KUKA

KUKA AMR Presentation

KMP Series

Contents

Demo


9.
KUKA
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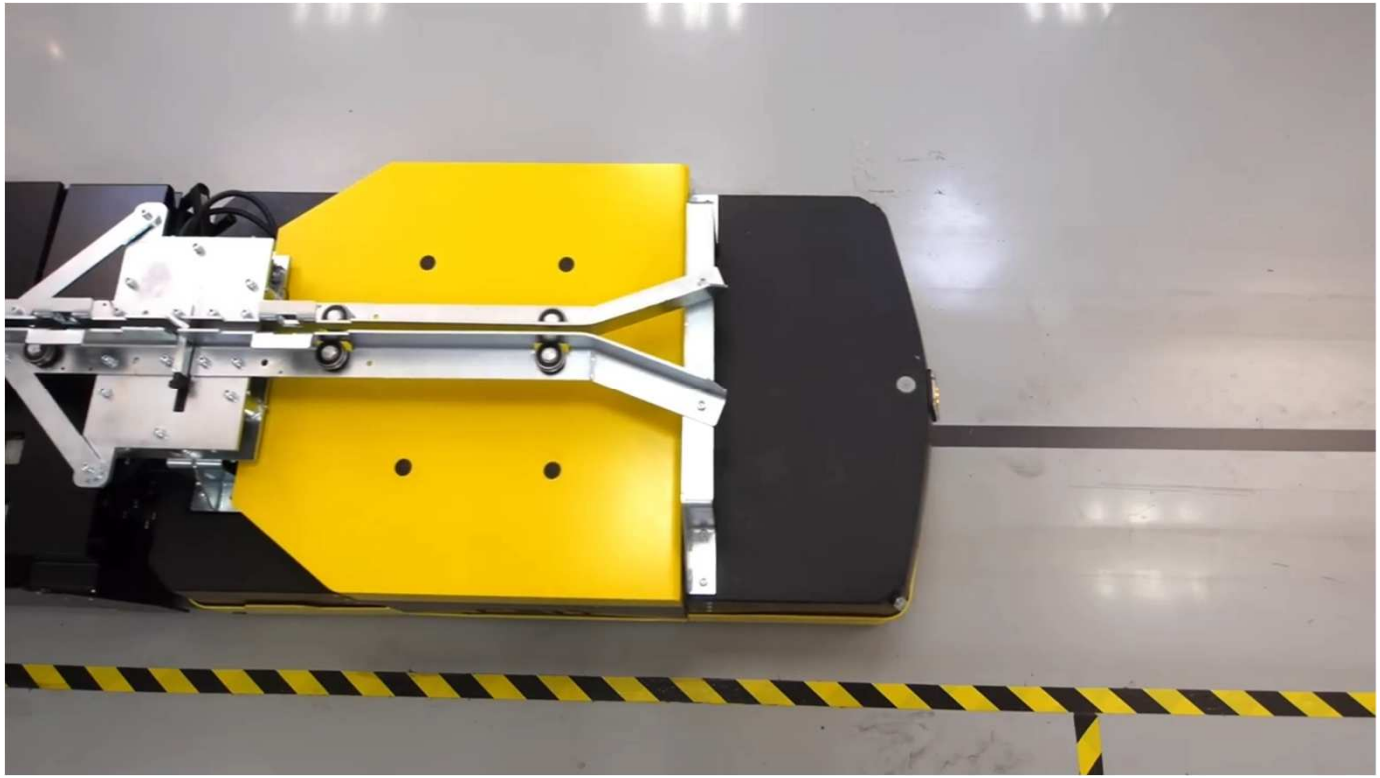
Introduction to KMP Series

Navigation Technology

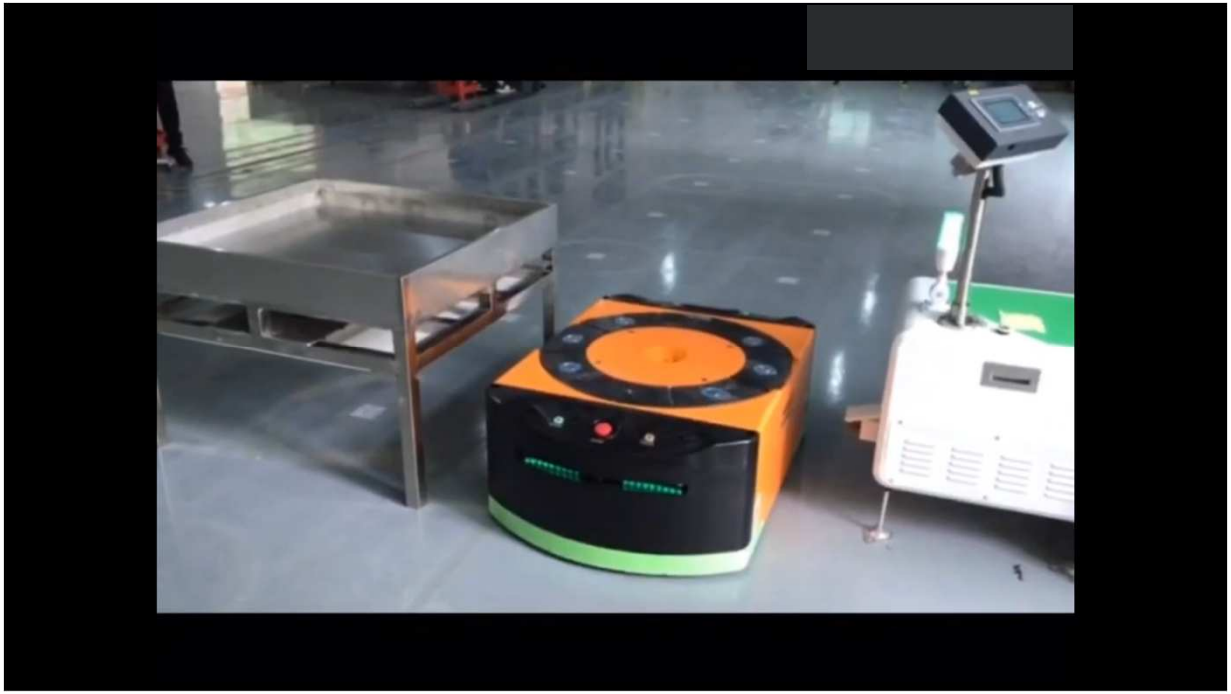
1. Magnetic stripe



Device required

- Magnetic guide sensor installed at vehicle.
- Magnetic strip installed on the floor.

2. QR Code



Device required

- Camera installed at the vehicle and faces downwards toward the ground.
- QR Code placed on the floor.

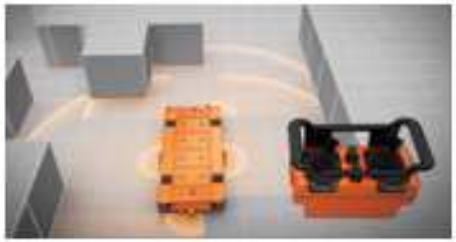
Navigation Technology

SLAM (Simultaneous Localization and Mapping)

Device required

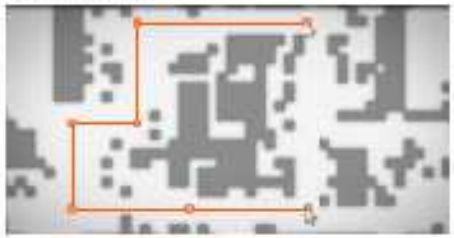
- Lidar sensor installed at the vehicle

Mapping (**Graph-Based SLAM**)



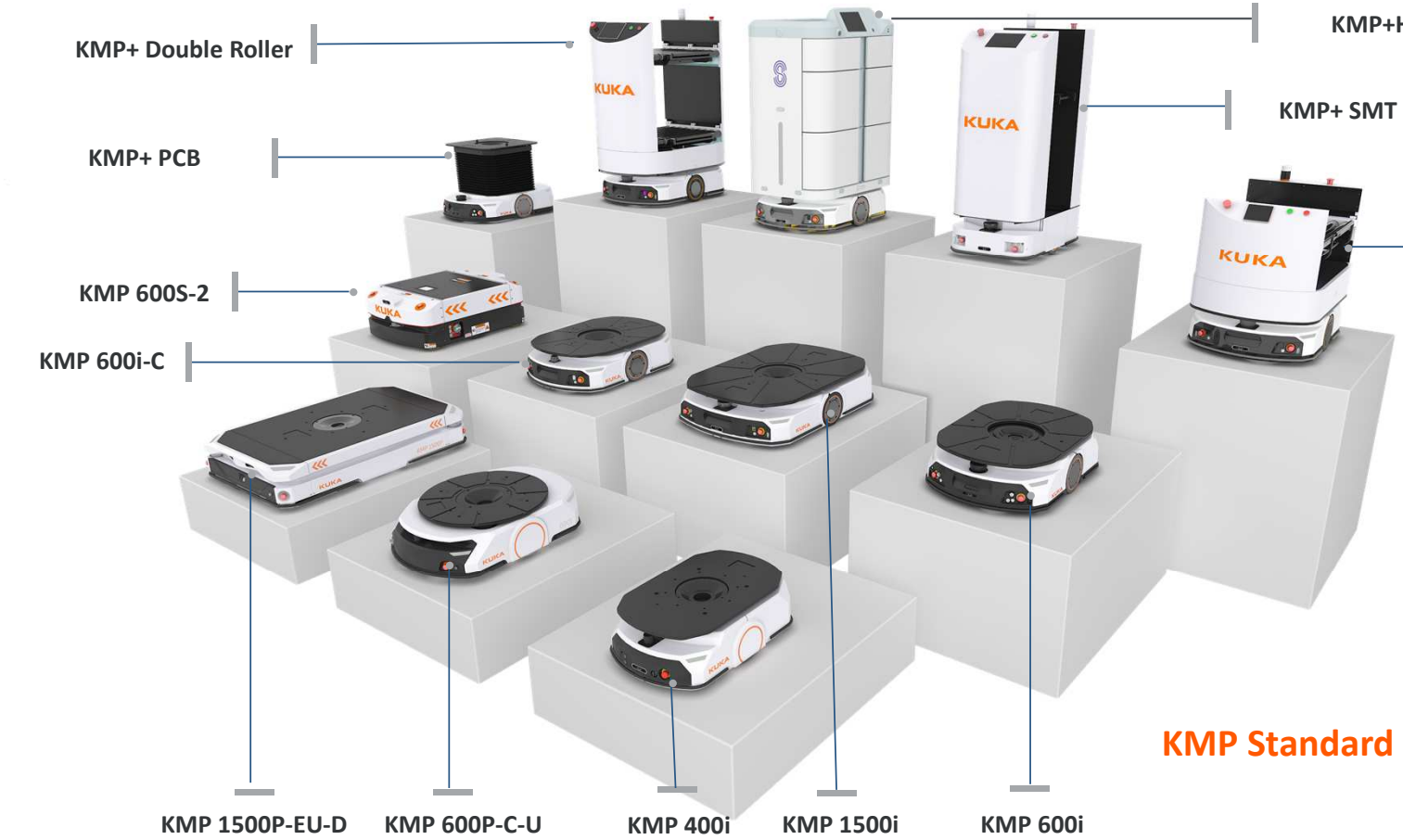
Localization (Particle filter)

Path Planning



❖ SLAM allows KMPs to navigate dynamically without relying on fixed routes.
This flexibility is crucial for adapting to changing layouts or operational needs.

KUKA AMR/AGV Product Family



KUKA

KMP

KUKA Mobile Platforms

* Product Launch

i-Series

KMP 600i

KMP 1500i

KMP 600i-C

KMP 400i

KMP 3000i

P-Series

KMP 600P-EU-D

KMP 1500P-EU-D

KMP 600W-C-U

KMP 3000P-D

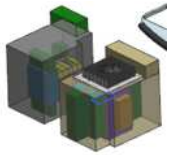
Our Entire KMP Products group into 2 main series:

- **i** -Series
- **P**-Series **(CE , UL , FCC)**

KUKA AMR_ KMP i Series Features

Payload
- ✓ max. 400kg / 600kg / 1500kg

Integrated Lifting Devices
- ✓ Max 60mm lifting stroke



Easy Maintenance
- ✓ Easy exchangeable control & power electronics cabinet

KUKA Navigation Solution
- ✓ SLAM Navigation (based on laser scanners)
- ✓ QR Code Navigation (based on bottom camera)
- ✓ Fleet Management system
- ✓ Highest flflexibility without external efforts

High Safety
- ✓ 1x laser scanner in front
- ✓ 3D camera in the front, and rear
- ✓ 4x emergency stops
- ✓ Sound alarm & visual signaling

Remote Controller
- ✓ Only for trained people

Load Detection Camera
- ✓ Load identification & tracking

Li-Ion/LFP Batteries
- ✓ 8 hours running time
- ✓ Less than 2 hours charging time

Differential drive
- ✓ Preferred driving direction (+ turn on spot)
- ✓ Up to 2.3 m/s speed

Touch Display
- ✓ Status / Control menue

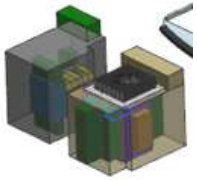
KUKA AMR_ KMP P Series Features

Payload

- ✓ max. 600kg / 1500 kg

IP 54 Protection

- ✓ Splash water
- ✓ Dust



Easy Maintenance

- ✓ Easy exchangeable control & power electronics cabinet

KUKA Navigation

- ✓ SLAM Navigation (based on laser scanners)
- ✓ QR Code Navigation (based on bottom camera)
- ✓ Fleet Management
- ✓ Highest flexibility without external efforts

High Safety

- ✓ 2x laser scanner in opposite corner (360° Protection)
- ✓ 3D camera in the front and rear
- ✓ Reduced velocity and sound alarm for backwards driving
- ✓ 4x emergency stops & side bumpers
- ✓ Sound alarm & visual signaling

Manual Controller

- ✓ Only for trained people

Load Detection Camera

- ✓ Load Identification & tracking

Certification

- ✓ UL certification by TÜV Rheinland
  FCC Options

Integrated Lifting Devices

- ✓ 60mm lifting stroke

Li-Ion/LFP Batteries

- ✓ 8 hours running time
- ✓ Less than 2 hours charging time
- ✓ Less than 1 hour recharged 80% SOC

Differential drive

- ✓ Preferred driving direction
  (+ turn on spot)
- ✓ Up to 1.8 m/s speed

Touch Display

- ✓ Status / Control menue

KUKA AMR_ KMP 3000i

Payload

_max. 3000 kg

Easy maintaining functions

_Side disassembly of wheel units
and inductive charger

KUKA Navigation

_SLAM Navigation (based on laser scanners)
_QR Code Navigation (based on bottom camera)
_VDA 5050 interface
_Highest flexibility without external efforts

High Safety

_2x laser scanner front and rear
_2x 3D camera in the front and rear
_4x emergency stops & side bumpers
_Sound alarm & visual signaling

Manual Controller

_Only for trained people

Load Detection Camera

_Load Identification & tracking

Integrated Lifting Devices

_80mm lifting stroke

LFP Batteries

_6-8 hours running time
_Less than 2 hours charging time (10-90%)
_Inductive charging on the ground

Omnidirectional drive

_Omnidirectional movement
_Unloaded max velocity 1.2m/s (flat)
_Loaded max velocity 1.0m/s (flat)

Touch Display

_Status / Control menue
_Display screen 5“

KUKA AMR_ KMP 3000P

Payload

_max. 3000 kg

IP 54 Protection

_Splash water
_Dust

Easy maintaining functions

_Side disassembly of wheel units
and inductive charger

KUKA Navigation

_SLAM Navigation (based on laser scanners)
_QR Code Navigation (based on bottom camera)
_VDA 5050 interface
_Highest flexibility without external efforts

High Safety

_2x laser scanner front and rear (360° Protection)
_4x 3D camera in the front and rear
_6x emergency stops & side bumpers
_Sound alarm & visual signaling

Manual Controller

_Only for trained people

Load Detection Camera

_Load Identification & tracking

Certification

_CE and UL certification

Integrated Lifting Devices

_100mm lifting stroke

LFP Batteries

_6-8 hours running time
_Less than 2 hours charging time (10-90%)
_Inductive charging on the ground

Omnidirectional drive

_Omnidirectional movement
_Unloaded max velocity 1.2m/s (flat)
_Loaded max velocity 1.0m/s (flat)

Touch Display

_Status / Control menue
_Display screen 5“

Omnidirectional movement brief introduction

Max unloaded velocity 1.2m/s (flat)

Max loaded velocity 1.0m/s (flat)

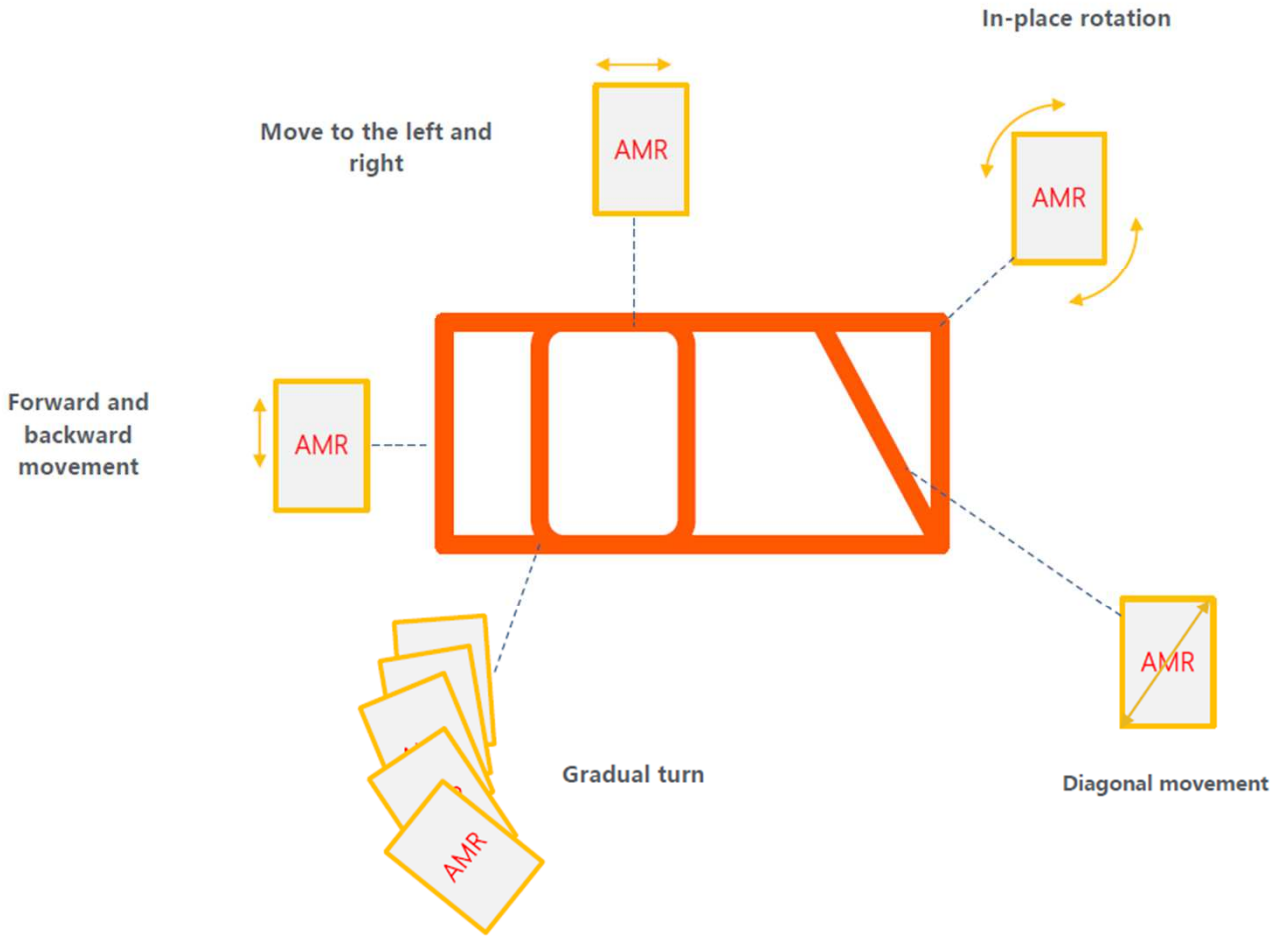
Payload 3000kg

Positioning accuracy

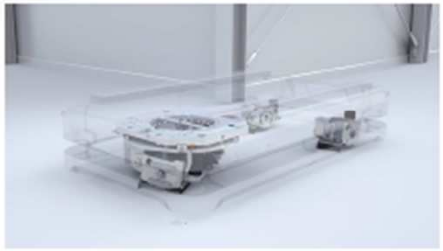
±15mm, ±1° (SLAM)

±5mm, ±0.5° (QR)

Turning radius in place 1.3m



Achieving omnidirectional movement using differential wheel units



- Innovation differential wheel units , make the vehicle lower wear, greater load ,simpler structure
- 4units wheels layout need narrower lane than 3units wheels of the competitor .

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Basic data	KMP 400i	KMP 600i	KMP 600i-C	KMP 600W	KMP 600P	KMP 1500i	KMP 1500P	KMP 3000i	KMP 3000P
Dimensions L×W×H	850×550 ×265mm	980×686 ×255mm	980×686 ×255mm	980×686 ×268mm	980×686 ×270mm	1180×820 ×255mm	1300×900 ×263mm	1900×1200 ×390mm	2200mm×1200mm ×370mm
Min. turning diameter	850mm	980mm	980mm	980mm	1115mm	1242mm	1505mm	2248mm	2506mm
Ground clearance	25mm	20mm	20mm	25mm	25mm	20mm	25mm	35mm	35mm
Lifting stroke	60mm	60mm	60mm	60mm	80mm	60mm	60mm	80mm	100mm
Weight	120kg	150kg	150kg	154kg	154kg	230kg	290kg	800kg	850kg
Rated load	400kg	600kg	600kg	600kg	600kg	1500kg	1500kg	3000kg	3000kg
Motion mode	Differential	Differential	Differential	Differential	Differential	Differential	Differential	Omni mode	Omni mode
Navigation mode	SLAM & QR	SLAM & QR	QR	QR	SLAM & QR	SLAM & QR	SLAM & QR	SLAM & QR	SLAM & QR
Lifting mode	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Hydraulic lifting	Electric
Security protection									
Laser obstacle	Front	Front	Front	Front	Front/rear	Front	Front/Rear	Front/Rear	Front/Rear
Front 3D obstacle	•	•	–	–	•	•	•	•	•
Rear 3D obstacle	•	•	–	–	•	•	•	•	•
Front point laser	–	•	–	–	-	•	–	•	–
Safety bumper	Surround	Surround	Surround	Surround	Surround	Surround	Surround	Surround	Surround
E–stop button	Diagonal, 2 buttons	Around, 4 buttons	Around, 4 buttons	Diagonal, 2 buttons	Around, 4 buttons	Around, 4 buttons	Around, 4 buttons	Around, 4 buttons	Around, 6 buttons
Sound warning	•	•	•	•	•	•	•	•	•
Indicator light	Front/Rear	Front/Rear	Front/Rear	Front/Rear	Front/Rear	Front/Rear	Front/Rear	Around	Around
Infrared laser light	–	•	–	–	-	•	–	-	–
Rack detection	•	•	•	•	•	•	•	•	•
Motion performance									
Max. driving speed (w/o load)	1.5m/s	2.3m/s	2.3m/s	2m/s	2m/s	1.8m/s	1.8m/s	1.2m/s	1.2m/s
Max. driving speed (w/ load)	1.0m/s	1.5m/s	1.5m/s	1.5m/s	1.5m/s	1.5m/s	1.5m/s	1.0m/s	1.0m/s
Positioning accuracy	±10mm, ±1° (SLAM)/ ±5mm, ±0.5° (QR)	±10mm, ±1° (SLAM)/ ±5mm, ±0.5° (QR)	±5mm, ±0.5°	±5mm, ±0.5°	±10mm, ±1° ±5mm, ±0.5° (QR)	±10mm, ±1° (SLAM)/ ±5mm, ±0.5° (QR)	±10mm, ±1° (SLAM)/ ±5mm, ±0.5° (QR)	±10mm,±1° (SLAM) ±5mm,±0.5° (QR)	±10mm, ±1°(SLAM) ±5mm, ±0.5°(QR)
angle	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Ground step height	5mm	5mm	5mm	5mm	10mm	5mm	10mm	10mm	10mm
Ground gap	35mm	35mm	35mm	35mm	35mm	35mm	35mm	35mm	35mm
Battery data									
Battery type	LFP	LFP	LFP	LFP	LFP	LFP	LFP	LFP	LFP
Battery endurance	8h	8h	8h	8h	8h	8h	10h	8h	8h
Battery lifecycle	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles	>2000 full charge cycles
Charging time	<1.5h	<1.5h	<1.5h	<1.5h	<1.5h	<1.5h	<1.5h	<2h	<2h
Charging method	Automatic / Manual Charging	Automatic / Manual Charging	Automatic / Manual Charging	Automatic / Manual Charging	Automatic / Inductive / Manual Charging	Automatic / Manual Charging	Automatic / nductive / Manual Charging	Inductive / Manual Charging	Inductive / Manual Charging
Other									
IP Class	IP20	IP20	IP20	IP20	IP54	IP20	IP54	IP20	IP54
Operating temperature	0°C~45°C	0°C~45°C	0°C~45°C	0°C~45°C	0°C~45°C	0°C~45°C	0°C~45°C	0°C~45°C	5°C ~ 45°C
Operating noise	≤ 75 dB(A)	≤ 75 dB(A)	≤ 75 dB(A)	≤ 65 dB(A)	≤75dB(A)	≤ 75 dB(A)	≤ 75 dB(A)	≤ 75 dB(A)	≤ 75 dB(A)
Communication method	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G	IEEE 802.11 a/b/g/n/ac, 2.4G / 5G
Certification	–	–	–	CE, NRTL, FCC	CE, UL, cUL, FCC	–	CE, UL, cUL, FCC	-	CE, UL, cUL, FCC

Charging

Charging station – P Series

Conductive charging

- 2 hour charging for approx. 8 hours of operation
- Li-ion battery: 48 V
- Battery capacity: 35Ah
- Battery life time: 1500 cycles

Technical Data	
Model	KMPC 48S35-1-S2 KMPC 48C35-1-S2 KMPC 48U35-1-S2
Weight	38±2 Kg
Dimension	530*500*820mm
Input voltage	110-240 V AC
Input current	13 A
Rated frequency	50/60 Hz
The output voltage	DC 57.6 V
Maximum output current	35 A
Default output current (manual model)	17.5 A
Operating temperature	-20-45 ℃

Charging station – I Series

Status Display Screen

- Charging state
- Input voltage & current
- output voltage & current
- Alarm information

Charger Connector

- Industrial connector
- Life>10 years
- Floating docking for safer and more reliable operation

Safety Protection

- Output current limiting protection
- Short circuit protection
- Reverse charging protection
- Over temperature protection, etc

Technical Data

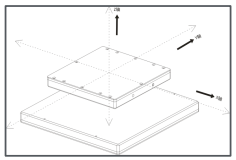
Size (L*W*H)	531*473*820 mm
Weight	≤40KG
Input voltage	110~240V AC
Charging port height	135mm
Output voltage	30-60 V DC
Output overvoltage alarm	59.5V
Output overvoltage protection	60V
Maximum output current	35A
Output overcurrent protection	35A
Communication protocol	MODBUS
Working environment humidity	10%~95%
Working temperature	0℃~45℃

High-power inductive charging on the ground

Input power	> 3000w
Positioning accuracy	±30mm
IP degree	IP65
Charging efficiency	>85%
Power connection	200-240V 50-60HZ 1.5mm² diameter cable Not multiple socket

Charging under the workstation.

No open flame, no contact wear



Four directions to enter the charging area

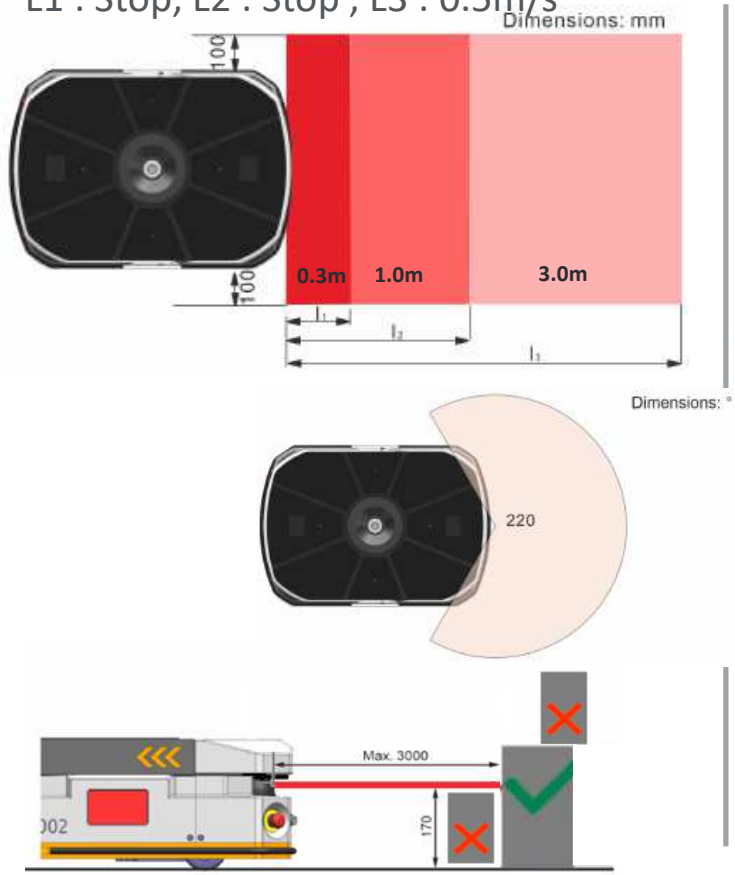
3000W High-power

Safety

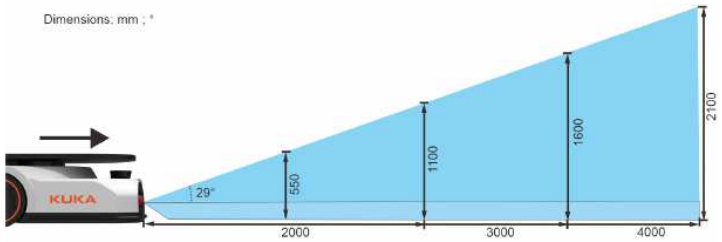
KUKA Safety - I Series (400i / 600i / 1500i)

Front Laser scanner

L1 : Stop, L2 : Stop , L3 : 0.5m/s

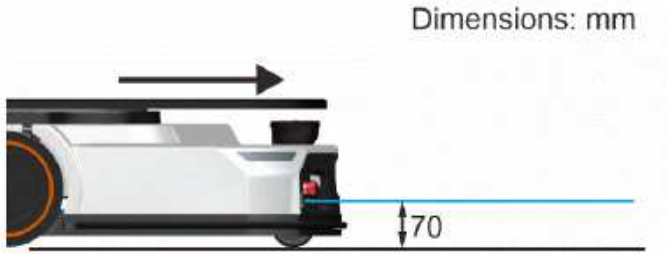


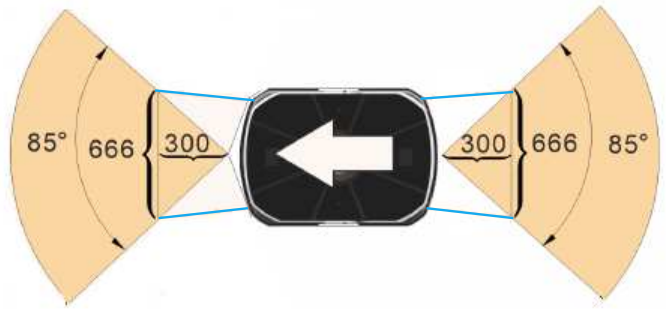
Front 3D binocular camera



Rear 3D binocular camera

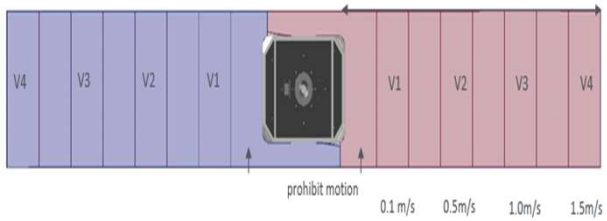
Single-point TOF laser



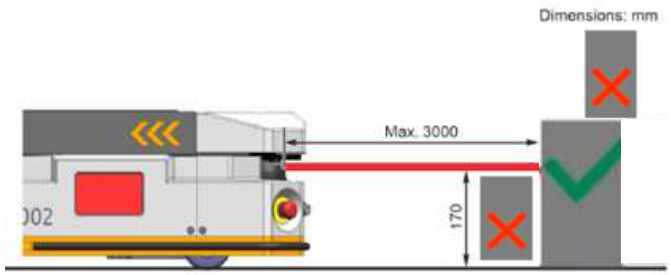


KUKA Safety – P Series (600P / 1500P)

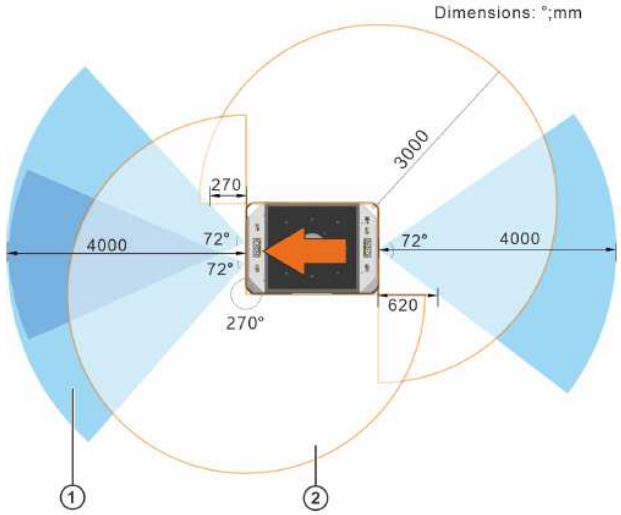
Front and rear laser scanner



Field	Protection field in forward	Protection field in lateral	Maximum velocity	Theta limit
1	385 mm	344 mm	100 mm/s	30 °/sec
2	591 mm	544 mm	500 mm/s	30 °/sec
3	1230 mm	544 mm	1000 mm/s	30 °/sec
4	2026 mm	544 mm	1500 mm/s	30 °/sec

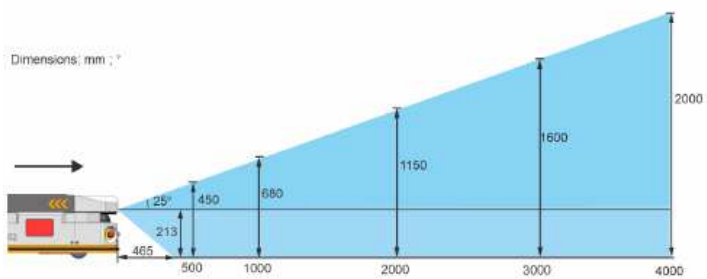


3D binocular camera

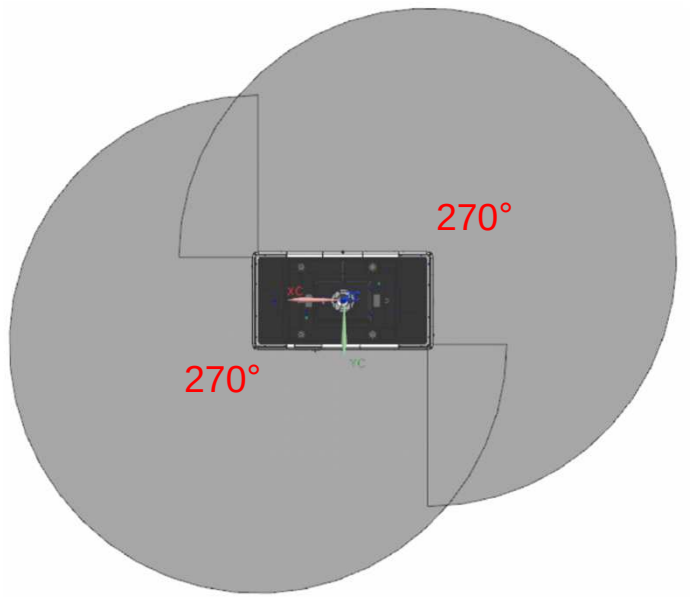


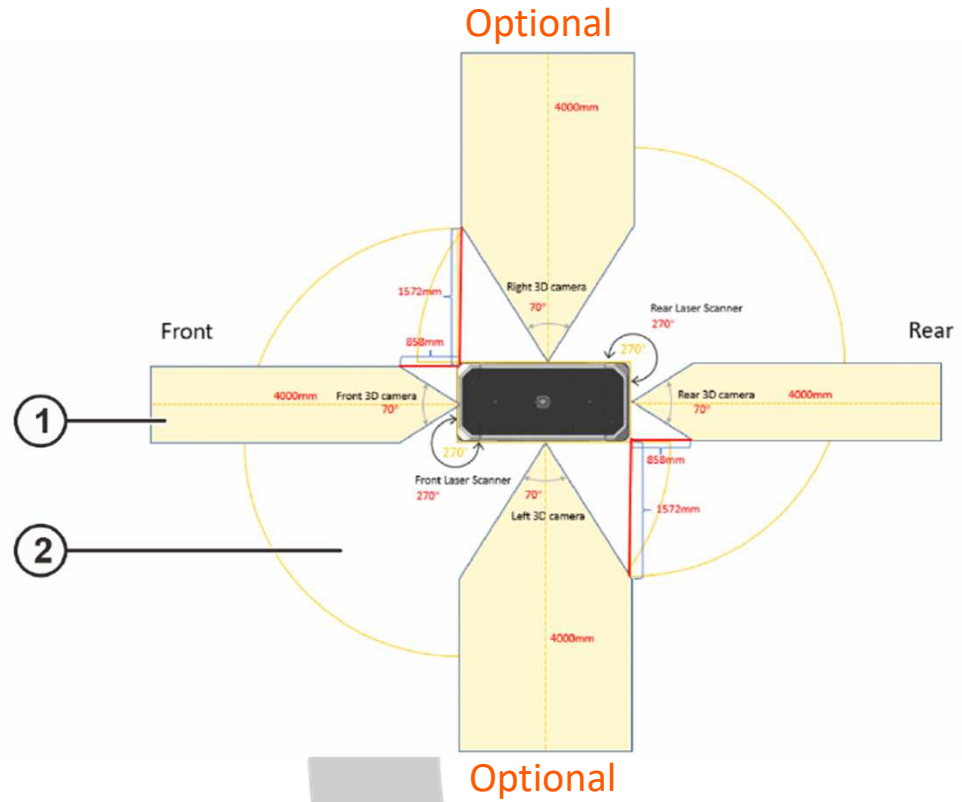
Obstacles detection overview

1 Detection range, 3D camera
2 Detection range, laser scanner



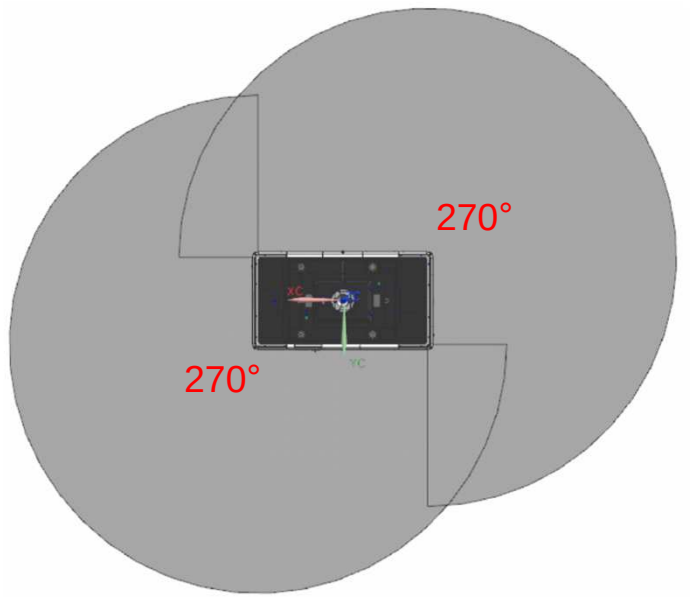
360° protection& 4-layers obstacle avoidance (KMP3000i)

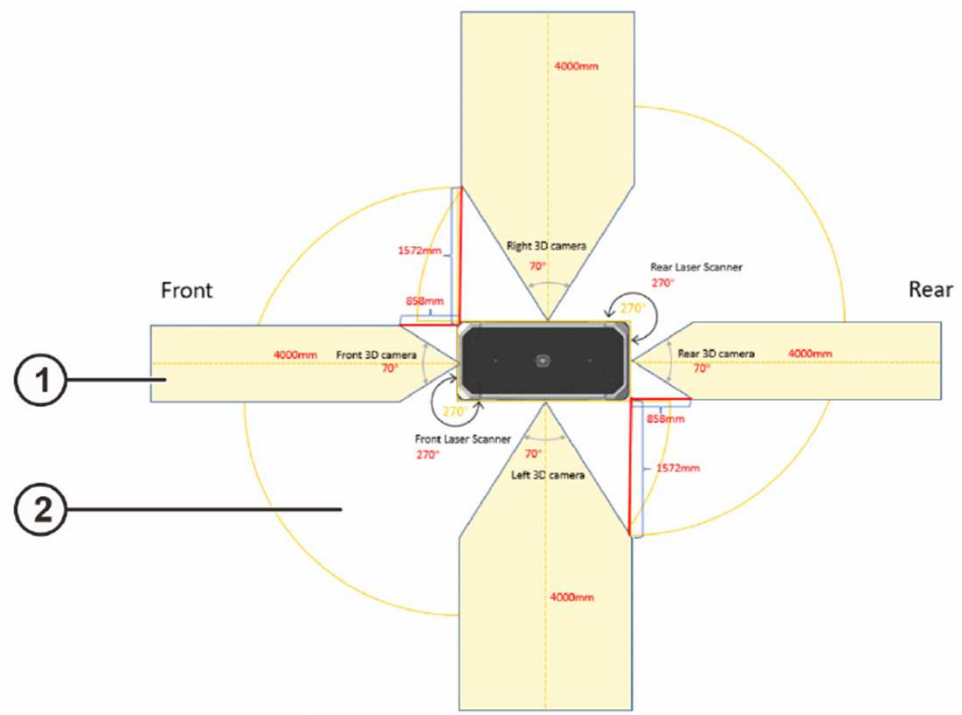




The first layer : 360° obstacle avoidance by 2 safety lidars
The second layer: Enhanced low dangling obstacle avoidance by 3D cameras
Standard 2 x 3D Camera (Front and Rear) (Optional for 4x 3D Camera)
The third layer : **4** Emergency stop buttons
The fourth layer : 360° bumper sensors

360° protection& 4-layers obstacle avoidance (KMP3000P)





The first layer : 360° obstacle avoidance by 2 safety lidars
The second layer: Enhanced low dangling obstacle avoidance by 4 3D cameras
The third layer: 6 Emergency stop buttons
The fourth layer: 360° bumper sensors

Safety Edge

The KUKA KMP is equipped with safety contact edges against collision with person or objects additionally. If the safety edge detects, the drive is stopped ***immediately***. As a result, the safety risk for workers and material damages during ongoing operations is reduced to a minimum.

❖ With this multi-layered safety approach, the KMP can operate confidently in busy environments, avoiding collisions and ensuring the well-being of people and goods.

i Series 360° All Around Protection

KUKA AMR Features (Highlights)

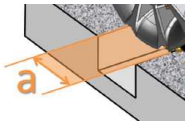
Shelf Leg Recognition Entry

Shelf Code Position Alignment

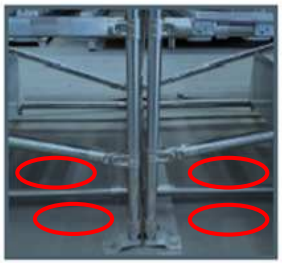
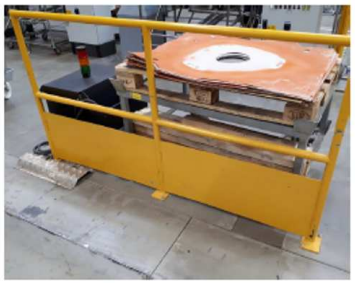
Vibration Suppression Algorithm

Environment

Environment _ Guideline

Flatness		<=5mm within 1m²
Slope		5%（H/L）
Gap		<=35mm
Temperature		Operation: 0°C - max. 45°C Storage: -10°C - max. 45°C Transporting: 0°C - max. 45°C
Humidity		Operation: 10% - max. 80% (No condensation) Storage: 5% - max. 95% (No condensation) Transportation: 5% - max. 95% (No condensation)

KUKA Environment _ Guideline

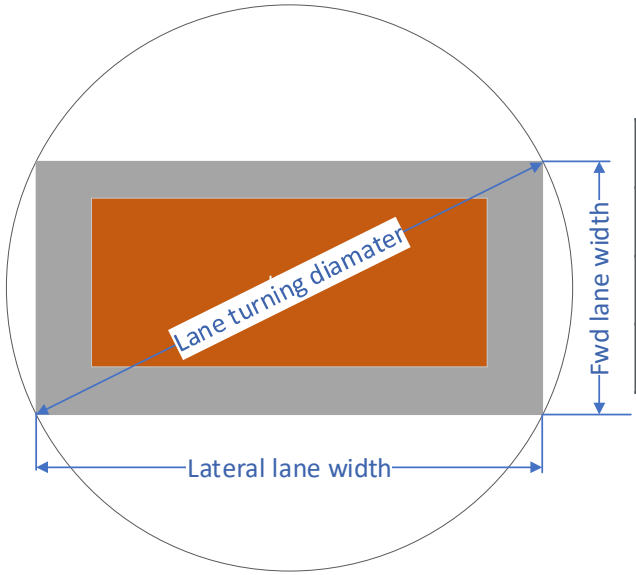
Situation	NG	OK
Laser scanner can see through 		
Dynamic change in production area	 	
Transparent surface		

KUKA Environment _ Guideline

Floor Condition : **Can the specific KMP/KMR drive on your shop floor?** Look for things like potential obstacles, holes, slopes, liquids. Information can be found in the operating instructions of the products.	
Traffic : **Can the specific KMP/KMR drive on your floor uninterrupted?** Check the driving path for areas with high foot or vehicle/forklift traffic. In very busy areas, the KMP/KMR might stop often	

KUKA AMR_ Guideline: Minimum free space required for KMP only (rack not included)

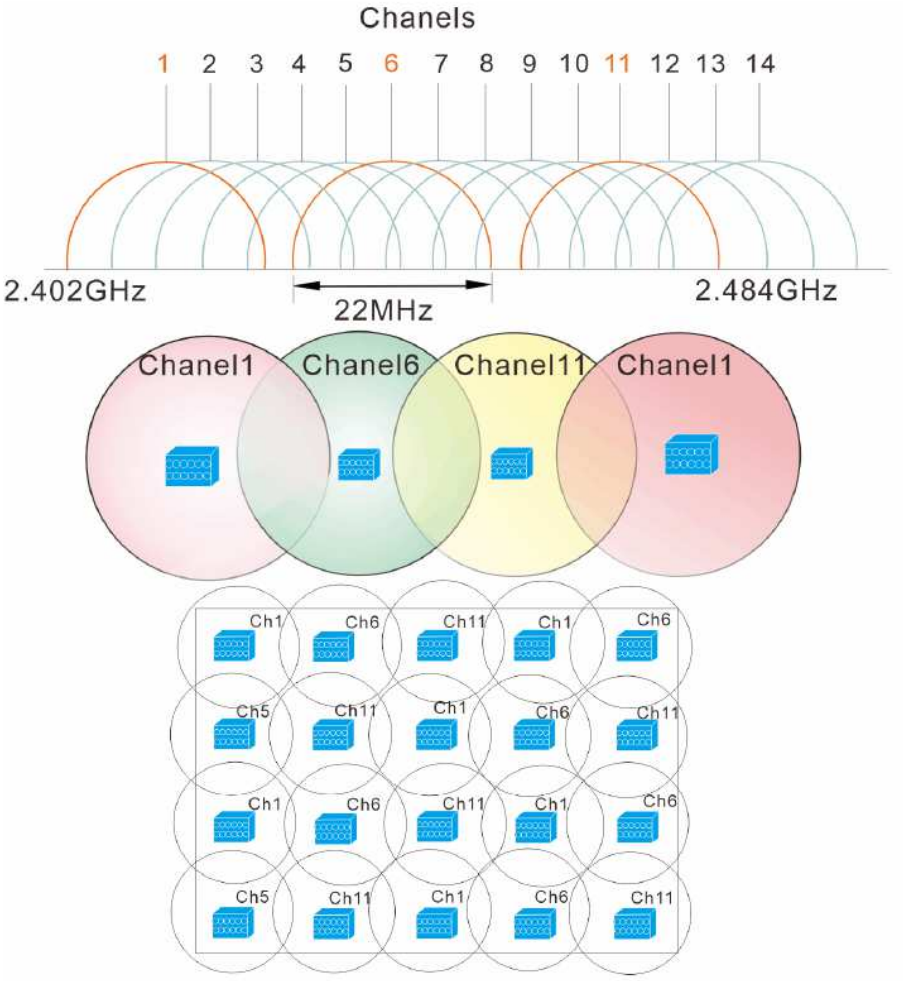
- Table below shows the minimum space needed for forward/backward motion, sideways motion and turning motion as well as for double lanes.



	KMP 600S-2	KMP 600i	KMP 1500i	KMP 1500P
Forward lane width (m)	1.45	1.12	1.62	2.02
Double forward lanes (m)	2.55	2.2	3.2	3.54
Turning diameter – fast (m)	2.26	1.42	1.68	2.61

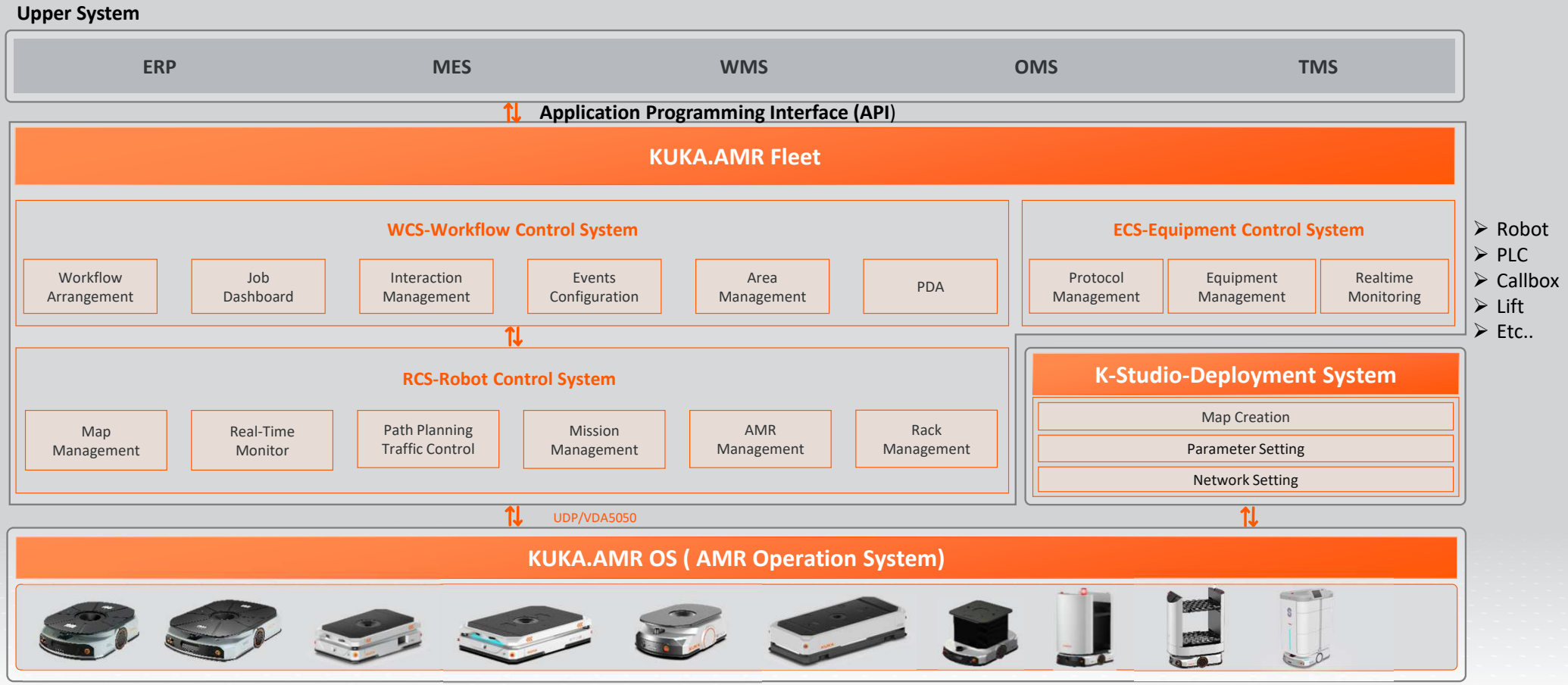
Wireless communication

- WIFI must cover all the running area
- In a network it must be guaranteed that the same frequency ranges/channels do not overlap.
- Support IEEE 2.4G Hz and 5G Hz WIFI
- WIFI quality: >=-65 dBm
- Channel 1, 6, 11 are recommended if 2.4G Hz used



Software : KUKA.AMR Fleet

KUKA.AMR Fleet =Robot Platform + Software Platform + Management Platform



Vehicle operating system / control system.
- Navigation , Motion and Interface Module

KUKA AMR_ KMReS (KUKA.AMR Fleet)

WCS

Workflow **C**ontrol **S**ystem

Job arrangement management system

- Supports customized integration
- Highly flexible workflow management
- Real-time monitoring of all operations

RCS

Robot **C**ontrol **S**ystem

Robot dispatching system

- Multi-type device dispatching
- Optimal path planning
- Traffic control based on the logic of no dead-lock
- Integrated design of monitoring center to meet different needs

ECS

Equipment **C**ontrol **S**ystem

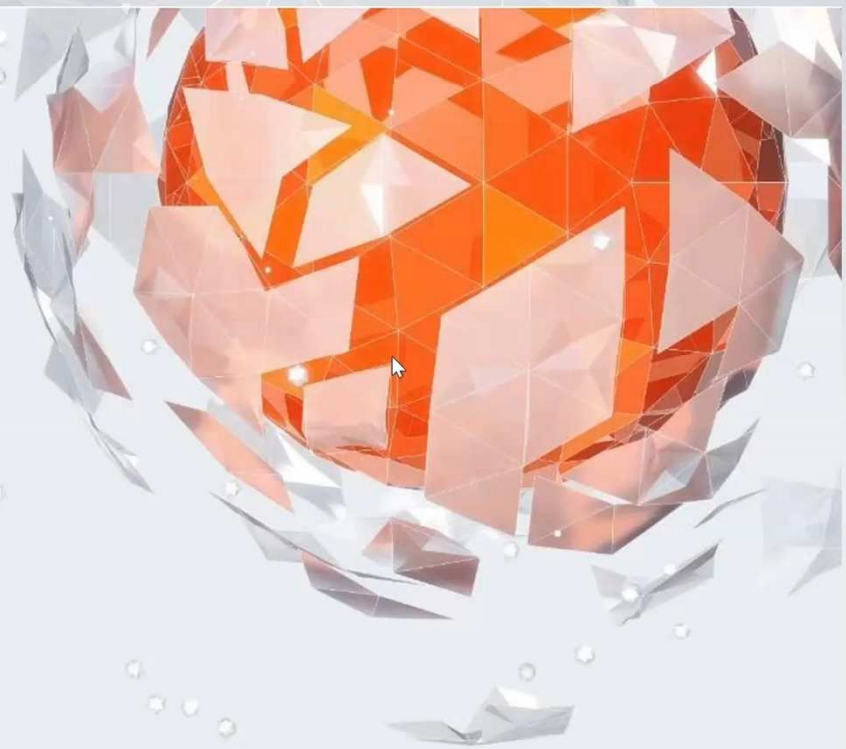
Equipment control system

- Check device running status in real time
- Graphical management & control
- Log management

KUKA

KUKA

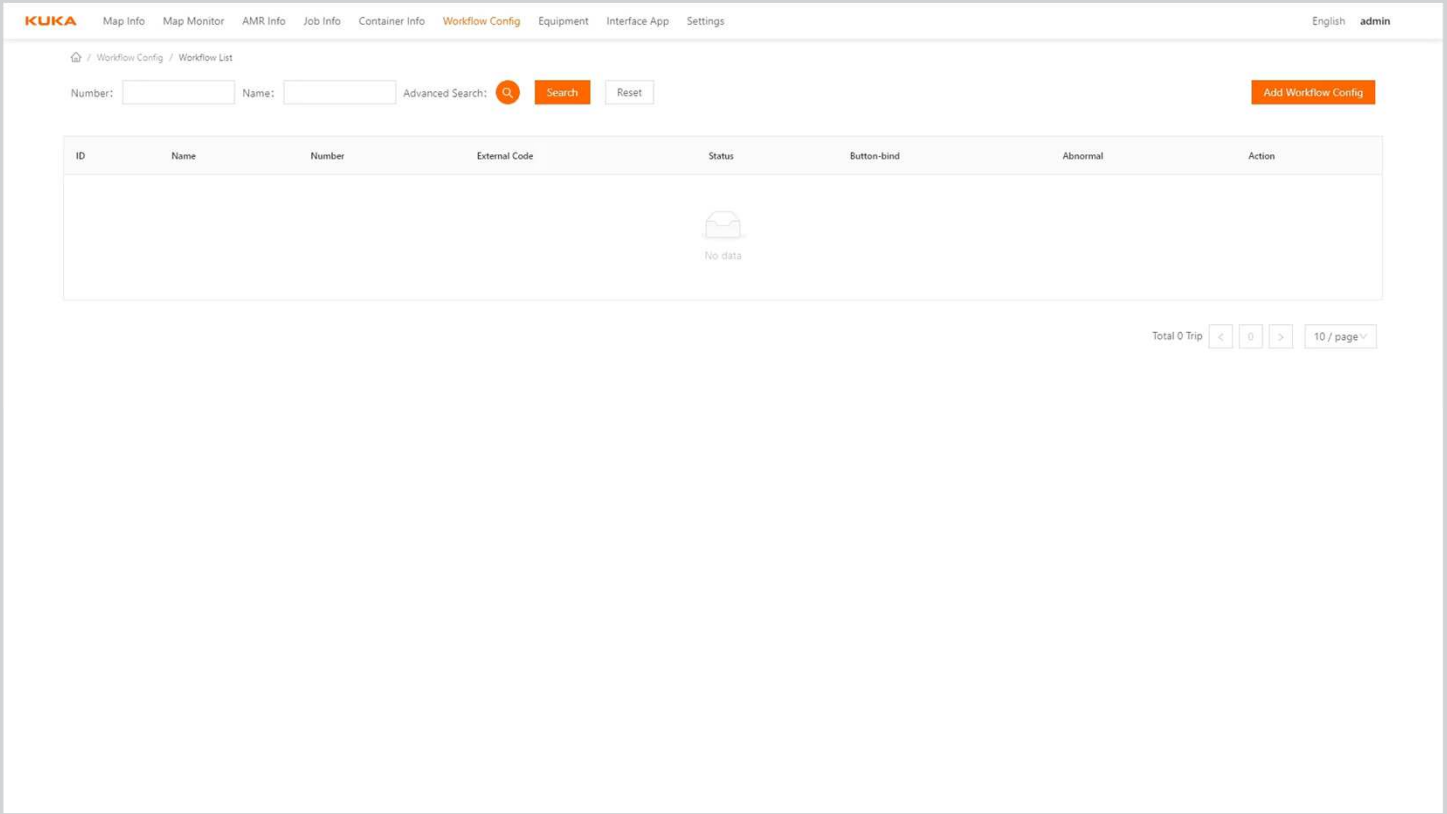
KUKA.AMR Fleet



KUKA.AMR Fleet software

Process management

- Graphical configuration
- convenient Interaction
- complete configuration

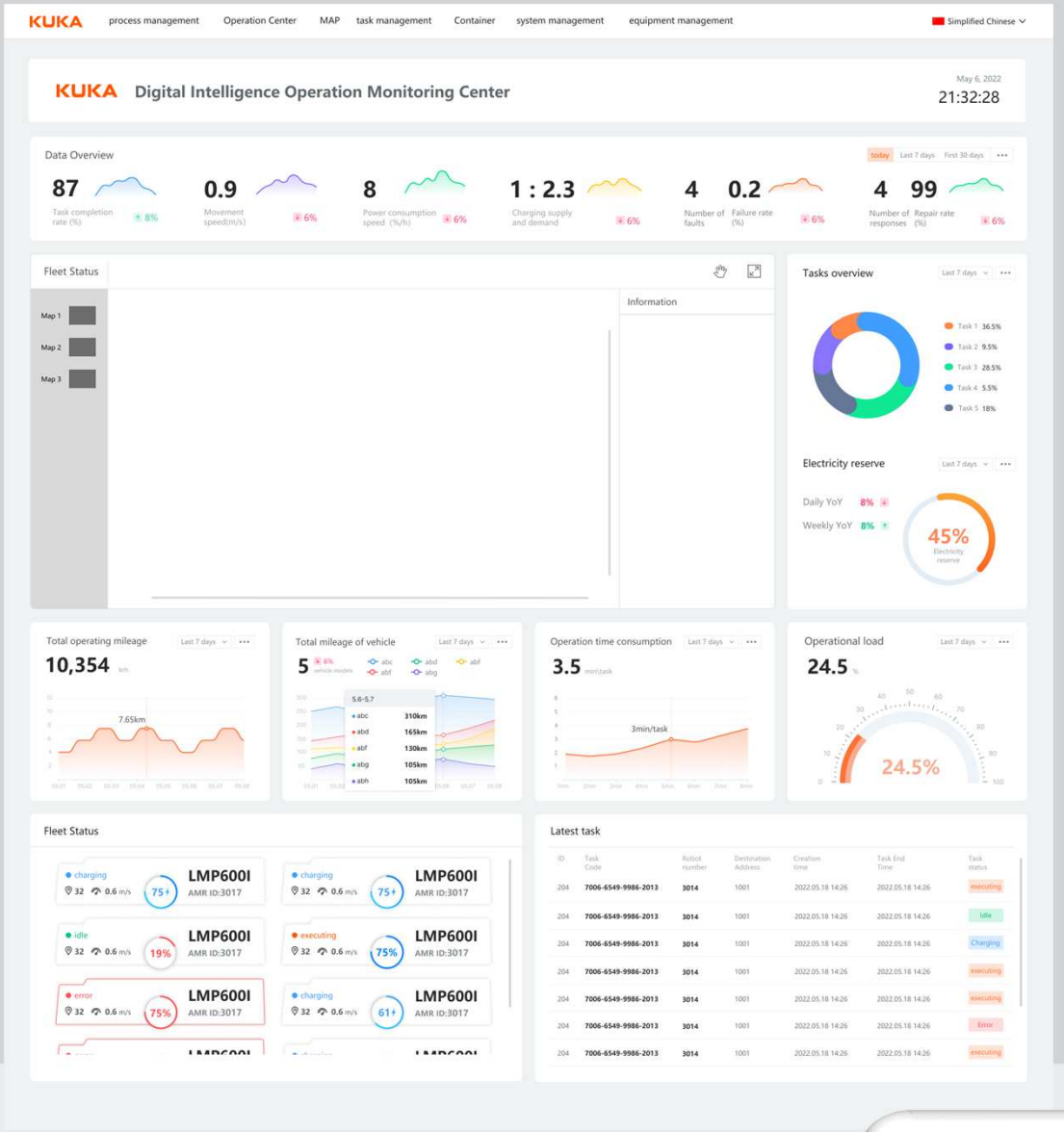


❖ Unlike complex coding-based systems, KUKA Fleet Manager adopts a user-friendly approach. Users can create and manage routes, tasks, and schedules using a simple drag-and-drop interface.

KUKA AMR_ WCS (Dashboard)

Dashboard Editor

- Design customized DB
- Map Monitor
- Different size of screens
- 15 different statistic data/cards



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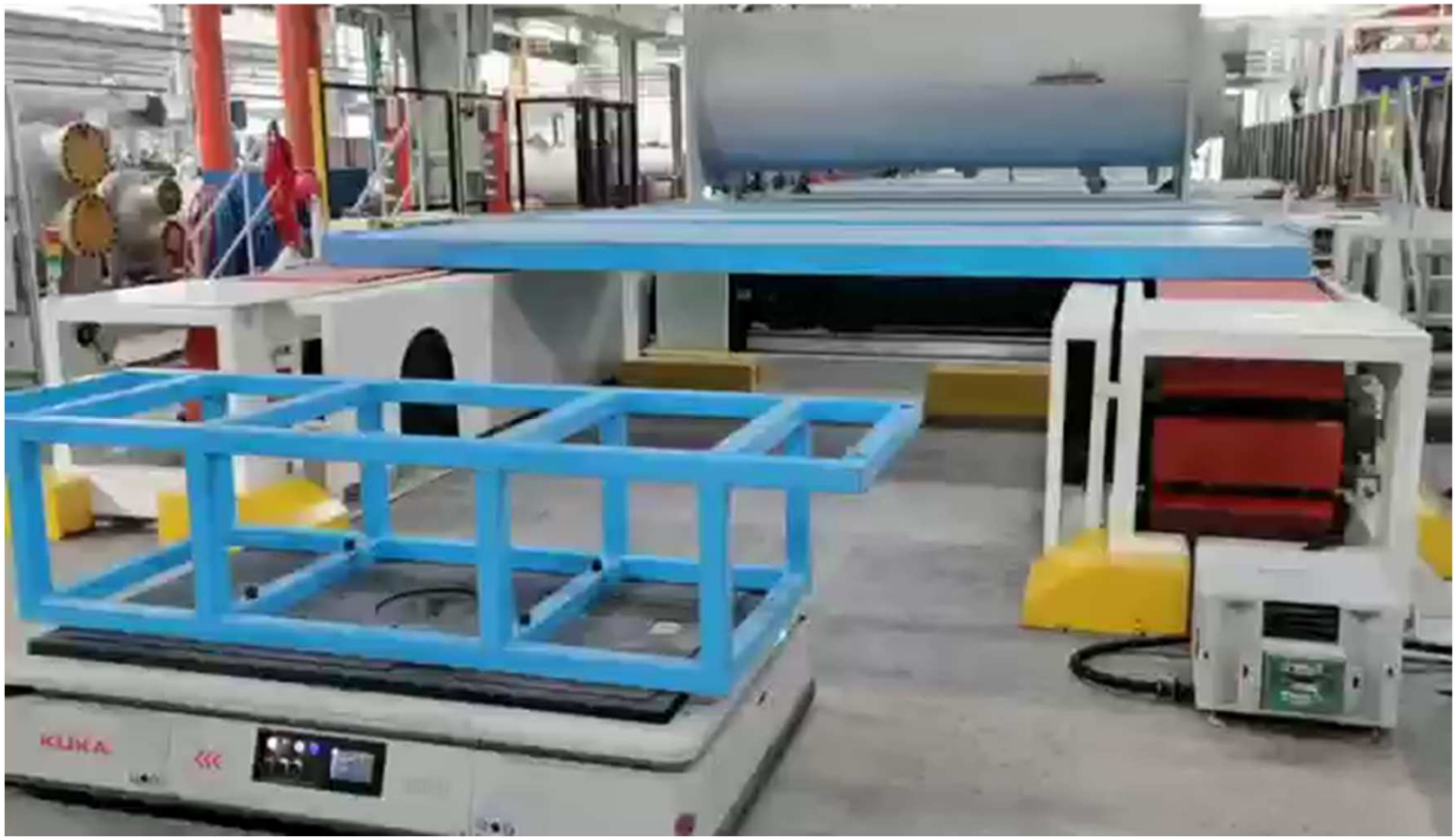
Applications

KUKA Shunde Factory_Robot manufacturing

Midea Building Technology and KUKA AMR

KMP 3000i



KLT Intelligent Logistics Project, Zhuhai

- References-3C industry

The business case

Background KLT Zhuhai established in 1998, the company is a modern small appliance company.

Objective Upgrading of the factory to improve the efficiency of logistics turnover, reduce error rates, increase productivity and decrease reliance on skilled labor.

The solution

Brings your logistics automation into the next level

Supply Scope

- KMP 600i : 4 with SLAM & QR code fusion navigation
- K-MReS software management

Solution

AMR system connect 10 production lines to kitting areas for automation, motor, base and injection molding in the area of 4,500 sqm

Customer benefits

- 2 less delivery staff, saving labor cost
- 99.9% delivery accuracy with digitalized system
- New employees can start operation within half day

Midea Refrigerator Intelligent Logistics Project, Hefei

- References-White Goods industry

The business case

Background	Hefei Midea Refrigerator was founded in 1996, this plant has the capability to manufacture multiple models of Midea refrigerator.
Objective	Upgrade factory automation to meet market demand by increasing warehouse logistic efficiency and at the same time achieve cost reductions.

The solution

Brings your logistics automation into the next level

Supply Scope

- KMP 600i : 10 with SLAM & QR code fusion navigation
- K-MReS software management

Solution

AMR system connect 10 production lines to warehouse area providing safe and reliable 7x24 hour all-weather full process operation.

Customer benefits

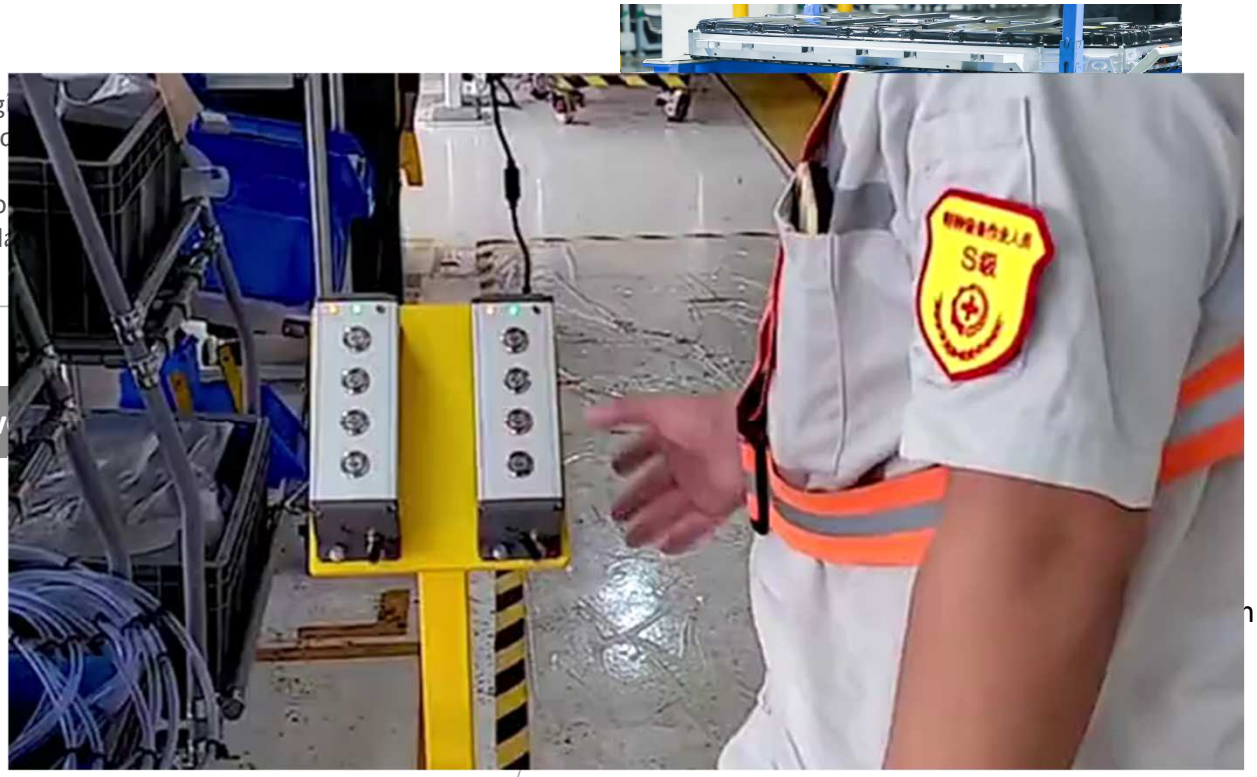
- High density storage, with increased usage: Product storage capacity increase by 2.6 times.
- 8 less, workers, saving labor costs.
- Fast, flexible deployment, digital management and control

GAC AION Assembly Workshop, Guangzhou

- References-Automotive industry

The business case

Background	GAC AION was established in 2017 as a strateg Group. The total planned production capacity c
Objective	In order to upgrade the Skylight & Battery pro automatically, digital monitoring, intelligent da



The solution

Brings your logistics automation into the next lev

Supply Scope

- KMP 1500i : 8
- K-MReS software management
- Customized WMS seamlessly connect to customer's WMS

Solution

Material sequencing, cache and transfer for car skylight&battery by 8 lifting AMRs

KUKA

_ Industry Case - GI

—Sheng Warehouse Tailings Intelligent Logistics Project
China – Dongguan

ASSAB

Project background & target

Project background :

Yishengbai was founded in 1945 and is a comprehensive steel manufacturing company for tooling and molds.

Customer target :

Realize intelligent logistics for mold processing in the entire factory, adapt to diverse handling needs in complex and changing scenarios, and solve the problem of severe oil pollution on the ground on site.

Solution

Supply Scope

- 8 AMR KMP 600i
- KUKA.AMR Fleet software platform

- Intelligent logistics system: realizes flexible material transportation from warehouses, mold processing areas to production line edge storage areas
- Integrating multiple task triggering methods: including PC/PDA/robotic arm/WMS
- Integrated navigation system: adopts laser SLAM+QR code navigation for vehicle, and SLAM navigation is used for operating route, without the need for sticking QR Code, adapting to oily ground environments

Customer benefits

1. **Reduce working force and lower labor costs**
2. **Establish an intelligent logistics system to set a model for the entire factory logistics**
3. **Rapid launch in 45 days without affecting normal factory production**

Industry Case - New Energy Storage

Weijing Energy Storage Intelligent Logistics Project
China – Yancheng

Project background & target

Project background :

Weijing Energy Storage was established in 2018 and is an intelligent manufacturing company for energy storage batteries.

Customer target :

Realize the management of raw materials and line side warehouse materials, and automatically enter and exit the warehouse; Intensive storage management and distribution in the finished product area, automatic docking of AMR with production line conveyor lines and robotic arms for material retrieval and release.

Solution

Supply Scope

- Two AMR KMP 1500i equipped with customized material trucks; 2 narrow aisle forklifts
- KUKA.AMR Fleet

- AMR robots: 2 AMR-KMP1500i with customized racks for automatic feeding and docking with robotic arm systems
- Forklift AMR: 2 narrow aisle forklifts AMR achieve automatic loading and unloading of raw material warehouses and automatic docking of stack assembly conveyor lines
- Software platform: KUKA AMR Fleet manages raw material warehouse, edge warehouse, finished product area material information, container information, inventory information etc

Customer benefits

1. **Reduce working force and lower labor costs**
2. **Eliminating information gaps in different areas of the workshop and improving the level of information collection and integration**
3. **Improved the intelligence level of the entire factory, with a delivery accuracy rate of 99.9%**

Online Time: 2023.Q4

Industry Case - New Energy photovoltaics

Shuangliang Third Factory Intelligent Logistics Project China – Baotou

Project background & target

Project background :

Shuangliang Group was founded in 1982 and is a new energy and new material research and development manufacturing company.

Customer target :

Realize intelligent logistics for the entire factory of silicon rod processing and production, while ensuring the accuracy requirements for automatic loading and unloading of the station's robotic arm/crane; The production line has a fast pace of production and requires high AMR efficiency.

Solution

Supply Scope

- Two AMR KMP 1500i equipped with customized material trucks; 2 narrow aisle forklifts
- KUKA.AMR Fleet

- Intelligent logistics system: 16 KMP 600i+KUKA .AMR Fleet software platform enables flexible material transportation from raw material warehouses, silicon rod processing areas to finished product storage areas
- Accurate positioning: The robotic arm/overhead crane is connected to KUKA AMR Fleet software platform, precise positioning of parking position QR code, with a point accuracy of ± 5mm/± 0.5 °

Customer benefits

1. **Realize unmanned entire process and intelligent logistics for the entire factory**
2. **More stable production pace and safer on-site environment**
3. **The accuracy rate of production material distribution reaches 99.9%**
4. **Support 7 * 24-hour uninterrupted production to improve work efficiency**

Online Time: 2023.Q2

_Industry Case – Automobile

Customer B's after-sales AGV warehouse project
in Xi'an, China

Project background and objectives

Background :

Customer B was established in 1995, with a business layout covering fields such as automotive manufacturing, electronics, new energy, and rail transit;

Customer Objectives :

By automating the handling and intelligent management of finished small items in the after-sales warehouse, we can improve the storage density and efficiency of small item storage, reduce error rates, and enhance operational efficiency.

Solution

Scope of supply

1. AMR 1500i * 20
2. Workbin AMR * 10
3. Robot Arm * 1
4. Conveyor line
5. Customized WMS, real-time management of warehouse, inventory, and inbound and outbound order information

- Automation equipment upgrade: achieving high-density storage and rapid entry and exit of finished small parts in the after-sales warehouse
- AMR robot: ① Transfer large pallets from the picking area to the area that meets the shipment review criteria. ② According to after-sales orders, meet the picking needs of people on delivery

Customer revenue

1. **Reduce 6 personnel and lower labor costs**
2. **Small item library storage density increased by 200%**
3. **Picking accuracy reaches 99.9%**
4. **Overall efficiency improvement by 100%**

Online time: 2023.Q2

_Industry Case – Automobile

Customer B Warehouse Logistics Project
in Pingshan, China

Project background and objectives

Project objectives :

Realize automatic handling of semi-finished products, automatic warehousing, picking, and outbound of semi-finished products and material boxes; IWMS implements customized functions such as inbound, outbound, inventory, tally, and posting.

Solution

Scope of supply

- AMR KMP 600i-C * 6
- Workbin AMR * 7
- IWMS improves the overall material handling process

- Intensive storage: A planned 1000 square meter material box warehouse with a total of 4224 storage locations
- AMR robot: realizes automatic transportation of semi-finished product carts from injection molding workshop workstations to inbound and outbound connection areas, as well as from outbound connection areas to assembly line workstations
- Realize functions such as automatic warehousing of material boxes, full box outbound, picking outbound, etc.

Customer revenue

1. **Realize the full process automation, unmanned, and digitalization of line edge handling/warehousing/storage /outbound**
2. **Reduce factory manpower investment and lower costs**
3. **Improve delivery timeliness, reduce the number of line side caches, and improve space utilization**

Online time: 2023.Q2

_Industry Case – Automobile

Customer A's Phase I Intelligent Logistics Project
in Guangzhou, China

Project background and objectives

Background :

Customer A was established in 2017 and is a strategic new energy vehicle brand. The factory plans to have an annual production capacity of 400000 vehicles.

Customer Objectives :

By upgrading the automation of the skylight canopy and PACK battery production line, material automatic distribution and handling can be achieved to meet production rhythm requirements and improve information management level.

Solution

Scope of supply

- KMP 1500i * 8
- KUKA.AMR Fleet docking with customer factory WMS to achieve business continuity

- Sort and distribute materials through 8 AMRs to meet high rhythm requirements and achieve AMR task management

Customer revenue

1. **Realize the automation and intelligence of the entire process of transportation**
2. **Reduce manpower input by 6 people and improve production efficiency by 5.8%**
3. **Improve the level of informatization and digital management, and enhance the level of intelligent manufacturing in factories**

_Industry Case – Automobile

Customer A Welding Material Distribution Project
in Guangzhou, China

Project background and objectives

Background :

Realize automated material distribution by welding fixture materials from the material preparation position and delivering them to the robotic arm docking station through AMR

Customer Objectives :

Through intelligent logistics transformation, high-precision automatic docking and transportation can be achieved, adapting to the flow rhythm while meeting the requirements of high-precision automatic docking.

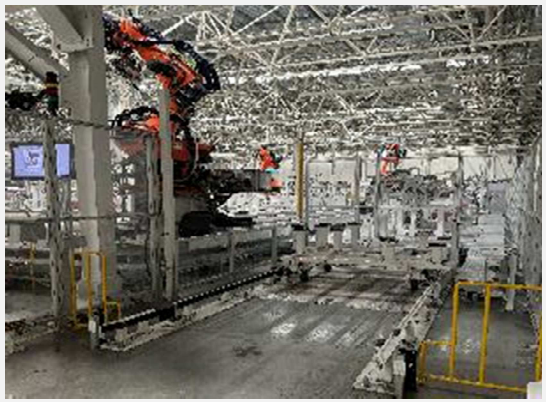
Solution

Scope of supply

- KMP 1500i * 2
- KUKA.AMR Fleet docking robotic arm

- By using two AMRs, the material handling of the welding fixture at the material preparation position is achieved. At the same time, signal interaction is carried out with the workstation robotic arm at the end, and precise positioning is achieved through the combination of reflective panels and QR codes. The point to point accuracy can reach ± 5mm/± 0.5 °, meeting the flow rhythm requirements and achieving high-precision docking and distribution

Customer revenue



1. **Reduce personnel walking for work**
2. **Fit to high production rhythm**
3. **Enhance the level of intelligence, achieve high-precision automatic docking of equipment, and improve the level of factory intelligent manufacturing**

APeC | **India** | Mahindra & Mahindra, Pune

AMR : KMP 3000i – 7 units

- End customer is a leader in Indian automotive sector for private, commercial and agricultural vehicles. They also export to APAC, Africa & Middle East, and South-Central America, across 16 countries with the headquarter in India.
- Mahindra & Mohammed began as a steel trading firm and later ventured into manufacturing and selling larger MUVs. It was renamed Mahindra & Mahindra in 1947. Today, Mahindra Automotive is one of India's leading manufacturers of passenger and commercial vehicles. Mahindra has vehicles which include SUVs, electric SUVs, Pik-ups, Electric Vehicles, Trucks, Small Commercial Vehicles, and buses. Its range includes various Mahindra cars, including new models, catering to a broad spectrum of customers
- Total 7 units AMR purchase for Phase 1. (10 in pipeline for phase 2)

- Responsible team: Shaurav Kumar / Abhishek Sharma
- Contact person: Ayush Chadha
- Product/Solution: 7 units KMP 3000i
- Application: Material Transportation
- Why was KUKA preferred: KUKA strong technical and commercial support, timely respond to customer, visit by Michael & Deric, and presence of robotics business with Mahindra, good customer relations

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Preventive Maintenance

KMP 600I

Interval	Activity
Before start-up and recommissioning	Check the vehicle for loose, defective and damaged components. Fasten loose components and contact KUKA Service to exchange the defective and damaged components.
	Check the SOC of the drive battery. To avoid exhaustive discharge, recharge the battery before the vehicle is switched on. Before charging the drive battery, visually inspect the charging cables, plugs for dirt and mechanical damage.
	Test the functions of the Emergency Stop buttons. Press each Emergency Stop button to check whether the vehicle stops. Contact KUKA if the EMERGENCY STOP buttons malfunctions
	Test the functions of the lidar. Check whether the vehicle stops when the obstacle is detected. Contact KUKA if the lidar malfunctions.
Three months	During the storage, charge the battery through a charging pile to compensate for self-discharge.
	When the battery pack is not used for a long time, replenish the battery every three months or so by using the charging station for 4 to 5 hours. Do not load or unload batteries in the battery pack during maintenance. Otherwise, the degradation of the battery performance may result. Do not remove or replace any battery in the battery pack without authorization, and do not dissect the battery.
1 year	Visually inspect the top preload rubber for wear and damage. Exchange the top preload rubber.
	Visually inspect the drive wheels for wear and damage. Exchange the worn and damaged drive wheels. Note: Each drive wheel must have a diameter of at min. 197 mm, and both drive wheels need to be exchanged.
	Visually inspect the rotary gear drive parts. Add lubricating grease. Grease model: GR 100-1 PD

Interval	Activity
	Check whether the cabling of the charging station and charging component are damaged and fitted securely.
	Check whether the cabling of the vehicle control cabinet is damaged and fitted securely.
	Check the function of emergency operation.
2 years	Check the connecting rod assembly and bearings for wear. Exchange the worn bearings
	Visually inspect PCB fans and check for fan noise. Contact KUKA Service to exchange the fans on the PCB.

KMP 600S-2

Interval	Activity
Before start-up and re-commission-ing	Check the vehicle for loose, defective or damaged components. Fasten loose components and contact KUKA Service to exchange the defective and damaged components.
	Check the SOC of the drive battery. To avoid exhaustive discharge, recharge the battery before the vehicle is switched on. Before charging the battery, visually inspect the charging cables, plugs for dirt and mechanical damage.
	Test the functions of the EMERGENCY STOP buttons. Press each EMERGENCY STOP button to check whether the vehicle stops. Contact KUKA if the EMERGENCY STOP buttons malfunctions.
	Test the functions of the laser scanners. Check whether the vehicle stops when the obstacle is detected. Contact KUKA if the laser scanner malfunctions.
3 Months	During the storage of the drive battery, charge drive battery to compensate for self-discharge.
	If battery pack is not used for a long period, it should be replenish charging one time for 4 to 5h for every three month.
6 months	Check whether the light signals of the LED strip light up and are assigned to the related status state. In the event of LED strip malfunctions, inform KUKA Service.
	Perform maintenance work on the drive battery according to the manufacture's documentation.

Interval	Activity
1 year	Visually inspect the preload rubber for wear and damage. Exchange the preload rubbers.
	Visually inspect the drive wheels for wear and damage. Exchange the worn and damaged drive wheels. Note: Each drive wheel must have a diameter of at min. 247 mm. You need to replace both drive wheels at the same time.
	Visually inspect the caster wheels for wear and damage. Exchange the worn and damaged rollers. Note: Each caster wheel must have a diameter of at min. 73 mm.
	Visually inspect the gear unit for leakage. When gear oil leaks, exchange the gearbox by the KUKA service.
	Check whether the cabling of the charging station and charging component are damaged and fitted securely.
	Check whether the ESD strap is present, damaged or contaminated. Exchange the ESD strap if necessary.
	Check whether the cabling of the vehicle control cabinet is damaged and fitted securely.
	Check the function of the emergency operation and the brake release cable.
	Perform brake test.
5 years	Contact KUKA Service to exchange the fan on the control cabinet.

KMP 1500I

Interval	Activity
Before start-up and recommissioning	Check the vehicle for loose, defective and damaged components. Fasten loose components and contact KUKA Service to exchange the defective and damaged components.
	Check the SOC of the drive battery. To avoid exhaustive discharge, recharge the battery before the vehicle is switched on. Before charging the drive battery, visually inspect the charging cables, plugs for dirt and mechanical damage.
	Test the functions of the Emergency Stop buttons. Press each Emergency Stop button to check whether the vehicle stops. Contact KUKA if the EMERGENCY STOP buttons malfunctions
	Test the functions of the lidar. Check whether the vehicle stops when the obstacle is detected. Contact KUKA if the lidar malfunctions.
Three months	During the storage, charge the battery through a charging pile to compensate for self-discharge.
	When the battery pack is not used for a long time, replenish the battery every three months or so by using the charging station for 4 to 5 hours. Do not load or unload batteries in the battery pack during maintenance. Otherwise, the degradation of the battery performance may result. Do not remove or replace any battery in the battery pack without authorization, and do not dissect the battery.
1 year	Visually inspect the top preload rubber for wear and damage. Exchange the top preload rubber.
	Visually inspect the drive wheels for wear and damage. Exchange the worn and damaged drive wheels. Note: Each drive wheel must have a diameter of at min. 197 mm, and both drive wheels need to be exchanged.
	Visually inspect the rotary gear drive parts. Add lubricating grease. Grease model: GR 100-1 PD

Interval	Activity
	Check whether the cabling of the charging station and charging component are damaged and fitted securely.
	Check whether the cabling of the vehicle control cabinet is damaged and fitted securely.
	Check the function of emergency operation.
2 years	Check the connecting rod assembly and bearings for wear. Exchange the worn bearings
	Visually inspect PCB fans and check for fan noise. Contact KUKA Service to exchange the fans on the PCB.

KMP 1500P-EU-D

Interval	Activity	Personnel
As required	Perform a visual inspection of the upward-facing and downward-facing camera. Clean the lens on the camera if dirty. In case of misalignment or defect: have the camera adjusted or exchanged by KUKA Service.	Operator KUKA Service
	Clean the drive batteries. Adapt the cleaning interval to the degree of fouling.	Operator
Before start-up and re-commissioning	Check the vehicle for loose, defective or damaged components. Fasten loose components and contact KUKA Service to exchange the defective and damaged components.	Operator
	Test the functions of the EMERGENCY STOP buttons Press each EMERGENCY STOP button to check whether the vehicle stops. Contact KUKA if the EMERGENCY STOP buttons malfunctions. Contact KUKA if the laser scanner malfunctions.	Operator
	Test the functions of the laser scanners. Check whether the vehicle stops when an obstacle is detected.	Operator
Monthly	Check bumper for secure fastening to chassis and for damage. Have it replaced by authorized specialist personnel if necessary.	Operator Maintenance technician
2 months	If the vehicle has been left unused for a longer period of time or put into storage: charge drive batteries fully to compensate for self-discharge. In addition, it is necessary to regularly charge the battery. It is recommended to perform a complete charge-discharge cycle of the battery every two months at temperatures between -20°C and 35°C . Otherwise, the battery may shut down the output due to undervoltage protection, and even the battery cells may be damaged.	Operator
3 months	Check the supply module and supply cable for defects, damage and insulation faults. Check the wireharness connection.	Maintenance technician with electrical training
	Check for loose, damaged, or cracked components, including housing, drive wheels, caster wheels, LED strips, emergency stop and laser scanner. Immediately rectify any faults that have occurred or replace the entire component.	Operator

Interval	Activity	Personnel
At power loss on the vehicle	Perform maintenance of the drive batteries	Maintenance technician with electrical training

Interval	Activity	Personnel
6 months	Check that all external EMERGENCY STOP equipment (external EMERGENCY STOP devices, safety gates, light curtains) is functioning correctly. If the vehicle continues moving after pressing emergency stop, the system must be shut down without delay. Inform KUKA Service.	Operator Operator
	Check the stop function of the vehicle. Set the vehicle to a stop state using the external safety function or the wired remote controller .	Operator
	Check the function of the enabling switch of the wired remote controller.	Operator
	Carry out a visual inspection for wear and damage of all drive wheels and caster wheels. Exchange worn and damaged drive wheels and caster wheels. Ensure that the diameter of each drive wheel must be at least 247 mm. Ensure that the diameter of each caster must be at least 73 mm. Attention must be paid to the following: • The drive wheels must both be exchanged together.	Operator KUKA Service
1 year	Check the brakes of the drive units for correct operation. 1. Switch off the vehicle. 2. Shake the drive wheel by hand and check whether the brake holds the wheel in position. If the brake has little or no effect and the wheel can be turned: have the drive unit exchanged by KUKA Service.	Operator KUKA Service
	Add lubricating oil to key components according to the following guidelines	Operator
	Check the gear units of the drive units for leaks. In case of a leak: have the drive unit exchanged by KUKA Service.	Operator KUKA Service
	Visual inspection of the condition of the lifting system and check that it is running smoothly. If any wear or damage is detected on parts of the lifting system: have these parts exchanged by KUKA Service.	Operator KUKA Service
	Exchanging the preload rubber.	Operator
	Check the acoustic signal of the buzzer.	Operator
	Check whether the light signals of the LED strip light up and are assigned to the related status state.	Operator
	Check the battery conditions.	KUKA Service
Max. 4 years	Perform electrical test of the battery charging station. Depending on the use, installation type and installation site, the test interval may be shorter.	Maintenance technician with electrical training

KUKA

Thank you.