Combination Compatibility

Combination Compatibility, which is also commonly known as combination braking harmonisation, describes the truck and trailer combination braking characteristics. It is the set-up of the vehicles combinations to ensure that the difference in braking delay times and threshold pressure, between truck and trailer, are kept to an absolute minimum. This is done to ensure road safety and stability during braking and release of brakes with a laden and / or un-laden vehicle combination.

What happens when the combination compatibility is incorrect

1. **Wheel lock-up**
   A locked wheel has a reduced capacity to manage steering, braking and road handling. A combination that has many of its wheels locked in the axle group will more than likely loose directional control. A vehicle with good brake balance (even application of the brakes across the combination) should not exhibit gross wheel lock-up during heavy braking.

2. **Uneven brake wear**
   The threshold is the control level at which the brakes start to work and uneven brake threshold pressures between axles can cause uneven brake wear. During braking, if the brakes on one axle group wear prematurely this is an indication of poor brake balance or poorly adjusted or dragging brakes. Vehicles with poor brake balance will generally develop glazed brake linings and excessive heat build-up. A good brake balance is necessary for even brake wear on a combination as well as good brake feel when the brakes are initially applied. For the same foundation brake setup, using the same linings, the brakes should operate at similar temperatures, within 10°C to 15°C of each other. Drum and disk brake groups have different temperature profiles and changing linings will change the indicative brake operating temperature. For the best brake balance under heavy brake applications, each trailing combination should have an electronically controlled brake distribution function, such as ABS or EBS.

To achieve best performance for the combination

The best braking and stability performance is achieved by the more advanced braking technologies such as Electronic brake system (EBS) with Electronic stability control (ESC) for truck and on trailer, T-EBS. Good results can also be achieved by Anti-lock Braking System (ABS) and reasonable results can be achieved by using Load Sensing Valve (LSV) braking systems on both the truck and trailer. Mixing of different systems on the truck and trailer can be detrimental to the combinations braking and stability performance. Using compatible systems on heavy vehicle combinations will improve the safety and reduce brake wear.

Testing the Combination Compatibility

The truck selection is a key influencing factor along with the trailer running gear selection. Disc brake and Drum brake compatibility are the criteria to be taken in to consideration along with the EBS or ABS selection. There are four different tests that can be performed, depending on what combination is run.

1. Running an ABS truck with EBS trailer

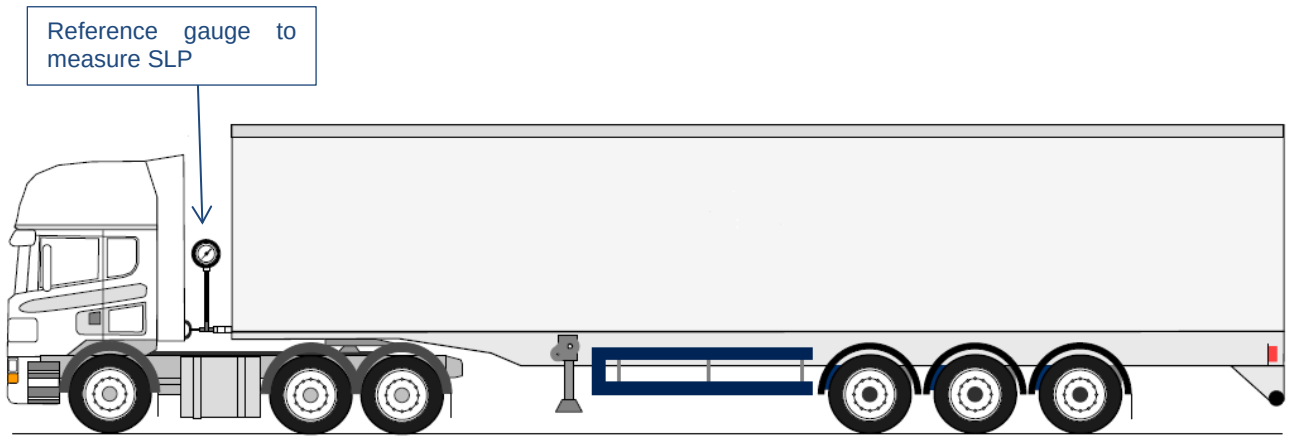
EBS trailers should always be used, whenever possible, in conjunction with EBS truck. However, a combination of an ABS truck with an EBS trailer is possible. In order to have compatible operation, the following needs to be checked:

1. When braking, the service line pressure (SLP) should be the same for laden and un-laden conditions.
2. When having a drum and disc brake combination, the drum SLP is 0.1 to 0.2 bar less than that of the disk brake.

Practical adjustment to the predominance setting of the truck may be required to ensure compliance. It is important that the EBS of the trailer is tailored to meet the brand of running gear fitted.

Threshold inspection for ABS truck and EBS trailer operation

1. Connect a reference gauge at the front coupling of the service line.
2. Lift each wheel of the truck in turn and rotate whilst applying a pressure at the service line using the tractor foot valve.
3. Record the SLP at which braking commences.
4. Refer to the EBS pressure setting data label located on the trailer. Read off the lowest control SLP setting relative to the lowest brake cylinder pressure – trailer EBS brake threshold.
5. Effective braking will occur when the SLP is the same at all wheel positions. Exception is drum and disc combinations.



2. Running an EBS truck with EBS trailer

To encourage balanced braking in a truck and trailer combination, assuming consistent and acceptable performance from all foundation brakes within the combination, the method below should be followed.

Dynamic compatibility checking for EBS truck and EBS trailer operation

1. Ensuring safety is maintained at all times and that all brakes are functioning correctly commence a 10 to 15min road trail.
2. Apply a series of brake applications, consistent with normal operations, in order to ensure adequate heating.
3. Record the number of applications made for future reference.
4. Using a temperature measuring equipment record the temperature values at each wheel brake (on the brake or brake disc).
5. Compare the average temperatures recorded for each axle of the truck against those for the trailer. Homogenous brake types (Disc/Disc or Drum/Drum) should show similarities in temperature. Non-homogenous brake types generally function at different temperatures and may thus require several tests in order to ascertain acceptable operation.
6. If unacceptable temperatures are recorded then the truck EBS control function must be adjusted. This in turn modifies the trailer predominance. A re-test run over the same course will be required to determine the effect.

3. Running an ABS truck with ABS trailer

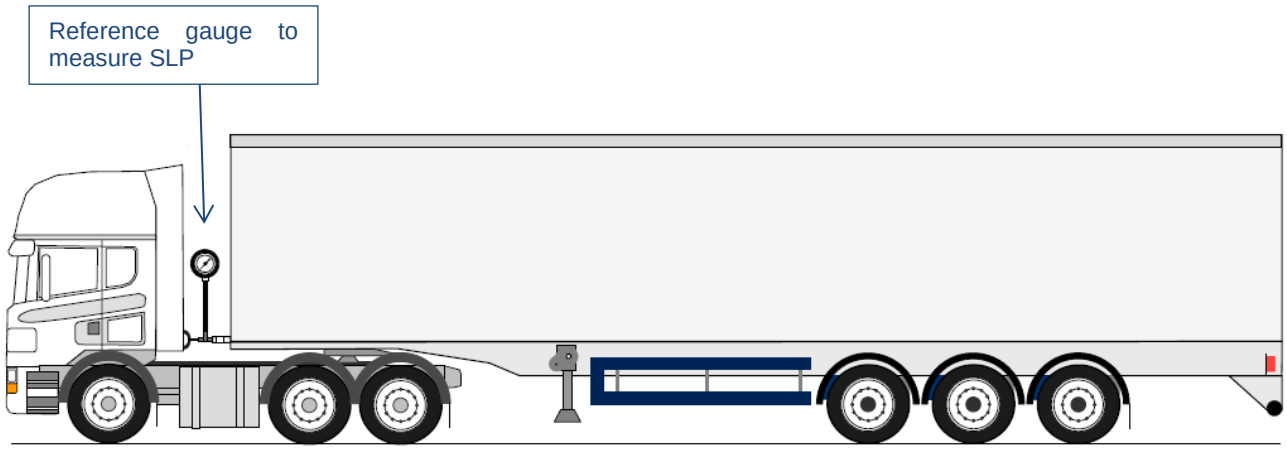
The following method can be followed to ensure balanced braking in a truck and trailer combination, assuming a consistent and acceptable performance from all foundation brakes within the combination. In order to have compatible operation, the following needs to be checked:

1. When braking, the service line pressure (SLP) should be the same for laden and un-laden conditions.
2. When having a drum and disc brake combination, the drum SLP is 0.1 to 0.2 bar less than that of the disk brake.

Practical adjustment to the predominance setting of the truck may be required to ensure compliance. It is important that the EBS of the trailer is tailored to meet the brand of running gear fitted.

Threshold inspection for ABS truck and EBS trailer operation

1. Connect a reference gauge at the front coupling of the service line
2. Lift each wheel of the truck in turn and rotate whilst applying a pressure at the service line using the truck foot valve.
3. Record the SLP at which braking commences.
4. Effective braking will occur when the SLP is the same at all wheel positions. Exception is drum and disc combinations.



4. Running an EBS truck with ABS trailer

Combining a truck which runs EBS to a trailer that runs ABS, the compatibility of the vehicle combination is automatically compromised. The tuck will try to brake in the shortest stopping distance possible and as a result ends up producing the brake force for the whole combination. The slower acting brake system of the trailer has not had the chance to develop sufficient braking force to share the load of the vehicle combination. Practical adjustment to the predominance setting of the truck may be required to ensure compliance. The predominance setting should be between 0.2 and 1.0 bar SLP.

Dynamic compatibility checking for EBS truck and ABS trailer operation

1. Ensuring safety is maintained at all times and that all brakes are functioning correctly commence a 10 to 15min road trail.
2. Apply a series of brake applications, consistent with normal operations, in order to ensure adequate heating.
3. Record the number of applications made for future reference.
4. Using a temperature measuring equipment record the temperature values at each wheel brake (on the brake or brake disc).
5. Compare the average temperatures recorded for each axle of the truck against those for the trailer. Homogenous brake types (Disc/Disc or Drum/Drum) should show similarities in temperature. Non-homogenous brake types generally function at different temperatures and may thus require several tests in order to ascertain acceptable operation.
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