

Proposal for amendments to Regulation No. 13, Annex 12 Clarification/Simplification

The text reproduced below was prepared by the experts from France and Germany to simplify the verification of sufficient movement on the balancer without having to take measurements underneath the trailer in an potentially unsecured position.

The modifications to the existing text are marked in **bold** for new or strikethrough for deleted characters.

I. Proposal

Annex 12,

Paragraph 2.2.18., amend to read:

"2.2.18. s': effective (useful) travel of control in millimetres, determined as required by paragraph **10.4.** of this annex;"

Paragraphs 2.3.10 and 2.3.11., shall be deleted.

Paragraph 2.3.12. (former), amend to read and renumber:

"2.3.10 s_{cd} Differential travel at compensator, **of which the balancer is capable to provide due to geometric and constructive relations** ~~when only one brake operates in the forward direction and the other in reverse direction~~

~~Where $s_{cd} = s_{ef} - s_{e'}$ (see Figure 5A of appendix 1)"~~

Footnote 1, shall be deleted.

Paragraph 8.1.2., amend to read:

"8.1.2. Drawing details are to be provided to demonstrate that the compensator articulation is sufficient to ensure equal cable tension is applied to each of the rear cables. The compensator needs to have sufficient distance across the width to facilitate the differential travels left to right. The jaws of the yokes also need to be deep enough relative to their width to make sure that they do not prevent articulation when the compensator is at an angle.

Differential travel at compensator (s_{cd}) shall be derived from:

$$S_{cd} \geq 1.2 \cdot (S_{ef} - S_{e'})$$

$$S_{cd} \geq 1.2 \cdot S_r$$

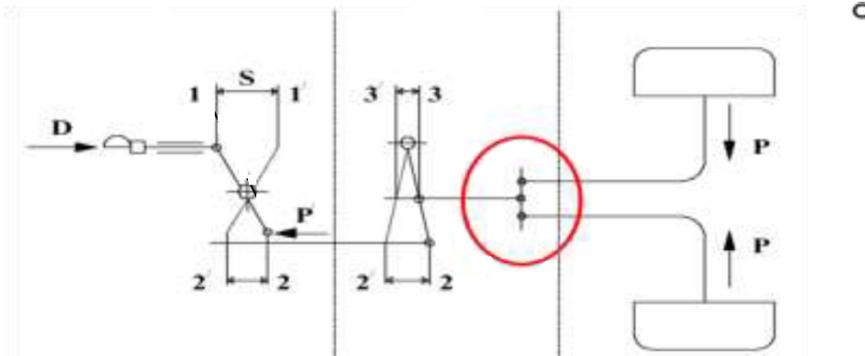
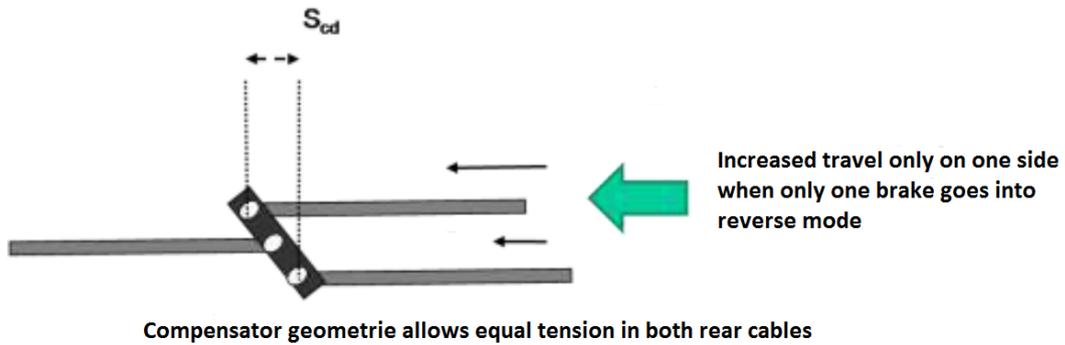
~~Where:~~

~~$S_{e'} = S_r / i_H$ (travel at compensator forward operation) and $S_{e'} = 2 \cdot S_B / i_g$~~

~~$S_{ef} = S_r / i_H$ (travel at compensator reward operation)"~~

Annex 12 - Appendix 1 Figure 5A, amend to read:

Figure 5A
Mechanical-transmission braking system
 (See paragraph 2.3. of this annex)



Annex 12, Appendix 4,

Paragraphs 6.1.1. to 6.1.3., shall be deleted

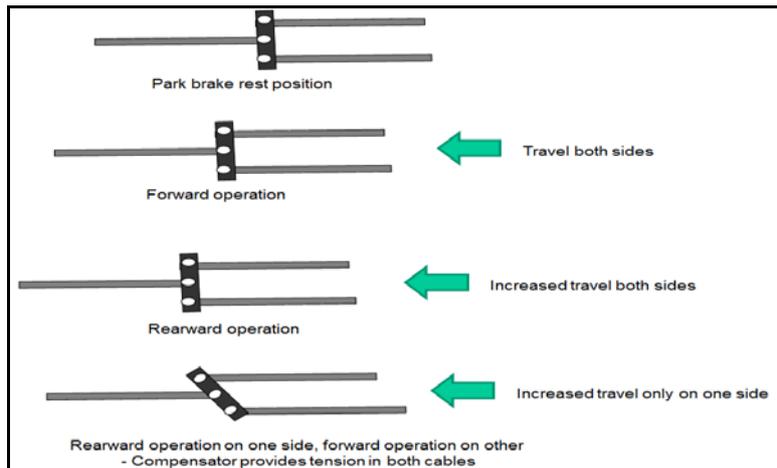
Insert new paragraphs 6.1.1. and 6.1.2., to read:

"6.1.1 Minimum possible differential compensator travel $s_{cd} =$ mm

6.1.2 Ratio 1.2 * $s_R =$ mm
 (shall not be greater than s_{cd})"

II. Justification

In Annex 12, para. 2.2.18 the reference will be corrected: definition for s ' is given in para. 10.4, not in para. 9.4.



Picture 1: different status of the balancer during brake actuation.

1. Service braking forwards direction: The intention of the so-called balancer is the compensation of differences in the adjustment and wear at the wheel brakes, so that both brakes of one axle are always actuated with the same force.

2. Parking brake forwards direction

In forwards direction also the parking brake is in balance due to the arrangement explained in 1 above

3. Rearwards direction The inertia control cannot distinguish, if the trailer is overrunning because of its inertia mass or if the control device is pushed in, because the towing vehicle is pushing the trailer in rearwards direction. Therefore when starting rearward going first the brakes are actuated, the linings are pressed to the brake drum rotating rearwards.

When the brake-shoes get in contact with the drum, they are generating a reverse braking moment.

As soon the reverse brake torque is higher than the rearwards switching point of the wheel brake, the brakes are switching to rearwards giving a supplement dead- travel to the brake rod. The sum of the normal travel in forward direction plus the supplement dead travel is more than the overrunning unit can generate being fully pushed in to the hard stop.

Now the trailer can be pushed backwards with a maximum remaining brake torque of 8% of $m \cdot G$.

4. Parking brake rearwards In case of actuating the parking brake the brakes are actuated via rods and bowden cables creating a torque in rearwards direction. As explained in 3. the supplement dead- travel is created from the switching point on.

This dead- travel instead must be compensated to hold the trailer on a slope in both directions.

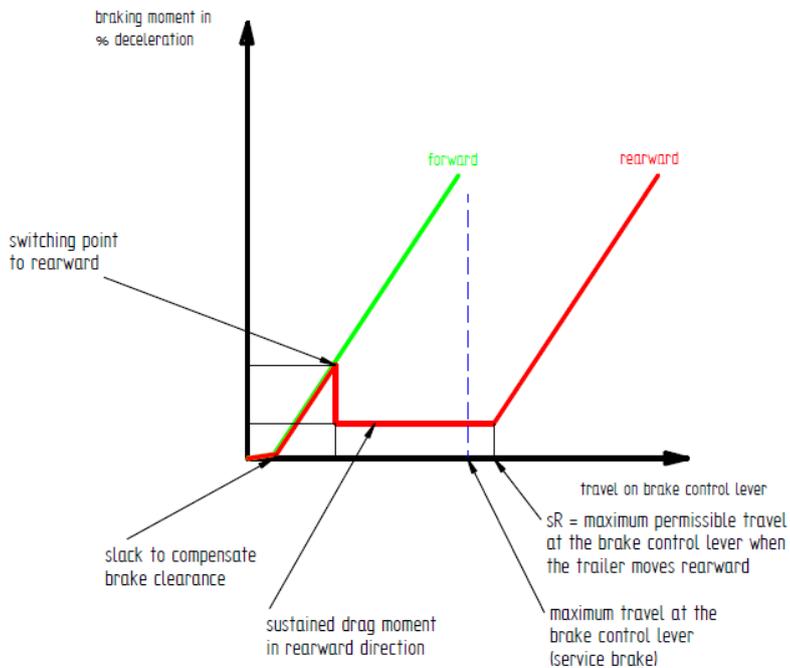
This is normally done by a pre-tensioned spring/damper, which is able to create longer actuating strokes than for the service brake is needed as minimum value in order to perform until its maximum brake torque

The brake torque increases linear to the actuating force at the hand brake lever.

See Picture 1 at the right side of the s_r -point.

If both, the left and the right side wheel brake are in the same direction status either forwards or backwards the balancer has to compensate small strokes, only because of the wear or adjustment of the brakes.

Schematic draft of the travel at the brake control lever on wheel-brakes with automatic reversing (ECE R13, Anh. 12)



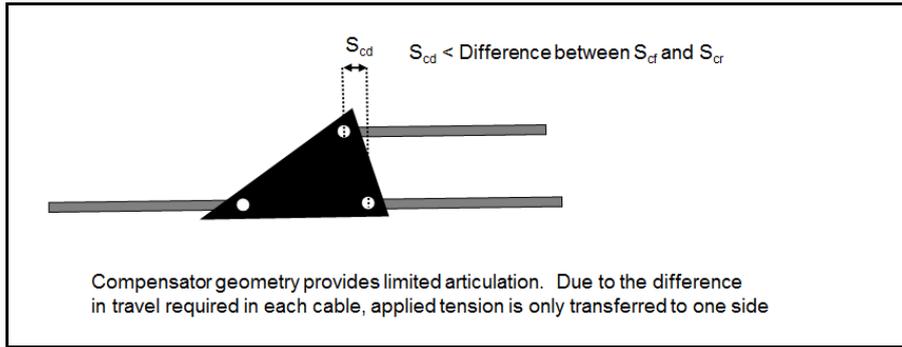
Picture 2: inertia brake, scheme of travels at the wheel brakes (sR shall name sr)

5. special case on parking brake with wheel brakes at different direction status
Initial accident for the amendment of Regulation No. 13 regarding the balancer was a fatal accident in UK.

The trailer was parked on a street with ascending slope near an open sewer. According to MIRA research at the beginning both brakes have been in forward direction (see picture 1).

Any downhill force turning the trailer to one side, this brake switched to backward (by passing the switching point and adding the dead-travel of this brake / side). The other brake remained in forwards braked direction.

Due to unsuitable geometry of the balancer (a triangle, see picture 3) the transmission rate between left hand and right hand side was changed and only the forwards brake was actuated. The trailer turned around the braked wheel and killed a man under the trailer standing in the open sewer.



Picture 3: unsuitable geometry of the balancer – in extreme, the whole actuating force (left rope) is transmitted into the lower rope / left hand side brake. The right hand brake is unbraked because of long travel

6. ECE R13 situation since serie 11, supplement 5 due to UK proposal (ECE/TRANS/WP29/GRRF/2010/5)

- (a) Assurance of constant distribution of forces and travel between left and right side, all rope fixings shall be in one line.
- (b) Assurance of articulation of the balancer, so that also the maximum difference in travel between the brakes can be compensated also in the case of the special case described in 5.

7. French proposal (ECE/TRANS/WP.29/GRRF/2016/26)

In the French proposal the minimum required compensation travel of the balancer is related to s_r , which is given in the brake laboratory test report according Annex 12, Appendix 3. So there is no need to take measurements under the trailer.

8. This proposal

The general idea of both documents has been picked-up in this paper.

As explained above the problem is the trailer in parking position getting a lateral push. One brake is still braked, so no need to refer to the s_B -Value.

The presented proposal from France and Germany underlines the requirements given in 6.

On the other hand in the actual Regulation No. 13 the required measurement of s_{cf} and s_{cr} is not practicable and potentially dangerous as the technical service has to review the trailer from underneath. The measurement method is not described, difficult and open to many interpretations. It should be possible to verify the requirements by simple comparison of the trailer with drawing and by calculation.