

Comparison of Drum and Disc braked trailer axles

Until the mid-1990s, the compressed air operated simplex cam brake, represented the standard for heavy commercial trailers. Whilst the disc brake has replaced the drum brake as the standard brake in the towing vehicle to large extend in Europe, the drum brake still remains the standard for vehicles operating in Africa. The reason being can be attributed to the robustness of the brake, the low operating and spare parts costs. In addition, it is also less sensitive to different towing vehicles and an unfavourable tractor/trailer synchronisation. The big advantages of the disc braked axle are the safety aspect and the weight saving. In the early 1990s BPW started to develop disc-braked trailer axles and started series production in 1996 at the same time as the tractor vehicle industry.

Operation and construction

Disc brake

Figure 1 shows cut out of pneumatically operated brake caliper for trailers.

When the brake pedal is pressed, the push rod of the brake cylinder presses against the brake lever (1). The roller (2), which is mounted eccentrically in the caliper, transfers the force onto the bridge (3). The tappets (4), which are mounted to the bridge, push against the brake pad (5) which in turn pushes against the brake disk. The reaction force which now arises on the caliper (6) is transferred to the opposite brake pad. When the brake pressure is reduced, the spring force in the threaded tube (7) returns the bridge together with the tappets to their original position.

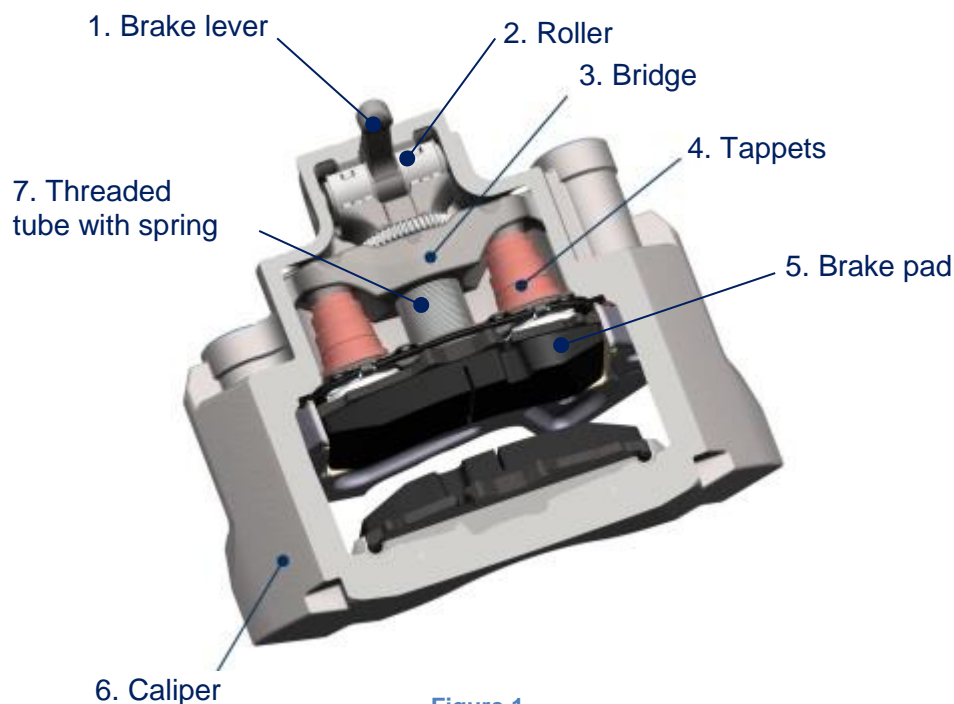


Figure 1

Drum Brake

Figure 2 shows an exploded view of a S-cam drum brake, for trailers, which is pneumatically operated.

The brake cylinder (1) generates a force which acts on the automatic slack adjustor (2) which in rotates the camshaft (3). The S-cam (4), which is connected to the camshaft, opens the brake shoes (5) and presses them against the inner face of the brake drum (7). When the brake is released, the camshaft rotates the S-cam back into neutral position. The brake shoes are returned to their starting position by the return springs (6).

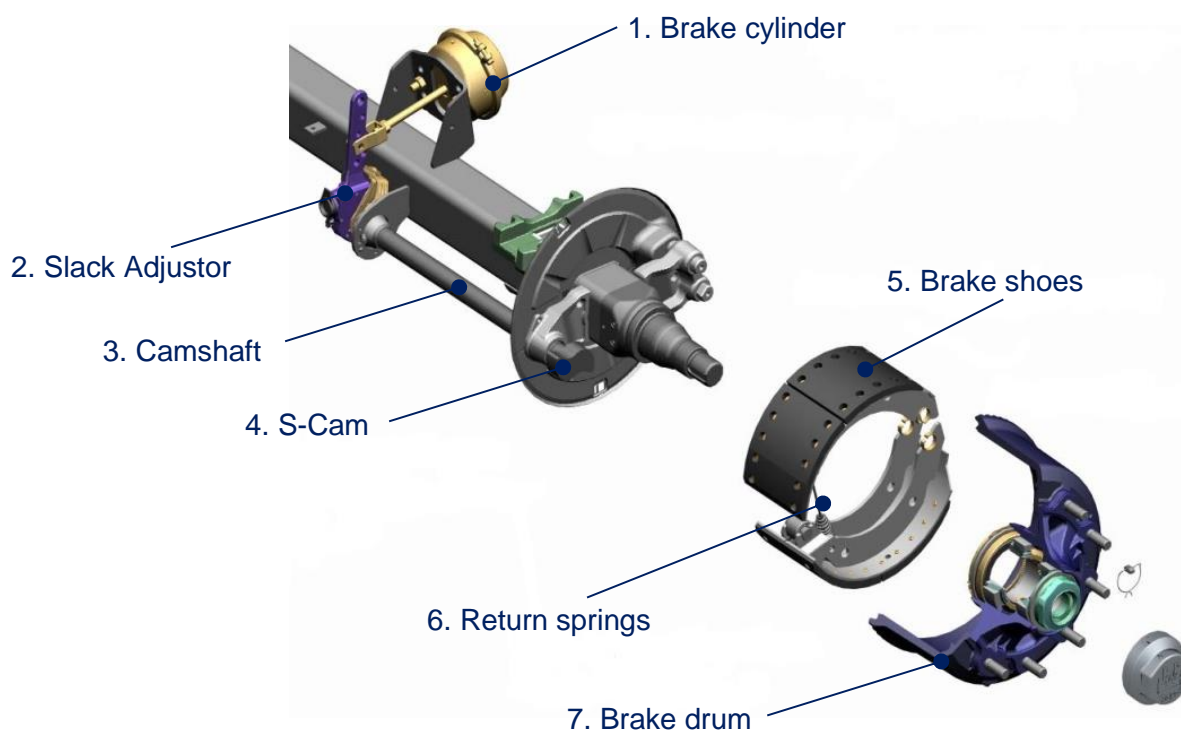


Figure 2

Comparison between disc and drum brakes

The choice of brake is very much dependent on the operating condition. Both systems have advantages and disadvantages depending on the application and demands. If a brake is not used appropriately, it will rapidly be either overloaded or underused. Optimum performance, weight, wear behaviour and service life are obtained by observing all relevant requirements.

Table 1 gives a summarized overview of the technical and economic aspects of the brake types, while Table 2 gives the tractor/trailer synchronisation options. These are essential for optimum performance and a longer brake service life

Feature	Drum Brake	Disk brake	Remark
Robustness	++	+	Drum brakes are more forgiving in case of overload. They are also better when the vehicle has been standing for a long time.
Brake Fade	-	++	When the drum brake overheats the drum moves away from the shoes and braking effort is increased. Disc brakes do not experience this phenomenon, which makes it a lot safer.
Operating temperatures	++	-	Disc braked axles operate at far higher temperatures and the components are subjected to higher thermal stresses.
Matching of trailer-tractor	++	0	Drum brake has a good compatibility also with old trucks. Disc braked axles, in general, need to be matched with tractors that are also run disc brakes. See Table 2
Susceptibility to dirt	++	0	Drum brakes are less susceptible to dirt due to their closed design. Dust covers, however, are available for disc braked axles.
Proportioning of the brake force and response time	0	+	EBS (instead of only ABS) has a higher influence on the braking distance.
Payload	-	++	Disc braked axles are lighter than drum braked axles, approx. 16kg per axle.
Operational costs	++	+	Servicing and maintaining the drum braked axle is easier and cost effective. However, both drum and disc braked axles benefit from the ECO system.
Resale value	0	+	Disc braked axles are regarded as the "modern" brake; however, this is highly dependent on the target market.

Table 1: Technical and economic aspects of the brake types

Tractor	Trailer			
	EBS + disc brake	ABS + disc brake	EBS + drum brake	ABS + drum brake
EBS + disc brake	+	0	+	0
ABS + disc brake	+	0	+	0
EBS + drum brake	0	--	+	+
ABS + drum brake	--	-	-	+

Table 2: Matching of trailer and tractor

Evaluation: ++ excellent
+ good
0 satisfactory
- bad
-- unacceptable