Technical Information

In Detail

TEXTAR®

Ansgar Trepper
Car mechanic
Richter GmbH
Bodywork, Mechanical Systems
and Paintshop
Leverkusen, Germany

“We fit TEXTAR!”

I don‘t accept that there should be any compromising, especially when it comes to spare parts. My customers expect the best and we make sure they get it. This is the reason why most automobile producers chose to use TEXTAR brake liners on their production models.

TEXTAR ServiceLine
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TEXTAR®

Technical Information

TEXTAR – in Detail

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Dear valued business associate,

This brochure offers you a comprehensive reference work dedicated to the field of brakes and brake liners.

Apart from containing a multitude of technical details and the latest legal regulations, our brochure provides answers and solutions you may find valuable in your daily business activities. It also includes information on preventive brake systems maintenance and servicing, from which your company as well as your customers will surely benefit.

We will, of course, continue to keep you informed on any technical modifications and legislative amendments in the interest of the comprehensiveness of this reference work.

To request more detailed information, please contact our technical sales promotion department. We would appreciate any complementary annotations you may wish to add to this document, making it a more and more indispensable work of reference.

Your partner in safety
TEXTAR Bremsbeläge

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Technical Information
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Content

Content

Background

1913 - 1934

BBA Group Plc of London founds the Cologne-based company TEXTAR as its distribution organisation for brake liners.

TEXTAR starts the production of drum brake linings, brake belts and clutch facings in Leverkusen under the brandname of TEXTAR.

1948 - 1960

Re-start of deliveries to the German automotive industry.

The legendary „Silver Arrows“ go from success to success with TEXTAR in car racing. Upswing of export activities. Toward the end of the decade: Introduction of the disc brake.

1961 - 1970

TEXTAR is the first friction materials manufacturer in Germany to supply series-produced disc brake pads to the OE market. Worldwide activities in the aftermarket.

Establishment of a new production facility at Hamm/Sieg (1962). Leverkusen is more and more becoming the central production site for disc brake pads.

1971 - 1983

The development of a new brake liner generation begins.

TEXTAR is again acting as forerunner in Europe as the first series supplier of the new generation of brake pads to the European automotive and brake industry.

1984 - 1993

TEXTAR in France. The French automotive industry is now supplied direct from Creutzwald.

The plants in Spain, France and Germany team up to forge the European production and development association TEXTAR.

The first step toward internationalisation: establishment of the Dublin/Virginia production site in the U.S.A.

1994 - 1999

Initial restructurings throughout the TEXTAR group:

The TEXTAR Improvement Process (TIP) is founded.
All TEXTAR plants are certified to DIN EN ISO 9001.

The “Hercules” project, a disc brake pad production system, introduces large-scale-series pad production.

Start-up of the “BEST” line production project for drum brake linings at Hamm/Sieg.

The “Phönix” line production of disc brake pads for commercial vehicles is also initialised at the Hamm/Sieg site.

Certification to QS 9000 for the plants in Leverkusen, Hamm/Sieg, France and Spain.

With disc brake pads for passenger cars and commercial vehicles the brandname TEXTAR is now market leader in Europe.

Background

2000

On the way to become a global player: Opening of the TMD Friction production site in China, supplying the Chinese brake and automotive industries as well as the Asian aftermarket.

By way of a management buyout, the newly founded TMD Friction has taken over the friction division of BBA Group Plc on its own account.

The new TMD Friction group is worldwide active with production sites in Germany, Great Britain, France, Spain, Sweden, the U.S.A. and China.

2001

TMD Friction takes over the friction liner sector RÜTGERS Automotive AG in Essen. Apart from our current trademarks the product range will now include the trademarks PAGID and COSID.

TÜV CERT

ZERTIFIKAT

Die TÜV CERT-Zertifizierungsstelle
der TÜV Anlagentechnik GmbH

bescheinigt gemäß
TÜV CERT-Verfahren, dass das Unternehmen

TMD Friction Beteiligungs GmbH & Co KG

für den Geltungsbereich

Konstruktion, Entwicklung, Herstellung und Vertrieb von Reibbelägen

ein Qualitätsmanagementsystem eingeführt hat und anwendet.

DIN EN ISO 9001:1994 und der ISO/TS 16949:1999

erfüllt sind.

Dieses Zertifikat ist gültig bis 14. Dezember 2003.

TÜV

TÜV Rheinland
Berlin Brandenburg

Certifications

QS-9000

ISO 14001

ISO/TS 16949

Requirements on brake liners

As stated in the TEXTAR-published book „Brake Linings for Road Vehicles“:

Friction lining formulations are always a compromise between desirable and actually achievable properties.

The objective when designing a brake liner is, therefore, to find an acceptable compromise between customer requirements and production technology, a task requiring experience as well as a fine instinct.

It is easy to understand that a friction material formulation, once developed, becomes one of the manufacturer´s best-guarded secrets.

No secret, on the other hand, is the “stuff” from which friction materials are made. It can be composed of the following raw materials: bonding agents (in the form of rubber and resin), organic and inorganic fillers (e.g. chalk and iron oxide), lubricants (of graphite or coke powder) and metals (in the form of steel wool or powder).

Therefore, the actual brake liner material comprises different additives and the matrix with up to 25 components.

Everything could be done much simpler, of course. With 30% steel wool, 55% petroleum coke and 15% bonding resin, that is only 3 components, it is possible to produce a liner with a high friction coefficient, though unfortunately with no comfort at all.

Comfort can only be achieved by complex calculations aimed at finding the ideal formula. This requires a high degree of expert knowledge.
The practical aspects as well, i.e. mixing, moulding and curing, demand considerable know-how. Uniform distribution and compacting of all raw materials during the mixing and moulding processes also affect the properties of a liner significantly.

Friction materials manufacturers are no less secretive about the selection of mixers and mixing sequences.

Requirements on brake liners

Below several criteria are listed which are of great significance in the brake liner production:

For safety

01. Bedding properties
02. Cold friction coefficient
03. Speed friction coefficient
04. Friction coefficient under temperature load
05. Friction coefficient after temperature load
06. Friction coefficient under wet conditions
07. Friction coefficient under the effects of thawing salt
08. Friction coefficient under pressure
09. Static friction coefficient
10. Friction coefficient while reversing
11. Growth and shrinkage
12. Compressibility
13. Heat transfer
14. Strength (cracks, tearing)
15. Flammability
16. Corrosion resistance
17. Bending strength

For comfort

18. Noise
19. Vehicle vibrations
20. Pedal feel
21. Smell
22. Smoke development
23. Operating force
24. Wheel fouling
25. Environmental pollution by abrasive wear

For economic efficiency

26. Liner wear
27. Counter-material wear
28. Weight
29. Production cost

Safety part brake liner

Brake liners are structural parts of a brake and already play a part in the calculation of the braking power included with the factor µ (friction coefficient). The counter-material is generally grey cast iron which has to meet the applicable standards.

Brake liners are available with a variety of different friction coefficients. Depending on the material, they behave differently under respective conditions (e.g. drum temperature, sliding speed, contact pressures, etc.).

Different friction coefficients will lead to different brake performances.

The design calculation for vehicle brakes includes axle loads as well as friction coefficients.

Another decisive factor influencing the braking power is, of course, the self-reinforcement of a brake. The higher the self-reinforcement of a brake, the bigger the effect of the friction coefficient variations. While the self-reinforcement of drum brake linings varies according to design type, this effect is much less pronounced in disc brake pads.

Therefore, only tested and type-approved brake liners may be installed.

Brake liner approval under German traffic law

Approval procedure

The brake liner is an essential structural part of a brake system and as such safety part of a vehicle. They are subject to legal regulations and require approval under the traffic law.

Vehicles to be registered for the first time require a GENERAL CERTIFICATION (ALLGEMEINE BETRIEBSERLAUBNIS - ABE) according to §20, StVZO, which is granted to the vehicle manufacturer by the Federal Office for Motor Traffic (Kraftfahrt-Bundesamt - KBA). This is preceded by obtaining a type approval from a Technical Control Association (TÜV), which verifies compliance with all legal requirements for the particular vehicle type. The tested brake liners mentioned in the type approval report are thereby approved for application in vehicles of the type in question.

Vehicles produced in small quantities are homologated individually according to §21 StVZO. For this purpose they have to be presented to a TÜV test agency for verification. The tests are based on the same regulations as for a type approval test. The liner type installed during acceptance procedures is approved for that particular vehicle.

Brake liner replacement

Brake liners needing replacement after a certain service period of a vehicle may not be replaced by just any liners fitting the brake. §19, para. 2, StVZO states that the homologation of a vehicle will expire if certain parts are modified or if unhomologated replacement parts are used. Brake liners in particular are parts requiring official approval.

If original replacement parts (OE) of the vehicle manufacturer are used, the homologation of a specific vehicle will remain in force because these parts have been approved.

Original brake liners are identified with the brand name of the vehicle manufacturer and in general also with their type designations. Original replacement liners do not generally carry an official testing or approval number.

When in doubt whether a certain brake liner has been approved as original spare part for a vehicle, the vehicle manufacturer or the TÜV agency should be asked for information.
Approved brake liners are not mentioned in the vehicle title.

Brake liner approval under German traffic law

Approval of brake liners by part homologation

An alternative possibility for obtaining brake liner approval is offered by § 22 StVZO. The manufacturer may obtain a homologation for a brake liner (with specification of friction material and measurements) to be used in specific vehicles. To this effect, the TÜV testing agency will perform tests based on the same regulations applying to vehicle type tests. In other words, the replacement liners must meet the same safety requirements as the original liners.

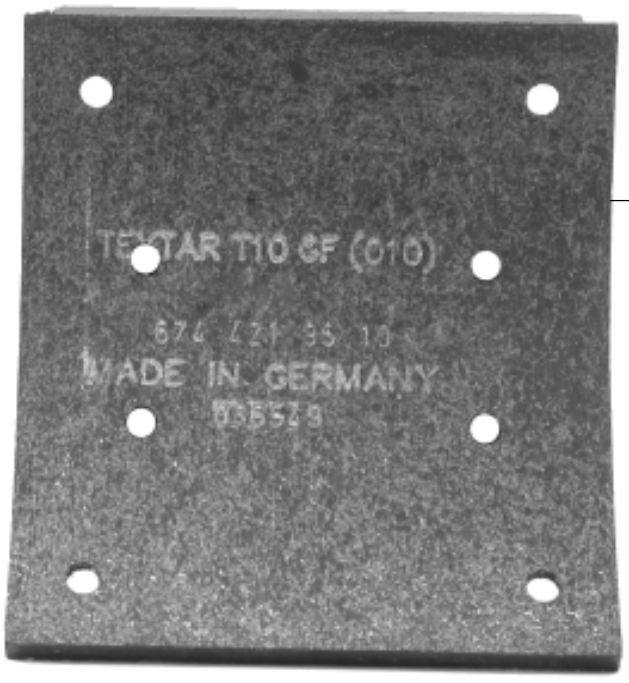
Brake liners with part homologation are identified as follows:

- Name or trademark of the liner manufacturer
- Type (designation of friction material)
- Liner number (generally the so-called WVA no.)
- Type mark (KBA no.(Federal Office for Motor Traffic))

Disc brake pads are marked (printed or embossed) on their backplates, drum brake linings on their edges and/or backsides.

The packaging contains a mention for which vehicle types a liner has been approved.
The product label contains mounting instructions which must be precisely adhered to, especially when the fitting is done by non-professionals.

Brake liners are safety parts and should only be installed by persons with respective special knowledge.



Brake liner approval under German traffic law

TEXTAR

Information on part homologation of replacement brake liners to ECE Regulation No. 90

ECE Regulation No. 90 was drafted by an ECE working team and officially published in the autumn of 1992.

This regulation covers the exchange of disc brake pads and complete shoes in vehicles up to 3.5 t (including light trucks and trailers).

ECE Regulations are recognised on a voluntary basis by the user states, i.e. EU and other European states (e.g. Eastern Europe), and implemented into national law.

Basically, this regulation is comparable with our previous KBA approvals to §22 StVZO. Both, ECE approval and KBA number, provide a legal protection of customer and supplier with regard to the respective liners.

The approval assures that the vehicle will not lose its registration because of the installation of a certain liner. Approved liners are legally equal to products from authorised garages.

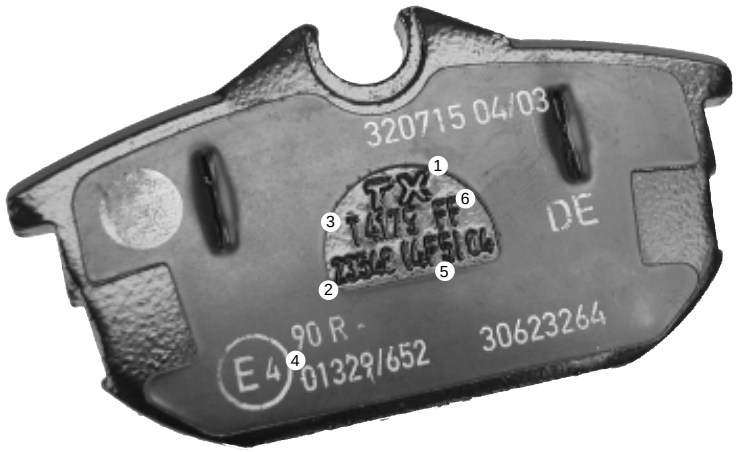
As the ECE regulation, in contrast to KBA approval (only for the German region), is applicable throughout Europe, TMD Friction GmbH has tested exclusively to ECE directives since mid-1993, so that the very first ECE approval was obtained on 19 July 1993 under No. E4-90R-00001/001.

Of even more significance for the replacement market is the partial adoption of ECE Regulation No. 90 into EU law, which took place by Directive 98/12/EC of 27 Jan. 1998 which decrees that replacement brake liners for vehicles type-approved under this EU directive must have legal approval according to the requirements in Annex XV to this directive as from 31 March 2001.

However, this binding requirement only applies to vehicles with up to 3.5 tons permissible total weight, and not to trucks, buses or heavy trailers (for these, national legislation still applies). Concerned are basically all recent passenger cars, vans and light trailers.

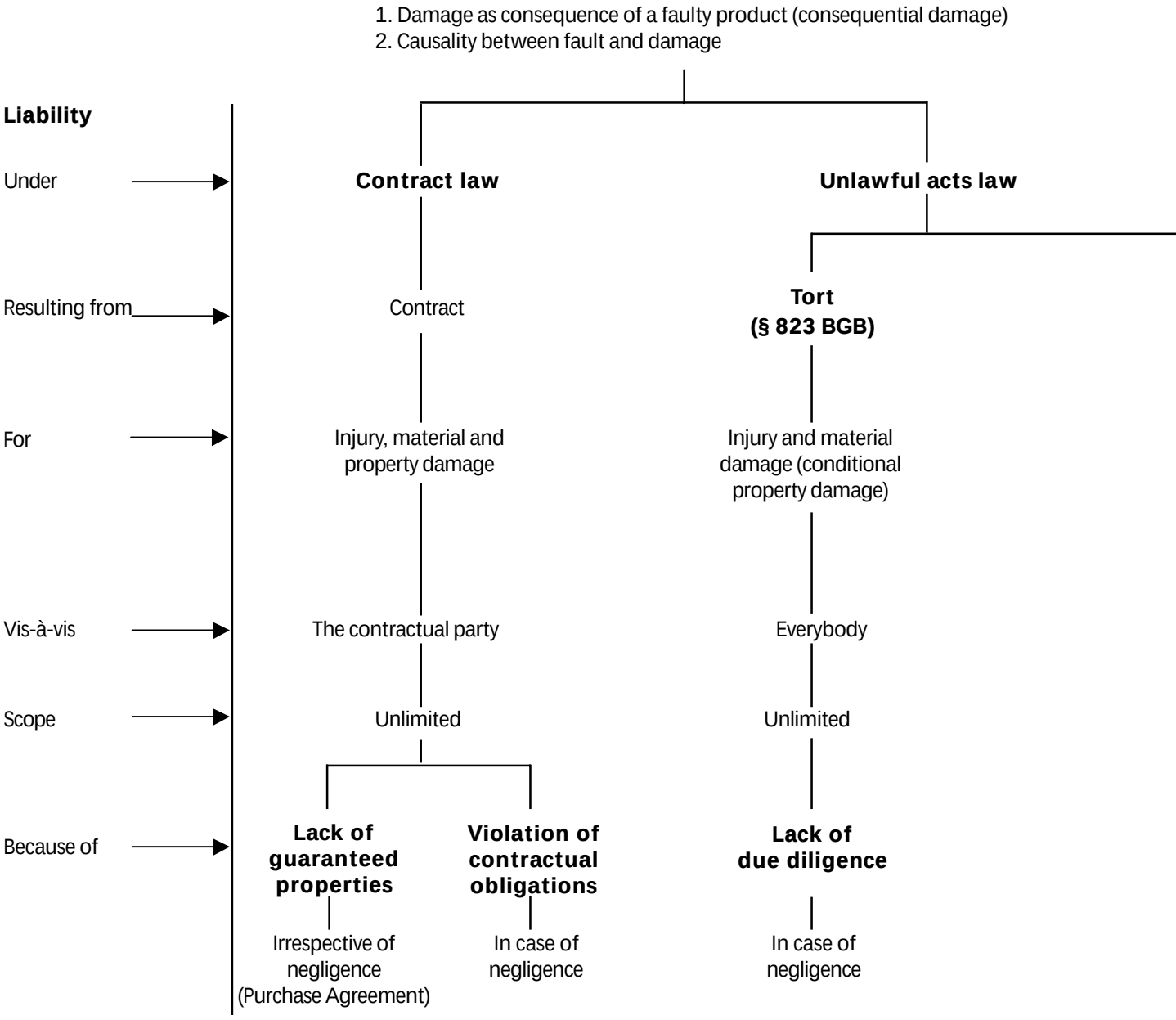
As the technical requirements are identical, ECE approvals according to Directive No. 90 are granted alternatively to approvals under the EU Directive (recognisable by a small “e” in the approval number).
In contrary to today´s situation, the liner manufacturer is therefore then obliged to homologate all liners concerned. If not, a sale after the transitional phase is no longer allowed.

At TMD Friction GmbH the homologation is an integral part of a new product introduction.

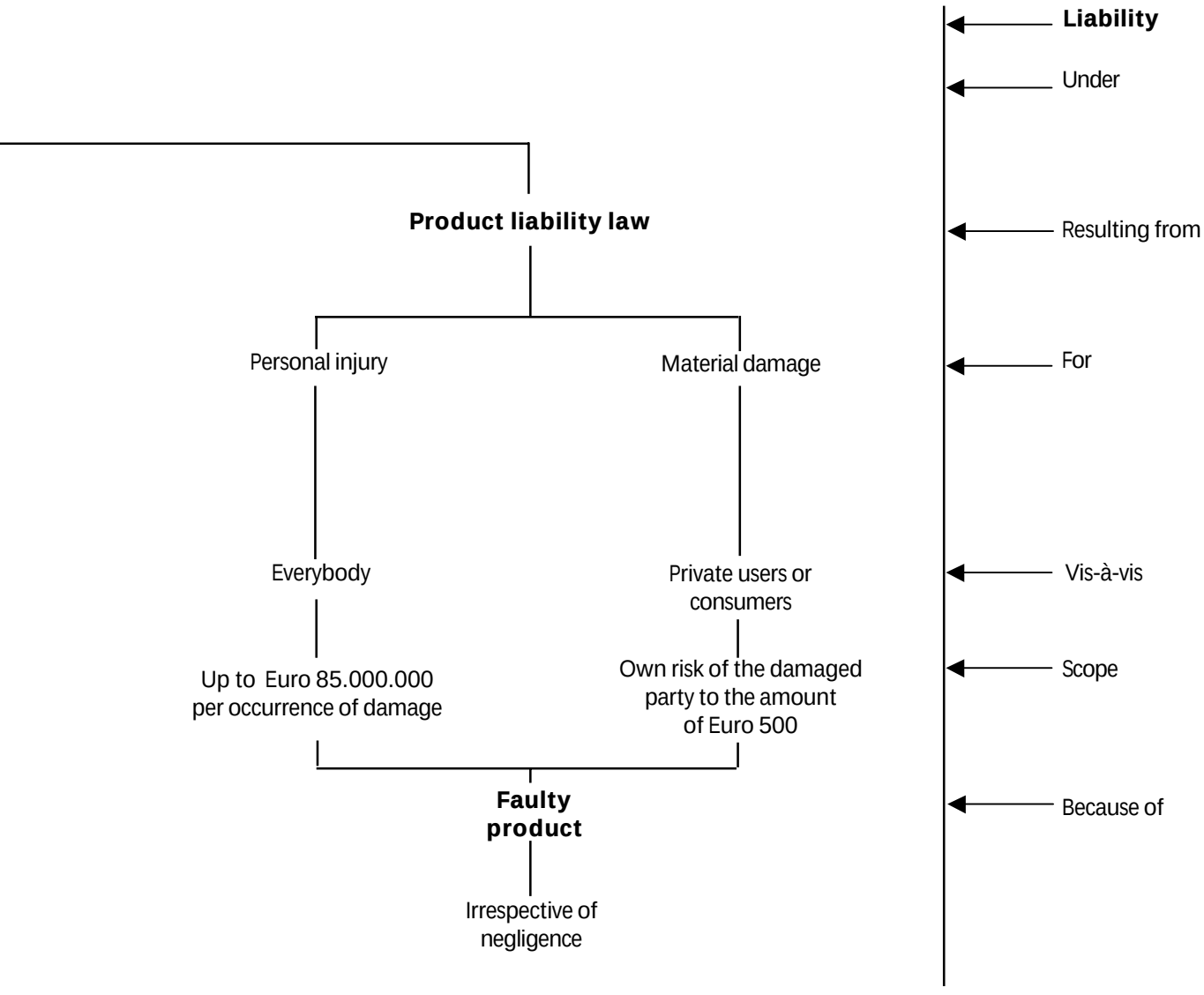


1. Manufacturer
2. Product number
3. Friction material
4. ECE number
5. Code number
6. US friction code

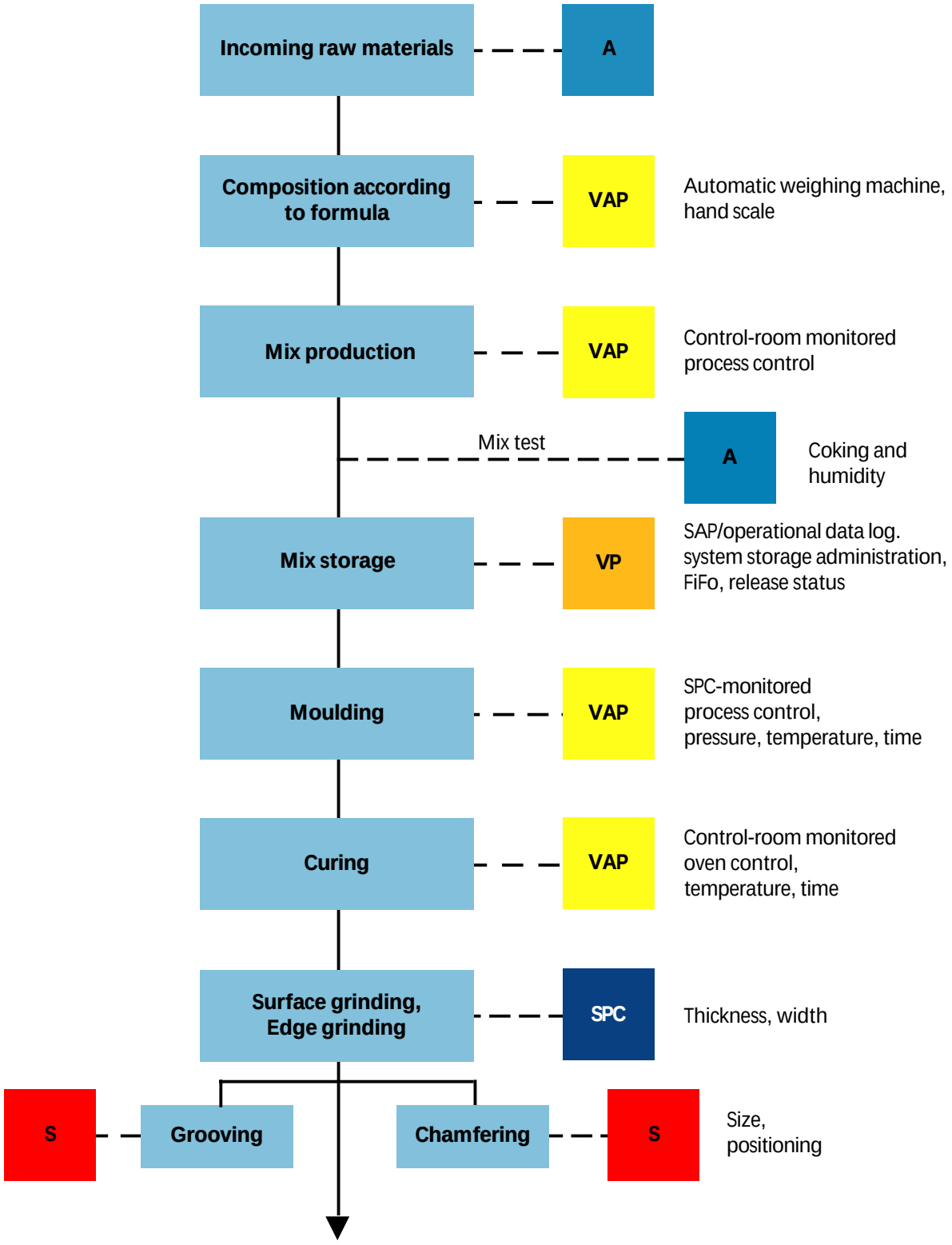
Principles of liability for faulty products



Principles of liability for faulty products



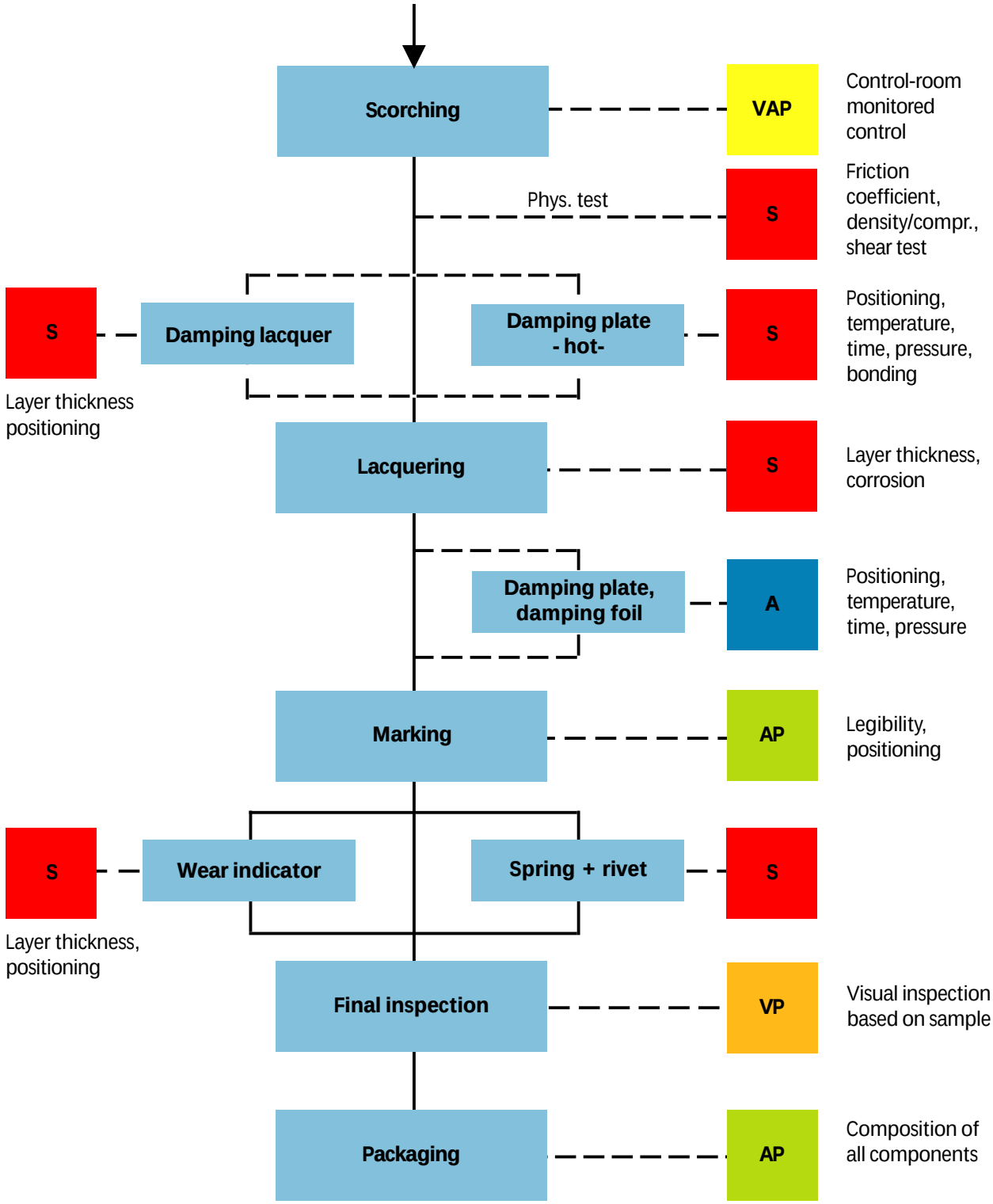
Quality assurance in the production of disc brake pads (1)



A = Incoming inspection
S = Random sample check
VP = Full inspection
VAP = Autom. full inspection
SPC = Statistic process control

Quality assurance in the production of disc brake pads (2)

TEXTAR



A	= Incoming inspection
S	= Random sample check
VP	= Full inspection
VAP	= Autom. full inspection
AP	= Attributive testing

EU Safety Data Sheets

Fine dust may be stirred up when carrying out servicing and repairs on vehicle brake systems, as well as during mechanical processing of brake liners. Inhalation of this dust can be harmful to health (Note: Follow the enclosed VRI instructions).

Your contact person at Customer Services will provide you with EU Safety Data sheets informing you of any potential dangers.

End of Life Vehicles Directive

EEC Directive 2000/53/EC relating to scrap vehicles, known as the "End-of- Life Vehicles Directive", comes into effect on 01. July 2003.

This EEC Directive also applies to materials used in replacement brake liners for passenger vehicles (up to 3.5 t) and specifies their maximum concentration levels.

According to the Directive, it is permitted to market brake liners for passenger vehicles produced and/or put on the road after 01. July 2003 only when they are free from lead, mercury, cadmium or hexavalent chrome as defined by the Directive on End-of-Life Vehicles.

Replacement brake liners used on vehicles licensed prior to 01. July 2003 do not come under this Directive. They may continue to be marketed in their current state for an unlimited period.

What does this mean for TMD Friction and their customers who are involved in sales or servicing on the independent aftermarket?

From 01. July 2003 TMD Friction Group shall supply their customers on the independent aftermarket only with liners which comply with the End-of-Life Vehicles Directive. This applies to TEXTAR, PAGID, MINTEX and DON products used on the affected vehicles.

Which vehicles are actually affected by the End-of-Life Vehicles Directive?

a) Vehicles such as the DaimlerChrysler E-class, Renault Kangoo, Opel Astra G, etc., which continue to be produced in series or will be launched after 01. July 2003 may only be fitted with replacement brake liners which are free from above mentioned toxic substances as specified in the End-of-Life Vehicles Directive.

b) This amendment does not apply to vehicles such as the DaimlerChrysler W124, Peugeot 405 and VW Golf II. The same replacement liners may also be used after 01. July 2003 for an unlimited period.

The company does not plan to use any special markings for the replacement liners.

Disposal

Brake liners: TEXTAR brake liners are disposed of in accordance with Waste Code 160112.

Disposal procedures: Recycling or

after consultation with the disposer/authorities.

Recycled together with iron (pads) or

disposed of at a refuse disposal site.

Brake disks and drums: are disposed of in accordance with Waste Code 160117 "Iron".

Disposal procedures: Recycling

Brake fluid: is disposed of in accordance with Waste Code 160113 "Brake fluids".

Disposal procedures: Reprocessed or disposed of as waste requiring special monitoring.

Unknown brake liners: must be disposed of in accordance with Waste Code 160111.

1. Principles

The German law on waste recycling and disposal integrates the production and use of products into the legislation on waste materials. It concentrates on waste avoidance as well as on the obligation for environmentally friendly recycling to the extent this is technically feasible and economically reasonable.

EEC Directive on End-of-Life vehicles specifies that scrapped vehicles must be taken back, dismantled and the parts recycled. Return, dismantling and recycling of old liners from vehicle repairs is also specified.

The concept „Material Cycle Brake Liners“ is the adequate answer to this demanding legal framework.

The principles for recycling brake liners were laid down in cooperation with an external Research and Development Institute. The goal was to develop recycling technologies and products without down-cycled properties and with a special focus on brake liners as safety parts.

This project was supported by the Federal Minister of Education and Research.

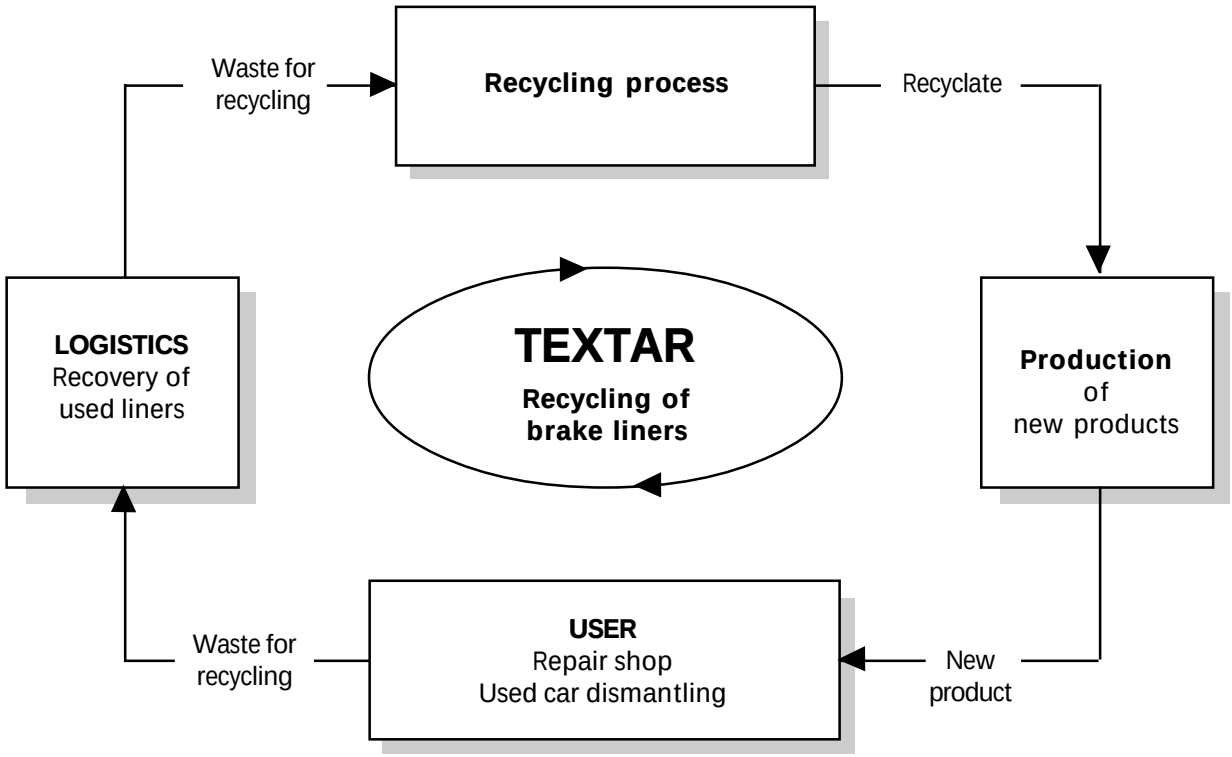


Fig. 1: Recycling of brake liners

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2. Task on hand, state of the art

In Germany, approx. 34,000 tons of used brake liners are dismantled each year, for which there had previously been no possibility of reuse. Extrapolated to the whole of Europe, this figure is presumed to rise to approx. 75,000 t/a. This quantity may increase by approx. 30 % if the dismantling of scrapped vehicles is to be included here.

Up until now, disposal of old liners and production waste was, in some cases, a costly procedure.

3. Solution

Within the framework of a joint project with industrial partners and scientists we have succeeded in using waste liners to produce raw materials which can be reused as a base material for brake liners. The project naturally also includes the development of usable friction material formulations based on these raw materials which make it possible to close the material cycle. These formulations are already used instead of conventional materials made of original raw materials.
Jointly with DaimlerChrysler AG, redistribution systems were established in order to integrate no longer usable brake liners as carefully and economically as possible into the material cycle as a reliable raw material source.

Reprocessing technology

New-generation brake liners for all applications can now be reprocessed in a cost-effective process leaving almost no waste at all. The result is a base material largely suitable for universal reuse in brake liners. A series of trials, lately under quasi-realistic conditions, have led to a process which safely removes even functionally detrimental substances present in the order of 0.034 mass-% from the process. The major process steps can roughly be described as “milling, screening, inspecting, sorting, homogenising”.

Product

The recyclate forms the basis for brake liners homologated to ECE R 90, i.e. approved by the respective authorities. The liners are offered to the aftermarket for cars made by Peugeot, Renault, DaimlerChrysler, BMW, VW, Opel, etc.
The AUTO-SERVICE-PRAXIS journal has tested disc brake pads from a number of manufacturers one of the brake sets being made from recycled material without special marking of this fact. The pads had been procured from a specialised dealer. The test vehicle, a VW Golf, had to perform 10 consecutive full brakings in loaded condition. Of the 12 tested liners, our recycled pad delivered the shortest braking distance cold (1st braking, 54.8 m). The 10th full braking resulted in a braking distance of 76.8 m. This means that our pad achieved a braking distance that is 12.6 m shorter than the worst performing pad, thereby rating among the upper third of the test candidates (best value hot: 70.2 m). Furthermore, the recycled pad was the lowest priced of all test sets.

4. Recycling strategy

The aforementioned developments have led to the foundation of "RR Reibstoff Recycling GmbH & Co KG" which has installed the machinery and equipment required for these new technologies. The used brake liners from all Mercedes Benz repair shops are already being collected and recycled. By producing brake liners from recyclates, TMD Friction is now substituting part of its previously needed primary raw materials.

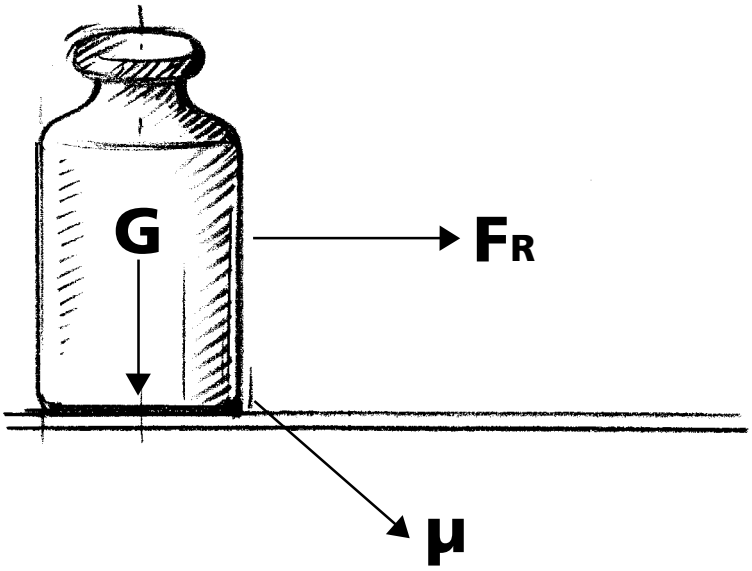
The economic viability of the recycling process can only be assured via raw material substitution and distribution of the resulting products.

The recycling processes are available to all friction materials manufacturers, and the produced raw materials can be used by all brake liner manufacturers as base materials in their specific formulas.

A major spin-off is the protection of primary raw material sources.

Definition of „friction“

The friction coefficient is a function of the material pairing of the contact surfaces and not a function of the friction contact area!



$$\mu = \frac{F_R}{G}$$

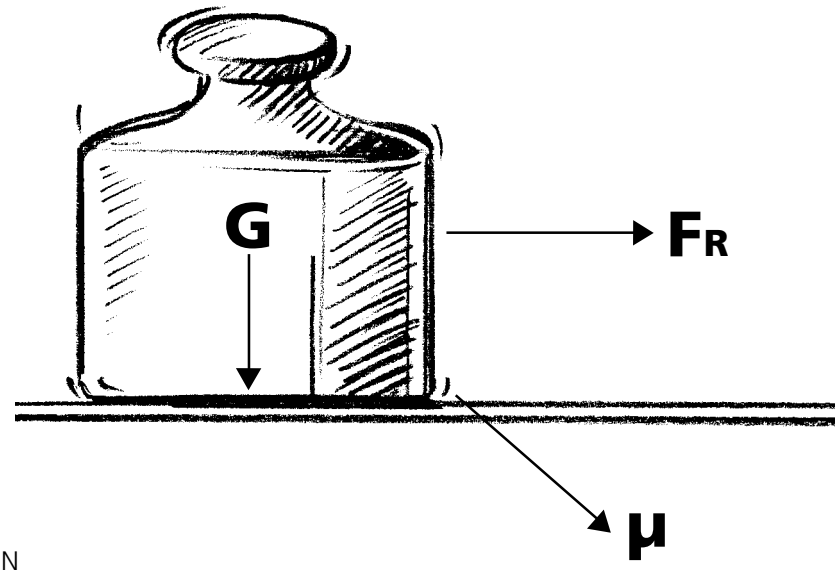
$$\mu = \frac{40\ N}{100\ N}$$

$$\mu = 0.4$$

$$F_R = \mu \times G$$

$$F_R = 0.4 \times 100\ N$$

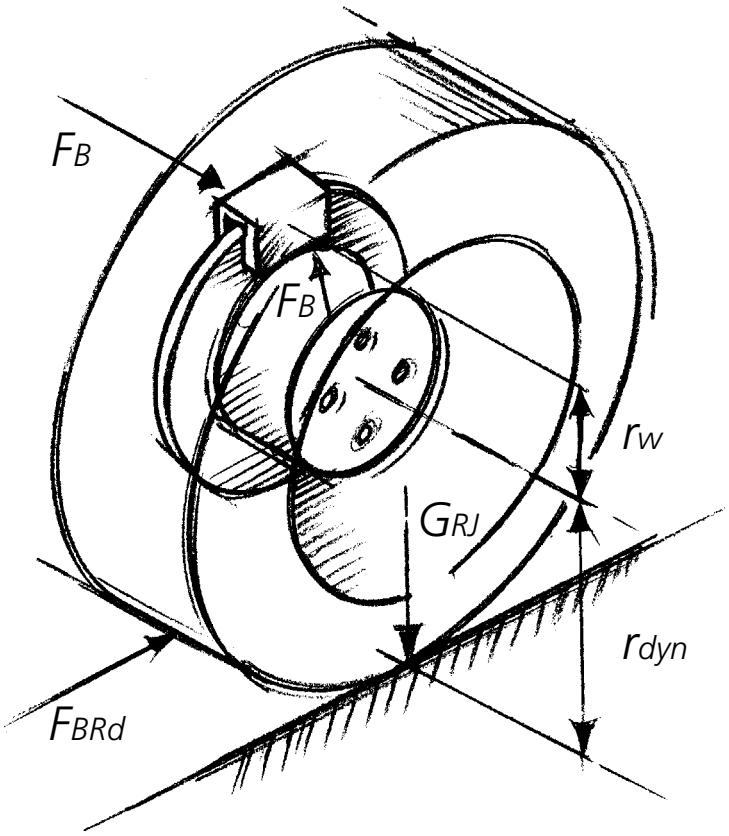
$$F_R = 40\ N$$



F_R	= Friction force in N	40 N
G	= Weight force in N	100 N
μ	= Friction coefficient	0.4

Maximum braking torque

To calculate the maximum braking force, the maximum braking torque and the maximum transmissible tire torque are equated



G_{Rd} = weight force, wheel

F_B = max. braking force

M_{BBr} = max. achievable braking force

M_{BRd} = max. transmissible torque, tire

r_{dyn} = dynamic tire radius

r_w = effective braking radius

μ = friction coefficient, brake liner

μ_{HF} = adhesive force, tire

$$M_{BRd} = \mu_{HF} \times G_{Rd} \times r_{dyn}$$

$$M_{BBr} = \mu \times F_B \times r_w$$

$$F_B = G_{RD} \times \frac{r_{dyn}}{r_w} \times \frac{\mu HF}{\mu}$$

G_{RD} = 3000 N
r_{dyn} = 304 mm
r_w = 160 mm
μ_{HF} = 0.8
μ = 0.35

$$F_B = 3000 \times \frac{304}{160} \times \frac{0.8}{0.35} = 13000 \text{ N}$$

Transmissible braking force

	µHF dry	µHF wet	µHF iced
Asphalt	0,8	0,5	<0,2
Concrete	0,6	0,4	<0,2
Small pavement	0,6	0,3	<0,2

The braking force cannot be increased infinitely, the adhesive force of the tires must not be exeeded.

F_B = highest possible braking force

μ_{HF} = adhesion

F_U = circumferential wheel force

Requirements on a brake system

The varying load cases occurring in practice require differently designed brake systems for each vehicle class. Although fulfilling the same function, the same parts may have different dimensions and look completely different.
Brake components are safety parts just like the steering system and tires of a vehicle. These parts must meet particularly stringent legal and production-related requirements.

All vehicles must be equipped with dual-circuit brake systems, i.e. the brake system must consist of 2 independent brake circuits, each of which must be effective even if the other fails (e.g. 1st circuit: Front axle, 2nd circuit: Rear axle).

Brake systems fall under 3 categories complying with the following requirements:

1. Service brake:
   The service brake is the main brake system and simultaneously acts on all four wheels when the brake pedal is actuated. It must be capable of decelerating the vehicle under all operating conditions.

2. Parking brake:
   The function of this brake system is, for instance, to hold the vehicle firmly at a standstill.

3. Emergency brake:
   In the event of complete or partial failure of the service brake system, the emergency brake must be capable of bringing the vehicle to a standstill after a specific delay.

The legal regulations apply to the total brake system. This means that all brake components must jointly fulfil these requirements.
Basic conditions are that the wheel brakes will remain stable even under high thermal loads and that the brake system will not fail because of excessive brake fluid temperatures. The strain on wheel brakes during successive stops from high speed and during long downhill drives is enormous and may lead to disc temperatures exceeding 750°C. However, there must be no undue impairment of braking effect or braking comfort.

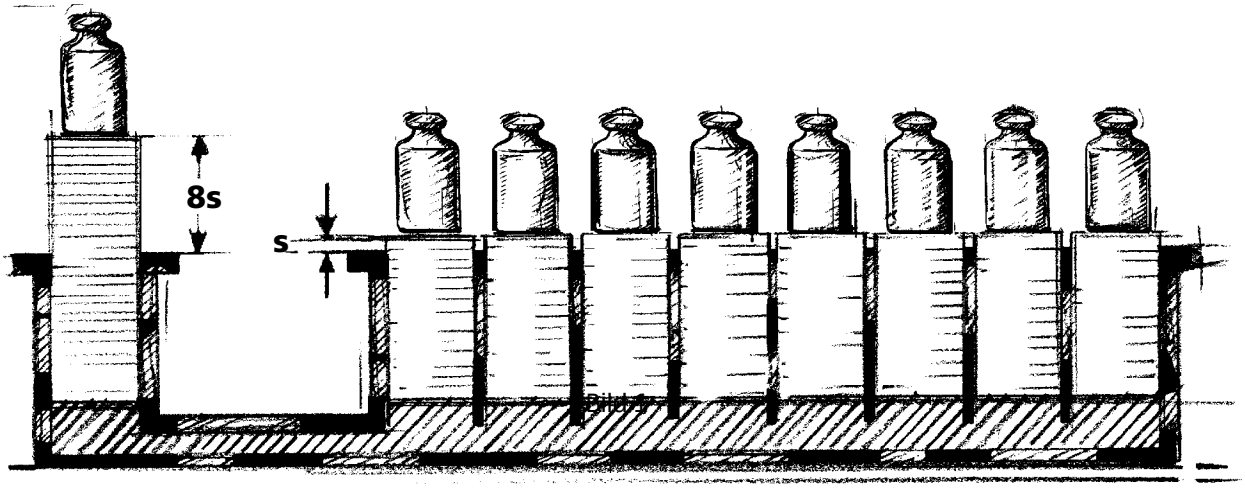
The applicable regulations, the often extreme operating conditions as well as weather conditions (moisture, dirt and thawing salt) and ageing phenomena demand careful maintenance and servicing of the brake system.

Function of the disc brake

It is generally known that „hydraulic transmission“ will yield the best results with regard to response time, pressure build-up time and uniform force transmission while allowing sensitive brake application.

The simultaneous braking of all wheels (provided with brakes) is possible because of Pascal´s principle: “Pressure applied at any point of an enclosed fluid is transmitted without loss to all other parts of the fluid.”

The hydraulic pressure is built up in the main brake cylinder by actuating the brake pedal and acts (in a closed system) on the wheel cylinders and calliper pistons. The pressure acting on the calliper pistons thereby generates the clamping force pressing the brake liners simultaneously against the rotating disc.



$$\text{Fluid pressure (P)} = \frac{\text{Force (t)}}{\text{Cross section area (s)}}$$

This shows that the braking effect is determined by the contact pressure of the brake liners, which in turn increases with the pedal force thus generating the hydraulic pressure.

In disc brakes, the sliding piston is sealed against the calliper housing (fluid part) by a sealing ring (see Fig. 1).

This pre-stressed sealing ring which surrounds the calliper also serves to retract the piston after pressure decrease ("roll-back") and to automatically readjust excessive brake clearance due to pad wear.

The rollback force of the sealing ring causes the piston to return to its original position when the pressure decreases.

To prevent clearance increase due to disc distortion, excessive disc runout or heavy vibration during unbraked driving, it is possible that the piston is slightly displaced in the direction of the calliper housing. However, the „knock-back" effect will always retract the piston into its original position (see Fig. 2).

With increasing clearance (due to wear) the piston has to travel a longer distance (than with new pads). The piston will slip through the sealing ring, as its retracting force is now less than the friction force.

The readjustment takes place infinitely, i.e. adapted to the specific wear.

A dust seal is provided to prevent contamination of the piston and cylinder surfaces from the outside (road dust, abrasive pad wear, splash water, etc.)

Care must be taken to install the cap correctly and to always keep it in perfect condition. 2 disc brake pads are needed per calliper, i.e. 4 pads per axle.

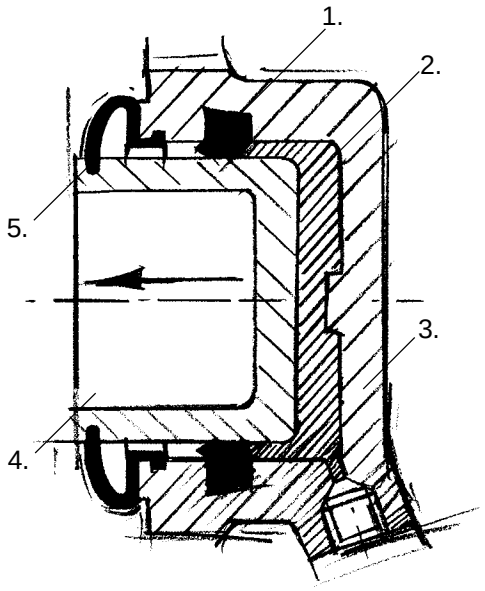


Fig. 1

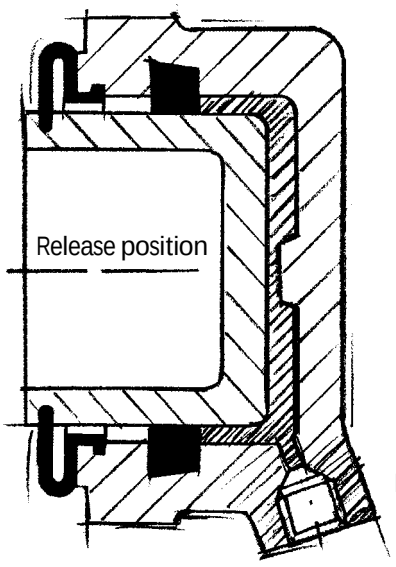


Fig. 2

1. Sealing ring
2. Fluid
3. Housing
4. Piston
5. Dust seal (dust cover)

Brake calliper types and their mode of action

Passenger cars are preferably fitted with brake systems using one of 3 calliper types:

1. Fixed calliper
2. Floating calliper
3. Fist calliper

These three calliper varieties are sometimes installed as so-called “combined” callipers meaning that the callipers are used for the standard service brake (hydraulically actuated) as well as for the parking or emergency brake (mechanically actuated).

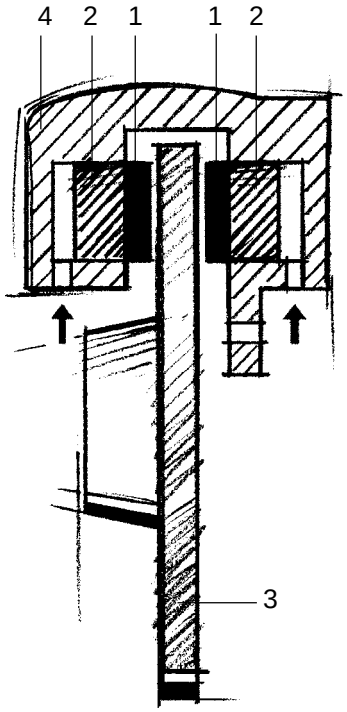
This dispenses with the need for large and weighty parts (e.g. small drum brake, drum-in-hat brake) for the parking brake in 4-wheel-disc-brake vehicles.

The mounting instructions in the repair shop manuals must be scrupulously observed when replacing pads and discs in combined callipers.

The same applies to piston retraction and clearance adjustment!
The mechanical actuation of the hand brake acts on the calliper piston which presses the pads against the disc.

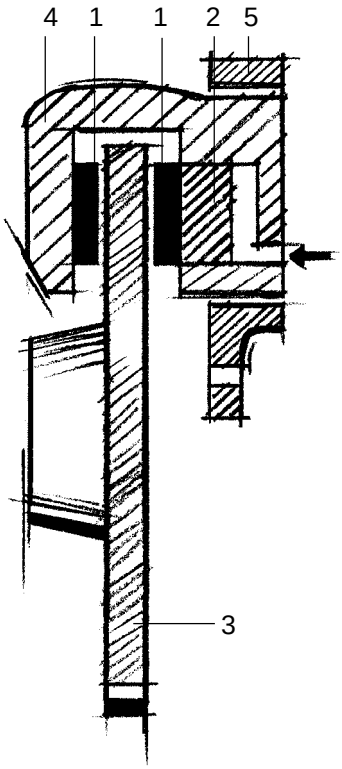
Fixed calliper disc brake

1. Brake pads
2. Pistons
3. Disc
4. Fixed calliper housing



Fist calliper disc brake

1. Brake pads
2. Pistons
3. Disc
4. Fist calliper housing
5. Support



Fixed calliper brake

The fixed calliper consists of 2 calliper halves (flange and cover) containing 1 or 2 pistons, each. Both parts, firmly screwed together (expansion screws) and hydraulically connected by a channel bore, form the „fixed calliper“.

In the vehicle, the calliper is screw-fastened to the wheel suspension (kingpin, axle flange) or, in the case of inboard brakes, to the gearbox.

Upon actuation of the brake (build-up of hydraulic pressure), two, respectively four, brake pistons force the pads into contact with the rotating disc simultaneously on each side (braking position). The pads are guided and supported in the calliper housing.

The calliper housing must be clean and undamaged to prevent jamming or corrosive adhesion of the pads which would prevent them from coming into contact with the disc (no braking effect).

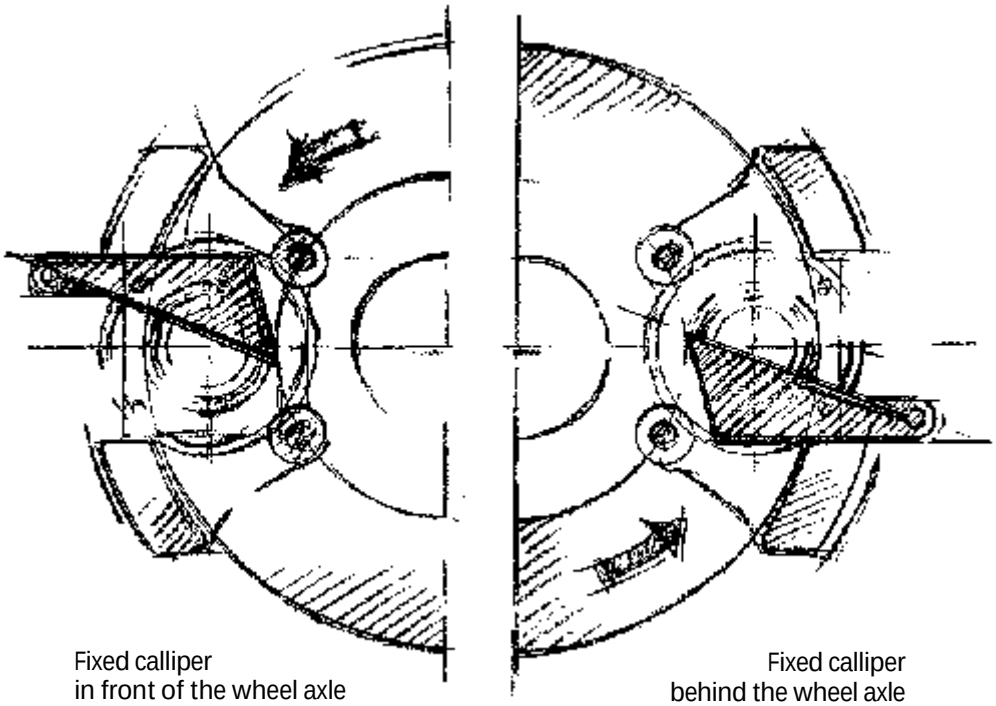
Following pressure decrease (termination of the braking action), the pistons are retracted by the “roll-back” effect - as described under “Function of the disc brake” - and the pads are forced against the piston by the expansion spring. The ensuing clearance now allows the brake disc to rotate freely.

To compensate for tapered pad wear on the leading edge, some fixed calliper pistons are provided with a “piston shoulder”.

The piston shoulder must always be in a specific position to the disc rotation (see repair shop manual).

If this is not the case, it will not be able to fulfil its function, and in addition might lead to undesirable noise development.

If the piston is twisted, it should be returned to its correct position using rotary piston pliers and a suitable piston gauge.



Fixed calliper
in front of the wheel axle

Fixed calliper
behind the wheel axle

To change the pads, pad retaining pins and expansion springs must be removed after the wheels have been dismounted. The pads can now be pulled out.

As the pistons are in an advanced position due to pad wear, they have to be pushed back using a piston retraction device (the pushed back brake fluid will cause the fluid level in the reservoir to rise).

After the new pads, expansion springs and pad retaining pins have been mounted, the brake pedal should be actuated repeatedly prior to the test drive in order to optimise calliper clearance.

Floating calliper brake

The floating calliper brake has the following advantages compared to the fixed calliper:

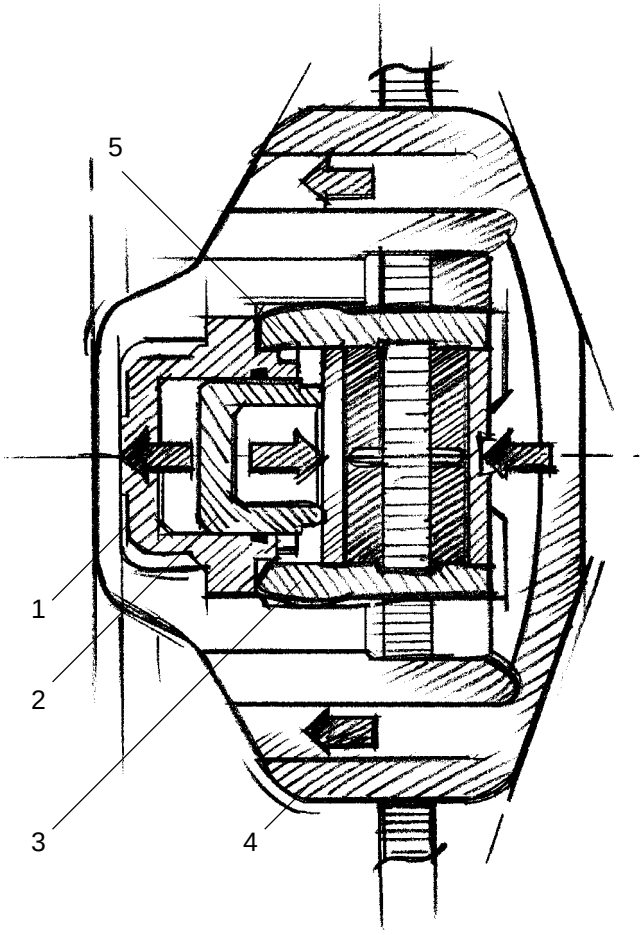
1. Less space required at the wheel side
2. This allows a negative kingpin offset
3. No highly stressed screw connections (expansion screws) required
4. Advantageous weight (e.g. only 1 piston)
5. Lower temperature generation in the brake fluid due to just one contact surface between piston and brake pad

The floating calliper brake comprises the following components:

1. Cylinder housing including piston and sealing ring
2. Guiding spring
3. Frame
4. Support
5. Pads
6. Pad retaining pins
7. Expansion spring

The support - like with the fixed calliper - is firmly screwed to the wheel suspension. It holds the brake pads in place and guides the frame in 2 grooves (linear support to keep sliding forces as low as possible).

The peripheral forces resulting from the braking torque are absorbed by the stationary support. The floating frame therefore only transmits the clamping forces.



1. Housing
2. Piston
3. Support
4. Frame
5. Groove

Floating calliper brake

The floating calliper, in contrast to the fixed calliper, has only one hydraulic cylinder. The piston acts directly on the inner pads facing the vehicle centre.

As soon as the piston presses the pad against the disc due to the hydraulic pressure built up in the main cylinder, and has traversed the clearance S_2, the cylinder housing starts shifting vis-à-vis the frame in the direction opposite to the piston. The frame then pulls the outer pads located in the support against the rotating disc while traversing the clearance S_1; in this condition, all pads are in braking position.

Clearance adjustment after termination of the braking action and the adjustment to compensate for pad wear is the same as for the fixed calliper.

The guiding spring assures spring-loaded contact between frame and support thereby preventing noise development.

Like with the fixed calliper, the pads can be changed while the floating calliper brake remains installed in the vehicle.

After the lower pad retaining pin has been carefully driven out, the expansion spring can be removed.

The piston-side brake pad must be removed first. To remove the pad on the frame side, the frame with the cylinder housing must be pushed outward. This will cause the spigot of the frame to slide out of the backing plate, and the pad can be pulled out of the support housing.

The dust seal and the position of the piston shoulder should then be inspected as described for the fixed calliper.

If repair work is necessary, the instructions in the repair shop manual as well as the mounting instructions must be followed precisely.

Before the new pads can be installed, the calliper piston must be carefully pushed back (check the brake fluid level in the reservoir and drain some fluid, if necessary, to prevent overflow).

After the new pads have been mounted, the brake pedal should be actuated repeatedly to optimise calliper clearance.

Repair work should always be performed by adequately trained personnel!

Fist calliper brake

The fist calliper brake, in contrast to the floating calliper brake, consists only of two main components. It comprises few structural elements and is of lower weight. The fist calliper has minimum space requirement thus allowing the use of axle structures with negative kingpin offset without requiring very convex rims. Its guide system is less sensitive to dirt and corrosion than that of the floating calliper.

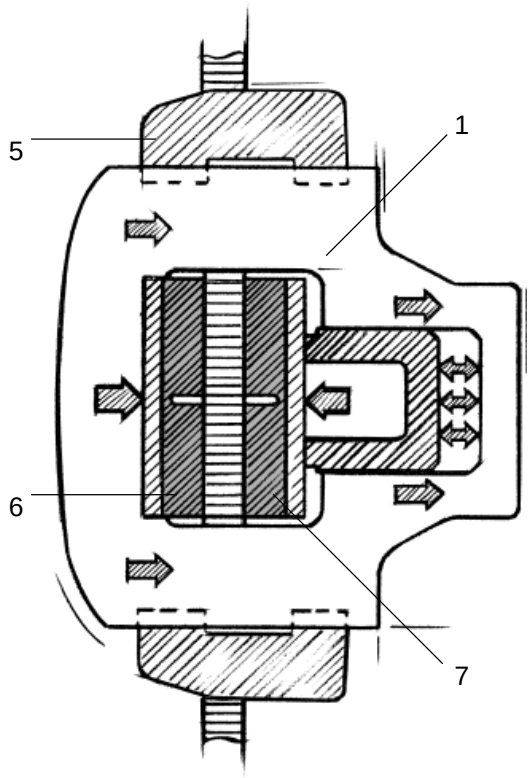
The functioning, i. e. pressure build-up, overcoming free travel and pad contact against the rotating disc are similar to the floating calliper brake.

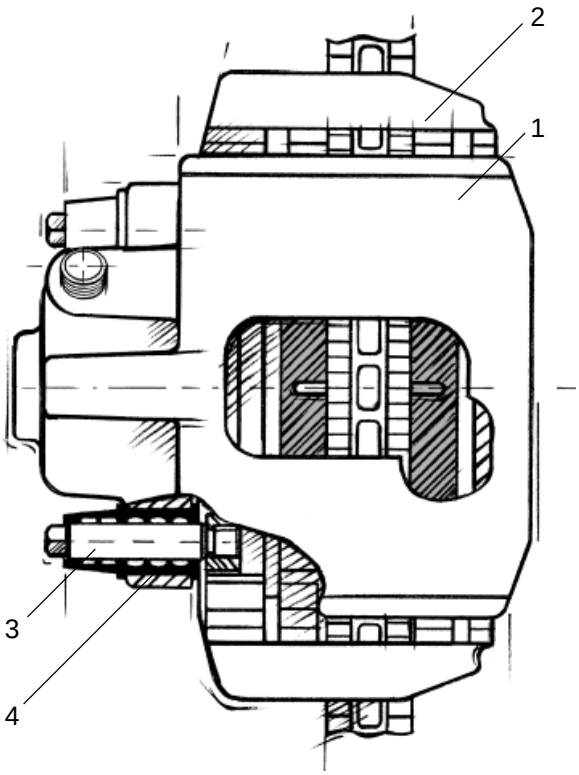
Clearance adjustment is the same as with the fixed calliper and the floating calliper.

During braking, the pad is supported by the support and by the housing (fist).

Several fist calliper variations are available from different manufacturers using different guiding systems, pad supports and pad removal options.

The repair shop manuals should be consulted for instructions on pad change and maintenance. Because of the vast variety of fist callipers available, we will not go into more detail here.





Configuration:

1. Cylinder housing
2. Backing plate
3. Guiding pin
4. Dust seals
5. Support
6. Outer brake pad
7. Inner brake pad

Service life of brake liners

The service life of brake liners and their wear behaviour is only one, albeit important factor in their assessment. From the concept of its formula and the requirements to be met, each liner is a compromise between the following essential assessment criteria:

- Friction coefficient stability under all operating conditions
- Comfort behaviour (squealing, judder, response, etc.)
- Wear behaviour

Extremely one-sided requirements generally have a negative effect on the other factors involved.

Physically, the braking action is a process of dry friction and needs specific friction liner and counter-material wear to maintain the effectiveness of the braking and to achieve on-going regeneration of the surfaces in friction contact.

Brake liners are, therefore, typical wear parts, although their wear rate is influenced by many factors. These can be differentiated as follows:

1. Friction-material-related properties

The primary influence on the wear rate is the temperature range of the brake disc or drum as well as the speed range, i.e. the energy turnover during braking. Wear strongly increases at higher temperature ranges.

Production-related or batch-related differences in wear behaviour are negligible compared to the other influential factors.

2. Operating conditions

Driving style (braking frequency, speed ranges), traffic conditions as well as topographic and climatic conditions are most influential on wear behaviour. Experience has shown that it is primarily the driving style which significantly influences the service life of a brake liner.

3. Condition of the brake system

The brake system is exposed to dirt, moisture, chemical substances (e.g. salt) as well as high temperatures and mechanical forces. As it contains function-relevant sliding parts, it requires regular maintenance. Jammed or tightly moving parts can have a highly adverse effect on the functionality of the brake as well as on liner and counter-material wear. However, the condition of brake disc or drum (surface, minimum thickness, geometrical form) is no less responsible for functional and wear behaviour.

In view of the above and assuming no functional defect of the brake system, liner service life is actually a statistical quantity, whereby the distribution function for passenger car liners shows that the upper service life values exceed the lower ones by a factor of 10-15.

This means a statistical mileage range of between

10,000 and 150,000 km.

In individual cases, the mileage may, of course, be below or above these limit values, so that the manufacturers of brake liners are unable to specify definitive service life values.

Wear indicators for brake liners

Wear indicators are vital for driving safety and assure that the driver can rely on functional brakes.

Wear indicators have a control function in that they inform the driver when the brake liners need to be replaced. Modern wear indicators are either embedded in the calliper or in the brake liner and monitor the actual condition of a liner by means of an electronic control system.

In commercial vehicles, this primarily serves to monitor advanced electronic operation and brake control systems and to harmonise liner wear on all axles. Strictly speaking, one distinguishes between wear end indicators and wear indicators. Wear end indicators do not supply any information on residual resources, although no distinction is made in actual practice.

Disc brake pads are fitted with either of two wear indicator variations:

Mechanical and electronic wear indicators mounted directly on the pad. Mechanical wear indicators are riveted or plugged onto the backing plate (see Fig. 1a). The wear indicator is positioned to come into contact with the disc when the friction material reaches a residual thickness of approx. 2 mm. This contact makes itself felt by an audible vibration.

Electronic wear indicators (see Fig. 1b) indicate the wear condition via a warning lamp on the dashboard. These wear indicators embedded in the friction material also contact the disc when the pad is worn down. They open or close a current circuit indicating the wear limit (approx. 2mm) by illuminating a warning lamp.

Drum brake linings, and thereby many commercial vehicles, are using visual wear inspection aids apart from electronic wear indicators. One distinguishes between wear edges, wear pockets or wear grooves (see Fig. 2).

The condition of the lining is visually checked through an inspection hole provided in the vehicle. As soon as the lower edge (wear limit) is reached, the brake lining has to be replaced.

Wear pockets are used most frequently, while wear grooves have become rare because of high production costs.
When the basic setting is correct, mechanical indicators mounted on brake shafts and/or on the ASA (automatic slack adjuster) also show the approximate amount of wear of the drum brake linings.

Electronic wear indicators for drum brake linings are mounted in through-holes or pocket holes.

Fig. 1a

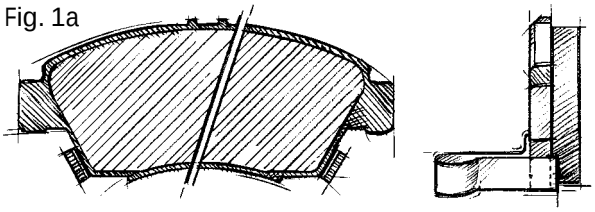


Fig. 1b

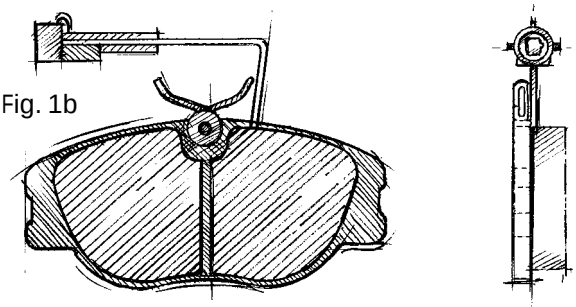
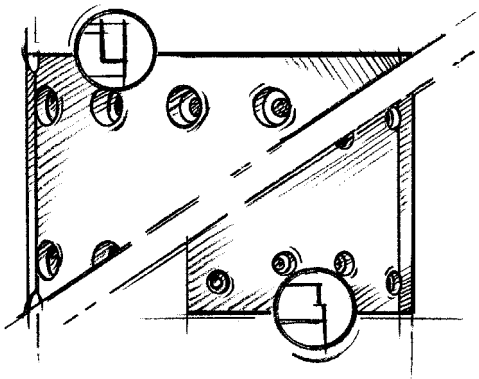


Fig. 2



Replacement of brake liners

Brake liners must be replaced as soon as their minimum residual thickness of 2 mm is reached.

Brake liners are principally replaced by axle, i.e. the brake liners of the left and right calliper are replaced at the same time to prevent the risk of non-uniform braking behaviour (e.g. brake pull) of the vehicle.

However, only "type-approved" brake liners may be used, as these were specifically selected for the vehicle and tested under extreme conditions.

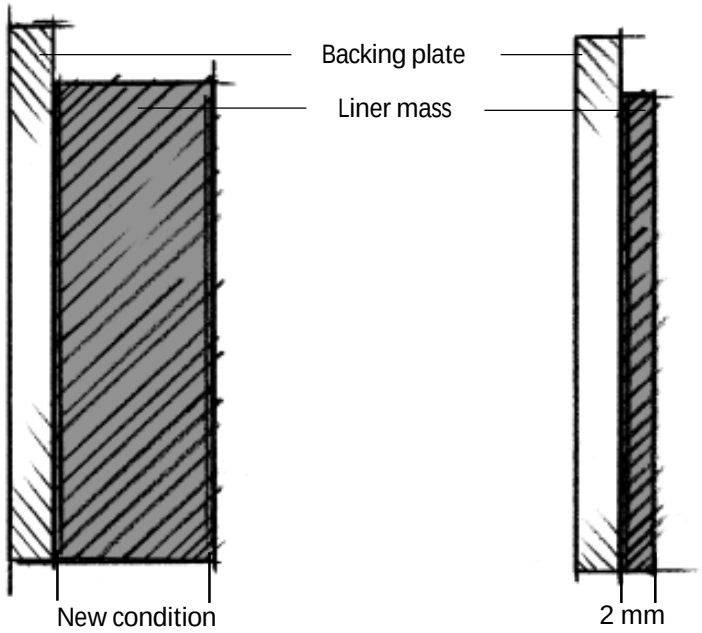
This will assure the required friction coefficient level and comfort behaviour under all operating conditions.

Liner replacement is different for the various brake callipers described earlier.

The wide variety of fist calliper brakes requires strict adherence to repair shop manuals and mounting instructions.

The manuals indicate the dismantling sequence of the parts, the tightening torque for screws and the accessorial parts to be dismantled in addition to the liners.

It is recommended to always have brake liners replaced at specialist repair shops.



Maintenance and servicing of vehicle-installed brake systems

A brake system not functioning properly spells danger for the driver but also for other traffic participants!

It is absolutely necessary to always replace wear parts as instructed by the vehicle and brake manufacturers. Here are some minimum requirements:

Maintenance of disc brakes

Adjustment is not necessary, but the pads should be checked for wear every 10 000 kilometres and replaced by new TEXTAR pads as soon as they are worn down to their minimum thickness. Satisfactory disc condition should be verified at the same time. If scoring, cracks, distortions or other faults are detected, the discs must be replaced to be on the safe side. The callipers as well should be checked for damage or leaking hydraulic fluid.

The pistons must move freely, which might be impeded by corroded parts or damaged dust seals. When in doubt, the callipers should be resealed or replaced. Fist callipers and callipers with open sliding guide should be completely overhauled or, if necessary, replaced after 3 years or 60 000 km; callipers with enclosed sliding guide, after 3 years or 90 000 km.

Maintenance of drum brakes

Drum brake linings should be checked for wear every 20 000 km. Riveted linings must be replaced before they are worn down to rivet head level. Bonded linings must be replaced when their residual thickness is down to 2 mm. Whenever the drums are dismantled, the entire brake system should be inspected. Worn drums must be replaced. The manual adjustment system must be undamaged and not jammed (although it should not be loose either). Wheel cylinders must be inspected for damage and tightness and replaced, if necessary. The retraction springs should be replaced together with the shoes. Only brake cleaning fluid or pure methyl alcohol should be used for cleaning. Never use petrol or paraffin!

Maintenance of control valves

It is highly recommended to replace the hydraulic control valves after 3 years or 90,000 km at the latest due to their safety-critical function. Even after this relatively short period, many valves are no longer functioning properly, and a detailed inspection after maintenance would require special equipment.
Important note: Control valves must always be replaced by control valves of identical design!

Maintenance of main cylinder and brake booster

The brake fluid level must remain constant and checked once per week at a minimum. Any drop in the fluid level below the expected level (allow for a tiny drop due to liner wear) signifies a leakage in the system. This situation must be traced back to its origin and remedied immediately. Fluid loss may cause brake failure! If the main cylinder leaks it must be dismounted and carefully inspected. If the inner surface is in perfect condition, new seals may suffice, but if the bore shows traces of wear or corrosion, the cylinder must be replaced by a new one. New air filters and dust caps for mechanical brake boosters are generally available as spare parts and should be replaced every 3 years or 60,000 km. Maintenance of the booster itself is not possible, however, the condition of the vacuum hose should be regularly inspected.

Mounting instructions for disc brake pads and drum brake linings

Mounting instructions

All our brake liner sets are delivered together with general mounting instructions from the **VRI** (Federation of the Friction Liner Industry) or the **FEMFM** (Federation of European Manufacturers of Friction Materials).

These mounting instructions must be strictly adhered to, just like the repair instructions from vehicle, axle and brake manufacturers.

Pursuant to the Kraftfahrtbundesamt (Federal Office for Road Traffic), failure to comply with these mounting and repair instructions will void the test certificates of the brake liners and thereby the type approval of the vehicle concerned.

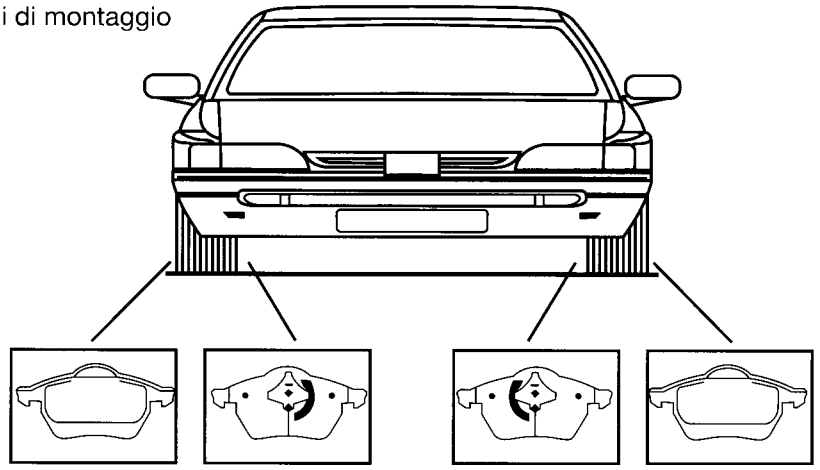
This applies to the turning off of drum brake linings, to rivet forces and numerous other instructions which have to be scrupulously adhered to.

Special mounting instructions for disc brake pads

TEXTAR

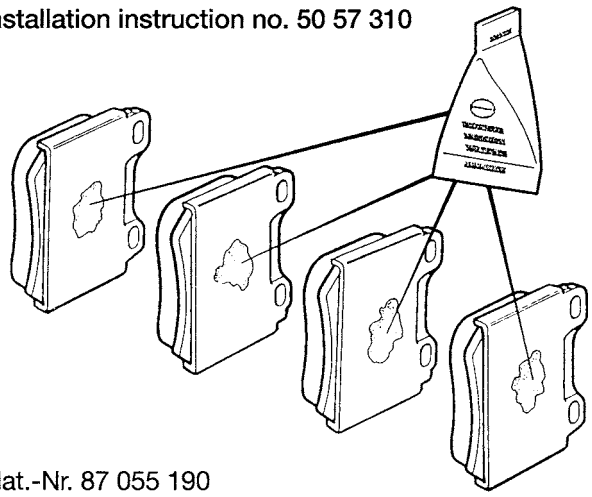
Montageanleitung

Mounting Instructions
Instructions pour le montage
Instrucciones para el montaje
Istruzioni di montaggio



Mat.Nr. 87 039 990

Installation instruction no. 50 57 310



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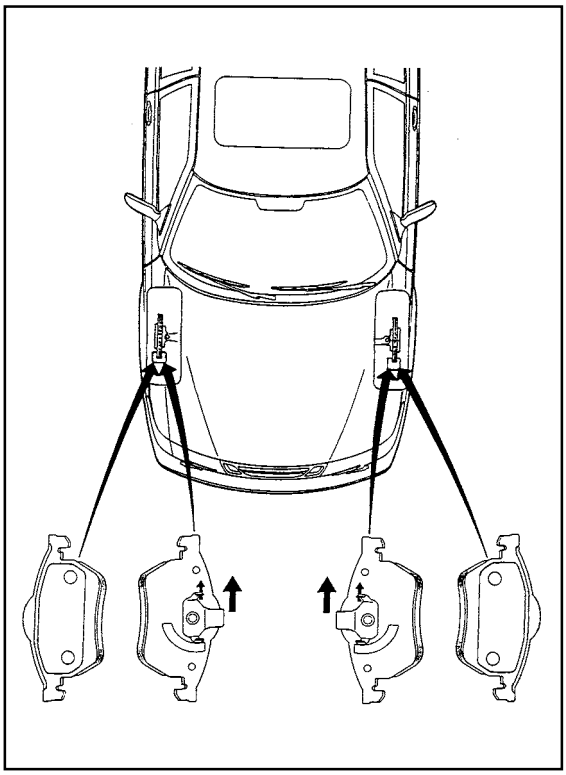
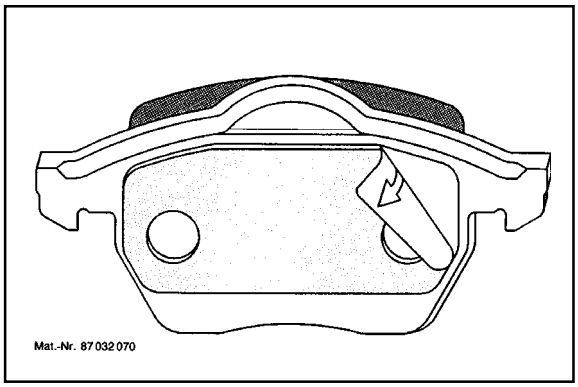
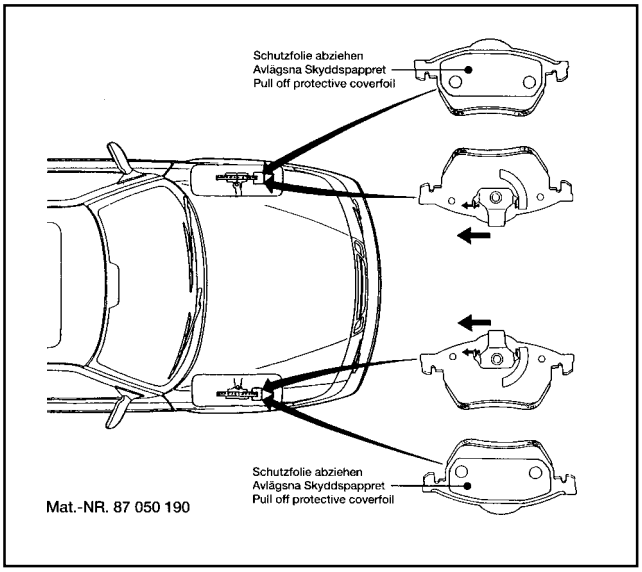
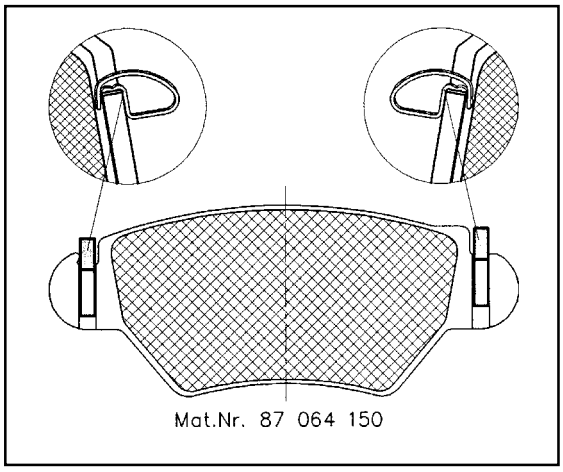
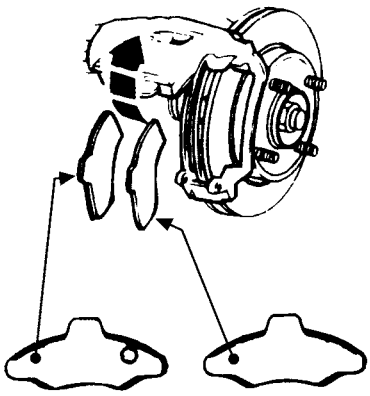


Special mounting instructions for disc brake pads









GB	white point	– piston side pad
F	point blanc	– garniture coté piston
D	weißer Punkt	– kolbenseitiger Bremsbelag
E	punto blanco	– forro al lado de pistón
P	ponto branco	– capa do lado do pistão
I	punto bianco	– pattino del freno al lato del pistone
NL	witte punt	– plunjerzijdse voering
SW	vit punkt	– bromsbelägg pä kolvsidan
SF	valkoinen piste	– männänpuoleinen jarrupala
N	hvitt punkt	– bremsebelegg på stempelsiden
DK	hvidt punkt	– stempelsidig bremsebelagning

Mat. Nr. 87041990

These and other mounting instructions are included in the disc brake boxes.

Brake fluid change

Most modern brake systems use synthetic brake fluids to transmit the hydraulic pressure generated in the main brake cylinder to the callipers and cylinders. The properties of brake fluids are, therefore, of vital importance to the overall brake system.

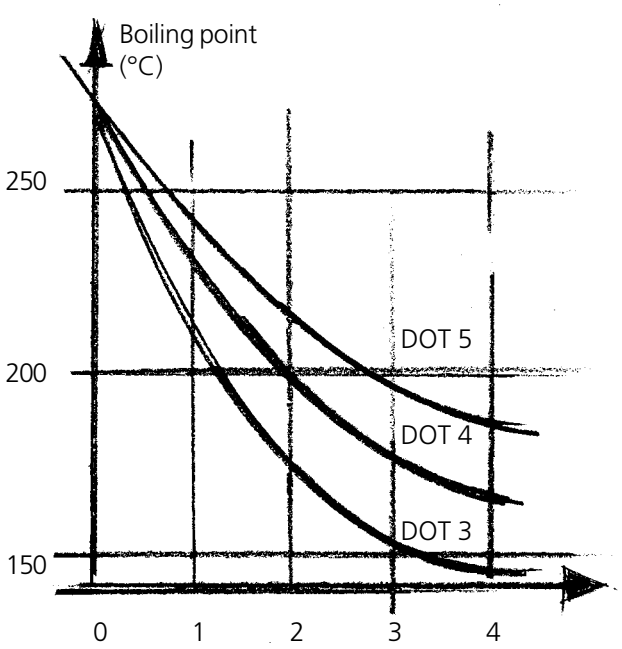
Brake fluids should not be referred to as "brake oil", as the slightest contamination with oil will destroy the rubber parts in the brake system and could provoke complete failure of the brake system.

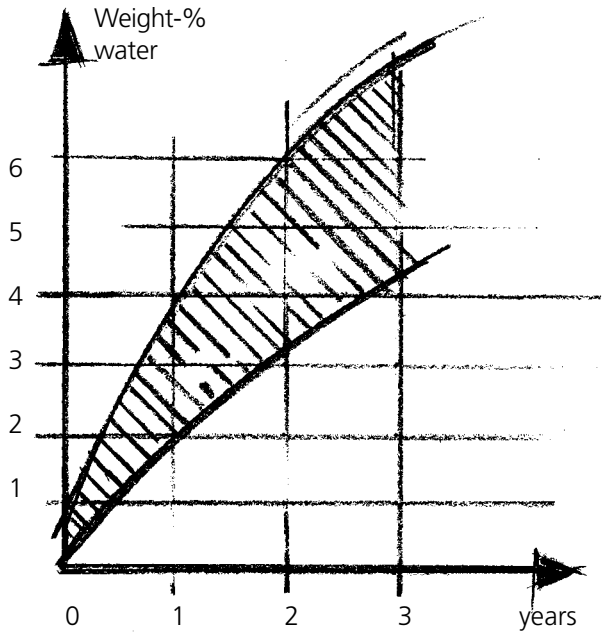
The chemical and physical properties of brake fluids are defined in the internationally valid regulation SAE J 1703 (Society of Automotive Engineers). This regulation specifies criteria such as boiling point, chemical neutrality, water compatibility, rubber swelling, corrosion and lubricity, which must neither be exceeded nor fallen short of. A very important point in the SAE regulation is the requirement of miscibility and compatibility of brake fluids among each other. The safety standard FMVSS No. 116 from the American Department of Transport for glycol-based brake fluids DOT 3 and DOT 4 based on SAE regulation J1703 is even more significant. The requirements defined for DOT 5 apply to silicone-based brake fluids. Standard DOT 5.1 also deals with conventional brake fluids meeting the respective requirements and particularly high demands on safety. As DOT 5.1 brake fluids do not contain any silicone, they are miscible with others of identical specification (DOT 3, DOT 4 and DOT 5.1).

	SAE J 1703	ISO 4925	FMVSS 116		
			DOT 3	DOT 4	DOT 5
Equilibrium boiling point (°C)	> 205	> 205	> 205	> 230	> 260
Wet boiling point (°C)	> 140	> 140	> 1401	> 155	> 180
Viscosity at -40°C (cSt)	< 1800	< 1500	< 1500	< 1800	< 900

Brake fluid

Glycol-based brake fluids are hygroscopic and even accumulate water when merely exposed to the atmosphere. This property assures that water constituents in the brake fluid will disperse so that isolated water spots freezing at 0°C and boiling at 100°C cannot occur. However, even the slightest water content will lower the boiling point of the brake fluid.





Brake fluid change

It is, therefore, recommended to change the brake fluid every year, at the latest, however, every 2 years irrespectively of the mileage!!

All references to health hazards when handling brake fluids must be observed! Brake fluid acts highly dissolving and discolouring, so that varnished surfaces, shoes or clothing must be immediately rinsed with plenty of water after having come into contact with brake fluid.

Deficiencies in commercial vehicles with drum brakes

Unfavourable brake force distribution across the individual axles frequently leads to untypical wear or failures apparently linked to the brake linings.

It is important to check and remedy the following deficiencies

- Inadmissible friction pairing on front and rear axle
- Incorrect loading, e.g. rear axle overloaded, or centre of gravity of the load is too high
- Wrong setting of manual control or ALB system
- Newly fitted axle may not yet be sufficiently bedded in; linings and drum not turned off
- Wrong cylinders, wrong lever lengths
- Pressure loss in the circuit concerned

Tractor & trailer compatibility

- Friction coefficients in trailer or tractor too high or too low
- Pressure lead not O.K.
- Defective brake in either one of the vehicles

Axle pull

- Unilateral lining replacement on the axle
- Drums from different manufacturers on the same axle
- Defective steering geometry
- Wrong retraction springs on one side
- Worn brake (e.g. worn brake shaft, shoe pivots, cams)
- Automatic adjustment defective, e.g. in a wedge brake
- Brake shoes heavily corroded
- Oil-contaminated brake with hydraulic clamping
- Ingress of foreign matter on one side, e.g. in construction site vehicles

Deficiencies in commercial vehicles with drum brakes

Heavy noise development and vibrations

- Insufficient bedding-in (e.g. improper turn-off)
- Drum heavily striated
- Heavily worn linings
- Worn brake and, possibly, steering system
- Out-of-true drums
- Wrong rivet material or improper riveting
- Lining contact on brake shoe improper or insufficient

High lining wear

- Excessive running-up of the trailer
- Deteriorated brake drums (striated, not turned off)
- Ingress of foreign matter into the drum during cross-country service
- Valves not correctly set (ALB, load-sensitive reduction valve)
- Cracks present in the drum
- Unbalanced vehicle handling (too many brakings in high temperature ranges)
- Overloading (wrong position of gravity centre)
- Inadequate drum material
- Inadequate tractor/trailer compatibility

Heavy drum wear, damage

- Cracking due to frequent brakings in low-pressure range with cold brake (approx. 1.0 bar)
- Wear by fish-scaling, also due to above reasons
- Burn marks caused by out-of-true drums and thermal overload
- Parking brake actuated simultaneously with hot service brake (ovality)
- Brake heavily worn (lack of proper shoe guidance)
- Drums not adequately machined
- Linings not turned off
- Ingress of foreign matter (favoured by irregular brake adjustment)

Deficiencies in commercial vehicles with drum brakes

TEXTAR

Heavy drum wear, damage (cont.)

- Drum material too soft
- Crown-shaped and uneven wear due to excessive wheel bearing clearance, worn pin guidance or insufficient play (especially in the presence of ovality)
- Bright spots with crack formation due to extremely high temperatures
- Transverse fracture of brake surface without crack formation due to blowholes in the cast drum or the introduction of forces caused by loosened and structurally unstable star wheels
- Defective overload protection of service and parking brake

Unsatisfactory braking effect

- Wrongly set regulator valves, defective control or brake valves
- Excessive drum turn-out
- Fitting of wrong brake cylinders or levers
- Inadequate dynamic effect of brake cylinder/lever (excessive play)
- Oil-contaminated brake liners due to leaking seals of hydraulic system
- Brake linings not turned off and inadequate bedding-in of linings
- Swelling drums caused by too many cracks
- Wrong friction pairing (insufficient drum material)
- Vitrified linings caused by constant braking in the lowest pressure range
- Erosion of brake shoes due to heavy corrosion
- Vehicle overload
- Thermal overload, especially during prolonged downhill driving
- Trailer axles installed offset by 180°
- Faulty assembly of brake
- Air in hydraulic system

Over-braking / noise development

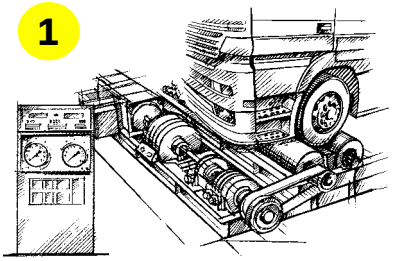
Causes of noise development/judder

The most common cause is over-braking of one or several brakes

Investigation

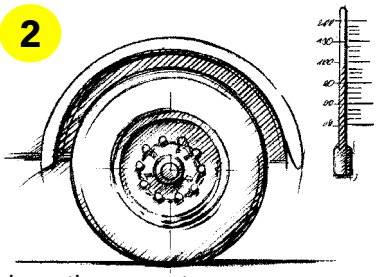
Determination of over-braking

On the roller test bench

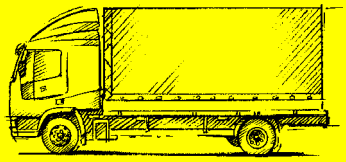
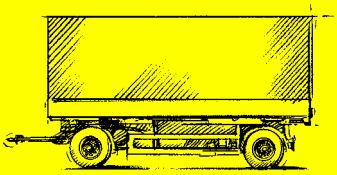
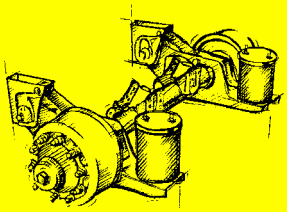
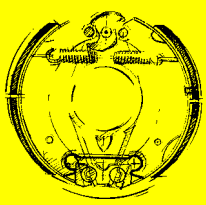


by means of the brake force meter

By temperature measurement



using a thermometer

Symptoms	Causes	Troubleshooting
 All brakes/ axles	Influence of driving style and road condition	Check of balanced braking of tractor and trailer or semi-trailer (+-0.2 bar)
 ...only tractors, trailers, semi-trailers	Defective pneum. system	Check of balanced braking of tractor and trailer or semi-trailer (+/– 0.2 bar)
 ...only in one axle	Defective pneum. system Defects in both wheel brakes	
 ... only one wheel brake	Defect in this wheel brake	**Cause analysis** 1. Bedding-in of linings under high temperatures and loads 2. Loose rivets, out-of-true drums, wrong linings, worn bearings, weak retraction springs, etc. 3. Incorrect contact pattern of linings (pointy contact)

Inadequate braking effect

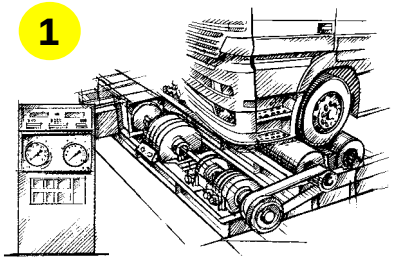
TEXTAR

Investigation

Determination of low braking effect.

On the roller test bench

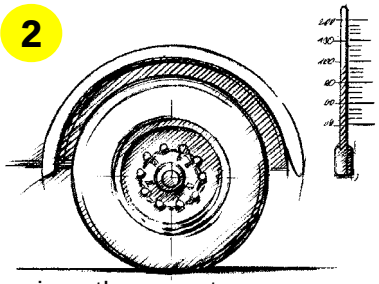
1



by means of the brake force meter

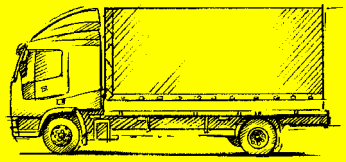
By temperature measurement

2

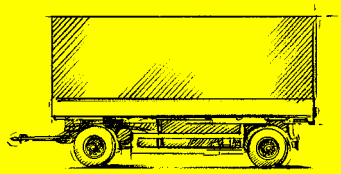


using a thermometer

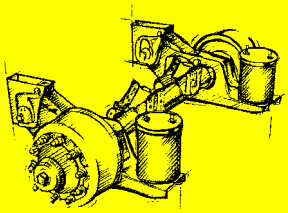
Symptoms



All brakes/ axles



...only tractors, trailers, semi-trailers



...only in one axle

Causes

Influence of driving style and road condition

Defective pneumatic system

Defects in both wheel brakes

Defect in this wheel brake

Troubleshooting

Check of balanced braking of tractor and trailer or semi-trailer (+ -0.2 bar)

Causes analysis

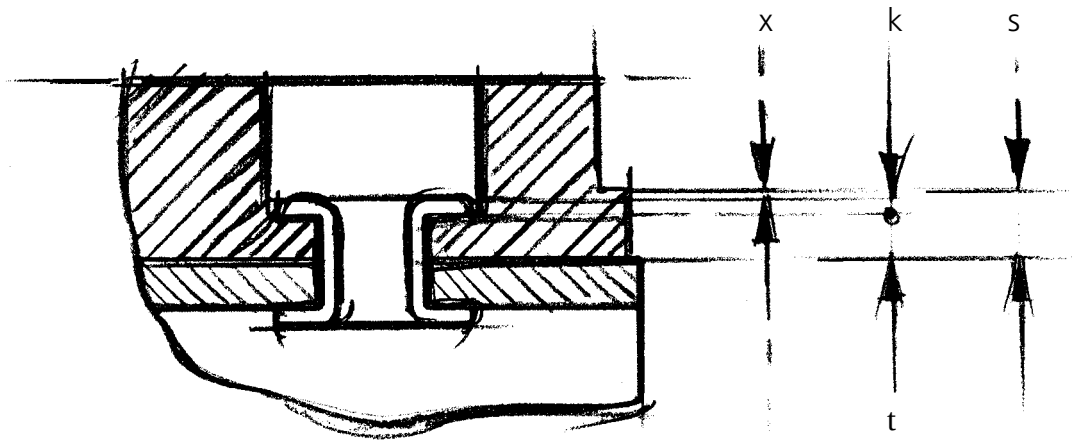
1. Inadequate lining quality
2. Improperly adjusted brake
3. Trailing shoes thicker than leading shoes
4. Unsatisfactory contact pattern of linings (shoe diameter considerably smaller than drum)
5. Linings not bedded-in
6. Heavily moving wheel brake parts like cam shaft, pin, etc.
7. Contaminated linings (oil, grease, etc)

CV drum brake linings
- wear edge -

Mounted drum brake linings for commercial vehicles are subject to continuous material wear. The height of the peripheral wear edges at both sides of the drum brake lining indicates whether a lining is to be changed.

The height of the wear edge takes into account the rivet dimensions (height of rivet head/rivet bottom thickness) and is therefore a visual aid in the assessment of lining wear.
The specialist repair shop generally uses a inspection opening provided in the drum cover for this inspection.

The following sectional drawing illustrates the wear edge:



$$x \geq 0.3$$

$$S = k + (t + x)$$

CV drum brake linings - wear pocket

The introduction of a new brake drum design requires an adapted wear indicating mark, the so-called „wear pocket“.

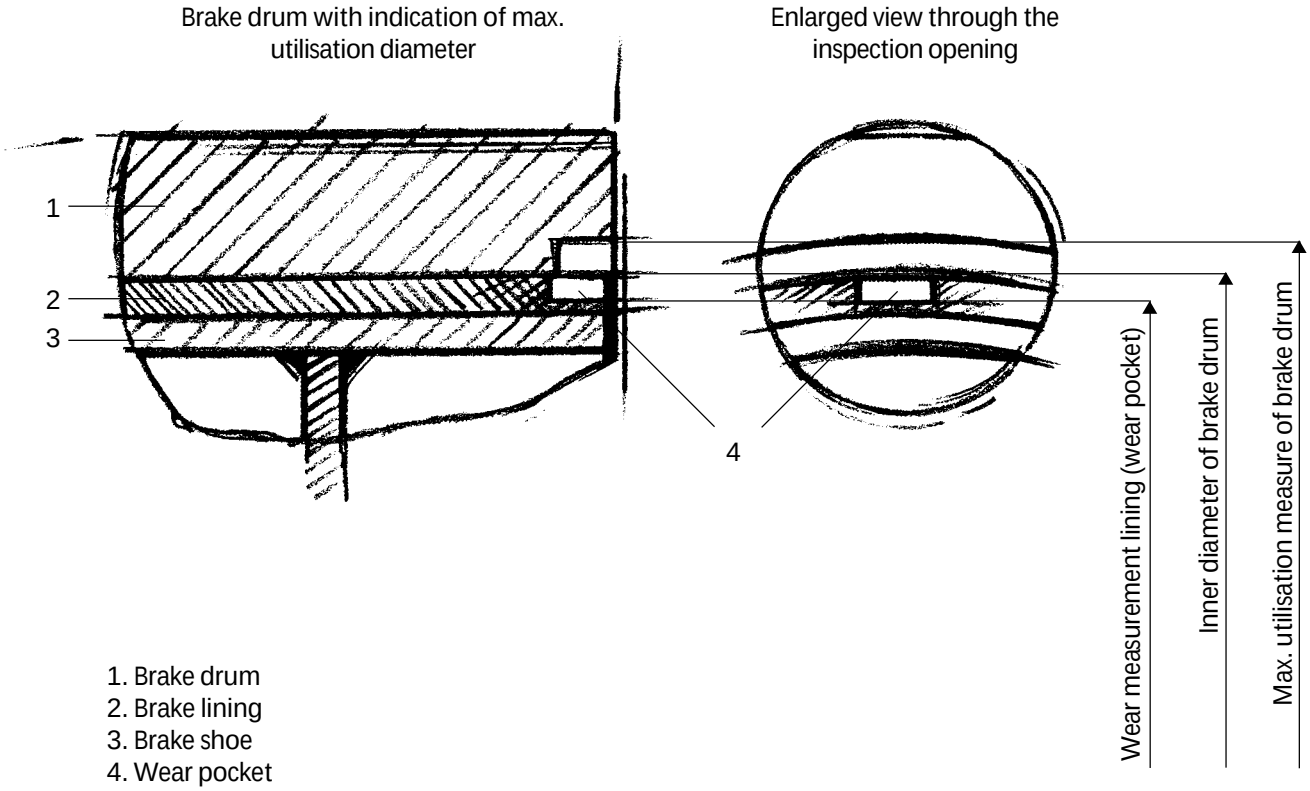
The geometrical design and the position of the wear pocket in the drum lining is configured to allow assessment of the wear level of the drum without measuring. Brake drums of this new design are provided with a relief grind, i.e. a larger diameter than the diameter of the lining jacket. This larger diameter is the test criterion for the maximum wear level of a drum.

The wear pocket design is not impaired by the configuration of this step in the wear surface of the brake drum and indicates the actual wear condition.

The position of the wear pockets depends on the position of the inspection opening in the drum cover.

The wear pockets are easily visible through the inspection opening.

See the following illustration.



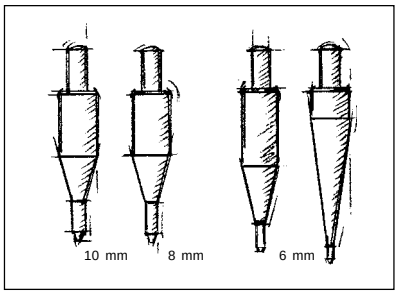
1. Brake drum
2. Brake lining
3. Brake shoe
4. Wear pocket

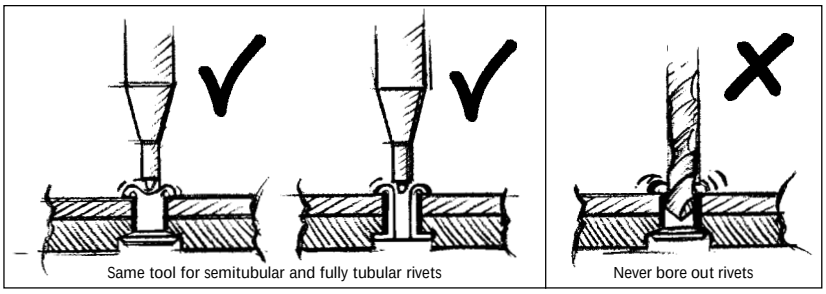
Removal of worn linings

The rivets should always be pushed out using a riveting machine, preferably one with hydraulically actuated strokes.

The equipment used must be suitable for the rivet diameter. Modern rivet punches are universally usable for fully tubular and semitubular rivets.

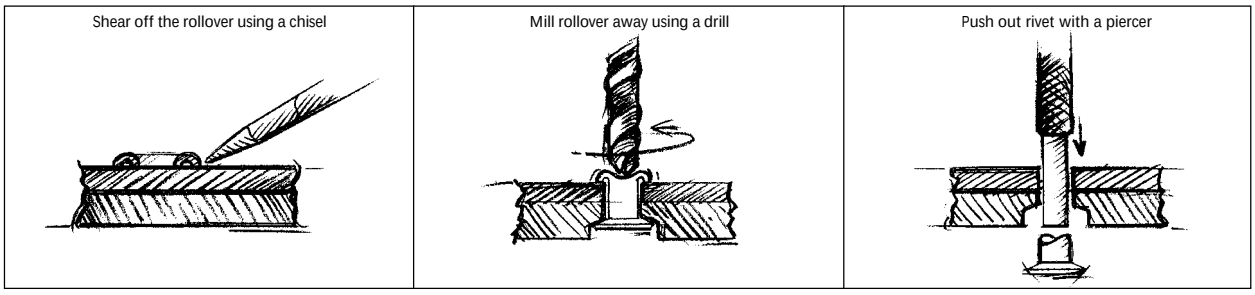
The use of unsuitable rivet punches may damage the brake shoe.





Other possibilities

If no riveting machine is available, or if solid rivets are to be removed, it is recommended to proceed as follows:



Health and safety precautions

Brake dust contains large amounts of respirable fine dust and is harmful to health. Safety regulations prescribe exhaust systems with a suction power between 40 and 50 m³/h.

Wheel brakes must never be dismounted using compressed air or cleaned using a dry brush. It is urgently recommended to use clean water without chemical additives for cleaning purposes. The use of detergents might impair the braking effect.

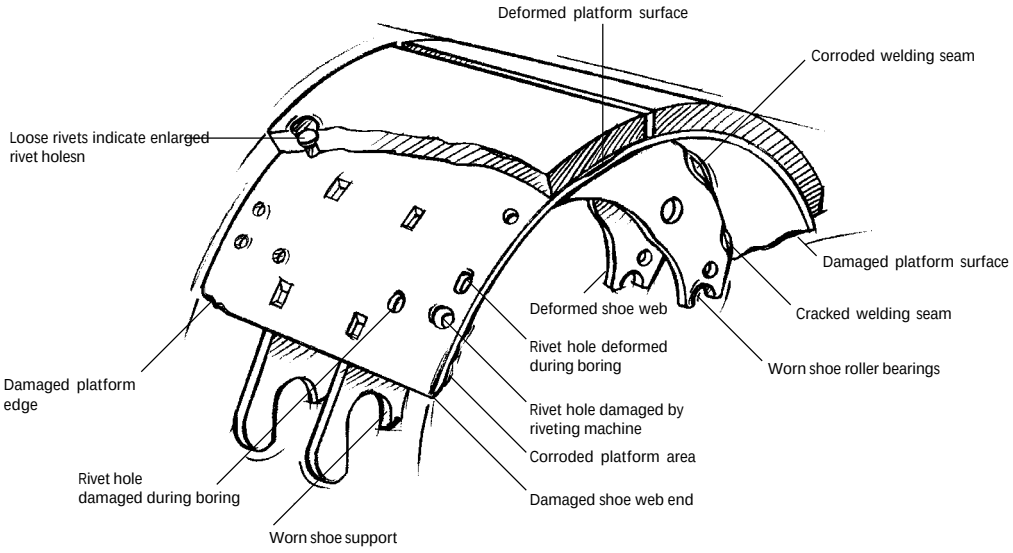
Brake shoe inspection

TEXTAR

Brake shoe inspection and preparation

1. Brake shoe inspection
2. Cleaning in a specific device under all safety precautions.
3. Coating of brake shoe with high temperature resistant anticorrosion medium, if required.

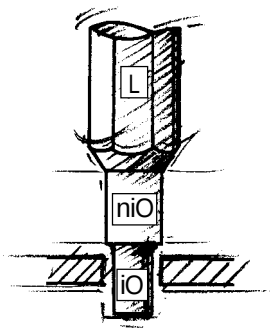
Frequent faults



Inspection of backing plate for concavity

The brake shoes must snugly fit on the shoe platform, i.e. the platform must not be concave. The brake shoe must not be distorted as a whole, and the radius of the contact surface must be neither too small nor too large. The diameter of the rivet bore hole must be no more than 0.6 mm larger than the rivet diameter (DIN 7513). This can be easily checked by means of a rivet hole gauge. The shoes must be carefully cleaned, e.g. by sandblasting (not with aluminium shoes) or by means of a shoe grinding unit.

The contact surface may also be treated with an anticorrosion agent which must be resistant to high temperatures. The brake shoes are now ready for fitting.



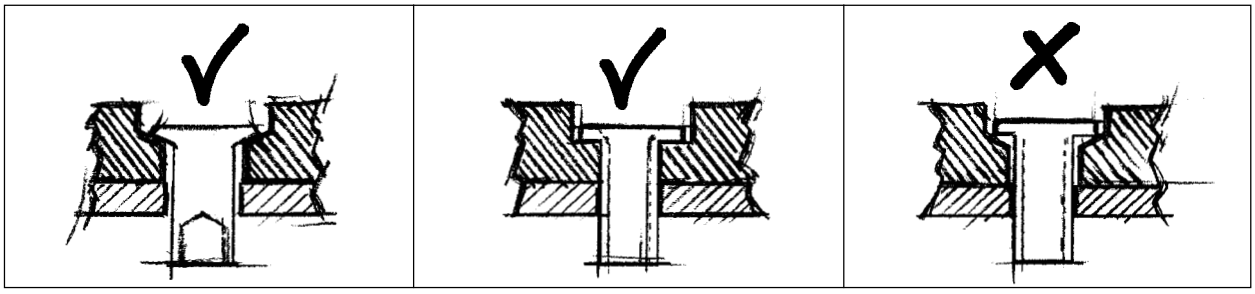
Riveting

It is mandatory to always use the lining material specified by the OE manufacturer or a material approved by the Kraftfahrtbundesamt (KBA). TEXTAR brake liners are available in a wide variety of designs for practically any application.

Rivet material: Mostly steel, brass or copper.

Rivet selection

The rivets must be selected to fit the rivet holes.

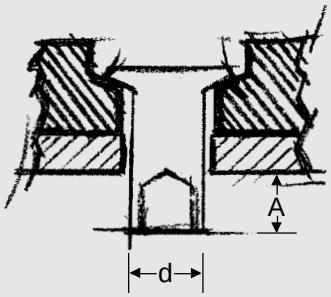


The rivet length can be determined by the following rule-of-thumb:

German standard
DIN 3575, semitubular

A = 0.5 - 0.75 * d
DIN 7338, fully tubular
a = 0.8 - 1.0 * d

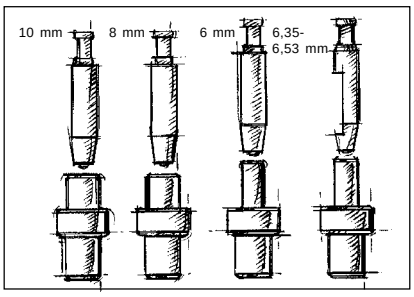
Example: A brake shoe rivet according to DIN 7338 with a diameter of d = 8 mm should not cause the rivet shaft A to project less than 0.8 * 8 mm = 6.4 mm and not more than 8mm beyond the brake shoe bore.



Important
With semitubular rivets, the bore hole bottom must be at the level of position “A” to allow the formation of a satisfactory rollover.

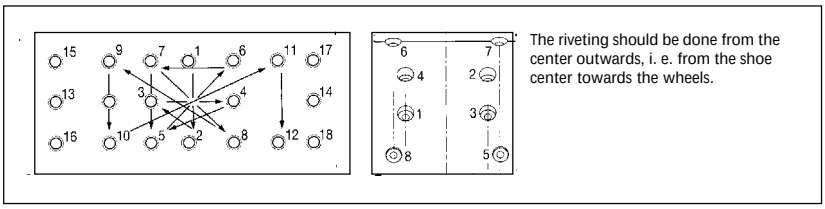
Riveting tools

Selection of correct rivet head formers and anvils. The instructions of the riveting machine manufacturer must be followed.



CV drum brake linings - mounting

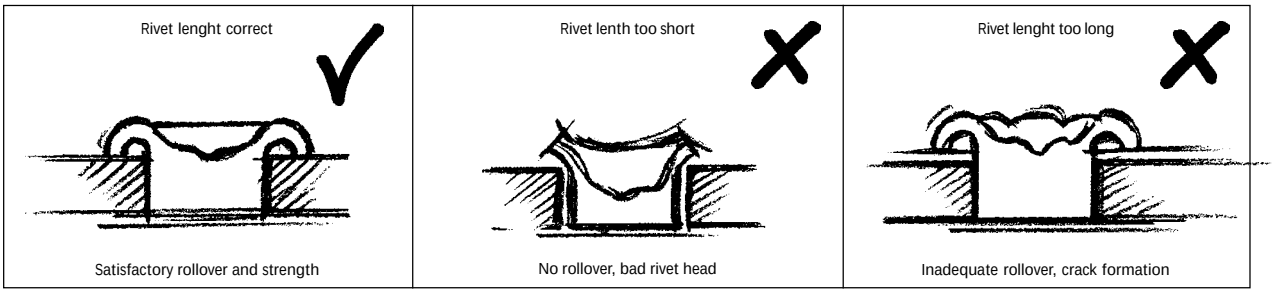
Some vehicle manufacturers specify that the linings have to be pressed onto the shoes with a pre-stressing force of 300 N. The special riveting header with pre-stressing supplied by TEXTAR, comply with this requirement and fit in virtually all conventional riveting machines. The riveting forces differ with the rivets and materials used, and the pressures indicated by the manufacturers must be precisely followed in order to obtain the riveting forces specified by the brake producers. The relation between the pressure applied and the resultant riveting force varies with the machine type.

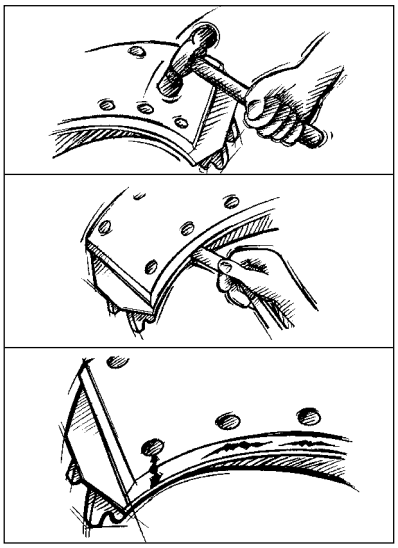


The riveting should be done from the center outwards, i. e. from the shoe center towards the wheels.

Final inspection

Riveting check:





A light knock with a hammer allows to assess whether the riveting is satisfactory or not: A dull thud indicates a loose lining. A high-pitched response indicates that the riveting is correct.

A valve gauge can be used to check for cavities under the lining. A cavity of more than 0.15 mm beyond the first row of rivet holes can lead to noise problems.

Finally, the linings should be checked for cracks in the area of the rivets which would indicate incorrect riveting.

CV drum brake linings - liner measurements (thickness)

Thickness measurements of drum brake linings generally pose no problems to specialist repair shops as long as they are dealing with parallel linings (uniform thickness across the length of a lining). So-called tapered linings (drum brake linings with varying thickness across their length) must be measured according to a specific standard.

The brake liner manufacturers belonging to the Federation of the Friction Liner Industry (VRI) as well as their licensees have standardised the measuring position as

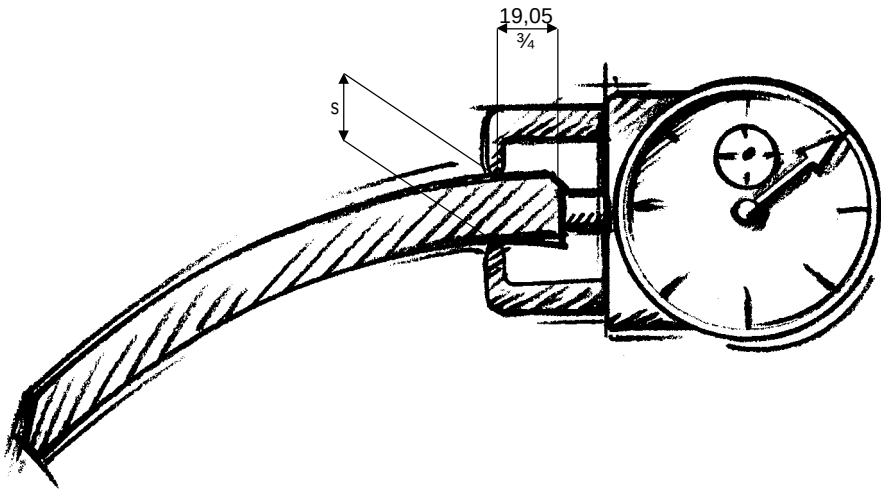
19.05 mm = 3/4"

distance from the thicker lining end (S).

TEXTAR, as renowned brake liner producer, has adopted this measuring positioning in all production drawings.

Customers in the replacement market also benefit from the application of the VRI standard.

The following sketch shows how the measuring instrument should be positioned.

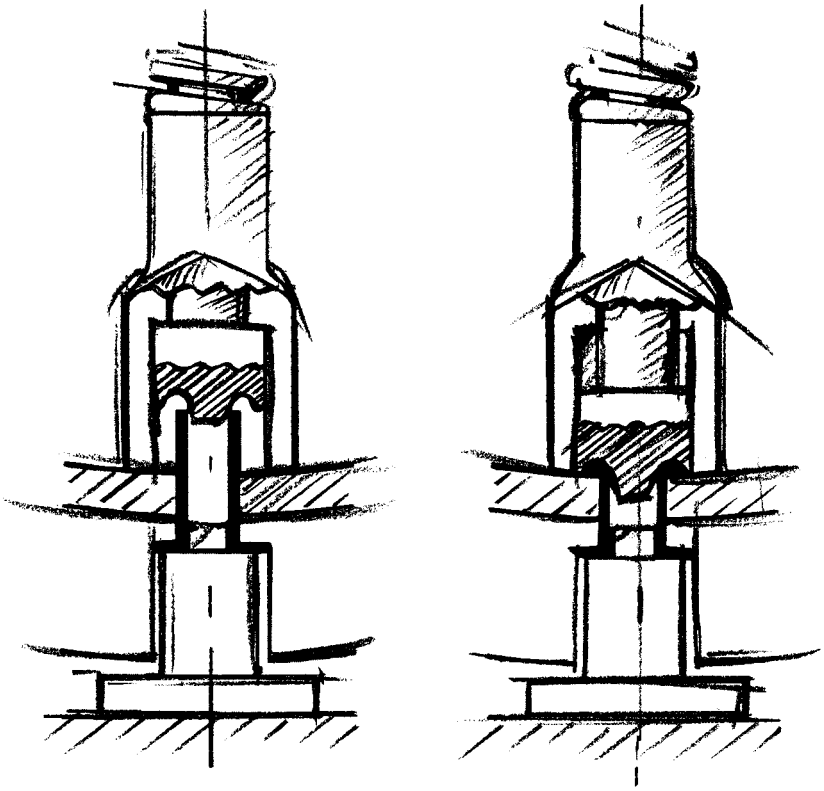


Rivet head formers

A special rivet head former for riveting under pre-stress is used to press the brake lining against the shoe with a pressure of approx. 30 DaN to assure air-gap-free contact.

This will prevent the development of brake noise and contributes to achieving an optimum braking effect.

Please see our price list for the respective part numbers.

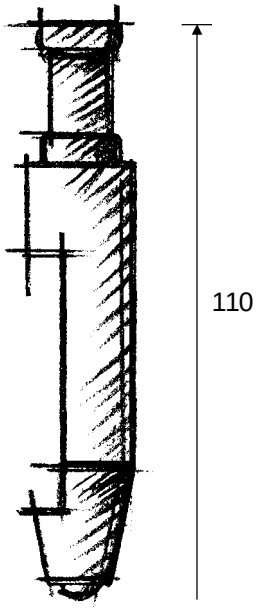


Start End

Special riveting tool

Special riveting tool

The new special riveting tool, part No. 98600 0148 0 1, can be used for the following rivet and replaces the previously used tools:



Rivet head former	TX No.:	Rivet		TX No.:
Volvo	98600 0127 0 1	6.35	x ... L9-12	96700 7090 - 7120
Iveco	98600 0131 0 1	6.3	x 16.5	96000 0068 0 1
Scania	98600 0129 0 1	6.3	x 18	96000 0028 0 1
DAF		6.53	x 17.65	

Recommended rivets and riveting forces

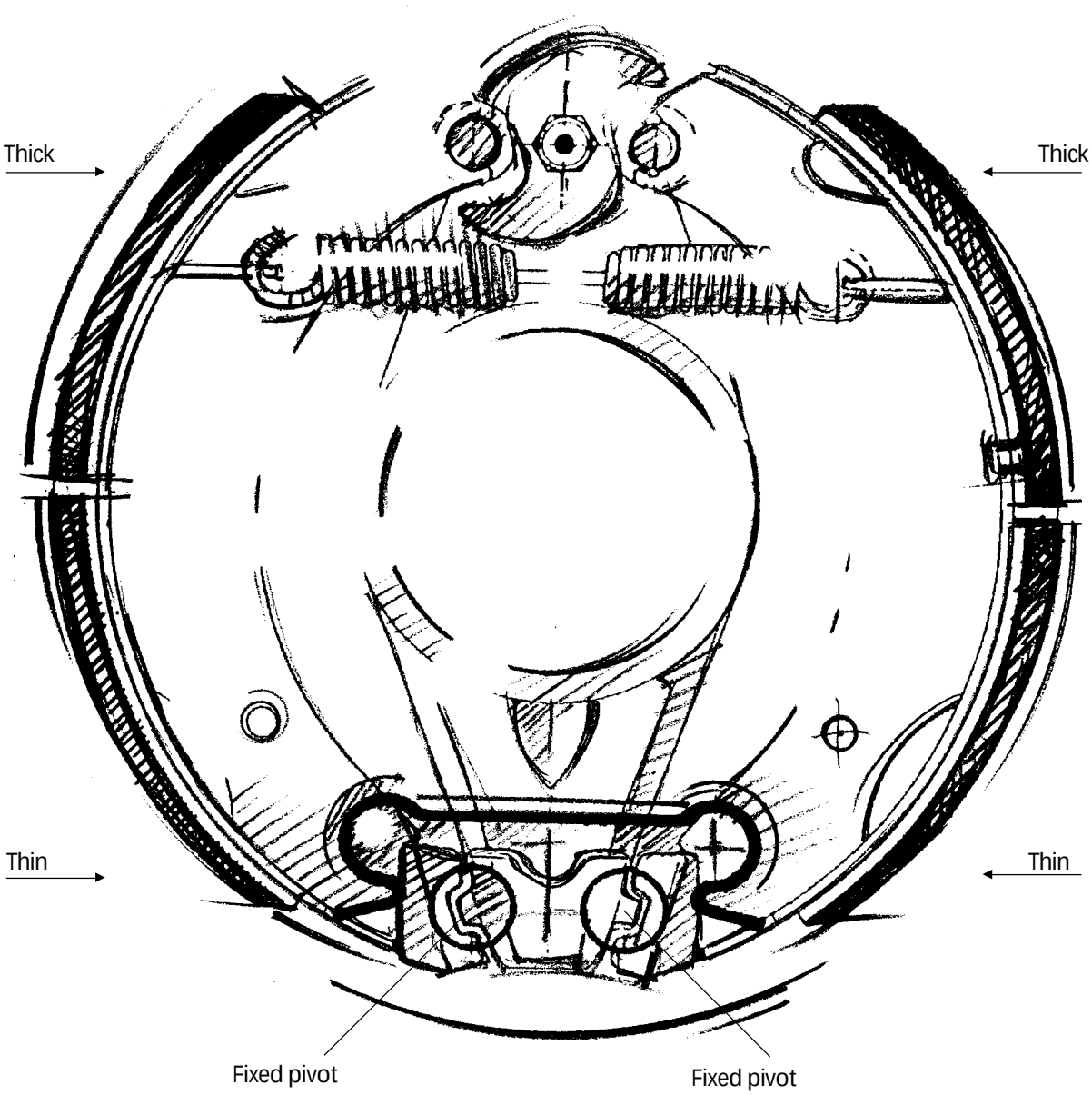
TEXTAR

Manufacturer	Brake	Rivet size	Material	Riveting force (daN)
BPW Warstein-Axles	Steel shoe Dia. 420 mm Dia. 360 mm Dia. 300 mm	Flat head with stepped bore 8 x 15 (96 000 0044 01) alternatively 8 x 15 (96 208 0150 01)	Iron 851 851	2000 ± 200
Mercedes Benz M A N	Dia. 410 mm Steel shoe 5 mm Steel shoe 9 mm Cast shoe machined Cast shoe milled Cast shoe not machined	Flat head with stepped bore 8 x 15 (96 000 0044 0 1) 8 x 18 (96 000 0045 0 1) 8 x 18 (96 000 0045 0 1) 8 x 20 (96 000 0046 0 1)	Iron 851	2000 ± 100
IVECO	Dia. 381 mm Stopmaster I + II	Counterbore head 6,3 x 16,5 mm (96 000 0068 0 1)	Iron 851	2000 ± 100
Kässbohrer-Axles Buses	Steel shoe 7 mm Dia. 400 mm Dia. 300 mm Dia. 410 mm	Flat head, semitubular 8 x 18 (96 208 0180 0 1) 10 x 16 (96 000 0070 0 1)	Iron 851 851	 1600 ± 100 2800 ± 200
Sauer	Steel shoe Dia. 420 mm Dia. 300 mm	Flat head, semitubular 8 x 15 (96 208 0150 0 1) alternatively 8 x 16 (96 000 0067 0 1)	Iron 851 851	2500
Volvo	Steel shoe Dia. 394 mm Dia. 413 mm	L11 6,35 x 17 mm (96 700 7110 0 1)	Brass 876	1700 ± 100
Scania	Dia. 412 mm	6,3 x 18 (96 000 0028)	Brass 876	1700 ± 100
R O R	(96 700 7100 0 1)	L10 6,35 x 15,9 876	Brass	1700 ± 100

Installation drawing for tapered linings

Tapered linings

When using axially symmetrical drum brake linings, so-called tapered linings, it is important to mount the thinner lining at the fixed pivot of the brake shoe.



Turn-off instructions for CV drum brake linings

TEXTAR

Turn-off instructions for CV drum brake linings

1. In order to be able to assure satisfactory functioning of the wheel brake, the brake linings must principally be turned off after assembly.

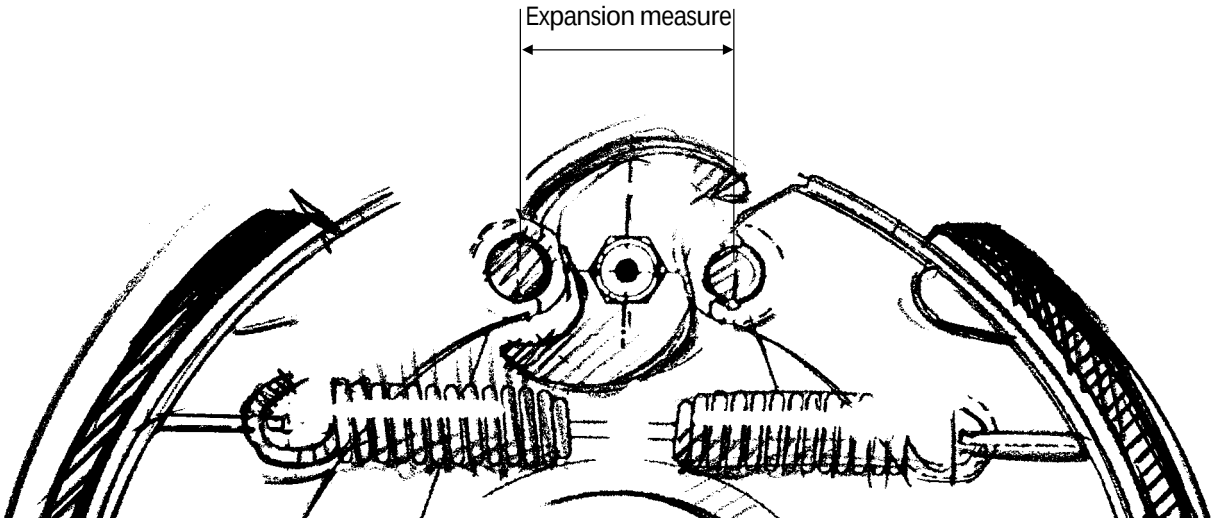
2. Prior to turn-off, the drum diameter must be determined (also for new drums) or defined. If drums are skimmed, the maximum turn-off measure must be observed and the same value set right and left.

3. Selection of lining thickness and, if necessary, use of oversized linings.

4. Expansion of shoes to braking position and turn-off using conventional machines (observe specifications of axle or brake manufacturers regarding expansion). The turn-off measure should be the previously determined drum diameter -0.5 mm.

5. A cutting thickness of 0.3 mm should not be exceeded during turn-off and the lining thickness should not be reduced by more than 1.5 mm.

The thickness should be checked during or immediately after the turning-off. After resetting of the clamping device, the thickness can no longer be checked or only with difficulty.



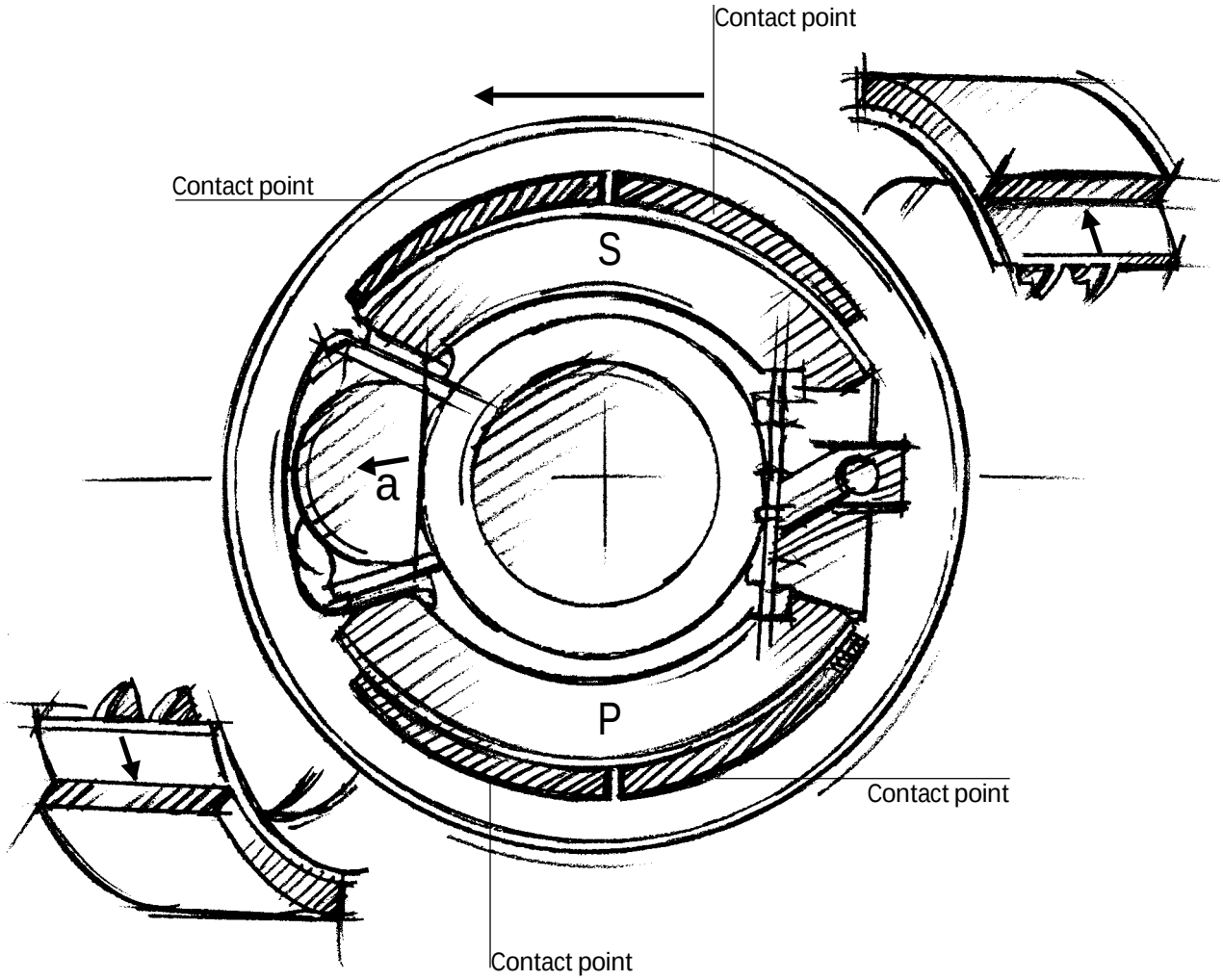
Pre-ground drum brake linings

Drum brake linings for wheel brakes with sliding shoe platforms (e.g. Z-cam, various wedge brakes) are pre-ground.

The purpose of the special shape is to guarantee a defined contact point for the linings on the friction surface of the brake drum thereby assuring self-centering in repair cases.

Such drum brake linings are turned off only exceptionally.

Furthermore, the drum diameters have to be adapted to the repair stage of the brake linings.



Mounting instructions drum brake linings - WVA-No. 19758

TEXTAR

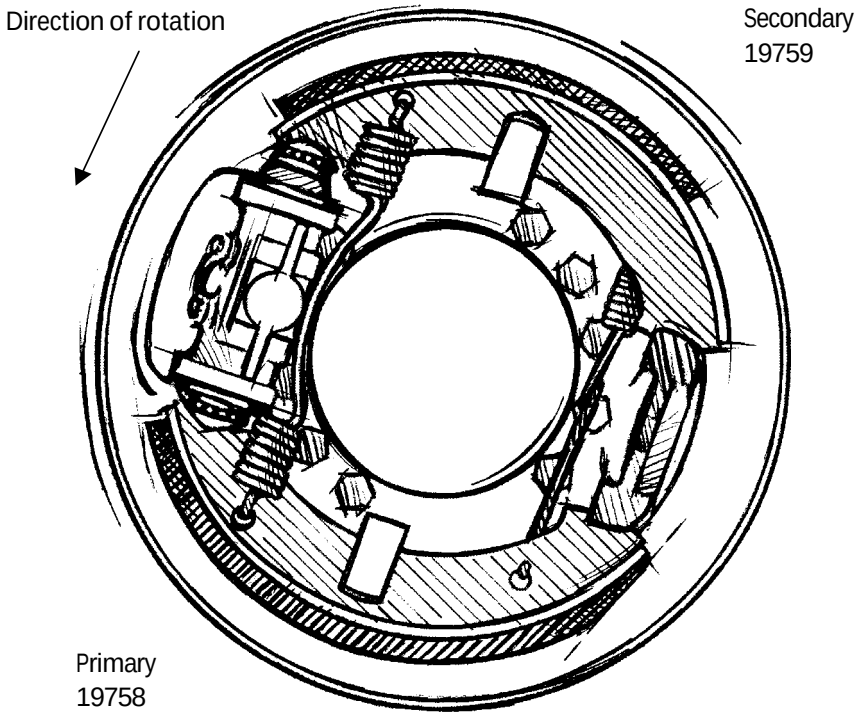
Volvo Simplex wedge brakes

Volvo Simplex wedge brakes use brake linings of various lengths and thicknesses.

This due to the varying wear characteristics of the primary and secondary linings.

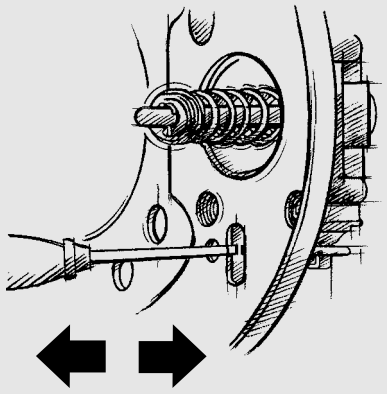
As the primary lining produces considerably more braking power (approx. 75%), it requires more lining material, i.e. the longer / thicker lining (19758) is mounted on the leading shoe.

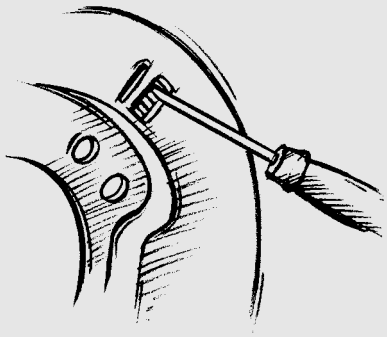
It is always important to observe the special mounting and adjustment instructions supplied by the vehicle manufacturers.

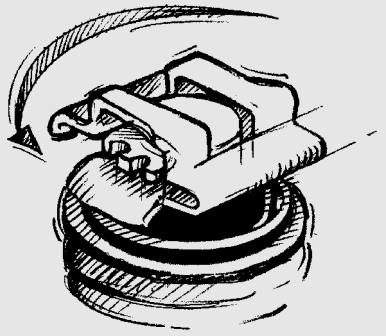


Volvo wedge brake		360 x 170
WVA-No.	Primary Secondary 1. Oversize 2. Oversize	4 x 19758 14.80 4 x 19759 09.70 15.80 10.70
Material		DON 7131
Number of rivets	Primary Secondary	22 pcs. 20 pcs.

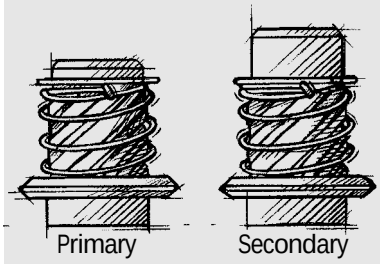
Drum brake lining WVA-No.19758 - adjustment







Various adjusters for leading and trailing shoes.



To remove the brake drums and to position the brake shoes, turn the toothed adjustment screws anticlockwise.

All adjustment screws have a right-hand thread.

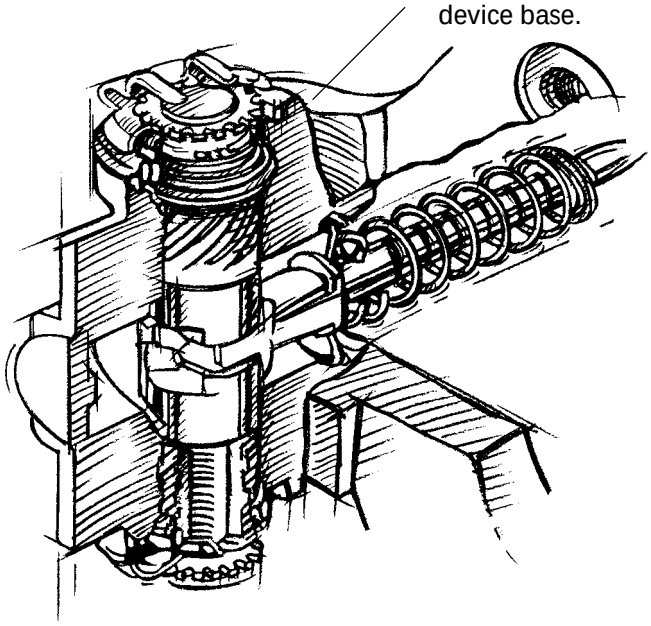
Volvo wedge brake	360 x 170
Automatic clearance adjustment	0.35 - 1.55 mm
Setting dimension after mounting	1.00 - 1.55 mm
Initial position Adjusting screw	Turn 2.5 - 3 x anticlockwise (right-hand thread)
Material	DON 7131

Adjust to basic position after relining. To do this, unscrew the adjusting screw to approx. 2.5 - 3 mm from the end stop in order to ensure that the adjusting device can function correctly.

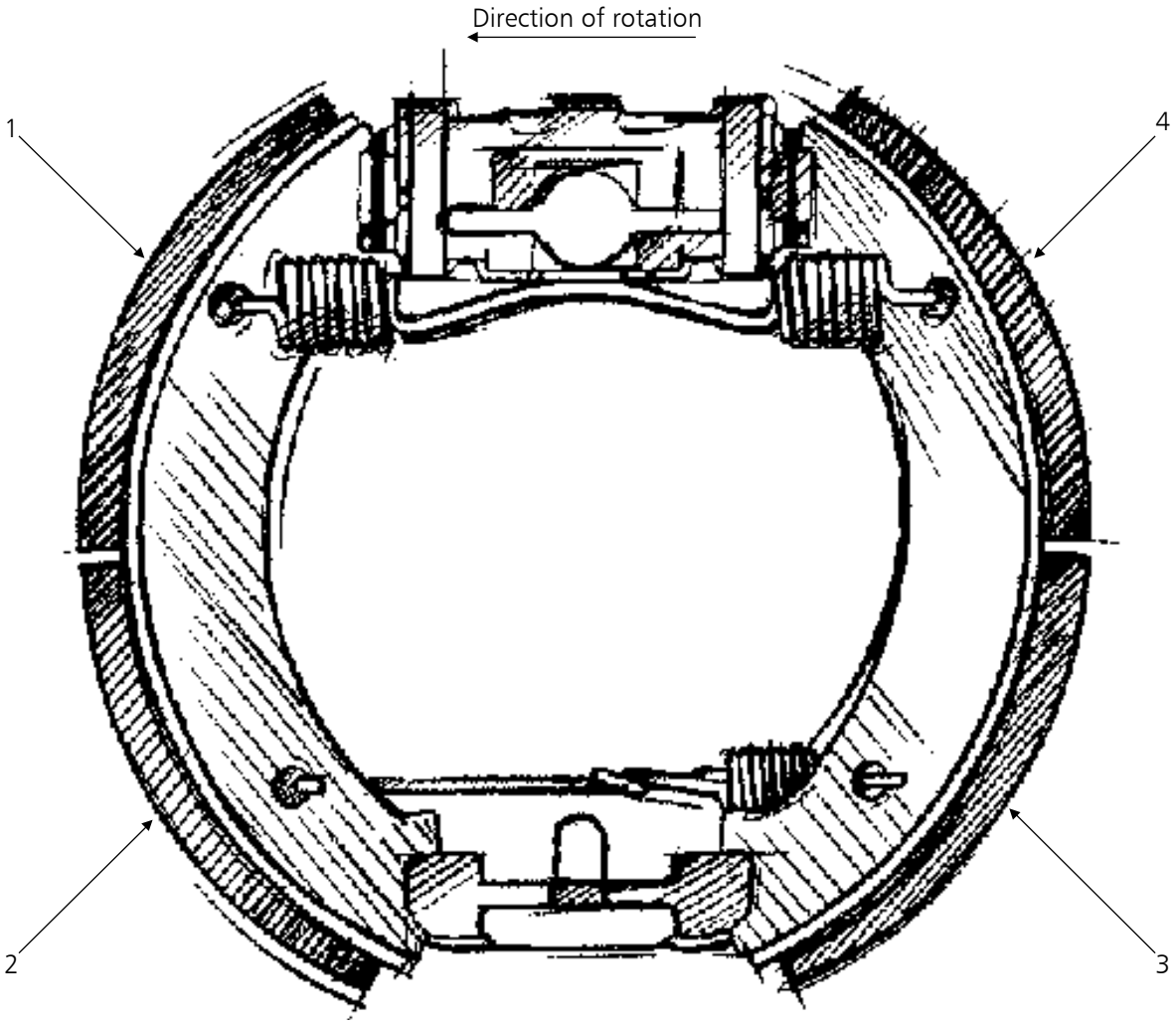
Also, set the lining / drum clearance to approx. 1.00 - 1.5 mm.

The recuperating spring affects the adjusting device and should therefore be replaced.

Do not grease the adjusting device base.



Assembly scheme for Rockwell brakes - drum brake linings



	410 x 180	410 x 200	Thickness	
1	19715	19717	22.1 – 0.3mm	
2	19714	19716	22.1 – 0.3mm	**with wear bore**
3	19556	19553	20.4 – 0.3mm	
4	19556	19553	20.4 – 0.3mm	

Rockwell brakes produced after 05/96 use drum brake linings of various designs and thicknesses!

It is important to adhere to the installation drawing!

Friction materials recommended by MAN and Mercedes Benz for dia. 410 mm brakes

Application range	MAN			Mercedes-Benz			
	TRUCK	BUS		TRUCK		BUS	
Product No./width	All	Regular	Coach	1)	2)	Regular	Coach
120 mm	T 020			T 012			
140 mm	T 020			T 012			
160 mm	T 020		T 020	T 012	T 012		
180 mm	T 020		T 020	T 012	T 012		
220 mm	T 020		T 020	T 012	T 012		
19706/07		D 7113	T 020			D 7113	T 016

= No application for this product number
1) Intermediate construction series (model 652-655)
2) Heavy construction series (as from model 656)

General mounting instructions for CV disc brake pads

TEXTAR

• Check the wheel brake clearance prior to dismantling the pads. Any deviation from the required distance points to a defective brake.

• Increase the clearance via the setting screw so that the pads can be easily removed from the housing after removal of the locating devices. (Caution: Do not turn the screw beyond the limit stop, risk of tear-off).

• Check the thickness of the used pads, the maximum admissible thickness variation is 3mm.

• Now check all rubber seals of the calliper for any damage and replace them, if necessary.

• Inspect the disc for wear, heat cracks or other damage and replace it, if necessary.

• In order to achieve a satisfactory braking effect and good wear values of pad and disc, used discs should always be turned off. Optimally, this takes place in their installed condition in order to minimise thickness variations and runouts. The minimum thickness of the brake disc must be observed by all means (sufficient reserve until the next pad change).

• Depending on pad thickness, oversized brake pads may be used.

• Check the holding-down springs prior to mounting and replace them, if necessary.

• Insert pads, mount accessories, if any, and fasten the holding-down bracket using the prescribed torque.

• After mounting, adjust the brake to achieve the prescribed clearance. Minimum clearance must be observed.

• A larger clearance will correct itself when the wheel brake is intact. (Caution: Pedal travel may be temporarily longer).

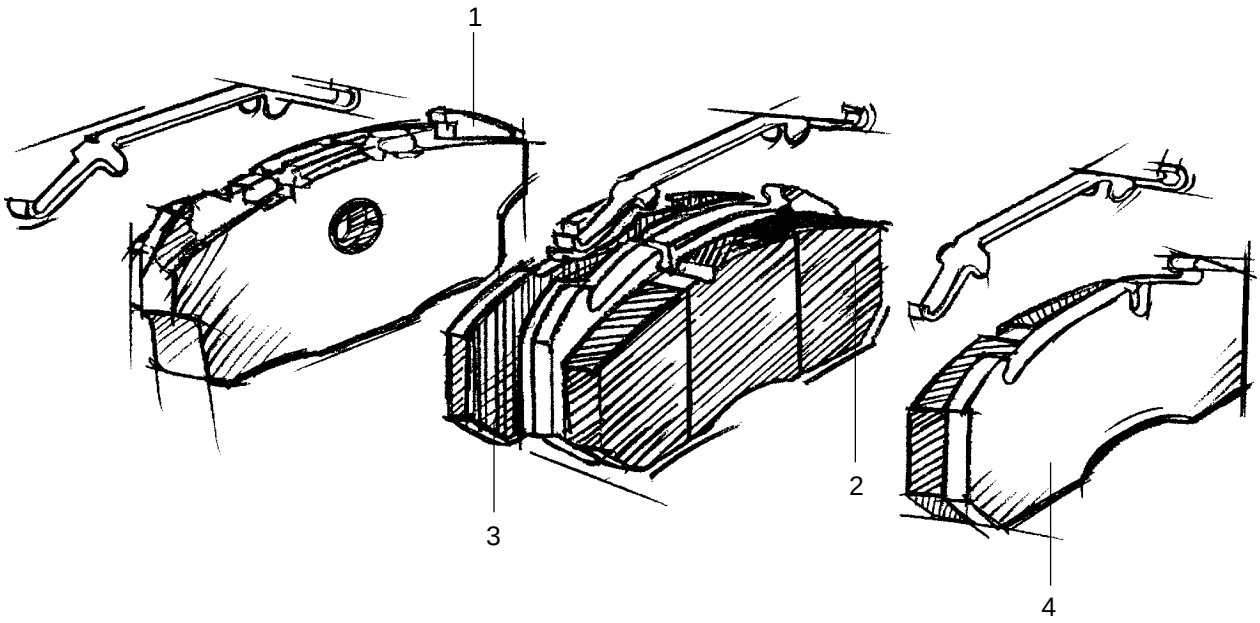
• Once the unit has been mounted, recheck the clearance setting (e.g. box wrench on the adjuster must not move when the brake is activated).

The general and special mounting instructions of the vehicle, axle, brake, and friction pad manufacturers must be strictly observed!

Omission of thermal insulation plates in Lucas D 3 and Elsa brakes

Omission of thermal insulation plates in Lucas D 3 + Elsa brakes

The material consistency and configuration of TEXTAR disc brake pads (WVA No. 29030 and variations) in Lucas D3 disc brakes make the installation of thermal insulation plates unnecessary!
This applies to all vehicles equipped with a Lucas D3 or "Elsa" disc brake.



1. Pressure plate
2. Inside pad
3. Thermal insulation plate
4. Outer pad

Disc brake pads - friction surface coating

Friction surface coating

Depending on their specific use, the brake pads may have a glossy, paint-like coating on the friction surface.

This friction surface coating has a number of functions and effects:

- Increased "initial friction coefficient" until the operating value is reached.
- Optimised bedding properties on non-turned-off brake discs.
- Improved cleaning of corrosion-protected or worn out brake discs.
- Reduced smearing when new brake pads are exposed to sudden thermal stress.
- Corrosion protection of the entire friction surface when storing.

Turn-off and thickness data for CV brake discs and pads

Turn-off and thickness data for CV brake discs

Before brake repair, the discs should be inspected for wear, cracks, scores, heat spots, uneveness and corrosion and turned off or replaced, depending on the diagnosis. When turning a disc off, the repair limit must be observed (see table) to leave a sufficient wear reserve until the next pad change.

Worn or torn brake discs (cracks with a depth down to the cooling channel and/or a length > 75% of the friction ring width) must be replaced by axle.

The repair instructions of the vehicle, axle, brake and/or friction material manufacturers must be observed!

CV disc brake	KNORR SB 5 pneumatic	KNORR SB 6.../ 7... pneumatic	KNORR 4K85 pneum./ hyd.	Meritor D 3/ Elsa pneumatic	Wabco Pan 17 pneumatic
Disc thickness, new	34 mm	45 mm	48 mm	45 mm	34 mm
Limit wear	28 mm	37 mm	38 mm	35 mm	26 mm
Repair limit	29 mm	39 mm	40 mm	41 mm	30 mm
Max. turn-off 1. Standard-sized backing plate 2. Oversize 1 backing plate		43 mm 39 mm	45 mm 40 mm		

Pressure matching of tractor/trailer unit

TEXTAR

Procedure

1. Note vehicle data on form sheet TF 0762.

2. If the individual axles display different wear behaviour, determine requested deceleration acc. to form sheet TF 0763.

3. Position the vehicles on a flat surface. Install test manometer in the brake line (connecting plug yellow = p_m), in the brake cylinders on front and rear axle of the tractor, on each axle of the trailer and at the input and output of the trailer brake valve.

Note:
If the trailer axles have no adjustment or control valve installed, a connection on one axle will suffice.

4. Fill the pneumatic system up to switch-off pressure, fully actuate the brake and check all connections for leaks.

5. Loosen the brake, then re-actuate it at the calculated pressures indicated by the vehicle manufacturer and enter the no-load brake pressures into form sheet TF 0765 as actual values.

6. Switch the ALB controller into full-load position and actuate the brake via the pressure p_m in 0.5 bar steps while reading the pressures of the individual axles, and enter the values obtained into form sheet TF 0765.

Note:
For ALB controllers which are actuated by air suspension: Connect a precision test control valve to the test connector of the ALB controller via the in-house supply or air reservoir of the truck and set the “loading” pressure according to the ALB type plate by means of the precision test control valve. With older systems, the test connector with a 3/2 multiple way valve is installed in the line coming from the air bellows.

CAUTION:
In the absence of a test connector and if the air bellows control line must be disconnected from the ALB valve, there is an accident hazard, as the vehicle height will decrease.

In any case it must be assured that the pin at the test connection can be pushed down completely and will return to its limit position after the test.

7. Remove the test manometer up to the p_m connector (connecting plug yellow) and the air bellows control pressure.

8. Record the circumferential wheel forces of the individual axles on the roller test bench acc. to form sheet TF 0765.

9. Convert the circumferential wheel forces relative to the test weight or admissible total vehicle weight in deceleration and enter the values either into form sheet TF 0776 (semi-trailer unit) or TF 0777 (truck and trailer), depending on the vehicle type.

10. Provided that all wheel brakes of the tractor/trailer unit are in technically satisfactory condition (e.g. liner quality, drum and pad turning work, smooth operation of all parts), both vehicles of the tractor/trailer unit should be in the same deceleration band.

    In semi-trailer units, the ideal line is not so easily determined because of the axle distances and the position of the centres of gravity.

    Generally, the tractor vehicle should be in the upper half of its deceleration band.

    Semi-trailers with "standard" dimensions should be approx. in the middle of the "semi-trailer" braking band.

    Extremely long and flat semi-trailers (e.g. flat steel transporters) should be in the upper range of the band, while extremely short vehicles with a high centre of gravity (e.g. concrete mixers) should be rated at the lower band limit because much of the weight is shifted to the tractor vehicle.

    Is a balancing of the vehicles required, the deceleration curve of the trailer or semi-trailer may be shifted by changing
    the pressure lead of the trailer brake valve.

    An increase of the pressure lead will shift the curve toward the left, i.e. the trailer will be braked stronger in relation to the tractor.

    A decrease of the pressure lead will shift the curve toward the right, so that the trailer will be braked with a relatively weaker force.

Note:
If the nominal brakings of tractor and trailer axles as described under item 2 differ considerably, a balancing of the tractor/trailer unit is not possible without technical modifications (e.g. lever lengths, cylinder sizes, retention valves, etc.). In this case the balancing solution must be effected in co-ordination with the vehicle manufacturer. After a technical modification, a new type approval according to § 19 para. 2 StVZO must be obtained from TÜV.

Friction material overview - CV drum brake linings

TEXTAR

Friction Material	OE	AM	Vehicle Type	Bus	Pulling Vehicle	Trailing Vehicle
T 0005	OE		IKARUS-Bus/RABA-Achsen	x		x
T 10	OE	KBA /ECE90R	Mercedes		x	
T 0104	OE		Renault Trucks		x	
T 0115	OE		Renault Trucks		x	
T 011	OE		IVECO/WABCO		x	
T 012	OE	KBA /ECE90R	Mercedes		x	
T 013	OE	KBA /ECE90R	Kässbohrer/Warstein/SAF		x	x
T 016	OE	KBA /ECE90R	DAF/ Mercedes/ Evobus Setra/ Auwärter	x		
T 017	OE		Mercedes/IVECO	x	x	
T 018		KBA /ECE90R	IKARUS	x		
T 020	OE	KBA /ECE90R	MAN		x	
T 021	OE	KBA /ECE90R	VW		x	
T 022	OE	KBA /ECE90R	IVECO		x	
T 024		KBA /ECE90R	IVECO		x	
T 026	OE	KBA /ECE90R	MAN/VOLVO	x	x	
T 030	OE		Auwärter/ IVECO		x	
T 053	OE	KBA /ECE90R	BPW/Knott-Achsen			x
T 066	OE		VW		x	
T 088		ECE90R	Mercedes/MAN	x	x	
T 090	OE	KBA /ECE90R	BPW/SAF			x
T 099		KBA /ECE90R	BPW/SAF/Frühauf Achsen/ROR			x
DON 7113	OE	KBA /ECE90R	Mercedes/MAN	x		
DON 7115	OE	KBA /ECE90R	Scania /Volvo		x	
DON 7203	OE		DAF		x	
DON G 110		KBA /ECE90R	Scania /Volvo		x	
DON G 115	OE	KBA /ECE90R	Scania /Volvo		x	
DON 7141	OE		IVECO/ROR	x	x	
DON 7151	OE		IVECO		x	

Friction material overview - CV disc brake pads

Friction Material	OE	AM	Vehicle Type	Bus	Pulling Vehicle	Trailing Vehicle
T 263	OE		Perlini		x	
T 402	OE	KBA /ECE90R	Mercedes		x	
T 450	OE		Perlini		x	
T 456	OE		Neoplan/IVECO/Evobus Setra	x	x	
T 457	OE		WABCO		x	
T 471	OE		Mercedes		x	
T 3010	OE		DAF/MAN	x	x	
T 3011	OE		Mercedes		x	
T 3016	OE		Renault Trucks/Mercedes	x	x	
T 3018		KBA /ECE90R	Ford/ IVECO/ Renault Trucks/ Volvo		x	
T 3023	OE		MAN/Van Hool	x		
T 3030	OE	KBA /ECE90R	BPW			x
T 3050	OE	KBA /ECE90R	Mercedes/Scania/IVECO/MAN		x	
T 3060		KBA /ECE90R	SAF/Fruehauf-Achsen			x
T 7400	OE	KBA /ECE90R	DAF/ Evobus Setra/Neoplan/Mercedes/ Scania	x	x	
D 7500	OE		VOLVO		x	

TEXTAR — Fahrzeugdatenblatt

Datum

Name

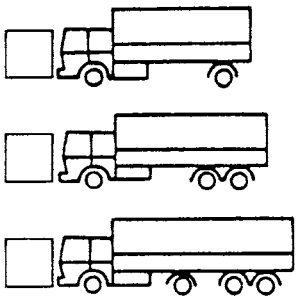
Kunde:

Daten Lastkraftwagen / Sattelzugmaschine

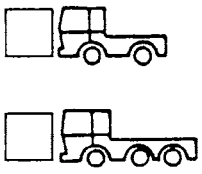
Typ und Hersteller			
Fahrzeug-Ident-Nr.			
Erstzulassung		Km-Stand	
Amtl. Kennzeichen			
zul. Gesamtgewicht	kg		
Achslasten			
1. Achse	kg	3. Achse	kg
2. Achse	kg	4. Achse	kg
Reifengröße			

ALB-Regler Typ	*Soll*	*Ist*
Eingangsdruck	bar	bar
Ausgangsdruck leer	bar	bar
Ausgangsdruck bel.	bar	bar
Balgdruck leer	bar	bar
Balgdruck bel.	bar	bar
Federweg = s	mm	mm
Hebellänge = f	mm	mm

Lastkraftwagen



Sattelzugmaschine



Daten Anhänger / Sattelanhänger

Typ und Hersteller			
Fahrzeug-Ident-Nr.			
Erstzulassung			
Amtl. Kennzeichen			
zul. Gesamtgewicht	kg		
Achslasten			
1. Achse	kg	3. Achse	kg
2. Achse	kg		
Reifengröße			

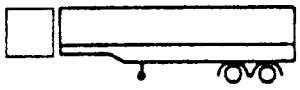
ALB-Regler Typ	*Soll*	*Ist*	*Soll*	*Ist*
Eingangsdruck	bar	bar	bar	bar
Ausgangsdruck leer	bar	bar	bar	bar
Ausgangsdruck bel.	bar	bar	bar	bar
Balgdruck leer	bar	bar	bar	bar
Balgdruck bel.	bar	bar	bar	bar
Federweg = s	mm	mm	mm	mm
Hebellänge = f	mm	mm	mm	mm

Bremskraftreglerdruck - leer	bar
- teilbeladen	bar
- vollbeladen	bar
Dauerbremse eingestellter Druck	bar

	Achse 1	*Achse 2*	*Achse 3*
Achsen-Typ			
Achsennummer			
Bremsengr. Ø / br.			
Bremszylinder-Typ			
Hebellänge mm			
Gestängesteller	☐ manuell	☐ automatisch	

Anhänger

Sattelanhänger



TF 0762

07 90

TEXTAR

Berechnung der Sollabbremsung druckluftgebremster Fahrzeuge

Datum

Teilnehmer

Kunde	Kennzeichen	Fahrzeug-Hersteller, Typ

Radlast	G	(kg)	
Trommelradius	$r_{Tr.}$	(mm)	
Hebellänge	l	(mm)	
dyn. Reifenradius	$r_{dyn.}$	(mm)	
Nockenradius	e	(mm)	
Kennwert	n_a C*	(-)	
Zylinderkraft	F	(N)	

	Nockenradius e (mm)	Kennwert naC*
BPW		
300 ø	13,0	1,20
360 ø	14,0	1,20
420 ø	14,0	1,20
Kässbohrer		
300 ø	15,0	1,28
400 ø	15,0	1,42
Sauer		
300 ø	12,0	1,40
355 ø	13,2	1,40
400 ø	12,0	1,40
420 ø	13,2	1,37
Warstein-Achsen		
300 ø	14,0	1,15
420 ø	14,0	1,21
MB + MAN		
410 ø	13,0	1,60

Zylinderkraft F (N)

Zyl.-Typ	*bei 6 bar*	*bei 7 bar*
12"	4 500	5 200
16"	6 200	7 200
20"	7 100	8 400
24"	8 400	9 800
30"	11 150	13 200
36"	13 900	16 300

Sollabbremsung

$$a = \frac{F \times l \times r_{Tr} \times n_a C^* \times 100}{G \times e \times r_{dyn.} \times 2 \times 9{,}81} =$$

→ Achse 1 = (%)

→ Achse 2 = (%)

→ Achse 3 = (%)

Reifengröße		*r_{dyn} (mm)*
☐ 7,50	R15	371
☐ 8,00	R17,5	380
☐ 8,25	R15	406
☐ 8,5	R17,5	388
☐ 9,00	R20	495
☐ 9,00	R22,5	470
☐ 9,5	R17,5	408
☐ 10,00	R15	440
☐ 10,00	R20	508
☐ 10,00	R22,5	495
☐ 11,00	R20	527
☐ 11,00	R22,5	510
☐ 12,00	R20	545
☐ 12,00	R22,5	527
☐ 13,00	R20	569
☐ 13,00	R22,5	546
☐ 14,00	R20	600
☐ 15,00	R22,5	519
☐ 16,5	R22,5	546
☐ 18,00	R19,5	516
☐ 18,00	R22,5	558
☐ 205/80	R15	347
☐ 215/75	R17,5	377
☐ 245/70	R17,5	385
☐ 265/70	R19,5	420
☐ 275/70	R22,5	466
☐ 275/80	R22,5	499
☐ 285/70	R19,5	430
☐ 295/80	R22,5	513
☐ 315/75	R22,5	506
☐ 315/80	R22,5	522
☐ 365/80	R20	535
☐ 385/65	R22,5	519
☐ 425/65	R22,5	546
☐ 445/65	R22,5	558
☐ 13/80	R20	509
☐ 14/80	R20	527
☐ 11/70	R22,5	466
☐ E20 Pilot		509
☐ F20 Pilot		527

Bemerkungen

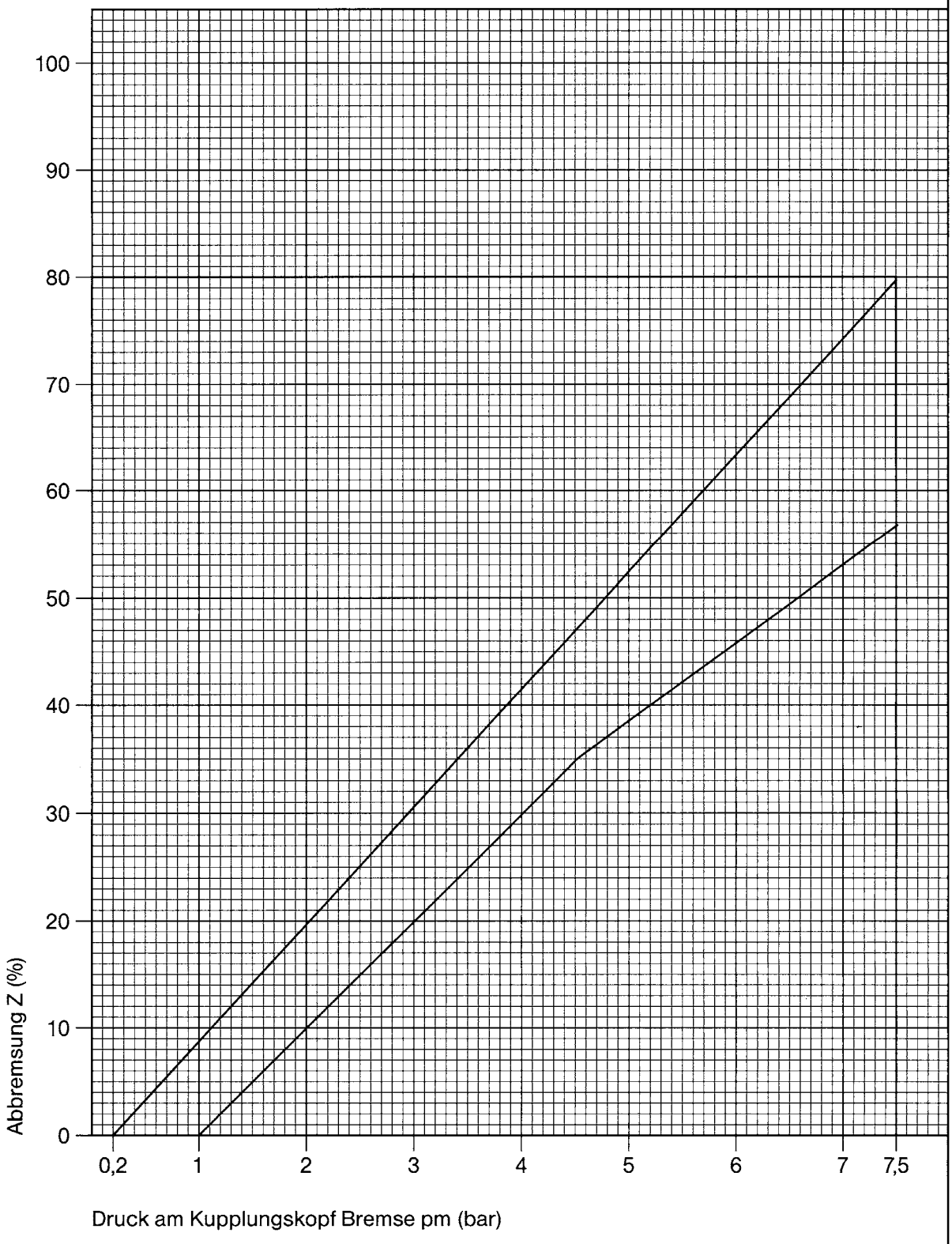
TF 0763 01.91

TEXTAR

EG-Abbremsungsband für Zugwagen und Anhänger beladen

Datum

Name



TF 0777

12.89

TEXTAR	*Prüfblatt zur Ermittlung der Bremskräfte auf dem Rollenprüfstand*	Datum Name

Kunde

Prüfgewichte der einzelnen Achsen
1. Achse:
2. Achse:
3. Achse:

☐ Lastkraftwagen ☐ Sattelzugmaschine

eingesteuerter Druck am Kupplungskopf gelb = p_m		0	0,5	1,0	1,5	2,0	2,5	3,0	4,0	5,0	6,0	7,0
Achse 1	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												
Achse 2	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												
Achse 3	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												

Prüfgewichte der einzelnen Achsen
1. Achse:
2. Achse:
3. Achse:

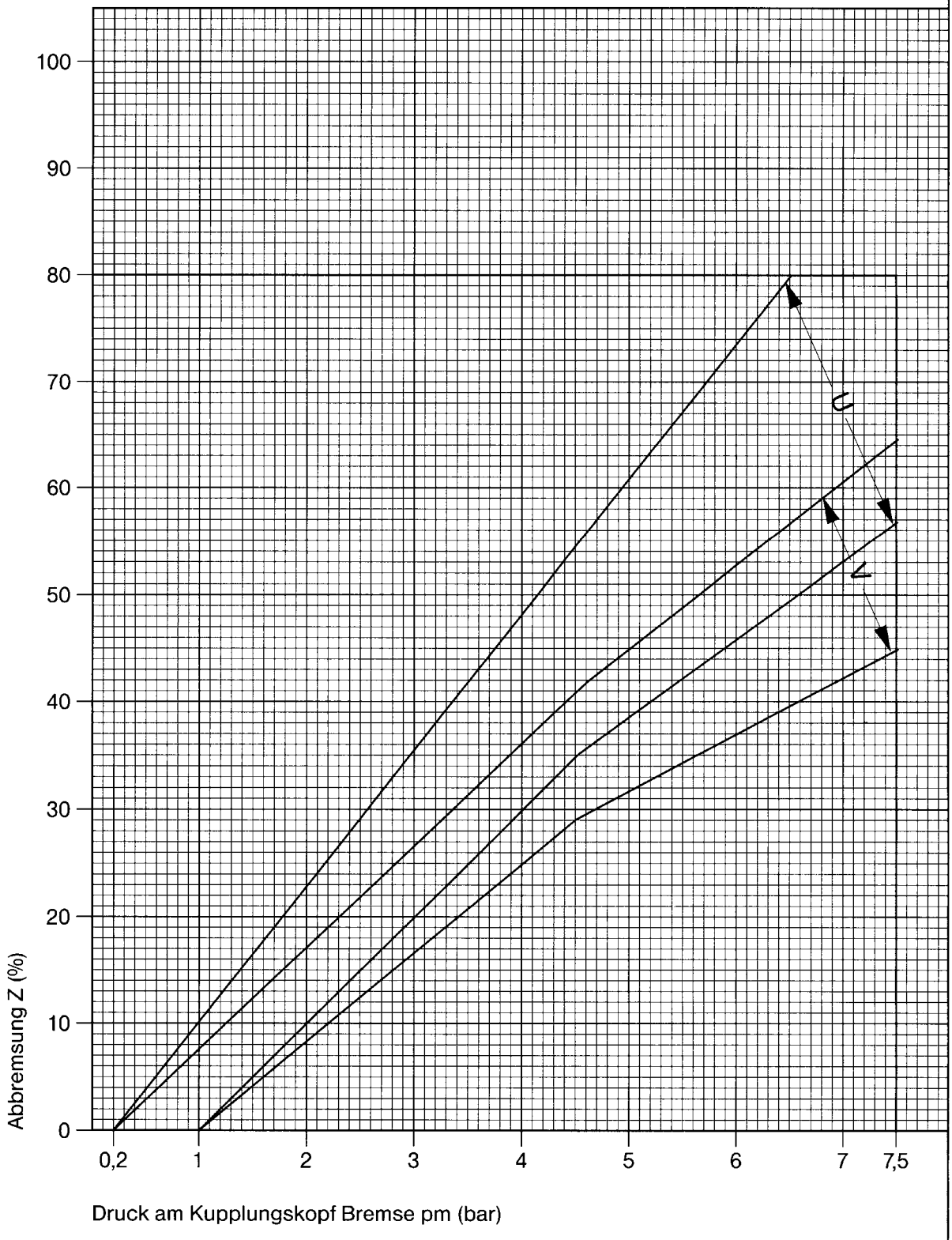
☐ Anhänger ☐ Sattelanhänger

eingesteuerter Druck am Kupplungskopf gelb = p_m		0	0,5	1,0	1,5	2,0	2,5	3,0	4,0	5,0	6,0	7,0
Achse 1	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												
Achse 2	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												
Achse 3	Bremszylinderdruck											
	Radumfangskräfte links											
	Radumfangskräfte rechts											
Summe der Radumfangskräfte												
Verzögerung in %												

Ermittlung d. Abbremsung nach Formel: $\% = \frac{\text{Summe der Radumfangskräfte}}{\text{Achsgewicht}}$

TF 0765 07.90

TEXTAR	EG-Abbremsungsband für Sattelzugmaschine mit beladenem Sattelanhänger = (U) EG-Basis-Abbremsungsband für Sattelanhänger = (V)	Datum Name



TF 0776

12.89

Notices

“30 tons is a terrific force!”

Brake liners must be reliable. At TMD Friction, safety is given top priority in the case of both disc and drum brakes. Liners are therefore subjected to hundreds of thousands of kilometers of testing under harsh conditions before they become standard products. This is why leading truck producers use TEXTAR brake liners on their vehicles.

TEXTAR ServiceLine
0049-21 71-703 397
serviceline@textar.com

TEXTAR®

TEXTAR supplies brake liners for trucks and utility vehicles to all European brake and automobile producers and to spare parts markets all over the world. People know that they can always trust our quality products. Why? Because we are constantly investing in the development and optimization of our solutions for the benefit of your customers.

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