

**Abnahmeprüfzeugnis**  
**Inspection Certificate** (EN 10204-3.2 :2004)  
**Certificat de Réception**  
**Certificato di Collaudo Materiali**

Prüf.-Nr.-Inspection No.. 133024510-A

No. de certificat - No. di collaudo:

Blatt - Page - Pagina - Pag: 1/3

Besteller - Customer - Acheteur - Committente:  
 Sample

Hersteller - Manufacturer - Fabricant - Produttore:  
 Werks-Nr. - Works No. - No usine - Commessa No.:  
 Sample

Hyundai Motor Company

Hy-Lok Korea Corporation  
 Noksan Works, Korea

Prüfgegenstand - Article - Produit - Prodotto: Fittings

Prüfgrundlagen/Anforderungen - Technical specifications/Requirements - Spécifications techniques/Exigences - Norma di controllo/Requisiti:

Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03

Werkstoff - Material - Matière - Materiale: entsprechend - according to - suivant - secondo : Ausgabe - Edition - Edizione:  
 Body : ASTM A479 TP316 EHIP Annex 8, Part B Rev. 12b, 12. 10. 03

Kennzeichnung - Marking - Marquage - Punzonatura

N/A

Herstellerzeichen - Brand of the manufacturer -

Schmelze-Nr. - Heat No.

Marque du fabricant - Marchio del produttore:



Blech-Nr. (Pos.-Nr.) – Plate No. (Item No.)

Stempel des Sachverständigen - Inspector's stamp -

Abmessungen - Dimensions

Poinçon de l'expert - Punzone dell' ispettore:

N/A

Umfang der Lieferung - Extent of delivery - Liste descriptive - Descrizione della fornitura:

Sample No.	Part No..	Part Name	Description of Part	Drawing No.
1	OFBTF4-06U	Female Branch Tee	1/4"O.D X 9/16-18UNF	2008B25D11
2	OFT-6	Union Tee	3/8"O.D	2008B20D02
3	SOLM06U-06U	Straight Thread Male/Female Elbow	9/16-18UNF	2008B20D04
4	OFSBT6-06U-02N	Straight Thread Branch & Female Run Tee	3/8"O.D X 9/16-18UNF X 1/4"NPT	2008B25D15
5	DVSTI-03U	Hollow Hex. Plug	3/8-24UNF	2008B20D06
6	DVSTI-06U	Hollow Hex. Plug	9/16-18UNF	2008B20D08
7	DVSTI-08U	Hollow Hex. Plug	3/4-16UNF	2008B20D07
8	OFSC4-06U	Straight Thread Male Connector	1/4"O.D(6M) X 9/16-18UNF	2008B25D14
9	OFSC4-04U	Straight Thread Male Connector	1/4"O.D(6M) X 7/16-20UNF	2008B25D15
10	OFSC6-06U	Straight Thread Male Connector	3/8"O.D(10M) X 9/16-18UNF	2008B25D16
11	OFSSL-4	Swivel Elbow	1/4"O.D(6M)	2010D08H01
12	OFSSL-6	Swivel Elbow	3/8"O.D(10M)	2010D08H01
13	OFSSBT-4	Swivel Branch Tee	1/4"O.D(6M)	2010D08H02
14	OFSSBT-6	Swivel Branch Tee	3/8"O.D(10M)	2010D08H02
15	OFSSRT-4	Swivel Run Tee	1/4"O.D(6M)	2010D08H03
16	OFSSRT-6	Swivel Run Tee	3/8"O.D(10M)	2010D08H03
17	OFSSC4-04U	Straight Thread Swivel Connector	1/4"O.D(6M) X 7/16-20UNF	2010D08H04
18	OFSSC6-04U	Straight Thread Swivel Connector	3/8"O.D(10M) X 7/16-20UNF	2010D08H04
19	OFSSC6-06U	Straight Thread Swivel Connector	3/8"O.D(10M) X 9/16-18UNF	2010D08H04

Die gestellten Anforderungen sind lt. Anlagen erfüllt. - The requirements are fulfilled as per annex - Les conditions imposées sont satisfaites suivant annexes. - I risultati sono conformi ai requisiti richiesti come da allegati.

**Abnahmeprüfzeugnis****Inspection Certificate**

(EN 10204-3.2 :2004)

**Certificat de Réception****Certificato di Collaudo Materiali**

Prüf.-Nr.-Inspection No.- 133024510-A

No. de certificat - No. di collaudo:

Blatt - Page – Pagina - Pag: 2/3

Ort - Place - Lieu - Località

Changwon

Datum - Date - Data

25.Jun.2010

Der Sachverständige - The inspector

L'expert - L'ispettore

Anlagen: 1) Test results

- (Annexes) 2) Test report: Report No. 133024510-A-1~8 (Except 133024510-A-7)  
3) Raw material test report  
4) Calibration report of the test equipment  
5) Drawing



J.S. Choi

**Ergebnis der Prüfungen - Test results - Résultats des essais - Risultati delle prove**

Anlage - Annex - Annexe - Allegato 1

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 Inspection No. Page  
 Certificat No. Page  
 No di collaudo Pagina

There are 8 kinds of test in Part B of the Draft ECE Compressed Gaseous Hydrogen(Revision 12b, 12.10.03).

Test No.	Sample No.																		
	1	2	3*	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

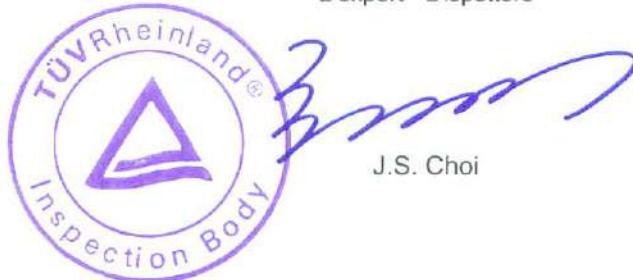
Note 1) \* : It was accepted with the test result of sample 2 because it was modified little with sample 2 product.

2) Test No. : 1=Part B-B1, 2=Part B-B2, 3=Part B-B3, 4=Part B-B4, 5=Part B-B5, 6=Part B-B6 and  
 8=Part B-B8 in Annex 8, Part B of the above draft regulation.

The meaning of "O" in above table is that it was tested and met the requirement of the Annex 8, Part B of the Draft ECE Compressed Gaseous Hydrogen(Revision 12b, 12.10.03).

 Ort - Place - Lieu - Località  
 Changwon

 Datum - Date - Data  
 25.Jun.2010

 Der Sachverständige - The inspector  
 L'expert - L'ispettore


J.S. Choi

# **Test Reports**

## Test Report

Report No. : 133024510-A-1  
Test : Hydrogen compatibility

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																								
Trade Mark																																																									
Manufacturer	As above																																																								
Test Location	As above																																																								
Test Date	2008. 03. 25																																																								
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																								
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03 Annex 8, Part B and B1 2) Demonstration of stainless steel(ASTM A479 TP316) and EPDM(O-Ring) - ISO 11114-1(Ed. 1997) for metallic material - Demonstration for non-metallic material																																																								
Detail Information of Test Specimen	1) Part name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Branch Tee</td><td>OFSSBT-4</td><td>2010D08H02</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0	Swivel Branch Tee	OFSSBT-4	2010D08H02	0
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Report No. : 133024510-A-1

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

2) Body material : ASTM A479 TP316

3) Sealing material : EPDM

Actual Test Condition  
1) Material Certificate for Stainless Steel ASTM A479 TP316  
2) Material certificate for EPDM

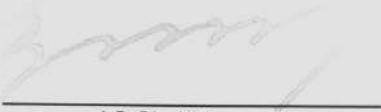
Test Results Requirement : Campatibility demonstration

Results  
1) ASTM A479 TP316 is campatibility with H<sub>2</sub> gas  
(Table 1 and Table A.1 of ISO 11114-1)  
2) EPDM is campatibility with H<sub>2</sub> gas  
(Manufacturer test data and Table 1 of EN ISO 11114-:2000)

Final Decision Above material has compatibility with H<sub>2</sub> gas

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea

  
J.S Choi(Manager)

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## Test Report

Report No. : 133024510-A-2  
Test : Ageing

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																								
Trade Mark																																																									
Manufacturer	As above																																																								
Test Location	As above																																																								
Test Date	2008. 11. 14 ~ 18																																																								
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																								
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03 Annex 8, Part B and B2 - ASTM D572 2) Test Condition - Test temp. : 70°C - Test duration : 96h - Test pressure : 2.0 MPa - Comply with manufacturer specification for microhardness																																																								
Detail Information of Test Specimen	1) Part name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Branch Tee</td><td>OFSSBT-4</td><td>2010D08H02</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0	Swivel Branch Tee	OFSSBT-4	2010D08H02	0
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Swivel Branch Tee	OFSSBT-4	2010D08H02	0																																																						

Report No. : 133024510-A-2

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

2) Sealing material : EPDM

Actual Test Condition

- Test temp. : 70°C
- Test duration : 96h
- Test pressure : 2.0 MPa
- Comply with manufacturer specification for tensile strength and elongation.

Test Results

Requirement :  
Hardness with Shore A :  $70 \pm 5$

Results

Specimen #		1	2	3	4	5	Average
Shore Hardness	Before Test	69	70	69	71	70	69.8
	After Test	69.5	70.5	68.5	70.5	70	69.8

Note. : This test had done in 2008 for same material and manufacturer.  
So TUV Rheinland accept the test result.

Final Decision

All test specimen meets the above requirement.

Note. 1) The test results done by KIMM was reviewed by TUV Rheinland Korea Inspector

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

J.S Choi(Manager)

Page 2 of 2

## Test Report

Report No. : 133024510-A-3  
Test : Ozone compatibility

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																								
Trade Mark																																																									
Manufacturer	As above																																																								
Test Location	As above																																																								
Test Date	2008. 11. 19 ~ 24																																																								
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																								
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03 Annex 8, Part B and B3 - ISO 1431/1 2) Test Condition - 20% elongation applied - Test temperature : 40 °C - Ozone concentration : 0.5 parts per million - Test duration : 72 hr																																																								
Detail Information of Test Specimen	1) Part name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Branch Tee</td><td>OFSSBT-4</td><td>2010D08H02</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0	Swivel Branch Tee	OFSSBT-4	2010D08H02	0
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Straight Thread Male Connector	OFSC6-06U	2008B25D16	0																																																						
Swivel Elbow	OFSSL-4	2010D08H01	0																																																						
Swivel Elbow	OFSSL-6	2010D08H01	0																																																						
Swivel Branch Tee	OFSSBT-4	2010D08H02	0																																																						

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Report No. : 133024510-A-3

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

2) Sealing material : EPDM

Actual  
Test Condition

- 20% elongation applied
- Test temperature : 40 °C
- Ozone concentration : 0.5 parts per million
- Test duration : 72 hr

Test Results

Requirement : No visible cracking

Results  
No visible cracking on all specimen

Note. : This test had done in 2008 for same material and manufacturer.  
So TUV Rheinland accept the test result.

Final Decision

All test specimen meets the above requirement.

Note. 1) The test results done by KIMM was reviewed by TUV Rheinland Korea Inspector

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

  
J.S Choi(Manager)

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## Test Report

Report No. : 133024510-A-4  
Test : Corrosion resistance

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																												
Trade Mark																																													
Manufacturer	As above																																												
Test Location	As above																																												
Test Date	2008. 04. 23 ~ 29, 2010. 04. 19 ~ 26																																												
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																												
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03 Annex 8, Part A and B4 - ISO 9227 : 2006 - NSS Method  2) Test Condition - Pressure : 0.07MPa ~ 0.17MPa - Temperature : Tower ; 50±2 °C, Chamber ; 35±2 °C - Spray amount : 1.5±0.5 ml/h - Holding Time : 144 h - Concentration of sodium : 50 g/l ± 5 g/l - Number of sample : 3																																												
Detail Information of Test Specimen	1) Part name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0
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Report No. : 133024510-A-4

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Test Results	<p>Requirements Mass loss : less than <math>70 \pm 20 \text{g/m}^2 (=0.7 \pm 0.2 \text{g/100cm}^2)</math> for 48 h</p> <p>Results  <ul style="list-style-type: none"> <li>- All specimen met the requirement(The surface of all specimen was below 100cm<sup>2</sup>)</li> </ul> </p> <p>Mass changing( test results in 2008)</p> <table border="1"> <thead> <tr> <th rowspan="2">Part No.</th> <th colspan="6">Mass of specimen(g)</th> <th colspan="3">Mass Changing (After test - Before test)</th> </tr> <tr> <th colspan="3">Before test</th> <th colspan="3">After test</th> <th>#1</th> <th>#2</th> <th>#3</th> </tr> <tr> <th>#1</th> <th>#2</th> <th>#3</th> <th>#1</th> <th>#2</th> <th>#3</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr><td>OFBTF4-06U</td><td>121.276</td><td>120.883</td><td>121.655</td><td>121.260</td><td>120.877</td><td>121.648</td><td>-0.016</td><td>-0.006</td><td>-0.007</td></tr> <tr><td>OFT-6</td><td>108.080</td><td>108.728</td><td>108.627</td><td>108.074</td><td>108.724</td><td>108.620</td><td>-0.006</td><td>-0.004</td><td>-0.007</td></tr> <tr><td>SOLM06U-06U</td><td>102.378</td><td>100.630</td><td>102.015</td><td>102.372</td><td>100.621</td><td>102.005</td><td>-0.006</td><td>-0.009</td><td>-0.010</td></tr> <tr><td>OFSBTF6-06U-02</td><td>117.235</td><td>116.783</td><td>117.057</td><td>117.226</td><td>116.768</td><td>117.050</td><td>-0.009</td><td>-0.015</td><td>-0.007</td></tr> <tr><td>DVSTI-06U</td><td>12.682</td><td>12.662</td><td>12.698</td><td>12.677</td><td>12.660</td><td>12.679</td><td>-0.005</td><td>-0.002</td><td>-0.019</td></tr> <tr><td>OFSC4-06U</td><td>41.028</td><td>41.020</td><td>41.055</td><td>41.024</td><td>41.011</td><td>41.049</td><td>-0.004</td><td>-0.009</td><td>-0.006</td></tr> </tbody> </table> <p>Mass changing(test results in 2010)</p> <table border="1"> <thead> <tr> <th rowspan="2">Part No.</th> <th colspan="3">Mass of specimen(g)</th> <th colspan="3">Mass Changing (After test - Before test)</th> </tr> <tr> <th colspan="2">Before test</th> <th>After test</th> <th>#1</th> <th>#2</th> <th>#3</th> </tr> <tr> <th></th> <th>#1</th> <th>#2</th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr><td>OFBTF4-06U</td><td>123.985</td><td></td><td>123.981</td><td></td><td></td><td>-0.004</td></tr> <tr><td>OFT-6</td><td>109.137</td><td></td><td>109.133</td><td></td><td></td><td>-0.004</td></tr> <tr><td>SOLM06U-06U</td><td>111.051</td><td></td><td>111.049</td><td></td><td></td><td>-0.002</td></tr> <tr><td>OFSBTF6-06U-02N</td><td>115.779</td><td></td><td>115.774</td><td></td><td></td><td>-0.005</td></tr> <tr><td>DVSTI-06U</td><td>5.196</td><td></td><td>5.194</td><td></td><td></td><td>-0.002</td></tr> <tr><td>OFSC6-06U</td><td>12.854</td><td></td><td>12.853</td><td></td><td></td><td>-0.001</td></tr> <tr><td>DVSTI-03U</td><td>26.940</td><td></td><td>26.936</td><td></td><td></td><td>-0.004</td></tr> <tr><td>DVSTI-08U</td><td>39.849</td><td></td><td>39.848</td><td></td><td></td><td>-0.001</td></tr> <tr><td>OFSC4-06U</td><td>26.071</td><td></td><td>26.063</td><td></td><td></td><td>-0.008</td></tr> <tr><td>OFSC4-04U</td><td>41.788</td><td></td><td>41.787</td><td></td><td></td><td>-0.001</td></tr> <tr><td>OFSSL-4</td><td>57.252</td><td></td><td>57.251</td><td></td><td></td><td>-0.001</td></tr> <tr><td>OFSSL-6</td><td>98.739</td><td></td><td>98.733</td><td></td><td></td><td>-0.006</td></tr> </tbody> </table>	Part No.	Mass of specimen(g)						Mass Changing (After test - Before test)			Before test			After test			#1	#2	#3	#1	#2	#3	#1	#2	#3				OFBTF4-06U	121.276	120.883	121.655	121.260	120.877	121.648	-0.016	-0.006	-0.007	OFT-6	108.080	108.728	108.627	108.074	108.724	108.620	-0.006	-0.004	-0.007	SOLM06U-06U	102.378	100.630	102.015	102.372	100.621	102.005	-0.006	-0.009	-0.010	OFSBTF6-06U-02	117.235	116.783	117.057	117.226	116.768	117.050	-0.009	-0.015	-0.007	DVSTI-06U	12.682	12.662	12.698	12.677	12.660	12.679	-0.005	-0.002	-0.019	OFSC4-06U	41.028	41.020	41.055	41.024	41.011	41.049	-0.004	-0.009	-0.006	Part No.	Mass of specimen(g)			Mass Changing (After test - Before test)			Before test		After test	#1	#2	#3		#1	#2				OFBTF4-06U	123.985		123.981			-0.004	OFT-6	109.137		109.133			-0.004	SOLM06U-06U	111.051		111.049			-0.002	OFSBTF6-06U-02N	115.779		115.774			-0.005	DVSTI-06U	5.196		5.194			-0.002	OFSC6-06U	12.854		12.853			-0.001	DVSTI-03U	26.940		26.936			-0.004	DVSTI-08U	39.849		39.848			-0.001	OFSC4-06U	26.071		26.063			-0.008	OFSC4-04U	41.788		41.787			-0.001	OFSSL-4	57.252		57.251			-0.001	OFSSL-6	98.739		98.733			-0.006
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Report No. : 133024510-A-4

Test Results

Part No.	Mass of specimen(g)		Mass Changing (After test - Before test)
	Before test	After test	
OFSSBT-6	127.258	127.255	-0.003
OFSSRT-4	73.112	73.112	0.000
OFSSRT-6	126.948	126.945	-0.003
OFSSC6-04U	54.268	54.260	-0.008
OFSSC6-06U	64.951	64.949	-0.002

Note : This test of this material grade had tested in 2008 for same products(Bold font in Detail information of specimen ). So additional test was done only with one specimen for each products.

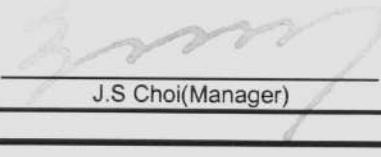
Final Decision

All test specimen meets the above requirement.

Note. 1) The above test was performed with the test facilities of Hy-Lok Korea.  
2) The test was witnessed by TUV Rheinland Korea Inspector

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

  
J.S Choi(Manager)

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## Test Report

Report No. : 133024510-A-5  
Test : Endurance

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																								
Trade Mark																																																									
Manufacturer	As above																																																								
Test Location	As above																																																								
Test Date	2010. 05. 03																																																								
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																								
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03, Annex 8, Part A and B5  2) Test Condition - Temperature : 20±5°C - Number of sample : 3 - 25times connection/disconnection cycles																																																								
Detail Information of Test Specimen	1) Parts name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Branch Tee</td><td>OFSSBT-4</td><td>2010D08H02</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0	Swivel Branch Tee	OFSSBT-4	2010D08H02	0
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Report No. : 133024510-A-5

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

Actual Test Condition	<p>2) Test Condition</p> <ul style="list-style-type: none"><li>- Temperature : 24°C</li><li>- Number of sample : 3</li><li>- 25times connection/disconnection cycles</li></ul>
Test Results	<p>Requirement :</p> <p>25 times connection.disconnection cycles</p> <p>Results :</p> <p>Finished the 25times connection/disconnection cycles</p>
Final Decision	<p>All test specimen met the above requirement.</p> <p>Note. 1) The above test was performed with the test facilities of Hy-Lok Korea. 2) The test was witnessed by TUV Rheinland Korea Inspector</p>

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

  
J.S Choi(Manager)

Page 2 of 2

## Test Report

Report No. : 133024510-A-6  
Test : Hydraulic pressure cycle

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																								
Trade Mark																																																									
Manufacturer	As above																																																								
Test Location	As above																																																								
Test Date	2010. 05. 03 ~ 06																																																								
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																								
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03, Annex 8, Part A and B6  2) Test Condition - Temperature : 20±5°C - Number of cycle : 3 times X filling cycle - Number of sample : 3 - Test pressure : 2.0MPa ~ 1.25 X Nominal Working Pressure(70MPa) - Duration for Cycle : Max. 4 cycles per Min.																																																								
Detail Information of Test Specimen	1) Parts name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Branch Tee</td><td>OFSSBT-4</td><td>2010D08H02</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0	Swivel Branch Tee	OFSSBT-4	2010D08H02	0
Part Name	Part No.	Drawing No.	Revision No.																																																						
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Report No. : 133024510-A-6

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

Actual Test Condition	<ul style="list-style-type: none"><li>- Temperature : 23°C</li><li>- Number of cycle : 15 000 cycles(Filling cycle is 5 000)</li><li>- Number of sample : 3</li><li>- Test pressure : 2.0MPa ~ 1.25 X 70MPa</li><li>- Duration for Cycle : 4 cycles per Min.</li></ul>
Test Results	<p>Requirements :</p> <ul style="list-style-type: none"><li>- 15 000 cycles with pressure cycle 2.0MPa~87.5MPa</li><li>- Meet the test requirement B8 of EIHP</li></ul> <p>Results :</p> <ul style="list-style-type: none"><li>- Finished the 15 000 cycles with pressure cycle 2.0MPa ~87.5MPa</li><li>- See the test report 133024510-A-8</li></ul>
Final Decision	<p>All test specimen met the above requirement.</p> <p>Note. 1) The above test was performed with the test facilities of Hy-Lok Korea. 2) The test was witnessed by TUV Rheinland Korea Inspector</p>

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

  
J.S Choi(Manager)

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## Test Report

Report No. : 133024510-A-8  
Test : External leakage

Applicant	HY-LOK CORPORATION #1467-1, SONGJEONG-DONG, GANGSEO-GU, BUSAN, KOREA ZIP-CODE : 618-817																																																				
Trade Mark																																																					
Manufacturer	As above																																																				
Test Location	As above																																																				
Test Date	2010. 05. 10 ~ 12																																																				
Product Tested	Fittings - Part No. : OFBTF4-06U, OFT-6, SOLMO6U-06U, OFSBTF6-06U-02N, DVSTI-03U, DVSTI-06U, DVSTI-08U, OFSC4-06U, OFSC4-04U, OFSC6-06U, OFSSL-4, OFSSL-6, OFSSBT-4, OFSSBT-6, OFSSRT-4, OFSSRT-6, OFSSC4-04U, OFSSC6-04U, OFSSC6-06U																																																				
Requirements	1) Regulation and Standard - Regulation : Draft ECE Compressed Gaseous Hydrogen - Revision 12b, 12.10.03, Annex 8, Part A and B8  2) Test Condition : It shall be tested after "Endurance Test" and " Hydraulic Pressure Test" - Temperature and Pressure 1) At $20 \pm 5^\circ\text{C}$ , Test pressure @ 0.02 X N.W.P Ⓛ N.W.P 2) After 2hours holding at $-40^\circ\text{C}$ , Test pressure @ 0.02 X N.W.P Ⓛ N.W.P 3) After 2hours holding at $85^\circ\text{C}$ , Test pressure @ 0.02 X N.W.P Ⓛ 1.25 X N.W.P Note : N.W.P - Nominal Working pressure - Number of sample : 3																																																				
Detail Information of Test Specimen	1) Parts name and drawing number. <table border="1"><thead><tr><th>Part Name</th><th>Part No.</th><th>Drawing No.</th><th>Revision No.</th></tr></thead><tbody><tr><td>Female Branch Tee</td><td>OFBTF4-06U</td><td>2008B25D11</td><td>0</td></tr><tr><td>Union Tee</td><td>OFT-6</td><td>2008B20D02</td><td>0</td></tr><tr><td>Straight Thread Male/Female</td><td>SOLM06U-06U</td><td>2008B20D04</td><td>0</td></tr><tr><td>Straight Thread Branch &amp; Female</td><td>OFSBTF6-06U-02N</td><td>2008B25D15</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-03U</td><td>2008B20D06</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-06U</td><td>2008B20D08</td><td>0</td></tr><tr><td>Hollow Hex. Plug</td><td>DVSTI-08U</td><td>2008B20D07</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-06U</td><td>2008B25D14</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC4-04U</td><td>2008B25D15</td><td>0</td></tr><tr><td>Straight Thread Male Connector</td><td>OFSC6-06U</td><td>2008B25D16</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-4</td><td>2010D08H01</td><td>0</td></tr><tr><td>Swivel Elbow</td><td>OFSSL-6</td><td>2010D08H01</td><td>0</td></tr></tbody></table>	Part Name	Part No.	Drawing No.	Revision No.	Female Branch Tee	OFBTF4-06U	2008B25D11	0	Union Tee	OFT-6	2008B20D02	0	Straight Thread Male/Female	SOLM06U-06U	2008B20D04	0	Straight Thread Branch & Female	OFSBTF6-06U-02N	2008B25D15	0	Hollow Hex. Plug	DVSTI-03U	2008B20D06	0	Hollow Hex. Plug	DVSTI-06U	2008B20D08	0	Hollow Hex. Plug	DVSTI-08U	2008B20D07	0	Straight Thread Male Connector	OFSC4-06U	2008B25D14	0	Straight Thread Male Connector	OFSC4-04U	2008B25D15	0	Straight Thread Male Connector	OFSC6-06U	2008B25D16	0	Swivel Elbow	OFSSL-4	2010D08H01	0	Swivel Elbow	OFSSL-6	2010D08H01	0
Part Name	Part No.	Drawing No.	Revision No.																																																		
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Report No. : 133024510-A-8

Part Name	Part No.	Drawing No.	Revision No.
Swivel Branch Tee	OFSSBT-4	2010D08H02	0
Swivel Branch Tee	OFSSBT-6	2010D08H02	0
Swivel Run Tee	OFSSRT-4	2010D08H03	0
Swivel Run Tee	OFSSRT-6	2010D08H03	0
Straight Thread Swivel Connector	OFSSC4-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-04U	2010D08H04	0
Straight Thread Swivel Connector	OFSSC6-06U	2010D08H04	0

Actual Test Condition

- Temperature and Pressure
  - 1) At 23°C, Test pressure @ 1.4 MPa @ 70MPa
  - 2) After 2hours holding at -40°C, Test pressure @ 1.4 MPa @ 70 MPa
  - 3) After 2hours holding at 85°C, Test pressure @ 1.4 MPa @ 87.5 MPa
- Number of sample : 3
- Test fluid : He gas

Note. He Detector used for test : Model Name – Inficon UL 200(Self calibrated type)

Test Results Requirements

Permitted leakage rate : 10N<sub>cm</sub>/hour (100% Hydrogen only)

Note.

For 100% Hydrogen, 10atm.cm/hour = 2.81mbar.l/sec

The equivalent leakage rate of Helium gas is  $1.99 \times 10^{-3}$ mbar.l/sec

Results

Below the permitted leakage rate

Test Temp. °C	Test Pressure MPa	Specimen Leakage Rate( X 10 <sup>-6</sup> mbar.l/sec)		
		#1	#2	#3
+23	0.7	2.2	2.2	2.3
	35	2.2	2.2	2.3
-40	0.7	2.3	2.3	2.3
	35	2.2	2.3	2.3
+85	0.7	2.3	2.3	2.3
	43.8	2.3	2.3	2.2

Note. The leakage test was done at same time with assembled fittings.

So the leakage rate checked at the same time.

Final Decision All test specimen met the above requirement.

Note. 1) The above test was performed with the test facilities of Hy-Lok Korea.  
2) The test was witnessed by TUV Rheinland Korea Inspector

Changwon, Korea Jun. 24. 2010

TÜV Rheinland Korea  
Industrial Service Division

J.S Choi(Manager)

Page 2 of 2

# **Raw material**

## **test report**

# TEST CERTIFICATE

Certificate No. : 807K25

Contract No. : 20080325-004

Date : 2008/10/09

Commodity: TP316 STAINLESS STEEL, ROUND BARS.

Specification: ASTM A783, DIA 100MM, L=600

Size mm	Number of Pieces	Net Weight kg	No.	Ch No.
13	143	448	24	XKG3D
13	144	452	25	

Condition: O.C.D. (B.W.H. 2)

Length: 2600 3000 MM

## Chemical Composition (%)

Element	C	Si	Mn	P	S	Ni	C <sub>3</sub>	Mo	N
Specification	MAX 0.08	0.100	MAX 1.00	MAX 0.030	MAX 0.006	MAX 10.0	MAX 0.04	MAX 2.00	MAX 0.015
Results	0.09	0.10	0.90	0.029	0.004	10.0	0.040	1.60	0.010

## Mechanical Properties

Item	Yield Strength (kgf)	Tensil Strength (kgf)	Elongation (%)	Reduction of Area (%)	Hardness HRC	Heat Treatment (C)	Micro Test G(0.09)	Macro Test G(0.09)	Intergranular Corrosion Test G(0.09)	Embrittlement Test ASTM A262 Pract. B G(0.09)
Specification	MIN 25	MIN 35	MIN 25	MIN 40	25	1060-1130	NO WELDING WITH FILLER METAL HAS BEEN PERFORMED ON THE MATERIALS. GRAIN SIZE RESULT -4, 5			
Results	24	410	33	73	27					

D = Cold Drawn

ST = Solution Treated

SPB = Skin Pass Bright  
CG = Centerless Ground

Chief of Quality Assurance Section

**YAMASHIN STEEL CO., INC.**Yamashin Bldg. 3F, 6-35, 2-chome Andojinmachi Chuo-ku,  
Osaka Japan  
TEL: (06) 6763-1395 FAX: (06) 6763-3191

ENA PLANT

30, Shintakecho Takenami-cho Ena-City Gifu Japan  
TEL: (0573) 28-1215 FAX: (0573) 28-2513

WKT NO. CV1

It is hereby certified that the above results are true and correct in every detail

A = Annealed

MESSRS. : **WOK CORPORATION**CERTIFICATE  
Certificate No. : **807352**Contract No. : **20060325, 004**Date : **2008/10/09**Commodity: **TP316 STAINLESS STEEL ROUND BAR(S)**Specification: **ASTM A479, DIA TOLERANCE H9**

Size	Mm	Number of Pieces	Net Weight Kg	No.	Ch No.
32		30	554	75	5007D
32		30	554	76	
32		30	554	77	

Condition:	<b>H(SH LFWH2)</b>
Length:	<b>2500 3000 MM</b>

**Chemical Composition (%)**

Element	C	Si	Mn	P	S	Ni	Cr	Mo	N
Element	X100	X100	X100	X1000	X100	X100	X100	X100	X100
Specification	MAX 40	140	MAX 20	20	1200	1750	200	MAX 10	
Results	43	46	145	36	1202	1752	203	4	

**Mechanical Properties**

Item	Yield Strength (kg/mm <sup>2</sup> )	Tensil Strength (kg/mm <sup>2</sup> )	Elongation (%)	Reduction of Area (%)	Hardness (HRc)	Heat Treatment (°C)	Micro Test (600#)	Macro Test (600#)	Intergranular Corrosion Test (60#)	Embrittlement ASTM A262 Prac-T (60#)
Specification	MN	MN	MN	MN	MN	MN	NO WELDING WITH FILLER METAL. MAX. 1000 °C	NO WELDING WITH FILLER METAL. MAX. 1000 °C	NO WELDING WITH FILLER METAL. MAX. 1000 °C	NO WELDING WITH FILLER METAL. MAX. 1000 °C
Results	93	113	26	46	23	24	GRAN SIZE #800-14, 5			

D = Cold Drawn

ST = Solution Treated

A = Annealed

It is hereby certified that the above results are true and correct in every detail

SPB = Skin Pass Bright  
CG = Centerless Ground

Chief of Quality Assurance Section

**YAMASHIN STEEL CO., INC.**  
 Yamashin Bldg 3F, 6-35, 2-chome Andojinachi Chuo-ku,  
 Osaka Japan  
 TEL (06) 6763-1395 FAX (06) 6763-3197

**ENA PLANT**  
 30, Shintakeodai Takeami-cho Ena-City Gifu Japan  
 TEL (0573) 26-1216 FAX (0573) 28-2513

DRAFT

JICU 50 C 22

Messrs. : HYUK CORPORATION

Certificate No. : 807339

Contract No. : 20040626 004

Date : 2004/10/09

## Commodity : TP316 STAINLESS STEEL ROUND BAR.

Specification : ASTM A479, A106R, A193B

Size MM	Number of Pieces	Net Weight KG	No.	Ch No.
22	A1	399	52	500070
22	A3	399	53	

Condition : 0°C(32°F)~100°C(212°F)

Length : 2500 ~3000 MM

Chemical Composition ( % )							
Element	C X1000	Si X100	Mn X100	P X1000	S X1000	Ni X100	Mo X100
Specification	MAX 40	140	MAX 200	40	20	1200	1750
Results	43	46	145	36	30	1262	1753
						2002	4

## Mechanical Properties

Item ( kgf /cm <sup>2</sup> )	Yield Strength ( kgf /cm <sup>2</sup> )	Tensil Strength ( kgf /cm <sup>2</sup> )	Elongation ( %)	Reduction of Area ( %)	Hardness HRc	Heat Treatment (°C)	
						Micro Test 60000	Macro Test 60000
Specification	MIN 75	MIN 95	MIN 25	MIN 40	25	1060	11
Results	93	109	35	72	27		

D = Cold Drawn  
ST = Solution Treated  
A = AnnealedSPB = Skin Pass Bright  
CG = Centerless Ground

Chief of Quality Assurance Section

*K. Sano*  
**YAMASHIN STEEL CO.,INC.**Yamashin Bldg. 3F, 6-35, 2-chome Andoimachi Chuo-ku,  
Osaka Japan  
TEL:(06)6763-1395 FAX:(06)6763-3197

It is hereby certified that the above results are true and correct in every detail

HCD  
I.O.  
E.C.J30. Shintakeo Takanami-cho Ena-City Gifu Japan  
TEL:(0573)28-2125 FAX:(0573)28-2513

DWG:16K

ІІІ. УПРИЧА

Certificate No.: 807337

*Minimally Invasive*

Contract No. : 20000000000000000000

Date : 2008/10/04

Gammalite - FIG. 16 STAINS OF WELLS 97 AND 98

卷之三

Specification: AT&T MA 100 TWISTER 100

Size MM	Number of Pieces	Net Weight kg.	No.	Ch No.
18 13	40 90	1325 526	43 49	(3394)

Condition:

Length: 2500-3000 mm

Chemical Composition ( % )									
Element	C X1000	Si X100	Mn X100	P X1000	S X1000	Ni X100	Cr X100	Mo X100	N X100
Specification	MAX 50	40 10	140 200	MAX 40	20 30	1200 1300	1150 1000	200 300	MAX 10
Results	38	47	146	37	20	1201	1151	201	3

## Mechanical Properties

Mechanical Properties					
Item	Yield Strength (ksi)	Tensile Strength (ksi)	Elongation (%)	Reduction of Area (%)	
Specification	MIN 75	MIN 95	MIN 25	MIN 40	
Results	96	114	32	72	

D = Cold Drawn  
ST = Solution Treated

SPB = Skin Pass Bright  
CG = Centerless Ground

It is hereby certified that the above results are true and correct in every detail.

K. June

**YAMASHIJI STEEL CO., INC.**

Yamashin Bldg 3E 6-35 2-chome Aoyama

2-chama Apollonius Chia-hui

HCD NO. 545

essrs. : **CW-LOK CORPORATION**

Contract No. : 20090914-001

# TEST CERTIFICATE

Co<sup>c</sup>ate No. : 003283

Date : 2010/05/12

modity : TP316 STAINLESS STEEL HEXAGON BARS.

Specification : ASTM A479, DIA TOLERANCE h11

Size MM	Number of Pieces	Net Weight KG	No.	Ch No.
15, 87	91	428	1	N149D
15, 87	92	433	2	

Condition : SPB(SH LEVEL 2)

Length : 2500 3000 MM

## Chemical Composition ( % )

Element	C X1000	Si X100	Mn X100	P X1000	S X1000	Ni X100	Cr X100	Mo X100	N X100
Specification	MAX 50	40	140	MAX 40	20	1200	1750	200	MAX 10
Results	42	46	146	35	20	1300	1800	300	

## Mechanical Properties

Item	Yield Strength ( KSI )	Tensil Strength ( KSI )	Elongation ( $\delta_0$ )	Reduction of Area ( $\%_0$ )	Hardness HRC	Heat Treatment (C)	Micro Test GOOD	Macro Test GOOD	Intergranular Corrosion Test GOOD	Embrittlement Test ASTM A262 Pract GOOD
Specification	MIN $r_b$	MIN 95	MIN 25	MIN 40	21 1660 ST	21 23	PERFORMED ON THE MATERIALS. NO WELDING WITH FILLER METAL HAS BEEN PERFORMED ON THE MATERIALS.			
Results	83	98	49	75	21					

$\sigma_T^M$   
 $\sigma_{UT}^M$

D = Cold Drawn  
ST = Solution Treated  
CG = Centerless Ground

A = Annealed

It is hereby certified that the above results are true and correct in every detail

Chief of Quality Assurance Section

**YAMASHIN STEEL CO.,INC.**  
Yamashin Bldg 3F. 6-35. 2-chome Andojimachi Chuo-ku,  
Osaka, Japan  
TEL:(06)6763-3395 FAX:(06)6763-3197  
**ENA PLANT**  
30, Shinakeori Takenami-cho Ena-City Gifu Japan  
TEL:(0573)28-1215 FAX:(0573)28-2513  
DGN059

# TEST CERTIFICATE

Certificate No. : 902746

Contract No. : 20090520-005

Date : 2009/07/14

modity: TP316 STAINLESS STEEL HEXAGON BARS.

Specification: ASTM A479, DIA TOLERANCE h11

Size MM	Number of Pieces	Net Weight KG	No. Ch. No.
19.05	62	451	22
19.05	62	451	23
19.05	62	451	24

Condition : SPB(SH LEVEL 2)	Length : 2500	3000 MM
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Chemical Composition ( % )									
Element	C X1000	Si X100	Mn X100	P X1000	S X1000	Ni X100	Cr X100	Mo X100	N X100
Specification	MAX 50	40	140	MAX 40	20	1200	1750	200	MAX 10
Results	40	54	146	34	30	1203	1759	200	3

## Mechanical Properties

Item	Yield Strength (kgf)	Tensil Strength (kgf)	Elongation (%)	Reduction of Area (%)	Hardness HRc	Heat Treatment			Micro Test GOOD	Macro Test GOOD	Intergranular Corrosion Test ASTM A262 Pract-B GOOD
						GOOD	GOOD	GOOD			
Specification	MIN 75	MIN 95	MIN 25	MIN 40	21	1060	ST				
Results	83	96	48	77	21						

D = Cold Drawn  
ST = Solution Treated  
A = Annealed

It is hereby certified that the above results are true and correct in every detail

SPB = Skin Pass Bright  
CG = Centerless Ground

Chief of Quality Assurance Section

**YANASHIN STEEL CO.,INC.**

Yanashin Bldg 3F, 6-35, 2-chome Andoimachi Chuo-ku,  
Osaka Japan  
TEL:(06) 6763-1305 FAX:(06) 6763-3107

**ENA PLANT**

30, Shintakeguri Takeanari-cho Ena-City Gifu Japan  
TEL:(0573)28-1215 FAX:(0573)28-2513

D95027

# **Calibration report of the test equipment**

고용기밀설비(Q63)

## 교정성적서

(주) 큐엔큐

부산시 사하구 당리동 43-4

Tel: 051-292-0395, Fax: 051-292-0397

성적서번호: Q10817-08205

페이지 (1) / (총 2)



## 1. 의뢰자

기관명: 하이록코리아 주

주소: 부산광역시 강서구 송정동 1467-1 번지

## 2. 측정기

기기명: 압력변환기

제작회사: SENSYS

형식 및 기기번호: PMSA1500KKAA, KIA885

3. 교정일자: 2010. 04. 02.

## 4. 교정환경

온도: (23.7 ± 0.1) °C

상대습도: (42 ± 2) % R.H.

교정장소: ■ 고정표준실

 이동교정 현장교정

## 5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 압력 변환기/압력전송기 교정지침서(QECI-PS416)에 따라 국가측정표준대표기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정되었음.

교정에 사용한 표준 장비 명세

사용장비명	제작자 및 형식	기기번호	교정유효일자	교정기관
액체형분동식압력계	DHI, PG-7302	552	2011. 10. 29.	(주) 피디케이
D.M.M	AGILENT, 34401A	MY41028217	2010. 04. 22.	(주) 큐엔큐
POWER SUPPLY	ISO-TECH, IPS303DD	0263542	2010. 11. 20.	(주) 큐엔큐
디지털 온·습도계	China, -	# 5	2011. 03. 25.	(주) 한국측정기술원

## 6. 교정결과: 교정결과 참조

## 7. 측정불확도: 교정결과 참조

확인인	작성자 성명: 박상일 <small>서명</small>	승인자 직위: (기술책임자) 성명: 박상철 <small>서명</small>
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위 성적서는 국제시험기관인정협력체 (International Laboratory Accreditation Cooperation) 상호인정협정 (Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인받은 항목의 교정결과입니다.

2010. 04. 03.

한국인정기구 인정

주식회사 큐엔큐 대표이사



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생하는 경우에는 무효가 됩니다.

# 교정 결과

(주) 큐엔큐 부산시 사하구 당리동 43-4 Tel : 051-292-0395, Fax : 051-292-0397	성적서번호 : Q10817-08205 페이지 (2) / (총 2)	
---	---	--

- \* 기기 번호 : KIA885
- \* 형식 : PMSA1500KKAA
- \* 제작자 : SENSYS

## 1. 교정 결과

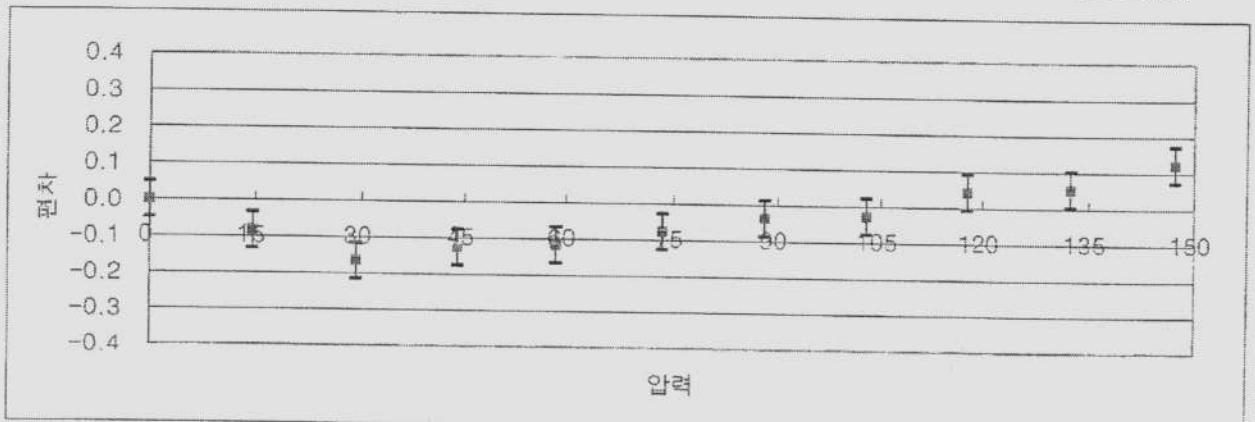
- 각 측정점에서 본 압력변환기의 평균 출력값이 갖는 확장불확도는 다음 표의 (1)과 같고 모델식을 적용할 경우의 불확도는 보정값을 포함하여 다음 표의 (2)와 같이 나타난다.(여기서 S는 전송계수이다.)

측정점 번호	표준기 압력	압력변환기					
		평균 출력값 및 모델에 의한 압력값 $P_{av} = \frac{1}{S} \cdot \bar{M}_i$ $1/S = 30.6650 \text{ MPa}/(\text{mv}/\text{v})$		편차	보정값	(1) 평균 출력값 확장불확도 ( $k=2$ )	(2) 모델식에 의한 계산값 오차구간 (정확도)
		$\bar{M}_i$	$P_{cal}$			MPa	mv/v
1	0.000	0.108	0.000	0.000	0.000	1.5	0.05
2	14.710	0.585	14.627	-0.083	0.083	1.5	0.13
3	29.420	1.062	29.254	-0.166	0.166	1.5	0.21
4	44.130	1.543	44.004	-0.126	0.126	1.5	0.17
5	58.840	2.023	58.724	-0.116	0.116	1.5	0.17
6	73.550	2.504	73.473	-0.076	0.076	1.5	0.13
7	88.260	2.985	88.223	-0.037	0.037	1.5	0.09
8	102.970	3.465	102.942	-0.027	0.027	1.5	0.08
9	117.680	3.947	117.723	0.043	-0.043	1.5	0.09
10	132.390	4.427	132.442	0.052	-0.052	1.5	0.10
11	147.100	4.909	147.223	0.123	-0.123	1.5	0.17

## 2. 불확도 그래프

- 각 측정압력에서 편차범위를 그려보면 다음 그림과 같다. 여기서 편자는 보정값과 부호가 반대이다.  
y 방향 길이는 확장불확도 크기를 나타낸다. 가운데 점은 평균값이다.

단위 : MPa



- 교정결과를  $\text{kgf/cm}^2$  단위로 사용할 경우에는 0.098067을 (를) 나누어 환산한다. 끝.

\* 국가교정기관지정제도운영요령 제 41 조 관련주기 : 12 개월



고증서증명번호(Q63)

## 교정성적서

(주)한국측정기술원

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-610

페이지 (1) / (총2)



## 1. 의뢰자

기관명 : 하이록코리아(주)

주소 : 부산시 강서구 송정동 1467-1

## 2. 측정기

기기명 : 온도지시조절계

제작회사 : AUTONICS

형식 및 기기번호 : TZN4M / ID03

3. 교정일자 : 2009. 07. 10.

## 4. 교정환경

온도 :  $(19.8 \pm 0.3)^\circ\text{C}$ 상대습도 :  $(47 \pm 3)\% \text{R.H.}$ 

교정장소 : ■ 교정표준실

 이동교정 현장교정

## 5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 온도지시조절계의 표준교정지침( KML-CAL-T02 )에 따라 국가측정표준대표기관(KRISS)로 부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 비교 교정됨.

교정에 사용한 표준장비 명세

사용장비명	제작자 및 형식	기기번호	교정 유효일자	교정기관
PROCESS CALIBRATOR	FLUKE, 741B	8776007	2009. 12. 08.	(주)표준교정기술원

6. 교정결과 : 교정결과 참조

7. 측정불확도 : 교정결과 참조

확인	작성자 성명: 장세갑 (서명)	승인자 직위: 기술책임자 성명: 이채현 (서명)
----	---------------------	----------------------------------

위 성적서는 국제시험기관인정협력체( International Laboratory Accreditation Cooperation ) 상호인정 협정( Mutual Recognition Arrangement )에 서명한 한국교정시험기관인정기구( KOLAS )로 부터 공인 받은 항목의 교정결과입니다.

2009. 07. 13.

한국인정기구 인정 (주)한국측정기술원 대표



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화에 대한 저항성을 평가하는 항목에 무효가 됩니다.

## 교정결과

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-610

페이지 (2) / (총2)



\* 입력센서 Type : K Type

\* 분 해 능 : 1 °C

기준값 (°C)	지시값 (°C)	보정값 (°C)
0.0	-2	2
50.0	48	2
100.0	98	2
150.0	148	2

보정값 = 기준값 - 지시값

1. 측정불확도 : 0.83 °C (신뢰수준 약 95%, k = 2). 끝.





고운사설설비(Q63)

## 교정성적서

(주)한국측정기술원

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-611

페이지 (1) / (총2)



## 1. 의뢰자

기관명 : 하이록코리아㈜

주소 : 부산시 강서구 송정동 1467-1

## 2. 측정기

기기명 : 온도지시조절계

제작회사 : AUTONICS

형식 및 기기번호 : TZN4M / HE21-2

3. 교정일자 : 2009. 07. 10.

## 4. 교정환경

온도 : (19.8 ± 0.3) °C

상대습도 : (47 ± 3) % R.H.

교정장소 : ■ 고정표준실

 이동교정 현장교정

## 5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 온도지시조절계의 표준교정지침( KML-CAL-T02 )에 따라 국가측정표준대표기관(KRISS)로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 비교 교정됨.

교정에 사용한 표준장비 명세

사용장비명	제작자 및 형식	기기번호	교정 유효일자	교정기관
PROCESS CALIBRATOR	FLUKE, 741B	8776007	2009. 12. 08.	(주)표준교정기술원

6. 교정결과 : 교정결과 참조

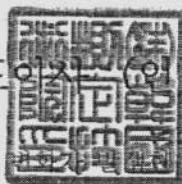
7. 측정불확도 : 교정결과 참조

확인	작성자 성명: 장세갑	승인자 직위: 기술책임자 성명: 이채현
----	----------------	-----------------------------

위 성적서는 국제시험기관인정협력체( International Laboratory Accreditation Cooperation ) 상호인정 협정( Mutual Recognition Arrangement )에 서명한 한국교정시험기관인정기구( KOLAS )로 부터 공인 받은 항목의 교정결과입니다.

2009. 07. 13.

한국인정기구 인정 (주)한국측정기술원 대표



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화에 따른 경우에는 무효가 됩니다.

## 교정결과

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-611

페이지 (2) / (총2)



\* 입력센서 Type : Pt 100Ω

\* 분 해 능 : 0.1 ℃

기준값 (℃)	지시값 (℃)	보정값 (℃)
-40.0	-39.8	-0.2
-30.0	-30.0	0.0
-20.0	-20.0	0.0
0.0	0.0	0.0

보정값 = 기준값 - 지시값

1. 측정불확도 : 0.47 ℃ (신뢰수준 약 95%,  $k = 2$ ) . 끝.

제조사(064) 교정성적서

(주) 큐엔큐

부산시 사하구 당리동 43-4  
Tel : 051-292-0395, Fax : 051-292-0397

성적서번호 : Q10817-08204

페이지 (1) / (총 2)



1. 의뢰자

기관명 : 하이록코리아 주

주소 : 부산광역시 강서구 송정동 1467-1 번지

2. 측정기

기기명 : 압력변환기

제작회사 : SENSYS

형식 및 기기번호 : PMSA1500KKAA, KIA886

3. 교정일자 : 2010. 04. 02.

4. 교정환경

온도 :  $(23.7 \pm 0.1) ^\circ\text{C}$

상대습도 :  $(42 \pm 2) \% \text{ R.H.}$

교정장소 : ■ 고정표준실

이동교정

현장교정

5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 압력 변환기/압력전송기 교정지침서(QECI-PS416)에 따라 국가측정표준대표기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정되었음.

교정에 사용한 표준 장비 명세

사용장비명	제작자 및 형식	기기번호	교정유효일자	교정기관
액체형분동식압력계	DHI, PG-7302	552	2011. 10. 29.	(주) 피디케이
D.M.M	AGILENT, 34401A	MY41028217	2010. 04. 22.	(주) 큐엔큐
POWER SUPPLY	ISO-TECH, IPS303DD	0263542	2010. 11. 20.	(주) 큐엔큐
디지털 온·습도계	China, -	# 5	2011. 03. 25.	(주) 한국측정기술원

6. 교정결과 : 교정결과 참조

7. 측정불확도 : 교정결과 참조

확인	작성자 성명 : 박상일	승인자 직위 : (기술책임자) 성명 : 박상철

위 성적서는 국제시험기관인정협력체 (International Laboratory Accreditation Cooperation) 상호인정협정 (Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인받은 항목의 교정결과입니다.

2010. 04. 03.

한국인정기구 인정

주식회사 큐엔큐 대표이사



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생하는 경우에는 무효가 됩니다.

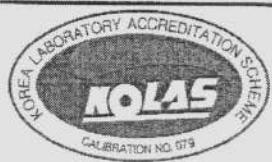
# 교정결과

(주) 큐엔큐

부산시 사하구 당리동 43-4  
Tel : 051-292-0395, Fax : 051-292-0397

성적서번호 : Q10817-08204

페이지 (2) / (총 2)



- \* 기기 번호 : KIA886
- \* 형식 : PMSA1500KKAA
- \* 제작자 : SENSYS

## 1. 교정 결과

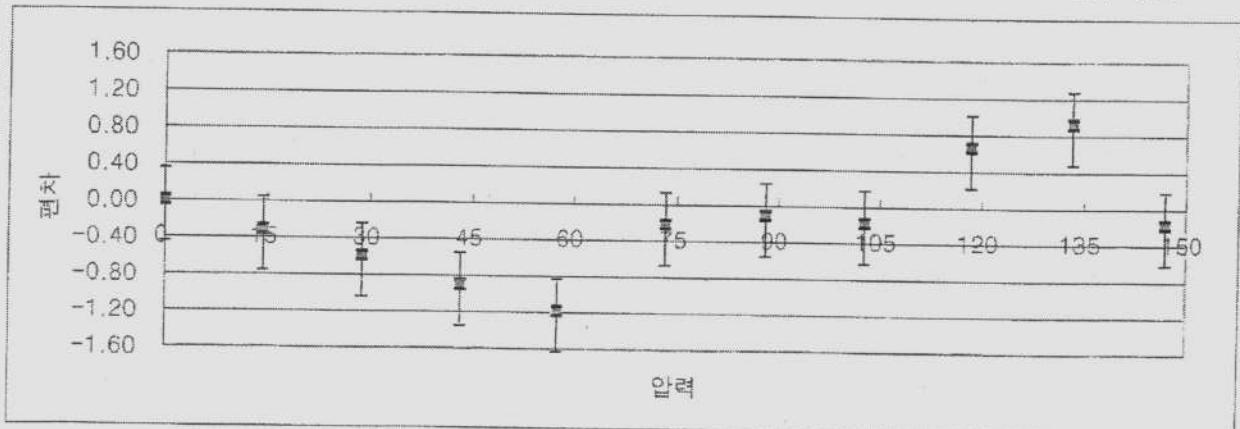
- 각 측정점에서 본 압력변환기의 평균출력값이 갖는 확장불확도는 다음 표의 (1)과 같고 모델식을 적용할 경우의 불확도는 보정값을 포함하여 다음 표의 (2)와 같이 나타난다.(여기서 S는 전송계수이다.)

측정점 번호	표준기	압력변환기					
		압력	평균출력값 및 모델에 의한 압력값		편차	보정값	(1)
			$P_{out} = \frac{1}{S} \cdot M_i$	$M_i$			평균출력값 확장불확도 ( $k=2$ )
			$1/S = 30.2509 \text{ MPa}/(\text{mv/v})$	$P_{cal}$			모델식에 의한 계산값 오차구간 (정확도)
	MPa	mv/v	MPa	MPa	MPa	mv/v	MPa
1	0.000	0.074	0.000	0.000	0.000	1.5	0.05
2	14.710	0.550	14.399	-0.311	0.311	1.5	0.36
3	29.420	1.027	28.829	-0.591	0.591	1.5	0.64
4	44.130	1.503	43.229	-0.901	0.901	1.5	0.95
5	58.840	1.980	57.658	-1.182	1.182	1.5	1.23
6	73.550	2.498	73.328	-0.222	0.222	1.5	0.27
7	88.260	2.988	88.151	-0.109	0.109	1.5	0.16
8	102.970	3.472	102.793	-0.177	0.177	1.5	0.23
9	117.680	3.986	118.342	0.662	-0.662	1.5	0.71
10	132.390	4.481	133.316	0.926	-0.926	1.5	0.98
11	147.100	4.931	146.929	-0.171	0.171	1.5	0.22

## 2. 불확도 그래프

- 각 측정압력에서 편차범위를 그려보면 다음 그림과 같다. 여기서 편자는 보정값과 부호가 반대이다.  
y 방향 길이는 확장불확도 크기를 나타낸다. 가운데 점은 평균값이다.

단위 : MPa



- 교정결과를 kgf/cm<sup>2</sup> 단위로 사용할 경우에는 0.098067을(를) 나누어 환산한다. 끝.

\* 국가교정기관지정제도운영요령 제 41 조 관련주기 : 12 개월



서울시립설비(064)

## 교정성적서

(주)한국측정기술원

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-609

페이지 (1) / (총2)



## 1. 의뢰자

기관명 : 하이록코리아㈜

주소 : 부산시 강서구 송정동 1467-1

## 2. 측정기

기기명 : 온도지시조절계

제작회사 : AUTONICS

형식 및 기기번호 : TZN4M / HE21-1

3. 교정일자 : 2009. 07. 10.

## 4. 교정환경

온도 :  $(19.8 \pm 0.3)^\circ\text{C}$ 상대습도 :  $(47 \pm 3)\% \text{R.H.}$ 

교정장소 : ■ 고정표준실

 이동교정 현장교정

## 5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 온도지시조절계의 표준교정지침( KML-CAL-T02 )에 따라 국가측정표준대표기관(KRISS)로 부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 비교 교정됨.

교정에 사용한 표준장비 명세

사용장비명	제작자 및 형식	기기번호	교정 유효일자	교정기관
PROCESS CALIBRATOR	FLUKE, 741B	8776007	2009. 12. 08.	■ 표준교정기술원

6. 교정결과 : 교정결과 참조

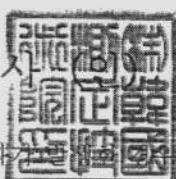
7. 측정불확도 : 교정결과 참조

확인	작성자 성명: 장세갑 (張世賛)	승인자 직위: 기술책임자 성명: 이체현 (李체현)
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위 성적서는 국제시험기관인정협력체( International Laboratory Accreditation Cooperation ) 상호인정 협정( Mutual Recognition Arrangement )에 서명한 한국교정시험기관인정기구( KOLAS )로 부터 공인 받은 항목의 교정결과입니다.

2009. 07. 13.

한국인정기구 인정 (주)한국측정기술원 대표이사



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화에 따른 교정 결과에 무효가 됩니다.

## 교정결과

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-609

페이지 (2) / (총2)



\* 입력센서 Type : K Type

\* 분 해 능 : 1 °C

기준값 (°C)	지시값 (°C)	보정값 (°C)
0.0	-2	2
50.0	48	2
100.0	98	2
150.0	148	2

보정값 = 기준값 - 지시값

1. 측정불확도 : 0.83 °C (신뢰수준 약 95%, k = 2). 끝.



제작시작일(064)

## 교정성적서

(주)한국측정기술원

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-612

페이지 (1) / (총2)



## 1. 의뢰자

기관명 : 하이록코리아㈜

주소 : 부산시 강서구 송정동 1467-1

## 2. 측정기

기기명 : 온도지시조절계

제작회사 : AUTONICS

형식 및 기기번호 : TZN4M / HE21-3

3. 교정일자 : 2009. 07. 10.

## 4. 교정환경

온도 :  $(19.8 \pm 0.3)^\circ\text{C}$ 상대습도 :  $(47 \pm 3)\% \text{R.H.}$ 

교정장소 : ■ 교정표준실

 이등교정 현장교정

## 5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 온도지시조절계의 표준교정지침( KML-CAL-T02 )에 따라 국가측정표준대표기관(KRISS)로 부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 비교 교정됨.

교정에 사용한 표준장비 명세

사용장비명	제작자 및 형식	기기번호	교정 유효일자	교정기관
PROCESS CALIBRATOR	FLUKE, 741B	8776007	2009. 12. 08.	㈜표준교정기술원

6. 교정결과 : 교정결과 참조

7. 측정불확도 : 교정결과 참조

확인	작성자 성명: 장세갑	승인자 직위: 기술책임자 성명: 이채현
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위 성적서는 국제시험기관인정협력체( International Laboratory Accreditation Cooperation ) 상호인정 협정( Mutual Recognition Arrangement )에 서명한 한국교정시험기관인정기구( KOLAS )로 부터 공인 받은 항목의 교정결과입니다.

2009. 07. 13.

한국인정기구 인정 (주)한국측정기술원 대표이사



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화에 대한 보완적인 교정을 받았음을 증명하는 내용을 포함하지 않습니다.

## 교정결과

경남 김해시 삼정동 638-4  
Tel : 055-338-8272 Fax : 055-326-6168

성적서번호 : KT0907-612

페이지 (2) / (총2)



\* 입력센서 Type : Pt 100Ω

\* 분 해 능 : 0.1 °C

기준값 (°C)	지시값 (°C)	보정값 (°C)
-40.0	-39.9	-0.1
-30.0	-29.9	-0.1
-20.0	-19.9	-0.1
0.0	-0.1	0.1

보정값 = 기준값 - 지시값

1. 측정불확도 : 0.47 °C (신뢰수준 약 95%,  $k = 2$ ) . 끝.

Impulse Test 장비(Q48) 교정성적서

(주) 큐엔큐

부산시 사하구 당리동 43-4  
Tel : 051-292-0395. Fax : 051-292-0397

성적서번호 : Q10817-08203

페이지 (1) / (총 2)



1. 의뢰자

기관명 : 하이.MaxLength코리아(주)

주소 : 부산광역시 강서구 송정동 1467-1 번지

2. 측정기

기기명 : 압력변환기

제작회사 : SENSYS

형식 및 기기번호 : (0 ~ 147.10) MPa, VI-T02

3. 교정일자 : 2010. 04. 02.

4. 교정환경

온도 : (23.7 ± 0.1) °C

상대습도 : (42 ± 2) % R.H.

교정장소 : ■ 고정표준실

이동교정

현장교정

5. 측정표준의 소급성

교정방법 및 소급성 서술

상기 기기는 압력 변환기/압력전송기 교정지침서(QECI-PS416)에 따라 국가측정표준대표기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정되었음.

교정에 사용한 표준 장비 명세

사용장비명	제작자 및 형식	기기번호	교정유효일자	교정기관
액체형분동식압력계	DHI, PG-7302	552	2011. 10. 29.	(주) 피디케이
D.M.M	AGILENT, 34401A	MY41028217	2010. 04. 22.	(주) 큐엔큐
POWER SUPPLY	ISO-TECH, IPS303DD	0263542	2010. 11. 20.	(주) 큐엔큐
디지털 온·습도계	China, -	# 5	2011. 03. 25.	(주) 한국측정기술원

6. 교정결과 : 교정결과 참조

7. 측정불확도 : 교정결과 참조

확인인	작성자 성명 : 박상일 일자 : 05(서명)	승인자 직위 : (기술책임자) 성명 : 박상철 일자 : 11(서명)
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위 성적서는 국제시험기관인정협력체 (International Laboratory Accreditation Cooperation) 상호인정협정 (Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인받은 항목의 교정결과입니다.

2010. 04. 03.

한국인정기구 인정

주식회사 큐엔큐 대표이사



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 금지한 변화가 발생하는 경우에는 무효가 됩니다.

# 교정결과

(주) 큐엔큐

부산시 사하구 당리동 43-4  
Tel : 051-292-0395, Fax : 051-292-0397

성적서번호 : Q10817-08203

페이지 (2) / (총 2)



- \* 기기 번호 : VI-T02
- \* 형식 : (0 ~ 147.10) MPa
- \* 제작자 : SENSYS

## 1. 교정 결과

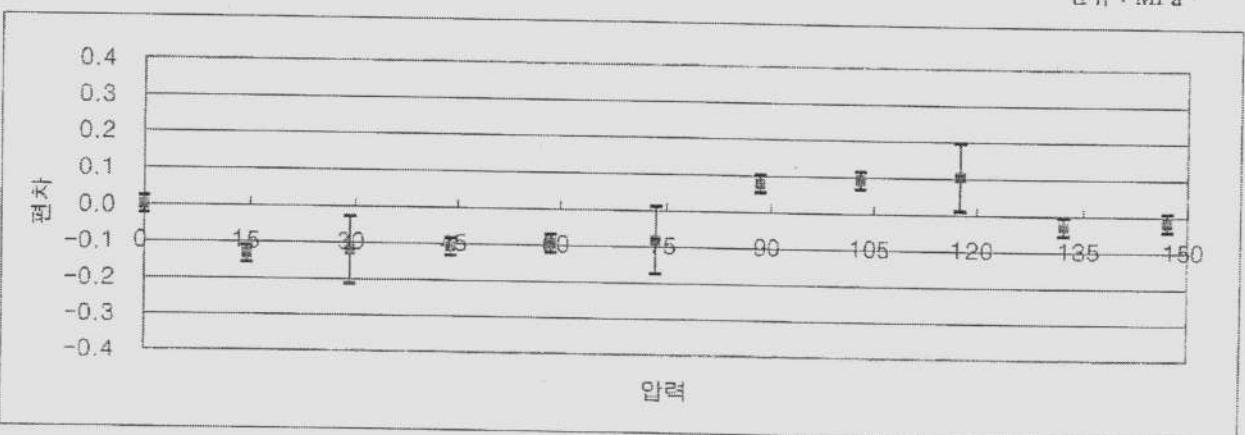
- 각 측정점에서 본 압력변환기의 평균출력값이 갖는 확장불확도는 다음 표의 (1)과 같고 모델식을 적용할 경우의 불확도는 보정값을 포함하여 다음 표의 (2)와 같이 나타난다.(여기서 S는 전송계수이다.)

측정점 번호	표준기 압력	압력변환기					
		평균출력값 및 모델에 의한 압력값 $P_{out} = \frac{1}{S} \cdot \bar{M}_i$ $1/S = 14.7230 \text{ MPa/(V)}$		편차	보정값	(1) 평균출력값 확장불확도 (k=2)	(2) 모델식에 의한 계산값 오차구간 (정확도)
		$\bar{M}_i$	$P_{out}$			MPa	V
1	0.000	0.000	0.000	0.000	0.000	0.3	0.02
2	14.710	0.990	14.576	-0.134	0.134	0.3	0.16
3	29.420	1.990	29.299	-0.121	0.121	1.4	0.21
4	44.130	2.990	44.022	-0.108	0.108	0.3	0.13
5	58.840	3.990	58.745	-0.095	0.095	0.4	0.12
6	73.550	4.990	73.468	-0.082	0.082	1.4	0.17
7	88.260	6.000	88.338	0.078	-0.078	0.4	0.10
8	102.970	7.000	103.061	0.091	-0.091	0.4	0.12
9	117.680	8.000	117.784	0.104	-0.104	1.4	0.20
10	132.390	8.990	132.360	-0.030	0.030	0.4	0.06
11	147.100	9.990	147.083	-0.017	0.017	0.4	0.04

## 2. 불확도 그래프

- 각 측정압력에서 편차범위를 그려보면 다음 그림과 같다. 여기서 편차는 보정값과 부호가 반대이다.  
y 방향 길이는 확장불확도 크기를 나타낸다. 가운데 점은 평균값이다.

단위 : MPa



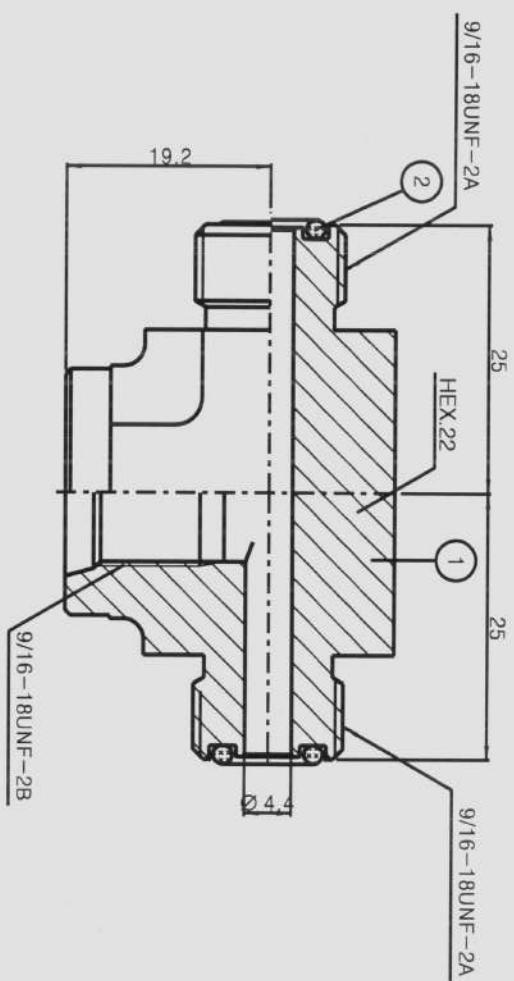
- 교정결과를 kgf/cm<sup>2</sup> 단위로 사용할 경우에는 0.098067을(를) 나누어 환산한다. 끝.

\* 국가교정기관지정제도운영요령 제 41 조 관련주기 : 12 개월

# **Drawing**

Signature

FILE NAME E:\PRODUCT\FITTINGS\OF\ASSY\OFBTF4-06U



## Specification

1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

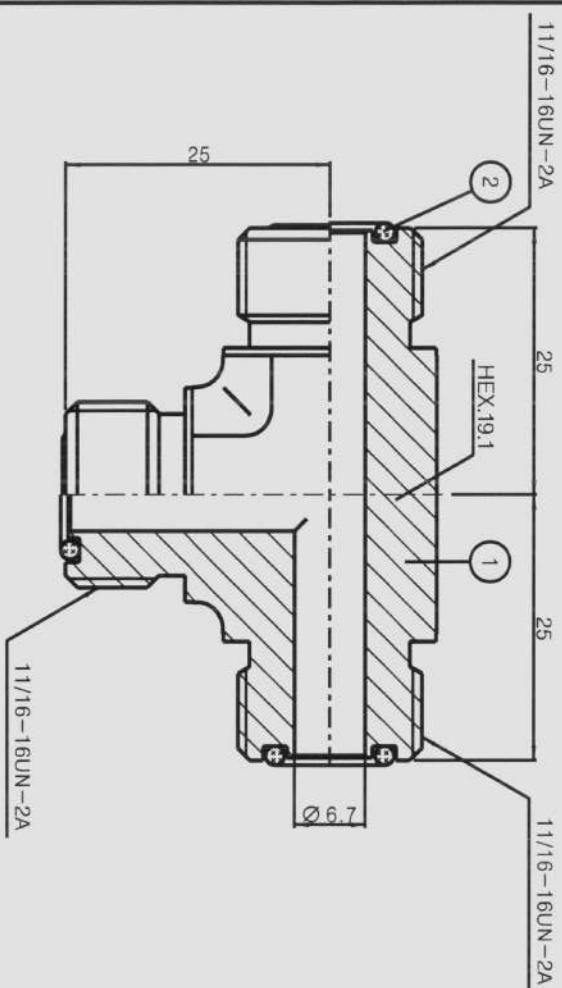
Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
2	O-ring	EPDM	2	OR2-011
1	Body	ASTM A182 F316	1	OFBTF4-06U
Part No.	OFBTF4-06U		Ref. Dwg No.	
Date	2008.02.25	FEMALE BRANCH TEE 1/4"O.D x 9/16-18UNF		
Scale	N/S			
Approved by	○ 김경수	Dwg No.	Rev. No.	0
Reviewed by	○ 정현	2008B25D11		
Checked by				
Prepared by	○ 정현			

**Hy-Lok** **HY-LOK CORPORATION**

Signature

FILE NAME

E:\PRODUCT\FITTINGS\OF\ASSY\OFT-6



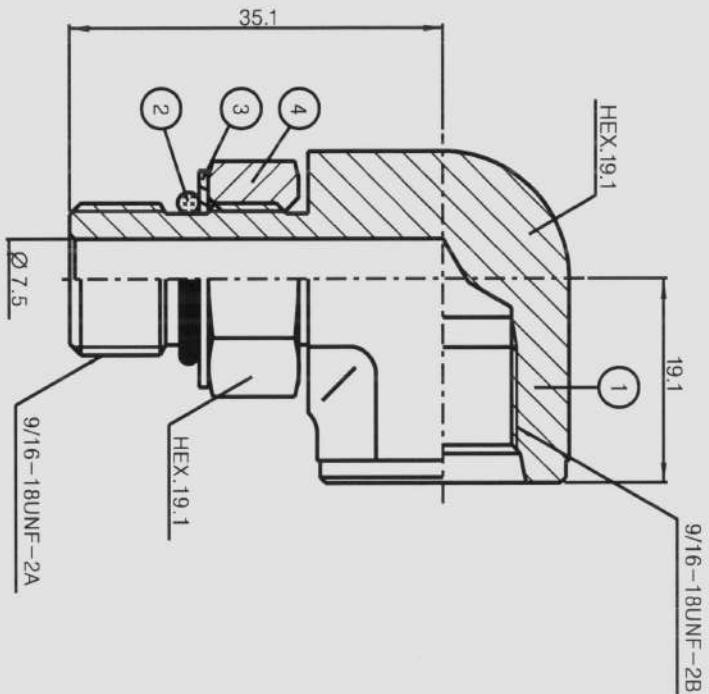
### Specification

1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

2	O-ring	EPDM	3	OR2-012
1	Body	ASTM A182 F316	1	OFT-6
Item NO.	Description	Material	Qty	Hy-Lok P/N
MAT'L	MAT'L SIZE		Hardness	
Part No.	OFT-6	Ref. Dwg No.		
Date	2008.02.20	UNION TEE 3/8"O.D		
Scale	N/S			
Approved by		Dwg No.	2008B20D02	Rev. No. 0
Reviewed by				
Checked by				
Prepared by	o 정 희	<b>Hy-Lok</b> <b>HY-LOK CORPORATION</b>		

Signature

FILE NAME E:\PRODUCT\FITTINGS\JISPIPE\ASSY\SOLM06U-06U



### Specification

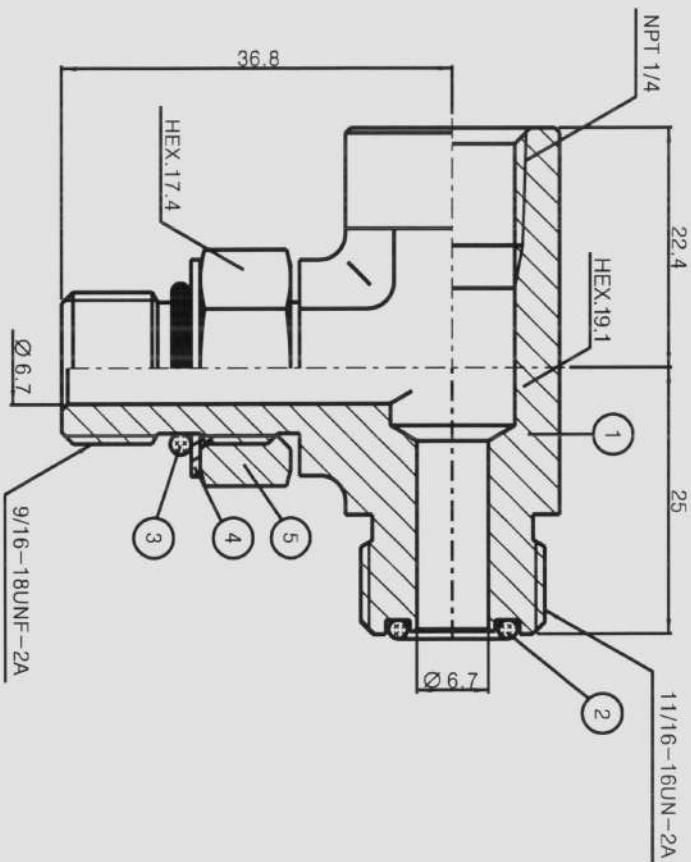
1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
Part No.	SOLM06U-06U	Ref. Dwg No.		
Date	2008.02.20	STRAIGHT THREAD MALE/FEMALE ELBOW		
Scale	N/S	9/16-18UNF		
Approved by		Dwg No.	2008B20D04	Rev. No. 0
Reviewed by				
Checked by				
Prepared by	이정혁			



HY-LOK CORPORATION





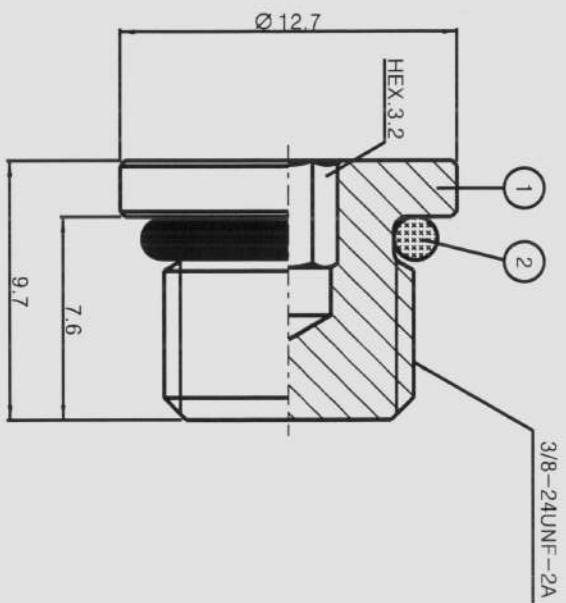
### Specification

1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1 - 1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
Part No.	OFSBTFF6-06U-02N	Ref. Dwg No.		
Date	2008.02.25	STRAIGHT THREAD BRANCH & FEMALE RUN TEE		
Scale	N/S	3/8"O.D x 9/16-18UNF x 1/4"NPT		
Approved by		Dwg No.	Rev. No.	0
Reviewed by		2008B25D15		
Checked by				
Prepared by	이정희			



**HY-LOK CORPORATION**



### Specification

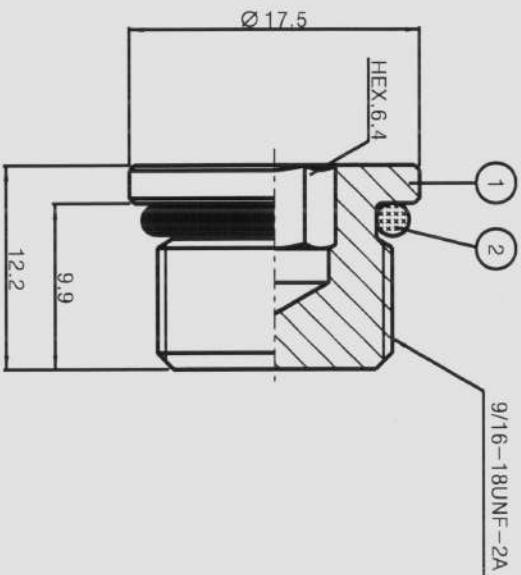
1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

2	O-ring	EPDM	1	OR3-903
1	Plug	ASTM A479 Type316	1	DVSTI-03U
Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
Part No.	DVSTI-03U	Ref. Dwg No.		
Date	2008.02.20	HOLLOW HEX PLUG		
Scale	N/S	3/8-24UNF		
Approved by	o o KING	Dwg No.	2008B20D06	Rev. No. 0
Reviewed by	<del>K C Song</del>			
Checked by				
Prepared by	이 정 혁	HY-LOK	HY-LOK CORPORATION	

Signature

FILE NAME

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### Specification

1. Working Pressure : Up to 70MPa(10150psi) @ 15 ° C (59 ° F)
  2. Temperature Rating : From -40 ° C to 149 ° C (-40 ° F to 300 ° F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

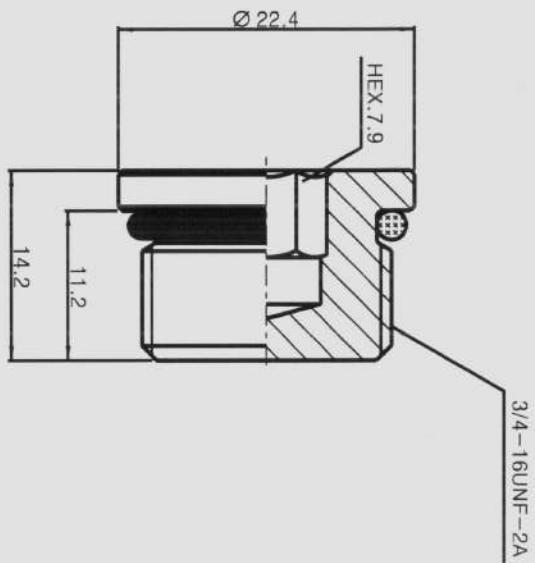
2	O-ring	EPDM	1	OR3-906		
Item NO.	Description	Material	Q'ty	Hy-Lok P/N		
MATL	MATL SIZE		Hardness			
Part No.	DVSTI-06U	Ref. Dwg No.				
Date	2008.02.20	HOLLOW HEX PLUG 9/16-18UNF				
Scale	N/S					
Approved by	○ 김경수	Dwg No.	2008B20D08	Rev. No. 0		
Reviewed by	○ 김경수					
Checked by	○ 정희					
Prepared by	○ 정희					



**HY-LOK CORPORATION**

Signature

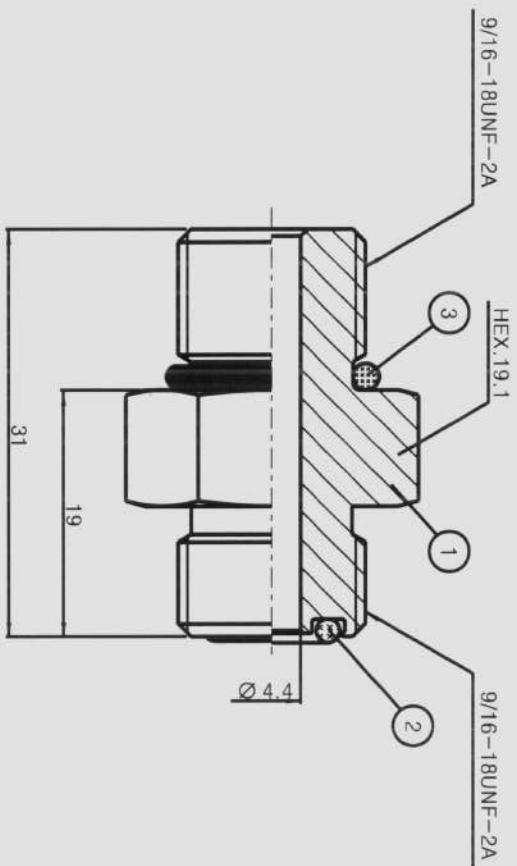
FILE NAME E:\PRODUCT\FITTINGS\IN\ASSY\DVSTI-08U



2	O-ring	EPDM	1	OR3-908
1	Plug	ASTM A479 Type316	1	DVSTI-08U
Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
Part No.	DVSTI-08U	Ref. Dwg No.		
Date	2008.02.20	HOLLOW HEX PLUG 3/4-16UNF		
Scale	N/S			
Approved by	<i>o o KING</i>	Dwg No.	2008B20D07	Rev. No. 0
Reviewed by	<i>K C Song</i>			
Checked by				
Prepared by	이정혁	<b>HY-LOK CORPORATION</b>		

Signature

FILE NAME E:\PRODUCT\FITTINGS\OF\ASSY\OFSC4-06U



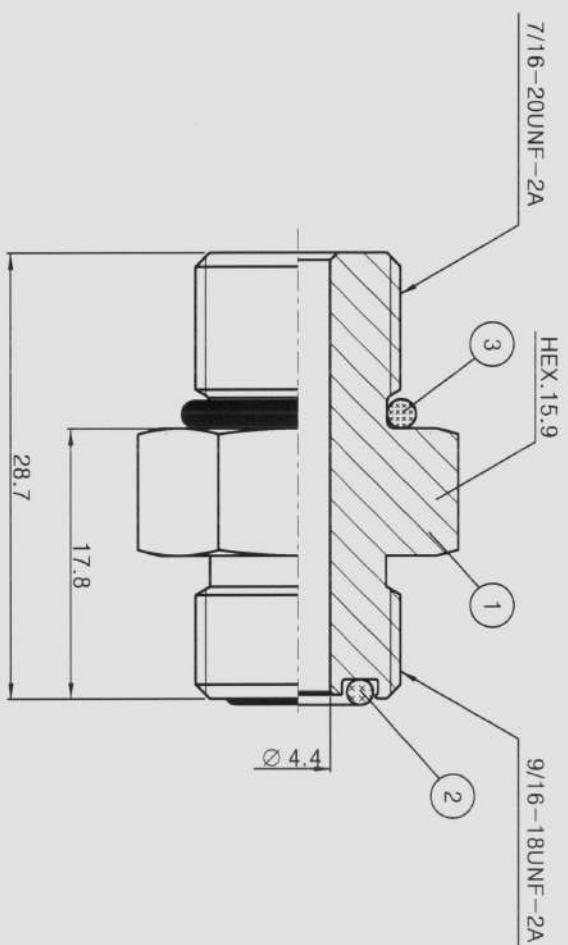
### Specification

1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Item NO.	Description	Material	Q'ty	Hy-Lok P/N
MATL	MATL SIZE		Hardness	
Part No.	OFSC4-06U	Ref. Dwg No.		
Date	2008 02 25	STRAIGHT THREAD MALE CONNECTOR		
Scale	N/S	1/4"O.D x 9/16-18UNF		
Approved by	<input checked="" type="checkbox"/> <i>K C Song</i>	Dwg No.	2008B25D14	Rev. No. 0
Reviewed by				
Checked by				
Prepared by	이정희	<b>HY-LOK HY-LOK CORPORATION</b>		

## Specification

1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.



Item NO.	Description	MAT'L	MAT'L SIZE	Material	Q'ty	Hy-Lok P/N
						Hardness
Part No.	OFSC4-04U					
Date	2008.02.25	STRAIGHT THREAD MALE CONNECTOR 1/4"O.D x 7/16-20UNF				
Scale	N/S					
Approved by		Dwg No.	2008B25D15	Rev. No.	0	
Reviewed by						
Checked by						
Prepared by						

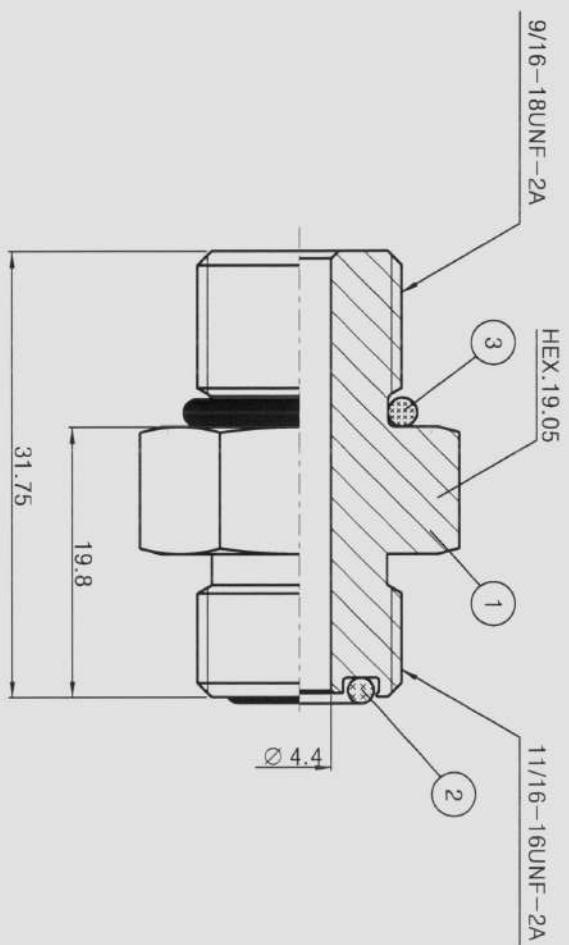


**HY-LOK CORPORATION**



## Specification

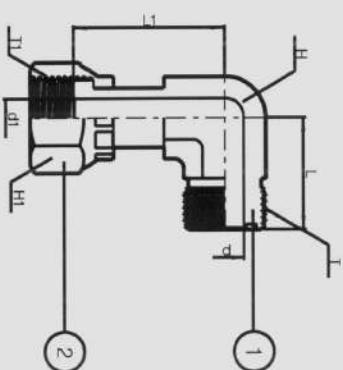
1. Working Pressure : Up to 70MPa(10150psig) @ 15°C (59°F)
  2. Temperature Rating : From -40°C to 149°C (-40°F to 300°F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.



Item NO.	Description	MATL	MATL SIZE	Material	Q'ty	Hy-Lok P/N
3	O-ring	EPDM		1	OR3-906	
2	O-ring	EPDM		1	OR2-012	
1	Body	ASTM A182 F316		1	OFSC4-06U	
Part No.	OFSC6-06U			Ref. Dwg No.		
Date	2008.02.25	STRAIGHT THREAD MALE CONNECTOR 3/8"O.D x 11/16-16UNF				
Scale	N/S	Dwg No.	2008B25D16	Rev. No.	0	
Approved by						
Reviewed by						
Checked by						
Prepared by						

**Hy-Lok** **HY-LOK CORPORATION**

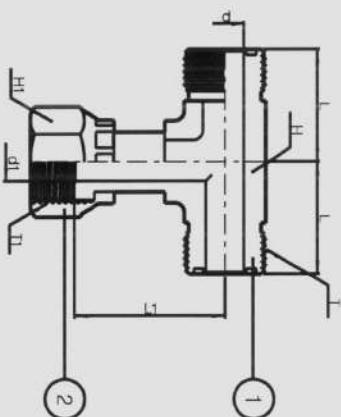
Part-NO.	Tube O.D		Width across flat		d	d1	L	L1	Tube End UN/UNF-2A
	in	mm	in	mm					
OFSSL-4	1/4	6.35	9/16	14.28	11/16	17.46	4.37	4.22	21.59
OFSSL-6	3/8	9.52	3/4	19.05	13/16	19.05	6.71	6.71	27.18
									9/16-18
									11/16-16



Item NO.	Description	Material	Q'ty	Hy-Lok PN
2	Swivel Nut	ASTM A479 TP316	1	
1	Body	ASTM A182 F316	1	
Item NO.	Description	Material	Q'ty	Hy-Lok PN
MATL	MATL SIZE		Hardness	
Part No.	OFSSL-X	Ref. Dwg No.		
Date	2010.04.08			SWIVEL ELBOW
Scale	N/S			
Approved by		Dwg No.	2010D08H01	Rev. No.
Reviewed by				0
Checked by				
Prepared by				

- Specification**
- Working Pressure : Up to 70MPa(10150psig) @ 15 ° C (59 ° F)
  - Temperature Rating : From -40 ° C to 149 ° C (-40 ° F to 300 ° F) with EPDM O-ring
  - Material : See Table
  - Unified Thread : ISO 725 / ASME B1.1-1989
  - All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Part NO.	Tube O.D		Width across flat		d	d1	L	L1	Tube End UN/UNF-2A
	in	mm	H	H1					
OFSSBT-4	1/4	6.35	9/16	14.28	11/16	17.46	4.37	4.22	21.59
OFSSBT-6	3/8	9.52	3/4	19.05	13/16	19.05	6.71	6.71	24.89
									27.18
									9/16-18
									11/16-16

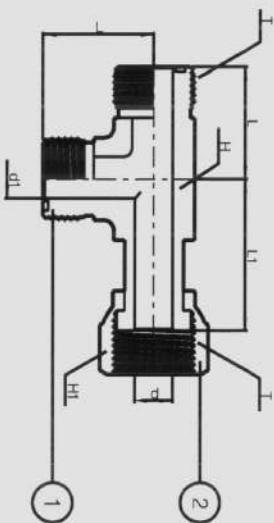


### Specification

- Working Pressure : Up to 70MPa(10150psi) @ 15 ° C (59 ° F)
- Temperature Rating : From -40 ° C to 149 ° C (-40 ° F to 300 ° F) with EPDM O-ring
- Material : See Table
- Unified Thread : ISO 725 / ASME B1.1-1989
- All Dimensions are in Millimeters unless otherwise specified.  
Dimensions are for reference only, subject to change.

Item NO.	Description	Material	Q'ty	Hy-Lok P/N
2	Swivel Nut	ASTM A479 TP316	1	
1	Body	ASTM A182 F316	1	
MATL	MATL SIZE		Hardness	
Part No.	OFSSBT-X		Ret. Dwg No.	
Date	2010.04.08			SWIVEL BRANCH TEE
Scale	N/S			
Approved by		Dwg No.	Rev. No.	
Reviewed by		2010D08H02	0	
Checked by				<b>HY-LOK</b>
Prepared by				<b>HY-LOK CORPORATION</b>

Part NO.	Width across flat		d	d1	L	L1	Tube End UN/UNF-2A
	in	mm					
OFSSRT-4	1/4	6.35	9/16	14.28	11/16	17.46	4.37
OFSSRT-6	3/8	9.52	3/4	19.05	13/16	19.05	6.71



### Specification

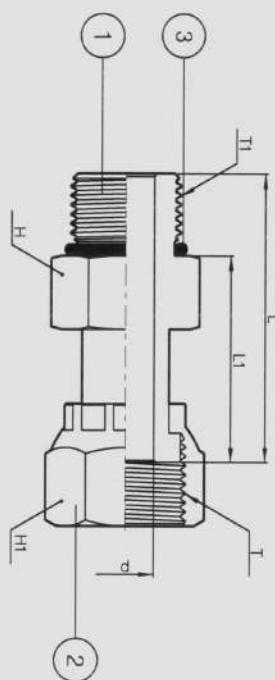
1. Working Pressure : Up to 70MPa(10150psig) @ 15 ° C (59 ° F)
  2. Temperature Rating : From -40 ° C to 149 ° C (-40 ° F to 300 ° F) with EPDM O-ring
  3. Material : See Table
  4. Unified Thread : ISO 725 / ASME B1.1-1989
  5. All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Item NO.	Description	Material	Q'ty		Hy-Lok P/N
			MAT'L	MAT'L SIZE	
2	Swivel Nut	ASTM A479 TP316	1		
1	Body	ASTM A182 F316	1		
Part No.	OFSSRT-X	Ref. Dwg No.			
Date	2010. 04.08				
Scale	N/S				
Approved by		Dwg No.	2010D08H03	Rev. No.	0
Reviewed by					
Checked by					
Prepared by					



**HY-LOK CORPORATION**

Part NO.	Tube O.D		Width across flat		d	$L^1$ Attter Assy	L	Tube End UN/UNF-2A	Straight Thread $T_1(U)$		
	in	mm	H	H1							
OFSSC4-04U	1/4	6.35	9/16	14.28	11/16	17.46	4.37	26.16	37.08	9/16-18	7/16-20
OFSSC6-04U	3/8	9.52	5/8	15.8	13/16	19.05	4.37	28.19	39.19	11/16-16	7/16-20
OFSSC6-06U	3/8	9.52	3/4	19.05	13/16	19.05	6.71	28.19	40.13	11/16-16	9/16-18



Item NO.	Description	Material	Q'ty	Hy-Lok P/N
3	O-Ring	EPDM	1	
2	Swivel Nut	ASTM A479 TP316	1	
1	Body	ASTM A182 F316	1	

### Specification

- Working Pressure : Up to 70MPa(10150psi) @ 15 ° C (59 ° F)
  - Temperature Rating : From -40 ° C to 149 ° C (-40 ° F to 300 ° F) with EPDM O-ring
  - Material : See Table
  - Unified Thread : ISO 725 / ASME B1.1-1989
  - All Dimensions are in Millimeters unless otherwise specified.
- Dimensions are for reference only, subject to change.

Prepared by



MAT'L	MAT'L SIZE	Ref. Dwg No.
Part No.	OFSSCX-XXX	

Date	Scale	SWIVEL TO SAE/MS MALE CONNECTOR
2010. 04.08	N/S	
Approved by	Dwg No.	Rev. No.
Reviewed by	2010D08H04	0
Checked by		

**HY-LOK CORPORATION**

