

Tubing

Tubing and Available Coatings

Restek sets the standard in tubing for analytical and process applications. Complete your system with precleaned or treated tubing and treated fittings and valves for an inert, corrosion-resistant pathway.

Available tubing coatings include:

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing or stack gas sampling.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.

Frequently Asked Questions

1. Can treated tubing be bent?

Treated tubing can be bent into curves with a bend radius greater than 1 inch for 1/16-inch OD tubing, 2 inches for 1/8-inch OD tubing, or 4 inches for 1/4-inch OD tubing. The treatment layer will remain intact as long as the tubing isn't stretched dramatically. If tight bends are necessary, use a treated elbow union or bend untreated tubing and send it to Restek for custom treatment.

2. Can compression fittings be used without crushing the treatment layer?

Yes. The layer is thin and permeates the surface. It compresses with minimal damage.

3. Is welding possible after Restek treatment?

Yes. The coating does not interfere with the welding of two coated components. The coating is lost at the weld and in the heat affected zones approximately 2 to 5mm on either side of the weld.

4. Is any additional chemical deactivation necessary?

A Sulfinert® or Silcosteel® layer leaves few exposed active sites, so there usually is no need for additional treatment. Chemical deactivation is useful in chromatographic applications in which water will be vaporized on the Silcosteel® treated surface, but is not necessary for Sulfinert® treated surfaces. Parts used in high-temperature applications (>400°C) cannot be chemically deactivated.

5. What are the temperature constraints of Restek surface treatments?

On stainless steel, a Silcosteel® layer is stable to 600°C. Parts treated with a secondary polymeric layer are limited to temperatures of 400°C in inert atmospheres and 250°C when oxygen is present, the temperature maximums for the polymer. Temperatures above 600°C can be used under certain conditions—please contact us for information.

6. Why use Sulfinert® or Silcosteel® treatment instead of Teflon® coating?

Three reasons: 1) Sulfinert® and Silcosteel® layers are nonpolymeric, so they do not exhibit the problems associated with gas permeability. 2) Teflon® coating often flakes off the surface, while the Sulfinert® or Silcosteel® layer is tightly integrated into the substrate lattice. 3) Teflon® coating is limited to 280°C, while Silcosteel® treated stainless steel tubing and fittings can be used to 600°C.

7. Why use Siltek®/Sulfinert® treated tubing for transfer lines?

Siltek®/Sulfinert® treated stainless steel tubing offers all of the advantages of glass or fused silica tubing for the transfer of active compounds (e.g., sulfurs), but is far more durable and flexible.

8. Is treated tubing similar to glass-lined tubing (GLT)?

No. Sulfinert® or Silcosteel® treated tubing is flexible and can be bent without heating. Also, the Sulfinert® or Silcosteel® layer is highly inert, unlike impure glass.

9. How can I clean the surface of a treated part after use?

Most often, a mild organic solvent (methylene chloride, methanol, hexane) or water is sufficient. Mild sonication may assist and accelerate the process. Do not use caustic, abrasive, or high pH (pH>8) cleaners, as they will damage or dissolve the layer. Steam cleaning in the presence of oxygen or air could create surface activity, and also should be avoided.

10. What materials should I avoid using with Silcosteel® treated parts?

The Silcosteel® coating is silicon-based and is prone to attack by hydrofluoric acid or by basic compounds. The surface should not be exposed to media with pH>8.

11. Siltek® and Sulfinert®: What's the Difference?

Siltek® is the name for our patented deposition process. When we developed the Siltek® process, the application that showed the greatest benefit, among many we investigated, was the storage and transfer of low ppb level active sulfur compounds, such as hydrogen sulfide and mercaptans. Because there was (and continues to be) demand for a reliable surface treatment for this application, we use the name Sulfinert® to describe Siltek® treated products created specifically for this purpose.

Instrument-Grade Welded and Drawn 304 Grade Stainless Steel Tubing

Clean tubing is critical to ensure the delivery of pure gas to your instrument. Restek's stainless steel tubing is specially cleaned for inertness by using the procedure for processing our Silcosteel® and Siltek®-treated products, because scrupulously clean parts are a prerequisite for a quality coating. This ensures you are getting a quality tubing for your chromatography system.

| Tubing Dimensions | | Length (per-foot pricing on 26 feet or more) | | | | | |
|-------------------|----------|--|-------|-------------|-------|------------|-------|
| ID (in.) | OD (in.) | 25 Feet | | 26–100 Feet | | >100 Feet* | |
| | | cat.# | price | cat.# | price | cat.# | price |
| 0.01" | 1/16" | 21500 | | 21501 | /ft. | 21502 | /ft. |
| 0.02" | 1/16" | 21503 | | 21504 | /ft. | 21505 | /ft. |
| 0.03" | 1/16" | 21506 | | 21507 | /ft. | 21508 | /ft. |
| 0.04" | 1/16" | 21509 | | 21510 | /ft. | 21511 | /ft. |
| 0.085" | 1/8" | 21512 | | 21513 | /ft. | 21514 | /ft. |
| 0.21" | 1/4" | 21515 | | 21516 | /ft. | 21517 | /ft. |

*The availability of long lengths (continuous lengths up to 500 feet) is subject to inventory constraints. Please inquire before ordering.

**ordering note**

Required length in meters x 3.2808 = length in feet.

Precleaned Copper Tubing

- Adheres to ASTM B-280.
- Precleaned and ready to use.
- Use for plumbing GC systems.

| ID | OD | Wall | qty. | cat.# | price |
|--------|------|--------|--------|-------|-------|
| 0.065" | 1/8" | 0.030" | 50 ft. | 21590 | |
| 0.190" | 1/4" | 0.030" | 50 ft. | 21592 | |

An extra charge is applied for cutting and/or straightening stainless steel and/or copper tubing, calculated from the total number of pieces produced for each line item:

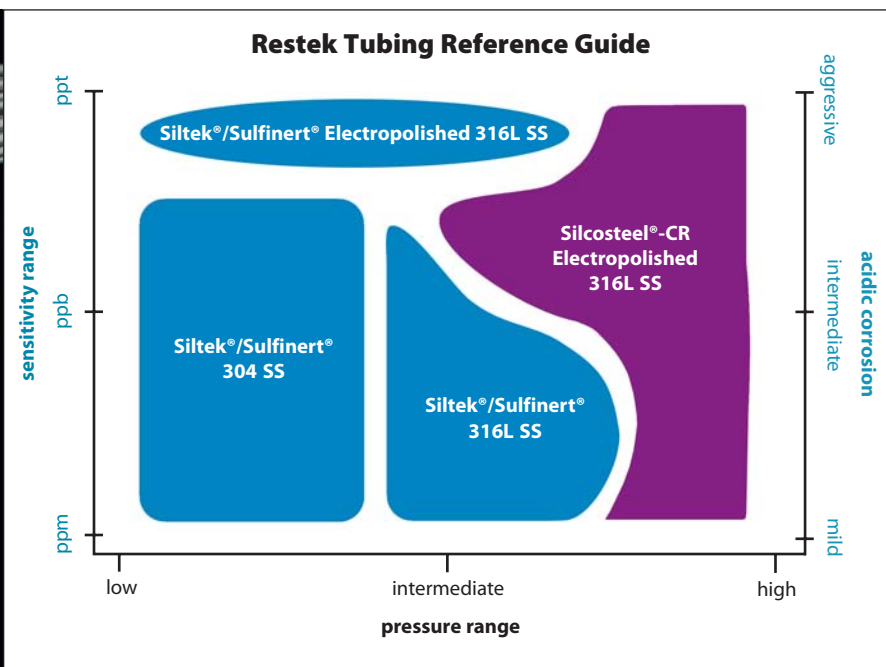
| # of Pieces | Added Charge |
|-------------|--------------|
| 5 to 15 | enquire |
| 16 to 30 | enquire |
| 31 to 75 | enquire |
| 76 to 99 | enquire |
| 100 to 200 | enquire |

**Plumbing a GC**

It is essential to use clean chromatographic-grade tubing to plumb a GC. Standard-grade tubing contains residual hydrocarbon contaminants from the drawing process. These contaminants migrate into the carrier gas stream, elevating background noise and causing down time.

frequently asked question**Which treated tubing should I use?**

This chart will help you determine the tubing best suited to your application with respect to pressure, sensitivity of your analysis, and acidic environment exposure. For more frequently asked questions on treated tubing, see previous page.



Tubing

did you know?

A smoother internal surface is less adsorptive.



Top: electropolished finish, surface roughness average number: 10-15.

Bottom: conventional finish, surface roughness average number: approx. 23-27.

An extra charge is applied for cutting Siltek®/Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item:

| # of Pieces | Added Charge |
|-------------|--------------|
| 5 to 15 | enquire |
| 16 to 30 | enquire |
| 31 to 75 | enquire |
| 76 to 99 | enquire |
| 100 to 200 | enquire |

Minimum Bend Radius for Coated Tubing

| OD | Min. Bend Radius |
|---------|------------------|
| ≤ 1/16" | 1" (2.5cm) |
| 1/8" | 2" (5.1cm) |
| 1/4" | 4" (10.2cm) |
| 3/8" | 6" (15.2cm) |

did you know?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000ft.

ordering note

Required length in meters x 3.2808 = length in feet.

Treated Seamless Electropolished 316L Grade Stainless Steel Tubing

Our highest performing tubing. Recommended for:

- demanding/corrosive environments.
- high temperatures.
- ultimate inertness.

Siltek®/Sulfinert® Treated Coiled Electropolished 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|---------------|-----------------|----------------|-------|----------------|-----------|-------------|-----------|
| | | | | 5-24 ft. | 25-99 ft. | 100-299 ft. | > 300 ft. |
| 1/8" (3.18mm) | 0.085" (2.16mm) | 0.020" | 22538 | /ft. /ft. | /ft. /ft. | | |
| 1/4" (6.35mm) | 0.180" (4.57mm) | 0.035" | 22539 | /ft. /ft. | /ft. /ft. | | |

Silcosteel®-CR Treated Coiled Electropolished 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|---------------|-----------------|----------------|-------|----------------|-----------|-------------|-----------|
| | | | | 5-24 ft. | 25-99 ft. | 100-299 ft. | > 300 ft. |
| 1/8" (3.18mm) | 0.085" (2.16mm) | 0.020" | 22536 | /ft. /ft. | /ft. /ft. | | |
| 1/4" (6.35mm) | 0.180" (4.57mm) | 0.035" | 22537 | /ft. /ft. | /ft. /ft. | | |

1/8" OD: 5 ft. to 100 ft. in one continuous coil; 1/4" OD: 5 ft. to 300 ft. in one continuous coil. Longer lengths will be more than one coil.

Treated Welded/Drawn 304 Grade Stainless Steel Tubing

Our most popular grade of tubing. Recommended for:

- chromatography applications.
- gas delivery systems.
- lower pressures.
- inert applications.

Siltek®/Sulfinert® Treated Coiled 304 Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|-----------------|-----------------|----------------|-------|----------------|------------|-------------|-----------|
| | | | | 5-24 ft. | 25-199 ft. | 200-399 ft. | > 400 ft. |
| 0.022" (0.56mm) | 0.011" (0.28mm) | | 22500 | /ft. /ft. | /ft. /ft. | | |
| 0.029" (0.74mm) | 0.021" (0.53mm) | | 22501 | /ft. /ft. | /ft. /ft. | | |
| 1/16" (1.59mm) | 0.010" (0.25mm) | | 22502 | /ft. /ft. | /ft. /ft. | | |
| 1/16" (1.59mm) | 0.020" (0.51mm) | | 22503 | /ft. /ft. | /ft. /ft. | | |
| 1/16" (1.59mm) | 0.030" (0.76mm) | | 22504 | /ft. /ft. | /ft. /ft. | | |
| 1/16" (1.59mm) | 0.040" (1.02mm) | | 22505 | /ft. /ft. | /ft. /ft. | | |
| 1/8" (3.18mm) | 0.085" (2.16mm) | 0.020" | 22506 | /ft. /ft. | /ft. /ft. | | |
| 1/4" (6.35mm) | 0.210" (5.33mm) | 0.020" | 22507 | /ft. /ft. | /ft. /ft. | | |

Treated Seamless 316L Grade Stainless Steel Tubing

High durability tubing. Recommended for:

- inert applications.
- high temperatures.
- high pressures.
- corrosive environments.

Siltek®/Sulfinert® Treated Coiled 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|---------------|-----------------|----------------|-------|----------------|------------|-------------|-----------|
| | | | | 5-24 ft. | 25-199 ft. | 200-399 ft. | > 400 ft. |
| 1/8" (3.18mm) | 0.055" (1.40mm) | 0.035" | 22508 | /ft. /ft. | /ft. /ft. | | |
| 1/4" (6.35mm) | 0.180" (4.57mm) | 0.035" | 22509 | /ft. /ft. | /ft. /ft. | | |
| 3/8" (9.52mm) | 0.277" (7.04mm) | 0.049" | 22914 | /ft. /ft. | /ft. /ft. | | |

Silcosteel®-CR Treated Coiled 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|---------------|-----------------|----------------|-------|----------------|------------|-------------|-----------|
| | | | | 5-24 ft. | 25-199 ft. | 200-399 ft. | > 400 ft. |
| 1/8" (3.18mm) | 0.055" (1.40mm) | 0.035" | 22896 | /ft. /ft. | /ft. /ft. | | |
| 1/4" (6.35mm) | 0.180" (4.57mm) | 0.035" | 22897 | /ft. /ft. | /ft. /ft. | | |
| 3/8" (9.52mm) | 0.277" (7.04mm) | 0.049" | 22915 | /ft. /ft. | /ft. /ft. | | |

Treated Hydroguard™ Deactivated Stainless Steel Tubing

Hydroguard™ deactivation creates a high-density surface that is not readily attacked by aggressive hydrolysis. Recommended for:

- plumbing purge and trap systems.
- headspace systems.

Silcosteel® Treated Hydroguard™ Deactivated 304 Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|---------------------------|-----------------|----------------|-------|----------------|------------|-------------|----------|
| | | | | 5-24 ft. | 25-199 ft. | 200-399 ft. | >400 ft. |
| $\frac{1}{16}$ " (1.59mm) | 0.010" (0.25mm) | | 22497 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{16}$ " (1.59mm) | 0.020" (0.51mm) | | 22496 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{16}$ " (1.59mm) | 0.030" (0.76mm) | | 22495 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{16}$ " (1.59mm) | 0.040" (1.02mm) | | 22494 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{8}$ " (3.18mm) | 0.085" (2.16mm) | 0.020" | 22493 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{4}$ " (6.35mm) | 0.210" (5.33mm) | 0.020" | 22492 | /ft. | /ft. | /ft. | /ft. |

Silcosteel® Treated Hydroguard™ Deactivated Seamless 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|--------------------------|-----------------|----------------|-------|----------------|------------|-------------|----------|
| | | | | 5-24 ft. | 25-199 ft. | 200-399 ft. | >400 ft. |
| $\frac{1}{8}$ " (3.18mm) | 0.055" (1.40mm) | 0.035" | 22491 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{4}$ " (6.35mm) | 0.180" (4.57mm) | 0.035" | 22490 | /ft. | /ft. | /ft. | /ft. |

Silcosteel® Treated Hydroguard™ Deactivated Electropolished 316L Grade Stainless Steel Tubing

| OD | ID | Wall Thickness | cat.# | Price-per-foot | | | |
|--------------------------|-----------------|----------------|-------|----------------|-----------|-------------|----------|
| | | | | 5-24 ft. | 25-99 ft. | 100-299 ft. | >300 ft. |
| $\frac{1}{8}$ " (3.18mm) | 0.085" (2.16mm) | 0.020" | 22489 | /ft. | /ft. | /ft. | /ft. |
| $\frac{1}{4}$ " (6.35mm) | 0.180" (4.57mm) | 0.035" | 22488 | /ft. | /ft. | /ft. | /ft. |

Treated Straight, 6-Foot Length Stainless Steel Tubing**Silcosteel®-CR Treated Straight Seamless 316L Grade Stainless Steel Tubing**

- Individual 6-foot pieces.

In response to customer requests, we offer 6-foot straight lengths of $\frac{1}{8}$ -, $\frac{1}{4}$ -, and $\frac{3}{8}$ -inch Silcosteel®-CR treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

6 foot Length (± 1/2")

| OD | ID | Wall Thickness | qty. | cat.# | price |
|--------------------------|-----------------|----------------|------|-------|-------|
| $\frac{1}{8}$ " (3.18mm) | 0.055" (1.40mm) | 0.035" | ea. | 22898 | |
| $\frac{1}{4}$ " (6.35mm) | 0.180" (4.57mm) | 0.035" | ea. | 22899 | |
| $\frac{3}{8}$ " (9.52mm) | 0.277" (7.04mm) | 0.049" | ea. | 22900 | |

Siltek®/Sulfinert® Treated Straight Seamless 316L Grade Stainless Steel Tubing

- Individual 6-foot pieces.

In response to customer requests, we offer 6-foot straight lengths of $\frac{1}{8}$ -, $\frac{1}{4}$ -, and $\frac{3}{8}$ -inch Siltek®/Sulfinert® treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

6 foot Length (± 1/2")

| OD | ID | Wall Thickness | qty. | cat.# | price |
|--------------------------|-----------------|----------------|------|-------|-------|
| $\frac{1}{8}$ " (3.18mm) | 0.055" (1.40mm) | 0.035" | ea. | 22901 | |
| $\frac{1}{4}$ " (6.35mm) | 0.180" (4.57mm) | 0.035" | ea. | 22902 | |
| $\frac{3}{8}$ " (9.52mm) | 0.277" (7.04mm) | 0.049" | ea. | 22903 | |

recommended for
purge & trap



An extra charge is applied for cutting Siltek®/Sulfinert®, or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item:

| # of Pieces | Added Charge |
|-------------|--------------|
| 5 to 15 | enquire |
| 16 to 30 | enquire |
| 31 to 75 | enquire |
| 76 to 99 | enquire |
| 100 to 200 | enquire |

ordering note

Required length in meters x 3.2808 = length in feet.

did you know?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000ft.