DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP0000093
Revision No:
1

This is to certify:

That the Swage type couplings

with type designation(s)
SWAGELOK

Issued to
Swagelok Company
Solon, OH, USA

is found to comply with
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV GL class programme DNVGL-CP-0185 – Type approval – Mechanical joints

Application :

Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.

Temperature range:	**See certificate**
Max. working press.:	**See certificate**
Sizes:	**For tube O.D. 1/16" to 2"**

Issued at **Høvik** on **2018-10-11**

This Certificate is valid until **2023-06-30**.
DNV GL local station: **New York**

Approval Engineer: **Maheshraja Venkatesan**

for **DNV GL**

Digitally Signed By: Marveng, Marianne Spæren
Location: DNV GL Høvik, Norway

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.

Job Id: **262.1-028527-1**
Certificate No: **TAP0000093**
Revision No: **1**

Product description

Swage type compression couplings available with or without O-rings.

Material in couplings:

Stainless steel	Type 316	ASTM A479 and A182
	SMO 254 (UNS S31254) & UNS N08367	ASTM A182 & ASTM A479
Duplex steel	2507 Duplex Alloy (UNS S32750)	ASTM A479 and A182
Nickel alloy	400/R-405 Alloy (Monel – UNS N04400)	ASTM B164 and B564 (Hot finished)
	Alloy 20 (C-20 – UNS N08020)	ASTM B473 and B462
	Alloy C-276 (Hastelloy C - UNS N10276)	ASTM B574 and B564
	Alloy 600 (Inconel – UNS N06600)	ASTM B166 and B564
	Alloy 825 (UNS N08825)	ASTM B425 and B564
	Alloy 625 (UNS N06625 Grade 1 & 2)	ASTM B446
Titanium alloy	Grade 4	ASTM B348 and B381

Material in O-rings:

- Viton
- Buna N Rubber/NBR

Type of fitting:

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

Application/Limitation

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 below table for detail):

System (acc. to DNV GL Ship Rules Pt.4 Ch.6 Sec.9 Table 11)	**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)

System (acc. to DNV GL Ship Rules Pt.4 Ch.6 Sec.9 Table 11)	Without O-ring	With O-ring (not approved fire resistant)
Fuel oil lines	+	NP
Lubricating oil lines	+	NP
Hydraulic oil	+	NP
Thermal oil	+	NP
Sea water 5)		
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

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.
5) Pipe couplings made of austenitic stainless steel material grades covered by this certificate are not permitted to use in sea-water applications.

Materials and material protection chosen for the specific system shall be suitable for the intended medium and environmental conditions.

The couplings may be used in Class I and Class II piping systems where OD ≤ 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.

Minimum wall thickness of tubing shall follow the requirements stated in DNVGL Ship Rules Pt.4 Ch.6 Sec.9 [1.]

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

Material	***Min temperature***	***Max temperature***
Stainless Steel	-29 ºC	537 ºC
2507 Duplex	-29 ºC	204 ºC
Alloy 400/R-405	-29 ºC	427 ºC
Alloy 20	-29 ºC	427 ºC
Alloy C-276	-29 ºC	537 ºC
Alloy 600	-29 ºC	537 ºC
Titanium	-29 ºC	316 ºC
Alloy 825	-29°C	427°C
Alloy 625	-29°C	537°C
SMO 254, UNS N08367	-29°C	316°C

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

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

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's catalogue MS-01-107).

Imperial Tubing Ratings (psig)

OD (inch)	***Stainless Steel type 316***	***Carbon Steel***	***2507 Duplex***	***Alloy 400/ R-405***
1/16	12000	-	-	-
1/8	10900	10200	-	10100
3/16	10200	9600	-	-
1/4	10200	9600	15000	9500
5/16	8000	7500	-	-
3/8	7500	6200	12700	6100
1/2	6700	5900	12900	4400
5/8	6000	5300	10000	-
3/4	5800	5100	10000	4600
7/8	4800	4300	-	-
1	4700	4100	-	4300
1 ¼	4900	5000	-	-
1 ½	4900	5100	-	-
2	3600	3700	-	-

Max. working pressure (psig)					
OD (inch)	***Alloys 20, C-276 and 600***	***Titanium Gr. 4***	***Alloy 825***	***Alloy 625***	***SMO 254 & UNS N08367***
1/8	-	-	-	-	10900
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

3/4	-	-	5800	-	5300
1	-	-	4200	-	4500

For metric tube ratings, please refer to manufacturer's catalogue MS-01-107

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

Temp. [°F]	***Temp. [°C]***	***Stainless Steel type 316***	***2507 Duplex***	***Alloy 400/ R-405***	***Alloys 20 and C-276***
100	37	1.00	1.00	1.00	1.00
200	93	0.85	0.90	0.87	1.00
300	149	0.77	0.85	-	-
400	204	0.71	0.82	0.79	0.96
500	260	0.67	-	-	-
600	315	0.63	-	0.79	0.85
800	427	0.58	-	0.75	0.79
1000	537	0.55	-	-	-, 0.76 [1)]

Temp. [°F]	***Temp. [°C]***	***Alloy 600***	***Titanium Gr. 4***	***Alloy 825***	***Alloy 625***	***SMO 254 & UNS N08367***
100	37	1.00	1.00	1.00	1.00	1.00
200	93	1.00	0.86	1.00	0.93	0.90
300	149	-	-	-	-	-
400	204	0.96	0.61	0.90	0.85	0.74
500	260	-	-	-	-	-
600	315	0.85	0.45	0.84	0.79	0.67
800	427	0.79	-	0.81	0.75	-
1000	537	0.35	-	-	0.73	-

Notes
1) Alloy 20 not rated to 1000 °F (537 °C)

Type Approval documentation

- Swagelok Test Program (Spec.) dated October 22, 1982.
- Test results dated October 22, 1982
- Manufacturer's Catalogues:
  - MS-01-140, RevX, June 2018
  - Tubing data MS-01-107, RevP, April 2018
  - MS-02-200, R6, October 2017
  - MS-01-174, RevH, October 2017
- Test reports dated Dec. 2004, Feb. 2005, April 2005
- Test reports dated July 31, 2007 and September 12, 2007
- Drawings SS-1614-1A and SS1614-1
- Test reports (nitrogen gas seal, tensile pull, hydrostaic pressure, rotary flexure) covering Alloy 625.
- Test reports (nitrogen gas seal, tensile pull, hydrostaic pressure, rotary flexure) covering SMO 254.
- Renewal burst and pull out tests, dated 2014-04-28, witnessed by DNV GL.
- Renewal burst test report CTR-10166 Ver. 000 dated 2018-04-16 witnessed by DNV GL Surveyor

Tests carried out

Tightness 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, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.