

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP000020U
Revision No:
2

This is to certify:

That the Pipe Couplings, Bite and Compression Type

with type designation(s)
u2 Twin Ferrule Fittings for metric and fractional tube sizes

Issued to

Schwer Fittings GmbH
Denkingen, Baden-Württemberg, Germany

is found to comply with

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

Application :

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

Temperature range: -55°C up to +300°C
Max. working press.: 270bar up to 810 bar. See certificate.
Sizes: Metric size 6 mm up to 28 mm / Fractional size 1/16" up to 1"

Issued at **Høvik** on **2023-01-18**

for **DNV**

This Certificate is valid until **2025-04-06**.

DNV local unit: **Augsburg**

Approval Engineer: **Hagen Markus**

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Sven Klinger
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

The u2 Twin Ferrule Fittings are classified as “compression coupling – swage type”, reference Pt.4 Ch.6 Sec. 9 - Table 8 Examples of mechanical joints

The fittings are metallically sealed and consist of the fitting body, a back and a front ferrule and coupling nuts with silver-plated thread.

Standard materials are stainless steel 316 / 316L, for both metric and fractional tube sizes.

Some fittings use soft sealings as follows:

ES – **E**lastomer **S**eal (Soft Seal) and RS – **R**ing **S**eal (metal ring with vulcanized Elastomer)

CS – **C**orner **S**eal (metal on metal)

Reference: Schwer Fittings catalogue “Instrumentation / Vacuum IT 5”.

Scope

This type approval includes the fitting types as specified above and in the u2 catalogue issue date 10/2019 (partly with rubber seal). Not included are needle valves, check valves, ball valves, filter and flanges.

Fitting types

Tube to Tube		Tube to Male Connector	
Short sign	Description	Short sign	Description
U	Union	MC_R, MC_G_ES, MC_G_RS, MC_G_CS, MCJ_JIC, MC_OR, MC_SAE ¹	Male Connector
		MCL_SAE ¹	Male Connector long
RU	Reducing Union	BMC_NPT, BMCJ_JIC	Bulkhead Male Connector
BU	Bulkhead Male Connector	ME45_NPT, ME45_SAE ¹	45 Degree Male Elbow
RBU	Reducing Bulkhead MC	ME_NPT, ME_R, ME_G_OR, ME_SAE ¹	Male Elbow
E	Union Elbow	MRT_NPT, MRT_G_OR, MRT_SAE ¹	Male Run Tee
T	Union Tee	MBT_NPT, MBT_G_OR, MBT_SAE ¹	Male Branch Tee
RT	Reducing Union Tee		
C	Union Cross		
TC	Tube Cap Union		not applicable

Note¹: For SAE J1926 / MS 16142 tapped holes with cylindrical thread.

Tube to Welded Ports		Tube to Female Connector	
Short sign	Description	Short sign	Description
FC_NPT, FC_R, FC_G	Female Connector	WPC	Weld Pipe Connector
GC_G	Gauge Connector	SWC	Socket Weld Connector
BFC_NPT	Bulkhead Female Connector	WPE	Weld Pipe Elbow
FE_NPT	Female Elbow	SWE	Socket Weld Elbow
FRT_NPT	Female Run Tee		
FBT_NPT	Female Branch Tee		

Tube to Shaft

Short sign	Description
RUS / US / URS	(Reducing) Union with Shaft
RUSL	Union with long Shaft
BUS	Bulkhead Union with Shaft
EUS	Union Elbow with Shaft
TUBS, TU2S, TURS	Union Tee with Shaft

For the following pipe coupling types limitations as specified in the Rules Pt.4 Ch.6 are to be observed:

Bulkhead couplings

The following **screwed bulkhead couplings** are not approved through tank walls, watertight decks and bulkheads. For application through fire divisions a separate type approval is required.

- Bulkhead Union **BU**, Reducing Bulkhead Male connector **RBU**
- Bulkhead Male connector **BMC-N**, Bulkhead Male connector for Bonded Seal **BMC-G-RS**
- Bulkhead Male connector JIC37° **BMCJ-U-JIC**

Pipe connectors where pressure -tight joints are made on the threads are limited in the application as follows:

Pipe connector design	Range of application ¹	
..with tapered or parallel thread	not approved for toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur	
..with parallel thread	approved for pipe class III	up to outside diameter 60.3mm
..with tapered thread	approved for pipe class I	up to outside diameter 33.7mm
	approved for pipe class II, III	up to outside diameter 60.3mm

Note
¹ Refer to DNV Rules, Pt.4, Ch.6 – Section 9 – 5.2.6.

Overview of threaded pipe couplings with limitations

Type	Name
MC-NPT, MC-R	Male stud connector
ME-NPT, ME-R	Male Elbow
MBT-NPT	Male Branch Tee
FE-NPT, FRT-NPT, FBT-NPT	Female Branch Tee

All other fittings with thread connection not listed in the above table may be used without limitations.

Application

The **u2 Twin Ferrule Fittings** are type approved for application in pipe class I, II and III piping systems.

Approved application according to Pt. 4 Ch. 6, Sec. 9 – Table 9 Application of mechanical joints – Compression couplings – Metallic sealing (fire resistant type).

Limitation

Fire resistance capability of couplings with rubber seals has not been tested. Application limitation acc. to “Footnotes – Fire resistance capability” of Table 9 are to be observed.

In general compression couplings are not approved for application in high pressure fuel injection systems of combustion engines.

Selection of materials

The standard stainless-steel materials AISI 316 (1.4401) and AISI 316L (1.4404) are suitable in marine atmospheric environment and flowing sea water but not suitable in piping systems with stagnant sea water.

It shall be noted that the selection of the materials considers the intended service condition and installation area of the piping system. In particular, the resistance to corrosion, erosion, oxidation and other deterioration which may occur during intended service life.

Reference is made to DNV Rules Pt.4 Ch.6 – Section 2 – Materials.

Sizes and pressure range¹

Metric fittings acc. to tube diameter²

OD [mm]	6	8	10	12	14	15	16	18	20	22	25	28
PN - Nominal Pressure [bar]	700	520	450	390			360			270		320

Fractional fittings acc. to tube diameter³

OD [inch]	1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	7/8"	1"
PN - Nominal Pressure [bar]	810	750	710		540	440		400	380	270	

Notes

¹ Max. working pressure of the piping system depend on selected pipe material, pipe wall thickness and individual PN of selected tube fittings and valid for temperature range - 54°C to 20°C. For service temperatures above 50°C the pressure reduction factors specified by manufacturer are to be observed.

² Pipe tolerances acc. to EN10305

³ Pipe tolerances acc. to ASTM A213/269

Temperature range

The temperature range for the fittings are limited by the selected soft seal material and/or fitting material.

Seal material Rubber or with rubber	
Elastomer sealing NBR	-30°C up to +100°C
Elastomer sealing FKM	-20°C up to +200°C
Elastomer sealing EPDM	-50°C up to +150°C

Assembling and Installation

For the assembling and installation, the instructions specified in the Schwer Fittings GmbH catalogue u2 issue date 10/2019 are to be observed.

For selection of the fittings and tube dimensions for the specific application the maximum allowable service pressures and tube qualities specified in the u2 assembly instruction brochure are to be observed. (www.schwer.com)
 Assembling of the fittings shall be carried out according to manufacturer assembly instructions.

This certificate is valid for pipe connections using pipe couplings manufactured by Schwer Fittings GmbH.

Responsibilities

The company Schwer Fittings GmbH, D-78588 Denkingen, Germany, takes the responsibility that the design and the production of the products are in compliance with the Rules, Standards and/or Regulations listed on page 1 of this certificate.

Type Approval Documentation

TAP000020U, Rev.1

- Technical update optimization of back ferrule to optimize shear stress distribution
- Burst testing on modified pipe joints "WOM..."

Test reports

- Summarized Test protocol Excel file_220907_22NEA1111_rev_1
- Pressure graphs sizes 12, 18 and 25
- Summarized burst pressure results pdf "DNV Test Prototypen Klemmring Änderung" signed by DNV surveyor, 09.09.2022

Miscellaneous documents

Schwer Fittings product catalogue "Instrumentation / Vacuum IT5", 2022

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Test reports

IMA Dresden K056/14_Tests for Type Approval of u2 Twin Ferrule Fittings

Test scope:

- Tightness Test, Pressure Test, Burst Test, Vacuum Test
- Combined Pressure Pulsation and Vibration Test
- Pull-out Test
- Repeated Assembly Test

IMA Materialforschung und Anwendungstechnik GmbH, Dresden, Germany_dated 2014-12-29

DNVGL documentation:

Audit report dated 2019-12-03

GL TA Certificate 61703-14_dated 2015-02-23

GL Approval Reference 14-052446, 14-060873 and 14-081713

ISO 9001:2015 and ISO 14001:2015 Certificate, dated 2018-05-22

Lloyd's Register Deutschland GmbH

Schwer Fittings GmbH documentation:

Product catalogue incl. Installation instruction, dated 2019-10

Burst and Tightness Test reports

2 x QUm25-4L – Union Straight (1043 bar / 270 bar)

2 x QUm12-4L - Union Straight (1401 bar / 390 bar)

2 x QTm18-4L – T-Union (1318 bar / 360 bar)

2 x QTm12-4L - T-Union/90° Elbow (1318 bar / 360 bar)

Laboratory Schwer Fittings GmbH (Quality Department), dated 2019-12-19

QC-RS1 15/051 - Certificate of quality DIN 55350-18-4.2.2 – Pressure Test Plant

Maximator GmbH, dated 2019-11-06

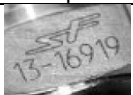
Type tests

DNV CP-0185

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

Marking of product

For traceability of products, marking shall be legible and indelible. Products are to be marked at least as follows:

Scope	Example
Manufacturer's name or trademark, Schwer monitoring no. (lasered)	
Type designation	u2-Lok, U2-MCm16G12CS, D16 / G1/2"
Fitting material grade	"-4": 1.4401 / AISI316 "-4L": 1.4404 / AISI 316L



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Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment to verify that the conditions for the Type Approval are complied with. Refer to the Class Programme DNV-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

End of certificate