DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. **P-13658**

This is to certify that the
Pipe Couplings, Bite and Compression Type

with type designation(s)
SWAGELOK

Manufactured by
Swagelok Company
SOLON 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 may be used in the following systems: Fresh water, Sea water, Water-based hydraulic oil, Compressed air and Steam. Couplings without o-rings may also be used in systems as specified in Application/Limitations. See certificate.

Temperature range:	**See certificate**
Max. working press.:	**See certificate**
Sizes:	**For tube O.D. 1/16" to 2" and 3mm to 50mm**

Høvik, 2010-11-22
for **Det Norske Veritas AS**

for **Marianne Spæren**
Head of Section

DNV local office:
New York

This Certificate is valid until
2014-06-30

Tom Berg-Nielsen
Surveyor

Product description

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
SAF-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	ASTM B348 Grade 4
Alloy 825	ASTM B 564 and B425

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 may be used in the following systems: Fresh water, Sea water, Water-based hydraulic oil, Compressed air and Steam.

In addition, the couplings without O-rings may be used for the following service:

1. Commercial propane, including max 5 mol% ethane in liquid phase
2. Butane
3. Butadiene 1,3 (Inhibited)
4. Propylene
5. Naphta
6. Butane/propane mixture
7. Butylene
8. Anhydrous ammonia (only couplings with stainless steel material)
9. Hydraulic oil
10. Fuel oil
11. Lubricating oil

The type approval does not cover different chemicals, except as above. Such applications will have to be evaluated in each separate case.

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

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
SAF 2507 Duplex	-29 °C	316 °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

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 °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 data sheets MS-01-107)

Imperial Tubing Ratings

Working Pressure (psig)								
OD inch	Stainless Steel	Carbon Steel	Brass w/copper tubing	SAF 2507 Duplex	Alloy 400/R-405	Alloys 20, C-276 and 600	Titanium	Alloy 825
1/16	12000	-	-	-	-	-	-	-
1/8	10900	10200	3600	-	10100	-	-	-
3/16	10200	9600	3400	-	-	-	-	-
1/4	10200	9600	3500	15000	9500	10200	9100	**11600**
5/16	8000	7500	2700	-	-	-	-	-
3/8	7500	6200	2200	12700	6100	6500	5800	**8200**
1/2	6700	5900	2100	12900	4400	5100	4200	**5900**
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	-	-	-	-	-	-

Metric Tubing Ratings

OD mm	Working pressure			OD mm	Working pressure	
	Stainless Steel	Carbon Steel	Alloy 825		Stainless Steel	Carbon Steel
3	670 bar	790 bar	-	20	380 bar	310 bar
6	710 bar	590 bar	660 bar	22	340 bar	280 bar
8	520 bar	430 bar	-	25	320 bar	260 bar
10	510 bar	330 bar	480 bar	28	330 bar	270 bar
12	470 bar	420 bar	480 bar	30	310 bar	250 bar
14	430 bar	350 bar	-	32	330 bar	270 bar
15	400 bar	330 bar	-	38	310 bar	260 bar
16	400 bar	350 bar	-	50	270 bar	
18	370 bar	310 bar	-			

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

The wall thickness and material of the tubes are to be in accordance with the current Rules of Det Norske Veritas.

The approval is only valid when the couplings are assembled with tubing of correct temper and tolerances as recommended by the manufacturer.

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

Temp. [°F]	Temp. [°C]	Stain-less Steel	Carbon Steel	Brass	SAF 2507 Duplex	Alloy 400/R-405	Alloys 20 and C-276	Alloy 600	Titaniu m	Alloy 825
100	37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
200	93	1.00	0.95	0.80	0.90	0.87	1.00	1.00	0.74	1.00
300	149	-	-	-	0.85	-	-	-	-	-
400	204	0.96	0.87	0.50	0.82	0.79	0.96	0.96	0.52	0.90
500	260	-	N.A.	N.A.	0.81	-	-	-	-	-
600	315	0.85			0.80	0.79	0.85	0.85	0.38	0.84
800	427	0.79			-	0.75	0.79	0.79	-	0.81
1000	537	0.76			-	-	0.76	0.35	-	-

Type Approval documentation

- The approval is based on the following documentation:
- Swagelok Test Program (Spec.) dated October 22, 1982.
- ASME Quality System Certificate (Materials) no. QSC 444.
- Test results dated October 22, 1982.
- Quality System Manual dated December 10, 2007
- AB Statens Anleggningsproving: Type Certificate no. 5936 dated 1985-12-20.
- Manufacturer's Catalogues MS-01-140, MS-02-15 and MS-01-82.
- At renewal 1993: Manufacturers test reports dated 22 September 1993.
- Test reports as received with letters dated 12 March, 1998 and 16 January, 1998.
- At renewal 2001: Manufacturers test reports dated 11 November and 18 December 2001, catalogues MS-01-140, MS-01-174, MS-02-15, MS-01-82 and supplement sheets. Reviewed Swagelok Quality Assurance Manual dated 22 September 2001.
- At renewal 2006: ISO9001 Certificate and Quality Manual.
- Manufacturer's catalogues MS-01-107, MS-20-200, MS-01-174.
- 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

Tests carried out

Repeated Assembly Test, Vibration Test, Impulse test, Tensile Pull 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

Certificate retention survey

For retention of the Type Approval, the DNV 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.

END OF CERTIFICATE