

# Collision avoidance solutions for industrial vehicles and heavy equipment using Leddar technology



Operators of heavy equipment have to accomplish complex tasks in a challenging environment, facing the constant challenge of keeping track of all activities and obstacles around the vehicle. Multiple sources of distractions may temporarily affect the attention of even the most experienced driver. Despite existing safety measures, accidents involving heavy machinery remain a serious issue in many industries.

Proximity detection alerts and collision avoidance systems, which generate warning signals and are capable of stopping the vehicle's movement, are part of the ongoing efforts to improve industrial equipment safety and automation.

Implementing Leddar optical detection and ranging as part of a collision prevention system provides a robust, reliable solution to detect the presence of still or moving obstacles in the vehicle's way, in any type of environment or weather conditions, from close-proximity to long-range operations.

The results of years of focused R&D, Leddar is an innovative, cost effective Lidar technology, which can contribute to significantly reducing the occurrence of incidents involving and machinery and personnel in various industrial sectors, such as construction, road works, mining and quarries, freight, and warehousing.

## Applications

- Collision avoidance
- Proximity detection
- Blind-spot coverage
- Perimeter monitoring
- Navigation in tight quarters and low visibility conditions
- Reverse edge-dumping
- Underground mining operations
- Vehicle automation and guidance



## Prevent collisions with the right combination of technologies

Large industrial vehicles have to deal with significant blind spots and limited maneuverability—all of which is amplified by their scale and configuration. Heavy machinery, such as loaders, excavators, and bulldozers, also have to secure their immediate surroundings in order to prevent contact with structures, other vehicles, or workers.

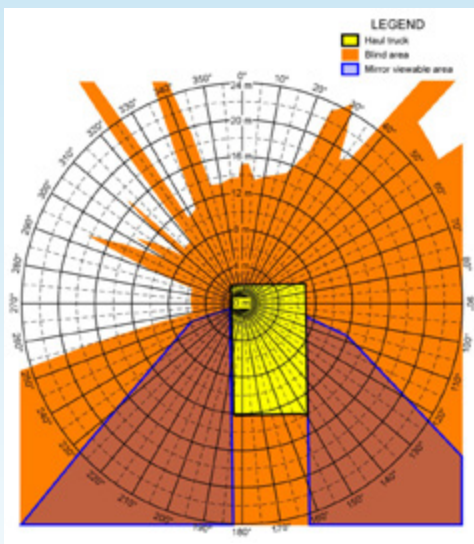
Comprehensive proximity detection and warning systems bring together a variety of technologies to assist operators and reduce risks of incidents. Tag-based systems (such as RFID) that are installed on vehicles and worn by

workers in controlled environments help indicate the presence within a certain area around the vehicle or warn of incoming traffic. On-board cameras are also used to provide up to 360-degree vision to operators and cover blind spots. Such solutions alone do not cover all risk scenarios, as non-tagged objects, people, and vehicles won't be detected. Moreover, since the operators' attention cannot be constantly shifting between the task at hand and multiple screens, additional safety issues arise. That's where innovative time-of-flight sensing solutions, such as Leddar, come in.

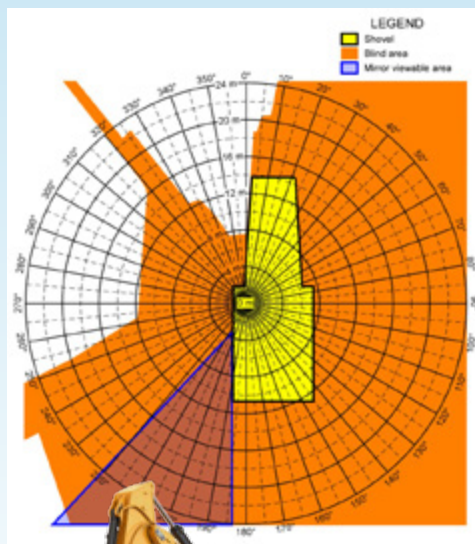
### Industrial vehicles: Blind-area diagrams at ground plane

**Heavy equipment operators have to deal with significant blindspots, which increase the risks of collision, which increase the risks of collision, as show by the following examples.**

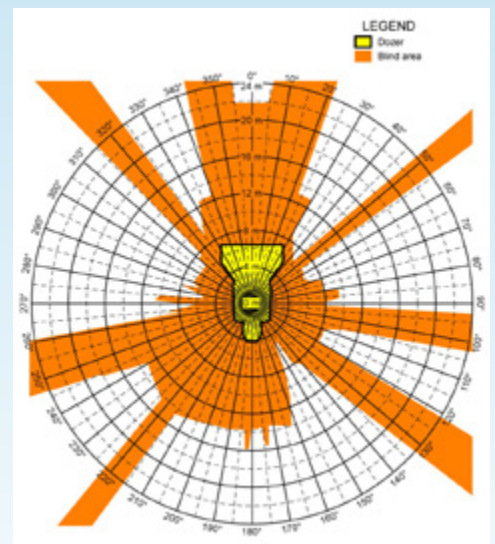
Source: National Institute for Occupational Safety and Health



HAUL TRUCKS



SHOVELS



BULLDOZERS



## Achieve superior optical detection and ranging with Leddar

An active sensing solution based on Leddar technology efficiently locates vehicles, objects, structures or people when machinery operators or other detection systems fall short.

Optical detection and ranging, and particularly the use of Lidars, is already recognized as one of automotive industry's key sensing technologies for implementing ADAS and active safety features on vehicles. Lidars are also instrumental in supporting the evolution towards autonomous driving.

Leading the way in optical time-of-flight solutions, LeddarTech is providing industrial vehicle OEMs and subsystem manufacturers with the patented Leddar technology for integration in critical driver assistance and collision avoidance systems.



Leddar-based sensors provide active, reliable obstacle detection at low and high speeds for all critical areas around large industrial vehicles.

### Unbeatable cost/performance ratio

Leddar accurately detects, locates, and measures still or moving objects in the most demanding environments. By digitalizing and accumulating full-signal waveforms and processing them through advanced proprietary algorithms, Leddar technology increases the range of any optical time-of-flight sensor and delivers more performance from a weaker light signal. As a result, Leddar's higher sensitivity provides unbeatable cost/performance ratios for your application, compared with other Lidar technologies.



Crane and loader operators significantly increase their spatial awareness around their equipment with Leddar optical detection and ranging.

### Superior robustness

The patented Leddar technology provides unique benefits for industrial vehicle applications. Its advanced signal processing delivers accurate detection in adverse environmental conditions, such as rain, snow, fog or dust. Leddar also has a high tolerance to vibrations and changes in ambient light and temperature levels.

Unlike scanning laser technologies, a Leddar sensor is able to deliver a wide field of view (FOV) without any moving parts, ensuring superior reliability. Leddar optical sensing also provide more effective detection capabilities than radio wave technologies (Radar) for still objects, pedestrians, structures and surfaces as well as a wide range of materials.

### Leddar Benefits

- Cost-effective fixed-beam Lidar optical detection
- Narrow to wide field-of-view
- Multi-segment configurations
- Precise multi-object detection/localization/classification
- Short- to long-range capabilities
- Reliable operation in all lighting and environmental conditions

## Enable your collision avoidance systems with Leddar at its core

Develop your new generation of industrial collision prevention system with Leddar technology and deliver superior, reliable detection and ranging performance levels in the most cost-effective way possible.

With various possible FOVs, configurable detection areas, lateral object discrimination capabilities, and simultaneous detection in multiple independent segments, Leddar stands out as the most versatile time-of-flight sensing technology available today.

Embedded into ICs, Leddar technology serves as the core for developing custom sensor modules. A wide variety of sensor configurations can be achieved from the same Leddar core, with tailored optical combinations that provide short to long ranges, narrow to wide field-of views, and single or multiple detection segments to perfectly fit the specific requirements of your collision avoidance application.

With its unique approach to active optical sensing, Leddar is the technology of choice to increase the efficiency and redundancy of your active safety solutions for industrial vehicles and heavy equipment.

### Sample sensor configurations

The table below presents two examples of the many possible Leddar configurations for mainstream ADAS applications.

|                              | Long-range Leddar  | Mid-range Leddar   |
|------------------------------|--|--|
| Detection range: vehicles    | Front-facing vehicles: 65 m<br>Rear-facing vehicles: 150 m   | Front-facing vehicles: 15 m<br>Rear-facing vehicles: 40 m                    |
| Detection range: pedestrians | 65 m   | 12 m   |
| Field of view                | 20°  | 90°  |
| Detection segment number     | 16   | 16   |
| Operating temperature        | -40° C to + 105° C   | -40° C to + 105° C   |
| Typical applications         | Front/rear collision warning<br>Automatic emergency breaking | Blind spot monitoring<br>Cross-traffic alert<br>Proximity obstacle detection |



Ask us about Leddar sensing for industrial vehicles: [leddartech.com/en/contact-us](http://leddartech.com/en/contact-us)

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