

TECHNICAL ADVISORY PROCEDURE

**SLACK ADJUSTER SETUP AND
NHVIM COMPLIANCE**

EDITION 2 / November 2024

ATA Technical Advisory Procedure

Slack Adjuster Setup and NHVIM Compliance

Edition 2

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This Technical Advisory Procedure (TAP) is published by the Australian Trucking Association Ltd (ATA) to assist the road transport industry in improving heavy vehicle safety.

This TAP is not, nor is it intended to be, complete or without exception.

The TAP is a guide only and its use is entirely voluntary. Recommendations or procedures may not be suitable for, or applicable to all operators. Operators should consider their own circumstances, practices and procedures when using this TAP.

Operators must comply with the Australian Design Rules (ADRs), the Australian Vehicle Standards Regulations, the Roadworthiness Guidelines and any specific information and instructions provided by manufacturers in relation to the vehicle's systems and components.

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Suggestions or comments about this TAP are welcome. Please write to the Industry Technical Council, Australian Trucking Association, 25 National Circuit, Forrest ACT 2603.

About the ATA Industry Technical Council (ITC):

The Industry Technical Council (ITC) is a standing committee of the Australian Trucking Association (ATA). The ITC's mission is to improve trucking equipment, its maintenance and maintenance management. The ITC was established in 1995.

As a group, the ITC provides the ATA with robust professional advice on technical matters to help underpin the ATA's evidence-based policymaking. It is concerned with lifting technical and maintenance standards, improving the operational safety of the heavy vehicle sector, and the development of guidelines and standards for technical matters.

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The ITC operates under the Australian Trucking Association's Council, which formulates industry policy for implementation by the organisation.

We welcome applications to join the ITC. For further information, please call the ATA on (02) 6253 6900 or email ata@truck.net.au or download information from the ATA website www.truck.net.au, follow the links under the members tab to join.

Acknowledgement

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Introduction

This Technical Advisory Procedure (TAP) was published by the Australian Trucking Association Ltd (ATA) to assist the road transport industry with an understanding of the adjustment for slack adjusters in association with the National Heavy Vehicle Inspection Manual (NHVIM).

It is not, nor is it intended to be, complete or without exceptions.

The NHVR's National Heavy Vehicle Inspection Manual (NHVIM) has been enhanced since the first edition of this TAP was published in September 2016. As a result, this TAP has moved towards awareness and checking adjustment. The mandating **automatic** slack adjusters has meant slack adjusters too often have their routine visual inspection skipped. However, their mechanisms can become jammed with road debris or from component strike events and may not perform their intended function. Check with your axle supplier for requirements of routine inspection and checks for automatic slack adjusters.

Note

- Slack adjusters are only used with drum brake system and the issues detailed in this TAP, won't apply to disc brake systems.

ADR35/04 - commercial motor vehicle brake systems, mandatory as of 1 January 2015, requires ABS braking on every heavy commercial vehicle as the minimum requirement.

4.1.4. Each 'Service Brake System must incorporate devices which compensate for any increased movement of its components arising from wear. Such devices must themselves contain provision for securing them throughout their working range in any position to which they may be adjusted to or to which they may themselves automatically adjust.

ADR35/06 Truck Braking was mandatory from 1 January 2022 for all category MD, ME, NB and NC vehicles.

5.1.4. The 'Service Brake System' must incorporate devices, which automatically compensate for any increased movement of its components arising from wear. Such devices must themselves contain provision for securing them throughout their working range in any position to which they adjust.

5.1.5. Category MD4, ME, NB or NC vehicles, with not more than four axles, must be equipped with an 'Antilock System'.

Trailers followed similarly via ADR38.

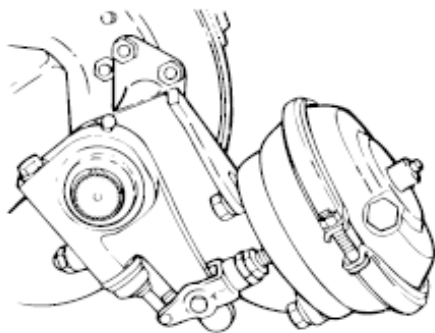


Figure 1: Brake equipment

1. Definitions

ADR [Australian Design Rules 3rd Edition](#)

Brake actuator Equivalent interchangeable terms – brake chamber, actuator, or booster.

NHVIM [NH VR's National Heavy Vehicle Inspection Manual \(NHVIM\)](#).

Slack adjuster Refer to figure 2 below. Slack adjusters take many shapes and forms to work around other wheel end componentry. Their arms can be offset and at a range of angles



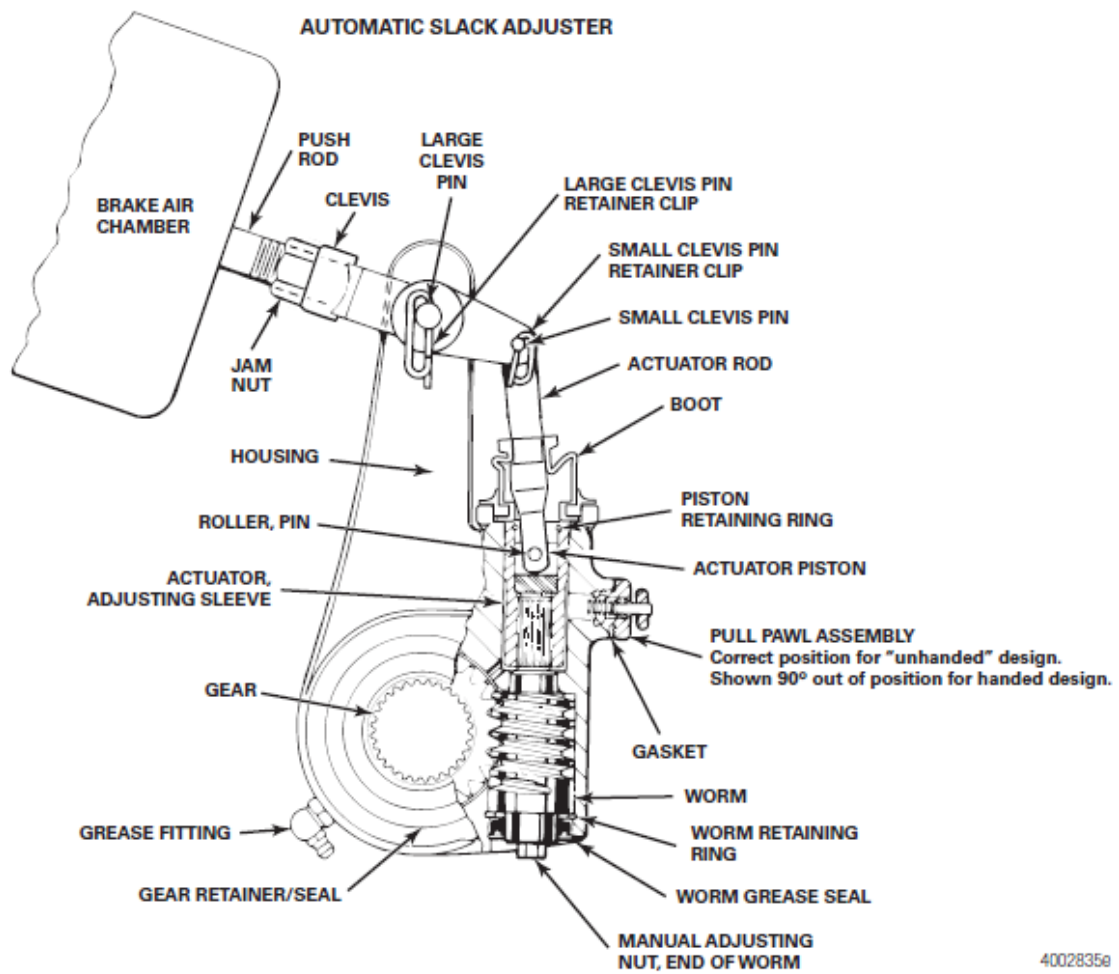
Figure 2: Slack adjuster examples

Source BPW Transpec

For further definitions and terms refer to [ATA's ITC Dictionary \[LINK\]](#)

Components an automatic slack adjuster

Cutaway View



4002835e

Figure 3: Section of an automatic slack adjuster in the retracted position.

Source Meritor

2. The NVHIM, Version 3, Section 2 - Brake Adjustment

The NVHIM notes the following regarding defecting a brake system due to adjustment and potential for over stroking.

2.2. Check brake adjustment

Reasons for rejection

- With any brake fully applied, a brake adjustment indicator runs out of travel or indicates that adjustment is necessary
- Brake chamber push or pull rods move more than the brake component manufacturers recommendation or where this is unavailable, 80% of their maximum stroke when the brakes are fully applied

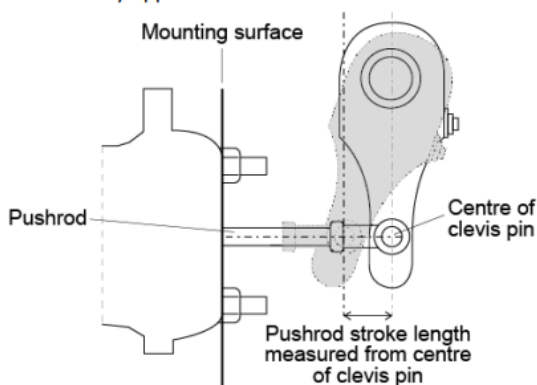


Figure 2.2

Measuring stroke length

Figure 4: NHVIM Section 2.2 Check Brake Adjustment – part 1

⚠ The push or pull rod may travel further on long stroke brake chambers. Further information on long stroke brake chambers can be sought from the brake component manufacturers or industry advisory documents

- With any brake fully applied, any stroke indicator displays evidence of excessive stroke (known as over-stroking)

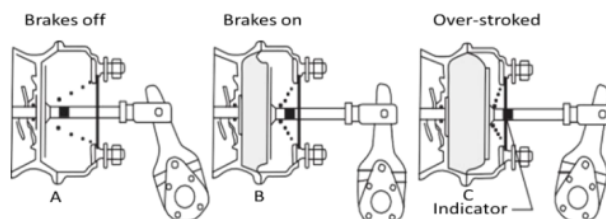


Figure 2.3 Example of excessive stroke/over-stroking

⚠ Not all push and pull rods will have a stroke indicator.

Not all automatic slack adjusters which travel past 90 degrees are considered over-stroked.

Further information on slack adjusters can be sought from the brake component manufacturers or industry advisory documents.

- The park brake and/or emergency brake is not capable of being fully applied without the control running out of available travel
- The brake adjusters are bent, damaged or excessively worn, or are not properly adjusted.

Figure 5: NHVIM Section 2.2 Check Brake Adjustment – part 2

The brake actuator’s push rod may not have an “over-stroke” indicator mark and the compliance of the slack adjuster to push rod angle could be misinterpreted. Additionally, the increasing use of longer stroke brake actuators can also add to the confusion as to what is 80% of its travel and correctly identifying the stroke of a particular actuator. Automatic slack adjuster suppliers have confirmed that may need to travel past the optimum 90 degree angle for maximum brake force before they adjust up.

3. Longer Stroke Brake Actuator Identification

Over recent years longer stroke brake actuators have become standard on a range of truck models. These actuators are not always easily identifiable and they don't all have the same stroke. A mismatch of actuators may lead to brake imbalance issue across an axle, particularly during a Roller Brake Testing. Refer to the applicable TAP for the detailed roller brake testing procedure. Component suppliers always recommend fitting matching actuators and other componentry.

Warning

Ensure components are identical across an axle and, optimally, within an axle group.

Identify long stroke brake actuators by two of the following methods
(Refer to SAE J1817 for details) :-

- Trapezoidal shaped tag with the stroke information detailed (figure 6)
- Square boss around the actuator's air supply port or ports (figure 7)
- Embossed or cast-in service instruction advising actuator details (figure 8)

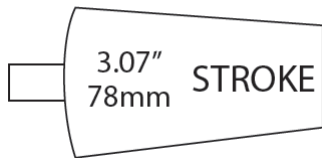


Figure 6: Reference tag

Source: Haldex



Figure 7: Boss shape

Haldex



Figure 8: Body marking

BPW Transpec

4. Actuator Stroke and Adjustment Lengths

Long stroke brake actuators are available in 3 classes or bands, based on their increase in stroke from the standard rated brake actuator stroke.

	Class I	Class II	Class III	
An actuator having a stroke of	6.4 to 12.4 mm	12.7 to 18.8 mm	19 mm	greater than standard rated stroke
	0.25 to 0.49"	0.50 to 0.74"	0.75"	

Table 1: Long stroke actuator classes

Refer to SAE J1817 for details

Table 2 lists the SAE recommendation for both the stroke length and maximum adjustment limit for brake actuators.

Actuator type or Size	Standard stroke brake actuators		Long stroke brake actuators													
			Class I Std. + 0.25" (6.4 mm)*				Class II Std. + 0.50" (12.7 mm)*				Class III Std. + 0.75" (19.0 mm)*					
	Standard Rate Stroke		Brake adjustment limit		Standard Rate Stroke		Brake adjustment limit		Standard Rate Stroke		Brake adjustment limit		Standard Rate Stroke		Brake adjustment limit	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
9	1.75	44.5	1.38	35.1	2.00	50.8	1.50	38.1								
12																
16	2.25	57.2	1.75	44.5	2.50	63.5	2.00	50.8	2.75	69.9	2.25	57.2	3.00 76.2 2.50 63.5			
20																
24	2.50	63.5	2.00	50.8	2.75	69.9	2.25	57.2	3.00	76.5	2.50	63.5				
30																
35	3.00	76.2	2.25	57.2	3.25	82.6	2.62	2.62	3.50	88.9	2.75	69.9				

Table 2: Recommended brake actuator stroke and adjustment limit

Refer to SAE J1817 for details

Note

“*” Nominal increase in stroke over the standard actuator. See table 1 for the increase in stroke range for each class of longer stroke brake actuator.

- Imperial dimensions are primarily used as the reference standard is the US SAE. Metric dimensions conversions are based on 1” = 25.4 mm, rounded to the nearest 1/10 (tenth) mm.
- Table 2 above indicates minimum design stroke of a actuator, so the actual stroke could be more and the actuator would still comply with the class.

5. Identification of Stroke on the Brake Actuator End Cap

If there is no tag detailing stroke reference information (refer to figure 9), the actuator may be embossed with the reference for the rated stroke as either an alpha character or measurement mark in the highlight location indicated below. Refer to table 2 for details.



Figure 9: Rated stroke marking location for all spring brake actuator

Source Bendix

Rated stroke marking	Actuator rated stroke		Brake adjustment limit	
	Imperial	Metric	Imperial	Metric
A	1.50"	38.1 mm	1.25"	31.8 mm
B	1.75"	44.5 mm	1.38"	35.1 mm
C	2.00"	50.8 mm	1.50"	38.1 mm
D	2.25"	57.2 mm	1.75"	44.5 mm
E	2.50"	63.5 mm	2.00"	50.8 mm
F	3.00"	76.2 mm	2.50"	64.5 mm
G	3.25"	82.6 mm	2.62"	66.5 mm
H	3.50"	88.9 mm	2.75"	69.9 mm
X.XX	other		X.XX"	XX mm

Table 3: Rated stroke located on brake actuator end cup

Refer to SAE J2899 for details.

Note

- Imperial dimensions are primarily used as the reference standard in the US SAE. Metric dimensions conversions are based on 1" = 25.4 mm, rounded to the nearest 1/10 (tenth) mm.

6. Stroke Length Based on Actuator Band Diameter

Alternatively, if none of the previous methodologies can be applied, table 4 can be used to interpret the stroke length for standard brake actuator from the service band clamp diameter.

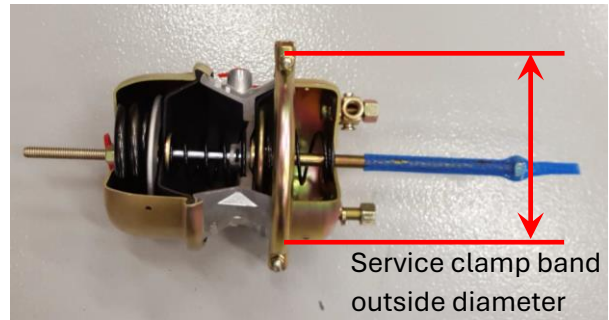


Figure 10: Brake actuator service band

Standard type S-Cam actuators	Stroke length for a standard rated stroke		Actuator service clamp band outside diameter	
	” / inch	mm	± 0.20	± 5mm
9	1.75	44.5	5.38	137
12			5.81	148
16	2.25	57.2	6.50	165
20			6.91	176
24	2.50	63.5	7.34	186
30			8.22	209
36	3.00	76.2	9.13	232

Table 4: Brake actuator defining dimensions

7. Correct Mounting of Actuators with Slack Adjusters

After adjustment, if the pushrod is cocked either up or down (see figure 11), the pushrod should not bind when the brakes have been applied.

If the pushrod is binding due to misalignment, check if the actuator was mounted in the proper mounting holes and that the proper slack adjuster arm length is being used. Different manufacturers have different mounting brackets. If the misalignment cannot be corrected, consult the foundation brake supplier for verification of the correct mounting position.

Incorrect pushrod length can also cause misalignment.

The angle between the pushrod and slack adjuster when either the park brake is applied or full brake pedal application has been achieved (550-620 kPa brake system air pressure), should ideally be $90^\circ \pm 5^\circ$.

The application of this tolerance has negligible impact on the brake system performance with 99.6% of the available force still available. Refer to figure 11.

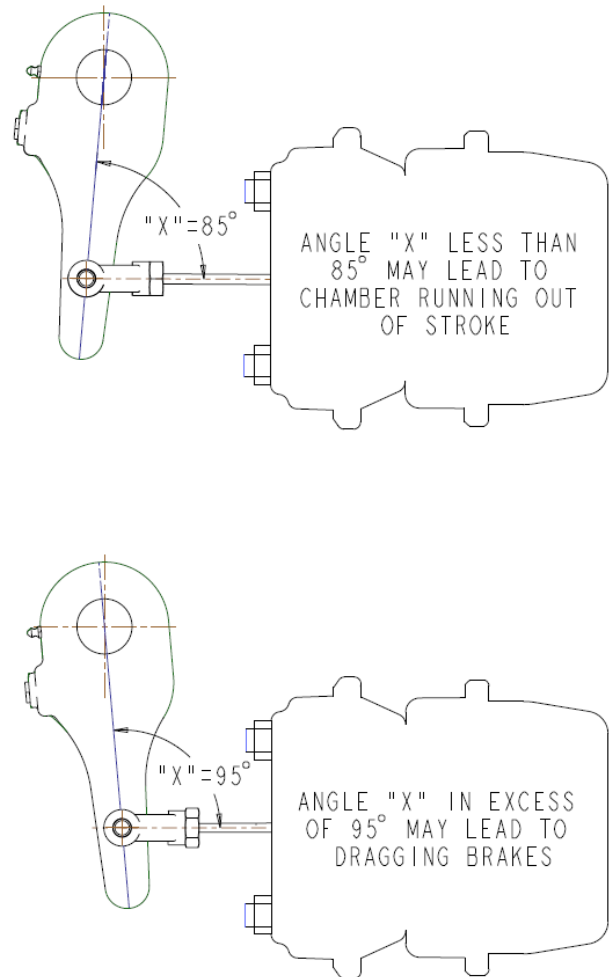


Figure 11: Alignment of actuator and slack adjuster

Source Meritor.

Slack adjusters often have a range of holes to suit different mounting situation. These may zig zag along the arm of the adjuster and as a result, the selected mounting hole may not align with the centre line of the slack adjuster arm. It is important to check against the right reference points.

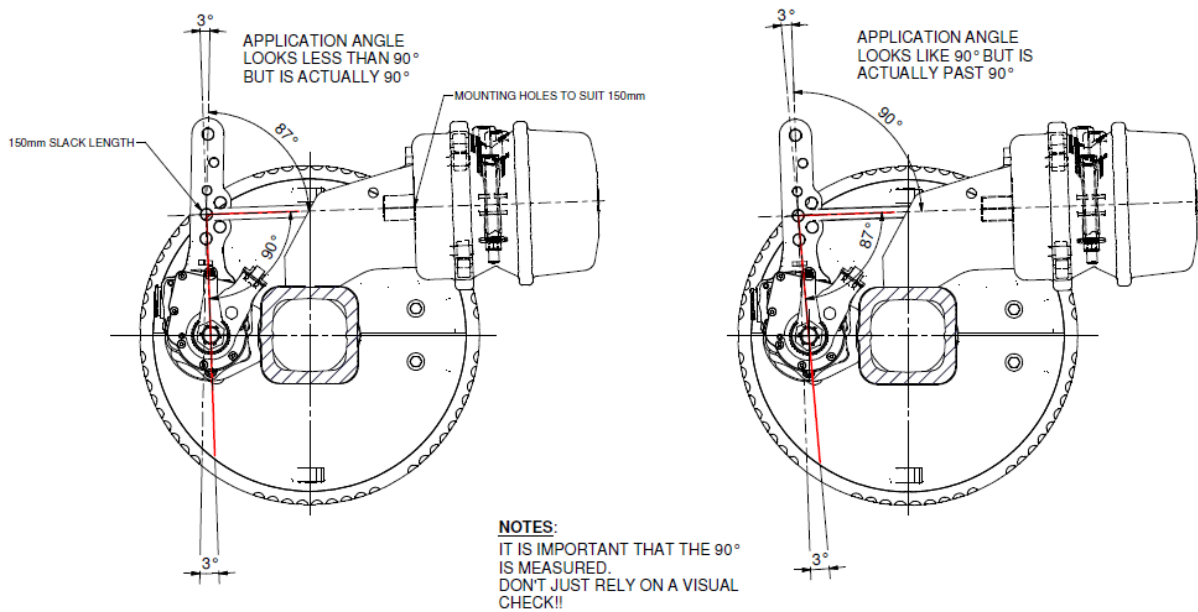


Figure 12: Slack adjuster mounting holes offset to the centre line of its arm

Source BPW Transpec

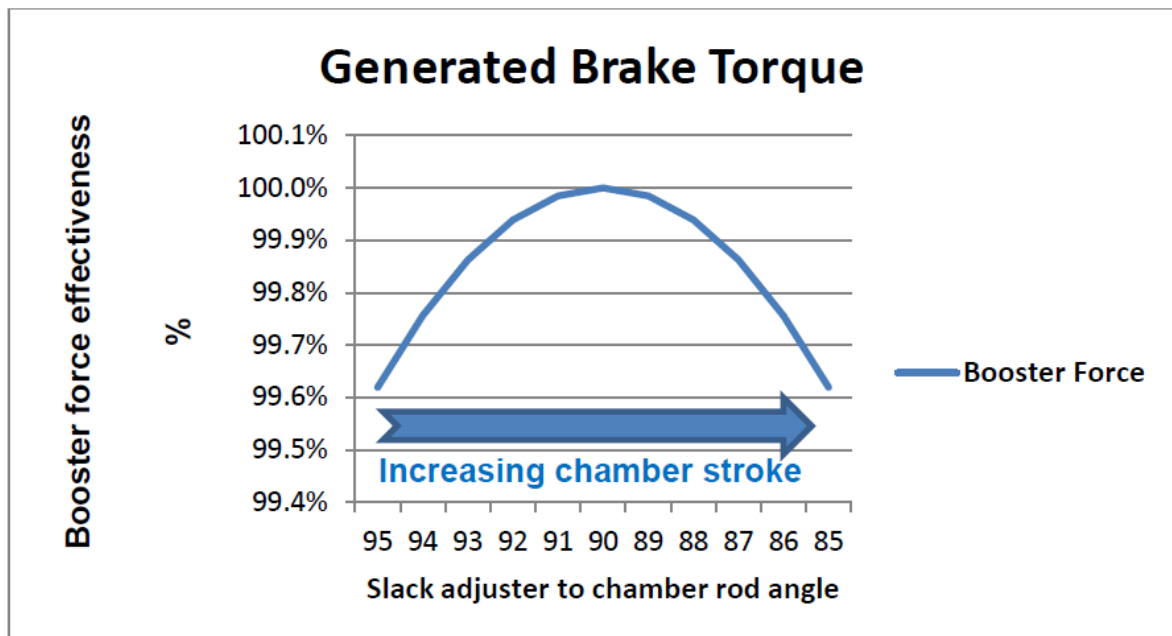


Figure 13: Brake booster applied force versus its angle to the slack adjuster

As the brake linings wear the actuator stroke will increase. For new linings it is best to set the brakes to 95°, which allows them to bed in, and in doing so the brake force will increase as the stroke increases with lining wear. It should be noted that the brake force reduces after 90° and the brakes may need to be more closely monitored.

8. Stroke Checking Tool

The Meritor Simple Check tool is a simple and easily used tool available in a range of shaft sizes. Other suppliers will have a similar tool.

Install it when the brakes are released onto the push-rod hard against the actuator. Apply the brakes to measure the travel distance. In the case of Meritor actuators/actuator, if the disc moves past the end of brake actuator mounting studs after the brakes have been operated, investigate further.

Warning

During this test, truck/combination should be parked on level ground with wheels chocked to prevent the unit from rolling.



Figure 14: SimpleCheck tool actuator stroke checking tool

Source Meritor



Figure 15: SimpleCheck tool in position on the push-rod of the brake actuator with the brakes applied

Source Meritor

9. Templates and Guides - Examples

- Simple fabricated slack adjuster length checking. With a pointed M10 screw added, the guide can check the slack adjuster length.
- Meritor automatic slack adjuster checking tool - example This tool can check slack adjuster length and adjustment.
- Push rod / slack adjuster angle template Simple template can be cut out or folded to provide a very basic guide to the angle for the actuator’s push rod to slack adjuster. Optimally, it is 90° when the brakes are applied.

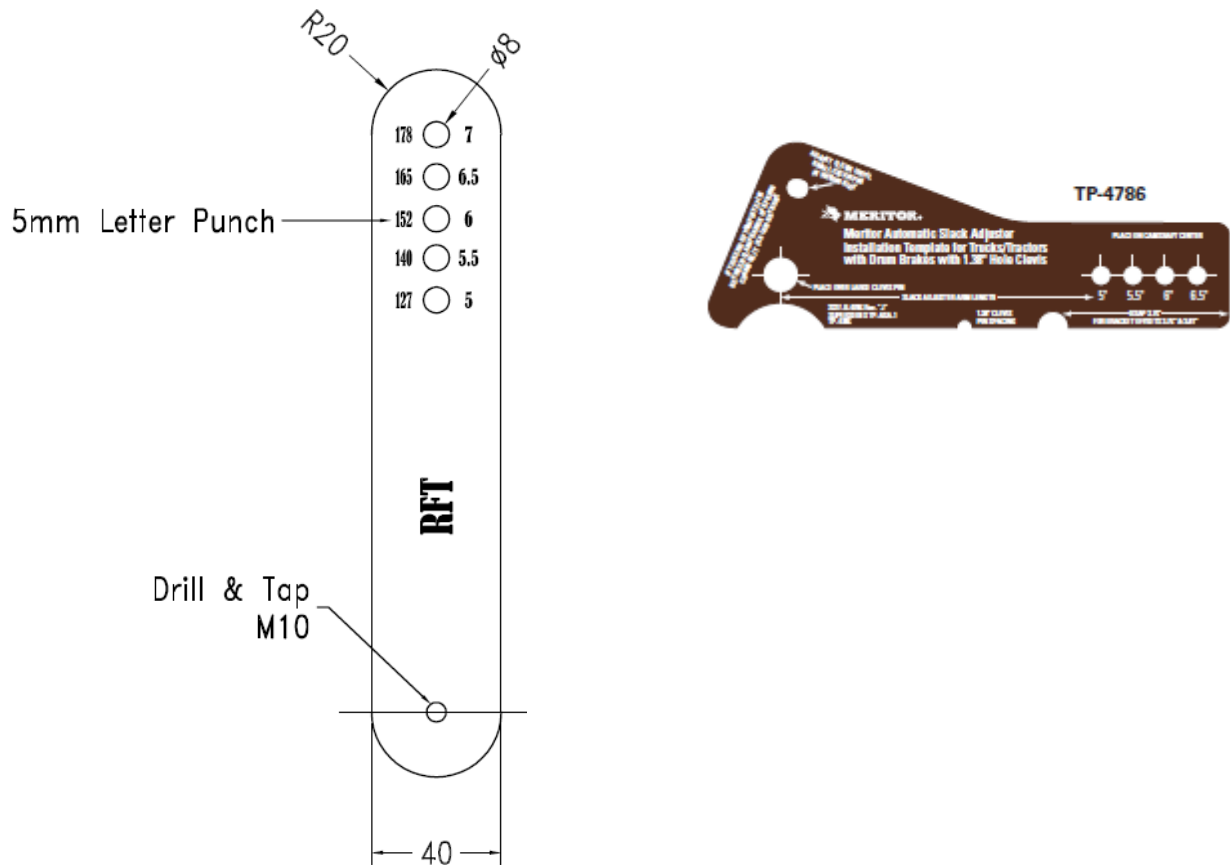


Figure 16: Adjustment and checking tools

10. Links - Service, Maintenance, and Correct Setup

There are a range of suppliers of both manual and automatic slack adjusters, all with unique designs and methods of function. As a result, it is not possible to provide a generic set of adjustment guidelines. All slack adjusters (manual and automatic adjustment) will require regular and routine service and maintenance to ensure the brakes are operating correctly. Please contact the supplier for installation requirements and service/maintenance requirements or click on the links below. These instructions must be followed.

General information

www.bpwtranspec.com.au



Specific supplier information

Gunite slack adjusters

www.accuridewheelendsolutions.com



www.haldex.com



www.knorr-bremse.com.au



www.meritor.com



Figure 17: Links to automatic slack adjuster supplier service/maintenance documentation

Note

Links may not operate correctly if the supplier changes the documents' location or updates the name. If this occurs, search within their website.

11. SAE Standards for Slack Adjusters

Slack adjusters are often seen as a commodity with the lowest priced option being fitted. However, there has been concern that inferior quality components are available in the Australian market don't live up to operator expectation for durability and operational life. A reputable supplier or brand will be able to provide compliance to the applicable following standards listed below.

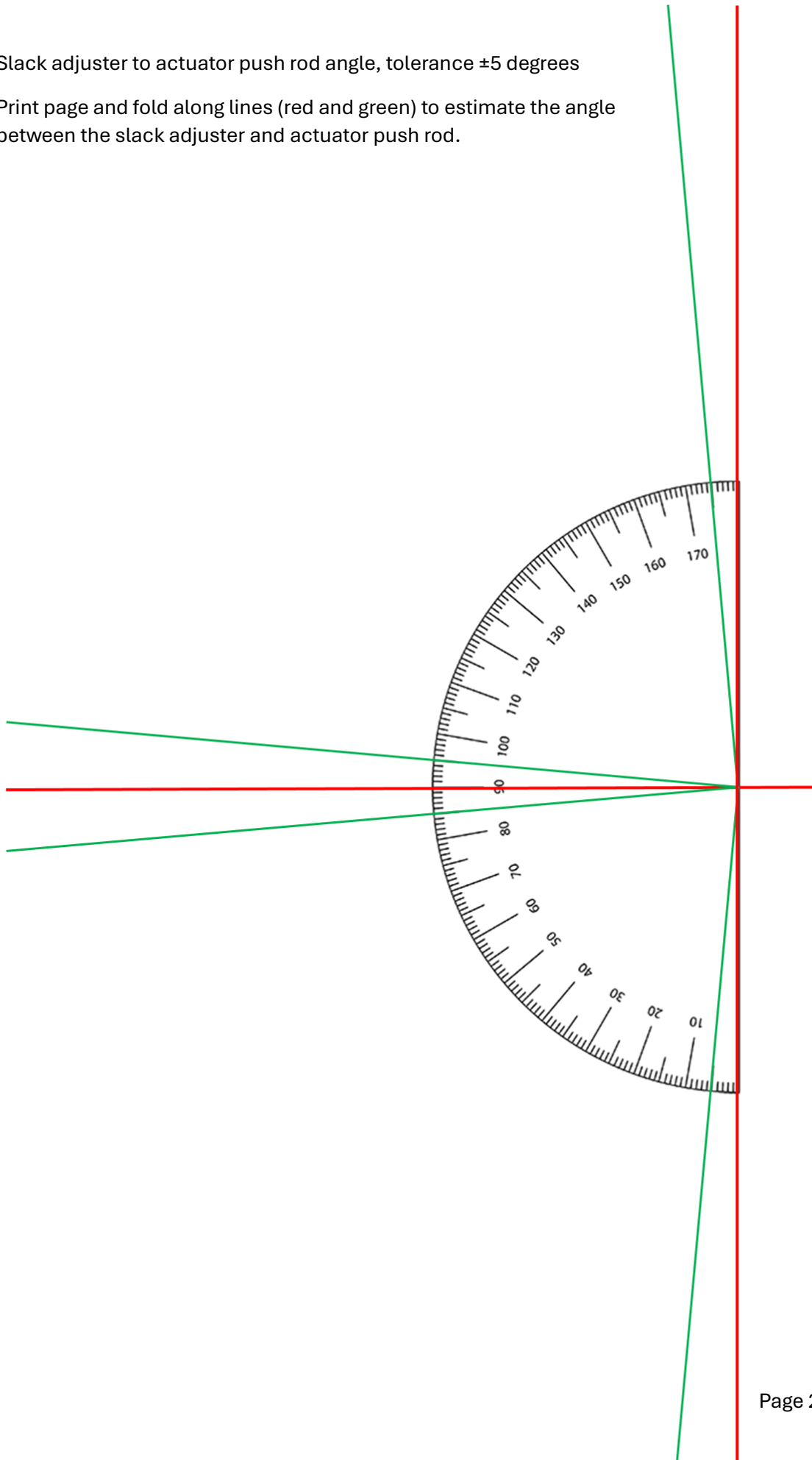
SAE Standard	Title
SAE J1512	Manual slack adjuster performance requirements
SAE J1461	External automatic slack adjuster test procedure
SAE J1513	Manual slack adjuster performance requirements
SAE J1462	External automatic slack adjuster test procedure

Table 5: Standards applicable for slack adjusters

Appendix A - Simple Adjustment Template

Slack adjuster to actuator push rod angle, tolerance ± 5 degrees

Print page and fold along lines (red and green) to estimate the angle between the slack adjuster and actuator push rod.



Appendix B - Comparison of ADR and UN Vehicle Categories

Vehicle Category	ADR Category Code	UN Category Code
Medium Goods Vehicle Over 3.5tonnes up to 12.0tonnes GVM Over 4.5tonnes up to 12.0tonnes GVM	NB NB2	N2
Heavy Goods Vehicle A goods vehicle with a ‘ <i>Gross Vehicle Mass</i> ’ exceeding 12.0tonnes.	NC	N3
Medium Trailer A trailer with a ‘ <i>Gross Trailer Mass</i> ’ exceeding 3.5tonnes but not exceeding 10.0tonnes	TC	O3
Heavy Trailer A trailer with a ‘ <i>Gross Trailer Mas</i> ’ exceeding 10.0tonnes	TD	O4

Table 6: Vehicle certification categories

Note

The source for the definitions is the [ADR Definitions and Vehicle Categories](#).

Drafting

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