Alfa Laval Tubes and Fittings

Introduction

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 for 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. Tubing is manufactured to Alfa Laval's stringent specifications, making it a perfect match for the weld fittings. Choose from a wide range of tube sizes, surface finishes and connect options. All products are labelled 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. The Alfa Laval tubes and fittings are divided into two product ranges, Hygienic and UltraPure. The Hygienic range is suitable for most standard duties and the UltraPure range is suitable for duties with extra high demands on hygiene and cleanability.



Hygienic range tubes and fittings

The Hygienic product range offers a wide range of tubes and fittings with an internal surface finish from Ra < 0.8 µm. The Hygienic range has tubes and fittings according to DIN EN 10357-A (DIN 11850), ISO EN 10357-D (ISO 2037) and BS 4825. Tri-Clover Tri-Clamp® and Tri-Weld® Fittings are part of Alfa Laval's product line produced according to ASME BPE dimension standards. 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 and connection options. The internal surface finish is Ra< 0.8 µm. All product wetted stainless steel items in the Hygienic range are delivered with 3.1. certificate in accordance with EN 10204.

UltraPure range tubes and fittings

Alfa Laval is proud to present the 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 UltraPure Fittings that are manufactured in compliance with the current ASME BPE Standard. All BPE items are individually capped and bagged. All products are labelled 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. The UltraPure product range offers an internal surface finish from Ra< 0.8 µm, either electro polished or mechanically polished. All product wetted stainless steel items in the UltraPure range are delivered with MTR (Mill Test Report) or with 3.1. certificate in accordance with EN 10204. The UltraPure range is manufactured under extra strict and thorough quality control methods. Wall thickness integrity is maintained by fabrication grade minimum wall tubing for all cold-formed tubular products. After cold forming, our tube product is resized to ensure that the ovality falls within the prescribed 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.

Technical data

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

Surface specification for Alfa Laval Hygienic range

Hygienic tubes

Alfa Laval designation	Surface texture (Ra µm)			Standard designation	According to	Treatment	Dimension ranges	
	Internal Surface	Welded area	External				DIN	ISO
BC	< 0.8	< 1.6	pickled	BC	EN 10357	Annealed	X	X
BD	< 0.8	< 1.6	< 1.0	BD	EN 10357	Annealed	X	X
CC	< 0.8	< 1.6	pickled	CC	EN 10357	Not annealed	X	
CD	< 0.8	< 1.6	< 1.0	CD	EN 10357	Not annealed	X	
Tri-Clover® Hygienic	< 0.8	< 0.8	< 0.8	No. 4 [1]	3A	Annealed		

[1] According to 3A 33-01 section D1

Hygienic fittings

Product	Alfa Laval designation	DIN	ISO	BS 4825	Tri-Clover® Hygienic
Bends	HSF2	x			
	HSF3	x	x		
	P (polished)			x	
	R (raw)			x	
	7				x
Tees	HSF2	x			
	HSF3	x	x		
	P (polished)			x	
	R/P (Raw/Polished)			x	
	7				x
Reducers	HSF2	x			
	HSF3	x	x		
	R/P (Raw/Polished)			x	
	7				x
Unions + Union parts	H3	x			
	HSF0	x	x	x	
	SB (semi bright)		x		
	7				x

Explanation of surface designation for fittings

Alfa Laval designation	Surface structure ID/OD	Surface texture Ra µm (µ-inch)			
		Wetted		Not wetted	
		Surface	Weld bead	Surface	Weld bead
HSF0	Machined	< 0.8 (32)		< 1.6 (64)	
H3	Machined	< 0.8 (32)		< 1.0 (40)	
HSF2	Polished/Shot blasted	< 0.8 (32)	< 0.8 (32)	< 1.6 (64)[1]	< 1.6 (64)[1]
HSF3[2]	Polished	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)
P (Polished)	Polished	< 0.8 (32)	< 0.8 (32)	< 1.0 (40)	< 1.0 (40)
R (Raw)	Raw	< 0.8 (32)	< 0.8 (32)	< 1.0 (40)	< 1.0 (40)

[1] Tolerances according to DIN 11852. Our products are machined to the finish-defined surface, or they are mechanically polished by using a progressive series of abrasives, from low to high grit. This allows consistent internal finish and both optimal and economic cleaning.

[2] For sizes larger than DN100, the "Not wetted" surface Ra can be up to 1.0 µm (40 µ-inch)

Alfa Laval designation	Surface structure ID/OD	Surface texture Ra µm (µ-inch)			
		Wetted		Not wetted	
		Surface	Weld bead	Surface	Weld bead
R/P (Raw/Polished)	Raw/Polished	< 0.8 (32)	< 0.8 (32)	< 1.0 (40)	< 1.0 (40)
SB (Semi bright)	Machined	< 0.8 (32)		< 1.0 (40)	
7 (3A surface)	Machined	< 0.8 (32)		< 0.8 (32)	
7 (3A surface)	Polished	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)

[1] Tolerances according to DIN 11852. Our products are machined to the finish-defined surface, or they are mechanically polished by using a progressive series of abrasives, from low to high grit. This allows consistent internal finish and both optimal and economic cleaning.

[2] For sizes larger than DN100, the "Not wetted" surface Ra can be up to 1.0 µm (40 µ-inch)

Surface specification for Alfa Laval Tri-Clover® UltraPure range

Alfa Laval designation	Surface texture (Ra µm)			Standard designation		According to	Treatment	Tri-Clover® UltraPure ASME-BPE
	Internal	Welded / Bended area	External	Tubular	Machined			
PL	< 0.5	< 0.5	< 0.8	SF1	SF1	ASME BPE	Annealed	X
PM	< 0.38 EP[1]	< 0.38 EP[1]	< 0.8	SF4	SF4	ASME BPE	Annealed	X

[1] Electro polished

Conversion table - surface finish correlation

Between Grit and Ra values

Ra (µm)	Ra (µ inch)	US Grit	UK Grit
3.00	125		120
2.00	85		180
1.65	70	80	
1.50	50		240
0.75	30		320
0.62	25	180	
0.45	18	240	
0.40	15		500
0.25	10	320	

Material specification for Alfa Laval Hygienic range

Wetted steel parts

Material	Dimension ranges			
	DIN	ISO	BS 4825	Tri-Clover® Hygienic
1.4301[1] (304)	X	X		
1.4307[1] (304L)	X	X	X	
1.4401[1] (316)			[2]	
1.4404[1] (316L)	X	X	X	
304[3]				X
316L[3]				X

[1] According to DIN EN 10088-1

[2] Reducing tees are only available in 1.4401 (316)

[3] According to ASTM A 269 and A 270

Seal ring material for clamp fittings

Material	Dimension ranges			
	DIN	ISO	BS 4825	Tri-Clover® Hygienic
NBR	X	X	X	
Nitrile (Buna-N)				X
White Nitrile (White Buna-N)				X
EPDM	X	X	X	X
FPM	X	X	X	
Viton®				X
PTFE	X	X	X	X
Silicone (Q)	X	X		X

Material specification for Alfa Laval Tri-Clover® UltraPure range

Wetted steel parts

Material	Dimension ranges Tri-Clover® UltraPure ASME-BPE
316L[1]	X

[1] According to ASTM A 269 and A 270 S2. All Tri-Clover® UltraPure ASME BPE weld ends are also according to ASME BPE sulphur content 0.005-0.017%

Gasket material in fittings

Material	Dimension ranges Tri-Clover® UltraPure ASME-BPE
Nitrile (Buna-N)	X
White Nitrile (White Buna-N)	X
EPDM	X[1]
FPM	
Viton®	X[1]
White Viton®	X
PTFE	X
Silicone (Q)	X[1]

[1] EPDM, Viton and Silicone available with USP Class 6 certificate - please request by order

Chemical composition table

Most common steelgrades

In the table below, we have shown the chemical composition of the materials.

Name	Material	Chemical composition								
		C	Si	Mn	Pmax.	S	N	Cr	Mo	Ni
1.4404	DIN-EN 10088-1	≤ 0.030	≤ 1.000	≤ 2.00	0.045	≤ 0.015	≤ 0.11	16.50 - 18.50	10.00 - 13.00	2.00 - 2.50
316L	ASTM A 269	≤ 0.035	≤ 0.750	≤ 2.00	0.040	≤ 0.030		16.00 - 18.00	10.00 - 15.00	2.00 - 3.00
316L[1]	ASTM BPE / ASTM A 270 S-2	≤ 0.035	≤ 0.075	≤ 2.00	0.040	0.005 - 0.017		16.00 - 18.00	10.00 - 10.00	2.00 - 3.00
X5CrNi18-10	1.4301 (304)	≤ 0.070	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.011	17.5 to 19.5		8.0 to 10.5
X2CrNi18-9	1.4307 (304L)	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.011	17.5 to 19.5		8.0 to 10.5
X5CrNiMo17-12-2	1.4401 (316)	≤ 0.070	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.011	16.5 to 18.5	2.0 to 2.5	10.0 to 13.0
X2CrNiMo17-12-2	1.4404 (316L)	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.011	16.5 to 18.5	2.0 to 2.5	10.0 to 13.0
X2CrNiMo18-14-3	1.4435 (316L)	≤ 0.030	≤ 1.00	≤ 2.00	0.045	≤ 0.015	≤ 0.011	17.0 to 19.0	2.5 to 3.0	12.5 to 15.0

[1] According to ASTM A 269 and A 270 S2. All Tri-Clover® UltraPure ASME BPE weld ends are also according to ASME BPE sulphur content 0.005-0.017%

(According to EN 10088-1)

(The material names 304, 304L, 316 and 316L according to AISI/SAE)

We do not offer 1.4435, we have chosen 1.4404 instead. Both materials are designed for highly corrosive environments. Material 1.4435 has due to the higher content of Chromium and Nickel a better corrosion resistance and formability than 1.4404, it also has a significantly higher price. Our many years in the Installation Material Business has proven 1.4404 as the best match for our customers processes.

Rubber material and application

Product and chemical resistance of flexible rubber materials

The information below is intended as an aid in selecting the best rubber quality for an actual application. It is not possible to state any general lifetime of rubber seals as many factors influence it: chemical attack, temperature, mechanical wear etc. Extreme temperatures, even within the generally accepted limits, may worsen other kinds of attack and thus reduce the lifetime.

Ratings

1 = Unsuitable.

2 = Limited suitability.

3 = Normal suitability.

4 = High suitability.

- = Not recommended for other reasons.

The table contains data which have been compiled from the results of our own tests and the recommendations of our raw material suppliers. The data should be considered as recommendations only and will be brought up-to-date from time to time. They are based on constant contact with the specified product.

In case of doubt or lack of information it would be advisable to consult us directly, which will enable us to investigate specific applications.

Product or process	NBR [1)]	EPDM [2)]	Q [3)]	FPM [4)]	PTFE [5)]
Dairy products (milk, cream)	3	3-4	3-4	-	3-4
Dairy products (sour milk products)	3	3-4	3-4	-	3-4
Brewery products (beer, hops etc.)	3	3-4	1-2	2-3	3-4
Wine and yeast	3	4	4	2-3	3-4
Animal and vegetable fats: 100 °C	3	1–2	3	4	3-4
Water and water solutions < 70 °C	3	4	3	2-4	3-4
Hot water and steam < 130 °C	1	4	2	-	3-4
Concentrated fruit juices and etheral oils < 100 °C	1	1	1	3	3-4
Non-oxydising acids < 80 °C	1-2	3	1–2	2	3-4
Oxydising acids < 80 °C	-	3	1	2	3-4
Weak concentrate of lye < 100 °C	2	4	2	2	3-4
Strong concentrate of lye < 100 °C	1	3	1	1	3-4
Mineral oils < 110 °C	3	-	-	4	3-4
Aliphatic carburetted hydrogen (hexane)	3	1	1	4	3-4
Aromatic carburetted hydrogen (benzole)	1	1	1	3	3-4
Alcohols	1–3	2-3	3-4	3-4	3-4
Ester and ketones	1-2	1-2	1-2	3-4	3-4
Ether	1	1	1-3	3-4	3-4
Methylene chloride	1	1	2-3	3-4	3-4
Ozone and atmospheric conditions	1-2	4	4	3-4	3-4

International designation of flexible rubber materials according to ISO R 1629.

ISO = International standard.

Notes

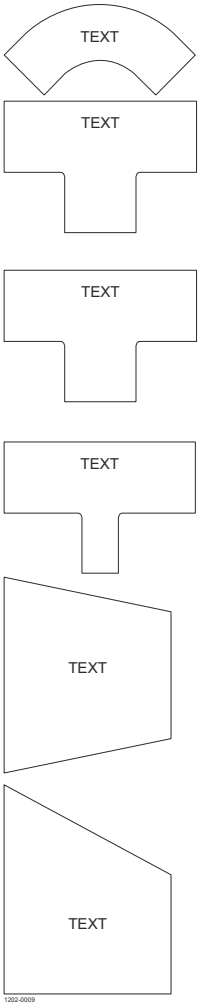
	Designation of flexible rubber materials	Abbreviation symbol
1)	Nitrile rubber	N
2)	Ethylene propylene rubber	E
3)	Silicone rubber	Q
4)	Fluorinated rubber	F
5)	Polytetraflour ethylene	

Marking and surface

Marking

In Alfa Laval we have chosen to mark our product as shown in this chapter. The marking provides all the needed information and is placed logical on the products.

Tubular



Tube dimensions:
Outer diameter and wall thickness
On reduced items both sizes has to be written

Surface
See AL “description” on AL 2061 300

ALFA LAVAL® - OD_1T_1 / OD_2xT_2 XXXX
X.XXX (XXX) XX-HT: XXXXXXX/XXXXX

Material type:
EN (AISI)

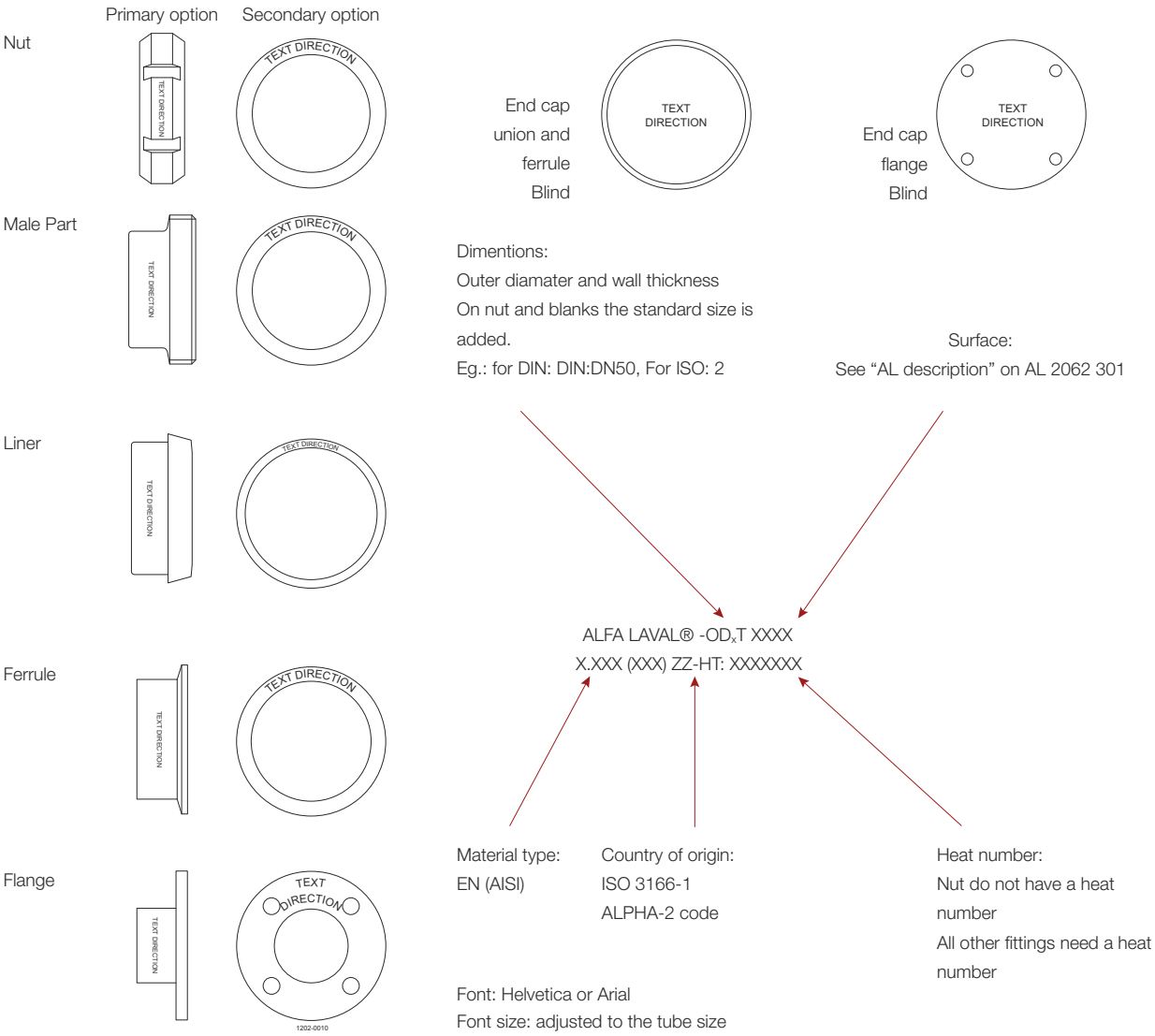
Country of origin:
ISO 3166-1
ALPHA-2 code

Heat number:
Write number for all parts

Font: Helvetica or Arial
Font size: adjusted to the tube size
Example on straight fitting with one heat number:
ALFA LAVAL® - 70x2.0 HSF3
1.4307 (304L) CN-HT:123456
Example on reduced fitting with two heat number:
ALFA LAVAL® - 70x2.0/ 41x1.5 HSF3
1.4307 (304L) IN-HT:123456/789012

Machined

Some of our machined products are very small and marking on the optimal place is impossible therefore we use “Secondary Option” instead of “Primary Option”.



Surface descriptions

We have chosen to provide a limited choice, most used, of all the surface possibilities. We have given them an Alfa Laval name. The names and descriptions are like in the below table.

Our surface philosophy has been to create a uniform surface finish which meets the standard or better and at the same time fits with the outer surface appearance of the DIN tubes across all DIN Fittings. The range “DIN Standard, new surface” will provide this benefit and will be visible in plants using Alfa Laval DIN Fittings only.

The new uniform appearance of all Alfa Laval DIN Fittings is also the reason for new surface descriptions. This is a unique product and therefore it deserves a unique surface description.

The surface on tubular fittings exceeds the requirement in DIN 11852. We are meeting the requirements to surface roughness in EHEDG and 3A. Our customers are therefore buying a product with a better surface roughness than most of the market supplies.

Machined Fittings

AL description	Standard	Surface texture R_a µm (µ-inch)	
		Wetted	Not wetted
HSF0	DIN (Hygienic)	< 0.8 (32)	< 1.6 (64)
H3	DIN UltraPure	< 0.8 (32)	< 1.0 (40)

Tubular Fittings

AL descritpion	Standard	Surface structure ID/OD	Surface texture R_a µm (µ-inch)			
			Wetted		Not wetted	
			Surface	weld bead	Surface	weld bead
HSF2	DIN (Hygienic)	Polished/Shot blasted	<0.8 (32)	<0.8 (32)	<1.6 (64)[1]	<1.6 (64)[1]
HSF3[2]	DIN (Hygienic)	Polished/Polished	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)	< 0.8 (32)

[1] Tolerances according to DIN 11852

[2] For sizes larger than DN100, the "Not wetted" surface Ra can be up to 1.0 µm.

Our products are mechanical polished. 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.

HSF2 is our tubular "MAT" version. Inside it is polished to Ra <0.8 and outside it is shot blasted to a surface Ra<1.6

Pressure ratings (bar) for Alfa Laval Hygienic range

Material	Dimension ranges			
	DIN	ISO	BS 4825	Tri-Clover® Hygienic
Tubes (20 °C)	39/355	39/355	56-467[1]	56-351[1]
Bends,Tees, Reducers (80 / 200 °C)	40/16	40/16	25/15	25/15
Nut unions (80 / 200 °C)	40/16	40/16	25/15	
Flange unions (80 / 200 °C)	25/16	25/16	25/15	

[1] Tube pressure ratings depending on size (larger diameter smaller pressure rating)

Pressure ratings (bar) of Tri-Clamp® Connections

Service rating[1] (bar) of Tri-Clamp® Connections

Size Tube OD	1/2 & 3/4 inch	1 & 1 1/2 inch	2 inch	2 1/2 inch	3 inch	4 inch	6 inch
13MHHM			**(Wing nut tightened to 2.8 Nm of torque)**				
at 20 °C	--	34.5	31.0	27.6	24.1	20.7	10.3
at 120 °C	--	20.7	20.7	13.8	13.4	10.3	5.2
13MHHS			(Wing nut tightened to 2.8 Nm of torque)				
at 20 °C	151.7	41.4	37.9	31.0	24.1	20.7	--
at 120 °C	82.7	20.7	19.0	15.5	12.1	10.3	--
A13MHP			Bolts tightened to 27 Nm of torque				
at 20 °C	--	103	68.9	68.9	68.9	55.1	20.7
at 120 °C	--	82.7	55.2	55.2	55.2	41.4	13.8
A13MHM			(Wing nut tightened to 2.8 Nm of torque)				
at 20 °C	--	34.5	31	27.6	24.1	20.7	10.3
at 120 °C	--	20.7	17.2	13.8	12.1	10.3	5.2

[1] 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. All ratings shown are dependent upon related components within the systems and proper installation. For temperatures above at 120 °C, we recommend using only 13MHP clamps.

Service Rating of Tri-Clamp® Connections

Service rating[1] (PSI) of Tri-Clamp® Connections

Size Tube OD	½ & ¾ inch	1 & 1½ inch	2 inch	2½ inch	3 inch	4 inch	6 inch
13MHHM	(Wing nut tightened to 25 in. lb. of torque)						
at 70 °F	--	500	450	400	350	300	150
at 250 °F	--	300	300	200	195	150	75
13MHHS	(Wing nut tightened to 25 in. lb. of torque)						
at 70 °F	2200	600	550	450	350	300	--
at 250 °F	1200	300	275	225	175	150	--
A13MHP	(Bolts tightened to 20 ft. lb. of torque)						
at 70 °F	--	1500	1000	1000	1000	800	300

[1] 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 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.

Service rating[1] (PSI) of Tri-Clamp® Connections

Size Tube OD	½ & ¾ inch	1 & 1½ inch	2 inch	2½ inch	3 inch	4 inch	6 inch
at 250 °F	--	1200	800	800	800	600	200
A13MHM	(Wing nut tightened to 25 in. lb. of torque)						
at 70 °F	--	500	450	400	350	300	150
at 250 °F	--	300	250	200	175	150	75

[1] 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 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)
Original Physical Properties	Hardness, Shore A	70	70	70	70	---
	Tensile Strength, PSI	1875	1650	1212	1340	---
	Elongation, %	340	317	272	260	---
Temperature Range		-65 to 200 °F	-60 to 300 °F	-20 to 350 °F	-40 to 400 °F	-40 to 200 °F [1]
Resistance	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

[1] 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 Hygienic OD-Tubing

OD Outer Diameter (inch)	ID Inner Diameter (inch)	Wall Thickness (inch/gauge)	A Ferrule Face (inch)
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

Hygienic Tube Information

Tube OD	Tube ID	Wall Thickness	Volume	Weight Dry	Weight with Water	Flow (GPM) at a Mean Velocity		
inch	inch	inch	Gal/100 ft	lbs/100 ft	lbs/100 ft	5 fps	7 fps	10 fps
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 inch	ID inch	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

Size	OD inch	ID inch	Wall Thickness
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

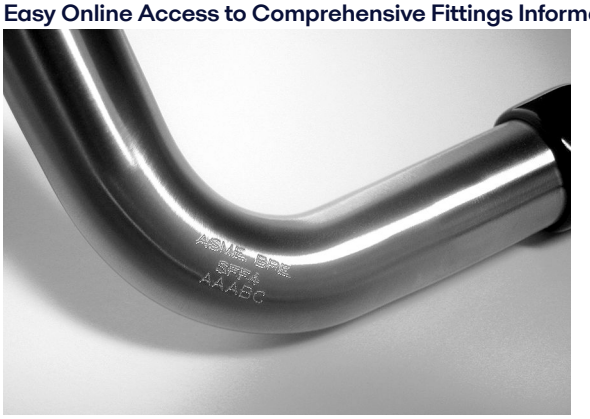
Chemical Composition %

	304	316L
C	0.080	0.030
MN	2.000	2.000
P	0.045	0.045
S	0.030	0.030[1]
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

[1] 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 marked 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.

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

Connection Types

Clamp Fittings

Authorized to carry the 3A symbol

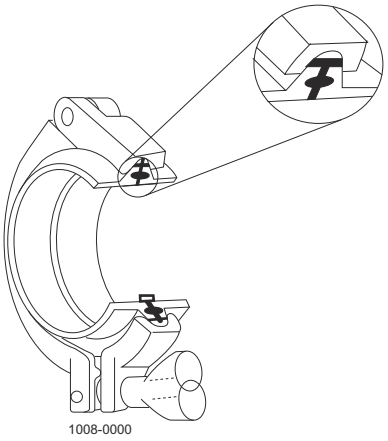


Figure 1. Tri-Clamp

Authorized to carry the 3A symbol

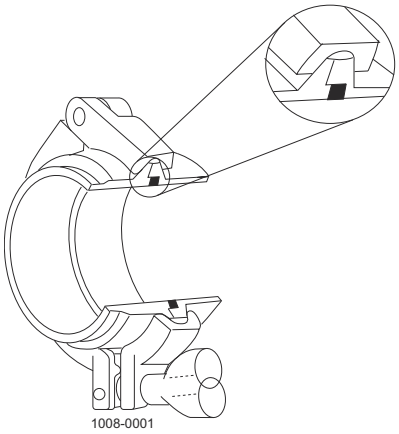


Figure 2. H-Line

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 neuter-style ferrules to simplify design and installation.
- H-Line male/female ferrules self-align during tightening so joints are quick and easy to assemble or take apart.

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

Capacity	O.D.		1"	O.D.		1½"	O.D.		2"	O.D.		2½"	O.D.		3"	O.D.		4"
in U.S.	I.D		0.902"	I.D.		1.402"	I.D.		1.870"	I.D.		2.370"	I.D.		2.870"	I.D.		3.834"
G.P.M.	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

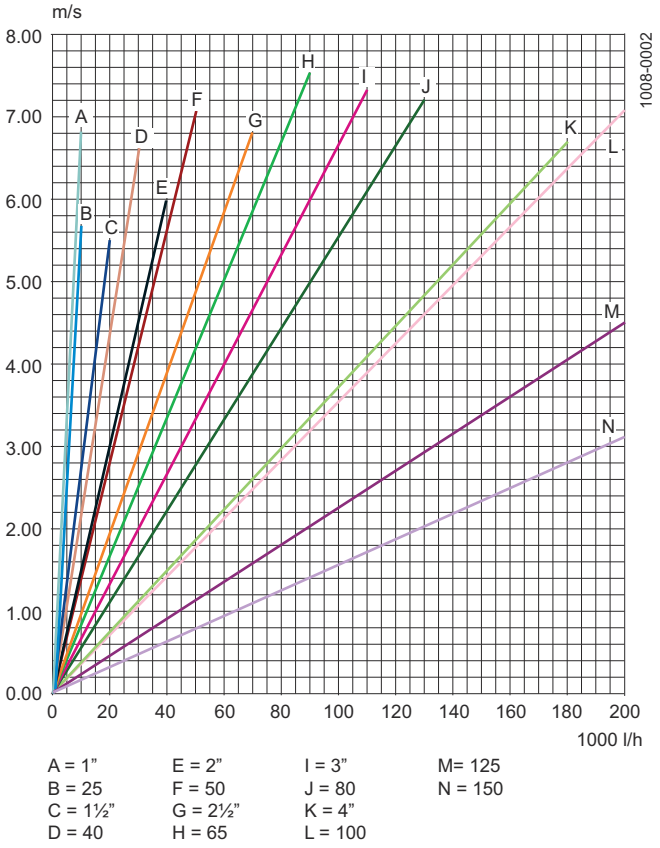
Capacity	O.D.		1"	O.D.		1½"	O.D.		2"	O.D.		2½"	O.D.		3"	O.D.		4"
in U.S.	I.D		0.902"	I.D.		1.402"	I.D.		1.870"	I.D.		2.370"	I.D.		2.870"	I.D.		3.834"
G.P.M.	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee
650													0.87	2.41	13.0	0.2	0.34	2.8
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. Test medium - water at 70 °F
3. Flow thru tees
   Flow A to B
   Port C capped off

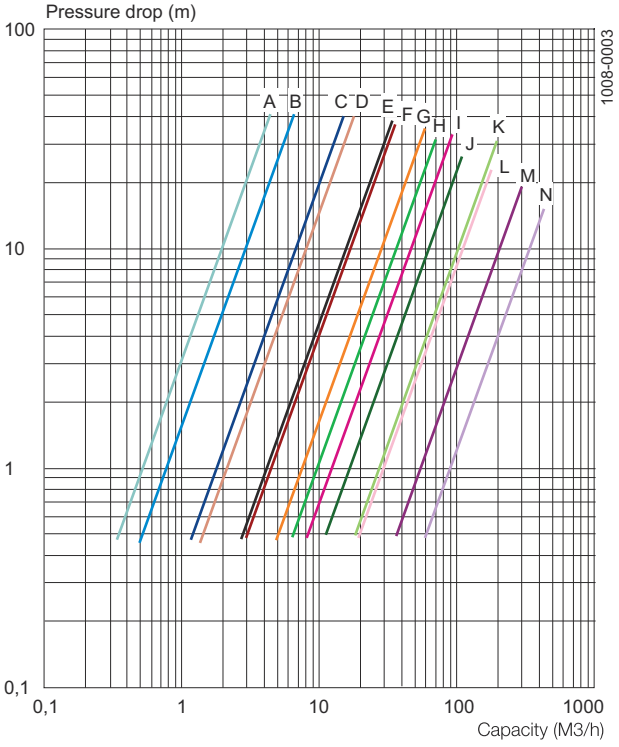
Prepared by members of the Hygienic pump subgroup of the natl. assn. of dairy equipment manufacturers.

Pressure drop and flow velocity curves



A = 1”
B = 25
C = 1½”
D = 40
E = 2”
F = 50
G = 2½”
H = 65
I = 3”
J = 80
K = 4”
L = 100
M= 125
N = 150

Figure 3. Flow velocity in EN 10357-A and EN 10357-D tubes



A = 25 mm
B = NW25
C = 38 mm
D = NW40
E = 51 mm
F = NW50
G = 63.5 mm
H = NW65
I = 76 mm
J = NW80
K = 101.6 mm
L = NW100
M = NW125
N = NW150

Figure 4. Pressure drop in 100 m EN 10357-A and EN 10357-D tubes

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