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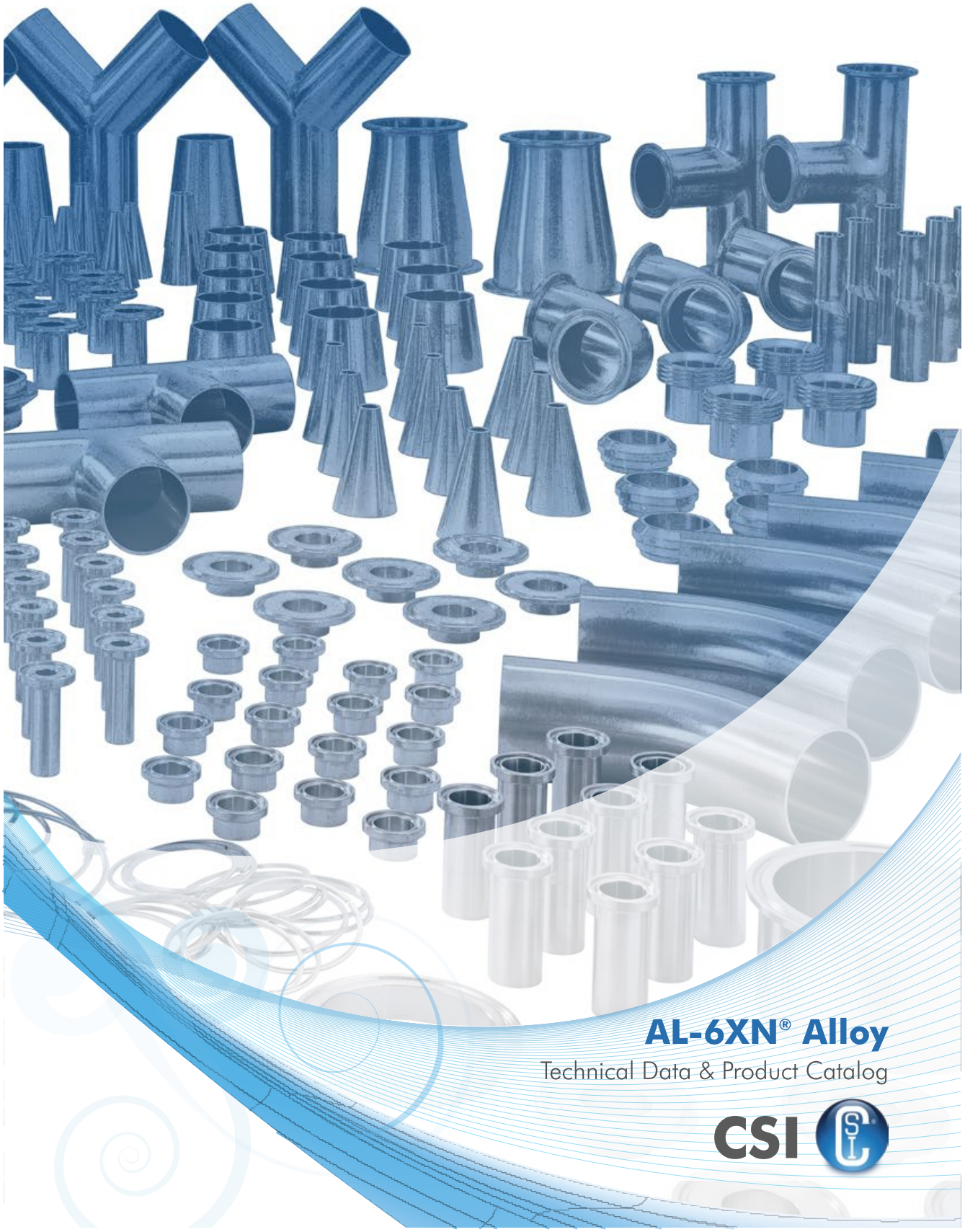

AL-6XN® Alloy

Technical Data & Product Catalog

CSI

Fluitek Componentes de Processos Ltda - Rua Santo Bassan 111 - Bosque das Palmeiras - CEP 13086-745
Campinas - SP - Fone (19) 3257.3400 - e-mail: atendimento@fluitek.com.br - www.fluitek.com.br

AL-6XN® Alloy
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General Properties

It is now possible to extend the life of system components that may experience problems with chloride induced corrosion by using **AL-6XN**® (UNS N08367) alloy sanitary tubing and fittings supplied by CSI. AL-6XN alloy is a "superaustenitic," low carbon stainless steel containing chromium, nickel, molybdenum, and nitrogen.

AL-6XN alloy is metallurgically stable to 1000°F (540°C) and has no phase transformation even after extensive deformation. Long term exposure in the temperature range of 1200–1800°F (650–1000°C) may result in the formation of a secondary phase (chi or sigma phase) along the grain boundaries. These secondary phases may adversely affect corrosion resistance and should be avoided.

Nitrogen is added to the alloy to minimize secondary phase formation, improve its corrosion resistance, increase its strength over a broad temperature range, and retain the superior formability of austenitic stainless steel. AL-6XN alloy has a face-centered cubic crystal structure similar to other austenitic stainless steels. The AL-6XN alloy is non-magnetic, and its magnetic permeability remains low even after severe cold forming.

Table I: Chemical Composition of AL-6XN® Alloy

Element	Typical	Allowable
Carbon	0.02	0.03 maximum
Manganese	0.40	2.00 maximum
Phosphorus	0.020	0.040 maximum
Sulfur	0.001	0.030 maximum
Silicon	0.40	1.00 maximum
Chromium	20.5	20.00 / 22.00
Nickel	24.00	23.50 / 25.50
Molybdenum	6.20	6.00 / 7.00
Nitrogen	0.22	0.18 / 0.25
Copper	0.2	0.75
Iron	Balance	Balance

Disclaimer: Always consult current standards.

Specifications

The American Society of Mechanical Engineers (ASME) and the American Society for Testing and Materials (ASTM) specifications for the wide range of AL-6XN alloy forms are listed in *table II*. AL-6XN alloy is approved for ASME Boiler and Pressure Vessel Code construction (Section VIII Div. 1) as Code Case 1997.

Table II: ASME & ASTM Specifications (UNS N08367)

Product	Specifications	
	ASME	ASTM
Plate, Sheet & Strip	SA 240 SB-688	A 240 B 688
Rod, Bar & Wire	SB-691	B 691
Welded Pipe	SB-675	B 675
Heat Exchanger Tubing	SA-249	A 249
Sanitary Tubing		A 270
Welded Tube (General Applications)	SB-676	B 676 A 269
Seamless Pipe & Tube	SB-690	B 690
Billets and Bars for Reforging		B 472
Forged Pipe Flanges, Fittings & Valves	SB-462	B 462
Wrought Nickel Alloy Welded Fittings	SB-366	B 366
Nickel Alloy Forgings	SB-564	B 564
Pipe Welded w/ Filler	SB-804	B 804
Castings (CN-3MN, UNS J94651)	SA-351	A 743 A 744

Source: ATI Allegheny Ludlum

Physical Properties

The physical properties of AL-6XN® alloy are similar to those of other austenitic stainless steels (*table III*). The elastic modulus values of AL-6XN alloy are lower than those for Type 316L and Alloy 625. However, these moduli are high in comparison to such non-ferrous alloys as titanium. The thermal conductivity and coefficient of expansion values are lower than those for Type 316L but are higher than Alloy 625. Physical properties of AL-6XN alloy at room temperature are presented in *table IV*.

Table III: Comparison of Physical Properties

Alloy	Elastic Modulus		Thermal Conductivity at 212°F		Expansion Coefficient from 77 to 212°F	
	psi x 10^6	GPa	Btu/hr • ft • °F	W/(m•K)	10^{-6}/°F	10^{-6}/°C
Type 316L	29.0	200	9.2	16.0	8.5	15.3
AL-6XN®	**28.3**	**195**	**7.5**	**13.0**	**7.9**	**14.2**
Alloy 904L	28.3	195	7.6	13.2	8.3	15.0
Alloy 625	29.7	205	6.2	10.7	7.1	12.8
Nickel 200	30.0	207	38.8	67.1	7.4	13.4
C-276	29.8	205	6.4	9.9	6.2	11.2
C-22®	29.9	206	6.4	11.1	6.9	12.4
Titanium	15.0	103	9.5	16.4	5.0	9.1

Sources: ATI Allegheny Ludlum and Haynes International

Table IV: Physical Properties of AL-6XN® Alloy at Room Temperature

Property	Value	Units
Density	0.291	lb/in³
	8.06	g/cm³
Modulus of Elasticity	28.3 x 10^6	psi
	195	GPa
Melting Range	2410 to 2550	°F
	1320 to 1400	°C
Thermal Conductivity		
68 to 212°F	7.5	Btu/hr•ft•°F
20 to 100°C	14.1	W/(m•K)
Coefficient of Expansion		
68 to 212°F	7.9	10^{-6}/°F
20 to 100°C	14.2	10^{-6}/°C
Specific Heat capacity	0.11	Btu/lb•°F
	500	J/kg•K
Electrical Resistivity	535	Ohm•circ mil/ft
	0.89	Ωm
Scaling temperature	1885	°F
	1030	°C

Source: ATI

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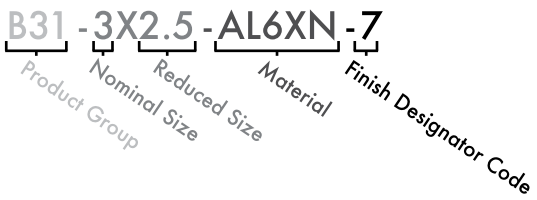
Surface Finish

Designator

Designator Location

The finish designator is indicated in the CSI part number as a suffix. The suffix will define the finishing requirements for that process component. Each part number can have several finish designators applied to it. *Figure 1* is an example of a part number with a specified finish designator of "7." Each finish designator in *table V* indicates the roughness average (Ra) specifications for the product and non-product contact surfaces.

Figure 1



Surface Finish Options

Mechanically Polished Tubing & Fittings (P7 & 7)

The outside of the tube shall be mechanically polished to a surface finish comparable to 0.8 µm or better and considered to be equivalent to a No. 4 finish as defined in 3-A Sanitary Standards.

The interior surfaces shall be drawn or mechanically polished to a 32 µ-inch Ra maximum finish for sizes 1/2" through 4" diameter. No interior surface finish reading above 32 µ-inch Ra is acceptable unless dimensionally defined in the *table V*.

Electropolished Tubing & Fittings (P25)

The outside of tubing and fittings shall be mechanically polished to a 32 µ-inch Ra maximum finish.

The interior surfaces shall be mechanically polished, or as drawn, to a 25 µ-inch Ra maximum finish for sizes 1/2" through 4" diameter. The electropolishing process may increase the Ra values post electropolishing and have areas of preferential etching (e.g., frosting or shadowing). Final Ra values for electropolished tubing and fittings shall not be used as criteria of acceptance for this product.

Table V: Surface Finish Designator Code

Finish Code	Product Contact Max Ra*		Product Contact Surface Finish Treatment (ID)	Non-Product Contact Max Ra*		Non-Product Contact Surface Finish Treatment (OD)
P7	32 µ-inch	0.8 µm	Mechanical Polish	32 µ-inch	0.8 µm	Mechanical Polish
7	32 µ-inch	0.8 µm	Mechanical Polish	32 µ-inch	0.8 µm	Mechanical Polish
P25	25 µ-inch	0.6 µm	Electropolished	32 µ-inch	0.8 µm	Mechanical Polish

*A 32 µ-inch (0.8 µm) surface finish is comparable to a 150 grit or better and considered to be equivalent to a No. 4 finish as defined in 3-A Sanitary Standards. 32 µ-inch Max Ra is an approximate value and is not guaranteed. Surface finish roughness shall be physically examined for "P25" using a profilometer calibrated to standards traceable to NIST. Surface finish roughness shall NOT be subject to physical examination for "P7" or "7".

CSI Quality Standards

Mechanically Polished "P7" and "7" Designations, Dimensional Tolerances, and Surface Finish

Surface Finish The surface finish acceptance criteria for **mechanically polished** and **as drawn** surfaces will meet a No. 4 finish per 3-A Standards. Surface finish equivalent to 0.8 µm Ra or better as obtained with silicon carbide, properly applied, is considered in compliance. A maximum Ra of 32 µ-inch is considered equivalent to a No. 4 finish.

Dimensional Tolerances for Tubing with Finish Designation Type "P7"

Tubing Description	Outside Diameter		Wall Thickness	
	Nominal	Tolerance	Wall Thickness	Tolerance
1/2" x 0.065" wall	0.500" (12.7 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 12.5% of wall
3/4" x 0.065" wall	0.750" (19.1 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 12.5% of wall
1" x 0.065" wall	1.000" (25.4 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 12.5% of wall
1-1/2" x 0.065" wall	1.500" (38.1 mm)	+/- 0.008" (+/- 0.20mm)	0.065" (1.65mm)	+/- 12.5% of wall
2" x 0.065" wall	2.000" (20.8 mm)	+/- 0.008" (+/- 0.20mm)	0.065" (1.65mm)	+/- 12.5% of wall
2-1/2" x 0.065" wall	2.500" (63.5 mm)	+/- 0.010" (+/- 0.25mm)	0.065" (1.65mm)	+/- 12.5% of wall
3" x 0.065" wall	3.000" (76.2 mm)	+/- 0.010" (+/- 0.25mm)	0.065" (1.65mm)	+/- 12.5% of wall
4" x 0.083" wall	4.000" (101.6 mm)	+/- 0.015" (+/- 0.38mm)	0.083" (2.11mm)	+/- 12.5% of wall

Dimensional Tolerances for Fittings with Finish Designation Type "7"

Nominal OD Size (inches)	OD Tolerance	Catalog Length Tolerance	Squareness of Elbow or Tee Branches	Wall Thickness	Fitting Wall Thickness Tolerance
1/2	± 0.010" (± 0.25 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
3/4	± 0.010" (± 0.25 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
1	± 0.010" (± 0.25 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
1-1/2	± 0.016" (± 0.40 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
2	± 0.016" (± 0.40 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
2-1/2	± 0.020" (± 0.50 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
3	± 0.020" (± 0.50 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.065" (1.65mm)	± 0.008/-010" (± 0.20/-0.25 mm)
4	± 0.030" (± 0.76 mm)	± 0.050" (± 1.27 mm)	90° ± 2°	0.083" (2.11mm)	± 0.010/-017" (± 0.25/-0.43 mm)

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CSI Quality Standards

Electropolished "P25" Designation, Dimensional Tolerances, and Surface Finish

Surface Finish Internal surfaces will be electropolished per CSI standard practices. These surfaces are visually inspected and measured for roughness (Ra) using a contact profilometer.

Dimensional Tolerances for Tubing with Finish Designation Type "P25"

Tubing Description	Outside Diameter		Wall Thickness	
	Nominal	Tolerance	Wall Thickness	Tolerance
1/2" x 0.65" wall	0.500" (12.7 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 10% of wall
3/4" x 0.65" wall	0.750" (19.1 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 10% of wall
1" x 0.65" wall	1.000" (25.4 mm)	+/- 0.005" (+/- 0.13mm)	0.065" (1.65mm)	+/- 10% of wall
1-1/2" x 0.65" wall	1.500" (38.1 mm)	+/- 0.008" (+/- 0.20mm)	0.065" (1.65mm)	+/- 10% of wall
2" x 0.65" wall	2.000" (20.8 mm)	+/- 0.008" (+/- 0.20mm)	0.065" (1.65mm)	+/- 10% of wall
2-1/2" x 0.65" wall	2.500" (63.5 mm)	+/- 0.010" (+/- 0.25mm)	0.065" (1.65mm)	+/- 10% of wall
3" x 0.65" wall	3.000" (76.2 mm)	+/- 0.010" (+/- 0.25mm)	0.065" (1.65mm)	+/- 10% of wall
4" x 0.83" wall	4.000" (101.6 mm)	+/- 0.015" (+/- 0.38mm)	0.083" (2.11mm)	+/- 10% of wall

These tolerances comply with ASME BPE part DT.

Dimensional Tolerances for Fittings with Finish Designation Type "P25"

Nominal OD Size (inches)	OD Tolerance	Catalog Length Tolerance	Min. Length of Straight Tangent	Perp. of Face to Tangent	Face to Face Squareness, Off Angle	Wall Thickness	Fitting Wall Thickness Tolerance
1/2	± 0.005" (± 0.13 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.005" (0.13mm)	0.014" (0.36mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
3/4	± 0.005" (± 0.13 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.005" (0.13mm)	0.018" (0.46mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
1	± 0.005" (± 0.13 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.008" (0.20mm)	0.025" (0.64mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
1-1/2	± 0.008" (± 0.20 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.008" (0.20mm)	0.034" (0.86mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
2	± 0.008" (± 0.20 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.008" (0.20mm)	0.043" (1.09mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
2-1/2	± 0.010" (± 0.25 mm)	± 0.050" (± 1.27 mm)	1.50" (38.10mm)	0.010" (0.25mm)	0.054" (1.37mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
3	± 0.010" (± 0.25 mm)	± 0.050" (± 1.27 mm)	1.75" (44.45mm)	0.016" (0.41mm)	0.068" (1.73mm)	0.065" (1.65mm)	± 0.005/-0.010" (± 0.13/-0.25 mm)
4	± 0.015" (± 0.38 mm)	± 0.050" (± 1.27 mm)	2.00" (50.80mm)	0.016" (0.41mm)	0.086" (2.18mm)	0.083" (2.11mm)	± 0.008/-0.012" (± 0.20/-0.30 mm)

These tolerances comply with ASME BPE part DT.

The American Society of Mechanical Engineers (ASME) has prepared a standard intended for design, materials, construction, inspection, and testing of vessels, piping, and related accessories (such as pumps, valves and fittings) for use in the biopharmaceutical industry, referred to as ASME BPE. This catalog does not intend to address all the criteria as stated in the ASME BPE specification. Items within this catalog that are identified with a "- P25" surface finish designation are the only standard fittings and tubing offered that are in accordance with ASME BPE dimensions and tolerances as stated in part DT. Due to the manufacturing processes, not all surface finish requirements can be met as stated in part SF. See Interior Surface Finish, Acceptance Criteria in this catalog for details of limits.

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Tubing and Weld Rings

Part numbers identified in this catalog are available through CSI. Most of the part numbers identified with a "7" or "P7" mechanically polished finish designation are also available in an electropolished "P25" finish designation. Mechanically finished components are in stock at CSI. Some exceptions apply.

AL-6XN® Alloy Tubing Specifications

- In compliance with **ASTM** A270/A249/B676 and **ASME** SA249/SB676
- Full line stencil on tube OD
- Plastic sleeved and capped on polished ID and OD tubing
- Tubing provided in random lengths, not less than 17 ft. Lengths of 20 ft. ± 1.0 in. are typical
- MTR provided with every order

AL-6XN® Alloy Tubing

"P7" Finish Part Number	Nominal Size	Finish ID/OD
T6XN-0.5X.065-W-P7	1/2" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-0.75X.065-W-P7	3/4" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-1.0X.065-W-P7	1" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-1.5X.065-W-P7	1-1/2" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-2.0X.065-W-P7	2" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-2.5X.065-W-P7	2-1/2" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-3.0X.065-W-P7	3" OD X 0.065" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra
T6XN-4.0X.083-W-P7	4" OD X 0.083" wall	150 grit MP / MP 32 µ-inch / 0.8 µm Ra

Electropolished tubing also available

Weld Insert Rings

CSI Part Number	Size	Alloy
AR6022W-0.5	1/2"	Hastelloy® C-22®
AR6022W-0.75	3/4"	Hastelloy C-22
AR6022W-1	1"	Hastelloy C-22
AR6022W-1.5	1-1/2"	Hastelloy C-22
AR6022W-2	2"	Hastelloy C-22
AR6022W-2.5	2-1/2"	Hastelloy C-22
AR6022W-3	3"	Hastelloy C-22
AR6022W-4	4"	Hastelloy C-22

See "Welding AL-6XN" on page 25-27

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Stocked Items | Ferrules

Tri-clamp® Ferrule, Short | 14WMPS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
14WMPS-0.5-AL6XN-7	1/2"	0.500"
14WMPS-0.75-AL6XN-7	3/4"	0.500"
14WMPS-1-AL6XN-7	1"	0.500"
14WMPS-1.5-AL6XN-7	1-1/2"	0.500"
14WMPS-2-AL6XN-7	2"	0.500"
14WMPS-2.5-AL6XN-7	2-1/2"	0.500"
14WMPS-3-AL6XN-7	3"	0.500"
14WMPS-4-AL6XN-7	4"	0.625"
Dimension "A" is identical to ASME BPE.		

Tri-clamp® Ferrule, Medium | L14AM-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
L14AM-0.5-AL6XN-7	1/2"	1.125"
L14AM-0.75-AL6XN-7	3/4"	1.125"
L14AM-1-AL6XN-7	1"	1.125"
L14AM-1.5-AL6XN-7	1-1/2"	1.125"
L14AM-2-AL6XN-7	2"	1.125"
L14AM-2.5-AL6XN-7	2-1/2"	1.125"
L14AM-3-AL6XN-7	3"	1.125"
L14AM-4-AL6XN-7	4"	1.125"
Dimension "A" is identical to ASME BPE.		

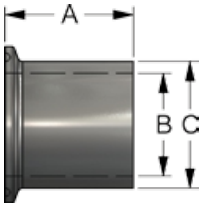
Tri-clamp® Ferrule, Long | B14AM-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B14AM-0.5-AL6XN-7	1/2"	1.750"
B14AM-0.75-AL6XN-7	3/4"	1.750"
B14AM-1-AL6XN-7	1"	1.750"
B14AM-1.5-AL6XN-7	1-1/2"	1.750"
B14AM-2-AL6XN-7	2"	2.250"
B14AM-2.5-AL6XN-7	2-1/2"	2.250"
B14AM-3-AL6XN-7	3"	2.250"
B14AM-4-AL6XN-7	4"	2.250"
Dimension "A" is identical to ASME BPE.		

Also Available | Ferrules

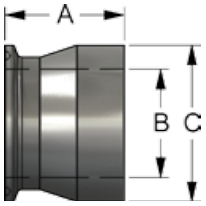
Tri-clamp® Ferrule, Heavy Wall | 14MPW-Size-AL6XN-Finish

"7" Finish Part Number	Size	Length (A)	(B)	(C)
14MPW-1-AL6XN-7	1"	1.625"	0.870"	1.160"
14MPW-1.5-AL6XN-7	1-1/2"	1.625"	1.370"	1.676"
14MPW-2-AL6XN-7	2"	1.750"	1.870"	2.192"
14MPW-2.5-AL6XN-7	2-1/2"	1.750"	2.370"	2.708"
14MPW-3-AL6XN-7	3"	1.813"	2.870"	3.224"
14MPW-4-AL6XN-7	4"	2.125"	3.834"	4.256"



Tri-clamp® Ferrule, Extra Heavy Wall | 14MPWH-Size-AL6XN

Machined Finish Part Number	Size	Length (A)	(B)	(C)
14MPWH051750-AL6XN	1/2"	1.75"	0.370"	0.984"
14MPWH102500-AL6XN	1"	2.50"	0.870"	1.984"
14MPWH104000-AL6XN	1"	4.00"	0.870"	1.984"
14MPWH152500-AL6XN	1-1/2"	2.50"	1.370"	1.984"
14MPWH153000-AL6XN	1-1/2"	3.00"	1.370"	1.984"
14MPWH153250-AL6XN	1-1/2"	3.25"	1.370"	1.984"
14MPWH154000-AL6XN	1-1/2"	4.00"	1.370"	1.984"
14MPWH202500-AL6XN	2"	2.50"	1.870"	2.516"
14MPWH203000-AL6XN	2"	3.00"	1.870"	2.516"
14MPWH203250-AL6XN	2"	3.25"	1.870"	2.516"
14MPWH302000-AL6XN	3"	2.00"	2.870"	3.579"
14MPWH303000-AL6XN	3"	3.00"	2.870"	3.579"
14MPWH303750-AL6XN	3"	3.75"	2.870"	3.579"
14MPWH304000-AL6XN	3"	4.00"	2.870"	3.579"
14MPWH306000-AL6XN	3"	6.00"	2.870"	3.579"
14MPWH402500-AL6XN	4"	2.50"	3.834"	4.682"
14MPWH403000-AL6XN	4"	3.00"	3.834"	4.682"
14MPWH403500-AL6XN	4"	3.50"	3.834"	4.682"
14MPWH404000-AL6XN	4"	4.00"	3.834"	4.682"



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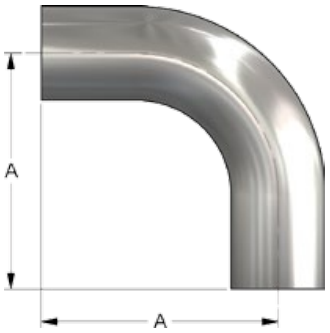
Stocked Items | Elbows

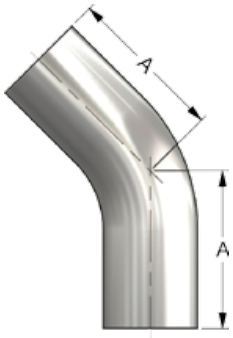
90° Weld Ell | B2S-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B2S-0.5-AL6XN-7	1/2"	3.000"
B2S-0.75-AL6XN-7	3/4"	3.000"
B2S-1-AL6XN-7	1"	3.000"
B2S-1.5-AL6XN-7	1-1/2"	3.750"
B2S-2-AL6XN-7	2"	4.750"
B2S-2.5-AL6XN-7	2-1/2"	5.500"
B2S-3-AL6XN-7	3"	6.250"
B2S-4-AL6XN-7	4"	8.000"
Dimension "A" is identical to ASME BPE.		



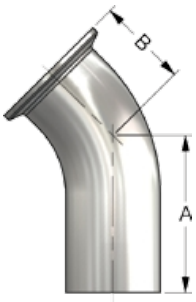
45° Weld Ell | B2KS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B2KS-0.5-AL6XN-7	1/2"	2.250"
B2KS-0.75-AL6XN-7	3/4"	2.250"
B2KS-1-AL6XN-7	1"	2.250"
B2KS-1.5-AL6XN-7	1-1/2"	2.500"
B2KS-2-AL6XN-7	2"	3.000"
B2KS-2.5-AL6XN-7	2-1/2"	3.375"
B2KS-3-AL6XN-7	3"	3.625"
B2KS-4-AL6XN-7	4"	4.500"
Dimension "A" is identical to ASME BPE.		



45° Tri-clamp® x Weld Ell | B2KMW-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
B2KMW-0.5-AL6XN-7	1/2"	2.250"	1.000"
B2KMW-0.75-AL6XN-7	3/4"	2.250"	1.000"
B2KMW-1-AL6XN-7	1"	2.250"	1.125"
B2KMW-1.5-AL6XN-7	1-1/2"	2.500"	1.438"
B2KMW-2-AL6XN-7	2"	3.000"	1.750"
B2KMW-2.5-AL6XN-7	2-1/2"	3.375"	2.063"
B2KMW-3-AL6XN-7	3"	3.625"	2.375"
B2KMW-4-AL6XN-7	4"	4.500"	3.125"
Dimensions "A" and "B" are identical to ASME BPE.			



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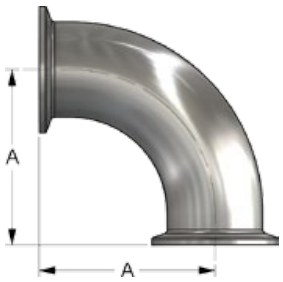
Stocked Items | Elbows

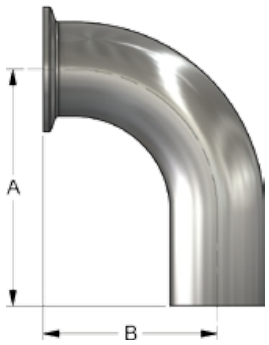
90° Tri-clamp® Ell | B2CMP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B2CMP-0.5-AL6XN-7	1/2"	1.625"
B2CMP-0.75-AL6XN-7	3/4"	1.625"
B2CMP-1-AL6XN-7	1"	2.000"
B2CMP-1.5-AL6XN-7	1-1/2"	2.750"
B2CMP-2-AL6XN-7	2"	3.500"
B2CMP-2.5-AL6XN-7	2-1/2"	4.250"
B2CMP-3-AL6XN-7	3"	5.000"
B2CMP-4-AL6XN-7	4"	6.625"
Dimension "A" is identical to ASME BPE.		



90° Tri-clamp® x Weld Ell | B2CMW-Size-AL6XN-Finish

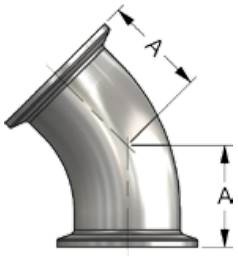
"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
B2CMW-0.5-AL6XN-7	1/2"	3.000"	1.625"
B2CMW-0.75-AL6XN-7	3/4"	3.000"	1.625"
B2CMW-1-AL6XN-7	1"	3.000"	2.000"
B2CMW-1.5-AL6XN-7	1-1/2"	3.750"	2.750"
B2CMW-2-AL6XN-7	2"	4.750"	3.500"
B2CMW-2.5-AL6XN-7	2-1/2"	5.500"	4.250"
B2CMW-3-AL6XN-7	3"	6.250"	5.000"
B2CMW-4-AL6XN-7	4"	8.000"	6.625"
Dimensions "A" and "B" are identical to ASME BPE.			



Also Available | Elbows

45° Tri-clamp® Ell | B2KMP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B2KMP-0.5-AL6XN-7	1/2"	1.000"
B2KMP-0.75-AL6XN-7	3/4"	1.000"
B2KMP-1-AL6XN-7	1"	1.125"
B2KMP-1.5-AL6XN-7	1-1/2"	1.438"
B2KMP-2-AL6XN-7	2"	1.750"
B2KMP-2.5-AL6XN-7	2-1/2"	2.063"
B2KMP-3-AL6XN-7	3"	2.375"
B2KMP-4-AL6XN-7	4"	3.125"
Dimension "A" is identical to ASME BPE.		



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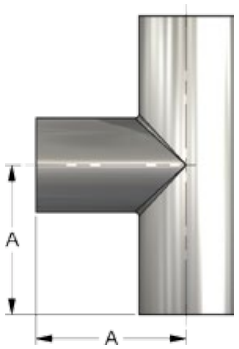
Stocked Items | Tees

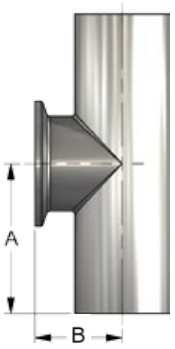
Weld Tee | B7WWW-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B7WWW-0.5-AL6XN-7	1/2"	1.875"
B7WWW-0.75-AL6XN-7	3/4"	2.000"
B7WWW-1-AL6XN-7	1"	2.125"
B7WWW-1.5-AL6XN-7	1-1/2"	2.375"
B7WWW-2-AL6XN-7	2"	2.875"
B7WWW-2.5-AL6XN-7	2-1/2"	3.125"
B7WWW-3-AL6XN-7	3"	3.375"
B7WWW-4-AL6XN-7	4"	4.125"
Dimension "A" is identical to ASME BPE.		



Short Outlet Tee | B7WWMS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
B7WWMS-0.5-AL6XN-7	1/2"	1.875"	1.000"
B7WWMS-0.75-AL6XN-7	3/4"	2.000"	1.125"
B7WWMS-1-AL6XN-7	1"	2.125"	1.125"
B7WWMS-1.5-AL6XN-7	1-1/2"	2.375"	1.375"
B7WWMS-2-AL6XN-7	2"	2.875"	1.625"
B7WWMS-2.5-AL6XN-7	2-1/2"	3.125"	1.875"
B7WWMS-3-AL6XN-7	3"	3.375"	2.125"
B7WWMS-4-AL6XN-7	4"	4.125"	2.750"
Dimensions "A" and "B" are identical to ASME BPE.			



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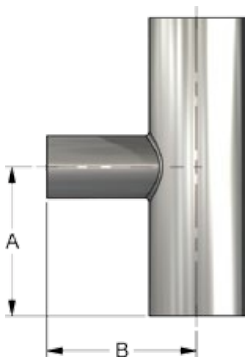
Stocked Items | Tees

Reducing Weld Tee | B7RWWW-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
B7RWWW-0.75X0.5-AL6XN-7	3/4" x 1/2"	2.000"	2.000"
B7RWWW-1X0.5-AL6XN-7	1" x 1/2"	2.125"	2.125"
B7RWWW-1X0.75-AL6XN-7	1" x 3/4"	2.125"	2.125"
B7RWWW-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	2.375"	2.375"
B7RWWW-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	2.375"	2.375"
B7RWWW-1.5X1-AL6XN-7	1-1/2" x 1"	2.375"	2.375"
B7RWWW-2X0.5-AL6XN-7	2" x 1/2"	2.875"	2.625"
B7RWWW-2X0.75-AL6XN-7	2" x 3/4"	2.875"	2.625"
B7RWWW-2X1-AL6XN-7	2" x 1"	2.875"	2.625"
B7RWWW-2X1.5-AL6XN-7	2" x 1-1/2"	2.875"	2.625"
B7RWWW-2.5X1-AL6XN-7	2-1/2" x 1"	3.125"	2.875"
B7RWWW-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	3.125"	2.875"
B7RWWW-2.5X2-AL6XN-7	2-1/2" x 2"	3.125"	2.875"
B7RWWW-3X0.5-AL6XN-7	3" x 1/2"	3.375"	3.125"
B7RWWW-3X0.75-AL6XN-7	3" x 3/4"	3.375"	3.125"
B7RWWW-3X1-AL6XN-7	3" x 1"	3.375"	3.125"
B7RWWW-3X1.5-AL6XN-7	3" x 1-1/2"	3.375"	3.125"
B7RWWW-3X2-AL6XN-7	3" x 2"	3.375"	3.125"
B7RWWW-3X2.5-AL6XN-7	3" x 2-1/2"	3.375"	3.125"
B7RWWW-4X1-AL6XN-7	4" x 1"	4.125"	3.625"
B7RWWW-4X1.5-AL6XN-7	4" x 1-1/2"	4.125"	3.625"
B7RWWW-4X2-AL6XN-7	4" x 2"	4.125"	3.875"
B7RWWW-4X3-AL6XN-7	4" x 3"	4.125"	3.875"
Dimensions "A" and "B" are identical to ASME BPE.			



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Stocked Items | Tees

Short Outlet Reducing Tee | B7RWWMS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
B7RWWMS-0.75X0.5-AL6XN-7	3/4" x 1/2"	2.000"	1.000"
B7RWWMS-1X0.5-AL6XN-7	1" x 1/2"	2.125"	1.125"
B7RWWMS-1X0.75-AL6XN-7	1" x 3/4"	2.125"	1.125"
B7RWWMS-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	2.375"	1.375"
B7RWWMS-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	2.375"	1.375"
B7RWWMS-1.5X1-AL6XN-7	1-1/2" x 1"	2.375"	1.375"
B7RWWMS-2X0.5-AL6XN-7	2" x 1/2"	2.875"	1.625"
B7RWWMS-2X0.75-AL6XN-7	2" x 3/4"	2.875"	1.625"
B7RWWMS-2X1-AL6XN-7	2" x 1"	2.875"	1.625"
B7RWWMS-2X1.5-AL6XN-7	2" x 1-1/2"	2.875"	1.625"
B7RWWMS-2.5X1-AL6XN-7	2-1/2" x 1"	3.125"	1.875"
B7RWWMS-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	3.125"	1.875"
B7RWWMS-2.5X2-AL6XN-7	2-1/2" x 2"	3.125"	1.875"
B7RWWMS-3X0.5-AL6XN-7	3" x 1/2"	3.375"	2.125"
B7RWWMS-3X0.75-AL6XN-7	3" x 3/4"	3.375"	2.125"
B7RWWMS-3X1-AL6XN-7	3" x 1"	3.375"	2.125"
B7RWWMS-3X1.5-AL6XN-7	3" x 1-1/2"	3.375"	2.125"
B7RWWMS-3X2-AL6XN-7	3" x 2"	3.375"	2.125"
B7RWWMS-4X0.5-AL6XN-7	4" x 1/2"	4.125"	2.625"
B7RWWMS-4X0.75-AL6XN-7	4" x 3/4"	4.125"	2.625"
B7RWWMS-4X1-AL6XN-7	4" x 1"	4.125"	2.625"
B7RWWMS-4X1.5-AL6XN-7	4" x 1-1/2"	4.125"	2.625"
B7RWWMS-4X2-AL6XN-7	4" x 2"	4.125"	2.625"
B7RWWMS-4X2.5-AL6XN-7	4" x 2-1/2"	4.125"	2.625"
B7RWWMS-4X3-AL6XN-7	4" x 3"	4.125"	2.625"
Dimensions "A" and "B" are identical to ASME BPE.			

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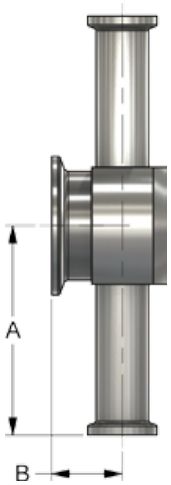
Stocked Items | Instrument Tees

Tri-clamp® Instrument Tee | B7IMPS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Run x Branch)	Length (A)	(B)
B7IMPS-0.5X1.5-AL6XN-7	1/2" x 1-1/2"	3.000"	0.875"
B7IMPS-0.5X2-AL6XN-7	1/2" x 2"	3.250"	1.000"
B7IMPS-0.75X1.5-AL6XN-7	3/4" x 1-1/2"	3.000"	1.000"
B7IMPS-0.75X2-AL6XN-7	3/4" x 2"	3.250"	1.125"
B7IMPS-1X1.5-AL6XN-7	1" x 1-1/2"	3.000"	1.125"
B7IMPS-1X2-AL6XN-7	1" x 2"	3.250"	1.250"
B7IMPS-1.5X2-AL6XN-7	1-1/2" x 2"	3.250"	1.500"
Dimensions "A" and "B" are identical to ASME BPE.			

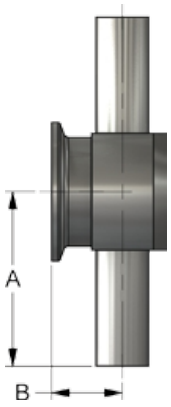
Other combinations available



Weld Instrument Tee | B7IWWMS-Size-AL6XN-Finish

"7" Finish Part Number	Size (Run x Branch)	Length (A)	(B)
B7IWWMS -0.5X1.5-AL6XN-7	1/2" x 1-1/2"	2.500"	0.875"
B7IWWMS -0.5X2-AL6XN-7	1/2" x 2"	2.750"	1.000"
B7IWWMS -0.75X1.5-AL6XN-7	3/4" x 1-1/2"	2.500"	1.000"
B7IWWMS -0.75X2-AL6XN-7	3/4" x 2"	2.750"	1.125"
B7IWWMS -1X1.5-AL6XN-7	1" x 1-1/2"	2.500"	1.125"
B7IWWMS -1X2-AL6XN-7	1" x 2"	2.750"	1.250"
B7IWWMS -1.5X2-AL6XN-7	1-1/2" x 2"	2.750"	1.500"
Dimensions "A" and "B" are identical to ASME BPE.			

Other combinations available



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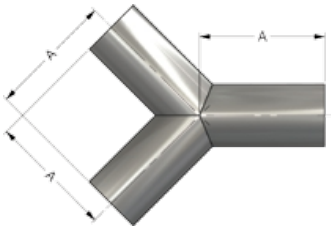
Also Available | True and Lateral Ys

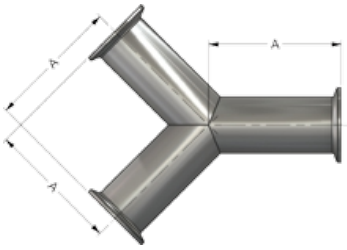
Weld True Y | 28BW-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
28BW-1-AL6XN-7	1"	2.000"
28BW-1.5-AL6XN-7	1-1/2"	3.000"
28BW-2-AL6XN-7	2"	4.000"
28BW-2.5-AL6XN-7	2-1/2"	4.500"
28BW-3-AL6XN-7	3"	5.000"
28BW-4-AL6XN-7	4"	7.000"



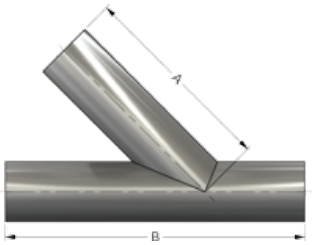
Tri-clamp® True Y | 28BMP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
28BMP-1-AL6XN-7	1"	2.500"
28BMP-1.5-AL6XN-7	1-1/2"	3.500"
28BMP-2-AL6XN-7	2"	4.500"
28BMP-2.5-AL6XN-7	2-1/2"	5.000"
28BMP-3-AL6XN-7	3"	5.500"
28BMP-4-AL6XN-7	4"	7.625"



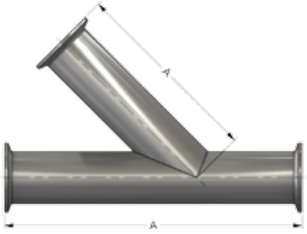
Weld Lateral | 28WA-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
28WA-1-AL6XN-7	1"	5.000"	7.500"
28WA-1.5-AL6XN-7	1-1/2"	5.000"	7.500"
28WA-2-AL6XN-7	2"	6.000"	9.000"
28WA-2.5-AL6XN-7	2-1/2"	6.500"	9.750"
28WA-3-AL6XN-7	3"	7.000"	10.500"
28WA-4-AL6XN-7	4"	9.000"	13.500"



Tri-clamp® Lateral | 28AMP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)	(B)
28AMP-1-AL6XN-7	1"	5.500"	8.500"
28AMP-1.5-AL6XN-7	1-1/2"	5.500"	8.500"
28AMP-2-AL6XN-7	2"	6.500"	10.000"
28AMP-2.5-AL6XN-7	2-1/2"	7.000"	10.750"
28AMP-3-AL6XN-7	3"	7.500"	11.500"
28AMP-4-AL6XN-7	4"	9.625"	14.750"



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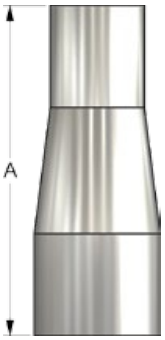
Stocked Items | Reducers

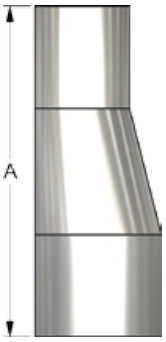
Weld Concentric Reducer | B31-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B31-0.75X0.5-AL6XN-7	3/4" x 1/2"	4.000"
B31-1X0.5-AL6XN-7	1" x 1/2"	4.500"
B31-1X0.75-AL6XN-7	1" x 3/4"	4.000"
B31-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	5.500"
B31-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	5.000"
B31-1.5X1-AL6XN-7	1-1/2" x 1"	5.000"
B31-2X1-AL6XN-7	2" x 1"	7.250"
B31-2X1.5-AL6XN-7	2" x 1-1/2"	5.250"
B31-2.5X1-AL6XN-7	2-1/2" x 1"	9.250"
B31-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	7.250"
B31-2.5X2-AL6XN-7	2-1/2" x 2"	5.500"
B31-3X1-AL6XN-7	3" x 1"	11.250"
B31-3X1.5-AL6XN-7	3" x 1-1/2"	9.250"
B31-3X2-AL6XN-7	3" x 2"	7.500"
B31-3X2.5-AL6XN-7	3" x 2-1/2"	5.500"
B31-4X2-AL6XN-7	4" x 2"	11.750"
B31-4X2.5-AL6XN-7	4" x 2-1/2"	9.750"
B31-4X3-AL6XN-7	4" x 3"	7.750"
Dimension "A" is identical to ASME BPE.		



Weld Eccentric Reducer | B32-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B32-0.75X0.5-AL6XN-7	3/4" x 1/2"	4.000"
B32-1X0.5-AL6XN-7	1" x 1/2"	4.500"
B32-1X0.75-AL6XN-7	1" x 3/4"	4.000"
B32-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	5.500"
B32-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	5.000"
B32-1.5X1-AL6XN-7	1-1/2" x 1"	5.000"
B32-2X1-AL6XN-7	2" x 1"	7.250"
B32-2X1.5-AL6XN-7	2" x 1-1/2"	5.250"
B32-2.5X1-AL6XN-7	2-1/2" x 1"	9.250"
B32-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	7.250"
B32-2.5X2-AL6XN-7	2-1/2" x 2"	5.500"
B32-3X1-AL6XN-7	3" x 1"	11.250"
B32-3X1.5-AL6XN-7	3" x 1-1/2"	9.250"
B32-3X2-AL6XN-7	3" x 2"	7.500"
B32-3X2.5-AL6XN-7	3" x 2-1/2"	5.500"
B32-4X2-AL6XN-7	4" x 2"	11.750"
B32-4X2.5-AL6XN-7	4" x 2-1/2"	9.750"
B32-4X3-AL6XN-7	4" x 3"	7.750"
Dimension "A" is identical to ASME BPE.		



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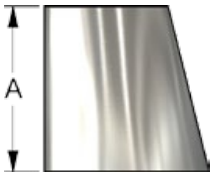
Stocked Items | Reducers

Weld Concentric Reducer | 31W-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
31W-0.75X0.5-AL6XN-7	3/4" x 1/2"	1.00"
31W-1X0.5-AL6XN-7	1" x 1/2"	1.50"
31W-1X0.75-AL6XN-7	1" x 3/4"	1.00"
31W-1.5X1-AL6XN-7	1-1/2" x 1"	2.00"
31W-2X1-AL6XN-7	2" x 1"	4.00"
31W-2X1.5-AL6XN-7	2" x 1-1/2"	2.00"
31W-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	4.00"
31W-2.5X2-AL6XN-7	2-1/2" x 2"	2.00"
31W-3X1-AL6XN-7	3" x 1"	8.00"
31W-3X1.5-AL6XN-7	3" x 1-1/2"	6.00"
31W-3X2-AL6XN-7	3" x 2"	4.00"
31W-3X2.5-AL6XN-7	3" x 2-1/2"	2.00"
31W-4X1.5-AL6XN-7	4" x 1-1/2"	10.00"
31W-4X2-AL6XN-7	4" x 2"	8.00"
31W-4X2.5-AL6XN-7	4" x 2-1/2"	6.00"
31W-4X3-AL6XN-7	4" x 3"	4.00"

Weld Eccentric Reducer | 32W-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
32W-0.75X0.5-AL6XN-7	3/4" x 1/2"	1.00"
32W-1X0.75-AL6XN-7	1" x 3/4"	1.00"
32W-1.5X1-AL6XN-7	1-1/2" x 1"	2.00"
32W-2X1-AL6XN-7	2" x 1"	4.00"
32W-2X1.5-AL6XN-7	2" x 1-1/2"	2.00"
32W-2.5X1-AL6XN-7	2-1/2" x 1"	6.00"
32W-2.5X2-AL6XN-7	2-1/2" x 2"	2.00"
32W-3X1.5-AL6XN-7	3" x 1-1/2"	6.00"
32W-3X2-AL6XN-7	3" x 2"	4.00"
32W-3X2.5-AL6XN-7	3" x 2-1/2"	2.00"
32W-4X1.5-AL6XN-7	4" x 1-1/2"	10.00"
32W-4X2-AL6XN-7	4" x 2"	8.00"
32W-4X2.5-AL6XN-7	4" x 2-1/2"	6.00"
32W-4X3-AL6XN-7	4" x 3"	4.00"



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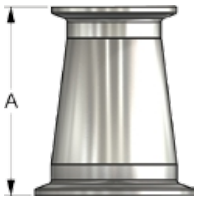
Stocked Items | Reducers

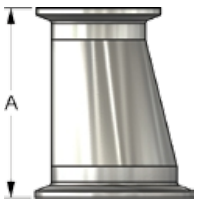
Tri-clamp® Concentric Reducer | B31-14MP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B31-14MP-0.75X0.5-AL6XN-7	3/4" x 1/2"	2.000"
B31-14MP-1X0.5-AL6XN-7	1" x 1/2"	2.500"
B31-14MP-1X0.75-AL6XN-7	1" x 3/4"	2.000"
B31-14MP-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	3.500"
B31-14MP-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	3.000"
B31-14MP-1.5X1-AL6XN-7	1-1/2" x 1"	3.000"
B31-14MP-2X1-AL6XN-7	2" x 1"	5.000"
B31-14MP-2X1.5-AL6XN-7	2" x 1-1/2"	3.000"
B31-14MP-2.5X1-AL6XN-7	2-1/2" x 1"	7.000"
B31-14MP-2.5X2-AL6XN-7	2-1/2" x 2"	3.000"
B31-14MP-3X1.5-AL6XN-7	3" x 1-1/2"	7.000"
B31-14MP-3X2-AL6XN-7	3" x 2"	5.000"
B31-14MP-3X2.5-AL6XN-7	3" x 2-1/2"	3.000"
B31-14MP-4X3-AL6XN-7	4" x 3"	5.125"
Dimension "A" is identical to ASME BPE.		



Tri-clamp® Eccentric Reducer | B32-14MP-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B32-14MP-0.75X0.5-AL6XN-7	3/4" x 1/2"	2.000"
B32-14MP-1X0.5-AL6XN-7	1" x 1/2"	2.500"
B32-14MP-1X0.75-AL6XN-7	1" x 3/4"	2.000"
B32-14MP-1.5X0.5-AL6XN-7	1-1/2" x 1/2"	3.500"
B32-14MP-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	3.000"
B32-14MP-1.5X1-AL6XN-7	1-1/2" x 1"	3.000"
B32-14MP-2X1-AL6XN-7	2" x 1"	5.000"
B32-14MP-2X1.5-AL6XN-7	2" x 1-1/2"	3.000"
B32-14MP-2.5X1-AL6XN-7	2-1/2" x 1"	7.000"
B32-14MP-3X2-AL6XN-7	3" x 2"	5.000"
B32-14MP-3X2.5-AL6XN-7	3" x 2-1/2"	3.000"
B32-14MP-4X2-AL6XN-7	4" x 2"	9.125"
B32-14MP-4X3-AL6XN-7	4" x 3"	5.125"
Dimension "A" is identical to ASME BPE.		



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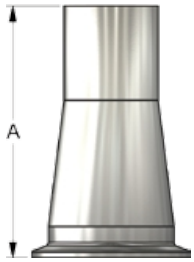
Stocked Items | Reducers

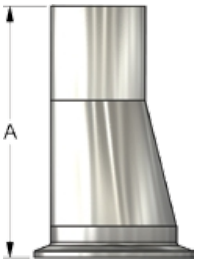
Tri-clamp® x Butt Weld Concentric Reducer | B31M-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B31M-0.75X0.5-AL6XN-7	3/4" x 1/2"	3.000"
B31M-1X0.5-AL6XN-7	1" x 1/2"	3.500"
B31M-1X0.75-AL6XN-7	1" x 3/4"	3.000"
B31M-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	4.000"
B31M-1.5X1-AL6XN-7	1-1/2" x 1"	4.000"
B31M-2X1-AL6XN-7	2" x 1"	6.000"
B31M-2X1.5-AL6XN-7	2" x 1-1/2"	4.000"
B31M-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	6.000"
B31M-2.5X2-AL6XN-7	2-1/2" x 2"	4.250"
B31M-3X2-AL6XN-7	3" x 2"	6.250"
B31M-3X2.5-AL6XN-7	3" x 2-1/2"	4.250"
B31M-4X2.5-AL6XN-7	4" x 2-1/2"	8.375"
B31M-4X3-AL6XN-7	4" x 3"	6.375"
Dimension "A" is identical to ASME BPE.		



Tri-clamp® x Butt Weld Eccentric Reducer | B32M-Size-AL6XN-Finish

"7" Finish Part Number	Size (Tube OD)	Length (A)
B32M-0.75X0.5-AL6XN-7	3/4" x 1/2"	3.000"
B32M-1X0.5-AL6XN-7	1" x 1/2"	3.500"
B32M-1X0.75-AL6XN-7	1" x 3/4"	3.000"
B32M-1.5X0.75-AL6XN-7	1-1/2" x 3/4"	4.000"
B32M-1.5X1-AL6XN-7	1-1/2" x 1"	4.000"
B32M-2X1-AL6XN-7	2" x 1"	6.000"
B32M-2X1.5-AL6XN-7	2" x 1-1/2"	4.000"
B32M-2.5X1.5-AL6XN-7	2-1/2" x 1-1/2"	6.000"
B32M-2.5X2-AL6XN-7	2-1/2" x 2"	4.250"
B32M-3X2-AL6XN-7	3" x 2"	6.250"
B32M-3X2.5-AL6XN-7	3" x 2-1/2"	4.250"
B32M-4X2.5-AL6XN-7	4" x 2-1/2"	8.375"
B32M-4X3-AL6XN-7	4" x 3"	6.375"
Dimension "A" is identical to ASME BPE.		



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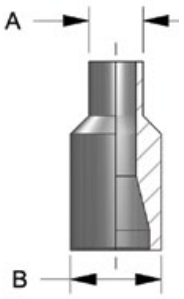
Also Available | Sanitary Pipe Adapters and Caps

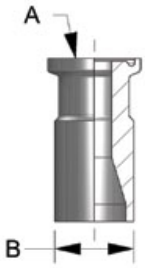
Butt Weld Pipe Adapters | Tube OD Weld Adapters for "Schedule" Pipe Welding

	A	B	Tube End - "A"	Pipe End - "B" (Schedule 10)	
CSI Part Number	Sanitary Tube Size	Nominal Pipe Size	Wall Thickness	Nominal Pipe OD Size	Wall Thickness
SW3105PX05T-AL6XN	1/2"	1/2"	0.065"	0.840"	0.083"
SW3105PX75T-AL6XN	3/4"	1/2"	0.065"	0.840"	0.083"
SW3175PX75T-AL6XN	3/4"	3/4"	0.065"	1.050"	0.083"
SW3110PX10T-AL6XN	1"	1"	0.065"	1.315"	0.109"
SW3115PX15T-AL6XN	1-1/2"	1-1/2"	0.065"	1.900"	0.109"
SW3120PX20T-AL6XN	2"	2"	0.065"	2.375"	0.109"
SW3125PX25T-AL6XN	2-1/2"	2-1/2"	0.065"	2.875"	0.120"
SW3130PX30T-AL6XN	3"	3"	0.065"	3.500"	0.120"
SW3140PX40T-AL6XN	4"	4"	0.083"	4.500"	0.120"



Clamp Pipe Adapters | Tube OD Clamp Adapters for "Schedule" Pipe Welding

	A	B	Pipe End - "B" (Schedule 10)	
CSI Part Number	Sanitary Tube Size	Nominal Pipe Size	Nominal Pipe OD Size	Wall Thickness
14MPW05P-AL6XN	1/2"	1/2"	0.840"	0.083"
14MPW75X05P-AL6XN	3/4"	1/2"	0.840"	0.083"
14MPW75P-AL6XN	3/4"	3/4"	1.050"	0.083"
14MPW10P-AL6XN	1"	1"	1.315"	0.109"
14MPW15P-AL6XN	1-1/2"	1-1/2"	1.900"	0.109"
14MPW20P-AL6XN	2"	2"	2.375"	0.109"
14MPW25P-AL6XN	2-1/2"	2-1/2"	2.875"	0.120"
14MPW30P-AL6XN	3"	3"	3.500"	0.120"
14MPW40P-AL6XN	4"	4"	4.500"	0.120"
14MPW60P-AL6XN	6"	6"	6.625"	0.134"



Tri-clamp® Solid End Cap | 16AMP-Size-AL6XN-Finish

"7" Finish Part Number	Size	Length (A)
16AMP-0.75-AL6XN-7	1/2" or 3/4"	0.19"
16AMP-1.5-AL6XN-7	1" or 1-1/2"	0.25"
16AMP-2-AL6XN-7	2"	0.25"
16AMP-2.5-AL6XN-7	2-1/2"	0.25"
16AMP-3-AL6XN-7	3"	0.25"
16AMP-4-AL6XN-7	4"	0.25"

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Product Catalog
Stocked Items | Clamps

Tri-clamp® Clamp | A13MHM-Size-S

Part Number	Size
A13MHM-1.5-S	1″ or 1-1/2″
A13MHM-2-S	2″
A13MHM-2.5-S	2-1/2″
A13MHM-3-S	3″
A13MHM-4-S	4″

S = 304 Stainless Steel

Tri-clamp® Clamp | 13MHHM-Size-S

Part Number	Size
13MHHM-1.5-S	1″ or 1-1/2″
13MHHM-2-S	2″
13MHHM-2.5-S	2-1/2″
13MHHM-3-S	3″
13MHHM-4-S	4″

S = 304 Stainless Steel

Tri-clamp® Clamp | 13MHHS-Size-S

Part Number	Size
13MHHS-1.5-S	1″ or 1-1/2″
13MHHS-2-S	2″
13MHHS-2.5-S	2-1/2″
13MHHS-3-S	3″
13MHHS-4-S	4″

S = 304 Stainless Steel

Tri® Clamp | 13MHHS-0.75-S

Part Number	Size
13MHHS-0.75-S	1/2″ or 3/4″

S = 304 Stainless Steel

Tri-clamp® Clamp | 13MHP-Size-S

Part Number	Size
13MHP-1.5-S	1″ or 1-1/2″
13MHP-2-S	2″
13MHP-2.5-S	2-1/2″
13MHP-3-S	3″
13MHP-4-S	4″

S = 304 Stainless Steel

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Applications and Additional Options

Common Industry Applications

- Candy and confection products
- Sauces and salsas
- Cosmetics and health care
- Pharmaceutical products
- Pharmaceutical water systems
- Hot water heating systems

Other Available Items

- Valves
- Instruments
- Pumps
- Spray balls and crosses
- CIP systems
- Holding tubes
- Skid systems
- Strainers
- Pipe
- Pipe fittings
- Round bar
- Plate/sheet

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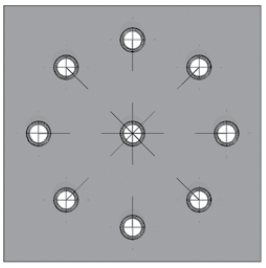
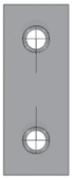
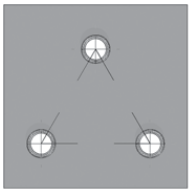
Standard Transfer Panel Configurations*



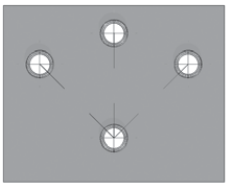
8 Around 1



2 Line



3 Triangle



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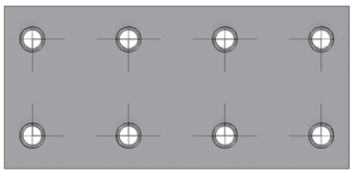
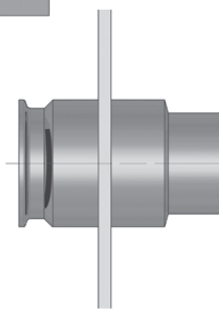
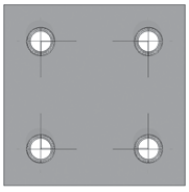


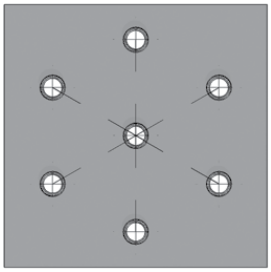
8 Double Square



Our AL-6XN® alloy spool design (US Patented) allows installation of product contact AL-6XN alloy spools into 304 stainless steel panels while maintaining the integrity of the corrosion resistant elements of the alloy as required by ASME-BPE-2002 specifications.



4 Square



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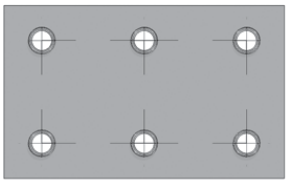
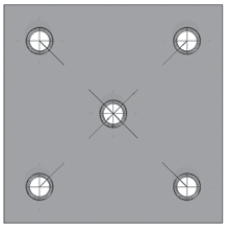


6 Rectangle



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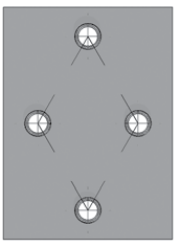

4 Diamond

*Custom transfer panels and non-standard sizes available

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Jacketed Tubing

Design Features of Concentric Jacketed Tube-in-Tube

- Product tube sizes ranging from 1/2" to 4"
- Multiple media jacket connections available
- Both pipe and tube sizes
- All stainless steel construction
- Standard 316L stainless steel outer tubes
- AL-6XN® alloy product tubes
- All welded or removable jacket design
- Variety of mounting options available

Applications of Jacketed Tube and Fittings

- Maintaining temperature in holding loops
- In-line cooking
- Transferring unstable products prone to crystallization or solidification
- Heating or cooling product lines
- Insulating product lines in areas where conventional insulation is impractical

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General Welding Recommendations

AL-6XN alloy is easily welded using similar weld parameters as Type 316L stainless steel, including travel speed (IPM) and weld current. It is typically suggested to use weld inserts for additional alloying when orbital or
manual welding in the field.

1. Use weld insert rings.

Use weld insert rings for additional alloying when orbital or manual welding in the field. Never use filler wire in place of weld rings for sanitary tubing. Welding techniques that apply filler wire to the weld face are not recommended due to the possibility of insufficient alloying in the weld root. The insert ring alloy must have a higher molybdenum content than the AL-6XN alloy to compensate for alloy dilution on cooling. Typically Alloy C-22® (13% Mo) is used. If Alloy C-22 is not available, Alloy 625 (9% Mo) or Alloy C-276 (15% Mo) may be substituted. CSI stocks C-22 weld insert rings.

2. Place the weld ring between the two sections to be welded, and fusion weld as usual.

The weld current must be increased slightly to compensate for the increased thickness of material contributed by the insert ring.

1.

2.

(continued on next page)

Welding AL-6XN®

General Welding Recommendations
(continued)

3. Use inert gas for both the weld cover and backing.

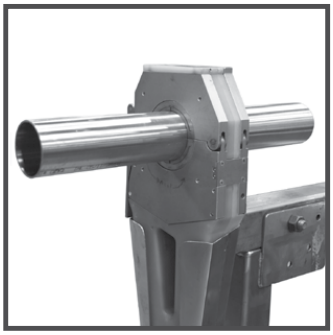
Either helium or argon may be used, although argon is more commonly used. To compensate for nitrogen that may be lost from the alloy during welding, 3-5% nitrogen may be added to both the torch and backing gas.

4. Remove heat tints.

The heat tint on tubing and welds should be no darker than a light, straw color. A color-free silver weld and heat-affected zone are best. Any darker weld heat tints must be removed before placing in service. Dark blue and black heat tints are the most susceptible to corrosion. Remove these tints using abrasives followed by acid cleaning/passivation. A poorly cleaned surface may be just as susceptible to attack as the original heat tint.

Note: Do not preheat the weld unless the material is below 50°F (10°C). When the temperature of the metal is below the dew point, allow it to warm above the condensation temperature to prevent moisture condensate on the surface. Remember: moisture can cause heat tint.

3.



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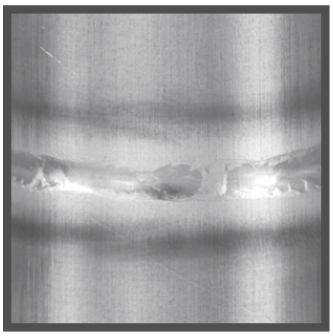

Watch the how-to video:
http://www.al6xn.com/video/Welding_AL6XN_web.mov

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Welding
AL-6XN®

Special Welding Requirements

If post-weld annealing is not possible, then an additional alloy must be added to the weld. We call this an over-alloyed weld. Although AL-6XN alloy is classified as a single-phase alloy, when it is melted—as in welding—it will solidify as a three-phase alloy: austenite, chi phase, and delta ferrite.

Chi phase, a chromium-iron-molybdenum compound, depletes the grain boundary in molybdenum and chromium, which reduces corrosion resistance. Delta ferrite also exhibits poor corrosion resistance. When over-alloyed by using weld insert rings or filler, the alloy balance and, therefore, the corrosion resistance of the weld is equal to or better than the base alloy.

Autogenous Welding (without filler)

When autogenous welding, chemical microsegregation in welds causes regions to be more susceptible to localized corrosion. Autogenous welding may be used with the following precautions:

- Post-weld annealing is required. Anneal above 2150°F (1180°C) followed by rapid cooling and pickling if a protective annealing atmosphere is not used.
- The duration of anneal, at least five minutes at temperature, must be sufficient to re-homogenize the weld segregation and to dissolve any chi phase.
- Use mixed gases with a nitrogen volume of 3-5% for weld shielding.
- The G48-B crevice test may be used to assess the quality of autogenously welded and annealed AL-6XN alloy.

In many applications, a post-weld anneal and pickle may not be possible, like in large vessel fabrication or field welding of piping systems. In these cases, the exposure conditions must be carefully reviewed to determine if autogenous welds are satisfactory. Autogenous AL-6XN alloy welds are more resistant to corrosion than similar welds in Types 316L, 317L, and 904L. Such autogenous AL-6XN alloy welds have a corrosion resistance that is approximately the same as that of Alloy 904L base metal, and superior to that of Types 316L and 317L base metal.

Welding

AL-6XN®

Weld Appearance

Weld appearance can be somewhat misleading when visually compared to hygienic welds made in 316L stainless steel. A typical AL-6XN weld will have non-uniform freeze lines and slag islands in the weld bead. These slag islands are dull or blue-gray in color and adhere to the surface. The appearance of "light" and "dark" spots on both the inside and the outside of the weld is common. The heat-affected zone can also have discoloration and is generally a little darker than conventional 316L stainless steel welds.

Acceptable weld made in **AL-6XN** electropolished tubing

Weld Test and Analysis

Welds were tested in order to identify the composition of slag islands, discoloration, and the impact of such on the integrity of AL-6XN welds. The evaluation process employed the following analytical techniques:

Scanning Electron Microscopy (SEM) determines what the surface "looks like" and determines areas for evaluation with microprobe analysis.

Energy Dispersive Spectroscopy (EDS), sometimes called microprobe analysis, determines the approximate composition of any areas in question.

X-ray Photoelectron Spectroscopy determines the molecular composition of areas or compounds present and provides light element detection.

Accelerated Corrosion Testing in a modified ASTM G48 solution identifies areas of potential corrosion attack.

Summary

1. The weld discoloration does not appear to have an effect on the corrosion resistance of the weld, and removal of the discoloration does not seem to be a requirement for good field performance.
2. Most of the discoloration observed originates from inclusions in the steel that are melted during welding and concentrated as slag on the weld. They originate in the steel-making process or enter as tramp elements from the scrap used to make up the alloy.
3. It appears that little, if anything, can be done during the welding operation to eliminate the discoloration since it comes from the steel itself.
4. The white and silver areas on both surfaces of the weld are areas free of oxides or nitrides. They represent clean surfaces.
5. The dark areas are composed of a mixture of oxides, silicates, and nitrides. They seem to come from the inclusions in the steel and possibly from the partial decomposition of the oxides in the slag. They appear to be stable and do not appear to be attacked by the very aggressive corrosion test.

Acceptable weld made in **AL-6XN** mechanically polished tubing

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References

1. AL-6XN® alloy PHYSICAL, MECHANICAL and CORROSION PROPERTIES, Bulletin No. 210, Rolled Alloys
2. Hastelloy® alloy C-276, Bulletin H-2002B, Haynes International, Kokomo, Indiana
3. INCONEL alloy 625, Bulletin T-42, Huntington Alloys Inc., Huntington, West Virginia
4. Private correspondence, Carpenter Technology Corporation, 1991

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2. Hastelloy and C-22 are registered trademarks of Haynes International.

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