

Declaration of safety of HLIF LIDAR B22

LDI Innovation OÜ herewith declares that the lidar is safe to use in normal operational conditions.

Eye and skin safety

The lidar contains Class 3B (IEC/EN 60825-1) laser operating at a wavelength of 308nm. The laser pulses cannot penetrate the eye due to the short wavelength. The laser does not produce hazardous diffuse reflections. Although the immediate hazard is limited to direct long time continuous viewing to the laser beam, the UV radiation is still dangerous and bystanders should never be able to look into the laser beam or have long skin exposure. From calculations based on IEC/EN 60825-1 the safe distance for getting a single accidental pulse into the eye is more than 1 meters. For longer-lasting exposure in more unfavorable conditions, where the distance to the lidar would minimally be around 10 meters, exposure times longer than 5 seconds could be harmful. The following table describes safe operating distances and times.

	Max exposure time	Min operating distance
Single pulse	< 0.5 seconds	1 meter
Longer exposure	5 seconds	10 meters

The usage of protective glasses and clothing is strongly encouraged when operating the lidar, especially when longer exposures to the beam are needed. The possible damage is cumulative, not immediate. For skin safety the exposure times and distances are similar to safe distances for eyes. The laser should not be allowed to hit uncovered skin area for a longer period. If this cannot be avoided, then uncovered skin should be covered with sunscreen lotion. In normal conditions the lidar will not be directed onto a pier and/or sway with the ship so that it would be improbable for a by-stander to get hit by more than a single pulse into their eyes or skin area. *No risk at normal operation. Low risk at misuse.*

Electrical safety

The lidar housing contains elements of high voltage (up to 10 kV) and typical wall-plug voltage (230V), but in normal operation this does not pose any risk, because the housing of the lidar is electrically connected to the ship's hull and is therefore at the same potential as the ship (grounded). The high voltage elements are only accessible when operating without the housing and using special tools to reach the high voltage elements. *No risk at normal operation. Low risk at misuse.*

Gas safety

The laser gas volume contains low concentration of HCl (less than 0.1% of the volume). The usage of the lidar in normal outdoor conditions during normal operations means that any leak of the XeCl gas would be carried away by the wind immediately. Secondly, the HCl gas is always filtered by a special halogen filter after every gas refill before letting the used gas into the atmosphere. Thirdly, the lidar itself is hermetically sealed, which means that any leak is contained inside the lidar.

No risk at normal operation. Low risk at misuse.

Operational safety

The lidar will be used during release of highly flammable fumes of a pollution event. The laser pulses do not have enough energy density (by a very large margin) to ignite oil products on the surface of surrounding water. The lidar compartment is hermetically sealed and filled with nitrogen increasing the operational safety in case pollution fumes are present. The lidar is safe to detect and monitor any pollution event in the sea. *No risk at normal operation. Low risk at misuse.*

16.05.2016 CEO **Sergey Babichenko**