
 <div>ERC PUNE</div> <div>TATA MOTORS LIMITED</div>	DESIGN VALIDATION PLAN		Transmission Testing
	TRANSMISSION TESTING GROUP		W.B.S No.: P.17.EL.150
Description of Component	AMT shifter	Reference no: ERC/TRN/DVP/	
Part No.	To be decided	Drawing No. : To be decided	
Vehicle Type	Tiago/Tigor(BS 4 & 6), Tigor EV, Nexon, X445 (BS 6)	Make: M/s Lumax	
Test Requested by	Transmission Design	No. of samples: Refer individual tests	
Reason for Testing	Alternate Supplier		
Regulatory Requirements	No		


Sr. No	Test Description	Test Specification	Acceptance Criteria	Test Responsibility	No. of samples	Proto Phase (Mule/ Alpha/ Beta/PP)	Approval Ownership
<b>A</b>	<b>System level test</b>						
1	Operating force measurement	Measure operating force at the end of lever	As per drawing specifications	M/s Lumax	6	PP	TRN Testing
2	Operating noise measurement	Operate lever in all shift modes at 100 mm distance, measure noise.	Noise should be free of squeaks and upto 60 db maximum.	M/s Lumax	6	PP	TRN Testing
3	Travel at gearshift knob	Operate lever in all shift modes and measure knob travel with respect to neutral.	As per drawing specifications	M/s Lumax	6	PP	TRN Testing
4	Shift Lever Free Play Measurement	Measure Free play of gearshift knob at $\pm 3N$ load in R, N, A & M positions. Load should be applied at gearshift knob center.	<u>Lateral play:</u> New 2 mm, worn 2.5 mm <u>Longitudinal play:</u> New 2.2 mm, Worn 2.7 mm <u>Rotational play:</u> New 2°, Worn 2.5°	M/s Lumax	6	PP	TRN Testing
5	Flexibility measurement	Measure flexibility at gearshift knob at 30 to 100N load in lateral and longitudinal direction.	<u>Lateral flexibility:</u> New $\leq 0.12$ N/mm Worn $\leq 0.15$ mm/N <u>Longitudinal flexibility:</u> New $\leq 0.12$ N/mm Worn $\leq 0.15$ mm/N	M/s Lumax	6	PP	TRN Testing
6	Repeated Assembly & Dismantling	Assemble and remove unit from its mounting fixture 10 times.	There should be no malfunction for 10 cycles.	TRN Testing	3	PP	TRN Testing

Signing Agencies						
Sign.						
Date						
	TRN Testing Engineer	TRN Testing Lead	TRN Design Engineer	TRN Design Lead	AQ	Supplier

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7	Misuse test	Following misuse load to be applied on the shifter: Lateral loading max – 200N Longitudinal loading max- 300N Along shift lever axis max- 700N Torsional load on shift lever axis- 20Nm at 180°/min	There should be no breakage. Shifter should be functional after test.	TRN Testing	3	PP	TRN Testing
8	Durability test	Move shift lever in following sequence (equivalent to 1 cycle): N-R-N-A-M-10*[M(+)-M(-)]-M-A-N-R-N Refer Figure 1 for the thermal cycle to be followed during test. Relative humidity during test should be 70% Loosening torque of mounting bolts before and after test should be measured	Shifter assembly should be functional and should meet the performance parameters (free-play, flexibility and lever travel) after 60,000 cycles.	M/s Lumax	3	PP	TRN Testing

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9	Vibration test	As per JIS D 1601	(1) Free from unwanted deformation & Breakage (2) Assembly should be functional for atleast 5 shifts of all mode.	M/s Lumax	3	PP	TRN Testing
10	Salt spray test	Salt Spray test as per test standard ASTM B-117 in assembly condition. Test to be performed in assembly condition & electric connections to be plugged in during test.	240 hrs	M/s Lumax	3	PP	TRN Testing
11	Screw test	Measure adapter mounting screw (on tunnel) tightening torque and loosening torque at room temperature, (-) 30°C & 70°C.	Data Generation	M/s Lumax	3	PP	TRN Testing
12	CASS test (for Bezel)	As per SS 8461	As per SS 8461	M/s Lumax / TML	1	PP	TRN Testing

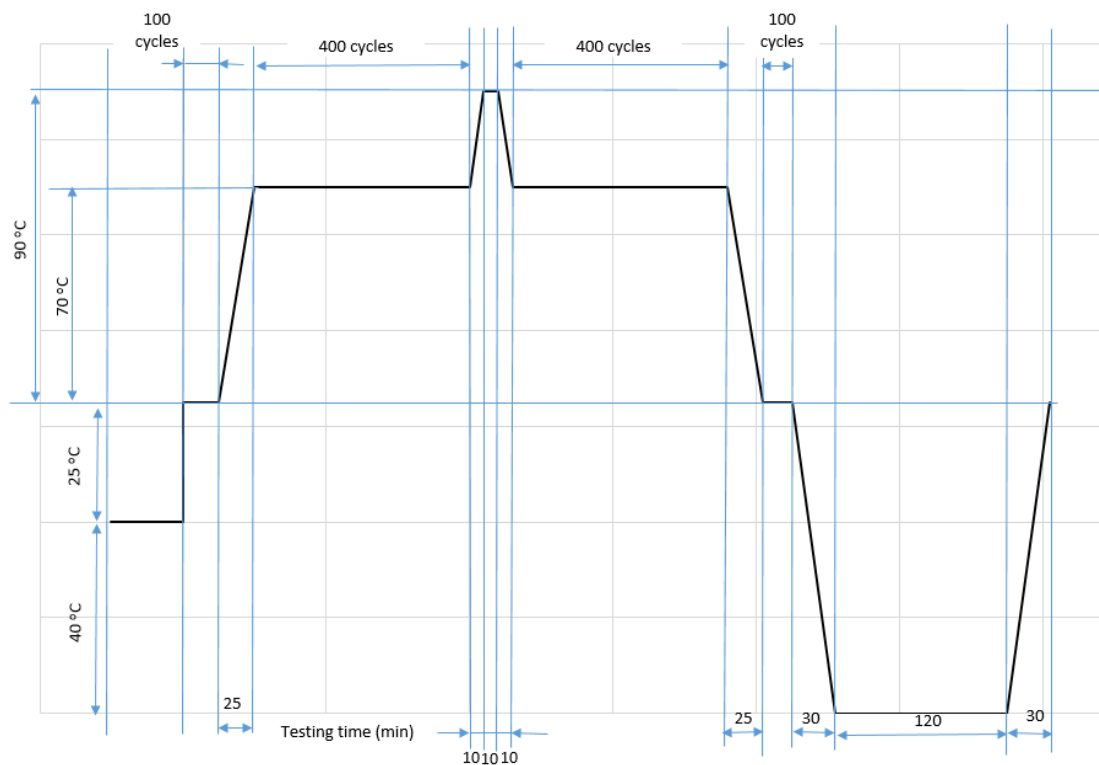
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<b>B Shifter housing assembly level test</b>							
1.	Strength test	Free falling from height 1.0 m on 100 mm (min) thick concrete floor. With hitting direction (Front, Rear, Bottom, Left, Right).	(1) Free from unwanted deformation & breakage (2) Assembly should be functional for at least 5 shifts of all mode.	M/s Lumax	3	PP	TRN Testing
<b>C Environmental test</b>							
1	Elimination of - Hazardous heavy metals – Lead, mercury, Hexavalent Chromium, Cadmium	Prohibition on use of hazardous heavy metals, except in the exempted applications	Supplier to submit declaration / test report as per TS11420	M/s Lumax	-	PP	TRN Testing
2	Elimination of Persistent Organic Pollutants	Prohibition on use of POPs based on Indian Regulation on POPs G.S.R.207 E/ Stockholm convention	Supplier to submit declaration / test report as per TS11420	M/s Lumax	-	PP	TRN Testing
3	Material part marking for plastic parts	All plastic parts weighing more than 100 gm, must have material marking	Supplier to submit declaration / test report as per TS11418	M/s Lumax	-	PP	TRN Testing

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**Figure 1: Temperature profile for durability test**

**Notes:**

- 1) This document is valid only after signature and approval from component owner testing group of Transmission Testing.
- 2) Supplier to give Inspection and Material reports for test samples being submitted.

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<b>Date</b>						
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