SAMHYUN

# THE AXIS OF AI HUMANOID MOTION

# AXLON™

I O L SERIES

## High-performance integrated joint actuator that completes humanoid motion




**AXLON Series**

| | |
|---|---|
| I | High-power · Efficient · Quiet **10 models** |
| O | QDD · Low-ratio, high-power **1 model** |
| L | Linear · Linear-drive **1 model** |

BLDC · FOC | 48V | CAN FD

Technology that breathes life into motion

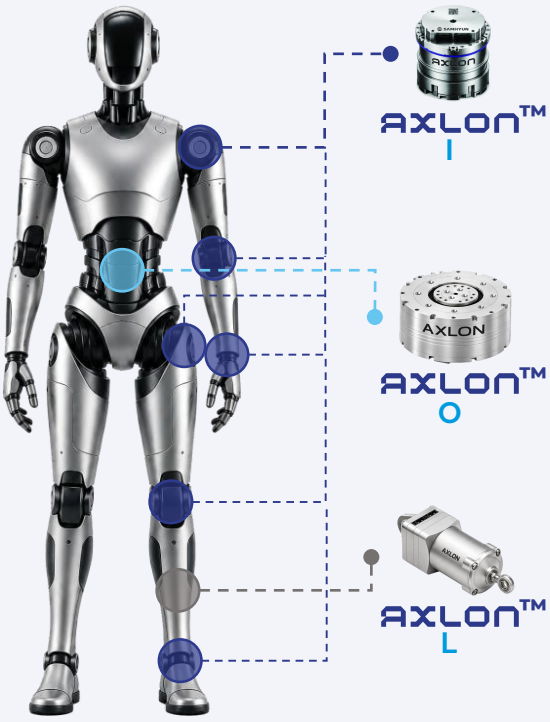
Every motion, We drive and control

# X-in-1 Core Technology
# Power of Smart Joints

AXLON Video

AXLON™ Series integrates a BLDC motor, reducer, dual encoder and ARM Cortex-M4 based FOC driver into one joint actuator module.
With 3 series (I · O · L) and 12 models, it supports the precise motion of humanoid robots.

## APPLICATION




Shoulder | Elbow | Wrist | Waist | Hip | Knee | Ankle

### NVH Optimization
Stable motor drive with reduced noise and vibration

### Frameless Motor
Better space use and flexible system integration

### High-Speed CAN FD
CAN 1 Mbps / CAN FD up to 5 Mbps bus connection

### 15-bit Dual Encoder
Precise position sensing with Dual Magnetic Angle Sensor

### 7 ~ 50:1 Gear Line-up
From QDD 7:1 to high-ratio 50:1, by joint application

### Efficiency & Torque
High-efficiency, high-torque technology for humanoids

AXLON - X Y - Z Z Z Z

- AXLON I · O · L Series
- Reducer P:Planetary H:Harmonic I:Roller Screw C:Cycloid
- Motor O.D. Size

## SYSTEM ARCHITECTURE

Input 48V · Digital Packet

**CAN FD** Command › **MCU** Cortex-M4 170MHz › **FOC Driver** PWM 20kHz › **BLDC** Motor › **Reducer** 7 ~ 50 : 1 › **Output** Hollow Shaft

Feedback · 15bit Dual Magnetic Angle Sensor

# 3 Series, from Rotary to Linear
# 12 Models in Total




**AXLON-IP**

Mid-ratio · Fast response

50x08 50x14 70x10 85x13 85x30




**AXLON-IH**

High-ratio · High torque

50x08 50x14 70x10 85x13 85x30




**AXLON-OP**

QDD · High power

102x19




**AXLON-LI**

Linear · Linear drive

38x22

## Series Comparison

| ITEM | AXLON-IP | AXLON-IH | AXLON-OP | AXLON-LI |
|---|---|---|---|---|
| Type | Inner Rotor | Inner Rotor | Outrunner | Linear |
| Models | 5 models | 5 models | 1 model | 1 model |
| Gear Ratio | 15.8 ~ 22.5:1 | 50:1 | 7:1 | - |
| Size [mm] | Ø62 ~ Ø99 | Ø62 ~ Ø99 | Ø124 × 63 | 50×50×147 |
| Weight [g] | 436 ~ 2,725 | 491 ~ 1,750 | 1,936 | 252 |
| Continuous Torque [N·m] | 4.3 ~ 62.3 | 12.8 ~ 132.0 | 31.5 | - |
| Maximum Torque [N·m] | 13.8 ~ 200.0 | 41.2 ~ 424.0 | 88.2 | - |
| Rated / Max Thrust [N] | - | - | - | 200 / 500 |
| Speed | 47.3 ~ 357.6 rpm | 21.0 ~ 113.0 rpm | 125.0 rpm | 38.1 mm/s |
| Power [W] | 133.3 ~ 308.4 | 125.5 ~ 290.0 | 471.0 | 215.2 |
| Backlash | < 10 arcmin | < 20 arcsec | - | - |

※ Speed: continuous speed for IP · IH · O, max. linear speed for L / Backlash: one-way for IH

MID-RATIO · HIGH-SPEED

# AXLON-IP

5 models with a 15.8 ~ 22.5:1 gear ratio for joints that require fast response

| Max Torque | Gear Ratio | Backlash |
|---|---|---|
| **200.0** N·m | **15.8 ~ 22.5 :1** | **< 10** arcmin |




## Model Specifications

| ITEM | 50x08 | 50x14 | 70x10 | 85x13 | 85x30 |
|---|---|---|---|---|---|
| MCU | ARM Cortex-M4, 170MHz, 32bit | | | | |
| Motor | BLDC | | | | |
| Communication | CAN / CAN FD | | | | |
| Baud Rate (Default) | CAN: 1Mbps / CAN FD: 1M / 5Mbps | | | | |
| Operating Mode | Position Control Mode · Velocity Control Mode<br>Torque Control Mode · Impedance Control Mode | | | | |
| Control Method | FOC | | | | |
| PWM Frequency | 20kHz | | | | |
| Input Voltage | 48V | | | | |
| Weight [g] | 440 | 450 | 970 | 1,890 | 2,725 |
| Dimensions D×H [mm] | 62×60.6 | 62×60.6 | 88×67.1 | 99×88.2 | 99×88.2 |
| Position Sensor | Dual Magnetic Angle Sensor | | | | |
| Encoder Specification | 15bit | | | | |
| Gear Ratio | 15.8 | 15.8 | 22.5 | 22 | 22.2 |
| No Load Speed [rpm] | 358 | 179 | 136 | 114 | 47 |
| Continuous Torque [N·m] | 4.3 | 7.1 | 11.9 | 25.6 | 62.3 |
| Continuous Current [A] | 3.4 | 2.8 | 3.5 | 6.4 | 6.4 |
| Maximum Torque [N·m] | 13.9 | 23.1 | 38.4 | 82.8 | 200 |
| Maximum Current [A] | 10.0 | 8.2 | 10.3 | 18.8 | 18.8 |
| Power [W] | 160.9 | 133.3 | 168.3 | 304.8 | 308.4 |
| Backlash | < 10 arcmin | | | | |
| Operating Temperature | -5 ~ +55 °C | | | | |
| Command Signal | Digital Packet | | | | |

※ Specifications are subject to change without prior notice.

HIGH-RATIO · HIGH-TORQUE

# AXLON-IH

5 models with a high 50:1 ratio for joints that require high torque

| Max Torque | Gear Ratio | Backlash (One-way) |
|---|---|---|
| **424** N·m | **50 : 1** | **< 20** arcsec |




## Model Specifications

| ITEM | 50x08 | 50x14 | 70x10 | 85x13 | 85x30 |
|---|---|---|---|---|---|
| MCU | ARM Cortex-M4, 170MHz, 32bit | | | | |
| Motor | BLDC | | | | |
| Communication | CAN / CAN FD | | | | |
| Baud Rate (Default) | CAN: 1Mbps / CAN FD: 1M / 5Mbps | | | | |
| Operating Mode | Position Control Mode · Velocity Control Mode<br>Torque Control Mode · Impedance Control Mode | | | | |
| Control Method | FOC | | | | |
| PWM Frequency | 20kHz | | | | |
| Input Voltage | 48V | | | | |
| Weight [g] | 610 | 635 | 995 | 2,040 | 2,820 |
| Dimensions D×H [mm] | 62×66.4 | 62×66.4 | 88×69.2 | 99×88.2 | 99×103.4 |
| Position Sensor | Dual Magnetic Angle Sensor | | | | |
| Encoder Specification | 15bit | | | | |
| Gear Ratio | 50 | | | | |
| No Load Speed [rpm] | 113 | 57 | 61 | 50 | 21 |
| Continuous Torque [N·m] | 12.8 | 21 | 24.8 | 54.8 | 132 |
| Continuous Current [A] | 3.1 | 2.6 | 3.3 | 6 | 6 |
| Maximum Torque [N·m] | 41.2 | 68.8 | 80 | 177 | 424 |
| Maximum Current [A] | 9.1 | 7.6 | 9.7 | 17.6 | 17.6 |
| Power [W] | 151 | 125.5 | 158 | 287 | 290 |
| Backlash | 20 arcsec (One-way) | | | | |
| Operating Temperature | -5 ~ +55 °C | | | | |
| Command Signal | Digital Packet | | | | |

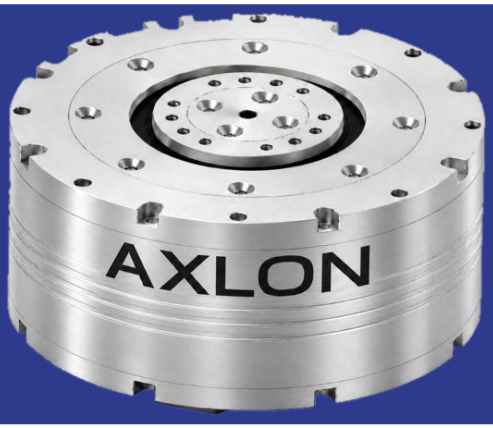
※ Specifications are subject to change without prior notice.

QUASI-DIRECT DRIVE

# AXLON-OP

Dynamic, highly back-drivable QDD
(Quasi-Direct Drive) actuator with a 7:1 low ratio

| Max Torque | Gear Ratio | Power |
|---|---|---|
| **88.2** N·m | **7:1** | **471** W |




## Model Specifications

| ITEM | 102x19 |
|---|---|
| MCU | ARM Cortex-M4, 170MHz, 32bit |
| Motor | BLDC |
| Communication | CAN / CAN FD |
| Baud Rate (Default) | CAN: 1Mbps / CAN FD: 1M / 5Mbps |
| Operating Mode | Position Control Mode · Velocity Control Mode<br>Torque Control Mode · Impedance Control Mode |
| Control Method | FOC |
| PWM Frequency | 20kHz |
| Input Voltage | 48V |
| Weight [g] | 1,940 |
| Dimensions D×H [mm] | 124×63 |
| Position Sensor | Dual Magnetic Angle Sensor |
| Encoder Specification | 15bit |
| Gear Ratio | 7:1 |
| No Load Speed [rpm] | 142 |
| Continuous Torque [N·m] | 31.5 |
| Continuous Current [A] | 9.81 |
| Maximum Torque [N·m] | 88.2 |
| Maximum Current [A] | 27.5 |
| Power [W] | 471 |
| Backlash | - |
| Operating Temperature | -5 ~ +55 °C |
| Command Signal | Digital Packet |

※ Specifications are subject to change without prior notice.

LINEAR ACTUATOR

# AXLON-LI

Linear actuator for joints that require linear motion
Lightweight 252 g body with up to 500 N thrust

Max Thrust **500** N

Stroke **35** mm




## Model Specifications

| ITEM | 38x22 |
|---|---|
| MCU | ARM Cortex-M4, 170MHz, 32bit |
| Motor | BLDC |
| Communication | CAN / CAN FD |
| Baud Rate (Default) | CAN: 1Mbps / CAN FD: 1M / 5Mbps |
| Operating Mode | Position Control Mode · Velocity Control Mode<br>Torque Control Mode · Impedance Control Mode |
| Control Method | FOC |
| PWM Frequency | 20kHz |
| Input Voltage | 48V |
| Weight [g] | 252 |
| Dimensions L×W×H [mm] | 50×50×147 |
| Position Sensor | Dual Magnetic Angle Sensor |
| Encoder Specification | 15bit |
| Rated Thrust [N] | 200 |
| Max Thrust [N] | 500 |
| Maximum Linear Speed [mm/s] | 38.1 |
| Stroke Length [mm] | 35 |
| Continuous Current [A] | 4.3 |
| Maximum Current [A] | 17.1 |
| Power [W] | 215.2 |
| Backlash | - |
| Operating Temperature | -5 ~ +55 °C |
| Command Signal | Digital Packet |

※ Specifications are subject to change without prior notice.

ROBOT HAND MOTOR Manus (Hand)

# AXLON-M

Compact precision motor for robot hands supporting delicate motion

Input Voltage
**24**V

Size
**Ø12~Ø14**



## Model Specifications

| ITEM | Ø12 | Ø14 |
|---|---|---|
| Motor | BLDC | |
| Input Voltage | 24V | |
| Dimensions D×H [mm] | 15 X 28 | 17X 23 |
| Continuous Speed [rpm] | 17,000 | 11,200 |
| Continuous Torque [N·m] | 0.0045 | 0.0122 |
| Continuous Current [A] | 0.39 | 0.89 |
| Maximum Speed [rpm] | 19,170 | 16,660 |
| Maximum Torque [N·m] | 0.0401 | 0.0378 |
| Maximum Current [A] | 3.4 | 2.79 |
| Power [W] | 8 | 14.3 |
| Operating Temperature | -5 ~ +55 °C | |

※ Specifications are subject to change without prior notice.

IN-WHEEL MOTOR

# In-Wheel Motor

Gearless, low-noise motor for serving & delivery robots
with 16-bit resolution sensor and UL safety design

Input Voltage
**24 / 48** V

Size
**6.5 ~ 10** Inch




## Model Specifications

| ITEM | 6.5 Inch | 8 Inch | 10 Inch |
|---|---|---|---|
| Input Voltage [V] | 24/48 | 48 | 48 |
| No-Load Max Speed [rpm] | 570 | 430 | 200 |
| Continuous Speed [rpm] | 500 | 350 | 150 |
| Continuous Torque [N·m] | 4 | 8 | 20 |
| No-Load Max Speed [rpm] | 340 | 300 | 150 |
| Max Torque[N·m] | 12 | 16 | 35 |

ELECTRIC BRAKE

# Electric Brake

Power-off brake, line-up by static friction torque,
for braking & safety in AMR·AGV modules and cobots

Input Voltage
**12 / 24** V

Size
**71 ~ 138** mm




## Model Specifications

| ITEM | 71mm | 80mm | 138mm |
|---|---|---|---|
| Static Friction Torque [N·m] | 3.2 | 8.0 | 30.0 |
| Input Voltage [V] | 24 | 12 | 12 |
| Weight [kg] | 0.3 | 1.0 | 2.3 |
| Size [mm] | ⌀71 x H19.4 | ⌀80 x H40.5 | ⌀137.5 x H27 |

QUADRUPED ROBOT

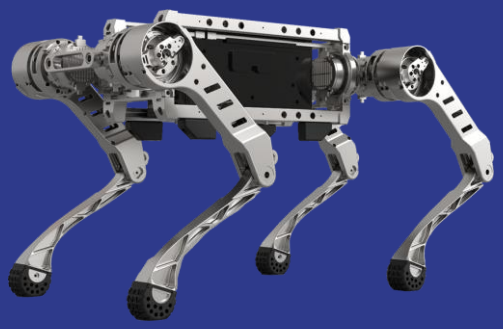
# DIY Open-Platform Quadruped Robot

Open modular quadruped platform with great value, scalability & full ROS2/NVIDIA support

Max Speed **4** m/s

Payload **5** kg

Gradeability **30°**



Weight (incl. battery) **15** kg

DoF **12** unit

Operating Time (approx.) **1.5** Hr (Standard) / **4.5** Hr (Pro)

Max Speed **4** m/s

## Specifications

| ITEM | DIY Kit-type Open-Platform Quadruped Robot |
|---|---|
| Standing Dimensions W×L×H | 66 cm × 37 cm × 48 cm |
| Weight (including battery) | Approx. 15 kg |
| Payload (Operating) | Continuous walking: 5 kg<br>Standing max: 8 kg |
| Degree of Freedom | 12 |
| Movement Speed | 0 - 4 m/s |
| Gradeability | 30° |
| Maximum Climbing Height | Approx. 20 cm (single step) |
| Maximum Joint Torque | Approx. 33 N·m |
| Movement Range | Side swing: -50°~50° /<br>Hip: -149°~45° /<br>Knee: 21°~147° |
| Overall battery life | 1.5 hours / 4.5 hours |
| Core Functions (Software & UI) | Secondary development<br>AI natural-language programming<br>Automatic joint calibration<br>OTA firmware upgrade & app integration |
| Hardware Feature | Supports modular disassembly and assembly |

※ Specifications are subject to change without prior notice.

UNMANNED SYSTEMS · DUAL 3-IN-1 EPT

# HOPLON

Open-architecture UGV on Dual 3-in-1 e-PT
1-ton payload · Battery swapping

| Payload | Max Speed | Gradeability |
|---|---|---|
| **1,000** kg | **30** km/h | **40** % |



| Max Speed | Operating Time (About) | Charging Time(About) | |
|---|---|---|---|
| **30** Km/h | **8** Hr | **4** Hr | HOPLON Video |

## Specifications

| ITEM | HOPLON™ |
|---|---|
| Navigation Type | Customizable |
| Dimension W×L×H [mm] | 2,500 x1,600 x 800 |
| Payload (Operating) [kg] | 1,000 |
| Power Train | Dual 3-in-1 e-PT |
| Driving Mode | Zero Turn |
| LiDAR Type | Customizable |
| Safety Sensor | Customizable |
| Positioning Sensor | Customizable |
| Max Speed [km/h] | 30 |
| Gradeability | 40% (22°) |
| Operating Temperature [°C] | -10 ~ +50 (Indoor / Outdoor) |
| Battery Type, Capacity | 16.2kWh/li-ion |
| Operating / Charging Time [Hr] | Operating: About 8 / Charging: About 4 |
| Charging Method | Battery Swapping |
| Outdoor / Indoor Network | Customizable |
| Fleet Management System (FMS) | Customizable |
| Internal Interface | CAN / CAN FD, Ethernet (TCP/IP) |
| Applicable Systems | Squad combat support<br>Surveillance, reconnaissance, target acquisition<br>Relay, charging support<br>Transport, escort support |

※ Specifications are subject to change without prior notice.

Think Heavy, Move Smart

# BOLDUM

Indoor/outdoor HAMR with 3D SLAM · RTK-GPS
3-ton payload · 4WD / 4WS · Platooning



| Payload | Max Speed | Stop Accuracy |
|---|---|---|
| **3,000** kg | **1.6m/s** | **±20** mm |

| Water/Dust Proof | Gradeability | Operating Time (approx.) | |
|---|---|---|---|
| **IP65** | **12%** | **8** Hr | BOLDUM Video |

## Specifications

| Item | BOLDUM |
|---|---|
| **Navigation Type** | 3D SLAM (LiDAR Mapping) & RTK-GPS / INS Fusion |
| **Dimension W×L×H [mm]** | 2,620x1620x1060 |
| **Payload (Operating) [Ton]** | 3 Ton |
| **Driving System** | 4WD / 4WS (4-Wheel Independent Driving & Steering) |
| **Driving Mode** | • Point-to-Point (P2P) Autonomous Navigation<br>• Dynamic Obstacle Avoidance<br>• Stop & Go Control (collision prevention & resume)<br>• Platooning / Multi-Robot Formation<br>• Crab Movement (sideways driving) |
| **LiDAR Type** | 3D LiDAR |
| **Safety Sensor** | Ultrasonic, Bumper Sensor, Camera |
| **Positioning Sensor** | RTK-GNSS Antenna, IMU, Wheel Odometry |
| **Stop Accuracy [mm]** | ± 20 (QR), ± 50(Lidar/RTK) |
| **Max Speed [m/s]** | 1.6 |
| **Gradeability** | 12% |
| **Operating Temperature [°C]** | -10 ~ +50 |
| **Operating / Charging Time [Hr]** | 8 / 3 |
| **Charging Method** | Auto Docking / Manual Plug-in |
| **Outdoor / Indoor Network** | P5G, WiFi |
| **Fleet Management System (FMS)** | EMCS powered by CSL Robotics |
| **Navigation** | Semantic Intelligent Navigation powered by CSL Robotics |

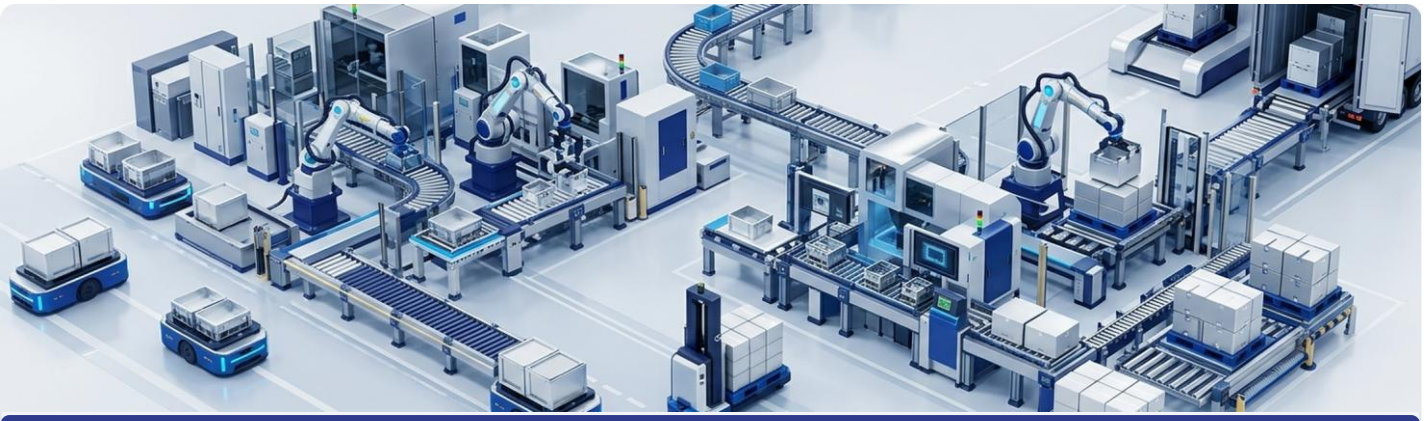
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SMART FACTORY · END-TO-END SYSTEM INTEGRATION

# Manufacturing & Logistics Automation

## From robots to factory operations, One Solution

SAMHYUN provides end-to-end solutions for site assessment, system design, equipment integration, and operational optimization.



MANUFACTURING + IN-PLANT LOGISTICS + CONTROL SYSTEMS

SI SOLUTION COVERAGE

## 4 Automation area for Your Site

### 01 Inter-Process

Parts & heavy loads via AMR·AMMR·HAMR·AGV/AGF




### 02 In-Process

Line feed/return, buffers, conveyor merge/divert



### 03 Production

Assembly, machining, tending with robots, cobots & AMMR



### 04 Inspect · Ship

Vision check, palletizing, wrapping, banding



WHY SAMHYUN

## 3 Differentiators of SAMHYUN

CORE DIFFERENTIATORS

01

**Site-Focused Design**

Engineering for process flow, bottlenecks and safety

02

**Integrated Control Sys.**

End-to-end design linking robots, PLC, FMS/ACS and host systems

03

**Build to Operation**

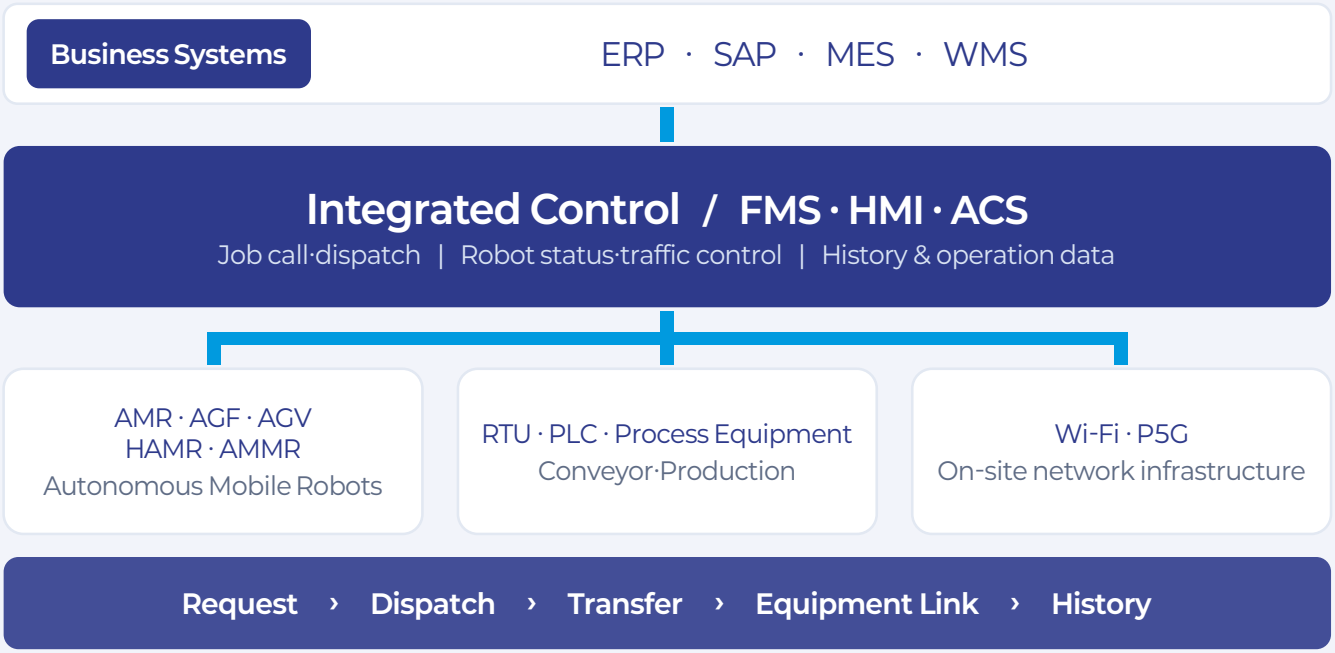
Diagnosis, build, commissioning, stabilization and expansion

SYSTEM ARCHITECTURE · APPLICATION REFERENCES

# Robots · Equipment · Data as One

## Connected from ERP to the shop floor

SYSTEM ARCHITECTURE




CUSTOMER-SPECIFIC ENGINEERING

## Customized Automation Engineering

AUTOMOTIVE

**Intelligent logistics for automotive plants**

AMR·AGF / Integrated control / Wireless communication

Proposal

IN-PLANT LOGISTICS

**Repetitive inter-plant logistics**

AGF·AGV / Job call·dispatch / Mixed-traffic safety

Proposal

PACKAGING & SHIPPING

**Packaging & shipping automation**

AGF / Wrapping·banding / Conveyor integration

Proposal

※ The above are proposal and review cases reflecting customer requirements, not completed installations.

Automation SI Inquiry

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Technology that breathes life into motion

# 3-in-1
# Power of Smart Joints

AXLON

*Every motion,*
*We drive & control*


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