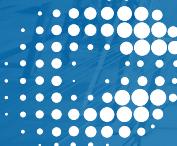


CARDINAL
UHP
AMETEK®

EP COIL TECH 50CR TUBING



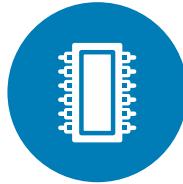
CARDINAL
UHP
AMETEK[®]

Since 1983 Cardinal Systems has supplied a variety of industries with specialty piping components and services. We introduced multiple best-practice methods that are now recognized as industry standards. Cardinal continues to be the industry leader in precision electropolishing and specialty cleaned piping components as well as specification development and validation.

OUR PRODUCTS & INDUSTRIES



Chemically cleaned and passivated tubing and fittings for high purity pharma and medical



High purity electropolished tubing and fittings for semiconductor applications



Long continuous heated tubing bundle for semiconductor and analytical sample transport

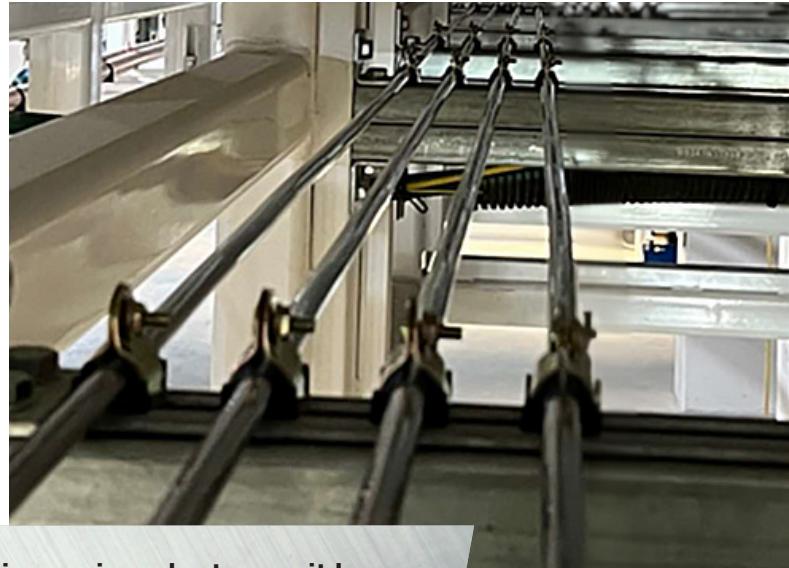
Cardinal UHP was the first company in the high purity tubing and fitting industry to adopt an internationally recognized ISO quality management program. Our unyielding commitment to quality is evident in every step of our manufacturing process and continues through to packaging, delivery, and support of the finished product.



WHY CARDINAL UHP EP COIL TECH 50CR TUBING?

Cardinal UHP tubing is the trusted choice within the semiconductor industry for transporting ultra-high purity (UHP) gases to essential equipment in critical processes. Ensuring UHP gas in mixing boxes, gas panels, and headers for etching, lithography, chemical vapor deposition (CVD) and ion implantation.

Our EP coiled tubing, electropolished in a proprietary single continuous 'draw' ensures a flawless surface eliminating risk of contamination, vital for precise and reliable operations. EP coil tubing adheres to the same stringent validation standards as our stick, guaranteeing unmatched reliability and purity across all applications.



Coil tubing is the new standard in semiconductor, as it has been for refining, petrochemical, power, and offshore, due to higher system integrity, lower labor costs, faster installation.

CASE STUDY

Based on a recent project, at an industry leading, Fortune 500, global semiconductor company's new Fab, a case study considering 15,600 ft of installed UHP EP tubing was done. EP Coil tubing was utilized on 156 separate runs, each 100 ft long and 13 ft above ground level. It was estimated the project would require an additional 780 orbital welds. Assuming 8–9 welds at height, per day, would yield 3,950 hours of additional labor, compared to coil, which took about 650 hours total for installation.

Therefore, the coil option saved 3,350 working hours, was safer due to no welding at height, reduced weld inspections while increasing integrity against corrosion with less heat affected zones. This equates to 500+% labor savings and a total project savings of 32% on the tubing and its installation.



COIL TUBING =

OVER 500%
IN DIRECT
LABOR SAVINGS
(compared to stick)

COIL TUBING =

✓ SAFER INSTALL, LESS WELDING AT HEIGHT

✓ HIGH INTEGRITY WITH LESS HEAT AFFECTED ZONES CAUSED BY ORBITAL WELDING



COIL TUBING =

32% LESS
TOTAL PROJECT
COST USING
COIL VS. STICK

EP COIL TECH 50CR TUBING PRODUCTS

T50CR EP COIL

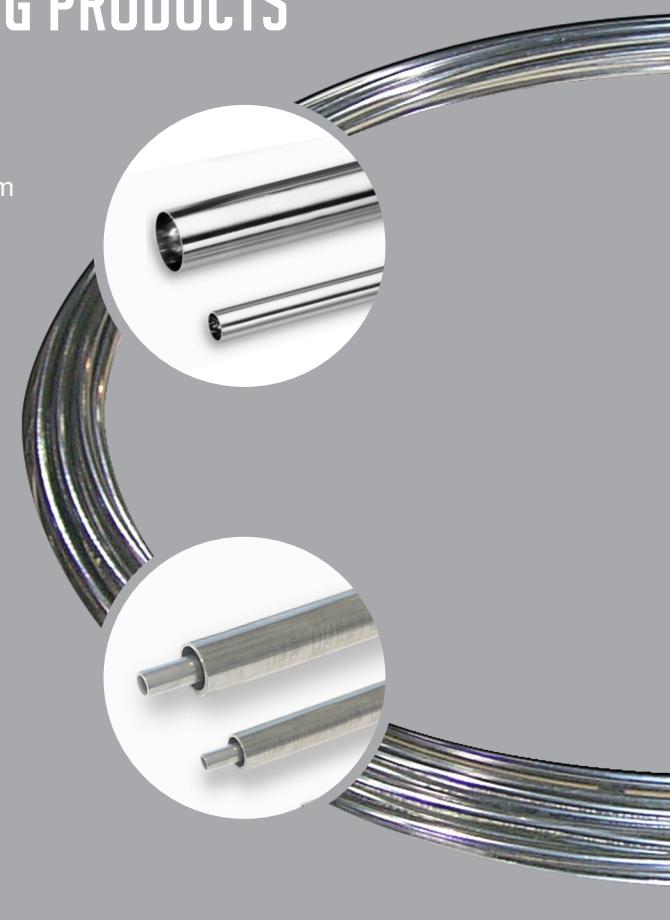
Long continuous lengths of electropolished tubing to 10 μ in / 0.25 μ m specifications. Used for general high purity gas distribution,

- 1/4", 3/8", 1/2", 3/4", and 1" up to 330 ft
- 1/8" up to 100 ft
- CFOS 20 Ra coils available in 1000 ft +
- Orbital-weld fittings available
- Also available in stick
- Heat traced bundle option (EP PAK)
- Sulfinert 2000 ID available
- Jacketed OD available

T50CR EP COAX COIL

Long continuous lengths of jacketed process tubing electropolished to 10 μ in / 0.25 μ m specifications. Used for highly corrosive or toxic gas distribution systems.

- 1/4" x 1/2" in lengths up to 300 ft
- 3/8" x 5/8" in lengths up to 300 ft
- Orbital-weld fittings available
- Also available in stick
- Heat traced bundle option (EP PAK)
- Sulfinert 2000 ID available
- Jacketed OD available



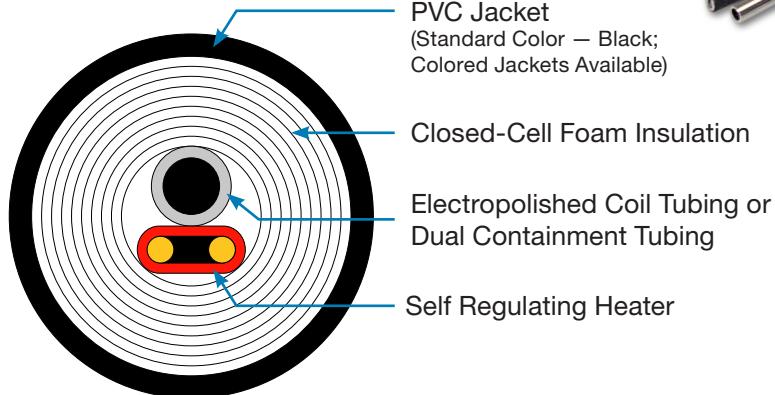
EP PAK PROVIDES EP COIL WITH TEMPERATURE MAINTENANCE IN AN ALL-IN-ONE BUNDLE

EP Pak is a preinsulated, electrically traced tubing bundle with 10 μ in / 0.25 μ m electropolished tubing that is delivered in long continuous spools.

EP Pak Benefits:

- Consistent temperature maintenance – maintain up to 180°C
- Reduced install time
- System integrity
- Minimized welds
- Reduced waste
- Non-fibrous insulation
- Improved performance
- Reduced layout time
- Save clean-in-place time
- Ready to use welding purge
- Line (jumper lines)

Typical Cross Section of EP Pak



EP COIL TECH 50CR TUBING OFFERS MULTIPLE ADVANTAGES OVER STICK TUBING

EASE OF INSTALLATION

- Minimize welds / fittings / inspection: 328 ft (100 m) section would require 17–18 welds for stick tubing versus 2–3 for coil tubing
- Reduce overall installation time and number of welders / tradesmen
- Coil tubing is easy to straighten and bend
- Coil is boxed, and much more compact for storage and maneuverability compared to 20 ft long sticks

IMPROVED PERFORMANCE

- Ensure integrity of system with fewer potential leak points
- Eliminate possible contamination and corrosion heat affected zones at welds

SPECIFICATION COMPARISON

Tech 50 — Stick Tube	Tech 50CR — Coil Tube
1/8" through 6"	1/8" through 1/2"
10 Ra Max (Optional 7 Ra Max)	10 Ra Max
Controlled Sulfur 0.005–0.012%	Controlled Sulfur 0.005–0.012%
Length per 20' stick + 1/8" / -18"	Length per Coil +5% / -0%
OD 1/4" - 3/8" size : +0.004" / -0.002" OD 1/2" size : + / - 0.005"	OD 1/8" size : + / - 0.003" OD 1/4" - 3/8" size : +0.004" / -0.002" OD 1/2" size : + / - 0.005"
Packaging: Film & cap, double bag individual sticks, packaged in ISO Class 4 clean room	Packaging: Film & cap, double bag and heat seal per coil, packaged in ISO Class 4 clean room
Specifications: ASTM-A213, ASTM-A269, ASTM-A270, ASTM-A1016A, ASTM-A632, ASTM-A262 Practice E, ASME SA213, EN 10204 3.1, Cleanroom ISO 14644-1	

QUALITY & VALIDATION

- Cardinal coil undergoes the same strict quality standards as our stick tubing. We perform quality studies on each cut section of tubing including SEM, and XPS to ensure the following parameters are within specification:
 - Surface roughness
 - Dimensional tolerance
 - Cr: Fe and CrO: FeO ratios
 - Oxide thickness
 - Pits, inclusions, and defects
 - Particle counts
 - Moisture
- MTR EN 3.1 and Certificate of Conformance is available for every material heat number of tubing used.





Cardinal UHP

1900 Crystal Industrial Ct.
St. Louis, MO 63114

P 314.236.2020
F 314.236.2080

sales.cardinal@ametek.com

cardinaluhp.com