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MADE IN GERMANY

SmartFork® AGVready!

Sensor forks for automated guided vehicles

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AGVready!
Forks for automated guided vehicles

Driverless transport systems must navigate safely in dynamic environments and pick up loads securely. The Smart**Fork**® **AGV**ready forks have been specially developed for use in automated guided vehicles (AGVs). With a range of intelligent sensors, from early warning of obstacles to load moment monitoring, they guarantee maximum safety and efficiency in material handling.

AGVready! VETTER forks for defined and safe load detection and pick-up.

Your all-around carefree package

Our team of experts will support you from the initial idea to the ready-to-install solution!
Benefit from the expertise of the market leader.

- Plug & Play – ready-to-install solutions
- Optimal integration of sensor technology
- Industrial-grade for the toughest conditions and long life
- Standardized communication interfaces using I/O-Link, CAN-open, etc.
- Designed in accordance with ISO 2330: Strength verification for static and dynamic loads
- FEM analyses and verification on the test bench
- Manufacturer‘s warranty for the entire package

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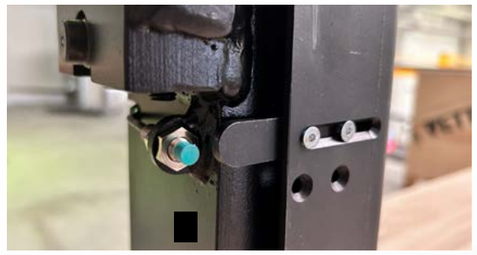
Sensors in the fork

VETTER Smart**Fork**® **AGV**ready! is revolutionizing the forks for the world of automated guided vehicles (AGV/AMR) by integrating state-of-the-art sensor technology directly into the forks. The intelligent Smart**Fork**® solutions enable unprecedented precision and safety for your autonomous vehicles. From obstacle detection to load monitoring — take advantage of the diverse, customized possibilities for driverless transport systems.

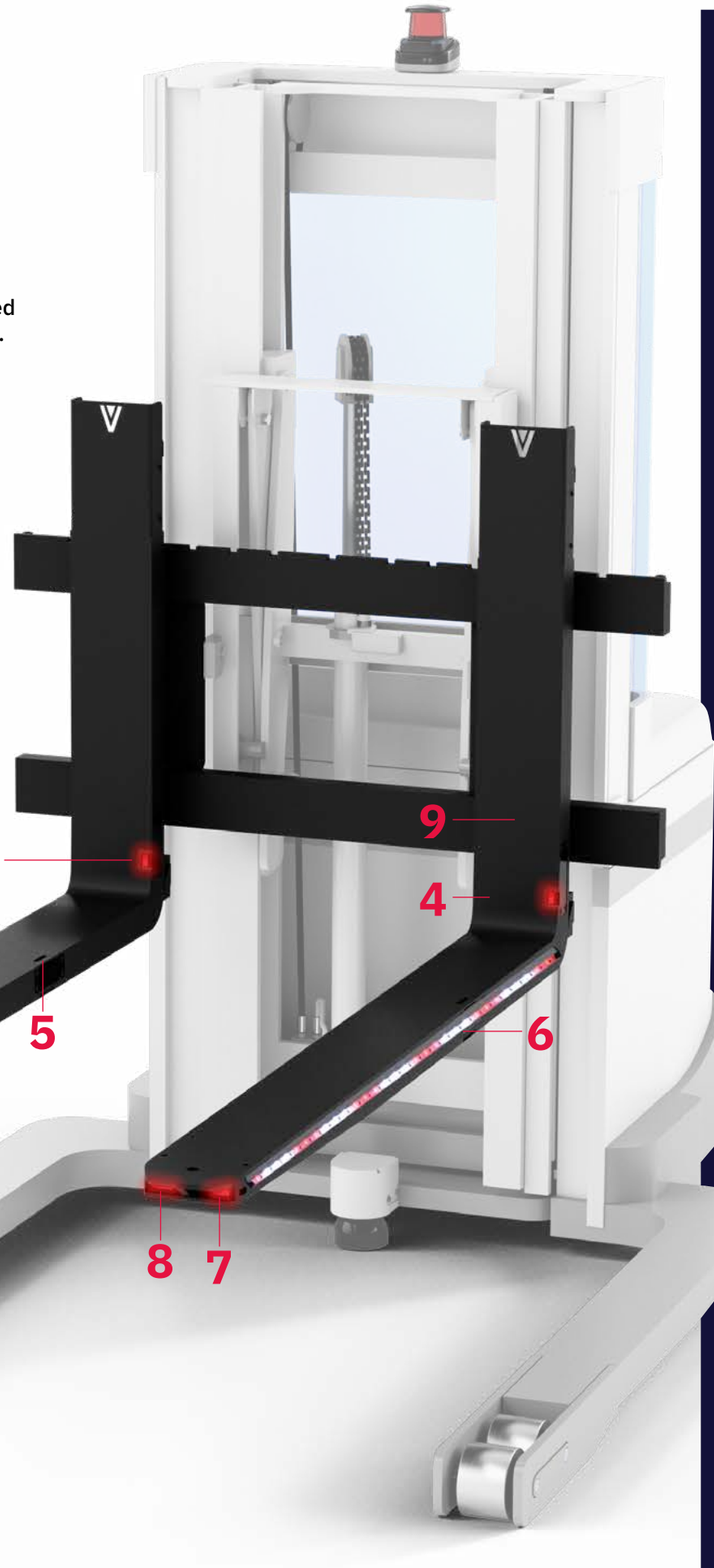
Additional add-ons:

CROC® fork coating for
increased **slip resistance**



Pressure plate in the fork back to
protect the fork heel

Brass hooks as **noise and vibration protection**



1 Obstacle detection sensor

Early detection of loads and interfering edges

2 Tilt sensor

Detection of fork tip deflection under load

3 Load control sensor

Position monitoring of the fork load

4 Load stop sensor

Precise monitoring of the load on the fork back

5 Occupancy sensor with entry depth measurement

Prevents fork tip from piercing load behind

6 LED element

Improved visibility of the forks. Indispensable where man and machine are working together

7 Distance sensor

Early detection of load and interfering edges by means of optical distance sensors

8 Pallet break sensor

Detection of obstacles in pallet pockets
(e.g. broken boards, sagging load)

9 Load monitoring sensor

Monitoring the load reduces the risk of tipping to the side and forwards

10 Your individual sensor

Pallet break sensor

Challenge

When approaching or entering the load carrier, an AGV must deactivate its powerful environment monitoring system so that the rack or pallets are not recognized as obstacles. The result: Pallet pockets are not approached precisely, leading to collisions with the fork tip.
Obstacles underneath the pallet, such as broken pallet boards, lashing equipment or plastic films must also be reliably detected. If these are not recognized correctly the AGV will push the pallet off the shelf, in the worst case scenario.

Solution

Sensors in the fork tip that detect obstacles in the immediate vicinity. Mechanical solutions are also possible as an alternative.

- Autonomous collision avoidance
- Detection of hidden obstacles
- Reliable load transport

Detection of entry pockets

Challenge

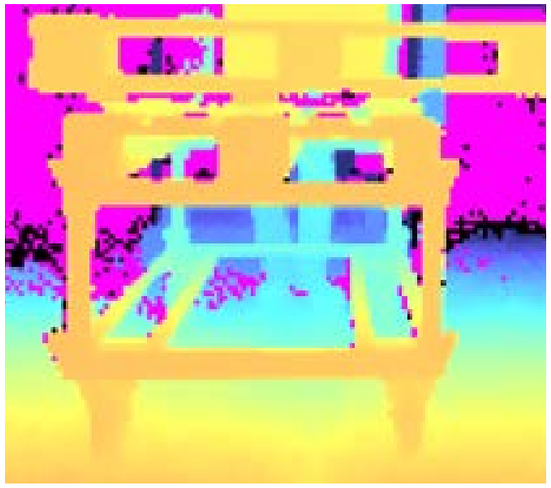
For optimal use of AGVs, the load carriers to be picked up must be positioned in precisely defined locations and aligned correctly on the shelf or on the floor. Localizing the entry pockets is only possible with considerable effort and is usually done using sensors from the vehicle. In order to detect the entry pocket, the length of the fork must first be bridged—this requires high-resolution and correspondingly expensive sensors.

Solution

The use of 2D or 3D scanners in the fork tip eliminates the need for expensive sensors on the AGV. This enables an expanded range of tasks, such as temporary location changes, truck loading and unloading, block storage, etc. In addition, the sensors can be used for environmental monitoring.

- Location-independent load acceptance
- Cost efficiency through fewer sensors
- Extended fields of application
- Precise, error-free handling

2D/3D sensor



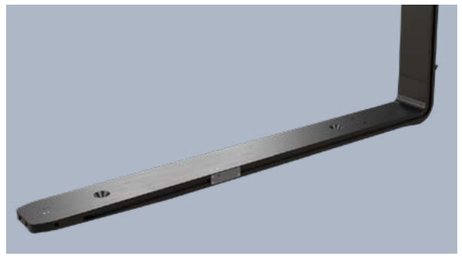
3D-point could

Detection of pallet position

Challenge

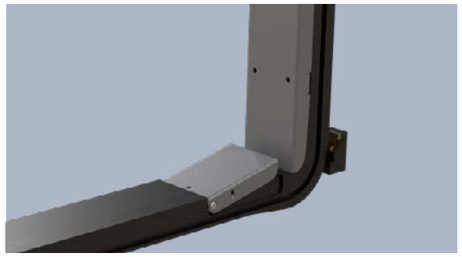
When transporting loads using AMR/AGV, the load carrier is positioned precisely in a specified position on the fork. Its applicable limits are specified in ISO 3691-4 and are constantly being tightened.

Solution



Option 1:
Appropriate distance sensors are used for monitoring. As a switching variant, these sensors are positioned directly in the fork blade to detect the load carrier upwards or to the side. This allows defined positions to be queried and transmitted to the AMR/AGV via a switching signal.

Option 2:
It is also conceivable to install switching sensors in the fork back in order to detect the end position of a load carrier. By using measuring sensors, the distance to the fork back can be detected continuously.



Option 3:
A mechanical variant may be applied if the previous sensor concepts are unsuitable.

- Safe transport
- ISO 3691-4 compliant
- Precise positioning of the load carrier
- Versatile solutions

Load Monitoring

Challenge

For safe transport of goods, the center of gravity of the load must be as close as possible to the center between the two forks and close to the fork back so that the balance of the AGV/AMR is not compromised.

Compared to a forklift driver, autonomous AGVs can only detect incorrect load pick-up or tilting of the device by using sensors. Furthermore, unintentional lifting of the load carriers in the second row can also cause the AGV and the entire load to tip over.

Solution

To determine the lateral position of the center of gravity sensors in the fork back or blade measure the deflection of the forks when the load is unevenly distributed. An additional sensor may be used to determine the load center in the longitudinal direction and the load weight. The sensor system detects when the forks are unloaded, allows for the load to be set down safely and preventing damage.

- Safe load handling
- Intelligent weight recording
- Protection against damage to the load or the floor
- Automated detection of empty forks

Side collision detection

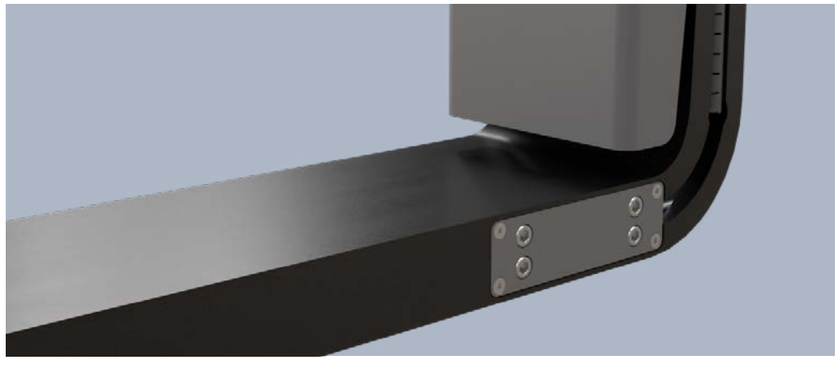
Challenge

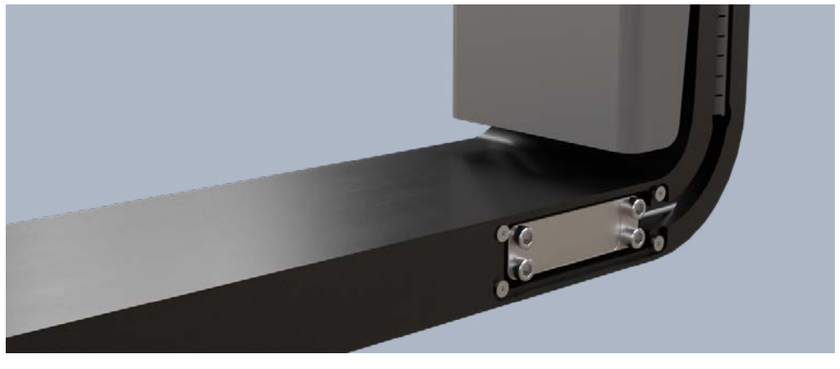
Loading trucks pose a completely new challenge for AMRs. While there is usually sufficient space between storage locations on shelves, this is not the case in trailers/containers. This means that goods or load carriers must be stored under pressure.

Solution

Side shift and adjustment systems require force monitoring, as hydraulic adjusters can generate high forces. Sensors in the fork and pressure plates in the fork back monitor these forces and their distribution to prevent damage to goods or vehicles during maneuvering and in block storage.

- Safe truck loading
- Optimal block storage protection
- Precise force monitoring
- No jamming of the load





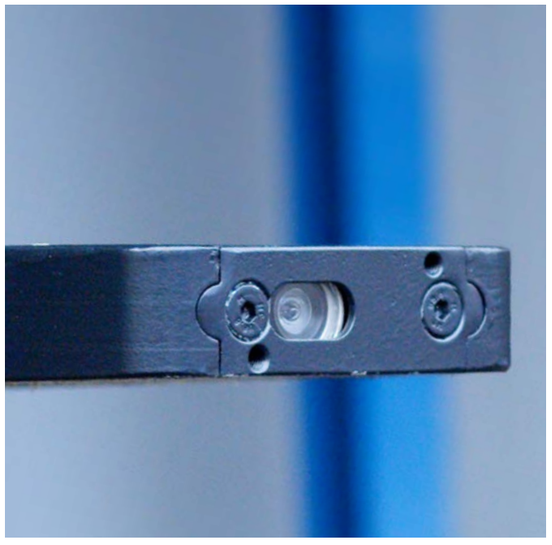
Reading QR and barcodes

Challenge

Barcodes and/or QR codes are the most important identification mark for reliably identifying storage locations or the goods stored there. While a forklift driver can aim a handheld scanner at a specific target, an AMR needs to scan the entire area in front of the vehicle to detect any codes. As the length of the fork blades increases, so does the distance over which the scanners must reliably detect the codes – and thus also the costs.

Solution

The digital camera enables the codes to be reliably detected from the fork tip. Since the focus is on the storage location in front of the fork tips, no “incorrect” codes from neighboring locations are scanned.



- Precise recognition of barcodes and QR codes
- Error-free navigation
- Optimized process, cost reduction

Mechanical collision sensor

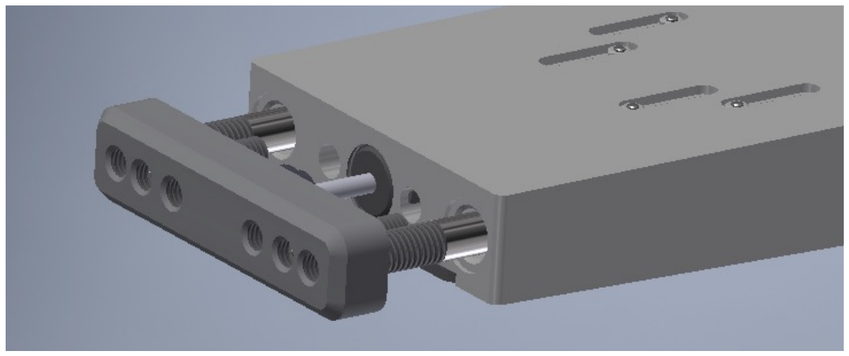
Challenge

Depending on the sensors use, these have difficulty reliably detecting special surfaces such as shiny plastic, dark wood or reflective materials. This can lead to misjudgments and collisions during approach.

Solution

The mechanical collision sensor in the fork tip reacts directly to physical contact. Deflection triggers a signal via an inductive sensor – completely independent of light, color or material.

- Universal surface detection
- Highest process reliability
- Robust technology
- Always ready for action



Tilt sensor

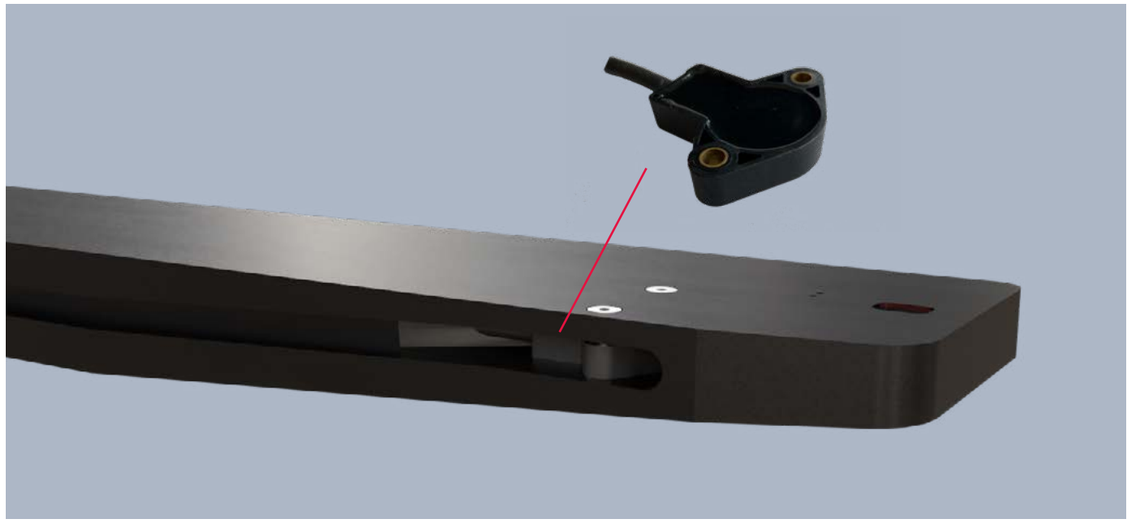
Challenge

A major challenge for AMR is a deflection of the fork under load, as the fork tip must remain horizontal to be stored safely. This is currently calculated and compensated using known load weights from the ERP system. This will be problematic in the furture, if AMR is to autonomously unload randomly loaded trucks, as the weights are often unknown or inaccurate.

Solution

The tilt sensor built into the fork tip allows the deflection of the tip to be precisely measured and the mast tilt can be adjusted automatically, regardless of the load weight.

- Compensation for fork bend
- No need to specify the load weight
- Optimized process



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Together for a perfect solution

Getting started with us is as flexible as your requirements. We meet you exactly where you are — with four product levels, we accompany you step by step to your optimal AGV solution. Whether you need individual components or a ready-to-install system, you decide how much support you need from us.

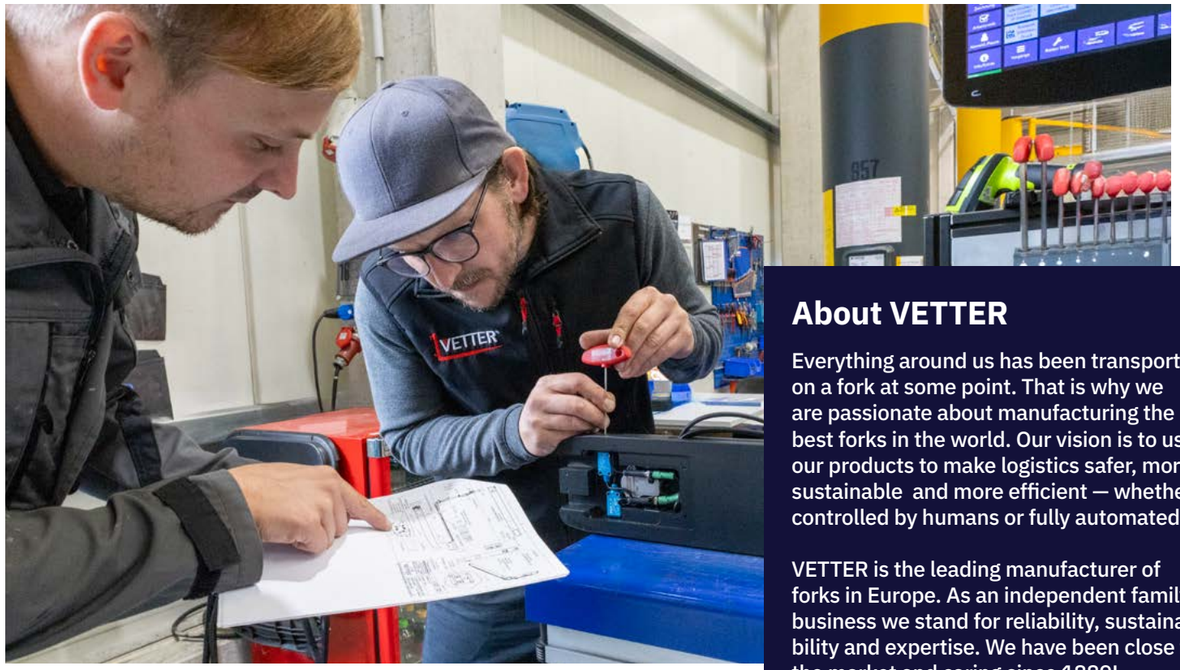
The design and calculation of the forks is always carried out in accordance with the applicable standards (ISO 2338) taking into account all static and dynamic requirements – for maximum safety, durability, and functionality of your solution.

\+ Project management with joint workshops

\+ Consulting on design and functionality

\+ Functional tests

\+ Installation service with presetting of sensor parameters

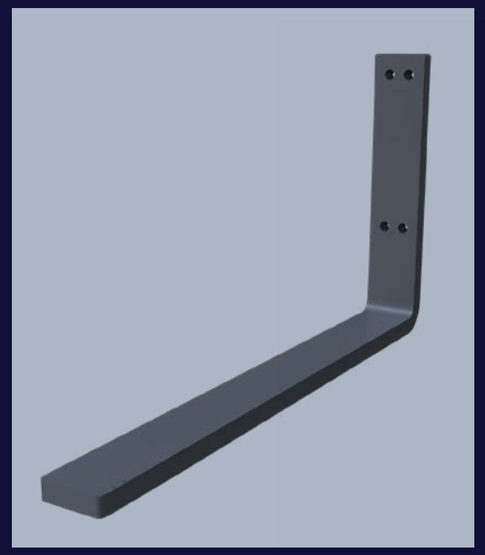


About VETTER

Everything around us has been transported on a fork at some point. That is why we are passionate about manufacturing the best forks in the world. Our vision is to use our products to make logistics safer, more sustainable and more efficient — whether controlled by humans or fully automated.

VETTER is the leading manufacturer of forks in Europe. As an independent family business we stand for reliability, sustainability and expertise. We have been close to the market and caring since 1889!

The SmartFork® AGVready is available in various stages of processing – just as you wish!



1. Fork blank with suspension (hook, drill, shaft, custom-made)

2. Pre-milled fork for cable channels and sensor mounts

3. Pre-milled fork and partially wired and assembled

4. Fork fully assembled, wired, with built-in sensors and function tested – ready to install!

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