HOKE Gyrolok® Tube Fittings

7 Decades of Product Excellence

Samuel W. Hoke began manufacturing small gas flow control valves for jewelers' torches in 1925. At the same time, he also laid the foundation for a top international fluid control products company, HOKE Incorporated.

In the early 1940's, S.W. Hoke produced the forerunners of today's HOKE valves, masterfully crafted with the highest quality materials.

In the early 1960's, HOKE Incorporated (HOKE) took the industry by storm, introducing the HOKE Gyrolok® Tube Fitting. To this day, no other manufacturer has been able to improve upon its unique design.

Over the years, HOKE Incorporated built a first-class reputation for designing and manufacturing state-of-the-art products. In striving for maximum quality and value, HOKE set the industry standards for product safety, operability, durability and reliability.

Training and Engineering Support

HOKE offers extensive training designed to ensure that your craftspeople thoroughly understand how a HOKE Gyrolok fitting functions. By teaching proper tubing preparation and installation procedures, maximum performance is assured.

HOKE will take the time to assist our customers in finding the HOKE Gyrolok fitting that is right for their specific needs. Ask your HOKE distributor for details regarding HOKE's valve and fitting installation workshop and additional support materials.

gyrolok®

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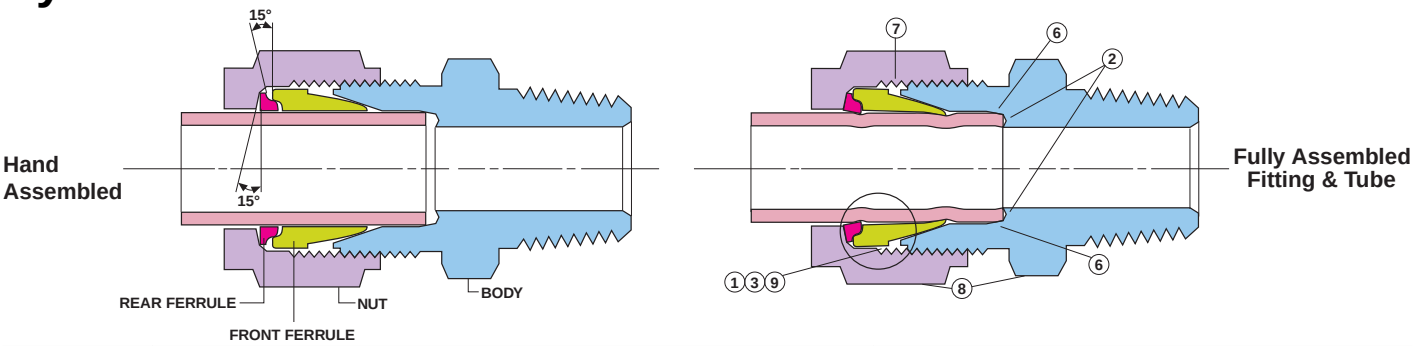
Gyrolok Features & Benefits



FEATURES	EXPLANATION	BENEFITS
1. CONTROLLED FERRULE DRIVE	Roll-in locking action of rear ferrule: During fitting makeup, 15° angles close — between the rear ferrule and nut, and between the rear ferrule and front ferrule — thus preventing overstressing of tubing or excessively reducing tubing inside diameter. Front ferrule shoulder: Front ferrule shoulder prevents body expansion and nut jamming, caused by over-tightening.	Provides maximum user safety under high pressure/vibration conditions. Prevents overstressing, which causes tubing failure and possible injury. System efficiency is improved by maximizing flow. Provides unmatched remake life. Maximizes value and economy.
2. BUTT SEAL	Provides a secondary seal and eliminates dead space.	Maximizes fitting leak integrity and user safety. Can seal with scratched tubing. Increases accuracy in sampling applications. Reduces pump-down time in vacuum applications.
3. HOKE VALVES WITH INTEGRAL HOKE GYROLOK END FITTINGS	Controlled ferrule drive prevents end connection expansion, thus prolonging valve life and eliminating the need to use female-ended valves with separate fittings. Eliminates a possible leak path and extends valve life.	Long product life and maximum value. Safety and economy.
4. GYROLOK SAFETY CHANGER NUT AND FERRULE SETS	Nut and ferrule sets supplied on rods, already correctly oriented. (Not necessary to handle ferrules when replacing components.)	Safest, simplest device for component replacement.
5. GYROGAGE	Marks tubing to show that tubing has been properly inserted into fitting, and that fitting has been properly tightened.	Maximum safety resulting from ability to verify correct tube insertion and proper tightening.
6. SIZING ANGLE	Slight taper in the base of the tube socket reduces possibility of tube sticking	Less tube sticking during disassembly saves time and money
7. SILVER-PLATED NUT THREADS	Silver-plating extends fitting life by preventing galling, up to 1200° F.	Extended product life at extreme temperatures.
8. MATERIAL TRACEABILITY ON FITTING BODY AND NUT	Bodies and nuts made of 316 Stainless Steel and Monel are heat code traceable to Certified Material Test Reports.	Traceability provides added safety. Certified Material Test Reports are available for review and verification.
9. PFA FERRULE COATING	Front ferrules—Sizes larger than 1" (25mm) are PFA coated.	Increased resistance to media and atmospheric corrosion.
10. SPECIAL HIGH TOLERANCE NPT THREAD		

Dimensions for reference only. Subject to change.

The HOKE Gyrolok Design

HOKE Gyrolok Tube Fittings have been carefully designed and manufactured to provide outstanding leak-tight integrity in a wide range of applications.

Materials

HOKE Gyrolok fittings are available in:

Brass:	BR
304 Stainless Steel:	304/304L
316 Stainless Steel:	316/316L
Monel:	M
Hastelloy® C-276:	HC
Duplex 2205:	DX3
Inconel:	600
Super Duplex 2507:	D50
Titanium:	TI
254 SMO:	6MO

316/316L SS Forgings:	ASTM A-182/SA182
304/304L SS Forgings:	ASTM A-182/SA182
Brass Bar Stock, Alloy 360:	ASTM B-16
316/316L SS Bar Stock:	ASTM A-479/SA479
304/304L SS Bar Stock:	ASTM A-479/SA479
Monel Forgings, Alloy 400:	QQ-N-281
Brass Forgings, Alloy 377: ASTM B-283	QQ-S-626
Monel Bar Stock, Alloy 405:	QQ-N-281
Brass Bar Stock, Alloy 353:	ASTM B-453

Contact your local HOKE distributor for further information.

Certified Material Text Reports (CMTRs)

Bodies and nuts of HOKE Gyrolok fittings in all materials other than Brass are heat code traceable. To obtain CMTRs for these components, place separate orders for such items and specify "CMTRs required on all items".

Pressure Rating

Hoke Gyrolok fitting ends are rated for working pressures higher than the tubing recommended for use with HOKE Gyrolok. Under no circumstances should tubing should be utilized at pressures above its maximum allowable working pressure. Refer to the HOKE Tubing Data Charts for specific information. If no pressure is identified for a given tube size and tube wall thickness, that tubing is not considered suitable for use with Gyrolok tube fittings. Pressure ratings may vary for the other fitting end if it is not Gyrolok (i.e. NPT or O-Ring Seal). For general working pressure ratings for NPT fittings ends, refer to the Hoke Pipe Fittings catalog. The user must determine whether both the Gyrolok side and the non-Gyrolok side working pressure ratings are suitable with the system pressure. For more information on Gyrolok pressure ratings, contact your local distributor, or HOKE directly.

PFA Coating

Stainless steel front ferrules larger than 1" and 25 mm are PFA coated.

Vacuum Rating

HOKE Gyrolok offers deep vacuum capability. With good quality tubing, HOKE Gyrolok fittings will be leak-tight at vacuum levels of 10^{-9} torr while tested with a leakage sensitivity of 10^{-9} scc

Temperature

HOKE Gyrolok fittings provide safe, reliable performance from cryogenic temperatures to high temperature bake out levels, depending on material.

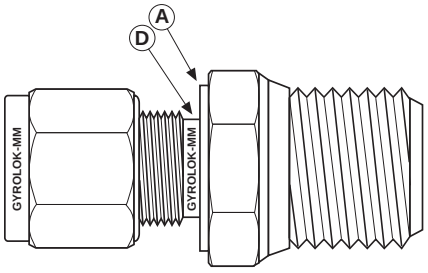
316 Stainless Steel:	-325° F to +800° F (-200° C to +426° C)*

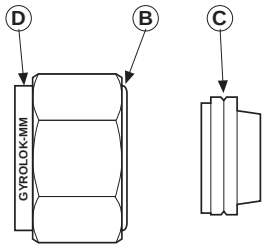
Stainless steel front ferrules larger than 1" and 25mm are PFA coated. Applications above 450° F (232° C) require silver-plated front ferrules and uncoated rear ferrules. To order extended temperature fittings, add –HT to the basic part number.

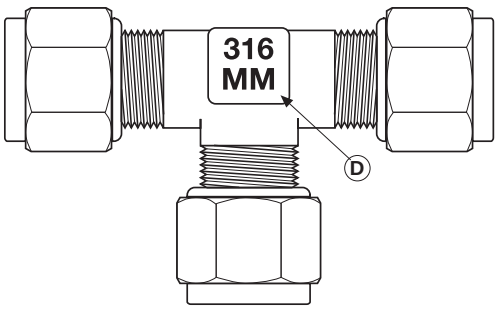
Brass (copper tubing):	-325° F to +400° F (-200° C to +203° C)
Monel:	-325° F to +800° F (-200° C to +426° C)

* **CAUTION: (for Stainless Steel):**
Intermittent use to 1200° F (649° C) is possible, however prolonged exposure to temperatures over 800° F (426° C) is not recommended.

Identifying Metric Gyrolok Products







HOKE metric Gyrolok products have certain features which allow you to identify them from fractional products.

A. Step Machined on Body Hex

Straight bodies with a metric Gyrolok end have a step on the tube fitting side of the hex.

B. Short Shank on Nut

Metric nuts have a short shank on the threaded end.

C. Groove in Front Ferrule

Metric front ferrules of brass or 316 stainless steel have a groove in the shoulder. For other materials, see D.

D. MM Marking

The metric designation "MM" is stamped on:

- metric nuts and straight bodies—after the Gyrolok trademark
- metric elbows, tees and crosses—on the side opposite the HOKE logo
- front ferrules made from materials other than brass or 316 stainless steel—after material identification.

Color Coding

Blue boxes designate metric parts and accessories, including Safety Changer packaging and Gyrogages.

General Information

How to Order

The HOKE Gyrolok numbering system is a completely descriptive system that's easy to understand. Each part number describes completely assembled fittings.

4 CM 4 316 [ ] [ ]

Tube O.D.
(Inches) In sixteenths of an inch (1/4" O.D.)
(Metric) In millimeters

Type Fitting
(male connector)

Pipe/Tube Size
(Inches) In sixteenths of an inch (1/4" NPT)
(Metric) In millimeters

Modifier per #9 (below)

Modifier per #5, 7, 8 (below)

Material

BR – Brass
316 – 316 stainless steel
M – Monel
HC – Hastelloy® C-276
600 – Inconel
TI – Titanium
DX3 – Duplex 2205
D50 – Super Duplex 2507
6MO – 254 SMO

1. The first number (4) identifies the tube O.D. size. For example, 4 = 4/16" for fractional fittings. 4 = 4mm for metric fittings. If there is no 5th group, sizes are fractional.

2. The letter group, (CM) identifies the type of fitting (Male Connector). See fitting locator, pages 2 and 3.

3. The third group, a number (4), is only necessary if the second tube connection size is different from the first tube O.D. size. For pipe sizes, a number is always required.

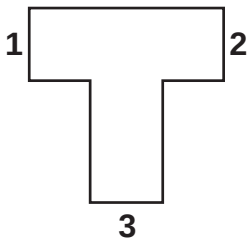
4. Material is identified in the fourth group.

5. With the exception of branch tees, the fifth group, if present, contains two letter codes. The first letter designates the unit of measure for the first number in the part number—i.e, E for fractional, M for metric. The second letter indicates the unit of measure (E or M), or thread type, for the second number in the part number. If there is no 5th group, all sizes are fractional.

   Examples:
   4CM4 316 = 1/4 tube x 1/4 NPT male connector, 316 stainless steel
   6RU3 BR ME = 6mm tube x 3/16 tube reducing union, brass
   8LM4 316 EC = 1/2 tube x 1/4 male RT, male elbow, 316 stainless steel

Unit of measure/end connector codes:

A = RS male ends
B = RP male ends
C = RT ends
E = fractional unit of measure in 1/16th of an inch
M = Metric tube, in millimeters
X = RS/RP female ends
Z = RG female ends



6. Tee part numbering: TEES are described by first the run (1 and 2) and next the branch (3), for example:
   TTM describes a tee that has tube connections at 1 and 2 and a male pipe thread at position 3.
   TFT describes a tee that has tube connections at 1 and 3 and a female pipe thread at position 2.

7. Fittings cleaned for oxygen service: To order, add HPS 18 to the end of basic fitting part number.
   Example: 4CM4 316 HPS 18

8. Fittings cleaned for nuclear service: To order, add HPS 90 to the end of basic fitting part number.
   Example: 4CM4 316 HPS 90

9. O-ring designator - Viton® (45) is standard for SAE fittings. In the event no material is specified, Viton will be supplied. Buna (21) is standard for other fittings with O-rings. Alternative O-ring materials are available, including silicone (01), and Buna-N (23). Example 6CMS631623

Thread Connections Available with Gyrolok Fittings

Pipe Thread Information

HOKE Gyrolok tube fittings are available with NPT (National Pipe Taper), BSP/ISO (British Standard Pipe/International Standards Organization), SAE or unified screw threads.

Tapered Threads

Specifications	Type	Part Number or Suffix Designation	Sealing Method
NPT	M/F	Fitting type ends in M or F, as in CM or CF	Seal is made on the thread. Thread sealant is required.
RT to ISO 7/1 • BS 21 • JIS B0203 • DIN 2999	M/F	Modifier is C, following the unit of measure for fractional (E) or metric (M), as in 6CM4316EC	Seal is made on the thread. Thread sealant is required. The BSP/ISO thread utilizes a different angle and the number of threads per inch may differ from NPT. Reference DIN 3852, Form C.
	M/F		
	M/F		
	Male		

FOR YOUR SAFETY

IT IS SOLELY THE RESPONSIBILITY OF THE SYSTEM DESIGNER AND USER TO SELECT PRODUCTS SUITABLE FOR THEIR SPECIFIC APPLICATION REQUIREMENTS AND TO ENSURE PROPER INSTALLATION, OPERATION AND MAINTENANCE OF THESE PRODUCTS. MATERIAL COMPATIBILITY, PRODUCT RATINGS AND APPLICATION DETAILS SHOULD BE CONSIDERED IN THE SELECTION. IMPROPER SELECTION OR USE OF PRODUCTS DESCRIBED HEREIN CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

Straight and Parallel Threads

Specifications	Type	Part Number or Suffix Designation	Sealing Method
American Standard unified screw threads	Male	Fitting type ends in S, as in COS or AOS.	Generally utilizes an elastomer o-ring to provide sealing.
RP to ISO 228/1 • BS 2779 • JIS B0202	Male	Modifier is B, following the unit of measure for fractional (E) or metric (M), as in 6CM4316EB	Metal to metal sealing to DIN 3852, Form B.**
RS to ISO 228/1 • BS 2779 • JIS B0202	Male	Modifier is A, following the unit of measure for fractional (E) or metric (M), as in 6CM4316EA	Utilizes a sealing washer to provide sealing. Reference DIN 3852, Form A.**
RG to ISO 228/1 • BS 2779 • JIS B0202	Female	Modifier is Z, following the unit of measure for fraction (E) or metric (M), as in 6CF4316EZ	Sealing form meets DIN 16288, Form Z.

** Female RP or RS end available with Form X.

HOKE Gyrolok Fittings with SAE Ends

SAE Straight Thread O-Ring Seal Fittings

HOKE Gyrolok's SAE Straight Thread O-Ring Seal Fittings are designed and manufactured to SAE standards defined below for use in many different applications including hydraulics and natural gas vehicles. HOKE's SAE Straight Thread O-Ring Fittings are supplied with Viton O-rings.

Fittings available include: Tube to SAE straight connectors, positionable SAE elbows and tees, and SAE reducers.

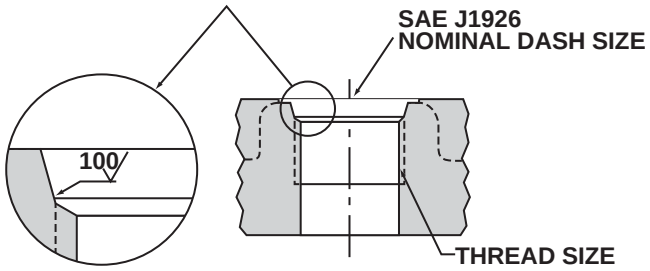
SAE Specifications

HOKE's SAE Straight Thread O-Ring Seal Fittings are designed and manufactured to meet SAE Standards as follows:

- Male or External Fitting End Dimensions: SAE J514
- Straight Threads: SAE J475 (equivalent to ANSI B1.1 or ISO R725)
- Female or Internal Straight Thread Boss: SAE J1926 (see diagram below)

Thread and O-ring Sizes

Nominal Tube O.D.	Port Size	Thread Size	O-ring Size #
1/8	2	5/16 - 24	902
1/4	4	7/16 - 20	904
3/8	6	9/16 - 18	906
1/2	8	3/4 - 16	908
5/8	10	7/8 - 14	910
3/4	12	1 1/16 - 12	912
1	16	1 5/16 - 12	916



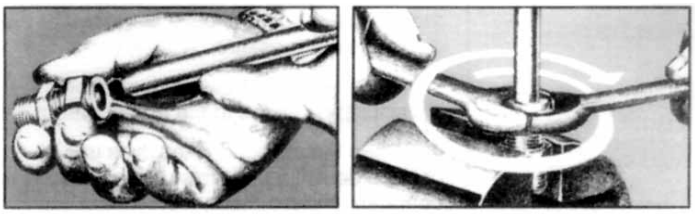
Installation Instructions

Positionable End Connections

1. Assure that the locknut is fully raised.
2. Turn the external SAE end clockwise into the internal boss until the metal washer is in contact with the boss.
3. Orient the Gyrolok end to the proper direction by now turning the fitting *counterclockwise* up to a *maximum* of 1 turn.
4. While supporting the body wrench pad with a backup wrench, tighten the locknut until the washer is snug against the face of the boss.

Gyrolok Assembly Instructions, see page 53.

HOKE Gyrolok Assembly Instructions



Initial setting of ferrules onto tubing or tube stub-ended fittings

Sizes 1", 25mm and Smaller

Manual Assembly

Use the following instructions when initially setting ferrules onto either tubing, or the tube stub end of certain fittings (e.g. adapters, port connectors, and reducers). Note that for tubing sizes above ½", or 12mm, the use of a presetting tool, either manual or hydraulic, may apply. See further details in the Section titled, "Presetting Tool Assembly".

1. Loosen the fitting nut.
2. Firmly insert the tubing into the fitting assembly. Proper assembly requires that the tubing be fully bottomed in the fitting body. Note: Use of the HOKE Gyrogage, explained below, will allow the assembler to confirm proper tube insertion.
3. Establish a consistent starting point for wrench tightening.
   For sizes under ½", finger tightening of the fitting nut is sufficient.

   For applications requiring high-pressure, high-safety factor or severe service as well as all sizes ½" and above, tighten the fitting nut until the tubing will not rotate. If it is not possible to determine tubing rotation then, while supporting the body with a backup wrench, use a wrench to tighten the fitting nut an additional ¼-turn past finger-tight.
4. Mark the fitting body and nut at the 12:00 position with a readily visible marking.
5. While supporting the body with a backup wrench, tighten the nut with a wrench 1¼-turns by going completely around past the 12:00 position to the 3:00 position. Note that if a Gyrogage is used, the mark made on the tubing will become visible at the back of the nut when the nut has been sufficiently tightened.

Presetting Tool Assembly

Due to the inherent strength of large diameter heavy wall tubing, HOKE recommends the use of a presetting tool, either manual or hydraulic, for all installations involving tubing sizes from 5/8" or 16mm and above, regardless of application. When the tubing wall thickness being utilized in sizes less than 0.065" or 2.0 mm, a manual presetting tool is sufficient. When the wall thickness is 0.065" or 2.0 mm and greater, the use of a hydraulic presetting tool is specifically required. Each Hydraulic Pre-setting Tool is supplied with its own set of instruction.

The use of manual presetting tools is also suggested for smaller size fittings and tubing when the actual installation is in a hard-to-reach location, making it difficult to count turns. Use manual presetting tools by following the instructions for initially setting ferrules. By presetting the ferrules in the presetting tool, installation in place simply requires following Gyrolok remake instructions.

Remaking a fitting end, or assembling a fitting body to tubing with preset-ferrules

1. Firmly insert the end with the previously set ferrules into the fitting body and tighten the nut to a finger tight condition.
2. While supporting the body with a backup wrench, tighten the nut with a wrench until a sharp rise in torque is felt, then simply snug tight.

Sizes 1¼", 28mm and larger

A Hydraulic Pre-setting Tool must be used when assembling 1¼", 1½", 2", 28 mm, 30 mm, 32 mm & 38 mm Gyrolok Tube Fittings

1. A Hydraulic Pre-setting Tool is designed to set the ferrules on the tubing prior to installation into a fitting body. Each Hydraulic Pre-setting Tool is supplied with its own set of instructions.
2. Prior to installation into the fitting body, lubricate the back surface of the rear ferrule and threads on the nut with the lubricant supplied.
3. Using the lubricant supplied, periodically lubricate the cone angle and threads of the Pre-setting Tool die-set (prior to first fitting make-up and approximately every fifth fitting thereafter).
4. Insert tubing with preset ferrules into Gyrolok body, hand tighten the nut, while supporting the body with a backup wrench, further tighten the nut with a wrench until a sharp rise in torque is felt.

Remake Instructions:

1. Firmly insert the end with the previously set ferrules into the fitting body and tighten the nut to a finger tight condition.
2. While supporting the body with a backup wrench, tighten the nut with a wrench until a sharp rise in torque is felt, then simply snug tight.

When initially assembling the pre-set ferrule end of over 1", 25mm Gyrolok adapters, follow the **remake instructions** listed above.

All Sizes

Installations that do not involve setting of ferrules

Assembly instructions differ when installing fitting ends that do not involve setting ferrules, such as a plug (P), or the machined ferrule end of a port connector (PC), as well as for threaded ends such as NPT or SAE, for which appropriate standards should be used.

When assembling a Gyrolok plug onto a Gyrolok body:

1. Remove nut and ferrules from fitting body.
2. Place plug assembly onto fitting body. Tighten plug nut to a hand-tight condition.
3. While supporting fitting body with a backup wrench, tighten plug nut with a wrench until a sharp rise in torque is felt, (approximately ¼-turn on initial makeup, less on reconnections) then simply snug.

When initially assembling the machined ferrule end of a Gyrolok port connector:

1. Remove nut and ferrules from a fitting body.
2. Firmly insert machined ferrule end of port connector into fitting body.
3. Slide nut over tube stub end of port connector and then over machined ferrule. Hand-thread onto fitting body.
4. While supporting fitting body with a backup wrench, tighten nut with a wrench until a sharp rise in torque is felt (approximately ¼-turn on initial makeup, less on reconnections), then simply snug.

HOKE Gyrogage Assembly and Inspection Tool

Use the HOKE Gyrogage to perform step-by-step inspections during the initial assembly process. Each Gyrogage is supplied with instructions, allowing the user to:

1. Verify all components are present.
2. Ensure proper insertion of the tubing into the fitting.
3. Confirm sufficient tightening of the fitting nut.

Ask your HOKE distributor for details regarding HOKE Valve & Fitting Safety Installation Workshops.

Safety Information

Count on HOKE Safety

We pride ourselves on our commitment to safety. HOKE products are machined with total precision, for a long life and maximum performance. Available materials include 316 stainless steel, brass, Monel, Hastelloy® C-276, Inconel, titanium, 254 SMO, Duplex 2205 and Super Duplex 2507. Each product is manufactured to resist the detrimental effects of corrosives, and to withstand extreme pressures or vacuum conditions, as well as temperatures ranging from cryogenic -325° F to +1200° F (-198° C to +648° C).

HOKE products meet the most stringent standards for safety, reliability and quality: AGA (American Gas Association), ANSI (American National Standards Institute), ASME (American Society of Mechanical Engineers), ASTM (American Society for Testing & Materials), MSS (Manufacturers Standardization Society) and NACE (National Association of Corrosion Engineers).

As a result, HOKE products are the choice of OEMs, refiners, chemical manufacturers and all those whose primary concern is safe, reliable performance.

If you have any questions about the design specifications of HOKE products, please contact your local HOKE distributor . Our worldwide network of distributors is specially trained to assist you in your selection of any HOKE product.

HOKE Gyrolok Safety Instructions

1. **Make sure the system is not pressurized when tightening or loosening a fitting or valve connection.**
2. **When relieving or bleeding system pressure**, do not loosen the HOKE Gyrolok nut or any product component.
3. **Do not exceed temperature specifications stated on page 5.**
4. **Do not exceed maximum allowable working pressure/temperature combinations for tubing** when using HOKE Gyrolok. Check the HOKE Tubing Data Charts for specific information. Note that if no pressure is identified for a given size and wall thickness of tubing, that tubing is not suitable for use with tube fittings.
5. **When the application involves use of a toxic or hazardous fluid**, exercise extra caution during operation and maintenance.
6. **When assembling new, unused HOKE Gyrolok tube fitting ends**, loosen the HOKE Gyrolok nut before inserting the tube to allow full insertion of the tube into the base of the body bore.
7. **Always use tubing that is compatible with the fitting or valve material.** Tubing appropriate for use with HOKE Gyrolok fittings is described in the HOKE Tubing Data Charts (e.g. use 316 Stainless Steel fittings with 316 Stainless Steel tubing).
8. **Always leave a length of straight tube between the tube bend and the fitting**. A tube bent too close to the fitting connection may be a source of leakage.
9. **During assembly of the HOKE Gyrolok tube end**, always hold the fitting or valve body with one wrench while separately wrench-tightening the HOKE Gyrolok nut. Follow the same precaution when disassembling.
10. **Always use a HOKE Tube Insert** when assembling a HOKE Gyrolok Fitting to soft, pliable plastic tubing (see page 48).
11. **Always use proper thread lubricants or sealants on tapered pipe threads**. Note that thread sealants may have different temperature ratings than the basic fitting.
12. **NPT threads should be torqued in accordance with an industry standard**, such as Underwriter's Laboratory UL842. Note that previously assembled threads may require additional tightening.
13. **When installing an NPT ended valve,** hold the valve body near the connection with one wrench, while separately wrench-tightening the mating pipe. Turn the pipe, not the valve. Follow the same precaution when disconnecting.
14. **Do not hold the valve handle when tightening an end connection**.
15. **For proper installation**, request a Safety Installation Training Program today! Ask your HOKE distributor for details.

The Issue of Interchangeability

Yes, you can interchange. Believe it. We guarantee the functional Interchangeability of HOKE Gyrolok® fittings with similar fittings of certain other manufacturers, including Swagelok®, Parker A-LOK®, and Parker CPI™.

You can interchange fittings either by using a complete HOKE Gyrolok® nut and ferrule system with a fitting body from certain other manufacturers, or vice versa. HOKE guarantees such interchanged fittings for a safe, secure, leak-tight seal, provided there is no deficiency in parts not supplied by HOKE. The properly interchanged product is covered by our standard warranty. For more information, ask your HOKE distributor.