



# TYPE APPROVAL CERTIFICATE

Certificate No:  
**TAP0000093**  
Revision No:  
**2**

## 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

**DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021**  
**DNV rules for classification – Ships Pt.4 Ch.6 Piping systems**  
**DNV class programme DNV-CP-0185 – Type approval – Mechanical joints**

## Application :

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

**Temperature range:** See page 4  
**Max. working press.:** See page 4  
**Sizes:** For tube O.D. 1/16" to 2"

Issued at **Høvik** on **2023-07-19**

for **DNV**

This Certificate is valid until **2028-06-30**.

DNV local unit: **New York**

Approval Engineer: **Maheshraja Venkatesan**

.....  
**Zeinab Sharifi**  
**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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



## 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 - 90°	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 - 45°		
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):

Systems	Without O-ring	With O-ring (not approved fire resistant)
<b>Flammable fluids (flash point ≤ 60 °C)</b>		
Cargo oil lines	+	+1)
Crude oil washing lines	+	+1)
Vent lines	+	+2)
<b>Inert gas</b>		
Water seal effluent lines	+	+
Scrubber effluent lines	+	+
Main lines	+	+1)
Distribution lines	+	+1)
<b>Flammable fluids (flash point &gt; 60 °C)</b>		
Cargo oil lines	+	+1)
Fuel oil lines	+	NP
Lubricating oil lines	+	+2)
Hydraulic oil	+	+2)

<b>Systems</b>	<b>Without O-ring</b>	<b>With O-ring (not approved fire resistant)</b>
Thermal oil	+	+2)
<b>Sea water 5)</b>		
Bilge lines	+	+3)
Water filled fire extinguishing systems, e.g. sprinkler systems	+	+2)
Non water filled fire extinguishing systems, e.g. foam, drencher systems	+	+2)
Fire main (not permanently filled)	+	+2)
Ballast system	+	+3)
Cooling water system	+	+3)
Tank cleaning services	+	+
Non-essential systems	+	+
<b>Fresh water</b>		
Cooling water system	+	+3)
Condensate return	+	+3)
Non-essential systems	+	+
<b>Sanitary/drains/scuppers</b>		
Deck drains (internal)	+	+4)
Sanitary drains	+	+
Scuppers and discharge (overboard)	+	+
<b>Sounding/vent</b>		
Water tanks/dry spaces	+	+
Oil tanks (f.p > 60 °C)	+	+2)
<b>Miscellaneous</b>		
Starting/control air	+	+3)
Service air (non essential)	+	+
Brine	+	+
CO <sub>2</sub> system (outside protected space)	+	+
CO <sub>2</sub> system (inside protected space)	+	NP
Steam	+	+
<b>Abbreviations</b>		
+ Application permitted		
NP Application not permitted		
<b>Footnotes</b>		
1) Not permitted in pump rooms and open decks.		
2) Not permitted except in cases where such mechanical joints are installed on exposed open decks, as defined in SOLAS II-2/Reg. 9.2.3.3.2.2(10) and not used for fuel oil lines.		
3) Not permitted in machinery spaces of category A.		
4) Permitted only above bulkhead deck of passenger ships and freeboard deck of cargo ships.		
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 DNV Ship Rules Pt.4 Ch.6 Sec.9 [1].

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

<b>Material</b>	<b>Min temperature</b>	<b>Max temperature</b>
Stainless Steel	-51 °C	537 °C
2507 Duplex		250 °C
Alloy 400/R-405		427 °C
Alloy 20		427 °C
Alloy C-276		537 °C
Alloy 600		537 °C
Titanium		316 °C
Alloy 825		427 °C
Alloy 625		537 °C
SMO 254, UNS N08367		316 °C

Impact testing for low temperature applications shall follow the applicable requirements stated in DNV Ship Rules Pt.2 Ch.2.

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

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

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)**

<b>OD (inch)</b>	<b>Stainless Steel type 316</b>	<b>2507 Duplex</b>	<b>Alloy 400/ R-405</b>
1/16	12000	-	-
1/8	10900	-	10200
3/16	10200	-	-
1/4	10200	15000	9600
5/16	8000	-	-
3/8	7500	12700	6100
1/2	6700	12900	4400
5/8	6000	10100	-
3/4	5800	10000	4600
7/8	4800	-	-
1	4700	-	4300
1 ¼	4900	-	-
1 ½	4900	-	-
2	3600	-	-

**Max. working pressure (psig)**

<b>OD (inch)</b>	<b>Alloys 20, C-276 and 600</b>	<b>Titanium Gr. 4</b>	<b>Alloy 825</b>	<b>Alloy 625</b>	<b>SMO 254 &amp; UNS N08367</b>
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	0.99	0.87	1.00
300	149	0.77	-	-	-
400	204	0.71	0.91	0.79	0.96
500	260	0.67	0.90 <sup>1)</sup>	-	-
600	315	0.63	-	0.79	0.85
800	427	0.58	-	0.75	0.79
1000	537	0.55	-	-	-, 0.76 <sup>2)</sup>

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) The specified derating factor corresponds to 250°C which is the maximum design temperature limit for 2507 Duplex material
- 2) 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, Rev AH, May 2023
  - Tubing data MS-01-107, Rev V, January 2023
  - MS-02-200, Rev J, August 2021
  - MS-01-174, Rev M, June 2021
- 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
- Renewal burst test report CTR-10778 Ver 00 dated June 21, 2023, witnessed by DNV.
- Table – TAP0000093 Renewal – Lower Temperature to -51°C for listed materials per ASME/ASTM material properties
- Alloy 2507 Elevated temperature factors

**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



Job Id: **262.1-028527-2**  
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### **Periodical assessment**

For retention of the Type Approval, a DNV 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 DNV-CP-0338.