W

### Warranty
- **Meter**: 5 year warranty
- **Battery Pack**: 5 year warranty
- **Liner**: Lifetime guarantee

### Outputs
- **Pulse Output**: Digital pulse (open collector) output for volumetric and/or alarm
- **Analog Output**: 4-20mA (not galvanically separated from the power supply). DC powered option only.

### Data Storage
- Data logger (standard with all models), minimum of five years of data stored

---

**FREQUENTLY ASKED QUESTIONS**

**Q**: What are the warranty lengths?
**A**: Meter warranty: 5 years
- Battery pack: 5 years
- Liner: Lifetime guarantee

**Q**: Is there a data logger?
**A**: Yes, every Dura Mag comes standard with an internal data logger for easy data recording and transfer.

**Q**: What alarms are available?
**A**: Two alarms: Empty pipe alarm and low battery.

**Q**: What if I need to connect to telemetry?
**A**: Choose one of the pulse or 4-20mA output options. If using one of McCrometer’s telemetry options, choose the telemetry-ready 7-pin connector.
**Environmental**

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>-4° to 140°F (-20° to 60°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-40° to 149°F (-40° to 65°C)</td>
</tr>
</tbody>
</table>

**Converter Enclosure**

| IP67 |

**Electrical Connections**

| Optional quick connect for easy installation |

**Pressure Rating**

| 150 psi |

**Options and Accessories**

- Two alarms: low battery and empty pipe
- Data logger cable (sold separately)
- DC power w/battery backup
- Pulse & 4-20mA output
- Annual verification / calibration

**Units**

| US gallons | megaliters |
| US gallons x1000 (standard totalizer) | cubic meters |
| US gallons x1,000,000 | cubic meters x1000 |
| cubic inches | acre feet |
| cubic feet | acre inches |
| cubic feet x1000 | imperial gallons |
| cubic centimeters | imperial gallons x1000 |
| cubic decimeters | imperial gallons x1,000,000 |
| milliliters, liters | standard barrels |
| deciliters | oil barrels |
| hectoliters | miner inch days |
| kiloliters | |

**Unit Rate Scales**

| seconds, minutes, hours, days |

*All Dura Mag meters are calibrated in a NIST traceable gravimetric test stand with a minimum straight run of 10D upstream and 2D downstream. A calibration certification report is provided with each Dura Mag meter certifying the specification accuracy in our laboratory test. Alternative piping configurations or electrical environments may impact the performance of the meter in the field.*
12.0 DIMENSION AND WEIGHTS

METER GROUNDING RECOMMENDATIONS

Grounding the meter body for safety according to national (NEC) or local electrical codes is recommended on ALL meter installations.

For best performance, grounding the fluid column is recommended when the meter is installed in an electrically noisy environment, such as with VFD pumps or nearby electrical systems with insufficient grounding.

**Conductive or uncoated pipe** - The uncoated pipe flange can be used to establish a connection to earth ground.

**Plastic or internally coated pipe** - Grounding rings can be installed to establish a connection to earth ground.

See the Dura Mag IOM Manual, Lit. # 30122-53, for more information on grounding configurations using grounding rods and grounding rings.

### DIMENSION AND WEIGHTS

**Dura Mag body type 1**

<table>
<thead>
<tr>
<th>Pipe Size (Nominal)</th>
<th>Standard GPM Flow Ranges Min - Max</th>
<th>DIMENSIONS (Lay Lengths in inches)</th>
<th>Estimated Shipping Weight (lbs.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>30 - 1,000</td>
<td>A&quot; 13.4&quot; B 9.0&quot; C 9.25&quot;</td>
<td>70</td>
</tr>
<tr>
<td>6&quot;</td>
<td>60 - 2,000</td>
<td>A&quot; 14.6&quot; B 11.0&quot; C 10.25&quot;</td>
<td>80</td>
</tr>
<tr>
<td>8&quot;</td>
<td>105 - 3,500</td>
<td>A&quot; 16.1&quot; B 13.5&quot; C 11.25&quot;</td>
<td>115</td>
</tr>
<tr>
<td>10&quot;</td>
<td>165 - 5,500</td>
<td>A&quot; 18.5&quot; B 16.0&quot; C 12.5&quot;</td>
<td>140</td>
</tr>
<tr>
<td>12&quot;</td>
<td>195 - 6,500</td>
<td>A&quot; 19.7&quot; B 19.0&quot; C 13.5&quot;</td>
<td>190</td>
</tr>
</tbody>
</table>

* Shipping weights are estimated and may change due to specific order packaging.
Dura Mag body type 2

**Meter Body Dimensions And Weights**

<table>
<thead>
<tr>
<th>Pipe Size (Nominal)</th>
<th>Standard GPM Flow Ranges Min - Max</th>
<th>Dimensions (Lay Lengths in inches)</th>
<th>Estimated Shipping Weight (lbs.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A* B C</td>
<td></td>
</tr>
<tr>
<td>2”</td>
<td>10-250</td>
<td>4.5 5 8.1</td>
<td>10.1</td>
</tr>
<tr>
<td>3”</td>
<td>20-550</td>
<td>4.5 5 8.6</td>
<td>11.7</td>
</tr>
</tbody>
</table>

**Dura Mag - S Series Dimensions**

<table>
<thead>
<tr>
<th>Pipe Size (Nominal)</th>
<th>L (inches)</th>
<th>Weight (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4”</td>
<td>10.24</td>
<td>34</td>
</tr>
<tr>
<td>6”</td>
<td>12.27</td>
<td>50</td>
</tr>
<tr>
<td>8”</td>
<td>14.24</td>
<td>71</td>
</tr>
<tr>
<td>10”</td>
<td>18.18</td>
<td>130</td>
</tr>
<tr>
<td>12”</td>
<td>19.68</td>
<td>170</td>
</tr>
</tbody>
</table>

**Other Supplier Dimensions***

<table>
<thead>
<tr>
<th>Pipe Size (Nominal)</th>
<th>L (inches)</th>
<th>Weight (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4”</td>
<td>10.24</td>
<td>70</td>
</tr>
<tr>
<td>6”</td>
<td>12.27</td>
<td>80</td>
</tr>
<tr>
<td>8”</td>
<td>14.24</td>
<td>115</td>
</tr>
<tr>
<td>10”</td>
<td>18.18</td>
<td>140</td>
</tr>
<tr>
<td>12”</td>
<td>19.7</td>
<td>190</td>
</tr>
</tbody>
</table>

* Shipping weights are estimated and may change due to specific order packaging.

---

*Dura Mag S Series meters are available in lay lengths compatible with products from other meter suppliers*. See the tables below for matched lay length options.

---

*S* Seametrics Electromagnetic Meters (Ag3000/Ag3000P or iMag4700 series); Seametrics® is a registered trademark of their respective owners. Sparling Instruments (BlueWater Flowmeter FM676); Sparling® is a registered trademark of their respective owners.

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13.0 DC POWER SUPPLY SPECIFICATIONS

Part Number: 115-12

Voltage – Input: 120 VAC ± 5% / 60 Hz (external fuse recommended)

Voltage – Output: 12V ± 0.5 VDC @ 200mA

Current – Output (Max): 200mA

Power – 2.4W

Environment: Operating Temperature: 0 to 55°C (21 to 130°F); Maximum Humidity: 95% Relative Humidity, Noncondensing

Weight – 0.38 lb.

Mounting – Side or base chassis mount
## 10.0 ALARM MESSAGES

<table>
<thead>
<tr>
<th>ALARM MESSAGE</th>
<th>POSSIBLE CAUSE / CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.TEMP.OUT R.</td>
<td>The measured board temperature is out of the allowed range. Ensure that the instrument is operating within the specified temperature conditions: -4° to 140°F (-20° to 60°C).</td>
</tr>
<tr>
<td>B1 LOW</td>
<td>The battery 'B1' powering the main board is exhausted. Replace the battery.</td>
</tr>
<tr>
<td>B2 LOW</td>
<td>The battery 'B2' powering the main board is exhausted. Replace the battery.</td>
</tr>
<tr>
<td>CALIBRATION ERR.</td>
<td>Contact Factory. This could be a damaged sensor or a noise issue. Check the ground connection.</td>
</tr>
<tr>
<td>CONFIG.ENTERED</td>
<td>The system detects an access to the configuration parameters. Check the data logger and take the appropriate action depending on your data protection policy.</td>
</tr>
<tr>
<td>EL.SIG.ERROR</td>
<td>The system detected an error condition on the measuring electrodes. Check the electrode surfaces, the grounding and the process condition.</td>
</tr>
<tr>
<td>EXCIT.ERROR</td>
<td>The system detected an error in the coil’s excitation circuit. Contact Factory.</td>
</tr>
<tr>
<td>F.SENSOR ERROR</td>
<td>The system detected one or more errors in the flow sensor. Contact Factory.</td>
</tr>
<tr>
<td>FLOW&gt;FS</td>
<td>The flow rate is higher than the set full scale value. Check the maximum full scale value and the process conditions.</td>
</tr>
<tr>
<td>MAX Q+</td>
<td>The positive flow rate is higher than the maximum threshold value set.</td>
</tr>
<tr>
<td>MIN Q+</td>
<td>The positive flow rate is lower than the minimum threshold value set.</td>
</tr>
<tr>
<td>NO ALARMS</td>
<td>The system is running with no problems.</td>
</tr>
<tr>
<td>P.EMPTY</td>
<td>The system detected an empty pipe alarm condition. Ensure pipe is full.</td>
</tr>
<tr>
<td>POWER SUPPLY OFF</td>
<td>The power coming from the external power supply went off. Check the power supply source and the relative cables.</td>
</tr>
<tr>
<td>PULS.1&gt;F.MAX</td>
<td>The pulse frequency at Output 1 is too high. Contact Factory.</td>
</tr>
<tr>
<td>PULS.2&gt;F.MAX</td>
<td>The pulse frequency at Output 2 is too high. Contact Factory.</td>
</tr>
<tr>
<td>SYSTEM RESTART</td>
<td>The system was restarted after a reset signal. If this message appears after an AUTO-TEST command, it is not an error indication, otherwise check all the connections, the batteries and the grounding.</td>
</tr>
<tr>
<td>SYSTEM STARTUP</td>
<td>The system was started.</td>
</tr>
</tbody>
</table>
11.0 RETURNING A UNIT FOR REPAIR

If the unit needs to be returned to the Factory for repair, please do the following:

- Prior to calling for a return authorization number, determine the model number, serial number (located inside the front panel of converter), and reason for return.

- Call the McCrometer Customer Service Department and ask for a Return Authorization (RA) number.

- Ship the meter in the original packaging, if possible. Do not ship manuals, power cords, or other parts with your unit unless required for repair.

- Please make sure the meter is clean and free from foreign debris prior to shipping.

- Write the RA number on the outside of the shipping box. All return shipments should be insured.

- Address all shipments to:
  
  McCrometer, Inc.
  
  RMA #
  
  3255 W. Stetson Avenue
  
  Hemet, CA 92545
McCrometer warrants that this product will be free from defects in material and workmanship for a period 5 (five) years from the date the equipment was first installed.

The liner is guaranteed against delamination, cracking, separation, or collapse within normal use guidelines for the lifetime of the meter.

Repairs shall be warranted for 12 months or, if the repair is performed under this warranty, for the remainder of the original warranty period, whichever is less.

Buyer shall report any claimed defect in writing to McCrometer immediately upon discovery and in any event, within the warranty period. McCrometer shall, at its sole option, repair the equipment or furnish replacement equipment or parts thereof, at the original delivery point.

McCrometer shall not be liable for costs of removal, reinstallation, or gaining access. If Buyer or others repair, replace, or adjust equipment or parts without McCrometer prior written approval, McCrometer is relieved of any further obligation to Buyer under this Article with respect to such equipment.

No equipment furnished by McCrometer shall be deemed to be defective by reason of normal wear and tear, failure to resist erosive or corrosive action of any fluid or gas (unless otherwise specified in Quotations/ Purchase Order Specifications), Buyer’s direct or indirect failure (or the failure of its agents or contractors) to properly store, install, operate, or maintain the equipment in accordance with good industry practices or specific recommendations of McCrometer, or Buyer’s failure to provide complete and accurate information to McCrometer concerning the operational application of the equipment.

THE FOREGOING LIMITED WARRANTIES WITH RESPECT TO EQUIPMENT AND PRODUCTS ARE EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER WARRANTIES OF QUALITY OR PERFORMANCE, EXPRESS, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ANY AND ALL WARRANTIES OF MERCHANTABILITY OR FITNESS OF SAID EQUIPMENT AND PRODUCTS FOR ANY PARTICULAR PURPOSE.

MCCROMETER DISCLAIMS ANY WARRANTY, WHETHER EXPRESS OR IMPLIED, REGARDING THE SUITABILITY OF PRODUCTS AND EQUIPMENT SUPPLIED PURSUANT TO ANY PURCHASE ORDER FOR INSTALLATION IN ANY PARTICULAR SYSTEM OF SYSTEMS. MCCROMETER MAKES NO WARRANTY OF ANY KIND WITH RESPECT TO ANY SERVICES PERFORMED BY MCCROMETER OR ITS AGENTS PURSUANT TO ANY QUOTATION.

Purchaser’s sole remedy and manufacturer’s sole obligation for alleged product failure, whether under warranty claim or otherwise, shall be the aforesaid obligation of manufacturer to repair or replace products returned within twenty-four months after date of original shipment. The manufacturer shall not be liable for, and the purchaser assumes and agrees to indemnify and save harmless the manufacturer in respect to, any loss or damage that may arise through the use by the purchaser of any of the manufacturer’s products.

All product warranties and guarantees set forth herein shall only be enforceable if (a) all equipment is properly installed, inspected regularly and is in good working order, (b) all operations are consistent with Supplier recommendations, (c) operating conditions at the Customer site have not materially changed and remain within anticipated specifications, and (d) no reasonably unforeseeable circumstances exist or arise.

McCrometer does not authorize any person or entity (including, without limitation, McCrometer agents and employees) to make any representations (verbal or written) contrary to the terms of this limited warranty or its exclusions. Such terms of this limited warranty and its exclusions can only be effectively modified in writing and only by the President of McCrometer.

**BATTERY GUARANTEE:**

Main power batteries will be replaced at no charge should they fail within 5 (five) years from the date of purchase with the meter. Guarantee is not valid for replacement batteries. Guarantee is limited to the a one-time replacement of the main power batteries. McCrometer is not responsible for any lost data or any other direct or indirect losses resulting therefrom. The batteries and their configuration are specific to the Dura Mag flow meter and only McCrometer batteries can be used. Any use of batteries other than those supplied from McCrometer will void the above Warranty.
OTHER McCROMETER PRODUCTS INCLUDE:

- Propeller Flowmeters
- Differential Pressure Flowmeters
- Magnetic Flowmeters
- Wireless Monitoring System