Manual

HAWK Magnetic Level Gauge
SPI

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## Contents

1. **0 Introduction** 3
   - 1.1 Features 3
   - 1.2 Detailed Description 3
   - 1.3 Temperature Considerations 4

2. **0 Storage and Handling Information** 4

3. **0 Installation** 5
   - 3.1 Float Information 5
   - 3.2 Leveling 5
   - 3.3 Isolation Valves 5
   - 3.4 Pressure Testing 5
   - 3.5 Insulation 6
   - 3.6 Scale Zero 6

4. **0 Troubleshooting** 6
   - 4.1 Indicator Decoupling Causes 6
   - 4.2 Float Sinks or Sticks 7

5. **0 Parts Ordering** 7

6. **0 Customer Specific Product Information** 7
   - Use this area to record pertinent information about your purchased unit. 7

7. **0 APPENDIX** 8
   - 7.1 Unpacking 8
   - 7.2 Pre-Installation Checklist 8
   - 7.3 Equipment & Tools 8
   - 7.4 Placing an MLG in Service (Startup) 9
   - 7.5 Maintenance 9
   - 7.6 MLG Replacement/Spare Parts 10
1.0 Introduction

1.1 Features

• Rugged construction
• Safe for flammable, corrosive, and toxic liquids
• Suitable or pressures from full vacuum to maximum specified pressure
• Special types for high and low temperature operations
• Positive zero indication
• Available with integral limit switches & transmitters

1.2 Detailed Description

The float chamber of the standard SPI is mounted as a communicating chamber to the process vessel. It is usually vertically flange mounted, but different mounting options are available upon request. Within the float chamber is a float that is designed and manufactured to float with approximately 70 to 80% of its mass submerged in the process fluid. The float magnet assembly is located such that the magnetic actuation point of the magnet assembly is at the liquid level when the fluid is at the specific gravity specified. The position of the float will vary directly with the level of the process fluid.

The indicator assembly, consisting of a glass or polycarbonate tube, an indicator (shuttle or magnetic bar graph), and a graduated scale, is installed parallel and in close proximity to the float chamber. This is necessary to allow for maximum magnetic coupling between the float and the indicator. The indicator and tube are mounted in a stainless steel channel which has a graduated scale attached. The graduations on this scale correspond to the desired operating range. The glass indicator tube is hermetically sealed to prevent the ingress and accumulation of dust and moisture. The indicators are painted with high visibility paint so readings can be obtained from long distances.

Around the middle of the shuttle is a black reference line that directly corresponds to a value on the graduated scale to obtain the process liquid level. The shuttle tube must be in the proper orientation for it to operate correctly and this is determined by the rubber bumper in the glass tube. This bumper, when the tube is correctly oriented, will be below the shuttle at the bottom of the tube. The optional magnetic bar graph indicator is available in yellow/black or red/white for use in locations where temperature is not excessive. The flippers on the bargraph rotate to change color at the fluid level. Consult the factory for applicable temperature limits.

The indicator tube is positioned such that the normal downward travel of the float is stopped at a position that corresponds to the scale zero by a spring mounted on the bottom flange for the SPI/A and a float stop tube for the SPI/E. Therefore, as long as the float and the shuttle are magnetically coupled, the shuttle will be visible. Both the SPI/A and the SPI/E are equipped with a float stop spring at the top of the chamber. These springs absorb the stopping force on the float that occurs when fluid levels change rapidly in the chamber.
1.3 Temperature Considerations

The SPI is capable of operation in extreme environments. Special consideration must be given to the components attached to the SPI when used at these extremes.

At high temperatures, scales, switches, and transmitters must be protected from the adverse effects of these temperatures on their internal components. High temperature insulation is frequently used to raise the limits at which these devices may operate. This insulation should not be removed without adequate replacement. These devices rely on proximity with the chamber to operate; therefore any replacement insulation should not increase the separation of the device from the float. Any additional insulation installed should not trap unwanted heat in these devices.

At low temperatures, condensation, frosting, and freezing are concerns. Insulation for these conditions is provided as an option and in some cases, it is highly recommended. Special indicator tubes are made to reduce the effects of cryogenic chambers on the indicator. These indicator tubes require insulation that can be provided as an option. Recommendations for this insulation are included at the end of this manual. Low temperatures also cause embrittlement of some metals. Chambers and flange bolting must meet the temperature specifications. HAWK does not recommend customer application of cryogenic insulation.

2.0 Storage and Handling Information

To prevent damage to the shipping tubes and/or crates that the level gauges are transported in, these items should not be over-exposed to inclement weather.

The SPI Magnetic Level Gauge should be stored in such a manner that would not allow the indicator tube to be immersed or submerged in any liquid.

Sufficient precautions should be taken so that the glass or polycarbonate indicator tubes are not broken or damaged. There are no special storage requirements for the EC chamber themselves. See data sheets for specific requirements.
3.0 Installation

3.1 Float Information
The SPI/A float is shipped inside the chamber unless specified for separate shipment. Most floats are labeled to indicate the top of the float, the specific gravity of the fluid, and the serial number of the chamber for which they are designed. If the float is coated, labeling is not performed and the float should stay with the chamber. The top of the float can be found by locating the magnet placement and direction with respect to the indicator in the scale. The indicator should be attracted to the float, not repelled, when inserted correctly.

The SPI/E float is wrapped separately in bubble wrap. The magnet assembly at the end of the float rod is inserted into the top of the guide chamber unless the float rod is too long, in which case it will be shipped outside of the guide chamber. The stop tube and disk are installed over the rod end and into the chamber. Then, the snap ring is inserted into the internal groove to hold the assembly in place. Finally, the float is threaded onto the rod and locked in place with the nut provided.

Floats and indicators are designed so that the magnetic actuation point of the magnets coincides with the fluid level at the reference specific gravity. If specific gravity decreases, the float will have more of its length below the fluid level and give a visual indication that is lower than actually exists. If the fluid specific gravity has significantly changed after the unit has been placed in service, it may be necessary to replace the float in order to allow for accurate level indication. This can change the length and magnet position of the float. The stop springs must be adjusted accordingly. On the SPI/A this is accomplished by either stretching or compressing (or cutting) the bottom and top springs. The scale may also have to be adjusted to coincide with the floats’ new zero position. To adjust the zero for the SPI/E, the float stop tube can be elongated or reduced. Dimensions are provided when the replacement float is designed in Applications Engineering. Pressure equalized floats require special provisions when being brought into and out of service. Gradual increases/decreases of pressure in the chamber, in increments not to exceed the pressure limits of the float, must be performed. A one-minute wait period between increments is necessary to ensure that the float does not collapse or burst. Contact the applications engineering department at the factory for assistance.

3.2 Leveling
The chamber must be vertically level to insure proper operation of the float and its follower. A unit that is not leveled properly may decouple unexpectedly due to friction with the sides or because the float travels too far away from the indicator.

3.3 Isolation Valves
Valves should be installed between the tank and the SPI for maintenance purposes and are available as an option.

3.4 Pressure Testing
The level indicator chamber should be blocked off or the float should be removed when the vessel is hydrostatically tested. This precaution is necessary because most vessels are tested at pressures much higher than the maximum operating pressures and, even though the float chamber is capable of the high pressures, the float may not be capable of handling such pressures. All units are clearly marked as to this danger and should be given special consideration. Failure to comply may result in damage to the float and expense to the customer.
3.5 Insulation
Chamber, switch, transmitter, and flange insulations are available as an option or, to meet the temperature requirements specified. These coverings protect the process, personnel, and/or equipment from temperature extremes. The customers may elect to install their own insulation. When this is done, care must be exercised to insure that associated equipment (i.e. scales, switches, transmitter, etc.) remains in proximity to the float magnets and that the insulation does not adversely affect the devices in terms of temperature retention.

3.6 Scale Zero
Scale zero (lowest measure point on the ruler) for the SPI/A is typically at the centerline of the lower side process connection or10” from the ace of the bottom flange. This varies with specific gravity requirements or custom designs. The SPI/E zero point is typically 6” to 10” from the face of the process connection unless some special requirement calls for a change. In any case, the scale zero point coincides with the float at the lowest point in the chamber. The scale is installed so that the indicator just begins to move when the float is against the bottom stop.

4.0 Troubleshooting

4.1 Indicator Decoupling Causes
- Float is upside down. Remove, check field strength of magnets, and install correctly. Proximity to opposing field may weaken magnetic field.
- Scale assembly is not flat against the chamber due to missing straps. Magnetic field strength drops exponentially with distance. Add gear clamps to eliminate channel separation from chamber. Add stainless steel retaining wires to eliminate indicator tube separation from channel.
- Float stop springs have been bent or broken. Adjust or replace springs as needed to prevent float travel outside the range of the indicator tube.
- Scale has been moved allowing float travel outside of range or causing too much separation from the float. Reposition the scale.
- Float or indicator demagnetizing by proximity to other magnetic material, high temperature, or repulsive fields. Consult factory for re-magnetization of float or replace the float and/or indicator and remove the source of demagnetization. Sources include floats and switches installed upside down, close ferrous materials, nearby magnetic fields, magnetic particles from process piping, etc.
- Indicator tube is no longer sealed and contains moisture or dirt. This increases friction inside the tube. Replace the tube.
- Chamber is not vertically level causing increased friction between the shuttle and glass and increased distance between the float and the scale assembly. Adjust the position of the chamber.
- Indicator tube incorrectly installed. See directions for installation.
5.0 Parts Ordering

HAWK can provide custom fit insulation for most installations. Contact the factory for details. Each SPI is built to the customer’s specifications, which makes parts for these units unique. Each unit is given a serial number to provide HAWK a means to track exactly how the unit was constructed. To order parts, specify the SPI’s serial number and the part number suffix shown on the drawings that follow.

Example: To order a scale for the SPI show:
• (Part number = Serial # - 1A)
• Part # 1108-9799-01-1A

Important Note: Floats are subject to change with customer requirements and only the last float provided is the float of record (previous versions are voided). Changes to float requirements when ordered then become the float of Record. These changes in float design may also require the customer to adjust the float stop springs to account for changes in float length and magnet position. Estimates of the necessary changes can be provided at quotation and final dimensions will be provided once the final float design is confirmed by Applications Engineering.

6.0 Customer Specific Product Information

Use this area to record pertinent information about your purchased unit.
Serial Number: __________________________________________
Process Fluid: __________________________________________
Process Temperature: _____________________________________
Process Pressure: _________________________________________
Fluid Specific Gravity (SG): _________________________________
Tag #: _________________________________________________
7.0 APPENDIX

7.1 Unpacking
Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours.

Check the contents of the packing slip and purchase order. Check and record the serial number. This can be used to Reference when ordering spare or replacement parts for the MLG and/or related accessories.

Note: Do not discard the shipping container until all parts/components are verified and checked.

7.2 Pre-Installation Checklist
• If equipment is used in a manner not specified by HAWK, protection provided by equipment may be impaired.

• Manually move the float from 0% to 100% and back to 0% prior to startup/check out in order to reinitialize any switch accessories (only required if magnetically actuated switches are supplied). Switches may inadvertently change state during any rough handling during transport.

• Remove float prior to pressurizing tank/vessel. Float damage may occur if not removed prior to any pressure testing.

• Verify the MLGs center-to-center dimension equals that of the tank/vessel.

7.3 Equipment & Tools
• Open-end wrenches or an adjustable wrench to fit the process studs/nuts. A torque wrench is also recommended.

• Flat-blade screwdriver or 5/16” nut driver

• Digital multi-meter or digital volt/ammeter if transmitters or switches are attached

• Level

• Gasket for mating flanges

• Teflon tape & “never seize” for threaded units

• Pipe wrench for threaded units

• Alan Wrench (5/32”)
7.4 Placing an MLG in Service (Startup)

Ensure that the operating conditions (temperature, pressure, and specific gravity, etc.) are within the maximum ratings of the MLG. At the bottom area of each MLG is a nameplate that indicates all of the relevant process specifications, serial number, and tag number.

Install the MLG float (this should have been accomplished in pre-installation steps). The float is marked “>>>> UP >>>>” to insure proper orientation when placing float inside chamber. For a SPI/E MLG (a top mount style), remove the float and guide rod. For a SPI/A MLG (a side mount style), the MLG are supplied with float start and stop springs. Verify these are installed at top and bottom locations.

The float chamber should be closed with no openings to the atmosphere. Check to see that all drain and vent plugs are securely in place and all vent and drain valves are closed.

The following procedural sequence is critical in pressurized applications.

When the MLG is mounted and ready to be applied to the liquid service, the TOP process connection valve should be opened FIRST and should be opened very slowly to allow pressure to equalize. This allows process fluid or vapor to enter the MLG at a slow and controlled rate that is reasonable and ultimately allows the MLG to reach operating pressure and temperature in a safe fashion.

When the MLG has reached process pressure, then the BOTTOM process connection can be opened slowly. Once this is accomplished, the startup procedure has been completed.

Vent or Drain valves should not be used during startup for pressure relief from the process under any circumstances. This has the potential to permanently damage the instrument and is a hazard to personnel.

7.5 Maintenance

1. Most SPI MLG are supplied with ½” vent and drain plugs (and associated valves) in the top and bottom of the float chamber to allow cleaning and removal of the process fluid as required.

MLG should be cleaned and inspected based on the severity of the service.

To perform cleaning procedure:

A. Block in the float and chamber with the process connection isolation valves or ensure the associated vessel/tank is empty or out of service. Follow steps outlined in “Removing an MLG from Service”.

B. Following a complete fluid drain from the MLG, remove the drain flange and allow the float to slide out of the chamber bottom. Be sure to examine the float for any excessive wear and clean as needed.

C. Clean the chamber inside wall with a bottle brush or scrubbing tool. Some processes may require a solvent of some type for cleaning.

D. If the MLG is located where the bottom drain is near the floor or other equipment where it is difficult to reach, it is possible to configure an instrument with the top flange in place of a standard weld cap/vent plug. This allows the MLG to be cleaned and serviced through the chamber top end.

2. After cleaning the MLG chamber, replace the float and drain flange. A new flange gasket may be required.

3. Note: Use gaskets compatible with process fluid.

4. Verify that the stainless steel pipe/gear clamps are tight and ensure that the scale assembly has the “positive zero” in the correct location relative to the chamber and float.
5. Use a permanent magnet or HAWK magnet tool to attract the “shuttle” until it is again coupled to float inside the chamber. (This step is not required if a magnetic bargraph type indicator is utilized.)

6. Magnetic Traps are available to reduce magnetic particulate travel from the tank/vessel to the chamber. Consult the HAWK factory for ordering information and configuration details.

7.6 MLG Replacement/Spare Parts

When ordering replacement or spare parts for a SPI MLG, the following information is a minimum requirement: Serial Number, Item Description.

7.6.1 Typical Float Chamber Parts

- Vent and Drain Plug
- Drain Flange & Spring
- Float
- Vent Flange and Spring

7.6.2 Typical Indicator Assembly Parts

- Scale/Channel Assembly
- Indicator Tube (glass or polycarbonate)
- Stainless Steel Gear Clamps
- Name Plate
- Indicator Tube Holders (top & bottom)
HAWK, Since 1988

Hawk Measurement Systems Pty Ltd (HAWK) was established in 1988. Its founding members saw the universal requirement of various industries requiring improved process control and efficiency in their operations.

We Can Help

HAWK understands the difficulties customers face when seeking accurate level measurement. Every application is different, involving a multitude of environmental factors. This is where HAWK excels. Our aim is to ensure that customers not only feel comfortable with our technology, but that we also ensure a consistent and reliable solution is in place for the long term. We believe that a combination of application and product expertise, as well as forward thinking and proactive support policies are the foundation of successful customer-supplier relationships.

Progressive Technical Support

HAWK believes that the future of the Level Measurement Industry revolves around the quality of pre and post sales - support. Our aim is for all sales & support staff to be product experts, and more importantly application experts making our customers applications as efficient and consistent as possible.

Knowledge Sharing

HAWK believes that knowledge sharing is key to creating long term relationships. Empowering our customers and our worldwide distribution network, whilst being available at all times to lend a helping hand, is the perfect recipe for long term solutions and relationships. HAWK openly extends an invitation to share our 25 years of level measurement experience, and ensure that your day to day processes are efficient, understood, and always working.
A Higher Level of Performance

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Hawk Measurement Systems
(Head Office)
15 - 17 Maurice Court
Nunawading VIC 3131, AUSTRALIA
Phone: +61 3 9873 4750
Fax: +61 3 9873 4538
info@hawk.com.au

Hawk Measurement
7 River Street
Middleton, MA 01949, USA
Phone: +1 888 HAWKLEVEL (1-888-429-5538)
Phone: +1 978 304 3000
Fax: +1 978 304 1462
info@hawkmeasure.com

For more information and global representatives: www.hawkmeasure.com