

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)

The H.A. Phillips Level Eye is a reliable, industrial type sight glass; and comes in a large 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. The reflex lens is ideal for determining the liquid level in a vessel or column and shows up to 1-1/2" of liquid. An optional clear lens is available when it is desirable to view into a vessel; and can be used in pairs by shining a light into the vessel through one while looking into the other.

The optional standard length frost shield allows clear vision with refrigerant temperatures down to -20°F/-29°C, and a 1" longer frost shield is available for refrigerant temperatures below -20°F/-29°C.

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

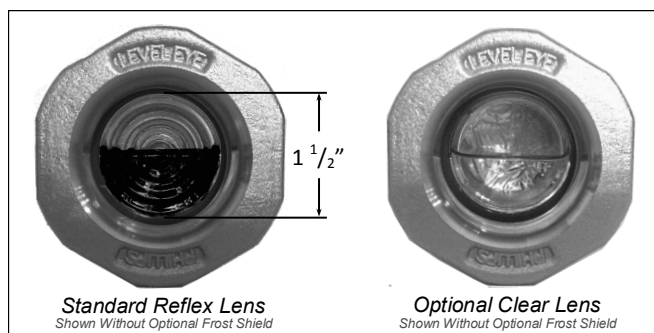
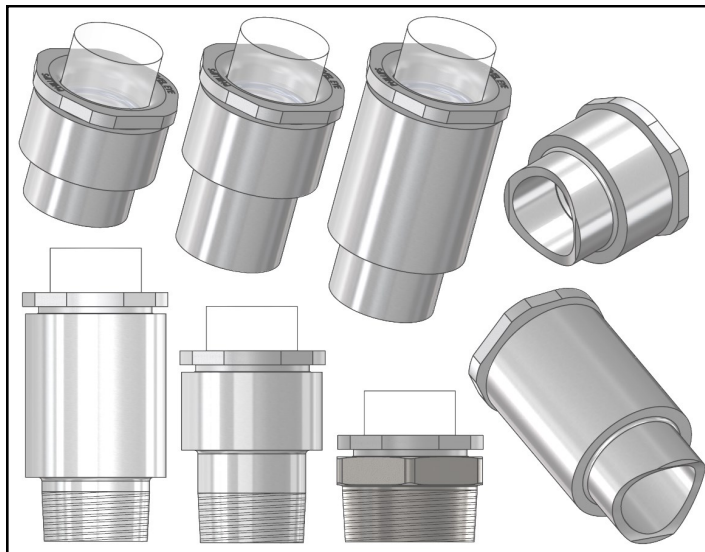
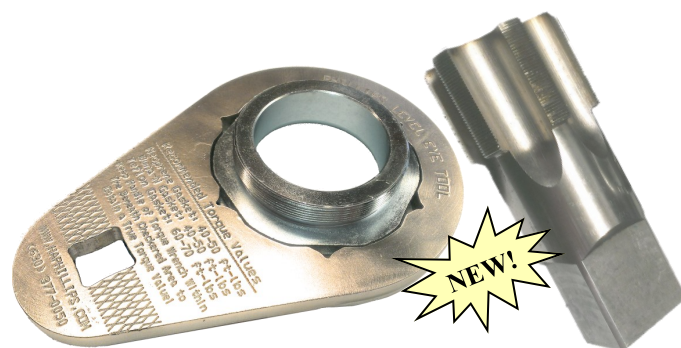


Figure 1: Lens Options and Optical View Length

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
	1100LS	Square End	3.0
Threaded SA36	1100AT	1-1/2" MPT	2.0
	1100T	1-1/2" MPT	3.0
Threaded Steel Forging	1100V	2" MPT	1.5
Threaded 304SS	1100SL	1-1/2" MPT	3.0

* See Page 3 for more info on assembly part numbers



See Last Page for New Level Eye Tools!

LEVEL EYE APPLICATIONS

The 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 or liquid line indicators, and other non-code applications.

The Level Eye assemblies are suitable for R717 (ammonia), R-22, R-134a, R-404a, R-410a, R-507a and many other common refrigerants.

GASKET MATERIAL COMPATIBILITY

The standard Neoprene gasket (1103) is compatible with most common refrigerants. Buna-N gasket material (1103B) is recommended for use with Propane (R-290) and CO₂ (R-744); Teflon gasket material (1103T) is recommended for use in high pressure applications and also with R-22.

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



INSTALLATION INSTRUCTIONS

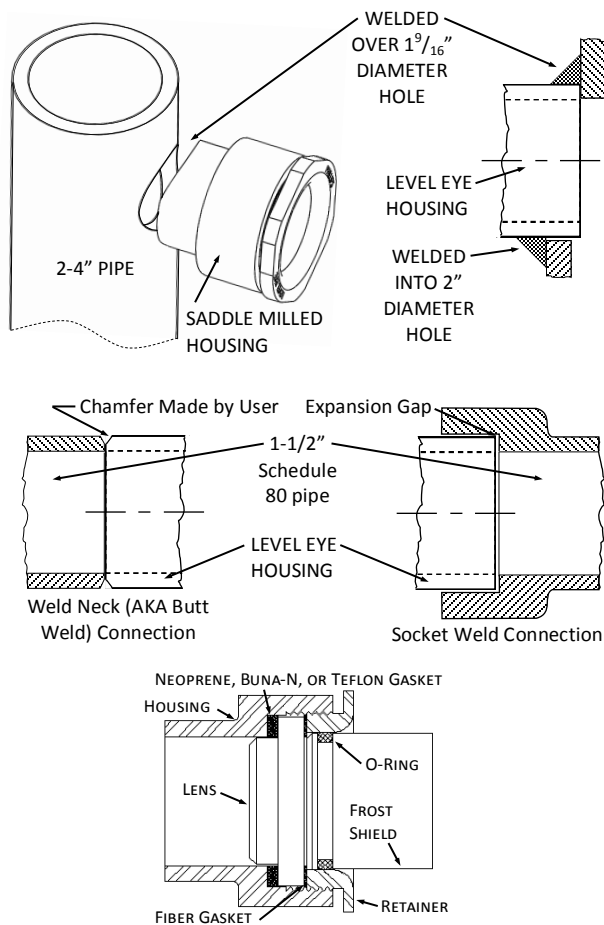


Figure 2: Installation Methods and Assembly Order

1. **To weld:** Housing can be welded into a 2" opening, over a 1- $\frac{9}{16}$ " opening, or treated as a 1-1/2 sch. 80 pipe as shown above. Remove the retainer, glass, and gaskets before welding. Anti spatter or a clean damp cloth applied/inserted over the threads will help protect the threads from weld spatter. Weld the housing into place employing good welding practices paying special attention to heat input into the work piece as an excessive amount of heat input can distort the housing.
 2. Once the work piece has cooled, clean the threads with a cloth or non-abrasive nylon brush. Install the lens and gaskets in the order as shown above. Make sure the lens is installed flat against the gaskets and all parts are clean and free of debris. Next insert the retainer, by engaging the threads by hand, being careful to avoid crossing and mutilation of the threads. **If retainer will not thread in properly please read about the thread tap on page 4.**
 3. Tighten 1102SH retainer to 40-50 ft-lbs torque for a Neoprene (1103) or Buna-N (1103B) gasket. For a Teflon gasket (1103T), torque to 60-70 ft-lbs. **See socket tool on page 4.**
 4. **Important:** Upon pressurizing the system (and before installation of a frost shield), and periodically thereafter, check for a proper seal by applying a dish soap/drinking water solution to the Level Eye; keeping an eye out for any bubbles that may form from 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.
- VERY THIN WIRE (AROUND 27 GAUGE) HELD OVER THE O-RING, ALLOWING AIR TO ESCAPE WHILE INSERTING, WILL AID INSTALLATION OF A FROST SHIELD. WITHDRAW THE THIN MATERIAL AFTER INSTALLATION.

SERVICE AND MAINTENANCE

- In service, do a periodic monthly visual inspection of the glass and a yearly retainer torque test. **Re-torque after a pressure cycle is completed and also when operating pressure is reached.** Replace glass and both gaskets immediately if any discoloration or physical damage is found.
- If refrigerant leakage is found, check torque on retainer; If torqued to the proper level and still leaking, then replace lens and gaskets.
- Do not reuse gaskets; whenever the glass is replaced, replace both gaskets**.
- When replacing the lens, look for any signs of damage. If the new lens is damaged, do not use. If the lens is dropped, do not reuse 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**. The two available kits come with the standard Neoprene (1103) gasket, either a standard reflex lens (1101R) or a clear lens (1101R) and a fiber gasket (1104).

1. Use only qualified and experienced persons to perform preventative maintenance work.
2. Read the latest PHILLIPS safety bulletin (available on our website or upon request) prior to 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/pulling it out by hand. Loosen and remove the 1102SH retainer. Next remove both gaskets and lens.
6. Install the lens replacement kit** by following the installation instructions steps 2 through 5.
7. When the time comes, after all installations are complete, evacuate and recharge the system as recommended/required per good practice standards, local codes, ordinances, and regulations.

Please order a custom lens replacement kit **if using propane (R-290), CO2 (R-744), or R-22: The kits contain the standard Neoprene gasket (1103) which is compatible with most common refrigerants. Buna-N gasket material (1103B) is recommended for use with Propane (R-290) and CO2 (R-744); Teflon gasket material (1103T) is recommended for use in high pressure applications and also with R-22. When needing a replacement lens kit for a system operating with any of these three refrigerants please order the appropriate gasket, the desired lens, and the 1104 fiber gasket separately.

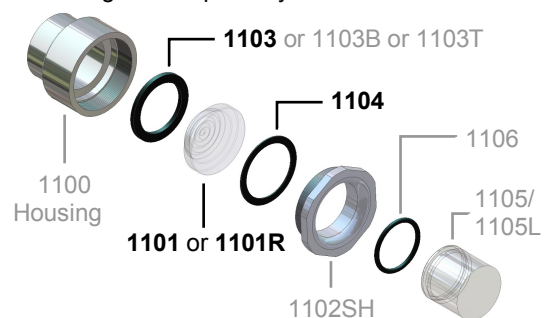


Figure 3: Lens Replacement Kits (includes parts in dark text)



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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
	1100LSH	4" long housing, square end
Housings Threaded SA36	1100ATH	3" long housing, 1-1/2" MPT
	1100TH	4" long housing, 1-1/2" MPT
Housing Threaded Steel Forging	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
	1102TH	retainer, forged 416SS hex
Gaskets ** & O-Rings	1103 **	gasket standard, neoprene **
	1103B **	gasket, Buna-N **
	1103T **	gasket, Teflon (PTFE) **
	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"); use for refrigerant temps. below -20°F/-29°C.
Lens Replacement Kits	K1100**	includes 1101 clear lens, 1103 Neoprene gasket** and 1104 fiber gasket
	K1100R**	includes 1101R reflex lens, 1103 Neoprene gasket** and 1104 fiber gasket

** See GASKET MATERIAL COMPATIBILITY section and custom lens replacement instructions under the Service and Maintenance section.

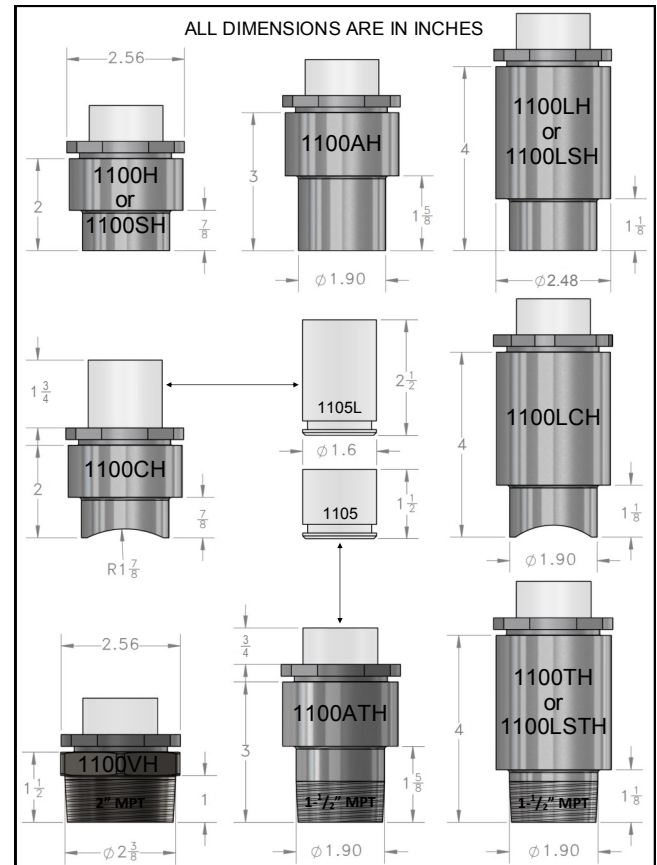


Figure 5: Level Eye Housings and Dimensions

ASSEMBLY PART NUMBER NOMENCLATURE

*When ordering please specify the assembly configuration number using the assembly configuration number Identifier table beneath:

Assembly Configuration Number Examples:

4" stainless steel Level Eye® (housing part number 1100LSH) with reflex lens, extended frost shield and Teflon gasket is: 1100LS-RNXT

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

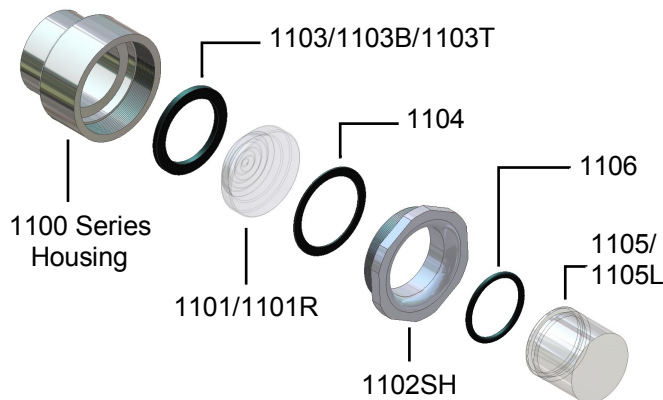


Figure 4: Level Eye Exploded Assembly View

ASSEMBLY CONFIGURATION NUMBER IDENTIFIER

1100	-R	NX	-T
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 Neoprene B = Buna-N T = PTFE* (Teflon®)			

*Teflon gasket is recommended for high pressure applications

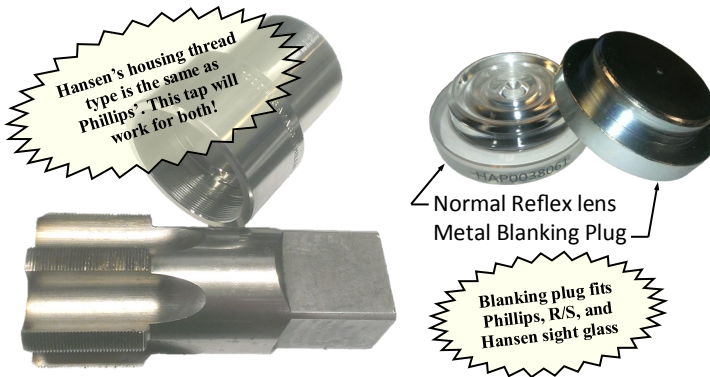


Visit us at: www.haphillips.com or e-mail us at: info@haphillip.com



LEVEL EYE TOOLS

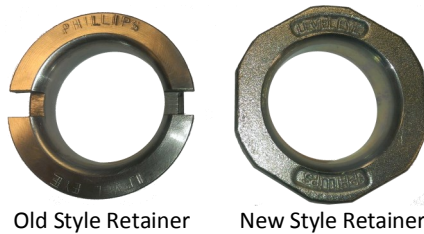
Housing Thread Tap and Blanking Plug:



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:

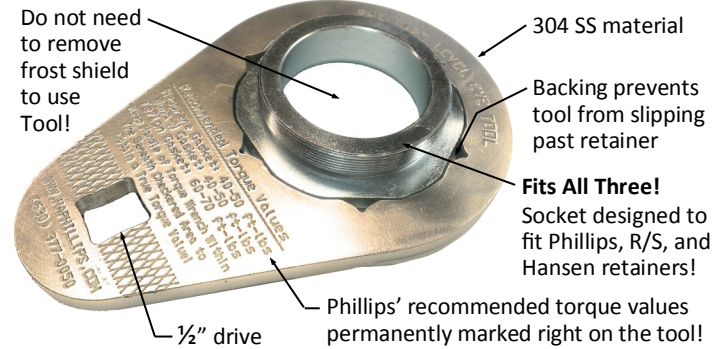
If the retainer threads (male threads) are damaged please replace the existing retainer with a new 1102SH retainer. If your existing retainer is an older style retainer, has slots in the face of the retainer (see image beneath), **you can use our newer style retainer to replace the older style retainer** (current design is backwards compatible).



If the housing threads (female threads) are stripped out, with insufficient thread material for the reforming process, or if the thread contact area is insufficient (due to a severely warped housing resultant from excess heat input during the welding process) then do not attempt to reuse the housing! If this is the case please contact Phillips to discuss your options.

1. Prior to using the tap to chase your female housing threads, first clean the existing threads by removing any dirt, rust scale, grease or other contaminants to the best of your ability. A small bristle brush and refrigerant oil can assist in this process.
2. Apply a generous amount of refrigerant oil to the housing threads and to the tap.
3. Hold the tap in line with the hole and carefully insert the thread chaser into the hole. It is designed to have undersized tap heads that enable it to start in the hole with much accuracy. Initially hand tighten the thread chaser whenever possible.
4. Use an adjustable wrench (needs to open up to about 1.35") to turn the thread chaser clockwise through the hole a little bit at a time. Counter rotate the thread chaser to lift grime and debris off the surface. Pull out and clean tap with a rag or brush. Repeat steps one through four until threads are completely chased.

Retainer Socket Tool:



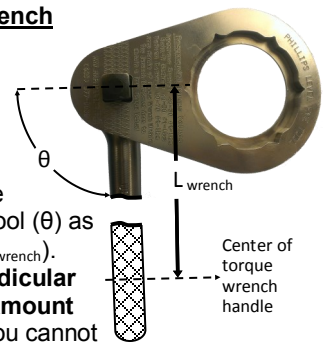
The back-side of the tool has a slightly larger socket for use with retainers that do not fit the main side (for example, this could be due to teeth marks in retainer from previously using a pipe wrench to tighten). This back-side can also be used more easily if your insulation runs all the way up to the lip of the retainer.

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

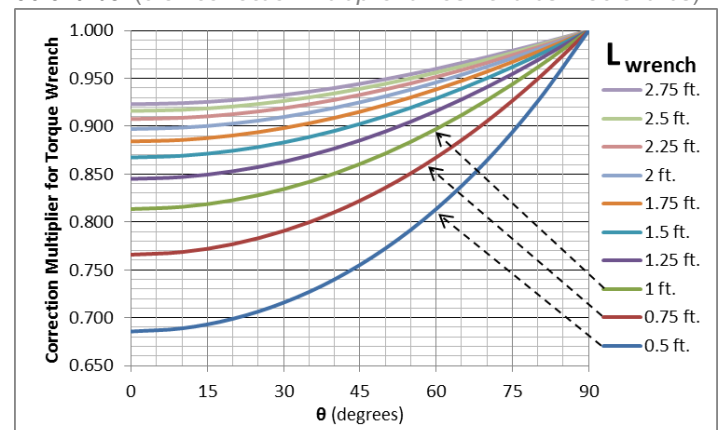
Instructions for setting torque wrench

Due to the additional length of the socket tool, the true amount of torque that you apply to the retainer may be more than what you are reading/have your torque wrench set to. This will be dependent on the angle of the wrench relative to the tool (θ) as well as the length of your wrench (L_{wrench}).

Whenever the tool is held perpendicular to the socket ($\theta = 90^\circ$), then the amount of torque applied will be true. If you cannot hold the wrench perpendicular to the tool then use the beneath graph to determine a correction factor to account for the additional amount of torque being applied.



Example: To tighten a retainer to a true value of 45 ft-lbs, with $\theta = 0^\circ$ & $L_{wrench} = 1$ ft., we should set our torque wrench to click at 36.5 ft-lbs: $(0.81 \text{ correction multiplier times } 45 \text{ ft-lbs} = 36.5 \text{ ft-lbs})$



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