**COP procedure for Fuel Consumption / Electric Energy Consumption in Japan**

１．Applicable to Fuel Consumption/Electric Energy Consumption Test under WLTP

２．Criteria : shall meet the all following criteria

①Yearly average criteria : official value－３σ／√N

・N : number of tests per year

・σ: standard deviation derived from all tests per interpolation family per year

②Production lot criteria : official value－３σ／√ｎ

・n : number of tests per lot (ｎ≧３）

・σ : standard deviation derived from applicable interpolation family

　　　In case that total number of “n” is equal or less than 10, appropriate “σ”shall be used

based on good engineering judgment.

③Not exceed criteria : official value－３σ

・σ: standard deviation derived from applicable interpolation family

　　　In case that total number of “n” is equal or less than 10, appropriate “σ” shall be used

based on good engineering judgment.

３．Run-in Factor

The following factor (either a or b) shall be applied to correct the vehicle “run-in” impact.

a : assigned “run-in” factor, 1.020

b : derived “run-in” factor according to appendix

prior to usage of derived “run-in” factor, need to consult with MLIT regarding

1. evidence of derived “run-in” factor including the possession of statistical significance on fitting slope (refer Fig1)
2. validation method after start of production

４．Data Processing

FC or EC (m)＝FC or EC (j)×RI(j)

FC or EC (m)：Final value

FC or EC (j)：Test results according to

GTR#15 Annex7 TableA7/1 \_Step\_4a or Annex8 TableA8/5 \_Step\_4a

RI(j)：derived ”run-in” factor at start point of cold Type I test or 1.020

５．Road Load Setting on a Chassis Dynamometer

It is manufacture’s choice to select the following methods. When derived “run-in” factor is applied, however, the method during COP shall be same as that during derived “run-in” factor development.

1. DPA method : apply dynamometer setting value derived during homologation test
2. Individual setting method : derive dynamometer setting value for each individual vehicle

６．Test Site Correction

It is allowed to apply test site correction between homologation and COP only when clear technical difference is observed.

７．Others

It is allowed to conduct COP only for WLTP official value in case that two official values for WLTP and JC08 are available.

Appendix

Procedure to derive “run-in” factor

1. Test vehicle

* Same vehicle shall be used before and after “run-in” test. No part and no ECU calibration which have an impact on FC/EC shall be replaced and/or modified.
* Any parts which have an impact on Fuel Consumption shall not have any operation prior to “run-in” procedure
* It is allowed to use the vehicles in which all of the following parts are newly installed simultaneously.

1. internal combustion engine
2. driven parts (e.g. transmission, tyre)
3. brake parts (e.g. tyre)

* Preferably Vehicle\_H condition shall be tested within interpolation family.
* At the request of the vehicle manufacturer and with confirmation by MLIT , it is allowed for manufacture to run the test with multiple vehicles.

1. Derived “Run-in” Factor family

* At the request of the vehicle manufacturer including technical evidence and with confirmation by MLIT, the derived “run-in” factor can be extended to other interpolation family.

1. Road Load Setting on a Chassis Dynamometer

It is manufacture’s choice to select the following methods. However, the method used for derived “run-in” factor development shall be applied for COP testing.

1. DPA method : same dynamometer setting value (including dynamometer mechanical loss and absorption power) shall be applied before and after “run-in” test.

In case that testing is performed on different test site, the dynamometer setting value shall be adjusted so that total power (dynamometer mechanical loss and absorption power) is identical for all tests.

1. Individual setting method : derive dynamometer setting value for each individual test according to GTR#15 Annex4 paragraph7.
2. Driving pattern and conditions during “run-in” procedure

Driving pattern and conditions during “run-in” is up to manufacture’s good engineering judgment. System odometer after “run-in” shall not exceed the minimum odometer during homologation tests within applicable derived “run-in” family

system odometer : set system odometer zero (0) at the point when vehicle parts which have impact on fuel consumption is newly exchanged or installed.

1. Procedure

5-1. System odometer at initial test points

Initial tests prior to “run-in” shall be performed until three valid results were obtained. It is recommended that system odometer during 1st or 2nd test is within ±10km of vehicle odometer during COP testing.

5-2. Testing after “run-in”

Testing after “run-in” shall be performed until at least two valid results were obtained.

1. Test site

It is strongly recommended to use same test site for both testing before and after “run-in”. In case that testing is performed on different test site, the dynamometer setting value shall be adjusted so that total power (dynamometer mechanical loss and absorption power) is identical for all tests

7．Test procedure

7-1.　 DPA method : according to Table1

7-2.　 Individual setting method : according to Table2

8．Derived “run-in” factor

The following methodology can be applied only when MLIT confirmed based on the documents submitted by vehicle manufacture.

RI(j)＝1+(a×(ln(Dk) - ln(Dj)))／FC(j)

RI(j)：derived “run-in” factor at Dj, Rounding to 3 places of decimal

a：sloop derived from FC(i) and Di or Dk, refer Fig1.

FC (i) : Test results at Di or Dk according to

GTR#15 Annex7 TableA7/1 \_Step\_4a or Annex8 TableA8/5 \_Step\_4a

Di : system odometer at start point of cold Type I test before “run-in”

Dk : average system odometer at start point of cold Type I test after “run-in”

Dj : odometer at start point of cold Type I test during COP

In case that Dj is less than minimum Di, Dj shall be set to minimum Di.

FC(j) : Test results at Dj according to

GTR#15 Annex7 TableA7/1 \_Step\_4a or Annex8 TableA8/5 \_Step\_4a

In case that derived “run-in” factor is obtained by multiple vehicles test results, final “a” and “Dk” shall be averaged.

9. others

・apply REESS factor derived from either test vehicles after “run-in” or other vehicle within derived “run-in” family

・apply DTI defined in GTR#15 (i.e. RMSSE < 0.8, -2% < IWR < +4%)

Fig１　sample

Table１ : **DPA method**

|  |  |  |
| --- | --- | --- |
|  | items | contents, notes, others |
| 1 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 2 | Vehicle restrain | follow GTR#15 |
| 3 | Road Load Setting | follow appendix para. 3 (i) |
| 4 | Preconditioning driving | follow GTR#15 |
| 5 | Vehicle soak | follow GTR#15 |
| 6 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 7 | Road Load Setting | follow appendix para.3 (i) |
| 8 | Vehicle restrain | follow GTR#15 |
| 9 | Initial test prior to “run-in” | follow GTR#15  record Di (system odometer at start point of cold Type I) |
| 10 | Repeat 1 to 9 until three valid data is obtained | procedure 1, 2, 3 and 4 can be omitted when conducted immediately after completion of procedure 9 |
| 11 | “run-in” | follow appendix para.4 |
| 12 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 13 | Vehicle restrain | follow GTR#15 |
| 14 | Road Load Setting | follow appendix para.3 (i) |
| 15 | Preconditioning driving | follow GTR#15 |
| 16 | Vehicle soak | follow GTR#15 |
| 17 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 18 | Road Load Setting | follow appendix 3 (i) |
| 19 | Vehicle restrain | follow GTR#15 |
| 20 | Testing after “run-in” | follow GTR#15  record Dk (system odometer at start point of cold Type I) |
| 21 | Repeat 12 to 20 until at least two valid data is obtained | procedure 12, 13, 14 and 15 can be omitted when conducted immediately after completion of procedure 20 |

Table 2 : Individual setting method

|  |  |  |
| --- | --- | --- |
|  | items | contents, notes, others |
| 1 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 2 | Vehicle restrain | follow GTR#15 |
| 3 | Road Load Setting | follow appendix para. 3 (ii) |
| 4 | Preconditioning driving | follow GTR#15 or modified driving cycle confirmed by MLIT |
| 5 | Vehicle soak | follow GTR#15 |
| 6 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 7 | Road Load Setting | set the same absorption value derived from procedure 3  (in case of procedure 10, the setting value shall be different for each test) |
| 8 | Vehicle restrain | follow GTR#15 |
| 9 | Initial test prior to “run-in” | follow GTR#15  record Di (system odometer at start point of cold Type I) |
| 10 | Repeat 1 to 9 until three valid data is obtained | procedure 1, 2 and 4 can be omitted when conducted immediately after completion of procedure 8. Procedure 3 (road load setting) shall be performed for every single test since vehicle conditions are dramatically changed at this stage. |
| 11 | “run-in” | follow appendix para.4 |
| 12 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 13 | Vehicle restrain | follow GTR#15 |
| 14 | Road Load Setting | follow appendix para. 3 (ii) |
| 15 | Preconditioning driving | follow GTR#15 |
| 16 | Vehicle soak | follow GTR#15 |
| 17 | Warm up chassis dynamometer | follow GTR#15  do NOT use the test vehicles for chassis dynamometer warm up |
| 18 | Vehicle restrain | follow GTR#15 |
| 19 | Road Load Setting | set the same absorption value derived from procedure 14 |
| 20 | Testing after “run-in” | follow GTR#15  record Dk (system odometer at start point of cold Type I) |
| 21 | Repeat 12, 13, 19, 15, 16, 17, 18, 19 and 20 until at least two valid data is obtained | procedure 12, 13, 19 and 15 can be omitted when conducted immediately after completion of procedure 20 |