

Mechanical Drive Solutions for Warehouse Automation

AGVs • AMRs • STORAGE & RETRIEVAL



MAY 2023



Solutions for Warehouse Automation & Intralogistics

Automated guided vehicles (AGVs) and autonomous mobile robots (AMRs), along with automated storage and retrieval systems, are indispensable in automating warehouses and other intralogistic movements of goods and materials. The many types of mobile robots require many types of wheel drives.

GAM has the experience and product range for all types of wheel drives. With our engineering and manufacturing flexibility, GAM can collaborate with you for the right product for your application — from our standard GML and OPG gearboxes to custom solutions for specific applications.

The GAM Advantage

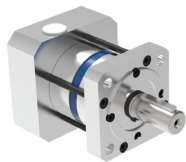
Find your exact solution at GAM!

GAM is a U.S.-owned manufacturing company in business for more than 30 years. Our product range of robotic and servo gear reducers, rack and pinion, linear mounts, servo couplings, and other specialized mechanical drive solutions is one of the largest in the industry.

Even with such a wide offering, we realize our standard wheel drives do not meet your exact requirements. One of our greatest strengths is our ability to modify standard designs, provide completely customized solutions, and integrate product assemblies to meet your specific application requirements. And, because of our flexible manufacturing, we can cost-effectively produce small batches of customized product in short lead-times.

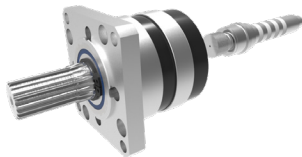
U.S. manufacturing, being flexible to meet the needs of customer requests, and great service are what set us apart from the rest.

So if you can't find what you are looking for, just ask!



Modified Standard Gearbox

Standard planetary gearbox modified for the demanding shock and reversing loads of the wheel drive of an automated parking robot



Customized Planetary Gearbox

GAM produced a custom motor rotor shaft with an integral sun gear for a motor manufacturer. This drives a customized planetary gearbox with a spline output shaft to directly mount and drive an AGV Wheel



Integrated Assembly

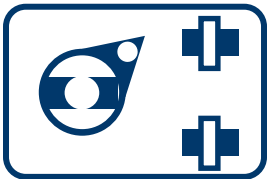
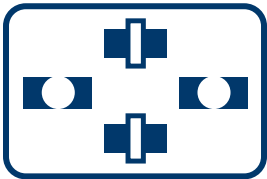
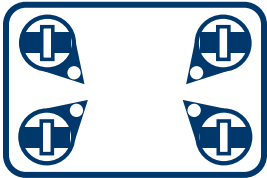
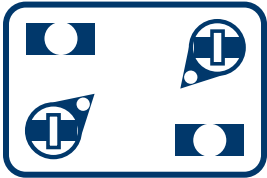

Customized wheel drive with a standard GSL strain wave gearbox in a custom housing to directly mount and drive a mobile robot wheel

Chassis Types for AGVs/AMRs - The Right Solution

Various chassis concepts are used in driver-less transport vehicles. These are differentiated according to their movement behavior. AGVs and AMRs have different requirements for maneuvering. For an AGV, a line-moving vehicle, the alignment of the vehicle frame is fixed by the chassis. This leads to increased space requirements when cornering. For an AMR, a surface-mobile vehicle, the orientation of the vehicle frame can be set independently of the vehicle position.

The required movement can be achieved using different combinations of travel, steering, and combination steering/travel wheel drives as well as non-driven wheels used for load support.

With our broad product line, design engineering, and flexible manufacturing, GAM can collaborate with you to integrate the right systems for your mobile robot.

Chassis Type	Features
Tricycle Drive 	<ul style="list-style-type: none"> • Drive via the two rear wheels • Steering movements are carried out via the nose wheel • Maneuverable due to separate steering axle • Good load distribution on uneven surfaces
Differential (Skid-Steer) Drive 	<ul style="list-style-type: none"> • Drive is via the middle pair of wheels • Steering through different speeds on the two wheels • Line movements through two drives and two support wheels • No separate steering drive necessary
4 Drive-Steer Drives 	<ul style="list-style-type: none"> • Drive-steer unit on each of the four wheels • Unrestricted surface mobility possible • Each drive pair can be used and driven independently of each other
2 Drive-Steer + 2 Wheel Drives 	<ul style="list-style-type: none"> • Load distribution on four wheels • Two wheels with combined drive/steer system • Omni-directional travel for almost surface-mobile travel
4 Drives with Mecanum Wheels 	<ul style="list-style-type: none"> • Mecanum wheels provide area-moving travel through four travel drives without steering drive • Mounting of the Mecanum wheels ensures area-moving travel due to different speeds of the drive axles

Key: Support Wheel (no drive) Steering Drive Drive Wheel





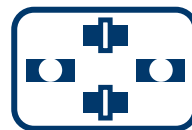
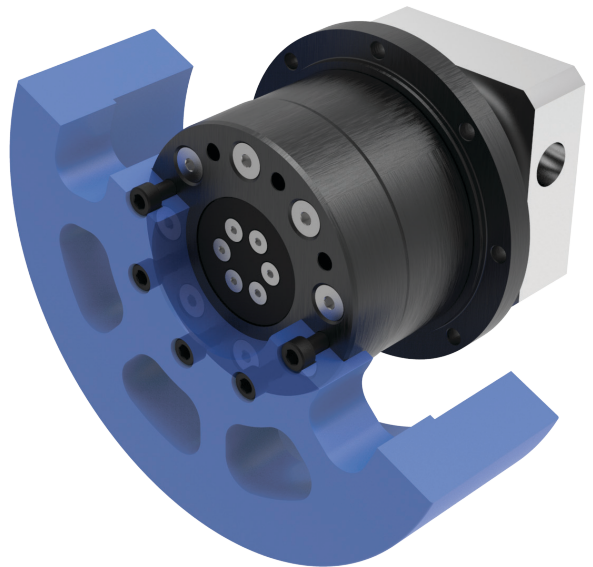
GML Series Coaxial Wheel Hub Drive

The GML Series Wheel Drive uses planetary gearing for a coaxial system. The motor is located directly behind the wheel without axle offset. This results in a cylindrical structure from the wheel to the motor.

This drive can be used as a direct drive or as a differential drive and can be combined with a steering drive to form a drive-steer unit.

Your Advantages

- Compact design with very short overall length
- Motor mount customized to your motor, no additional coupling needed.
- Directly mount wheel to the gearbox output flange
- Integrated wheel bearing for high loads
- Very high efficiency
- 3 frame sizes available
- Fully sealed and maintenance-free
- Optional wheel available





OPG Series Offset Parallel Drive

The OPG Series Offset Parallel Wheel Drive uses planetary gearing along with spur gears for parallel offset input and output axes.

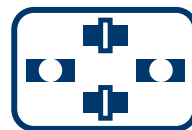
This design is particularly suited to applications with a narrow track gauge where a coaxial drive would not work.

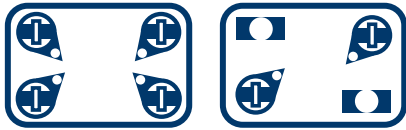
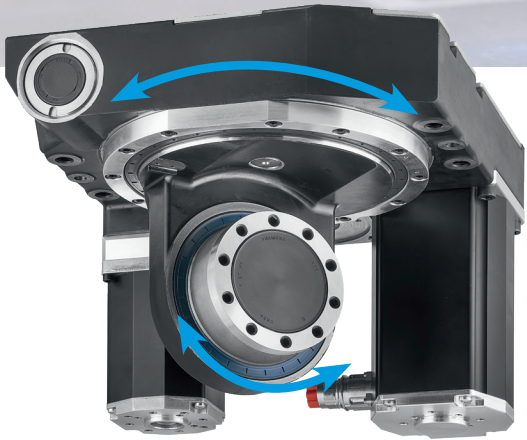
The offset design gives access to the output axis opposite the output flange. This allows an encoder or external braking systems to be directly mounted directly to the output axis instead of to the motor.

This drive can be used as a direct drive or as a differential drive and can be combined with a steering drive to form a drive-steer unit.

Your Advantages

- Compact, light-weight design
- High efficiency
- Motor mount customized to your specific servo motor
- Offset between input & output for opposite motor arrangement





IN PARTNERSHIP WITH
**SCHWABEN
PRAEZISION**

Steering/Travel Drive

The steering travel drive combines two drives in one complete system. The drive axis can be controlled independently of the steering axis. This drive is particularly suitable for a surface-moving driving profile.

our Advantages

- Compact travel/steering unit
- Travel drive with an optimally combined gear train
- Steering drive with a self-locking gear combination for energy-saving regulation
- 360° endlessly swiveling drive wheel for precise maneuvering
- The travel movement is mechanically compensated during the steering movement
- Brake arrangement for the travel drive optimized in terms of size and installation space
- Travel speeds up to 10 km/h
- Drive loads up to 1.25 t
- Maintenance-free for up to 20,000 hours

Steering-Only Drive

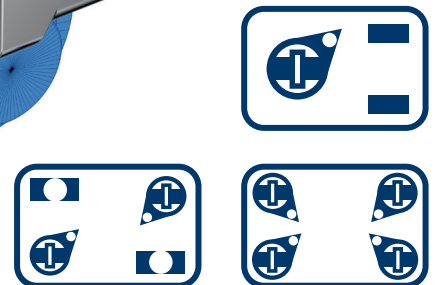
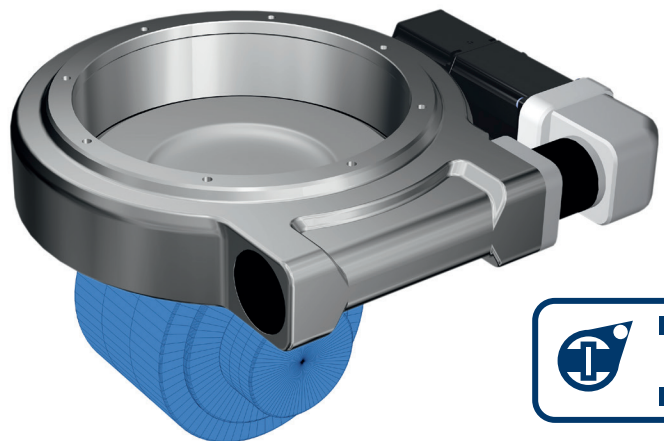
The steering-only drive can be used in combination with rear drive wheels in a three-wheel mobile robot.

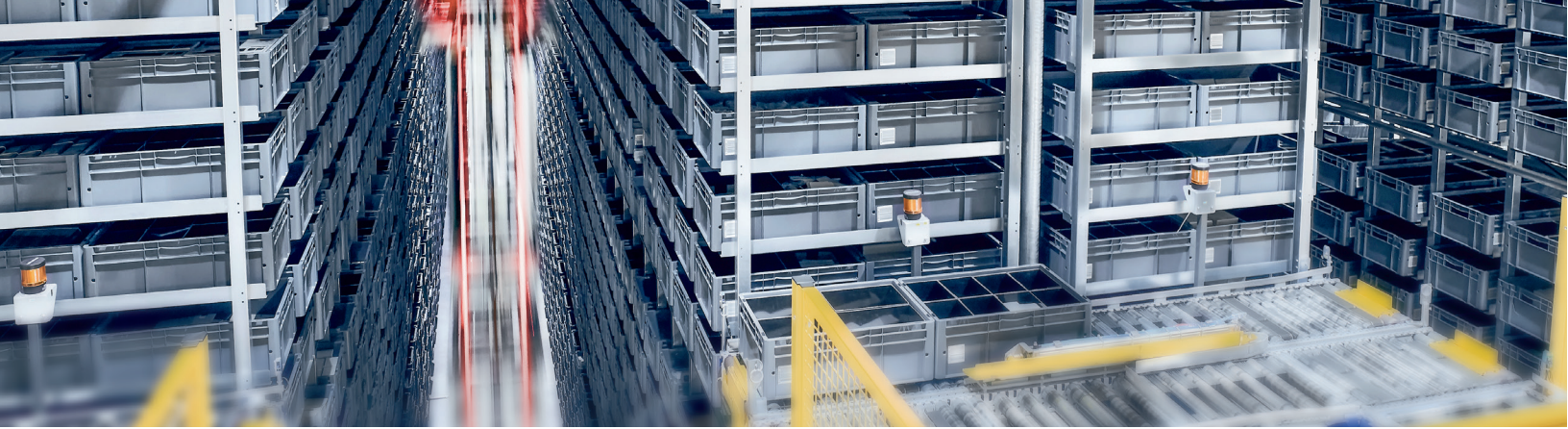
It can be combined with a travel drive wheel for a combination travel-steering unit.

Due to its sealed design, the steering drive is resistant to dirt and does not require re-lubrication.

Your Advantages

- Compact design with optional pre-stage
- Separate traction drive due to hollow shaft
- Sealed
- Maintenance-free





Cartesian Systems for Automatic Storage & Retrieval

Build your own Cartesian system

with GAM Linear Mount Products designed specifically to simplify the process of designing and building your own Cartesian System

Your Advantages

- Components supplied with mounting plates and adapters ready to mount to your preferred actuators
- Components are designed and manufactured to work with any actuator and motor
- Hollow shaft gearboxes mount directly to actuators - no coupling required
- Parallel and Inline mounts connect motors to actuators in a wrap-around or linear configuration
- Add a wrist axis for maximum flexibility



Vertical System

Horizontal System

EPL-U

Inline gearbox, with hollow output design for easy mounting to linear actuators

PMK

Parallel mounting kits save space by mounting the motor parallel to the ball-screw actuator

WDS

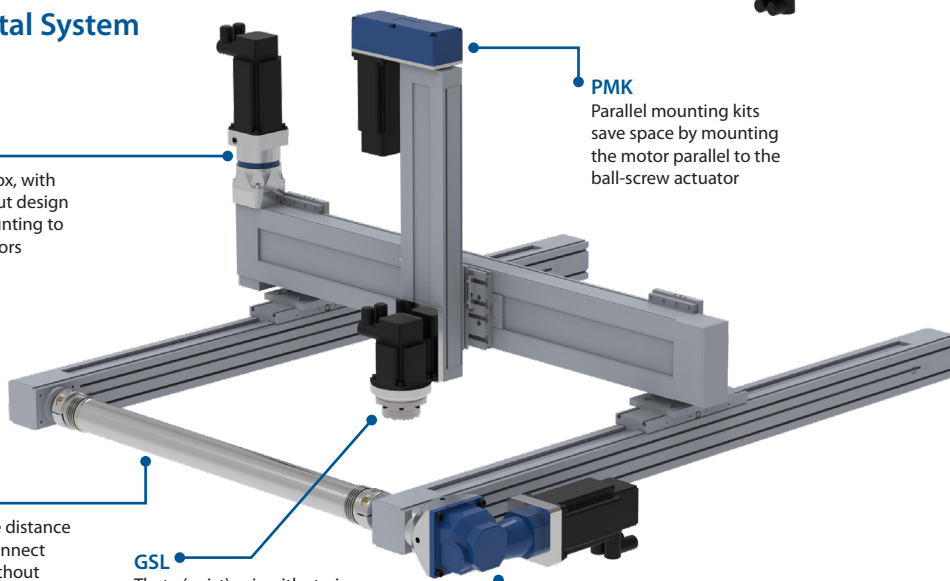
Bellows style distance couplings connect actuators without additional shafts

GSL

Theta (wrist) axis with strain wave gearbox. Can be supplied with motor mount and standard ISO output flange

DL-DC

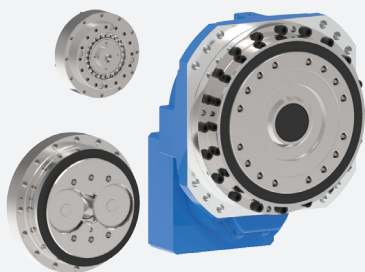
Right angle Dyna-Lite gearbox with hollow output design for easy mounting to linear actuators. Includes output adapter tailored to the actuator



Broadest automation product range on the market

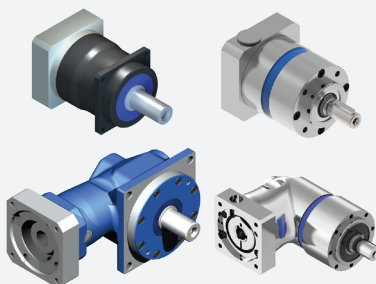
GAM is your complete source for innovative products used in automation technology.

Robotic Gearboxes



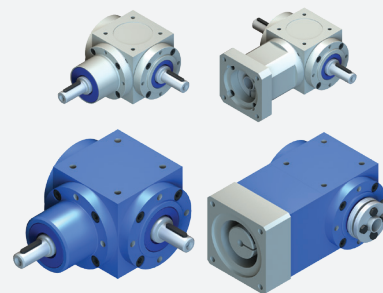
Zero-backlash gearboxes for robotics and high-precision applications with revolutionary zero-backlash planetary, cycloidal, or strain-wave (harmonic) gearing

Servo Gearboxes



In-line and right angle gearboxes for precision servo applications in a wide variety of configurations and frame sizes. Off-the-shelf or custom, GAM has the gearbox for your application

Bevel Gearboxes



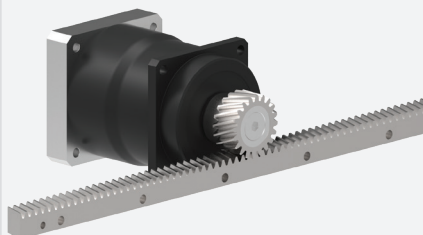
Precision spiral bevel gearboxes, from miniature to extremely large, with multiple shaft configuration options for servo or precision power transmission applications

Servo Couplings



Bellows, elastomer, safety, or distance (line shaft) couplings are all zero-backlash and custom bored

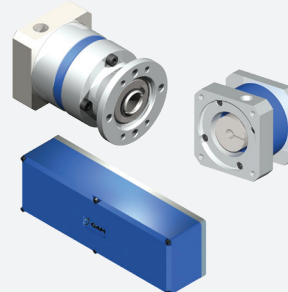
Rack & Pinion Systems



Helical rack and pinion pair with GAM gearboxes for optimal system performance in a complete linear system.

GAM rack available separately

Linear Mounts



Everything Between the Motor and the Actuator: GAM linear mounts make it easy to connect any motor to any actuator.



GAM, a U.S. company, is your complete source for robotic and servo gear reducers, rack and pinion systems, servo couplings, linear mounting kits, and other precision mechanical drive solutions used in automation technology.

With one of the largest product offerings in the motion control industry as well as the engineering expertise and manufacturing capabilities to develop customized solutions, GAM can help with your application.

U.S. manufacturing, being flexible to meet the needs of customer requests, and great service are what set us apart from the rest.

GAM Can.

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