

**Documents regarding Approval of**

**CNG Micro Tee Filter of class 0**

**Of BMT Co. Ltd. Make**

Approval number: **E4-110R-000311-00**

Report No: **IN110-A0-120038** 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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RDW

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- ~~- approval withdrawn~~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.

**Approval number: E4-110R-000311**

**Extension number: 00**

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

:  SUPERLOK T&S VALVES  
MICRON TEE FILTER (STF1, STF2)

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



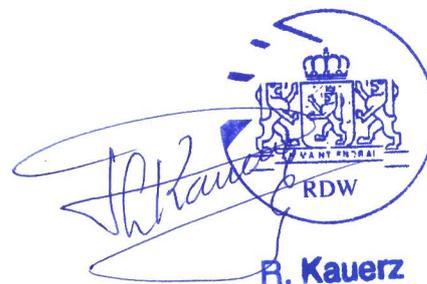
P.O. Box 777  
2700 AT Zoetermeer  
The Netherlands

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-000311****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**  
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-A0-120038
9. Approval : granted/~~refused/extended/withdrawn~~<sup>(1)</sup>
10. Reason(s) of extension (if applicable) : NA
11. Place : ZOETERMEER
12. Date : 06-NOV-2012
13. Signature :
14. The documents filed with the application or extension of approval can be obtained upon request.




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<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. 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) <sup>(2)</sup> : Not Applicable
    - 1.2.2. Material : Not Applicable
  - 1.3. Pressure relief valve (discharge valve)
    - 1.3.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.3.2. Material : Not Applicable
  - 1.4. Automatic valve(s)
    - 1.4.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.4.2. Material : Not Applicable
  - 1.5. Excess flow valve
    - 1.5.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.5.2. Material : Not Applicable
  - 1.6. Gas-tight housing
    - 1.6.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.6.2. Material : Not Applicable
  - 1.7. Pressure regulator(s)
    - 1.7.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.7.2. Material : Not Applicable
  - 1.8. Check valve(s) or non-return valve(s)
    - 1.8.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.8.2. Material : Not Applicable
  - 1.9. Pressure relief device (temperature triggered)
    - 1.9.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.9.2. Material : Not Applicable
  - 1.10. Manual valve
    - 1.10.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.10.2. Material : Not Applicable
  - 1.11. Flexible fuel lines
    - 1.11.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.11.2. Material : Not Applicable
  - 1.12. Filling unit or receptacle
    - 1.12.1. Working pressure(s) <sup>(2)</sup> : Not Applicable
    - 1.12.2. Material : Not Applicable



1.13.	Gas injector(s)	
1.13.1.	Working pressure(s) <sup>(2)</sup>	: Not Applicable
1.13.2.	Material	: Not Applicable
1.14.	Gas flow adjuster	
1.14.1.	Working pressure(s) <sup>(2)</sup>	: Not Applicable
1.14.2.	Material	: Not Applicable
1.15.	Gas/air mixer	
1.15.1.	Working pressure(s) <sup>(2)</sup>	: 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) <sup>(2)</sup>	: Not Applicable
1.17.2.	Material	: Not Applicable
1.18.	CNG filter(s)	
1.18.1.	Working pressure(s) <sup>(2)</sup>	: 260 bar for consideration of R110
1.18.2.	Material	: 316 Stainless steel

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<sup>(2)</sup> 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>

PAGE 1 OF 6

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

**INFORMATION DOCUMENT No : BMT-CNG-120717-05**

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:  
STF SERIES / MICRON TEE FILTER
- 1.4 Working Pressure(s) :

Valve Name	Working Pressure for ECE R110 TYPE
Micron Tee Filter	260 bar

- 1.5 Description and Drawing : See attached document
- 1.6 Material : 316 Stainless steel
- 1.7 Operating temperatures : -40°C to 120°C

Valve Name	Temperature rating
Micron Tee Filter	-40°C to 120°C

- 1.8 Remarks: CNG filter(s)



Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Attachment 01 to Approval No. : E4-110R-000311

 **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 6

**2. Features of Micron Tee Filter**

Micron Tee Filter

- Replacement of filter elements with body in line
- Compact and robust integral union bonnet design
- Filter elements are made of sintered stainless steel

**3. Description**

	MICRON TEE FILTER
Working Pressure for ECE R110 TYPE	260 bar
Temperature rating	-40°C to 120°C
Body material	316 Stainless Steel
Port Connection	1/4" to 1/2" and 6mm to 12mm
Orifice	4.4mm
Filter element	1, 10, 50, 100, 150 Micron

**4. Working Pressure and MAWP**

Micron Tee Filter

Valve Name	Working Pressure for ECE R110 TYPE
Micron Tee Filter	260 bar

**5. Material Standard**

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



Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Attachment 01 to Approval No. : E4-110R-000311

## 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>

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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

### 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 Micron Tee Filter



Picture 1. Micron Tee Filter



Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Attachment 01 to Approval No. : E4-110R-000311

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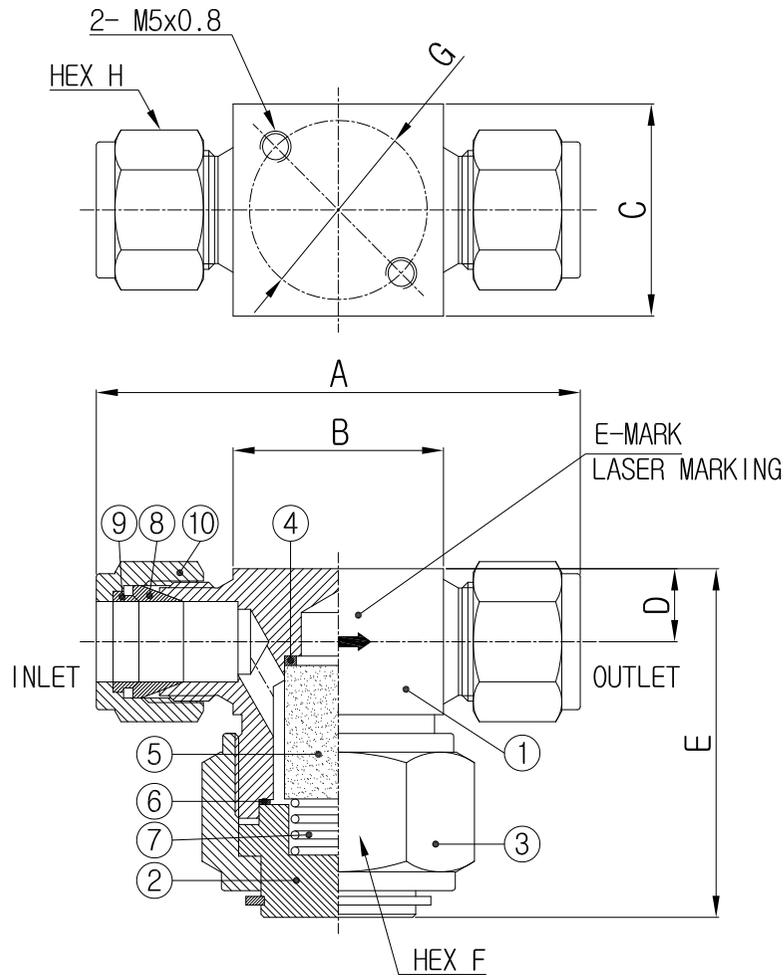
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**9. Drawings**

NO	TITLE	DWG No.
1	Micron Tee Filter	111124-01-114-06 (Rev.A)
2	Type Approval Mark	111124-01-114-07 (Rev.A)



Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Attachment 01 to Approval No. : E4-110R-000311



NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	CAP	SS316	1	
3	NUT	SS316	1	
4	PACKING	PTFE	1	
5	FILTER ELEMENT	SS316	1	
6	GASKET	SS316	1	
7	SPRING	SS304	1	
8	FRONT FERRULE	SS316	2	
9	BACK FERRULE	SS316	2	
10	FERRULE NUT	SS316	2	

**SPECIFICATIONS**

1. Maximum pressure rating : 6000 psig (414 bar)
2. Temperature rating : -40 to 400° F (-40 to 204° C)
3. Filtering range : 0.5 to 90 Micron

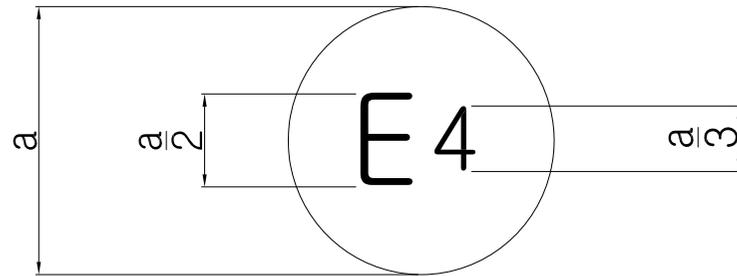


Unit : mm

PART NO.	END CONNECTION	A	B	C	D	E	F	G	H	Q'TY	WORKING PRESSURE for ECE R110 TYPE	MAX WORKING PRESSURE
STF1-S4-2	1/4" SUPERLOK	62.7	27	27	9.7	47.5	28.6	25.4	14.3	5 EA	260 bar	414 bar
STF2-S8-7	1/2" SUPERLOK	78.2	34	34	11.7	55.9	38.1	28.7	22.2	5 EA	260 bar	414 bar

Rev.	Issue Data	Description	Originator	Checked	Approved
A	25.NOV.11	Issued for Approval	H.P.SEO	S.M.LEE	J.H.LIM
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		STF Series			
ITEM NAME		MICRON TEE FILTER			
TAG NO.		-			
DRAWING NO.		111124-01-114-06			
GENERAL ARRANGEMENT DRAWING for TEE FILTER			<b>BMT Co., Ltd.</b>		

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK



\*Approval mark Drawing\*

110 R-XXXXXX

$a \geq 8\text{mm}$



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					

**Test Report**  
**No.:** IN110-A0-120038

Dated: 16/07/2012

ECE Regulation No.110



Type : MICRON TEE FILTER – STF 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 RECOGNITION OF 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-000311

**Test Report**  
**No.:** IN110-A0-120038  
 Dated: 16/07/2012  
 ECE Regulation No.110



Type : MICRON TEE FILTER – STF 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  
 21-1, Bukjeong-dong, Yangsan-si,  
 Gyeongsangnam-do,  
 626-110 S.Korea
- 0.3 Type and Commercial Description : MICRON TEE FILTER  
 STF Series
- 0.4 Working Pressure : 260 bar  
 Class 0
- 1.0 Test information
- 1.1 Test Objects : Micro Tee Filter
- 1.2 Test dates : May'2012-June'2012
- 1.3 Equipment /facilities used : The test equipment and facilities used were in compliance with the requirements of the Standards

**2.0 Equipment used**

	<b>Equipment</b>	<b>Make/Model</b>	<b>Calibration Validity</b>
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-A0-120038**

Dated: 16/07/2012  
 ECE Regulation No.110



Type : MICRON TEE FILTER – STF Series  
 Manufacturer : BMT CO., LTD

Micro Tee Filter:

PART NO.	END CONNECTION	A	B	C	D	E	F	G	H	Q'TY	WORKING PRESSURE for ECE R110 TYPE	MAX WORKING PRESSURE
STF1-S4-2	1/4" SUPERLOK	62.7	27	27	9.7	47.5	28.6	25.4	14.3	5 EA	260 bar	414 bar
STF2-S8-7	1/2" SUPERLOK	78.2	34	34	11.7	55.9	38.1	28.7	22.2	5 EA	260 bar	414 bar

**Conclusion of matrix:**

BMT produces Micro Tee Filter as provided in the matrix. Based on the above information and analyzing, both filters were selected for testing.

**List of Enclosures:**

Enclosure 1: Information Documents and drawings.

Enclosure 2: Results of test

**Test Report**  
**No.: IN110-A0-120038**

Dated: 16/07/2012  
 ECE Regulation No.110



Type : MICRON TEE FILTER – STF Series  
 Manufacturer : BMT CO., LTD

**3.0 Report of compliance:**

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 5.

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-A0-120038

Dated: 16/07/2012  
 ECE Regulation No.110



Type : MICRON TEE FILTER – STF Series  
 Manufacturer : BMT CO., LTD

**List of modifications**

<b>Appendix 1</b>
-------------------

**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

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PAGE 1 OF 6

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

**INFORMATION DOCUMENT No : BMT-CNG-120717-05**

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:  
STF SERIES / MICRON TEE FILTER
- 1.4 Working Pressure(s) :

Valve Name	Working Pressure for ECE R110 TYPE
Micron Tee Filter	260 bar

- 1.5 Description and Drawing : See attached document
- 1.6 Material : 316 Stainless steel
- 1.7 Operating temperatures : -40°C to 120°C

Valve Name	Temperature rating
Micron Tee Filter	-40°C to 120°C

- 1.8 Remarks: CNG filter(s)

Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Enclosure 01 to Report No. : IN110-A0-120038

 **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 Micron Tee Filter**

## Micron Tee Filter

- Replacement of filter elements with body in line
- Compact and robust integral union bonnet design
- Filter elements are made of sintered stainless steel

**3. Description**

	MICRON TEE FILTER
Working Pressure for ECE R110 TYPE	260 bar
Temperature rating	-40℃ to 120℃
Body material	316 Stainless Steel
Port Connection	1/4" to 1/2" and 6mm to 12mm
Orifice	4.4mm
Filter element	1, 10, 50, 100, 150 Micron

**4. Working Pressure and MAWP**

## Micron Tee Filter

Valve Name	Working Pressure for ECE R110 TYPE
Micron Tee Filter	260 bar

**5. Material Standard**

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

Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Enclosure 01 to Report No. : IN110-A0-120038

## 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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### 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

### 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 Micron Tee Filter



Picture 1. Micron Tee Filter

Vehicle / Component Model	: MICRON TEE FILTER (STF Series)
Information Document No.	: BMT-CNG-120717-05
Date	: 01-12-2011
Description	: CNG Component approval as per ECE R110
Enclosure 01 to Report No.	: IN110-A0-120038

 **BMT CO., LTD**

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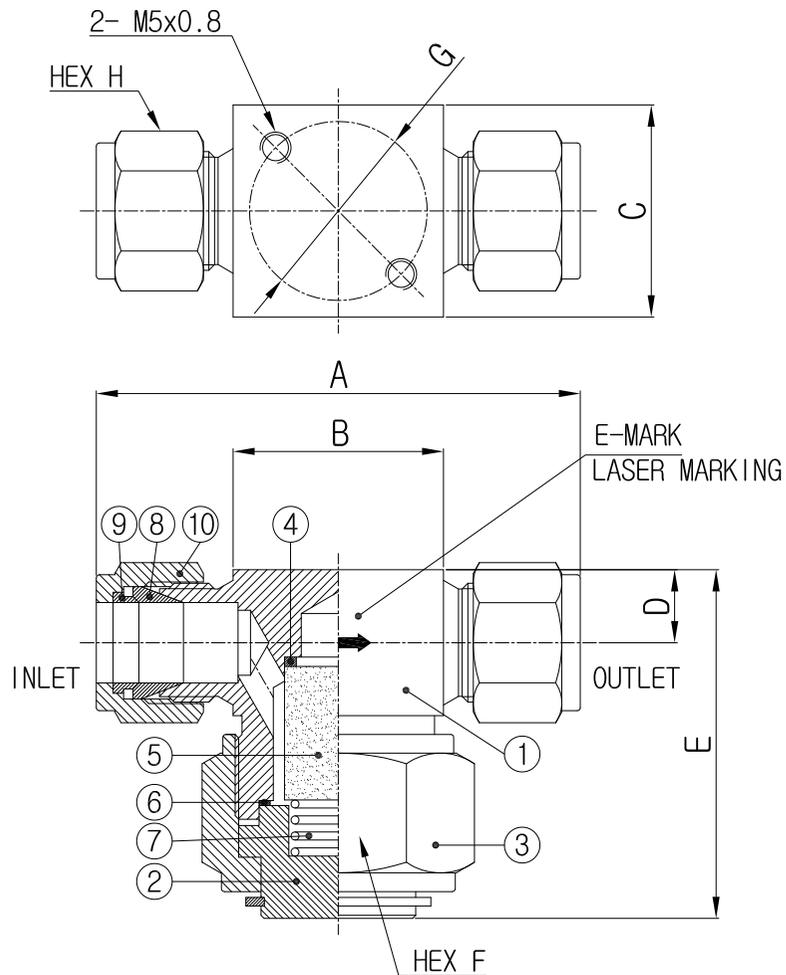
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**9. Drawings**

NO	TITLE	DWG No.
1	Micron Tee Filter	111124-01-114-06 (Rev.A)
2	Type Approval Mark	111124-01-114-07 (Rev.A)

Vehicle / Component Model : MICRON TEE FILTER (STF Series)  
 Information Document No. : BMT-CNG-120717-05  
 Date : 01-12-2011  
 Description : CNG Component approval as per ECE R110  
 Enclosure 01 to Report No. : IN110-A0-120038



NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK
1	BODY	SS316	1	
2	CAP	SS316	1	
3	NUT	SS316	1	
4	PACKING	PTFE	1	
5	FILTER ELEMENT	SS316	1	
6	GASKET	SS316	1	
7	SPRING	SS304	1	
8	FRONT FERRULE	SS316	2	
9	BACK FERRULE	SS316	2	
10	FERRULE NUT	SS316	2	

SPECIFICATIONS

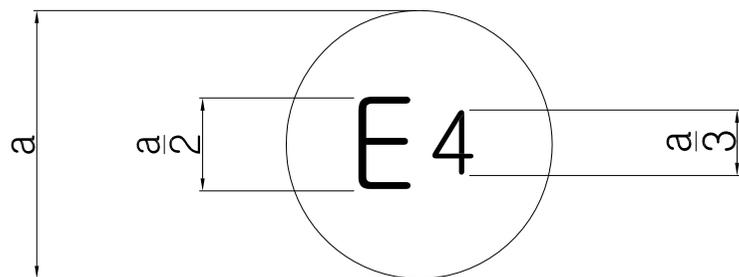
1. Maximum pressure rating : 6000 psig (414 bar)
2. Temperature rating : -40 to 400° F (-40 to 204° C)
3. Filtering range : 0.5 to 90 Micron

Rev.	Issue Date	Description	Originator	Checked	Approved
A	25.NOV.11	Issued for Approval	H.P.SEO	S.M.LEE	J.H.LIM
PURCHASER					
CLIENT					
PROJECT NAME		-			
PROJECT NO.		-			
PO. NO.		-			
MFR. MODEL/TYPE		STF Series			
ITEM NAME		MICRON TEE FILTER			
TAG NO.		-			
DRAWING NO.		111124-01-114-06			
GENERAL ARRANGEMENT DRAWING for TEE FILTER					

Unit : mm

PART NO.	END CONNECTION	A	B	C	D	E	F	G	H	Q'TY	WORKING PRESSURE for ECE R110 TYPE	MAX WORKING PRESSURE
STF1-S4-2	1/4" SUPERLOK	62.7	27	27	9.7	47.5	28.6	25.4	14.3	5 EA	260 bar	414 bar
STF2-S8-7	1/2" SUPERLOK	78.2	34	34	11.7	55.9	38.1	28.7	22.2	5 EA	260 bar	414 bar

NO.	DESCRIPTION	MATERIAL	Q'TY	REMARK



\*Approval mark Drawing\*

110 R-XXXXXXXX

$a \geq 8\text{mm}$

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					

Manufacturer: BMT CO., LTD  
 Component type: MICRON TEE FILTER  
 (STF Series)

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

0.1	Observer: Mr. M.S. Ogale Mr. Yeshwant Ambure	Place : ARAI, Pune and Praj Lab.
0.2	Operator :- Mr. Dekate, ARAI Ashok Bhagat, Praj Lab	Test date:- May'2012-June'2012
0.3	Customer	BMT CO., LTD 21-1, Bukjeong-dong, Yangsan-si, Gyeongsangnam-do, 626-110 S.Korea
1.0	Component under test	MICRON TEE FILTER STF1-S4-2 and STF2-S8-7
<b>2.0</b>	<b>Manufacturer's Specification</b>	
2.1	Trademark or Trade name	 SUPERLOK T&S VALVES
2.2	Model name and number	MICRON TEE FILTER (STF Series)
2.3	Manufacturers Specification	As attached at Enclosure 1
3.0	<b>Results of Tests</b>	
	<b>General Requirements of standard</b>	<b>Observations</b>
3.1	The CNG filter shall be so designed to operate at temperatures as specified in Annex 5O.	Meets the Requirement Satisfactory
3.2	CNG filter shall be Classified with regard to the maximum working pressure	Class 0 working pressure 260 bar Meets the Requirement Satisfactory
3.3	Class 0: The CNG filter shall be so designed to withstand a pressure of 1.5 times the working pressure (MPa).	Meets the Requirement Satisfactory
3.4	The materials used in the CNG filter which are in contact with CNG when operating, shall be compatible with this gas (see Annex 5D).	Meets the Requirement Satisfactory

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3.5	The component has to comply with the test procedures for Class components according to the scheme in Figure 1-1 of paragraph 2 of this Regulation.	Meets the Requirement Satisfactory
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<b>4.0</b>	<b>Specific test requirements</b>							
<b>4.1</b>	<b>Overpressure Test:</b>							
	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 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.	<b>Observations:</b> Water used as test medium. No leakage observed at 1.5 times working pressure of 390 bar  Meets the Requirement Satisfactory						
	<table border="1"> <thead> <tr> <th>Class</th> <th>Working pressure</th> <th>Test pressure</th> </tr> </thead> <tbody> <tr> <td>Class 0</td> <td>3000&lt;P&lt;26000</td> <td>1.5times working pressure</td> </tr> </tbody> </table>	Class	Working pressure	Test pressure	Class 0	3000<P<26000	1.5times working pressure	
Class	Working pressure	Test pressure						
Class 0	3000<P<26000	1.5times working pressure						
	1. Working pressure: 260 bar 2. Test Pressure: 390 bar							

<b>4.2</b>	<b>EXTERNAL LEAKAGE TEST</b>	
	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 cm <sup>3</sup> /hour.	

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4.2.1	<b>Room temperature test</b>	
	<b>Requirements:</b> A CNG containing component shall not leak more than 15 cm <sup>3</sup> /hour with the outlet plugged when submitted to a gas pressure, at room temperature	<b>Observations:</b> No Leakage Observed  Meets the requirement Satisfactory
4.2.2	<b>Maximum operating temperature test</b>	
	<b>Requirements:</b> A CNG containing component shall not leak more than 15 cm <sup>3</sup> /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	<b>Observations:</b> No Leakage Observed.  Meets the Requirement Satisfactory
4.2.3	<b>Minimum operating temperature test</b>	
	<b>Requirements:</b> A CNG containing component shall not leak more than 15 cm <sup>3</sup> /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	<b>Observations:</b> No Leakage Observed.  Meets the Requirement Satisfactory

<b>4.3</b>	<b>CNG Compatibility Test</b>																																					
	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			<b>Requirements:</b> 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.																																		
	<b>Observations:</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sr. No.</th> <th rowspan="2">Sample Identification Mark</th> <th colspan="2">Change in Volume in %</th> <th colspan="2">Change in Mass in %</th> <th rowspan="2">Remark</th> </tr> <tr> <th>Specified Value</th> <th>Observed Value</th> <th>Specified Value</th> <th>Observed Value</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PTFE</td> <td>20 Max.</td> <td>0.06</td> <td>- 5 % Max</td> <td>-0.2</td> <td>OK</td> </tr> <tr> <td>2</td> <td>PEEK</td> <td>20 Max</td> <td>0.07</td> <td>- 5 % Max</td> <td>-0.01</td> <td>OK</td> </tr> <tr> <td>3</td> <td>'O' ring</td> <td>20 Max</td> <td>2.5</td> <td>- 5 % Max</td> <td>- 3.48</td> <td>OK</td> </tr> </tbody> </table>						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
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																																					

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4.4 CORROSION RESISTANCE TEST			
<b>Requirements:</b> 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			
<b>Observation:</b>			
<b>EXTERNAL LEAKAGE TEST</b>			
<b>Test Conditions</b>	Room Temp	Low Temp	High Temp
	30° C at 390 bar	-40° C at 390 bar	+120°C at 390 bar
<b>Observations</b>	<b>No Leakage Observed</b>	<b>No Leakage Observed</b>	<b>No Leakage Observed</b>
	Meets the Requirement Satisfactory		

4.5 Resistance to dry heat						
<p>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.</p> <p>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</p>						
<b>Observations:</b>						
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						

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4.6	<b>Temperature cyclic test</b>		
	<b>Requirements:</b> 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		
	<b>Observation</b>		
	<b>EXTERNAL LEAKAGE TEST</b>		
	Test Conditions	Room Temp	Low Temp
		30°C at 390 bar	-40° C at 390 bar
			High Temp
			+120°C at 390 bar
	Observations	<b>No Leakage Observed</b>	<b>No Leakage Observed</b>
		Meets the Requirement Satisfactory	

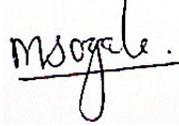
4.7	<b>OZONE TEST</b>		
	Medium : Ozone	Duration: 72 Hours	Ref Standard: ISO 1431-1
	Test Temp: 40°C		
	<b>Requirement of Standard</b>		
	The test piece, which has to be stressed to 20 per cent elongation, shall be exposed to air at 40C with an ozone concentration of 50 parts per hundred million during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

4.8	<b>The operating temperatures of the Filter shall be classified as per the table given below</b>		
	<b>ANNEX 50 - OPERATING TEMPERATURES</b>		
		Engine compartment	Assembled on the engine
	Moderate	- 20 ° C + 105 ° C	- 20 ° C + 120 ° C
	Cold	- 40 ° C + 105 ° C	- 40 ° C + 120 ° C
			On board
			- 20 ° C + 85 ° C
			- 40 ° C + 85 ° C
	<b>Requirement:</b>	<b>Observation:</b>	
	The Micro Tee Filter should meet operating temperature require as given in the table annex 50	The Micro Tee Filter Type: STF1-S4-2 and STF2-S8-7 has the temperature range of -40°C to +120°C. The Filter meets the test requirements when subjected to all relevant tests with this temperature.	

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5.0	<p><b>Conclusion:</b> The Micro Tee Filter STF Series as described in the information document as above meets the requirement of Regulation ECE R110.</p> <p> Yeshwant Ambure Project Leader</p> <p> M. S. Ogale Head Homologation</p> <p></p>
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