EVE-92-XYe

Proposal on Force Tolerance of Chassis Dynamometers in GTR21

prepared by Japan

@EVE92

9th Dec. 2025

Study of Chassis Dynamometer Force Requirements (Note of ±10 [N])

[Proposal] Add the underlined words: ±10 N **or ±0.1 % of full scale force, whichever is greater**

Table 2
Measurement items and required accuracy

Item	*Units*	*Accuracy*	*Remarks*
Chassis dynamometer speed	km/h	The dynamometer speeds shall be controlled with an accuracy of ±0.2 km/h or ±0.1% of full scale vehicle speed, whichever is greater.	
Chassis dynamometer force	N	The accuracy of the force transducer shall be at least ±10 N for all measured increments. This shall be verified upon initial installation, after major maintenance and within 370 days before testing.	
Axle/wheel rotational speed **of Hub dynamometer or System bench**	rev/s	± 0.05 s^{-1} or ± 1 % **of full scale rotational speed**, whichever is greater.	
Axle/wheel torque **of Hub dynamometer or System bench**	Nm	± 6 Nm or ± 0.5 % **of full scale torque**, whichever is greater.	

Even if the force increased from 10 N to 20 N, the torque value maintains a value equivalent to the 6 Nm axle/wheel torque.

< hypothesis >
General Passenger car：180 km/h, 25 rev/s (1,500 r/min)
High-Performance car：250 km/h, 35 rev/s (2,100 r/min)

< UNR177 & UN GTR#21 Requirement >		
Chassis dynamometer force	±	10.0 [N]
Axle/wheel torque	±	6.0 [Nm]
< Tire Effective Radius Settings (Temporary) >		
Minimum tire effective radius		0.25 [m]
Maximum tire effective radius		0.38 [m]
< Torque to Force conversion from UNR177 & UN GTR#21 requirement >		
Axle/wheel force (Minimum tire effective radius)	±	24.0 [N]
Axle/wheel force (Maximum tire effective radius)	±	15.8 [N]
Axle/wheel force (Average)	±	19.9 [N]

< Calculation of Power [kW] based on Vehicle Speed [km/h] and Force [N] >	
Chassis dynamometer speed	250 [km/h]
Chassis dynamometer force	10 [N]
Power [W]	694 [W]
Power [kW]	0.69 [kW]

< Calculation of Power [kW] based on Rotational Speed [rev/s] and Torque [Nm] >	
Axle/wheel rotational speed	35 [rev/s]
Axle/wheel torque	6 [Nm]
Power [W]	1319 [W]
Power [kW]	1.32 [kW]

< Calculation of Rotational Speed [rev/s] based on Vehicle Speed [km/h] >	
Vehicle Speed	250 [km/h]
Tire Effective Radius	0.315 [m]
Rotational Speed	2105.2 [r/min]
Rotational Speed	35.09 [rev/s]

【Summary】
① Using a four-wheel independent chassis dynamometer makes it technically feasible to achieve force accuracy of ±10 N even for high-performance vehicles. However, it doesn't justify to invest a ton of money to replace the existing equipment considering the purpose of this regulation.
② Even if the force accuracy of chassis dynamometer is set to ± 20 N, it corresponds to ±6 Nm of axle/wheel torque as defined for measurement accuracy. Considering consistency, Japan proposes to add the note: "±10 N **or ±0.1% of full-scale force, whichever is greater.**"
← support OICA suggestion in EVE-91-02e

Next Actions

In addition to modification of GTR#21,

Japan plans to submit Informal Document to amend the UNR177 during 94th GRPE session (March 2026)

Considering the efficient amendment process in UNECE,
Japan is happy to coordinate with TF-AVRS who also plans to submit the Working Documents to amend UNR177.

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