Operating Instructions

Magnetic Level Indication and Bridle Measurements

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MLI/Bridle

Revision History

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1.0	Initial release	100202
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1 About this Document

1.1 Intended Use

These **Operating Instructions** provide specific instructions for the safe setup and operation of the equipment. The instructions and procedures in the documentation are designed for users seeking product knowledge, usage, and functionality.

The instructions in this guide are written for qualified and well-trained personnel. Make sure you read and understand all the instructions and safety guidelines in the **Operating Instructions** before operating this equipment.

Figure 1.1: VEGAMAG Series

1.2 Targeted Group

The **Operating Instructions** not only provide instructions for the setup and operation of the instrument, but also specifically addresses topics and procedures required by an intermediate level user such as the following:

- Operator
- Instrumentation Technician
- Field Service
- Internal Support
- Process Engineers
- Field Sales

1.3 Explanation of Symbols

Identifies an imminently hazardous situation which, if not avoided, will result in death or injury.

Warning: Identifies a potentially hazardous situation which, if not avoided, could result in death or injury.

Caution: Identifies a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in equipment damage.

Identifies tips or useful information about the instrument.

● **Bulleted list**

Indicates a list of items with no intended or implied sequence

1 **Steps or Sequence**

Identifies successive steps in a procedure

1 For Your Safety

2.1 General Safety

Make sure you read and understand all the instructions and safety guidelines in the **Installation and Operation Guide** before operating the equipment. The instructions in this guide are written for qualified and trained personnel.

2.2 Applications

Intended Applications

The VEGAMAG Series is used primarily as an indirect visual liquid level indicator.

Alternative Applications

In addition to providing visual liquid level indication, the VEGAMAG Series provide a complete line of magnetic level indicators and bridle combinations that use pulse radar and guided wave radar.

2.3 Certifications

The VEGA Bridle/MLI system is engineered and manufactured to ASME B31.1 and B31.3 standards. The VEGA pulse radar and guided wave radar sensors are designed for certification compliance for the following agencies:

- ATEX Standard
- CSA
- FM Standard
- GOST-R Standard
- IECEx
- WHG
- FDA
- ABS

- NACE
- CRN

SIL Compliance

The VEGAMAG Series is certified for compliance wit IEC 61508, SIL 2.

2.4 Manufacturer's Responsibility

VEGA Americas provides test procedures ranging from dye penetration to x-ray and provides qualifications such as Materials Test Reports (MTR) and Positive Material Indication Certificates (PMI).

2.5 User's Responsibility

All users who operate and service the equipment are responsible for ensuring safety requirements are met. This responsibility requires a basic understanding of the nature of Bridle/MLI systems and an adherence to all operating procedures.

3 Product Description

The VEGAMAG Series magnetic level gauges are designed as an indirect reading liquid level indicator. The magnetic level is constructed of a non-magnetic chamber, an externally mounted flag indicator chamber, and magnets housed within a float. The magnetic float assembly is installed in the non-magnetic chamber. VEGA Americas, Inc. manufactures the chambers to match the connections of the vessel or tank The process connections may be:

- Side mounted, threaded, flanged or socket welded
- Top and bottom flanged mounted
- Tank top mounted
- Combination

A variety of mounting styles is available to suit any vessel or piping requirements.

2.1 Components

The MLI gauge chamber contains a magnetic float and is completely isolated from the indicator housing attached to the outside of the gauge chamber. External indicators, or Flags (Typically Yellow and Black) represent the Liquid Level. The magnetic float maintains a magnetic bond with the external level flags. As the level of the process medium fluctuates within the tank and gauge chamber, the float reacts accordingly with the flags visually correlating to the level of the fluid within the chamber. **Yellow** represents liquid column. **Black** represents vapor space. Other colors are available

2.2 Chamber Material

VEGA Americas, Inc. manufactures gauges to meet exact specifications of the process media such as operating pressure, temperature, specific gravity, etc. Standard chamber materials are 316/304 Stainless Steel, but any non-magnetic material may be used. Other chamber materials that are available include Alloy 20, Hastelloy, Zirconium, Monel, Kynar, and CPVC.

2.3 Reference Manuals

Depending on the accessories and equipment order, a number of reference manuals and specifications may also be included with the chamber.

Reference manuals may include:

VEGAFLEX – Guided Wave Radar Gauges, VEGAPULS – TDR Radar Gauges, VEGASWING – Vibration switches, VEGACAP and other accessory manuals. Be sure to locate and keep in a safe place for future reference.

2.4 Internal Float

The float chamber houses a magnetized float, designed to the requirements of the process conditions, inside. For this reason, floats are not interchangeable unless the process conditions and gauge chambers are identical. The float moves freely inside the chamber reacting to fluctuating level changes within the vessel_

2.5 Float Buoyancy

Under normal operating conditions, the process fluid should cover the float about 80% or more.

The position of the float in the media will vary with different process conditions. Float magnets are located in the upper portion of the float.

2.6 Hydrostatic Testing

Gauge chambers receive hydrostatic testing to 150% of indicated gauge rating **WITHOUT** floats installed. Floats receive individual testing. Gauges can be field hydrostatically tested after installation at the operator's discretion.

Caution: Do not conduct hydrostatic testing of the magnetic gauge chamber attached to a process vessel with the float installed. If a gauge is field tested with the float installed, the float may crush and the chamber may become damaged. This procedure will void the warranty.

4 Installation

4.1 Inspection

VEGA Americas, Inc. securely packs all magnetic level indicators to provide the maximum protection of the equipment during shipment. Make certain that when the equipment arrives at your facility, it is unpacked and inspect to ensure the indicator and chamber was not damaged in shipment. If you find damaged parts, contact VEGA immediately. VEGA fully insures all magnetic gauges against damage or loss unless specified by the customer otherwise. Claims should be filed within five (5) days from the date of receipt of the shipment.

4.2 Chamber Orientation

Remove the magnetic float, packaged separately in the shipment crate, before installation. Make sure that the chamber is level the float chamber is installed vertically. If the chamber is not level, the float may magnetically uncouple from the flag indicators during operation.

Use care when lifting the MLI chamber. Try not to lift from center of chamber. The result can be broken Glass on the Flag Chamber and/or breaking of Guide Rod Welds (if used).

4.3 Connection Valves

Install valves between the process vessel and level gauge to allow for isolation, draining, and cleaning purposes. (See section 4.1.0 on Maintenance for more details on cleaning and maintenance procedures). Standard block valves can be ordered with the gauge or can be purchased separately from VEGA Americas, Inc.

4.4 Float Orientation

The internal magnetic float has a preferred orientation of vertical. An inscription at the top of the float indicates this orientation. If the float is installed into the chamber inverted, it will not couple with the external indicator correctly and result in improper level indication. Floats installed in gauges with inverted chamber

construction will contain a loop at the top of the float for installation and removal purposes.

Do not install internal floats until any hydrostatic field tests of the chamber and connecting vessel are complete.

4.5 Chamber Gaskets

Standard magnetic level gauges include 1/8” composition gaskets. If this type of gasket is not compatible with all process media, make sure you use the appropriate gaskets instead of those shipped with the gauge.

4.6 Flanges and Connections

VEGA designs process connections and vent/drain flanges to meet each customer's specifications. All flange bolt holes straddle the centerline unless otherwise specified. Both male and female threaded connections and socket weld connections are available.

5 Operation

5.1 Introduction

Make certain to thoroughly read all instructions pertaining to entering magnetic level gauges into service before commencing with service operations. Failure to do so may void the warranty by subjecting the gauge to a potential safety hazard.

5.2 Procedures

1. Verify that the operating conditions, temperature, pressure and specific gravity, are within the maximum rating of the gauge. Each gauge has a permanent nameplate indicating process specifications, serial number, tag number, etc.
2. Level the gauge chamber vertically and make sure that the tank is empty, blocked-in, and isolate the chamber. Check to see that all drain and vent plugs are in place. Close all vent and drain valves if plugs are not used.
3. Install the float.
   - For standard gauges, install the float by removing the bottom drain flange located at the base of the gauge. The float is marked TOP to insure proper orientation. The drain flange has a spring attached to cushion the float when the vessel is empty. Reinstall the bottom drain blind flange with a new flange
   - For inverted gauges, remove the top vent blind flange from the gauge chamber. Install the float by inserting a string through the float loop and lower the float into position slowly. **DO NOT DROP THE FLOAT INTO THE CHAMBER**. Remove the string from the float and chamber after the float is resting on the bottom of the gauge. An auxiliary magnet may be required to re-couple the indicators to the internal float.
4. Reinstall the blind flange with a new gasket. The gauge chamber should be isolated so that it is not open to the atmosphere.
5. Check to see that all drain and vent plugs are securely in place and that all vent and drain connections are closed.

6. When the gauge is mounted and ready for placement into service, partially open the top process connection valve first. This valve must be opened slowly to allow initial pressure and temperature equalization between the vessel and the level gauge. Opening the valve in this manner allows the process conditions of the vessel to equalize with the gauge slowly and reach operating conditions at a slow, even, and reasonable rate.

Caution: Do not open the bottom process connection valve first. If you open the bottom valve first, with the top valve closed and the vessel under pressure, the internal float rises instantly. If the float rises instantly, it will lodge itself into the top of the chamber and cause severe damage to the float and the chamber.

7. After the float chamber has reached process conditions, continue to open the TOP process connection valve slowly. Opening the top process valve slowly allows any liquid or condensate to enter the gauge slowly. This procedure is critically important for high pressure and temperature applications. The float and indicator may react or rise to condensate accumulation migrating through the top valve with the bottom valve closed.
8. When the gauge chamber has obtained normal operating conditions, open the BOTTOM process valve connection slowly. Opening the bottom process slowly allows proper fluid entry into the gauge chamber under normal operating conditions. The level indicator should rise vertically, thus rendering a fluid level. Flag or flipper indication will result in black to yellow rotation of the flippers as the fluid rises. At this point, installation should be complete.

Allow at least 30 minutes for both top and bottom valve procedures.

Under elevated operating conditions, the indicator may record a significant level from condensate influx through the top valve before you open the bottom valve. If this is the Magnetic Level condition, it is possible the indicator (and float) may readjust and fall slightly from the effects of final process equalization after opening the bottom valve completely.

6 Maintenance

6.1 Introduction

VEGA Americas magnetic level gauges contain a standard vent and drain plug in the top and bottom of the gauge chamber to allow cleaning and removal of the process fluid if required..

To help with cleaning, gauges may be connected to a solvent or steam line. This solvent or steam line provides a way to decontaminate or “blow-down” **empty gauges without floats** periodically without removing the gauge from the vessel location. It is suggested that the MLI Gauges are maintain and inspect least on an annual basis, or more frequently depending on the process system.

6.2 Procedures

1. Block in (Isolate) the gauge chamber with the process connection valves or wait until the vessel is empty and/or out of service.
2. Close the bottom isolation valve first and the top valve(s) second.
3. Open the vent valve slowly to depressurize the gauge especially if the gauge has been under pressure.
4. Open the drain valve slowly or remove the drain plug carefully to allow any remaining fluid to drain from the chamber.
5. When all the fluid has been drained from the chamber, carefully remove the drain flange and float from the gauge chamber. Examine the float for excessive wear and clean as required. If the float has excessive wear or damage, reorder from VEGA.
6. Clean the inside wall of the chamber with a "bottle brush" or similar scrubbing tool. Some processes may dictate the use of a suitable solvent for cleaning.
7. After the chamber has been cleaned, replace the float and drain flange. VEGA recommends installing a new flange gasket before re-installing the flange. Use gaskets compatible with the process media, if replaced.

8. Check the stainless steel pipe clamps to insure they are tight and adjust the flag channel assembly. Correctly match the zero point to the lower process connection elevation.

9. If necessary, use a magnet (Shipped with the Gauge) to attract the yellow indicators until they couple to the float inside the chamber.

7 Removal from Service

7.1 Introduction

To remove the gauge from service, make sure you follow the next steps to prevent danger to personnel and damage to the gauge when the vessel is pressurized.

7.2 Procedures

1. Close the bottom process connection valve first.
2. Completely close the top process connection valve to isolate the gauge.
3. Attach proper vapor collection equipment to the gauge vent connection.
4. Open the vent valve slowly to relieve gauge pressure.
5. Attach the proper liquid collection equipment to the drain connection.
6. Open the drain valve slowly to remove remaining gauge liquid.

Caution: Never use the vent or drain on a gauge as a pressure relief mechanism for the process system. Doing so may permanently damage parts of the gauge and create a safety hazard.

NOTES

8 Troubleshooting

8.1 Introduction

The VEGA Americas, Inc. magnetic level gauges are simple to install and operate. Read and use the following troubleshooting tips if assistance is needed during installation and startup.

8.2 Float & Indicator Detachment

1. Several factors may cause float or indicator detachment. Detachment most often occurs as a result of improper installation of the gauge, particularly the float.
2. Verify that the scale and channel assembly is tight against the gauge chamber. This will maintain the magnetic coupling along the entire length of the chamber.
3. Check to ensure the internal magnetic float within the chamber is right side up.
   - Check Float Orientation “TOP”
4. If the float was installed inverted (Upside-Down), the indicator will still magnetically couple, but the actual process level will be higher then what the indicator shows. All floats are clearly marked “TOP”. Floats designed for inverted gauges will have a loop (Bail) welded at the top of the float for installation and removal purposes.
5. If the process connection dimension has been miscalculated and the gauge length is too long, do not force an installation because it will warp the chamber. A warped chamber will prohibit the float from moving freely. If the float cannot move freely, the float and indicator may detach.

8.3 Differential Level

Differential level may occur during startup, but this can be easily corrected. Under normal operating conditions, most floats are about 80% submerged in the process media. It is important to note that the position of the float in the fluid will vary with different process conditions. To attain a true level elevation, adjust the scale vertically to get an exact reading.

8.4 Start-up Level Indication

1. Several factors may cause levels to be different than expected during start-up
   - Verify Temperatures, Pressure and SG to Process Plate of Chamber
2. Allow chamber to come up to operating conditions for at least 2 hours.
3. Alternatively, minor adjustments may be made to the flag chamber/scale location up/down to meet operating conditions.

9 Parts List

9.1 Introduction

When ordering spare parts for the VEGAMAG Series magnetic level gauges, to help insure proper items are identified, VEGA Americas, Inc. requests that the following information be provided:

Most of the requested information can be obtained off the Process Identification Plate located on the VEGAMAG Chamber. (Attached to the Flag Channel Assembly)

- Serial/Model number of the gauge or accessory item
- Specific Gravity, Process Temperature and Pressure
- Centers dimension
- Description of parts required
- Original purchase order (Helpful)

9.2 Chamber

- Vent plug
- Float chamber
- Chamber blind flange, spring, and gasket.
- Studs and nuts
- Drain plug
- Internal magnetic float

9.3 Indicator & Scale Assembly

- Channel assembly
- Anodized aluminim indicator track with wide flag indication
- Stainless steel Indicator track with wide flag indication

- Top and bottom seals
- Scale assembly (percent, feet & inches, centimeters, etc.)
- Chamber clamps
- Identification tag

10 General Terms and Conditions

Modifications or Additions to Terms and Conditions: No modification of, addition to, or waiver of any of the terms and conditions stated herein shall be binding on Seller except by written consent of Seller.

Design: Seller reserves the right to make design improvements without notice.

Compliance with regulations: Buyer shall comply with the equal employment opportunity clause in Section 202 of Executive Order 11246 and all applicable rules, regulations and relevant orders pertaining to Executive Order 11246, Section 503 of the Rehabilitation Act of 1973, and Section 4212 of the Vietnam Era Readjustment Assistance Act of 1974, as amended.

Seller represents that it does not and shall not provide or maintain for its employees facilities that are segregated on the basis of race, color, religion, sex or national origin. Seller represents that it will not assign its employees to perform any work at a location where facilities are segregated.

Seller certifies that Goods covered by this order were produced in compliance with all applicable requirements of the Fair Labor Standards Act, as amended, and with regulations and orders of the United States Department of Labor.

Export: Seller reserves the right to withdraw a quotation or cancel an order at any time without the incurrence of penalties or damages if, at Seller's sole discretion, the export or re-export of any item on such quotation or order would violate any US export or re-export laws or regulations.

Changes: If Buyer directs changes, which affect the drawings or specifications; quantities ordered; delivery schedule; method of shipment or packing; or place of delivery, such changes must be in writing and signed by both parties.

Seller reserves the right to an equitable adjustment in the pricing or delivery of the order, which will be agreed to by both parties before further work is performed on the order. Change order requests will be priced according to the scope of changes and the status of the current order. Seller may impose an escalation fee on projects lasting longer than one year.

Buyer must return signed approval drawings within two weeks of their date of issue. If this time frame is not met, the delivery date will be pushed back, and no damages will apply.

Licenses/Permits: Seller's Goods may contain a radioactive source which requires a license. A General License is provided and maintained by the Seller;

A Specific License is the sole responsibility of Buyer and must be obtained and maintained by Buyer.Payment terms: Net 30 days from invoice date unless otherwise approved in writing by Seller. If at any time the financial condition of the Buyer does

not warrant shipment of product on the above terms (in the sole judgment of Seller), Seller may require full or partial payment prior to shipment.

Prices do not include any applicable Federal, State, or Local Sales tax; Customs, Duty, or Excise tax; or any other surcharges unless specifically indicated. Seller is responsible for all taxes related to employment, and for sales/use tax remitted by Buyer. All other taxes are the responsibility of Buyer.

The following items are critical and Seller may elect to tie payments to any or all of these milestones:

1. Buyer receipt of approval drawings.
2. Completion of manufacturing.
3. Delivery of major components.
4. Buyer receipt of all required documentation.

Unless otherwise stated, all stipulated amounts shall be in US dollars.

Delivery and Freight: All goods are sold FOB point of shipment. Transportation to destination is Buyer's responsibility and Buyer alone shall bear the cost of freight, special elections/options, and insurance. Seller's responsibility for the Goods shall terminate when Seller delivers such Goods to the shipper/carrier, and all risk of loss or damage shall immediately pass to Buyer. Receiving, unloading and storing Goods will be the responsibility of the Buyer.

Buyer must make any and all claims for corrections or deductions within ten days of the delivery of the Goods.

Seller has no control over the length of time shipments may be held at customs, etc. For this reason, Seller commits only to a "shipment date", not a "delivery date".

Buyer shall not hold Seller liable for claims resulting from delay in shipment except in cases where these terms are accepted in writing by Seller. Acceptance of delivery of goods by Buyer shall constitute a waiver of all claims for delay.

Title: Seller warrants good title to all the Goods furnished by it hereunder. Title to Goods shall pass to Buyer at the date such Goods are delivered to Buyer.

Warranty: Seller warrants its product against defects in material and workmanship, when used on those services/applications approved by Seller, for a period of one year from the date of original shipment. Seller's liability under this warranty shall be limited to repair or replacement at Seller's option of such defective products, FOB factory, upon proof of defect satisfactory to Seller.

The Seller is not responsible for damages to Seller's or other equipment or products because of improper installation or misapplication of the Goods by Buyer. Installation or startup of Seller's equipment or Goods must be performed under adherence to Seller's instruction manuals, wiring diagrams, etc., or performed under the direct supervision of Seller's field service personnel or Seller's authorized

agent in order to be covered by Seller's warranty.

Intellectual property: Seller warrants that Buyer's use or sale of the Goods will not infringe upon any valid patents, copyrights, trademarks, or other proprietary information.

Return: No goods may be returned without Seller's permission and an MRA number. Seller assumes no responsibility for return shipments made without permission. In issuing credit for such shipments, Seller reserves the right to deduct a restocking charge dependent on Seller's ability to recondition and resell the returned equipment.

Cancellation: Buyer may cancel upon written consent of Seller, but the Seller is entitled to reasonable cancellation charges including but not limited to labor, material and overhead expenses.

Termination Fee Schedule:

Order entered but not released for manufacturing10%

Order in any stage of production50%

Order complete and ready for shipment 100%

Cancellation for Default: In the event Buyer is declared bankrupt, makes a general assignment for the benefit of its creditors, or is in default of any material provision or requirement of the order, Seller may, by written notice to Buyer, cancel further performance by Seller under the purchase order. Any amounts due Seller for goods and services completed by Seller in compliance with the terms of the order shall be immediately due and payable to Seller.

Indemnification: Buyer and Seller shall indemnify, defend and hold each other harmless from claims, demands, and causes of action asserted by any person (including, without limitation, Buyer's and Seller's employees) for personal injury, death, or loss of or damage to property resulting from the negligence, gross negligence, or willful misconduct of either party. Where personal injury, death, or loss of or damage to property is the result of joint negligence, gross negligence, or willful misconduct of Buyer and Seller, the duty of indemnification of each party shall be in proportion to its allocable share of joint negligence, gross negligence or willful misconduct.

The term "negligence" shall include active and passive negligence. "Gross negligence" is defined as any act or failure to act (whether sole, joint or concurrent) which seriously and substantially deviates from a diligent course of action or which is in reckless disregard of or indifference to the harmful consequences. "Willful misconduct" is defined as an intentional disregard of good and prudent standards of performance.Force Majeure: Neither party shall be liable to the other for failure to perform or for delay in performance due to any cause or event which, in an objective view, is unforeseeable, unavoidable, and is not able to be overcome (i.e., an event of Force Majeure). Force Majeure events

shall include, but not be limited to, natural disasters; acts of government authority; war, hostilities, riots, acts of terrorism and civil commotions; embargoes or other import/export restrictions; shortage of or inability to obtain energy, equipment, transportation, products or services not resulting from actions or omissions of the party claiming Force Majeure.

In the event of a delay in performance due to any such cause, the date of delivery or time for completion shall be extended by a period of time reasonably necessary to overcome the effects of such delay. The party claiming a Force Majeure event shall give written notification to the other party within 48 hours after becoming aware of a cause entitling it to an extension of time.

Inspection: Seller requires two weeks notice for all inspections to be conducted at Buyer's site. All inspection expenses shall be borne by Buyer.

Expediting/Reporting: Monthly progress reports will be provided only with prior agreement by Seller.

Confidential Information: All drawings, specifications, and technical information provided by either Buyer or Seller shall be treated as confidential and shall not be disclosed to anyone other than those who require it as part of fulfillment of the order.

Storage: All materials ready for shipment and delayed due to Buyer shall be subject to monthly storage fees of 3.0% of the value of stored materials. If the shipment cannot be made after 12 months of storage, 100% of the value of the materials will be billed and payment will be due Net 30 days. Storage fees will continue to be assessed until 18 months from storage commencement. Unless otherwise negotiated, if shipment cannot be made after 18 months of storage, the entire order will be considered cancelled.

Arbitration of Disputes: Any controversy or claim arising out of or relating to this contract or the breach thereof shall be settled by arbitration in accordance with the commercial arbitration rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator may be entered in any court having jurisdiction thereof.

Appendix

Replacing Flag/Follower Indicators - Retrofit

VEGA Americas, Inc. can retrofit their Flag Indicators to any existing MLI Chamber. If you remove the indicator or purchase a retrofit kit for a gauge already in service, note the following information:

1. If replacing another Manufactures Flag or Follower assembly, VEGA recommends replacing both the float and flag assembly together. This will ensure proper functionality between the Flags and the Floats magnetic field.
2. Remove the existing Flag Housing or Follower Housing assembly from the chamber.
3. Most flag chambers are connected via mounting clamps that can be unscrewed easily. Using the mounting clamps provided with the new VEGA Americas Flag assembly, attached the assembly to the chamber.
4. Be sure to line up the “0” of the Scale with the lower process connection and tighten the clamps.
5. Depending on when the Float was installed, use the key chain magnet that was also supplied with the new Flag assembly and rotate the flags to meet the float location/level.
6. If the Float and Flag assembly is being replace at the same time, ignore #5 above.
7. Follow the insulation instructions for installing and/or removing the float assembly.
8. As the liquid level and float rise, the level indication should react accordingly to the liquid level inside the chamber.

NOTES

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