

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*

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

Addendum 159 – UN Regulation No. 160

Revision 1 - Amendment 1

Supplement 1 to the 01 series of amendments – 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.



UNITED NATIONS

* 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).

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

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
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.	$\pm 10\%$	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.	$\pm 10\%$	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.	Planar Rollover VRU
Engine throttle, % full (or accelerator pedal, % full)	Mandatory	-5.0 to 0 sec	2	0 to 100%	$\pm 5\%$	1%	Planar Rollover VRU

¹ "Mandatory" is subject to the conditions detailed in Section 1.

² 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.)

³ 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".

⁴ 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.

⁵ "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.

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
Service brake, on/off	Mandatory	-5.0 to 0 sec	2	On or Off	N/A	On or Off.	Planar VRU Rollover
Ignition cycle, crash	Mandatory	-1.0 sec	N/A	0 to 60,000	±1 cycle	1 cycle.	Planar VRU Rollover
Ignition cycle, download	Mandatory	At time of download ⁶	N/A	0 to 60,000	±1 cycle	1 cycle.	Planar VRU Rollover
Safety belt status, driver	Mandatory	-1.0 sec	N/A	Fastened, not fastened	N/A	Fastened, not fastened	Planar Rollover
Air bag warning lamp ⁷ ,	Mandatory	-1.0 sec	N/A	On or Off	N/A	On or Off.	Planar Rollover
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 ⁸ .	Mandatory	Event	N/A	0 to 250 ms	±2 ms	1 ms.	Planar

⁶ 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.

⁷ 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.

⁸ List this element n times, once for each device

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
Multi-event crash, number of event	If Recorded ⁹	Event	N/A	1 or more	N/A	1 or more.	Planar VRU Rollover
Time from event 1 to 2	Mandatory	As needed	N/A	0 to 5.0 sec	±0.1 sec	0.1 sec.	Planar Rollover
Complete file recorded	Mandatory	Following other data	N/A	Yes or No	N/A	Yes or No.	Planar VRU Rollover
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	Planar Rollover
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 ¹⁰	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

⁹ "If recorded" means if the data is recorded in non-volatile memory for the purpose of subsequent downloading.

¹⁰ For rollover events the time at which the event is determined to have started as defined by the manufacturer.

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
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.	$\pm 10\%$	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 ¹¹	100 rpm.	Planar Rollover
Vehicle roll angle	If recorded	0 to at least 250 ms ¹¹	10	-1080 deg to + 1080 deg.	$\pm 10\%$	10 deg.	Rollover
Vehicle roll rate ¹²	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% ¹³	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	Planar VRU Rollover
Stability control	Mandatory	-5.0 to 0 sec	2	Faulted, On, Off, Engaged	N/A	Faulted, On, Off, Engaged	Planar VRU Rollover
Steering input	Mandatory	-5.0 to 0 sec	2	-250 deg CW to + 250 deg CCW.	$\pm 5\%$	$\pm 1\%$.	Planar VRU Rollover

¹¹ These elements do not need to meet the accuracy and resolution requirements in specified crash tests.

¹² The manufacturer will indicate the direction of positive roll/yaw rate

¹³ Relative to the full range of the sensor

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
Safety belt status, front passenger ⁹	Mandatory	-1.0 sec	N/A	Fastened, not fastened	N/A	Fastened, not fastened	Planar Rollover
Passenger air bag suppression status, front ⁹	Mandatory	-1.0 sec	N/A	Suppressed or not suppressed	N/A	Suppressed or not suppressed	Planar Rollover
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 ^{14, 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.	Planar Rollover
Side curtain/tube air bag deployment, time to deploy, passenger side.	Mandatory	Event	N/A	0 to 250 ms	±2 ms	1 ms.	Planar Rollover
Pretensioner deployment, time to fire, driver.	Mandatory	Event	N/A	0 to 250 ms	±2 ms	1 ms.	Planar Rollover

¹⁴ List this element n - 1 times, once for each stage of a multi-stage air bag system.

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
Pretensioner deployment, time to fire, front passenger ⁹ .	Mandatory	Event	N/A	0 to 250 ms	±2 ms	1 ms.	Planar Rollover
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.	Planar Rollover
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.	Planar Rollover
Occupant size classification, driver	If recorded	-1.0 sec	N/A	5th percentile female or larger.	N/A	Yes or No.	Planar Rollover
Occupant size classification, front passenger ⁹	If recorded	-1.0 sec	N/A	6yr old HIII US ATD or Q6 ATD or smaller	N/A	Yes or No.	Planar Rollover
Safety belt status, rear passengers ¹⁵	Mandatory	-1.0 sec	N/A	Fastened, not fastened	N/A	Fastened, not fastened	Planar Rollover
Tyre Pressure Monitoring System Warning Lamp Status	Mandatory	-1.0 second relative to time zero	N/A	N/A	N/A	On, Off	Planar Rollover
Longitudinal acceleration (pre – crash)	Mandatory	-5.0 to 0 second relative to time zero	2	-1.5g to +1.5g	+/- 10%	0.1g	Planar VRU
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 Rate ¹³	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	Planar Rollover

¹⁵ List this element n times, once for each device in 2nd, 3rd, row

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
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	Planar Rollover
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	Planar VRU Rollover
Cruise Control System Status	Mandatory	-5.0 to 0 second relative to time zero	2	N/A	N/A	Engaged, Faulted, Off, Non-engaged	Planar VRU Rollover
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	Planar VRU Rollover
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 ¹⁶	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	Planar Rollover
Far-side impact centre air bag deployment, time to deploy ⁹	Mandatory	Event	N/A	0 to 250 ms	+/-2 ms	1 ms	Planar Rollover

¹⁶ Multiple safety system status indications can be combined into the air bag warning indicator

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
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	Planar Rollover
Corrective steering function status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, On but not engaged, Engaged	Planar Rollover
Emergency steering function status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, On but not engaged, Engaged	Planar Rollover
Automatically commanded steering function category A status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover
Automatically commanded steering function category B1 status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover
Automatically commanded steering function category B2 status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover
Automatically commanded steering function category C status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover
Automatically commanded steering function category D status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover

¹⁷ Faulted = Faulted, Per R79 Off = Off, Standby – ACSF can't control, Active = ACSF is on but not controlling or ACSF is on and controlling.

<i>Data element</i>	<i>Condition for requirement¹</i>	<i>Recording interval/time² (relative to time zero)</i>	<i>Data sample rate (samples per second)</i>	<i>Minimum range³</i>	<i>Accuracy⁴</i>	<i>Resolution⁴</i>	<i>Event(s) recorded for⁵</i>
Automatically commanded steering function category E status	Mandatory	-5.0 to 0 sec	2	N/A	N/A	Faulted, Off, Stand-By Active ¹⁷	Planar Rollover
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	Planar VRU Rollover