VARIABLE RETARDER SYSTEM FOR SPEED CONTROL IN MARSHALING YARDS

Trackguard Retarder

SIEMENS

Trackguard Retarder TW-F-/TW-E retarders

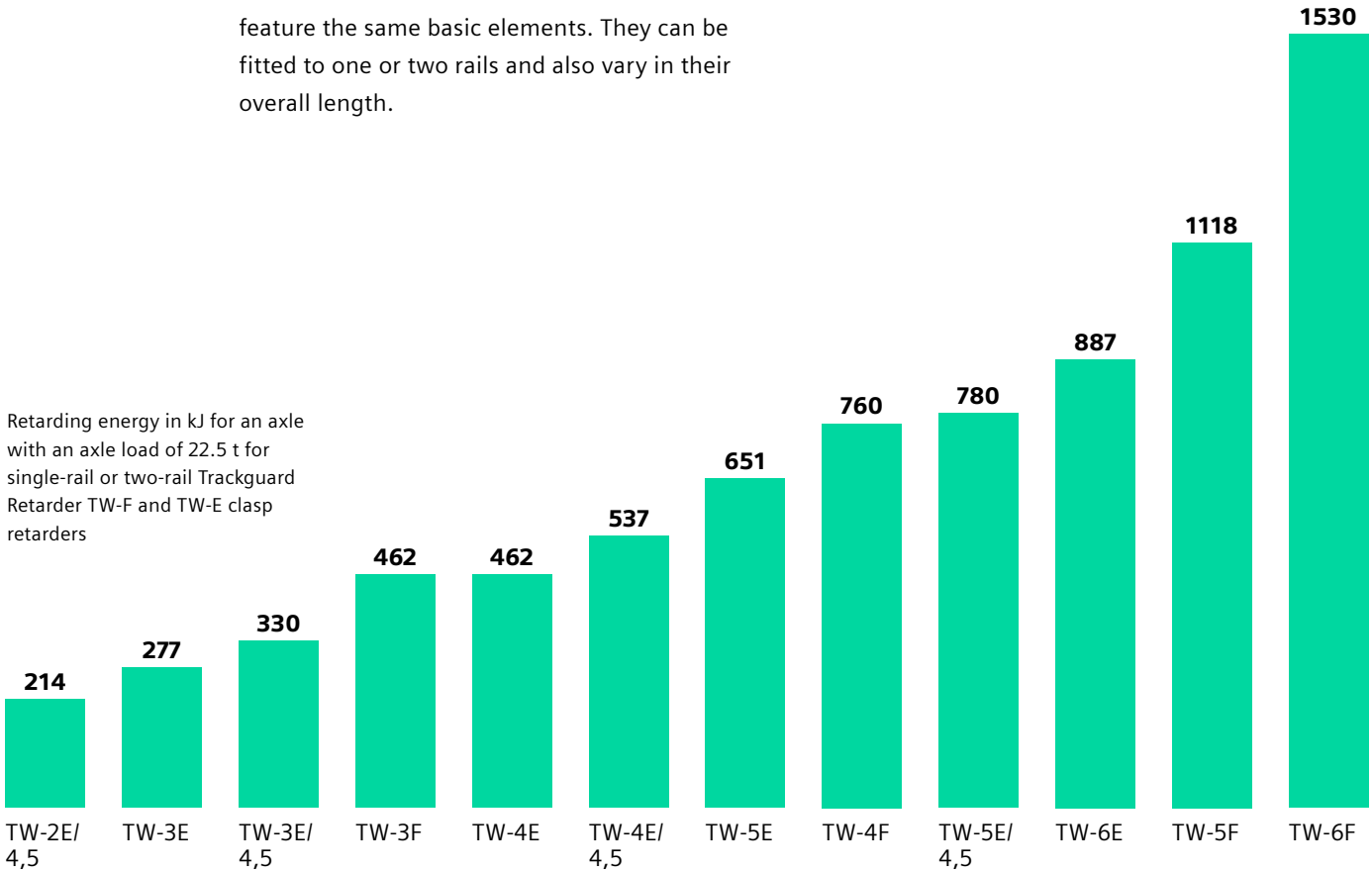
At humps in marshaling yards, retarders function as very important elements for controlling the speed of humping operations. Retarders in the classification zones permit spacing between the differently running cars and in this way boost yard performance.

Important speed control elements

Retarders have various applications and are subject to very different requirements. Conditions at humps vary considerably. That is why, in terms of their performance, the retarder used should be of modular design (see the diagram below). The basic elements best remain identical whereas their number and the length-dependent components vary.

This design principle is consistently applied to Trackguard Retarder TW-F-/TW-E retarders. Lower main retarders and classification track retarders feature the same basic elements. They can be fitted to one or two rails and also vary in their overall length.

These numerous possibilities combine to make up the wide range of performance features available, simplifying the planning procedure by resorting to the modular system and thus enabling optimally dimensioned systems to be implemented. The modular system comprises identical parts, considerably cutting down on costs for spare parts stockage and maintenance.



Low operating costs ensured

Clasp retarder with five power units

Single-rail clasp retarders are noted for their very low operating costs and minimum level of necessary maintenance.

Principle of operation

In the Trackguard Retarder TW-F-/TW-E clasp retarders, rolled retarding beams are mounted on individual power units. Facing the rail head, the retarding segments are bolted on as wear parts. The power units subject the retarding beams to the controllable pressing force which is created by rubberspring assemblies. These parts only need to be replaced or reconditioned after they have been traversed by approx. 5 to 7 million axles.

In order to keep operating costs low, a retarding principle is applied which needs little external energy and which features active retarding by means of rubber-spring assemblies laterally arranged below the yellow hoods. These rubber-spring assemblies apply pressure to the outer retarding beams by way of a roller. This applied pressure and thus the retarding force vary depending on the position of the link which can be hydraulically adjusted via retarding rods. The link is driven by a hydraulic cylinder located on the exit side of the retarders.

Optimum controllability

Low energy costs and good controllability must not be mutually exclusive. Exact exit speeds from the retarders assume good controllability. This is particularly true for the classification zone where correctly kept distances between cars are intended to enhance humping performance.

The process of joining cars in the exact position for coupling with due regard to their load is also a major requirement on classification tracks with respect to target-shooting. In order to meet this requirement and use these benefits for customers, retarders and the Trackguard Cargo MSR32 control system have been combined to form a highly efficient system for many years now.

Short response times of the overall system are crucial for good controllability. Small masses which have to be moved are an advantage. The relevant force can be set exactly by means of a two-stage valve system on the control plate and precisely queried and adjusted by means of a position sensor on the cylinder.

Trackguard Retarder TW-F-/TW-E retarder provide short response times of 100 ms between stages. In combination with usage of the Trackguard Cargo MSR 32 control system, these optimum conditions for good controllability within the entire adjustment range ensure exact control of the retarder's exit speed. The electronic controller electromagnetically operates the valves of the control plate which are integrated into a closed control loop.

Hydraulic controller
A central oil supply unit which is housed in a prefabricated building is used to operate the hydraulic controller. An external pipe ensures that the retarders are centrally supplied with oil.

The central hydraulic system comprises a unit with two fitted pumps and electric motors with a driving power of 22 kW each (see Figure 2). In general, only one pump is used for operation. A second pump serves as a stand-by for peak loads. These pumps also replenish the wall-mounted storage tanks which, if necessary, continuously discharge the pressure oil into the external pipe and also serve as buffers for the pumps.

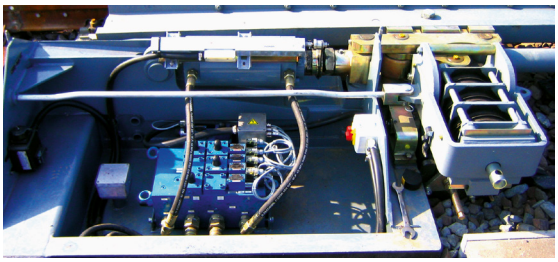
Special pressure switches control the oil pressure within a narrow range of 160 to 180 bar. The temperature, oil level and filter condition are permanently monitored. Important switching elements are designed to be redundant. Deviations from the specified limit values are recorded by the Trackguard Cargo MSR32 control system and indicated to the operator and the maintenance staff.

At the Trackguard Retarder plant in Duisburg, the central oil hydraulic system is installed in a prefabricated building. After a trial run, it is then delivered to the intended site ready for connection. A special benefit is the fact that the pump building can be easily removed and, if necessary, erected at another hump.

Emissions: a good environmental balance
State-of-the-art retarders may create only low emission levels, i.e. primarily escaping oil and noise emission during retarding.

The piping between the retarders and the central hydraulic system is housed in oil-tight ducts. During retarding, very unpleasant squealing is sometimes caused by the wheels. After years of research and optimization, we have succeeded in reducing noise levels considerably. Although the phenomenon of squealing wheels has not been entirely eliminated, such noise is encountered less frequently and noise levels are lower.

The illustration below shows our technical solution. PUCK retarding segments made of special cast iron are used on the rolled retarding beam.



Central
oil supply

Hydraulic controller

Active water protection with piping installed in oil-tight ducts

Monitoring elements of the hydraulic controller

PUCK retarding segments

Ideal adaptability
Operational, on-site adjustability is the hallmark of state-of-the-art retarders.

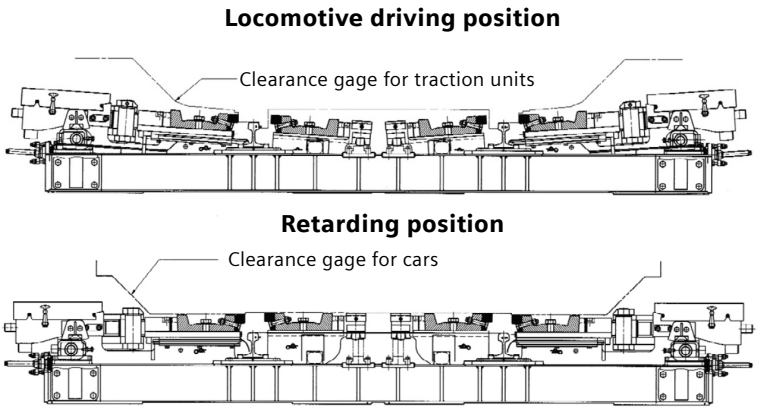
During retarding, the retarding beams engage with the wheel as far above the top of the rail as possible in order to create maximum retarding potential. This engagement height is often an obstruction when locomotives have to run over the retarder. In such operational conditions, lowerable retarders (see the illustration below) can be used. When set to the locomotive driving position, such lowerable retarders allow locomotives to pass unobstructed.

The engineering effort involved in designing lowerable retarders is relatively low. A hydraulic cylinder acts on a wedge-type lift linkage in the middle of the track. The lifting cylinders are located in the actuator chamber of the retarder. Here, they are controlled via the hydraulic control plate and monitored by position sensors. This principle enables significant operational freedom.

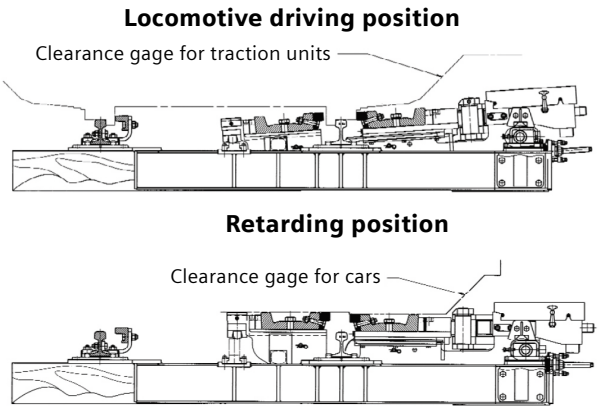
Good on-site adjustability is demonstrated by the Trackguard Retarder TW-F-/TW-E retarders when equipping marshaling yards since classification track retarders can be installed in curves. This is particularly so if the retarder beams can precisely follow the track curve. In this case, installation lengths are reduced, especially on short curves, since the retarders can be installed immediately behind the fouling point markers. The minimum radius is 190 m and can be increased variably. A wedge-type lift linkage located in the middle of the track permits the installation of curved lowerable classification track retarders.

Benefits

- Large functional scope
- Low operating costs
- Good controllability
- Low-level emissions
- Good operational and on-site adaptability
- Scalability to the respective application
- Low noise levels due to the use of special retarder pads
- Low level of maintenance
- Elimination of hazardous workplaces



Operating positions of a two-rail TW-F clasp retarder



Operating positions of a single-rail TW-E clasp retarder

Trackguard Retarder
TKG piston retarder

Piston retarders are primarily used in speed control systems for deceleration and coasting runs. Their effectiveness can be adjusted depending on the speed involved.

Efficient speed control in marshaling yards

Trackguard Retarder TKG piston retarders are automatically controlled by a hydraulic valve system in the damper and need not be supplied with power. The hydraulic damper is the active retarding element and is based on a speed-controlled valve system. Hydraulic dampers can be permanently set to different response rates and damper forces.

Principle of operation (variable retarding)
When a car traverses the retarder, the wheel flange presses against the piston tube and thus forces down the piston rod of the damper.
The speed-dependent valve system in the damper then decides whether the car continues to roll retarded or unretarded.

If the traversal speed of the car is greater than the response speed of the retarding element damper, the valve system extracts energy from the car at the level of the retarding energy and causes the car to be retarded. This is referred to as the "load stroke".

If the traversal speed of the car is lower than the response speed, this is the "idle stroke". The valve system extracts only minimum energy from the car at the level of idle energy, causing no retarding. The level of retarding energy generated by different damper types depends on the actuation speed and is virtually independent of the damper temperature.

Principle of operation (constant retarding)
A special application of the Trackguard Retarder TKG piston retarder involves usage on a deceleration run with the objective of retarding the car until it comes to a standstill or keeping stabled cars in a particular position.

For this purpose, retarding elements with "zero" response speed are used. These elements extract a defined level of energy from the passing cars and thus always have a retarding effect. A large number of piston retarders cause cars to be retarded and to stay on the track.

Technical features of piston retarders

Dimensioning
The piston retarders used are dimensioned on the basis of each track's height and dimensioning is confirmed during humping simulation.

Installation conditions
Trackguard Retarder TKG piston retarders can be used in combination with all rail profiles, rail fastening accessories and sleeper types.
They are not subject to any restrictions with regard to distances between track centers, curves and gradients. Piston retarders are installed in the same way, irrespective of whether rails are worn or new. They are fitted by drilling appropriate holes in the rail web or by adjusting the retarding elements to the installation conditions up to a wear level of 7 mm.

Weather conditions and ambient temperature
The retarding elements function constantly at the weather conditions prevailing in Central Europe. The ambient temperature range extends from –25 °C to +40 °C.

Water protection
The guide cylinder of a Trackguard Retarder TKG piston retarder surrounds the damper at its lower end like a pot. It is designed as an oil drip pan which safely collects any oil which might escape in the event of damage.

Operation, maintenance and inspection
No special tools are required for operation, maintenance and inspection. In the majority of cases, trackside maintenance and inspection work can be performed by one person without having to connect up to a power supply. A grease gun is required for greasing the retarding elements.

Trackguard Retarder TKG gradient compensation retarder

Gradient compensation retarders are used to retard cars primarily in marshaling yards. More or less considerable gradients entail the usage of gradient compensation retarders so that moving cars do not accelerate excessively.

The innovative element for the automation of marshaling yards

Trackguard Retarder TKG gradient compensation retarders can be actively or inactively positioned at any time, without interrupting operations. In the inactive position, the gage is not infringed and a car can run along the track unobstructed. This prevents bad runners being retarded prematurely and thus impeding any further shunting. Furthermore, the noise emitted when a train leaves the retarding zone is considerably reduced and trains can be moved out faster.

Principle of operation

Gradient compensation retarders comprise up to 16 piston retarders and a device for lowering the piston tubes. A lowering device causes the gradient compensation retarders to move into an active or inactive position.

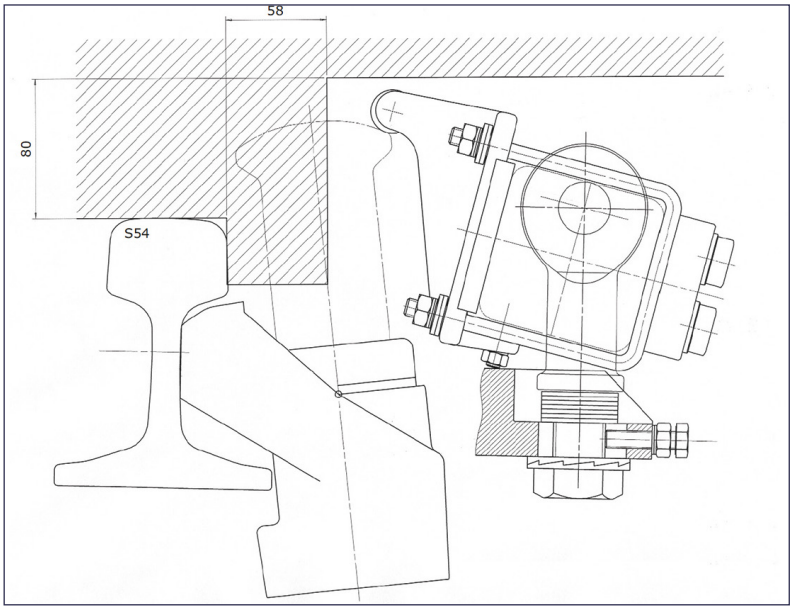
Gradient compensation retarders are driven by an electric gear motor installed outside the track and by electric position detection sensors. If requested, they can also be driven pneumatically.

Control

The Trackguard Retarder TKG gradient compensation retarder is an integral part of humping and can be activated or deactivated at any time, irrespective of whether humping operations take place during retarding or whether cuts run in, run out or run through. Twoway traffic is permitted as well as the oscillation of cuts within gradient compensation retarders. The "retarding position" and "locomotive driving position" functions are stable positions which are monitored and indicated by a position detector.

Dimensioning

Like the piston retarder, the gradient compensation retarder is dimensioned on the basis of the height of each track, and this is confirmed during humping simulation.

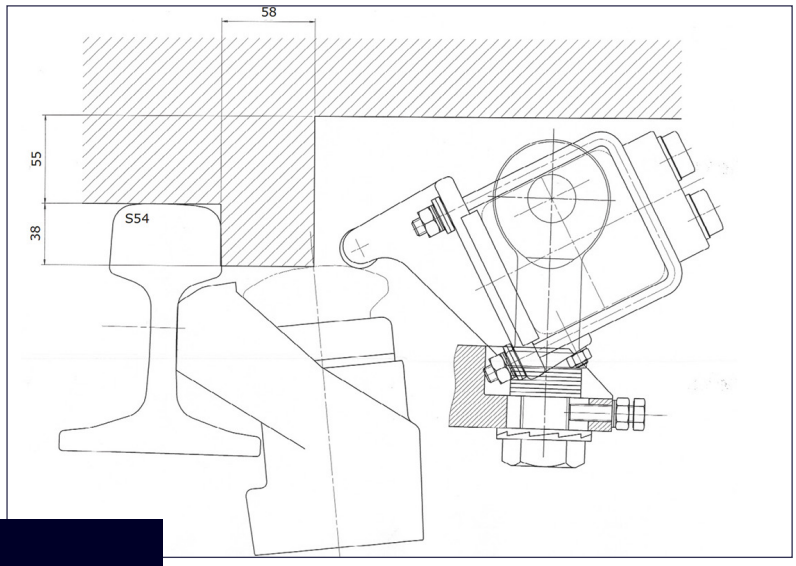


Locomotive driving position

Cars are not retarded in the locomotive driving position. In line with UIC 505.4, the piston retarders are lowered to 55 mm above the top of the rail and thus do not come into contact with the wheels and other parts of rail vehicles.

Retarding position

In line with UIC 505.4, piston retarders in their retarding position have an engagement height of 80 mm above the top of the rail. Only idle energy is encountered below the response speed and is less than 3% of the nominal energy. The retarding ability on which dimensioning is based is achieved above the response speed.



Benefits

- Based on tried-and-tested piston retarders
- Retarding system and lowering device functionally separate from each other
- Like piston retarders, lowering device simply bolted to the rail web without modifying or adjusting the superstructure
- Electric gear motor with position detector sensors as a drive unit located outside the track

Trackguard Retarder
PUCK retarding segments

Active environmental protection by reducing retarding noise

Trackguard Retarder PUCK retarding segments make an active contribution to both environmental protection and industrial safety by effectively reducing noise levels generated during retarding.

This noise is caused by wheel vibration when the retarding beams of the retarding segment act on the wheels. The noise extends over a wide frequency range; the high frequencies with, in some cases, very high sound pressure levels, predominate. It is particularly this which makes retarding noise especially unpleasant. Thanks to novel retarding segments, such noise emission levels are reduced and both staff and local residents are less affected.

Benefits

- Considerable reduction in high-frequency retarding noise
- Reliable retarding effect with excellent sliding properties
- Increase in the average friction coefficient and thus increased retarding capacity
- Dimensions compatible with those of existing retarding segments

Due to series of tests performed over many years under real-life operating conditions and at test installations at stations, a novel material has been developed for use on retarding segments, audibly cutting down on high-frequency retarding noise. This material combines both the reliable retarding effect with excellent sliding properties and the environmental compatibility of the materials used.

In terms of their dimensions, the retarding segments are compatible with those already fitted by Siemens and can thus be easily replaced by existing PUCK retarding segments.

Technical data

- Dimensions (w x h x d):
  560 mm x 103 mm x 61 mm
- Weight: 19 kg
- Material, variant, quality class:
  retarding segment: GGG 70 (cast iron with spheroidal graphite)
- PUCK inserts:
  hybrid friction material
- Standards, certificates, approvals:
  The friction materials involve products as defined by the EU's REACH Ordinance (EC 1907/2006)
- Chemical characterization:
  in line with Directive 67/548/EEC or 1999/45/EC

Retarding segment (retarding beam with PUCK inserts)

Trackguard Electric Grip Retarder

For a firm grip on track

The electric grip retarder can be used in many rail areas as a reliable element to protect stabled cars and car cuts from rolling away, particularly in differently used stabling areas such as in marshaling yards or at loading points. It combines safety, simple handling, cost-effectiveness, and occupational safety.

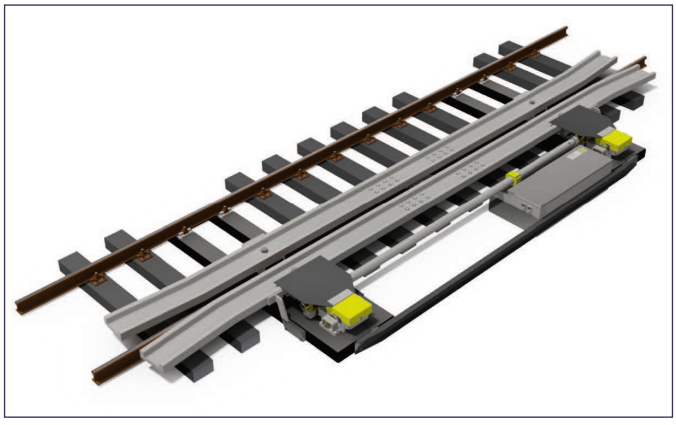
This retarder type is intended to retain standing cars and is therefore specially designed and constructed for this application cost-effectively with an electric motor – an innovation.

The operating principle of retarding force transfer corresponds to that of the well-known TW-F and TW-E hydraulic retarders. Its modular design enables it to be easily adjusted to existing application and operating conditions depending on the requirements involved.

The electric grip retarder can be used in fully automatic shunting, thus doing away with the staffintensive, hazardous work incurred in placing drag shoes on the track. Coupling and functional monitoring via suitable interlockings in hump yards and flat yards and integration into production control systems are possible.

Benefits

- Safety and low operating costs: the wheel is retained by the retarder even in the deenergized condition
- Little need for maintenance due to the electric motor in use
- Low installation costs since installation involves a normal permanent way measure
- Traversable by locomotives without the retarding beams having to be lowered
- Grip retarder system with single-rail layout
- For safe, controlled stabling in stabling areas of any kind
- For use in marshaling yards, in arrival and departure zones, and on classification tracks
- For controlled car loading/unloading at loading points



Electric grip retarder

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