

installation, operation and maintenance for liquid level gages

Models 4200 and 4300

This manual has been prepared as an aid and guide for personnel involved in installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation or maintenance. Failure to follow *any* instruction could possibly result in a malfunction of the gage or glass breakage with resulting sudden release of pressure causing property damage or physical injury to personnel.

CAUTION: Yarway Corporation does not have any control over the manner in which its liquid level gage is handled, installed or used. Yarway Corporation cannot and will not guarantee that a liquid level gage is suitable or compatible for the user's specific application.

WARNING: Contained fluids may be pressurized and can unexpectedly exit vessel connections due to apparatus or material failure. Safety glasses should be worn when installing a liquid level gage. Failure to do so could result in serious physical injury to personnel.

INTRODUCTION

Yarway Corporation liquid level gages are used to allow direct visualization of liquid level in vessels. By peering through the glass, it is possible to monitor color, clarity and level of a liquid interface. Gages are available in varying lengths and configurations (end connect, multiple sections, flange connections, etc.). Visual indication can be enhanced by using reflex glass or illuminators (accessory).

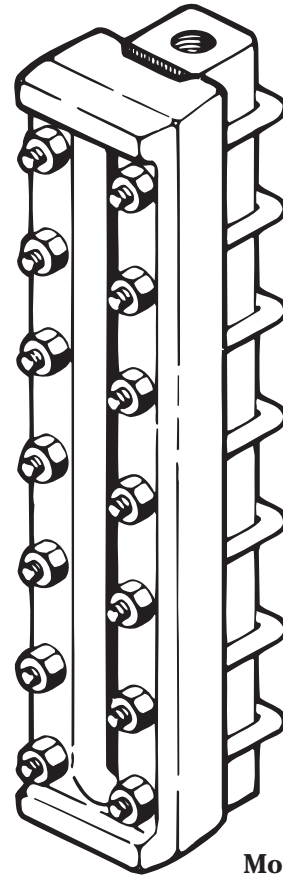
System Description

Yarway Corporation gages are comprised of six basic components. Each component may vary slightly, depending on the desired physical and mechanical properties for the gage. Use the exploded parts view in Figure 3 or Figure 4 as additional reference material.

Chamber—provides a pressure retaining metallic channel for the fluid to enter and be viewed. Slot(s) are machined into the chamber to provide direct visualization of the fluid.

Gaskets—seal the gap and prevent leakage between the chamber and the glass.

Glass—allows for visual observation of the fluid in the chamber.



Model 4200

Cushion—acts as a protective buffer between the glass and the cover. For proper sealing, cushions must be as hard or harder than the gasket material.

Cover—protects the glass assembly from external hits and provides a flat, rigid surface that is used to evenly compress the gage assembly.

Bolting—compresses the components between the covers (Model 4300) or cover and chamber (Model 4200).

Mica Shield—used to prevent the fluid from contacting the glass (Model 4300).

To determine the maximum allowable working pressure for a specific temperature within the design limits, the user should refer to Yarway Corporation dimension sheets, or when provided, the specifically stated design limits on a

Yarway Corporation product proposal or product nameplate data.

NOTE: Under no circumstances should mica shields be used in Model 4200 gages. Installation of mica shields in Model 4200 gages will keep the liquid from coming in contact with the refractive prisms, thereby prohibiting visualization of the liquid level in the gage.

DANGER: NEVER exceed these design ratings or application data. Exceeding design ratings or application data may result in mechanical failure of gage components resulting in death, serious personal injury and property damage.

INSPECTION

Upon receipt of a liquid level gage, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request damage inspection.

Glass Inspection

The self-stick caution tape was applied at the factory to protect the glass during shipping, handling and installation. Do not remove the tape from the glass until all installation procedures have been completed, except during receiving inspection to momentarily inspect glass for shipping damage. Glass that is not protected will be vulnerable to dust, grit, tools and any other objects which may scratch, chip or break the glass.

WARNING: DO NOT use glass that is chipped or even slightly scratched. Glass surface defects weaken the glass which may result in glass breakage and fluid loss under pressure resulting in serious personal and property damage.

User Rating Inspection

The user should confirm that:

1. The liquid level gage model and pressure/temperature rating stamped on the nameplate conform to the description on the user's purchase order.
2. The operating conditions described in the purchase order agree with the actual operating conditions at the installation site.
3. The actual operating conditions at the installation site are within the application data shown on the Yarway Corporation Technical Bulletin, product proposal or nameplate data.
4. the materials of construction of the liquid level gage are compatible with both the contained media and surrounding atmosphere in the specific application.

SAFETY INSTRUCTION: If the size, model or performance data of the liquid level gage as received does not conform with any of the criteria above, do not proceed with installation. Contact Yarway Corporation for assistance. The incorrect gage can result in unacceptable performance and potential damage to the gage.

INSTALLATION

CAUTION: Liquid level gage should not be subjected to acid wash cleaning. Gage must be isolated from this process or replaced with a boil out gage during startup or cleaning.

Installation should only be undertaken by qualified personnel who are familiar with the equipment of this type. They should have read and understood all of the instructions in this manual. The user should refer to Yarway Corporation dimension sheets or Yarway Corporation product proposal to obtain dimension information for the specific size and model liquid level gage.

Yarway Corporation recommends that all liquid level gage installations be provided with gage valve sets equipped with ball check shutoff. gage valve sets are designed to isolate the gages from the pressure vessel when it becomes necessary to drain or service the gages. The ball check shutoff is designed to retard leakage of the contained fluid in the event of gage glass breakage.

The number of different types of gage and valve installations is too great to adequately detail in an installation manual. It is, therefore, the user's responsibility to assure that the knowledgeable installation personnel plan and carry out the installation in a safe manner. The following procedures are some of the installation guidelines that should be employed.

Piping Strain

The gage should be mounted and connected so that it does not support any piping weight. Piping not properly supported, independent of the gage, may subject the gage to stresses that can cause leaks or glass breakage.

Differential Thermal Expansion

High mechanical loads may be imposed on a gage by expanding and contracting pipes due to hot or cold service. Such mechanical loads on the gage must be minimized by the use of expansion loops in the system. Failure to allow for expansion and contraction can result in leaks or glass breakage.

Mirror Viewing

For added safety, a system of indirect viewing by means of mirrors should be installed to protect personnel from the hazards of possible gage failure.

Nut Retorquing

Nut retorquing is vital to the operation of a liquid level gage because gaskets take permanent set under initial bolt

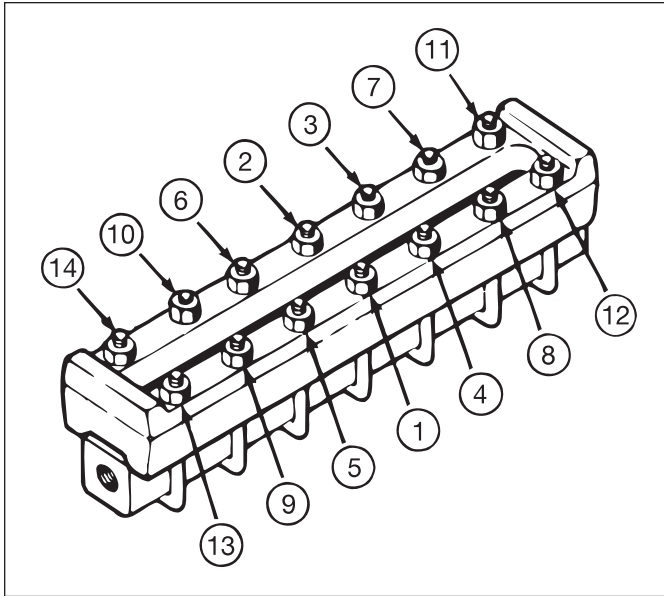


Fig. 1: Model 4200 shown. Nut tightening sequence is the same for the Model 4300.

loading at assembly. Tightening of nuts before installation to values specified is necessary to insure pressure retaining capabilities of liquid level gage to specific design ratings.

Using a torque wrench, tighten nuts in 5 ft/lb (6.8 N•m) increments following the spiral sequence in Figure 1, until the torque values of 25 to 30 ft/lb (33.9 to 40.7 N•m) are reached. For multiple section gages, torque the center section(s) and progressively work toward the ends of the gage.

If bolting, gasketing or glass on any section of a multi-section gage is disturbed, all sections must be checked for integrity and retorqued if necessary.

WARNING: Failure to comply with the proper torquing sequence or torque value can lead to leakage, gasket blow-out or glass breakage resulting in gage failure, serious injury and/or property damage.

NOTE: Depending on gage size there may be less bolting than shown in Figure 1. Start at the center and spiral outward to the limit of bolting on a specific gage.

OPERATION

Before initializing liquid level gage operation, check that all installation procedures have been completed. Use only qualified, experienced personnel who are familiar with liquid level gage equipment and thoroughly understand the implications of all the instructions. Check to determine that all connections are pressure tight. assure that nuts have been retorqued to their proper values as specified. Remove self-stick caution tape from the glass and inspect to be sure that glass is clean and free of any damage such as cracks, scratches, pits and chips.

Hydrostatic Test

WARNING: Liquid level gage installations should be brought into service slowly to avoid excessive shock or stress on the glass. Rapid pressurization or sudden changes in temperature may cause glass breakage. To avoid excessive thermal shock or mechanical stress on the glass, the connecting valves should be opened slightly, and the gage temperature and pressure allowed to slowly equalize. If the valves are equipped with ball checks, the valves must be opened all the way after the pressure and temperature have equalized to permit operation of the automatic ball checks in the event of failure. Failure to follow the recommended operating procedures can result in death, severe personal injury and/or property damage.

Take all precautions necessary to handle the possibility of leakage during the test. Hydrostatically pressure test all installations to at least 100 psig (690 kPa) but less than design pressure and correct any leakage before proceeding.

MAINTENANCE

WARNING: use only qualified, experienced personnel who are familiar with liquid level gage equipment and thoroughly understand the implications of all the instructions. DO NOT proceed with any maintenance unless the liquid level gage has been relieved of all pressure, has been allowed to reach ambient temperature and has been drained or purged of all fluids. failure to do so can cause serious personal injury and property damage.

The rate at which components degrade is dependent upon a variety of conditions. Pressure, temperature and contained fluid all influence the rate at which gage components deteriorate. Higher temperatures can accelerate the corrosion of gaskets, glass and metals. Acids and similar chemicals can break down the integrity of almost any material. Concentration of chemicals can accelerate the corrosion rate. Yarway Corporation cannot create a blanket maintenance schedule for every application.

The end user is the most familiar with the contained fluid and conditions and must be responsible for creating a maintenance schedule. The user must create maintenance schedules, safety manuals, and inspection details for each liquid level gage. Realistic maintenance schedules can only be determined with full knowledge of the services and application situations involved. These will be based upon the user's own operating experience with their specific application.

If bolting, gasketing or glass on any section of a multi-section gage is disturbed, all sections must be checked for integrity and retorqued or repaired as necessary.

On all installations the following items should be regularly evaluated by the user for purposes of maintenance:

1. Glass, for cleanliness and signs of damage or wear.
2. Shields, if used, for signs of clouding, wear or deterioration.
3. Gage, for signs of leakage around gaskets or at connections and,
4. Gage, for signs of internal or external corrosion.

Maintenance Procedures

GLASS should be given regular and careful attention. Keep glass clean using a commercial glass cleaner and a soft cloth. Inspect the surface of the glass for any clouding, etching or scratching or physical damage such as bruises, checks or corrosion. Glass that is damaged is weakened and may break under pressure. Shining a light at approximately a 45° angle will aid in detecting some of these conditions. Typical damaged areas will glisten more brightly than the surrounding glass because the light is reflected.

Detection of any damage, problem areas or surface wear is sufficient evidence to take the liquid level gage out of service. **DO NOT** proceed with operation of the liquid level gage until the glass has been replaced with a glass replacement kit following the removal-disassembly-reassembly instructions.

MICA SHIELDS showing any signs of clouding, wear or deterioration are an indication that the gage glass has been exposed, or could soon be exposed to the contained fluid. Immediately take liquid level gage out of service. **DO NOT** proceed with operation of the liquid level gage until mica shields and glass have been replaced by following the disassembly-reassembly instructions.

GASKET LEAKS must be repaired immediately. **DO NOT** proceed with operation of liquid level gage until gaskets have been replaced by following the disassembly-reassembly instructions.

CONNECTION LEAKS at a flanged or threaded connection should be corrected by tightening the bolting at the connection or by taking the liquid level gage out of service and wrapping the connection threads with Teflon® tape on all male pipe threads.

CORROSION may occur if the user has selected an improper material for the liquid level gage application. It is the responsibility of the user to choose a material of construction compatible with both the contained fluid and the surrounding environment. If internal or external corrosion is present, an investigation must immediately be performed by the user. It may be necessary to contact Yarway Corporation for consultation.

Troubleshooting

Problem: Mica shields and glass have become prematurely etched or clouded in service.

Cause: Deteriorated or cracked mica shield.

Solution: Install new glass shield kit. Check boiler chemistry to assure it meets your required standard. Re-evaluate your maintenance schedule.

Problem: Glass continually breaks in service despite careful attention to maintenance procedures:

Cause: thermal shock, hydraulic shock, mechanical loads, exceeding design ratings or a combination of these.

Solution: Check entire system to determine possible sources of loads. Check application to determine actual operating conditions and contact Yarway Corporation on how to proceed.

REMOVAL - DISASSEMBLY - REASSEMBLY

WARNING: Use only qualified, experienced personnel who are familiar with liquid level gage equipment and thoroughly understand the implications of all the instructions. **DO NOT** proceed with any maintenance unless the liquid level gage has been relieved of all pressure, has been allowed to reach ambient temperature and has been drained or purged of all fluids. Failure to do so can cause serious personal injury and property damage.

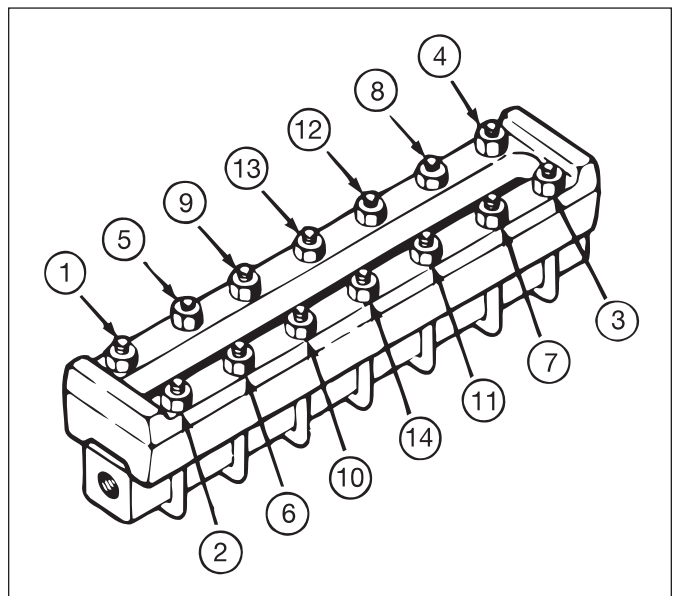


Fig. 2: Model 4200 shown. Nut loosening sequence is the same for the Model 4300.

Disassembly

Secure workbench longer than the liquid level gage, and sufficiently wide to lay out parts as they are removed.

1. Lay gage on its back.
2. Hold gage firmly and loosen nuts starting at both ends of each section and then proceeding from both ends to the center of each section as shown in Figure 2.

3. Nut Loosening Sequence:

- a. Remove nuts.
- b. Tap covers with rubber hammer as needed to loosen and remove.
- c. Remove cushions, glass, mica shields (Model 4300), and gaskets.
- d. Tap liquid chamber or remaining covers as necessary with rubber hammer to break loose and remove remaining components.
- e. Remove, destroy and dispose of all glass, cushions, gaskets and mica shields. Under no circumstances should these components be re-used or installed on a gage.

NOTE: If size of gage is smaller than shown, follow spiraling sequence from the ends until all bolting is loosened.

WARNING: Once used cushions, gaskets and mica shields are permanently deformed by compression and if re-used, may cause leaks and high stress points resulting in glass breakage. Glass may contain hidden damage and internal stresses caused by previous usage. If re-used, the glass may break under pressure causing personal and property damage.

Inspection of Glass Seating Surfaces

Clean the glass seating surfaces on the chamber and cover with a soft metal scraper (preferably brass) to remove all burrs, rust and remnants of the previous gaskets and cushions. Exercise extreme care to avoid gouging or scarring gasket and cushion seating surfaces.

Use a known flat piece of metal the same approximate length as the glass or a new piece of glass and a thickness gage to check flatness of each glass seating surface on liquid chamber and under cover. Surface must be flat within 0.002 inch (0.05mm). If any one surface is found to be beyond a tolerance of 0.002 inch (0.05mm) the entire gage must be disposed of and replaced.

Glass seating surfaces should NOT be machined to achieve seating tolerance. The chamber and cover are designed for a critical thickness to achieve the pressure/temperature ratings. Machining glass seating surfaces may result in non-compliance to the necessary critical thickness due to material removal.

WARNING: Flatness of glass seating surfaces outside 0.002 inch (0.05mm) tolerance specified is an indication of the gage having been overstressed through repeated exposure to mechanical, thermal or hydraulic shock during its previous service or material has degraded due to corrosion or erosion. Operation of a liquid level gage in this condition will result in abnormal stresses on the glass which may cause glass to break with resulting sudden release of pressure, leakage of contained fluid, personal injury or property damage.

Reassembly

If all glass seating surfaces are found to be within the 0.002 inch (0.05mm) tolerance described in the previous section, proceed to obtain new glass, gaskets, cushions and mica shields (Model 4300) and proceed to reassemble as follows (refer to exploded parts view in Figure 3 or Figure 4):

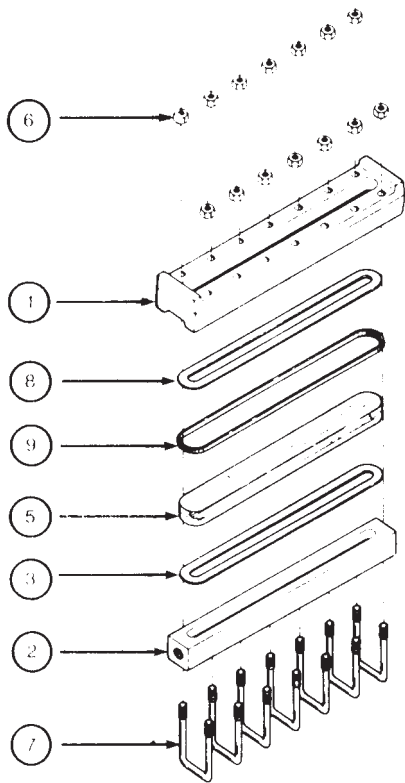
1. Clean threads on bolts and nuts to remove all paint, rust and scale. Apply a light coat of oil to the threads.
2. For Model 4300 gages, insert bolts through half the cover and lay out covers along the bench, side by side, with the liquid chambers. Use chambers to space covers and line them up with vision slots.
3. For Model 4200 gages, lay out covers along bench, side by side, with liquid chambers. Use chambers to space covers and line them up with vision slots.
4. Install one cushion inside each cover.

WARNING: Separate installation instructions are supplied with replacement glass. All instructions supplied with the glass must be followed as there are precautions to be taken when handling gage glass. Among the precautions is avoidance of bumping or sliding glass against any surface and inspection of individual pieces. Failure to follow any of the replacement gage glass instructions could result in glass breakage with resulting sudden release of pressure, personal or property damage.

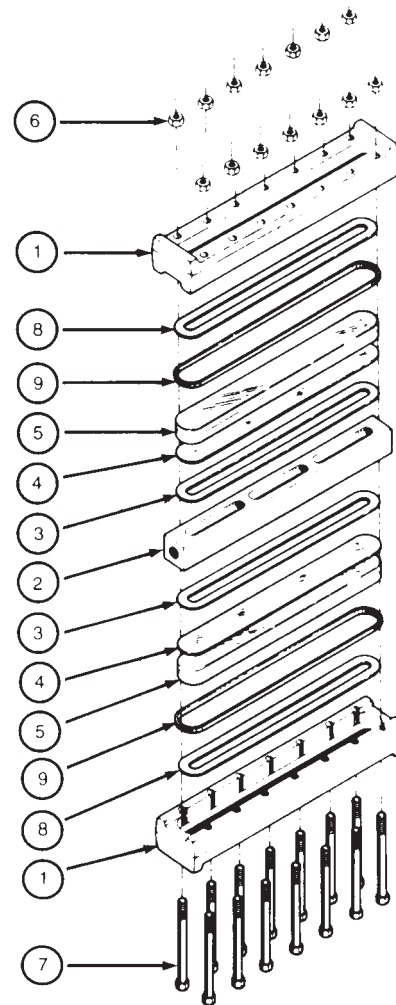
5. Install rubber band around each piece of glass, then place glass centered inside each cover.
6. Install mica shields (Model 4300) and gasket on glass being careful to keep components centered.
7. Place chamber on the gaskets, mica shields (Model 4300) making sure all components are aligned with vision slot.
8. For Model 4200 gage, install U-bolts in place by tapping as needed with rubber hammer, being careful not to lose alignment with vision slot.
9. For Model 4200 gage, quickly turn over assembly onto back side of U-bolts. Assemble nuts to U-bolts. Tighten nuts with fingers. Using a torque wrench, tighten nuts in 5 ft/lb (6.8 N•m) increments, following the sequence in Figure 1 until the torque value of 25-30 ft/lb (33.9 to 40.7 N•m) is reached.

NOTE: depending on gage size there may be less bolting than shown in Figure 1. Start at the center and spiral outward to the limit of the bolting on a specific gage.

10. For Model 4300 gage, install gaskets and mica shields.



Model 4200
Figure 3



Model 4300
Figure 4

11. Install one cushion on each piece of glass.
12. Install rubber band around each piece of glass, then place glass centered inside each cover.
13. Install covers in place being careful to maintain components alignment inside.
14. Install nuts to studs. Tighten nuts with fingers. Using a torque wrench, tighten nuts in 5 ft/lb (6.8 N•m) increments, following the sequence in Figure 1 until the torque value of 25-30 ft/lb (33.9 to 40.7 N•m) is reached.

Refer to installation and operation of liquid level gage when returning to service

Parts List

Item	Description	Min. Qty. Spare Parts
1	Cover	-
2	Chamber	-
3	Gasket	2
4*	Mica Shield	2
5**	Glass	2
6	Nut	2 per Sect.
7	Bolt	2 per Sect.
8	Cushion	2
9	Band	-

Recommended Spare Parts

* Not used in Model 4200

** Minimum quantity of 1 for Model 4200



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