

### **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

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Vehicle Technology Division

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





### COMMUNICATION

Concerning<sup>(1)</sup>:

- approval granted

-approval extended

-approval refused

- approval withdrawn

-production definitely discontinued

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

RDW

### Approval number: E4-110R-000308

### 1. CNG component considered:

- Container(s) or cylinder(s)<sup>(1)</sup>
- 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

Manufacturer's name and address

LE MAINTIENDE AL RDW

SUPERLOK T&S VALVES Trunnion Ball valve (SBT2, SBT3 Series)
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

**Extension number: 00** 

Approv	al 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	: <b>TÜV NORD Mobilität GmbH &amp; Co. KG</b> Institut für Fahrzeugtechnik und Mobilität Adlerstr. 7 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/ <del>refused/extended/withdrawn (1)</del>
10.	Reason(s) of extension (if applicable)	: NA
11.	Place	: ZOETERMEER
12.	Date	: 06-NOV-2012
13.	Signature	R. Kauerz

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

<sup>&</sup>lt;sup>(1)</sup> Strike out what does not apply.

### ADDENDUM

1.	Additional information concerning the type-approval of a type of CNG components pursuant to Regulation number 110.		
1.1. 1.1.1. 1.1.2.	Container(s) or cylinder(s) Dimensions Material	: Not Applicable : Not Applicable	
1.2. 1.2.1. 1.2.2.	Pressure indicator Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.3. 1.3.1. 1.3.2.	Pressure relief valve (discharge valve) Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.4. 1.4.1. 1.4.2.	Automatic valve(s) Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.5. 1.5.1. 1.5.2.	Excess flow valve Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.6. 1.6.1. 1.6.2.	Gas-tight housing Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.7. 1.7.1. 1.7.2.	Pressure regulator(s) Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.8. 1.8.1. 1.8.2.	Check valve(s) or non-return valve(s) Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.9. 1.9.1. 1.9.2.	Pressure relief device (temperature trigg Working pressure(s) <sup>(2)</sup> Material	gered) : Not Applicable : Not Applicable	
1.10. 1.10.1. 1.10.2.	Manual valve Working pressure(s) <sup>(2)</sup> Material	<ul><li>260 bar for consideration of R110</li><li>316 Stainless steel</li></ul>	
1.11. 1.11.1. 1.11.2.	Flexible fuel lines Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	
1.12. 1.12.1. 1.12.2.	Filling unit or receptacle Working pressure(s) <sup>(2)</sup> Material	: Not Applicable : Not Applicable	

RDW

## Approval number: E4-110R-000308

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

<sup>(2)</sup> Specify the tolerance



# **7 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 <u>http://www.superlok.com</u> PAG

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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 : 76 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



Vehicle / Component Model Information Document No. Date Description Attachment 01 to Approval No. : TRUNNION BALL VALVE (SBT Series) : BMT-CNG-120717-01 : 01-12-2011 : CNG Component approval as per ECE R110 : E4-110R-000308

## **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

PAGE 2 OF 7

### 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	ASTM A182
	ASME SA479	ASME SA182

Vehicle / Component Model	: TRUNNION BALL VALVE (SBT Series)
Information Document No.	: BMT-CNG-120717-01
Date	: 01-12-2011
Description	: CNG Component approval as per ECE R110
Attachment 01 to Approval No.	: E4-110R-000308



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### 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



Vehicle / Component Model Information Document No. Date Description Attachment 01 to Approval No. : TRUNNION BALL VALVE (SBT Series) : BMT-CNG-120717-01 : 01-12-2011 : CNG Component approval as per ECE R110 : E4-110R-000308

# 🕻 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 PAC

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### 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), 111124-01-114-03 (Rev.A)
2	Type Approval Mark	111124-01-114-07 (Rev.A)

Vehicle / Component Model Information Document No. Date Description Attachment 01 to Approval No. : TRUNNION BALL VALVE (SBT Series) : BMT-CNG-120717-01 : 01-12-2011 : CNG Component approval as per ECE R110 : E4-110R-000308



			9 of 30				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	
			<u> </u>				5	STEM	SS 316	2	
							6	BALL SEAT	PEEK	2	
	IT SUPERCON						7	SEAL GUIDE	SS 316	2	
			}H				8	RETAINER O-RING	EPDM	4	
							9	BACKUP RING	PTFE	4	
	L						10	DISC SPRING	X-750	12	
	<u> </u>						11	CONNECTOR SEAL	PTFE	2	
							12	TRUNNION O-RING	EPDM	2	
							13	BACKUP RING	PTFE	2	
(15)							14	STEM O-RING	SS 316	1	
		A		_			15	STEM BEARING	PEEK	1	
	<b>•</b>	+	-(17)	Ī			16	PANEL LOCK NUT	SS 316	1	
			-(5)				17	HANDLE	NYLON	1	
		E-MA LASE	RK R MARK I N	G	LE MAINTIE NORAL RDW	linit : mm	A Rev. PURCHA	24.NOV.11 Issued for / Issue Data Descrip SER	Approval C.S.RA tion Originat	S.M.LE or Checke	E J.H.LIM d Approved
PART NO. END CONNECTION A B	L	Н	D	Q'TY	WORKING PRESSURE for ECE R110 TYPE	MAX WORKING PRESSURE	CLIENT				
SBT2-S8-CNG 1/2" SUPERLOK 25.4 27.7	117	47	4.8	2 EA	260 bar	414 bar	000.150				
SBT2-F2N-CNG 1/8" FEMALE NPT 25.4 27.7	76.4	47	4.8	2 EA	260 bar	414 bar	PROJEC	TNAME –			
SBT2-F4N-CNG 1/4" FEMALE NPT 25.4 27.7	82.4	47	4.8	2 EA	260 bar	414 bar	P0. N0	. –			
	1 1			1	1	<u>1</u> ]	MFR. M VALVE I	DDEL/TYPE SBT2 VAME 2-W/	SERIES AY TRUNNION BALI	_ VALVE	
							TAG NO	. – G NO 11112	4-01-114-02		
Attachment 01 to Approval No. E4-110R-0003	)8		Page 5 c	of 7			GENERA ARRANG for VA	L EMENT DRAWING LVE	BMT	ГСо	., Ltd.

		10 of 30	)			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	
	$\blacksquare + \_$	-(17)	Ī			16	PANEL LOCK NUT	SS 316	1	
		(16)				17	HANDLE	NYLON	1	
29111026	E- LA NPT 1/	-MARK ASER MARK	E ING	LE MAINTIE NORAL RDW		A 2 Rev. I PURCHASI	24.NOV.11 issued for Ap ssue Data Descripti ER	proval C.S.R on Origina	A S.M.LEI tor Checker	E J.H.LIM d Approved
					Unit : mm					
PART NO. END CONNECTION A B L	Н	D	Q'TY	WORKING PRESSURE for ECE R110 TYPE	MAX WORKING PRESSURE	ULIENI				
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	PROJECT PROJECT	NAME - NO			
SBT3-F4N-CNG 1/4" FEMALE NPT 25.4 27 82.4	47	4.8	2 EA	260 bar	414 bar	PO. NO.	-			
		1	1			MFR. MO VALVE N	DEL/TYPE SBT3 S MME 3-WA	eries 7 Trunnion Bal	L VALVE	
						TAG NO.	=			
						DRAWING	NO. 111124	-01-114-03		
Attachment 01 to Approval No. E4-110R-000308		Page 6 c	of 7			GENERAL ARRANGE for VAL	MENT DRAWING VE	BM'	Т Со.	., Ltd.

11 of 30	NO. DI	SCRIPTION	MATERIAL	Q'TY	REMARK
the second mark Drawingt					
*Approval mark drawing*					
110 P - Y Y Y Y Y	A 24.NOV. Rev. Issue Da	1 Issued for Appr ta Description	oval C.S.R Origina	A S.M.I tor Check	.EE J.H.LIM ked Approved
	PURCHASER				
a≥8mm	ULTENT				
	PROJECT NAME	-			
	PROJECT NO. PO. NO.				
RDW	MFR. MODEL/TYP	-			
	TAG NO. DRAWING NO.	- 111124-0	1-114-07		
Attachment 01 to Approval No. E4-110R-000308 Page 7 of 7	GENERAL ARRANGEMENT DR	WING	BM	T Co	., Ltd.
	for VALVE				

#### **Test Report** No.: IN110-A0-120035 Dated: 16/07/2012 ECE Regulation No.110 Type : Trunnion Ball valve (SBT Series) BMT CO., LTD 2



Manufacturer

### **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		
	Previous Approval: Nil		
ECE	Current Approval No. E4-110R-000308		

Туре	Test Report No.: IN110-A0-120035 Dated: 16/07/2012 ECE Regulation No.110 : Trunnion Bal	(SBT Series)	
Manuf	acturer : BMT CO., LT	D	
0.0	General		
0.1	Make	:	SUPERLOK T&S VALVES
0.2	Manufacturer's name and address	:	BMT CO., LTD 21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
0.3	Type and Commercial Description	:	Trunnion Ball valve (SBT Series) (SBT2 and SBT3 Series)
0.4	Working Pressure	:	260 bar 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 LABORATORY RDW Registration Number 99050016

### Test Report No.: IN110-A0-120035 Dated: 16/07/2012 ECE Regulation No.110 : Trunnion Ball valve (SBT Series)



Туре

Manufacturer

: BMT CO., LTD

### Trunnion Ball Valve SBT Series

PART NO.	END CONNECTION	А	В	L	Н	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" SLIPERLOK	25 A	97	117	47	4.8	2 FA	260 har	A1A har
0010 00 000		20.4	21	117	47	4.0	2 LA	200 041	414 041
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 Repo	ort
1	No.: IN110-A0-	-120035
	Dated: 16/07/	2012
	ECE Regulation	No.110
Туре	:	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

reduced

Yeshwant Ambure Project Leader



M. S. Ogale Head Homologation

TEST LABORATORY RDW Registration Number 99050016

<b>No.: II</b> Da ECE Type	) )		
Manufacturer			
List of modificat	ions		Appendix 1
More details for app	blication of	: Date	:
Correctio	n of	: -	
Modificat	ion of	: -	
Addition	of	: -	
Deletion	of	: -	



## **7 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 <u>http://www.superlok.com</u> PAGE 1 OF 7

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 : 76 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

## 诺 BMT CO., LTD

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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°C to 120°C			
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
21(Chairless Chaol	ASTM A276, A479	ASTM A182
510 Stanness Steel	ASME SA479	ASME SA182

: TRUNNION BALL VALVE (SBT Series)
: BMT-CNG-120717-02
: 01-12-2011
: CNG Component approval as per ECE R110
: IN110-A0-120035

# 诺 BMT CO., LTD

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### 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

: TRUNNION BALL VALVE (SBT Series)
: BMT-CNG-120717-02
: 01-12-2011
: CNG Component approval as per ECE R110
: IN110-A0-120035

# **BMT CO., LTD**

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### 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), 111124-01-114-03 (Rev.A)
2	Type Approval Mark	111124-01-114-07 (Rev.A)

Vehicle / Component Model: TRUNNION BALL VALVE (SBT Series)Information Document No.: BMT-CNG-120717-02Date: 01-12-2011Description: CNG Component approval as per ECE R110Enclosure 01 to Report No.: IN110-A0-120035

	21 of 30								NO	DESCRIPTION	MATERIAL	Q'TY	REMARK	
									1	BODY	SS 316	1		
									2	EMD CONNECTION	SS 316	2		
										3	SEAL RETAINER	SS 316	2	
											TRUNNION BALL	SS 316	1	
											STEM	SS 316	2	
			2 92 ID IM T							6	BALL SEAT	PEEK	2	
	P P		°	SUP GROOM-						7	SEAL GUIDE	SS 316	2	
	<u>Y</u>					H				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	
	(	14								13	BACKUP RING	PTFE	2	
	(	15								14	STEM O-RING	SS 316	1	
	(	16	$\sum$		2		_			15	STEM BEARING	PEEK	1	
	(	4		•	$\overline{+}$	-(17)	Ī			16	PANEL LOCK NUT	SS 316	1	
	(		Hill Hard			-(5)				17	HANDLE	NYLON	1	
		2	91111	0 (13 (12 6	E-MA LASE	RK R MARK I N	G		lloit 'mm	A Rev. PURCH	24.NOV.11 Issued for Issue Data Descri ASER	Approval C.S.R/ ption Originat	S.M.LE	J.H.LIM d Approved
		٨	D		11	0		WORKING PRESSURE	MAX WORKING	CLIEN	Т			
PART NU.		A	В	L	H I		Q IY	for ECE R110 TYPE	PRESSURE					
SBT2-S8-CNG	1/2" SUPERLOK	25.4	27.7	117	47	4.8	2 EA	260 bar	414 bar	PROJE	CT NAME -			
SBT2-F2N-CNG	SBT2-F2N-CNG         1/8" FEMALE NPT         25.4         27.7         76.4         47         4.8         2 EA         260 bar         414 bar								414 bar	PROJE	CT NO			
SBT2-F4N-CNG	SBT2-F4N-CNG         1/4" FEMALE NPT         25.4         27.7         82.4         47         4.8         2 EA         260 bar         414 bar									MED. N		0.050150		
									VALVE	NAME 2-V	2 SERTES WAY TRUNNION BAL	L VALVE		
										TAG N	IO. – NG NO 111	124-01-114-02		
Enclosu	Enclosure 1 to Report No. IN110-A0-120035 Page 5 of 7							GENER ARRAN for V	AL IGEMENT DRAWING ALVE	BM'	Г Со	, Ltd.		

22 of 30								NO	DESCRIPTION	MATERIAL	_ Q'TY	REMARK	
									1	BODY	SS 316	1	
									2	EMD CONNECTION	SS 316	2	
									3	SEAL RETAINER	SS 316	2	
										TRUNNION BALL	SS 316	1	
				=					5	STEM	SS 316	2	
					<u>}{ </u>				6	BALL SEAT	PEEK	2	
F			- Superierieun						7	SEAL GUIDE	SS 316	2	
<u> </u>									8	RETAINER O-RING	EPDM	4	
									9	BACKUP RING	PTFE	4	
			L						10	DISC SPRING	X-750	12	
									11	CONNECTOR SEAL	PTFE	2	
									12	TRUNNION BEARING	i PEEK	2	
	(14)								13	STEM O-RING	EPDM	1	
									14	STEM BACKUP RING	PEEK	1	
		$\downarrow$		A					15	STEM BEARING	PEEK	1	
	$\overline{7}$		•	+-	-(17)				16	PANEL LOCK NUT	SS 316	1	
				<u> </u>	(16)				17	HANDLE	NYLON	1	
	291	11 10 12 6		E- LA NPT 1/	MARK SER MARK	E NG			A Rev. PURCH	24.NOV.11 Issued for Issue Data Descrig ASER	Approval C.S tion Origi	.RA S.M.Lt nator Checke	E J.H.LIM dd Approved
								Unit : mm					
PART NO. END CONNECTION	Α	В	L	H	D	Q'TY	WORKING PRESSURE for ECE R110 TYPF	MAX WORKING PRESSURE	ULIEN				
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	SBT3-S4-CNG 1/4" SUPERLOK 25.4 27 104.8 47 4.8 2 EA 260 bar 414 bar							414 bar	PR0JE PR0JE	CT NAME - CT NO			
SBT3-F4N-CNG 1/4" FEMALE NPT	SBT3-F4N-CNG 1/4" FEMALE NPT 25.4 27 82.4 47 4.8 2 EA 260 bar 414 bar								P0. N	0. –			
								MFR. VALVE	MODEL/TYPE SBT3 NAME 3-W	3 SERIES /AY TRUNNION E	BALL VALVE		
									TAG N	0	04.04.444.00		
Enclosure 1 to Report No.	N110-A0-1	20035			Page 6 c	of 7			GENEF ARRAN for V	NG NU.   1111 AL GEMENT DRAWING ALVE	24-01-114-03	IT Co	., Ltd.

23 of 30	NO. DESCRIPTION MATERIAL Q'TY REMARK
*Approval mark Drawing*	
$110 P_VVVVV$	A 24.NOV.11 Issued for Approval C.S.RA S.M.LEE J.H.LIM Rev. Issue Data Description Originator Checked Approved
	PURCHASER
	OLIENT.
$a \ge 8 \text{mm}$	
	PROJECT NAME -
	PROJECT NO. – PO. NO. –
	MFR. MODEL/TYPE - VALVE NAME -
	TAG NO. – DRAWING NO. 111124-01-114-07
Enclosure 1 to Report No. IN110-A0-120035 Page 7 of 7	GENERAL ARRANGEMENT DRAWING for VALVE

Manufacturer: BMT CO., LTD

Component type: Trunnion Ball valve SBT Series Test Report No IN110-A0-120035 Technical Report Enclosure 2 Page 1 of 7



## **RECORD OF TEST ON**

CNG Manual valve as regards to Test and performance requirements, as per standard ECE R 110

0.1	Observer:	Place : ARAI, Pune and Praj Lab.			
	Mr. M.S. Ogale				
	Mr. Yeshwant Ambure				
0.2	Operator :-	Test date:- May'12-June12			
	Mr. Dekate, ARAI				
	Ashok Bhagat, Praj Lab				
0.3	Customer	BMT CO., LTD			
		21-1, Bukjeong-dong, Yangsan-si,			
		Gyeongsangnam-do,			
		626-110 S.Korea			
1.0	Component under test	Trunnion Ball valve			
		SBT2-F2N-CNG and SBT3-S8-CNG			
2.0	Manufacturer's Specification				
0.4	Tradamark ar Trada nama				
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			
	General Requirements of standard				
31	The manual valve device in Class () shall be	Meets the Requirement			
0.1	designed to withstand a pressure of 1.5 times	Satisfactory			
	the working pressure	Calibrationy			
3.2	The manual valve device in Class 0 shall be	Meets the Requirement			
0.2	designed to operate at a temperature from $-40^{\circ}$	Satisfactory			
	C to $85^{\circ}$ C.	Calibration			
3.3	Manual valve device requirements				
3.3.1	One specimen shall be submitted to a fatigue	Meets the Requirement			
	test at a pressure cycling rate not to exceed 4	Satisfactory			
	cycles per minute as follows:				
	(i) Held at 20 °C while pressured for 2,000				
	cycles between 2 MPa and 26 MPa.				

Manufacturer:	BMT CO., LTD		
Component type:	Trunnion Ball valve SBT Series		

Test Report No IN110-A0-120035 Technical Report Enclosure 2 Page 2 of 7



Specific	test requirer	nents	
Overpre	essure Test:		
A CNG	containing co	omponent shall withstand	Observations:
without	any visible	evidence of rupture or	
permane	ent distortion a	hydraulic pressure of 1.5	Water used as test medium.
times t	he working	pressure (MPa) during	No leakage observed at 1.5 times working
minimal	3 minutes at r	oom temperature with the	pressure of 390 bar
outlet of	the high-pres	sure part plugged. Water	
or any	other suitable	e hydraulic fluid may be	Meets the Requirement
used as	a test medium	).	Satisfactory
Class	Working	Test pressure	
	pressure		
Class 0 3000 <p<2 1.5times="" th="" working<=""><th>1.5times working</th><th></th></p<2>		1.5times working	
	6000	pressure	
1. Working pressure: 260 bar			
2. T	est Pressure:	390 bar	
	Specific Overpre A CNG without permane times t minimal outlet of or any used as Class Class 0 1. V 2. T	Specific test requirerOverpressure Test:A CNG containing colwithout any visiblepermanent distortion atimes the workingminimal 3 minutes at routlet of the high-pressor any other suitableused as a test mediumClassWorkingpressureClass 03000 <p<2< td="">60001.Working pressure2.Test Pressure:</p<2<>	Specific test requirementsOverpressure 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.ClassWorking pressureClass 03000 <p<2 </p<2  60001.5times working pressure1.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:

(a) at room temperature at pressure of 390 bar

(b) at the minimum operating temperature: -40°C at pressure of 390 bar

(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:	Observations:					
	A CNG containing component shall not leak more	No Leakage Observed.					
	than 15 cm3/hour with the outlet plugged when						
	submitted to a gas pressure, at room temperature	Meets the Requirement					
		Satisfactory					

Manufacturer: BMT CO., LTD

Component type: Trunnion Ball valve SBT Series Test Report No IN110-A0-120035 Technical Report Enclosure 2 Page 3 of 7



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

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

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





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				not <b>Requiren</b> of Maximun to storage i period of original v SO percent.	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.		
	Obse	rvations:					
	Sr. No.	Sample Identification Mark	Change in Vo in % Specified Value	Observed	Change Mass in Specified	in Observed	- Remark
	1	DTEE	20 May			Value	
		PIFE	20 Wax.	0.06	- 5 % Max	-0.2	UN
	2	PEEK	20 Max	0.07	- 5 % Max	-0.01	OK
	3	'O' ring	20 Max	2.5	- 5 % Max	- 3.48	ОК
	Meets Satisf	s the requirements actory		I	1		

4.6	CORROSION RESISTANCE TEST						
	Requirements:						
	A metal CNG co	ntaining component shall	comply with the leakage t	tests, after submitting it to			
	144 hours salt sp	ray test with all connection	s closed. Solution: 5% Na	Cl in 95% distilled water by			
	weight. External I	eakage test carried out at	room temp/ at 120°C / at -	40°C and internal leakage			
	test carried out at	room temperature					
	Observation: No	o corrosion observed					
	Meets the Requir	rement					
	Satisfactory						
4.6.1	External leakage	e test after corrosion resi	stance test				
	Test	Room Temp	Low Temp	High Temp			
	conditions30° C at 390 bar-40		-40° C at 390 bar	+120°C at 390 bar			
	Observations	No Leakage Observed	No Leakage Observed	No Leakage Observed			
		Meets the Requirement					
		Satisfactory					
4.6.2	Internal Leakage	e test after corrosion resi	stance test				
	Internal Leak tes	t at room temperature as p	per Observations: No le	akage observed.			
	Annex 5C		Meets the requirement	nts			
			Satisfactory.				



Component type: Trunnion Ball valve SBT Series

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4.7	Resistance to dry heat							
	<ul> <li>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.</li> <li>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:</li> <li>-Maximum increase 10 per cent</li> <li>-Maximum decrease 30 per cent</li> </ul>							
	Obse	rvations:						
	Sr. No.	Sample	Change in Tensile Change in elongation % Rema				Remark	
			Specifie d Value	Observed Value	Specified Value	Observed Value		
	1	PTFE	+25 Max	9.20	+10	-0.64	OK	
	2	PEEK		2.61	-30	- 27.3	OK	
	3	O-Ring EPDM	12.37 -17.50 Ok					
	Meets Satisf	the requirements actory						

### 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	Room Temp Low		Temp	High Temp		
Conditions	30°C at 390 bar	-40°	<sup>2</sup> C at 390 bar +120°C at 390			
Observations	No Leakage Observed	No L	eakage Observed	No Leakage Observe		
	Meets the Requirement					
	Satisfactory					
Internal Leaka	ge Test after Temperature	cyclic	c test			
Internal Leak t	est at room temperature as	s per	Observations:			
Annex 5C			No leakage observed.			
			Meets the requireme	nts		
			Satisfactory.			



Component type: Trunnion Ball valve SBT Series

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4.9	Vibration Resistance:					
	<b>Requirements:</b>			Observations:		
	All components with moving parts shall			No Leakage observed	ł.	
	remain undamag	ed, continue to operate, a	nd			
	comply with the	component's leakage tes	sts	Meets the requiremer	its.	
	after 6 hours of	vibration in accordance w	ith			
	the following test	method.		Satisfactory.		
	Test method					
	The component	shall be secured in	an			
	apparatus and vi	brated for 2 hours at 17	Hz			
	with an amplitude	e of 1.5 mm (0,06 in.) in ea	ch			
	of three orientation	on axes. On completion of	f 6			
	hours of vibration	the component shall com	oly			
	with Annex 5C.					
4.9.1	External leakage	e test				
	Test	Room Temp	Lo	w Temp	High Temp	
	conditions	30° C at 390 bar	-4	0° C at 390 bar	+120°C at 390 bar	
	Observations	No Leakage Observed	No	b Leakage Observed	No Leakage Observed	
		Marta tha Daminana at				
		Meets the Requirement				
100		Satisfactory				
4.9.2	Internal Leakage	Leakage test				
	Internal Leak tes	t at room temperature as p	ber	Observations: No leakage observed.		
	Annex 5C			Meets the requirements		
				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	20 per cent	Observation:					
	elongation, shall be exposed to	No cracks observed at						
	concentration of 50 parts per hundre	10X Magnification.						
	No cracking of the test piece is allow		Satisfactory.					



Component type: Trunnion Ball valve SBT Series

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The operati given below	g temperatures of the Trunnion Ball valve shall be classified as per the table					
ANNEX 50	NNEX 50 - OPERATING TEMPE Engine Ass compartment		<b>RES</b> n the engine	On board		
Moderate	- 20 ° C <sup>÷</sup> 105 ° C	- 20 ° C	÷ 120 ° C	- 20 ° C <sup>÷</sup> 85 ° C		
Cold	- 40 ° C <sup>÷</sup> 105 ° C	- 40 ° C	<sup>÷</sup> 120 <sup>°</sup> C	-40°C÷85°C		
Requirement:			Observation:			
The Manual	Valve should mee	t operating	The High Pressure Manual Valve			
temperature require as given in the table annex 50			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.** 

Nedman

Yeshwant Ambure Project Leader Msogale.

IFM TUV NORD Mediate TUV North Mediate Market Marke

M. S. Ogale Head Homologation