



Haldex Electronic Lining Wear Sensor

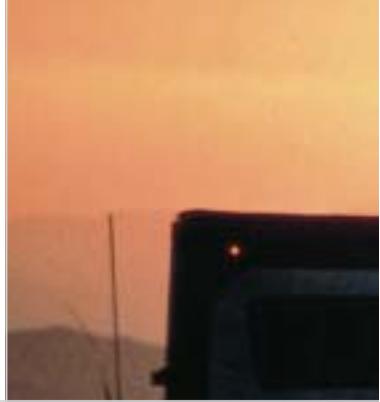
Continuously
Monitors
Wear on Drum Brake
Linings



The Ultimate Wearwatcher



- Haldex has patented the principle of using digital Hall sensor technology for continuous measurement of the wear on brake linings via the angle of the S-cam shaft.
- The patent also includes an energy-saving Haldex design for extremely low power consumption. This makes the sensor a perfect match for electronic braking systems as minimizing power requirements is a priority.



Valuable data at your fingertips: the highly accurate lining wear data delivered by the sensor is vital for efficient utilisation of electronic braking and diagnostic systems

Unique, Patented and Proven

The Haldex Electronic Lining Wear Sensor provides continuous monitoring of wear on drum brake linings in heavy vehicles.

- It is the only electronic lining wear sensor available which has been developed specifically for heavy vehicle drum brakes.

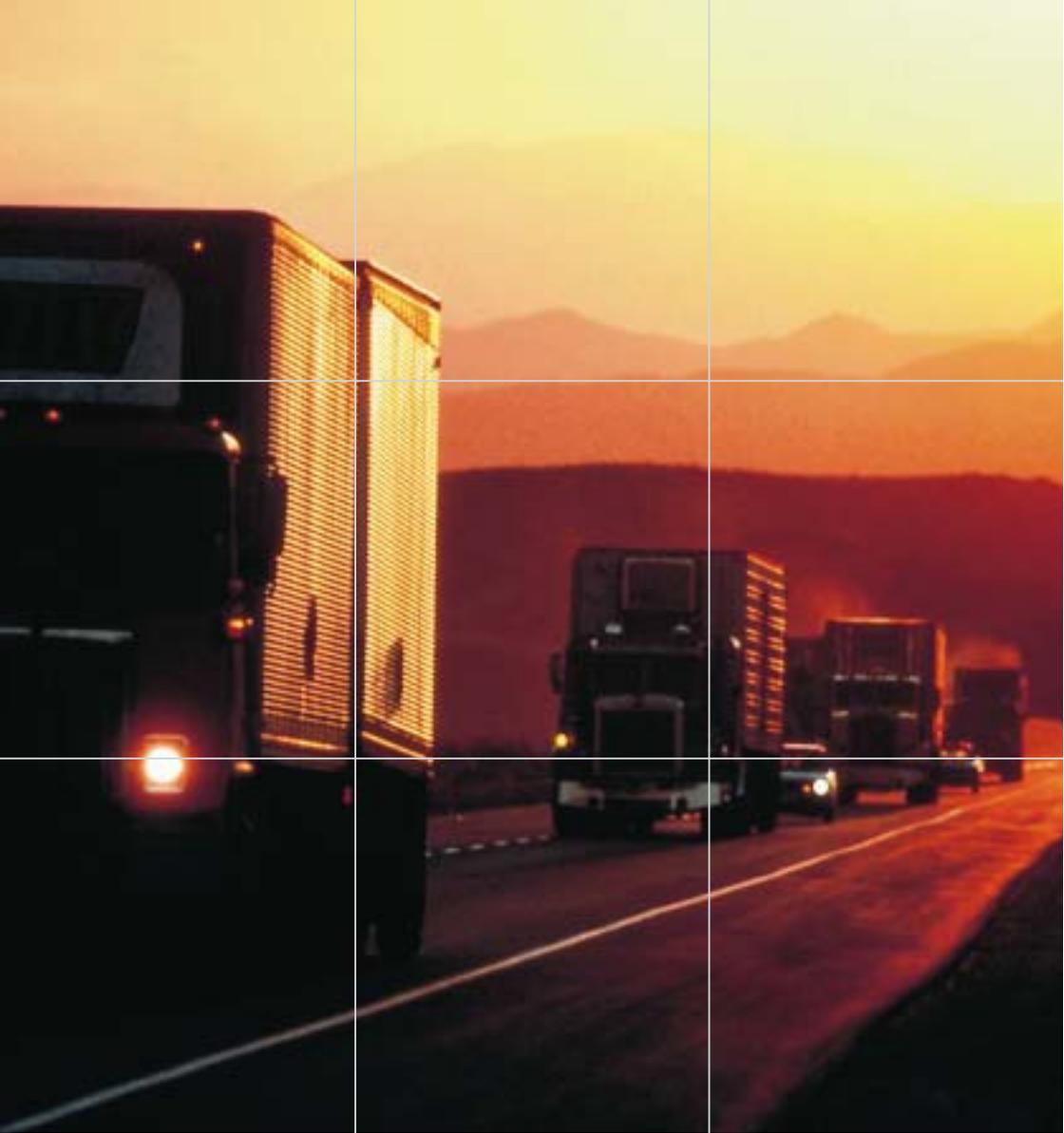
- Launched in early 1997, the Haldex Electronic Lining Wear Sensor is now a proven data deliverer to electronic braking and diagnostic systems for heavy vehicles.

The Value of Lining Wear Data

By providing a constant flow of data on brake lining wear to electronic braking and diagnostic systems, the sensor gives continuous access to information which can be used to improve control, safety, efficiency and operating profits. Benefits include:

- Optimum control over every wheel. Sensor data on uneven lining wear enables electronic braking systems (EBS) to adjust brake pressure for more even wear.

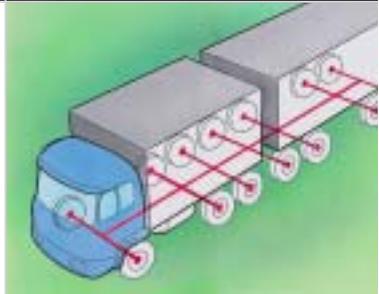
- Increased braking safety. The sensor clearly indicates when linings are worn out – the signal characteristic can be adapted to customer requirements.
- Early brake fault detection. If the sensor registers no wear on a particular brake lining while others show an



expected level of wear, it may indicate that the brake is faulty.

- Higher efficiency. With a sensor in each wheel, overall wear monitoring helps to determine the optimum time to replace the vehicle's brake linings. This cuts operating costs by keeping service stops to a minimum.

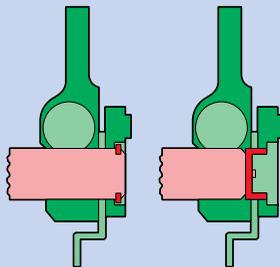
***Total monitoring:** with a wear sensor in each wheel, information on the overall state of the vehicle's brake linings is always accessible.*



Developed for Tough Conditions

The Haldex Electronic Lining Wear Sensor has been developed to withstand the extremes of its dirty, damp, unsprung working environment. The contact-free design ensures monitoring performance is unimpaired by:

- Accelerations from the unsprung vehicle axle.
- Temperatures ranging from -40°C to $+80^{\circ}\text{C}$ and peaks of up to $+100^{\circ}\text{C}$.
- High pressure washing with commonly used chemicals.
- Electromagnetic interference (EMC).
- Reversed polarity.
- Excessive input voltage.
- Static electricity.



Suits S-cam shafts: the sensor fits most spline types of S-cam shafts. Installation is also possible where the S-cam shaft does not pass through the brake adjuster.



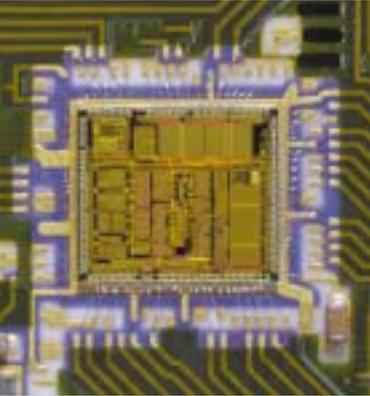
A Perfect Fit for Your Needs

Designed with your requirements for simplicity and smooth integration in mind, the Haldex Electronic Lining Wear Sensor offers:

- **System compatibility.** Integrates with electronic braking systems and most diagnostic systems. Both analogue and digital communication is accepted.
- **Easy installation.** Mount the brake adjuster without adjusting it to the basic setting. Fit the wear sensor, which is supplied in its basic set up position. Connect signal cable. Installation is complete.
- **Compact performance.** Less than 80 mm wide and only 10 mm thick, the senso delivers hi-tech wear monitoring from a harsh, cramped environment.
- **S-cam shaft suitability.** The sensor can be supplied to fit most existing spline types of S-cam shafts.



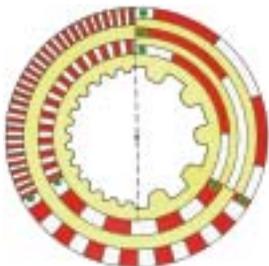
Non-stop, High-precision Wear Monitoring



Inside the sensor: a close-up of bonded wires and the chip-on-board lay out.

Collecting the wear data: when the magnetic disc rotates, each of the seven Hall sensors notes whether it is currently registering a north or south pole. The data is converted into a voltage signal corresponding to the present angle of the S-cam shaft and, by correlation, the brake lining's state of wear.

Key: green spot = Hall sensor; red field = a magnetic north pole; white field = a magnetic south pole.



How the Sensor Works

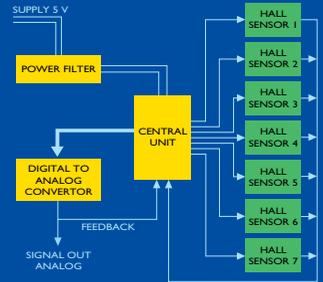
The Haldex Electronic Lining Wear Sensor continuously measures the angle of the S-cam shaft on the drum brake, which changes when the automatic brake adjuster alters the brake. The S-cam shaft angle has a direct correlation to lining wear.

Internally, the sensor has two parts. One contains seven magnetically sensitive Hall sensors, the other a built-in magnetic disc which rotates along with the S-cam shaft.

The Hall sensors continuously register the north or south pole combinations encoded on the seven-track magnetic disc as it rotates. A microprocessor collects data from the Hall sensors and translates into a digital signal corresponding to the angle of the S-cam shaft. The accuracy of the sensor is better than +/-3%.

For compatibility with today's electronic brake systems and on-board diagnostic systems, the digital signal is converted into an analog signal before transmission to the vehicle system.

Wear signalling system: changes in the S-cam shaft angle are picked up to the microprocessor via the seven Hall sensors integrated in each lining wear sensor. A DC converter converts the digital value into an analog signal to harmonise with electronic braking and diagnostic systems. Highly accurate data is ensured by a feedback feature – the outgoing signal is rechecked and, if necessary, adjusted to the correct level by the microprocessor.





Hi-tech Production Technology

To limit the dimensions of the sensor, it is manufactured using the chip-on-board method in which naked microchips are mounted directly on the pattern board.

Use the Sensor Again and Again

The Haldex Electronic Lining Wear Sensor outlives the lining. After measuring wear on the brake lining from brand new to worn out, the sensor still functions perfectly due to contact-free operation and its positioning outside the brake. The sensor can be reused on each new lining. A change of lining does not affect the sensor in any way – it simply returns to a signal strength indicating a new lining.

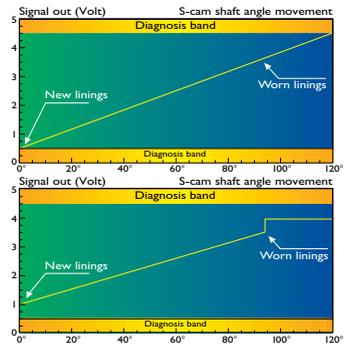
- Haldex Brakes Systems are innovators in the brake sector and developed the first automatic brake adjuster with lining wear monitoring in mind – the Haldex S-ABA. Designed for integration, the Haldex Electronic Lining Wear Sensor and the Haldex S-ABA are a perfect combination for the tough wheelbase world of heavy vehicles.

Advance With Haldex

- The unique Haldex Electronic Lining Wear Sensor has been developed to meet data needs created by the increasing use of electronic braking and diagnostic systems.
- The sensor effectively replaces the present visual wear indicators located directly on the brake adjuster.

Customising the Signal

Information from the sensor is transmitted as a signal between 0 and 5 V, depending on the degree of lining wear. Through pre-production software modifications, signal ranges and characteristics can be easily adjusted to the particular vehicle installation and to a specific S-cam shaft angle.



Customising the signal: examples
 Top: the signal ranges between 0.5 (new linings) and 4.5 V where linings are assumed to be worn out.
 Lower: in this case the signal range is 1.0 to 3.5 V with a voltage jump from 3.5 to 4.0 V to indicate a worn out lining.

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