Precise Docking for Safe Pallet Transfer at Transfer Stations

R2400 2-D LiDAR Sensor Enables Precise AMR Positioning

At a Glance

- Compact design with a height of 81 mm for easy integration
- Full 360° contour detection for precise AMR positioning during docking
- High angular resolution of 0.05° for precise detection of station geometry
- Flexible mounting and reproducible alignment due to precise guide holes
- Fast system integration via ROS drivers and the PFSDP protocol



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The Application

In automated logistics systems, loaded pallets are exchanged between different transport units at defined transfer stations. To ensure a safe and efficient material flow, autonomous mobile robots (AMRs) must be precisely positioned at these transfer points. Accurate detection of the environment and station geometry is crucial for reliable and collision-free pallet transfer.

The Goal

The main challenge lies in precisely positioning the AMR at the transfer station while ensuring simple mechanical integration of the sensor into vehicle architectures. Despite limited installation space, the sensor must reliably detect the contour of the transfer station and provide highly accurate position data for the docking maneuver. The goal is safe pallet transfer through precise AMR alignment with minimal integration effort.

The Solution

The R2400 2-D LiDAR sensor, with its compact design measuring just 81 mm in height, enables space-saving integration into AMR systems. With its full 360° environmental coverage and high angular resolution of 0.05°, it precisely detects the contours of the transfer station as well as reference markers and provides exact position data for the docking maneuver. Flexible mounting, due to its all-around field of view, enables optimal sensor alignment regardless of the vehicle's structural configuration. Precise alignment holes ensure reproducible mounting and, if necessary, allow for quick sensor replacement without time-consuming recalibration. System integration is carried out via the proven PFSDP protocol or ROS.

The Advantages

The combination of a compact design, 360° all-around detection, and high angular resolution makes the R2400 the ideal solution for precise docking at transfer stations. Full all-around detection allows for flexible sensor positioning within the AMR, while the high angular resolution reliably detects even fine structural features of the transfer station, such as guide rails or positioning markers. This ensures precise alignment of the AMR, minimizes the risk of collisions, and maximizes process reliability during pallet transfer. The high angular accuracy ensures reproducible positioning and consistent process quality.

The durable metal construction, featuring a sturdy sensor housing and high-quality bearings, guarantees consistent measurement performance even in the presence of vibrations during movement. Due to the optical separation of the transmitter and receiver, the measurement data remains stable even under changing ambient conditions such as dust, humidity, or condensation, which increases availability and extends maintenance intervals.

Technical Features

- Measuring range: 25 m at 90% reflectivity, 10 m at 10% reflectivity, 40 m with reflector for flexible applications
- Scanning angle: 360° for complete all-around coverage of the transfer station
- Angular resolution: up to 0.05° for precise contour detection
- Scan rate: 10–20 Hz for dynamic docking maneuvers
- Repeat accuracy: < 16 mm
- Compact height of 81 mm for space-saving integration into AMR systems



For more information, visit: **pepperl-fuchs.com/px-R2400**