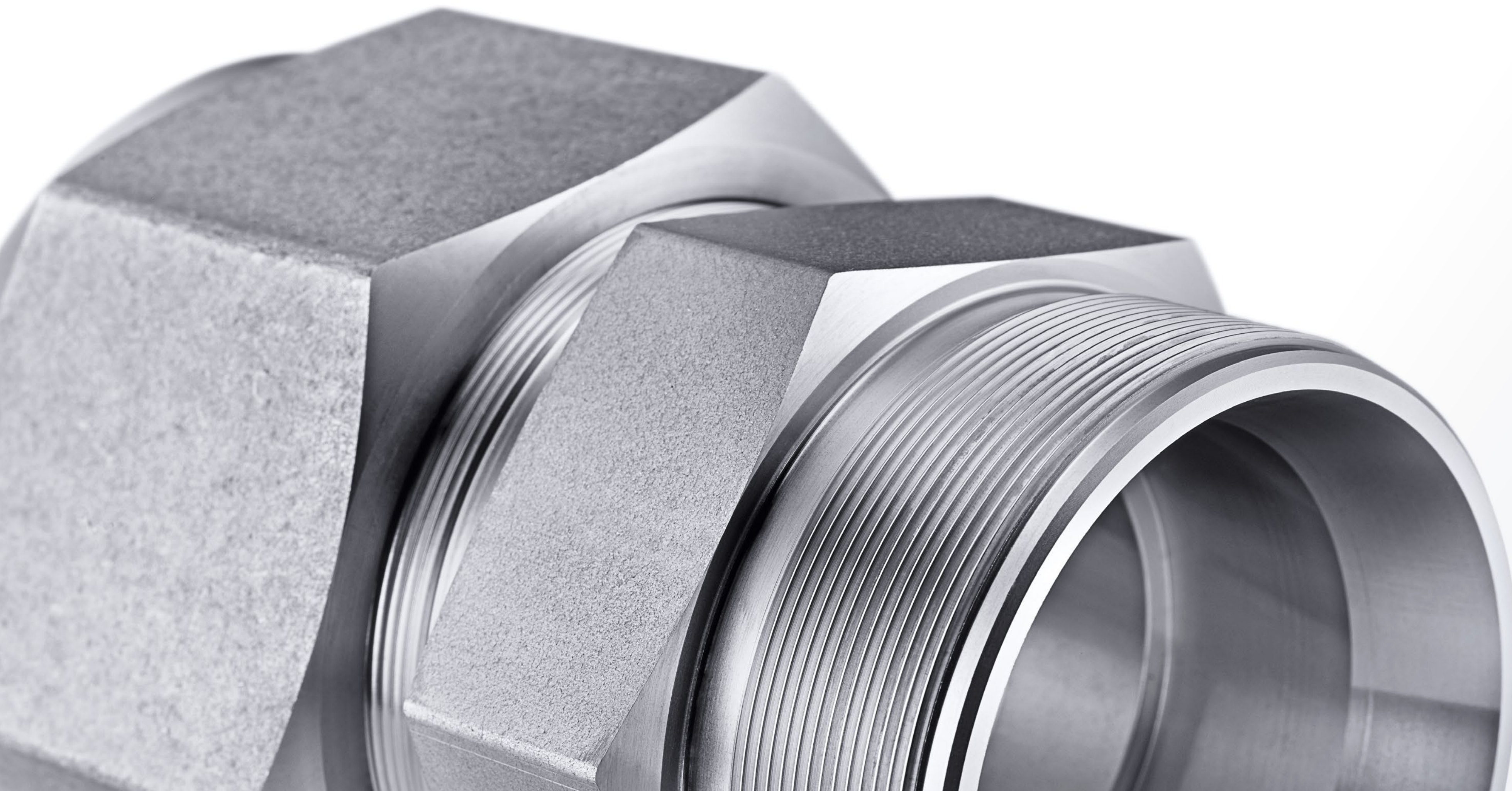


# Tube Fitting Advantage

Swagelok

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Swagelok®



The unfailing reliability of the Swagelok® tube fitting is the result of our proven design, manufacturing excellence, and superior raw materials.

These advantages, along with the care of our associates, quality culture, and unrivaled experience, all work together to ensure that every Swagelok fitting meets our customers' highest expectations for safety and dependability.



## Engineered to Perform Under Pressure

Swagelok delivers world-class design knowledge, manufacturing know-how, and materials science expertise.

**Learn why so many trust their operations to us.**







## Better by Design

Swagelok's Tube Fitting Advantage

Swagelok developed the original two-ferrule tube fitting in 1947, and with 200 active patents worldwide, our proprietary design for use in thousands of diverse applications:

- other fittings in three key areas—tube grip, gas seal, and vibration resistance.
- Our unique SAT12® carburization process produces
- Swagelok fittings are and are backed by extensive training.
- We conduct continuous, for extreme environments.

Above all, our reputation is for reliability.

**Swagelok is your best option for repeatable, leak-tight connections.**

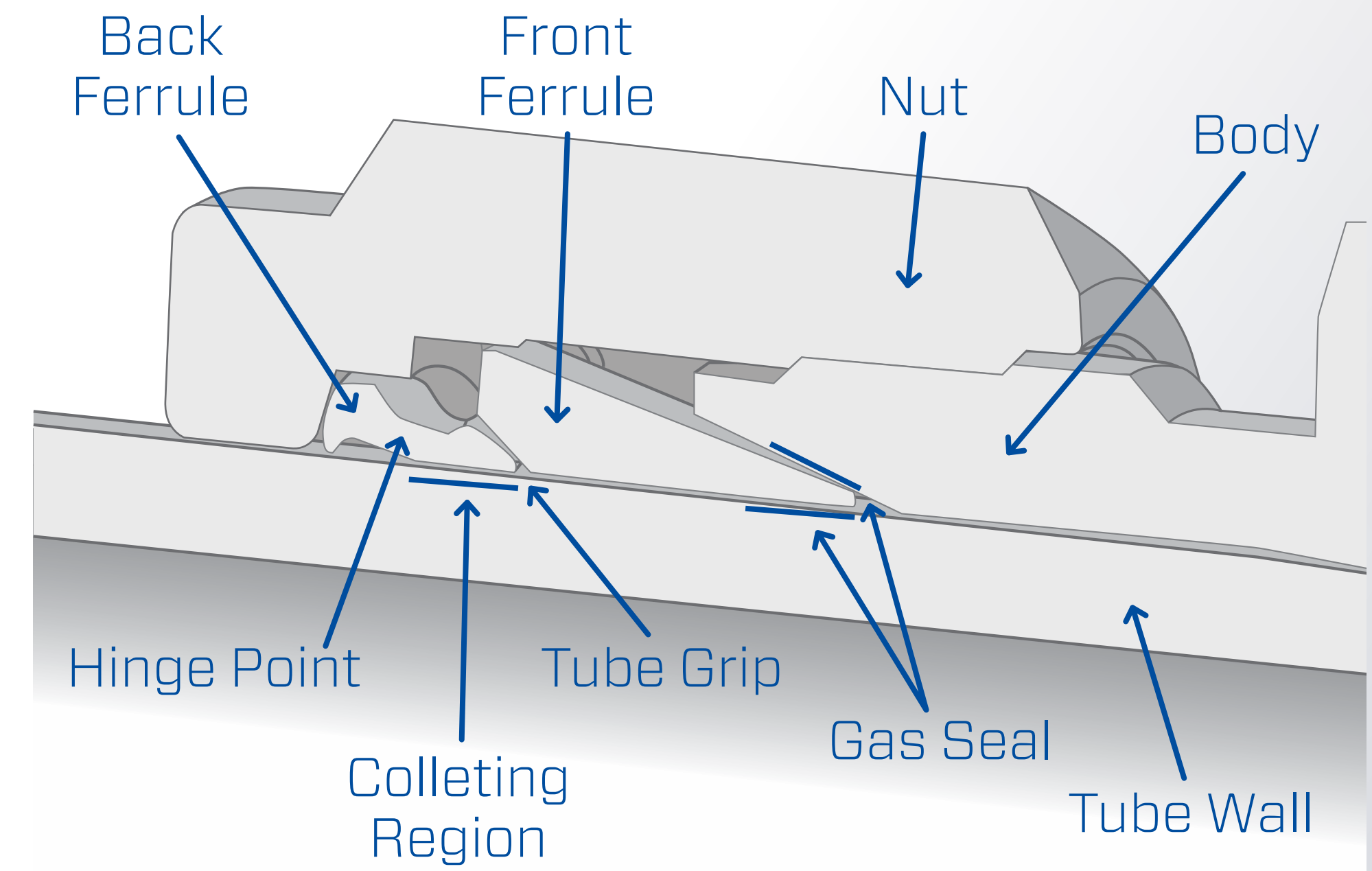




## How We Outperform

Swagelok tube fittings have a **grip-type design** that uses a unique “**hinging and colleting**” action to achieve optimal performance in three key areas:

- **Tube grip**—Hinging and colleting action provides **more direct tube contact/gripping support**.
- **Gas seal**—Burnishing/Polishing action of the front ferrule creates **concentrated zones of contact** on the tube and on the body bevel for a stronger seal.
- **Vibration resistance**—The colleting region **better isolates stress risers** at the tube grip to resist bending, deflection, and vibration.





## About the SAT12® Process

SAT12 is Swagelok's unique low-temperature carburization process.

It achieves a phenomenal tool-steel-like hardness and strength in the ferrule without sacrificing corrosion resistance or material ductility (is nonbrittle).

- Enriches the surface of stainless and other metal alloys by diffusing carbon atoms between metal atoms without forming carbides
- In use for nearly two decades

### Did You Know?

Swagelok has received numerous patents, prestigious awards, and global recognition for the SAT12 process since 1999, including the 2006 ASM Engineering Materials Achievement Award.

**“This is one of the most significant breakthroughs in material science in many decades, as well as one with many extraordinary technical implications.”**

— Arthur Heuer, Ph.D.  
Kyocera Professor of Materials,  
Case Western Reserve University





## Installation Is Easy

**Swagelok fittings are easy to install**, and our equips your workforce with the essential know-how.

- Only standard wrenches are needed
- No threading or flaring
- No soldering or brazing
- No welding
- Significantly lower torque required compared to most other tube fitting brands

**Swagelok fittings come fully assembled, and connections can be reassembled many times.**





## Tested to Extremes

Swagelok performs **continuous, rigorous testing on thousands of samples** of production tube fittings to ensure only highly reliable components.

### Our passion for perfection:

- We publish **the most comprehensive book of tube fitting** in the industry.
- **Ongoing validation** tests ensure fittings consistently meet our most stringent standards.
- We conduct customized testing in our state-of-the-art labs to prepare **Customer Test Reports (CTRs)** for specific conditions and applications.

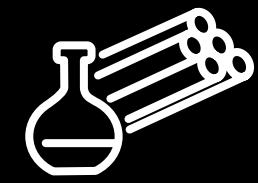
**Constantly evaluating the performance of our products means customers never need to reevaluate their choices.**



*Swagelok fittings are subjected to extreme burn, rotary flex, impulse, corrosion, and shock impact testing; some tests take as many as 10 million cycles to complete.*







## A Material Difference

Special Recipe, Superior Results

For optimal performance, Swagelok tube fittings:

- Take advantage of a
- Are made from only
- Provide superior
- Are offered in a
- Can be used in

**From the melt to machining,  
we never compromise on quality.**



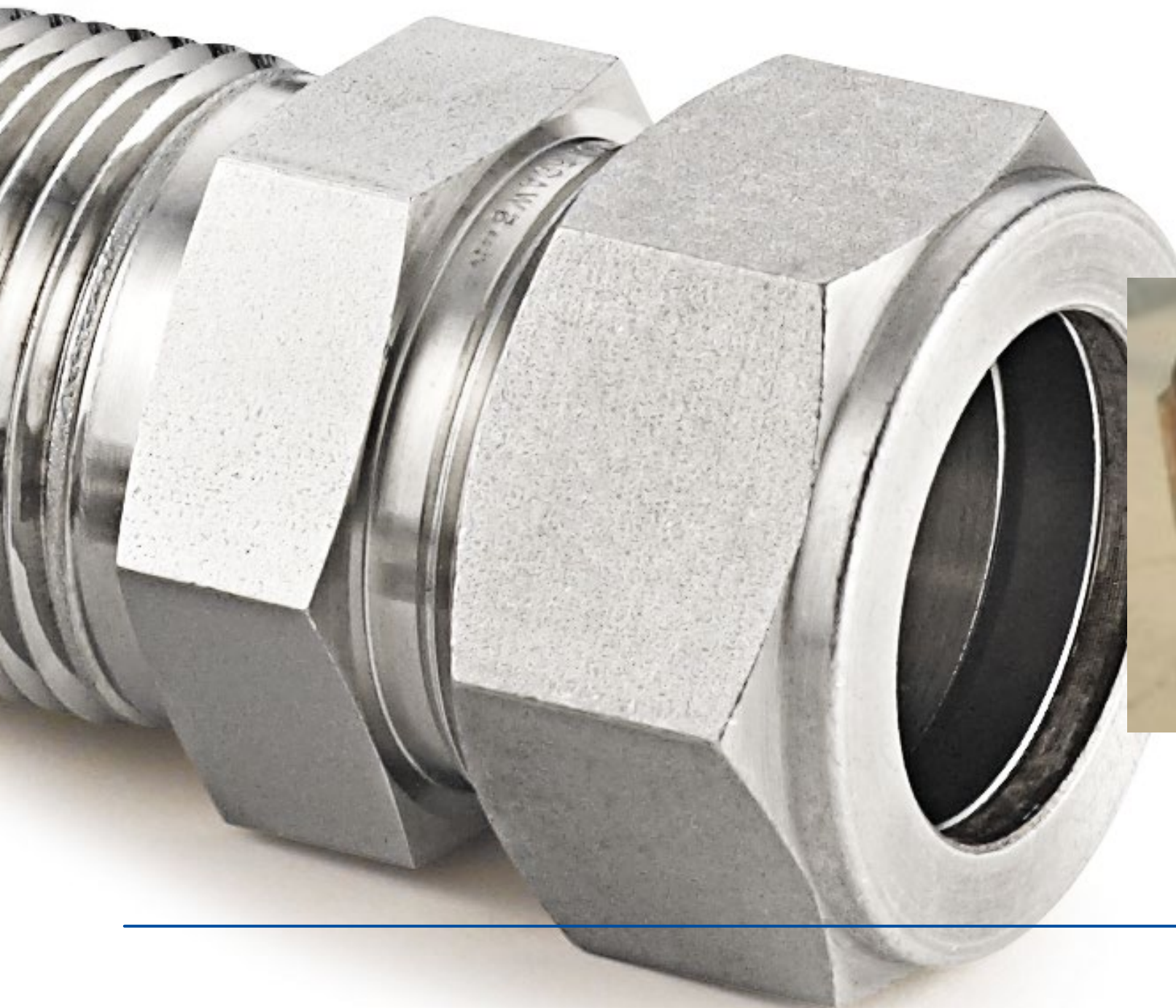


# What's in Your Stainless Steel?

You can be confident we know what's in ours

Chromium and nickel are critical for corrosion resistance and ductility in stainless steel.

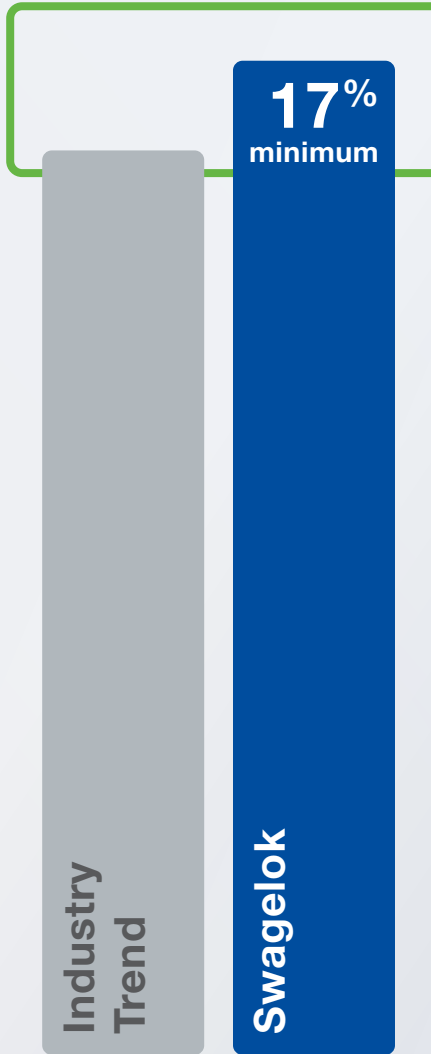
Swagelok has maintained chromium content in its fittings at a minimum of 17% and nickel at a minimum of 12% for many years.



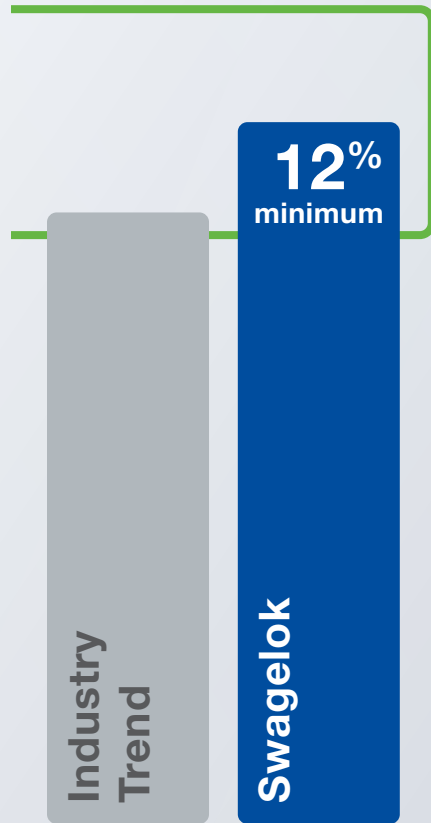
10.1% nickel content 316 stainless steel nut from another manufacturer shows cracking after installation in a corrosive environment.



ASTM requires 16-18%



ASTM requires 10-14%



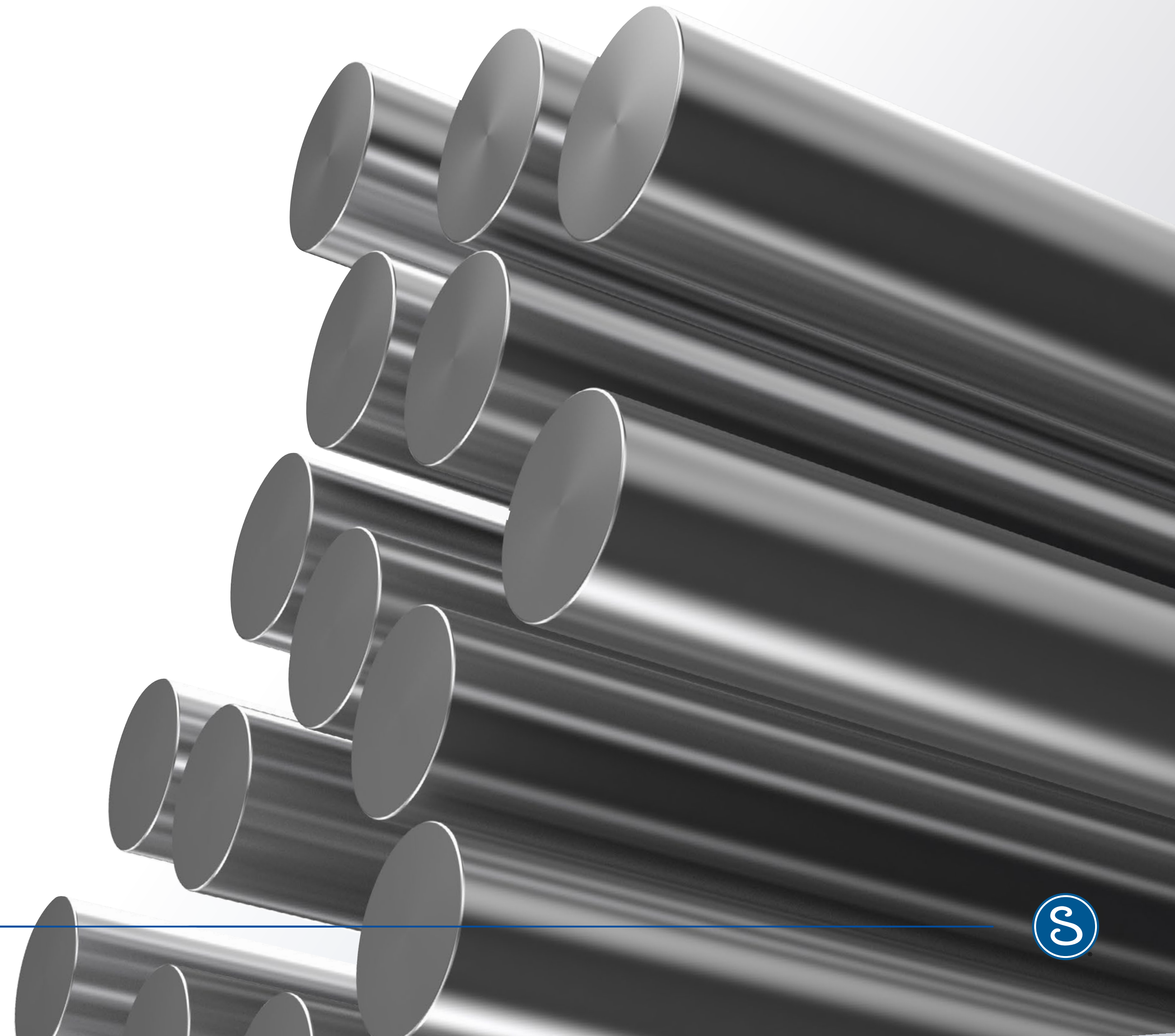


## Start With a Higher Stock

We place multiple controls on procurement of 316 stainless steel from our approved mills, from its elevated alloy chemistry to the inspection steps used to validate it.

- This material is unique to Swagelok—it cannot be purchased by anyone else.
- Raw materials undergo extensive testing, including 100% ultrasonic analysis (identifies abnormalities) and eddy current testing (detects cracks).

**These measures help ensure uniform manufacturability when making our tube fittings.**





## Chloride Stress Corrosion Cracking (CSCC) in 316 Stainless Steel

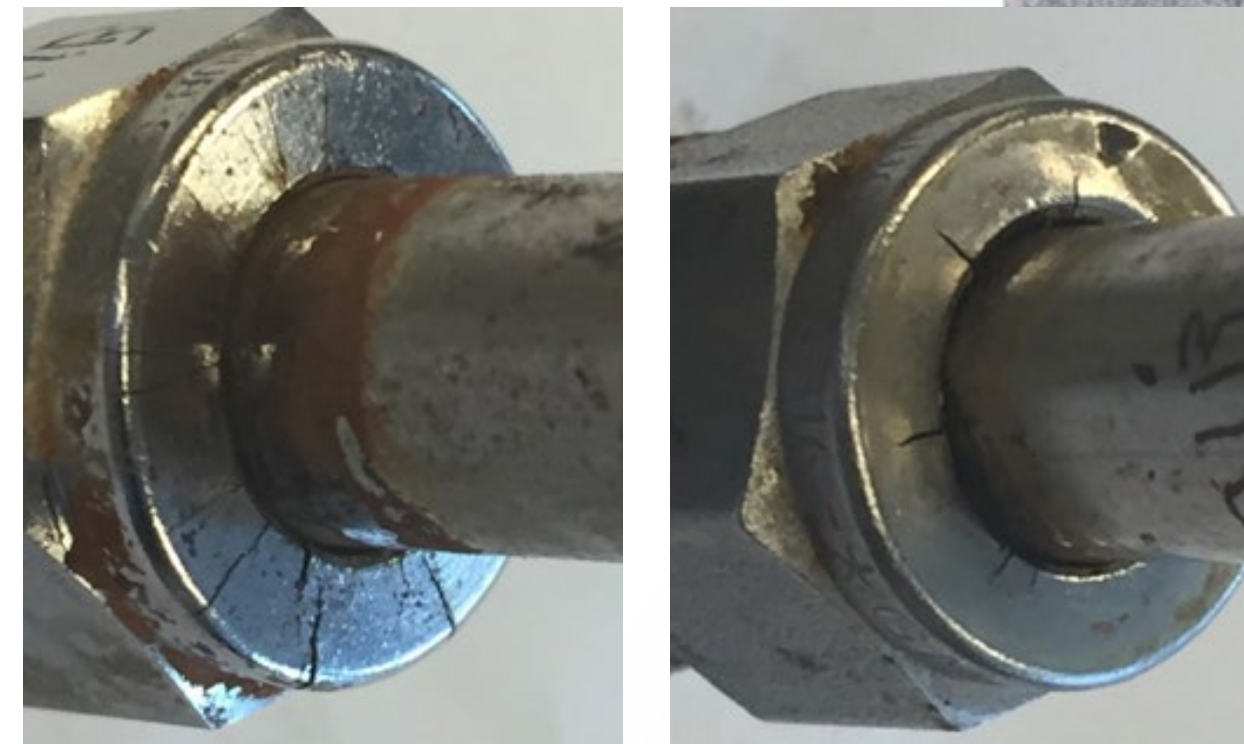
CSCC occurs where chloride concentrations and stress levels are present. No stainless steel is completely immune—another reason why

We have performed **extensive CSCC testing\*** on Swagelok fittings with exceptional results:

- Alloy 316 stainless steel nuts tested (Swagelok and eight other brands).
  - None of the Swagelok nuts cracked or leaked.
  - 39% of the other nuts cracked (at least one from each brand) and 2.7% leaked.

\*See

*After 700+ hours in the test environment, the 316 stainless steel nuts from other brands clearly showed cracking.*





## Alloys and Combatting Corrosion

Swagelok offers a **wide range of alloys** and works closely with customers to solve their needs for fittings with **enhanced chemical and corrosion resistance**.

### Standard options include:

- 316 Stainless Steel
- Alloy 625
- 6-Moly
- Alloy 825
- Alloy 20
- Alloy C-276
- Alloy 400
- Alloy 2507
- Alloy 600
- Titanium (Grade 4)

**For a full list of available materials, see the**

### Did You Know?

Swagelok offers [Material Selection Tools](#) where customers can learn how specific alloys behave and how industry standards impact material choice. Swagelok also offers rated





## Engineered Combinations

Swagelok can engineer a **cost-efficient and corrosion-resistant solution for installations exposed to seawater.**

Elevated chromium and nickel levels in our fittings mean we can offer engineered combinations as a **rated alternative to full exotic alloy solutions** in certain applications.

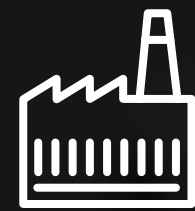
Rather than a traditional alloy-to-alloy tubing and fitting combination, Swagelok's innovative thinking combines 316 stainless steel fittings with 6-Moly, 904L, Tungum®, and Alloy 825 tubing.



**Traditional Thinking:**  
higher alloy tube fitting +  
matching higher alloy tubing







## Excellence in Manufacturing

Uncommon Expertise

Others can try to copy our methods, but they can't replicate our **skilled operators, strict process control, and complete traceability.**

Swagelok owns the manufacturing process from start to finish:

- We forge, machine, electropolish, weld, assemble, and test—all in our own facilities.
- We use optimized top-of-the-line tools and machining methods across 20 production facilities.
- Our robust Reliability Excellence program keeps equipment running at optimal efficiency.
- is an integral part of our overall quality system.
- Our is a promise as strong as our products.
- Can be used in engineered combinations.

**It all adds up to quality  
and consistency  
customers can count on.**





## Traceability and Quality

Raw material traceability is an integral part of Swagelok's overall quality system throughout all phases of material receipt, manufacturing, processing, storage, and delivery. All fittings are marked with the Swagelok name, material type, and trace identifier.

The quality system our fittings are manufactured under has been approved by:

- ISO 9001:2000
- UN/ECE R110
- METI/KHK
- Canadian Registrations
- CSA NGV 3.1 and 4.6
- ASME N and NPT
- The U.S. Navy
- DNV GL (Det Norske Veritas)
- American Bureau of Shipping
- The Bureau Veritas
- Lloyd's Register





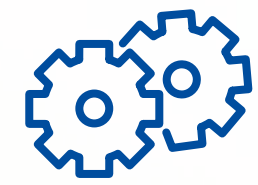
## A Promise as Strong as Our Products

The demonstrates our relentless commitment to quality and our customers. Every Swagelok product is backed by this promise for the life of the product.

**Protect your fluid system investment from installation to everything after.**







## Services Tailored to You

The Swagelok Advantage

**Swagelok is more than a component provider.** We are your source for everything from working safer and smarter to designing new solutions, to improving plant maintenance.

It's true we're known for tube fittings—it's also true Swagelok is known for:

- 
- 
- 
- 
- 
- 

**Swagelok is a high-performance resource for your plant and your people.**





## Safety Above All

Safety is the constant focus of all Swagelok associates from every component we machine to every class we instruct, to every solution we provide.

- Our unique fitting design has been proven to **minimize leaks and the risk of accidents** in the harshest environments for decades.
- **Expert-led technical training** transfers our wealth of knowledge to our customers; all courses have a consistent safety theme.
- We bring you the advisory services and custom solutions that help you **safeguard your operation.**

**Safety is our top priority  
because we know it is yours.**





## Training and Education

**Build an even better workforce** with Swagelok. We offer one of the most comprehensive product and safety training programs available.

**Expert-led, hands-on seminars** at **convenient locations and times** teach your workforce to:

- Correctly prepare, install, and maintain Swagelok tube fittings.
- Minimize leaks, lower costs, and increase uptime throughout the plant.

**Other popular courses include:**

- Tube Bending Essentials
- Tube Fitting Inspection Essentials
- Hose Essentials
- Medium- and High-Pressure Cone and Thread Essentials
- Among many more...

### Did You Know?

One of **the most common installation errors** is not fully inserting the tube into the fitting. Another is trying to tighten by “feel,” which can result in a connection that is undertight and prone to leakage.

Small leaks may go undetected for months or even years, resulting in potentially higher costs and environmental consequences.





## Custom Solutions to Count On

No one knows the inner workings and intricacies of fluid system components better than Swagelok.

We can build custom assemblies to **meet specifications for many industries.** You will find no higher quality or expertise anywhere.

### All assemblies:

- Use only **high-quality components.**
- Are built by **Swagelok-certified assemblers.**
- Are backed by the **Swagelok Limited Lifetime Warranty.**
- Are **pressure- and/or leak-tested.**

From quote to delivery, we can also provide **the detailed support you need,** including CAD drawings, piping and instrumentation diagrams (P&ID), and a bill of materials.

### Did You Know?

With distributorships in 70 countries and five global tech centers, Swagelok can deliver custom solutions anywhere in the world.





## Your On-Site Specialist

Time and again, **Swagelok is selected for its technical expertise**. We get **the right people in the field** working closely with our customers to get the right results.

Each day, the **local experts at our sales and service centers** are trusted to help you keep operations running smoothly, whether they are advising you about component selection or troubleshooting your system.

And for more complex problems, **Swagelok field engineers** are familiar with the most demanding industries and applications.

### Our dedicated team of engineers can also help with:

- Installation training
- Life-cycle cost analysis
- Safety training
- System improvements

So bring us your biggest challenges, and we will answer them with our best solutions.

## Swagelok knows your systems.





## Improving Plant Maintenance

Our expertise also extends to operational maintenance and efficiency.

**Swagelok helps your plant run smoother** with:

- **Fluid System Evaluation and Advisory Services**

Your local sales and service center can conduct a detailed assessment of your plant's fluid systems and components, document areas needing attention, and share best practices for top performance.

- **Hose Advisory Services**

A Swagelok-certified advisor can visit your site and work with you to best understand your needs and goals for improving your hose systems.

- **Compressed Gas Leak Detection**

Improve efficiency in everyday plant operations by increasing reliability, reducing energy consumption, and reducing emissions due to component failures, installation errors, and incorrect product selection.





## Global Project Support

**Swagelok Capital Projects Company (SCPC) helps your largest projects run smoothly.** A subsidiary of Swagelok Company, SCPC:

- Is **dedicated to supporting new construction projects** across the globe.
- **Excels at bringing people together** and providing seamless global support for large projects that span geographical regions.
- Brings you **specialists adept at global coordination** as well as **valuable technical partners**.
- Is there at **every location and every step** of the project.

### Did You Know?

SCPC has coordinated projects in many countries, including Algeria, Australia, Brazil, Canada, Chile, China, Equatorial Guinea, Gabon, Germany, India, Iraq, Malaysia, Nigeria, Norway, Oman, Philippines, Qatar, Russia, Taiwan, Thailand, Trinidad and Tobago, United Arab Emirates, U.K., U.S., and Yemen.

**Across the world, we are built  
for your biggest challenges.**





## Low Cost of Ownership

### Swagelok fittings cost less to own:

- Leak-tight design = less risk of
- Optimal reliability = lower maintenance costs and minimal downtime
- Global experts = fast answers and efficient solutions
- Vendor-managed inventory = reduced operating expenses
- Training services = less installation time and lower rework costs

**The price of a fitting is only part of its potential cost. Real value is saving over the life of your installation.**







## A Stronger Supply Chain

We Make Your World Smaller

Swagelok can support your success wherever it takes you. Our business model puts **local inventory close to you:**

- operates in **70 countries** from **225 sales and service centers, 20 manufacturing facilities,** and **five global tech centers.**
- **Local talent runs the operation.** Our people know the culture, speak the language, and understand the region.
- Our **7,800 associates worldwide work together** to provide factory support, field engineering, technical services, coordinated deliveries, inventory replenishment, and a range of special expertise.
- With our you are **never far from the products you need,** when you need them.

We are one interconnected global team.





## Our Global Distribution Network

Swagelok knows that **inventory, availability, and reach** keep your operation and budget on point. That's why we built our **global distribution base** to deliver under pressure.





## Inventory and Availability

**Availability is a critical part of our brand promise.** We ensure our distributors have the right level of inventory for the products you need immediately:

- Thousands of standard products in inventory
- Over 6,800 line items shipped daily
- 99% shipping and inventory accuracy

**We also collaborate with key customers to supply:**

- Short lead times on **Assemble to Order (ATO)** products
- A robust supply of **Make to Order (MTO)** products
- **Engineer to Order Products (ETOP)** for unique needs

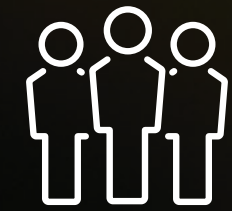
### It's Only Fitting.

Swagelok keeps significant amounts of raw materials on hand in case our suppliers' own supply chains are interrupted. We also have a team of 35 professionals working side-by-side with our suppliers to overcome any issues.

## Swagelok delivers the proper balance of cost, quality, and service.







## Unmatched Associates

Our Culture Sets Us Apart

A **spirit of collaboration** is embedded in our organization. It is woven throughout departments and distributorships, committees, and teams.

### Our culture:

- Is enriched with people who want to do the right thing.
- Is focused on leading customers to a better future.
- Is that everyone owns safety.

Swagelok associates strive to adhere to the **highest standards of integrity and ethical behavior**. Our constant mission is to **respect others** and to **create new ways to work better**.

•

### It's Only Fitting.

Swagelok provides professional training and development opportunities for our associates at every level. It's one of the many reasons that many choose to stay with us for 20, 30, 40—even 50—years.





## In the Right Hands

Our **highly skilled machine operators** also help ensure **precision quality components**:

- 1,800+ manufacturing associates call Swagelok home.
- Nearly 200 have 20+ years with the company.
- The average tenure is 12 years.

### Did You Know?

Our shop floor associates receive 80,000+ hours of training annually; making our workforce smarter means quality and consistency at every step.





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## The Swagelok Advantage

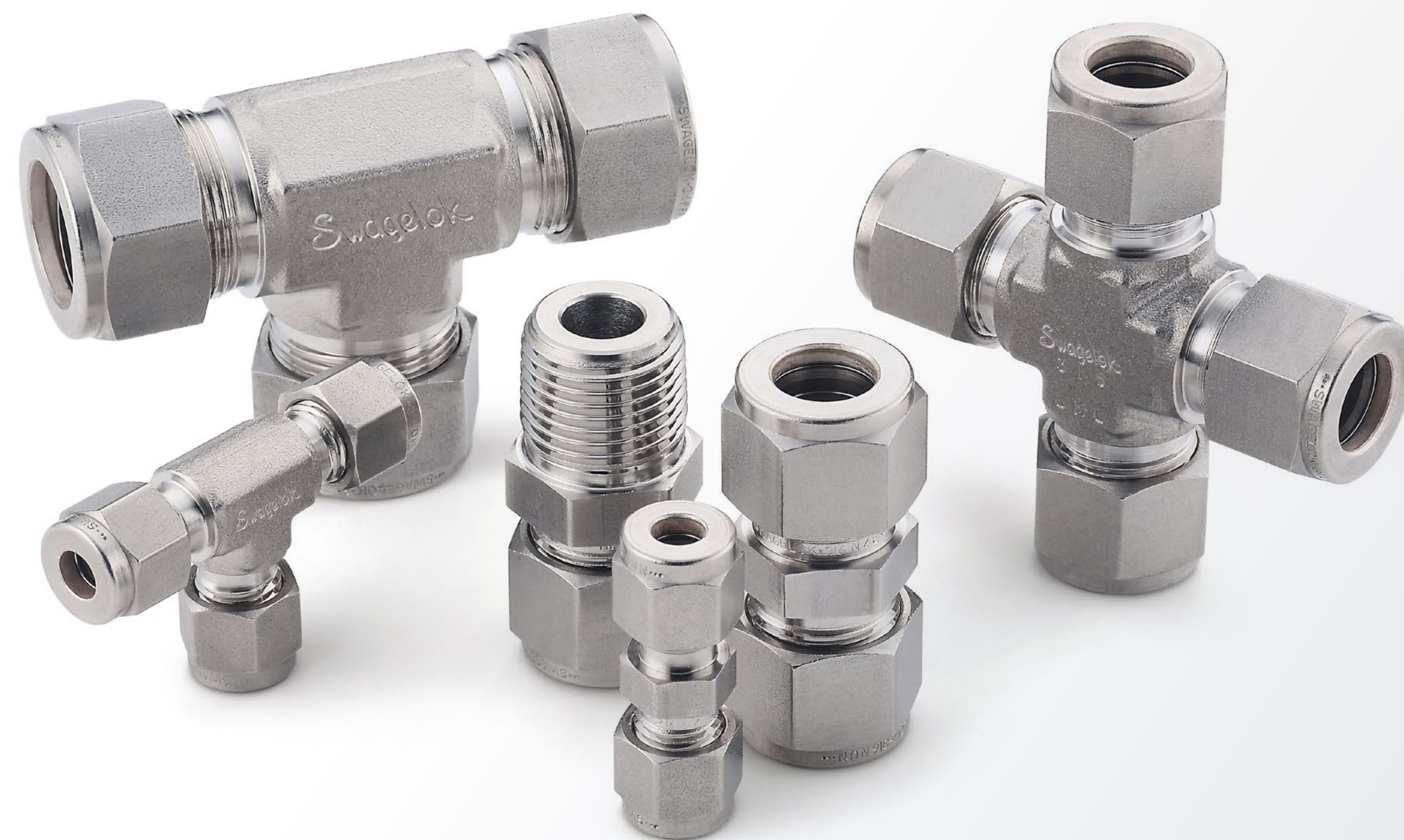
Swagelok has been the established market leader in tube fittings since 1947. That's because **we make the fitting and the difference for our customers.**

In fact, we make more than 40 million fittings a year, but our real impact is measured in **uptime, savings, and safety** in plants, refineries, and wherever critical applications are found. Around the world, our local experts bring you the **knowledge, services, and inventory** needed to maintain a fluid operation.

With Swagelok at your side, your workforce receives **top-notch training**, your critical processes are improved by our **unrivalled understanding of fluid systems**, and you are **never far from the products you need.**

When **leaks aren't a problem**, when **solutions are smarter**, and when **projects run smoothly**, that's when you feel the pride our associates put into ensuring the best results each day.

We've set the standard for tube fitting quality and reliability for 70 years, but we've never settled. **That's why, for every pressure you face, Swagelok is engineered to perform.**





## Introducing Swagelok

Since 1947, Swagelok has been **on a mission to provide only the highest-quality fluid system components and services** to customers worldwide.

Our goal is to deliver **simple, reliable solutions to complex problems.**

### How do we do it?

**Our people are unsurpassed.** Methodical in problem-solving, genuinely proud to serve the customer, Swagelok associates stand apart, from the factory to the field.

**We are not under pressure for short-term results.** As a privately held company, we strive to make the best long-term decisions for everyone—our associates, our sales and service centers, and our customers.

Our culture reinforces these qualities while extensive training and education build on this foundation. **We never stop learning.**

We are recognized for a relentless pursuit of quality, from the raw materials we start with to the rigorous testing we require for all products. **We never stop improving.**





## Company Facts

- ▶ **\$2 billion** in annual revenue
- ▶ **99%** shipping and inventory **accuracy**
- ▶ **6,800** line items shipped daily
- ▶ about **200** active tube fitting patents
- ▶ **225** sales and service centers **worldwide**
- ▶ Swagelok manufactures about **40 million** tube fittings a year
- ▶ **\$10 million** annual R&D investment
- ▶ **7,800** associates in **70** countries





# Everything You Need

Customers depend on Swagelok for **tube fittings and much more.** We offer many products designed for everyday needs and unusual challenges, most available with Swagelok tube fittings, and we can deliver **the right combination of options** to fit any job.

## Did You Know?

Swagelok also offers preswaging tools for tube fitting installations in close quarters and for higher-volume applications.

FPO Link

FPO Link





## Our Values

### Customer Focus

Creating value for the customer creates value for Swagelok

### Integrity

Choosing to do the right thing with courage and character

### Quality

High value and performance in our people, products, and processes

### Innovation

Challenging conventional wisdom creates new value for the customer

### Respect

Success starts with an environment where people are trusted and treated fairly

### Continuous Improvement

Systematically doing things better





## A Focus on the Future

At Swagelok, innovation starts with you.

Whether introducing a part or designing a new system, we rely on the voice of the customer and our considerable market insight to understand—and exceed—your expectations.

We are constantly \_\_\_\_\_ to enhance the performance of our products and the

With Swagelok, you are backed by a dedicated team—of hundreds of engineers, technicians, scientists, and subject matter experts—that has already solved many of the biggest challenges.

No pain is too small, no pressure too great—





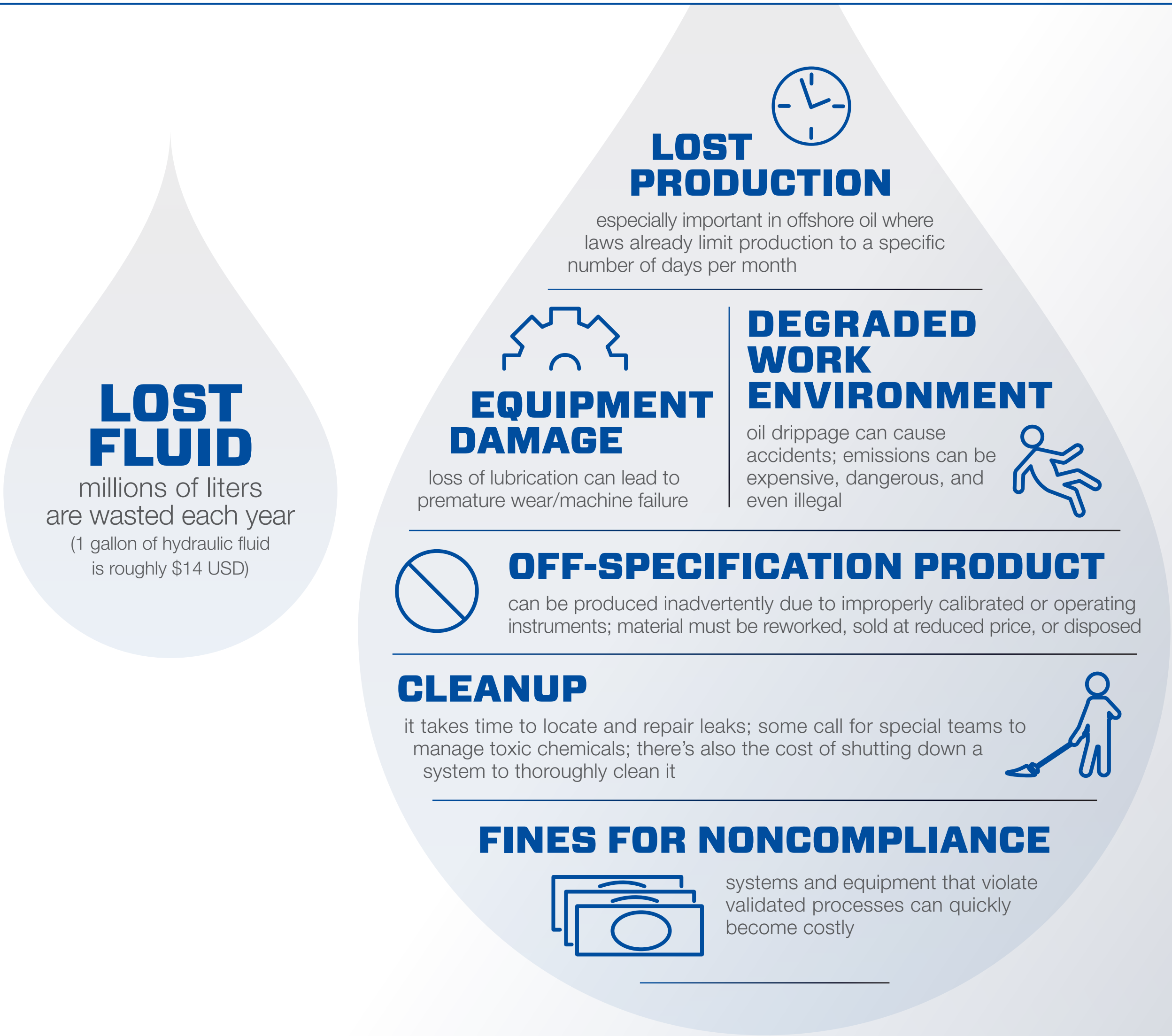


Video Links



## The Lowdown on Leakage

Choosing the most reliable fittings and installing them correctly can save you money and make the workplace safer. Consider the many costs and consequences of leakage:





## Continuous Innovation Means Our Story Never Ends

Innovation applies to more than products. It is the way Swagelok has conducted business since its inception in 1947.

**It's Only Fitting.**  
Innovation at Swagelok goes beyond just products.

<b>Twin-ferrule tube fitting</b>	<b>Localized sales, service, and training</b>	<b>Face seal metal-to-metal fittings</b>	<b>Expanding line of fitting sizes</b>	<b>High-purity manufacturing processes</b>	<b>Advanced geometry</b>	<b>SAT12® surface treatment</b>	<b>Evaluation and Advisory Services</b>
<b>Advanced materials science</b>			<b>Micro-Fit® weld fittings for precision process standards</b>		<b>Increasing breadth of alloys</b>	<b>Optimized inventory management</b>	<b>Evolving Assembly-by-Torque (AbT) fittings</b>
						<b>FK Series fitting for medium-pressure applications</b>	
40s	50s	60s	70s	80s	90s	00s	10s





# Product Test Reports

Available Swagelok PTRs Include:

## Tube Grip

Use when the customer requires documentation regarding pressure ratings for pressure-containing systems that use Swagelok fittings.

See

## Gas Seal

Use when discussing leak rates and environmental/health concerns like fugitive emissions and energy surveys.

See

## Vibration Resistance

Use in discussions concerning usage of fittings in proximity to rotating equipment (i.e., pumps, compressors, turbines, vehicles, seismic activity, etc.).

See

## Alloys

Use when fittings are exposed to corrosive environments.

See





## Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

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Engineering



Operations



Purchasing