# Comments on Document ACV5-7 Rev 1

**The BLUE text are comments and proposed amendments from Colin Ross of Meritor**:

General:

In the proposed amendments to Regulation 13 the requirements may be applied to semi-trailer combinations and draw bar combinations. However in Appendix 1 to Annex 22 the diagrams only illustrate a semi-trailer combination. There are fundamental differences between these two combination types with respect to the flexible hoses and cables. In the case of a semi-trailer these are deemed to be part of the towing vehicle but in the case of drawbar trailers they are deemed to be part of the trailer – see paragraph 5.1.3.8 of the Regulation. In consequence either the new provisions are limited to semi-trailer combinations or Appendix 1 to Annex 22 is extended or another Appendix is drafted.

Nothing is defined as to the positioning or physical specification of the interface which means anything can be used provided it complies with the functional and performance requirements. Is GRRF aware of this limitation?

It is proposed to include information on the interface connections in the driver's handbook. It would be beneficial to include information adjacent to the connector on the towing vehicle and trailer to inform the driver of the connection process. This is particularly relevant when both automatic and manual connections are installed.

Comments on text within ACV-7 Rev 1:

Insert new paragraph 2.37., to read:

"2. DEFINITIONS"

**2.37.** "**Brake electric/electronic interface**" **means ~~a connector or part of a~~ connector pins dedicated to the braking system for the electrical/electronic connection between towing and towed vehicle, that has to provide contacts for :**

1. **Plus voltage ~~supply~~ for electrovalve (Braking), referred to as Pin 1**
2. **Plus voltage ~~supply~~ for electronics (Braking), referred to as Pin 2**
3. **Minus voltage ~~return~~ for electronics (Braking), referred to as Pin 3**
4. **Minus voltage ~~return~~ for electrovalve (Braking), referred to as Pin 4**
5. **Signal for Warning device (Braking), referred to as Pin 5 (Open connection on the towed vehicle during normal operation)**
6. **Communication line for CAN_High (Braking) referred to as Pin 6 (to conform to ISO11992-1 and ISO11992-2)**

**7. Communication line for CAN_Low (Braking) referred to as Pin 7 (to conform to ISO11992-1 and ISO11992-2)**

**Comment:** This definition is unnecessary when all that is required is to define the basic functionality of the interface. Equally this definition contains requirements which is inappropriate but should be included in Annex 22

**2.38 "Automated or Automatic Connector" means ~~a system through~~ an interface by which two vehicles are automatically ~~connected~~ electrically ~~pneumatically~~ and/or ~~electrically~~ pneumatically connected without manual intervention ~~direct intervention of a human operator~~.**

**Comment**: The paragraph number should be 2.39 as 2.38 already exists

Paragraph 5.1.3.6.

**Comment:** The current requirements within R13 do not require amendment

Add a new paragraph 5.1.6 to read:

5.1.6. Throughout this Regulation and Annexes references are made to the ISO 7638 connector with respect to functionality. As an alternative to this connector it is permitted to utilise an "Automated or Automatic Connector" as defined within paragraph 2.39 of this Regulation provided it fulfils the relevant requirements of ISO 7638:2007 and those prescribed within Annex 22 to this Regulation.

**As an alternative to the ISO 7638 connector, in the case of systems where the connection of the electric control line is automated, the automated connector shall provide as a minimum the same number of pins with the same electrical properties and functionality as the ISO 7638 connector. The automated connector shall meet all the electrical requirements contained within this regulation applicable to the ISO 7638 connector and the requirements specified in Annex 22 of this Regulation.**

Paragraph 5.2.1.23.

**Comment:** The current requirements within R13 do not require amendment

Paragraph 5.2.2.17.

**Comment:** The current requirements within R13 do not require amendment

Annex 22:

~~TECHNICAL REQUIREMENTS FOR THE BRAKE ELECTRIC/ELECTRONIC INTERFACE~~

REQUIREMENTS FOR AUTOMATIC OR AUTOMATED ELECTRIC/ELECTRONIC BRAKE CONNECTORS

## 1. Scope

1.1. This annex ~~defined~~ **defines** requirements for **connectors** ~~applicable to installations~~ where the connection and disconnection of the brake electric/electronic interface **and/or** the pneumatic interface between towing and towed vehicle is **realized without manual intervention** ~~automated~~.

1.2. For vehicles subject to this Annex 22 it shall be observed that references to ISO 7638 made in the remainder of this regulation shall be interpreted as references to the interface detailed in this Annex 22.

**Comment**: It is not clear what paragraph is specifying, however it is believed that it is trying to say that the automatic connector may be used instead of the ISO 7638 connector. If this is correct it should not be in this Annex but in the main body of the Regulation and would now be covered by the addition of paragraph 5.1.6 above.

## 2. Definitions

**2.1. For the purposes of this document, the terms and definitions given in ISO 4091 apply.**

**Comment:** it is not necessary for such a statement as any reference to ISO 4091 automatically includes the definitions

**2.2.** **[~~A manual brake electric/electronic interface comprises connectors having a geometrically excluding interface such that unintended connection is not possible.~~ ]**

**2.3.** **[~~An automatic brake electric/electronic interface comprises separate connectors or part of an integrated connector having a geometrically excluding interface such that unintended connection is not possible and that is operated through an automatic process.~~ ]**

**2.4. *Automated Coupling Vehicle (ACV)*, is a vehicle where the coupling/uncoupling between towing and towed vehicle is operated through an automated process.**

**Comment:** This definition is not necessary when the definition within 2.39 exists

**2.5. "*Mixed mode operation*" ~~is operation where an ACV equipped truck tows a non-ACV equipped trailer or a non-ACV truck tows an ACV trailer. {See Appendix 1 of this Annex }~~ means a vehicle combination where either the towing or towed vehicle is equipped with an "Automated or Automatic Connector" and the other vehicle is equipped with a non "Automated or Automatic Connector".**

**Comment:** This definition should be included with the definitions within the main body of the Regulation

**3. General requirements for the brake electric/electronic interface**

**3.1. [The contacts for the brake electric/electronic interface according to definition 2.37 shall be realized ~~either as one separate connector ISO 7638 or~~ as a part, geometrically kept together, in an integrated connector.]**

**Comment:** The designation and functionality of the respective pins should be defined here.

**3.1.1. The contact designation numbers shall be permanently marked on the terminal faces of both plug and socket. The character size shall not be less than 2 mm.**

**3.2. The connectors for the brake electric/electronic interface shall fulfill the ~~technical~~ requirements of ISO4091: DATE associated with the ISO 7638 connector.**

**Comment:** Are all the requirements of ISO 4091 relevant

**3.2.1. Individual test may be waived by the technical service if the as installed conditions exclude the failure mode addressed by that test.**

**Comment:** What is this paragraph trying to convey

**3.2.2. ~~The~~ Individual tests specified within ISO 4091:DATE shall be performed ~~at conditions emulating conditions as installed in the automated appliance with respect to~~ using the selected method of encapsulation and cable fixation [clamping].**

**Comment:** this should be a sub paragraph to paragraph 3.2 above

**3.2.3. The endurance test specified with paragraph 5.15 of ISO 4091: DATE shall be extended to 10 000 cycles.**

**3.3. The contacts for plus and minus voltage for electrovalves (Pin 1 and Pin 4) of the brake electric/electronic interface shall be physically realized such that leads with 4 $mm^2$ cross section may be used. The remaining contacts in the brake electric/electronic interface shall handle at least 1.5 $mm^2$.**

**Comment:** The content of the above paragraph is contrary to that defined with ISO 7638 as there is the following derogation*: Terminals accepting cables of a different cross-sectional area shall be as agreed between manufacturer and user*. Additionally within

Regulation 13 there is the footnote 16 to paragraph 5.2.2.17 which allows a further derogation which should be maintained irrespective of the connector type.

**3.4. Automated connectors have to be fully equipped according to definition 2.37 even if some of the pins are not used. The contacts are not to be used for purposes other than defined in 2.37.**

**Comment:** It is suggested that the proposed paragraph 2.37 in ACV-5-7 Rev 1 be deleted therefore the option not to use pins 6 & 7 in the case of vehicles that do not have an electric control line should be included in paragraph 3.1 of this Annex.

**General Comment:** it is possible for a manufacturer to obtain a test report which includes results demonstrating compliance with ISO 7638 and this is used to show technical services compliance with the standard and therefore additional tests are not necessary. The way that it is proposed to defined the requirements for an automated or automatic connector within Regulation 13 then this option is no longer available. As a result each vehicle submitted for approval would have to be subject to the requirements of Regulation 13 and this Annex before it could be approved. This would be time consuming and expensive therefore it will be necessary to produce an Appendix to this Annex so that a given connector can be evaluated and a test report issued.

**4. Operations requirements**

**4.1. Vehicles with an automated or automatic connector as defined within paragraph 2.39 of the Regulation and require the option to operate with a vehicle not equipped a compatible connector to enable mixed mode operation shall include the following additional connections:**

- **conventional connections for the control and supply lines**
- **a connector as specified within paragraphs 5.2.1.13 or 5.2.2.17 of the Regulation as appropriate.**

~~**process with respect to coupling /uncoupling pneumatic and electric/electronic connectors that have the capacity to mechanically couple to a vehicle with only manual brake electric/electronic interface shall have a manual option for the pneumatic supply and a manual option complying with paragraph 5.1.3.6. of this Regulation. This is to enable mixed mode operation {See Appendix 1 of this Annex }**~~

**4.2. A towing vehicle with capacity to operate in manual as well as in automatic mode shall have two parking sockets for ISO7638 connector. When such a towing vehicle is operating in automatic mode the helix cable shall be completely disengaged from the ABS/EBS system and occupy both parking sockets on the tractor. The helix cable shall be permanently fixed to the truck to safeguard that the cable is always available.**

**Comment:** While it is understood why it is necessary not to have open circuit data communication lines having two park sockets for the ISO 7638 flexible cable is likely to lead to operational problems. In the case of semi-trailer combinations a driver

connecting the ISO 7638 interface removes the connection from the park socket on the rear of the tractor and connects this to the trailer. Following this practice with two park sockets will result in the trailer ABS/EBS not being powered or relying on stop lamp power. As an alternative the flexible cable could be part of the automatic connection and manual connection if an ISO 7638 socket was placed on the chassis of the tractor adjacent to the automatic coupling. However care would need to be taken or a CAN router used to ensure the maximum length of the cable which carries the data communications is not exceeded.

Additionally with the current arrangement proposed for semi-trailers operating in mixed mode requires the cable from the automatic connector to the trailer headboard to have some flexibility as it must have the capability of being connected to the normal ISO 7638 socket and would therefore require a park socket when the conventional ISO 7638 connection is being used,

**5. Installation requirements**

**5.1. The electric control line according to ISO 11992-1 and 11992-2 between the brake ECU (electronic control unit) on the towing vehicle and the towed vehicle has to be point-to-point to ensure an explicit and unequivocal correlation.**

**Comment:** This is already stated within the Regulation and the addition of paragraph 5.1.6 to the Regulation makes it unnecessary for the requirement to be redefined.

**5.2. Vehicles capable of mixed mode operation**

**5.2.1. The basic installation on mixed mode capable vehicles shall be equal to a non-ACV vehicle. Leaving the middle section i.e. what corresponds to the helix cable for proration in the ACV-installation. In this proration 3m maximum is allowed on the towing vehicle and 4 m maximum on the towed vehicle.**

**Comment:** It would be more appropriate to define the respective cable lengths in the Appendix for the different operating modes then there can be no misinterpretation of what is required.

**5.2.2. [In order to realize alternative point-to-point routings inline ISO 7638:~~1997~~ 2003 connectors may be used. Only one route shall be active.]**

**Comment:** This obviously only applies to vehicles with data communications and does not apply to vehicles with only ABS. Ideally a common approach is preferable but it must be foolproof and not reliant on the operator making the right connections. This is not clear from the diagrams in Appendix 1

~~**5.3. [Active connections shall not have any bypasses or dead ends.]**~~

**5.4. Vehicles only capable of ACV operation**

**5.4.1. The cable length on the towing vehicle is maximum 18 m while the maximum cable length on the towed vehicle is 22 m.**

**Comment:** It would be more appropriate to define the respective cable lengths in the Appendix.

**5.5. ~~For installations having only two cable sections (i.e. that are not capable to run in mixed mode), the length of the middle cable section (according to ISO 11992-1) may shall be prorated to the two remaining cable sections such that the length of the cable section on the towing vehicle is maximum 18 meter and that the length of the cable section on the towed vehicle is maximum 22 meter.~~ The cable sections shall be arranged such that ~~as long as~~ the electrical specifications according to ISO 11992-1 are met.**

**Comment:** ISO 11992 should not be used to specify cable cross sections as this standard is only applicable to vehicles with data communications. However this topic has already been address under paragraph 3.3 above.

**5.6. [Vehicles shall in general at the most have one singular socket at each end of the vehicle realizing the brake electric/electronic interface. ]**

**Comment:** This would be preferable – see comments associated with paragraph 4.2 above.

**5.6.1. [Vehicles having more than one mechanical coupling e.g. one fifth wheel and one drawbar coupling shall by any of the alternative couplings comply with the requirement of ISO 11992-1 and ISO 11992-2 for point-to-point interface.]**

**Comment:** This is a general requirement not specific to the automatic connector and is not currently specified within the Regulation. Therefore if it is necessary to ensure point to point with no open circuits then the requirement should be included in the base Regulation and not this Annex.

**5.6.2. [Vehicles having more than one socket realizing the brake electric/electronic interface installed at any one end shall have means to exclude (See fifth wheel example in Appendix 1 of this Annex) that more than one socket realizing the brake electric/electronic from being active at one given moment in time. Such an installation is accepted as being one singular socket. A CAN-router is accepted as an alternative solution.]**

**5.7. Response time**

**5.7.1.** **A vehicle equipped with an automated or automatic connector only shall ~~in all modes of operation comply with the provisions~~ fulfill the relevant requirements of Annex 6 ~~of~~ to this Regulation.**

**5.7.2.** **A vehicle equipped with an automated or automatic connector and manual connections shall fulfill the relevant requirements of Annex 6 to this Regulation for both connections**

**Comment:** New procedure required in Annex 6 but the respective response times would remain unchanged.

**Comment**: Automatic Brake – requirements exist in the event of a break in the supply line – see paragraphs 5.2.1.18.3, 5.2.1.18.4 and 5.2.1.18.5. These requirement must continue to be fulfilled irrespective of the method of connection of the pneumatic lines

6. **The embodiment of the brake electric/electronic interface:**

6.1. **[A vehicle intended to be part of a vehicle combination where the engaging/disengaging of the mechanical, the electrical and the pneumatic connections are implemented as part~~s~~ of an automatic process ~~shall have a~~ the brake electric/electronic interface shall be ~~that is~~ part of a fully integrated ~~electrical~~ electro pneumatic connector.**

6.1.1. **This electro pneumatic connector shall fulfill the relevant requirements of Regulation 13 and this Annex ~~22~~.**

6.1.2. **The driver's manual shall contain information associated with the coupling and uncoupling process as well as the functionality of the respective electric and pneumatic connections within the connector.**

6.1.3. **The pneumatic connection between towing and towed vehicle shall be handled through the same automatic process ~~mechanism~~ as the brake electric/electronic interface.**

**Comment**: This is already covered by paragraph 6.1

Appendix 1

FIFTH WHEEL EXAMPLE OF ELECTRICAL LAYOUT OF AUTOMATED CONNECTIONS BETWEEN VEHICLES (ACV)

## I. FULLY ACV EQUIPPED

**Comment**: The diagram below only illustrates vehicles which are equipped with both automatic and manual connections. A new diagram should added which defines automatic connection only.

Electrical control line point-to-point in manual and ACV mode

### *ACV mode*

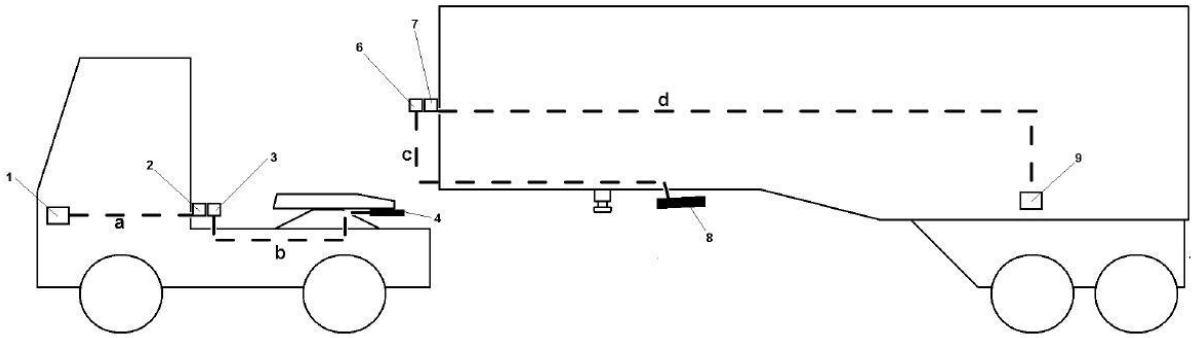


**Figure A: Point-to-point connection ECU Tractor (1) and ECU Trailer (9) when Fifth Wheel is closed**

**ACV mode: No helix cables installed, Connection between 3 and 6 when 4 and 8 are connected (i.e. fifth wheel coupled)**

### Key

1 ISO 11992-2 node on the towing vehicle, i.e. ECU ABS/EBS
2 Bottom connector for helix cable, mounted on towing vehicle
3 Connector socket to the ACV on towing vehicle acc. to ISO7638
4 Towing vehicle-side of the brake electric/electronic and pneumatic interface embodiment
5 Helix cable
6 Connector socket from the ACV on the towed vehicle acc. to ISO7638
7 Towed vehicle-sided connector for helix cable
8 Towed vehicle-side of the brake electric/electronic and pneumatic interface embodiment
9 ISO 11992-2 node on the towed vehicle, i.e. ECU ABS/EBS
a Cable harness from 1 to 2
b Cable harness from 3 to 4
c Cable harness from 8 to 6
d Cable harness from 7 to 9

### *Manual mode*

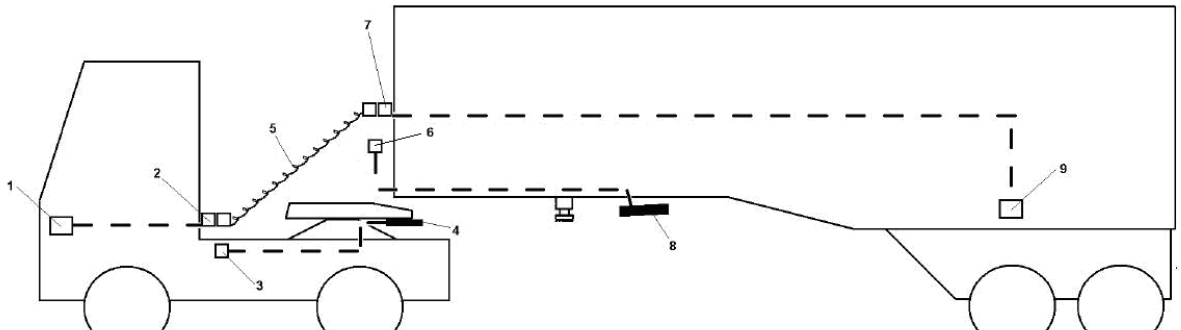

**Figure B: Point-to-point connection ECU Tractor (1) and ECU Trailer (9) when Fifth Wheel is closed**

**Manual mode: Helix cables installed, Connection between 3 and 6 as 4 and 8 are not connected**

**II. PARTLY ACV EQUIPPED**

***Manual mode A (only the truck ACV equipped)***

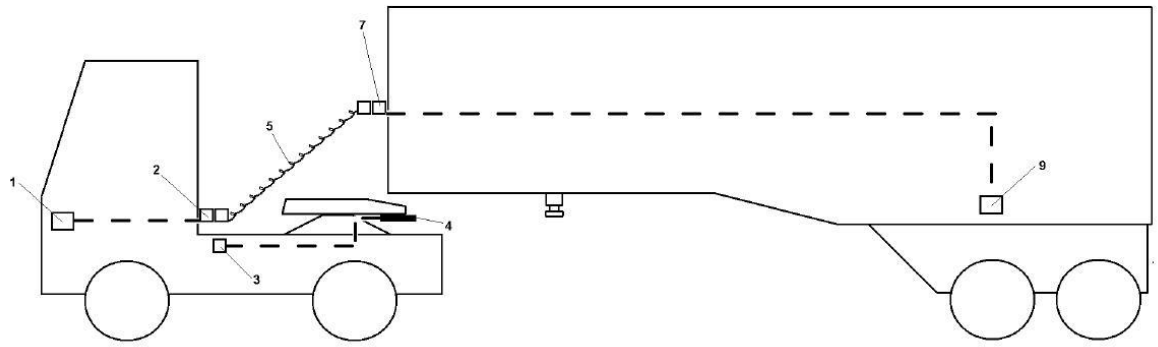


**Figure C: Point-to-point connection ECU Tractor (1) and ECU Trailer (9) when Fifth Wheel is closed**

**Helix cables installed, Line 3 to 4 is not connected**

***Manual mode B (only the trailer ACV equipped)***

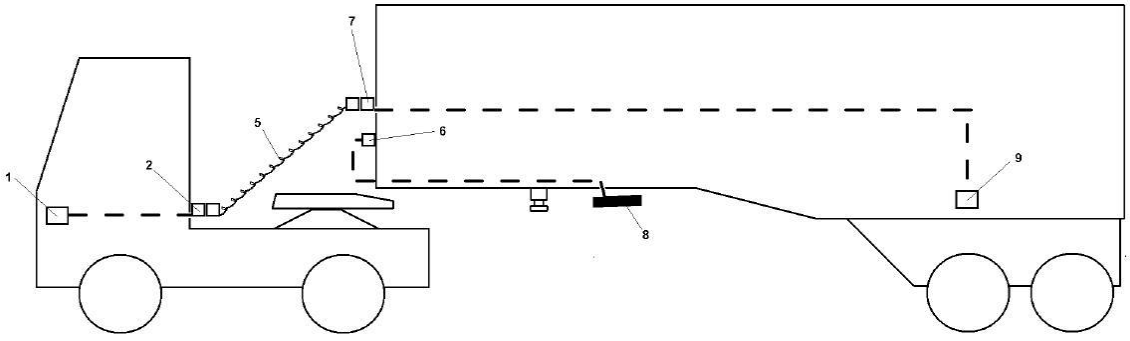


**Figure D: Point-to-point connection ECU Tractor (1) and ECU Trailer (9) when Fifth Wheel is closed**

**Helix cables installed, Line 6 to 8 is not connected**