FLEX PROBE
INSTALLATION AND PROGRAMMING GUIDE
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Contents

Introduction ......................................................................................................................................1
Conventions used in this manual ..................................................................................................1
Questions and concerns ................................................................................................................1
Operating precautions ..................................................................................................................2
Unpacking and handling the flex probe .......................................................................................3
Installation........................................................................................................................................5
Installing the flex probe ................................................................................................................5
Procedure .......................................................................................................................................5
Flex probe wiring ..........................................................................................................................8
Connect the flex probe to the console ...........................................................................................9
Flex probe programming .................................................................................................................9
Troubleshooting ............................................................................................................................11
Float Missing ................................................................................................................................11
No Probe, Probe Sync, and Unstable Probe ...................................................................................11
Additional troubleshooting steps .................................................................................................12
FMP-FLX flex probe measurements.............................................................................................13
Specifications ...............................................................................................................................13
Introduction

Franklin Fueling Systems (FFS) flex probes are magnetostrictive measuring probes that provide a highly accurate level measurement for tanks up to 70 feet (21 meters) in height. These probes are ideal for tall tanks or tanks with low overhead clearance where conventional magnetostrictive probes are not an option. Flex Probes are available in lengths from 2 to 70 feet (0.6 to 21 m) and can be ordered in 12” (305 mm) increments.

Conventions used in this manual

This manual includes safety precautions and other important information presented in the following format:

**NOTE**: This provides helpful supplementary information.

**IMPORTANT**: This provides instructions to avoid damaging hardware or a potential hazard to the environment, for example: fuel leakage from equipment that could harm the environment.

⚠️ **CAUTION**: This indicates a potentially hazardous situation that could result in minor or moderate injury if not avoided. This may also be used to alert against unsafe practices.

⚠️ **WARNING**: This indicates a potentially hazardous situation that could result in severe injury or death if not avoided.

⚠️ **DANGER**: This indicates an imminently hazardous situation that will result in death if not avoided.

Questions and concerns

In case of emergency, follow the procedures established by your facility. If you have questions or concerns about safety or need assistance, use the information below to contact Franklin Fueling Systems:

Web: franklinfueling.com
Telephone:
USA and Canada: +1.608.838.8786, +1.800.225.9787
USA Technical Support: 1.800.984.6266
UK: +44 (0) 1473.243300
Mexico: 001.800.738.7610
China: +86.10.8565.4566
Operating precautions

FFS equipment is designed to be installed in areas where volatile liquids such as gasoline and diesel fuel are present. Working in such a hazardous environment presents a risk of severe injury or death if you do not follow standard industry practices and the instructions in this manual. Before you work with or install the equipment covered in this manual, or any related equipment, read this entire manual, particularly the following precautions:

**IMPORTANT:** When you move the drop tube inside the tank riser pipe, do so slowly and carefully to help prevent the drop tube from impacting the riser pipe.

**IMPORTANT:** To help prevent spillage from an underground storage tank, make sure the delivery equipment is well-maintained, that there is a proper connection, and that the fill adaptor is tight. Delivery personnel should inspect delivery elbows and hoses for damage and missing parts.

⚠️ **CAUTION:** Use only original FFS parts. Substituting non-FFS parts could cause the device to fail, which could create a hazardous condition and/or harm the environment.

⚠️ **WARNING:** Follow all codes that govern how you install and service this product and the entire system. Always lock out and tag electrical circuit breakers while installing or servicing this equipment and related equipment. A potentially lethal electrical shock hazard and the possibility of an explosion or fire from a spark can result if the electrical circuit breakers are accidentally turned on while you are installing or servicing this product. Refer to this manual (and documentation for related equipment) for complete installation and safety information.

⚠️ **WARNING:** Before you enter a containment sump, check for the presence of hydrocarbon vapors. Inhaling these vapors can make you dizzy or unconscious, and if ignited, they can explode and cause serious injury or death. Containment sumps are designed to trap hazardous liquid spills and prevent environmental contamination, so they can accumulate dangerous amounts of hydrocarbon vapors. Check the atmosphere in the sump regularly while you are working in it. If vapors reach unsafe levels, exit the sump and ventilate it with fresh air before you resume working. Always have another person standing by for assistance.

⚠️ **WARNING:** Follow all federal, state, and local laws governing the installation of this product and its associated systems. When no other regulations apply, follow NFPA codes 30, 30A, and 70 from the National Fire Protection Association. Failure to follow these codes could result in severe injury, death, serious property damage, and/or environmental contamination.

⚠️ **WARNING:** Always secure the work area from moving vehicles. The equipment in this manual is usually mounted underground, so reduced visibility puts service personnel working on it in danger from moving vehicles that enter the work area. To help prevent this safety hazard, secure the area by using a service truck (or some other vehicle) to block access to the work area.

⚠️ **WARNING:** Make sure all wiring enters the console’s enclosure through the designated knockouts and is run in conduit separate from all other wiring. An explosion hazard may result if you use other openings or conduit.

⚠️ **DANGER:** Make sure you check the installation location for potential ignition sources such as flames, sparks, radio waves, ionizing radiation, and ultrasound sonic waves. If you identify any potential ignition sources, you must make sure safety measure are implemented.
Unpacking and handling the flex probe

IMPORTANT: Before you begin the installation, make sure you read the following information about proper unpacking, handling, and installation practices. If you do not follow these precautions, your probe can be kinked or damaged. Probes that are damaged by improper unpacking, handling, or installation are not covered under your warranty. If you have questions, please use the information in "Questions and Concerns" to contact FFS Technical Support.

Take special care when you unpack and handle the flex probe to avoid damaging it. In particular:

- Two people are required to install the flex probe.
- Do not cut the ties that hold the flex probe together before you install the probe.
- Do not bend the top 2 feet (0.61 m) of the probe. This area contains electronic components that must remain straight.

- Always keep the coils parallel. When you remove the tie wraps, do not lift one coil separately from the other coils. Never twist a coil 90º from the other coils.

- Do not assemble the weight and floats on the flex probe until you are ready to install it. Carry the parts to the top of the tank before assembling them. Do not unwrap the flex probe until you are ready to install it.

- Do not twist the probe while you are installing it. Always keep the coils of the probe parallel. Unroll it into the tank.

- Do not let the coil become less than 44.5" (1.13 m) in diameter while you are uncoiling it.
Installation

Installing the flex probe

The flex probe must have a specific amount of clearance from the bottom of the tank to allow for expansion. See the following table for clearance measurements:

<table>
<thead>
<tr>
<th>Overall Length</th>
<th>Tank Bottom Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>47–144 (1.2–3.7)</td>
<td>1&quot; (25)</td>
</tr>
<tr>
<td>145–288 (3.7–7.3)</td>
<td>2&quot; (51)</td>
</tr>
<tr>
<td>289–432 (7.3–11)</td>
<td>3&quot; (76)</td>
</tr>
<tr>
<td>433–600 (11–15.2)</td>
<td>4&quot; (102)</td>
</tr>
<tr>
<td>601–720 (15.3–18.3)</td>
<td>5&quot; (127)</td>
</tr>
<tr>
<td>721–840 (18.3–21.3)</td>
<td>6&quot; (152)</td>
</tr>
</tbody>
</table>

There are two ways to install the flex probe with the correct clearance:
- Use an adjustable sleeve with a compression fitting to set the clearance.
- Use the riser to set the clearance.

**NOTE:** The weight holds the probe straight and functions as a spacer for the water float.

**NOTE:** The water float, product float, and tank mounting components are in a separate box.

**IMPORTANT:** The customer provides the following process connection:
- Fixed mounting: A bushing, flang, or metal cover for a 2" NPT opening. The probe has a 0.75" NPT connector.
- Adjustable mounting: A bushing, flange, or metal cover for a 2" NPT opening. The compression fitting has a 1" NPT connector.

**Procedure**

1. Cut the tie wrap, but make sure it is at the end of the tube with a hole in the plug. Leave the other tie wraps intact to prevent the coil from unwrapping before you install it.
IMPORTANT: The flex probe MUST have both the product float and the water float.

IMPORTANT: Make sure you thoroughly clean the stainless steel pin at the tip of the flex probe tip before you use the probe.

2. Place the appropriate equipment on the end of the probe in the following order:
   a. Height adjustment sleeve with compression fitting (if used)
   b. Thread adapter (1" or ¾")
   c. Product float
   d. Float spacer (for overall lengths > 288" (7.3m))
   e. Water float
   f. Stainless steel weight
   g. Stainless steel pin
3. Hold the weighted end while another person holds the coiled probe. The weight must always hang straight down. Do not bend it.

**IMPORTANT:** Do not drop the probe into the riser or the end of the probe may be damaged.

4. Feed the weight slowly into the riser while you uncoil the tube. Cut the remaining tie wraps, one by one, as you go. Do not cut all of the tie wraps at once. They are sequentially marked. Start with number 1 at the end of the probe.

**NOTE:** If you are doing an adjustable mount installation, go to step 13.

5. Thread and tighten the 4 x 1" adapter to the top of the probe and install it in the riser. Do not lift the probe by the electrical cable.

6. Thread the 1" compression fitting into the 4 x 1" adaptor. Make sure you support the probe by its body and not the electrical cable.

7. Thread the adjustable sleeve onto the probe.

8. Gently lower the probe into the tank until it rests on the bottom.

9. Mark the spot where the adjustable sleeve meets the compression fitting.

10. Raise the probe and measure from the spot you marked in the previous step to the correct clearance distance (from the table at the beginning of this section), and make a second mark.

11. Lower the probe until the second mark lines up with the adjustable sleeve, tighten the compression fitting finger tight, and then use a wrench to tighten the nut an additional 1¼ turns.
12. Continue to step 15.

13. Use the appropriate riser length to make sure there is the correct clearance according to the table at the beginning of this section.

14. Thread and tighten the 4 x 3/4" adapter to the top of the probe, and mount it in the riser. Do not lift the probe by the electrical cable.

15. Attach a junction box to the top of the probe and proceed to the "Flex probe wiring" section.

**Flex probe wiring**

The Flex Probe Splice Kit includes two electrical connectors for installation inside a junction box. The junction box must be connected to the top of the probe to prevent water from entering.

1. Install a junction box to the top of the flex probe.

2. Record the wire speed for when you do programming later. This number is located on a metal tag attached to the probe cable.

3. Use two moisture-resistant connectors (provided) for each probe installation.

**IMPORTANT:** Do not cut back (strip) the wiring that is inserted into the splices.

4. Insert two red wires into two separate openings of the first connector. Make sure the wires are fully inserted and seated at the end of the connector.

5. Insert two black wires into two separate openings of the second connector and then insert the two shield wires into the remaining opening of the second connector. Make sure the wires are fully inserted and seated at the end of the connector.

6. The white wire inside the probe cable is not used. Do not insert it into any connector. Cut the white wire back flush to the jacket of the probe cable.

7. Use slip-joint pliers to squeeze each connector together (position the plier’s jaws on the connector perpendicular to the wires and drive the black cap down almost flush to the edge of the connector body).
Connect the flex probe to the console

Flex probe programming

Use the following procedure to program the flex probe.

1. Select the FMP-FLX Type for each flex probe in the Probe Module section of the Setup Parameters.

<table>
<thead>
<tr>
<th>Probe Modules</th>
<th>Channels</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel 1</td>
<td>Name</td>
<td>Probe 101</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>FMP-FLX</td>
</tr>
<tr>
<td>Channel 2</td>
<td>Name</td>
<td>Probe 102</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>FMP-FLX</td>
</tr>
<tr>
<td>Channel 3</td>
<td>Name</td>
<td>Probe 103</td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>FMP-FLX</td>
</tr>
</tbody>
</table>
2. Set the following values in the Fuel Management System/Tanks/Probe section of the Setup Parameters:
   - Select the appropriate probe module and channel. The Type will need to be set to a Special probe (Special 1 – 48). Each flex probe must be setup up with a unique Special Probe number.
   - Obtain the wire speed from the probe label, and then use that number to set the Gradient number.

3. Under the Fuel Management System / Special Probes section of the Setup Parameters set the Length for each flex probe.

4. Program one RTD location to be able to read the temperature. This location can be approximately half of the probe length. (Each flex probe contains one RTD.)
Troubleshooting

When troubleshooting a probe problem, it is important not to presume any particular cause. Follow the steps outlined below to properly and quickly troubleshoot probes:

**NOTE:** Do not start troubleshooting by swapping probes. It may cause confusion in the process of identifying the problem.

**Float Missing**

1. Check programming of probe for the correct number of floats.
2. Look for an active High Water or Float Missing alarm in the run status at the ATG.
3. If possible, have the technician stick the tank and compare the measurement with the level reported by the ATG.
4. Is the level correct? If not, is the ATG measuring in reverse (i.e. the lower the actual product level the higher it reads on the ATG)?
5. Make sure "1 to 1 tip to head" is selected in the Probe Ratio drop-down list. If "1 to 1 tip to head" is selected, the problem may be a probe issue. Proceed to the next step.
6. Check the water level. Does the ATG list it as Float Missing? If it is listed as missing, it could be a probe issue. Proceed to the next step.
7. Turn off the power and then turn it on again. If previously noted, check to see if the High Water or Float Missing alarm changed from “ACTIVE” to “CLEARED.” If they clear, this could be a probe issue. Acknowledge and proceed to the next step.
8. If these steps did not solve the problem, contact FFS for assistance. (See "Questions and concerns" in the "Introduction" chapter for contact information.)

**No Probe, Probe Sync, and Unstable Probe**

(New Install or Replacement Probe)

1. Check the wiring. Make sure the red, black and shield wires are connected to the correct terminals to the ATG. There should be two connections in the junction box. (See "Connect the flex probe to the console" earlier in this chapter.)

(Probe Alarms on Multiple Channels or Only One Probe Connected)

2. Check the main board power supply. There should be approximately 21 VDC loaded (probe connected) and 24 VDC unloaded across the red and black terminals of the probe channel in the ATG.
3. Check the field wiring. Make sure the voltage is getting to the probe by checking at the junction box splice or quick disconnect pigtail. With the pigtail end facing you, keyslot up, there should be 24 VDC across the two bottom pins. Test the field wiring for a short or open.
4. Remake the splice. Use the approved seal pack and connectors to cut back and remake the splice connection in the junction box.

5. Try another probe channel. Once you have checked the field wiring and remade the junction box connection, move the field wiring to another channel.

**Additional troubleshooting steps**

The following are additional troubleshooting steps for the probe. For missing float or incorrect level problems, consider the following actions:

- Remove the probe from the tank, and manually raise and lower the floats. Check to see if the ATG accurately reports the change in level.
- Is the correct number of floats installed on the probe? (Verify the number of floats that are programmed.)
- Are the floats installed correctly? The product float should be on top, closest to the probe head. Water floats have a weighted ballast ring.
- Is the probe shaft clean? If it is dirty, use an abrasive pad to clean it.
- Make sure the wire connections from the probe cable to the field wiring are secure and dry.
Specifications

- Input voltage: 16 to 31 VDC.
- Resolution: 0.010 inch (0.254 mm).
- Linearity: +/- 0.01% of full scale, +/- 0.010 inch (.254 mm), whichever is greater.
- Repeatability: +/- 0.001% of full scale, +/- 0.00025 inch (0.0064 mm), whichever is greater.
- Temperature accuracy: Absolute +/- 2 ºF (+/- 1.11 ºC).
- Temperature measurement resolution: +/- 0.01 ºF (0.02 ºC).
- Temperature sensing range: -40 ºF to 150 ºF (-40 ºC to 66 ºC).
- Operating temperature range: -40 ºF to 158 ºF (-40 ºC to 70 ºC).
- Maximum tank capacity: 5,875,000 gal (22,200,000 liters).
- Total float capability: 2 floats.
- Environment: NEMA 4.
- Probe material: PVDF (polyvinylidene fluoride).
- Weight and weight pin material: stainless steel.
- Includes 2 ft (610 mm) cable (for additional cable, order P/N 88761 for 500 ft (152 m) or P/N 88760 for 1,000 ft (305 m).
- Compatible with EVO™ TS-550/5000 fuel management systems (software version 2.6.2.8040 or later), and Colibri® monitoring systems (with software version 1.18.16.8543 or later).
- Use appropriate flexible probe installation kit for installing flexible probes.
- Use appropriate flexible probe float kits only.