**Documents regarding Approval of**

# CNG Trunnion Ball valve of class 0

# Of BMT Co. Ltd. Make

Approval number: **E4-110R-000308-00**

Report No: **IN110-A0-120035** Dated **16-July-2012**

**Name of technical service**

**TÜV NORD Mobilität GmbH & Co. KG**
**Institut für Fahrzeugtechnik und Mobilität**
**Adlerstr. 7**
**D-45307 Essen**

## CONTENTS

RDW

Vehicle Technology Division

**THE NETHERLANDS**
(N E D E R L A N D)

E4

**COMMUNICATION**

Concerning [1]:

- approval granted
~~- approval extended~~
~~- approval refused~~
~~- approval withdrawn~~
~~- production definitely discontinued~~

of a type of CNG component pursuant to Regulation number 110.

**Approval number: E4-110R-000308** **Extension number: 00**

1. CNG component considered:

- ~~Container(s) or cylinder(s)~~ [1]
- ~~Pressure indicator~~
- ~~Pressure relief valve~~
- ~~Automatic valve(s)~~
- ~~Excess flow valve~~
- ~~Gas-tight housing~~
- ~~Pressure regulator(s)~~
- ~~Non-return valve(s)~~
- ~~Pressure relief device~~
- Manual valve
- ~~Flexible fuel lines~~
- ~~Filling unit or receptacle~~
- ~~Gas injector(s)~~
- ~~Gas flow adjuster~~
- ~~Gas/air mixer~~
- ~~Electronic control unit~~
- ~~Pressure and temperature sensor(s)~~
- ~~CNG filter(s)~~

2. Trade name or mark : SUPERLOK T&S VALVES
Trunnion Ball valve (SBT2, SBT3 Series)

Manufacturer's name and address : BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si,
Gyeongsangnam-do,
626-110 S.Korea

P.O. Box 777
2700 AT Zoetermeer
The Netherlands

Tel. + 31 (0)79 345 81 43
Fax + 31 (0)79 345 80 43
www.rdw.nl

*Vehicle Approval and Information*

**Approval number: E4-110R-000308** **Extension number: 00**

| | | |
|---|---|---|
| 4. | If applicable, name and address of manufacturer's representative | : NA |
| 5. | Submitted for approval on | : December'2011 |
| 6. | Technical service responsible for conducting approval tests | : **TÜV NORD Mobilität GmbH & Co. KG**<br>Institut für Fahrzeugtechnik und Mobilität<br>Adlerstr. 7<br>D-45307 Essen |
| 7. | Date of report issued by that service | : 16-July-2012 |
| 8. | Number of report issued by that service | : IN110-A0-120035 |
| 9. | Approval | : granted/~~refused/extended/withdrawn~~ (1) |
| 10. | Reason(s) of extension (if applicable) | : NA |
| 11. | Place | : ZOETERMEER |
| 12. | Date | : 06-NOV-2012 |
| 13. | Signature | : |

RDW
R. Kauerz

14. The documents filed with the application or extension of approval can be obtained upon request.

(1) Strike out what does not apply.

**Approval number: E4-110R-000308** **Extension number: 00**

## ADDENDUM

1. Additional information concerning the type-approval of a type of CNG components pursuant to Regulation number 110.

| | | |
|---|---|---|
| 1.1. | Container(s) or cylinder(s) | |
| 1.1.1. | Dimensions | : Not Applicable |
| 1.1.2. | Material | : Not Applicable |
| 1.2. | Pressure indicator | |
| 1.2.1. | Working pressure(s) (2) | : Not Applicable |
| 1.2.2. | Material | : Not Applicable |
| 1.3. | Pressure relief valve (discharge valve) | |
| 1.3.1. | Working pressure(s) (2) | : Not Applicable |
| 1.3.2. | Material | : Not Applicable |
| 1.4. | Automatic valve(s) | |
| 1.4.1. | Working pressure(s) (2) | : Not Applicable |
| 1.4.2. | Material | : Not Applicable |
| 1.5. | Excess flow valve | |
| 1.5.1. | Working pressure(s) (2) | : Not Applicable |
| 1.5.2. | Material | : Not Applicable |
| 1.6. | Gas-tight housing | |
| 1.6.1. | Working pressure(s) (2) | : Not Applicable |
| 1.6.2. | Material | : Not Applicable |
| 1.7. | Pressure regulator(s) | |
| 1.7.1. | Working pressure(s) (2) | : Not Applicable |
| 1.7.2. | Material | : Not Applicable |
| 1.8. | Check valve(s) or non-return valve(s) | |
| 1.8.1. | Working pressure(s) (2) | : Not Applicable |
| 1.8.2. | Material | : Not Applicable |
| 1.9. | Pressure relief device (temperature triggered) | |
| 1.9.1. | Working pressure(s) (2) | : Not Applicable |
| 1.9.2. | Material | : Not Applicable |
| 1.10. | Manual valve | |
| 1.10.1. | Working pressure(s) (2) | : 260 bar for consideration of R110 |
| 1.10.2. | Material | : 316 Stainless steel |
| 1.11. | Flexible fuel lines | |
| 1.11.1. | Working pressure(s) (2) | : Not Applicable |
| 1.11.2. | Material | : Not Applicable |
| 1.12. | Filling unit or receptacle | |
| 1.12.1. | Working pressure(s) (2) | : Not Applicable |
| 1.12.2. | Material | : Not Applicable |

**Approval number: E4-110R-000308** **Extension number: 00**

| | | |
|---|---|---|
| 1.13. | Gas injector(s) | |
| 1.13.1. | Working pressure(s) [(2)] | : Not Applicable |
| 1.13.2. | Material | : Not Applicable |
| 1.14. | Gas flow adjuster | |
| 1.14.1. | Working pressure(s) [(2)] | : Not Applicable |
| 1.14.2. | Material | : Not Applicable |
| 1.15. | Gas/air mixer | |
| 1.15.1. | Working pressure(s) [(2)] | : Not Applicable |
| 1.15.2. | Material | : Not Applicable |
| 1.16. | Electronic control unit (CNG-fuelling) | |
| 1.16.1. | Basic software principles | : Not Applicable |
| 1.17. | Pressure and temperature sensor(s) | |
| 1.17.1. | Working pressure(s) [(2)] | : Not Applicable |
| 1.17.2. | Material | : Not Applicable |
| 1.18. | CNG filter(s) | |
| 1.18.1. | Working pressure(s) [(2)] | : Not Applicable |
| 1.18.2. | Material | : Not Applicable |

[(2)] Specify the tolerance

**BMT CO., LTD**
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com 

This is for Type Approval of ECE Regulation 110 (CNG) for Specific Components of Vehicles

**INFORMATION DOCUMENT No : BMT-CNG-120717-02**

Essential Characteristics of the CNG Component

1.1 Trade Name or Mark : SUPERLOK T&S VALVES

1.2 Maker name and Address: BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 South Korea

1.3 Type/General commercial description:
SBT SERIES/ TRUNNION BALL VALVE

1.4 Working Pressure(s) :

| Valve Name | Working Pressure for ECE R110 TYPE |
|---|---|
| Trunnion Ball Valve | 260 bar |

1.5 Description and Drawings : See attached document

1.6 Material : 316 Stainless steel

1.7 Operating temperatures :

| Valve Name | Temperature rating |
|---|---|
| Trunnion Ball Valve | -40℃ to 120℃ |

1.8 Remarks: Manual valve

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BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com


## 2. Features of Trunion Ball Valves

STB Trunnion Ball valve

- PEEK trunion bearings for longer cycle life
- Two-way and three way designs
- Blow-out resistant two-piece ball/stem
- Low operating torque
- Panel mountable to 9.7mm thickness
- Handle indicates direction of flow
- Positive handle stops

## 3. Description

| | STB Trunnion Ball valve |
|---|---|
| Working Pressure for ECE R110 TYPE | 260 bar |
| Temperature rating | -40℃ to 120℃ |
| Body material | 316 Stainless Steel |
| Port Connection | 1/8″ to 1/2″ and 6mm to 12mm |
| Orifice | 4.8mm |

## 4. Working Pressure and MAWP

| Valve Name | Working Pressure for ECE R110 TYPE |
|---|---|
| High Pressure Ball valve | 260 bar |

## 5. Material Standard

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

BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com


**6. Non-Metallic Materials**

6.1 O-ring

| | |
|---|---|
| Elastomer base | EPDM |
| Hardness Shore A Durometer | 70 +/-5 |
| Tensile Strength | 7.5 MPa |

6.2 Seat & Packing

| Chemical Designation | Tensile Strength |
|---|---|
| Polyterafluoroethylene (PTFE) | 20MPa |
| Poly ether ether ketone (PEEK) | 80MPa |

**BMT CO., LTD**
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
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http://www.superlok.com


## 7. Manufacturer's Statement

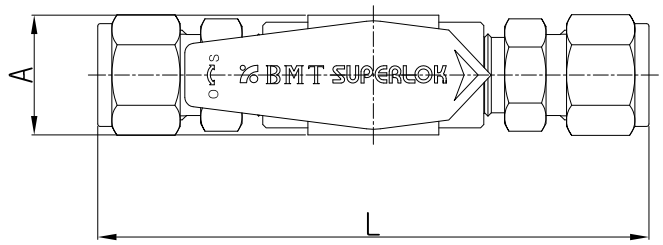
The samples, which have been presented for evaluation, are made during mass production according to the presented documents.
We, as the producer of SUPERLOK T&S VALVE, carry on our own responsibility - the production process guarantees the parameter stability & unchanging and outlet inspection guarantee. SUPELOK T&S VALVE will accomplish permanently the requirements which are specified by our instruction.

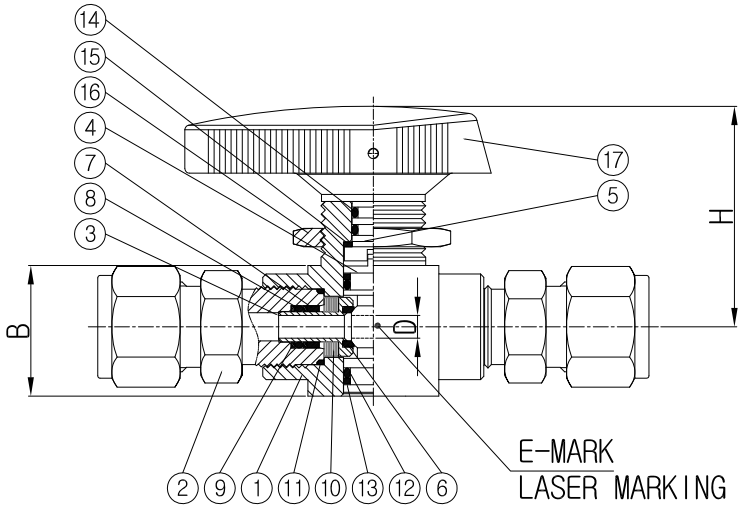
## 8. Pictures of Trunion Ball Valves

Picture 1. Trunion Ball Valve

## 9. Drawings

| NO | TITLE | DWG No. |
|---|---|---|
| 1 | Trunnion Ball valve | 111124-01-114-02 (Rev.A),<br>111124-01-114-03 (Rev.A) |
| 2 | Type Approval Mark | 111124-01-114-07 (Rev.A) |



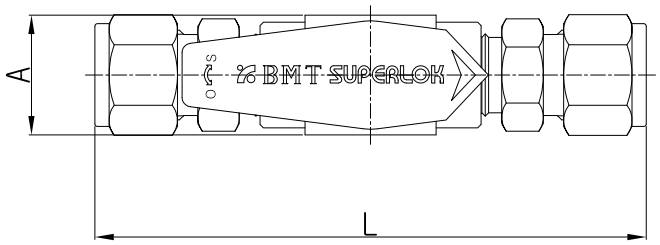

| NO | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| 1 | BODY | SS 316 | 1 | |
| 2 | EMD CONNECTION | SS 316 | 2 | |
| 3 | SEAL RETAINER | SS 316 | 2 | |
| 4 | TRUNNION BALL | SS 316 | 1 | |
| 5 | STEM | SS 316 | 2 | |
| 6 | BALL SEAT | PEEK | 2 | |
| 7 | SEAL GUIDE | SS 316 | 2 | |
| 8 | RETAINER O-RING | EPDM | 4 | |
| 9 | BACKUP RING | PTFE | 4 | |
| 10 | DISC SPRING | X-750 | 12 | |
| 11 | CONNECTOR SEAL | PTFE | 2 | |
| 12 | TRUNNION O-RING | EPDM | 2 | |
| 13 | BACKUP RING | PTFE | 2 | |
| 14 | STEM O-RING | SS 316 | 1 | |
| 15 | STEM BEARING | PEEK | 1 | |
| 16 | PANEL LOCK NUT | SS 316 | 1 | |
| 17 | HANDLE | NYLON | 1 | |

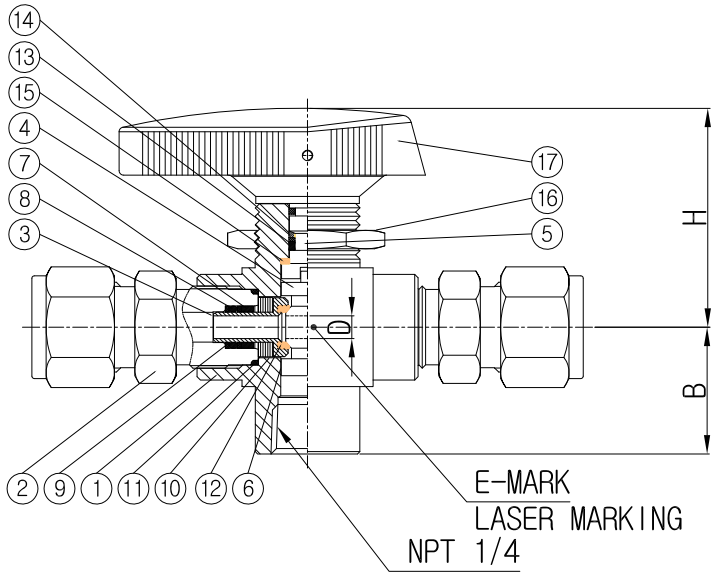
Unit : mm

| PART NO. | END CONNECTION | A | B | L | H | D | Q'TY | WORKING PRESSURE for ECE R110 TYPE | MAX WORKING PRESSURE |
|---|---|---|---|---|---|---|---|---|---|
| SBT2-S8-CNG | 1/2" SUPERLOK | 25.4 | 27.7 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F2N-CNG | 1/8" FEMALE NPT | 25.4 | 27.7 | 76.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27.7 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |

| Rev. | Issue Data | Description | Originator | Checked | Approved |
|---|---|---|---|---|---|
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE<br>VALVE NAME | SBT2 SERIES<br>2-WAY TRUNNION BALL VALVE |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-02 |
| GENERAL ARRANGEMENT DRAWING for VALVE | BMT Co., Ltd. |




| NO | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| 1 | BODY | SS 316 | 1 | |
| 2 | EMD CONNECTION | SS 316 | 2 | |
| 3 | SEAL RETAINER | SS 316 | 2 | |
| 4 | TRUNNION BALL | SS 316 | 1 | |
| 5 | STEM | SS 316 | 2 | |
| 6 | BALL SEAT | PEEK | 2 | |
| 7 | SEAL GUIDE | SS 316 | 2 | |
| 8 | RETAINER O-RING | EPDM | 4 | |
| 9 | BACKUP RING | PTFE | 4 | |
| 10 | DISC SPRING | X-750 | 12 | |
| 11 | CONNECTOR SEAL | PTFE | 2 | |
| 12 | TRUNNION BEARING | PEEK | 2 | |
| 13 | STEM O-RING | EPDM | 1 | |
| 14 | STEM BACKUP RING | PEEK | 1 | |
| 15 | STEM BEARING | PEEK | 1 | |
| 16 | PANEL LOCK NUT | SS 316 | 1 | |
| 17 | HANDLE | NYLON | 1 | |

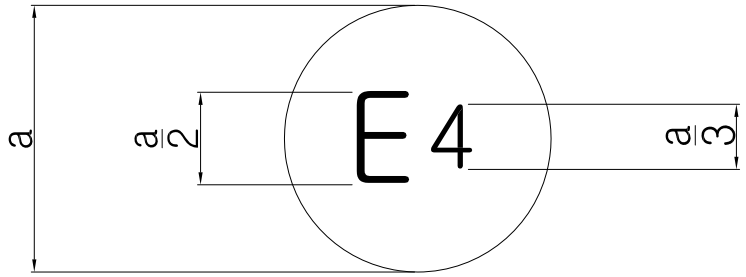
Unit : mm

| PART NO. | END CONNECTION | A | B | L | H | D | Q'TY | WORKING PRESSURE for ECE R110 TYPE | MAX WORKING PRESSURE |
|---|---|---|---|---|---|---|---|---|---|
| SBT3-S8-CNG | 1/2" SUPERLOK | 25.4 | 27 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-S4-CNG | 1/4" SUPERLOK | 25.4 | 27 | 104.8 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |

| Rev. | Issue Data | Description | Originator | Checked | Approved |
|---|---|---|---|---|---|
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE<br>VALVE NAME | SBT3 SERIES<br>3-WAY TRUNNION BALL VALVE |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-03 |
| GENERAL ARRANGEMENT DRAWING for VALVE | BMT Co., Ltd. |

| NO. | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| | | | | |




*Approval mark Drawing*

# 110 R-XXXXXX

a ≥ 8mm

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| Rev. | Issue Data | Description | Originator | Checked | Approved |
|---|---|---|---|---|---|
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE | - |
| VALVE NAME | - |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-07 |
| GENERAL ARRANGEMENT DRAWING for VALVE | BMT Co., Ltd. |

**Test Report**
**No.:** IN110-A0-120035
Dated: 16/07/2012
ECE Regulation No.110

Type : Trunnion Ball valve (SBT Series)

Manufacturer : BMT CO., LTD

## Test Report

AGREEMENT CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITIONOF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS

**UNIFORM PROVISIONS CONCERNING THE APPROVAL OF:**
**SPECIFIC COMPONENTS OF MOTOR VEHICLES USING COMPRESSED NATURAL GAS (CNG) IN THEIR PROPULSION SYSTEM;**

**ECE-R 110**
as last amended

Revision 1 – Amendment 1 - Amendment 2
Including Supplement 9 to Regulation No. 110 – Date of entry into force: 19 August 2010

| Approval status | |
|---|---|
| | Number of approval |
| ECE | Previous Approval: Nil |
| | Current Approval No. E4-110R-000308 |

**Test Report**
**No.:** IN110-A0-120035
Dated: 16/07/2012
ECE Regulation No.110

Type : Trunnion Ball valve (SBT Series)

Manufacturer : BMT CO., LTD

| | | | |
|---|---|---|---|
| 0.0 | General | | |
| 0.1 | Make | : | SUPERLOK T&S VALVES |
| 0.2 | Manufacturer's name and address | : | BMT CO., LTD<br>21-1, Bukjeong-dong, Yangsan-si,<br>Gyeongsangnam-do,<br>626-110 S.Korea |
| 0.3 | Type and Commercial Description | : | Trunnion Ball valve (SBT Series)<br>(SBT2 and SBT3 Series) |
| 0.4 | Working Pressure | : | 260 bar<br>Class 0 |
| 1.0 | Test information | | |
| 1.1 | Test Objects | : | Trunnion Ball Valve |
| 1.2 | Test dates | : | May2012-June2012 |
| 1.3 | Equipment /facilities used | : | The test equipment and facilities used were in compliance with the requirements Standards |

2.0 **Equipment used**

| | **Equipment** | **Make/Model** | **Calibration Validity** |
|---|---|---|---|
| 2.1 | Salt Chamber | CM Enviro | Jan'13 |
| 2.2 | Over Pressure Test | Praj | Dec'12 |
| 2.3 | Hot Chamber | S A Electrical | Feb'13 |
| 2.4 | Cold Chamber | Praj | Dec'12 |
| 2.5 | Ammonia Chamber | Praj | Dec'12 |
| 2.6 | Temperature cyclic test setup | ARAI | Dec'12 |

**Test Report**
**No.:** IN110-A0-120035
Dated: 16/07/2012
ECE Regulation No.110

Type : Trunnion Ball valve (SBT Series)

Manufacturer : BMT CO., LTD

Trunnion Ball Valve SBT Series

| PART NO. | END CONNECTION | A | B | L | H | D | Q'TY | WORKING PRESSURE for ECE R110 TYPE | MAX WORKING PRESSURE |
|---|---|---|---|---|---|---|---|---|---|
| SBT2-S8-CNG | 1/2" SUPERLOK | 25.4 | 27.7 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F2N-CNG | 1/8" FEMALE NPT | 25.4 | 27.7 | 76.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27.7 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-S8-CNG | 1/2" SUPERLOK | 25.4 | 27 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-S4-CNG | 1/4" SUPERLOK | 25.4 | 27 | 104.8 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |

**Conclusion of matrix:** BMT produces Trunnion Ball valves as provided in the matrix. Based on the above information and analyzing, a WCC is obtained and valve SBT2-F2N-CNG (Low fitting size) and SBT3-S8-CNG (High fitting size) are taken for testing, hence all other valves which fall within the matrix need not be tested.

**List of Enclosure:**
Enclosure 1: Information Document and Drawings
Enclosure 2: Results of Test

**Test Report**
**No.:** IN110-A0-120035
Dated: 16/07/2012
ECE Regulation No.110

Type : Trunnion Ball valve (SBT Series)

Manufacturer : BMT CO., LTD

## 3.0 Statement of Conformity

The type described in this test report and the appendices attached are in compliance with the Test Specification mentioned above.
The Test Report comprises pages 1 to 6.
The Test Report shall be reproduced and published in full only and by the client only. It shall be reproduced partially with the written permission of the Test Laboratory only.

**TEST LABORATORY**

TÜV NORD Mobilität GmbH & Co. KG
IFM - Institut für Fahrzeugtechnik und Mobilität,
Adlerstr. 7, 45307 Essen

Designated Technical Service
RDW No. 99050016

Pune, India. 16.07.2012

Yeshwant Ambure
Project Leader

M. S. Ogale
Head Homologation

**Test Report**
**No.:** IN110-A0-120035
Dated: 16/07/2012
ECE Regulation No.110

Type : Trunnion Ball valve (SBT Series)

Manufacturer : BMT CO., LTD

**List of modifications**

**Appendix 1**

**More details for application of** : **Date** :

Correction of : -

Modification of : -

Addition of : -

Deletion of : -

**BMT CO., LTD**
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com 

This is for Type Approval of ECE Regulation 110 (CNG) for Specific Components of Vehicles

**INFORMATION DOCUMENT No : BMT-CNG-120717-02**

Essential Characteristics of the CNG Component

1.1 Trade Name or Mark : SUPERLOK T&S VALVES

1.2 Maker name and Address: BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 South Korea

1.3 Type/General commercial description:
SBT SERIES/ TRUNNION BALL VALVE

1.4 Working Pressure(s) :

| Valve Name | Working Pressure for ECE R110 TYPE |
|---|---|
| Trunnion Ball Valve | 260 bar |

1.5 Description and Drawings : See attached document

1.6 Material : 316 Stainless steel

1.7 Operating temperatures :

| Valve Name | Temperature rating |
|---|---|
| Trunnion Ball Valve | -40℃ to 120℃ |

1.8 Remarks: Manual valve

**BMT CO., LTD**
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
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## 2. Features of Trunion Ball Valves

STB Trunnion Ball valve

- PEEK trunion bearings for longer cycle life
- Two-way and three way designs
- Blow-out resistant two-piece ball/stem
- Low operating torque
- Panel mountable to 9.7mm thickness
- Handle indicates direction of flow
- Positive handle stops

## 3. Description

| | STB Trunnion Ball valve |
|---|---|
| Working Pressure for ECE R110 TYPE | 260 bar |
| Temperature rating | -40℃ to 120℃ |
| Body material | 316 Stainless Steel |
| Port Connection | 1/8″ to 1/2″ and 6mm to 12mm |
| Orifice | 4.8mm |

## 4. Working Pressure and MAWP

| Valve Name | Working Pressure for ECE R110 TYPE |
|---|---|
| High Pressure Ball valve | 260 bar |

## 5. Material Standard

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

BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com


**6. Non-Metallic Materials**

6.1 O-ring

| | |
|---|---|
| Elastomer base | EPDM |
| Hardness Shore A Durometer | 70 +/-5 |
| Tensile Strength | 7.5 MPa |

6.2 Seat & Packing

| Chemical Designation | Tensile Strength |
|---|---|
| Polyterafluoroethylene (PTFE) | 20MPa |
| Poly ether ether ketone (PEEK) | 80MPa |

BMT CO., LTD
21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
Tel: 82-55-783-1000 Fax: 82-55-783-1110
http://www.superlok.com


## 7. Manufacturer's Statement

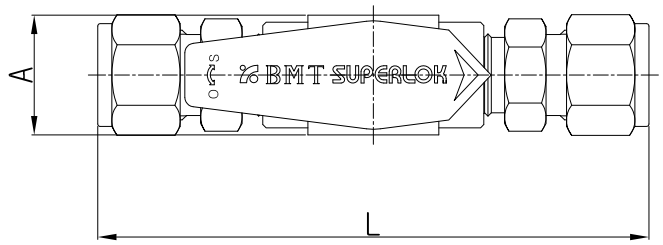
The samples, which have been presented for evaluation, are made during mass production according to the presented documents.
We, as the producer of SUPERLOK T&S VALVE, carry on our own responsibility - the production process guarantees the parameter stability & unchanging and outlet inspection guarantee. SUPELOK T&S VALVE will accomplish permanently the requirements which are specified by our instruction.

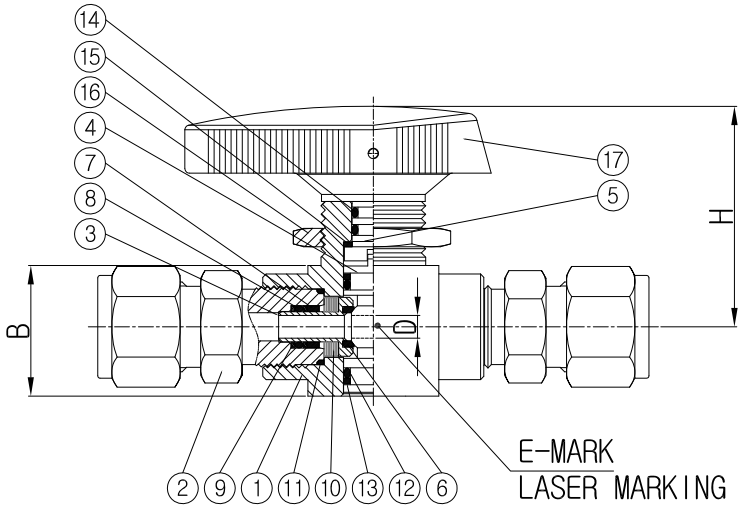
## 8. Pictures of Trunion Ball Valves

Picture 1. Trunion Ball Valve

## 9. Drawings

| NO | TITLE | DWG No. |
|---|---|---|
| 1 | Trunnion Ball valve | 111124-01-114-02 (Rev.A),<br>111124-01-114-03 (Rev.A) |
| 2 | Type Approval Mark | 111124-01-114-07 (Rev.A) |



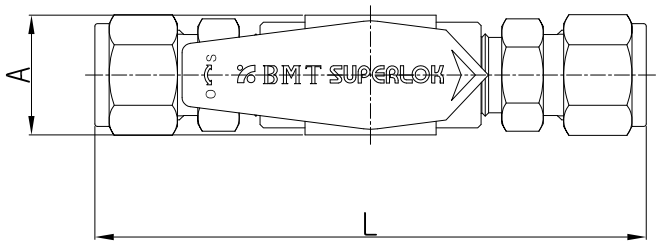

| NO | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| 1 | BODY | SS 316 | 1 | |
| 2 | EMD CONNECTION | SS 316 | 2 | |
| 3 | SEAL RETAINER | SS 316 | 2 | |
| 4 | TRUNNION BALL | SS 316 | 1 | |
| 5 | STEM | SS 316 | 2 | |
| 6 | BALL SEAT | PEEK | 2 | |
| 7 | SEAL GUIDE | SS 316 | 2 | |
| 8 | RETAINER O-RING | EPDM | 4 | |
| 9 | BACKUP RING | PTFE | 4 | |
| 10 | DISC SPRING | X-750 | 12 | |
| 11 | CONNECTOR SEAL | PTFE | 2 | |
| 12 | TRUNNION O-RING | EPDM | 2 | |
| 13 | BACKUP RING | PTFE | 2 | |
| 14 | STEM O-RING | SS 316 | 1 | |
| 15 | STEM BEARING | PEEK | 1 | |
| 16 | PANEL LOCK NUT | SS 316 | 1 | |
| 17 | HANDLE | NYLON | 1 | |

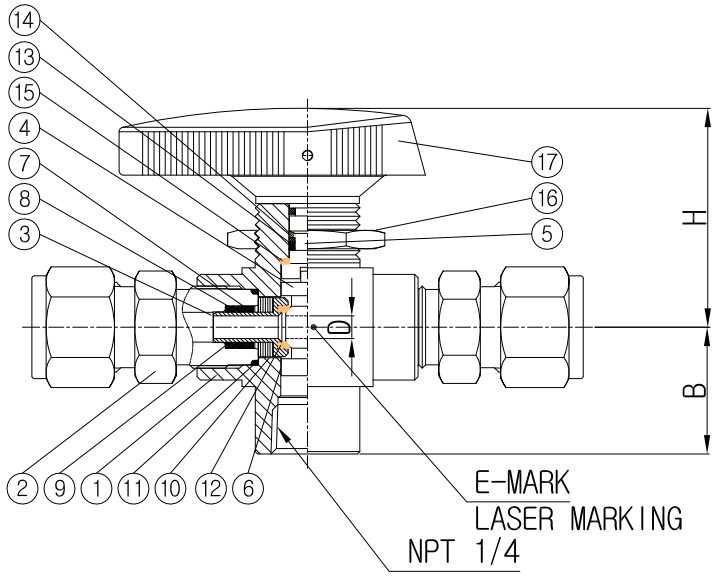
Unit : mm

| PART NO. | END CONNECTION | A | B | L | H | D | Q'TY | WORKING PRESSURE for ECE R110 TYPE | MAX WORKING PRESSURE |
|---|---|---|---|---|---|---|---|---|---|
| SBT2-S8-CNG | 1/2" SUPERLOK | 25.4 | 27.7 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F2N-CNG | 1/8" FEMALE NPT | 25.4 | 27.7 | 76.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT2-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27.7 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |

| Rev. | Issue Data | Description | Originator | Checked | Approved |
|---|---|---|---|---|---|
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE<br>VALVE NAME | SBT2 SERIES<br>2-WAY TRUNNION BALL VALVE |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-02 |
| GENERAL ARRANGEMENT DRAWING for VALVE | BMT Co., Ltd. |




| NO | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| 1 | BODY | SS 316 | 1 | |
| 2 | EMD CONNECTION | SS 316 | 2 | |
| 3 | SEAL RETAINER | SS 316 | 2 | |
| 4 | TRUNNION BALL | SS 316 | 1 | |
| 5 | STEM | SS 316 | 2 | |
| 6 | BALL SEAT | PEEK | 2 | |
| 7 | SEAL GUIDE | SS 316 | 2 | |
| 8 | RETAINER O-RING | EPDM | 4 | |
| 9 | BACKUP RING | PTFE | 4 | |
| 10 | DISC SPRING | X-750 | 12 | |
| 11 | CONNECTOR SEAL | PTFE | 2 | |
| 12 | TRUNNION BEARING | PEEK | 2 | |
| 13 | STEM O-RING | EPDM | 1 | |
| 14 | STEM BACKUP RING | PEEK | 1 | |
| 15 | STEM BEARING | PEEK | 1 | |
| 16 | PANEL LOCK NUT | SS 316 | 1 | |
| 17 | HANDLE | NYLON | 1 | |

Unit : mm

| PART NO. | END CONNECTION | A | B | L | H | D | Q'TY | WORKING PRESSURE for ECE R110 TYPE | MAX WORKING PRESSURE |
|---|---|---|---|---|---|---|---|---|---|
| SBT3-S8-CNG | 1/2" SUPERLOK | 25.4 | 27 | 117 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-S4-CNG | 1/4" SUPERLOK | 25.4 | 27 | 104.8 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |
| SBT3-F4N-CNG | 1/4" FEMALE NPT | 25.4 | 27 | 82.4 | 47 | 4.8 | 2 EA | 260 bar | 414 bar |

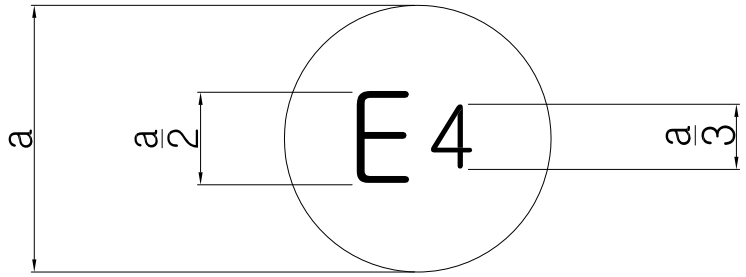
| Rev. | Issue Data | Description | Originator | Checked | Approved |
|---|---|---|---|---|---|
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE<br>VALVE NAME | SBT3 SERIES<br>3-WAY TRUNNION BALL VALVE |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-03 |

GENERAL ARRANGEMENT DRAWING for VALVE

BMT Co., Ltd.

| NO. | DESCRIPTION | MATERIAL | Q'TY | REMARK |
|---|---|---|---|---|
| | | | | |




*Approval mark Drawing*

# 110 R-XXXXXX

a ≥ 8mm

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| A | 24.NOV.11 | Issued for Approval | C.S.RA | S.M.LEE | J.H.LIM |
| Rev. | Issue Data | Description | Originator | Checked | Approved |

| | |
|---|---|
| PURCHASER | |
| CLIENT | |
| PROJECT NAME | - |
| PROJECT NO. | - |
| PO. NO. | - |
| MFR. MODEL/TYPE | - |
| VALVE NAME | - |
| TAG NO. | - |
| DRAWING NO. | 111124-01-114-07 |
| GENERAL ARRANGEMENT DRAWING for VALVE | BMT Co., Ltd. |

Manufacturer: BMT CO., LTD

Component type: Trunnion Ball valve
SBT Series

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TÜV NORD Mobilität

**RECORD OF TEST ON**
CNG Manual valve as regards to
Test and performance requirements, as per standard ECE R 110

| | | |
|---|---|---|
| 0.1 | Observer:<br>Mr. M.S. Ogale<br>Mr. Yeshwant Ambure | Place : ARAI, Pune and Praj Lab. |
| 0.2 | Operator :-<br>Mr. Dekate, ARAI<br>Ashok Bhagat, Praj Lab | Test date:- May'12-June12 |
| 0.3 | Customer | BMT CO., LTD<br>21-1, Bukjeong-dong, Yangsan-si,<br>Gyeongsangnam-do,<br>626-110 S.Korea |
| 1.0 | Component under test | Trunnion Ball valve<br>SBT2-F2N-CNG and SBT3-S8-CNG |
| **2.0** | **Manufacturer's Specification** | |
| 2.1 | Trademark or Trade name | SUPERLOK T&S VALVES |
| 2.2 | Model name and number | Trunnion Ball valve (SBT2 and SBT3 Series) |
| 2.3 | Manufacturers Specification | As attached at Enclosure 1 |
| 3.0 | **Results of Tests** | |
| | **General Requirements of standard** | **Observations** |
| 3.1 | The manual valve device in Class 0 shall be designed to withstand a pressure of 1.5 times the working pressure. | Meets the Requirement<br>Satisfactory |
| 3.2 | The manual valve device in Class 0 shall be designed to operate at a temperature from -40$^{o}$ C to 85$^{o}$ C. | Meets the Requirement<br>Satisfactory |
| 3.3 | Manual valve device requirements | |
| 3.3.1 | One specimen shall be submitted to a fatigue test at a pressure cycling rate not to exceed 4 cycles per minute as follows:<br>(i) Held at 20 °C while pressured for 2,000 cycles between 2 MPa and 26 MPa. | Meets the Requirement<br>Satisfactory |

| | | |
|---|---|---|
| 4.0 | **Specific test requirements** | |
| 4.1 | **Overpressure Test:** | |
| | A CNG containing component shall withstand without any visible evidence of rupture or permanent distortion a hydraulic pressure of 1.5 times the working pressure (MPa) during minimal 3 minutes at room temperature with the outlet of the high-pressure part plugged. Water or any other suitable hydraulic fluid may be used as a test medium. | **Observations:**<br><br>Water used as test medium.<br>No leakage observed at 1.5 times working pressure of 390 bar<br><br>Meets the Requirement<br>Satisfactory |

| Class | Working pressure | Test pressure |
|---|---|---|
| Class 0 | 3000<P<26000 | 1.5times working pressure |

1. Working pressure: 260 bar
2. Test Pressure: 390 bar

| | | |
|---|---|---|
| 4.2 | **EXTERNAL LEAKAGE TEST** | |
| | A component shall be free from leakage through stem or body seals or other joints, and shall not show evidence of porosity in casting when tested as described in the tests below. | |
| | The test shall be performed at the following conditions:<br>(a) at room temperature at pressure of 390 bar<br>(b) at the minimum operating temperature: -40°C at pressure of 390 bar<br>(c) at the maximum operating temperature: +120°C at pressure of 390 bar | |
| | Equipment under test will be connected to a source of aerostatic pressure. An automatic valve and a pressure gauge having a pressure range of not less than 1.5 times nor more than 2 times the test pressure is to be installed in the pressure supply piping. The sample is subjected to the gas pressure equal to working pressure. The sample should be submerged in water to detect leakage or any other equivalent test method Test carried out under following conditions | |
| | The external leakage must be lower than the requirements stated in the annexes or if no requirements are mentioned the external leakage shall be lower than 15 cm3 /hour. | |
| 4.2.1 | **Room temperature test** | |
| | **Requirements:**<br>A CNG containing component shall not leak more than 15 cm3/hour with the outlet plugged when submitted to a gas pressure, at room temperature | **Observations:**<br>No Leakage Observed.<br><br>Meets the Requirement<br>Satisfactory |

| | | |
|---|---|---|
| 4.2.2 | **Maximum operating temperature test** | |
| | **Requirement:**<br>A CNG containing component shall not leak more than 15 cm3/hour with the outlet plugged when submitted to a gas pressure at the maximum operating temp of 120°C, after conditioning the component for 8 hours at 120°C | **Observations:**<br>No Leakage Observed.<br><br>Meets the Requirement<br>Satisfactory |
| 4.2.3 | **Minimum operating temperature test** | |
| | **Requirement:**<br>A CNG containing component shall not leak more than 15 cm3/hour with the outlet plugged when submitted to a gas pressure, at the minimum operating temp of -40°C , after conditioning the component for 8 hours at -40°C | **Observations:**<br>No Leakage Observed.<br><br>Meets the Requirement<br>Satisfactory |

| | | |
|---|---|---|
| **4.3** | **Internal Leakage test** | |
| | The seat of the valves, when in the closed position, shall be free from leakage at any aerostatic pressure between 0 to 1.5 times the working pressure (kPa).<br>The internal leakage tests are conducted with the inlet of the sample valve connected to a source of aerostatic pressure, the valve in the closed position, and with the outlet open. An automatic valve and a pressure gauge having a pressure range of not less than 1.5 times nor more than 2 times the test pressure is to be installed in the pressure supply piping. The pressure gauge is to be installed between the automatic valve and the sample under test. While under the applied test pressure, observations for leakage are to be made with the open outlet submerged in water unless otherwise indicated. | |
| | Test condition:<br>Test Pressure: 390 bar | No Leakage observed.<br>Meets the Requirement<br>Satisfactory |

| | | |
|---|---|---|
| **4.4** | **Fatigue Test** | |
| | Requirements:<br>One specimen shall be submitted to a fatigue test at a pressure cycling rate not to exceed 4 cycles per minute as follows:<br>(i) Held at 20 °C while pressured for 2,000 cycles between 2 MPa and 26 MPa. | Observations:<br><br>Meets the Requirement<br>Satisfactory |

**4.5 CNG Compatibility Test**

A synthetic part in contact with CNG shall not show excessive volume change or loss of weight. Resistance to n-pentane according to ISO 1817 with the following conditions:
(a) medium: n-pentane
(b) temperature: 23 °C (tolerance acc. to ISO 1817)
(c) immersion period: 72 hours

**Requirements:**
Maximum change in volume 20 percent After storage in air with a temperature of 40 °C for a period of 48 hours the mass compared to the original value may not decrease more than 5 percent.

**Observations:**

| Sr. No. | Sample Identification Mark | Change in Volume in % | | Change in Mass in % | | Remark |
|---|---|---|---|---|---|---|
| | | Specified Value | Observed Value | Specified Value | Observed Value | |
| 1 | PTFE | 20 Max. | 0.06 | - 5 % Max | -0.2 | OK |
| 2 | PEEK | 20 Max | 0.07 | - 5 % Max | -0.01 | OK |
| 3 | 'O' ring | 20 Max | 2.5 | - 5 % Max | - 3.48 | OK |

Meets the requirements
Satisfactory

**4.6 CORROSION RESISTANCE TEST**

**Requirements:**
A metal CNG containing component shall comply with the leakage tests, after submitting it to 144 hours salt spray test with all connections closed. Solution: 5% NaCl in 95% distilled water by weight. External leakage test carried out at room temp/ at 120°C / at -40°C and internal leakage test carried out at room temperature

**Observation:** No corrosion observed
Meets the Requirement
Satisfactory

4.6.1 **External leakage test after corrosion resistance test**

| | | | |
|---|---|---|---|
| **Test conditions** | Room Temp | Low Temp | High Temp |
| | 30° C at 390 bar | -40° C at 390 bar | +120°C at 390 bar |
| **Observations** | **No Leakage Observed** | **No Leakage Observed** | **No Leakage Observed** |
| | Meets the Requirement<br>Satisfactory | | |

4.6.2 **Internal Leakage test after corrosion resistance test**

Internal Leak test at room temperature as per Annex 5C

**Observations**: No leakage observed.
Meets the requirements
Satisfactory.

Manufacturer: BMT CO., LTD

Component type: Trunnion Ball valve SBT Series

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**4.7 Resistance to dry heat**

1. The test has to be done in compliance with ISO 188. The test piece has to be exposed to air at a temperature equal to the maximum operating temperature for 168 hours.
2. The allowable change in tensile strength should not exceed 25 per cent. The allowable change in ultimate elongation shall not exceed the following values:
-Maximum increase 10 per cent
-Maximum decrease 30 per cent

**Observations:**

| Sr. No. | Sample | Change in Tensile strength in % | | Change in elongation % | | Remark |
|---|---|---|---|---|---|---|
| | | Specified Value | Observed Value | Specified Value | Observed Value | |
| 1 | PTFE | +25 Max | 9.20 | +10 -30 | -0.64 | OK |
| 2 | PEEK | | 2.61 | | - 27.3 | OK |
| 3 | O-Ring EPDM | | 12.37 | | -17.50 | OK |

Meets the requirements
Satisfactory

**4.8 Temperature cyclic test**

A non metallic part containing CNG shall comply with the leakage tests mentioned in Annexes 5B and 5C after having been submitted to 96 hours temperature cycle from the minimum operating temperature up to the maximum operating temperature with a cycle time of 120 minutes, under maximum working pressure

**External leakage test after Temperature cyclic test**

| Test Conditions | Room Temp | Low Temp | High Temp |
|---|---|---|---|
| | 30°C at 390 bar | -40° C at 390 bar | +120°C at 390 bar |
| Observations | **No Leakage Observed** | **No Leakage Observed** | **No Leakage Observed** |
| | Meets the Requirement<br><br>Satisfactory | | |

**Internal Leakage Test after Temperature cyclic test**

| | |
|---|---|
| Internal Leak test at room temperature as per Annex 5C | **Observations**:<br>No leakage observed.<br>Meets the requirements<br>Satisfactory. |

Manufacturer: BMT CO., LTD

Component type: Trunnion Ball valve
SBT Series

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| | | | | |
|---|---|---|---|---|
| **4.9** | **Vibration Resistance:** | | | |
| | **Requirements:**<br>All components with moving parts shall remain undamaged, continue to operate, and comply with the component's leakage tests after 6 hours of vibration in accordance with the following test method.<br>**Test method**<br>The component shall be secured in an apparatus and vibrated for 2 hours at 17 Hz with an amplitude of 1.5 mm (0,06 in.) in each of three orientation axes. On completion of 6 hours of vibration the component shall comply with Annex 5C. | | **Observations:**<br>No Leakage observed.<br><br>Meets the requirements.<br><br>Satisfactory. | |
| 4.9.1 | **External leakage test** | | | |
| | **Test conditions** | Room Temp | Low Temp | High Temp |
| | | 30° C at 390 bar | -40° C at 390 bar | +120°C at 390 bar |
| | **Observations** | **No Leakage Observed** | **No Leakage Observed** | **No Leakage Observed** |
| | | Meets the Requirement<br>Satisfactory | | |
| 4.9.2 | **Internal Leakage test** | | | |
| | Internal Leak test at room temperature as per Annex 5C | | **Observations**: No leakage observed.<br>Meets the requirements<br>Satisfactory. | |

| | | | |
|---|---|---|---|
| **4.10** | **OZONE TEST** | | |
| | Medium : Ozone | Duration: 72 Hours | Ref Standard: ISO 1431-1 |
| | Test Temp: 40°C | | |
| | **Requirement of Standard** | | |
| | The test piece, which has to be stressed to 20 per cent elongation, shall be exposed to air at 40C with an ozone concentration of 50 parts per hundred million during 72 hours.<br>No cracking of the test piece is allowed. | | **Observation:**<br>**No cracks observed at 10X Magnification.**<br>**Satisfactory.** |

| | | |
|---|---|---|
| Manufacturer: | BMT CO., LTD | Test Report No IN110-A0-120035 Technical Report Enclosure 2 Page 7 of 7 |
| Component type: | Trunnion Ball valve SBT Series | |

TÜV NORD Mobilität

| | |
|---|---|
| 4.11 | **The operating temperatures of the Trunnion Ball valve shall be classified as per the table given below** |

**ANNEX 5O - OPERATING TEMPERATURES**

| | Engine compartment | Assembled on the engine | On board |
|---|---|---|---|
| Moderate | - 20 ° C ÷ 105 ° C | - 20 ° C ÷ 120 ° C | - 20 ° C ÷ 85 ° C |
| Cold | - 40 ° C ÷ 105 ° C | - 40 ° C ÷ 120 ° C | - 40 ° C ÷ 85 ° C |

| **Requirement:** | **Observation:** |
|---|---|
| The Manual Valve should meet operating temperature require as given in the table annex 5O | The High Pressure Manual Valve Type: SBT2-F2N-CNG and SBT3-S8-CNG has the temperature range of -40°C to +120°C. The Trunnion Ball valve meets the test requirements when subjected to all relevant tests with this temperature. |

| | |
|---|---|
| 5.0 | **Conclusion: Trunnion Ball valve SBT Series as described in the information document as above meets the requirement of Regulation ECE R110.** |

Yeshwant Ambure
Project Leader

M. S. Ogale
Head Homologation

IFM TÜV NORD Mobilität Designated Technical Service RDW No. 99050016