

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Pipe Couplings, Bite and Compression Type**with type designation(s)
SWAGelok

Issued to

Swagelok Company
OLON OH, United States

is found to comply with

Det Norske Veritas' Rules for Classification of Ships
Offshore Standard DNV-OS-D101, Marine and Machinery Systems and Equipment
Det Norske Veritas' Standards for Certification 2.9 No. 5-792.20**Application :****The couplings including o-rings may be used in systems where a fire resistant type is not required. Couplings without o-rings may be used in systems where fire resistance is required. See certificate for detail.****Temperature range:** See certificate
Max. working press.: See certificate
Sizes: For tube O.D. 1/16" to 2" and 3mm to 50mmThis Certificate is valid until **2018-06-30**.Issued at **Høvik** on **2014-06-27**for **DNV GL**DNV GL local station: **New York**Approval Engineer: **Simon Ratcliffe**

Marianne Spæren Marveng
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

Bite and compression type couplings available with or without O-rings.

Material in couplings:

Stainless steel 316	ASTM A276 and A182
Carbon steel	ASTM A108
Brass 360	ASTM B-16
Bras 345/ 353	ASTM B-453
Brass 377	ASTM B-283
2507 Duplex Alloy	ASTM A479 and A182
400/R-405 Alloy (Monel)	ASTM B164 and B564
Alloy 20 (C-20)	ASTM B473 and B462
Alloy C-276 (Hastelloy C)	ASTM B574 and B564
Alloy 600 (Inconel)	ASTM B166 and B564
Titanium Grade 4	ASTM B348 and B381
Alloy 825	ASTM B425 and B564
Alloy 625	ASTM B446
SMO 254	ASTM A182

Material in O-rings:

- Viton
- Buna N Rubber/NBR

Type of fitting:

Designation	Type of Fitting
1	Male Connector
2	Male Elbow - 90°
3	Tee, Union
3TTF	Tee, Female Branch
3TFT	Tee, Female Run
3TTM	Tee, Male Branch
3TMT	Tee, Male Run
3TST	Tee, Positionable Run
3TTS	Tee, Positionable Branch
4	Cross, Union
5	Male Elbow - 45°
6	Union, Reducing Union
7	Female Connector
8	Female Elbow
9	Elbow, Union
11	Bulkhead Male Connector
61	Bulkhead Union
71	Bulkhead Female Connector
A	Adapter
C	Cap
P	Plug
PC	Port Connector
R	Reducer
R1	Bulkhead Reducer
F	Flange

Application/Limitation

The couplings are approved for use in the following systems:

System (acc. to DNV Ship Pt.4 Ch.6 Sec.7 Table E3)	Without O-ring	With O-ring (not approved fire resistant)
Flammable fluids (flash point ≤ 60 °C)		
Cargo oil ines	+	+4)
Crude oil washing lines	+	+4)
Vent lines	+	+3)
Inert gas		
Water seal effluent lines	+	+
Scrubber effluent lines	+	+
Main lines	+	+2) 4)
Distribution lines	+	+4)
Flammable fluids (flash point > 60 °C)		
Cargo oil ines	+	+4)
Fuel oil lines	+	NP
Lubricating oil lines	+	NP
Hydraulic oil	+	NP
Thermal oil	+	NP
Sea water		
Bilge lines	+	+1)
Fire main and water spray	+	NP
Foam system	+	NP
Sprinkler system	+	NP
Ballast system	+	+1)
Cooling water system	+	+1)
Tank cleaning services	+	+
Non-essential systems	+	+
Fresh water		
Cooling water system	+	+1)
Condensate return	+	+1)
Non-essential systems	+	+
Sanitary/drains/scuppers		
Deck drains (internal)	+	+3)
Sanitary drains	+	+
Scuppers and discharge (overboard)	+	NP
Sounding/vent		
Water tanks/dry spaces	+	+
Oil tanks (f.p > 60 °C)	+	NP
Misc.		
Starting/control air	+	NP
Service air (non essential)	+	+
Brine	+	+
CO2 system	+	NP
Steam	+	+
Abbreviations + Application permitted NP Application not permitted		
Footnotes		

System (acc. to DNV Ship Pt.4 Ch.6 Sec.7 Table E3)	Without O-ring	With O-ring (not approved fire resistant)
1) Not permitted inside machinery spaces of category A. 2) Not permitted inside machinery spaces of category A or accommodation spaces. May be accepted in other machinery spaces provided the joints are located in easily visible and accessible positions. 3) Above free board deck only. 4) Not permitted in pump rooms and open decks .		

The couplings may be used in Class I and Class II piping systems where $OD \leq 60.3$ mm. No such restriction applies to Class III piping systems.

The couplings are not approved for high-pressure fuel injection systems on diesel engines.

The couplings are not approved for use in vacuum lines or in systems contains more than 25% oxygen by volume.

Couplings of brass:

For use in sea water systems it is recommended not to use couplings with a high zinc content (> 30%) due to the possibility of dezincification.

Allowable temperature range is defined by type of materials used in the couplings:

Material	Min temperature	Max temperature
Stainless Steel	-29 °C	537 °C
Carbon Steel	-29 °C	190 °C
Brass	-29 °C	204 °C
2507 Duplex	-29 °C	204 °C
Alloy 400/R-405	-29 °C	427 °C
Alloy 20	-29 °C	427 °C
Alloy C-276	-29 °C	537 °C
Alloy 600	-29 °C	537 °C
Titanium	-29 °C	316 °C
Alloy 825	-29 °C	427 °C
Alloy 625	-29 °C	537 °C
SMO 254	-29 °C	316 °C

For couplings with O-rings, allowable temperature range is defined by quality of rubber in O-rings:

Job Id: **262.1-010298-4**
Certificate No: **TAP0000093**

Type of rubber	Min temperature	Max temperature	
		Dry air	Seawater and steam
Viton	-28 °C	200 °C	100 °C
Buna N	-40 °C	120 °C	80 °C
Rubber			

Allowable working pressures are based on the working pressure ratings of the tubing. The ratings below are based on tubing with the maximum suggested wall thickness for each tubing size (reference: manufacturer data sheets MS-01-107).

Imperial Tubing Ratings

Working pressure (psig)					
OD inch	Stainless Steel	Carbon Steel	Brass w/copper tubing	2507 Duplex	Alloy 400/R-405
1/16	12000	-	-	-	-
1/8	10900	10200	3600	-	10100
3/16	10200	9600	3400	-	-
1/4	10200	9600	3500	15000	9500
5/16	8000	7500	2700	-	-
3/8	7500	6200	2200	12700	6100
1/2	6700	5900	2100	12900	4400
5/8	6000	5300	1900	10000	-
3/4	5800	5100	1800	10000	4600
7/8	4800	4300	1500	-	-
1	4700	4100	1500	-	4300
1 ¼	4900	5000	-	-	-
1 ½	4900	5100	-	-	-
2	3600	3700	-	-	-

Working pressure (psig)					
OD inch	Alloys 20, C-276 and 600	Titanium	Alloy 825	Alloy 625	SMO 254
1/16	-	-	-	-	-
1/8	-	-	-	-	-
3/16	-	-	-	-	-
1/4	10200	9100	11600	14600	13900
5/16	-	-	-	-	-
3/8	6500	5800	8200	9400	8900
1/2	5100	4200	5900	6800	9000
5/8	-	-	-	-	-
3/4	-	-	5800	-	-
7/8	-	-	-	-	-
1	-	-	4200	-	-
1 ¼	-	-	-	-	-
1 ½	-	-	-	-	-
2	-	-	-	-	-

Metric Tubing Ratings

OD mm	Working pressure		
	Stainless Steel	Carbon Steel	Alloy 825
3	670 bar	790 bar	-
6	710 bar	590 bar	660 bar
8	520 bar	430 bar	-
10	580 bar	330 bar	480 bar
12	470 bar	420 bar	480 bar
14	430 bar	350 bar	-
15	400 bar	330 bar	-
16	400 bar	350 bar	-
18	370 bar	310 bar	400 bar
20	380 bar	310 bar	-
22	340 bar	280 bar	-
25	320 bar	260 bar	300 bar
28	330 bar	270 bar	
30	310 bar	250 bar	
32	330 bar	270 bar	
38	310 bar	260 bar	
50	270 bar		

Allowable working pressure is also dependent on the tube wall thickness, ref.: manufacturers catalogue MS-01-107.

At temperatures above 20 °C, the max working pressure shall be reduced as follows:

Temp. [°F]	Temp. [°C]	Stain- less Steel	Carbon Steel ¹⁾	Brass	2507 Duplex
100	37	1.00	1.00	1.00	1.00
200	93	0,85	0.95	0.80	0.90
300	149	0,77	0,89	-	0.85
400	204	0,71	0.81	0.50	0.82
500	260	0,67	N.A.	N.A.	-
600	315	0.63			-
800	427	0.58			-
1000	537	0.55			-

Temp. [°F]	Temp. [°C]	Alloy 400/R -405	Alloys 20 and C- 276	Alloy 600	Titanium	Alloy 825	Alloy 625	SMO 254
100	37	1.00	1.00	1.00	1.00	1.00	1.00	1.00
200	93	0.87	1.00	1.00	0.86	1.00	0.93	0.90
300	149	-	-	-	-	-	-	-
400	204	0.79	0.96	0.96	0.61	0.90	0.85	0.74
500	260	-	-	-	-	-	-	-
600	315	0.79	0.85	0.85	0.45	0.84	0.79	0.67
800	427	0.75	0.79	0.79	-	0.81	0.75	-
1000	537	-	-, 0.76 ²⁾	0.35	-	-	0.73	-

Job Id: **262.1-010298-4**
Certificate No: **TAP0000093**

Notes

- 1) Based on 375 °F (190 °C) max.
- 2) Alloy 20 not rated to 1000 °F (537 °C)

Type Approval documentation

Tests carried out

Repeated Assembly Test, Vibration Test, Pressure Pulsation Test, Pull-out Test and Burst Test.

Marking of product

For traceability to this Type Approval the products are to be marked with:

- Manufacturer's name or trade mark
- Type designation

Periodical assessment

For retention of the Type Approval, the DNV GL Surveyor shall perform a survey every second year to verify that the conditions for the type approval are complied with, and to witness burst test and pull-out test on samples of couplings selected at random from stock or from the running production. Obtained burst pressure shall at least be 4 times the max design pressure