

AGV-AMR CASTERS

SMART SOLUTION FOR HEAVY LOADS
AND EASY MANEUVERABILITY



GAAD
GAGD
GASD
GATD
SERIES

FOOT MASTER®

CONTENTS

01 | FOOT MASTER

- About Us 1
- The Pride of Top Quality 2
- The First Step of Innovation 3

02 | AUTOMATED & AUTONOMOUS

- Basics 4
- Elements 5
- AGV Problems 6
- AMR Problems 7
- Factors 8

03 | AGV-AMR CASTERS

- Applications 10
- **GAAD SERIES**
 - Components 12
 - Special Features 13
 - Product Numbers 14
- **GAGD SERIES**
 - Components 16
 - Special Features 17
 - Product Numbers 18
- **GASD SERIES**
 - Components 20
 - Special Features 21
 - Product Numbers 22
- **GATD SERIES**
 - Component 24
 - Special Features 25
 - Product Numbers 26

04 | AGV-AMR DRIVE WHEELS

- High Quality TDI Wheels 28
- Premium PPI/NDI Wheels 29

The Pride of Top Quality

一流品への自負心

고객의 내기 만족하는 제품 회사
The Accomplishment of
Perfect Products & Company

FOOT MASTER®

CASTERS & WHEELS

ABOUT US

FOOT MASTER designs, engineers and manufactures casters and wheels that address industry specific performance gaps.

From our global headquarters in South Korea, engineers are striving to develop the best caster products in the world.

This pursuit of perfection starts with an intense focus to serve customers and solve problems.

FAMILY OF TOP QUALITY CASTERS



AGV-AMR CASTERS



COMPACT CASTERS



SHOCK ABSORBING CASTERS



LEVELING CASTERS



MEDIUM DUTY CASTERS



HEAVY DUTY CASTERS

the pride of TOP QUALITY



DESIGN

An engineering response to a strategic question balancing form and function.



MANUFACTURE

Precision engineering with advanced technology reflects superb craftsmanship.



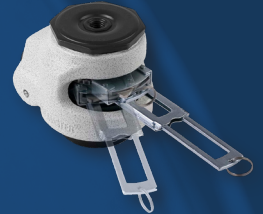
SOLUTION

The elimination of a problem to deliver successful outcomes and satisfaction.

the first step of innovation

1 CURIOUS OBSERVATION

Integrated ratcheting system improves height adjustability in leveling casters



2 CALIBRATED QUESTIONS

Advanced technology introduces superior shock absorbing with special rubber cushion



3 ENGINEERED SOLUTIONS

Self-aligning, Dual Swivel™ casters reduce drive motor overload and minimize offset



Innovation is the process of assessing a situation, determining what is working and what is not, intently listening to customers and harnessing the creative ability to introduce a better way.

Field-reversible brake, forged steel, and double thrust bearings used to optimize heavy loads



Premium AGV-AMR drive wheels are customized for superior performance

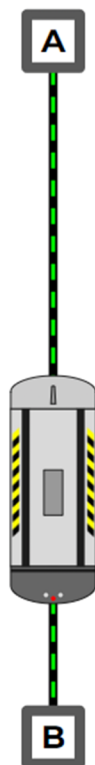




AGV-AMR BASICS

AUTOMATED GUIDED VEHICLE
AUTONOMOUS MOBILE ROBOT

AUTOMATED GUIDED VEHICLE

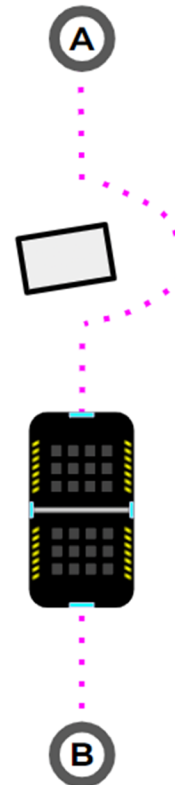


AGV is a computer-controlled electric vehicle that is guided along a predefined path completing a specific set of tasks.

Engineers deploy the following guidance devices to enable the vehicle to navigate: magnetic tape and/or bars, lasers, beacons, barcodes and optical sensors.

They can be designed for heavier payloads and moving faster since they remain within the confines of the area of operation and lanes of transport.

AUTONOMOUS GUIDED VEHICLE



AMR is an intelligence-driven electric robot that moves dynamically without infrastructure to execute various tasks.

Utilizing laser-based perception and advanced navigation algorithms, an AMR is able to move freely to avoid obstacles and plan a new path. Machine learning capabilities empower the robot to become more efficient.

They can be quickly deployed with minimal planning and allow flexibility to scale with ease.

AGV-AMR ELEMENTS

SYSTEM

Computing hardware for installing programs and applications.



NAVIGATION

Means of acquiring and transferring data for directional guidance.



DRIVING CONTROL

Sends commands and monitors feedback in a continuous loop.



Casters play a vital role as one of the key components to prevent operation failure.



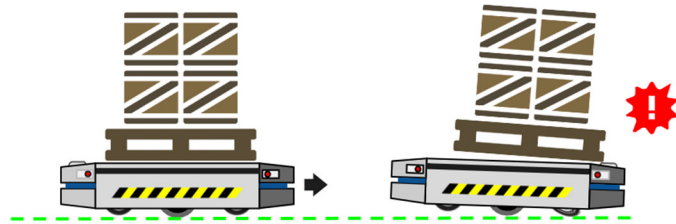
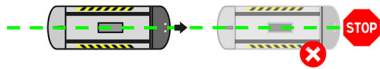
STEERING

The most important element as it is the mechanical assembly of components to control direction.

AGV PROBLEMS

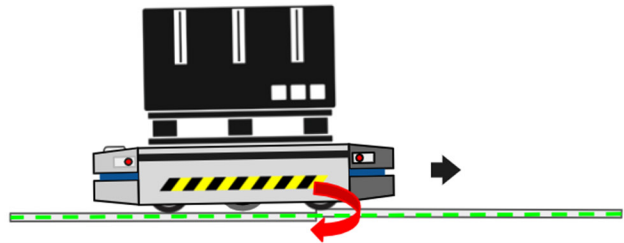
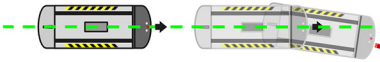
DURABILITY ISSUE

DOWNTIME DURING OPERATION



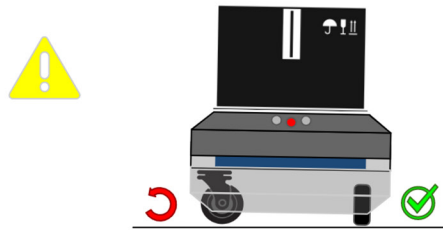
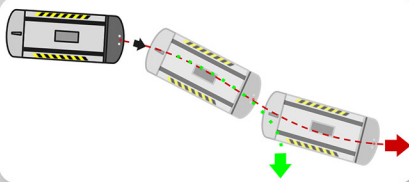
IMPACT ISSUE

OFF-TRACK GOING STRAIGHT



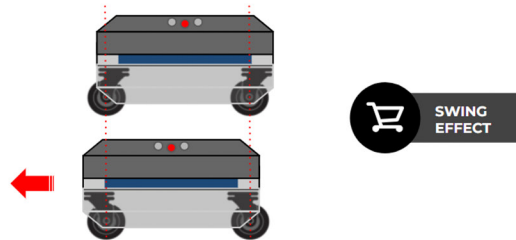
SURFACE CONTACT ISSUE

OFF-TRACK CORNERING

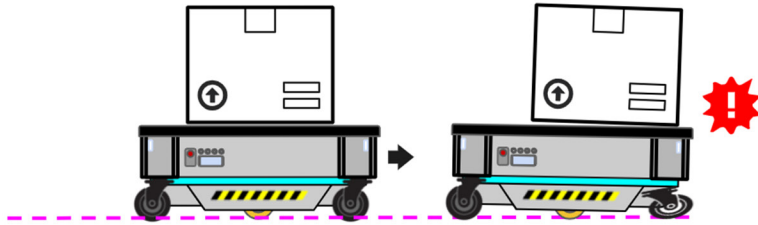


CASTER OFFSET ISSUE

OFF-TRACK MOVING IN & OUT

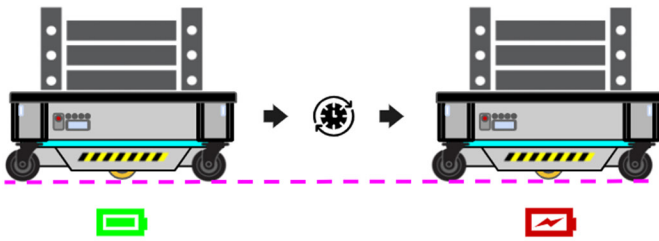
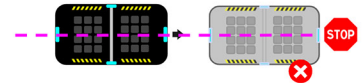


AMR PROBLEMS



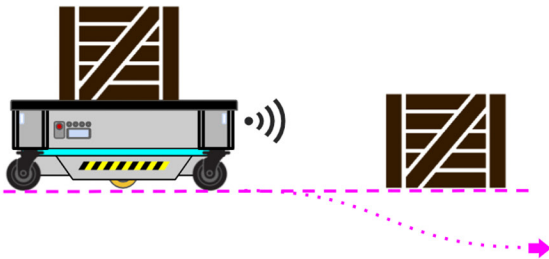
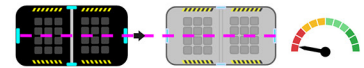
DURABILITY ISSUE

DOWNTIME DURING OPERATION



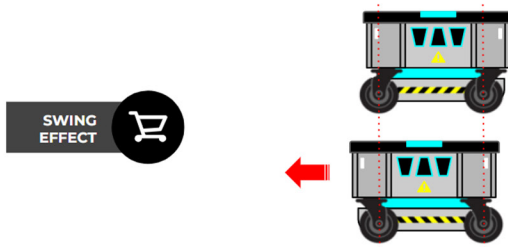
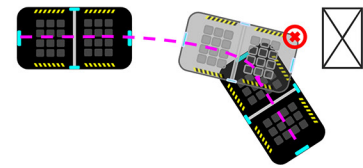
POWER CONSUMPTION ISSUE

DECREASED PERFORMANCE



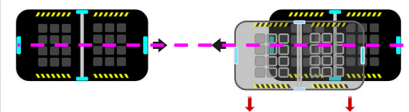
MANEUVERABILITY ISSUE

INEFFICIENT STEERING



CASTER OFFSET ISSUE

TROUBLE MOVING IN & OUT

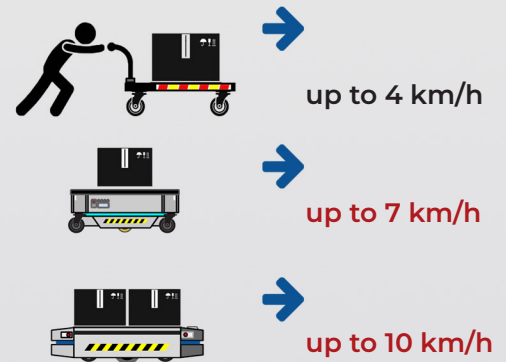


AGV-AMR FACTORS

SPEED is a major factor with multiple implications. Automatic Guided Vehicles and Autonomous Mobile Robots are faster than a cart being manually pushed by a person.

WHAT TO LOOK FOR

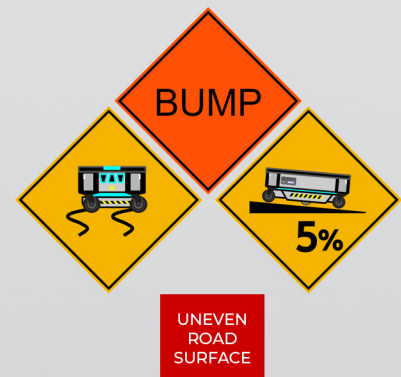
Casters are classified differently based on intended purpose, so verify the load capacity rating with the product's manufacturer. If a general duty caster is being used for AGV-AMR operations, the allowable load capacity significantly decreases.



SURFACE conditions and requirements can drastically affect AGV-AMR performance, longevity and efficiency. Floor grade, transitions and thresholds, accumulation of debris, moisture, and type of cargo are some of the factors that should be considered.

WHAT TO LOOK FOR

AGV-AMR solutions typically require additional capital investments to improve floor conditions. Is this really necessary? Quality casters engineered to maintain surface contact, negotiate bumps & cracks, and protect sensitive cargo are a less expensive investment.



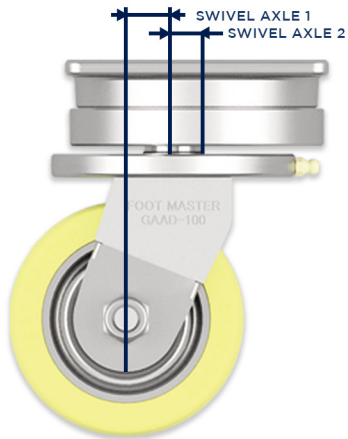
RUN CYCLE can be limited by the casters selected, performing fewer tasks in an allotted time frame. Conversely, casters designed specifically for AGV-AMR applications can boost productivity.

WHAT TO LOOK FOR

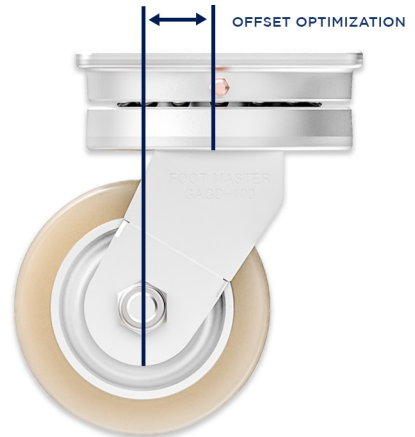
Constant operation under power abuses swivel sections and wheel bearings. Carefully inspect the engineering and quality of the swivel components, as the massive transfer of radial and axial forces over time will expose any weakness.



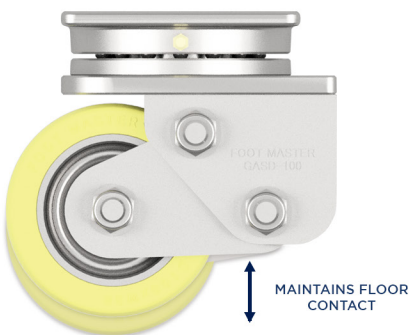
THERE'S A **SMART SOLUTION** TO ANY PROBLEM.



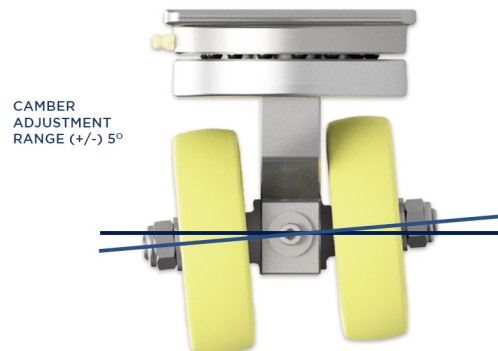
**TWO SWIVEL AXES WITH
DIFFERENT RADIUS OF ROTATION**



**OFFSET IS OPTIMIZED TO BE SMALLER
AND STRENGTHENED FOR DURABILITY**



**SPECIAL RUBBER CUSHION
EXERTS DOWNWARD FORCE**



**WHEEL AXLE TILTS FREELY
ON CENTRAL AXIS**

APPLICATIONS

A photograph of a modern medical operating room with surgical lights and equipment.

MEDICAL

A photograph of a car body on an assembly line with robotic arms.

AUTOMOTIVE

A photograph of a large commercial airplane on a tarmac.

AEROSPACE

A photograph of a red forklift moving a large blue and red shipping container.

LOGISTICS

A photograph of a factory floor with various production equipment and workers.

PRODUCTION

A photograph of a worker operating a machine that fills yellow containers.

**FOOD
/BEVERAGE**

GAAD

S E R I E S

Materials & Specifications

Top plate: Forged Steel

Frame: Cast Steel

Swivel: GAAD 75/100: (1) Thrust Bearing

(1) Taper Roller Bearing

GAAD 125/150: Double Thrust Bearings

Finish: Zinc Plated

Capacity: 250 kg - 630 kg

Temp: (-10)~90°C

Wheel Diameter Options

75 mm (3")

100 mm (4")

125 mm (5")

150 mm (6")



GAAD-75-ASF-HUD

GAAD-100-ASF-HUD

GAAD-125-ASF-HUD

GAAD-150-ASF-HUD

GAAD COMPONENTS

STEEL RIG

To augment the offset optimization of the Dual Swivel® assembly, GAAD applies a cast steel frame fit to manage the forces of two rotational axes. Following a meticulous casting process ensures molds are cooled at constant temperatures to meet strict tolerances. Delicate and fine welding affixes the forks to the frame, further exploiting the high tensile strength of steel to yield a capable rig with extreme durability.



DUAL SWIVEL™ ASSEMBLY

Dual Swivel™ technology is the engineering response to common problems AGV-AMR units encounter due to caster offset. Two rotational axes, each with a different rotational radius, work together to reduce the overall radius of rotation. This patented function reciprocates the movement of the axes by automatically aligning their rotation, thus solving the “swing” problem caused by caster offset.



FORGED STEEL TOP PLATE

Specifically designed for the Dual Swivel® assembly, GAAD top plate is manufactured using forged steel, and is equipped with a grease fitting for lubricating internal components. Forged steel offers the strength and reliability required to handle the constant transfer of directional forces. This is further aided by securing the top plate to the swivel assembly using a full array of steel fasteners.



ECCENTRIC CAM

Designated as swivel axle 2, the eccentric cam is the most vital component of the Dual Swivel® assembly. Mechanically engineered with the center offset from the center of swivel axle 1, this robust, circular component is expertly crafted to reciprocate motion. This drastically reduces caster offset as the eccentric cam automatically aligns the two rotational axes relative to the direction of movement.

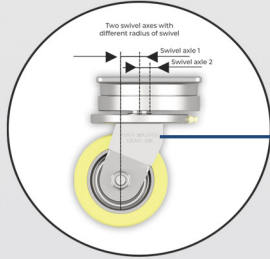


THRUST BEARING

To allow smooth rotation under considerable axial loads, GAAD employs a high quality thrust bearing (double thrust bearings on 125/150 models). Friction is reduced as force is transferred from the shaft to the housing, making it easy to change direction.

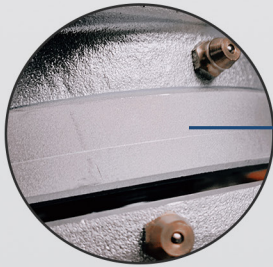


SPECIAL FEATURES



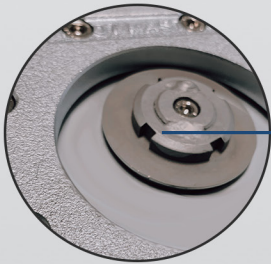
EASY REDIRECTION

Two rotational axes, each with a different rotational radius, make it easy to change direction



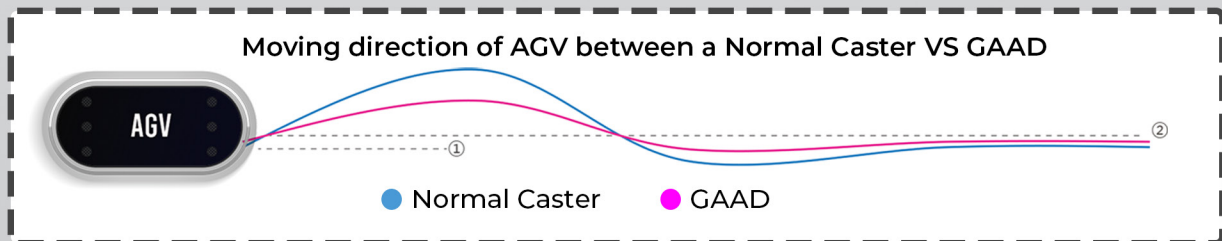
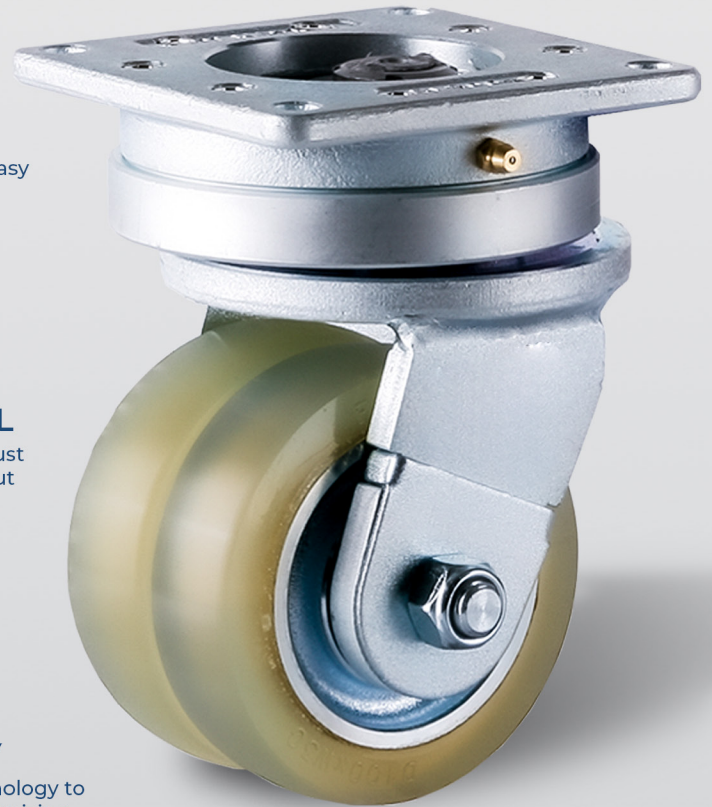
HIGHER LOAD POTENTIAL

A forged steel top plate employing thrust bearings allows for heavy loads without sacrificing dexterity



PRECISE MOTILITY

Engineers apply Dual Swivel™ technology to offer precise movement while optimizing caster offset and eliminating the swing effect











Manueverability is greatly affected by caster offset. A larger offset causes a guided vehicle to swing and deviate from its designated path. A smaller offset can overload drive motors causing downtime and even failure. **Patented Dual Swivel™** technology solves both problems simultaneously with Auto-Align, a function to automatically optimize caster offset by aligning the two rotational axes. And the best part is GAAD does this all on its own, making it **the preferred choice for engineers struggling to find a solution.**

SERIES SPECIFICATIONS

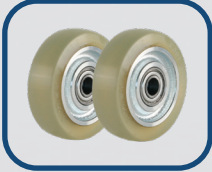
standard

SWIVEL	WHEEL TYPE	 in	 in	 lbs	 in	 in	 in	 in	 in
GAAD-75-ASF	HUD	2.95	1.18x0.08	551	5.12	0.4~1.18	4.41x4.41	3.6x3.6	0.35
GAAD-100-ASF		3.94	1.18x0.08	683	6.30	0.4~1.18			
GAAD-125-ASF	HUD	4.92	1.38x0.08	970	7.48	0.6~1.3	5.71x5.71	4.72x4.72	0.43
GAAD-150-ASF		5.90	1.57x0.08	1390	8.46	0.6~1.47			
GAAD-75-ASF	NUD	2.95	1.18x0.08	551	5.12	0.4~1.18	4.41x4.41	3.6x3.6	0.35
GAAD-100-ASF		3.94	1.18x0.08	683	7.09	0.4~1.18			
GAAD-125-ASF	NUD	4.92	1.38x0.08	970	7.48	0.6~1.3	5.71x5.71	4.72x4.72	0.43
GAAD-150-ASF		5.90	1.57x0.08	1390	8.46	0.6~1.47			

metric

SWIVEL	WHEEL TYPE	 mm	 mm	 Kg	 mm	 mm	 mm	 mm	 mm
GAAD -75-ASF	HUD	75	30x2	250	130	10~30	112x112	92x92	9
GAAD-100-ASF		100	30x2	310	160	10~30			
GAAD-125-ASF	HUD	125	35x2	440	190	15~33	145x145	120x120	11
GAAD-150-ASF		150	40x2	630	215	15~35			
GAAD-75-ASF	NUD	75	30x2	250	130	10~30	112x112	92x92	9
GAAD-100-ASF		100	30x2	310	160	10~30			
GAAD-125-ASF	NUD	125	35x2	440	190	15~33	145x145	120x120	11
GAAD-150-ASF		150	40x2	630	215	15~35			

wheel options




material:
CAST POLYURETHANE
STEEL CORE

characteristics:
HIGH TENSILE STRENGTH
DURABILITY AGAINST TEARING
CORROSION RESISTANT
EXCELLENT ADHESION

hardness:
A95

temperature range:
(-10°C) ~ 90°C



material:
CAST POLYURETHANE
STEEL CORE

characteristics:
HIGH REPULSIVE ELASTICITY
FAST RECOVERY FORCE
DURABILITY AGAINST ABRASION
LOW PARTICLE GENERATION

hardness:
PREMIUM NDI 95A

temperature range:
(-10°C) ~ 90°C

GAGD

S E R I E S

Materials & Specifications

Top plate: Forged Steel
Frame: Cast Steel
Swivel: Double Thrust Bearings
Finish: Zinc Plated
Capacity: 250 kg - 630 kg
Temp: (-10)~90°C

Wheel Diameter Options

75 mm (3")
100 mm (4")
125 mm (5")
150 mm (6")



GAGD-75-ASF-HUD

GAGD-100-ASF-HUD

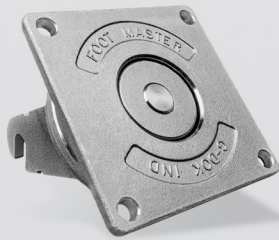
GAGD-125-ASF-HUD

GAGD-150-ASF-HUD

COMPONENTS

STEEL RIG

Born for heavy duty, GAGD boasts a cast steel rig endowed with the structural integrity to endure excessive weight. While the reinforced neck provides brute strength, it's the elegant design that carries the load with grace. An optimal offset ensures minimal force is required to change direction under heavy loads, thus preventing abrupt stops and downtime.

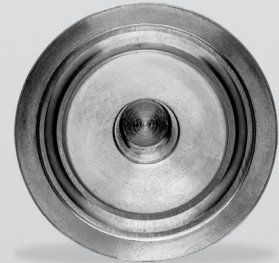


FORGED STEEL TOP PLATE

Formidable and imposing, a forged steel top plate commands the connection linking GAGD capabilities to its load. Using high quality steel, the top plate is expertly forged to bolster the reinforced swivel section, empowering GAGD to easily handle massive transfer forces over long periods of operation.

OUTER BEARING RACEWAY

To guarantee better performance and extreme durability, two rows of thrust bearings are employed to absorb and transfer weight. As friction decreases, swivel ability increases for easy maneuverability. Now, the unsung hero is the outer bearing raceway. Hardened for resilience, this vital component protects the cast steel rig from gouging and galling, which can be caused by overloaded thrust bearings under rotation.



OUTER THRUST BEARING

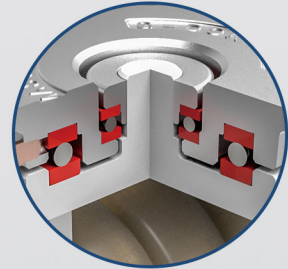
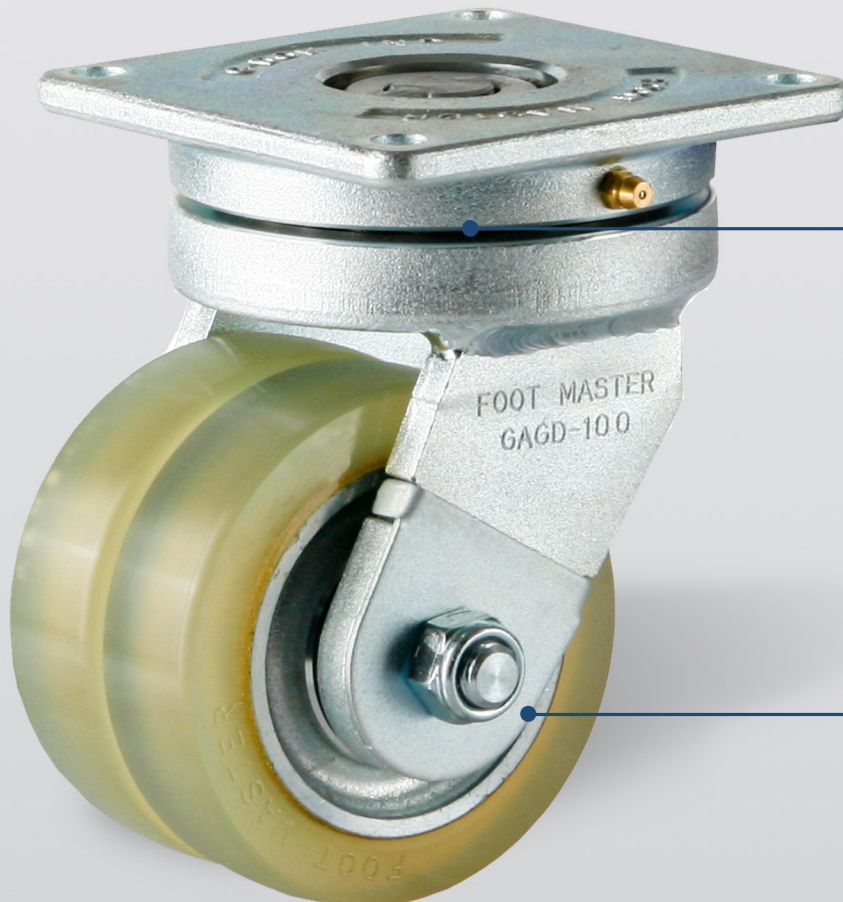
A gigantic thrust bearing dominates the reinforced swivel section. Oversized and confident, the outer thrust bearing of GAGD is assigned to mitigate the abuse typical of heavy duty operation. It aptly maintains smooth mobility and eliminates sudden stops when changing direction.

SWIVEL ASSEMBLY RETAINER

A small component with a big responsibility, the GAGD swivel assembly retainer is precisely crafted by cold forging steel to significantly improve strength and dimensional accuracy. It is threaded for the swivel axle and includes yet another hardened steel raceway for an inner thrust bearing. Tightened to exact specification during manufacturing ensures the entire swivel assembly is securely fastened together.

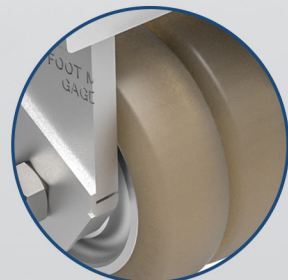


SPECIAL FEATURES



A PAIR OF THRUST BEARINGS

GAGD consists of two-layer thrust bearings that are top-tier quality which enables the AGV-AMR castor to withstand heavy loads and perform a quiet and smooth operation even at high speed.



DUAL WHEELS

Changing directions is made easy and only requires small force with this dual wheel structure. It is made of highly elastic polyurethane wheels that perform best in heavy AGV-AMR environments.

WHY CHOOSE GAGD?



EASY
MANEUVERABILITY



BEST FOR
HEAVY LOADS



OPTIMAL
SETTINGS

SERIES SPECIFICATIONS

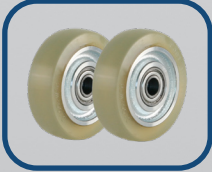
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wheel options



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LOW PARTICLE GENERATION

hardness:
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temperature range:
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GASD

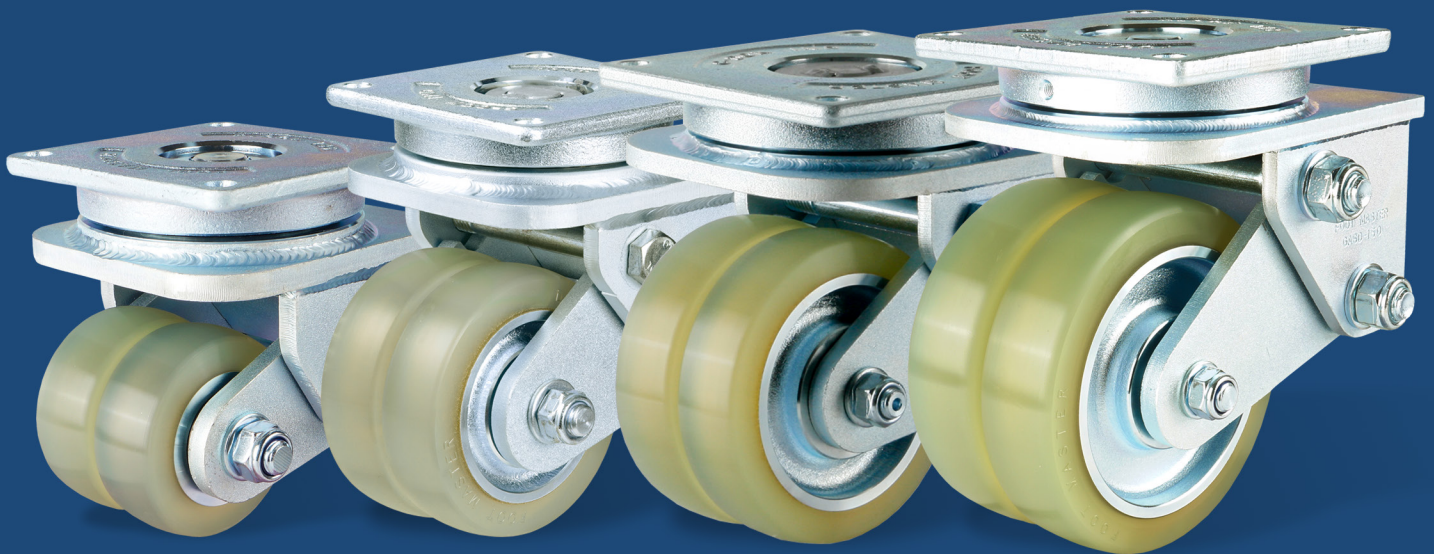
S E R I E S

Materials & Specifications

Top plate: Forged Steel
Frame: Cast Steel
Feature: Special Rubber Cushion
Swivel: Double Thrust Bearings
Finish: Zinc Plated
Capacity: 250 kg - 630 kg
Temp: (-10)~90°C

Wheel Diameter Options

75 mm (3")
100 mm (4")
125 mm (5")
150 mm (6")



GASD-75-ASF-HUD

GASD-100-ASF-HUD

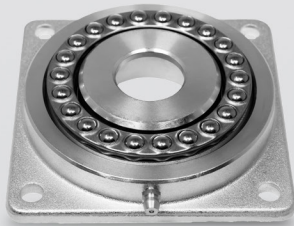
GASD-125-ASF-HUD

GASD-150-ASF-HUD

COMPONENTS

STEEL RIG

Form follows function to integrate FOOT MASTER® Advanced Shock Absorbing Technology into the design of GASD. Seven specialized components of cast steel are sophisticatedally welded with an obsession for excellence, delivering a rig with elite capabilities. This tactical engineering includes two large forks to attach a cast steel leg assembly, and showcases a stout rear support plate commissioned to protect a special rubber cushion.

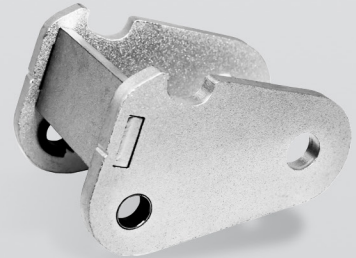


FORGED STEEL TOP PLATE

Punctual and dependable, GASD is a hard worker that shows up on time and gets the job done without failing. Typically burdened with a heavy load, and always on the move, it is subjected to a barrage of viscous axial forces and expected to perform flawlessly. Outfitted with a specialized, forged steel top plate designed to utilize two powerful thrust bearings, this overachiever goes above and beyond to exceed expectations.

STEEL LEG ASSEMBLY

Agility and flexibility are achieved when pairing the cast steel leg assembly with the strength and stability of the steel rig. Enabling bidirectional movement, this multi-part rig system is configured to allow the leg assembly to move independently via a pivot bolt forged from cold steel. Friction from this constant motion is mitigated by two hardened steel bushings installed in the legs, preventing degradation and elongation.



SPECIAL RUBBER CUSHION

Flexibility is the key to stability. By applying FOOT MASTER® Advanced Shock Absorbing Technology, GASD gains the ability to react quickly and appropriately to surface variations. It incorporates a specially designed rubber cushion to absorb impact forces and even repeated fine shocks. The cushion is compressed during assembly to ensure the wheels stay in contact with the floor, reducing the possibility of abrupt stops.

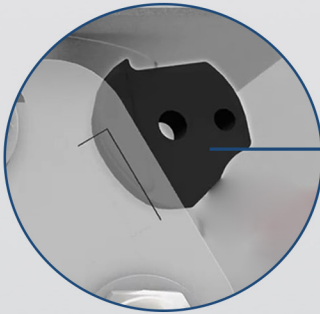
WHEEL AXLE

Numerous stages of meticulous machining transforms high quality steel into a wheel axle perfectly balanced for dual wheels. For big loads to change direction with little effort, the dual wheel structure is essential, not optional. Each wheel can rotate independently at various speeds, drastically improving ergonomics and efficiency.

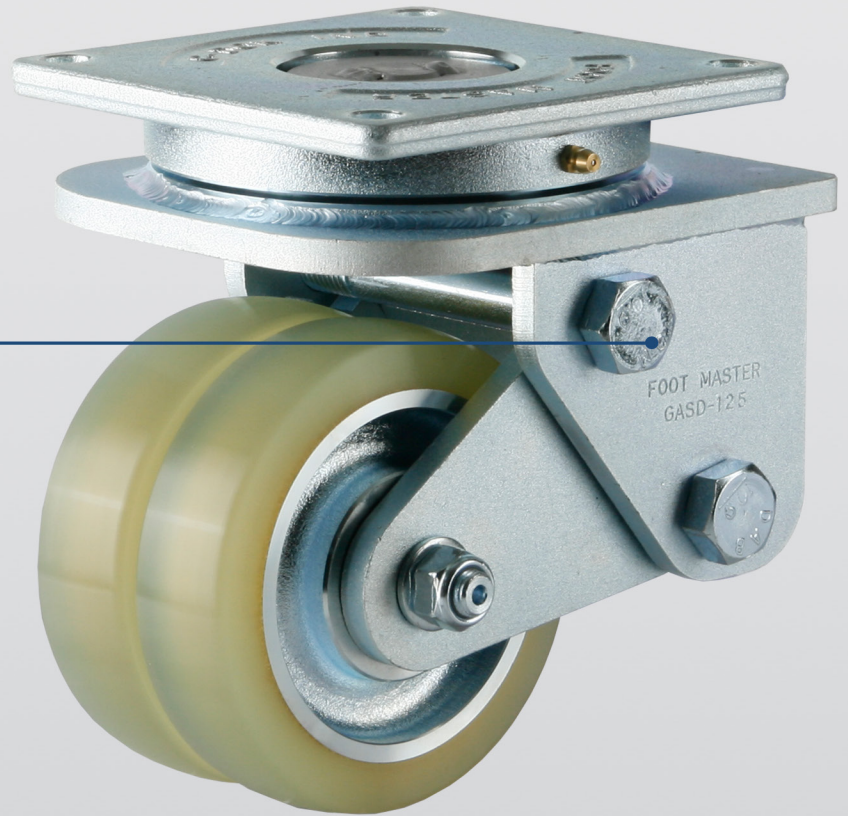


SPECIAL FEATURES

RUBBER CUSHION



A special rubber cushion provides precise shock absorption capabilities that outperform traditional steel coil spring casters, offering better functionality.



PRECISE



Effective shock absorption requires the ability to eliminate or reduce vibrations across a wide range of impact forces. GASD is equipped with a special rubber cushion to decrease the amplitude of the shock's energy waves. It is precise, even absorbing the repeated fine shocks caused by an uneven surface.


BALANCED



Changing direction is vital for an AGV to perform optimally. This demands that all casters maintain floor contact, as an AGV is unbalanced if one caster loses contact, then suddenly touches the floor. Using a 10 mm special rubber cushion, GASD ensures that an AGV always runs in contact with the surface, reducing the potential of abrupt stops and deviation.

SERIES SPECIFICATIONS

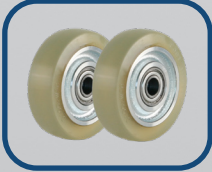
standard

SWIVEL	WHEEL TYPE	 in	 in	 lbs	 in	 in	 in	 in	 in
GASD-75-ASF	HUD	2.95	1.18x0.08	551	5.12—0.4	1.18	4.41x4.41	3.6x3.6	0.35
GASD-100-ASF		3.94	1.18x0.08	683	6.30—0.4	1.18			
GASD-125-ASF	HUD	4.92	1.38x0.08	970	7.50—0.4	1.3	5.71x5.71	4.72x4.72	0.43
GASD-150-ASF		5.90	1.57x0.08	1390	8.46—0.4	1.47			
GASD-75-ASF	NUD	2.95	1.18x0.08	551	5.12—0.4	1.18	4.41x4.41	3.6x3.6	0.35
GASD-100-ASF		3.94	1.18x0.08	683	7.09—0.4	1.18			
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metric

SWIVEL	WHEEL TYPE	 mm	 mm	 Kg Kg	 mm	 mm	 mm	 mm	 mm
GASD-75-ASF	HUD	75	30x2	250	130—10	30	112x112	92x92	9
GASD-100-ASF		100	30x2	310	160—10	30			
GASD-125-ASF	HUD	125	35x2	440	185—10	33	145x145	120x120	11
GASD-150-ASF		150	40x2	630	210—10	35			
GASD-75-ASF	NUD	75	30x2	250	130—10	30	112x112	92x92	9
GASD-100-ASF		100	30x2	310	160—10	30			
GASD-125-ASF	NUD	125	35x2	440	185—10	33	145x145	120x120	11
GASD-150-ASF		150	40x2	630	210—10	35			

wheel options



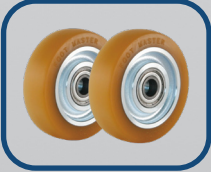
HUD

material:
CAST POLYURETHANE
STEEL CORE

characteristics:
HIGH TENSILE STRENGTH
DURABILITY AGAINST TEARING
CORROSION RESISTANT
EXCELLENT ADHESION

hardness:
A95

temperature range:
(-10°C) ~ 90°C



NUD

material:
CAST POLYURETHANE
STEEL CORE

characteristics:
HIGH REPULSIVE ELASTICITY
FAST RECOVERY FORCE
DURABILITY AGAINST ABRASION
LOW PARTICLE GENERATION

hardness:
PREMIUM NDI 95A

temperature range:
(-10°C) ~ 90°C

GATD

S E R I E S

Materials & Specifications

Top plate: Forged Steel
Frame: Cast Steel
Swivel: Double Thrust Bearings
Feature: Tilting Axle
Finish: Zinc Plated
Capacity: 250 kg - 630 kg
Temp: (-10)~90°C

Wheel Diameter Options

75 mm (3")
100 mm (4")
125 mm (5")
150 mm (6")



GATD-75-ASF-HUD

GATD-100-ASF-HUD

GATD-125-ASF-HUD

GATD-150-ASF-HUD

COMPONENTS

STEEL RIG

To grant the freedom to tilt and adjust camber, GATD deploys a cast steel rig engineered with a single, prodigious fork. This stalwart allows the dual wheels to be spaced apart in order to accommodate a central pivot on which the axle tilts freely. Using a split wheel configuration enhances maneuverability, as the two wheels rotate opposite one another to reduce caster offset, also known as the self-compensation effect.



FORGED STEEL TOP PLATE

Strength and durability are essential requirements for GATD to show off its skillful versatility. Energy transferring up the thick central fork is confronted by a stubborn top plate that refuses to give. Made of forged steel, it performs its job admirably to establish a secure union between GATD and its application.

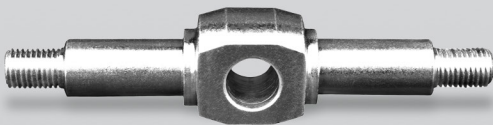
THRUST BEARINGS

Straight roads don't make skillful drivers. Resilient thrust bearings help GATD rotate tight corners with finesse, while tactfully negotiating uneven surfaces to maintain traction. An emphasis on performance and durability demands an enthusiastic commitment to excellence. Therefore, hardened steel bearing raceways are strategically integrated to ensure GATD can endure the rigorous stress of operation.



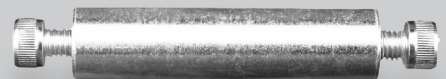
TILTED WHEEL AXLE

The practical brilliance of GATD is a tilting axle shaft of high grade steel, methodically machined to allow camber angle adjustments in a range of $\pm 5^\circ$. Camber is the angle between the vertical axis of the caster and the vertical axis of the wheel. Endowed with the ability to tilt, GATD stays connected to the ground while improving overall grip, protecting loaded cargo and delivering a smooth drive.

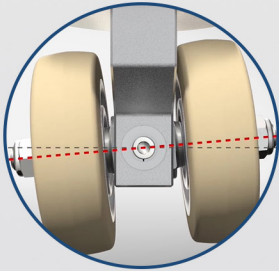


CENTRAL AXLE ASSEMBLY

The tilted wheel axle is attached to the steel rig via a central axis assembly. Composed of a central axis pin and threaded fasteners, the assembly is crafted by cold forging steel to achieve close dimensional tolerances and high surface quality, essential characteristics for the central pivot. Critical to GATD operation, the central axis assembly is engineered to endure the stress caused by the continual tilting of the wheel axle.

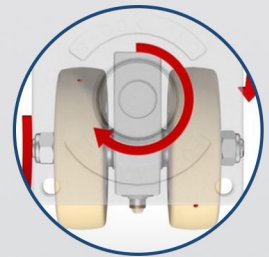


SPECIAL FEATURES



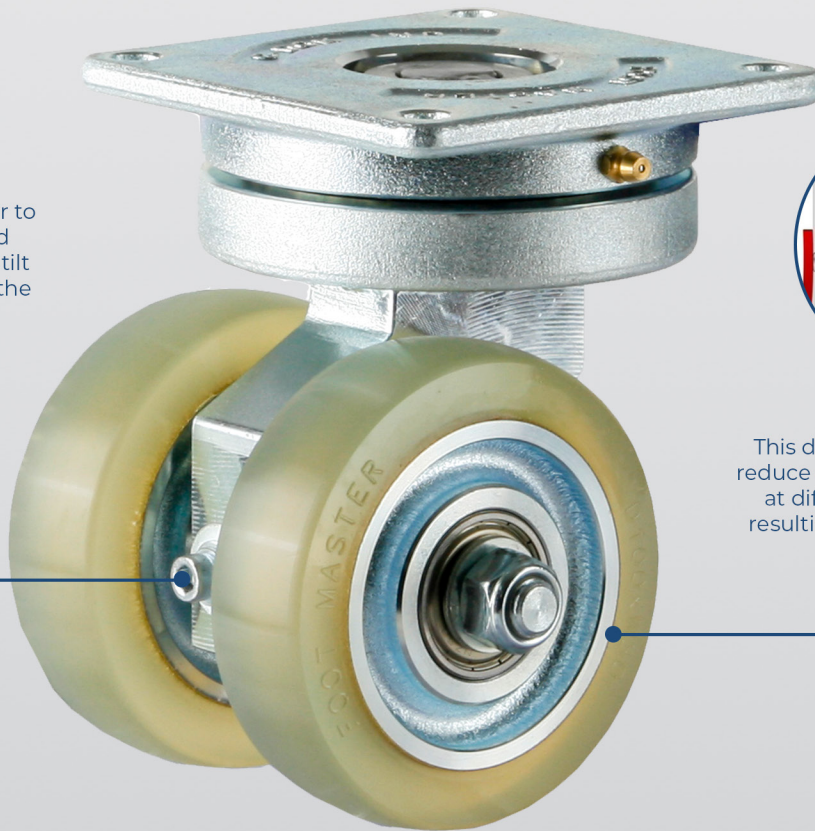
TILTING STRUCTURE

This structure enables the caster to tilt while keeping traction and reducing slippage. It has a free tilt of $\pm 5^\circ$ to function respective of the floor surface.

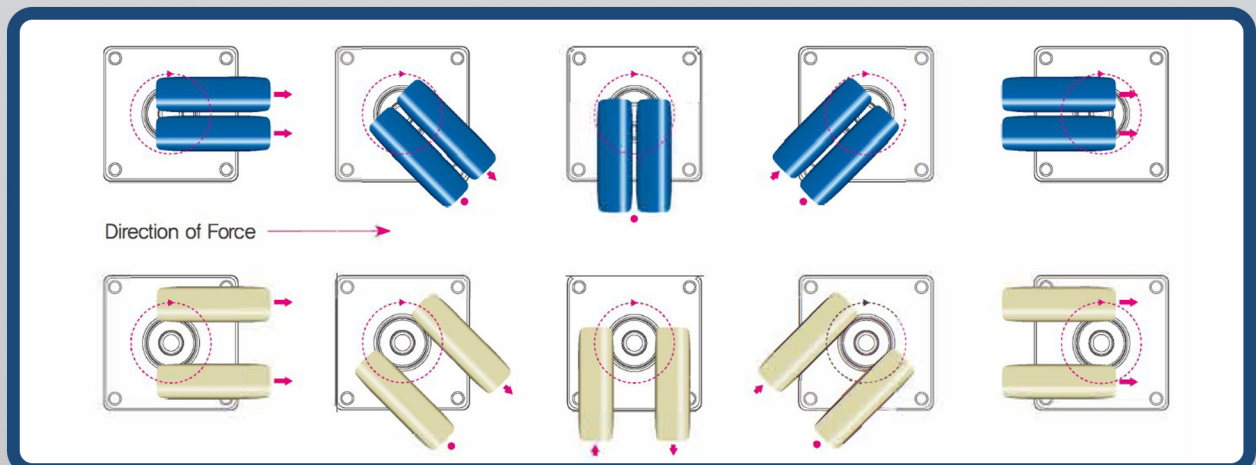


SPLIT WHEEL

This design allows the caster to reduce caster offset. Its wheels roll at different speeds as it turns resulting in position differences.









ROLLING DIRECTIONS OF A GENERAL DUAL-WHEEL VS THE GATD DUAL WHEEL



SERIES SPECIFICATIONS

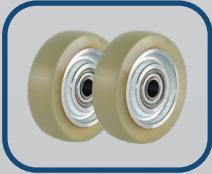
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wheel options

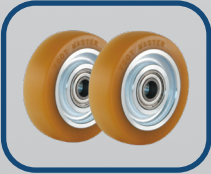


material:
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STEEL CORE

characteristics:
HIGH TENSILE STRENGTH
DURABILITY AGAINST TEARING
CORROSION RESISTANT
EXCELLENT ADHESION

hardness:
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temperature range:
(-10°C) ~ 90°C



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FAST RECOVERY FORCE
DURABILITY AGAINST ABRASION
LOW PARTICLE GENERATION

hardness:
PREMIUM NDI 95A

temperature range:
(-10°C) ~ 90°C



AGV-AMR DRIVE WHEELS

DRIVE WHEELS can be selected from designing the initial concept to replacing them once delivered to the end user.

TO DELIVER THE BEST OUTCOME TO END USERS, it is highly recommended to use drive wheels optimized to enhance AGV-AMR performance.

AGV-AMR DRIVE WHEELS (HIGH QUALITY TDI WHEELS)



AGV-AMR DRIVE WHEELS (PREMIUM PPD/NDI WHEELS)



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Casters & Wheels

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