

J1939 CABLE TRANSDUCER

## Position feedback for container loading system

Combilift's CSS container loading system uses Variohm Eurosensor's cable-extension transducers to monitor the slip-sheet's position while loading and retracting procedure.

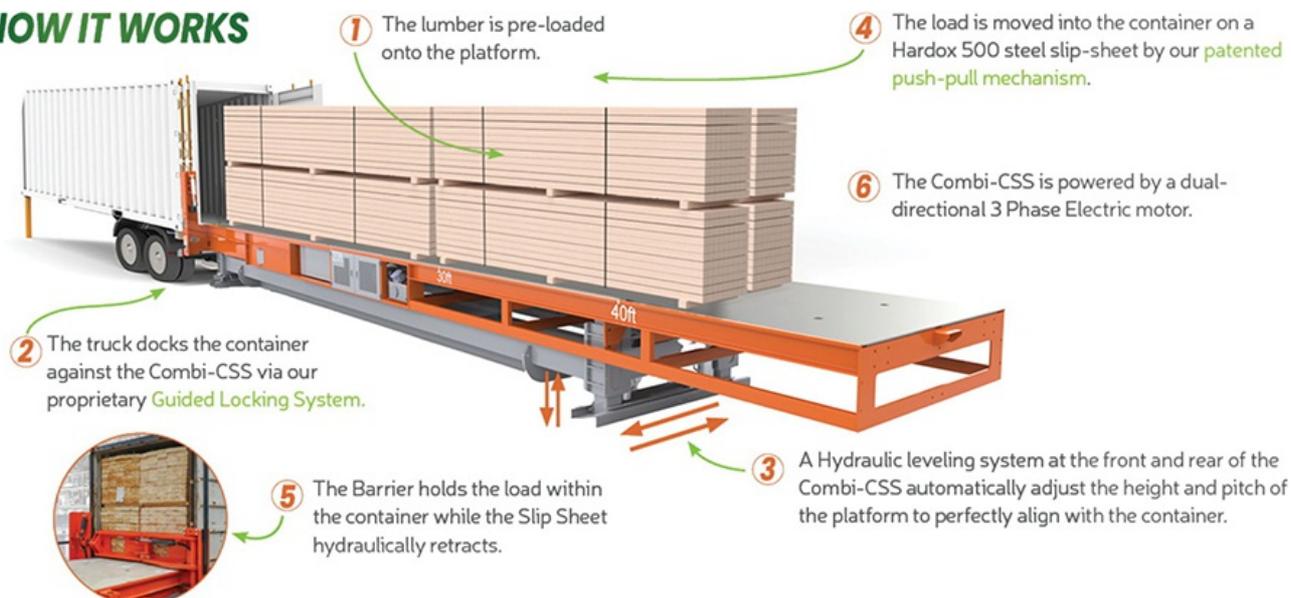


SGJ series cable extension transducers (CETs) (Source: Variohm Eurosensor)

Combilift (Ireland) is a global manufacturer of multi-directional forklifts and long-load handling solutions. The recently launched Combi-CSS (container slip-sheet) enables fast and efficient freight container loading for the transportation of timber, flat-packed furniture, panel products, and similar goods, informs the company. The system features a large platform where goods are pre-loaded on a powered steel slip-sheet. With the integral laser-assisted container alignment and hydraulic levelling, the slip sheet and its payload are driven directly into the container hold using manufacturer's patented push-pull mechanism. For the loading and retracting procedure, the control system relies on the SGJ series cable-extension transducers (CETs) from Variohm to monitor the slip-sheet's position via the J1939 interface. This enables full-loading time of ca. 6 minutes and ensures process safety.

The 16-m-long Combi-CSS is capable of loading up to 30000 kg in 6,1-m to 12,2-m containers with the alignment and load transfer process managed by a single operator. The slip-sheet material, Hardox 500, is a very hard grade of steel commonly used for large structural wear plate components in construction and mining equipment. With resistance to scratching and surface scraping, these properties help maintain a low sliding friction for the loading and sheet retraction process. The slip-sheet has several pairs of holes at equal intervals along its length. The push-pull mechanism, which sits underneath, utilizes hydraulically-driven linear actuators. The latter engage with the holes in an alternating pattern to drive the sheet forwards for loading or backwards to retrieve the sheet. The distance travelled by the actuators for each push or pull cycle determines how far the slip sheet travels. The position is controlled using the displacement feedback from the SGJ transducers.

### HOW IT WORKS



Combi-CSS enables fast and efficient freight container loading (Source: Combilift)

The CET transducers from Variohm's distribution partner TE Connectivity, were chosen for its industrial-grade quality and IP67 environmental protection rating. Its rugged glass-filled polycarbonate housing protects a precision high-cycle, plastic-hybrid rotary potentiometer in a spring-loaded cable and winding drum arrangement. The durable stainless-steel measuring cable is attached to the moving element in a "free-release" tolerant design that safeguards against damage if the cable is accidentally released. A stainless-steel mounting bracket and a standard M12 connector make the installation straightforward in any orientation.

Transducer's several output options include CANopen and J1939, as well as voltage and current signals. The chosen J1939 connection, which is widely used on mobile equipment and factory automation applications, interfaced seamlessly with the CSS's control system. The chosen version with the measurement range from 0 mm to 2032 mm provides an accuracy of 0,5 % and a full-scale repeatability of 0,02 %. The position data with a 12-bit resolution, and the device status information are transmitted as proprietary messages over the J1939 network. The node-ID, bit-rate, and data rate options can be set using DIP switches. Versions are available with or without terminal resistors. The 2032-mm travel version can be mounted in a volume of less than 100 mm x 67 mm x 127 mm. A larger 120-inch travel version is available as well.

CETs, sometimes referred to as 'string pot sensors' provide a cost-effective technology for long-travel linear displacement measurement. They are used across industrial applications such as mobile construction and forklift vehicle safety monitoring, winch and crane position feedback, large agricultural machines, flood management systems, etc. Transducer variants in miniature designs

with position measurement starting from 40 mm through to long-travel models with over 40 m are available. The sensors used in CETs include rotary potentiometers, incremental encoders, and multi-turn absolute encoders. Cable actuated technology requires no critical alignment and suits applications where space is limited or where moving components may be submerged, deep underground or partially obscured by other equipment. The devices can be adapted for use in harsh environmental conditions with IP68 protection ratings and application-matched versions supplied with hazardous-area certification.

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