

Alfa Laval Hygienic fittings DIN EN 10357-A

Hygienic fittings

Introduction

After years of intensive work with the portfolio we have achieved a unique surface appearance across the different DIN Fittings of which we are very proud. We have uniformed our marking, to support our high-quality Fittings and the result is fantastic. We call this range for “DIN Standard, new surface”, to highlight it, and give it a special space in the new catalogue, because it truly is unique. With focus on simplicity we have reduced the surface appearances to two on machined and one on tubular Fittings and we have concentrated on “Hygienic Fittings” with an exception of DIN 11864. We have invested heavily in availability of “DIN Standard, new surface” portfolio and supported by the new automatic warehouse in Kolding and our online ordering tool “Anytime”, this will provide a superior customer experience. Moreover, we have divided the catalogue into the different DIN standards, to show the differences and make it easy to choose the right product.

The old portfolio is, where possible and convenient, upgraded to our “DIN Standard, new surface”, the rest we have kept “as is”. In the price files we have made the following split:

- “DIN Standard, new surface”
- “Fit to DIN Tubes”

The complete DIN Fittings range we supply fits with the tube dimensions of EN 10357-A and DIN 11866- Reihe A (except from DIN 11851 W, which is according to the standard). The products in the chapter “Fit to DIN Tubes”, have deviations from the DIN standards, but will still fit to EN 10357-A tubes.

Thank You for reading this and we hope You enjoy!

Product presentation

Alfa Laval’s range of DIN Tubes & Fittings are used 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 fittings. 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.



On the product we have laser marked all the needed information such as heat number, dimension, surface, material and country of origin

DIN Standard, Overview

Product	DIN Standard	Surface ¹	Material ²	Application	Part
Tubes	EN 10357-	BC, BD, CC and	1.4307 (304L)	Hygienic	
	A/DIN 11850	CD	1.4404 (316L)		
	DIN 11866-A ³	H3	1.4404 (316L)	Aseptic	
Bends, Tees and Reducers	DIN 11852	HSF3	1.4307 (304L)	Hygienic	
	DIN 11865 ³	H3	1.4404 (316L)	Aseptic	
Connections	DIN 11851	HSF0	1.4307 (304L) 1.4404 (316L)	Hygienic	For Welding. Ends are ready for Orbital Welding (Screw connections) W: Expanding S: Welding
	DIN 11853	H3	1.4404 (316L)	Hygienic	1: Screw connection 2: Flange connection 3: Clamp connection
	DIN 11864	H3	1.4404 (316L)	Aseptic	1: Screw connection 2: Flange Connection 3: Clamp connection
	DIN 32676	HSF0	1.4307 (304L)	Hygienic	Clamp connection
		H3	1.4404 (316L)		

¹ Surface table is available later in the document

² Material is according to EN 10088-1. Regarding complete Connections, Nut is always in 1.4301. A Nut in 1.4404 is available as a single item. We hold the right to deliver better material than stated in our brochures and order confirmation. Meaning, if stated 1.4301, it is allowed for us to deliver 1.4307 or 1.4404, at same price of course.

³ We do currently not offer this part of the DIN standard

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Tubes

Material and surface overview

Standard	Material	Symbol	Surface			Heat Treatment
			External surface and Welded area	Internal surface	Internal Welded area	
EN 10357-A / DIN 11850	1.4307 (304L) 1.4404 (316L)	CC	Pickled and passivated			No
		CD	Polished Ra < 1.0 µm	Ra < 0.8 µm Pickled and passivated	Ra < 1.6 µm Pickled and passivated	
		BC	Pickled and passivated or Bright annealed			Yes
		BD	Polished Ra < 1.0 µm	Ra < 0.8 µm Pickled and passivated or Bright annealed	Ra < 1.6 µm Pickled and passivated or Bright annealed	
DIN 11866-A	1.4404 (316L)	H3	Pickled or Bright annealed without Ra requirement, or Polished to Ra < 1.0 µm	Ra < 0.8 µm	Ra < 0.8 µm	Yes

Sizes



Note! We supply EN10357-A which has the same dimensions as former DIN 11850 Reihe 2, and DIN 11866-A. Please also notice "Nominal size" is not always equal to inner diameter (see DN15, DN25, DN40, DN65 and DN 80). The EN 10357-A standard is only referring to outer diameter. All dimensions in this catalogue are in millimeter.

Nominal size (only DIN 11866)	OD (outer diameter)	ID (inner diameter)	t (wall thickness)
DN10	13	10	1.5
DN15	19	16	1.5
DN20	23	20	1.5
DN25	29	26	1.5
DN32	35	32	1.5
DN40	41	38	1.5
DN50	53	50	1.5
DN65	70	66	2
DN80	85	81	2
DN100	104	100	2
DN125	129	125	2
DN150	154	150	2
DN200	204	200	2

Tolerances

Outer diameter tolerances



Note! Outer diameter tolerances in DIN 11866 are lower from DN100 to DN200.

Nominal size:	DN10	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80	DN100	DN125	DN150	DN200
OD:	13	19	23	29	35	41	53	70	85	104	129	154	204
EN 10357-A	±0,10	±0,10	±0,12	±0,15	±0,18	±0,21	±0,27	±0,35	±0,43	±0,78	±0,97	±1,16	±1,53
DIN 11866	±0,10	±0,10	±0,12	±0,15	±0,18	±0,21	±0,27	±0,35	±0,43	±0,52	±0,65	±0,77	±1,02

Wall thickness tolerances



Note! Wall thickness tolerances in DIN 11866 are lower from DN65 to DN200.

Nominal size:	DN10	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80	DN100	DN125	DN150	DN200
OD:	13	19	23	29	35	41	53	70	85	104	129	154	204
EN 10357-A	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,20	±0,20	±0,20	±0,20	±0,20	±0,20
DIN 11866	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15	±0,15

EN 10357-A/DIN 11850

The stainless-steel tubes in this standard are for the food, chemical and pharmaceutical industry.

Typically used with DIN 11852, DIN 11851, DIN 11853 and DIN 32676.

BC and BD tubes are annealed, whereas CC and CD tubes are pickled and passivated internal and external

All materials according to EN 10217-7.

DIN 11866

The stainless-steel tubes in this standard are for aseptic, chemical and pharmaceutical industry

Typically used with DIN 11864 and DIN 11865.

All tubes are annealed, pickled and passivated in accordance with DIN EN 10217-7 W2Ab.

Comment to DIN 11851 W

DIN 11850 Reihe 1, different measures up to DN50:



Note! Regarding Connections DIN 11851 W (Expanding), this is the only product in this catalogue which does not match tube EN 10357-A from sizes up to DN50, above DN50 they fit. This standard is meant for the old "DIN 11850, Reihe 1".

Dimensions	DN10	DN15	DN20	DN25	DN32	DN40	DN50
OD	12	18	22	28	34	40	52
ID	10	16	20	26	32	38	50
Thickness	1	1	1	1	1	1	1

Bends, Tees and Reducers

DIN 11852 overview

Tees

Type Name	Design Name	Comment	Picture
Tees	TS $d_1=d_2$	Standard Tee	
	RTS $d_1>d_2$ (d_2 pointing down)	Reduced Tee	
	TK $d_1=d_2$	Short Tee	
	RTK $d_1>d_2$ (d_2 pointing down)	Reduced Short Tee	

Reducers

Type Name	Design Name	Comment	Picture
Reducers	RK	Concentric Reducer	
	RE	Eccentric Reducer	

Example of the Alfa Laval name for a short tee according to DIN 11852:

TEE TK DN25 HSF3 1.4404 DIN 11852



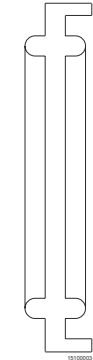
TEE	TK	DN25	HSF3	1.4404	DIN 11852
Type Name	Design Name	Nominal Size	Surface	Material	Standard

Bends

Type Name	Design Name	Comment	Picture
	BS-90	Standard Bend 90 Degrees	
	BS-45	Standard Bend 45 Degrees	
	BS-180	Standard Bend 180 Degrees	
Bends	BA5-90 ³	Radius and l ₀ are the same in mm	
	BL-90	Long Bend 90	
	BL-45	Long Bend 45	

Connections

Gasket overview

DIN Standard	Surface	Material (Steel parts)	Material (Rubber parts)	Part	Seal Type
DIN 11851	HSF0	1.4307 (304L) 1.4404 (316L)	EPDM FPM NBR PTFE Q	Screw Connection W: Expanding (only 11851, Liner and Male end are expanded to the tube) S: Welding	 Gasket (G)
DIN 11853	H3	1.4404 (316L)	FPM EPDM	1: Screw Connection 2: Flange Connection 3: Clamp Connection	 O-Ring (R)
DIN 11864	H3	1.4404 (316L)	FPM EPDM	1: Screw Connection 2: Flange Connection 3: Clamp Connection	
DIN 32676	H3 HSF0	1.4307 (304L) 1.4404 (316L)	PTFE FPM	Clamp Connection	 Gasket (D)

DIN 11851 overview

All Connections in DIN 11851 are screw connections

Parts Type Name	Parts Design Name	Connection Name	Comment
Male (Gewindestutzen)	C	W	Connection to tube by expanding, DN10-DN100
Liner (Kegelstutzen)	D	W	
Male (Gewindestutzen)	SC	S	Connection to tube by welding, DN10-DN150
Liner (Kegelstutzen)	SD	S	
Male (Gewindestutzen)	SKC	SK (Short)	
Liner (Kegelstutzen)	SKD	SK (Short)	
Blind Male (Blind-Gewindestutzen)	BC		Alfa Laval does currently not offer this (real design name is "C")

Parts Type Name	Parts Design Name	Connection Name	Comment
Blind Liner (Blind-Kegelstutzen)	BD		The real design name is "D" but Alfa Laval has chosen to call it "BD". The blind is not expanded or welded to the tube, therefore it can be used for all connection versions in DIN 11851
Nut (Nutüberwurfmutter)	F		Used for all connection versions in DIN 11851
Gasket (Dichtring)	G		Used for all connection versions in DIN 11851

A Complete connection is Male + Liner + Gasket + Nut. It is possible to blind from Liner side. Please do not mix connection W with connection S.

The "Connection Name" equal to W, is from the German word, Walzen, which in English is translated to Expanding.

The "Connection Name" equal to S, is from the German word, Schweissen, which in English is translated to Welding.

The "Connection Name" equal to SK, is from the German word, Schweissen, Kurz, which in English is translated to Welding, Short.

Examples of DIN 11851 products:

SKC:			
S		K	C
Welding		Short	Male

SKD:			
S		K	D
Welding		Short	Liner

Example of the Alfa Laval name for a complete Connection, DIN 11851:

CONNECTION S DN50 HSF0 1.4307 DIN 11851 EPDM

CONNECTION	S	DN50	HSF0	1.4307	DIN 11851	EPDM
Type Name	Design Name (S=Welding)	Nominal Size	Surface	Material	Standard	Seal Type

Example of the Alfa Laval name for a Male, DIN 11851:

MALE SC DN50 HSF0 1.4307 DIN 11851

MALE	SC	DN50	HSF0	1.4307	DIN 11851
Type Name	Design Name	Nominal Size	Surface	Material	Standard

[DIN 11853 overview](#)

We state this product group is for hygienic application, but please be aware it is using the same O-ring as 11864 which is for aseptic applications, the only difference between the two standards is the "build in length". "Build in length" of DIN 11864 is longer than DIN 11853, which makes it easier to perform orbital welding.

[DIN 11853-1](#)

Screw Connection (Verschraubungen)

Parts Type Name	Parts Design Name	Connection Name
Male (Gewindestutzen)	GS	V
Liner (Bundstutzen)	BS	V
Blind Male (Blindgewindestutzen) (Same item as in 11864-1)	BGS	V
Blind Liner (Blindbundstutzen) (Same item as in 11864-1)	BBS	V
Nut (Nutüberwurfmutter)	F (DIN 11851)	V
O-Ring	R	V

A complete connection (V) is: Male (GS) + Liner (BS) + O-Ring (R) + Nut (F).

It is possible to blind from both Liner and Male side, you will have to replace normal Male or Liner. The Nut for DIN 11853 is the same as in DIN 11851.

DIN 11853-2

Flange Connection (Flanschverbindung)

Parts Type Name	Parts Design Name	Connection Name
Currently not part of offering		
Flange Groove (Nutflansch)	NF	F
Currently not part of offering		
Flange Collar (Bundflansch)	BF	F
Blind Flange Groove (Blindnutflansch) (Same item as in 11864-2)	BNF	F
Blind Flange Collar (Blindbundflansch) (Same item as in 11864-2)	BBF	F
Screw (Sechskantshraube, DIN EN ISO 4017)		F
Nut (Sechskantmutter, DIN ISO 4032)		F
O-Ring	R	F

For NF and BF please use 11864-2 NF and BF

A complete connection (F) is Flange Groove (NF) + Flange Collar (BF) + O-Ring (R) + Screw and Nut set.

It is possible to blind from both Groove and Collar side, you will have to replace normal Groove or Collar.

DIN 11853-3

Clamp Connection (Klemmverbindung)

Parts Type Name	Parts Design Name	Connection Name
Currently not part of offering		
Clamp Liner Groove (Nutklemmstutzen)	NKS	K
Currently not part of offering		
Clamp Liner Collar (Bundklemmstutzen)	BKS	K
Blind Clamp Liner Groove (Blindnutklemmstutzen) (Same item as in 11864-3)	BNKS	K
Blind Clamp Liner Collar (Blindbundklemmstutzen) (Same item as in 11864-3)	BBKS	K
Clamp Ring (Klammer)		K
O-Ring	R	K

For NKS and BKS please use from 11864-3.

A complete connection (K) is: Clamp Liner Groove (NKS) + Clamp Liner Collar (BKS) + O-Ring (R) + Clamp Ring.

It is possible to blind from both Groove and Collar side, you will have to replace normal Groove or Collar.

DIN 11864

DIN 11864-1

Same structure as DIN 11853-1. Only "build in length" is different on Male and Liner (GS and BS), both are longer in the DIN 11864-1 version.

Screw Connection (Verschraubungen)

Parts Type Name	Parts Design Name	Connection Name
Male (Gewindestutzen)	GS	V
Liner (Bundstutzen)	BS	V
Blind Male (Blindgewindestutzen)	BGS	V
Blind Liner (Blindbundstutzen)	BBS	V
Nut (Nutüberwurfmutter)	F (DIN 11851)	V
O-Ring	R	V

A complete connection (V) is: Male (GS) + Liner (BS) + O-Ring (R) + Nut (F).

It is possible to blind from both Liner and Male side. Both "Blind Male" and "Blind Liner" are equal to the ones in DIN 11853-1. The Nut for DIN 11864 is the same as in DIN 11851.

DIN 11864-2

Same structure as DIN 11853-2. Only "build in length" is different on Flange Groove and Flange Collar (NF and BF), both are longer in the DIN 11864-2 version.

Flange Connection (Flanschverbindung)

Parts Type Name	Parts Design Name	Connection Name
Flange Groove (Nutflansch)	NF	F
Flange Collar (Bundflansch)	BF	F
Blind Flange Groove (Blindnutflansch)	BNF	F
Blind Flange Collar (Blindbundflansch)	BBF	F
Screw (Sechskantshraube, Din En Iso 4017)		F
Nut (Sechskantmutter, Din En Iso 4032)		F
O-Ring	R	F

It is possible to blind from both Groove and Collar side, BNF and BBF in DIN 11853-2 and DIN 11864-2 are identical.

A complete connection (F) is: Flange Groove (NF) + Flange Collar (BF) + O-Ring (R) + Screw and Nut set.

DIN 11864-3

Same structure as DIN 11853-3. Only "build in length" is different on "Clamp Liner Groove" and Clamp Liner Collar (NKS and BKS), both are longer in the DIN 11864-3 version.

Clamp Connection (Klemmverbindung)

Parts Type Name	Parts Design Name	Connection Name
Clamp Liner Groove (Nutmstutzen)	NKS	K
Clamp Liner Collar (Bundklemmstutzen)	BKS	K
Blind Clamp Liner Collar (Blindbundklemmstutzen)	BNKS	K
Blind Clamp Liner Collar (Blindbundklemmstutzen)	BBKS	K
Clamp Ring (Klammer)		K
O-Ring	R	K

A complete connection (K) is: Clamp Liner Groove (NKS) + Clamp Liner Collar (BKS) + O-Ring (R) + Clamp Ring.

It is possible to blind from both Groove and Collar side, BNKS and BBKS in DIN 11853-3 and DIN 11864-3 are identical.

DIN 32676

Clamp Connection (Klemmverbindung)

Parts Type Name	Parts Design Name	Connection Name
Ferrule Short (Klemmstutzen Kurz)	KK	KK KL
Ferrule Long (Klemmstutzen Lang)	KL	KK KL
Blind (Blindklemmstutzen)	B	KK KL
Gasket (Dichtring)	D	KK KL
Clamp Ring (Klammer)		KK KL

A complete connection is: Ferrule x 2 + Gasket (D) + Clamp Ring.

It is possible to blind from both sides by changing one of the Ferrules with a Blind.

Length of assembled connections

Approx. length in mm of the assembled connections (Baulänge)

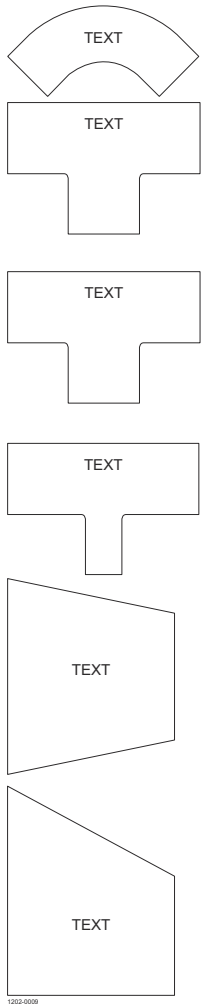
Nominal size	DIN 11851		DIN 11853			DIN 11864			DIN 32676	
	W and S	SK	1	2	3	1	2	3	KK	KL
DN10	35	27	32	48	44	76	80	76	37.7	58.9
DN15	35	27	32	48	44	76	80	76	37.7	58.9
DN20	37	27	34	48	44	76	80	76	37.7	58.9
DN25	45	31	42	48	44	77	80	77	44.7	73.7
DN32	51	31	48	48	48	88	90	88	44.7	73.7
DN40	53	31	50	48	48	88	90	88	44.7	73.7
DN50	57	33	54	48	49	89	90	89	44.7	73.7
DN65	65	35	62	48	53	113	108	113	57.7	97.7
DN80	75	35	72	52	57	117	116	117	57.7	97.7
DN100	89	41	86	52	60	120	116	120	57.7	97.7
DN125	70	49		56			120		57.7	133.7
DN150	76	56		56			120		57.7	133.7

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

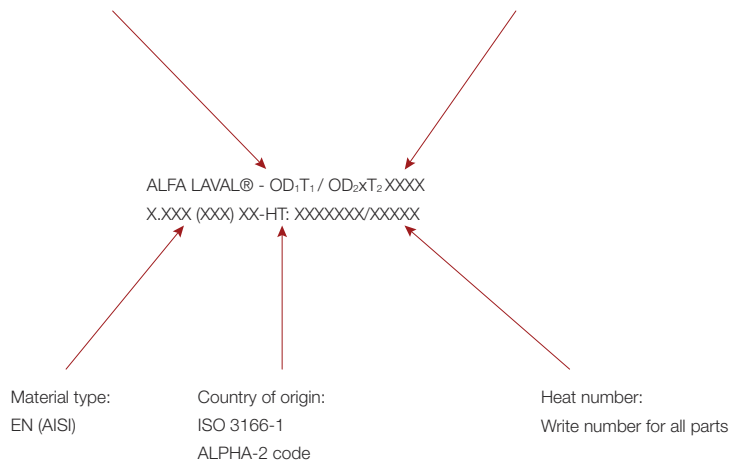


Tube dimensions:

Outer diameter and wall thickness

Surface

On reduced items both sizes has to be written See AL "description" on AL 2061 300



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

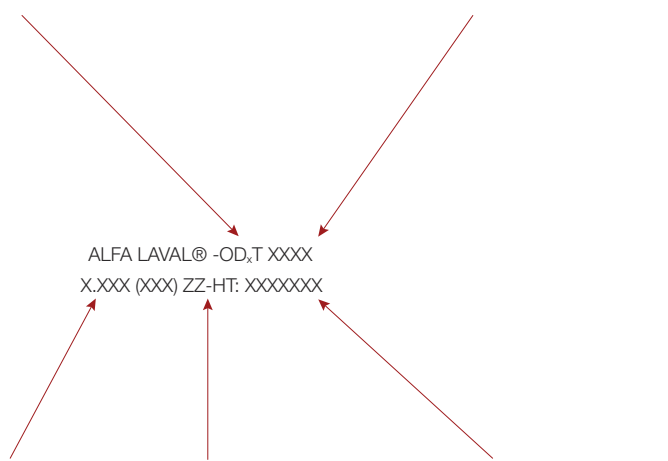
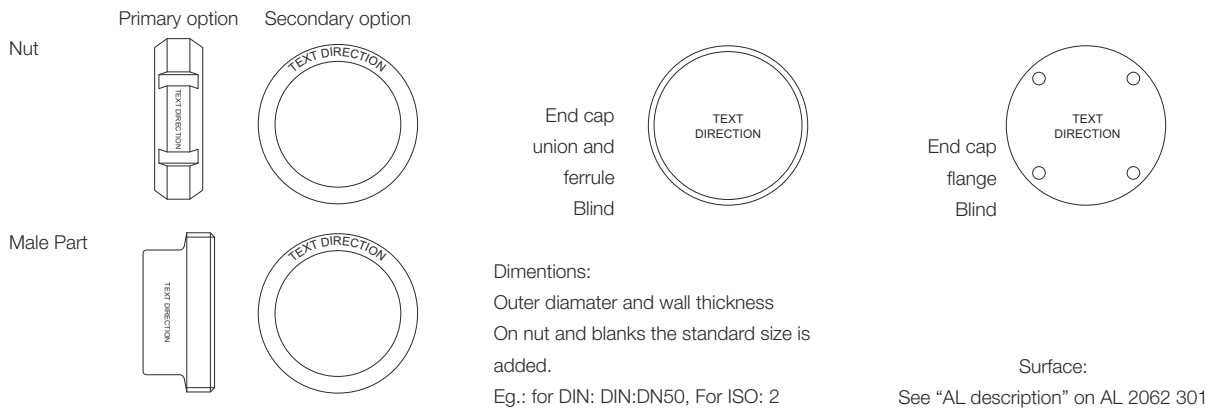
Example on reduced fitting with two heat number:

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".



Material type: EN (AISI)
Country of origin: ISO 3166-1 ALPHA-2 code
Heat number: Nut do not have a heat number All other fittings need a heat number

Font: Helvetica or Arial
Font size: adjusted to the tube size
Example on male part, liner, ferrule and flange
ALFA LAVAL® - 70x2.0 HSF0
1.4301 (304) CN-HT: 123456
Example on nut and blanks
ALFA LAVAL® - 70x2.0/HSF0
1.4301 (304) IN-HT: 123456
Example on secondary option, on nut, male part, liner and ferrule
ALFA LAVAL® - 70x2.0 HSF0 1.4301 (304) DK-HT: 123456

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 description	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

Basics

Test procedure

Our manufacturing facilities operate under an approved ISO 9001 quality standard. Wall thickness integrity is maintained using fabrication grade minimum wall tubing for all cold-formed tubular products.

Our fittings are put through visual inspection and ovality and squareness tolerances are inspected with calibrated equipment. Surface finish is inspected with calibrated profilometer to ensure the Roughness average (Ra) maximum is not exceeded.

Certificates

All product wetted stainless-steel products are delivered with a 3.1 certificate in accordance to EN 10204.

Packing

We protect our products by packing them into high quality cardboard boxes. This ensure they keep the high quality during storing and transportation.

Packing sizes as below:

DN10-DN80 = 10 pcs per cardboard box

DN100 = 5 pcs per cardboard box

> DN100 = 1 pcs per cardboard box

Rubber

Rubber Materials

In order to obtain the longest possible lifetime for rubber seals it is essential to choose the right quality for the actual duty. Consequently when choosing rubber quality, the characteristics of the different rubber types should be considered. All product wetted rubber material are in conformity of FDA.

EPDM Rubber (Ethylene Propylene)

EPDM rubber is widely used within the food industry as it is resistant to most products used in this sector. Another advantage is that it may be used to a recommend max. temperatures of 140°C (244°F). However, there is one essential limitation, EPDM is not resistant to organic and non-organic oils and fats. The resistance to ozone is excellent.

Acrylonitrile Butadiene Rubber, NBR

NBR is the rubber type most frequently used for technical purposes. It is quite resistant to most hydrocarbons, e.g oil, grease and fat. It is sufficiently resistant to diluted lye and nitric acid and may be used to a recommend max. 95°C (203°F). As NBR is attacked by ozone it may not be exposed to ultraviolet rays and should thus consequently be stored so that this is avoided.

Silicone Rubber, Q

The most significant quality of silicone rubber is that it can be applied from temperatures below -50°C (-58°F) to approx. + 180°C (356°F) and still keep its elasticity. The chemical resistance is satisfactory to most products. However, undiluted lye and acids as well as hot water and steam may destroy silicone rubber. The resistance to ozone is good.

Fluorine Rubber, FPM

FPM is often used when other rubber types are unsuited, especially at high temperatures up to approx. 180°C (356°F). The chemical resistance is good to most products, however hot water, steam, lye, acid and alcohol should be avoided. The resistance to ozone is good.

Hydrogenated acrylonitrileButadiene Rubber, HNBR

Mechanically strong and normally resistant to ozone and strong oxidizers, animal and vegetable fats, nonpolar solvents, oils and lubricants, water and aqueous solutions. The recommend max. temperature is 130°C (266°F).

Perfluoroalkoxy polymer, PFA

PFA is very similar to PTFE, but opposite to those PFA is thermo plastic and has minimal porosity. PFA has a very high mechanical strength which makes it a perfect choice when dealing with abrasive products. The PFA seal offers longer service intervals. The recommend max. temperature for the PFA seal is 90°C (194°F).

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	

Pressure ratings

EN 10357-A Tubes

Permissible max. Operating Pressures at a temperature of 20 °C

Nominal diameters													
DN	10	15	20	25	32	40	50	65	80	100	125	150	200
Permissible operating pressures in bar for tubes													
	355	242	200	159	131	112	87	87	72	59	47	39	30

The permissible operating pressures have been calculated for welded pipes with the calculation value for material number 1.4301 acc. to DIN EN 10088-2 product shape C (cold strip) taking into consideration calculation voltage of 100% in the welded seam.

Permissible max. Operating Pressures at a temperature of 150 °C

Nominal diameters													
DN	10	15	20	25	32	40	50	65	80	100	125	150	200
Permissible operating pressures in bar for tubes													
	219	150	124	98	81	69	53	54	44	36	29	24	18

Maximum pressure for the DIN Connections [bar]

The pressures are usable up to maximum 140 °C

Size	Standard						
	11851	11853-1	11853-2	11853-3	11864-1	11864-2	11864-3
DN10							
DN15							
DN20	40	40	25	40	40	25	40
DN25							
DN32							
DN40							
DN50				25			25
DN65	25	25	16		25	16	
DN80				16			16
DN100					16		16
DN125	16		10			10	
DN150							

Maximum pressure for the Tubular Fittings [bar]

The pressures are usable up to maximum 150 °C

Size	DIN 11852		
	TEES	BENDS	REDUCERS
DN10			
DN15			
DN20			
DN25	25	25	25
DN32			
DN40			
DN50			
DN65	16		
DN80		16	16
DN100	12.5		
DN125	10		
DN150	8	10	10
DN200	5		

For reduced Tees and Reducers the DN size refers to the largest diameter.

Pressure drop and flow velocity curves

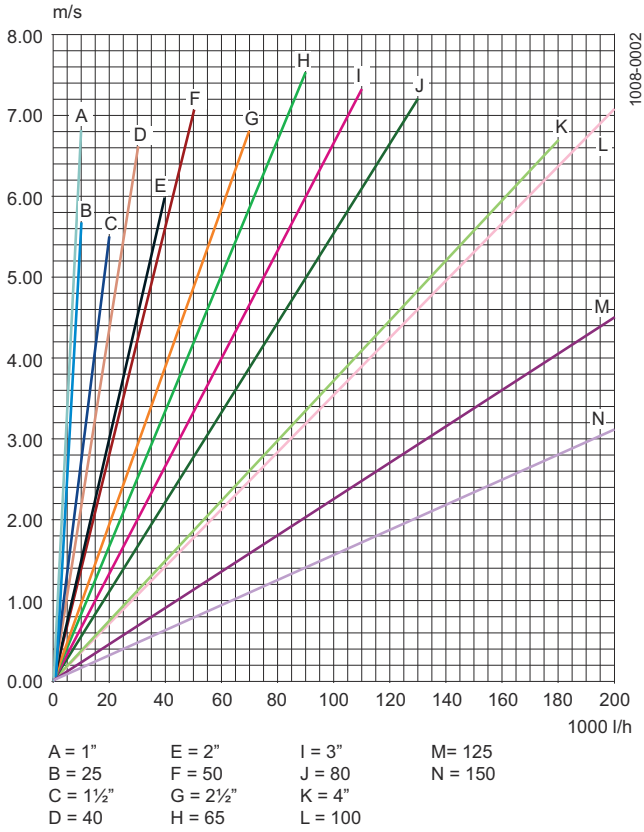


Figure 1. Flow velocity in ISO 2037 and EN 10357-A tubes

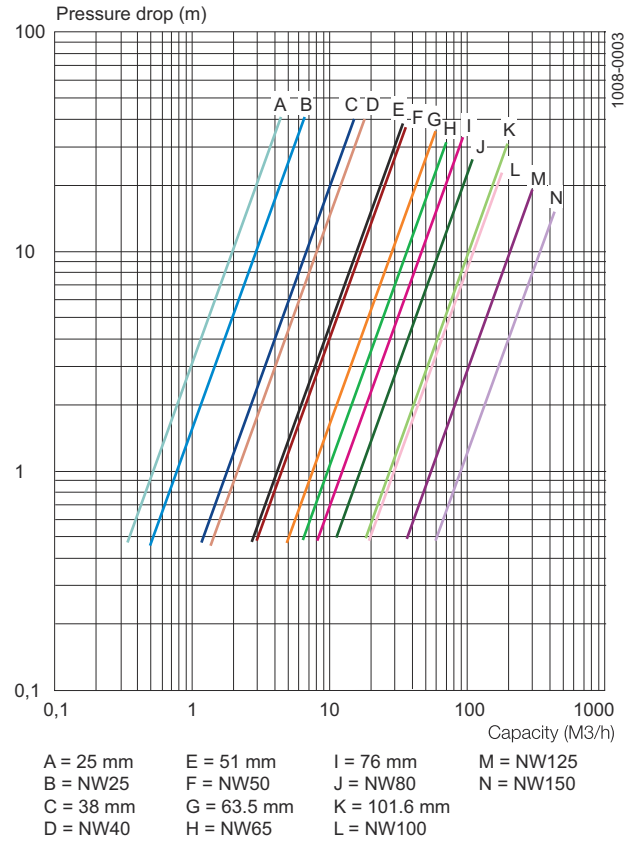


Figure 2. Pressure drop in 100 m ISO 2037 and EN 10357-A tubes

Steelgrades

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
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

(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.

Treatment of stainless steel

We will shortly touch two of the most important areas:

1. Heat treatment
2. Chemical surface treatment

Heat treatment

Processes where you are heating the metal to a certain temperature, which will make the atoms migrate in the crystal lattice.

We will focus on the most important.

Annealing

A process where the metal is heated to a temperature around 1050 ° - 1150 °C, kept there for a specific time and then cooled at a very slow and controlled rate. The process is used to:

- Reduce hardness
- Increase ductility
- Release mechanical stresses

After annealing the metal is more workable.

Chemical surface treatment

To understand why we do surface treatments, it is important to understand the role of the passive layer.

The passive layer is a thin invisible oxide film (most important are the chromium- and iron oxides), which protects the steel from its surroundings, and therefore from corrosion. If the layer is locally broken, for example by a scratch, it will, under normal conditions (clean surface and enough oxygen), naturally self-passivate, and thereby restore the ability to avoid corrosion. Stainless steels ability to have this in-built self-repairing corrosion protection system, is what we benefit from.

In some cases, typically after reworking the steel, we need to help the steel to restore the oxide film, here the surface treatment is important. The good thing is, stainless steel treated in the right way and not exposed above its "chemical strength", will last very long. On the other side, if the "rules" working with stainless steel are not followed or the stainless steel is placed in an environment above its "chemical strength", the oxide layer will "break" and corrosion will start, once the corrosion has started it will proceed very fast.

The two most common mentioned chemical surface treatments are "Pickling" and "Passivation".

Pickling

A process where the metal is put into an acid bath (typically 15 % Nitric acid and 3 % Hydrofluoric acid). Time and temperature of the bath is depending by the case. Pickling is used to remove weld heat tinted layers from the surface. A thin layer of metal is removed by the process and cleaning the steel, after the process the steel has totally lost its oxide film, but after flushing with water it will automatically be reestablished. It will take up to 24 hours before the layer is as robust as before the welding process.

Passivation

When the surface is clean the passivation (reestablishing the oxide film), is happening automatically, but as discussed above it will take some time before the layer has the natural strength. This can be forced to happen very fast by a chemical passivation. The passivation bath is one type of acid (normally 20 % Nitric acid). No metal is removed from the surface and the surface roughness is not changed, only the passive layer is strengthened.

Elastomer review

Elastomers

Seal rings are available in EPDM, FPM and PTFE

Elastomer properties

	EPDM	FPM	PTFE
FDA (CFR 21: 177.2600)	Yes	Yes	Yes
USP Class VI certified	No	No	No
Recommended operating temperature °C	-10 °C to +140 °C	-10 °C to +180 °C	-10 °C to +220 °C
Resistance			
Steam resistance	Yes	No	Yes
Alkali resistance	Yes	No	Yes
Resistance to fats/oils	No	Yes	Yes
Ozone resistance	Yes	Yes	Yes

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