

**Test Report No. 719171152-MEC10/01-CLC**  
dated 12 APRIL 2010



PSB Singapore

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**SUBJECT:**

Testing of Tap/Fitting/Mixers.

**TESTED FOR:**

Vola A/S  
Lunavej 2  
DK 8700 Horsens  
Denmark

Attn: Mr. Tommy Jorgenson

**METHOD OF TEST:**

PUB Requirement for Water Efficiency Labelling Scheme

BS EN 817 : 2008  
Sanitary tapware – Mechanical mixer ( PN 10 ) – General technical specifications

**DESCRIPTION OF SAMPLE:**

Product : Tap/Fittings/Mixers  
Brand Name : Vola

S/N	Description	Model
1.	Deck Mounted Sink Mixer	SC 5
2.	Deck Mounted Sink Mixer	SC 7
3.	Deck Mounted Sink Mixer	SC 9
4.	Deck Mounted Sink Mixer	SC 10
5.	Deck Mounted Sink Mixer	SC 12
6.	Sink Mixer	KV 1
7.	High Flow Mixer	SC 1

**Note:** Refer to APPENDIX for photo.



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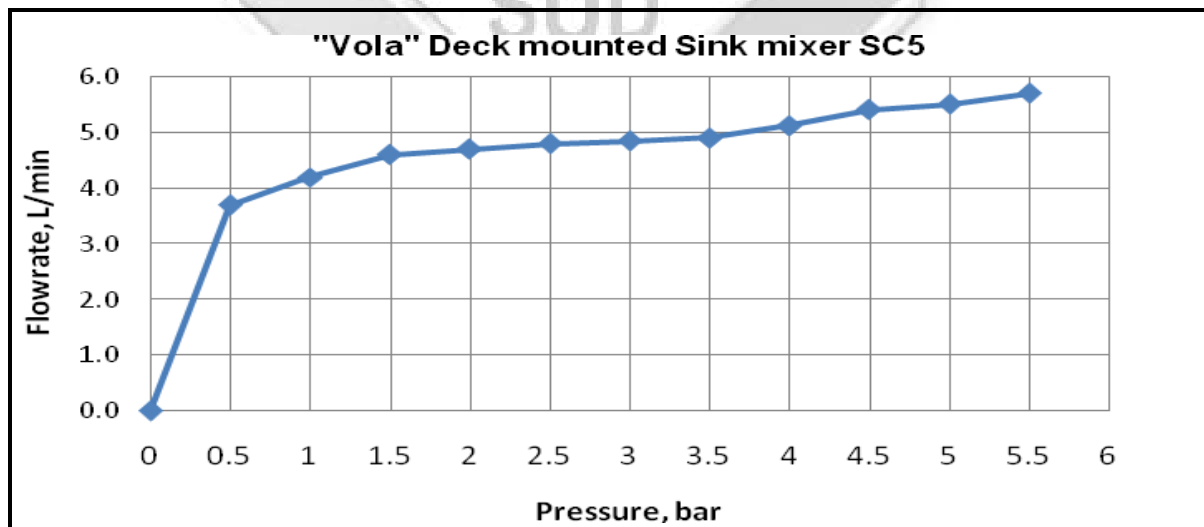
Regional Head Office:  
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The Franklin, Singapore 118223  
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**TEST RESULTS:**

**Hydraulic Characteristics**

- 1) Description: Deck Mounted Sink Mixer  
Model: SC 5

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0	<p><b>Products/Fittings</b> Sink Taps &amp; Mixers/Bib Taps</p> <p>6 to 8 litres/min ( 1 tick ) 4 to 6 Litres/min ( 2 ticks ) 4 litres/min or less ( 3 ticks )</p>	
0.5	3.7		
1.0	4.2		
1.5	4.6		
2.0	4.7		
2.5	4.8		
3.0	4.8		
3.5	4.9		
4.0	5.1		
4.5	5.4		
5.0	5.5		
5.5	5.7		




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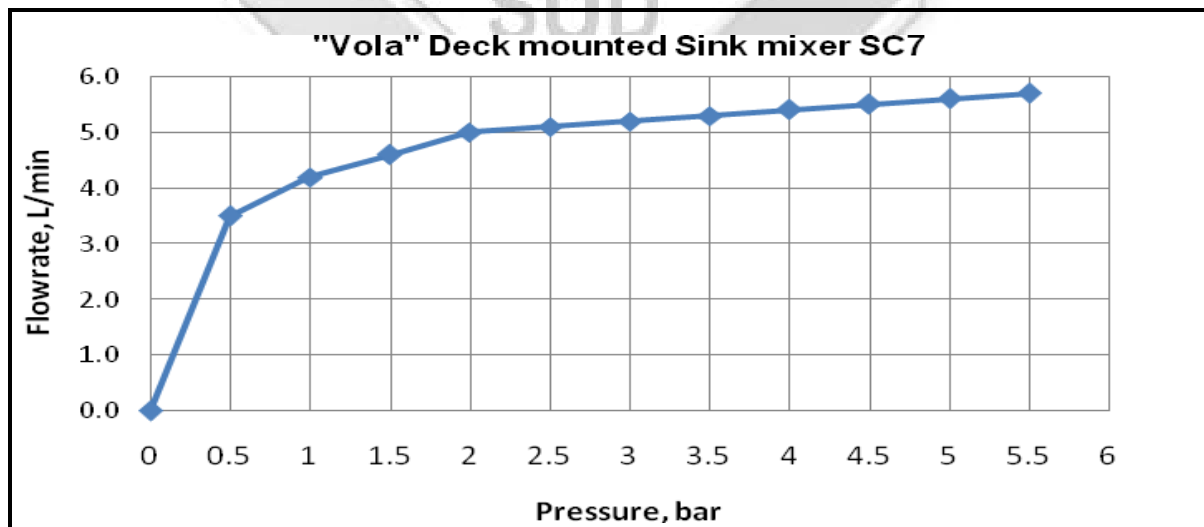
*Aldehany*

**TEST RESULTS: (Cont'd)**

**Hydraulic Characteristics**

2) Description: Deck Mounted Sink Mixer  
Model: SC 7

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0	<p><b>Products/Fittings</b> Sink Taps &amp; Mixers/Bib Taps</p> <p>6 to 8 litres/min ( 1 tick ) 4 to 6 Litres/min ( 2 ticks ) 4 litres/min or less ( 3 ticks )</p>	
0.5	3.5		
1.0	4.2		
1.5	4.6		
2.0	5.0		
2.5	5.1		
3.0	5.2		
3.5	5.3		
4.0	5.4		
4.5	5.5		
5.0	5.6		
5.5	5.7		




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**TEST RESULTS: (Cont'd)**

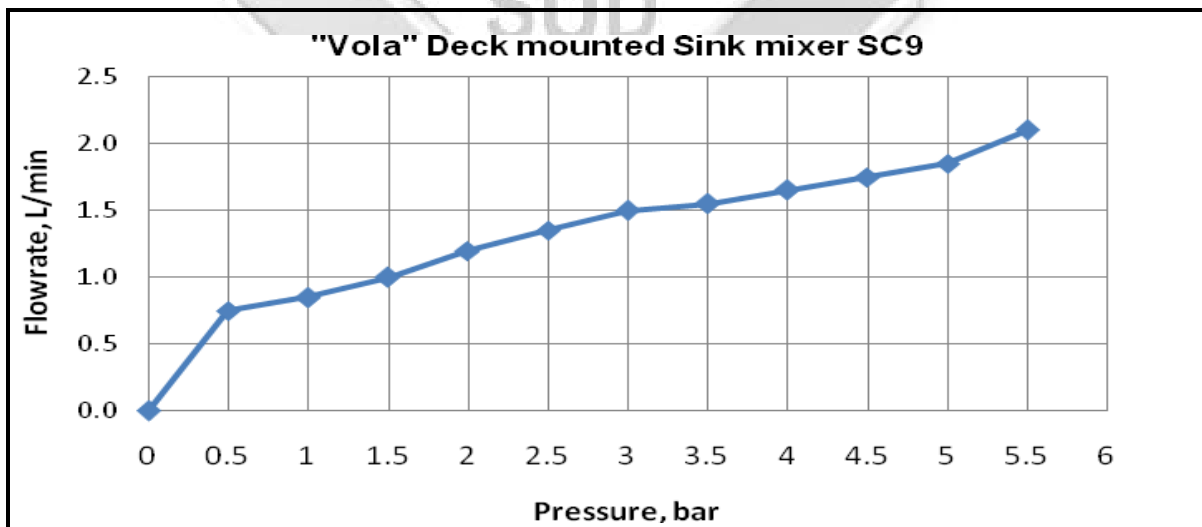
**Hydraulic Characteristics**

3) Description: Deck Mounted Sink Mixer  
Model: SC 9

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0		
0.5	0.8		
1.0	0.9		
1.5	1.0		
2.0	1.2		
2.5	1.4		
3.0	1.5	6 to 8 litres/min ( 1 tick )	
3.5	1.6	4 to 6 Litres/min ( 2 ticks )	
4.0	1.7	4 litres/min or less ( 3 ticks )	
4.5	1.8		
5.0	1.9		
5.5	2.1		

**Products/Fittings**  
Sink Taps & Mixers/Bib Taps

6 to 8 litres/min ( 1 tick )  
4 to 6 Litres/min ( 2 ticks )  
4 litres/min or less ( 3 ticks )




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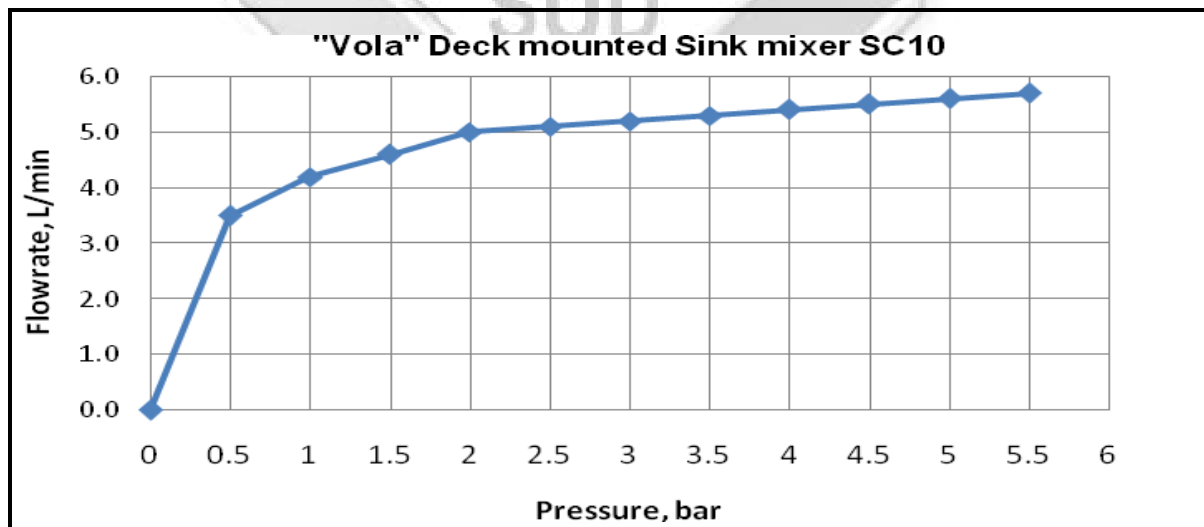
**TEST RESULTS: (Cont'd)**

**Hydraulic Characteristics**

4) Description: Deck Mounted Sink Mixer  
Model: SC 10

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0		
0.5	3.5		
1.0	4.2		
1.5	4.6		
2.0	5.0		
2.5	5.1		
3.0	5.2		
3.5	5.3		
4.0	5.4		
4.5	5.5		
5.0	5.6		
5.5	5.7		

**Products/Fittings**  
Sink Taps & Mixers/Bib Taps  
6 to 8 litres/min ( 1 tick )  
4 to 6 Litres/min ( 2 ticks )  
4 litres/min or less ( 3 ticks )




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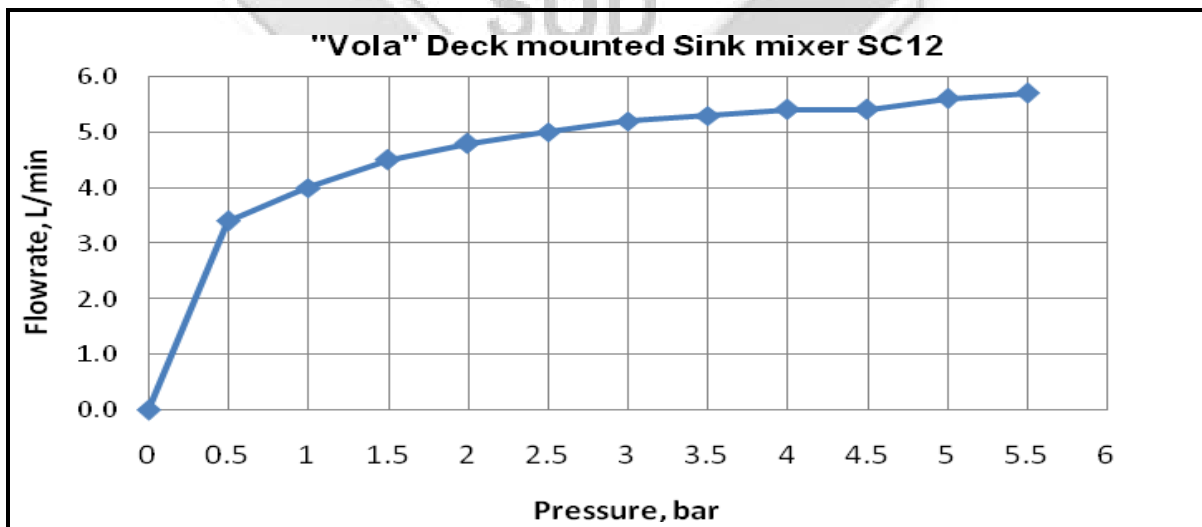
**TEST RESULTS: (Cont'd)**

**Hydraulic Characteristics**

5) Description: Deck Mounted Sink Mixer  
Model: SC 12

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0		
0.5	3.4		
1.0	4.0		
1.5	4.5		
2.0	4.8		
2.5	5.0		
3.0	5.2		
3.5	5.3		
4.0	5.4		
4.5	5.4		
5.0	5.6		
5.5	5.7		

**Products/Fittings**  
Sink Taps & Mixers/Bib Taps  
6 to 8 litres/min ( 1 tick )  
4 to 6 Litres/min ( 2 ticks )  
4 litres/min or less ( 3 ticks )




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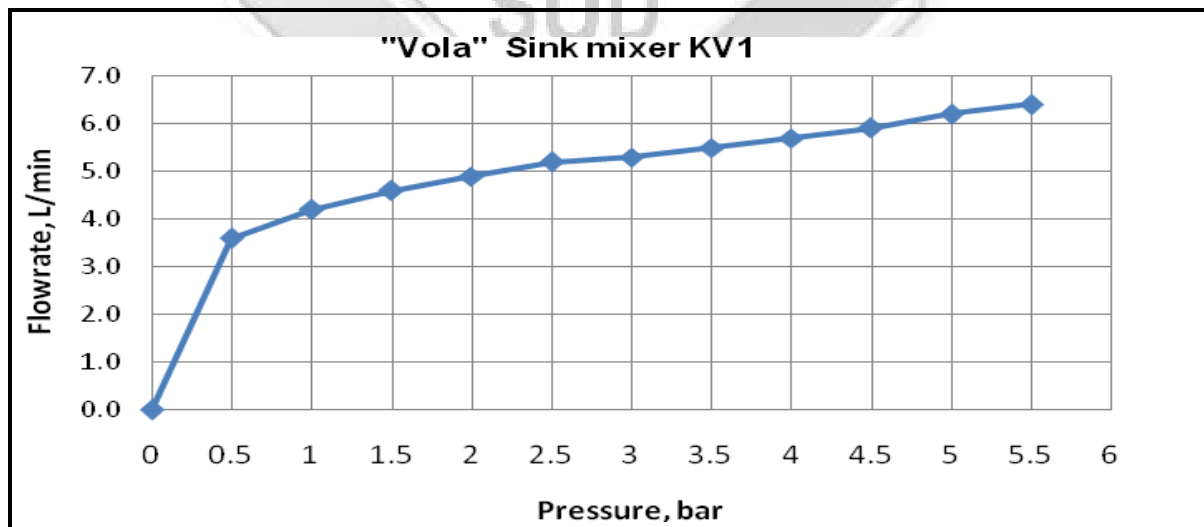
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**TEST RESULTS: (Cont'd)**

**Hydraulic Characteristics**

6) Description: Sink Mixer  
Model: KV1

Flow Pressure ( bar )	Flow Rate ( litres/min )	Flow Rate Requirements for Water Efficiency Labelling	Photo
0	0	<p><b>Products/Fittings</b> Sink Taps &amp; Mixers/Bib Taps</p> <p>6 to 8 litres/min ( 1 tick ) 4 to 6 Litres/min ( 2 ticks ) 4 litres/min or less ( 3 ticks )</p>	
0.5	3.6		
1.0	4.2		
1.5	4.6		
2.0	4.9		
2.5	5.2		
3.0	5.3		
3.5	5.5		
4.0	5.7		
4.5	5.9		
5.0	6.2		
5.5	6.4		



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**TEST RESULTS:**

**(A1) Leaktightness Characteristics**

Sample Reference Characteristics	Deck Mounted Sink Mixer SC5, SC7, SC9, SC10, SC12	BS EN 817 : 2008 Requirements
Leaktightness of the obturator and of the mixing valve upstream of the obturator with the obturator in the closed position	Passed	Clause 8.3.2 a) Verification of leaktightness upstream of the obturator; Throughout the duration of the test there shall be no leakage or seepage through the walls  b) Verification of leaktightness of the obturator; Throughout the duration of the test there shall be no leakage of the obturator
Leaktightness of the mixing valve downstream of the obturator with the obturator open	Passed	Clause 8.4.3 Throughout the duration of the test there shall be no leakage or seepage through the walls
Leaktightness of the obturator: cross flow between hot water and cold water	Passed	Clause 8.7.2 Throughout the duration of the test, there shall be no leakage or seepage at the outlet or at the end of the unconnected inlet.

**(B1) Hydraulic Characteristics**

Sample Reference Characteristics	Deck Mounted Sink Mixer	BS EN 817 : 2008 Requirements
Determination of Flow rate; Test at 3.0 bar dynamic reference pressure	SC5	4.8**
	SC7	5.2**
	SC9	1.5**
	SC10	1.7**
	SC12	2.0**
Determination of sensitivity; Supply pressure of 3.0 bar	Passed	Clause 10.7.5 The sensitivity measured shall, depending on the type of appliance for which the mixing valve is intended, be as specified in Table 11 (Refer Appendix)

\*\*\*Non-compliance with BS EN 817 : 2008 requirements (Please refer to page 14 of 17)

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**TEST RESULTS: Cont'd**

**(C1) Torsion Test**

Sample Reference Characteristics	Deck Mounted Sink Mixer SC5, SC7, SC9, SC10, SC12	BS EN 817 : 2008 Requirements
Submitting the operating mechanism to a given torque to verify its strength with no water supplied	Passed	Clause 11.2.5 There shall be no deformation or other deterioration which impairs the function of the mixing valve; the mixing valve shall satisfy the requirement for leaktightness.

**(D1) Mechanical Performance under Pressure Characteristics**

Sample Reference Characteristics	Deck Mounted Sink Mixer SC5, SC7, SC9, SC10, SC12	BS EN 817 : 2008 Requirements
Mechanical behaviour upstream of the obturator - Obturator in the close position	Passed	Clause 9.4.2 Throughout the duration of the test, there shall be no permanent deformation of any part of the mixing valve
Mechanical behaviour downstream of the obturator - Obturator in the open position	Passed	Clause 9.5.2 There shall be no permanent deformation in any part of the mechanical mixing valve.

**(E1) Mechanical Endurance Test of Swivel spout**

Sample Reference Characteristics	Deck Mounted Sink Mixer SC5	BS EN 817 : 2008 Requirements
Number of cycles : 80,000	Passed	Clause 12.3.4 During the test, there shall be no deformation, fracture of the swivel nozzle or the device connecting it to the body or any leakage of the assembly

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**TEST RESULTS: Cont'd**

**(A2) Leaktightness Characteristics**

Sample Reference Characteristics	Sink Mixer KV1	BS EN 817 : 2008 Requirements
Leaktightness of the obturator and of the mixing valve upstream of the obturator with the obturator in the closed position	Passed	Clause 8.3.2 a) Verification of leaktightness upstream of the obturator; Throughout the duration of the test there shall be no leakage or seepage through the walls
	Passed	b) Verification of leaktightness of the obturator; Throughout the duration of the test there shall be no leakage of the obturator
Leaktightness of the mixing valve downstream of the obturator with the obturator open	Passed	Clause 8.4.3 Throughout the duration of the test there shall be no leakage or seepage through the walls
Leaktightness of the obturator: cross flow between hot water and cold water	Passed	Clause 8.7.2 Throughout the duration of the test, there shall be no leakage or seepage at the outlet or at the end of the unconnected inlet.

**(B2) Hydraulic Characteristics**

Sample Reference Characteristics	Sink Mixer		BS EN 817 : 2008 Requirements
Determination of Flow rate; Test at 3.0 bar dynamic reference pressure	KV1	5.3**	Clause 10.6.3 The flow rate measured at 3.0 bar shall, depending on the type of appliance for which the mixing valve is intended, be as specified in Table 10 (Refer Appendix)
Determination of sensitivity; Supply pressure of 3.0 bar	Passed		Clause 10.7.5 The sensitivity measured shall, depending on the type of appliance for which the mixing valve is intended, be as specified in Table 11 (Refer Appendix)

\*\*\*\*Non-compliance with BS EN 817 : 2008 requirements (Please refer to page 14 of 17)

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**TEST RESULTS: Cont'd**

**(C2) Torsion Test**

Sample Reference Characteristics	Sink Mixer KV1	BS EN 817 : 2008 Requirements
Submitting the operating mechanism to a given torque to verify its strength with no water supplied	Passed	Clause 11.2.5 There shall be no deformation or other deterioration which impairs the function of the mixing valve; the mixing valve shall satisfy the requirement for leaktightness.

**(D2) Mechanical Performance under Pressure Characteristics**

Sample Reference Characteristics	Sink Mixer KV1	BS EN 817 : 2008 Requirements
Mechanical behaviour upstream of the obturator - Obturator in the close position	Passed	Clause 9.4.2 Throughout the duration of the test, there shall be no permanent deformation of any part of the mixing valve
Mechanical behaviour downstream of the obturator - Obturator in the open position	Passed	Clause 9.5.2 There shall be no permanent deformation in any part of the mechanical mixing valve.

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**TEST RESULTS: Cont'd**

**(A3) Leaktightness Characteristics**

Sample Reference Characteristics	High Flow Mixer SC 1	BS EN 817 : 2008 Requirements
Leaktightness of the obturator and of the mixing valve upstream of the obturator with the obturator in the closed position	Passed	Clause 8.3.2 a) Verification of leaktightness upstream of the obturator; Throughout the duration of the test there shall be no leakage or seepage through the walls  b) Verification of leaktightness of the obturator; Throughout the duration of the test there shall be no leakage of the obturator
Leaktightness of the mixing valve downstream of the obturator with the obturator open	Passed	Clause 8.4.3 Throughout the duration of the test there shall be no leakage or seepage through the walls
Leaktightness of the obturator: cross flow between hot water and cold water	Passed	Clause 8.7.2 Throughout the duration of the test, there shall be no leakage or seepage at the outlet or at the end of the unconnected inlet.

**(B3) Hydraulic Characteristics**

Sample Reference Characteristics	High Flow Mixer		BS EN 817 : 2008 Requirements
Determination of Flow rate; Test at 3.0 bar dynamic reference pressure	SC 1	9.0**	Clause 10.6.3 The flow rate measured at 3.0 bar shall, depending on the type of appliance for which the mixing valve is intended, be as specified in Table 10 (Refer Appendix)
Determination of sensitivity; Supply pressure of 3.0 bar	Passed		Clause 10.7.5 The sensitivity measured shall, depending on the type of appliance for which the mixing valve is intended, be as specified in Table 11 (Refer Appendix)

\*\*\*Non-compliance with BS EN 817 : 2008 requirements (Please refer to page 14 of 17)

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**TEST RESULTS: Cont'd**

**(C3 Torsion Test**

Sample Reference Characteristics	High Flow Mixer SC 1	BS EN 817 : 2008 Requirements
Submitting the operating mechanism to a given torque to verify its strength with no water supplied	Passed	Clause 11.2.5 There shall be no deformation or other deterioration which impairs the function of the mixing valve; the mixing valve shall satisfy the requirement for leaktightness.

**(D3) Mechanical Performance under Pressure Characteristics**

Sample Reference Characteristics	High Flow Mixer SC 1	BS EN 817 : 2008 Requirements
Mechanical behaviour upstream of the obturator - Obturator in the close position	Passed	Clause 9.4.2 Throughout the duration of the test, there shall be no permanent deformation of any part of the mixing valve
Mechanical behaviour downstream of the obturator - Obturator in the open position	Passed	Clause 9.5.2 There shall be no permanent deformation in any part of the mechanical mixing valve.

**(E2) Mechanical Endurance Test of Obturator (Headwork)**

Sample Reference Characteristics	High Flow Mixer SC 1	BS EN 817 : 1998 Requirements
Number of cycles : 70,000	Complied	Clause 12.1.2 During the test, no component fracture, sticking or leakage shall occur.

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**REMARKS:**

S/N	Type of tap fittings	Model	BS EN 817 : 2008 Requirements	Characteristics
1.	Deck Mounted Sink Mixer	SC 5	Complied	A) Leaktightness Characteristics C) Torsion test D) Mechanical performance under pressure Characteristics E) Mechanical Endurance Characteristics
2.	Deck Mounted Sink Mixer	SC 7	Complied	
3.	Deck Mounted Sink Mixer	SC 9	Complied	
4.	Deck Mounted Sink Mixer	SC 10	Complied	
5.	Deck Mounted Sink Mixer	SC 12	Complied	
6.	Sink Mixer	KV 1	Complied	
7.	High Flow Mixer	SC 1	Complied	

- a. The test samples complied with BS EN 817 : 2008 requirements except hydraulic characteristics.
- b. The hydraulic characteristics complied with SS CP 48: 1989 requirements.
- c. Effect on Water Reference : S08MEC07709-1A&1B-LYP dated 08/04/2009 and S08MEC07709-2A&2B-LYP dated 08/04/2009
- d. Headwork Endurance Reference : S08MEC07709/CLC dated 15/04/2009

  
 Chua Lee Choong  
 Associate Engineer

  
 Chua Peck Cheong  
 Product Manager  
 Automotive & Industrial Group  
 Mechanical Centre



**APPENDIX**

Table 10- Flow rates according to application

Application of mixing valve	Requirement
With water saving:	
Basin, bidet, sink	(4.0 to 9.0) l/min [(0.066 to 0.15) l/s]
Without water saving:	
Basin, Bidet, sink, shower	Min 12.0 l/m (0.2 l/s) <sup>a</sup>
Bath	Min 19.0 l/min (0.316 l/s) (Full cold or full hot position)
	Min 20.0 l/min (0.33 l/s) in the range of (34°C to 44°C)
<sup>a</sup> For mixing valve with pull out spray or spray attachments or flexible supply hoses a minimum flow rate of 9.0 l/min (0.15 l/s) shall apply	

\*Table as per BS EN 817 : 2008

Table 11- Performance levels

Actuation of the mixing valve <sup>b</sup>	Basin, sink, bidet <sup>a</sup>	Shower, bath/shower at shower outlet only
Control devices with $r > 45\text{mm}$	Min 10mm	Min 12 mm
Control devices with $r \leq 45\text{mm}$	Min 10° angular or min 10 mm	Min 12° angular or min 12 mm
<sup>a</sup> Basin, bidet or sink mixing valve are not tested if they are equipped with the same valve and control device as the shower and bath/shower mixing valve.		
<sup>b</sup> Including sequential mixing valve, joystick or any new technology		

\*Table as per BS EN 817 : 2008

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**APPENDIX: Cont'd**



Photo 1. Deck Mounted Sink Mixer  
Model: SC 5



Photo 2. Deck Mounted Sink Mixer  
Model: SC 7



Photo 3. Deck Mounted Sink Mixer  
Model: SC 9



Photo 4. Deck Mounted Sink Mixer  
Model: SC 10



Photo 5. Deck Mounted Sink Mixer  
Model: SC 12



Photo 6. Sink Mixer  
Model: KV1



Photo 7. High Flow Mixer  
Model: SC 1

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March 2010