Optical technology in safety:

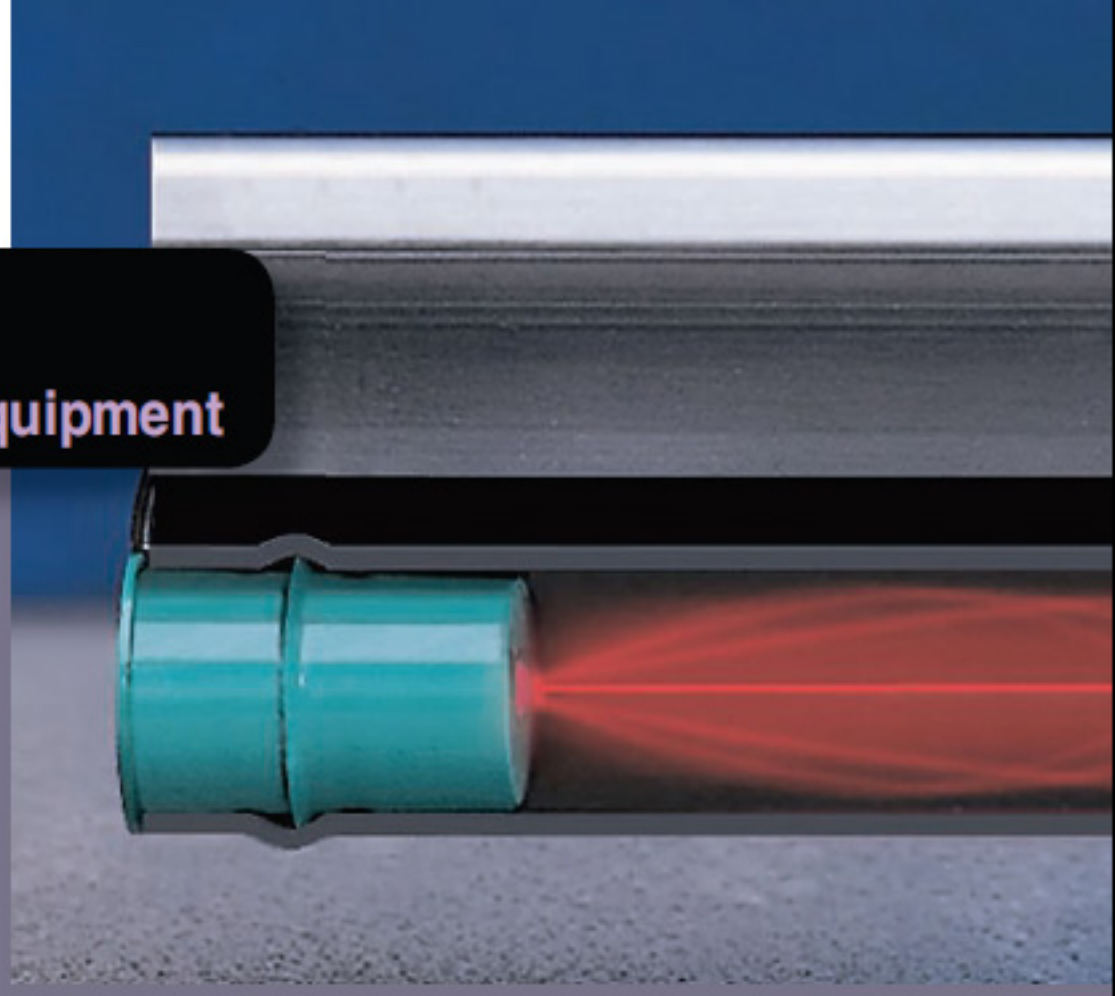
Safety edges protect people and equipment

Safety edges are devices that are mounted on the edge of large moving objects — such as doors or automated guided vehicles — to provide an instant warning signal to a control system when the object collides with a person or another object in its path. In response to this signal, the control system can stop or reverse the motion and avoid harming the person or object.

Two safety-edge technologies exist: The first version is based on an optical system. A hollow rubber tube is mounted on the edge of the moving object with an infrared light source mounted at one end and a sensor at the other. If the tube is deformed because of contact between the moving edge and another object, the light path is partially blocked and the optical sensor sends a warning to the control system. Because of the internal reflection of light inside the tube, gradual bending of the edge (for example, due to wind pressure on a large door) won't trigger the alarm. In this way, the system is able to distinguish between insignificant events and potentially dangerous collisions. The system is also failsafe. The receptor is designed to recognize only light from the source, so that stray light entering the system (as from a tear in the rubber tube) will not give a false-positive response.

The second safety-edge technology relies on air pressure. Here, the hollow rubber profile mounted on the edge of the moving object is sealed and connected to a sensitive pressure switch. When the edge contacts another object, the switch is activated and sends a warning to the control system. The pneumatic system lacks the failsafe feature, but is less expensive and suitable for noncritical installations.

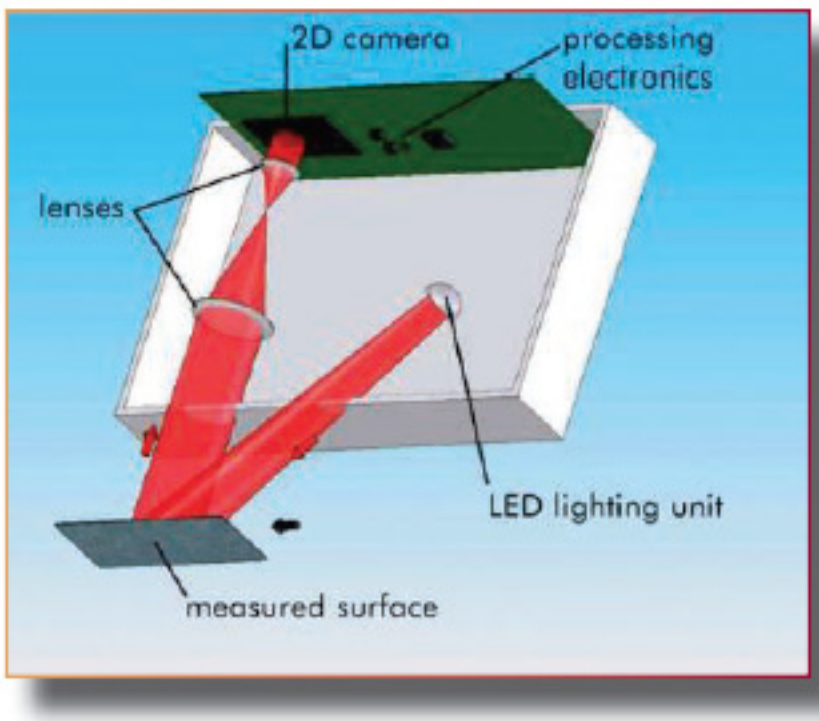
Both safety-edge technologies are easy to install, as the rubber tube that lines the edge can be cut to any length. Finally, a malfunction anywhere in the system causes a warning signal to be sent to the controls.



Safety edge light source: The VITECTOR unit of the FRABA group manufactures safety edge products based on two technologies. (Shown above is the company's infrared-based design.) These safety edges reduce risks associated with the movement of large, heavy objects and help designers and operators meet demanding safety standards.

viding the measured displacement by the shot-to-shot time interval. ($V_x = \Delta x/\Delta t$, $V_y = \Delta y/\Delta t$). Note: The relationship between the focal length of the optical system and the standoff distance between the sensor and the target object are needed to translate the shift in the position of the image on the photo-sensor into an estimate of the movement of the observed surface.

These motion sensors are compact, robust, reasonably accurate (to 1%), and relatively affordable. Depending on the configuration, they are capable of measuring speeds of up to 4 m/sec (780 fpm). They can also handle a variety of surfaces, including those that are rough, smooth, and shiny. In addition, the sensors can recognize part edges and surface markings. Due to this versatility, these sensors have been successfully used in production processes for materials such as woven and nonwoven fabrics, paper, metal foils, and plastic films. With their ability to track movements in two dimen-



This optical motion sensor contains a light source that shines a spot of light on the surface. This light is reflected back into an optical system that includes a lens and a photo-sensors array that monitors the optical image of the target surface as it moves across the field of view. INTACTON Gmbh, a member of the FRABA Group of sensor technology companies, has developed motion sensors of this type for use in industrial automation and similar applications.