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**Economic Commission for Europe****Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on General Safety Provisions****Seventy-first session**

Geneva, 9–13 May 2022

Item 16 of the provisional agenda

**Mutual Resolution No. 1****Proposal for Mutual Resolution No. 1, Addendum 1  
(Specifications for the Construction, Preparation and  
Certification of the 50th percentile male Biofidelic Rear  
Impact Dummy, (BioRID-II UN) anthropomorphic test  
Device)****Submitted by the Expert from the United Kingdom \***

The text reproduced below was prepared by the expert from the United Kingdom. It aims to clarify the text of Addendum 1 to Mutual Resolution No. 1 (M.R.1), and reflects comments and questions received following the adoption of the Addendum by the World Forum for Harmonization of Vehicle Regulations (WP.29) at its 185th session, 23–25 November 2021 (ECE/TRANS/WP.29/2021/146). The modifications to the current text of the Addendum 1 of M.R.1. (ECE/TRANS/WP.29/2021/146), are marked in bold for new and strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (part V, sect. 20), para. 20.76), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



## I. Proposal

Paragraph 1.2.1., Table 1, amend to read:

"Table 1.

### BioRID-II UN Instrumentation

|                   |                           | <i>Measurement</i> |                        |                    |
|-------------------|---------------------------|--------------------|------------------------|--------------------|
| Location          | Type                      | Required           | Optional               | Number of Channels |
| Head              | Accelerometer             | AX                 | AY, AZ                 | 1–3                |
| Head              | Tilt Sensor               |                    | Angle                  | 2                  |
| Head              | Angular Rate Sensor (ARS) |                    | AVX, AVY, AVZ          | 1–3                |
| Head              | Contact Switch            | Event              |                        | 1                  |
| Upper Neck        | Load Cell                 | FX, FZ, MY         | FY, MX, MZ             | 6                  |
| Lower Neck        | Load Cell                 | FX, FZ, MY         |                        | 3                  |
| Thorax (T1) right | Accelerometer             | AX, AZ             |                        | 2                  |
| Thorax (T1) left  | Accelerometer             | AX, AZ             |                        | 2                  |
| Thorax (T1)       | Angular Rate Sensor (ARS) |                    | AVX, AVY, AVZ          | 1–3                |
| Thorax (T8)       | Tilt Sensor               |                    | Angle                  | 2                  |
| Thorax (T8)       | Accelerometer             |                    | AX, AZ                 | 1                  |
| Thorax (T8)       | Angular Rate Sensor (ARS) |                    | AVX, AVY, AVZ          | 3                  |
| Lumbar (L1)       | Angular Rate Sensor (ARS) |                    | AVX, AVY, AVZ          | 2                  |
| Lumbar (L1)       | Accelerometer             |                    | AX, AZ                 | 1–3                |
| Lumbar (L5)       | Load cell                 |                    | FX, FY, FZ, MX, MY, MZ | 6                  |
| Pelvis            | Accelerometer             |                    | AX, AY, AZ             | 3                  |
| Pelvis            | Tilt Sensor               |                    | Angle                  | 2                  |
| Pelvis            | Angular Rate Sensor (ARS) |                    | AVX, AVY, AVZ          | 3                  |

"

Annex 1,

Paragraph 2.2.1., amend to read:

"2.2.1. Assembly Components

The BioRID-II UN dummy shall be equipped with the following neck instrumentation: an upper neck load cell measuring X, Y and Z forces and

moments, a lower neck load cell at T1 measuring Fx, Fz and My, and two uni-axial piezoresistive accelerometers ~~at T1. Accelerometers may be~~ located on the right ~~or~~ **and the** left side of the ~~cervical~~ **T1** vertebrae. If fitted, angular rate sensors may also utilize the accelerometer mounting on the cervical vertebrae."

*Paragraph 2.2.2.*, amend to read:

"2.2.2. Mounting of Accelerometers

~~The T1 Cervical spine~~ accelerometers shall be mounted on the sides of the accelerometer block and shall measure Ax and Az accelerations when the block is mounted on the spine. Two uni-axial piezoresistive accelerometers shall be mounted onto the tri-axial mount block with two each #0-80 X 1/8" SHCS (UNF) (4 total) such that their seismic masses point to one corner of the block as shown in Figure 71.

**Accelerometers shall not be mounted on the cervical spine (C1 – C7).**

*Paragraph 2.2.2., Figure 71*, amend the title to read:

Figure 71

**Cervical Spine Accelerometer Mounting**

*Paragraph 2.3.2.*, amend to read:

"2.3.2. Mounting of Accelerometers

Thoracic spine accelerometers, if fitted, shall be mounted only on the sides of the accelerometer block, and when mounted to the spine shall measure Ax and Az accelerations. Two uni-axial piezoresistive accelerometers shall be mounted onto the tri-axial mount block with two each #0-80 X 1/8" SHCS (UNF) (4 total) so that their seismic masses all point to one corner of the block as shown for the ~~cervical~~ spine accelerometer mounting in Figure 71. This step is identical for T8 and L1 accelerometer locations."

*Annex 3,*

*Paragraph 4.3.6.*, amend to read:

"4.3.6. Using the spine-torso interface pin holes in the jacket with the pin assemblies that came with the torso jacket assembly, install the jacket onto the jacket core (Figure 8a and 8b) and, using an attachment plate, attach the jacket and jacket core assembly to the impact plate of the sled. The combined mass of the test equipment system and the jacket impact attachment fixture is 55.75 +/- .08 kg **(not including** ~~—{Does not include~~ the jacket or the spine-torso interface pins})."

*Paragraph 5.3.1.*, amend to read:

"5.3.1. Prepare the sled system and lower torso impactor as described for the jacket validation in paragraphs 4.3.1. to 4.3.3. above. **In addition, the dummy equivalent mass package (Annex 3, Appendix.1, Paragraph. 1) shall be installed on the sled.**"

*Paragraph 5.3.4.*, amend to read:

"5.3.4. Using the lower torso test fixture (Figure 10), attach the **pelvis** assembly to the sled impact plate with the posterior surface uppermost (Figure 11). The assembly includes all the components shown in Figure 12."

*Insert new paragraph 5.3.5.*, to read:

"**5.3.5. The combined mass of the test equipment system, the dummy equivalent mass package, and the impact attachment fixture shall be 75.35 +/- 0.10 kg.**"

*Paragraph 5.3.5. (former)*, renumber as paragraph 5.3.6.

## II. Justification

1. This proposal aims to improve the application of Addendum 1 of Mutual Resolution No.1 when used by laboratories to maintain and certify the BioRID-II UN dummy. Questions are addressed that have been raised since the Addendum was issued and seeks to remove interpretation differences that could affect the outcome of dummy calibration.

2. Paragraph 1.2.1., Table 1:

The number of data channels required is related directly to the instrumentation that is installed. Table 1 includes the required instrumentation and the instrumentation that may be used on an optional basis. Listing the data channels in Column 5 does not provide any additional information and could cause confusion.

3. Annex 1, paragraphs 2.2.1. and 2.2.2., Figure 71, and paragraph 2.3.2.:

The work of the GTR7 Informal Working Group and the GTR7 TEG, established that the accuracy, repeatability, and reproducibility of the BioRID-II UN dummy could be affected negatively if accelerometers were fitted to the cervical spine (C1 to C7). However, the acceleration of the lower neck could be assessed by the installation of accelerometers on the T1 vertebrae. These amendments remove the opportunity for misunderstanding of the accelerometer installation requirements.

4. Annex 3, paragraph 4.3.6.:

In error, square brackets remained at the end of this paragraph in the text submitted to GRSP and WP.29. This amendment removes the square brackets and refines the text.

5. Paragraph 5.3.1. and new paragraph 5.3.5.:

The absence of the upper torso during the certification of the lower torso impacts on the inertia of the sled system. To compensate it is necessary to install the dummy equivalent mass package used during the validation test of the sled system. The amendment to paragraph 5.3.1. makes this clear while the provision of a mass value for the combination of the test equipment, the dummy equivalent mass package, and the impact fixture in new paragraph 5.3.5. improves the uniformity of test conditions.

6. Paragraph 5.3.4.:

This clarifies the text to ensure that it is understood that the assembly refers to the pelvis assembly.

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