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# Common Instrumentation Tube Fitting Mistakes

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Made During System Design & Selection,  
Installation, and Maintenance



# Introduction

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Tube fittings support instrumentation systems by providing leak-free and reliable connections between sections of tubing and instrumentation equipment. These fittings come in various shapes, sizes, and materials to accommodate for unique specifications and operating conditions of end applications. Minimizing safety risks, optimizing performance, and maximizing value in an instrumentation system necessitates selecting, implementing, and maintaining the appropriate tube fitting style.

The SSP team has identified several frequently occurring end-user errors related to tube fittings. The following guide will highlight some of the common mistakes associated with the selection, installation, and long-term handling and maintenance of instrumentation tubing, and recommendations as to how to avoid them.



# Mistakes Made During Instrumentation Tube Fitting Design & Selection

When it comes to tube fitting design and selection, there are several factors to consider to ensure the fitting is compatible with the instrumentation system. Choosing a fitting that is not appropriate for the given application can be detrimental to the total costs involved, employee safety, and equipment performance.

Three common mistakes users encounter during the design and selection process are:

## 1 Ruling Out Compatible Ferrule Designs

There are two basic types of ferrule fitting styles—single ferrule and double ferrule—both of which offer sealing and gripping functions. Single ferrule fittings perform both gripping and sealing actions in a single unit, while double ferrule fittings rely on a front ferrule to seal and rear ferrule to grip.

Choosing the appropriate fitting depends on the nature of the application and the operating conditions. While single ferrules offer design simplicity and ease-of-use, they can also exert greater stress on the tubing's outside diameter (OD). Double ferrules overcome this issue by separating the gripping and sealing functions, but their design complexity makes them more difficult to install and replace. Leakages should not be tolerated under any condition as they are extremely costly and can lead to system performance issues and safety hazards.

## 2 Making Costly Design Decisions

When choosing a fitting design, the types of conditions that will be encountered in end applications should be considered thoroughly. Additionally, multiple designs and brand alternatives should be researched and compared to ensure that the best-suited and most cost-effective (lowest Total Cost of Ownership) technology for the application is selected. The following formula can help guide financially sound fitting decisions:

$$\text{Total Cost of Ownership} = \text{Initial Unit Cost} \times \text{Consumption} + \text{Logistics} + \text{Functionality}$$

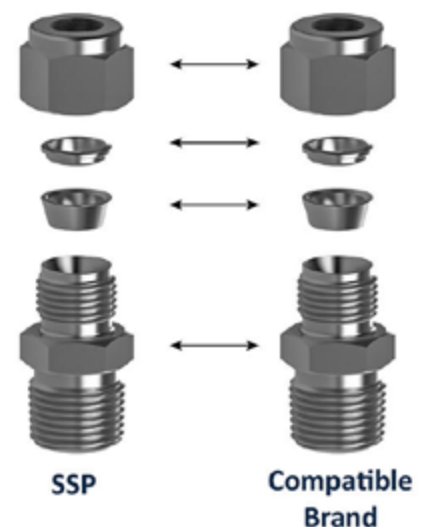
Functionality costs are the expenses associated with the inability of a tube fitting to perform to the required standard, such as those related to increased risk, safety issues, installation inconsistencies, and lack of availability.

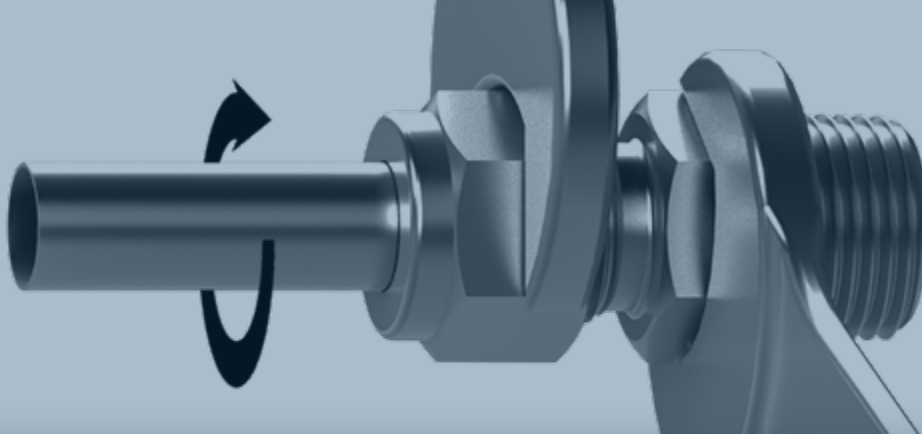
One element of functionality to consider is the design's safety, including its track record with other users, potential safety design attributes, and proven success with the specific application. The potential for a design to provide value beyond sealing and holding should also be evaluated, such as its remake life, ease-of-installation, and ease-of-use. All of these factors can influence costs and affect the Total Cost of Ownership.

## 3 Not Considering Interchangeability & Intermixability

Interchangeability refers to the ability of a nut and ferrule(s) system to be assembled with the body of a compatible brand (or vice-versa). Intermixability means that any combination of tube fitting components can be used with a compatible brand's components.

Interchange and intermix are safe provided that the parts are 100% compatible, correctly installed, and properly maintained. Your fittings supplier should be able to provide tailored recommendations as to whether this could be a cost- and resource-effective option for your fitting needs.





## Mistakes During Instrumentation Tube Fitting Installation

Improper installation is the leading cause of failed tube fittings. Some of the most common mistakes made during the installation process are:

### Over-Tightening or Under-Tightening

Certain technologies, such as threaded and flare-type fittings, rely on a tactile indication of when a connection is sufficiently tight. Unlike these types of technologies, proper installation for tube fittings should be performed based on geometry (recommended number of rotations) rather than a “right” feeling to avoid overtightening. It is also important to keep in mind that assembly instructions from fitting manufacturers often vary among different fitting sizes. Confusing these details can result in under-tightening or over-tightening. Making sure that the fittings manufacturer provides clear assembly instructions can help reduce the risk of installation errors.



### Overlooking Scratches on Tubing

For the fitting to form a successful seal, the OD of the tube must be scratch-free. Scratches and other types of damage to the tube’s surface can make the system more susceptible to leaks and lead to compensation-related overtightening issues.

## Skimping on Time for Pre- and Post-Inspection

Preliminary inspection is necessary for double-checking the fitting's ferrules system, specifically the number of ferrules present and their orientation.

Post-inspection should include a careful evaluation of the tube's insertion into the fitting body. If the tube is inserted improperly, it can result in tube blowout.

A depth marking tool is useful for making sure the tube is completely bottomed within the fitting.



## Bypassing Cutting and Deburring

When preparing the tube for the fitting, cutting the end of the tube with a designated tube cutter helps to ensure that it is as square as possible.

Deburring of the tube's OD prior to insertion is also essential to proper bottoming out. Any swarf produced by de-burring must be removed from inside the tubing prior to assembly of the connection.



## Mistakes During Instrumentation Tube Fitting Maintenance

Scratches on the tubing's surface are one of the primary reasons for tube fitting failures. These surface abrasions are often caused by improper handling and storage.

For example, tubing stored outside on unprotected pipe racks or the ground can accumulate scratches from exposure to the elements and other environmental factors. Additional damages can occur if the tubing is dragged from storage to the place of installation, which is quite common!

Fortunately, these issues can be easily avoided by adhering to the following guidelines:



Asking suppliers to deliver tubing in protective tubes



Carrying—rather than dragging—the tubing from storage



Never storing or laying tubing on the ground



Avoiding combining pipe and tubing on a single rack arm



Lining designated tubing racks with protective padding



Ensuring tube racks are side loaded rather than end-loaded to prevent cut sections of tubing from scratching adjoining tubes



Inspecting tubing thoroughly before use and removing any sections with scratches

# Instrumentation Tube Fitting Solutions at SSP

Instrumentation depends on leak-free tubing connections for optimal system performance and operator safety. Mistakes during the fitting design, selection, or installation process can potentially result in injury to employees and damage to equipment. By working closely with the tube fitting manufacturer and adhering to recommended guidelines, users can largely avoid these risks.

At SSP, we offer a broad selection of stainless steel tube fittings, including:



## Duolok

Duolok fittings rely on a two-ferrule system to enable exceptional leak-tight performance for the most critical analytical and process instrumentation applications.



## Unilok

Unilok fittings use a single-ferrule compression system to provide leak-free and remakeable connections for control systems, process and analytical instrumentation, utilities, and other industrial applications.



## Griplik

Griplik fittings consist of a tested dual-ferrule compression seal to ensure leak-tight connections, especially for applications with high vibrations (gas transmission, turbines, etc.).

Our durable and high-quality products support performance-critical applications in the following industries:



**Aerospace**



**Chemical Processing**



**Defense**



**Shipbuilding**



**Alternative Fuels**



**CNG Fueling Construction**



**Shale Oil & Gas**



**Transportation**

# By Choosing SSP For Their Tube Fitting Needs, Our Customers Benefit From Our:



## Extensive support network

Our products and services are supported by over 4,000 people and 350 distributor locations worldwide.



## Product compatibility

Customers can interchange or intermix our fittings with the approved compatible brands identified by SSP. SSP Duolok brand tube fittings are interchangeable and intermixable with both Swagelok® and Parker A-Lok® tube fittings. SSP Unilok brand tube fittings are interchangeable with Parker Hannafin CPI™ tube fittings. SSP Griplok tube fittings are interchangeable and intermixable with Hoke Gyrolok® tube fittings.



## Industry week best plants

On February 25, 2020 SSP was awarded the IndustryWeek 2019 Best Plants Award as a manufacturer delivering “truly exceptional performance.” This award recognizes manufacturers who create rich work environments and nurturing partnerships up and down the supply chain while delivering world-class quality products. Winners of the award are identified as having embraced technologies that help them to increase competitiveness and enhance customer service.



## Superior customer service

Regardless of company size, our team treats every customer with unparalleled service for projects ranging from simple to complex and small to big. Our goal is to provide effective solutions that are carefully tailored to the needs of each customer. In this regard, we are constantly working on developing new, improved solutions and making them available to our customers as quickly as possible.

Swagelok® is a registered trademark of the Swagelok Company

Gyrolok® is registered trademark of Hoke Incorporated

Parker A-Lok® and Parker CPI™ are trademarks of Parker Hannifin Corporation



## About Us

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SSP takes industry-standard products and makes them better: Instrumentation fittings, valves, tubing and the tools to put them together.

Backed by a 100% America Pledge – our products are made in America by American workers solving American challenges. SSP products are used in demanding industries such as oil and gas, CNG transportation, petrochemicals and power generation.

### Speed

Fast response to urgent requests

### Performance

Certified to industry standards

### Availability

Most products available from stock

### Safety

Backed by certified training

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