

1) WARNING

- a) **Read the complete instructions before attempting to install the rupture disk and holder assembly.**
- b) It is the user's responsibility for the design of adequate venting and installation of adequate vent piping or directional flow after rupture occurs with the rupture disk as intended. When size is specified, ZOOK assumes that adequate provisions have been made by the purchaser and/or user for proper venting of a system to relieve the specific pressure. Locate the rupture disk where people or property will not be exposed to the system discharge in the event of rupture. Vent toxic or flammable fumes to a safe location to prevent personnel injury or property damage.
- c) It is the user's responsibility to specify the burst pressure rating at the coincident temperature at which the rupture disk is to be used. A rupture disk is a temperature sensitive device. The burst pressure of the rupture disk is directly affected by its exposure to the coincident temperature. Failure to utilize a rupture disk at the specified coincident temperature could cause premature failure or overpressurization of the system.
- d) Particles may discharge when the rupture disk ruptures. These particles may be part of the rupture disk itself, or other environmental matter in the system. It is the user's responsibility to ensure that particles are directed to a safe area to prevent personnel injury or property damage.
- e) Rupture disk service life is affected by corrosion, creep and fatigue, and physical damage. These conditions will derate the rupture disk to a lower pressure. The user should be prepared to handle a premature failure of the rupture disk. The media or other environmental conditions should not allow for any build-up or solidification of media on the rupture disk. This may increase the burst rating of the rupture disk.
- f) ZOOK rupture disks, when installed in their respective holders correctly, will provide a very good seal for liquids and most gases or vapors. However, ZOOK cannot guarantee the leakage rate of the disk seal without prior knowledge of the requirement and details of the piping layout. Consult ZOOK for guidance if leakage is critical to the installation.
- g) The customer and/or its installer shall be responsible for the proper installation of rupture disk device into a system.
- h) Customer and/or its installers shall be responsible for improper installation and physical damage resulting therefrom, including, but not limited to, damage resulting from leakage, improper torquing, and/or failure to follow installation instructions.
- i) ZOOK standard Terms and Conditions of Sale/Contract apply unless otherwise stated in writing by ZOOK.

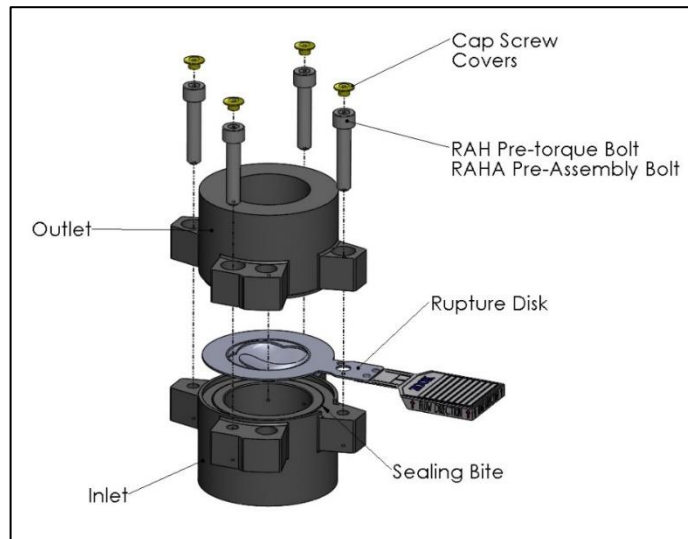


Figure 1. RAH Holder

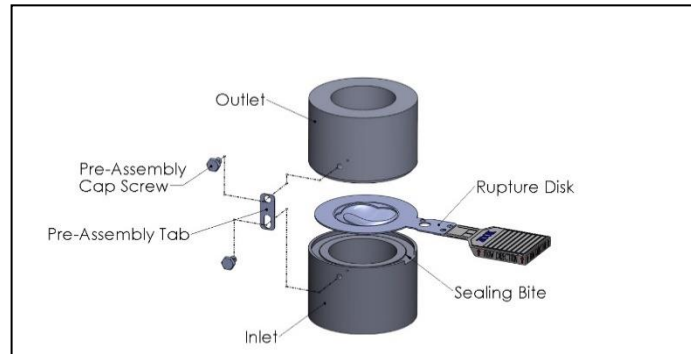


Figure 2. RAHI Holder

2) HOLDER INSPECTION AND PREPARATION

a) New Holders

- (1) Carefully remove the rupture disk holder from its packaging and disassemble by removing **socket head cap screws (SHCS)** for pre-torque RAH type holders (figure #1), or the pre-assembly tab screws for insert type RAHI holders (figure #2), lift the outlet up and set aside. Discard the protective shipping paper sandwiched between the two halves of the holder.
- (2) Wipe with a clean cloth and suitable solvent to remove all rust inhibitors and foreign material.
- (3) Inspect the seat area for any scratches, dents, or nicks. Imperfections on these surfaces can cause leaks. **DO NOT USE** if any scratches, dents or nicks are detected, contact ZOOK immediately for instructions.
- (4) The holder must not be machined or modified in any way without prior written approval from ZOOK.

b) Skid Safe or Fully Assembled Holders

- (1) Carefully remove the assembly from its packaging and discard the protective shipping covers.
- (2) The assembly must not be taken apart or modified in any way without prior written approval from ZOOK.
- (3) Proceed to section 4 Installation of the assembly in the the system.

c) Existing Holders

- (1) For existing installations remove the complete assembly (disk and holder) from the piping by removing the companion flange bolts and nuts and place on a clean flat surface.
- (2) Disassemble the assembly by removing SHCS for pre-torque type RAH holders (figure #1) or the pre-assembly tab screws for type RAHI holders (figure #2), and lift the outlet up and set aside.
- (3) Remove the used rupture disk from the holder, inspect the sealing bite indentation formed into the rupture disk. The indentation should be consistent around the seat of the rupture disk and be visible to the naked eye. **DO NOT USE** the holder if any inconsistencies are observed, contact ZOOK immediately for instructions. Inconsistencies generally indicate a worn holder which can lead to leakage and/or erratic burst pressures.
- (4) Inspect the holder's mating surfaces for foreign material. Remove any adhered gasket material from the previous installation and clean the gasket surfaces of the holder thoroughly. Dirt and grit on these surfaces can cause leaks.
- (5) Inspect the holders seat area for any scratches, dents, or nicks. Imperfections on these surfaces can cause leaks. **DO NOT SCRAPE OR SCRATCH** any seating surface. If wiping these surfaces with a clean cloth and suitable solvent does not remove surface residue, fine emery cloth or steel wool may be utilized. Care should be exercised not to exert sufficient pressure on the emery cloth or steel wool to cut or groove these sealing surfaces. **DO NOT USE** if any scratches, dents or nicks cannot be removed, contact ZOOK immediately for instructions.

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INSTALLATION INSTRUCTIONS

For Flat Seated Bolted Type RAH Series Disk Holders RA Series Rupture Disks

(6) The holder must not be machined or modified in any way without prior written approval from ZOOK.

3) ASSEMBLY OF THE RUPTURE DISK AND HOLDER

- a) **CAUTION: All ZOOK Rupture Disks are recommended for installation into holders manufactured by ZOOK ONLY.**
- b) **CAUTION: Rupture disks are precision instruments and must be handled with extreme care. Rupture disks should be installed only by qualified personnel familiar with rupture disks and proper piping practice.**
- c) **CAUTION: ZOOK does not recommend reinstalling a rupture disk that has been removed from its holder. Reinstallation may adversely affect the sealing capabilities and/or the performance of the rupture disk.**
- d) Place the holder inlet on a clean flat work surface with the flow arrows pointing up.
- e) Carefully remove the disk from its package.
- f) Examine the disk carefully before installation. **DO NOT USE IF THERE IS ANY INDICATION OF DAMAGE.** Handle with extreme care.
- g) Place the rupture disk into the inlet counterbore with the flow arrows pointing up from the work surface so the convex (dome) side of the rupture disk faces down towards the work surface and the alignment pin located in the inlet holder is engaged with the corresponding hole in the rupture disk tab. **DO NOT USE A SEPARATE GASKET.**
- h) Carefully align and place the outlet flange into the inlet counterbore with the alignment pin located in the inlet holder engaged with the corresponding hole in the outlet and the with the flow arrows pointing up from the work surface.
- i) **For “insert” type RAHI holders:**
 - (1) Fasten the assembly together by reinstalling the pre-assembly tabs and screws as shown in figure 2. The pre-assembly screws should be snug, NOT wrench-tight.
- j) **For “pre-assembly” type RAHA holders:**
 - (1) Pre-Assembly SHCS should be free-running non-coated stainless steel. Fasten the assembly together by reinstalling the pre-assembly SHCS as shown in figure 1. The pre-assembly screws should be lightly tightened with wrench 1/8 of a turn past first contact with holder. Over-torqueing can damage holder or bolt. Sealing of the disk is obtained by tightening of the companion flange studs and nuts, NOT via tightening of the pre-assembly bolts.
- k) **For “pre-torque” type RAH holders with Fluoropolymer Coated SHCS (Blue):**
 - (1) Fasten the assembly together by reinstalling the SHCSs as shown in figure 1 finger tight before torquing. **High strength** SHCSs are supplied with the assembly, **DO NOT SUBSTITUTE**, high strength material is required for correct assembly.
 - (2) Torque Values assume threads with a coefficient of friction of $\mu = 0.08$.
 - (3) Using a torque wrench, develop the required torque incrementally in a minimum of four (4) steps in a crisscross pattern. The initial torque should be no more than 25% of the final required torque listed in table #1. After following this sequence, a final tightening should be performed SHCS-to-SHCS to ensure that all SHCSs have been evenly torqued.
 - (4) SHCSs when tightened correctly will properly seat the rupture disk into the holder engaging the sealing bite. They do not eliminate the need for proper flange bolt tightening for proper functionality of the assembly.
- l) **For “pre-torque” type RAH holders with 17-4 Stainless Steel SHCS:**
 - (1) Fasten the assembly together with **lightly oiled** 17-4 stainless steel SHCS as shown in figure 1 finger tight before torquing. **High strength** SHCS are supplied with the assembly, **DO NOT SUBSTITUTE**, high strength material is required for correct assembly. If SHCS are not lightly oiled the rupture disk may not be fully seated for optimal performance.
 - (2) Torque Values assume threads lightly oiled with a coefficient of friction of $\mu = 0.08$.

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- (3) Using a torque wrench, develop the required torque incrementally in a minimum of four (4) steps in a crisscross pattern. The initial torque should be no more than 25% of the final required torque listed in table #1. After following this sequence, a final tightening should be performed SHCS-to-SHCS to ensure that all SHCSs have been evenly torqued.
- (4) SHCSs when tightened correctly will properly seat the rupture disk into the holder engaging the sealing bite. They do not eliminate the need for proper flange bolt tightening for proper functionality of the assembly.

Table 1 - Torque Data For Fluoropolymer Coated High Strength SHCS (Blue) And Lightly Oiled 17-4 Stainless Steel SHCS			
Nominal Diameter of Bolt		Typical Holder Diameter (All Pressure Ratings)	Max Recommended Torque Ft-Lbs (Nm)
Diameter	Threads Per Inch		
1/4"	28	1" (25mm)	9 (12)
5/16"	24	1½" (40mm) & 12" (300mm)	18 (24)
3/8"	24	2" (50mm) & 6" (150mm)	32 (43)
7/16"	20	2-1/2" (63mm), 3" (80mm), 4" (100mm), 8" (200mm), 10" (250mm)	49 (67)
1/2"	20	-	76 (103)
5/8"	18	-	151 (205)

m) For RAH holders with Teflon Sleeve Insert and Sintered:

(1) New Installation

- i. Inspect the O-ring groove of the holder for any scratches, dents, nicks, or debris. Imperfections in the groove can cause leaks. DO NOT USE if any scratches, dents, or nicks are present, contact ZOOK immediately when damaged.
- ii. Inspect the provided O-ring for scratches, dents, or nicks. DO NOT USE if O-ring is damaged, contact ZOOK immediately for replacements.
- iii. Place the O-ring in the groove of the holder and follow holder assembly instructions from section 3) i), j), k), or l).
- iv. O-ring is a custom size, contact ZOOK for replacements.
- v. Figure 3 displays a teflon sleeved holder. Teflon sintered holders are similar except they do not have a sleeve.

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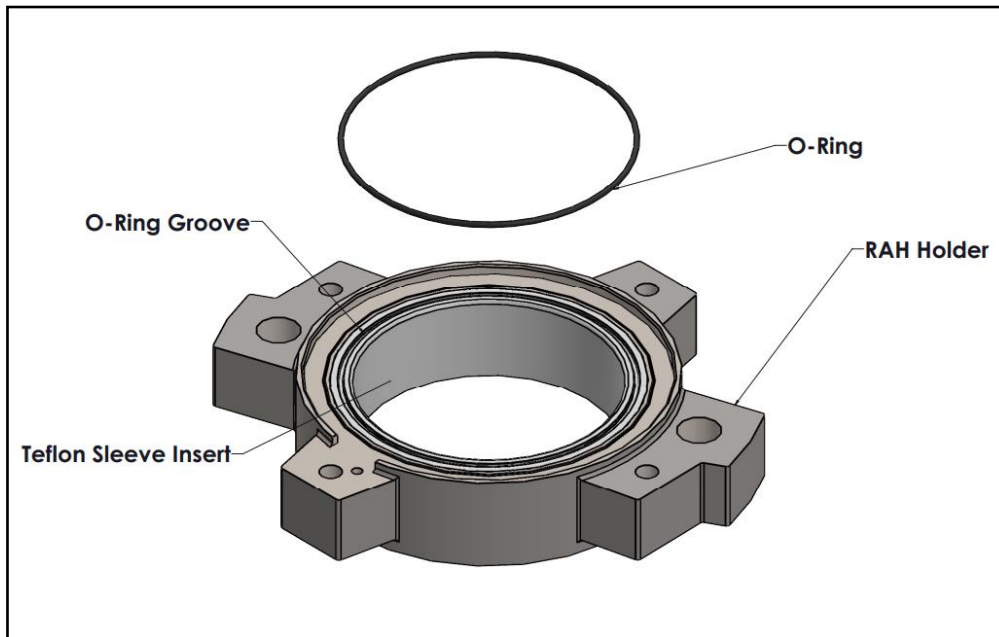


Figure 3. RAH Holder with Teflon Sleeve Insert

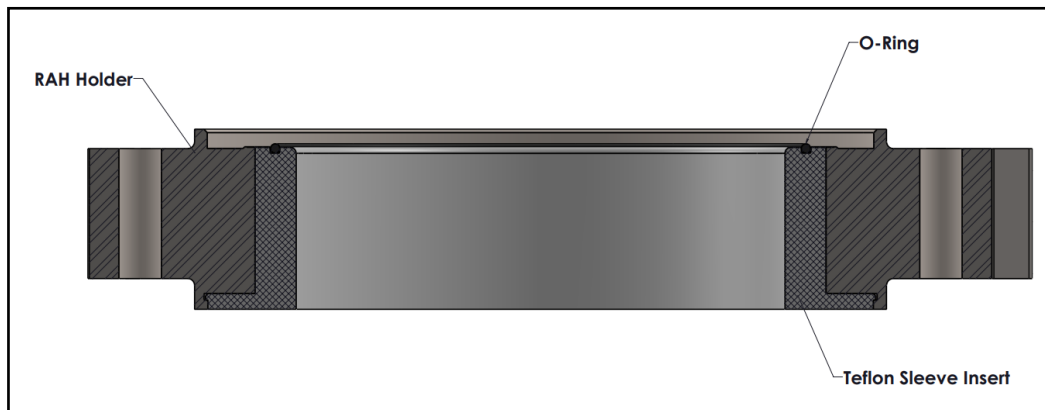


Figure 4. RAH Holder with Teflon Sleeve Insert Cross Section

4) INSTALLATION OF THE ASSEMBLY (RUPTURE DISK AND HOLDER) INTO THE SYSTEM

- a) To achieve a high degree of success in attaining accurate burst pressures and a leak-free joint, several steps are required. It is imperative that a regimented bolt-up procedure is applied.
 - (1) Inspect the Companion Flanges:
 - i. Before installing the assembly into the system, ensure that the companion flange gasket surfaces are clean and free from all rust, corrosion, and foreign material. The allowable imperfections in the flange gasket surface should not exceed the depth of the surface finish grooves, and that the radial marks are no deeper than the depth of the flange surface finish and less than 50% in length of the overall gasket sealing surface width.
 - ii. To assure proper sealing of the assembly and flange gaskets parallelism, flatness, and waviness should be within 0.008" (0.2mm) or less.

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- (2) Insert the assembly between the companion flanges insuring that ALL FLOW ARROWS POINT IN THE PROPER DIRECTION. The convex domed side of the disk should be facing towards the process pressure.
- (3) Install new gaskets between the assembly and the companion flanges. We recommend compressed fiber gasket no greater than 1/16" (1.6mm) thick. The user is cautioned to select a gasket material that is suitable for the intended service and will resist "cold flow". In the event of cold flowing of the gaskets, the assembly torque will relax in non-pretorqueable holders, which can result in erratic bursting of the rupture disk and/or leakage.
- (4) Do not apply any compounds to the gasket or seating surfaces.
- (5) Reinstall companion flange studs and nuts, making sure they are free of any foreign matter, and well lubricated. Lubricate the nut bearing surfaces as well. Lubrication is not required if PTFE coated fasteners are used.
- (6) **WARNING:** If the assembly is installed upside down, the burst pressure may exceed the marked burst pressure. PAY CLOSE ATTENTION TO THE FLOW ARROWS ON THE RUPTURE DISK AND HOLDER.
- (7) **WARNING:** The disk tag is designed to provide critical information about the rupture disk only and should NOT be used as a hand hold to lift or adjust the assembly during installation. This practice can damage the disk resulting in failure of the disk below its marked burst pressure.
- (8) Run-up all nuts finger tight while maintaining parallelism in accordance with 5.a.1.2.
- (9) Determine the recommended bolting torque from table #2 for the size and thread designation of the flange bolts to be used.
- (10) Using a torque wrench, develop the minimum recommended torque incrementally in a minimum of four (4) steps in a crisscross pattern. The initial torque should be no more than 25% of the minimum required torque. After following this sequence, a final tightening should be performed bolt-to-bolt to ensure that all bolts have been evenly torqued.
- (11) Under torquing can cause lower than expected burst pressures and leaks.
- (12) The use of hardened washers will enhance the installation by reducing the friction due to possible galling of the nut bearing surfaces.
- (13) Verify parallelism is in accordance with 4.a.1.2.
- (14) Companion flange torque values should be verified periodically at the system temperature.

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TABLE 2 - RECOMMENDED FLANGE BOLT TORQUE VALUES

IMPERIAL A193 Grade B7 Studs and A194 Grade 2H Nuts				METRIC ISO 898-1 Class 8.8			
Nominal Diameter of Bolt (inches)	Number of Threads (per Inch)	Recommended Torque Ft-Lbs		Thread Designation	Thread Pitch (mm)	Recommended Torque Nm	
		Recommended 30,000 Psi Bolt Stress	Maximum 45,000 Psi Bolt Stress			Recommended 205 N / mm ² Bolt Stress	Maximum 310 N / mm ² Bolt Stress
1/2	13	30	51	M10	1.5	20	30
5/8	11	59	88	M12	1.75	34	52
3/4	10	105	158	M14	2	55	83
7/8	9	170	255	M16	2	86	130
1	8	255	383	M18	2.5	118	178
1 1/8	8	378	566	M20	2.5	167	254
1 1/4	8	533	798	M22	2.5	228	346
1 3/8	8	725	1,087	M24	3	286	434
1 1/2	8	961	1,440	M27	3	423	641
1 5/8	8	1,244	1,865	M30	3.5	577	875
1 3/4	8	1,571	2,355	M33	3.5	788	1,190
1 7/8	8	1,968	2,893	M36	4	1,010	1,530
2	8	2,401	3,599	M39	4	1,305	1,977
2 1/4	8	3,471	5,203	M42	4.5	1,622	2,458
2 1/2	8	4,819	7,223	M45	4.5	2,013	3,051

Standard Conditions for Torque Calculations

- The values provided should be used with caution. They need engineering judgement and experience to allow the results to be properly interpreted. Due to the inherent variations in the coefficient of friction, both in the threads and between the nut face and clamped surface, there is no single "correct" tightening torque for all circumstances. A range of values can be determined however given the anticipated frictional scatter. The amount of frictional scatter, which the engineer allows for when determining the clamp force and tightening torque, should be based upon experimental results taken from the application.
- Recommended torque values do not consider piping stress or alignment.
- Torque Values assume lightly oiled clean free running threads with a coefficient of friction of $\mu = 0.180$. The use of high performance friction reducing compounds may result in permanent damage to the rupture disk holder and adversely affect the performance of the disk.
- Torquing loss is inherent in any bolted joint. The combined effects of bolt relaxation, (approximately 10% during the first 24 hours after installation), gasket creep, vibration in the system, thermal expansion and elastic interaction during bolt tightening contribute to torque loss. In the event of leaks, increase the bolt torque in 10% increments until the leak stops or until the maximum recommended value is achieved. If leaks persist, contact the factory immediately, DO NOT CONTINUE TO TIGHTEN THE BOLTS IN EXCESS OF THE MAXIMUM VALUES LISTED.
- Consult ZOOK for recommended torque values for non-standard conditions.

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