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|  | E/ECE/TRANS/505/Rev.3/Add.159/Rev.1/Amend.1 |
|  |  | 24 November 2022 |

**Agreement**

 Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations[[1]](#footnote-2)\*

 (Revision 3, including the amendments which entered into force on 14 September 2017)

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 **Addendum 159 – UN Regulation No. 160**

 **Revision 1 - Amendment 1**

Supplement 1 to the the original version of the Regulation – Date of entry into force: 8 October 2022

 Uniform provisions concerning the approval of motor vehicles with regard to the Event Data Recorder

This document is meant purely as documentation tool. The authentic and legal binding text is: ECE/TRANS/WP.29/2022/26.

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**UNITED NATIONS**

*Paragraph 1.3.,* amend to read:

"1.3. The following data elements are excluded from the scope: VIN, associated vehicle details, location/positioning data, information of the driver, date and time of an event."

*Paragraph 2. Insert new paragraphs 2.2 – 2.4, 2.6 – 2.11, 2.13, 2.17, 2.23, 2.28, 2.42, 2.61 to read:*

2.2. "*Accident Emergency Call System*" means a system that is activated either automatically via in-vehicle sensors or manually, which carries, by means of public mobile wireless communications networks, a set of crash-related data and establishes an emergency audio channel between the occupants of the vehicle and an answering point.

2.3. “*Adaptive cruise control*” is a system which accelerates or decelerates the vehicle to automatically maintain a driver pre-set speed and driver pre-set gap distance from the vehicle in front.

2.4. “*Advanced emergency braking system status*” means the operating status of a system which can automatically detect an imminent forward collision and activate the vehicle braking system to decelerate the vehicle with the purpose of avoiding or mitigating a collision.

2.6. *“Automatically commanded steering function category A*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to assist the driver in low speed or parking manoeuvring.

2.7. “*Automatically commanded steering function category B1*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to assist the driver in keeping the vehicle within the chosen lane by influencing the lateral movement of the vehicle.

2.8. “*Automatically commanded steering function category B2*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to keep the vehicle within its lane by influencing the lateral movement of the vehicle for extended periods without further driver command/confirmation.

2.9. “*Automatically commanded steering function category C*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to perform a single lateral manoeuvre (e.g. lane change) when commanded by the driver.

2.10. “*Automatically commanded steering function category D*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to indicate the possibility of a single lateral manoeuvre (e.g. lane change) but perform that function only following a confirmation by the driver.

2.11. “*Automatically commanded steering function category E*” means a function within an electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate control action in order to continuously determine the possibility of a manoeuvre (e.g. lane change) and complete these manoeuvres for extended periods without further driver command/confirmation.

2.13. “*Corrective steering function*” means a control function within an electronic control system whereby, for a limited duration, changes to the steering angle of one or more wheels may result from the automatic evaluation of signals initiated on-board the vehicle, in order to compensate a sudden, unexpected change in the side force of the vehicle, improve the vehicle stability (e.g. side wind, differing adhesion road conditions "µ-split"), or correct lane departure (e.g. to avoid crossing lane markings, leaving the road).

2.17. “*Emergency Steering Function*” means a control function which can automatically detect a potential collision and automatically activate the vehicle steering system for a limited duration, to steer the vehicle with the purpose of avoiding or mitigating a collision, with an obstacle obstructing the path of the subject vehicle or when the obstruction of the subject vehicle’s path is deemed imminent.

2.23. “*Far-side impact centre air bag deployment, time to deploy*" means the deployment time of an air bag between driver and front seat passenger, relative to Time 0.

2.28. “*Lane Departure Warning System*" means a system to warn the driver of an unintentional drift of the vehicle out of its travel lane.

2.42. “*Rollover*” means any vehicle rotation of 90 degrees or more about any true longitudinal or lateral axis.

2.61. "*Tyre Pressure Monitoring System*" means a system fitted on a vehicle, able to perform a function to evaluate the inflation pressure of the tyres or the variation of this inflation pressure over time and to transmit corresponding information to the user while the vehicle is running.

*Paragraph, 2.1, 2.26 – 2.27, 2.66, 2.69 – 2.70:* amend to read:

2.1. "*Anti-lock brake system activity*" means the anti-lock brake system is actively controlling the vehicle's brakes.

2.26. "*Ignition cycle, crash*" means the number (count) of power mode cycles as determined by the EDR ECU at the time when the crash event occurred since the first use of the EDR.

2.27. "*Ignition cycle download*" means the number (count) of power mode cycles as determined by the EDR ECU at the time when the data was downloaded since the first use of the EDR.

2.66. "*X-direction*" means in the direction of the vehicle’s X-axis, which is parallel to the vehicle's longitudinal centreline. The X-direction is positive in the direction of forward vehicle travel.

2.69. "*Vehicle roll rate*" means the change in angle over time of the vehicle about its X-axis as determined by the sensing system.

2.70. "*Vehicle yaw rate*" means the change in angle over time of the vehicle about its Z-axis as determined by the sensing system."

*Paragraphs 2.3. (former) to 2.68., renumber as 2.5. to 2.70., respectively.*

*Paragraph 5.3.2., amend to read :*

"5.3.2. Conditions for triggering locking of data

 In the circumstances provided below, the memory for the event shall be locked to prevent any future overwriting of the data by subsequent events."

*Annex 4. Table 1, Data elements and format*, amend to read*:*

# Table 1

| *Data element* | *Condition for requirement****[[2]](#footnote-3)*** | *Recording interval/time[[3]](#footnote-4) (relative to time zero)* | *Data sample rate (samples per second)* | *Minimum range[[4]](#footnote-5)* | *Accuracy[[5]](#footnote-6)* | *Resolution4* | *Event(s) recorded for[[6]](#footnote-7)* |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Delta-V, longitudinal | Mandatory **-** not required if longitudinal acceleration recorded at ≥500 Hz with sufficient range and resolution to calculate delta-v with required accuracy | 0 to 250 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | 100 | -100 km/h to + 100 km/h. | ±10% | 1 km/h. | Planar |
| Maximum delta-V, longitudinal | Mandatory **-** not required if longitudinal acceleration recorded at ≥500 Hz | 0–300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | N/A | -100 km/h to + 100 km/h. | ±10% | 1 km/h. | Planar |
| Time, maximum delta-V, longitudinal | Mandatory **-** not required if longitudinal acceleration recorded at ≥500 Hz | 0–300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | N/A | 0–300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter. | ±3 ms | 2.5 ms. | Planar |
| Speed, vehicle indicated | Mandatory | -5.0 to 0 sec | 2 | 0 km/h to 250 km/h | ±1 km/h | 1 km/h. | PlanarRolloverVRU |
| Engine throttle, % full (or accelerator pedal, % full) | Mandatory | -5.0 to 0 sec | 2 | 0 to 100% | ±5% | 1% | PlanarRolloverVRU |
| Service brake, on/off | Mandatory | -5.0 to 0 sec | 2 | On or Off | N/A | On or Off. | PlanarVRURollover |
| Ignition cycle, crash | Mandatory | -1.0 sec | N/A | 0 to 60,000 | ±1 cycle | 1 cycle. | PlanarVRURollover |
| Ignition cycle, download | Mandatory | At time of download[[7]](#footnote-8) | N/A | 0 to 60,000 | ±1 cycle | 1 cycle. | PlanarVRURollover |
| Safety belt status, driver  | Mandatory | -1.0 sec | N/A | Fastened, not fastened | N/A | Fastened, not fastened | PlanarRollover |
| Air bag warning lamp[[8]](#footnote-9), | Mandatory | -1.0 sec | N/A | On or Off | N/A | On or Off. | PlanarRollover |
| Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver.  | Mandatory | Event | N/A | 0 to 250 ms | ±2ms | 1 ms. | Planar |
| Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, front passenger[[9]](#footnote-10). | Mandatory | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | Planar |
| Multi-event crash, number of event | If Recorded[[10]](#footnote-11) | Event | N/A | 1 or more | N/A | 1 or more. | PlanarVRURollover |
| Time from event 1 to 2 | Mandatory | As needed | N/A | 0 to 5.0 sec | **±**0.1 sec | 0.1 sec. | PlanarRollover |
| Complete file recorded | Mandatory | Following other data | N/A | Yes or No | N/A | Yes or No. | PlanarVRURollover |
| Lateral acceleration(post-crash) | If Recorded | 0–250 ms or 0 to End of Event Time plus 30 ms, whichever is shorter.11 | 500 | -50 to +50g | +/- 10% | 1 g | PlanarRollover |
| Longitudinal acceleration(post-crash) | If Recorded | 0–250 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | 500 | -50 to +50g | +/- 10% | 1 g | Planar |
| Normal acceleration(post-crash) | If recorded | 0 to at least 250 ms[[11]](#footnote-12) | 10  | -5 g to +5 g | ± 10% | 0.5 g | Rollover |
| Delta-V, lateral | Mandatory - not required if lateral acceleration recorded at ≥500 Hz and with sufficient range and resolution to calculate delta-v with required accuracy | 0–250 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | 100 | -100 km/h to + 100 km/h. | ±10% | 1 km/h. | Planar |
| Maximum delta-V, lateral | Mandatory - not required if lateral acceleration recorded at ≥500 Hz | 0–300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | N/A | -100 km/h to + 100 km/h. | ±10% | 1 km/h. | Planar |
| Time maximum delta-V, lateral | Mandatory - not required if lateral acceleration recorded at ≥500 Hz | 0–300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | N/A | 0–300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter. | ±3 ms | 2.5 ms. | Planar |
| Time for maximum delta-V, resultant. | Mandatory - not required if relevant acceleration recorded at ≥500 Hz | 0–300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter. | N/A | 0–300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter. | ±3 ms | 2.5 ms. | Planar |
| Engine rpm | Mandatory | -5.0 to 0 sec | 2 | 0 to 10,000 rpm | ±100 rpm[[12]](#footnote-13) | 100 rpm. | PlanarRollover |
| Vehicle roll angle | If recorded | 0 to at least 250 ms 11 | 10 | -1080 deg to + 1080 deg. | ±10% | 10 deg. | Rollover |
| Vehicle roll rate[[13]](#footnote-14) | Mandatory if fitted and used for rollover protection system control algorithm | 0 to at least 250 ms 11 | 10 | -240 to + 240 deg/sec | +/- 10%[[14]](#footnote-15) | 4 deg/sec | Rollover |
| Anti-lock braking system activity  | Mandatory | -5.0 to 0 sec | 2 | Faulted, Non-Engaged, Engaged  | N/A | Faulted, Non-Engaged, Engaged  | PlanarVRURollover |
| Stability control  | Mandatory | -5.0 to 0 sec | 2 | Faulted, On, Off, Engaged  | N/A | Faulted, On, Off, Engaged  | PlanarVRURollover |
| Steering input | Mandatory | -5.0 to 0 sec | 2 | -250 deg CW to + 250 deg CCW. | ±5% | ±1%. | PlanarVRURollover |
| Safety belt status, front passenger 9 | Mandatory | -1.0 sec | N/A | Fastened, not fastened | N/A | Fastened, not fastened | PlanarRollover |
| Passenger air bag suppression status, front 9 | Mandatory | -1.0 sec | N/A | Suppressed or not suppressed | N/A | Suppressed or not suppressed | PlanarRollover |
| Frontal air bag deployment, time to nth stage, driver**15**. | Mandatory if fitted with a driver’s frontal air bag with a multi-stage inflator. | Event  | N/A | 0 to 250 ms | ±2 ms | 1 ms. | Planar |
| Frontal air bag deployment, time to nth stage, front passenger[[15]](#footnote-16), 9. | Mandatory if fitted with a front passenger’s frontal air bag with a multi-stage inflator. | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | Planar |
| Side air bag deployment, time to deploy, driver. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | Planar |
| Side air bag deployment, time to deploy, front passenger. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | Planar |
| Side curtain/tube air bag deployment, time to deploy, driver side. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | PlanarRollover |
| Side curtain/tube air bag deployment, time to deploy, passenger side. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | PlanarRollover |
| Pretensioner deployment, time to fire, driver. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | PlanarRollover |
| Pretensioner deployment, time to fire, front passenger9. | Mandatory  | Event | N/A | 0 to 250 ms | ±2 ms | 1 ms. | PlanarRollover |
| Seat track position switch, foremost, status, driver. | Mandatory if fitted and used for deployment decision | -1.0 sec | N/A | Yes or No | N/A | Yes or No. | PlanarRollover |
| Seat track position switch, foremost, status, front passenger 9. | Mandatory if fitted and used for deployment decision | -1.0 sec | N/A | Yes or No | N/A | Yes or No. | PlanarRollover |
| Occupant size classification, driver  | If recorded | -1.0 sec | N/A | 5th percentile female or larger. | N/A | Yes or No. | PlanarRollover |
| Occupant size classification, front passenger9 | If recorded | -1.0 sec | N/A | 6yr old HIII US ATD or Q6 ATD or smaller | N/A | Yes or No. | PlanarRollover |
| Safety belt status, rear passengers[[16]](#footnote-17) | Mandatory | -1.0 sec | N/A | Fastened, not fastened | N/A | Fastened, not fastened | PlanarRollover |
| Tyre Pressure Monitoring System Warning Lamp Status  | Mandatory | -1.0 second relative to time zero | N/A | N/A | N/A | On, Off | PlanarRollover |
| Longitudinal acceleration(pre – crash) | Mandatory | -5.0 to 0 second relative to time zero | 2 | -1.5g to +1.5g | +/- 10% | 0.1g | PlanarVRU |
| Lateral acceleration(pre – crash) | Mandatory | -5.0 to 0 second relative to time zero | 2 | -1.0g to +1.0g | +/- 10% | 0.1g | Planar |
| Yaw Rate13 | Mandatory | -5 to 0 seconds relative to time zero | 2 | -75 to +75 degrees / second | ± 10% of the full range of the sensor | 0.1 | PlanarRollover |
| Traction Control Status | Mandatory if not fitted with Stability control  | -5.0 to 0 second relative to time zero | 2 | Faulted, On, Off, Engaged | N/A | Faulted, On, Off, Engaged | PlanarRollover |
| Advanced emergency braking system status | Mandatory | -5.0 to 0 second relative to time zero | 2 | N/A | N/A | Faulted,Deactivated,On but Non-engaged,Warning but Non-engaged,Engaged | PlanarVRURollover |
| Cruise Control System Status | Mandatory | -5.0 to 0 second relative to time zero | 2 | N/A | N/A | Engaged, Faulted, Off, Non-engaged | PlanarVRURollover |
| Adaptive Cruise Control Status (driving automation system level 1) | Mandatory | -5.0 to 0 second relative to time zero | 2 | N/A | N/A | Engaged, Faulted, Off, Non-engaged | PlanarVRURollover |
| Vulnerable road user secondary safety system deployment, time to deploy | Mandatory | Event | N/A | 0 to 250 ms | ± 2 ms | 1 ms | VRU |
| Vulnerable road user secondary safety system warning indicator status**[[17]](#footnote-18)** | Mandatory | -1.1 to 0 relative to time zero | N/A | N/A | N/A | On or Off | VRU |
| Safety belt status mid-position front | Mandatory | -1.0 sec | N/A | Fastened, not fastened | N/A | Fastened, not fastened | PlanarRollover |
| Far-side impact centre air bag deployment, time to deploy9 | Mandatory | Event | N/A | 0 to 250 ms | +/-2 ms | 1 ms | PlanarRollover |
| Lane departure warning system status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,On but not warning,On – Warning left,On – Warning right | PlanarRollover |
| Corrective steering function status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,On but not engaged, Engaged | PlanarRollover |
| Emergency steering function status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,On but not engaged, Engaged | PlanarRollover |
| Automatically commanded steering function category A status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive[[18]](#footnote-19) | PlanarRollover |
| Automatically commanded steering function category B1 status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive17 | PlanarRollover |
| Automatically commanded steering function category B2 status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive17 | PlanarRollover |
| Automatically commanded steering function category C status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive17 | PlanarRollover |
| Automatically commanded steering function category D status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive17 | PlanarRollover |
| Automatically commanded steering function category E status | Mandatory | -5.0 to 0 sec | 2 | N/A | N/A | Faulted,Off,Stand-ByActive17 | PlanarRollover |
| Accident emergency call system status | Mandatory | Event | N/A | N/A | N/A | Faulted,On but emergency call not automatically triggered,On – Emergency call automatically triggered | PlanarVRURollover |

1. \* Former titles of the Agreement:

 Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958 (original version);

 Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, done at Geneva on 5 October 1995 (Revision 2). [↑](#footnote-ref-2)
2. "Mandatory" is subject to the conditions detailed in Section 1. [↑](#footnote-ref-3)
3. Pre-crash data and crash data are asynchronous. The sample time accuracy requirement for pre-crash time is -0.1 to 1.0 sec (e.g., T = -1 would need to occur between -1.1 and 0 seconds.) [↑](#footnote-ref-4)
4. For data elements with system states, the term "engaged" also means "actively controlling" or "actively intervening" and "not-engaged" also means "on but not controlling". Likewise, "off" also means "deactivated". [↑](#footnote-ref-5)
5. Accuracy requirement only applies within the range of the physical sensor. If measurements captured by a sensor exceed the design range of the sensor, the reported element shall indicate when the measurement first exceeded the design range of the sensor. [↑](#footnote-ref-6)
6. "Planar" includes triggered events in sections 5.3.1.1, 5.3.1.2, and 5.3.1.3 and "VRU" includes triggered events in section 5.3.1.4. [↑](#footnote-ref-7)
7. The ignition cycle at the time of download is not required to be recorded at the time of the crash but shall be reported during the download process. [↑](#footnote-ref-8)
8. The air bag warning lamp is the readiness indicator specified in national air bag requirements and may also illuminate to indicate a malfunction in another part of the deployable restraint system. [↑](#footnote-ref-9)
9. List this element n times, once for each device [↑](#footnote-ref-10)
10. "If recorded" means if the data is recorded in non-volatile memory for the purpose of subsequent downloading. [↑](#footnote-ref-11)
11. For rollover events the time at which the event is determined to have started as defined by the manufacturer. [↑](#footnote-ref-12)
12. 11 These elements do not need to meet the accuracy and resolution requirements in specified crash tests. [↑](#footnote-ref-13)
13. The manufacturer will indicate the direction of positive roll/yaw rate [↑](#footnote-ref-14)
14. 13 Relative to the full range of the sensor [↑](#footnote-ref-15)
15. List this element n - 1 times, once for each stage of a multi-stage air bag system. [↑](#footnote-ref-16)
16. List this element n times, once for each device in 2nd, 3rd, row [↑](#footnote-ref-17)
17. 16 Multiple safety system status indications can be combined into the air bag warning indicator [↑](#footnote-ref-18)
18. Faulted = Faulted, Per R79 Off = Off, Standby – ACSF can’t control, Active = ACSF is on but not controlling or ACSF is on and controlling. [↑](#footnote-ref-19)