



RACHEL MICHAUD

Trailer response timing and harmonisation with European legislation

to the homologation requirements of UNECE R13. Locally manufactured North American vehicles will comply with ADR 35 and are mostly tested locally in Australia. The majority of trailers built in Australia utilise the timing and performance tests dictated in ADR 38/05. Pneumatic brake timing is a key requirement for a trailer brake control system and must be measured for every unique circuit and submitted to the Federal Authority (Department of Infrastructure) for approval. This response time is key to ensure that the driver's brake demand is received quickly enough by the trailer brakes to be effective in combination braking and provide sufficient braking performance. So what is sufficient brake timing? Around 15 years ago, when ADR 38 Revision 2 was the latest local requirement, the air signal at the front coupling of the trailer had to reach the rear-most wheelend or actuator by no less than 0.35 seconds. The time measurement is taken from when the air pressure has built to at least 420kPa at the brake actuator and this 'sufficient'

timing was based on the UNECE R13 requirement at the time. When Antilock Braking System (ABS) braking modules and later Trailer Electronic Braking System (TEBS) modules entered global markets, it was realised that 0.35 seconds was too short a time frame for the modules to achieve. ADR 38 was then revised to Revision 3 to extend the response time requirement from 0.35 seconds to 0.4 seconds. This was deemed sufficient by the market at the time. Figure 1 shows a commonly used TEBS electro-pneumatic brake valve. To date, the latest ADR 38 (Rev 5) requires that all trailer pneumatic circuits still meet the 0.4 second time frame. However with TEBS now being mandated on most heavy trailers since 2019, it is becoming increasingly difficult for manufacturers to meet this timing requirement for some special purpose trailers that are often longer and/or wider. Often in testing, these circuits time anywhere from 0.41 – 0.6 seconds and beyond depending on the complexity of the control line and length of the service hoses.

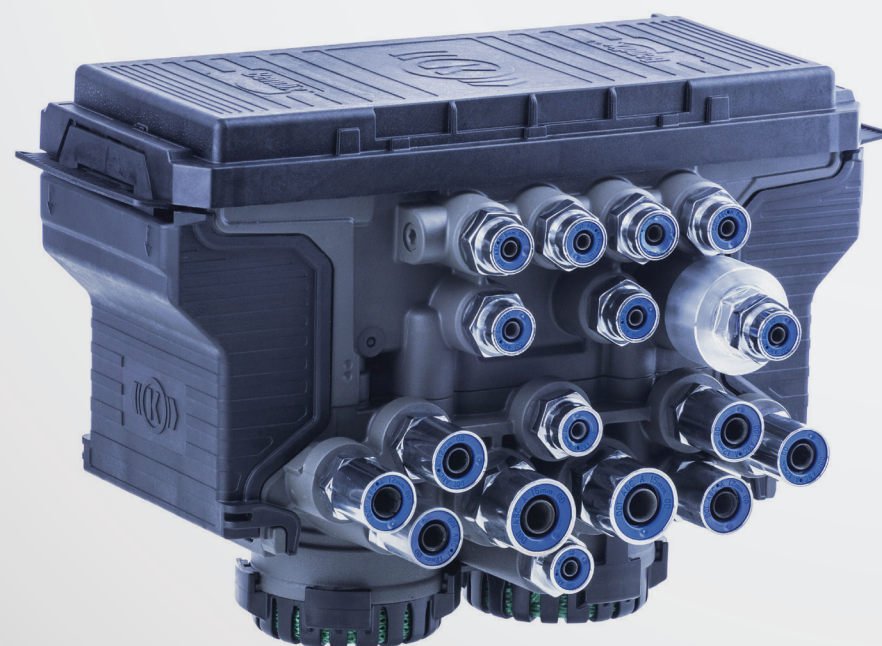


Figure 1: A commonly used Trailer Electronic Braking System (TEBS) valve.

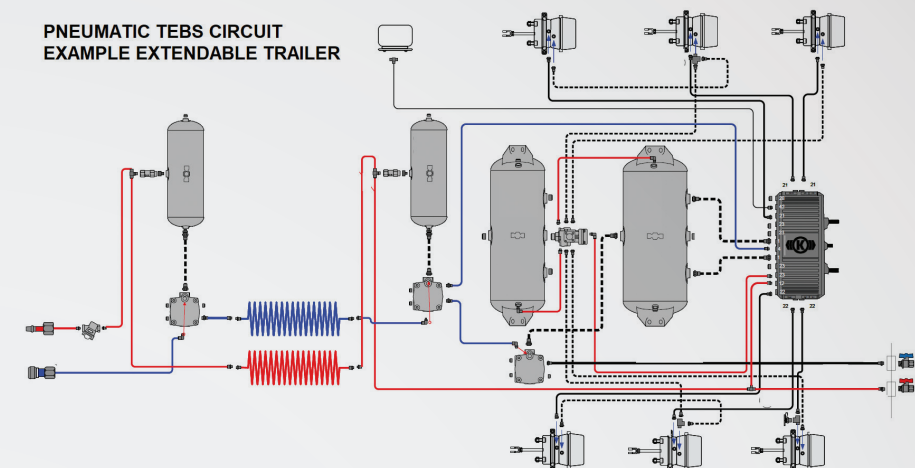


Figure 2: Air timing limit must be met at the 'least-favoured' service brake actuator.

Operators are motivated to fit TEBS to special trailers to benefit from the 'intelligent' capabilities of the modules, which improves their combination brake timing and compatibility. TEBS trailers, when towed by vehicles with electronic brake signal capability can actually meet application timing as quick as 0.15 seconds for a simple triaxle semi trailer circuit. However, for ADR 38 response time compliance the legal requirement is to meet the pneumatic only timing ignoring the electronic timing capability. Neither the UNECE R13 nor ADR 38 rules allow for electronic timing to be used for compliance submission in place of the pneumatic timing. Trailers in this category that do not meet the pneumatic response timing need to be granted a non-standard trailer approval. This results in an additional cost and paperwork penalty for the manufacturer, despite having fitted the TEBS to access improved electronic brake timing. The air timing limit is illustrated in Figure 2.

Currently imported trailers to Australia have the option of complying with the UNECE R13 or ADR braking regulation. This includes the brake timing requirement which is consistent at 0.4 seconds. According to our European colleagues, apparently not. The actual wording for UNECE R13 from Annex 6 is the below:

3.5. Performance requirements

3.5.1. For trailers with a pneumatic control line the time elapsing between the moment when the pressure produced in the control line by the simulator

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reaches 65 kPa and the moment when the pressure in the brake actuator of the trailer reaches 75 per cent of its asymptotic value shall not exceed 0.4 second. There is then a general condition given as per Annex 6, which many in Australia may not be aware of: Annex 6. 1.3. The response times determined in accordance with the provisions of this annex shall be rounded to the nearest tenth of a second. If the figure representing the hundredth is five or more, the response time shall be rounded up to the next higher tenth.

Given this, the UNECE timing requirement listed as 0.4 seconds is in fact 0.449 seconds. Adoption of this interpretation by the Australian regulator would be helpful. The additional 0.049 s may not sound like much of a difference, but when it comes to brake circuit response timing,

would bring much relief to Australian OEMs undergoing compliance testing for Control System Component Type Approvals (CTAs). Consistently, circuits will test at 0.42 seconds, meaning that modifications are needed to get the control line response to be below the 0.40 second requirement. Given that for the past ten years it has been technically acceptable for trailers to be imported from Europe with 0.449sec response timing, could our own ADR 38 be easily updated to reflect the same provision and harmonise with UNECE R13?

Ideally there would also be an alternative approval route for long and wide combinations to submit higher pneumatic timing ie. <0.6s under the provision that the electronic brake timing was <0.4s and additional measures were taken to confirm the TEBS unit was powered and functioning at all times without faults impacting the electronic brake signal efficacy. A simple large warning sticker on the front bulk head paired with a dual warning light circuit indicating power and fault status could assist. For North American prime movers, a trailer roadtrain module (TRM) or alternative device to transmit a ISO11992-2 compliant electronic control signal must be fitted. Towing Vehicles meeting UNECE R13 will already comply. The indicator light system would provide useful feedback to the driver about the status of the electronic brake communication.

Rachel Michaud,
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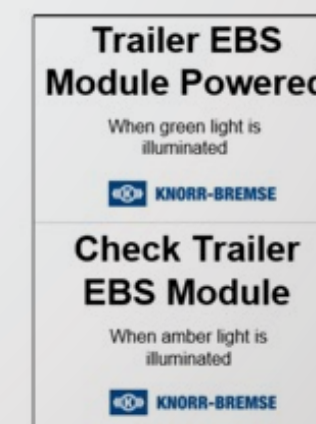


Figure 3: Indicator lights can be installed at the front of the rear trailer to verify TEBS power status.