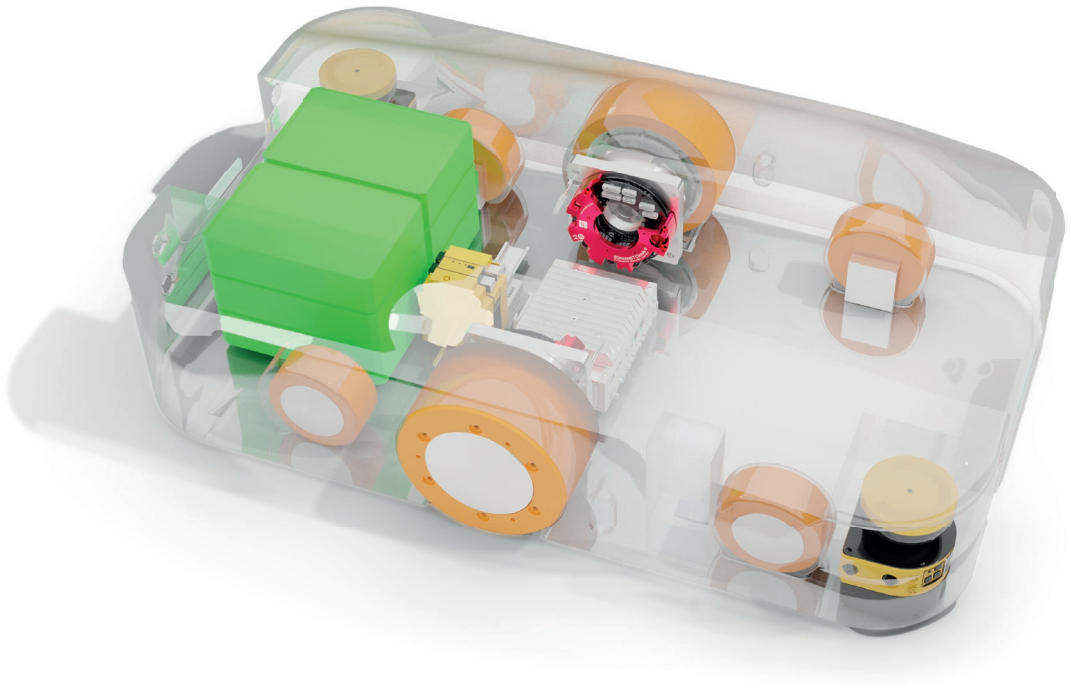
Ketterer DRIVES

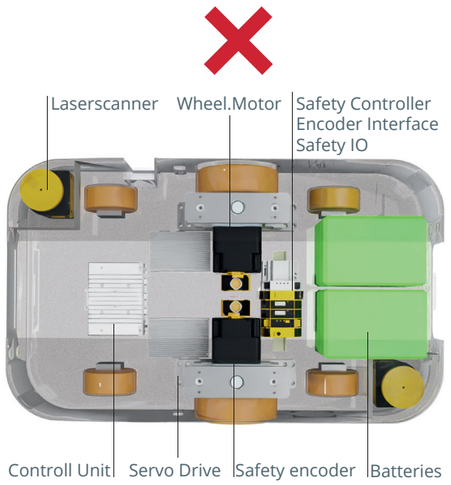
AGV-Platform Next Generation

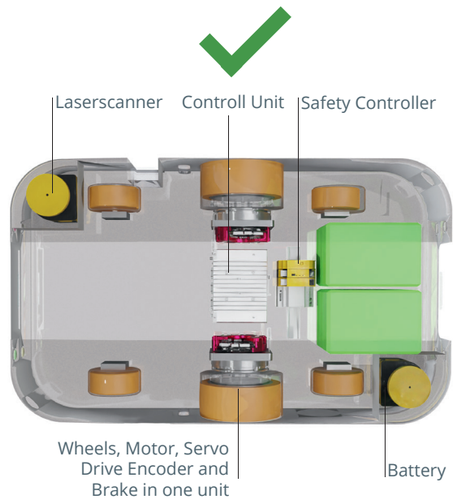
Ketterer Wheel hub motor i-Wheel C 3213



The Next Generation AGV-Platform FSoE

AGVs / AMRs have become an indispensable part of modern manufacturing and logistics.
Such high-tech products have an elaborate AGV system architecture, comprising a large number of individual components and complex cabling. The complexity results in high development, procurement and commissioning costs, causing a clutter of cables and resulting in space shortages inside the vehicle.
Therefore, AGVs are extremely costly to manufacture and most demanding in terms of maintenance.

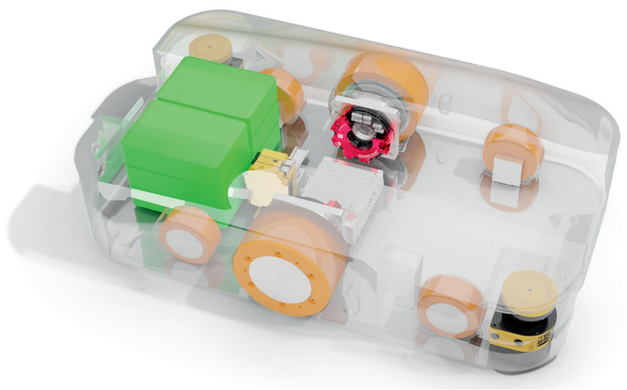




We do it differently

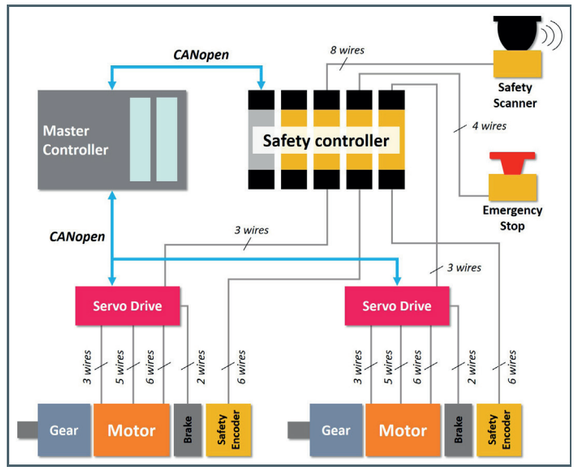
In cooperation with the companies Synapticon, Kontron, Brinkmann and Sick, we have developed a future-oriented Next Generation AGV system architecture (FSoE = FailSafe over EtherCAT):

Rather than using complex mechanical drive components, we use the ultra-compact gearless **Ketterer i-Wheel C 3213 direct drive** with a fully integrated Synapticon Circulo 9 safety controller.
Combined with just one Safety Master Controller, simple safety logic and proven protective field detection, our new FSoE system architecture covers everything a modern AGV/AMR needs.
What makes it special is the simple connection of all components via a single cable due to FSoE via EtherCAT protocol. Consequently, the AGVS / AMR gets by with significantly fewer components and minimal interior cabling.
Such integration reduces components and interfaces, as well as development effort and assembly time.

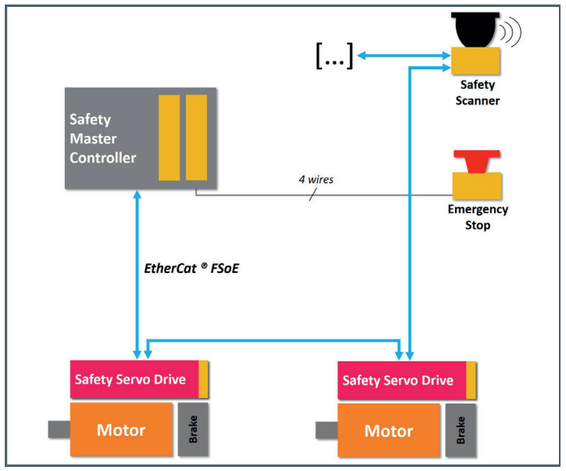


Less complexity of the system	→	Faster R&D time
More space for batteries	→	Longer runtime
Quick maintenance	→	Shorter downtime
Fewer components	→	Lesser system failures

Traditional System



NEW FSoE System



Increased performance with reduced system costs

Fewer components	→	**More space**
Fewer cables	→	**More efficiency**
Less complexity	→	**More performance**

- More straightforward, faster development
- Leaner, more cost-efficient production
- Easier procurement
- Maintenance becomes less complex
- System cost savings of up to 50 %
- More space for batteries: Vehicles with more power, greater mileage and higher availability
- Dependable functional safety based on FSoE technology: STO, SS1, SS2, SLS, etc.
- Expandable as desired, scalable and future-proof with EtherCAT FSoE

i-Wheel Clever 3213.00-21XX

SIL2 PL-d FUNCTIONAL SAFETY

synapticon INTEGRATED MOTION

Wheel hub drive with fully integrated Circulo 9 Motion Controller from Synapticon - a compact, intelligent drive system with minimal integration expenses.

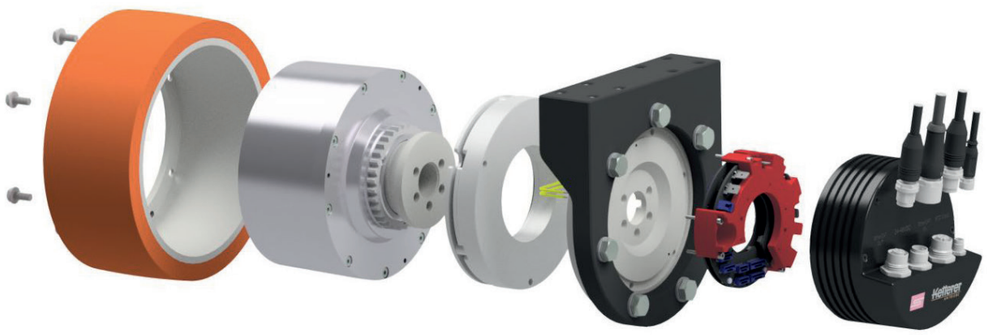
Direct drive: Advantages in a nutshell

- 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
- Safer operation through permanent temperature monitoring
- Ultra-compact with extremely high power density
- Easy replacement of wheel coating on site possible thanks to patented Ketterer solution

PATENTED

Overall System: Intelligent - Safe - Ultracompact

- Optimum Performance Scaling: Available in all three Ketterer standard performance classes of the i-Wheel family on request
- Highest performance in drive control in the smallest installation space
- Easy to Use: Seamless Integration in a few easy steps
- Plug & Play: Standard plug & standard cable can be used
- High speed EtherCAT interface, low latency, negligible Jitter
- Over 10 certified safety functions (SIL2, Pl-d)
  SIL 3, PL-e on request
- High Resolution Absolute Encoder
- User-friendly Synapticon parameterization and tuning software
- Model predictive field-oriented control for high efficiency, maximum bandwidth
- Optional emergency holding brake with energy saving mode
- Available in the near future: Circulo 9 with Safe Motion Module



3213.00-21XX i-WheelC-A-170-185	
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
Max. efficiency[2)]	82 %
Standstill torque[2)]	19.7 Nm
Starting current at idle speed[2)]	35 A
Max. radial axle load F[3)]	2,500 N
Max. axial axle load F[3)]	1,250 N
Encoder resolution	262,144 cpr
Material of the coating	PU-Rad: 92° ±3° Shore A
Braking torque of the emergency holding brake	16 Nm

1) Max. ambient temperature = 40 °C, controller-specific
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

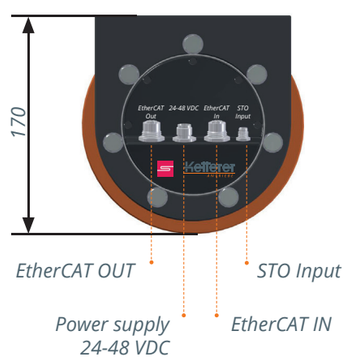
Circulo 9 Motion Controller by Synapticon	
Communications interface	EtherCAT, FSoE (FailSafe over EtherCAT)
Rated voltage range	24 - 48 V DC
Max. voltage	60 V DC
Continuous phase current RMS	20 A
Max. efficiency	99 %
Hardware Protection	Overcurrent, overvoltage, undervoltage, PW deadtime, overtemperature, PWM shoot through
Standard Safety Functions	STO/SBC
Safe Motion Modul	FSoE, STO, SBC, SS1/2, SOS, SMS, 4xSLS, Safe Process Data (position, velocity)

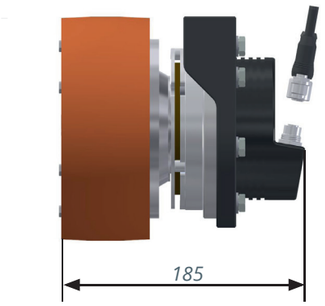
Certified Safety Functions

STO – SAFE TORQUE OFF
SBC – SAFE BRAKE CONTROL
SBT – SAFE BRAKE TEST*
SS1 – SAFE STOP 1
SS2 – SAFE STOP 2
SLS – SAFELY LIMITED SPEED
SLP – SAFELY LIMITED POSITION*
SLT – SAFELY LIMITED TORQUE*
SAFE VELOCITY PROCESS DATA
SAFE POSITION PROCESS DATA
SAFE TORQUE PROCESS DATA
SAFE DIGITAL GPIO AND ANALOG INPUTS

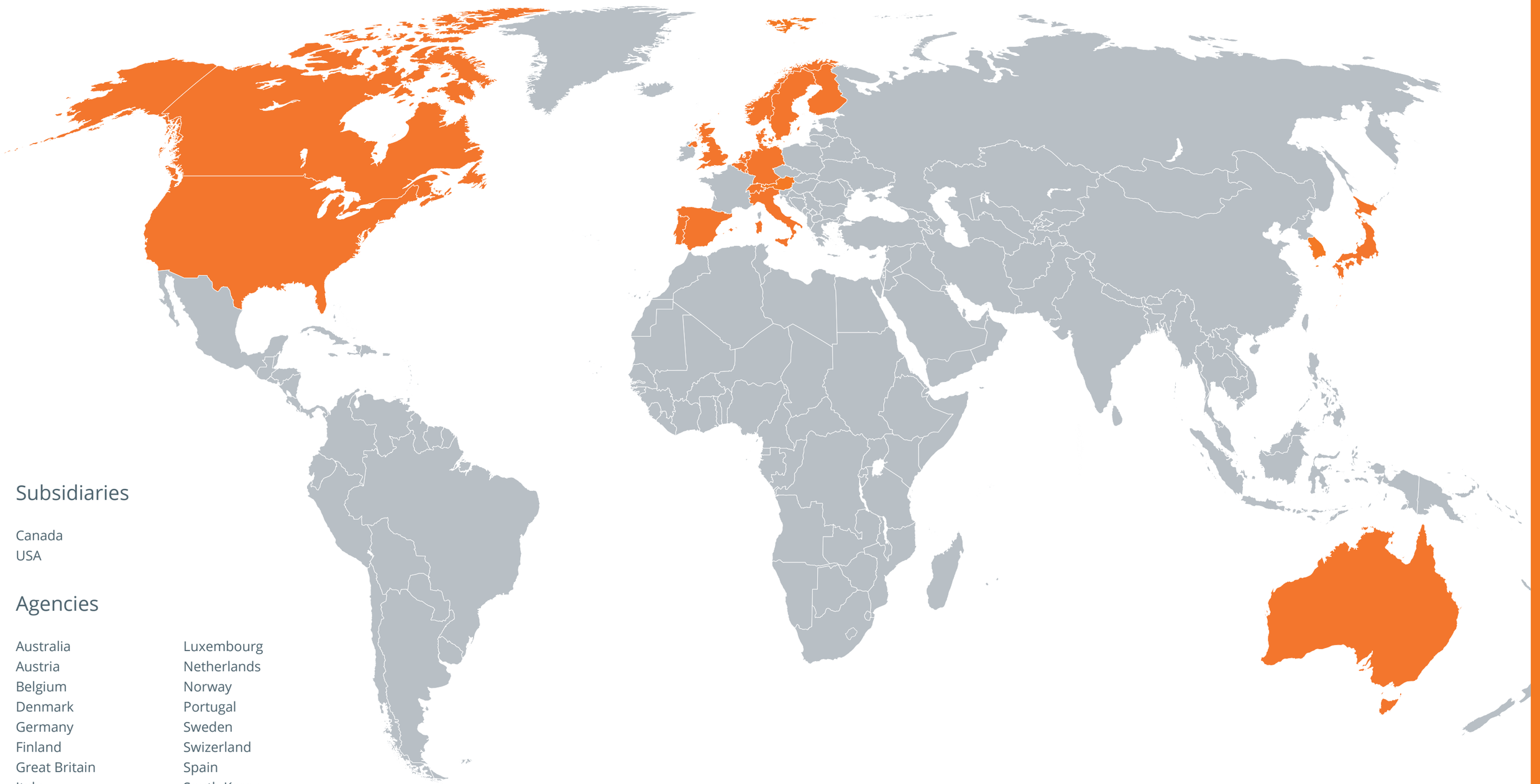
*The functions must be implemented in the safety controller using secure process data

i-Wheel Clever 3213 with integrated Circulo 9 Motion Controller by Synapticon





USED AROUND THE WORLD



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