**GRVA-EMB-03** 29-30 March 2023

Correlation UN R13 / UN R13-H

**The following Correlation Table shows the corresponding provisions of the current versions of UN R13 and UN R13‑H as far as they are related to the proposed amended provisions by the EMB Informal Group regarding electro-mechanical braking systems.**

**The asterisks (\*) in column 3 (UN R13‑H) of the following "Correlation Ta­ble" address the new proposed "R13-EMB requirements" which should be checked whether they are also of interest for a possible update of UN R13‑H (passenger M1 vehicles and light commercial N1 vehicles).**

From the "**Correlation Table**" below it can be seen that the current **UN R13** requirements **referenced** in the current **'EMB Proposal'** (Issue January 2023 - Informal document **GRVA-15-17**) exist also **more or less** as **identical** requirements in **UN R13‑H**.

**Correlation Table** **(UN R13 / UN R13‑H)**

| **Subject** | **UN R13** | **UN R13‑H** | **Notes** |
| --- | --- | --- | --- |
| Definition "*Electric state of charge*" | 2.21.4 | 2.17.4 | R13 **=** R13‑H |
| Definition "*Reference braking forces*" | 2.31 | -  \* | not existing in UN R13‑H  This definition is currently used only for vehicles with **com­pressed air** operated brakes |
| Definition "*Electro-mechanical brake*" | - | \* | proposed new definition 2.44 |
| Definition "*Electro-mechanical brak­ing system*" | - | \* | proposed new definition 2.45 |
| Definition "*Wheel brake demand value*" | - | \* | proposed new definition 2.46 |
| Definition “performance of an elec­trical energy storage device” | - | \* | proposed new definition 2.47 |
| Definition “usable performance” | - | \* | proposed new definition 2.48 |
| Definition “Actual Electric Usable Performance (AEUP)” | - | \* | proposed new definition 2.49 |
| Definition “AEUPW” - low electrical performance level | - | \* | proposed new definition 2.50 |
| Definition "*Pw*" - the low electrical supply power warning | - | \* | proposed new definition 2.51 |
| Definition "*Energy source*" | - | \* | proposed new definition 2.52 |
| Definition "*Electrical energy storage device*" | - | \* | proposed new definition 2.53 |
| Definition "*Electrical supply device*" | - | \* | proposed new definition 2.54 |
| Definition "*Certified Usable Perfor­mance (CUP)*" | - | \* | proposed new definition 2.55 |
| Definition "*Minimum Required Usa­ble Performance (MRUP)*" | - | \* | proposed new definition 2.56 |
| Provisions for the periodic technical inspection of braking systems | 5.1.4 | 5.1.4 | R13 **=** R13‑H (Heading) |
| Data of compressed-air braking sys­tem | 5.1.4.5.1 | - | **compressed-air** braking sys­tems not covered by UN R13‑H |
| Requirements regarding checking the correct behaviour of the warning sig­nals AEUPW and Pw | new  5.1.4.5.3 | \* | proposed **new** requirement |
| Reference braking forces | 5.1.4.6 | -  \* | Currently, a reference braking force procedure is only defined for vehicles with compressed air operated brakes |
| Reference braking force require­ments for compressed-air braking systems | 5.1.4.6.2 and 5.1.4.6.3 | - | **reinserted as new** paragraphs 5.1.4.6.1.1 and 5.1.4.6.1.2 (para­graphs have been only renum­bered) |
| Reference braking force require­ments for electro-mechanical braking systems | new  5.1.4.6.2  5.1.4.6.2.1  5.1.4.6.2.2  5.1.4.6.2.3 | \* | proposed new requirements (an­alogue requirement as for vehi­cles with compressed-air brak­ing systems) |
| Requirement of **dual** energy reserves if the service braking force and trans­mission depend exclusively on the use of an energy reserve | 5.2.1.2.7.2 | 5.2.2.8 | \* **except** for the **additional** last sentence in paragraph 5.2.1.2.7.2: "*In each service braking circuit in at least one of the air reser­voirs a device for draining and exhausting is required in an ade­quate and easily accessible posi­tion*;" ⇒ **R13 = R13‑H\*** |
| This new added paragraph 5.2.1.2.7.3. **also** permits - in contrast to the requirement of current para­graph 5.2.1.2.7.2 - that in the case of EMB, e.g. only one or more wheel brake(s) is/are provided with energy either by an energy reserve providing electrical power to the whole trans­mission or separately to the electric control and separately to the energy transmissions of a braking circuit. | **new** 5.2.1.2.7.3 | \* | This new proposed **EMB** re­quirement is an additional **alter­native** requirement to current paragraph 5.2.1.2.7.2 (address­ing **all** braking systems) |
| Paragraph permitting that the driver’s braking effort is assisted only by one energy reserve when in the absence of such an assistance secondary brak­ing performance can be achieved by muscular energy only. | 5.2.1.2.7.3  **renumbered** in the EMB proposal as paragraph 5.2.1.2.7.4 | 5.2.2.9 | R13 **=** R13‑H\*  \* except for the different refer­ences to the dead redundancy paragraphs of R13/5.2.1.6 and R13-H/5.2.5 respectively |
| "*Energy source shall be as safe as practicable*" | 5.2.1.5 | 5.2.4 | R13 **=** R13‑H |
| *"In the event of failure in any part of the transmission of a braking system, the feed to the part not affected by the failure shall continue to be en­sured ..."* | 5.2.1.5.1 | 5.2.4.1 | R13 **=** R13‑H |
| Test procedure regarding a failure in the energy supply | 5.2.1.5.2 | 5.2.4.2 | R13 **=** R13‑H |
| Alternative provisions for paragraphs 5.2.1.5.1 and 5.2.1.5.2 for an electro-mechanical braking system | new  5.2.1.5.4  5.2.1.5.4.1 | \* | proposed new requirements (ana-logue requirements as for vehicles with hydraulic braking systems) |
| Warning required when the defined brake pressure compensation for a deterioration or defect within the braking system is exceeded | 5.2.1.8.1.1 | 5.2.8.1.1 | R13 **=** R13‑H |
| Low pressure warning requirements (optical or acoustic signal) | 5.2.1.13.1 | 5.2.14.1 | R13 **≈** R13‑H ⇐ Paragraph 5.2.1.13.1 contains also the totally superfluous wording "*in addition to a pressure gauge, where fitted*") |
| In order that the driver can - at any time - check the actual electrical usa­ble performance (AEUP), it is re­quired that this value shall not only be displayed automatically on activa­tion of the AEUPW warning signal but also in response to the manual demand of the driver | new  5.2.1.13.2 | \* | proposed new requirement |
| Requirement as to vehicles **author­ized to tow a trailer** of category O3 or O4 | 5.2.1.18 | - | only R13 requirement  (only editorial clarification pro­posed) |
| **Auxiliary equipment** may be sup­plied with energy from the electric transmission of the **parking braking system** provided that ... | 5.2.1.26.3 | 5.2.19.3. |  |
| Special additional requirements for service braking systems with electric control transmission | 5.2.1.**27** | 5.2.**20** | R13 **=** R13‑H (Heading)  The requirements of these sec­tion had been introduced in the nineties for EBS vehicles having a service braking system with an electric **control** transmission but having no electrical **energy** transmission.  For vehicles with electric con­trol **and** electrical energy trans­mission, the new section **5.2.1.35** is proposed for EMB vehicles |
| This requirement demands that the service braking system must be able to generate a static total braking force even when the ignition/start switch has been switched off and/or the key has been removed | 5.2.1.27.1 | 5.2.20.1 | R13 R13‑H  However, **both** regulations re­quire that the service braking system must be able to generate a static total braking force **even when**  - the ignition/start switch has been switched off and/or the key has been removed (**R13**) or  - the propulsion system on/off control has been deactivated to the ''Off'' or ''Lock'' posi­tion and/or the ignition key has been removed (**R13‑H**) |
| A single temporary failure (< 40 ms) shall have no distinguishable effect on the service braking performance | 5.2.1.27.2 | 5.2.20.2 | R13 **=** R13‑H |
| A failure within the electric control transmission | 5.2.1.27.3 | 5.2.20.3 | R13 **=** R13‑H\*  \* The last R13 sentence "*These re­quirements shall not be construed as a departure from the requirements concerning secondary braking*." (which is **only a clarification**) is not included in the R13‑H paragraph 5.2.20.3 |
| Warning requirement for a power-driven vehicle, **electrically con­nected to a trailer** via an electric control line | 5.2.1.27.4 | - | only R13 requirement |
| In the event of a failure of the energy source of the electric control trans­mission, full stroke actuations of the service braking control 20 must still be possible | 5.2.1.27.5 | 5.2.20.4 | R13 **=** R13‑H |
| Red warning signal required when the battery voltage falls below a value nominated by the manufacturer | 5.2.1.27.6 | 5.2.20.5 | R13 **≈** R13‑H\*  \* Since UN R13‑H has no require­ments concerning **residual** braking performance, the R13 H paragraph 5.2.20.5 demands "**secondary** braking performance" instead of "re­sidual braking performance" (in 5.2.1.27.6) 'after the warning signal has been activated'. |
| Requirement addressing the case when auxiliary equipment is supplied with energy from the same reserve as the electric control transmission | 5.2.1.27.7 | 5.2.20.6 | R13 **≈** R13‑H\*  \* The R13 H paragraph 5.2.20.6 does not has the sentence "*For vehicles authorized to tow a trailer of cate­gory O3 or O4 the energy consump­tion of the trailer shall be taken into account by a load of 400 W*". |
| Requirements addressing the case when the auxiliary equipment is sup­plied with energy from the electric control transmission | 5.2.1.27.8  5.2.1.27.8.1  5.2.1.27.8.2 | 5.2.20.7  5.2.20.7.1  5.2.20.7.2 | R13 **=** R13‑H |
| Requirement addressing a failure in the electric control transmission of the service braking system of a **tow­ing vehicle** equipped with an **electric control line** | 5.2.1.27.9 | - | only R13 requirement |
| Requirement addressing a failure in the electric control transmission of a **trailer** | 5.2.1.27.10 | - | only R13 requirement |
| Warning signal requirements must also be respected despite the effect of environmental conditions (e.g., tem­perature) and ageing. | new  5.2.1.29.4.4. | \* | proposed new requirement |
| Special additional requirements for service braking systems with **electro-mechanical** braking system with **electric transmission** | new Section  5.2.1.**35** | \* | In this proposed new Section, all relevant electrical **control** trans­mission requirements of R13-Section 5.2.1.27 are covered **and also** requirements with re­gard to electric **energy** transmis­sion (which are not contained in the requirements of R13-Section 5.2.1.27) |
| Clarification that for electro-mechan­ical braking systems the require­ments of this section 5.2.1.35. apply instead of those of section 5.2.1.27. | 5.2.1.35.1 | \* | proposed clarification |
| Residual performance must be en­sured for all driving conditions | 5.2.1.35.2 | \* | proposed new requirement |
| The manufacturer is required to de­scribe the functionality of the system triggering the warning levels AEUPw and Pw. | 5.2.1.35.3 | \* | proposed new requirement |
| This paragraph corresponds to para­graph 5.2.1.27.1. | 5.2.1.35.4 | \* | proposed new requirement (tak­ing also account of the require­ment of paragraph 5.2.1.27.1) |
| This paragraph addresses an electri­cal energy storage device feeding **only** the electric control transmis­sion. This requirement is similar to that in paragraph 5.2.1.27.5. but adapted to electro-mechanical brak­ing systems | 5.2.1.35.5 | \* | proposed new requirement |
| In contrast to paragraph 5.2.1.35.5., this requirement addresses a configu­ration of an electro-mechanical brak­ing system where energy storage de­vices are providing electrical energy for the electrical control **and** electri­cal energy transmission. | 5.2.1.35.6 | \* | proposed new requirement |
| As an alternative to the requirements of Annex 7, Part D, paragraph 1.2., electrical energy storage devices that provide power only to the control transmission of the braking system may satisfy this requirement. | 5.2.1.35.7 | \* | proposed new requirement |
| The paragraph ensures that if the electrical energy storage devices are used also by other vehicle systems (e.g. automatic traction control or other auxiliary systems) then the en­ergy consumption of these systems shall not cause the reserves of energy to fall under a level which ensures the prescribed service braking perfor­mance as per the minimum perfor­mance requirements defined by these regulation | 5.2.1.35.8 | \* | proposed new requirement |
| A warning signal shall be displayed when the energy storage capacity of the electrical energy storage de­vice(s) is not sufficient to fulfil the requirements of Annex 7, Part D, paragraph 1.2.1. | 5.2.1.35.9 | \* | proposed new requirement |
| A warning signal shall be displayed when ... | 5.2.1.35.10 | \* | proposed new requirement; however, text still under discus­sion and not yet agreed |
| The warning signal may not be dis­played ... | 5.2.1.35.11 | \* | proposed new requirement; however, text still under discus­sion and not yet agreed |
| Power warning (Pw) requirement | 5.2.1.35.12 | \* | proposed new requirement |
| The functions to monitor the ageing and charging of the electrical energy storage devices shall be checked at ... | 5.2.1.35.13 | \* | proposed new requirement |
| Priority of the braking system | 5.2.1.35.14 | \* | proposed new requirement |
| This requirement is essentially a copy of paragraph 5.2.1.27.6. | 5.2.1.35.15 | \* | proposed new requirement |
| This requirement is similar to para­graph 5.2.1.27.7. However, this re­quirement addresses the **whole** elec­trical (control **and** energy) transmis­sion of the service braking system. | 5.2.1.35.16 | \* | proposed new requirement |
| This requirement is identical with paragraph 5.2.1.27.3 except that this requirement covers the **whole** electric transmission and not only the electric control transmission as addressed in paragraph 5.2.1.27.3. | 5.2.1.35.17 | \* | proposed new requirement |
| This requirement is identical with paragraph 5.2.1.27.2. | 5.2.1.35.18 | \* | proposed new requirement |
| Except for the added and clarifying wording "In the case of" at the begin­ning of the text, this requirement is identical with paragraph 5.2.1.27.4 | 5.2.1.35.19 | \* | proposed new requirement |
| In the case of a failure in the electric control transmission of the service braking system of a towing vehicle ....  This requirement is identical with paragraph 5.2.1.27.9. | 5.2.1.35.20 | \* | proposed new requirement |
| If the auxiliary equipment is supplied with energy from the electric trans­mission, the following requirements shall be fulfilled.  5.2.1.35.21.1.  5.2.1.35.21.2. | 5.2.1.35.21 | \* | proposed new requirement |
|  |  |  |  |
| Additional requirements to Annex 2 | **A2**/14.17 | \* | proposed new provisions |
|  |  |  |  |
| Prescribed test procedure for a vehi­cle with electrically actuated service brakes powered from traction batter­ies which receive energy only from an independent external charging system | **A4**/1.2.11 | A3/1.2.11 | R13 **=** R13‑H  proposal for an amendment |
| No setting requirements for hydrau­lically operated disc brakes | A4/1.5.1.7.2 | - | currently, only R13 requirement  new proposal to demand same provision also for electro-me­chanical braking systems |
| This test requirement demands that e.g., a failure on a single wheel on a high-µ surface where a very high braking force may be generated and may cause a severe condition with regard of stability, is assessed | new  A4/1.3.3 | \* | proposed new requirement |
| Behaviour of the vehicle during a brake transmission failure  Paragraphs 1.3.3. (see above) and 2.5. of Annex 4 ensure that there is an integrated control strategy to en­sure that the driver can maintain ve­hicle control under fault/failure con­ditions. | new  A4/2.5 | \* | proposed new requirement |
| General time response requirement for hydraulic systems | A4/4.1.3 | A3/3.1.2 | R13 **=** R13‑H |
| General time response requirement (analogue to paragraph A4/4.1.3 for hydraulic systems) | new  A4/4.1.4 | \* | proposed new requirement |
|  |  |  |  |
| Provisions relating to energy sources and energy storage devices (energy accumulators) for electro-mechanical braking systems | new  A7 Part D | \* | proposed new requirement |
|  |  |  |  |
| Requirement for spring braking sys­tem | **A8** | - | proposal for an amendment of heading of Annex 8 proposed |
|  |  |  |  |
| Current paragraph "5.1.1.3. The vehicle’s engine shall then be stopped or the supply to the energy transmission storage de­vice(s) cut off." amended | **A13**/5.1.1.3 | A6/5.1.1.3 | R13 **=** R13‑H  proposal for an amendment |
| Current paragraph "5.1.1.4. amended | A13/5.1.1.4 | A6/5.1.1.4 | R13 **=** R13‑H  proposal for an amendment |
| Test procedure for the determination of the coefficient of adhesion (k) | A13/App. 2, 1.13 | A6/App. 2, 1.13 | R13 **=** R13‑H  proposal for an amendment |