System drawings shown in this bulletin are for illustration purposes only. Refrigeration systems should only be serviced by a qualified technician. Always observe proper safety procedures when servicing a refrigeration system. For more information see the latest revision of Phillips Safety Bulletin SGRV.

GENERAL INFORMATION

Temperature Rating: -60°F to 250°F (-51°C to 121°C)

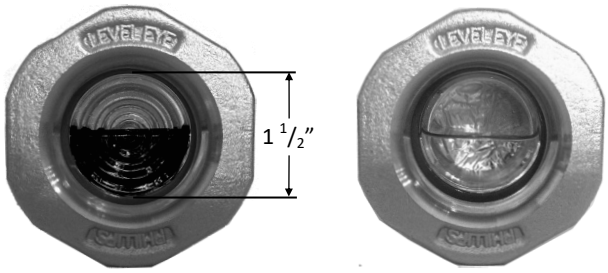
CRN: 0F00829.2C (all models carbon and stainless steel except 1100V)

The H.A. Phillips Level Eye is a reliable, industrial-type sight glass that comes in a wide variety of housing styles and viewing options.

The standard reflex lens indicates the true level of the liquid present without requiring a second lens. The reflex lens appears dark in the presence of liquid and clear otherwise, as shown in Figure 1. It is ideal for determining the liquid level in a vessel or column and displays up to 1-1/2" of liquid. An optional clear lens is available when it is desirable to view inside a vessel. It should be used in pairs, with a light shone into the vessel through one lens while observing through the other.

The optional standard-length frost shield (1-1/2" long) provides clear visibility down to refrigerant temperatures of -20°F (-29°C). For temperatures below –20° (-29° C), an extended-length frost shield is (2-1/2" long) available.

H.A. Phillips offers a wide variety of Level Eye configurations to accommodate most refrigerant viewing situations. Some common configurations are summarized in Table 1, and all the available options are illustrated in Figure 5.



Standard Reflex Lens
Shown Without Optional Frost Shield

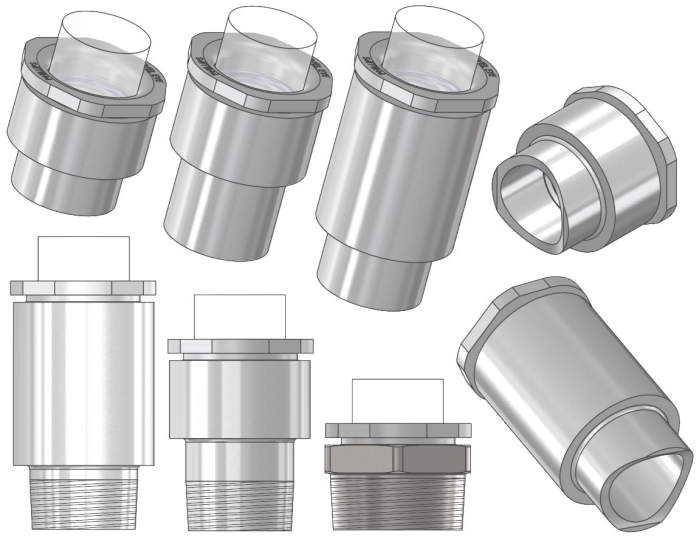
Optional Clear Lens
Shown Without Optional Frost Shield

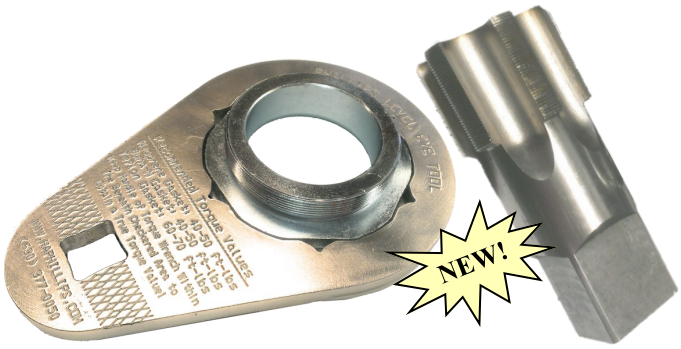
Figure 1: Lens Options and Optical View Length

Table 1: Common Level Eye Configuration Information

Housing Style/Material	Assembly Number*	Connection Geometry	Weight (lbs)
Weld SA36	1100	Square End	1.5
	1100A	Square End	2.0
	1100C	Saddle Milled	1.5
	1100L	Square End	3.0
	1100LC	Saddle Milled	3.0
Weld 304SS	1100S	Square End	1.5
	1100SC	Saddle Milled	1.5
	1100LS	Square End	3.0
	1100LSC	Saddle Milled	3.0
Threaded SA36	1100AT	1-1/2" MPT	2.0
	1100T	1-1/2" MPT	3.0
Threaded SA105	1100V	2" MPT	1.5
Threaded 304SS	1100LST	1-1/2" MPT	3.0

* See Page 3 for more information on assembly part numbers





See Last Page for New Level Eye Tools!

LEVEL EYE APPLICATIONS

Level Eye assemblies are suitable for ASME code vessels such as receivers, intercoolers, suction accumulators, oil separators, surge drums, and oil pots.

The 1100 Series Level Eyes can also be used in refrigeration columns, liquid line indicators, and other non-code applications.

The Level Eye assemblies are suitable for R-717 (ammonia) as well as numerous other synthetic and natural refrigerants.

GASKET MATERIAL COMPATIBILITY

The standard Teflon (PTFE) gasket (1103) is compatible with most common refrigerants and performs well under high pressure. Buna-N gasket material (1103B) is recommended for use with propane (R-290) and CO_2 (R-744). Neoprene gasket material (1103N) is also available upon request and is compatible with most common refrigerants, but is **not recommended for systems using POE (polyolester) oil.**

For more information on gasket material compatibility with refrigerants and refrigerant oils, please contact H.A. Phillips & Co.

INSTALLATION INSTRUCTIONS

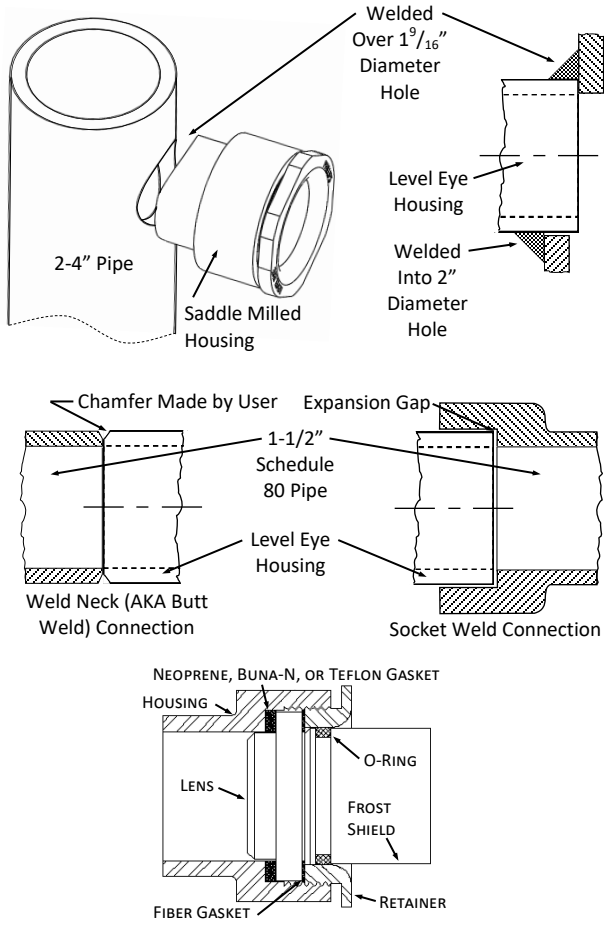


Figure 2: Installation Methods and Assembly Order

1. **To weld:** Housings can be welded into a 2" opening, over a $1^{9}/_{16}$" opening, or treated as a 1-1/2" Sch. 80 pipe, as shown above. Remove the retainer, glass, and gaskets before welding. Applying anti-spatter or placing a clean, damp cloth over the threads will help protect them from weld spatter. Weld the housing into place using proper welding practices, paying special attention to heat input into the workpiece, as excessive heat can distort the housing.
2. **After welding:** Once the workpiece has cooled, clean the threads with a cloth or non-abrasive nylon brush. Install the lens and gaskets in the order shown above. Ensure the lens sits flat against the gaskets, and that all parts are clean and free of debris. Next, insert the retainer by hand, carefully engaging the threads to avoid cross-threading or damaging them. **If the retainer will not thread in properly, please read about the thread tap on page 4.**
3. Tighten the 1102SH retainer to **60-70 ft-lbs** when using a Teflon gasket (1103). For a Neoprene (1103N) or Buna-N (1103B) gasket, torque the retainer to **40-50 ft-lbs**. **See the socket tool on page 4.**
4. **Important:** Upon pressurizing the system (and before installing a frost shield), and periodically thereafter, check for a proper seal by applying a dish soap and water solution to the Level Eye. Watch for any bubbles that may indicate a leak.
5. **If applicable**, insert the frost shield using a light coating of Neoprene-safe oil on the O-Ring. Push the frost shield into the 1102SH by hand.

A VERY THIN WIRE (APPROXIMATELY 27 GAUGE), HELD OVER THE O-RING TO ALLOW AIR TO ESCAPE DURING INSERTION, WILL AID IN THE INSTALLATION OF THE FROST SHIELD. REMOVE THE THIN WIRE AFTER INSTALLATION.

SERVICE AND MAINTENANCE

- Perform a monthly visual inspection of the glass and an annual retainer torque test. **Re-torque after completing a pressure cycle and again when the operating pressure is reached**. Replace glass and both gaskets immediately if any discoloration or physical damage is found.
- For systems of cyclic nature, it is recommended to perform inspections and re-torques more frequently.
- If refrigerant leakage is detected, check the torque on retainer. If the retainer is torqued to the proper specification and the leak still persists, replace the lens and gaskets.
- Do not reuse gaskets. Whenever the glass is replaced, both gaskets must also be replaced.**
- When replacing the lens, inspect it carefully for any signs of damage. If the new lens is damaged, do not use it. If the lens is dropped, do not reuse it, even if there no visual damage.
- Do not use any type of metal or sharp object to remove ice from the sight glass. Always use low heat to slowly melt the frost.

Lens Replacement Kits and Instructions

Please see Table 2 for lens replacement kits and spare parts.** Two available kits are offered, each including the standard Teflon (PTFE) gasket (1103) and a fiber gasket (1104). One kit comes with a standard reflex lens (1101R), while the other includes a clear lens (1101).

1. Use only qualified and experienced personnel to perform preventative maintenance work.
2. Read the latest PHILLIPS Safety Bulletin SGRV (available on our website or upon request) before performing any maintenance and service work.
3. Follow all procedures for pumping out and discharging refrigerant as described in the safety bulletin mentioned above, and as required by good practice, local codes, ordinances, and regulations.
4. **DO NOT** begin disassembly of any valve or accessory component until its internal pressure is confirmed to be equalized to atmospheric pressure.
5. If a frost shield is installed, remove it by twisting and pulling it out by hand. Then, loosen and remove the 1102SH retainer. Next, remove both gaskets and lens.
6. Install the lens replacement kit** by following steps 2 through 5 in the installation instructions.
7. When all installations are complete, evacuate and recharge the system as recommended or required by good practice standards, local codes, ordinances, and regulations.

****Please order a custom lens replacement kit when using propane (R-290) or CO_2 (R-744).** The standard kits include the Teflon (PTFE) gasket (1103), which is compatible with most common refrigerants. However, Buna-N gasket material (1103B) is specifically recommended for use with propane (R-290) and CO_2 (R-744). When replacing a lens in a system operating with either of these refrigerants, please order the appropriate gasket (1103B), the desired lens (1101R or 1101), and the fiber gasket (1104) individually.

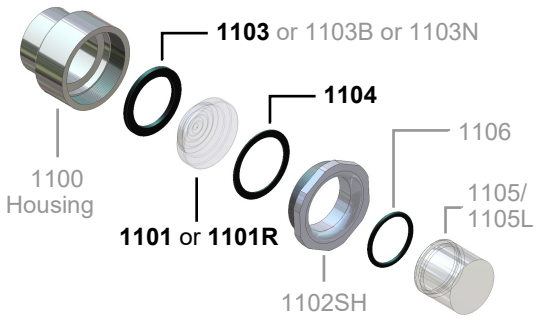


Figure 3: Lens Replacement Kits (includes parts in dark text)

LEVEL EYE HOUSINGS AND PARTS

Table 2: Level Eye Parts and Descriptions

Part Type	Part No.	Description
Housings Weld SA36	1100H	2” long housing, square end
	1100AH	3” long housing, square end
	1100CH	2” long housing, saddle milled
	1100LH	4” long housing, square end
	1100LCH	4” long housing, saddle milled
Housings Weld 304SS	1100SH	2” long housing, square end
	1100SCH	2” long housing, saddle milled
	1100LSH	4” long housing, square end
	1100LSCH	4” long housing, saddle milled
Housings Threaded SA36	1100ATH	3” long housing, 1-1/2” MPT
	1100TH	4” long housing, 1-1/2” MPT
Housing Threaded SA105	1100VH	1-1/2” long housing, 2” MPT
Housing Threaded 304SS	1100LSTH	4” long housing, 1-1/2” MPT
Lenses	1101	Clear lens, borosilicate glass
	1101R	Reflex lens, borosilicate glass
Retainer	1102SH	Retainer, forged 416SS hex
Gaskets & O-Rings	1103	Gasket, standard Teflon (PTFE)**
	1103B	Gasket, Buna-N**
	1103N	Gasket, Neoprene**
	1104	Gasket, vulcanized fiber
	1106	O-Ring, Neoprene
Frost Shields	1105	Frost shield, Lucite, standard length (1-1/2”)
	1105L	Frost shield, Lucite, extended length (2-1/2”); for refrigerant temperatures below -20°F/-29°C
Lens Replacement Kits	K1100	Includes 1101 clear lens, 1103 Teflon (PTFE) gasket**, and 1104 fiber gasket
	K1100R	Includes 1101R reflex lens, 1103 Teflon (PTFE) gasket**, and 1104 fiber gasket

** See GASKET MATERIAL COMPATIBILITY section on page 1

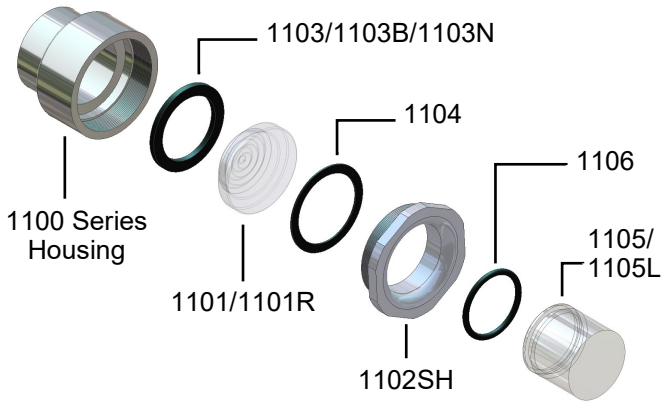


Figure 4: Level Eye Exploded Assembly View

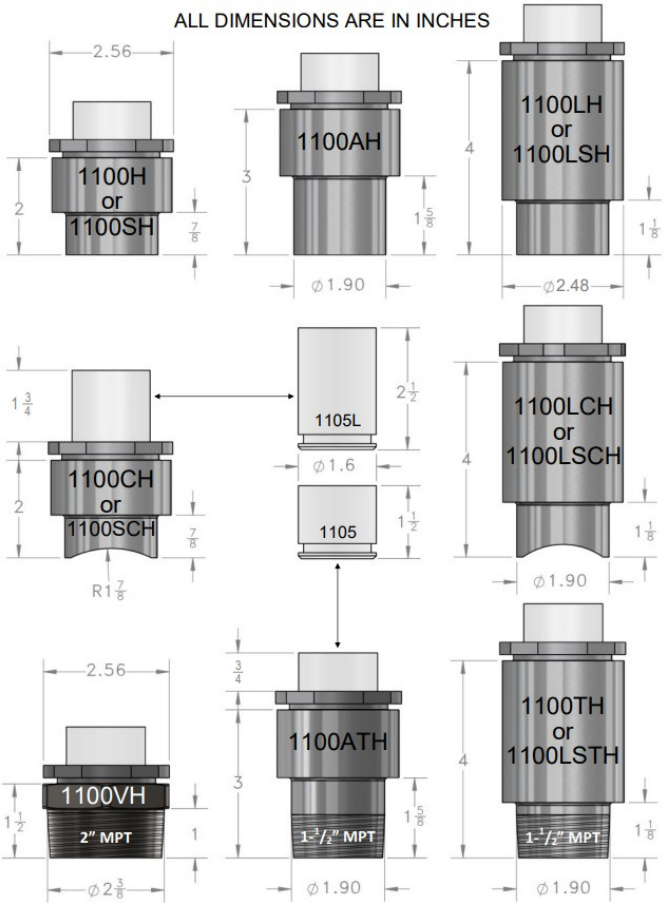


Figure 5: 1100 Series Housing Options

ASSEMBLY PART NUMBER NOMENCLATURE

When ordering, please specify the assembly configuration number using the Assembly Configuration Number Identifier table below.

Assembly Configuration Number Examples:
A 4” stainless steel Level Eye® with reflex lens, extended frost shield, and Teflon (PTFE) gasket has the configuration part number: ***1100LS-RNX***

If the exploded assembly (Figure 4; shown with a 1100H housing) had a Neoprene gasket (1103N), a reflex lens (1101R, as pictured), and a standard-length frost shield (1105), then its configuration part number would be: ***1100-RN-P***

ASSEMBLY CONFIGURATION NUMBER IDENTIFIER

1100	-R	NX	-P

Housing Style (less ‘H’)
See assembly parts table above
Please note that you do not list the ‘H’ that is part of the housing part number.

LENS
(Blank) = Clear Lens
R = Reflex Lens

FROST SHIELD
(Blank) = No Frost Shield
N = Standard Length (1-1/2”)
NX = Extended Length (2-1/2”)

GASKET MATERIAL
(Blank) = Standard Teflon (PTFE)
B = Buna-N
P = Neoprene

LEVEL EYE TOOLS

Housing Thread Tap and Blanking Plug:

Part No.	Description
Level Eye Tap	Level Eye Thread Tap (**for sale only**)
Level Eye Tap - Leased	Level Eye Thread Tap (**for lease only**)
1101B	Level Eye Glass Blanking Plug, Plated Steel

Instructions for Using Tap to Chase Housing Threads

If the retainer threads (male threads) are damaged, please replace the existing retainer with a new 1102SH retainer. If your existing retainer is an older style with slots on the face (see image to the right), **it can be replaced with our newer style retainer,** as the current design is backwards compatible.

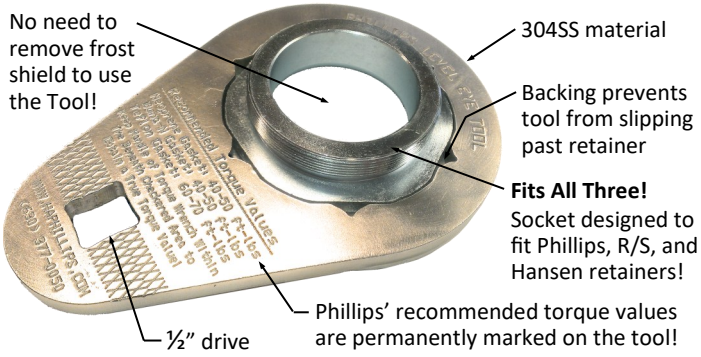
Old Style Retainer

If the housing threads (female threads) are stripped, lack sufficient material for the reforming process, or if the thread contact area is inadequate due to a severe warping caused by excessive heat during the welding process, **do not attempt to reuse the housing!** In such cases, please contact Phillips to discuss your options.

New Style Retainer

1. Before using the tap to chase the female housing threads, thoroughly clean the existing threads by removing any dirt, rust scale, grease, or other contaminants. A small bristle brush and refrigerant oil can assist in this process.
2. Apply a generous amount of refrigerant oil to both the housing threads and the tap.
3. Hold the tap in line with the hole and carefully insert the thread chaser. It is designed with undersized tap heads to allow for precise alignment and easy starting. Whenever possible, begin by hand-tightening the thread chaser.
4. Use an adjustable wrench (capable of opening to approximately 1.35") to turn the thread chaser clockwise through the hole, advancing a little at a time. Periodically rotate the thread chaser in the opposite direction to help lift grime and debris from the threads. Remove the thread chaser and clean it with a rag or brush. Repeat steps one through four until threads are fully chased.

Retainer Socket Tool:

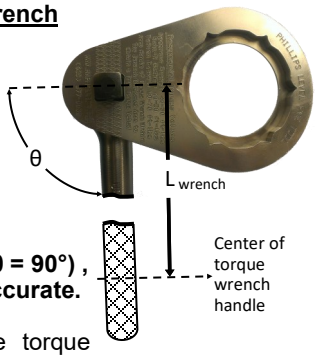


The back side of the tool features a slightly larger socket for retainers that don't fit the main side *(such as those with teeth marks from using a pipe wrench to tighten)*. It's also easier to use when insulation extends up to the retainer's lip.

Part No.	Description
LevelEyeTool	Level Eye sight glass retainer socket tool; 304SS material; 1/2" drive socket; for use with Phillips, Hansen, and R/S's bulls eye style sight glasses.

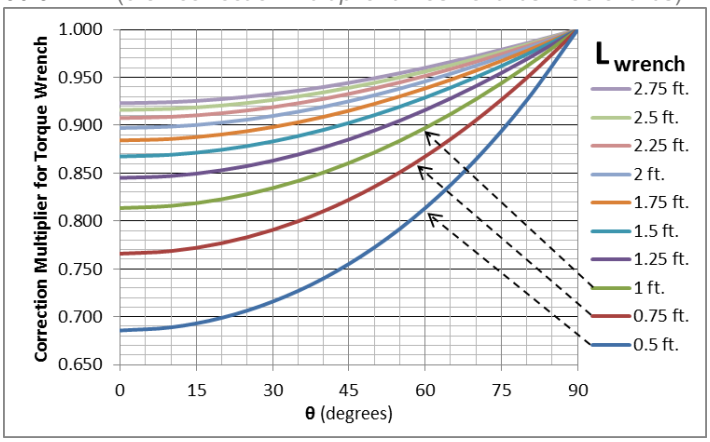
Instructions for Setting Torque Wrench

Due to the socket tool's additional length, the actual torque applied to the retainer may be higher than the reading on your torque wrench set point. This depends on the angle between the wrench and the tool (θ) as well as the length of your wrench (L_{wrench}). **When the wrench is held perpendicular to the socket tool (θ = 90°) , the amount of torque applied is accurate.**



If you are unable to position the torque wrench perpendicular to the tool, use the beneath graph to determine a correction factor. This accounts for the additional amount of torque being applied.

Example: To tighten a retainer to a true value of 45 ft-lbs, with θ = 0° & L_{wrench} = 1 ft, we should set our torque wrench to click at 36.5 ft-lbs (*0.81 correction multiplier times 45 ft-lbs = 36.5 ft-lbs*)



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