Safe AGV Forklift

PROTECTING AUTOMATED GUIDED FORKLIFT VEHICLES – EFFICIENT AND FUTURE-PROOF

Functional safety systems

Sensor Intelligence.
For Automated Guided Vehicles (AGV) with lifting forks, every stop comes at the expense of productivity. On the other hand, AGVs are also required to be fully safeguarded and in accordance with standards for collision avoidance and for the protection of individuals located in the path of the AGV.

Safe AGV Forklift is an innovative total solution that cleverly addresses this conflict between productivity and safety.

A safety encoder continuously monitors the speed of the AGV. The proven safety laser scanner from SICK reduces the speed if necessary. And protective field switching automatically takes place with curve maneuvers. That means that Safe AGV Forklift has achieved a visionary approach to safety that conforms to standards, while maximizing productivity and taking a decisive step toward the full automation of automated guided vehicles equipped with lifting fork and drive wheel.
HiGH PRODUCtIVITY AND SAFETY – EVEN WITH LOWERED LIFTING FORKS

Safe AGV Forklift replaces the two non-safe encoders required for conventional safety solutions with a DFS60S Pro safety encoder. It provides the underlying safety control with a reliable signal on the speed of the AGV, making activities such as automatic and standardized loading and unloading possible at a reduced speed. The crucial advantage of Safe AGV Forklift is its use for guided vehicles with lowered lifting forks. Whenever the lifting fork conceals the IN3000 Direct non-contact safety switch installed on the back of the AGV, the latter sends a signal to the underlying control unit and the speed is reduced to a maximum of 0.3 m/s. Safe AGV Forklift monitors this reduction in speed safely and reliably, combining productivity with safety.
Safety and collision protection are the main priorities for the Safe AGV Forklift. When combined with the Flexi Soft safety controller, the S300 Mini Remote and S3000 Remote safety laser scanners are both able to detect people and objects that are located in the path of an AGV, even under demanding application conditions. This is also the case when taking curves, as two IN3000 Direct non-contact safety switches detect the steering angle. The protective fields of the safety laser scanner are then adapted to the direction of travel of the AGV.

The benefits of Safe AGV Forklift at a glance

- Fully-automated yet completely safe operation of AGVs with lifting forks up to PL d (EN ISO 13849-1)
- High investment security due to compliance with all the current standards for AGV as well as alignment with future specifications and standards
- High productivity achieved by minimizing down times and driving at a safe speed with a lowered lifting fork
- Protective field switching implemented for curve maneuvers
- Easy integration and commissioning of the system using safety-tested, coordinated and ready to use components
- A complete system composed of proven SICK components
- High availability, low follow-up costs and worldwide service
PROVEN SICK COMPONENTS WITH RELIABLE FUNCTIONALITY

The structure of the basic Safe AGV Forklift package

Safe AGV Forklift is a complete system composed of proven SICK safety components that are coordinated and easily integrated into vehicles and quickly brought into operation.

- Modular safety controller
  - Flexi Soft
- Non-contact safety switch
  - IN3000 Direct
- DFS60S Pro safety encoder
- S300 Mini Remote safety laser scanner
- S3000 Remote safety laser scanner
The Safe AGV Forklift operating principle

The DFS60S Pro safety encoder is responsible for a crucial function of the Safe AGV Forklift. It safely monitors the drive of the guided vehicle, and sends a safety signal to the Flexi Soft safety controller.

When taking curves, the protective fields of the AGV are switched depending on both the speed and the steering angle. That reduces downtimes.

The Flexi Soft safety controller transmits a signal to the AGV control in order to reduce speed in the following cases:

- When the IN3000 Direct safety switch transmits a corresponding signal due to a lowered lifting fork
- When the warning fields of the S300 Mini Remote and S3000 Remote safety laser scanners attached to the front and rear of the AGV have been crossed with a raised lifting fork. In these cases, the safety laser scanner protection field is adjusted according to the speed, exactly as with curve maneuvers.

A person approaches the S3000 remote warning field when the AGV is traveling forward.

The AGV still operates at normal speed.

The speed is reduced and the protection field is adjusted by detecting objects or people in the path of the AGV.

The Flexi Soft safety controller throttles the speed of the AGV.

If the person is located outside the hazardous area, the protection fields can be expanded depending on the speed.

The Flexi Soft safety controller increases the speed of the AGV again.
Product description
Safe AGV Forklift is the efficient safety solution for automated guided vehicles (AGVs) with lifting forks. Installation on automated lifting fork vehicles with a drive wheel is easy. The speed and direction-independent protective field switching of the safety laser scanner prevents stops and is gentle on wear and tear parts. Previous solutions prevent automated loading and unloading compliant with standards because the protective field of the laser scanner was violated by the lifting fork. Thanks to the use of the safety encoders, the vehicle can continue to move with the lifting fork lowered at a safely reduced speed. This increases productivity and enables fully-automated and safe operation of AGVs with lifting forks.

At a glance
- Proven combination of reliable SICK safety components
- Easy configuration with function blocks
- Reliable evaluation of the current vehicle speed
- Integration into all common field-buses (optional)
- Reliable field switching during cornering

Your benefits
- Increased productivity by driving at a safe speed with the lifting fork lowered
- Fully-automated yet completely safe operation of AGVs with lifting forks
- Tested SICK solution consisting of hardware, software and integration aids for easy installation, commissioning and maintenance
- Reliable safety in line with current and future standards
- Protective field switching regardless of speed prevents stops and protects wear and tear parts
- Proven SICK safety technology for maximum reliability and availability – even under difficult conditions

Additional information
Detailed technical data ...........9
Ordering information .............9
Accessories .......................10

=> www.sick.com/Safe_AGV_Forklift
For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.
Detailed technical data

Features

<table>
<thead>
<tr>
<th>Safety task</th>
<th>Safe Motion Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Mobile hazardous area protection on automated guided vehicles</td>
</tr>
</tbody>
</table>

Safety-related parameters

<table>
<thead>
<tr>
<th>Performance level</th>
<th>PL d (EN ISO 13849)</th>
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Ordering information

<table>
<thead>
<tr>
<th>Encoder: mechanical design</th>
<th>Encoder shaft: diameter</th>
<th>Encoder shaft: length</th>
<th>Type</th>
<th>Part no.</th>
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<tbody>
<tr>
<td>Solid shaft, Servo flange</td>
<td>6 mm</td>
<td>10 mm</td>
<td>SAPPB0D-14A0021</td>
<td>1087180</td>
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<td>Solid shaft, face mount flange</td>
<td>10 mm</td>
<td>19 mm</td>
<td>SAPPB0D-14A0022</td>
<td>1087181</td>
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<tr>
<td></td>
<td>10 mm</td>
<td></td>
<td>SAPPB0D-14A0020</td>
<td>1087179</td>
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<tr>
<td></td>
<td>12 mm</td>
<td></td>
<td>SAPPB0D-14A0027</td>
<td>1087186</td>
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<td></td>
<td>14 mm</td>
<td></td>
<td>SAPPB0D-14A0028</td>
<td>1087187</td>
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<tr>
<td>Solid shaft with key seat</td>
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<td>1087182</td>
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<tr>
<td>Solid shaft with key, face mount flange</td>
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<td>19 mm</td>
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<td>1087178</td>
</tr>
<tr>
<td></td>
<td>10 mm</td>
<td></td>
<td>SAPPB0D-14A0024</td>
<td>1087183</td>
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<tr>
<td></td>
<td>12 mm</td>
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<td>SAPPB0D-14A0025</td>
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<td>5/8&quot;</td>
<td></td>
<td>SAPPB0D-14A0029</td>
<td>1087188</td>
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Safe AGV Forklift scope of delivery:
- DFS60S Pro safety encoder in different variants
- S3000 Remote safety laser scanner
- S300 Mini Remote safety laser scanner
- IN3000 Direct non-contact safety switches
- Flexi Soft safety controller main module CPU2
- Flexi Soft system plug MPL1
- Flexi Soft safety controller I/O module XTI0
- Flexi Soft safety controller I/O module XTDI
- Flexi Soft safety controller Motion Control module MOC0

Accessories required for commissioning

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Items supplied</th>
<th>Further information</th>
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<tbody>
<tr>
<td>Encoder: Connection cable to MOC0</td>
<td>1</td>
<td>–</td>
<td>Plug connectors and cables</td>
</tr>
<tr>
<td>IN3000 Direct: Connecting cable, M12, 4-pin</td>
<td>3</td>
<td>–</td>
<td>Plug connectors and cables</td>
</tr>
<tr>
<td>S3000 Mini Remote: Extension cable, 5 m</td>
<td>1</td>
<td>–</td>
<td>Plug connectors and cables</td>
</tr>
<tr>
<td>S3000 Remote and S300 Mini Remote: Configuration cable</td>
<td>1</td>
<td>–</td>
<td>Plug connectors and cables</td>
</tr>
</tbody>
</table>
**Accessories**

**Mounting systems**

Mounting brackets and plates

Mounting brackets

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Packing unit</th>
<th>Type</th>
<th>Part no.</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Mounting bracket" /></td>
<td>Mounting bracket for direct mounting, from the rear, on wall or machine, not adjustable</td>
<td>1 piece</td>
<td>Mounting kit 1</td>
<td>2015623</td>
</tr>
<tr>
<td><img src="image" alt="Mounting bracket" /></td>
<td>Mounting bracket for rear mounting on wall or machine</td>
<td>1 piece</td>
<td>Mounting kit 1a</td>
<td>2034324</td>
</tr>
</tbody>
</table>

Dimensional drawings ➔ page 11

**Connection systems**

Plug connectors and cables

System plugs

- **Model**: Pre-assembled, Not for use of incremental encoders, integrated configuration storage, PVC, unshielded

<table>
<thead>
<tr>
<th>Figure</th>
<th>Number of cores</th>
<th>Cable length</th>
<th>Items supplied</th>
<th>Type</th>
<th>Part no.</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Cable" /></td>
<td>9-wire</td>
<td>5 m</td>
<td>With 1 x cable gland M20, 1 x blanking plug M20, 2 x blanking plug M12</td>
<td>SX0A-B0905B</td>
<td>2027170</td>
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</table>

Connecting cables with female connector

<table>
<thead>
<tr>
<th>Figure</th>
<th>Connection type</th>
<th>Description</th>
<th>Model</th>
<th>Conductor cross-section</th>
<th>Cable length</th>
<th>Type</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Cable" /></td>
<td>Female connector, M12, 4-pin, straight</td>
<td>Cable</td>
<td>PVC, unshielded</td>
<td>0.25 mm²</td>
<td>15 m</td>
<td>DOL-1204-G15M</td>
<td>6010753</td>
</tr>
<tr>
<td><img src="image" alt="Cable" /></td>
<td>Female connector, M12, 7-pin, straight</td>
<td>Cable</td>
<td>Extension cable S300 Mini Remote</td>
<td>Shielded</td>
<td>5 m</td>
<td>DOL-1SS2G5MOE15KM3</td>
<td>6042338</td>
</tr>
</tbody>
</table>

Connecting cables with male and male connector

<table>
<thead>
<tr>
<th>Figure</th>
<th>Connection type</th>
<th>Model</th>
<th>Conductor cross-section</th>
<th>Cable length</th>
<th>Type</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Cable" /></td>
<td>Male connector, M8, 4-pin, straight</td>
<td>Male connector, USB-A, straight</td>
<td>PVC, unshielded</td>
<td>0.25 mm²</td>
<td>10 m</td>
<td>DSL-8U04G10M025KM1</td>
</tr>
</tbody>
</table>
Other connectors and cables

- **Description:** The connection cable is designed for the use of sine-cosine encoders. If other encoders are used, other protective measures must be taken in the event of cable breakage or a male connector coming loose.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Connection type</th>
<th>Model</th>
<th>Cable length</th>
<th>Type</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="connection_cable.png" alt="Image" /></td>
<td>Female connector, Micro D-Sub, 15-pin, angled</td>
<td>Female connector, M12, 8-pin, straight</td>
<td>Shielded</td>
<td>0.85 m</td>
<td>2071072</td>
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</table>

**Dimensional drawings for accessories (Dimensions in mm (inch))**

**Mounting brackets and plates**

Mounting kit 1

![Image](mounting_kit1.png)

Mounting kit 1a

![Image](mounting_kit1a.png)
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We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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