

**THE NETHERLANDS**  
(N E D E R L A N D)**EC TYPE-APPROVAL CERTIFICATE**

Communication concerning:

- EC type-approval <sup>(1)</sup>
  - ~~extension of EC type approval~~ <sup>(1)</sup>
  - ~~refusal of EC type approval~~ <sup>(1)</sup>
  - ~~withdrawal of EC type approval~~ <sup>(1)</sup>
- } of a type of  
hydrogen component

with regard to Regulation (EC) number 79/2009, as implemented by Regulation (EU) number 406/2010.

**EC type-approval number** : **e4\*79/2009\*406/2010\*0001\*00**

Reason for extension :

## SECTION I

- 0.1. Make (trade name of manufacturer) : BMT Co Ltd
- 0.2. Type : SUPERLOK TUBE FITTINGS
- 0.3. Means of identification of type, if marked on the component <sup>(2)</sup> : Laser marked on the body of tube fittings
- 0.3.1. Location of that marking : Laser marked on the body of tube fittings
- 0.5. Name and address of manufacturer : BMT Co Ltd  
21-1, Bukjeong-dong  
Yangsan-si Gyeongsangnam-do, 626-110  
South Korea
- 0.7. In the case of components and separate technical units, location and method of affixing of the EC approval mark : Laser marked on the body of tube fittings
- 0.8. Name(s) and address(es) of assembly plant(s) : BMT Co Ltd  
21-1, Bukjeong-dong  
Yangsan-si Gyeongsangnam-do, 626-110  
South Korea

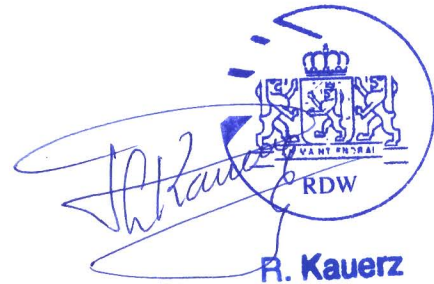


- 0.9. Name and address of manufacturer's : NA  
representative (if any)

**SECTION II**

- |    |   |   |
|----|---|---|
| 1. | Additional information<br>(where applicable)                | : see Addendum  |
| 2. | Technical service responsible for<br>carrying out the tests | : Kiwa Nederland B.V.<br>P.O.Box 137<br>7300AC Apeldoorn<br>The Netherlands |
| 3. | Date of test report   | : 24-04-2012  |
| 4. | Number of test report                                       | : 126069  |
| 5. | Remarks (if any)  | : see Addendum  |
| 6. | Place   | : Zoetermeer  |
| 7. | Date  | : 12-JUN-2012   |
| 8. | Signature   | :   |

Attachments:  
– Information package.  
– Test report.



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<sup>(1)</sup> Delete where not applicable.

<sup>(2)</sup> If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered by this information document, such characters shall be represented in the documentation by the symbol '?' (e.g. ABC??123??).

## ADDENDUM

to EC type-approval certificate number: e4\*79/2009\*406/2010\*0001\*00

relating to EC component type-approval of a hydrogen component or system

1. Additional information
  - 1.1. ~~Hydrogen system designed to use liquid hydrogen/Hydrogen system designed to use compressed (gaseous) hydrogen/Hydrogen component designed to use liquid hydrogen/Hydrogen component designed to use compressed (gaseous) hydrogen~~<sup>(1)</sup>
2. Specifications and test results
  - 2.1. Containers designed to use compressed (gaseous) hydrogen
    - 2.1.1. Container material specifications



Material specifications		Applicable to material						Details
		Steel	Aluminium alloy	Plastic liner	Fibre	Resin	Coating	
	Material manufacturer	V	V	V	V	V		
	Type of material	V	V	V	V	V		
	Material identification	V	V	V	V	V		
	Heat treatment definition	V	V					
	Chemical composition	V	V					
	Cold or cryoforming procedure	V						
	Welding procedure definition	V	V					

- 2.1.2. Container material test results

Material test		Applicable to material						Specified material value	Test value
		Steel	Aluminium alloy	Plastic liner	Fibre	Resin	Coating		
	Tensile test	V	V	V					
	Charpy impact test	V							
	Bend test	V	V						
	Macroscopic examination	V							

Material test	Applicable to material						Specified material value	Test value
	Steel	Aluminium alloy	Plastic liner	Fibre	Resin	Coating		
Corrosion test		✓						
Sustained load cracking test		✓						
Softening temperature test			✓					
Glass transition temperature test					✓			
Resin shear strength test					✓			
Coating test						✓		
Hydrogen compatibility test	✓	✓	✓	✓	✓			

2.1.3. Container test results

Container test	Specified design value	Test result
Burst Test		
Ambient Temperature Pressure Cycle Test		
LBB Performance Test		
Bonfire test		
Penetration Test		
Chemical Exposure Test		
Composite Flaw Tolerance Test		
Accelerated Stress Rupture Test		
Extreme Temperature Pressure Cycle Test		
Impact Damage Test		
Leak Test		
Permeation Test		
Boss Torque Test		
Hydrogen Gas Cycling Test		

3. Restriction of use of the device (if any) :

4. Remarks :

<sup>(1)</sup> Delete where not applicable.



**1 HEADING SHEETS (report contents)**

**2 SUMMARY SHEETS**

**3 IDENTIFICATION SHEETS**

**4 DECLARATION SHEETS**

**5 TEST SHEETS**

**6 RESULT SHEETS**

**7 DRAWING AND TECHNICAL DESCRIPTION SHEETS**

**8 CORRESPONDENCE SHEETS**

**9 Kiwa Nederland B.V. FILES (if applicable, included  
in Kiwa Nederland B.V. report only)**

**10 UPDATES (if applicable)**

Date of report: 24-04-2012

# COMMISSION REGULATION (EC) NO 79/2009 test report

**HYDROGEN PARTS**

**Series** SUPERLOK TUBE FITTINGS

BMT Co. Ltd.

Yongsan-si

South Korea

Report number: 126069

**CERTIFICATION**

File Issue: 001	<b>HEADING SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: HS 1/00

### **Report contents:**

<b><u>Sheet</u></b>	<b><u>Chapter</u></b>	<b><u>Code</u></b>	<b><u># Pages</u></b>
Heading Sheets	1	HS	2
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Measurement equipment in use uncertainties	6	RU	1
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(if applicable, included in Kiwa Nederland B.V. report only)			
Updates (if applicable as identified in the Report History Sheets)	10		

Note: The revision number of each page of this report is identified in the right heading of the page by means of the last 2 digits in the page number (e.g. HS 1/00, Heading Sheet page 1, revision 00).

### **Report history:**

<b>Date:</b>	<b>Description:</b>	<b>Report No:</b>	<b>Job Ref:</b>
24-04-2012	New (initial report)	126069	126069
Any modification and/or extension made to this report shall be recorded in a Report History Sheet and be inserted as a first page when opening this report. This sheet shall detail the modification and/or extension applicable to this initial report and shall clearly state where these details can be found. A copy of this sheet shall also be provided to the applicant/manufacture, in order to keep the reports identical.			

Signed by Test Engineer:

Name:

Date: 24-04-2012

Henry Rooks




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Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>HEADING SHEETS</b>	 Partner for progress
Report Number: 126069	Hydrogen Parts	Page: HS 2/00

Responsible Test House: Kiwa Nederland B.V.  
Address: Wilmersdorf 50  
7327 AC Apeldoorn  
P.O. Box 137  
7300 AC Apeldoorn  
The Netherlands  
Telephone: + 31 555 393 393  
Facsimile: + 31 555 393 685  
E-mail: [automotive@kiwa.nl](mailto:automotive@kiwa.nl)

Name of the Applicant: BMT Co. Ltd.  
Address: 21-1, Bukjeong-dong, Gyeongsangnam-do,  
626-110, Yangsan-si  
South Korea

Name of the Manufacturer: BMT Co. Ltd.  
Address: 21-1, Bukjeong-dong, Gyeongsangnam-do,  
626-110, Yangsan-si  
South Korea

Test report of the examination of the:


<b>HYDROGEN PARTS</b>
<b>Series SUPERLOK TUBE FITTINGS</b>

Tested and examined to:

REGULATION (EC) No 79/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 14 January 2009  
On type-approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC

Job Reference: 126069	Initials: Dijkhpa
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File Issue: 001	<b>SUMMARY SHEETS</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	Hydrogen parts	Page: SS 1/00

The HYDROGEN PARTS, Series SUPERLOK TUBE FITTINGS made by BMT Co. Ltd., meet(s) the requirements of:

REGULATION (EC) No 79/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 14 January 2009  
On type-approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC

See the Identification Sheets for all available types.

Signed in Acceptance:



Name: Paul Dijkhof


Date: 24-04-2012

Project Manager Automotive Systems  
Kiwa Nederland B.V.

Notes:

The described test results are only valid for the tested materials and objects

Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	Information Sheets	 Partner for progress
Report Number: 126069	Hydrogen parts	Page: IS 1/00

Type break down:

Type: SUPERLOK TUBE FITTINGS e4\*79/2009\*406/2010\*0001\*

Make: BMT Co. Ltd.

Temperature range: -40°C up to 120°C

Product: Fittings

Description: compression fittings with front and back ferrule


Working pressure: See information document no: BMT-Q-120404-01 page 6 of 19.

Material: 316 STAINLESS STEEL, For Bar Stock: ASTM A276, ASTM A479, ASME SA479 For Forging: ASTM A182, ASME SA182

Versions:

SU-8 Union 1/2
SRU-8-6 Reducing union 1/2x3/8
SBHRU-8-6 Bulkhead reducing union 1/2 x3/8
SBHU -8 Bulkhead union 1/2"
SMC-8-8N M-Connector 1/2xNPT1/2
SGMC-8-8G Gauge male connector 1/2xPF1/2
SGC-8-8G Gauge connector 1/2x1/2PF
SMCB-8-8N Bulkhead male connector 1/2x1/2NPT
SUE-8 Union elbow 1/2
SME-8-8N Male elbow 1/2xNPT1/2
SHME-8-8N Half male elbow 1/2"x1/2"NPT
SFE-8-8N Female elbow 1/2xNPT1/2
SMBT-8-8N M-Branch tee 1/2xNPT1/2
SFBT-8-8N Female branch tee 1/2xNPT1/2
SFRT-8-8N Female run tee 1/2x1/2NPT
SP-8 Plug 1/2"
SC-8 Cap 1/2"
SPWC-8-8P Male pipe weld connector 1/2x1/2
SOSC-8-8U O-seal straight thread connector 1/2"x1/2U
SSMC-8-8U Sae/ms m-connector 1/2x1/2U
SMPWE-8-8P M-pipe weld elbow 1/2x1/2
SSWC-8 Socet weld connector 1/2
SSWE -8 Socet weld elbow 1/2
SFC-8-8N Female connector 1/2xNPT1/2
SFCB-8-8N Bulkhead FE-Connector 1/2x1/2NPT
SUT-8 Union tee 1/2"
SRUT-8-6 Reducing union tee 1/2x1/2x3/8
SMRT-8-8N Male run tee 1/2xNPT1/2
SUC-8 Union cross 1/2

Job Reference: 126069	Initials: Dijkhpa
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File Issue: 001	<b>DECLARATION SHEETS</b>	 Partner for progress
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**Manufacturer's declaration(s):**

**Declaration title**

**Date**

Declaration sheet rubber material  
Declaration sheet product classification  
Declaration sheet compliance with general design rules  
Declaration sheet material in contact with H2

-  
-  
-  
27-03-2012

Job Reference: 126069		Initials: Dijkhpa
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## DECLARATION SHEET MATERIAL IN CONTACT WITH H2

This is to declare that the material used in the component(s) mentioned in this report:

Make: BMT CO., LTD  
Type: SUPERLOK TUBE FITTING

is complying with the following requirements from COMMISSION REGULATION (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles;

The materials used 316 Stainless steel in the Type couplings SUPERLOK TUBE FITTING where the material is in contact with hydrogen except comply with:

(a) Steels that conform to section 6.3. and 7.2.2. of ISO 9809-1.

(See attached Bill of Material)

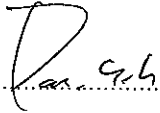
Name: PARK SUNG HO.....

Job title: QA Section Chief.....

Company: BMT CO., LTD.....

Address: 21-1, Bukjeong-dong Yangsan-si Gyeongsangnam-do S. Korea.....


Date: 2012. 3. 27.....

Signature: .....

# BILL OF MATERIAL

ITEM DESCRIPTION: SUPERLOK TUBE FITTING

NO	DESCRIPTION	MATERIAL	REMARK
1	BODY	316 STAINLESS STEEL	
2	NUT	316 STAINLESS STEEL	
3	Front Ferrule	316 STAINLESS STEEL	
4	Back Ferrule	316 STAINLESS STEEL	

File Issue: 001	<b>TEST SHEETS</b> <b>REGULATION 79/2009</b> <b>HYDROGEN EQUIPMENT</b>	<b>kiwa</b>  Partner for progress
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**Part 3 Requirements for hydrogen components other than containers designed to use compressed (gaseous) hydrogen.**

Key to Test Sheets:	YES = YES	NA = Not Applicable	NT = Not Tested	NO = NO	Example:	<del>YES-NA-NT-NO</del>
Notes: When filling in Test Sheets, answers are crossed out which are not applicable for that clause.						

3.1	General requirements	
3.1.1.	Unless otherwise stated all tests shall be performed at ambient temperature	YES-NA-NT-NO
3.1.2.	Explosive gas mixtures shall be prevented from developing during the test procedures described in this part.	YES-NA-NT-NO
3.1.3.	The test period for leakage and pressure tests shall be not less than 3 minutes.	YES-NA-NT-NO
3.1.4	Unless otherwise stated the applied test pressure shall be measured at the inlet of the component under test.	YES-NA-NT-NO
3.1.5.	If a component is exposed to the pressure due to refilling operating, then filling cycles shall be used. If a component is exposed to pressure due to the operation of the vehicle, i.e. switching of the vehicle activation switch, then duty cycles shall be used.	Filling cycles / Duty cycles
3.1.6.	In addition to the requirements given below, the manufacturer shall complete all documents referred to in section 4 and submit them to the competent authority when applying for type approval.	YES-NA-NT-NO
3.1.7.	The components shall be subjected to the applicable test procedures as referred to in the table in Annex V to Regulation (EC) No 79/2009. The tests shall be conducted on components that are representative of normal production and shall have the manufacturer's identification marks.	YES-NA-NT-NO
3.1.8.	The tests specified in section 4.2 shall be conducted on the same samples of components in the sequence given in table in Annex V to Regulation (EC) No 79/2009 unless otherwise indicated, e.g. for fittings the corrosion resistance test (4.2.1) shall be followed by an endurance test (4.2.2), then by a hydraulic pressure cycle test (4.2.3.) and finally by an external leakage test (4.2.5). if a component does not contain metallic sub-components the testing shall commence with the first applicable test.	YES-NA-NT-NO

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File Issue: 001	<b>TEST SHEETS</b> <b>REGULATION 79/2009</b> <b>HYDROGEN EQUIPMENT</b>	<b>kiwa</b>  Partner for progress
Report Number: 126069		Page: TM02/00

4.1	<b>Material tests</b>	
4.1.1	Hydrogen compatibility test	YES- <b>NA</b> -NT-NO
4.1.2.	Ageing test	YES- <b>NA</b> -NT-NO
4.1.3.	Ozone compatibility test	YES- <b>NA</b> -NT-NO
4.2	<b>Components tests</b>	
4.2.1	Corrosion resistance test	
4.2.1.2	Salt spray test according to ISO9227 for 144 hours	YES-NA-NT-NO
	Ammonia test according to ISO6957 for 24 hours	YES- <b>NA</b> -NT-NO
4.2.2	Endurance test	YES-NA-NT-NO
4.2.3	Hydraulic pressure cycle test	YES-NA-NT-NO
4.2.4	Internal leakage test	YES- <b>NA</b> -NT-NO
4.2.5	External leakage test	YES-NA-NT-NO


**NA** = Hydrogen compatibility test is declared see attached declaration sheet.

**NA** = Ageing test and ozone compatibility test are not performed due to the fact that there are no non-metallic.

**NA** = Ammonia test not applicable, the used material is not brass.

**NA** = Internal leakage test not applicable, the couplings do not have a internal sealing.

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File Issue: 001	<b>RESULT SHEETS IDENTIFICATION OF EUT</b>	 Partner for progress
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**Sample designation:**

Description	Reference no.	Date intake
1 SU-8 Union 1/2	C110940	22-9-2011
1 SU-8 Union 1/2	C110941	22-9-2011
1 SU-8 Union 1/2	C110942	22-9-2011
1 SU-8 Union 1/2	C110943	22-9-2011
1 SU-8 Union 1/2	C110944	22-9-2011
2 SRU-8-6 Reducing union 1/2x3/8	C110945	22-9-2011
2 SRU-8-6 Reducing union 1/2x3/8	C110946	22-9-2011
2 SRU-8-6 Reducing union 1/2x3/8	C110947	22-9-2011
2 SRU-8-6 Reducing union 1/2x3/8	C110948	22-9-2011
2 SRU-8-6 Reducing union 1/2x3/8	C110949	22-9-2011
3 SBHRU-8-6 Bulkhead reducing union 1/2 x3/8	C110950	22-9-2011
3 SBHRU-8-6 Bulkhead reducing union 1/2 x3/8	C110951	22-9-2011
3 SBHRU-8-6 Bulkhead reducing union 1/2 x3/8	C110952	22-9-2011
3 SBHRU-8-6 Bulkhead reducing union 1/2 x3/8	C110953	22-9-2011
3 SBHRU-8-6 Bulkhead reducing union 1/2 x3/8	C110954	22-9-2011
4 SBHU -8 Bulkhead union 1/2"	C110955	22-9-2011
4 SBHU -8 Bulkhead union 1/2"	C110956	22-9-2011
4 SBHU -8 Bulkhead union 1/2"	C110957	22-9-2011
4 SBHU -8 Bulkhead union 1/2"	C110958	22-9-2011
4 SBHU -8 Bulkhead union 1/2"	C110959	22-9-2011
5 SMC-8-8N M-Connector 1/2xNPT1/2	C110960	22-9-2011
5 SMC-8-8N M-Connector 1/2xNPT1/2	C110961	22-9-2011
5 SMC-8-8N M-Connector 1/2xNPT1/2	C110962	22-9-2011
5 SMC-8-8N M-Connector 1/2xNPT1/2	C110963	22-9-2011
5 SMC-8-8N M-Connector 1/2xNPT1/2	C110964	22-9-2011
6 SGMC-8-8G Gauge male connector 1/2xPF1/2	C110965	22-9-2011
6 SGMC-8-8G Gauge male connector 1/2xPF1/2	C110966	22-9-2011
6 SGMC-8-8G Gauge male connector 1/2xPF1/2	C110967	22-9-2011
6 SGMC-8-8G Gauge male connector 1/2xPF1/2	C110968	22-9-2011
6 SGMC-8-8G Gauge male connector 1/2xPF1/2	C110969	22-9-2011
7 SGC-8-8G Gauge connector 1/2x1/2PF	C110970	22-9-2011
7 SGC-8-8G Gauge connector 1/2x1/2PF	C110971	22-9-2011
7 SGC-8-8G Gauge connector 1/2x1/2PF	C110972	22-9-2011
7 SGC-8-8G Gauge connector 1/2x1/2PF	C110973	22-9-2011
7 SGC-8-8G Gauge connector 1/2x1/2PF	C110974	22-9-2011
8 SMCB-8-8N Bulkhead male connector 1/2x1/2NPT	C110975	22-9-2011
8 SMCB-8-8N Bulkhead male connector 1/2x1/2NPT	C110976	22-9-2011
8 SMCB-8-8N Bulkhead male connector 1/2x1/2NPT	C110977	22-9-2011
8 SMCB-8-8N Bulkhead male connector 1/2x1/2NPT	C110978	22-9-2011
8 SMCB-8-8N Bulkhead male connector 1/2x1/2NPT	C110979	22-9-2011
9 SUE-8 Union elbow 1/2	C110980	22-9-2011
9 SUE-8 Union elbow 1/2	C110981	22-9-2011
9 SUE-8 Union elbow 1/2	C110982	22-9-2011
9 SUE-8 Union elbow 1/2	C110983	22-9-2011
9 SUE-8 Union elbow 1/2	C110984	22-9-2011
10 SME-8-8N Male elbow 1/2xNPT1/2	C110985	22-9-2011
10 SME-8-8N Male elbow 1/2xNPT1/2	C110986	22-9-2011
10 SME-8-8N Male elbow 1/2xNPT1/2	C110987	22-9-2011
10 SME-8-8N Male elbow 1/2xNPT1/2	C110988	22-9-2011
10 SME-8-8N Male elbow 1/2xNPT1/2	C110989	22-9-2011
11 SHME-8-8N Half male elbow 1/2"x1/2"NPT	C110990	22-9-2011
11 SHME-8-8N Half male elbow 1/2"x1/2"NPT	C110991	22-9-2011
11 SHME-8-8N Half male elbow 1/2"x1/2"NPT	C110992	22-9-2011
11 SHME-8-8N Half male elbow 1/2"x1/2"NPT	C110993	22-9-2011
11 SHME-8-8N Half male elbow 1/2"x1/2"NPT	C110994	22-9-2011


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File Issue: 001	<b>RESULT SHEETS IDENTIFICATION OF EUT</b>	 Partner for progress
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12 SFE-8-8N Female elbow 1/2xNPT1/2	C110995	22-9-2011
12 SFE-8-8N Female elbow 1/2xNPT1/2	C110996	22-9-2011
12 SFE-8-8N Female elbow 1/2xNPT1/2	C110997	22-9-2011
12 SFE-8-8N Female elbow 1/2xNPT1/2	C110998	22-9-2011
12 SFE-8-8N Female elbow 1/2xNPT1/2	C110999	22-9-2011
13 SMBT-8-8N M-Branch tee 1/2xNPT1/2	C111000	22-9-2011
13 SMBT-8-8N M-Branch tee 1/2xNPT1/2	C111001	22-9-2011
13 SMBT-8-8N M-Branch tee 1/2xNPT1/2	C111002	22-9-2011
13 SMBT-8-8N M-Branch tee 1/2xNPT1/2	C111003	22-9-2011
13 SMBT-8-8N M-Branch tee 1/2xNPT1/2	C111004	22-9-2011
14 SFBT-8-8N Female branch tee 1/2xNPT1/2	C111005	22-9-2011
14 SFBT-8-8N Female branch tee 1/2xNPT1/2	C111006	22-9-2011
14 SFBT-8-8N Female branch tee 1/2xNPT1/2	C111007	22-9-2011
14 SFBT-8-8N Female branch tee 1/2xNPT1/2	C111008	22-9-2011
14 SFBT-8-8N Female branch tee 1/2xNPT1/2	C111009	22-9-2011
15 SFRT-8-8N Female run tee 1/2x1/2NPT	C111010	22-9-2011
15 SFRT-8-8N Female run tee 1/2x1/2NPT	C111011	22-9-2011
15 SFRT-8-8N Female run tee 1/2x1/2NPT	C111012	22-9-2011
15 SFRT-8-8N Female run tee 1/2x1/2NPT	C111013	22-9-2011
15 SFRT-8-8N Female run tee 1/2x1/2NPT	C111014	22-9-2011
16 SP-8 Plug 1/2"	C111015	22-9-2011
16 SP-8 Plug 1/2"	C111016	22-9-2011
16 SP-8 Plug 1/2"	C111017	22-9-2011
16 SP-8 Plug 1/2"	C111018	22-9-2011
16 SP-8 Plug 1/2"	C111019	22-9-2011
17 SC-8 Cap 1/2"	C111020	22-9-2011
17 SC-8 Cap 1/2"	C111021	22-9-2011
17 SC-8 Cap 1/2"	C111022	22-9-2011
17 SC-8 Cap 1/2"	C111023	22-9-2011
17 SC-8 Cap 1/2"	C111024	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111025	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111026	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111027	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111028	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111029	22-9-2011
18 SPWC-8-8P Male pipe weld connector 1/2x1/2	C111030	22-9-2011
19 SOSC-8-8U O-seal straight thread connector 1/2"x1/2U	C111031	22-9-2011
19 SOSC-8-8U O-seal straight thread connector 1/2"x1/2U	C111032	22-9-2011
19 SOSC-8-8U O-seal straight thread connector 1/2"x1/2U	C111033	22-9-2011
19 SOSC-8-8U O-seal straight thread connector 1/2"x1/2U	C111034	22-9-2011
19 SOSC-8-8U O-seal straight thread connector 1/2"x1/2U	C111035	22-9-2011
20 SSMC-8-8U Sae/ms m-connector 1/2x1/2U	C111036	22-9-2011
20 SSMC-8-8U Sae/ms m-connector 1/2x1/2U	C111037	22-9-2011
20 SSMC-8-8U Sae/ms m-connector 1/2x1/2U	C111038	22-9-2011
20 SSMC-8-8U Sae/ms m-connector 1/2x1/2U	C111039	22-9-2011
20 SSMC-8-8U Sae/ms m-connector 1/2x1/2U	C111040	22-9-2011
21 SMPWE-8-8P M-pipe weld elbow 1/2x1/2	C111041	22-9-2011
21 SMPWE-8-8P M-pipe weld elbow 1/2x1/2	C111042	22-9-2011
21 SMPWE-8-8P M-pipe weld elbow 1/2x1/2	C111043	22-9-2011
21 SMPWE-8-8P M-pipe weld elbow 1/2x1/2	C111044	22-9-2011
21 SMPWE-8-8P M-pipe weld elbow 1/2x1/2	C111045	22-9-2011
22 SSWC-8 Socet weld connector 1/2	C111046	22-9-2011
22 SSWC-8 Socet weld connector 1/2	C111047	22-9-2011
22 SSWC-8 Socet weld connector 1/2	C111048	22-9-2011
22 SSWC-8 Socet weld connector 1/2	C111049	22-9-2011
22 SSWC-8 Socet weld connector 1/2	C111050	22-9-2011
23 SSWE -8 Socet weld elbow 1/2	C111051	22-9-2011
23 SSWE -8 Socet weld elbow 1/2	C111052	22-9-2011
23 SSWE -8 Socet weld elbow 1/2	C111053	22-9-2011
Job Reference: 126069	Initials: Dijkhpa	




File Issue: 001	<b>MEASUREMENT EQUIPMENT IN USE UNCERTAINTIES</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	Hydrogen Parts	Page: RU 1/00

**List of general measurement equipment:**

Voltage	± 2 % Reading
High voltage test device (SPS) 500 – 3750 Vac	± 5 % Reading
Resistance	± 2 % Reading
Protective wire and insulation test device	± 5 % Reading
Sliding gauge	± 0.1 mm
Measuring tape	± 1 mm
Cooling and heating < -10 °C	± 5 °C
Cooling and heating -10 C / +100 °C	± 3 °C
Cooling and heating > 100 °C	± 5 % Reading
Climate chamber	± 2 °C / ± 3 %RV
Ambient temperature	± 1 °C (10-30)
Time =< 1 hour	± 0.2 s
Time > 1 hour	± 0.1 % Reading
Torque	± 5 % Reading
Bending moment	± 5 % Reading
Standard weight	± 5 % Reading
Weighing < 30 g	± 0.1 % Reading
Weighing > 30 g	± 2 % Reading
Pressure (gas + air) general	± 5 % Reading
Barometer reading	± 5 mbar
Pressure (water)	± 5 % Reading
Burst water pressure	± 1 % Reading
Gastightness 0-100 cm <sup>3</sup> /h	± 5 cm <sup>3</sup> /h
Gastightness > 100 cm <sup>3</sup> /h	± 5 % Reading
Actual Flow rate (general)	± 5 % Reading

More info about measurement uncertainty of testing in the context of ISO/IEC 17025 can be found on;  
<http://www.kiwa.nl/netherlands/publications.aspx>

Job Reference: 126069	Initials: Dijkhpa
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File Issue: 001	<b>RESULT SHEET 79/2009</b> <b>HYDROGEN EQUIPMENT</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	<b>CORROSION TEST (SALT spray)</b>	Page RS 01/00


<b>Product:</b>	<b>Superlok fittings</b>
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<b>Tested in accordance with:</b>			
Approval requirement:	EC 79/2009		
clause:	ANNEX IV PART 3 # 4.2.1.2		
Task instructions*:	ISO 9227		
<b>Testing Equipment</b> (when no accuracy is specified the Kiwa standard applies)	<b>Equipment no.</b>	<b>Calibrated (✓)</b>	<b>Operation OK (✓)</b>
Salt spray equipment	110930	✓	✓
<b>Test Conditions</b>			
<i>Safety precautions:-</i>			
		<b>Complies (✓)</b>	<b>N.A. (✓)</b>
- Before testing the sample is cleaned and dried at ambient temperatures < 40 °C		✓	
- All connections and openings are closed		✓	
- The salt solution shall consist of 5% sodium chloride and 95% distilled water by weight		✓	
- The temperature of the test room is measured at 35°C ±2°C		✓	
- The adjustment of nozzle is settled at 1.5 cm <sup>3</sup> /h ±0.5cm <sup>3</sup> /h		✓	
- The received salt solution has been checked every 24 h or 48 h		✓	
- After testing the sample is cleaned		✓	

<b>Test results</b>	<b>Requirement</b>	<b>Sample no.: see sample list remarks</b>	<b>Sample no.:</b>
Date and time starting the test	Timing aspects to be monitored	30-09-2011	
Date and time stopping the test	Timing aspects to be monitored	06-10-2011	
Salt spray testing time	144 h	✓	
Ambient temperature during testing	Between 33 and 37°C	✓	
Store time at room temperature	0,5 –1h	✓	
Test to be performed after the endurance test are:			
External leakage test	Annex 5B	See page RM 04/00	See page RM .....
Internal leakage	Annex 5C	See page RM .....	See page RM ....

<b>Conclusion</b>		
<b>Requirement</b>	<b>Complies (✓)</b>	<b>N.A. (✓)</b>
<b>Samples meet requirement</b>	✓	
<b>Remarks:</b> C110944, C110949, C110954, C110959, C110964, C110979, C110984, C110989, C110999, C111004, C111009, C111014, C111015, C111016, C111017, C111018, C111020, C111021, C111022, C111023, C111024, C111060, C111061, C111066, C111075, C111080, C111086 fitted together and C110943, C110947, C110952, C110956, C110962, C110975, C110983, C110986, C110998, C111003, C111008, C111012, C111016, C111017, C111018, C111019, C111020, C111021, C111022, C111023, C111024, C111059, C111065, C111068, C111073, C111076, C111082 fitted together.		

Job Reference: 126069	Initials: Rookshe
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File Issue: 001	<b>REGULATION 79/2009 HYDROGEN EQUIPMENT</b>	<b>kiwa</b> Partner for progress 
Report Number:126069	<b>HYDRAULIC PRESSURE TEST</b>	Page: RS02/00

<b>Product:</b>	<b>Superlok</b>
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<b>Tested in accordance with:</b>			
Approval requirement:	EC 79/2009		
Annex:	ANNEX IV PART 3 # 4.2.3		
<b>Testing Equipment</b> (when no accuracy is specified the Kiwa standard applies)	<b>Equipment no.</b>	<b>Calibrated (✓)</b>	<b>Operation OK (✓)</b>
Hydraulic pressure equipment	111322	✓	✓
Pressure gauge, when tested pneumatically	110934		
Stopwatch	112107	✓	✓
<b>Test Conditions</b>			
Safety precautions:			
- safety rules for high pressures Kiwa reference HP1			
- safety rules for use of gas cylinders,, reference CP16-3.			
		<b>Complies (✓)</b>	<b>N.A. (✓)</b>
- Test is to be performed before and after the durability test;		✓	
- The samples are filled with water and slowly pressurised;		✓	
- The samples surface shows no visible cracks as a result of this test;		✓	
- Retest a new sample with a pressure gauge with accuracy $\pm 5\%$ , if samples have failed			✓

<b>Test Results</b>	Requirement				sample no.: see list below remarks		sample no.:		sample no.:	
Moment of test	Before/after Saltspray test				before	After	before	after	before	after
Classification of component*	0	1	2	3	0	0				
Test pressure (kPa / MPa) *	1,5 x wp	<del>2-x wp</del>	<del>2-x wp</del>	<del>2-x wp</del>	69.29M Pa	69.29M Pa				
Test time	$\geq 3$ min				✓	✓				
Rupture	No				✓	✓				
Permanent distortion	No				✓	✓				
Test dated	To be monitored				30-09- 2011	6-1- 2012				


<b>Conclusion</b>		
<b>Requirement</b>	<b>Complies (✓)</b>	<b>N.A. (✓)</b>
<b>Samples meet requirement</b>		
Remarks: Samples used: C110944, C110949, C110954, C110959, C110964, C110979, C110984, C110989, C110999, C111004, C111009, C111014, C111015, C111016, C111017, C111018, C111020, C111021, C111022, C111023, C111024, C111060, C111061, C111066, C111075, C111080, C111086 fitted together and C110943, C110947, C110952, C110956, C110962, C110975, C110983, C110986, C110998, C111003, C111008, C111012, C111016, C111017, C111018, C111019, C111020, C111021, C111022, C111023, C111024, C111059, C111065, C111068, C111073, C111076, C111082 fitted together.		

\* Cross out which is not applicable

Wp = working pressure

Wp = 46.19mpa

Job Reference: 126069	Initials: HR
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File Issue: 001	<b>RESULT SHEET 79/2009</b> <b>HYDROGEN EQUIPMENT</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	<b>DURABILITY TEST</b>	Page: RS 03/00

<b>Product:</b>	<b>Superlok fittings</b>
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<b>Tested in accordance with:</b>			
Approval requirement:	EC79/2009		
Annex:	ANNEX 3 PART4.2.2		
<b>Testing Equipment</b> (when no accuracy is specified the Kiwa standard applies)	<b>Equipment no.</b>	<b>Calibrated (✓)</b>	<b>Operation OK (✓)</b>
Robot / PLC	111379		
Life test device			
Pressure gauge	111655		
Stopwatch	111646		
<b>Test Conditions</b>			
<i>Safety precautions:</i> - safety rules for high pressures Kiwa reference HP1 - safety rules for use of gas cylinders, reference CP16-3			
		<b>Complies (✓)</b>	<b>N.A. (✓)</b>
- The test is performed with a period of not less than 10 seconds;			✓
- 96 % of the total cycles is performed at room temperature			✓
- 2 % of the total cycles is performed at minimum temperature			✓
- 2 % of the total cycles is performed at maximum temperature			✓

Test Results	Requirement				sample no.: see samples remarks	sample no.:	sample no.:
Classification of component *	0	1	2	3	0		
Test pressure (kPa) *	Wp	Wp	Wp	Wp	NA		
Date & time starting the test	To be monitored				09-01-2012		
Date & time stopping the test	To be monitored				09-02-2012		
Actual cycles performed *	According 4.2.2.2.2				25 times		
Test to be performed after the endurance test are:							
External leakage	According to annex 5B				See RM 04/00	See RM	See RM
Seat leakage	According to annex 5C				See RM	See RM	See RM

<b>Conclusion</b>		
<b>Requirement</b>	<b>Complies (✓)</b>	<b>N.A. (✓)</b>
<b>Samples meet requirement</b>		
<b>Remarks:</b> C110944, C110949, C110954, C110959, C110964, C110979, C110984, C110989, C110999, C111004, C111009, C111014, C111015, C111016, C111017, C111018, C111020, C111021, C111022, C111023, C111024, C111060, C111061, C111066, C111075, C111080, C111086 fitted together and C110943, C110947, C110952, C110956, C110962, C110975, C110983, C110986, C110998, C111003, C111008, C111012, C111016, C111017, C111018, C111019, C111020, C111021, C111022, C111023, C111024, C111059, C111065, C111068, C111073, C111076, C111082 fitted together.		

- \* Cross out which is not applicable
- wp = working pressure
- wp = 46.19 MPa

Job Reference: 126069		Initials: Rookshe
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File Issue: 001	<b>REGULATION 79/2009 HYDROGEN EQUIPMENT</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	<b>EXTERNAL LEAKAGE TEST</b>	Page: RM 04/00

<b>Product:</b>	<b>Superlok fittings</b>
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<b>Tested in accordance with:</b>			
Approval requirement:	EC 406/2010		
Annex:	ANNEX IV PART 3 # 4.2.5		
<b>Testing Equipment</b> (when no accuracy is specified the Kiwa standard applies)	<b>Equipment no.</b>	<b>Calibrated (✓)</b>	<b>Operation OK (✓)</b>
Flow meter (for metal to metal seat only)			
Pressure gauge	111655	✓	✓
Leakage gauge			
Stopwatch	112107	✓	✓
<b>Test Conditions</b>			
		<b>Complies (✓)</b>	<b>N.A. (✓)</b>
A leak test gas shall be used			✓
The measured combined leakage and permeation rate is less than 10 Ncm <sup>3</sup>			✓
The permitted leakage rate is applicable to tests with 100 per cent hydrogen only.			✓
Permitted leakage rates for other gases or gas mixtures shall be converted to an equivalent rate to that for 100 per cent hydrogen			✓

<b>Test Results</b>	<b>Requirement</b>	<b>Ambient temperature</b>		<b>85°C / 120°C</b>		<b>-20°C / -40°C</b>	
		before	after	before	after	before	after
Moment of test	Corrosion test/temperature cycle test						
Test pressure (kPa / <del>MPa</del> )	0.02 times nominal working pressure		924 KPa		924KPa		924KPa
Test pressure (kPa / MPa)	Nominal working pressure		46.19 MPa		<b>1.37 x NWP = 63.28 MPa</b>		46.19 MPa
Seat leakage *	< 10 dm <sup>3</sup> /h		✓		✓		✓
Time	> 3 min		✓		✓		✓
Test date	To be monitored		16-03-2012		19-03-2012		16-03-2012

<b>Conclusion</b>		
<b>Requirement</b>	<b>Complies (✓)</b>	<b>N.A. (✓)</b>
<b>Samples meet requirement</b>	✓	
<b>Remarks:</b> C110944, C110949, C110954, C110959, C110964, C110979, C110984, C110989, C110999, C111004, C111009, C111014, C111015, C111016, C111017, C111018, C111020, C111021, C111022, C111023, C111024, C111060, C111061, C111066, C111075, C111080, C111086 fitted together and C110943, C110947, C110952, C110956, C110962, C110975, C110983, C110986, C110998, C111003, C111008, C111012, C111016, C111017, C111018, C111019, C111020, C111021, C111022, C111023, C111024, C111059, C111065, C111068, C111073, C111076, C111082 fitted together.		

- \* Cross out which is not applicable
- NWP = nominal working pressure
- Wp = 46.19 MPa

Job Reference: 126069	Initials: Rookshe
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File Issue: 001	<b>REGULATION 79/2009 HYDROGEN EQUIPMENT</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	<b>HYDRAULIC PRESSURE CYCLE TEST</b>	Page: RS 05/00

<b>Product:</b>	<b>Superlok fittings</b>
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<b>Tested in accordance with:</b>			
Approval requirement:	EC 79/2009		
Annex:	ANNEX IV PART 3 # 4.2.3		
<b>Testing Equipment</b> (when no accuracy is specified the Kiwa standard applies)	<b>Equipment no.</b>	<b>Calibrated (✓)</b>	<b>Operation OK (✓)</b>
PLC	111929		✓
Pressure gauge, when tested pneumatically	110934	✓	✓
Stopwatch	112107	✓	✓
<b>Test Conditions</b>			
Safety precautions:			
- safety rules for high pressures Kiwa reference HP1			
- safety rules for use of gas cylinders,, reference CP16-3.			
		<b>Complies (✓)</b>	<b>N.A. (✓)</b>
- Test is with a period of not less then 10 seconds;		✓	
- The pressure shall periodically change from 2MPa to 1.25 time's nominal working pressure;		✓	
- The max frequency of the cycles may not exceed 6 cycles pro minute;		✓	

Test Results	Requirement				sample no.: see sample list below.	sample no.:	sample no.:
Classification of component*	0	1	2	3	0		
Test pressure (kPa / MPa) *	1,25 x wp	<del>2 x wp</del>	<del>2 x wp</del>	<del>2 x wp</del>	57.74 MPa		
Date & time starting the test	To be monitored				28-11-2011		
Date & time stopping the test	To be monitored				06-01-2012		
Actual cycles performed *	<del>1.5 X cycles confirmed to point 2.7.6</del> 3 X cycles confirmed to point 2.7.6 or 2.7.7				150.000		
Test to be performed after the endurance test are:							
External leakage		According to annex 5B			See RM 04/00		
Seat leakage		According to annex 5C			See RM		

<b>Conclusion</b>		
<b>Requirement</b>	<b>Complies (✓)</b>	<b>N.A. (✓)</b>
<b>Samples meet requirement</b>	✓	
Remarks: C110944, C110949, C110954, C110959, C110964, C110979, C110984, C110989, C110999, C111004, C111009, C111014, C111015, C111016, C111017, C111018, C111020, C111021, C111022, C111023, C111024, C111060, C111061, C111066, C111075, C111080, C111086 fitted together and C110943, C110947, C110952, C110956, C110962, C110975, C110983, C110986, C110998, C111003, C111008, C111012, C111016, C111017, C111018, C111019, C111020, C111021, C111022, C111023, C111024, C111059, C111065, C111068, C111073, C111076, C111082 fitted together.		


\* Cross out which is not applicable

Wp = working pressure

Wp = 46.19 MPa

Job Reference: 126069	Initials:Rookshe
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress 
Report Number: 126069	Hydrogen Parts	Page: DR 1/00

**Drawings and Technical Descriptions:**

**Description**

Photo Sheets

Information document BMT-Q-120404-01

**# Pages   Date**

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Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Union:



Reducing union:



Bulkhead reducing union:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 3/00

Bulkhead union:



M- connector:



Gauge male connector:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 4/00

Gauge connector:



Bulkhead male connector:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Union Elbow:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Male Elbow:



Half male Elbow:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 7/00



Female Elbow:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 8/00

M-branch tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 9/00

Female Branch tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 10/00

Female run tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 11/00

Plug:



Cap:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 12/00



Male pipe weld connector:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 13/00

SAE-MS M-connector:



M-pipe weld elbow:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 14/00



Socket weld connector:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 15/00



Socket weld elbow:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Female connector:



Bulkhead FE-connector:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Union tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
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Reducing union tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 19/00



Male run tee:



Job Reference: 126069		Initials: Dijkhpa
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File Issue: 001	<b>DRAWING AND TECHNICAL DESCRIPTION SHEETS</b>	<b>kiwa</b> Partner for progress
Report Number: 126069	Hydrogen Parts	Page: DR 20/00



Union cross:



Job Reference: 126069		Initials: Dijkhpa
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This is for Type Approval of EC 79/2009 and EC 406/2010 (Compressed gaseous Hydrogen) for Compression Tube Fittings (Double Ferrule Type).

### INFORMATION DOCUMENT No : BMT-Q-120404-01

#### Relating to EC component type-approval of hydrogen components or system

#### 0. GENERAL

- 0.1. Make (trade name of Manufacturer) : **BMT CO., LTD**
- 0.2.. Type : **Compression Fittings with front and back ferrule**
- 0.2.1 Commercial Name(s) (if available) : **SUPERLOK**
- 0.2.2. Reference or part number of the component : **N/A**
- 0.5 Name(s) and address(es) of manufacture : **BMT CO., LTD**  
**21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110**  
**South Korea**
- 0.7 Location and method of affixing of the EC type-approval mark(s) :  
**Laser marked on the body of tube fittings**  
**See attached drawing on page 19**
- 0.8 Location and address(es) of assembly plant(s) :  
**21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110**  
**South Korea**
- 3.9. Hydrogen propulsion :
- 3.9.1. ~~Hydrogen system designed to use liquid hydrogen / Hydrogen system designed to use compressed (gaseous) hydrogen / Hydrogen component designed to use liquid hydrogen~~  
 / Hydrogen component designed to use compressed (gaseous) hydrogen
- 3.9.1.7 Fittings : : yes/~~no~~
- 3.9.1.7.1. Make(s) : **BMT CO., LTD**
- 3.9.1.7.2. Type(s) : **Compression Fittings with front and back ferrule**
- 3.9.1.7.3. Nominal working pressure(s) and if downstream of the first pressure regulator, maximum allowable working pressure(s) :  
**See on working pressure on page 6 of information document**
- 3.9.1.7.4. Number of filling cycles or duty cycles as appropriate : n/a
- 3.8.1.7.5. Approval number :





- 
- 3.9.1.7.6. Material: **316 STAINLESS STEEL, For Bar Stock: ASTM A276, ASTM A479, ASME SA479 For Forging: ASTM A182, ASME SA182**
- 3.9.1.7.7. Operating principles :  
**See attached information document**
- 3.9.1.7.8. Description and drawing :  
**See attached description and drawing on page 4, 12~19 of Information document.**
- 3.9.1.7.9. Date of application:  
**April 4, 2012**



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### 3. FEATURE OF SUPERLOK TUBE FITTINGS

SUPERLOK Tube Fitting is produced by a strict material management, a high precision design and the best processing technology.

SUPERLOK Tube Fitting is tightened softly in linking and is leakage free entirely under shock, impact and high tension. Therefore, it can contribute for productivity

improvement and cost reduction to SUPERLOK Tube Fitting users because It's the best product whose flow of fluid is very smooth caused by Fitting's excellent inner surface condition.

SUPERLOK can be assembled easily without any other special tool but the use of low quality tubing may deteriorate Fitting's function.

The whole system design should be considered so that there is no problem to secure reliable safety.

SUPERLOK is consists of 4 precision parts and all parts are being manufactured through a very strict tolerance superintendence under systematic and constant quality control.

All parts that are being made by this process can cope with the inferior environmental conditions and various customer's needs.

SUPERLOK Tube Fitting secures the leakage prevention and sufficient tightness with less forces in all the tubing connections and reduces the cost and potential leakage risk in a course of tubing assembly and process.





#### 4. TYPE DESCRIPTION OF TUBE FITTINGS

- UNIONS:

Union(SU), Reducing Union(SRU), Bulkhead Reducing Union(SBHRU),  
Bulkhead Union(SBHU)

- CONNECTORS:

Male Connector(SMC), Male Connector for Bonded Washer Seal(SGMC),  
Male Connector for Metal Gasket Seal(SOMC), Female Connector(SFC),  
Gauge Connector(SGC), Bulkhead Male Connector(SBMC),  
Bulkhead Female Connector(SBFC)

- ELBOWS:

Union Elbow(SUE), Male Elbow(SME), 45° Male Elbow(SHME), Female  
Elbow(SFE)

- TEES:

Union Tee(SUT), Reducing Union Tee(SRUT), Male Branch Tee(SMBT),  
Male Run Tee(SMRT), Female Branch Tee(SFBT), Female Run Tee(SFRT),  
Union Cross(SUC)

- STUB TUBE CONNECTORS:

Reducer(SR), Bulkhead Reducer(SBR), Male Adaptor(SMA), Female  
Adaptor(SFA), Port Connector(SPC), Reducing Port Connector(SRPC),  
Flange Lapped Tubes Connector(SFTC).

- AN TUBES:

An Flare(SAF), An Union(SAU), An Adaptor(SAA)

- WELD ENDS

Male Pipe Weld Connector(SPWC), Male Pipe Weld Elbow(SMPWE),  
Socket Weld Elbow(SSWE)

- PLUGS & CAPS:

Plug(SP), Cap(SC)



## 5. NOMINAL WORKING PRESSURE AND MAWP

INCH SIZE		
Tube O.D(inch) X Wall Thickness(inch)	Working Pressure	MAWP
1/16" x 0.020"t	12000psi (827.4bar)	12000psi (827.4bar)
1/8" x 0.035"t	10900psi (751.5bar)	10900psi (751.5bar)
3/16" x 0.049"t	10200psi (703.3bar)	10200psi (703.3bar)
1/4" x 0.065"t	10200psi (703.3bar)	10200psi (703.3bar)
5/16" x 0.065"t	8000psi (551.6bar)	8000psi (551.6bar)
3/8" x 0.065"t	6500psi (448.2bar)	6500psi (448.2bar)
1/2" x 0.083"t	6700psi (461.9bar)	6700psi (461.9bar)
5/8" x 0.095"t	6000psi (413.7bar)	6000psi (413.7bar)
3/4" x 0.109"t	5800psi (399.9bar)	5800psi (399.9bar)
7/8" x 0.109"t	4800psi (330.9bar)	4800psi (330.9bar)
1" x 0.120"t	4700psi (324.1bar)	4700psi (324.1bar)

METRIC SIZE		
Tube O.D(mm) X Wall Thickness(mm)	Working Pressure	MAWP
3mm x 1.00t	15300psi (1054.9bar)	15300psi (1054.9bar)
4mm x 1.25t	14400psi (992.8bar)	14400psi (992.8bar)
6mm x 1.65t	12700psi (875.6bar)	12700psi (875.6bar)
8mm x 1.65t	9300psi (641.2bar)	9300psi (641.2bar)
10mm x 1.65t	7300psi (503.3bar)	7300psi (503.3bar)
12mm x 2.11t	7200psi (496.4bar)	7200psi (496.4bar)
16mm x 2.50t	6800psi (468.8bar)	6800psi (468.8bar)
18mm x 2.77t	6700psi (461.9bar)	6700psi (461.9bar)
20mm x 2.77t	6000psi (413.7bar)	6000psi (413.7bar)
22mm x 2.77t	5400psi (372.3bar)	5400psi (372.3bar)
25mm x 3.00t	5100psi (351.6bar)	5100psi (351.6bar)



**6. MATERIALS STANDARDS**

Material	Bar Stock	Forgings
316 Stainless Steel	ASTM A276, A479 ASME SA479	ASTM A182 ASME SA182

**7. THREAD SPECIFICATIONS**

Thread Type	Reference Specification
NPT	ASME B1.20.1, SAE AS71051
ISO/BSP(parallel) (Based on DIN3852)	ISO 228, JIS B 0202
ISO/BSP(tapered) (Based on DIN3852)	ISO 7, BS 21 JIS B 0203
ISO/BSP(gauge) (Based on EN837-1and 837-3)	ISO 228
Unified(SAE)	ASME B 1.1



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## 8. MANUFACTURE'S STATEMENT

The samples, which have been presented for evaluation, are made during mass production according to the presented documents.

We, as the producer of SUPERLOK TUBE FITTING, carry on our own responsibility - the production process guarantees the parameter stability & unchanging and outlet inspection guarantee. SUPELOK TUBE FITTING will accomplish permanently the requirements which are specified by our instruction.



## 9. PICTURE OF SUPERLOK TUBE FITTINGS



Picture 1. UNION(SU)



Picture 2. UNION ELBOW(SUE)





PICTURE 3. MALE CONNECTOR(SMC)



PICTURE 4. SOCKET WELD CONNECTOR(SSWC)





PICTURE 5. PLUG & CAP



## 10. DRAWINGS

NO	TITLE	DWG No.
1	UNION(SU)	110908-115-SU/Rev.A
2	UNION ELBOW(SUE)	110908-115-SUE/Rev.A
3	MALE CONNECTOR(SMC)	110908-115-SMC/Rev.A
4	WELD END(SSWC)	110908-115-SSWC/Rev.A
5	PLUG	110908-115-SP/Rev.A
6	CAP	110908-115-SC/Rev.A





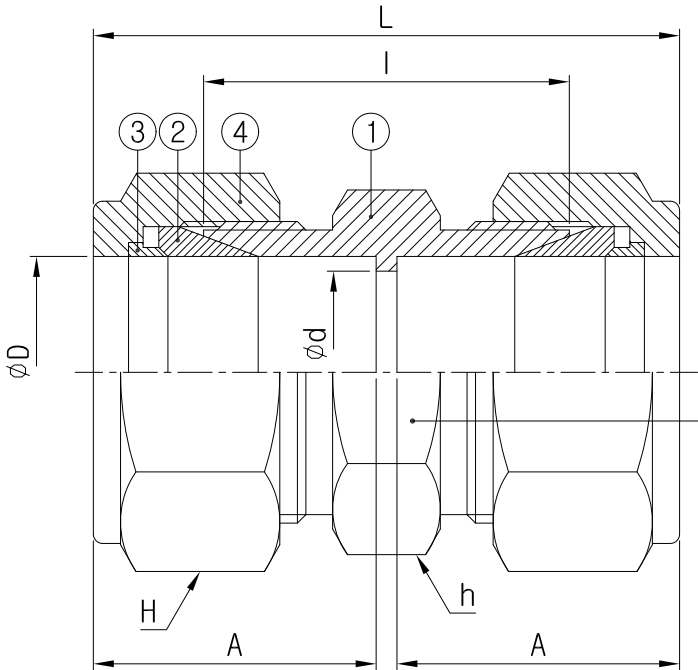
USAGE CONDITION

TUBING WORKING PRESSURE (psi)

TUBE O.D. ( inch)	TUBE WALL THICKNESS ( inch)													
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120	
1/16	5600	6800	8100	9400	12000									
1/8						8500	10900							
3/16						5400	7000	10200						
1/4						4000	5100	7500	10200					
5/16							4000	5800	8000					
3/8							3300	4800	6500					
1/2							2600	3700	5100	6700				
5/8								2900	4000	5200	6000			
3/4								2400	3300	4200	4900	5800		
7/8								2000	2800	3600	4200	4800		
1									2400	3100	3600	4200	4700	

Allowable stress value between -20° F and 100° F (-28.9° C~37.8° C) is 19,500 psi.  
Safety factor is 4.  
(Ultimate tensile strength is 75,000 psi)

- The above data are based on the minimum wall thickness and the maximum O.D allowed by and under the standard ASTM A269.
- The dimensions are not considered to erosion or corrosion.



E-MARK e4\*79/2009\*406/2010\*0001\*00  
HEX FLAT LASER MARKING

NO.	PART NO.	TUBE O.D. D , inch	Dimensions, mm				Width Across Flat, inch	
			d	A	I	L	h	H
1	SU-8	1/2	10.41	22.9	31	51.3	13/16	7/8

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	FRONT FERRULE	SS316	2	
3	BACK FERRULE	SS316	2	
4	NUT	SS316	2	

Partner for progress



A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SU Series			
ITEM NAME		UNION			
TAG NO.		-			
DRAWING NO.		110908-115-SU			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			BMT Co., Ltd.		

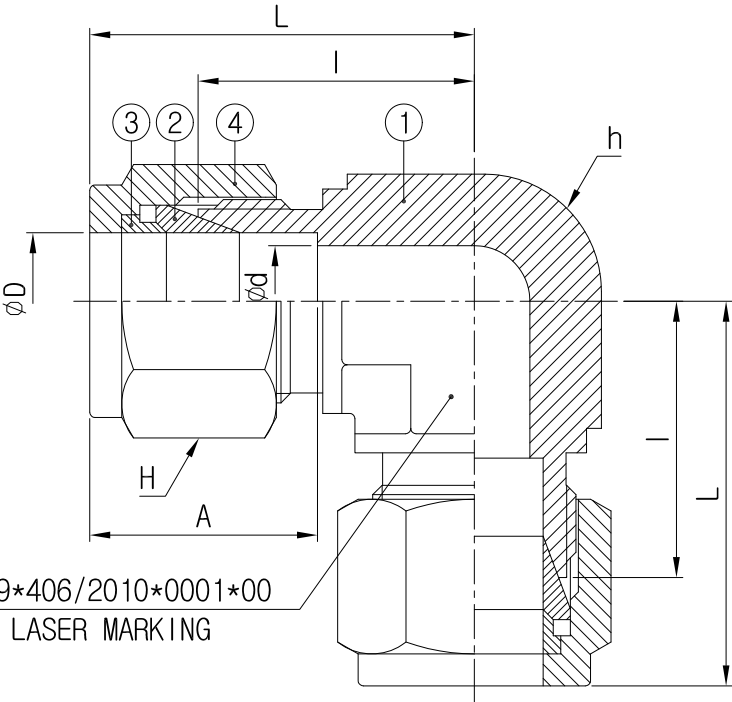
USAGE CONDITION

TUBING WORKING PRESSURE (psi)

TUBE O.D (inch)	TUBE WALL THICKNESS (inch)												
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
1/16	5600	6800	8100	9400	12000								
1/8						8500	10900						
3/16						5400	7000	10200					
1/4						4000	5100	7500	10200				
5/16							4000	5800	8000				
3/8							3300	4800	6500				
1/2							2600	3700	5100	6700			
5/8								2900	4000	5200	6000		
3/4								2400	3300	4200	4900	5800	
7/8								2000	2800	3600	4200	4800	
1									2400	3100	3600	4200	4700

Allowable stress value between -20° F and 100° F (-28.9° C~37.8° C) is 19,500 psi.  
Safety factor is 4.  
(Ultimate tensile strength is 75,000 psi)

- The above data are based on the minimum wall thickness and the maximum O.D allowed by and under the standard ASTM A269.
- The dimensions are not considered to erosion or corrosion.



E-MARK e4\*79/2009\*406/2010\*0001\*00  
FORGING BODY FLAT LASER MARKING

NO.	PART NO.	TUBE O.D. D , inch	Dimensions, mm				Width Across Flat, inch	
			d	A	I	L	h	H
1	SUE-8	1/2	10.41	22.9	25.9	36.1	13/16	7/8

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	FRONT FERRULE	SS316	2	
3	BACK FERRULE	SS316	2	
4	NUT	SS316	2	

Partner for progress



A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SUE Series			
ITEM NAME		UNION ELBOW			
TAG NO.		-			
DRAWING NO.		110908-115-SUE			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			BMT Co., Ltd.		

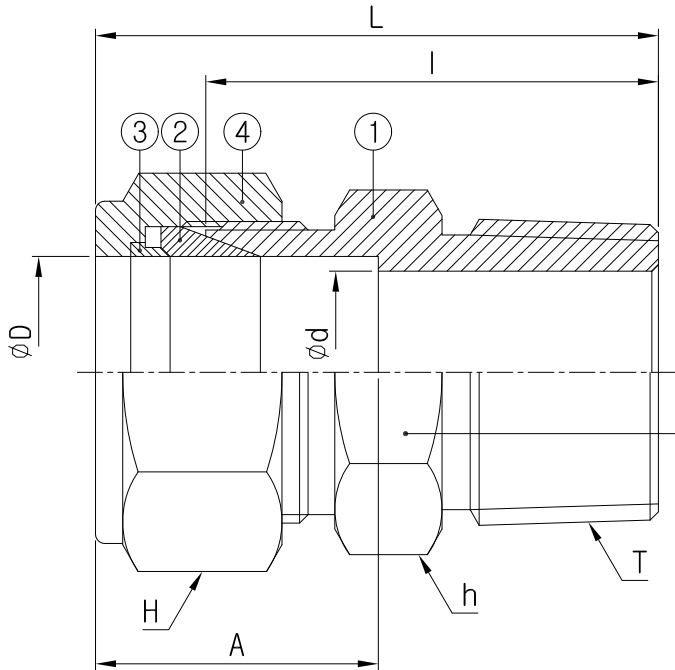
USAGE CONDITION

TUBING WORKING PRESSURE (psi)

TUBE O.D (inch)	TUBE WALL THICKNESS (inch)												
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
1/16	5600	6800	8100	9400	12000								
1/8						8500	10900						
3/16						5400	7000	10200					
1/4						4000	5100	7500	10200				
5/16							4000	5800	8000				
3/8							3300	4800	6500				
1/2							2600	3700	5100	6700			
5/8								2900	4000	5200	6000		
3/4								2400	3300	4200	4900	5800	
7/8								2000	2800	3600	4200	4800	
1									2400	3100	3600	4200	4700

Allowable stress value between -20° F and 100° F (-28.9° C~37.8° C) is 19,500 psi.  
Safety factor is 4.  
(Ultimate tensile strength is 75,000 psi)

- The above data are based on the minimum wall thickness and the maximum O.D allowed by and under the standard ASTM A269.
- The dimensions are not considered to erosion or corrosion.



E-MARK e4\*79/2009\*406/2010\*0001\*00  
HEX FLAT LASER MARKING

NO.	PART NO.	TUBE O.D. D , inch	Dimensions, mm				Width Across Flat, inch		T , THREAD NPT
			d	A	l	L	h	H	
1	SMC-8-8N	1/2	10.41	22.9	38.9	49.1	7/8	7/8	1/2

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	FRONT FERRULE	SS316	1	
3	BACK FERRULE	SS316	1	
4	NUT	SS316	1	

Partner for progress



A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SMC Series			
ITEM NAME		MALE CONNECTOR			
TAG NO.		-			
DRAWING NO.		110908-115-SMC			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING		BMT Co., Ltd.			

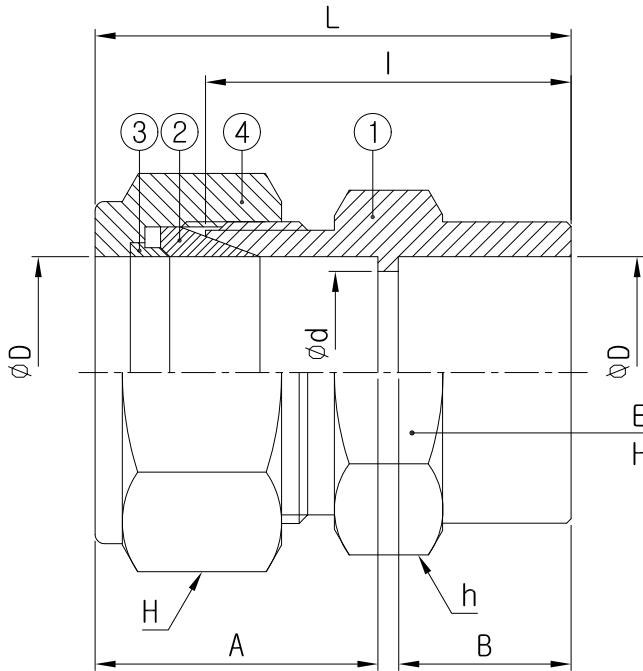
USAGE CONDITION

TUBING WORKING PRESSURE (psi)

TUBE O.D (inch)	TUBE WALL THICKNESS (inch)												
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
1/16	5600	6800	8100	9400	12000								
1/8						8500	10900						
3/16						5400	7000	10200					
1/4						4000	5100	7500	10200				
5/16							4000	5800	8000				
3/8							3300	4800	6500				
1/2							2600	3700	5100	6700			
5/8								2900	4000	5200	6000		
3/4								2400	3300	4200	4900	5800	
7/8								2000	2800	3600	4200	4800	
1									2400	3100	3600	4200	4700

Allowable stress value between -20° F and 100° F (-28.9° C~37.8° C) is 19,500 psi.  
Safety factor is 4.  
(Ultimate tensile strength is 75,000 psi)

- The above data are based on the minimum wall thickness and the maximum O.D allowed by and under the standard ASTM A269.
- The dimensions are not considered to erosion or corrosion.



E-MARK e4\*79/2009\*406/2010\*0001\*00  
HEX FLAT LASER MARKING

NO.	PART NO.	TUBE O.D. D , inch	Dimensions, mm					Width Across Flat, inch	
			d	A	B	l	L	h	H
1	SSWC-8	1/2	10.41	22.9	12.7	31	41.1	13/16	7/8

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	FRONT FERRULE	SS316	1	
3	BACK FERRULE	SS316	1	
4	NUT	SS316	1	

Partner for progress

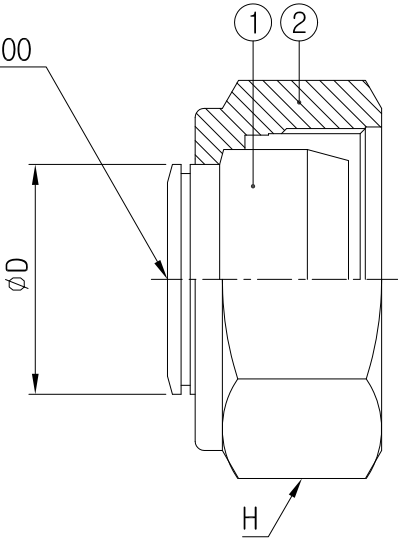


A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SSWC Series			
ITEM NAME		SOCKET WELD CONNECTOR			
TAG NO.		-			
DRAWING NO.		110908-115-SSWC			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			BMT Co., Ltd.		

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	PLUG	SS316	1	
2	NUT	SS316		



E-MARK e4\*79/2009\*406/2010\*0001\*00  
 PLUG BOTTOM LASER MARKING



NO.	PART NO.	TUBE O.D. D , inch	Width Across Flat, inch
			H
1	SP-8	1/2	7/8

A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SP Series			
ITEM NAME		PLUG			
TAG NO.		-			
DRAWING NO.		110908-115-SP			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			BMT Co., Ltd.		

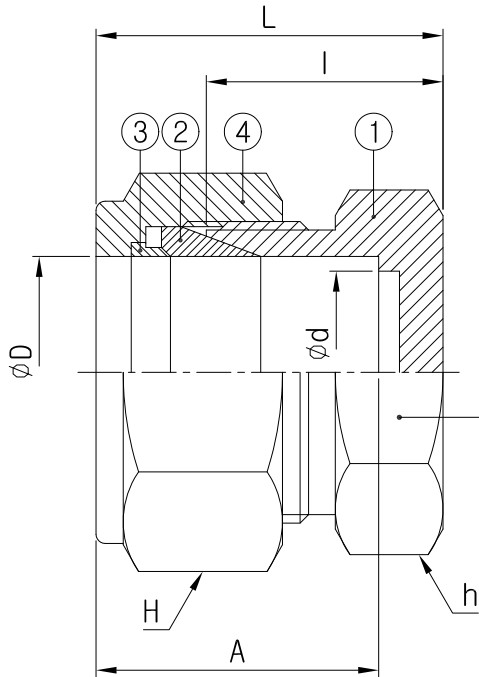
USAGE CONDITION

TUBING WORKING PRESSURE (psi)

TUBE O.D (inch)	TUBE WALL THICKNESS (inch)												
	0.010	0.012	0.014	0.016	0.020	0.028	0.035	0.049	0.065	0.083	0.095	0.109	0.120
1/16	5600	6800	8100	9400	12000								
1/8						8500	10900						
3/16						5400	7000	10200					
1/4						4000	5100	7500	10200				
5/16							4000	5800	8000				
3/8							3300	4800	6500				
1/2							2600	3700	5100	6700			
5/8								2900	4000	5200	6000		
3/4								2400	3300	4200	4900	5800	
7/8								2000	2800	3600	4200	4800	
1									2400	3100	3600	4200	4700

Allowable stress value between -20° F and 100° F (-28.9° C~37.8° C) is 19,500 psi.  
Safety factor is 4.  
(Ultimate tensile strength is 75,000 psi)

- The above data are based on the minimum wall thickness and the maximum O.D allowed by and under the standard ASTM A269.
- The dimensions are not considered to erosion or corrosion.



E-MARK e4\*79/2009\*406/2010\*0001\*00  
HEX FLAT LASER MARKING

NO.	PART NO.	TUBE O.D. D , inch	Dimensions, mm				Width Across Flat, inch	
			d	A	l	L	h	H
1	SC-8	1/2	10.41	22.9	19.1	29.2	13/16	7/8

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	FRONT FERRULE	SS316	2	
3	BACK FERRULE	SS316	2	
4	NUT	SS316	2	

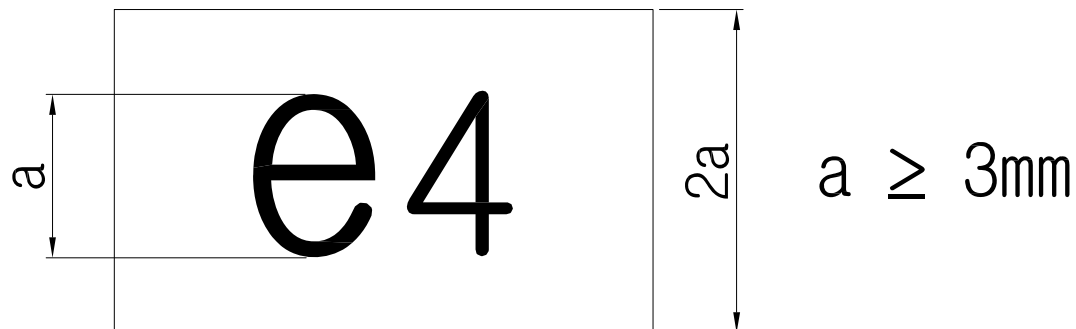
Partner for progress



A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		SC Series			
ITEM NAME		CAP			
TAG NO.		-			
DRAWING NO.		110908-115-SC			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			BMT Co., Ltd.		

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK


# TYPE APPROVAL MARK



e4\*79/2009\*406/2010\*0001\*00

a

(Laser marked on the body)

A	08.SEP.11	Issued for Preliminary	H.P.SEO	S.M.LEE	J.H.LIM
Rev.	Issue Data	Description	Originator	Checked	Approved
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		-			
ITEM NAME		-			
TAG NO.		-			
DRAWING NO.		110908-115-MARK			
GENERAL ARRANGEMENT DRAWING for TUBE FITTING			 <b>BMT Co., Ltd</b>		



### 1. Installation under 1 inch or 25MM

SUPERLOK Tube Fitting shall be delivered to customer with completely assembled state, so be ready to immediate use only with finger-tightening. Disassembling the product prior to use can be a cause of leakage or a cause of inflow something into the fitting's inside. Do not use for the poor quality tubes, which can be a cause of leakage or functional deterioration.

SUPERLOK Tube Fittings are installed in three easy steps:

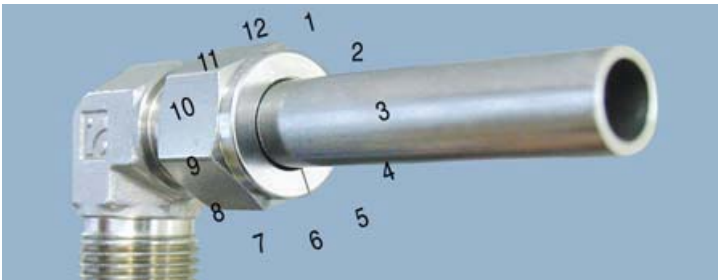
#### Step 1

Insert the tubing into SUPERLOK Tube Fitting's inside. At this moment, make sure that the tubing is completely contact with the shoulder of fittings and then finger-tighten the nut.



#### Step 2

Before tightening the SUPERLOK nut, mark the starting point of turning at the 6 o'clock position.

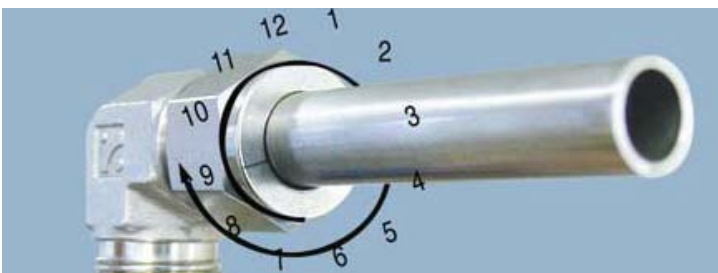


#### Step 3

Hold the fitting body safely with a backup wrench and tighten the nut 1-1/4 turns.

(pay attention to the mark of starting point of turning, make one revolution and place at 9 o'clock position. Marking the starting point of turning at the 6 o'clock position will let you notice where the starting point is).


After 1-1/4 revolution, when the starting point is placed at 9 o'clock position, you can easily confirm and see that SUPERLOK Tube Fitting is installed accurately.



After 1-1/4 revolution of the SUPERLOK nut by finger-tightening, make sure whether it is sufficiently tightened using by the Gap Inspection Gage.





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