Ketterer Electric Hub Motors

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BONDY

INDUSTRIAL EQUIPMENT SUPPLIER

Visit our website



Wheel hub motors

FOR AUTOMATED GUIDED VEHICLES

WE GET IDEAS MOVING

The spirit of innovation and a sense of ideas beyond the familiar has made us into a pioneering company over more than 185 years.

For a quarter of a century, we have been offering customized drive solutions for office and workplace workstations, as well as for shading systems and building technology. Through our tradition of innovation, we have succeeded in establishing ourselves as a specialist and problem-solver in numerous areas.



THE RIGHT PRODUCT FOR EACH APPLICATION

Liftung Units Page 04 Wheel hub motor family 3213

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Page 12 Ket-Rob – Drive platform for AGV/AGC

Wheel hub motors i-Wheel 3213

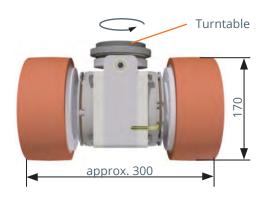


An optimal drive solution for every transport task

The Ketterer i-Wheel 3213 wheel hub drives have been specially developed for use in Automated Guided Vehicles (AGV). They are designed as direct drives that are completely integrated in the wheel and therefore need nei-ther an additional gearbox nor an extra motor.

An extremely flat design combined with a high power density allows an application with very tight installation spaces. The compact all-in-one solution not only impresses due to its benefits in terms of space requirements but also thanks to the fact it is maintenance-free and has a service life many times longer than systems equipped with a gearbox.

The i-Wheel 3213 series consists of three high-performance wheel hub drives, which can reach torques up to 34 Nm and speeds up to 27 km/h.



The ultra-compact design enables a simple arrangement of two drives on one rotary disk. This means that maneuvering the vehicle with a zero turning radius is no longer a challenge.

In terms of its efficiency and individual scalability, the family of drives offers an optimal modular solution for electric transportation vehicles.

We would be pleased to develop a solution for you that is specially tailored to your drive task! Motor layout, flange geometry, the type of brake and the encoder can be implemented in line with your requirements.

Our technology - Your benefit

- Neither a gearbox nor an extra motor is needed
- Ultra-compact for tight installation spaces
- High power density in the smallest installation space
- Much longer service life compared to conventional drive technology with a gear stage
- No gear no wear
- Easy to replace the wheel coating
- Very good running properties with minimal noise level



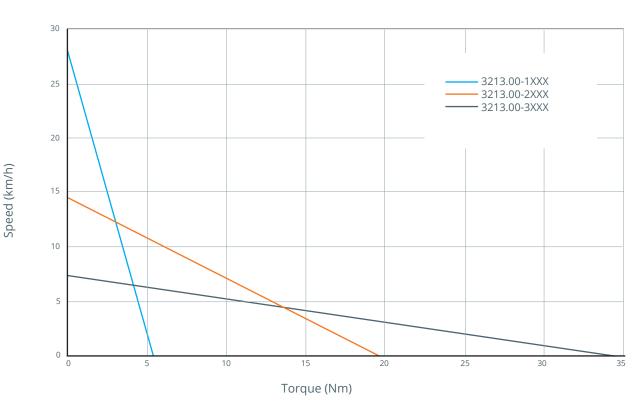
Safety first

- Safety architecture of the rotational control system using diverse redundancy, or two-channel design
- In combination with a suitable controller, a safety level of **PL-d** in accordance with EN ISO 13849-1 can be achieved
- Safe production processes, as there are no risks of contamination from gear oils and greases (no gearbox)

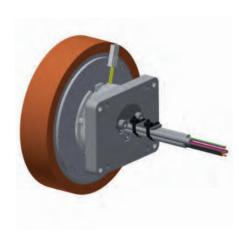
Flexibility and customer orientation are our strengths: The choice is yours - we implement it!

- Flexible voltage range from 24 V to 48 V
- Encoder: BiSS, SSI, TTL incremental in different resolutions
- Brake: Permanent magnetic brake or spring-operated brake with low energy consumption
- Can be combined with various controllers
- Adaptations for mechanical integration and system connection

i-Wheel 3213 family: Torque & achievable speeds & 48 V DC



i-Wheel 3213.00-1XXX



Direct drive - Benefits in a nutshell

- No gearbox no wear
- Much longer service life compared to conventional drive technology with a gear stage
- Excellent running properties with barely perceptible noise level
- Ultra-compact with extremely high power density
- Replacement of the the wheel coating possible on site

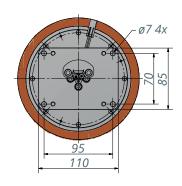
Safety first

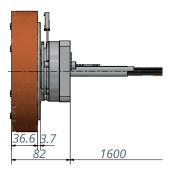
- Rotational control system using diverse redundancy
- **PL-d** safety level achievable with suitable controller
- Safe production processes, as there are no risks of contamination from gear oils and greases (no gearbox)

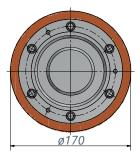
The choice is yours - we implement it

- Encoder optional: BiSS, SSI, TTL incremental (various resolutions)
- Brake optional: Permanent magnetic brake or spring-operated brake
- Can be combined with various controllers
- Customer-specific mechanical integration and system connection

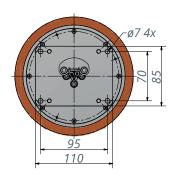
3213.00-1XXX with brake

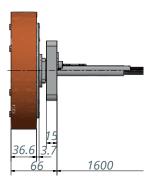


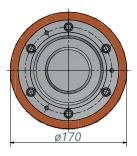




3213.00-1XXX without brake



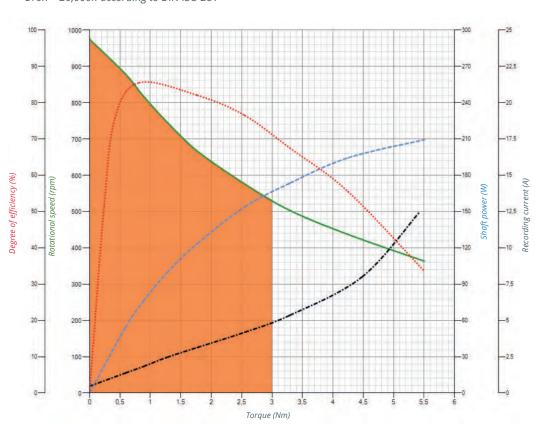




3213.00-1XXX				
Rated voltage	48 VDC			
Rated current¹)	5 A			
Rated torque ¹⁾	3 Nm			
Rated speed ¹⁾	530 rpm			
Max. speed at rated torque ¹⁾	15 km/h			
Shaft power (output)¹)	165 W			
Idle running speed ²⁾	975 rpm			
No-load current ²⁾	0.5 A			
Achievable max. speed ²⁾	up to 27 km/h			
Max. efficiency ²⁾	86 %			
Idle speed ²⁾	5.4 Nm			
Starting current at idle speed ²⁾	12 A			
Torque constant ²⁾	0.6 Nm/A			
Speed constant ²⁾	11 rpm/V			
Terminal resistance (phase to phase)	0.65 Ohm			
Terminal inductance	3.7 mH			

1)	Мах.	ambient	temp	e	rature	= 40	°C,	controller	-specific	
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²⁾ At the nominal point (TU = 20°C), controller-specific 3) Radial and axial forces apply to the nominal service life L10h = 20,000h according to DIN ISO 281



3213.00-1XXX

Rotor inertia	2,900 kgmm²
Max. radial axle load F ³⁾	800 N
Max. axial axle load F ³⁾	200 N
Number of magnets poles	32
Interconnection of the motor	L63S4
Encoder type in standard	Digital Halls + TTL magnetic incremental AB
Encoder resolution	65,536 cpr
Material of the coating	Vulkollan 92 Shore A®

Braking torque	4.5 Nm
Power supply brake	24 VDC / 12 W
Power consumption brake	6 W through PWM Power reduction
Weight incl. brake	3.4 kg

+24 V red GND

Motor phases: Alpahwire 6716 AWG16

U = red V = black W = yellow

Hall sensors and encoders: igus CF240.PUR.01.14 (14x0.14)C

1	5V Encoder	red
2	GND Encoder	blue
3	A	white
4	В	black
5	H1	yellow
6	H2	green
7	H3	gray
8	5V Hall	pink
9	GND Hall	brown
10	PT1000	gray-pink
11	PT1000	red-bue

Hall output signal: 3 square-wave

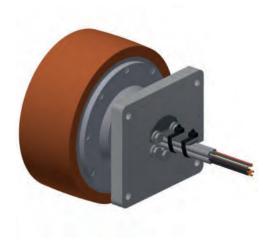
The hall signals have a phase shift of 120° to each other.

Power supply: 5V ± 5%

Input current: typ. 40 mA

Differential encoder output signal: 3 square-wave signals (RS422) Channel A, B (90° phase shift) and Accuracy: ± 0.5° Power supply: 5V ± 5% Input current: typ. 35 mA

i-Wheel 3213.00-2XXX



Direct drive - Benefits in a nutshell

- No gearbox no wear
- Much longer service life compared to conventional drive technology with a gear stage
- Excellent running properties with barely perceptible noise level
- Ultra-compact with extremely high power density
- Replacement of the the wheel coating possible on site

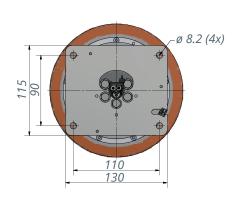
Safety first

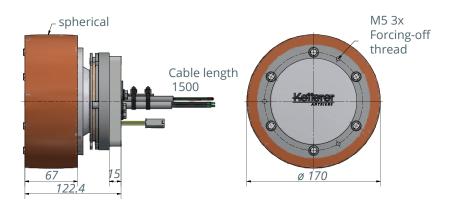
- Rotational control system using diverse redundancy
- **PL-d** safety level achievable with suitable controller
- Safe production processes, as there are no risks of contamination from gear oils and greases (no gearbox)

The choice is yours - we implement it

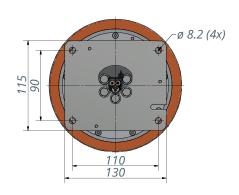
- Encoder optional: BiSS, SSI, TTL incremental (various resolutions)
- Brake optional: Spring-operated brake
- Can be combined with various controllers
- Customer-specific mechanical integration and system connection

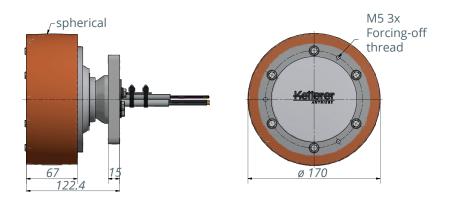
3213.00-2XXX with brake





3213.00-2XXX without brake





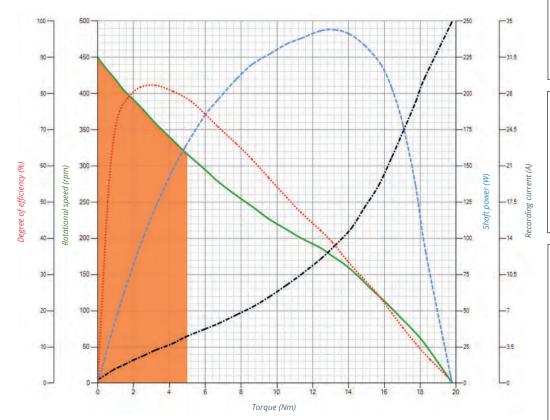
3213.00- <mark>2</mark> XXX i-Wheel-A-170-123					
Rated voltage	48 VDC				
Rated current ¹⁾	4.5 A				
Rated torque ¹⁾	5 Nm				
Rated speed ¹⁾	316 rpm				
Max. speed at rated torque ¹⁾	10 km/h				
Shaft power (output) ¹⁾	165 W				
Idle running speed ²⁾	450 rpm				
No-load current ²⁾	0.3 A				
Achievable max. speed ²⁾	up to 14 km/h				
Max. efficiency ²⁾	82 %				
Idle speed ²⁾	19.7 Nm				
Starting current at idle speed ²⁾	35 A				
Torque constant ²⁾	1.25 Nm/A				
Speed constant ²⁾	9.4 rpm/V				
Terminal resistance (phase to phase)	1.05 Ohm				
Terminal inductance	7 mH				

i-Wheel-A-170-123					
Rotor inertia	14,500 kgmm ²				
Max. radial axle load F ³⁾	2,500 N				
Max. axial axle load F³)	1,250 N				
Number of magnets poles	32				
Interconnection of the motor	L63S4				
Encoder type in standard	Digital Halls + TTL magnetic incremental ABZ				
Encoder resolution	4,096 cpr				
Material of the coating	PU-Wheel: 92° ±3° Shore A				

3213.00-2XXX

Braking torque	16 Nm
Power supply brake	24 VDC / 19.4 W
Power consumption brake	7 W through PWM Power reduction
Weight incl. brake	10 kg

Max. ambient temperature = 40 °C, controller-specific
 At the nominal point (TU = 20°C), controller-specific
 Radial and axial forces apply to the nominal service life L10h = 20,000h according to DIN ISO 281



Brake: +24 V PIN1 PIN2 GND

Motor phases: igus CF77.UL.25.04.D (4G2.5)

U = 1 V = 2 W = 3

The PE conductor is not connected

Hall sensors: igus CF240.PUR.01.08 (8x0.14)C

1	+5 V	red
2	GND	blue
3	H1	white
4	H2	brown
5	H3	green

Output signal: 3 square-wave signals The hall signals have a phase shift of 120° to each other.

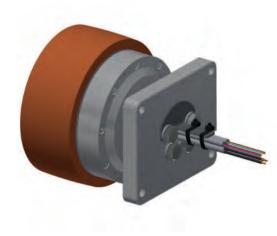
Power supply: 5V ± 5% Input current: typ. 40 mA

Encoder: igus CF240.PUR.01.08 (8x0.14)C

_		
1	+5 V	red
2	GND	blue
3	Α	gray
4	A-	pink
5	В	green
6	B-	yellow
7	Z	white
8	7-	hrown

Differential output signal: 3 square-wave signals (RS422) Channel A, B (90° phase shift) and Index Z Accuracy: ± 0.5° Power supply: 5V ± 5% Input current: typ. 35 mA

i-Wheel 3213.00-3XXX



Direct drive - Benefits in a nutshell

- No gearbox no wear
- Much longer service life compared to conventional drive technology with a gear stage
- Excellent running properties with barely perceptible noise level
- Ultra-compact with extremely high power density
- Replacement of the the wheel coating possible on site

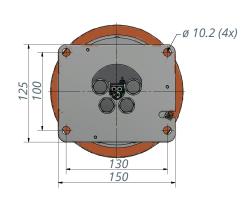
Safety first

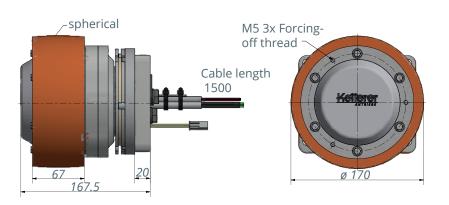
- Rotational control system using diverse redundancy
- **PL-d** safety level achievable with suitable controller
- Safe production processes, as there are no risks of contamination from gear oils and greases (no gearbox)

The choice is yours - we implement it

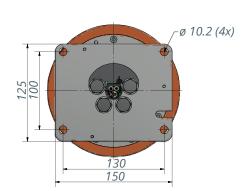
- Encoder optional: BiSS, SSI, TTL incremental (various resolutions)
- Brake optional: Spring-operated brake
- Can be combined with various controllers
- Customer-specific mechanical integration and system connection

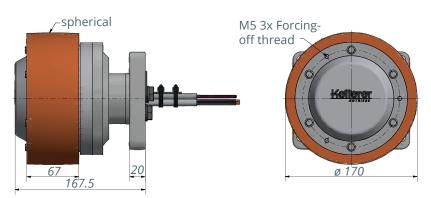
3213.00-3XXX with brake





3213.00-3XXX without brake





3213.00-3XXX i-Wheel-A-170-168

Rated voltage	48 VDC
Rated current ¹⁾	4.7 A
Rated torque ¹⁾	10 Nm
Rated speed ¹⁾	154 rpm
Max. speed at rated torque ¹⁾	5 km/h
Shaft power (output) ¹⁾	161 W
Idle running speed ²⁾	225 rpm
No-load current ²⁾	0.4 A
Achievable max. speed ²⁾	up to 7 km/h
Max. efficiency ²⁾	78 %
Idle speed ²⁾	34 Nm
Starting current at idle speed ²⁾	30 A
Torque constant ²⁾	2.1 Nm/A
Speed constant ²⁾	3.2 rpm/V
Terminal resistance (phase to phase)	1.75 Ohm
Terminal inductance	15 mH

7)	Max.	ambient	tei	mper	atur	$e = 40^{\circ}$	Ľ,	controlle	r-specific	
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Rotor inertia	26,850 kgmm ²		
Max. radial axle load F ³⁾	7,500 N		
Max. axial axle load F ³⁾	2,500 N		
Number of magnets poles	32		
Interconnection of the motor	L62S4		
Encoder type in standard	Digital Halls + TTL magnetic incremental ABZ		
Encoder resolution	4,096 crp		
Material of the coating	PU-Wheel: 92° ±3° Shore A		

Braking torque	30 Nm
Power supply brake	24 VDC / 21.5 W
Power consumption brake	7 W through PWM Power reduction
Weight incl. brake	17.6 kg

Brake:

+24 V PIN1

Motor phases: igus CF77.UL.25.04.D (4G2.5)

U = 1 V = 2 W = 3

The PE conductor is not connected

Hall sensors: igus CF240.PUR.01.08 (8x0.14)C

1	+5 V	red
2	GND	blue
3	H1	white
4	H2	brown
5	H3	green

Output signal: 3 square-wave signals The hall signals have a phase shift of 120° to each other. Power supply: $5V \pm 5\%$ Input current: typ. 40 mA

Encoder: igus CF240.PUR.01.08 (8x0.14)C

.0		
1	+5 V	red
2	GND	blue
3	Α	gray
4	Α-	pink
5	В	green
6	B-	yellow
7	Z	white
8	Z-	brown

Differential output signal: 3 square-wave signals (RS422) Channel A, B (90° phase shift) and Index Z Accuracy: ± 0.5° Power supply: 5V ± 5% Input current: typ. 35 mA

100-	250		/ 250	30
90-	225—	/	-225	-27
80—	200-	/	-200	-24
70	175-	_/_	175	21
60— (wc	150-	\bigvee	150	-18
Rotational speed (rpm)	125-	\wedge	Shaft power (W)	-15
Rotationa	100-		Sha	12
30-	75-	\	75	9
20-	50-	1	50	-6
10-	25-		-25	-3
0_	0 2 4 6 8 10 12 14 16 18 20 22 24 26	3 28 30 32	34	Lo

²⁾ At the nominal point (TU = 20°C), controller-specific 3) Radial and axial forces apply to the nominal service life L10h = 20,000h according to DIN ISO 281

Ket-Rob - Drive platform for AGV/AGC



DS

Description

Tailored to the requirements of autonomous robot technology, Ketterer offers a modular drive platform for **A**utomated **G**uided **V**ehicle systems or - **C**arts (**AGV/AGC**).

All components are designed for simple integration.

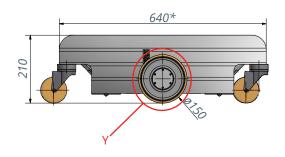
Your benefits

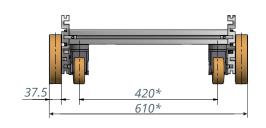
- Complete basic drive module for Automated Guided Vehicle systems or - Carts (AGV/AGC)
- Dimensioning of the drive platform according to individual requirements
- Gearless BLDC wheel hub drives with a durable Vulkollan or solid rubber wheel
- Noise-reduced direct drive with spring suspension (spring travel 20 mm). Therefore driving on uneven surfaces is not a problem
- Large design scope of the vehicle structure due to very low installation depth of the wheel hub drives
- Very quiet in operation
- Maintenance-free, therefore no maintenance and service needed
- Load platform height adjustment and load platform in accordance with customer-specific requirements optionally possible
- Customer-specific adaptions of the drives or systems are possible

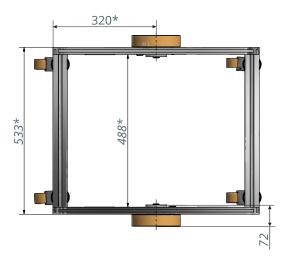
Technical data

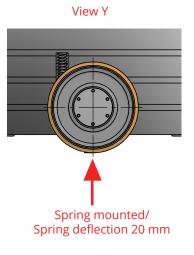
	Ket -Rob	
Power supply	24 V- 48 V	
Utilize speed	7 km/ h	
Acceleration	0.5 m/s ²	
Max. Engine power (per drive unit)	210 W	
Load capacity	100 kg	
Starting torque (per drive unit)	6 Nm	
Braking torque (per brake)	9 Nm	
Power supply brake (per drive unit)	24 V/ 18 W	
Driving direction	forward and backward	
Ground clearance	30 mm	
Max. incline	4 %	
Protection class	IP 20	
Operating temperature	5 to 40 °C (Humidity 10-90 % non-condensing)	

Basis: Without height adjustment for transport platform









* Dimensions can be customized

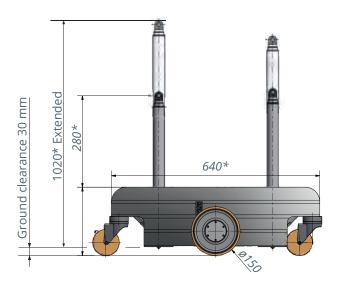
Ket Rob consists in the standard version of:

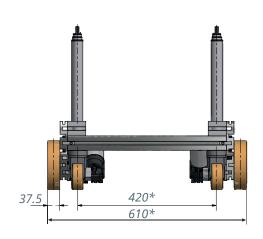
- 2 x BLDC wheel hub drives with encoder and brake (without regulation/control)
- 4 x load bearing steering wheels
- Frame

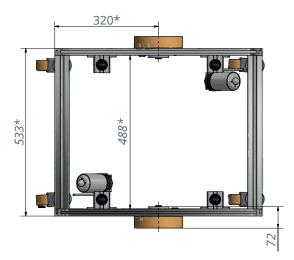
Additional options:

- Height adjustment for transport platform
- Transport platform

Additional option: Height adjustment for transport platform







* Dimensions can be customized

Technical notes

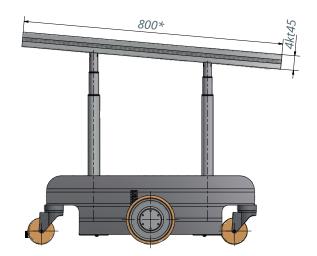
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- For the linear height adjustment many Ketterer standard solutions conceivable: e.g. 3120, 4643, 4114, Information about these products can be found at www.ketterer-drives.com/products
- Customer-specific adaptations are possible

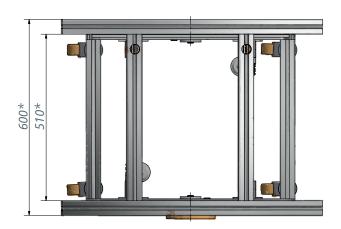


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Additional option: Transport platform







* Dimensions can be customized

Orientation aid

In the era of Industry 4.0 and Big Data, it is unimaginable to do without Automated Guided Vehicle Systems (AGVS) and Automated Guided Vehicles (AGV).

They have become a component of modern intralogistics solutions.

Automated Guided Vehicle Systems (AGVS)

Automated Guided Vehicle Systems are floor-bound systems that are used in-plant, inside and/or outside of buildings. They essentially consist of one or more automatically controlled vehicles, guided without contact, with their own travel drive and, if necessary, of

- a master controller,
- a device for location determination and position detection
- a device for data transmission and
- infrastructural and peripheral devices

The main task of an AGVS is the automatic transport of materials. In the broader sense, AGVSs also include systems that are used for service tasks such as handling, monitoring, cleaning, mobile information and guidance – including in areas accessible to the general public.

VDI guideline 2510

Automated Guided Vehicles (AGVs)

Automated Guided Vehicles (AGVs) are floor-bound conveyances with their own travel drive, which are automatically controlled and guided without contact.

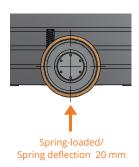
They are used for the transport of materials, i.e. for pulling and/or carrying conveyed goods with active or passive load handling devices. This guideline deals with vehicles with wheel drives. Rail-guided vehicles, air-cushion vehicles and walking machines are excluded.

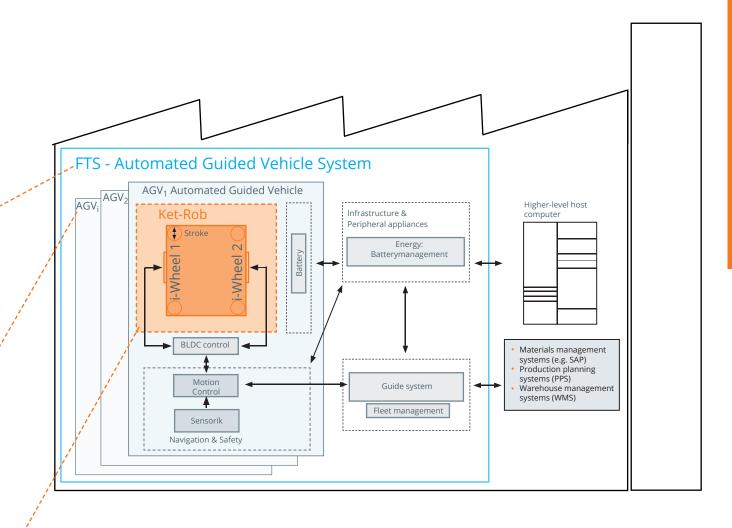
VDI guideline 2510











Ket-Rob – more time for essentials

Ketterer's drive platform "Ket-Rob" enables the project manager, in the development of an AGV / AGVS, to concentrate on the complex part of the work, i.e. the proprietary application and idea, including the programming and coordination of the necessary control systems.

If the controller is to be evaluated, the Ketterer platform enables a prototype for an AGV / AGVS to be created and tested very quickly. The time saved can be used in the development of system variants in order to find the optimum solution for the in-house AGV / AGVS.



BONDY

INDUSTRIAL EQUIPMENT SUPPLIER



Transmission



Handling



Motor & Gear



Vacuum Conveying



Linear



Support

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