ERNST®
FLOW INDUSTRIES

Guidelines For:
INSTALLATION, OPERATION & MAINTENANCE FOR CLEAR AND REFLEX BOROSILICATE GLASS

This instruction sheet 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 instructions could possibly result in glass breakage resulting in property damage or physical injury to personnel.

CAUTION: The glass manufacturer does not have control over the manner in which the glass is handled, installed or used and the glass distributor cannot and does not warrant or guarantee that the gage glass is suitable or compatible with the user's specific application.

WARNING: Safety glasses should be worn when removing old glass or when installing replacement gage glass.

I. Introduction:

A. Features and Specifications:

Borosilicate gage glass is available in two types: **TRANSPARENT** glass for use in thru vision type liquid level gages and **REFLEX** glass for use in reflex type liquid level gauges.

Glass Ratings: See attached rating charts

II. Inspection and Performance Confirmation:

A. Receiving and Inspection

Upon receipt of glass, inspect each piece individually for shipping damage. During inspection and during any subsequent handling of glass, care must be taken to keep glass pieces from contacting each other or any surface, including table tops. If shipping damage is evident or suspected, notify carrier immediately and request damage inspection. Glass should be kept within original box until ready to use.

B. User's Rating Inspection

The user should confirm that the gage style, size, rating and quantity meet the requirements of the specific application.

CAUTION: If the style, size or performance data of the gage glass as received does not conform with any of the criteria above, do not proceed with installation. Contact **Ernst® Flow Industries** for direction on what to do and clarification.

Check Glass Size and Number: Refer to attached dimension chart

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III. Installation:

Installation should only be undertaken by qualified experienced personnel who are familiar with this equipment and have read and understood all the instructions in this manual.

CAUTION: Do not proceed with installation of replacement gage glass until the liquid level gage has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids.

Refer to manufacturer's installation instructions for the specific model liquid level gage for the required installation procedures.

Before installing replacement glass, all old glass, gaskets, cushions and shields (if used) **must be destroyed and disposed of, and under no circumstances should be reused.**

CAUTION: Under no circumstances should shields be used in reflex style gauges. Installation of shields in reflex style gauges will keep the liquid from coming in contact with the reflective prisms, thereby prohibiting visibility of liquid level in gage.

WARNING: Cushion, gaskets and shields are permanently deformed by compression and if reused, may cause leaks and high stress points resulting in glass breakage. Glass may contain hidden damage and internal stresses caused by previous pressure and temperature usage. If reused, the glass may break under pressure causing property damage or physical injury to personnel.

A. Inspection of Glass Seating Surfaces:

1. Clean the glass seating surfaces on the liquid chamber and cover with a soft metal scraper (preferably brass). Make sure that all burrs, rust and bits of old gaskets are removed.

CAUTION: Extreme care must be taken to avoid gouging or scarring seating surfaces. Failure to properly clean gasket surfaces may result in gasket leaks and high stress points which may cause glass breakage.

2. Check flatness of each glass seating surface on liquid chamber and cover, by using a known flat piece the same size as the glass, and a thickness gage. Surface must be flat within .002 inch.

3. If any one surface is found to be beyond a tolerance of .002 inch, the entire gage must be disposed of and replaced.

WARNING: Flatness of glass seating surface outside the .002 inch tolerance specified above is an indication of the gage having been overstressed through repeated exposure to mechanical, thermal or hydraulic shock during its previous service. Operation of a liquid level gage which has been overstressed will result in abnormal stresses on glass which may cause glass to break with resulting sudden release of pressure, leakage of contained fluid, property damage or physical injury to personnel.

4. If all glass surfaces are found to be within .002 tolerance as described above, proceed to reassemble liquid level gage by following the specific reassembly instructions in the manufacturer's liquid level gage instruction manual.

B. Mirror Viewing:

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

STANDARD PRESSURE

Reflex or Clear Flat Glass

Ratings Chart

R E F L E X

Maximum Recommended Working Pressure, PSI

Size	Length In. (+0, –1/32)	Steam Boiler No Mica	Steam Boiler Mica Protected	Non-Steam Service -150˚F to +150˚F*
1	4-1/2"	400		2500
2	5-1/2"	400	*Mica not used with Reflex Gage Glass*	2500
3	6-1/2"	400		2500
4	7-1/2"	400		2500
5	8-5/8"	400		2500
6	9-7/8"	400		2500
7	11"	400		2500
8	12-5/8"	400		2500
9	13-3/8"	400		2500

*Chemical service which will not corrosively attack the glass.

IV. Operation:

A. Pre-Operation Check:

1. Assure that all installation procedures have been completed.
2. Check to determine that all connections are pressure tight.
3. Assure that nuts have been retorqued to their proper values.

B. Hydrostatic Test:

1. Take all precautions necessary to handle the possibility of leakage during the test.
2. Hydrostatic pressure test all installations to 100 PSIG, and correct any leakage before proceeding.

C. Operating:

Gages should be brought into service slowly. The glass is tempered and can stand minimal thermal shock or mechanical stress. The connecting valves should be opened slightly, and the gage temperature and pressure allowed to slowly equalize with the vessel. If the gage is equipped with valves which have a ball check, the valves must be opened all the way after the pressure and temperature have equalized to permit operation of the automatic ball check in the event of gage failure.

V. Maintenance:

Maintenance should only be undertaken by qualified experienced personnel who are familiar with this equipment and have read and understood all the instructions in this manual.

CAUTION: Do not proceed with installation of replacement gage glass until the liquid level gage has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids.

A. Preventative Maintenance:

The user must inspect the glass daily and keep inspection details and maintenance records to verify that routine inspection is being properly done for each specific installation of a liquid level gage.

On all installations, the gage glass should be regularly evaluated by the user for purposes of maintenance for cleanliness and signs of damage or wear.

The user must determine upon evaluation of his or her own operating experience an appropriate maintenance schedule necessary for his or her specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

B. Maintenance Procedures:

Regular and careful attention must be given to the cleaning and inspection of glass. **Glass that is etched or even slightly scratched is weakened and may break under pressure. Glass ratings listed under Section I. above are no longer valid for gages that contain scratched, worn or otherwise damaged glass, and such glass must be immediately replaced.**

a. Cleaning of Glass:

Keep glass clean using commercial glass cleaner and a soft cloth. **Do not use** wire brushes, metal scraper or any device which could scratch the glass.

b. Inspection of Glass:

Inspect the surface of the glass for any signs of clouding, etching, scratching or physical damage such as bruises, chips or corrosion. Shining a light at approximately a 45

WARNING: Under no circumstances should these glass ratings or ratings of liquid level gage Manufacturer be exceeded. Exceeding these ratings may cause property damage or physical injury to personnel.

Ratings Chart

C L E A R

Maximum Recommended Working Pressure, PSI

Size	Length In. (+0, –1/32)	Steam Boiler No Mica	Steam Boiler Mica Protected	Non-Steam Service -150˚F to +150˚F*
1	4-1/2"	400	1000	2500
2	5-1/2"	400	1000	2500
3	6-1/2"	400	1000	2500
4	7-1/2"	400	1000	2500
5	8-5/8"	400	1000	2500
6	9-7/8"	400	1000	2500
7	11"	400	1000	2500
8	12-5/8"	400	1000	2500
9	13-3/8"	400	1000	2500

* Chemical service which will not corrosively attack the glass.

degree angle will aid in detecting some of these conditions which will glisten more brightly than the surrounding glass when reflecting light. Detection of any such problem areas or any surface wear is sufficient evidence of damage. Immediately take liquid level gage out of service. Do not proceed with operation of liquid level gage until glass has been replaced by following the disassembly - Reassembly instructions under Section V. Paragraph D.

C. Troubleshooting for Glass Condition:

Problem:
Glass or shields become etched or clouded in service.

Cause:
Fluid being gaged is not compatible with glass or shield material.

Cure:
Install shields which will not be affected by contained fluid. Observe caution under Section III. above, and consult with the liquid level gage manufacturer.

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

Cause:
Thermal shock, hydraulic shock, mechanical loads, exceeding manufacturer's ratings or a combination of these.

Cure:
Check entire system to determine possible sources of loads. Check application to determine actual operating conditions and contact the liquid level gage manufacturer for direction on how to proceed.

D. Removal-Disassemble-Reassembly:

CAUTION: Do not proceed with installation of replacement gage glass until the liquid level gage has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids.

Refer to manufacturer's installation instructions for the specific model liquid level gage for Removal-Disassembly-Reassembly instructions.

HIGH PRESSURE

Clear Flat Glass

Ratings Chart

CLEAR HIGH PRESSURE

Maximum Recommended Working Pressure, PSI

Size	Length In. (+0, –1/32)	Steam Boiler No Mica	Steam Boiler Mica Protected	Non-Steam Service -150˚F to +150˚F*
1	4-1/2"	400	1500	5000
2	5-1/2"	400	1500	5000
3	6-1/2"	400	1500	5000
4	7-1/2"	400	1500	5000
5	8-5/8"	400	1500	5000
6	9-7/8"	400	1500	5000
7	11"	400	1500	5000
8	12-5/8"	400	1500	5000
9	13-3/8"	400	1500	5000

* Chemical service which will not corrosively attack the glass.

WARNING: Under no circumstances should these glass ratings or ratings of liquid level gage Manufacturer be exceeded. Exceeding these ratings may cause property damage or physical injury to personnel.

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