

Nano Pure



UHP

PIPES TUBES FITTINGS

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GAS DELIVERY
TOTAL SOLUTION



INDEX



01	INTRODUCTION
06	TUBE & PIPE CLEAN PROCESS
08	FITTING CLEAN PROCESS
10	PRODUCT SPECIFICATIONS
17	PRODUCTS
18	• Tube & Pipe
21	• Elbow & Cap
26	• Reducer
28	• Equal Tee
30	• Reducing Tee
34	• Cap Reducer
38	• Joint-Fittings
41	• Mul-Tees
44	• Flanges
49	• COXIAL- FITTING
57	ORDERING INFORMATION



"NanoPure" is a brand of Gas Delivery Total Solution, belongs to King Lai Group, who was founded 1991 in Taiwan and expanded production facility in Kunshan, Jiangsu Province, China. Supplying tubing/piping and fitting materials service for Semiconductor, FPD, LED and Photovoltaic industries, the core idea of **"NanoPure"** is providing "High purity materials" with high quality components for gas delivery applications.

Gas supply and delivery is always the topic to study in Semiconductor processing. To ensure the accuracy of the processing, the purity of gas sources is the vital factors. Keeping the purity while the gas has been transferred into processing tools is highly monitored by process engineers.

"NanoPure" is composed of people who are specialist in stainless steels fabrication. By making sure the selection of finest materials, we provide finest products. The key point is how to control the quality of materials



which makes big difference of welding quality while installing or welding assembly. There will be the potential impurity or inclusion in welding process. Therefore, electropolish is the solvable process for increasing reliability of stainless steel to against corrosion gases.

"NanoPure" aims to provide the highest quality products, so the quality control and uniformity are essential points to promise customers. In the meantime, we do put emphasis on the details of



products such as dimension and tolerance which are important for quality control and therefore remain the high yield rate for assembly. Operational packages can be followed according to the customer's instruction, the ranging from normal standard clean package to Ultra High Purity clean room package.

"NanoPure" In addition to UHP products, we also provide various products needed by various Industries, such as Oil & Gas Industries, Process Instrumentation, Power Generation, Pulp & Paper, Chemical, Analytical Instrumentation, Hydrogen Fuel Cells and Natural Gas

"NanoPure" considers every single key processing during the fabrication.

Our goal is keeping continually improvement to reach customers' satisfaction!





Ra Inner Surface Roughness Assurance

Tube	Size	AP Grade	BA、MP Grade	EP Grade
	1/4"- 8"	Ra ≤ 100µin 2.5µm	Ra ≤ 20µin 0.5µm	Ra ≤ 10µin 0.25µm
Pipe	Size	AP Grade	BA、MP Grade	EP Grade
	6A – 350A	Ra ≤ 100µin 2.5µm	Ra ≤ 20µin 0.5µm	Ra ≤ 10µin 0.25µm
	400A – 800A			—

Raw material:

Stainless steel is the best material for Ultra High Purity, anti-corrosion, resistance of high temperature and highly mechanism characters.

316L is a low carbon steel alloy, attractive because of its good weldability and inherent corrosion resistance. The general of 316L may contain impurities in the form of trapped gases and non-metallic inclusions. To prevent this from becoming a problem for our customer, "NanoPure" selects only specific C grades of 316L and purchase materials to our own specifications.

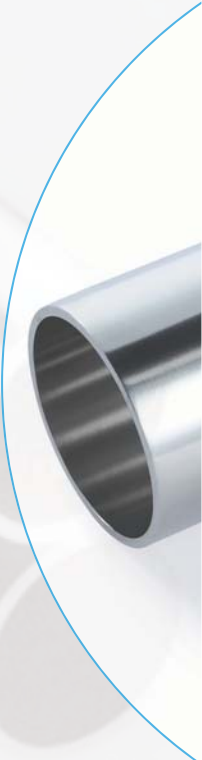
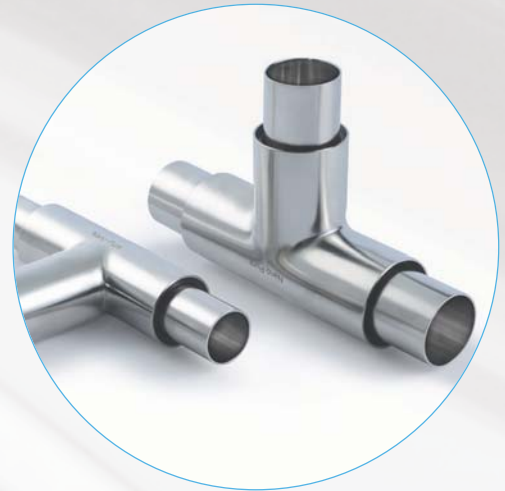
Electropolishing

Electropolishing creates a smooth clean surface that enhances corrosion resistance and reduces particle entrapment in microscopic crevices. With our innovative and proprietary process, greatly increases the ability to deliver quality electropolished components for dependable performance in any system.

Quality

"NanoPure" focus in the Ultra 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. From the start of procurement we specify stringent material standards. When raw materials arrive at our loading dock they are quarantined until wall thickness, ovality, smoothness, surface morphology, and chemical composition have been verified to insure it will meet our rigorous electropolishing procedures.

Before packaging tubing and fittings are cleaned with DI water produced through a reverse osmosis deionized process, surpassing SEMI guidelines for pure water. Components are then purged with heated, high purity nitrogen filtered through filter. Finally, caps are placed over nylon film and the finished product is sealed in single or double poly bags. The final cleaning and packaging is done in our cleanroom.



Fittings and tubing are not only inspected visually.

Additionally, the following quality assurance options are available:

- Scanning Electron Microscope (SEM) photographs
- Auger Electron Spectroscopy (AES) tests
- Electron Spectroscopy Chemical Analysis (ESCA) tests
- Testing for presence of moisture
- Testing for presence of particles down to 0.1 micron
- Certification for oxygen and medical gas service
- Image processing (video probe and/or boroscoping capabilities)

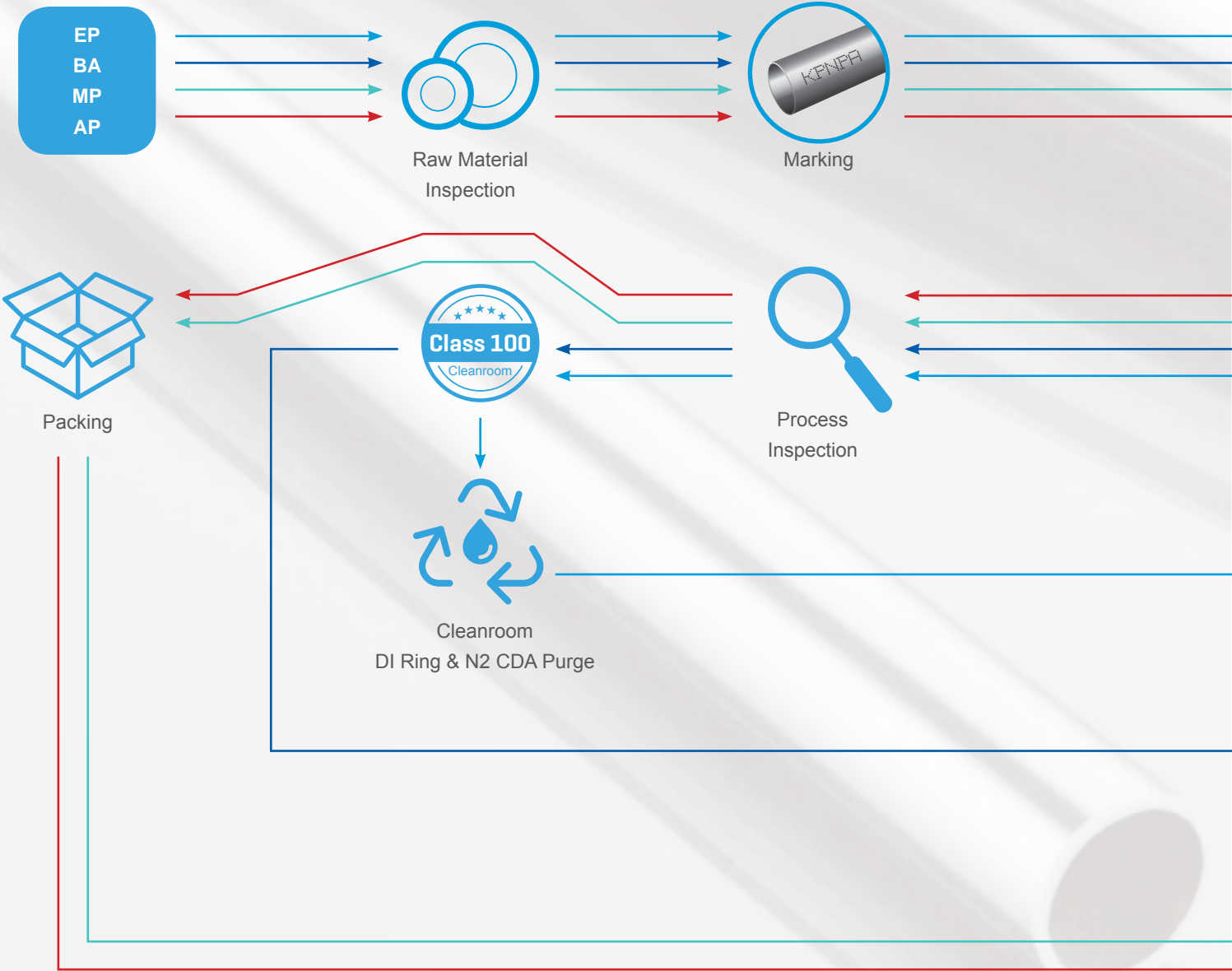
With "**NanoPure**" tubing and fittings, you can be sure that you are installing cleaner components.

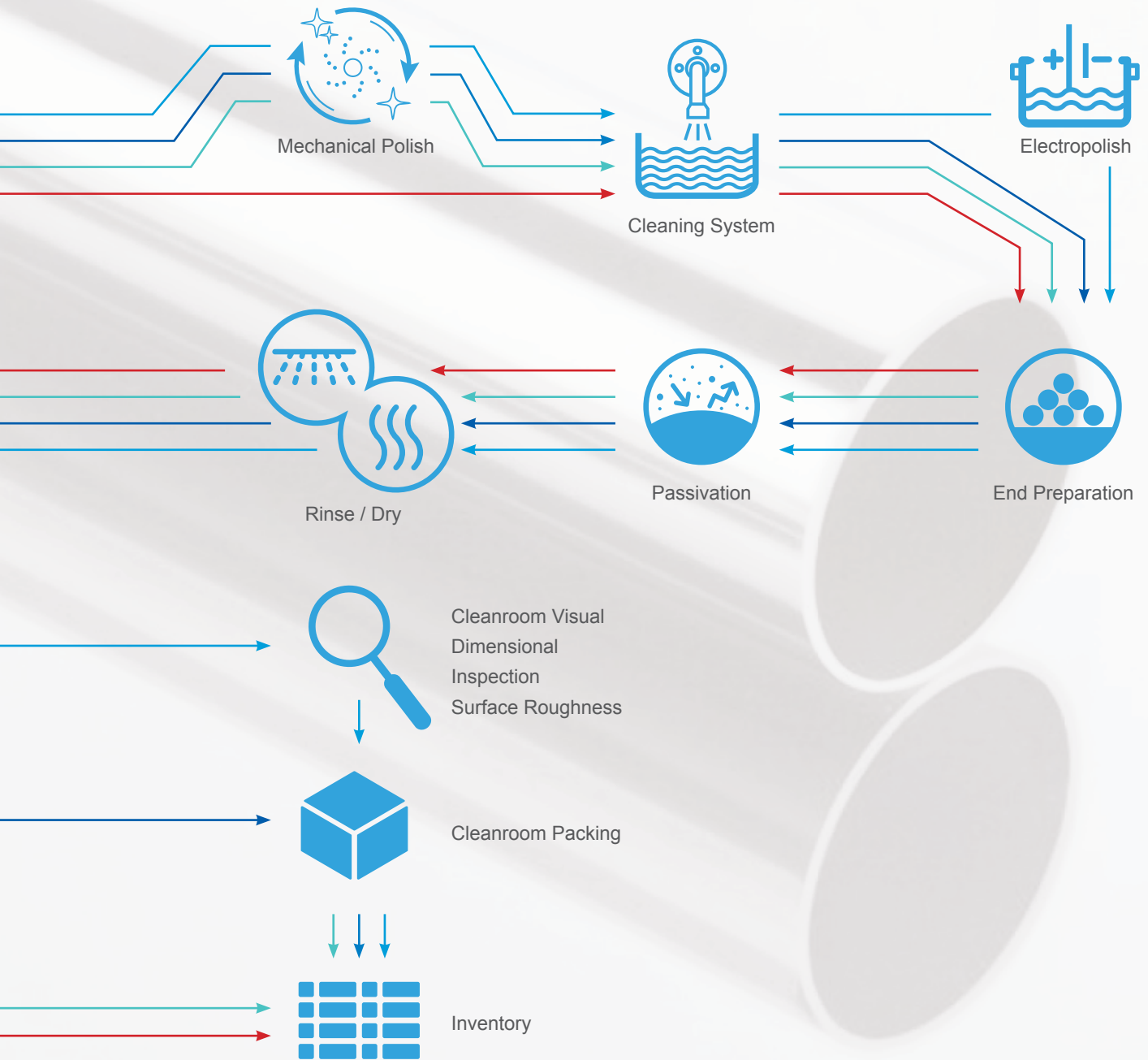
Cleaning and Bagging

"**NanoPure**" offers a range of cleaning services including cleaning for oxygen service and specialized cleaning to customer specifications requiring solvent and heated deionized water processing. In addition to providing cleaning services we also provide packaging services such as capping, bagging, double bagging and sealing in an ISO Class 4 clean room environment.

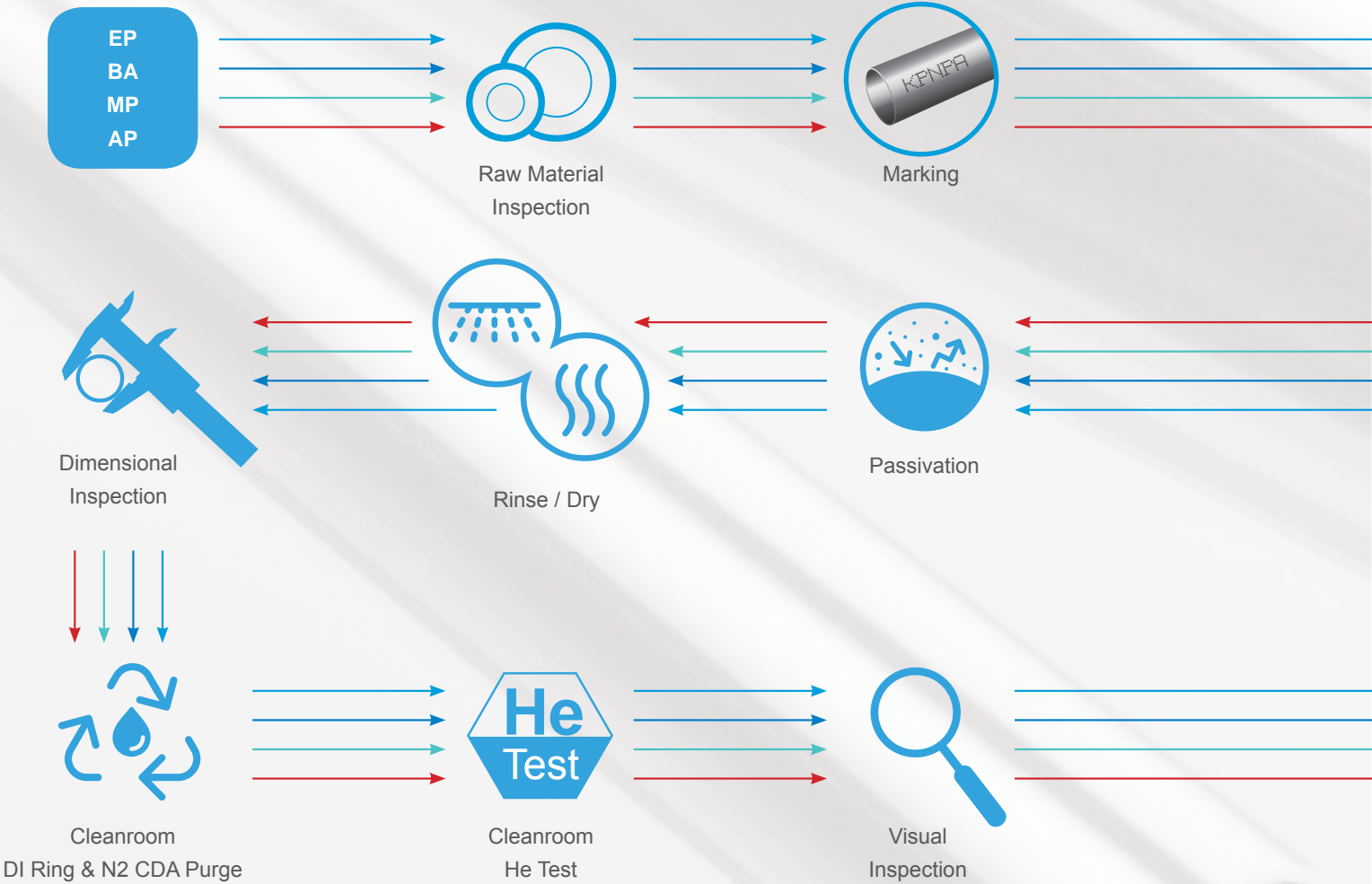


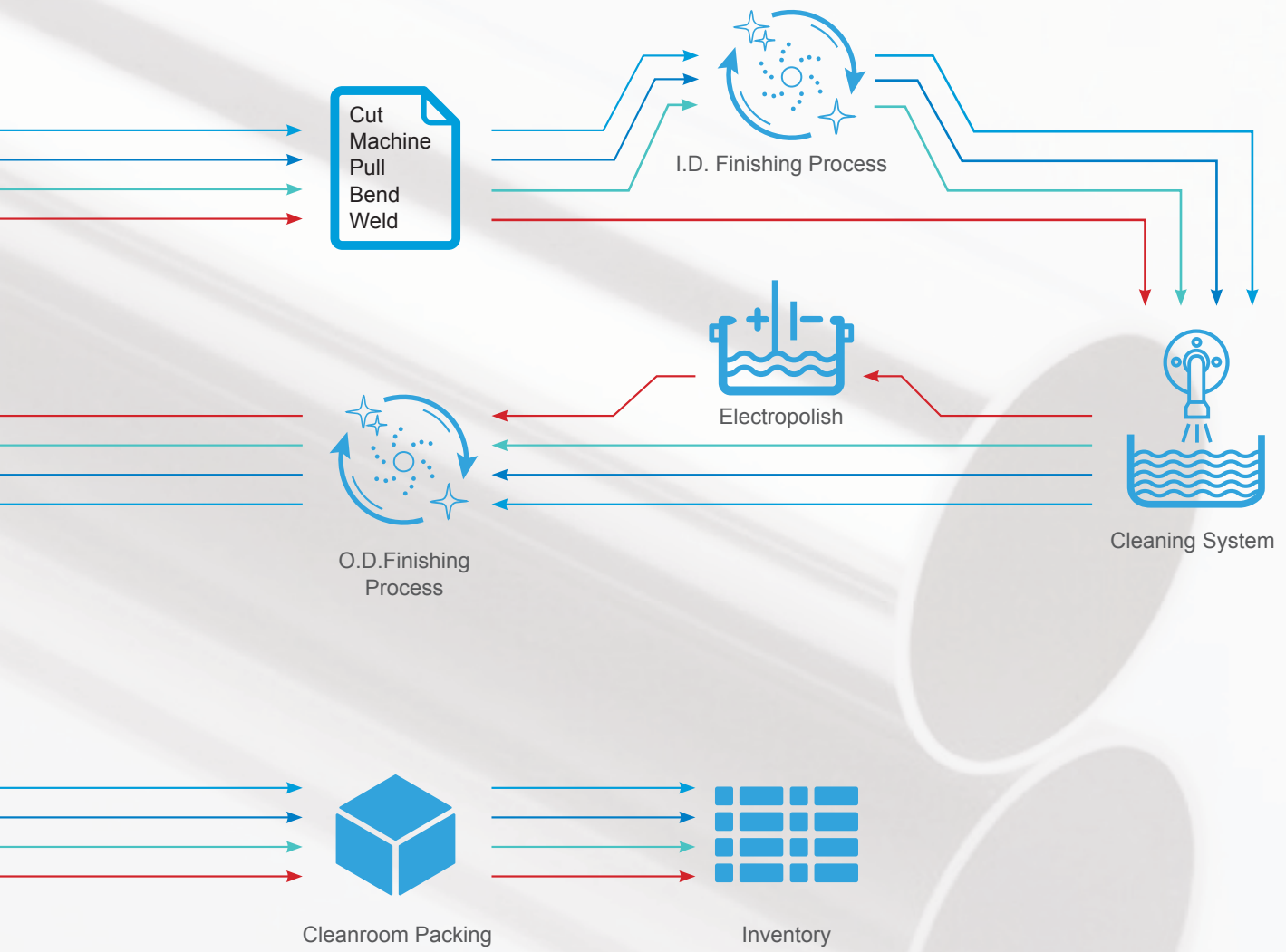
Tube & Pipe Clean Process





Fitting Clean Process





Product Specifications

KNPA (EP)

Product Line

Applications

Ultra High Purity Systems requiring the highest grade of Materials and certifications, Electropolished

Materials

316L Stainless steel, single-melt or double-melt (seamless or welded, depending on size)

Sizes

ASTM Tube: 1/4" to 8" ASTM

Fittings: 1/4" to 8"

JIS Pipe: 8A to 350A

I.D. Surface Finish Options

FA: 5µin Ra

FB: 7µin Ra

FC: 10µin Ra

Tolerances

In accordance with ASTM: A 269, A 632 & JIS: G 3459

Testing & Inspection

- Visual inspection
- Surface roughness measurement
- Helium-leak testing
- Scanning Electron Microscopy (SEM)
- Auger Electron Microscopy (AES)
- Election Spectroscopy for Chemical Analysis (ESCA or XPS)
- Particle testing
- Moisture testing

Cleaned

Cleaned with 60° C DI water, purged with heated and filtered nitrogen, capped, individually double bagged and then bulk bagged in an Class 100 clean room.

Packaging

All components are purged with UHP nitrogen, capped, double-bagged and packaged for shipment in such a manner, which prevents damage to product and primary product packaging.

PS: VIM/VAR only 1/4", 3/8", 1/2", 3/4", 1" the size.



Product Specifications

KNPB (EP)

Product Line

Applications

Ultra High Purity Systems, Electropolished

Materials

316L Stainless steel, single-melt (seamless or welded, depending on size)

Sizes

ASTM Tube: 1/4" to 8" ASTM

Fittings: 1/4" to 8"

JIS Pipe: 8A to 350A

I.D. Surface Finish

FC: 10 μ in Ra

Tolerances

In accordance with ASTM: A 269 & A 632 & JIS: G 3459

Testing & Inspection

- Visual inspection
- Surface roughness measurement
- Dimensional inspection

Documentation

A quality inspection certificate is furnished with each shipment.

The report contains the following information:

- Material composition & applicable specification designation
- Nominal outside diameter size
- Chemical composition
- Statement of quality assurance testing
- Lot & heat identification for traceability

Packaging

All components are purged with UHP nitrogen, capped, double-bagged and packaged for shipment in such a manner, which prevents damage to product and primary product packaging.

Product Specifications

KNPC (BA)

Product Line

Applications

High-Purity Systems

Materials

316L, 304L, or 304 Stainless steel, single-melt
(Seamless or welded, depending on size)

Sizes

ASTM Tube: 1/4" to 8"

ASTM Fittings: 1/4" to 8"

JIS Pipe & Fittings: 15A to 800A

I.D. Surface Finish

ASTM Tube: 25 $\mu\text{in Ra}$

ASTM Tube Fittings: 25 $\mu\text{in Ra}$

JIS Pipe: 25 $\mu\text{in Ra}$

JIS Pipe Fittings: 25 $\mu\text{in Ra}$

Tolerances

In accordance with ASTM: A 269 & A 632 JIS: G 3459
& G 3468

- Visual inspection
- Surface roughness measurement
- Helium-leak testing
- Dimensional inspection

Documentation

A quality inspection certificate is furnished with each shipment. The report contains the following information:

- Material composition
- Specification designation
- Nominal outside diameter size
- Chemical composition
- Statement of quality assurance testing
- Lot & heat identification for traceability

Packaging

All components are capped, bagged and packaged for shipment in such a manner, which prevents damage to product and primary product packaging.



Product Specifications

KNPD (MP)

Product Line

Applications

High-Purity Systems

Materials

316L, 304L, or 304 Stainless steel, single-melt
(Seamless or welded, depending on size)

Sizes

ASTM Tube: 1/4" to 8"
JIS Pipe: 15A to 800A

I.D. Surface Finish Options

ASTM Tube: 1/8" to 8" = 20 μ in Ra
JIS Pipe: 15A to 800A = 20 μ in Ra

Tolerances

In accordance with ASTM: A 269 & A 632, JIS: G 3459
& G 3468

Documentation

A quality inspection certificate is furnished with each shipment. The report contains the following information:

- Material composition & applicable
- Specification designation
- Nominal outside diameter size
- Chemical composition
- Statement of quality assurance testing
- Lot & heat identification for traceability

Packaging

All components are capped, bagged and packaged for shipment in such a manner, which prevents damage to product and primary product packaging.

Product Specifications

KNPE (AP)

Product Line

Applications

High Purity Systems

Materials

316L, 304L, or 304 Stainless steel, single-melt
(Seamless or welded, depending on size)

Sizes

ASTM Tube & Fittings: 1/4" to 8"

JIS Pipe: 25A to 800A

JIS Fittings: 15A to 800A

I.D. Surface Finish Options

ASTM Tube: 1/8" to 4" = 40 $\mu\text{in Ra}$

5" to 8" = 100 $\mu\text{in Ra}$

JIS Pipe: 15A to 100A = 40 $\mu\text{in Ra}$

125A to 800A = 100 $\mu\text{in Ra}$

Tolerances

In accordance with ASTM, ASME & JIS specifications

Testing & Inspection

- Visual inspection
- Surface roughness measurement
- Dimensional inspection

Documentation

A quality inspection certificate is furnished with each shipment. The report contains the following information:

- Material composition & applicable

Specification designation

- Nominal outside diameter size
- Chemical composition
- Statement of quality assurance testing
- Lot & heat identification for traceability

Packaging

Packaged for shipment in such a manner, which prevents damage to product and primary product packaging.



Chemical Composition (%)

ASTM Standard	C	Si	Mn	P	S	Ni	Cr	Mo
304	≤ 0.080	≤ 1.00	≤ 2.00	≤ 0.045	≤ 0.030	8.00 – 11.00	18.00 – 20.00	-
304L	≤ 0.035	≤ 1.00	≤ 2.00	≤ 0.045	≤ 0.030	8.00 – 12.00	18.00 – 20.00	-
316	≤ 0.080	≤ 1.00	≤ 2.00	≤ 0.045	≤ 0.030	10.00 – 14.00	16.00 – 18.00	2.00 – 3.00
316L	≤ 0.035	≤ 1.00	≤ 2.00	≤ 0.045	≤ 0.030	12.00 – 16.00	16.00 – 18.00	2.00 – 3.00
316L VAR	0.015 – 0.030	≤ 1.00	1.00 – 1.50	≤ 0.045	0.005 – 0.012	12.00 – 16.00	16.00 – 18.00	2.00 – 3.00
316L VIM/VAR	0.015 – 0.030	≤ 1.00	0.15 – 0.40	≤ 0.045	0.005 – 0.010	12.00 – 16.00	16.00 – 18.00	2.00 – 3.00

Characteristics

ASTM	Mechanical			Specific Gravity	Thermal Expansion X 10-6 0 - 100°C	Specific Electric Resistance Room Temp. (10-8Ωm)	Specific Heat 0 - 100°C kj / (kg. °C)	Anti – Oxidation Critical Temperature	
	Tensile Strength (N/mm ²)	Yield Strength (N/mm ²)	Elongation (%)					Continuous Use (°C)	Intermittent Use (°C)
304	≥ 520	≥ 205	≥ 30	7.93	17.3	72	0.5	900	810
304L	≥ 480	≥ 175	≥ 30	7.93	17.3	72	0.5	900	810
316	≥ 520	≥ 205	≥ 30	7.98	16.0	74	0.5	900	810
316L	≥ 480	≥ 175	≥ 30	7.98	16.0	74	0.5	900	810

Cleaned Quality Assurance Values

Inspection Item	Assurance Values					
	AP	Grade	BA Grade	MP + EP Grade	EP	Grade
Oil content measurement	≤ 0.1mg/ft ²		≤ 0.01mg/ft ²			
Particle count	≤ No. of particle 0.3μm is 5/cf		≤ No. of particle 0.1μm is 5/cf		≤ No. of particle 0.1μm is 1/cf	
Liquid resistivity measurement	-		≥ 0.5MΩ-cm			
Ion chromatography analysis	-		≤ 10ng/cm ²		≤ 5ng/cm ²	
Dew point measurement	-		≤ -75°C			

Seamless Clean Pipes and Tubes

Type	Melting Process	Grade	Cleaning Level
SUS304	Single Melting	AP、BA、MP、EP	Regular Cleaning or Super I Cleaning
SUS304L			
SUS316L			
SUS316L	Double Melting	EP	Super Cleaning

Production Size

Seamless Pipe				Welded Pipe			
Outer Diameter		Wall Thickness		Outer Diameter		Wall Thickness	
In	mm	mm		In	mm	mm	
1/4	6.35	0.89	1.00				
3/8	9.53	0.89	1.00				
1/2	12.70	1.00	1.24				
5/8	15.88	1.00	1.24				
3/4	19.05	1.24	1.65				
1	25.40	1.24	1.65	1	25.40	1.24	
1 1/2	38.10	1.65		1 1/2	38.10	1.65	
2	50.80	1.65		2	50.80	1.65	
2 1/2	63.50	1.65		2 1/2	63.50	1.65	
3	76.20	1.65		3	76.20	1.65	
4	101.60	2.11		4	101.60	2.11	
5	127.00	2.77		5	127.00	2.77	
6	152.40	2.77		6	152.40	2.77	
8	203.20	2.77		8	203.20	2.77	
A size	mm	Sch5S	Sch10S	A size	mm	Sch5S	Sch10S
6A	10.50	1.00	1.20				
8A	13.80	1.20	1.65				
10A	17.30	1.20	1.65				
15A	21.70	1.65	2.10	15A	21.70	1.65	
20A	27.20	1.65	2.10	20A	27.20	1.65	
25A	34.00	1.65	2.80	25A	34.00	1.65	
32A	42.70	1.65	2.80	32A	42.70	1.65	
40A	48.60	1.65	2.80	40A	48.60	1.65	
50A	60.50	1.65	2.80	50A	60.50	1.65	
65A	76.30	2.10	3.00	65A	76.30	2.10	
80A	89.10	2.10	3.00	80A	89.10	2.10	
90A	101.60	2.10	3.00	90A	101.60	2.10	
100A	114.30	2.10	3.00	100A	114.30	2.10	
125A	139.80	2.80	3.40	125A	139.80	2.80	3.40
150A	165.20	2.80	3.40	150A	165.20	2.80	3.40
200A	216.30	2.80	4.00	200A	216.30	2.80	4.00
250A	267.40	3.40	4.00	250A	267.40	3.40	4.00
300A	318.50	4.00	4.50	300A	318.50	4.00	4.50
350A	355.60	4.00	5.00	350A	355.60	4.00	5.00
400A	406.40	4.50	5.00	400A	406.40	4.50	5.00
450A	457.20	4.50	5.00	450A	457.20	4.50	5.00
				500A	508.00	5.00	5.50
				550A	558.80	5.00	5.50
				600A	609.60	5.50	6.50
				700A	711.20	5.50	8.00
				800A	812.80		8.00

ELBOW & CAP

JOINT-FITTINGS

TUBE & PIPE REDUCER

PRODUCT

EQUAL TEE

FLANGES REDUCING TEE

CAP REDUCER

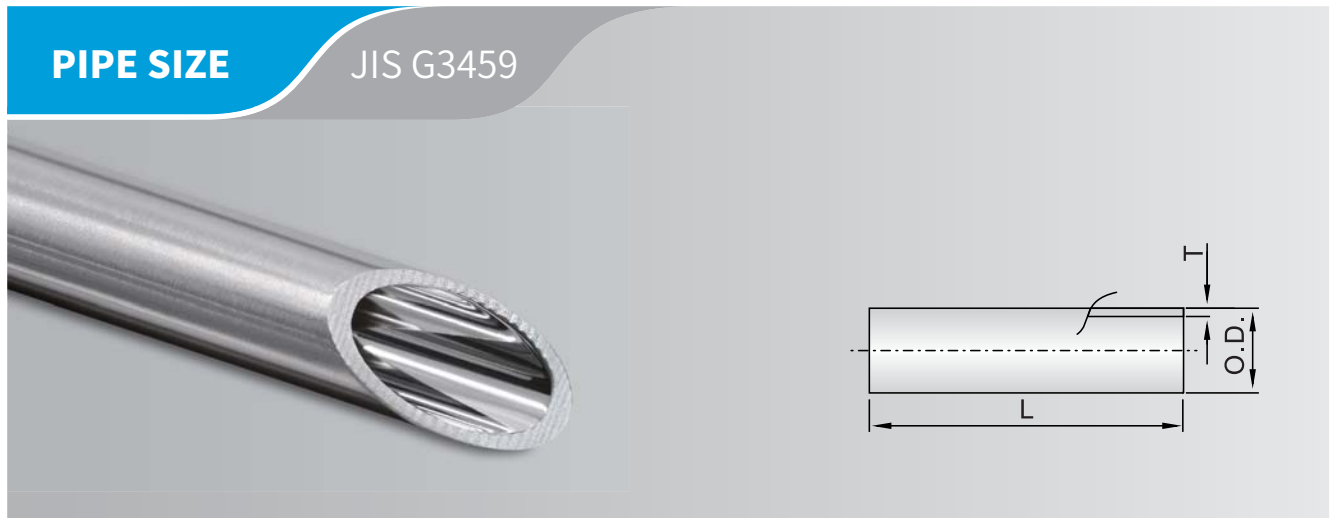
MUL-TEES

HEADERS

DOUBLE-FIT

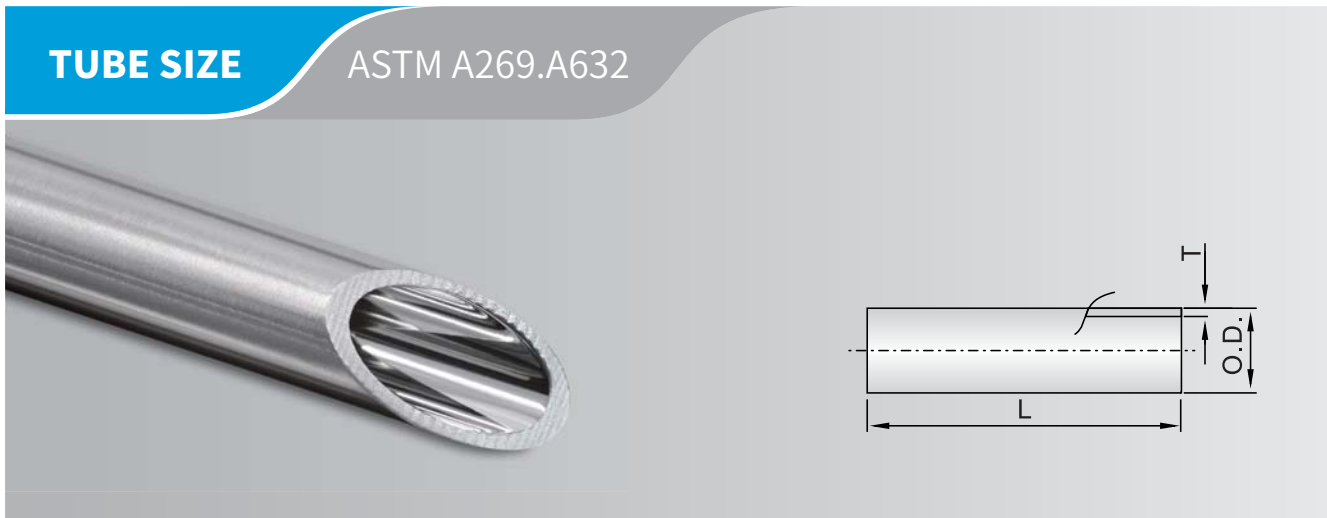
TUBE & PIPE





Unit= mm

Nominal Pipe Size	Outside diameter at end	Wall thickness at end	
OD	OD(OD1, OD2)	T(T1,T2)	
		5S	10S
8A	13.8	1.2	1.65
10A	17.3	1.2	1.65
15A	21.7	1.65	2.1
20A	27.2	1.65	2.1
25A	34.0	1.65	2.8
32A	42.7	1.65	2.8
40A	48.6	1.65	2.8
50A	60.5	1.65	2.8
65A	76.3	2.1	3.0
80A	89.1	2.1	3.0
100A	114.3	2.1	3.0
125A	139.8	2.8	3.4
150A	165.2	2.8	3.4
200A	216.3	2.8	4.0
250A	267.4	3.4	4.0
300A	318.5	4.0	4.5



Unit= mm

Nominal Tube Size	Outside diameter at end	Wall thickness at end
OD	OD(OD1, OD2)	T(T1,T2)
1/8"	3.18	0.7
1/4"	6.35	1.0(0.89)
3/8"	9.53	1.0(0.89)
1/ 2"	12.7	1.0, 1.24(1.65)
5/8"	15.88	1.0(1.24)
3/4"	19.05	1.24, 1.65
1"	25.4	1.65, 1.24
1 1/4"	31.8	1.65
1 1/ 2"	38.1	1.65
2"	50.8	1.65
2 1/ 2"	63.5	1.65
3"	76.2	1.65
4"	101.6	2.11
5"	127.0	2.77, 3.05
6"	152.4	2.77, 3.05

ELBOW & CAP



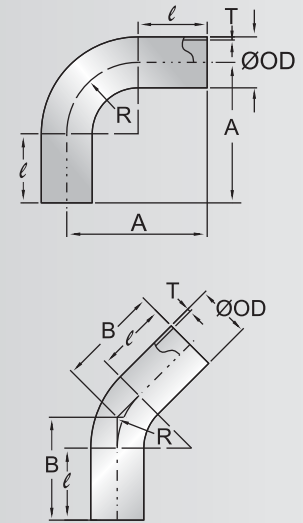


Unit= mm

Nominal Pipe Size	90° Elbow				45° Elbow	
	Long radius		Short radius		Long radius	
	R	A	R	A	R	B
8A	25.4	55	12.7	42	25.4	40
10A	25.4	62	12.7	49	25.4	47
15A	38.1	75	12.7	49	38.1	52
20A	38.1	75	19.1	56	38.1	52
25A	38.1	75	25.4	62	38.1	52
32A	47.6	94	31.8	78	47.6	66
40A	57.2	104	38.1	85	57.2	70
50A	76.2	123	50.8	97	76.2	78
65A	95.3	147	63.5	115	95.3	91
80A	114.3	166	76.2	128	114.3	99
100A	152.4	204	101.6	153	152.4	115
125A	190.5	250	127.0	185	190.5	145
150A	228.6	290	152.4	210	228.6	155
200A	304.8	375	203.2	275	304.8	195

ELBOW

ASTM A269.A632



Unit= mm

Nominal Tube Size	90° Elbow		45° Elbow	
	R	A	R	B
OD(OD1)				
1/4"	20	49	20	38
3/8"	23	52	23	39
1/2"	25	54	25	40
5/8"	28	64	28	48
3/4"	30	66	30	49
1"	33	69	33	50
1 1/4"	47.6	84	47.6	56
1 1/2"	57.2	104	57.2	70
2"	76.2	123	76.2	78
2 1/2"	95.3	147	95.3	91
3"	95.3	147	95.3	91
4"	133.4	185	133.4	107
5"	190.5	250	190.5	140
6"	228.6	290	228.6	155



Unit= mm

JIS G3459

Nominal Pipe Size	CAP
OD(OD1)	E
8A	12.7
10A	19.1
15A	25.4
20A	25.4
25A	38.1
32A	38.1
40A	38.1
50A	38.1
65A	38.1
80A	50.8
100A	63.5
125A	76.2
150A	88.9
200A	101.6

ASTM A269.A632

Nominal Tube Size	CAP
OD(OD1)	E
1/4"	12.7
3/8"	12.7
1/2"	12.7
5/8"	12.7
3/4"	19.1
1"	25.4
1 1/4"	38.1
1 1/2"	38.1
2"	38.1
2 1/2"	38.1
3"	38.1
4"	63.5
5"	-
6"	-

**REDUCER
EQUAL TEE
REDUCING TEE
CAP REDUCER**



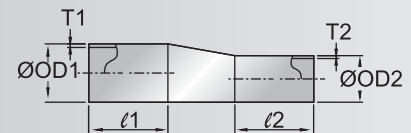
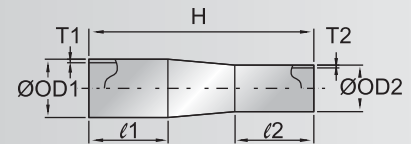


Unit= mm

Nominal Pipe Size	Concentric reducer	Eccentric reducer				
		Nominal pipe size at small end	Wall thickness at end		Straight end length	H
			T(T1,T2)		l (l1, l2)	
			5S	10S		
8A	[1/2", 3/8", 1/4"]	1.2	1.65	29	RC 80 RE 85	
10A	[8A, 1/2", 3/8", 1/4"]	1.2	1.65	36	90	
15A	[10A, 8A, 3/4", 1/2", 3/8", 1/4"]	1.65	2.1	36	100	
20A	15A, [10A, 8A, 1", 3/4", 1/2", 3/8", 1/4"]	1.65	2.1	36	105	
25A	20A, 15A, [10A, 8A, 1 1/4", 1", 3/4", 1/2", 3/8", 1/4"]	1.65	2.8	36	120	
32A	25A, 20A, 15A, [1 1/2", 1 1/4"] (10A~8A, 1"~1/4")	1.65	2.8	46	125	
40A	32A, 25A, 20A, 15A, [1 1/2"] (10A~8A, 1 1/4"~1/4")	1.65	2.8	46	130	
50A	40A, 32A, 25A, 20A, [2"] (15A~8A, 1 1/2"~1/4")	1.65	2.8	46	140	
65A	50A, 40A, 32A, 25A, [3", 2 1/2"] (20A~8A, 2"~1/4")	2.1	3.0	51	165	
80A	65A, 50A, 40A, 32A, [3"] (25A~8A, 2 1/2"~1/4")	2.1	3.0	51	170	
100A	80A, 65A, 50A, 40A, [4"] (32A~8A, 3"~1/4")	2.1	3.0	51	180	
125A	100A, 80A, 65A, 50A, [5"] (40A~8A, 4"~1/4")	2.8	3.4	56	250	
150A	125A, 100A, 80A, 65A, [6"] (50A~8A, 5"~1/4")	2.8	3.4	56	260	
200A	150A, 125A, 100A, (80A~8A, 6"~1/4")	2.8	4.0	56	280	

REDUCER

ASTM A269.A632

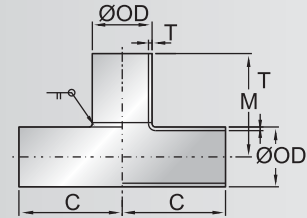


Unit= mm

Nominal Tube Size	Concentric reducer	Eccentric reducer		
		Wall thickness at end	Straight end length	H
OD(OD1)	Nominal pipe size at small end	T(T1, T2)	l (l1, l2)	
1/4"	[1/8"]	1.0(0.89)	29	70
3/8"	[1/4"]	1.0(0.89)	29	RC 70 RE 80
1/2"	3/8", [1/4"]	1.0, 1.24(1.65)	29	RC 75 RE 85
5/8"	[1/2", 3/8", 1/4", 8A]	1.0(1.24)	36	90
3/4"	[5/8"], 1/2", [3/8", 1/4", 10A](8A)	1.24, 1.65	36	100
1"	3/4", [5/8"], 1/2", [3/8", 1/4", 15A](10A~8A)	1.65, 1.24	36	105
1 1/4"	1", [3/4", 20A](5/8"~1/4", 15A~8A)	1.65	36	120
1 1/2"	1 1/4", 1", [3/4", 25A](5/8"~1/4", 20A~8A)	1.65	46	125
2"	1 1/2", [1 1/4"], 1", [40A](3/4"~1/4", 32A~8A)	1.65	46	130
2 1/2"	2", 1 1/2", [1 1/4", 50A](1"~1/4", 40A~8A)	1.65	51	140
3"	2 1/2", 2", [1 1/2", 50A](1 1/4"~1/4", 40A~8A)	1.65	51	165
4"	3", 2 1/2", 2", [80A](1 1/2"~1/4", 65A~8A)	2.11	51	175
5"	[100A](4"~1/4", 80A~8A)	2.77, 3.05	56	230
6"	[125A](5"~1/4", 100A~8A)	2.77, 3.05	56	250

EQUAL TEE

JIS G3459

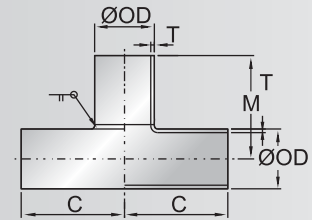


Unit= mm

Nominal sizes of pipe and large end	Equal tee	
	Standard	Short
OD(OD1)	C=M	
8A	42	-
10A	49	-
15A	59	52
20A	65	55
25A	68	59
32A	88	74
40A	95	77
50A	102	83
65A	121	97
80A	130	103
100A	145	116
125A	160	-
150A	170	-
200A	190	-

EQUAL TEE

ASTM A269.A632

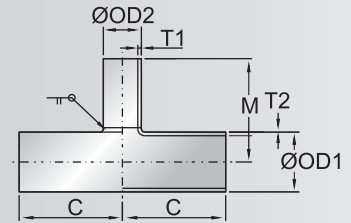


Unit= mm

Nominal sizes of tube and large end	Equal tee
OD(OD1)	C=M
1/4"	35
3/8"	37
1/ 2"	39
5/8"	49
3/4"	52
1"	55
1 1/4"	59
1 1/ 2"	74
2"	77
2 1/ 2"	90
3"	97
4"	110
5"	140
6"	160

REDUCING TEE

JIS G3459

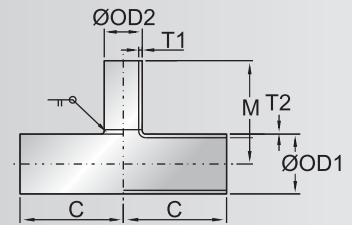


Unit= mm

Nominal sizes of pipe and large end			
OD(OD1)	C	M	OD2
8A	42	42	1/2", 3/8", 1/4"
10A	47	44	8A, 1/2", 3/8", 1/4"
15A	47	44	8A, 1/2", 3/8", 1/4"
	52	52	10A, 3/4", 5/8"
20A	47	47	8A, 1/2", 3/8", 1/4"
	55	55	15A, 10A, 1", 3/4", 5/8"
25A	47	50	8A, 1/2", 3/8", 1/4"
	59	59	20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
32A	57	54	8A, 1/2", 3/8", 1/4"
	68	62	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
40A	57	57	8A, 1/2", 3/8", 1/4"
	68	65	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	77	77	32A, 1 1/2"
50A	57	63	8A, 1/2", 3/8", 1/4"
	68	71	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	83	83	40A, 32A, 2", 1 1/2"
65A	61	71	8A, 1/2", 3/8", 1/4"
	72	79	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	88	90	50A, 40A, 32A, 2", 1 1/2"
	97	97	2 1/2"
80A	61	77	8A, 1/2", 3/8", 1/4"
	72	85	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	88	96	50A, 40A, 32A, 2", 1 1/2"
	103	103	65A, 3", 2 1/2"

REDUCING TEE

JIS G3459

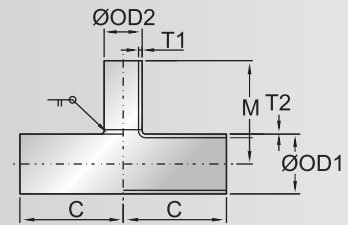


Unit= mm

Nominal sizes of pipe and large end			
OD(OD1)	C	M	OD2
100A	61	90	8A, 1/2", 3/8", 1/4"
	72	98	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	88	109	50A, 40A, 32A, 2", 1 1/2"
	116	116	80A, 65A, 4", 3", 2 1/2"
125A	80	110	8A, 1/2", 3/8", 1/4"
	100	120	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	120	130	50A, 40A, 32A, 2", 1 1/2"
	140	140	100A, 80A, 65A, 4", 3", 2 1/2"
	160	160	5"
150A	90	130	8A, 1/2", 3/8", 1/4"
	110	140	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	130	150	50A, 40A, 32A, 2", 1 1/2"
	150	160	100A, 80A, 65A, 4", 3", 2 1/2"
	170	170	125A, 5"
200A	100	150	8A, 1/2", 3/8", 1/4"
	120	160	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
	140	170	50A, 40A, 32A, 2", 1 1/2"
	160	180	100A, 80A, 65A, 4", 3", 2 1/2"
	180	190	150A, 125A, 6", 5"

REDUCING TEE

ASTM A269.A632

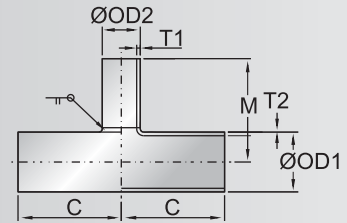


Unit= mm

Nominal sizes of tube and large end			
OD(OD1)	C	M	OD2
1/4"	-	-	-
3/8"	37	37	1/4"
1/2"	39	39	3/8", 1/4"
5/8"	47	44	1/2", 3/8", 1/4", 8A
3/4"	47	44	1/2", 3/8", 1/4", 8A
	52	52	5/8", 10A
1"	47	47	1/2", 3/8", 1/4", 8A
	55	55	3/4", 5/8", 15A, 10A
1 1/4"	47	50	1/2", 3/8", 1/4", 8A
	59	59	1", 3/4", 5/8", 20A, 15A, 10A
1 1/2"	57	54	1/2", 3/8", 1/4", 8A
	68	62	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
2"	57	57	1/2", 3/8", 1/4", 8A
	68	65	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	77	77	1 1/2", 40A, 32A
2 1/2"	61	63	1/2", 3/8", 1/4", 8A
	72	71	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	90	83	2", 1 1/2", 50A, 40A, 32A
3"	61	71	1/2", 3/8", 1/4", 8A
	72	79	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	90	90	2", 1 1/2", 50A, 40A, 32A
	97	97	2 1/2", 65A

REDUCING TEE

ASTM A269.A632



Unit= mm

Nominal sizes of tube and large end			
OD(OD1)	C	M	OD2
4"	61	87	1/ 2",3/8", 1/4", 8A
	72	95	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	90	105	2", 1 1/ 2", 50A, 40A, 32A
	110	110	3", 2 1/ 2", 80A, 65A
5"	70	100	1/ 2", 3/8", 1/4", 8A
	90	110	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	110	120	2", 1 1/ 2", 50A, 40A, 32A
	140	140	4", 3", 2 1/ 2", 100A, 80A, 65A
6"	80	115	1/ 2", 3/8", 1/4", 8A
	100	125	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
	120	135	2", 1 1/ 2", 50A, 40A, 32A
	140	145	4", 3", 2 1/ 2", 100A, 80A, 65A
	160	160	5", 125A



Unit= mm

Nominal sizes of pipe and large end			
OD(OD1)	E	Q	OD2
8A	-	-	1/2", 3/8", 1/4"
10A	-	-	8A, 1/2", 3/8", 1/4"
15A	25.4	60	8A, 1/2", 3/8", 1/4"
		(67)	10A, 3/4", 5/8"
20A	25.4	60	8A, 1/2", 3/8", 1/4"
		67	15A, 10A, 1", 3/4", 5/8"
25A	38.1	73	8A, 1/2", 3/8", 1/4"
		(80)	20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
32A	38.1	73	8A, 1/2", 3/8", 1/4"
		80	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
40A	38.1	73	8A, 1/2", 3/8", 1/4"
		80	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		(90)	32A, 1 1/2"
50A	38.1	73	8A, 1/2", 3/8", 1/4"
		80	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		(90)	40A, 32A, 2", 1 1/2"
65A	38.1	73	8A, 1/2", 3/8", 1/4"
		80	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		(90)	50A, 40A, 32A, 2", 1 1/2"
		(100)	2 1/2"
80A	50.8	85	8A, 1/2", 3/8", 1/4"
		92	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		102	50A, 40A, 32A, 2", 1 1/2"
		(110)	65A, 3", 2 1/2"



Unit= mm

Nominal sizes of pipe and large end			
OD(OD1)	E	Q	OD2
100A	63.5	98	8A, 1/2", 3/8", 1/4"
		105	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		115	50A, 40A, 32A, 2", 1 1/2"
		(125)	80A, 65A, 4", 3", 2 1/2"
125A	76.2	120	8A, 1/2", 3/8", 1/4"
		130	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		140	50A, 40A, 32A, 2", 1 1/2"
		(150)	100A, 80A, 65A, 4", 3", 2 1/2"
		(160)	5"
150A	88.9	130	8A, 1/2", 3/8", 1/4"
		140	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		150	50A, 40A, 32A, 2", 1 1/2"
		160	100A, 80A, 65A, 4", 3", 2 1/2"
		(170)	125A, 5"
200A	101.6	140	8A, 1/2", 3/8", 1/4"
		150	25A, 20A, 15A, 10A, 1 1/4", 1", 3/4", 5/8"
		160	50A, 40A, 32A, 2", 1 1/2"
		170	100A, 80A, 65A, 4", 3", 2 1/2"
		(180)	150A, 125A, 6", 5"

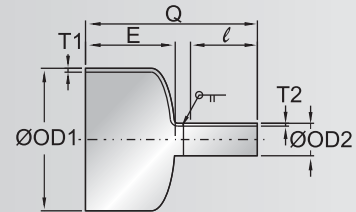


Unit= mm

Nominal sizes of tube and large end				
OD(OD1)	E	Q	OD2	
1/4"	-	-	-	
3/8"	-	-	1/4"	
1/2"	-	-	3/8", 1/4"	
5/8"	-	-	1/2", 3/8", 1/4", 8A	
3/4"	19.1	54	1/2", 3/8", 1/4", 8A	
		60	5/8", 10A	
1"	25.4	60	1/2", 3/8", 1/4", 8A	
		67	3/4", 5/8", 15A, 10A	
1 1/4"	38.1	73	1/2", 3/8", 1/4", 8A	
		80	1", 3/4", 5/8", 20A, 15A, 10A	
1 1/2"	38.1	73	1/2", 3/8", 1/4", 8A	
		80	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A	
2"	38.1	73	1/2", 3/8", 1/4", 8A	
		80	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A	
		(90)	1 1/2", 40A, 32A	
2 1/2"	38.1	73	1/2", 3/8", 1/4", 8A	
		80	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A	
		(90)	2", 1 1/2", 50A, 40A, 32A	
3"	38.1	73	1/2", 3/8", 1/4", 8A	
		80	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A	
		(90)	2", 1 1/2", 50A, 40A, 32A	
		(95)	2 1/2", 65A	

CAP REDUCER

ASTM A269.A632

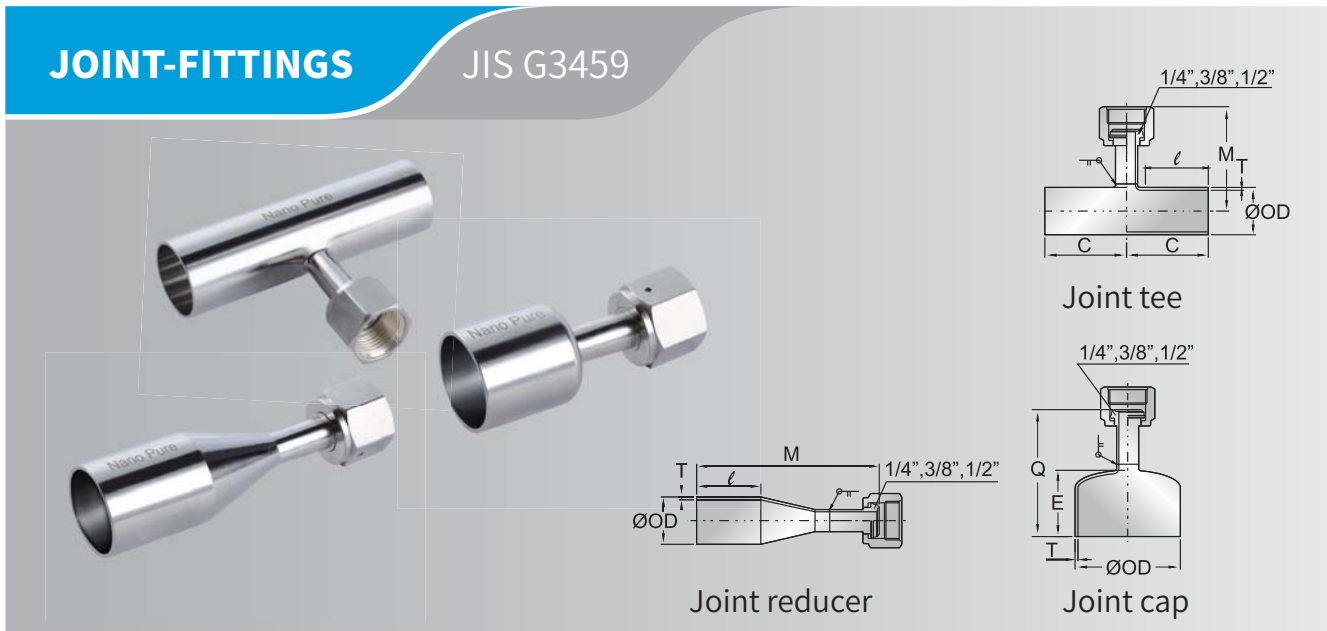


Unit= mm

Nominal sizes of tube and large end			
OD(OD1)	E	Q	OD2
4"	63.5	98	1/ 2",3/8", 1/4", 8A
		105	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
		115	2", 1 1/ 2", 50A, 40A, 32A
		(125)	3", 2 1/ 2", 80A, 65A
5"	-	-	1/ 2",3/8", 1/4", 8A
		-	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
		-	2", 1 1/ 2", 50A, 40A, 32A
		-	4", 3", 2 1/ 2", 100A, 80A, 65A
6"	-	-	1/ 2",3/8", 1/4", 8A
		-	1 1/4", 1", 3/4", 5/8", 25A, 20A, 15A, 10A
		-	2", 1 1/ 2", 50A, 40A, 32A
		-	4", 3", 2 1/ 2", 100A, 80A, 65A
		-	5", 125A

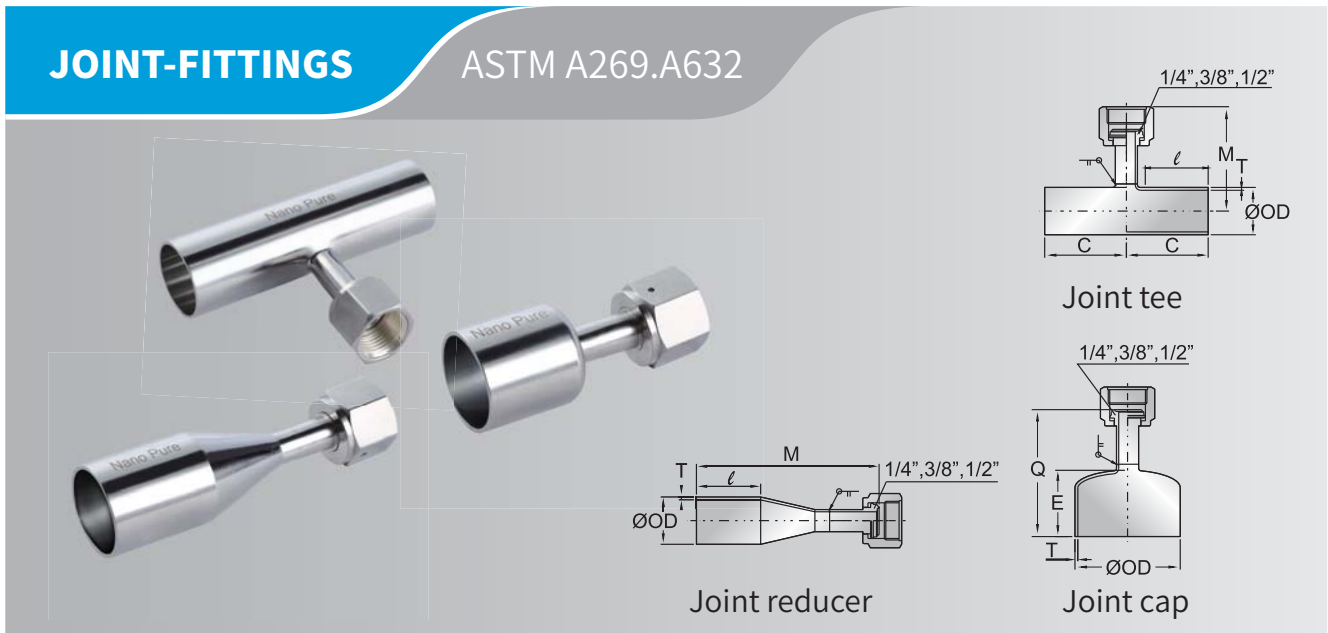
JOINT-FITTINGS





Unit= mm

Nominal pipe size	Joint tee			Joint reducer		Joint cap		
	OD	Female	Male	Female	Male	Cap length	Female	Male
	C	M	M	H	H	E	Q	Q
8A	45	35	45	90	100	-	-	-
10A	52	37	47	100	110	19.1	48	58
15A	52	39.5	49.5	110	120	25.4	55	65
20A	55	42.5	52.5	115	125	25.4	55	65
25A	59	46.5	56.5	130	140	38.1	68	78
32A	68	51	61			38.1	68	78
40A	68	54	64			38.1	68	78
50A	68	60	70			38.1	68	78
65A	72	68	78			38.1	68	78
80A	72	74.5	84.5			50.8	81	91
100A	72	87	97			63.5	94	104
125A	100	100	110			76.2	107	117
150A	110	113	123			88.9	120	130
200A	120	138.5	148.5			101.6	133	143



Unit= mm

Nominal tube size	Joint tee			Joint reducer		Joint cap		
	OD	Female	Male	Female	Male	Cap length	Female	Male
	C	M	M	H	H	E	Q	Q
1/4"	43	31.5	41.5	-	-	-	-	-
3/8"	45	33.5	43.5	80	90	-	-	-
1/2"	45	35	45	85	95	-	-	-
5/8"	52	36.5	46.5	100	110	-	-	-
3/4"	52	38	48	110	120	19.1	48	58
1"	55	42	52	115	125	25.4	55	65
1 1/4"	59	45.5	55.5	-	-	38.1	68	78
1 1/2"	68	48	58	-	-	38.1	68	78
2"	68	55	65	-	-	38.1	68	78
2 1/2"	72	61.5	72.5	-	-	38.1	68	78
3"	72	68	78	-	-	38.1	68	78
4"	72	81	91	-	-	63.5	94	104
5"	90	94	104	-	-	-	-	-
6"	100	107	117	-	-	-	-	-

MUL-TEES





Unit= mm

Nominal pipe size	Mul- Tees								
	Length at end	Pitch	Total length				Branch tube height		
			Number of branches				Tube-end	Female	
OD	EL	P	2	3	4	5			
8A	60	125	245	370	495	620	42	35	
10A							44	37	
15A							44	39.5	
20A							47	42.5	
25A							50	46.5	
32A							54	51	
40A							57	54	
50A							63	60	
65A	70	145	285	430	575	720	71	68	
80A							77	74.5	
100A							90	87	

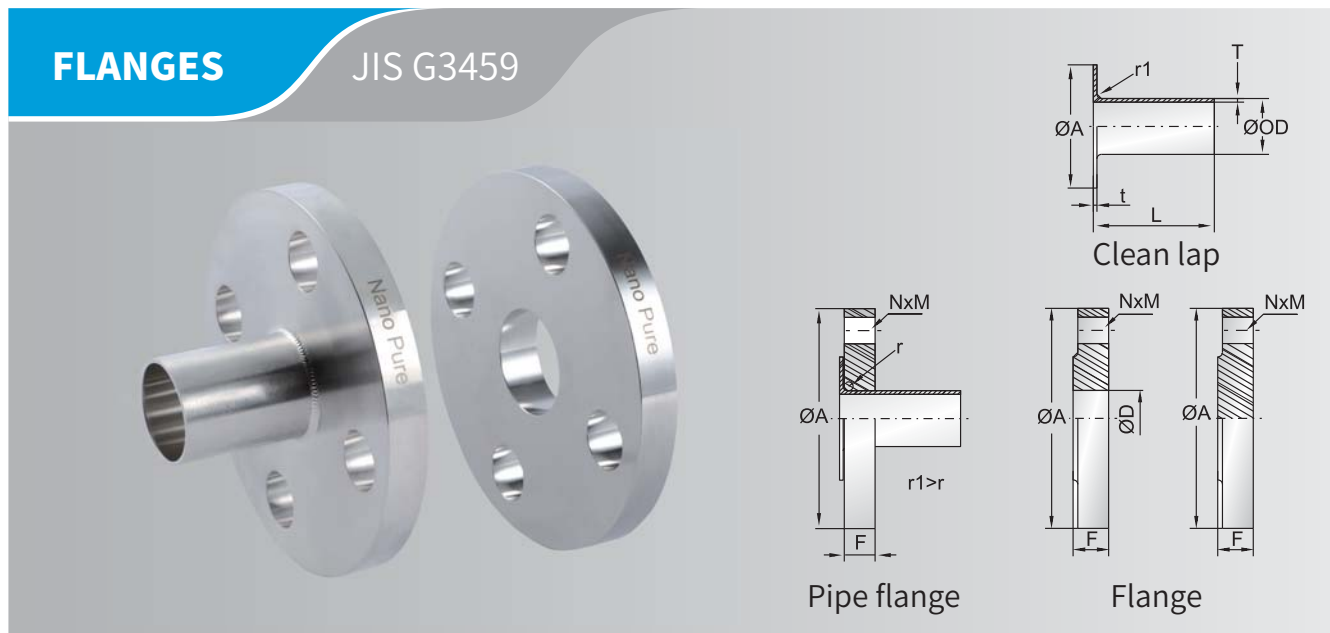


Unit= mm

Nominal tube size	Mul- Tees							
	Length at end	Pitch	Total length				Branch tube height	
			Number of branches				Tube-end	Female
OD	EL	P	2	3	4	5		
1/4"	76.2	152.4	304.8	457.2	609.6	762	35	31.5
3/8"							37	33.5
1/2"							39	35
5/8"							44	36.5
3/4"							44	38
1"							47	42
1 1/4"							50	45.5
1 1/2"							54	48
2"							57	55
2 1/2"							63	61.5
3"							71	68
4"							87	81

FLANGES





Unit= mm

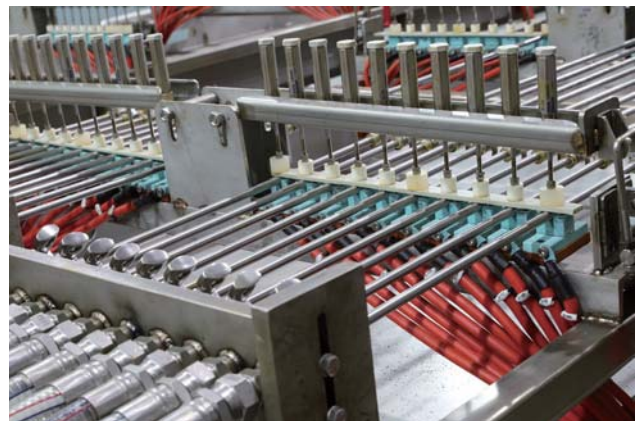
Nominal pipe size	Clean lap				Pipe flange	JIS Flange, Blind								Teflon packing		
	Length	Diameter of lap		Corner	Length	JIS10K				JIS5K				JIS10K		JIS5K
		JIS10K	JIS5K			Outside dia.	Thick-ness	No. of bolts	Dia. of bolt	Outside dia.	Thick-ness	No. of bolts	Dia. of bolt	Outside dia.	Inside dia.	Outside dia.
OD	L	A	A	r1	L	A	F	N	M	A	F	N	M	OD	ID	OD
10A	55	46	39	1.5~3	55	90	12	4	M12	75	9	4	M10	53	18	45
15A	55	51	44	1.5~3	55	95	12	4	M12	80	9	4	M10	58	22	50
20A	55	56	49	1.5~3	55	100	14	4	M12	85	10	4	M10	63	28	55
25A	55	67	59	1.5~3	55	125	14	4	M16	95	10	4	M10	74	35	65
32A	70	76	70	2~4	70	135	16	4	M16	115	12	4	M12	84	43	78
40A	70	81	75	2~4	70	140	16	4	M16	120	12	4	M12	89	49	83
50A	70	96	85	2~4	70	155	16	4	M16	130	14	4	M12	104	61	93
65A	75	116	110	2.5~5	75	175	18	4	M16	155	14	4	M12	124	77	118
80A	75	126	121	2.5~5	75	185	18	8	M16	180	14	4	M16	134	90	129
100A	75	151	141	2.5~5	75	210	18	8	M16	200	16	8	M16	159	115	149
125A	85	182	176	3~6	85	250	20	8	M20	235	16	8	M16	190	141	184
150A	90	212	206	3~6	90	280	22	8	M20	265	18	8	M16	220	167	214
200A	90	262	252	3~6	90	330	22	12	M20	320	20	8	M20	270	218	260



Unit= mm

Nominal tube size	Clean lap			Pipe flange	Flange, Blind				Teflon packing	
	Length	Diameter of lap	Corner	Length	Out side dia .	Thic k- ness	No. of bolt s	Dia . of bolt	Outside dia .	Inside dia .
OD	L	A	r1	L	A	F	N	M	OD	ID
3/4"	55	51	1.5~3	55	95	12	4	M12	58	19.5
1"	55	56	1.5~3	55	100	14	4	M12	63	26
1 1/4"	55	67	1.5~3	55	125	14	4	M16	74	32.5
1 1/2"	70	76	2~4	70	135	16	4	M16	84	38.5
2"	70	81	2~4	70	140	16	4	M16	89	51.5
2 1/2"	70	96	2~4	70	155	16	4	M16	104	64
3"	75	116	2.5~5	75	175	18	4	M16	124	77
4"	75	136	2.5~5	75	195	18	8	M16	144	102.5
5"	85	182	3~6	85	250	20	8	M20	190	128
6"	90	212	3~6	90	280	22	8	M20	220	153.5

GAS DELIVERY TOTAL SOLUTION





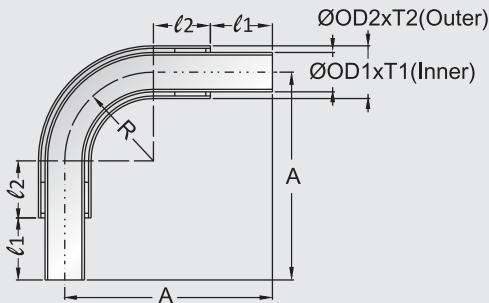
COXIAL- FITTING



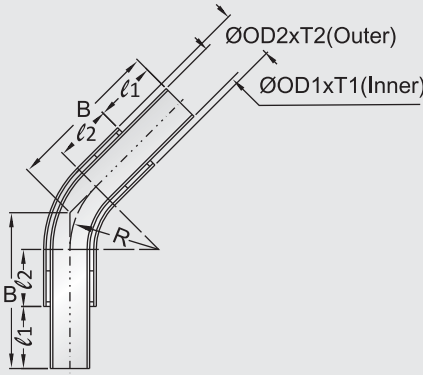


Unit= mm

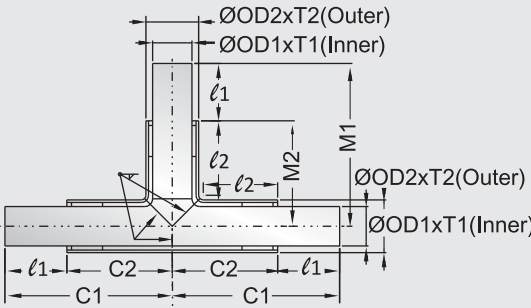
Nominal size		Straight end length		Elbow			Equal Tee		Stop spacer	Half tube	Over tube
Inner tube	Outer tube	1	2	R	A	B	C1 ,M1	C2,M2	H	ODxT	ODxT
1/4"x 1t	1/2" x ^{1t} 1.24t	40	29	25	94	80	82	42	9	12.7 x ^{1.0} 1.24	15 x 1.05
	8A x S5S	40	29	26	95	80	82	42	9	13.8 x 1.2	16.5 x 1.25
3/8"x 1t	5/8" x ^{1t} 1.24t	40	36	28	104	88	89	49	9	15.88 x ^{1.0} 1.24	18.5 x 1.2
	10A x S5S	40	36	30	106	89	89	49	9	17.3 x 1.2	20 x 1.25
1/2"x ^{1t} 1.24t	3/4" x 1.24t	40	36	35	111	91	92	52	9	19.05 x 1.24	22 x 1.35
	15A x S5S	40	36	38	114	92	92	52	9	21.7 x 1.65	25.4 x 1.7
3/4"x ^{1.24t} 1.65t	20A x S5S	40	36	47.6	124	96	95	55	12	27.2 x 1.65	Over tube, Please refer to page 53
1" x ^{1.24t} 1.65t	25A x S5S	40	36	57.2	134	100	99	59	12	34.0 x 1.65	
1 1/2" x 1.65t	2" x 1.65t	46	46	95.3	188	132	123	77	12	50.8 x 1.65	
2" x 1.65t	2 1/2"x 1.65t	46	51	120	217	147	136	90	12	63.5 x 1.65	
10A x S5S	20A x S5S	40	36	47.6	124	96	95	55	12	27.2 x 1.65	
15A x S5S	25A x S5S	40	36	57.2	134	100	99	59	12	34.0 x 1.65	
20A x S5S	32A x S5S	40	46	76.2	163	118	114	74	12	42.7 x 1.65	
25A x S5S	40A x S5S	40	46	95.3	182	126	117	77	12	48.6 x 1.65	
32A x S5S	50A x S5S	46	46	47.6	143	124	129	83	12	60.5 x 1.65	



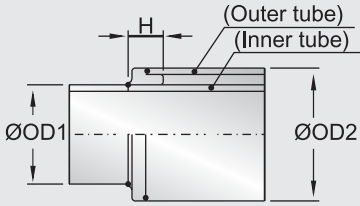
90° Elbow



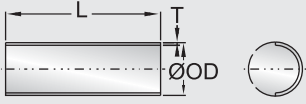
45° Elbow



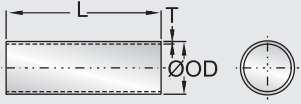
Equal Tee



Stop spacer



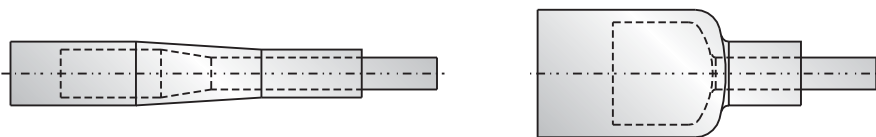
Half tube



Over tube

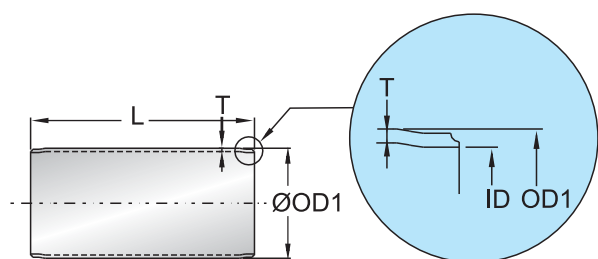
CONCENTRIC/ECCENTRIC REDUCERS

Inner tube		Outer tube	
Large end	Small end	Large end	Small end
1/4"	[1/8"]	1/2"	3/8", (1/4")
		8A	1/2", 3/8", 1/4"
3/8"	[1/4"]	5/8"	1/2", 8A
		10A	1/2", 8A
1/2"	3/8", [1/4"]	3/4"	5/8", 1/2", 10A, (8A)
		15A	5/8", 1/2", 10A, (8A)
3/4"	1/2", [3/8", 1/4", 10A]	20A	15A, 10A, 8A, 3/4", 1/2"
		1"	3/4", (5/8"), 1/2", 15A, (10A~8A)
1"	3/4", 1/2", [3/8", 1/4", 15A](10A)	1 1/4"	1", (3/4", 20A), (5/8"~1/2", 15A~8A)
		25A	20A, 15A, 10A, 8A, 1", 3/4", 1/2"
1 1/2"	1", [3/4", 25A](1/2"~1/4", 20A~10A)	2"	(1 1/4"), 1", (40A), (3/4"~1/2", 32A~8A)
2"	1 1/2", 1", (3/4"~1/4", 32A~10A)	2 1/2"	2", 1 1/4", 50A, (1"~1/2", 40A~8A)
10A	[1/2", 3/8", 1/4"]	20A	15A, [10A, 8A, 3/4", 1/2"]
15A	[10A, 3/4", 1/2", 3/8", 1/4"]	25A	20A, 15A, [10A, 8A, 1", 3/4", 1/2"]
20A	15A, [10A, 1", 3/4", 1/2", 3/8", 1/4"]	32A	25A, 20A, 15A, [1 1/4"](10A~8A, 1" 1/2")
25A	20A, 15A, [10A, 1", 3/4", 1/2", 3/8", 1/4"]	40A	32A, 25A, 20A, 15A, (10A~8A, 1 1/4"~1/2")
32A	25A, 20A, 15A, [1 1/2"](10A, 1"~1/4")	50A	40A, 32A, 25A, 20A, [2"](15A~8A, 1 1/4"~1/2")



OVER TUBE

Nominal tube size	OD1	ID	t	L
1/2"	15.88	13.0	1.0	100
5/8"	19.05	16.2	1.24	100
3/4"	25.4	19.3	1.65	100
1"	31.8	25.7	1.65	100
1 1/4"	38.1	32.1	1.65	100
1 1/2"	42.7	38.4	1.65	100
2"	55.0,60.5	51.1	1.65	112
2 1/2"	70.0,76.2	63.8	2.0,1.65	112
8A	17.3	14.1	1.2	100
10A	21.7	17.6	1.65	100
15A	25.4	22.0	1.65	100
20A	31.8	27.5	1.65,2.15	100
25A	38.1	34.3	1.65,1.9	100
32A	48.6	43.0	1.65	112
40A	54.0,60.5	48.9	1.65	112
50A	65.0,76.3	60.8	2.0,2.1	112

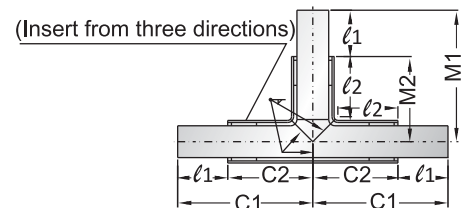


REDUCING TEES

Nominal tube size				Inner tube		Outer tube	
Inner tube		Outer tube		C1	M1	C2	M2
Nominal tube size	Branch tube size	Nominal tube size	Branch tube size				
3/8"	1/4"	5/8", 10A	8A, 1/2"	87	84	47	44
1/2"	1/4"	3/4", 15A	8A, 1/2"	87	84	47	44
	3/8"		10A, 5/8"	92	92	52	52
3/4"	1/4"	1", 20A	8A, 1/2"	87	87	47	47
	3/8", 1/2"		10A, 5/8", 15A, 3/4"	95	95	55	55
1"	1/4"	1 1/4", 25A	8A, 1/2"	87	90	47	50
	3/8", 1/2", 10A, 3/4", 15A		10A, 5/8", 15A, 3/4", 20A, 1", 25A	99	99	59	59
1 1/2"	1/4"	2"	8A, 1/2"	103	97	57	57
	3/8", 1/2", 10A, 3/4", 15A, 1"		10A, 5/8", 15A, 3/4", 20A, 1", 25A, 1 1/4"	114	105	68	65
	20A, 25A		32A, 40A	123	117	77	77
2"	1/4"	2 1/2"	8A, 1/2"	107	103	61	63
	3/8", 1/2", 10A, 3/4", 15A, 1"		10A, 5/8", 15A, 3/4", 20A, 1", 25A, 1 1/4"	118	111	72	71
	20A, 25A		32A, 40A, 2", 50A	136	123	90	83
	1 1/2", 32A		32A, 40A, 2", 50A	136	129	90	83
10A	1/4"	20A	8A, 1/2"	87	87	47	47
	3/8", 1/2"		10A, 5/8", 15A, 3/4"	95	95	55	55
15A	1/4"	25A	8A, 1/2"	87	90	47	50
	3/8", 1/2", 10A, 3/4"		10A, 5/8", 15A, 3/4", 20A, 1"	99	99	59	59
20A	1/4"	32A	8A, 1/2"	97	94	57	54
	3/8", 1/2", 10A, 3/4", 15A, 1"		10A, 5/8", 15A, 3/4", 20A, 1", 25A, 1 1/4"	108	102	68	62
25A	1/4"	40A	8A, 1/2"	97	97	57	57
	3/8", 1/2", 10A, 3/4", 15A, 1"		10A, 5/8", 15A, 3/4", 20A, 1", 25A, 1 1/4"	108	105	68	65
	20A		32A	117	117	77	77
32A	1/4"	50A	8A, 1/2"	103	103	57	63
	3/8", 1/2", 10A, 3/4", 15A, 1"		10A, 5/8", 15A, 3/4", 20A, 1", 25A, 1 1/4"	114	111	68	71
	20A, 25A		32A, 40A	129	123	83	83

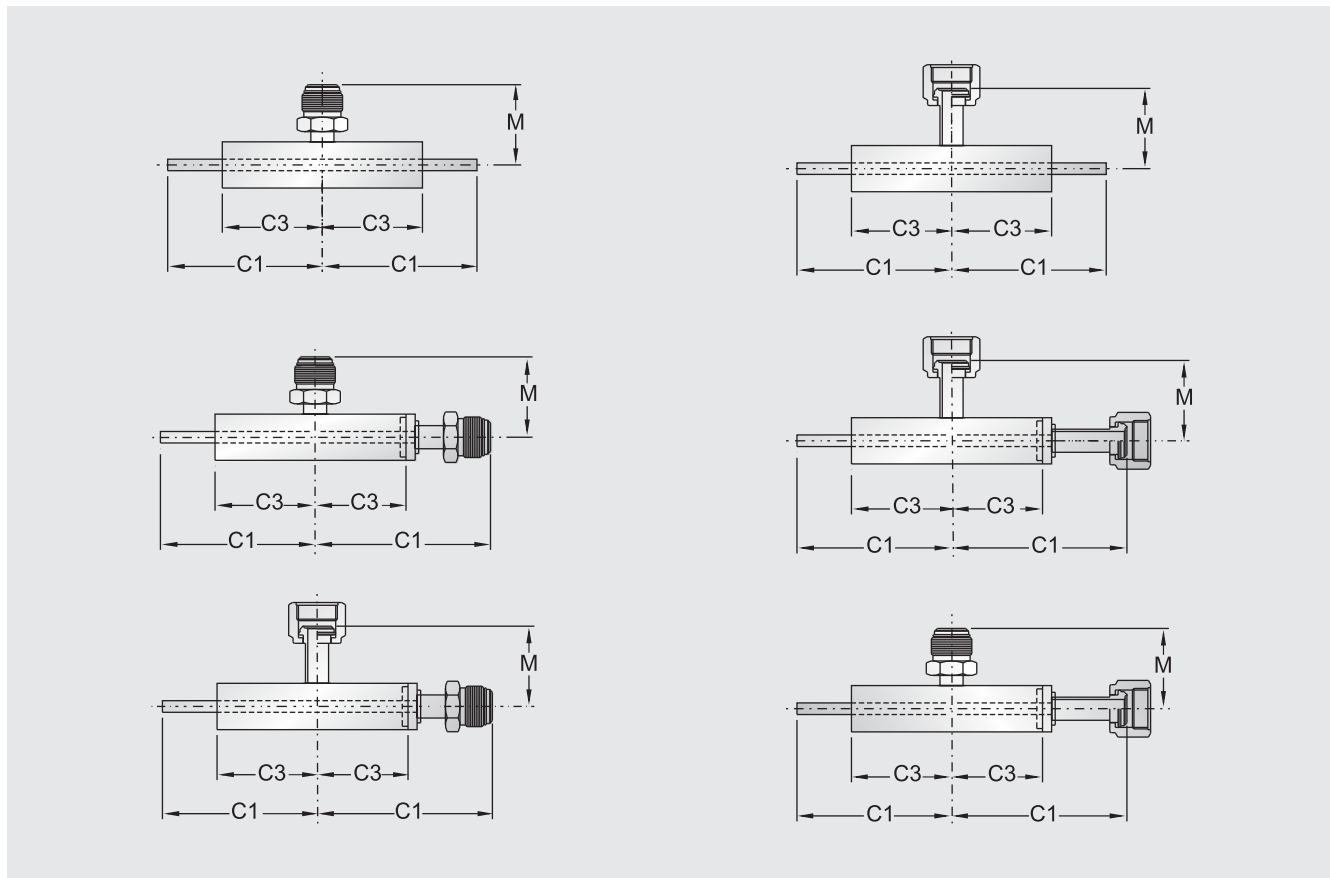
Inner tube-outer tube combination table

Inner tube	Outer tube	Inner tube	Outer tube
1/4"x 1t	1/2"x 1t 1.24t	1"x 1.24t 1.65t	25A x S5S
	8A x 1t		1 1/4"x 1.65t
3/8"x 1t	5/8"x 1t 1.24t	1 1/2"x 1.65t	2"x 1.65t
	10A x S5S	2"x 1.65t	2 1/2"x 1.65t
1/2"x 1t 1.24t	3/4"x 1.24t	10A x S5S	20A x S5S
	15A x S5S	15A x S5S	25A x S5S
	20A x S5S	20A x S5S	32A x S5S
3/4"x 1.24t 1.65t	1"x 1.24t	25A x S5S	40A x S5S
	1"x 1.65t	32A x S5S	50A x S5S



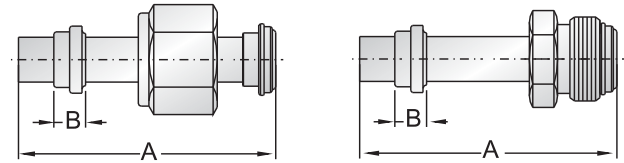
JOINT TEES

Inner tube	Outer tube	Inner tube			Outer tube			Joint size
		C1	C2		C3	M		
			Female	Male		Female	Male	
1/4"	1/2"	85	80	90	45	35	45	1/4"
	8A	85	80	90	45	35	45	
3/8"	5/8"	92	87	97	52	36.5	46.5	1/4", 3/8"
	10A	92	87	97	52	37	47	
1/2"	3/4"	92	87	97	52	38	48	1/4"~1/2"
	15A	92	87	97	52	39.5	49.5	
3/4"	1"	95	90	100	55	42	52	
	20A	95	90	100	55	42.5	52.5	
1"	1 1/4"	99	94	104	59	45.5	55.5	
	25A	99	94	104	59	46.5	56.5	
10A	20A	95	90	100	55	42.5	52.5	
15A	25A	99	94	104	59	46.5	56.5	



STOP SPACER + GRAND

Nominal tube size	A		B
	Female	Male	
1/4"	73	80	9
3/8"	73	80	9
1/2"	73	80	9



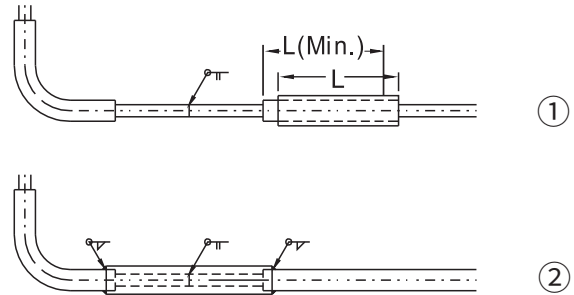
* The stop spacer is not fixed.

HOW TO USE AN OVER TUBE (JOINT PROCESS)

Step 1: Insert an over tube into the outer tube of a double tube and weld the inner tube automatically.

Step 2: Apply automatic fillet welding to both ends of the over tube and the outer tube.

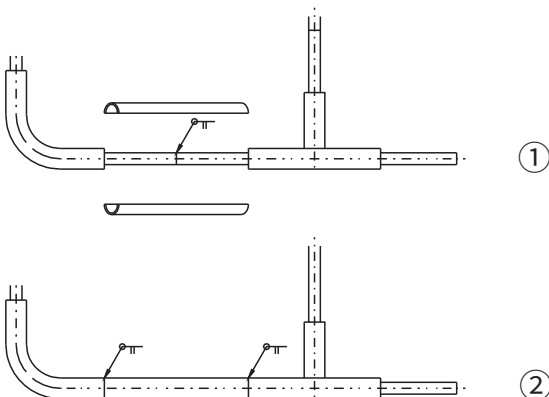
N.B. The right side of the tube must have a straight length L (Min.) as shown above, to allow an over tube to enter. In case the tube has no straight length L, please study if it is replaceable with a half tube shown below.



HOW TO USE A HALF TUBE (JOINT PROCESS)

Step 1: Weld the inner tube automatically.

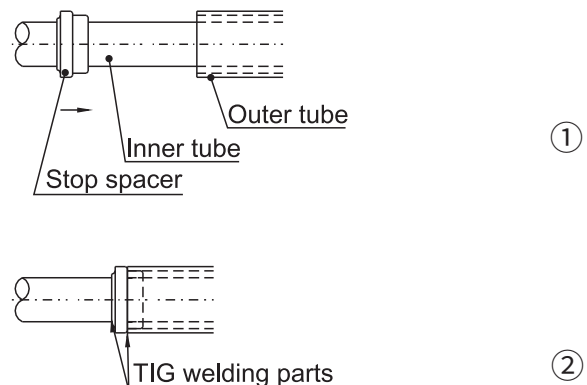
Step 2: Weld manually the joint part of the half-cuts, and weld automatically both sides.



HOW TO USE A STOP SPACER (JOINT PROCESS)

Step 1: Insert a stop spacer into an inner tube.

Step 2: Weld automatically the spacer, inner tube, and outer tube.



Tube

For example

KTNPA - S6L - 16 - L4 - 5 - FA

A	B		C		D		E		F	
Process	Materials		Size		Length		Wall Thickness		Surface Finish	
KTNPA	S4	304 Seamless	02	1/8"	L4	4M	1	0.89	FA	Ra ≤ 5µin (0.13µm)
KTNPB	W4	304 Welded	04	1/4"	L6	6M	2	1.00	FB	Ra ≤ 7µin (0.18µm)
KTNPC	S4L	304L Seamless	06	3/8"			3	1.24	FC	Ra ≤ 10µin (0.25µm)
KTNPD	W4L	304L Welded	08	1/2"			4	1.65	FD	Ra ≤ 20µin (0.50µm)
KTNPE	S6	316 Seamless	12	3/4"			5	2.10	FE	Ra ≤ 40µin (1.00µm)
	W6	316 Welded	16	1"			6	2.77	FF	Ra ≤ 100µin (2.50µm)
	S6L	316L Seamless	20	1 1/4"						
	W6L	316L Welded	24	1 1/2"						
	VVS	316L Seamless VIM/VAR	32	2"						
			40	2 1/2"						
			48	3"						
			64	4"						
			80	5"						
			96	6"						
			128	8"						

Pipe

For example

KPNPA - S6L - 25A - L6 - A - FC

A	B		C	D		E		F	
Process	Materials		Size	Length		Wall Thickness		Surface Finish	
KPNPA	S4	304 Seamless	6A	L4	4M	A	5S	FA	Ra ≤ 5µin (0.13µm)
KPNPB	W4	304 Welded	8A	L6	6M	B	10S	FB	Ra ≤ 7µin (0.18µm)
KPNPC	S4L	304L Seamless	10A					FC	Ra ≤ 10µin (0.25µm)
KPNPD	W4L	304L Welded	15A					FD	Ra ≤ 20µin (0.50µm)
KPNPE	S6	316 Seamless	20A					FE	Ra ≤ 40µin (1.00µm)
	W6	316 Welded	25A					FF	Ra ≤ 100µin (2.50µm)
	S6L	316L Seamless	32A						
	W6L	316L Welded	40A						
			50A						
			65A						
			80A						
			90A						
			100A						
			125A						
			150A						
			200A						
			250A						
			300A						
			350A						
			400A						
			450A						
			500A						
			550A						
			600A						
			700A						
			800A						

Fitting

For example

KFNPA - S6L - R3 - 25A - 20A - A - FC

A		B		C		D		E			F			G	
Process	Materials		Configuration		Main Size		Branch Size			Wall Thickness		Surface Finish			
					Tube	Pipe	Tube	Pipe	VCR	Tube	Pipe				
KFNPA	S4	304 Seamless	09	90° Elbow	02	6A	02	6A	04F	0.71	A	5S	FA	Ra ≤ 5µin (0.13µm)	
KFNPB	W4	304 Welded	09W	90° Elbow WLD	04	8A	04	8A	08F	0.89	B	10S	FB	Ra ≤ 7µin (0.18µm)	
KFNPC	S4L	304L Seamless	045	45° Elbow	06	10A	06	10A	04M	1.00			FC	Ra ≤ 10µin (0.25µm)	
KFPND	W4L	304L Welded	045W	45° Elbow WLD	08	15A	08	15A	08M	1.24			FD	Ra ≤ 20µin (0.50µm)	
KFPNE	S6	316 Seamless	03	Equal Tee	12	20A	12	20A		1.65			FE	Ra ≤ 40µin (1.00µm)	
	W6	316 Welded	03W	Equal Tee WLD	16	08F	16	08F		2.10			FF	Ra ≤ 100µin (2.50µm)	
	S6L	316L Seamless	R3	R- Tee	20	32A	20	32A		2.77					
	W6L	316L Welded	R3W	R-Tee WLD	24	40A	24	40A							
			04	Cross	32	50A	32	50A							
			04W	Cross WLD	40	65A	40	65A							
			CP	Cap	48	80A	48	80A							
			CPW	Cap WLD	64	90A	64	90A							
			RD	Reducer	80	100A	80	100A							
			RDW	Reducer WLD	96	125A	96	125A							
			CPR	Cap Reducer	128	150A	128	150A							
			CPRW	Cap Reducer WLD		200A		200A							
			ECP	End Cap		250A		250A							
			ECPW	End Cap WLD		300A		300A							
			JR	Joint Reducer		350A		350A							
			JT	Joint Tee		400A		400A							
			JC	Joint Cap		450A		450A							
						500A		500A							
						550A		550A							
						600A		600A							
						700A		700A							
						800A		800A							

Flange For example

KFNPB - S6 - PF - 15A - 15K - 0

A	B		C		D	E	F	
Process	Materials		Type		Size	Work Pressure	Packing	
KFNPB	S4	SS 304	CL	Clean Lap	10A	10K	0	With Out
KFNPC	S6	SS 316	PF	Pipe Flange	15A	15K	1	With
			FB	Flange Blind	20A	20K		
					25A			
					32A			
					40A			
					50A			
					65A			
					80A			
					90A			
					100A			
					125A			
					150A			
					200A			

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