



## In all forms and shapes

### Fittings from Alfa Laval - Tri-Clover

#### Application

Alfa Laval is your complete source for specialized fittings and tubing required in food, dairy, beverage, personal care, biotechnology and pharmaceutical process applications. Smooth, crevice-free interiors and secure, self-aligning joints are characteristic of Alfa Laval Fittings. Each offers superior corrosion resistance and unmatched service life. Alfa Laval fittings are designed and manufactured to ensure dimensional accuracy and structural integrity, making them easy to install. Tri-Clover Tri-Clamp® and Tri-Weld® Fittings are part of Alfa Laval's product line. Tubing is manufactured to Alfa Laval's stringent specifications, making it a perfect match for the Weld Fittings. Choose from a complete range of tube sizes, surface finishes and connection options. All BPE items are individually capped and bagged in clear 6 mil. Poly bags. All product is labeled with a bar code, product information and manufacturing date. This provides the optimum identification and ensures that the product arrives to the job site in a clean orbital weld condition.

#### BioPharm Fittings

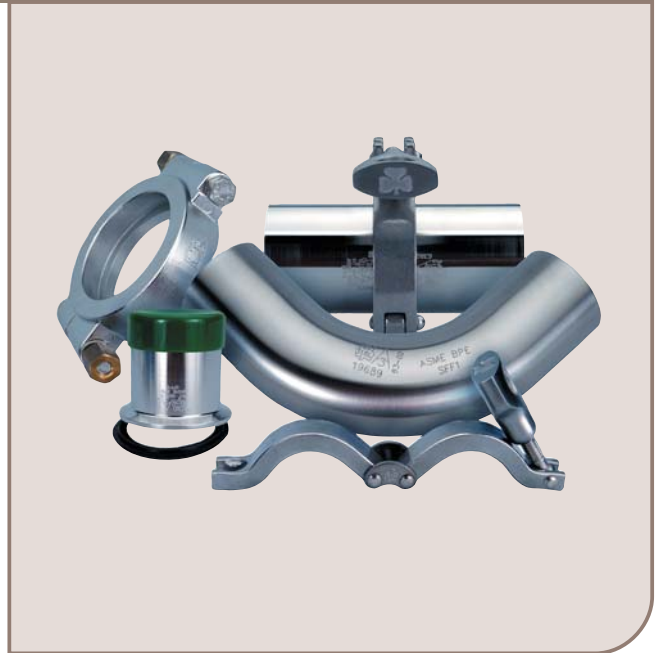
Alfa Laval is proud to present their line of Fittings designed for use in the Pharmaceutical and Bio-Technologies Industries. This line consists of Tri-Clover parts with either Tri-Weld® ends suitable for use with Orbital Welding Equipment or self-aligning Tri-Clamp® end connections. Alfa Laval offers a full line of BioPharm Fittings that are manufactured in compliance with the current ASME BPE Standard.

All BPE items are individually capped and bagged in clear 6 mil. Poly bags. All product is labeled with a bar code, product information and manufacturing date. This provides the optimum identification and ensures that the product arrives to the job site in a clean orbital weld condition.

#### Technical Data

Wide Range of Surface Finish offering - Alfa Laval offers a range of Mechanical Polish as well as Electropolish finishes. Mechanical polishing is achieved by using a progressive series of abrasives, from low to high grit. This allows a consistent internal finish and both optimal and economical cleaning. Electropolishing is a further process that promotes a chromium-enriched surface layer that maximizes corrosion resistance as well as minimizing bacterial buildup on surface cavities.

Metallurgy - Incoming raw material goes through a stringent inspection process to ensure its chemistry will be ideal for both weldability and electropolishing



Quality Control Methods - Our manufacturing facilities operate under an approved ISO 9001 quality standard. Wall thickness integrity is maintained through the use of fabrication grade minimum wall tubing for all cold-formed tubular products. Our BPE fittings are designed for use with all current orbital welding equipment. After cold forming, our tube product is resized to ensure that the ovality falls within the prescribed BPE tolerances. End facing is provided with a machined square-cut method. This allows for the most accurate and consistent orbital weld result. All fittings are put through 100% visual inspection and ovality and squareness tolerances are inspected with calibrated equipment. Surface finish is inspected with a calibrated profilometer to ensure the Roughness average (Ra) maximum is not exceeded.

Sanitary fittings identified with this symbol on the following pages are accepted as meeting the 3A sanitary standards by the appropriate committees of the International Association of Milk, Food and Environmental Sanitarians, U.S. Public Health Service, and Dairy Industry Committee.

Finish code	ID or Product Contact Surface			Polishing Method	OD or Product Non-contact Surface
	Maximum Surface Roughness (Ra)				
	Microinches (μ-inch)	Micrometers (μm)	ASME BPE Finish Code		
#1				Unpolished	Unpolished
#3	32	0.8	----	Mechanical polished	Unpolished
#7	32	0.8	----	Mechanical polished	Polished to Ra, 32 μ-inch/0.8 μm
PC	20	0.5	SFF1	Mechanical polished	Unpolished
PD	15	0.4	SFF4	Mechanical polished and electropolished	Unpolished
PL	20	0.5	SFF1	Mechanical polished	Polished to Ra, 32 μ-inch/0.8 μm
PM	15	0.4	SFF4	Mechanical polished and electropolished	Polished to Ra, 32 μ-inch/0.8 μm

### Service Rating of Tri-Clamp® Connections

Size Tube OD	Service Ratings* (PSI)						
	½ & ¾ inch	1 & 1½ inch	2 inch	2½ inch	3 inch	4 inch	6 inch
<b>13MHLA</b>	<b>(Screw tightened to maximum)</b>						
at 70°F	--	150	150	150	150	100	--
at 250°F	--	125	125	125	125	75	--
<b>13MHMM</b>	<b>(Wing nut tightened to 25 in. lb. of torque)</b>						
at 70°F	--	500	450	400	350	300	150
at 250°F	--	300	300	200	195	150	75
<b>13MHHS</b>	<b>(Wing nut tightened to 25 in. lb. of torque)</b>						
at 70°F	2200	600	550	450	350	300	--
at 250°F	1200	300	275	225	175	150	--
<b>13MHP</b>	<b>(Bolts tightened to 20 ft. lb. of torque)</b>						
at 70°F	--	1500	1000	1000	1000	800	300
at 250°F	--	1200	800	800	800	600	200
<b>A13MO</b>	<b>(1-3" nuts tightened to 20 in. lb., 4" to 30 in. lb.)</b>						
at 70°F	--	500	350	300	200	100	75
at 250°F	--	250	200	150	100	100	50
<b>A13MHM</b>	<b>(Wing nut tightened to 25 in. lb. of torque)</b>						
at 70°F	--	500	450	400	350	300	150
at 250°F	--	300	250	200	175	150	75

\* Service ratings are based on hydrostatic tests using standard-molded Buna-N material gaskets, with proper installation of ferrules, assembly of joints and absence of shock pressure. Contact Tri-Clover for service of other type and material gaskets, and for ratings at higher temperatures. All ratings shown are dependent upon related components within the systems and proper installation. For temperatures above 250° F, we recommend using only 13MHP clamps. This information is only valid if Tri-Clover clamps, ferrules, and gaskets are used.

### Tri-Clamp® Gasket Materials

Characteristic	Buna-N (U)	EPDM (E)	Fluoro-elastomer (SFY)	Silicone (X)	PTFE (G)
<b>Original Physical Properties</b>					
Hardness, Shore A	70	70	70	70	---
Tensile Strength, psi	1875	1650	1212	1340	---
Elongation, %	340	317	272	260	---
<b>Temperature Range</b>					
	-65 to 200° F	-60 to 300° F	-20 to 350° F	-40 to 400° F	-40 to 200° F *
<b>Resistance</b>					
Acid Resistance	Good	Good to Excel.	Good to Excel.	Poor to Good	Good to Excel.
Alkali Resistance	Fair to Good	Good to Excel.	Poor to Good	Poor to Fair	Excellent
Resistance to Fats/Oils	Good to Excel.	Poor	Good to Excel.	Poor to Good	Excellent
Abrasion Resistance	Excellent	Good	Good to Excel.	Poor	Fair
Compression Set Resistance	Good	Fair	Good to Excel.	Good to Excel.	Cold Flows

\* Note: PTFE materials tendency to "cold flow" and incompressibility, limit its max. temperature to 200° F due to possible leaking problems.

## Basic Dimensions of Tri-Clamp ®

Connection for Sanitary OD-Tubing			
OD Outer Diameter (Inches)	ID Inner Diameter (Inches)	Wall Thickness (Inches/Gauge)	A Ferrule Face (Inches)
½	0.37	0.065 / 16 ga.	0.984
¾	0.62	0.065 / 16 ga.	0.984
1	0.87	0.065 / 16 ga.	1.984
1½	1.37	0.065 / 16 ga.	1.984
2	1.87	0.065 / 16 ga.	2.516
2½	2.37	0.065 / 16 ga.	3.047
3	2.87	0.065 / 16 ga.	3.579
4	3.87	0.083 / 14 ga.	4.682

## Sanitary Tube Information

Tube OD	Tube ID	Wall Thickness	Volume	Weight Dry	Weight with Water	Flow (GPM) at a Mean Velocity		
						5 fps	7 fps	10 fps
Inches	Inches	Inches	Gal/100 ft	Lbs/100 ft	Lbs/100 ft			
½	0.37	0.065	0.56	30.6	35.3	1.7	2.3	3.4
¾	0.62	0.065	1.57	48.2	61.3	4.7	6.6	9.4
1	0.87	0.065	3.09	65.8	91.5	9.3	13	19
1½	1.37	0.065	7.66	100.9	164.8	23	32	46
2	1.87	0.065	14.27	136.1	255.1	43	60	86
2½	2.37	0.065	22.92	171.2	362.4	69	96	138
3	2.87	0.065	33.6	206.4	486.7	101	141	202
4	3.834	0.083	59.97	351.8	851.9	180	252	360
6	5.782	0.109	136.39	694.7	1832.2	409	573	818
8	7.782	0.109	247.07	930.6	2991.1	741	1038	1482

## Technical Information

### Pipe Schedule and Chemical Composition

Schedule 5 Pipe			
Size	OD Inches	ID Inches	Wall Thickness
⅛	0.405	0.335	0.035
¼	0.540	0.442	0.049
⅜	0.675	0.577	0.049
½	0.840	0.710	0.065
¾	1.500	0.920	0.065
1	1.315	1.185	0.065
1¼	1.660	1.530	0.065
1½	1.900	1.770	0.065
2	2.375	2.245	0.065
2½	2.875	2.790	0.083
3	3.500	3.334	0.083
3½	4.000	3.834	0.083
4	4.500	4.334	0.083
5	5.563	5.345	0.109
6	6.625	6.407	0.109
8	8.625	8.407	0.109

Chemical Composition %		
	304	316L
C	0.080	0.030
MN	2.000	2.000
P	0.045	0.045
S	0.030	0.030*
Si	1.000	1.000
Cr	18.0-20.0	16.0-18.0
Ni	8.0-13.0	10.0-14.0
Mo	-	2.0-3.0

\* The sulfur content for 316L ASME BPE fittings is 0.005-0.017% for all weld ends.

## Material Test Reports (MTRs)

### Easy Online Access to Comprehensive Fittings Information



A 5-alpha character serial ID is stenciled on to each new 316SS fitting

As one of the most comprehensive and technologically advanced reports in the market, our new Material Test Reports (MTRs) provide detailed information that takes traceability and validation to a new level. Alfa Laval has established a new standard as all MTRs are available 24 hours a day, 7 days a week online at [www.alfalaval.us](http://www.alfalaval.us).

Simply type a 5-alpha character code (e.g. AAABC) called the serial ID, which you can find stenciled on each new 316SS fitting, to access the following information:

- All heat certification numbers used to manufacture the fitting
- Date the fitting was manufactured
- The fitting's part number and description
- View and print any MTR and the above information

This web site will even allow you to print the MTR or original heat certification from the raw material supplier. If you do not know the actual number, MTRs can be searched by either MTR serial ID or heat certification number.

Go to [www.alfalaval.us](http://www.alfalaval.us) and follow these simple steps to access MTRs:

#### Step 1. Once at our website, click on the MTR link

The screenshot shows the Alfa Laval website homepage. Key elements include:
 

- Alfa Laval in the USA:** A section with a map of the USA and text describing their market presence.
- News:** A section with a 'Seafarers Awards' article and a 'New Material Test Reports' article.
- Navigation Links:** A sidebar with links for 'Bookmark this page', 'Links', 'Contacts', 'About Alfa Laval', 'Parts and Service', 'Case stories', 'Press Releases', and 'Tools'.
- Material Test Reports Link:** A red circle highlights the 'Material Test Reports' link in the 'Tools' section.

#### Step 2. On the MTR page, click "View Material Test Reports"

The screenshot shows the 'New Material Test Reports' page. Key elements include:
 

- Headline:** 'New Material Test Reports saves you time and takes traceability to a new level!'.
- Text:** 'You now have the ability to access our improved Material Test Report for any bio-pharmaceutical fitting on-line, 24 hours a day!'.
- What's new and improved:** A section explaining that each fitting is stamped with a 5-letter serial ID.
- Material Test Reports on-line:** A section stating that the website provides 24-hour access to fitting information.
- Navigation Links:** A sidebar with links for 'Bookmark this page', 'Links', 'Contacts', 'About Alfa Laval', 'Parts and Service', 'Case stories', 'Press Releases', and 'Tools'.
- View Material Test Reports on-line:** A red circle highlights this link in the 'Tools' section.


#### Step 3. Enter or search for the Serial ID

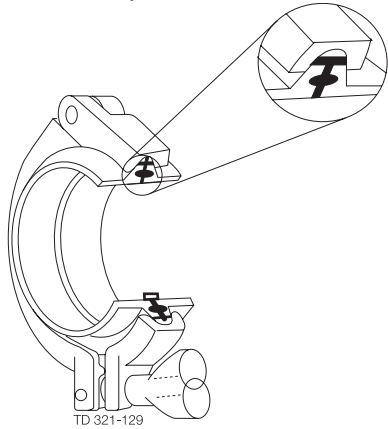
The screenshot shows the 'MTRWEB' search interface. Key elements include:
 

- Logo:** Alfa Laval logo at the top left.
- Search Form:** A form with 'MTR Serial ID' and 'Heat Cert Number' input fields, each with a 'Search' button.
- MTRweb Instructions:** A list of instructions: 'Search For MTR Serial ID Documents', 'Print A Copy Of An MTR Serial ID Document', 'Search For Heat Certifications', and 'Create an Ad Hoc MTR Serial Document'.
- Ad Hoc MTR Serial Document:** A button to create a new document.
- Navigation:** 'Show MTR Help' and 'Login' links.


## Connection Types

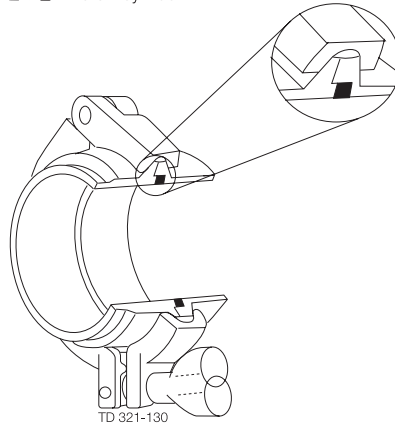
### Clamp Fittings

 Authorized to carry the 3A symbol




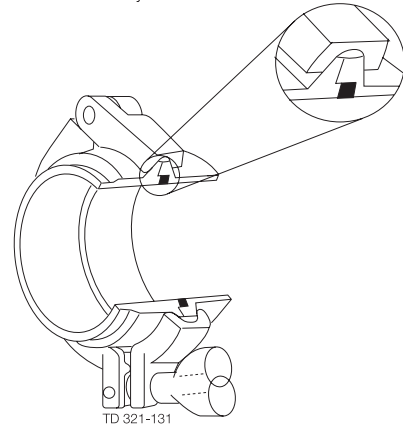
Tri-Clamp

 Authorized to carry the 3A symbol



HDI-Line

 Authorized to carry the 3A symbol




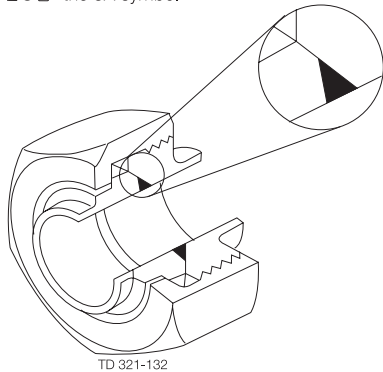
H-Line

A connection is made up of a plain ferrule, a clamp, and a gasket. Tees, elbows and reducers are available with Tri-Clamp connections. All three styles are in compliance with 3A standards for C.I.P. (clean in place). The three types of clamp fittings are designed for use in Food, Dairy, Pharmaceutical and Chemical Industries.


- Tri-Clamp connections are the industry standard, having nueter-style ferrules to simplify design and installation.
- H-Line and HDI-Line male/female ferrules self-align during tightening so joints are quick and easy to assemble or take apart.
- H-Line uses the same series of clamps as the Tri-Clamp.

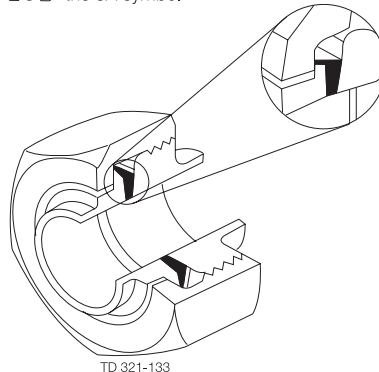
### Threaded Fittings

 Authorized to carry the 3A symbol




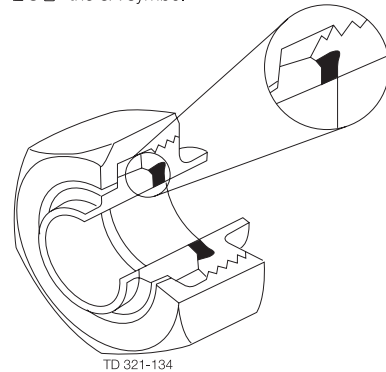
Bevel Seat

 Authorized to carry the 3A symbol



John Perry

 Authorized to carry the 3A symbol



DC

A connection is made up of a plain ferrules, a threaded ferrule, a nut and a gasket. The faces on Bevel Seat fittings are angled to create a metal to metal sealing surface. A John Perry fitting consists of a flat-faced threaded ferrule, a flat-faced plain ferrule and a profiled gasket. These joints are particularly useful with swing connections and flow diverter panels. A DC fitting utilizes the Bevel Seat plain ferrule and a threaded ferrule with a grooved face to retain a gasket. The three types of threaded fittings are designed for use in the Food, Dairy, and Beverage processing industries. Bevel Seat Joints are in compliance with 3A standards for manual cleaning. Both John Perry and DC fittings are in compliance with 3A standards for C.I.P. (clean-in-place).

- Bevel Seat
- John Perry
- DC

**Loss of head pressure due to friction. Loss is shown in feet of head. Loss through tubing is for 1ft.of tube**

Capacity in U.S. G.P.M.	O.D. 1" I.D. 0.902"			O.D. 1½" I.D. 1.402"			O.D. 2" I.D. 1.870"			O.D. 2½" I.D. 2.370"			O.D. 3" I.D. 2.870"			O.D. 4" I.D. 3.834"		
	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee
2	0.01	0.01	0.1															
4	0.025	0.02	0.2															
5	0.035	0.025	0.25															
10	0.12	0.06	0.4	0.02	0.01	0.15	0.005	0.015	0.1									
15	0.25	0.1	0.8	0.04	0.02	0.25	0.013	0.02	0.15									
20	0.43	0.22	1.5	0.06	0.03	0.3	0.02	0.025	0.2	0.005	0.02	0.1	0.003	0.02	0.06			
25	0.66	0.4	2.3	0.08	0.04	0.4	0.025	0.03	0.25	0.006	0.03	0.15	0.004	0.03	0.08			
30	0.93	0.7	3.3	0.105	0.06	0.55	0.035	0.05	0.3	0.008	0.05	0.2	0.005	0.04	0.1			
35	1.22	1.25	5.2	0.135	0.09	0.8	0.04	0.06	0.4	0.011	0.06	0.25	0.006	0.05	0.13			
40				0.17	0.11	1.0	0.05	0.08	0.5	0.015	0.07	0.3	0.007	0.06	0.15			
45				0.21	0.16	1.3	0.063	0.1	0.6	0.02	0.09	0.35	0.008	0.065	0.18			
50				0.25	0.2	1.6	0.073	0.12	0.7	0.022	0.1	0.4	0.01	0.07	0.2			
60				0.34	0.35	2.2	0.1	0.18	0.9	0.03	0.12	0.45	0.015	0.08	0.25			
80				0.57	0.76	3.7	0.16	0.3	1.5	0.05	0.15	0.55	0.02	0.1	0.4			
100				0.85	1.35	5.8	0.23	0.44	2.3	0.075	0.18	0.6	0.03	0.11	0.5	0.008	0.04	0.1
120				1.18	2.05	9.1	0.32	0.64	3.3	0.105	0.21	1.0	0.04	0.13	0.6	0.01	0.05	0.15
140							0.42	0.85	4.5	0.14	0.23	1.25	0.05	0.16	0.8	0.013	0.06	0.2
160							0.54	1.13	5.8	0.17	0.28	1.6	0.07	0.2	1.1	0.015	0.07	0.25
180							0.67	1.45	7.4	0.205	0.31	2.0	0.08	0.21	1.3	0.02	0.08	0.3
200							0.81	1.82	9.0	0.245	0.35	2.5	0.1	0.26	1.6	0.025	0.09	0.4
220							0.95	2.22	11.0	0.29	0.41	3.0	0.12	0.3	1.9	0.028	0.1	0.5
240							1.10	2.63	13.5	0.34	0.48	3.7	0.14	0.33	2.2	0.035	0.11	0.55
260										0.39	0.53	4.5	0.165	0.39	2.5	0.04	0.115	0.6
280										0.45	0.61	5.3	0.19	0.42	2.8	0.045	0.12	0.65
300										0.515	0.7	6.2	0.22	0.5	3.1	0.05	0.13	0.7
350										0.68	1.05	8.5	0.28	0.67	4.1	0.07	0.15	0.9
400										0.86	1.55	11.0	0.36	0.88	5.2	0.085	0.18	1.2
450										1.05	2.25	13.5	0.44	1.1	6.6	0.105	0.2	1.5
500													0.54	1.4	8.0	0.13	0.23	1.75
550													0.64	1.7	9.5	0.15	0.27	2.1
600													0.75	2.05	10.2	0.175	0.3	2.5
650													0.87	2.41	13.0	0.2	0.34	2.8
700													1.0	2.8	15.0	0.23	0.4	3.4
750																0.26	0.43	3.8
800																0.3	0.5	4.4
850																0.33	0.56	5.0
900																0.37	0.62	5.7
950																0.41	0.7	6.3
1000																0.45	0.8	7.0
1100																0.53	1.06	8.6

- NOTES:** 1. For elbows - R/D=1.5  
2. Flow thru tees  
Flow A to B  
Port C capped off  
3. Test medium - water at 70° F

**Prepared by members of the sanitary pump subgroup  
of the natl. assn. of dairy equipment manufacturers.**



ESE00155ENUS 0705

The information contained herein is correct at the time of issue,  
but may be subject to change without prior notice.

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**How to contact Alfa Laval**

Contact details for all countries  
are continually updated on our website.  
Please visit [www.alfalaval.com](http://www.alfalaval.com) to  
access the information direct.