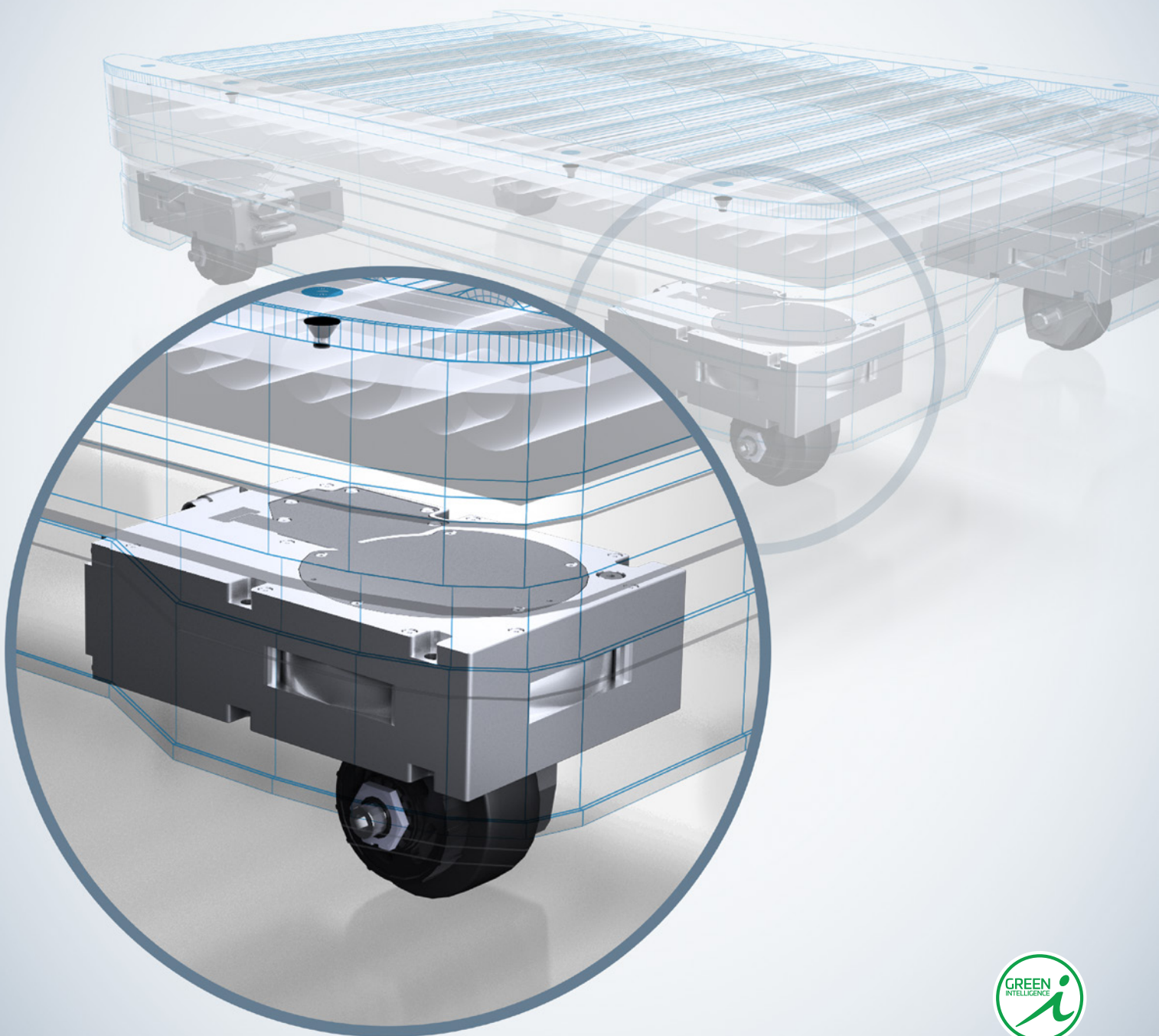


Intralogistics is learning *new flexibility.*

With the innovative Driving-Steering-Unit ArgoDrive
for automated guided vehicles.

ebmpapst

engineering a better life



About ebm-papst.

As the leading supplier of ventilation and drive technology, ebm-papst is a highly respected engineering partner in many industries. With over 20,000 different products, we provide the right solution for just about any challenge. As the logical next stage in the development of our high-efficiency GreenTech EC technology, we believe that sustainably oriented industrial digitization offers the greatest future prospects for our customers. With GreenIntelligence, ebm-papst already offers intelligently interconnected complete solutions that are unrivaled worldwide and save energy costs and emissions.

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Six reasons that make us the ideal partner:

Our systems expertise: as experts in advanced motor technology, electronics and aerodynamics, we provide system solutions from a single source.

Our spirit of invention: our 600 engineers and technicians will develop a solution that precisely fits your needs.

Our lead in technology: with our EC technology and GreenIntelligence, we combine the highest energy efficiency with the advantages of IoT and digital networking.

Closeness to our customers: at 48 sales offices worldwide.

Our standard of quality: our quality management is uncompromising, at every step in every process.

Our sustainable approach: we assume responsibility with our energy-saving products, environmentally-friendly processes, and social commitment.

GreenIntelligence. *Making Engineers Happy.*

Why do our customers look so happy? Because when it comes to digitalization and sustainability, we provide them with a clear competitive edge with GreenIntelligence. The intelligent control and networking of fans and drives makes applications more powerful and efficient. Together with a long product life and highly efficient EC technology, we achieve lasting reductions in energy costs and emissions.

For the wide range of automation tasks needed in **industrial drive technology**, what you need most is an experienced partner who understands your needs. The drive experts at ebm-papst have detailed applications expertise and, thanks to GreenIntelligence, can offer drive solutions with intelligent networking capabilities that cater for all requirements perfectly.

This is how much GreenIntelligence there is in the new ArgoDrive:

- Communication and functional safety via defined interface
- Prepared for interaction with people or other transport vehicles
- Quick and easy integration into different control environment



The compact Driving-Steering-Unit ArgoDrive provides maximum logistics freedom.

New drive for autonomous transport tasks.

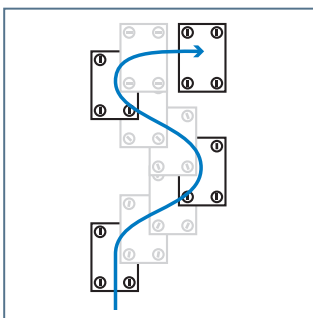
Battery-powered driverless transport systems are considered the future-proof solution for fast, flexible and reliable flows of goods in intralogistics. That's why the market for them is growing disproportionately – and developing rapidly. From track-guided approaches to completely free-navigating transport solutions. Such systems place great demands on their drives.

That's why ebm-papst participated in the KARIS PRO project from October 2013 to December 2016, focusing on flexible logistics and material flow systems thanks to subsidies from the German Federal Ministry of Research and Technology (BMBF) and support from the Projektträger Karlsruhe (PTKA). The quick start-up and smooth integration of autonomous transport systems into existing logistics processes are just as essential as extensive safety techno-

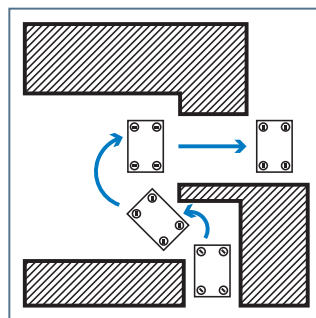
logy. Intelligent networking via BUS systems is a prerequisite for this, which results in requirements for maximum efficiency with minimal installation space and a long service life.

Created for the most demanding requirements: the Driving-Steering-Unit ArgoDrive.

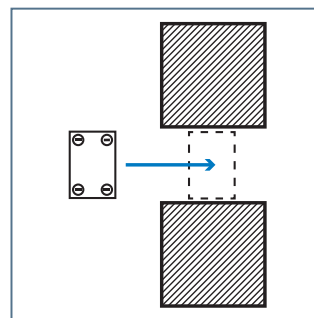
ebm-papst meets all these requirements with an innovative drive solution: the I/Iot-capable Driving-Steering-Unit ArgoDrive for mobile batteryoperated applications. This unit includes everything necessary for autonomous driving and for maximum safety, yet it is very compact. With its omnidirectional mobility, it not only allows free navigation across the entire area and in all directions, it also requires very little space. The ArgoDrive can master even gradients of up to 10 % and large loads, thus ensuring that every logistics process will be fit for the future.



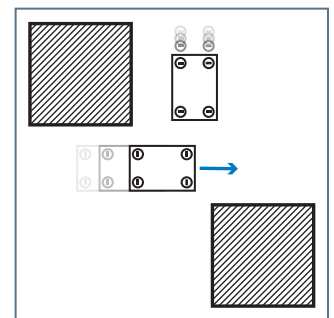
Driverless transport systems use the ArgoDrive to freely navigate across the entire area and easily avoid any unexpected obstacles.



Even if space gets tight, the driverless transport system with the ArgoDrive will find its way and maneuver in all directions in the smallest possible space.



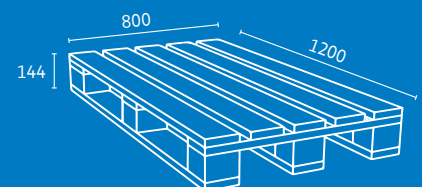
Equipped with high-resolution sensors and low-backlash mechanics, the ArgoDrive positions every driverless transport system as precisely as possible.



The brake unit in combination with redundant sensors forms the structural preparation for requirements regarding functional safety.

Driving-Steering-Unit ArgoDrive for proven dimensions.

Among other things, requirements for drive technology depend greatly on the weight of the goods to be transported. This is why the modular system of the ArgoDrive is available in three application and performance classes with corresponding impeller diameters. If several Driving-Steering-Units are combined, overall vehicle weights up to two tons are possible. For example, is as much as a fully loaded Euro pallet or a mid-sized car.



Many strengths *in the smallest space.*

The innovative Driving-Steering-Unit ArgoDrive is a complete unit consisting of motor, transmission, omnidirectional steering, sensors and all necessary connections. With their superposition gear, its two motors contribute to steering, acceleration, movement and braking depending on requirements.

The infinite steering angle enables space-saving vehicle movement – even from a standing position. Integrated intelligence enables condition monitoring and predictive maintenance. That's GreenIntelligence from ebm-papst.

INTERFACES

+ Kommunikation & Safety



- CANopen (STO hardwired)*
- EtherCAT (STO hardwired)*
- Profinet (STO, SLS, SDI)*

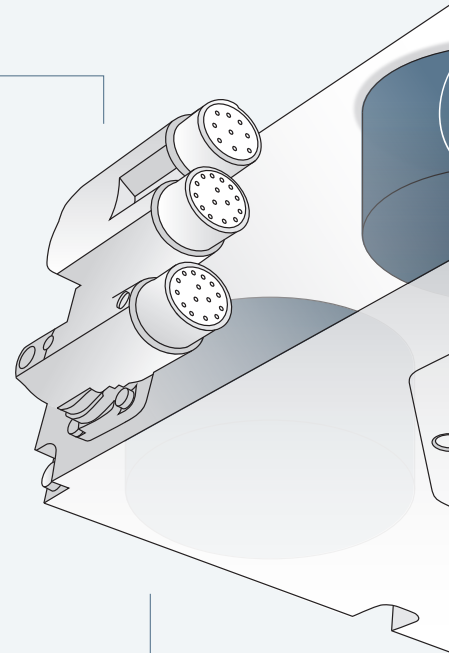
* With external controller

+ Simple connection

- industrial plug-in connections

+ Easy project planning

- electrical, mechanical and control interfaces identical across all variants



HOUSING

+ Compact dimensions

- length times width in every configuration just 250x170mm

+ Convenient installation

- several mechanical fastening points for maximum flexibility across all variants

+ Robust design

- for heavy loads and long service life

+ Flexible positioning in the vehicle

- position and orientation of the ArgoDrive freely selectable



IMPELLER

+ High load capacity

- three diameters for loads up to 500kg
- up to 10% gradient

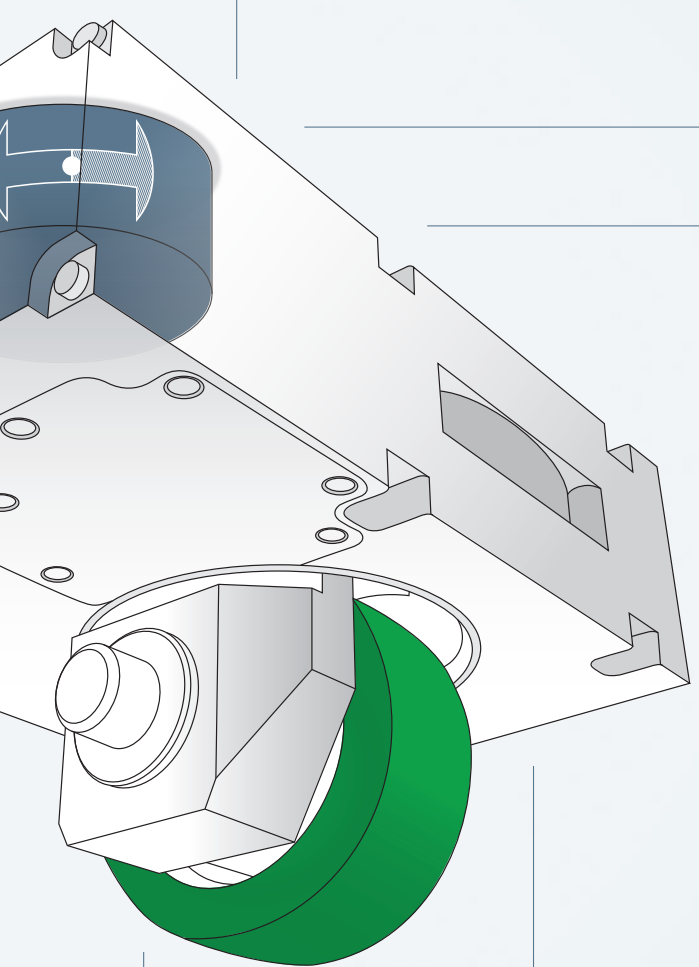
+ Ground clearance

- 26–128mm depending on requirements

+ Easy to maintain

- easily accessible and quickly interchangeable





STEERING ANGLE MEASUREMENT

- + Permanent information about setting of steering angle
- + Redundant information for functional safety

FUNCTIONAL SAFETY

- + redundant encoder system SSI
- + Separate steering angle detection
- + MttF values for sensors
- + B10 value for brake
- + Brake with emergency stop function

TWO MOTORS

- + High power
 - three times the power possible for a brief while
 - acceleration/braking up to 2.5 m/s²
 - Speed up to 3m/s
- + Compact design
 - thanks to optimal space-saving distribution of drive power across two motors
- + Simplified installation
 - due to safety extra-low voltage (48V)
- + Demand-based
 - to provide the necessary drive power for driving and steering



GEARBOX

- + Flexible rotation
 - enables rotation and movement by 360°
- + Steering
 - enables synchronous adjustment of a steering angle and provision of the drive power of both motors for driving



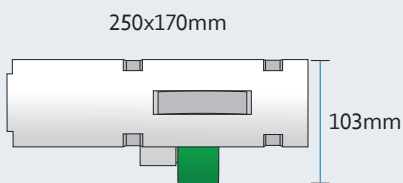
Custom-tailored *to your requirements.*

One system for many applications.

Whatever requirements you want to satisfy, the Driving-Steering-Unit ArgoDrive will meet all requirements. Regardless of whether it is a question of the fastest possible transport from A to B, moving large loads or mastering uphill climbs.

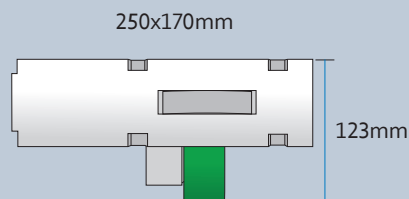
Regardless of the size of your vehicles or robots: With the ArgoDrive versions Light, Standard and Heavy, as well as the option of combining several ArgoDrives with one another, there are many possibilities.

Light up to 100kg



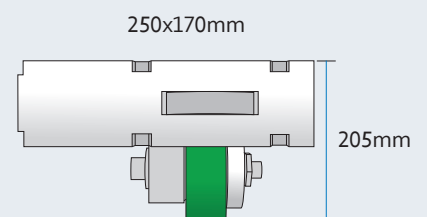
Wheel diameter 80mm
3m/s | 100kg
Ground clearance 26mm

Standard up to 300kg



Wheel diameter 100mm
2m/s | 300kg
Ground clearance 45.5mm

Heavy up to 500kg



Wheel diameter 145mm
1,5m/s | 500kg
Ground clearance 128mm

The best features for future-proof logistics.

Unbeatable advantages combined in ArgoDrive.

There are various suspension concepts for putting driverless transport systems into service. How maneuverable the vehicle is in the end and how much load it can carry depend greatly on the drive and the wheels. Depending on topology, users often have to accept compromises and, for example, sacrifice maneuverability or compactness. This is not the case with the ArgoDrive from ebm-papst, which combines all the advantages as shown in the following overview.

The Driving-Steering-Unit ArgoDrive from ebm-papst:

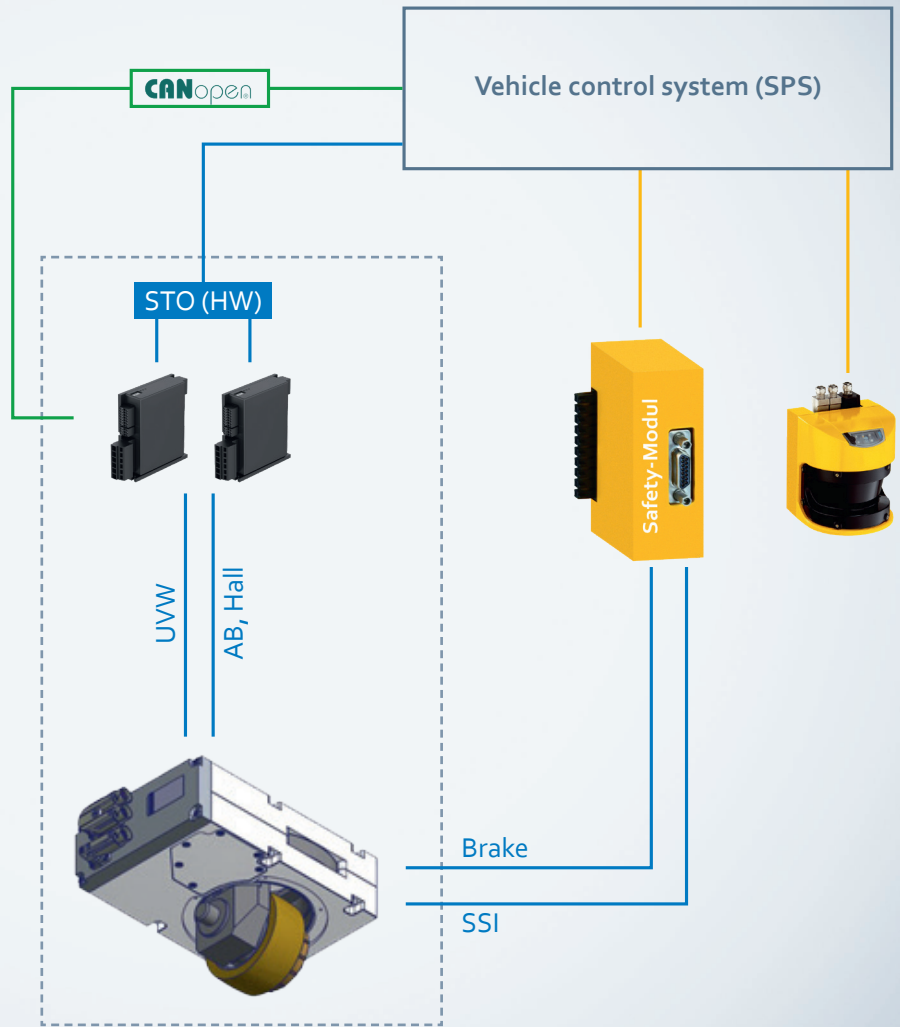
Advantages:

- + Maneuverability
- + Compact design
- + Modular principle
- + Service life

Alternative suspension concepts:

Three-wheel	Differential	Center pivot plate	Mecanum
<ul style="list-style-type: none"> - Maneuverability - Traction - Load 	<ul style="list-style-type: none"> - Maneuverability - Load - Load distribution 	<ul style="list-style-type: none"> - Requirements for floor properties - Availability - Complex evaluation 	<ul style="list-style-type: none"> + Maneuverability - Complex mechanics - Speed - Gradients

Would you like further information? But we're happy to say:
For technical inquiries, please call us at +49 9123 945 7000
or send an e-mail to info4@de.ebmpapst.com



CANopen®

Integration of ArgoDrive into an AGV

Use case
CANopen
with STO

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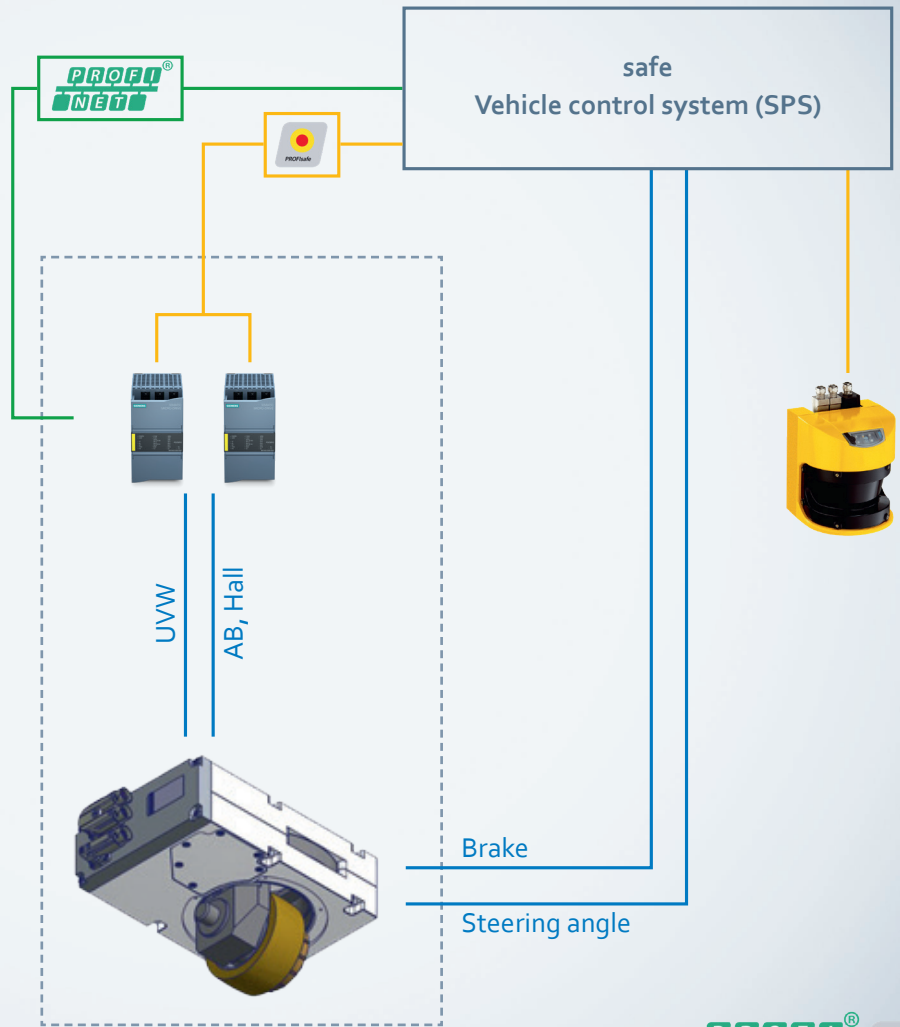
System

- +
- +

Advantages

- ✓ Flexible design of functional safety and control
- ✓ MTTFd and B10 available
- ✓ Standard safety components can be used
- ✓ Approvable basic concept

- SPS communicates with ArgoDrive via CANopen
- Two drive controllers in master/slave configuration
- STO via separate cable to ArgoDrive drive controller
- Plausibility check of the CAN data with safely recorded data from SICK's MOC module
- Brake control incl. feedback via drive controller and SICK module
- Scalable system from one to several drives per vehicle



Integration of ArgoDrive into an AGV

Use case
SIMOVE
by Siemens

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System

- + Control via ProfiNet
- + Fully automated system

Advantages

- ✓ Compatibility with Siemens automation
- ✓ Software modules can be selected
- ✓ Available in the TIA portal
- ✓ Certified overall system
- ✓ Mechanics, electrics and software are standardized

- S7 communicates with ArgoDrive via ProfiNet
- Two PDC drive controllers in master/slave configuration
- STO via separate cable to ArgoDrive drive controller
- Plausibility check of the ProfiNet data with safely recorded data from SICK's MOC module
- Brake control incl. feedback via SIMATIC drive controller and SICK module
- Scalable system from one to several drives per vehicle
- All suspension topologies are stored in the TIA SW library

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**ebm-papst St. Georgen
GmbH & Co. KG
Hauptverwaltung**

Hermann-Papst-Straße 1
78112 St. Georgen
Germany
Phone +49 7724 81-0
Fax +49 7724 81-1309
info2@de.ebmpapst.com

**ebm-papst St. Georgen
GmbH & Co. KG
Werk 7 Lauf**

Industriestraße 9
91207 Lauf a. d. Pegnitz
Germany
Phone +49 9123 945-0
Fax +49 9123 945-145
info4@de.ebmpapst.com