This document lists the requirements to be met by Gear shifter unit (man machine interface) supplier for Tata Nano, Zest, Nexon, Tiago/Tigor & Hornbill variants with an Automated Manual Transmission (AMT). A common shifter for all these variants would be preferred. (A) (B) (C) (D)

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# **1) Introduction:** (A) (B) (C) (D)

TML plans to have an option of Automated Manual Transmission (AMT) on Nano variants (with TA59 transaxle variants suitable for 2 Cylinder Gasoline Engine and 3 Cylinder Gasoline Engine), Zest variants (with C510 transaxle variants suitable for 4 Cylinder Diesel Engine), Nexon variants (with TA6300 transaxle variants suitable for 3 Cylinder Gasoline Engine and 4 Cylinder Diesel Engine),Tiago/Tigor variants (with TA65\* transaxle variants suitable for 3 Cylinder Gasoline Engine and 3 Cylinder Diesel Engine) and Hornbill variants (with TA65\* transaxle suitable for 3 Cylinder Gasoline Engine)

The base transmission for these variants will be same as that of corresponding manual transmission variant. The base transmissions will be converted to an AMT by addition of suitable actuation system – procured from a competent third party supplier. The actuation system will be controlled by suitable Transmission Electronic control unit (TCU).

These vehicle variants with AMT require a gear shifter unit (Man Machine interface) which will act as a communication link between the driver and the TCU. This document covers TML requirements vis-à-vis hardware requirements, technical information and support required from the subject Gear shifter unit supplier.

# **Objective:**

To supply a gear shifter unit suitable for the vehicle variants mentioned in the previous paragraph. The gear shifter unit should be aesthetic, provide delightful shift feel, deliver error free and noise / vibration free operation throughout the life of the vehicle.

All questions related to the preparation and requirements of this quotation must be referred to:

**Transaxle – (related to mechanical aspects of gear shifter)**

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**Electrical and Electronics- (related to electrical and electronic aspects of gear shifter)** (A) (B) (C)

Mrs. Anupama Gore ([Anupama.Gore@tatamotors.com](mailto:Anupama.Gore@tatamotors.com) )

**Vehicle testing- (related to Annexure 3)** (A) (B) (C) (D)

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**Indoor testing / Rig testing- (related to Annexure 4)**

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**FMQ:** (A) (C)

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**Commercial:** (A)

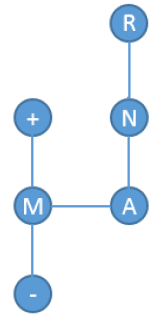
Mr. Rajendra Kulkarni ([rsk40582@tatamotors.com](mailto:rsk40582@tatamotors.com))

# **2) Scope of work and RASIC:**

**Scope of Work-**

Supplier is expected to support by providing information and executing suitable actions as per requirements specified below.

1. If the same / similar system is supplied to some other OEM’s the same should be informed to TML along with volumes, market details and failure details.
2. The scope of supply shall include (A) (B) (C) (D)
3. Base shifter suitable for mounting on floor – if required suitable adaptor to be worked out by supplier in consultation with TML. The base shifter must have manual over ride mode for gear selection. Preferred gear shift pattern is shown below. R, N, A, M should be stable positions, other positions should be unstable.



1. Bezel – appearance item which will interface with the floor console – it must give an indication of the mode in which the gear box is (Neutral, Drive / Automatic, Reverse or Manual mode) by means of suitable illumination. It should have provision for fitment of floating frame (a component which is used to close the gap between bezel and floor console). Floating frame should also be part of the gear shifter unit. TML shall define the shape and other aesthetic requirements for this part.
2. The electrical connectors must be part of the gear shifter unit.
3. Adapter required for fixing shifter on tunnel should be part of gear shifter unit.
4. Refer following table for application matrix:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr.** | **Parameter** | **Nano** | **Zest** | **Tiago / Tigor** | **Tiago / Tigor (BS6)** | **Nexon** | **Hornbill** |
| 1 | Drive Modes | City / Sport | | | City | City / Eco / Sport | City/Sport |
| 2 | Mode button | With Shifter | | | No mode button required | Not in shifter supplier scope | Not in shifter supplier scope |
| 3 | Bezel | With Shifter | | | | On console (not in shifter supplier scope) | On console (not in shifter supplier scope) |
| 4 | Adaptor  (For shifter fixing) | Type 1 | Type 2 | Type 3 | Type 3 | Type 2 | Type 3 |
| 5 | Illumination color | Amber | White | White | White | On console (not in shifter supplier scope) | On console (not in shifter supplier scope) |
| 6 | Selected position illuminated | Required on bezel | Required on bezel | Required on bezel | Required on bezel | On console (not in shifter supplier scope) | On console (not in shifter supplier scope) |

1. Supplier should provide 2D drawings and 3D Cad data to TML in mutually agreed format.
2. Supplier must submit detailed technical specifications of the unit being proposed.
3. Supplier must justify the weight of the gear shifter unit by means of appropriate bench mark data.
4. Appropriate safety features must be incorporated in the design of the hardware and software of the Gear shifter unit to prevent hazard to vehicle occupants and other vehicle systems. These details along with associated risk estimates must be provided to TML.
5. Supplier will be responsible for meeting the homologation requirements related to the gear shifter unit in the markets where the vehicles will be sold.
6. Supplier will be responsible for tuning the gear shifter unit parameters like gear shift feel, forces (expected force 20 N), noise / vibration parameters, illumination, aesthetic feel, ergonomic feel etc. as per TML requirements. These can be based on subjective jury feedback and need not necessarily be objective targets. Supplier representative will be required at TML during scheduled dates for this activity.
7. Supplier must share the maintenance and service requirements of the proposed gear shifter unit with TML.
8. Supplier must define the list of serviceable components in the gear shifter unit and share the same with TML.
9. Supplier must provide technical support for Gear shifter unit integration with TCU and other vehicle systems (such as driver display unit) as required during the validation phase and initial period following the product launch (period to be decided jointly between TML and supplier). Supplier will be required to train TML personnel in failure diagnostics and repair pre/post warranty.
10. Supplier must share their FMEA and Risk assessment documents with TML.
11. The Gear shifter unit must meet TML test requirements. Some of the tests will be carried out at TML and some will have to be carried out by supplier. (Refer Annexure3 and Annexure 4)
12. The Gear shifter unit must conform to design for recycling guidelines as given in TS-11414. (Refer attachments)

Note: - TML will be retaining the IPR generated during the course of designing the Gear shifter unit.

**RASIC CHART**

Abbreviations:

R: Responsible for the task

A: Approval of completion of task with veto right

S: Support with resources for completion of task

I: Task related information to be shared with

C: Consult for the task

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No | TASK DESCRIPTION | TML | | Supplier |
| 1 | Transmission and vehicle specifications data supply | R | | I |
| 2 | Concept design | I | | R |
| 3 | General arrangement of Gear shifter Unit | S | | R |
| 4 | Specification of System Requirements | S | A | R |
| 5 | Layout packaging on vehicle & interface parts | S | | R |
| 6 | 3D Cad data of package space/ environment | R | | I |
| 7 | DFMEA | S | | R |
| 8 | Benchmark data and Target setting | S | | R |
| 9 | Design & Spec of suitable shift lever unit | I | | R |
| 10 | Sensors and Shift Lever Specification | I | | R |
| 11 | Weight target and estimate | I | | R |
| 12 | Preliminary BOM | I | | R |
| 13 | Prediction of durability of shifter components | I | | R |
| 14 | Approval of the design / installation shifter components | R | | S |
| 15 | 3D CAD Models and 2D drawings after design completion | I | | R |
| 16 | DVP | R | | S |
| 17 | ECU- TCU – shifter communication (With All vehicle controllers) | R | | S |
| 18 | Interface Requirements Specification with other ECUs | R | | S |
| 19 | Design checks for extreme high/ low temperatures | I | | R |
| 20 | Design protection for dust/ water ingress and necessary sealing with centre console | I | | R |
| 21 | CAE Analysis and reports | I | | R |
| 22 | NVH Analysis and reports | R | | S |
| 23 | Find out regulation norms in domestic and export. Confirm the system specifications to the same \* | I | | R |
| 24 | Find out safety norms and confirm the system specifications to the same | I | | R |
| 25 | DFM, DFA, DFS Documents | A | | R |
| 26 | Diagnostic Manual of Gear Shifter system | I | | R |
| 27 | Design review schedule \* Electrical and Mech | I | | R |
| 28 | Arrange design review meetings | A | | R |
| 29 | DMU Clearance Mechanical | R | | S |
| 30 | Release BOM | I | | R |
| 31 | Design release in PLM Mechanical system | R | | I |
| 32 | Supply of Alpha prototypes for vehicle build | S | | R |
| 33 | Support shifter installation on the prototype vehicles in TML | R | | S |
| 34 | Bench validation Alpha prototypes batch | S | A | R |
| 35 | Vehicle level validation Alpha prototypes batch | R | | S |
| 36 | Supply of beta batch prototypes | S | | R |
| 37 | Bench validation beta batch | S | A | R |
| 38 | Attend and analyze failures in testing | S | | R |
| 39 | Resolution on the failure and implementation of the same. | R | | R |
| 40 | Update DFMEA document accordingly | I | | R |
| 41 | Carry out PFMEA based on DFMEAs | I | | R |
| 42 | Test and validation reports | A | | R |
| 43 | Support field trials | R | | S |
| 44 | Attend and analyze failures in field | S | | R |
| 45 | End of the line testing for series production | S | | R |
| 46 | Training to assembly line engineers | S | | R |
| 47 | Support series production related activities | S | | S |
| 48 | Service / Dealer training ( Supplier to indicate ) | S | | R |
| 49 | Make a detailed workshop manual | S | | R |
| 50 | Specify service schedule | S | | R |
| 51 | Arrange training for using diagnostic tools | S | | R |
| 52 | Supply of diagnostic tools during development | I | | R |
| 53 | Support for TML diagnostic tools for series production | R | | S |
| 54 | Shifter component certification (if applicable) at ARAI / VRDE | TBD | | TBD |
| 55 | Vehicle level certification ARAI / VRDE | R | | S |

**3) Quotation Deliverables:**

Quotation to be given with following details

1. Detailed activity and time plan.
2. Deliverables and responsibilities
3. Project management
4. Assumptions
5. Commercial terms and conditions
6. Validity

# **4) Modification history:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Issue No.** | **Date** | **Revision Details** | **Reason for revision** | **Prepared by** | **Approved by** |
| 1 | 01.08.2012 | NR | New release | A.R. Biradar | M K Ponkshe |
| 2 | 13.01.2015 | A | Vehicle applications changed to Nano, Zest, Bolt, Osprey, Kite from Vista, Manza, Indica facelift.  Changes related to responsibility are done.  Gear shift knob deleted from scope of supply. | D.M. Aswale | M K Ponkshe |
| 3 | 03.05.2016 | B | Vehicle applications changed to Nano / Pelican, Osprey, Tiago from Nano, Zest, Bolt, Osprey, Kite.  Changes related to responsibility are done.  Scope of supply and shift pattern changed. | D.M. Aswale | M K Ponkshe |
| 4 | 23.07.2018 | C | Vehicle applications changed to Nano, Zest, Nexon, Tiago / Tigor from Nano / Pelican, Osprey, Tiago.  Changes related to responsibility are done.  Scope of supply and shift pattern changed.  Tiago/Tigor (BS6) application added in matrix. | D.M. Aswale | M K Ponkshe |
| 5 | 26.11.2018 | D | Vehicle application Hornbill added. | Sumit Sus | M K Ponkshe |