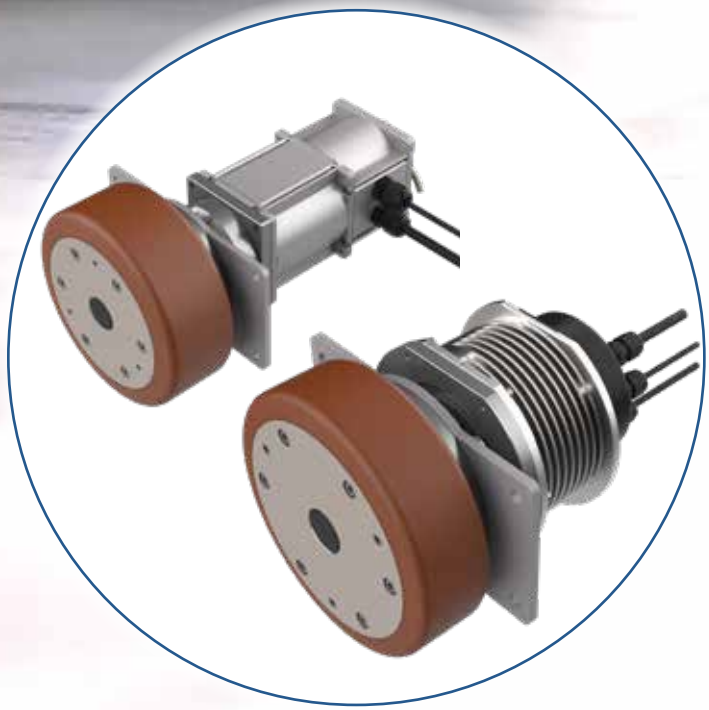
FRAMO MORAT
FMG Industry

The all-inclusive powerhouse.

Highly integrated wheel hub drive with Plug & Play function.



Wheel hub drive - Features

- Maximum power density
- Smart drive system
- Long service life
- High level of integration
- Low level of maintenance
- Comprehensive communication

The all-inclusive powerhouse

All functional elements in one compact system.

Framo Morat has developed a **highly integrated** wheel hub drive that combines all functional elements, such as the wheel, a high-precision planetary gear, a powerful electric motor and a brake and electronics, into one all-inclusive solution. This modular and scalable system boasts high performance in a compact design and lets users make adaptations to the load capacity, torque, interfaces, sensor system and control profiles.

The wheel hub drive is available in two sizes. The **RNA250** is suitable for smaller and flatter vehicles. The standard variant features a two-stage gear box, a total system length under 242 mm, and a standard wheel size of 125 mm. This model can handle a load of up to 250 kg per wheel. The **RNA500**'s total system length of less than 200 mm and its standard wheel size of 160 mm make it a very compact system. With a wheel load of up to 500 kg, it is designed for larger vehicles.

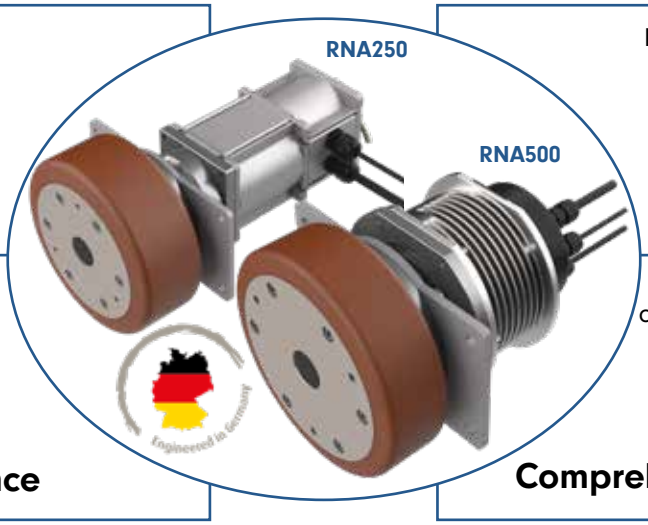
Product features at a glance:

Maximum power density

High radial loads and constantly high acceleration and speed

Smart drive system

Plug & Play function and a central parameter check using an optional sensor system



Long service life

Drive system designed for efficiency with a long-lasting PUR wheel

High level of integration

All functional elements housed in a compact space with minimal weight

Low level of maintenance

Components can be replaced individually thanks to the modular design

Comprehensive communication

Interdisciplinary drive control system as an e-axle thanks to standard interfaces (e.g. RS485 or CAN)

All in one – one for all: The wheel hub drive in use in a variety of industries...

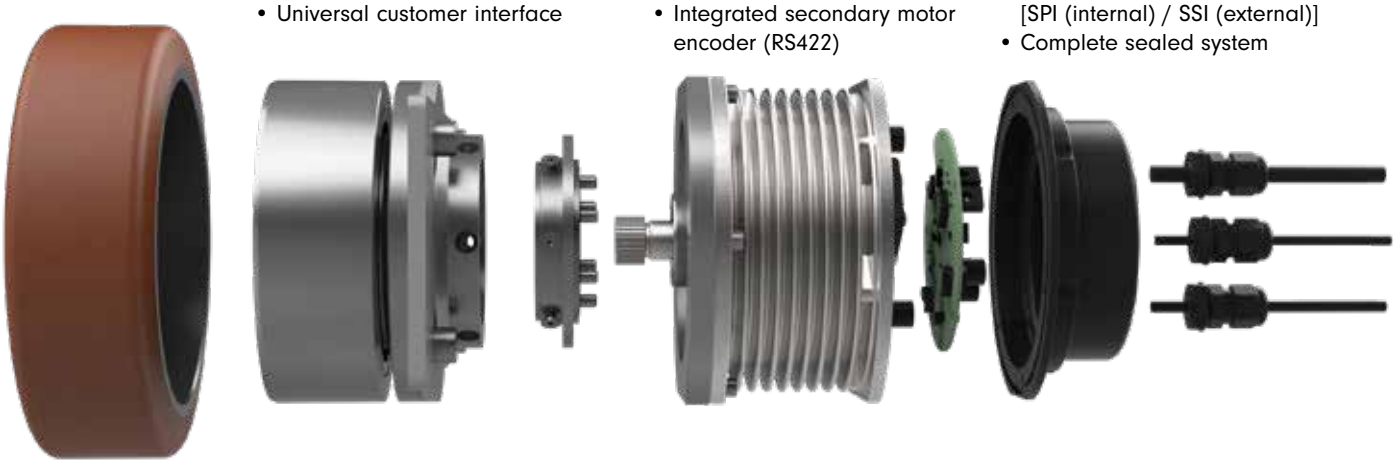
Intralogistics - wheel hub drives for AGVs & AMRs

Thanks to unmanned operation around the clock, automated guided vehicles (AGVs) in warehouses, package distribution centers and production halls ensure maximum efficiency and reliability in the distribution of goods, packages and components.
The highly integrated Framo Morat wheel hub drive combines all the functional elements in a compact design and is ideal for use in AGVs and AMRs thanks to its high power density.

Modular design with powerful components:

(exemplary illustration based on the RNA500 in the Advanced version)

- Powerful, replaceable PUR wheel
- Efficient planetary gear (1- or 2-stage)
- Separate wheel bearing
- Universal customer interface
- High-performance BLDC motor
- Integrated holding brake
- Integrated secondary motor encoder (RS422)
- Industrial standard serial interfaces (RS485 / CAN)
- Integrated primary motor encoder [SPI (internal) / SSI (external)]
- Complete sealed system



Overview of variants:

	Feature	Standard	Advanced	Ultimate	Individual
Wheel hub drive RNA250 & RNA500	PUR wheel	✓	✓	✓	Selection based on customer specifications
	Gear unit	✓	✓	✓	
	BLDC-Motor	✓	✓	✓	
	Holding brake	✓	✓	✓	
	Integrated encoder	✓			
	Motor controller incl. integrated encoder		✓	✓	
	Secondary motor encoder incl. safety function		✓	✓	
	Torque sensor			✓	

Medical technology - wheel hub drives in hospitals

The highly integrated Framo Morat wheel hub drive is an all-rounder in hospital logistics.
This applies to all situations, whether it is used in autonomous UV disinfection robots that quietly and reliably kill off germs and viruses, or in AGVs and AMRs that provide automated transport of goods to medical facilities.

Wheel hub drives from Framo Morat.

End-to-end system solutions designed to meet specific requirements.

The modular, scalable system of the wheel hub drive comes in different versions with uniform installation space and identical load capacities. The **Standard** version boasts a tried-and-true system that's easy to use in vehicles due to its quick and simple plug-and-play setup. With this, AGV manufacturers have a system matched to the application, yielding either more compact vehicles with the same load capacity or increased usable installation space for batteries and electronics.

There are also two higher-tier versions, each of which adds more functionality than the previous. In addition to the integrated motor controller, the "**Advanced**" system has a secondary motor encoder with safety function and thus offers intelligent and safe control and evaluation of the systems. The **Ultimate** version has additional sensors for optimizing operation according to the application and enabling continuous data capture to improve the entire drive cycle.

Furthermore, if required, adjustments can be made with regard to the load capacity, torque and interfaces. A high level of vertical integration in the component production, motor winding and assembly helps achieve short delivery times. When providing service and consultation, Framo Morat draws upon 110 years of experience in gear technology and drive engineering and many years of industry expertise. Due to the fact that all quality-critical parameters come from a single source, complex machining tasks can be precisely carried out in the highest quality according to the customers requirement.

What can we do for you?

+49 7657 88 306

intralogistics@framo-morat.com

https://www.wheelhubdrive.com

Ultimate version - you benefit from:

Performance Improvement

- More accurate measurement of motor power
- Shorter latency times
- Faster acceleration and braking
- ABS function for detection of wheel spin
- Wheel-individual power adaptation depending on the load

Image source: Adlatus Robotics GmbH

Cleaning technology - Autonomous cleanliness through wheel hub drives

The shortage of cleaners coupled with increasing demand calls for the automation of cleaning operations. Especially the challenges regarding cleanliness in the healthcare sector and in highly frequented public buildings, do not allow any compromises.
Specially selected wheels and dynamic motion characteristics enable Framo Morat's wheel hub drive to be used in this important segment.

	Standard	Advanced	Ultimate
High radial loads	✓	✓	✓
Long service life	✓	✓	✓
Low level of maintenance	✓	✓	✓
Compact design	✓	✓	✓
Plug & Play	✓ *	✓	✓
Safe-Torque Off	✓ *	✓	✓
Error diagnosis	✓ *	✓	✓
Intelligent speed control and feedback		✓	✓
Intelligent power control		✓	✓
Real-time acquisition of operating parameters			✓
Wheel-specific power adjustment depending on the radial loads			✓
Predictive maintenance			✓

*with external controller

Vehicle Status Information

- Precise measurement of the vehicle weight
- Status analysis of load distribution
- Detection of change in load distribution
- Precise position detection & tracking

Data Analytics & Predictive Maintenance

- Real-time recording of operating data (speed, driving behavior, load, friction)
- Optimization of motor performance
- Calculation of component wear, e.g. wheel
- Derivation of individual maintenance intervals depending on usage profile

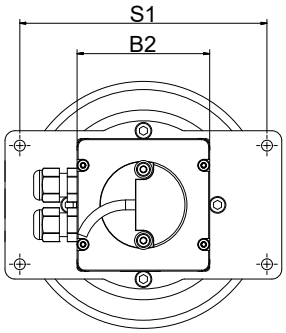
Agriculture - wheel hub drives for outdoor use

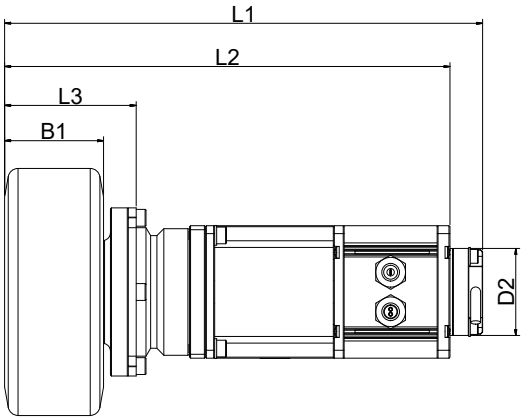
Larger areas and their sustainable use are increasing the need for autonomous vehicles for agriculture. Unmanned and time-independent operation enables users to manage their cultivated areas more efficiently.
By making specific adjustments to the wheel hub drive, a system can be designed that is adapted to agricultural conditions and is resistant to dirt and environmental influences.

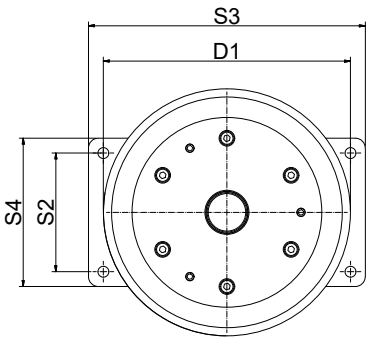
Dimensional drawing

(exemplary illustration based on the RNA250 and RNA500 in the 2-stage Advanced version)

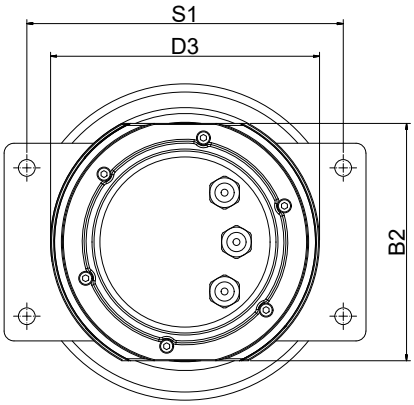
RNA250

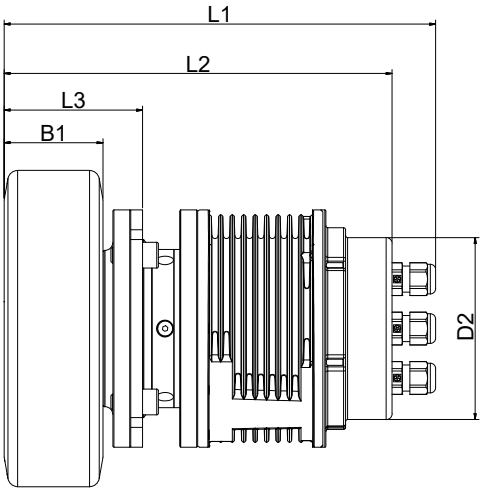


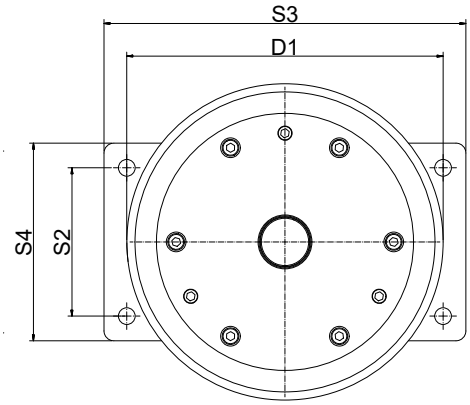




RNA500







Dimensions RNA250	1-stage	2-stage
L1	221 mm	242 mm
L2	204 mm	225 mm
L3	66 mm	
D1	125 mm	
D2	44 mm	
B1	50 mm	
B2	67 mm	
S1	125 mm	
S2	60 mm	
S3	140 mm	
S4	75 mm	

Dimensions RNA500	1-stage / 2-stage
L1	218 mm
L2	196 mm
L3	70 mm
D1	160 mm
D2	92 mm
D3	136 mm
B1	50 mm
B2	120 mm
S1	160 mm
S2	75 mm
S3	183 mm
S4	100 mm

Performance data

	RNA250		RNA500	
	1-stage	2-stage	1-stage	2-stage
Power continuous operation (S1) [W]	138		360	
Power intermittent operation (S3) [W]	220		660	
Max. power*1 [W]	500		1300	
Nominal voltage [VDC]	24		48	
Nominal current [A]	6		20	
Max. power consumption*2 [A]	40		35	
Brake holding torque*3 [Nm]	0,6		2,2	
Brake nominal voltage [VDC]	24/48		24/48	
Encoder	Contactless, absolute angle sensor (up to 14-bit)			
Encoder communication	Serial SPI, incremental ABZ interface (12-bit) and SSI output (14-bit)			
Max. speed*4[km/h]	8			
Max. acceleration*5[m/s²]	1			
Acceleration (80% of the load capacity) [m/s²]	0,75			
Max. system speed*6 [rpm]	265		340	
Nominal torque*7 [Nm]	9	11	18	21
Acceleration torque*8 [Nm]	18	22	36	42
Emergency torque*9 [Nm]	27	33	54	63
Protection class	IP54			
Ambient temperature [°C]	0 - 40			
Load capacity per wheel*10 [kg]	250		500	
Max. radial force per wheel [N]	2.500		5.000	
Max. axial force per wheel [N]	850		1.700	
Wheel diameter [mm]	Ø 125		Ø 160	
Wheel width [mm]	50			
Hardness of tread [°shore]	92			
Rolling resistance [N]	65			
Friction coefficient	> 0,25			
Drive weight*11 [kg]	7,8	8,5	9	10

Deviating values must be observed and evaluated separately

*1 Maximum electrical power at stall torque
*2 Maximum current consumption during the test cycle
*3 Holding torque based on input side
*7 Recommended maximum speed
*7 Max. acceleration based on empty run
*7 Corresponds to 8 km/h at Ø125mm or Ø 160 mm
*7 Nominal values are based on a service life of 30,000 h
*7 Max. 250 cycles per h, T2B proportion < 5 % of the total running time
*7 Max. 1000 cycles during the entire service life
*10 The load capacity specifications of the wheel manufacturer may vary
*11 Drive weight based on condition upon delivery

Customized drive solutions for all submarkets of intralogistics:

From **wheel hub drives** used in AGVs, AMRs or warehouse shuttles and **planetary gears** for conveyor belts or robot handling systems, to **gear motors** for safety gate drives, or high-precision **gear components** for industrial trucks or electric cargo bikes, the Franz Morat Group has been a reliable partner of the most notable global players in the intralogistics sector for generations.

You benefit from:

- Over 110 years of expertise in designing and developing custom drive components & complete systems
- Project specific choice of materials (metals, thermoplastics or combinations of both) according to your requirements regarding quality, weight, smooth operation or lifetime
- All process steps from a single source

The best of both worlds.

Gear technology and drive solutions of both metals & plastics.

Combining local expertise & global presence.

Since the founding of Franz Morat GmbH in 1912, gear and drive engineering has been in a continuous state of development at the company's headquarters in Eisenbach, Black Forest. Today, the Franz Morat Group is a globally operating manufacturer of high-quality drive solutions for many industries and applications. The company counts more than 700 employees and runs subsidiaries in the United States, Turkey, Poland and México.

Uniting metals & plastics.

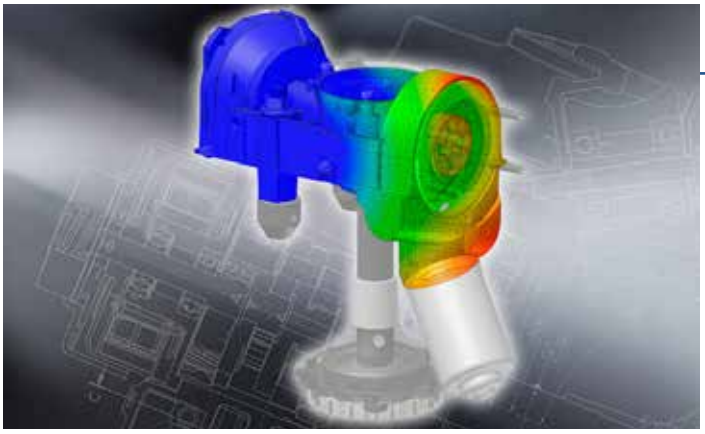
Our core competencies lie in the production of high-precision gears, rotor shafts and worm gear sets made from various metals as well as technically advanced injection-molded parts from thermoplastics. This results in solutions that incorporate the technical advantages of both material groups depending on the required specifications. You benefit from more than 110 years of expertise and an experienced partner who offers all process steps from a single source.

Metal machining:

Turning, Milling, Gear Hobbing, Gear Shaping, Broaching, Hardening, Cylindrical Grinding, Honing, Profile & Hob Grinding

Plastic injection molding:

Mold Design & Tool Making, Over 70 injection molding machines, All technical thermoplastics (incl. PEEK™), Subsequent processing



Pioneering research & development.

In developing custom engineered drive solutions, Framo Morat and F. Morat cooperate closely under the umbrella of the Franz Morat Group. Our many years of experience make us your ideal partner, from development and design engineering to prototyping and testing all the way to series production and assembly. Numerous highly respected companies from a wide variety of industries rely on our development services and the resulting drive solutions.

Drive technology:

Specification, Development & Design, Prototyping, Testing & Quality Control, Serial Production, Assembly & Use

Germany

Franz Morat Holding GmbH & Co. KG
Franz-Morat-Straße 6
79871 Eisenbach
Phone +49 (0) 7657 88-0
E-Mail info@franz-morat.com
www.franz-morat.com

FRAMO MORAT
FMG Industry

RNA-EN-2025-10-01