Hampus Carlqvist
Department of Design Sciences
Faculty of Engineering LTH

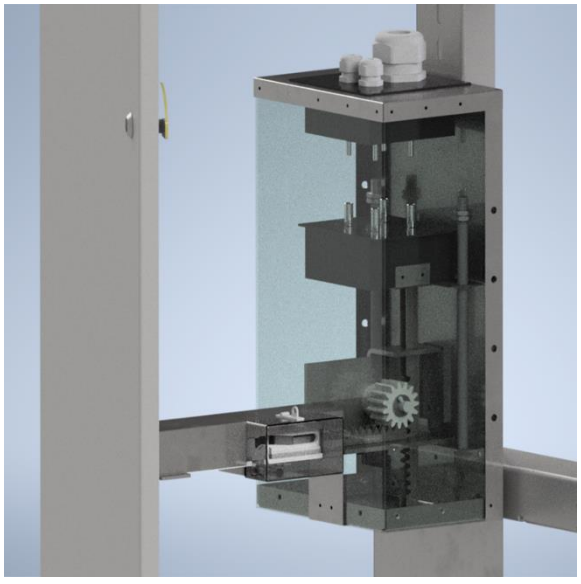
Developing a High-Voltage Mechanical Disconnector: Meeting Safety Standards

Developing a safety feature poses difficulties, as adhering to both safety standards and specific design criteria limits the range of possible solutions. While utilizing recognized frameworks and developing processes can ease this, the underlying issue will still impact design freedom.

The aim of this project was to design a mechanical disconnector for Opticept Technologies' high-voltage machines, where safety is crucial and a continuous focus for Opticept. The mechanical disconnector's role is to prevent electric shocks during maintenance tasks. Throughout the development process, relevant standards were incorporated to enhance safety measures.

The development process involved segregating the requirements from both Opticept and the safety standards into distinct categories of demands and wishes. Demands, constituting vital safety and machine integration aspects, were treated as non-negotiable requirements, acting as gatekeepers to filter concepts. Wishes, being more subjective, held weight in concept evaluation.

The outcome of the project was a concept that fulfilled Opticept's demands and adhered to safety standards. A detailed 3D CAD model was generated, ensuring seamless integration within the machine, and improving safety compared to the existing solution. This was achieved by utilizing gravity as an additional separator force. Facilitated by gears and gear rails, coupled with a resetting locking mechanism to prevent unintended reconnection.



Throughout the developmental process, the utilization of standards as design criteria emerged as a double-edged sword: while enhancing safety, it constricted design freedom and posed challenges in disconnector design. This experience underscored a deficiency in the current specialization program's *product realization* and *product development*, as it inadequately addresses these real-world scenarios where standards influence product design, particularly in terms of safety.

Several solutions were conceived, and through a comprehensive concept scoring matrix, the optimal solution was selected and presented to Opticept, as seen in the figure on the left.

The proposed solution's next phase involves prototype manufacturing to validate key components' functionality and waterproof integrity.