JERGUSON® SOLUTIONS

Magnicator® II Specification Checklist

Jerguson's reliability and performance are a direct result of our focus on manufacturing high quality magnetic level gages. Key elements in evaluating magnetic level gages include:

- ***Chamber Construction***
- ***Magnetic Coupling Between the Float, Indicator, & Accessories***
- ***Specific Application Considerations***

The following guide is provided as a checklist to assure key considerations in the overall vessel and Magnetic Level Gage (MLG) application and construction are taken into account while still in the design stage so that start up errors are eliminated.

Concern	***Application Issue***	***Jerguson® Solution***
❑ **Vessel Nozzle Alignment**	Unlike on DP level measurement, the alignment of vessel nozzles is critical when installing a level gage. The precision alignment of the chamber connections typically won't match up with the vessel nozzles if they are not jigged. In the field, when this occurs, come-alongs and hammers are the standard tools to "make it fit," usually resulting in chamber damage.	To prevent this from affecting your project, require the vessel fabricator to jig the nozzle connections for all MLG's.
❑ **Clearance for Float Installation and Removal**	Typically on a MLG, the float is installed and removed for maintenance through the bottom access flange. To accomplish this, the clearance required below the bottom-side process connection and grade (or obstruction) is twice the length of the float. In the case of a standard 12" long float, the bottom access flange will be located a distance equal to the float length, or 12", below the bottom-side process connection to allow the float to activate the flags down to 0% level. To remove the float, another 12" of clearance is required. If this is not allowed for during design, then the installation, commissioning, and maintenance will be negatively impacted. (This applies to standard gage configurations. Please consult factory for other options.)	To prevent this issue, check for a distance equal to at least 1x the float length below the bottom flange of the gage, or 2x the float length from the bottom-side process connection to the ground, deck, or any other obstruction below the MLG chamber. If this is not achievable, work with your Jerguson rep to design the gage with a shorter float, top removal, or other solution.

Clark•Reliance®
16633 Foltz Parkway • Strongsville, Ohio 44149, USA
Telephone (440) 572-1500 • Fax (440) 238-8828
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❑ **Pressure Ratings / Specification**	Confirm that the operating and design conditions do not exceed the ANSI flange class specified. Jerguson will not process an order with this contradiction in ratings and the order will be placed on hold until a clarification is received.	Check this prior to the bid stage to assure everything matches appropriately. This will save time and delays in delivery.
❑ **Flange Connection Material**	The chamber of the MLG must be of a non-ferrous or non-magnetic material, commonly stainless steel. Flanges/connections may be desired to be of a different material. Some manufacturers' part numbers do not designate the flange connection material. Additionally, ISA data sheet may not call for the connection material either.	The ISA data sheet should have a <u>completed</u> line for "connection material." If it does not, then on the "Chamber" or "Body Material" line, enter both as "chamber material (flange material)." Example: 316 SS (CS flanges). Note that the flange material is specified in the Jerguson model code.
❑ **Specific Gravity of Fluid**	One of the most common errors is specification of an inaccurate specific gravity. Often this is due to failure to consider the effects of pressure and/or temperature during all expected start-up and operating states. If there is doubt, it is always better to specify the <u>minimum expected specific gravity</u>.	Always confirm specific gravities of the fluid being measured during both start-up and maximum operating conditions. If the specific gravity of the fluid changes or has ranges, always specify the minimum value expected. A chart for the float can be provided showing the range of error by specific gravity.
❑ **Specific Gravity of Condensate (Steam Applications)**	The specific gravity of condensate (hot water) is <u>**not**</u> 1.0, but will be less than 1.0 according to the properties of saturated steam/condensate. This is a very common error that will cause the float to sink once operating conditions are attained.	Always confirm the specific gravity of the condensate at full operating temperature.

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❑ **Density Changes / Temperature Fluctuations**	A change in the product density will cause the position of the float relative to the surface of the liquid to change. This is common in steam service, since the SG of cold water is 1.0 but the value will be much lower when at operating temperature.	Jerguson can provide float deviation curves so operations has a clear understanding of the float position under varying conditions. If the gage is being used with a transmitter, the user may wish to consider Guided Wave Radar since the GWR will not be affected by varying SG's.
❑ **Handling – Damaged Float**	Floats are manufactured from very thin material, typically 0.020" to 0.030" in thickness, which makes them susceptible to damage if they are dropped or something hits them.	Always inspect the float for any deformations. Even the slightest "ding" in a float may cause it to collapse when exposed to process pressure.
❑ **Commissioning - Damaged Float**	When the vessel is already under pressure, damage may occur if valves are opened in the incorrect sequence. If the bottom valve is opened first, the process pressure can cause the fluid to rapidly fill the gage, compressing the gas above it which is at atmospheric conditions. This causes the float to "rocket" to the top of the gage, resulting in damage. This creates delays or ineffective measurement at start-up.	Jerguson has springs at the top and bottom of every gage to prevent damage during normal operation, but a spring will not prevent damage from a "rocketed" float. Open the TOP VALVE first, then the bottom valve. This allows the process pressure to equalize in the chamber prior to introducing liquid into the gage.
❑ **Hydrostatic Pressure Test**	Floats are commonly sized for operating conditions in order to meet the combination of pressure, temperature, and specific gravity requirements.	Confirm float pressure rating meets or exceeds the required test pressure prior to commencing a hydrostatic test. If it does not, remove the float prior to test.

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❑ **Incorrect Installation of the Float / Incorrect Reading:**	If the float is installed upside down, it will result in a reading that is low and a magnitude of error equal to the float length less four inches. For example, if the float length is 12" and the float is installed upside down, the error will be 8" low**.**	The magnet end is the top end of a float. This is typically the heavy end of the float too. Jerguson floats are permanently etched with an arrow on the top side, along with the part no., specific gravity, serial no., and tag no.
❑ **Interface Applications and Nozzle Requirements**	MLG's work well in interface applications, provided there is a difference of at least 0.1 between the upper and lower specific gravities. However, if a vessel is not always flooded then a minimum of 3 process connections are required and sometimes a 4th or more. Take care in locating nozzles to ensure each fluid can enter the MLG.	Work with your Jerguson rep and the vessel designers to assure an appropriate number of nozzles in the design.
❑ **Interface Application – Dual Level Measurement**	It is possible to have a MLG indicate both the interface and total level with a single gage containing two floats. If this is desired, a Follower style indicator must be used. There are design considerations that must be taken into account not only for nozzle placement (as noted above), but to ensure the two floats will not collide in the chamber. This will occur if the height of the top fluid is less than the length of the top float.	Review the application with your Jerguson rep to address all considerations. While more expensive, the most reliable solution is to use two different gages with Flag style indicators, one to indicate the interface and one for total level.
❑ **Floats for All Magnetic Level Gages are Shipped Outside of the Chamber**	Floats are shipped in their own packing tube to prevent damage to them during shipment and/or hydro-testing of the complete system. Some manufacturers ship all of the floats for a project in a single box. When it is time to install the floats, they are all mixed up**.** Countless hours are spent matching the proper float to the proper gage.	Jerguson physically attaches each float (in proper packaging tube) to the outside of the MLG. The shipping tubes and floats are both marked with the tag no. and serial no. The floats should not be removed from the gage until it is time to install them in the chambers. Match the tag nos. to the gage for final verification.

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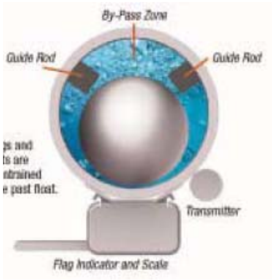
❑ **Boiling or Flashing of Light End Hydrocarbon Liquids in Cryogenic Applications**	When a light end hydrocarbon is operating at or near saturation conditions, it is possible for the fluid in the MLG to boil or flash off. This is common in cryogenic applications because temperature differences will exist between the fluid in the vessel and the MLG chamber. Even when a gage is well insulated, a high ambient temperature will elevate the temperature of the process fluid in the gage chamber. When the fluid begins to boil or flash, the vapor bubbles cannot pass by the float due to the minimal clearance around a float in a standard gage chamber. The bubbles collect under the float, and the net specific gravity of the fluid and vapor mixture is not sufficient to support the weight of the float. The float will then sink to a low (if it finds a point of equilibrium or sufficient positive buoyancy) or zero level reading.	The Jerguson FlashProof chamber addresses this application issue by using an oversized chamber with guide rods to create a vapor by-pass zone. This allows the bubbles to harmlessly pass behind the float and provide accurate level measurement. 
❑ **Measurement Ranges over 20 feet (6 meters) required**	There are two important considerations for long gage lengths: support and handling during transit.	Jerguson has experience manufacturing gages up to 60 feet (18 meters) in length. Typically, a long gage will be provided in multiple sections with flanged joint(s) at mid-span. This type of construction allows for ease of handling during transit. It is possible to construct a single chamber over 20 feet (6 meters) in length, however care must be exercised during transit and at the job site as it can be difficult to ensure the gage is not bent prior to installation. Consult your Jerguson rep or Applications Engineer for additional information.

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❑ **Dual Chamber Magnetic Level Gages with Guided Wave Radar**	There are benefits to designing a Dual Chamber MLG in terms of cost, space, and weight. However, if the client does not understand the maintenance and operational ramifications (isolate both simultaneously) then they may prefer a different design such as an extra set of nozzles, a standpipe, or tee and valve arrangement so each can be isolated individually.	Review with client the tradeoffs of a dual chamber versus other designs to assure satisfaction at project conclusion.
❑ **Guided Wave Radar Transmitter Maintenance / Head Clearance**	There are several different types of probes for GWR transmitters, including single rod, coaxial, and flexible cable probes. In the design stage, it is important to understand the type of transmitter specified to ensure adequate head clearance for installation and removal.	Understand the head room and allow for a distance equal to the <u>overall length</u> of the radar transmitter for a solid rod or coaxial probe transmitter to be removed. If there is minimal head clearance, specify a flexible cable probe.
❑ **Shipping of Dual Chamber Level Gages with Guided Wave Radar**	It is important to understand the form and condition instruments will ship in to determine the scope of work at the job site or fabrication yard. Dual chamber devices may or may not have the GWR assembled at the factory, depending upon the probe style. Ensure a clear understanding of how the instrument will be packaged for shipment prior to completion of the material requisition.	Typical practice for Jerguson is to ship <u>rod</u> or <u>coaxial</u> probe units unassembled to prevent damage during transit. Units with <u>flexible cable</u> probes will be shipped assembled because the bottom of the probe is fastened at the bottom of the chamber and pulled taught to avoid slack in the lead.

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