

Humanoids at Schaeffler

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Schaeffler AG
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Due to rounding, numbers presented in this presentation may not add up precisely to the totals provided and percentages may not precisely reflect the absolute figures.

1

Introduction Schaeffler

2

Now is the right time to enter the humanoid market

3

Humanoid market development, incl. Schaeffler's market share ambition

4

What value does Schaeffler generate for the humanoid market

5

Why will Schaeffler be successful in the humanoid market

6

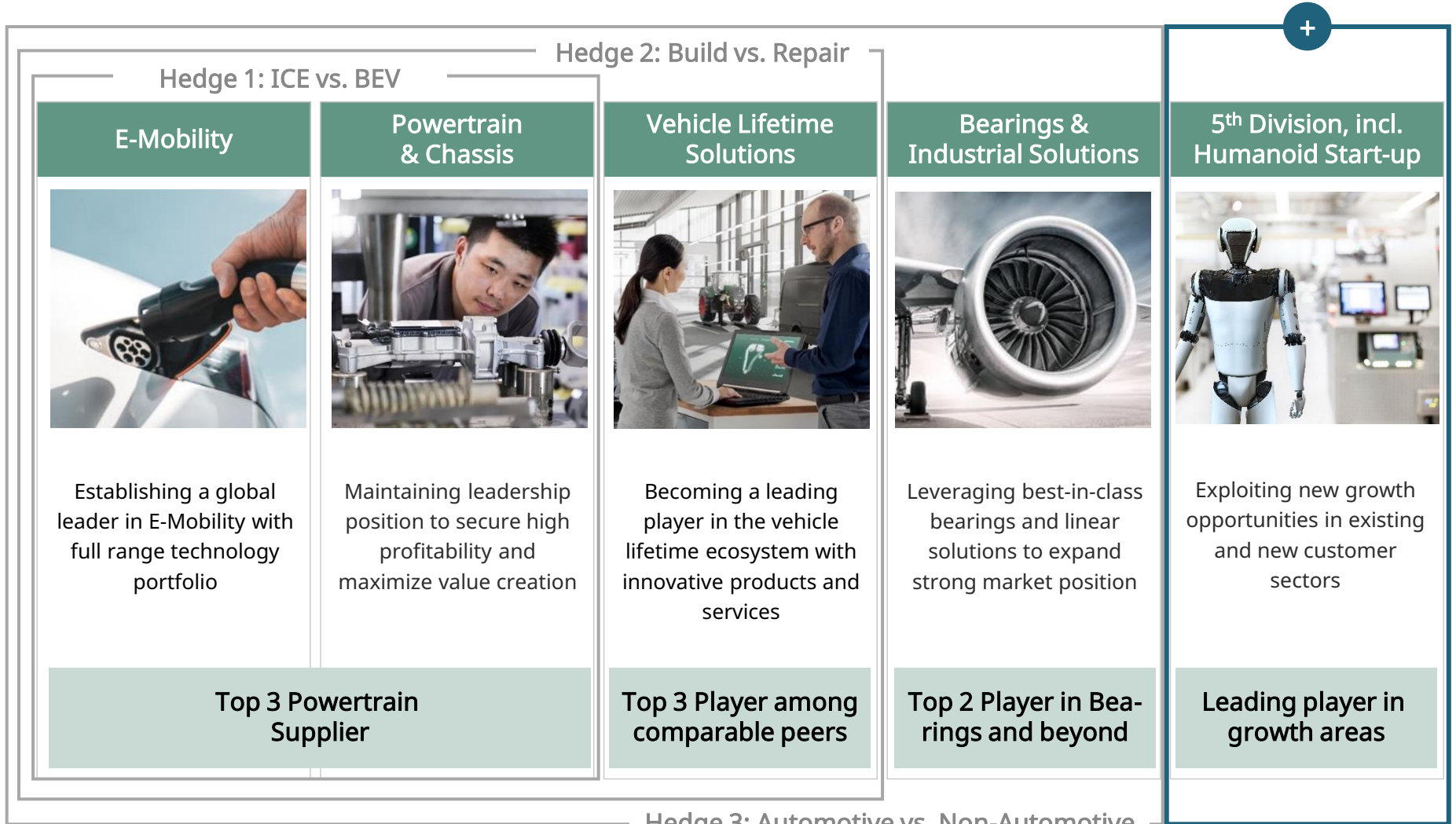
Proofpoints & summary

AGENDA

4 pure play Divisions plus the “5th Division” – Room for new business

Product Families

Sustain motion	Repair & Monitoring Services
Energize motion	Battery & Hydrogen Solutions
Drive motion	E-Motors & E-Drives
Power motion	Power Electronic Units
Generate motion	Actuators
Control motion	Electric Control Units & Sensors
Transmit motion	Transmission & Engine Components
Guide motion	Bearings & Linear Guides

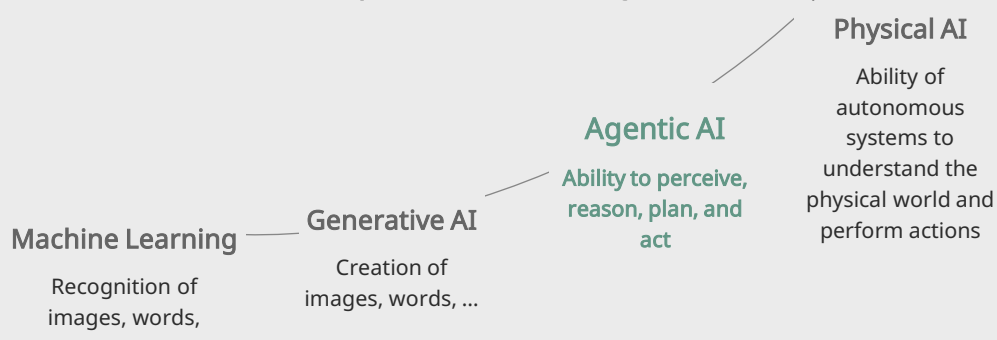


Artificial Intelligence enables humanoid robots to reach market maturity – now is the time to grow with the industry and enter the market

Breakthroughs in AI and technology →

- Disruption in AI from machine learning, to generative AI, to agentic AI, to physical AI
- Robots now can perceive the environment (**vision**), understand the context, make autonomous decisions (**reasoning**), take appropriate actions (**action**) and learn from experience

Advances in AI enable adaptive decision-making



← Economic need

- (Qualified) labor shortages
- Economic stagnation
- Rising cost pressure across industries

Impact on the industrial sector

Today:
~ 800 mn.
industrial workers
worldwide¹

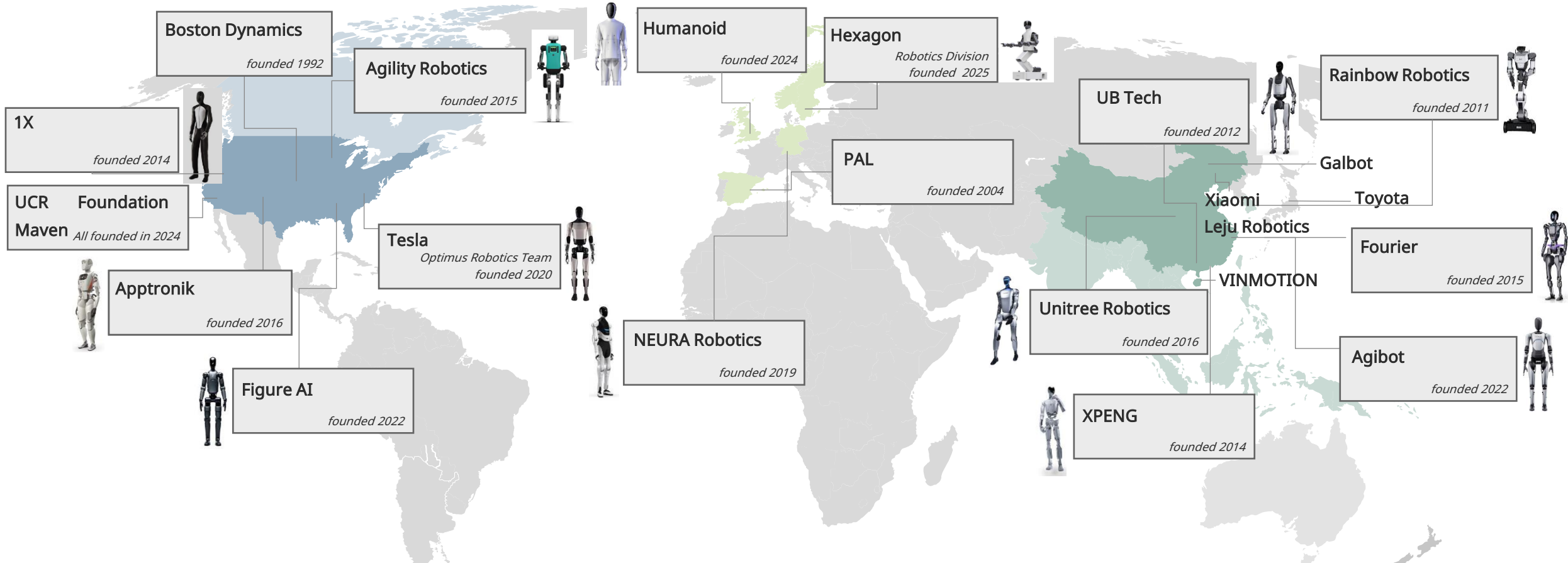
Today:
~ 60% of today's
tasks are
automatable³

By 2030:
~ 85 mn. unfilled
positions globally²

Humanoid robots will fundamentally transform traditional work models!

1) Statista (2023) | 2) Forbes (2023) | 3) Neura (2025)

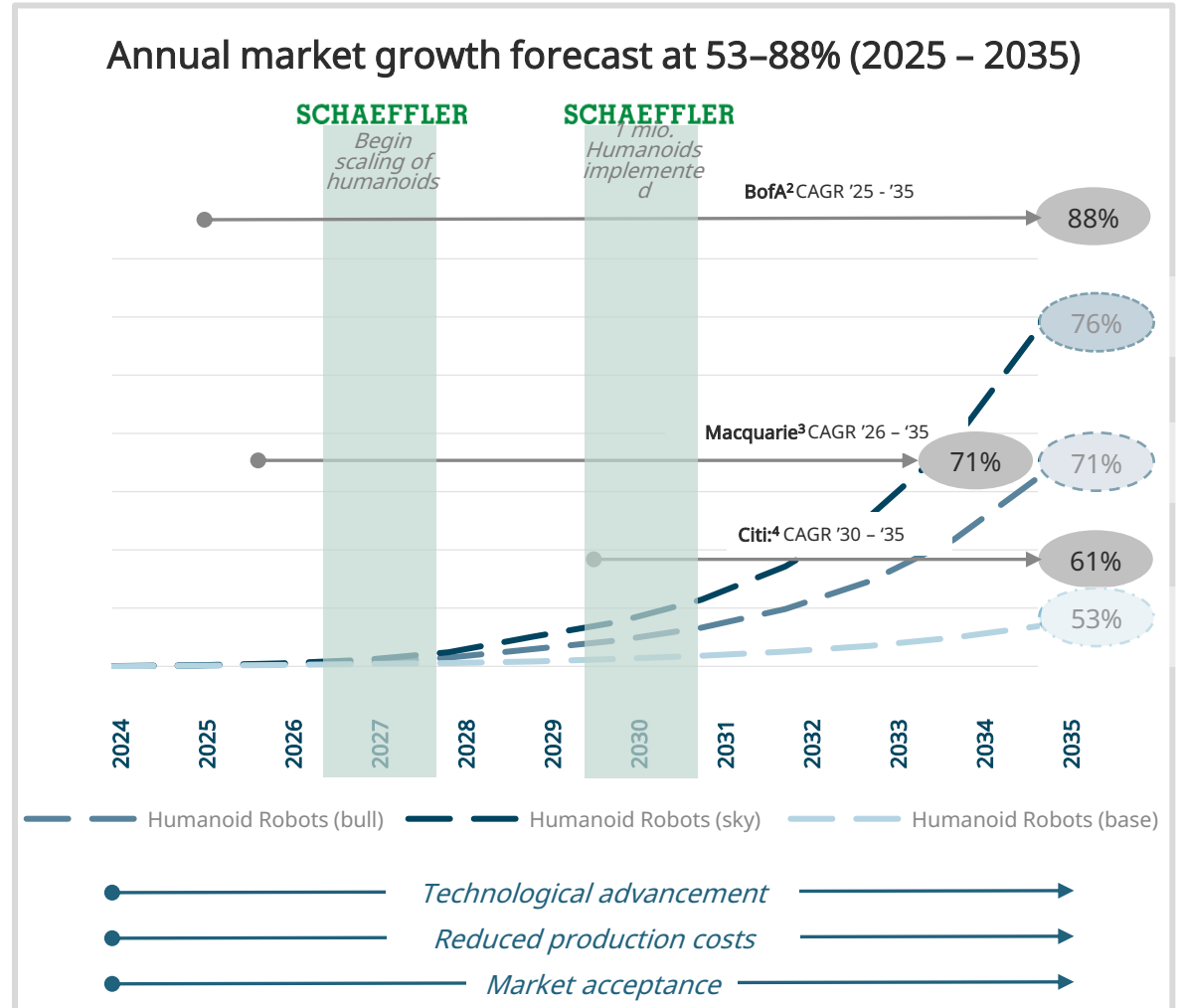
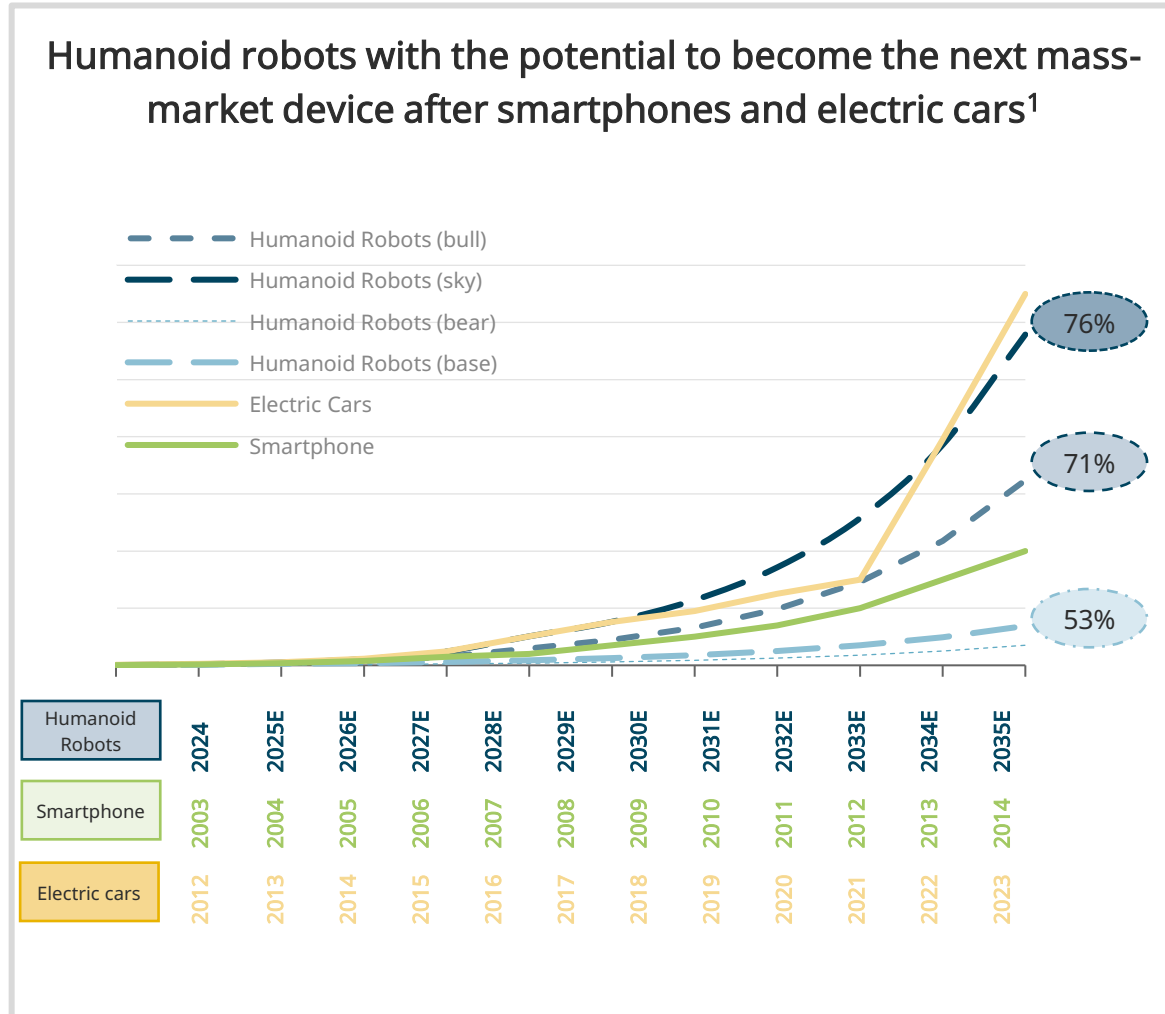
Number of humanoid OEMs is growing rapidly – especially in China and USA



Schaeffler is highly engaged in the product development for the relevant humanoid players in all regions

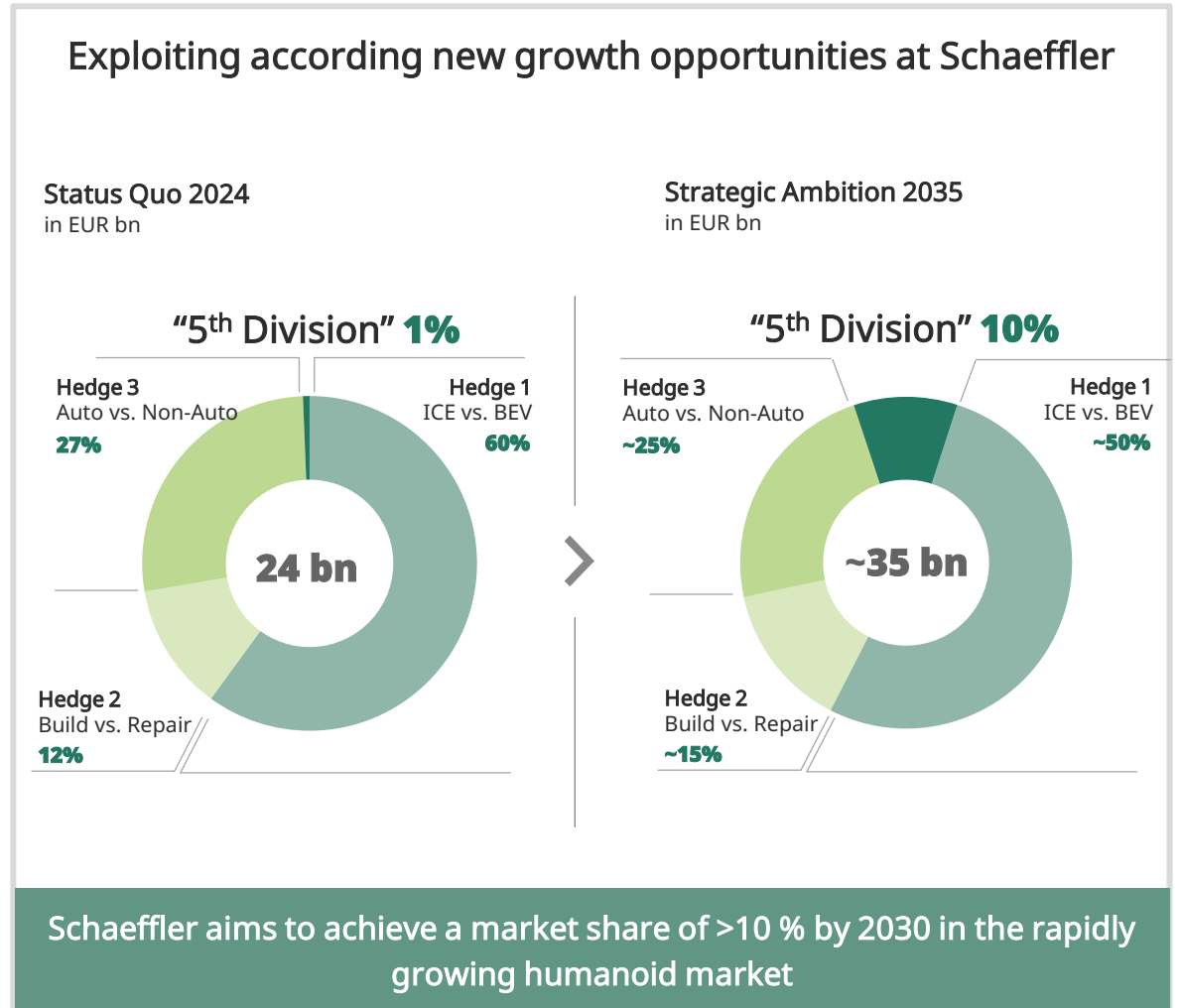
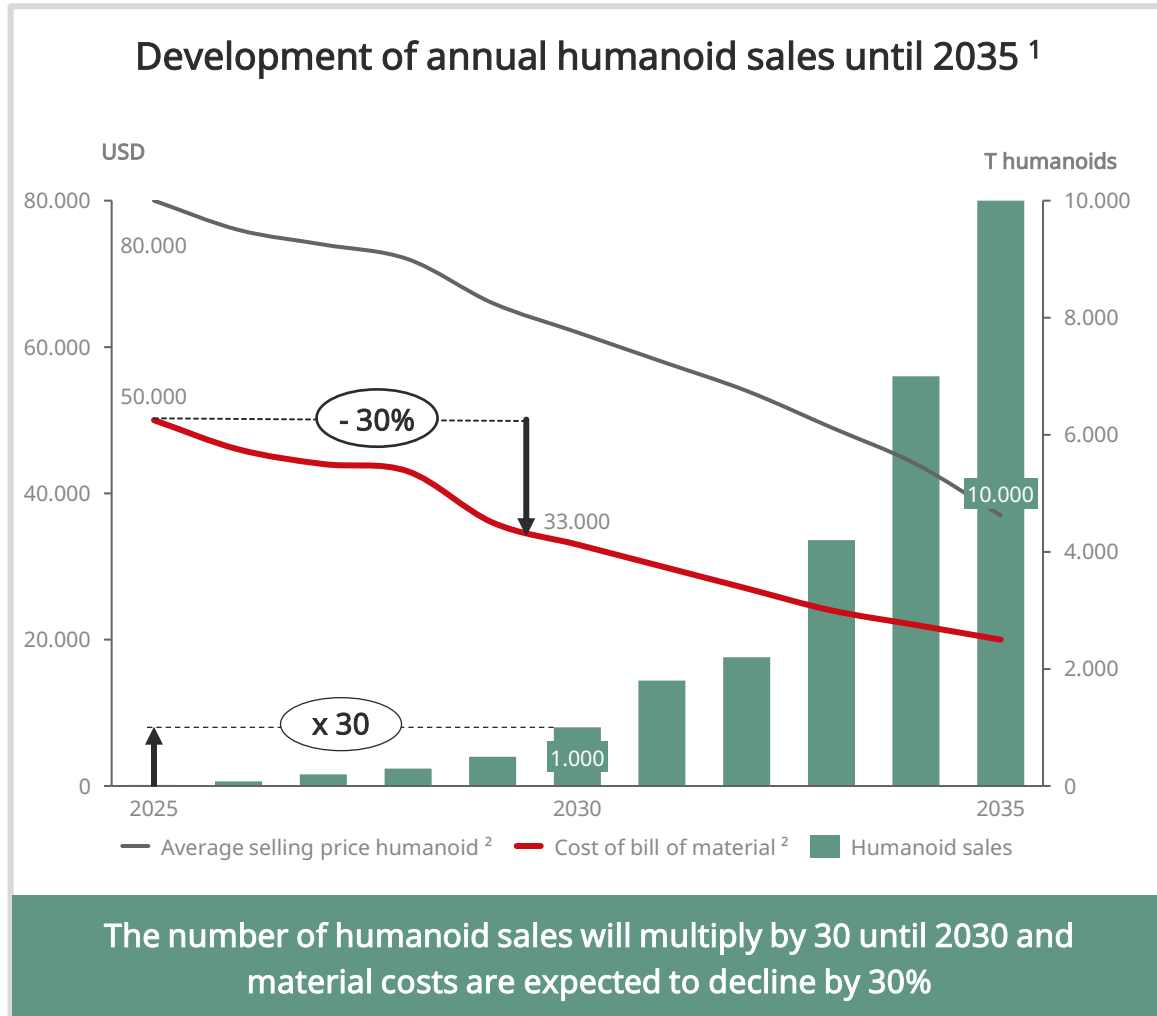
Note: This list is not exhaustive and exemplary

Tech visionaries, researchers and analysts agree: Demand for humanoid robots will grow exponentially



1) IDC, IEA, Goldman Sachs Global Investment Research (2025) | 2) Bank of America (2025) | 3) Macquarie Equity Research (2025) | 4) Citi (2024)

Diversifying Schaeffler's business portfolio – so far 32 sample orders and one serial order received



1) Bank of Americas (2025) | 2) Goldman Sachs (2025)

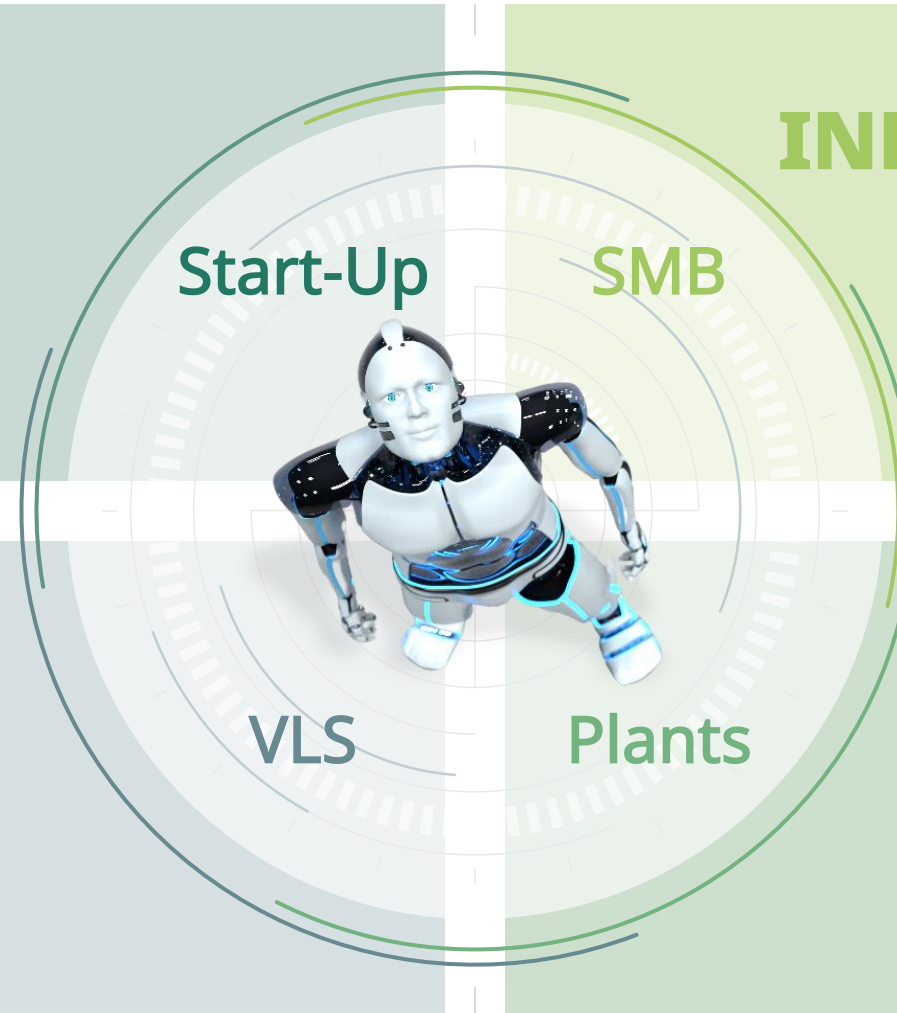
Schaeffler Supports the Entire Humanoid Lifecycle

SYSTEM & COMPONENT SUPPLIER

We provide an integrated motion portfolio for humanoids with bearings joints drives sensors and smart actuators from a single partner with automotive scale quality.

LIFETIME SOLUTION PROVIDER

Cradle-to-grave support via REPERT with local parts training diagnostics and predictive maintenance to protect uptime from day one.



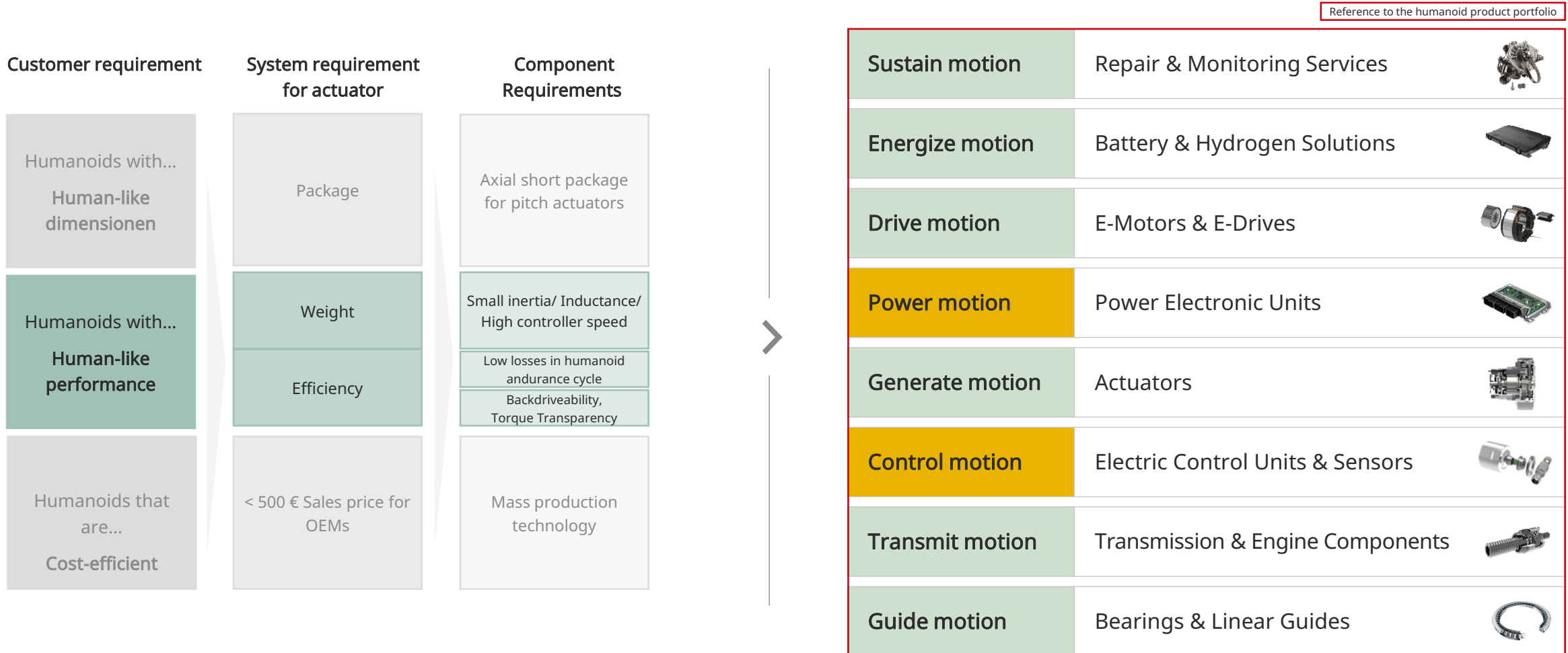
INTEGRATOR & INDUSTRIALIZATION PARTNER

Schaeffler Special Machinery develops machines for high volume production (turning, grinding, honing, ...) and our global plants turn pilots into production.

HUMANOID USER









We will deploy a significant number of humanoids across our global network of over 100 plants with operational insights driving continuous improvement in the near future.

Understanding of customer requirements as foundation of Schaeffler's humanoid product development

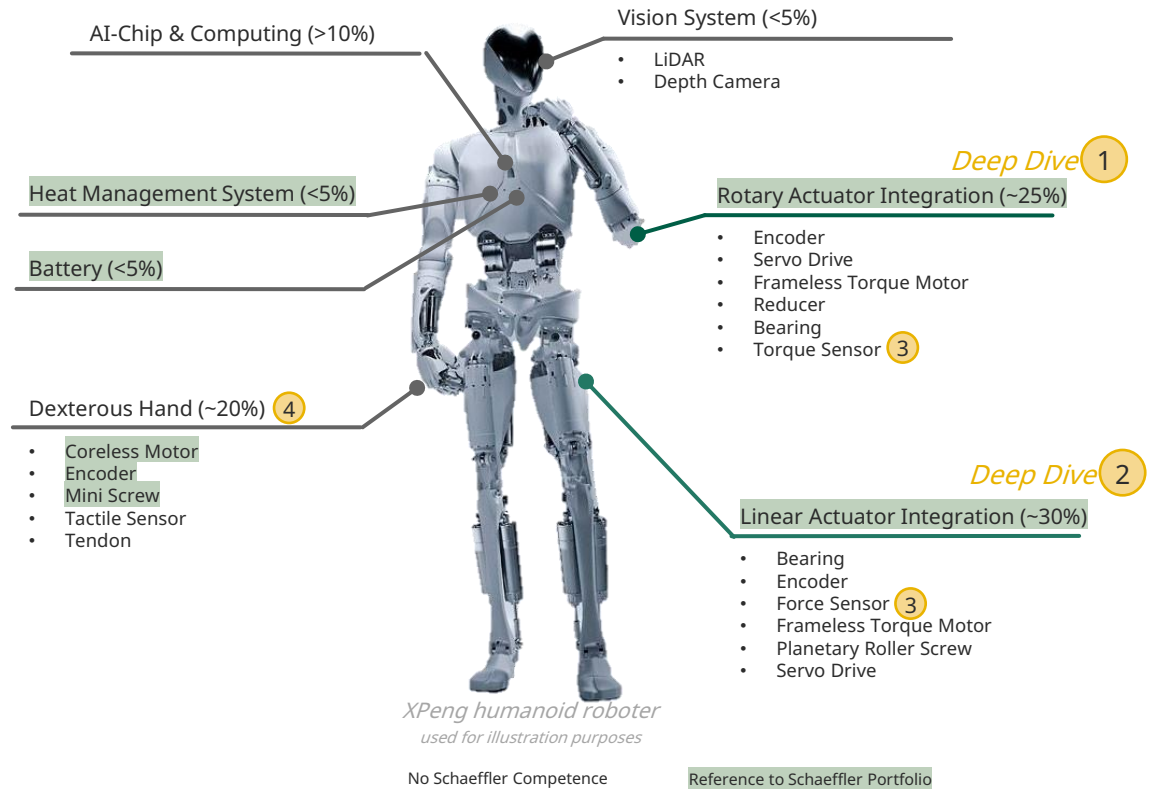


Schaeffler's core competence with integrated linear and rotary actuators account for ~ 50 % of the bill of material costs for humanoids

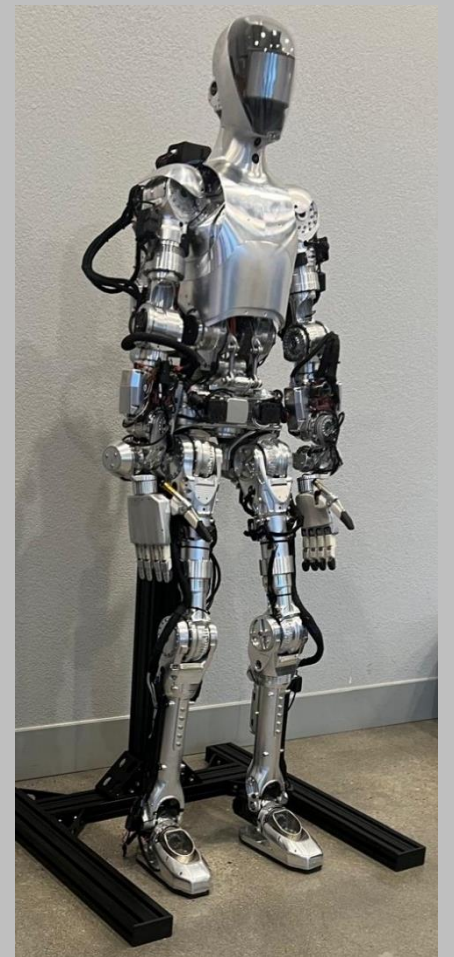
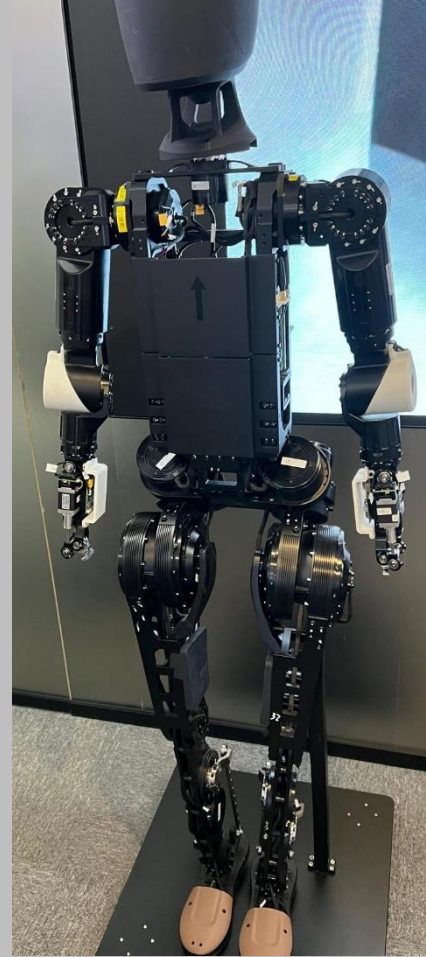
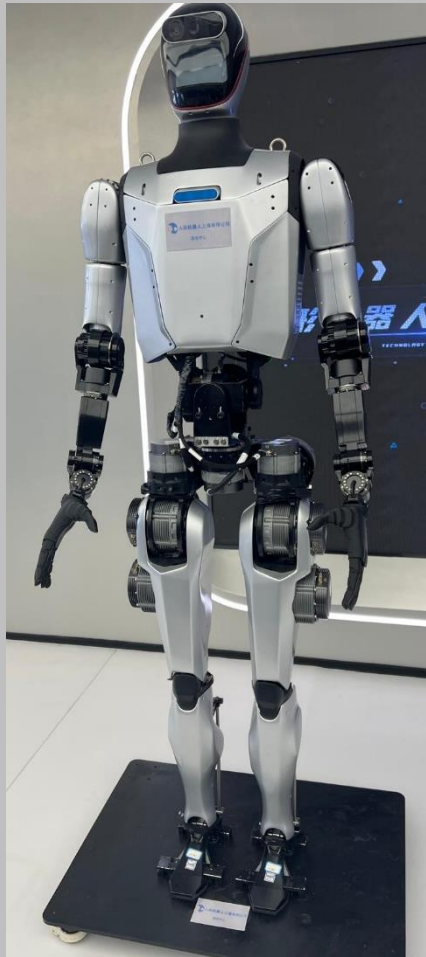
Reference to the humanoid product portfolio

Sustain motion	Repair & Monitoring Services	
Energize motion	Battery & Hydrogen Solutions	
Drive motion	E-Motors & E-Drives	
Power motion	Power Electronic Units	
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Schaeffler's Holistic System Understanding as foundation to establish a strong position in the humanoid market

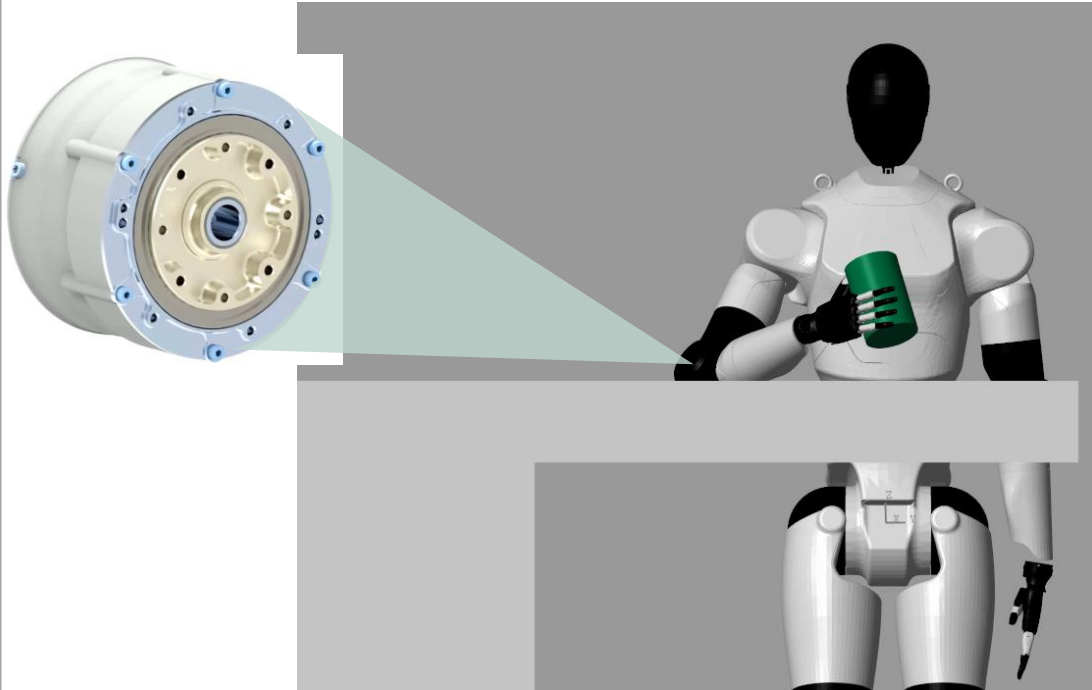


Rotary and linear actuators account for ~ 50 % of the bill of material costs for humanoids



1 Rotary Actuators – high dynamic motion at maximum payload

Robot joint actuator elbow

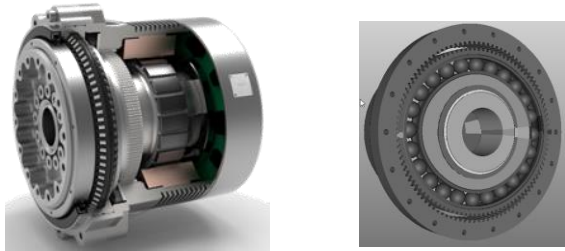


Rotary actuator Hornbill
currently in development for multiple
Humanoids



Three types of rotary actuators – Schaeffler’s competence covers all of them

A Strainwave actuator



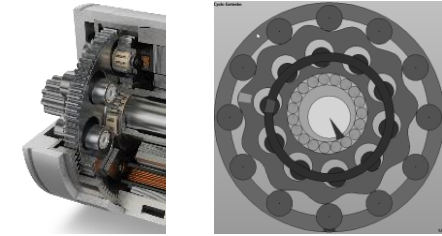
- Highest power density enabling **low weight**
- Lowest backlash for highest precision

B Planetary actuator



- Highest efficiency for **long battery life**
- **High backdriveability** for easy human interaction

C Cycloid actuator



- Highest impact resistance for **high robustness** of humanoid robot
- High **torque transparency** for senseless control

- Schaeffler offers all major gearbox types to satisfy the demand of humanoid OEMs
- Re-use of core components like sensors, motors and controls for all gearbox types to ensure **best actuator costs**

Technical features

Our competitive advantage

2 Linear actuators – full lineup for multiple mounting positions

Linear actuator
in Chinese OEM humanoid



Linear actuators



Technical features

- Lightweight module, reducing limb inertia and improving **flexibility**
- High power density, enabling higher **load capacity**
- Low heat generation, supporting **long duration** in operation

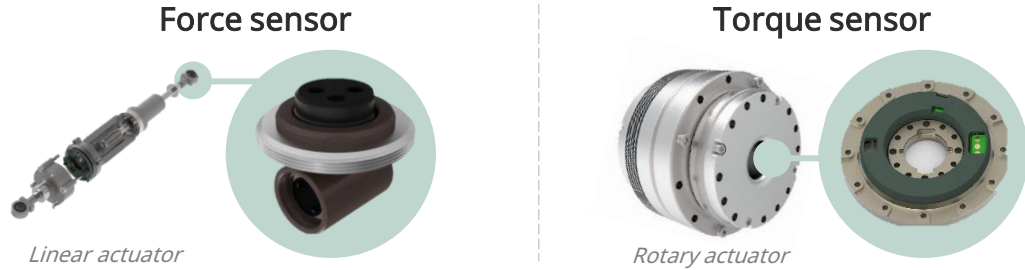
Our competitive advantage

- **High vertical integration** – all main components developed and produced in-house to meet highest quality standards
- **Schaeffler global production footprint of >100 plants** for production close to our customers

3
4

Sensors & dexterous hand – utilizing Schaeffler’s high vertical integration

Sensors for linear and rotary actuators



Technical features

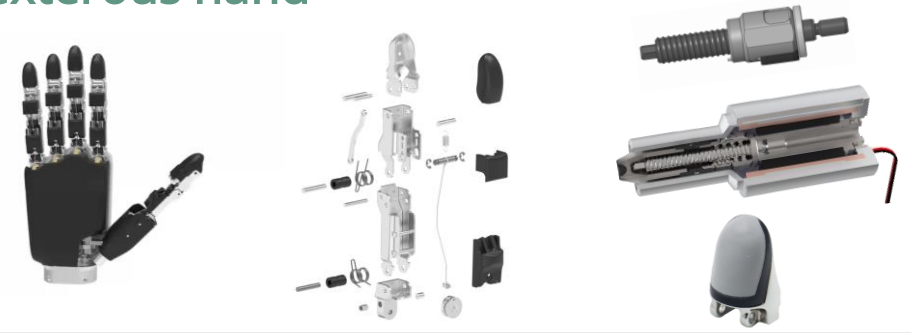
- Accurate to 1% of full-scale range; Designed to reject undesired signals
- Compact, space-saving system with integrated installation hardware

Our competitive advantage

- High volume production – Mature MEMS technology at Schaeffler derived from automotive products
- High vertical integration – Modular design for compact packaging
- Cost effective solution vs. state-of-the-art Humanoid sensors

Dexterous hand

i Add. ~ 20 % of the humanoid BOM costs



- Modular fingers with 20 DoF with tendon-based actuation
- Integrated tactile sensors
- Highly integrated in-house transmission and motor drive

- Mature sheet metal forming for low cost and scalable design
- High efficiency ball screw transmission with in-house manufacturing
- High vertical integration – development, integration and implementation in-house with Advanced Production Technology

1) Micro ElectroMechanical System

Schaeffler's humanoid activities gaining traction globally – Establishment in the humanoid ecosystem



- Investment of 10 mn \$ by Schaeffler Invest USA in November 2024
- Three "Digits" as specialist for material handling and logistics used in Schaeffler plants in the US



- Partnership with Nvidia to embed AI across the Omniverse ecosystem



HUMANOID

- Technology partnership signed in January 2026
- Completed Proof of Concept with pre-alpha robot

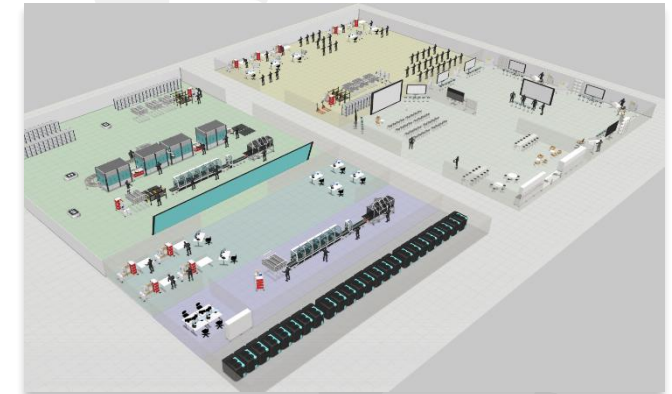
NEURA

- Technology Partnership signed in November 2025
- Purchase agreement signed for two of the NEURA Humanoid series



SCHAEFFLER

- Taicang Humanoid Lighthouse Factory as a Cooperation Platform for a Humanoid Ecosystem in China
- Up-to-date Digital & AI technology, fully autonomous, highly flexible, full stack data driven with close-loop evolution



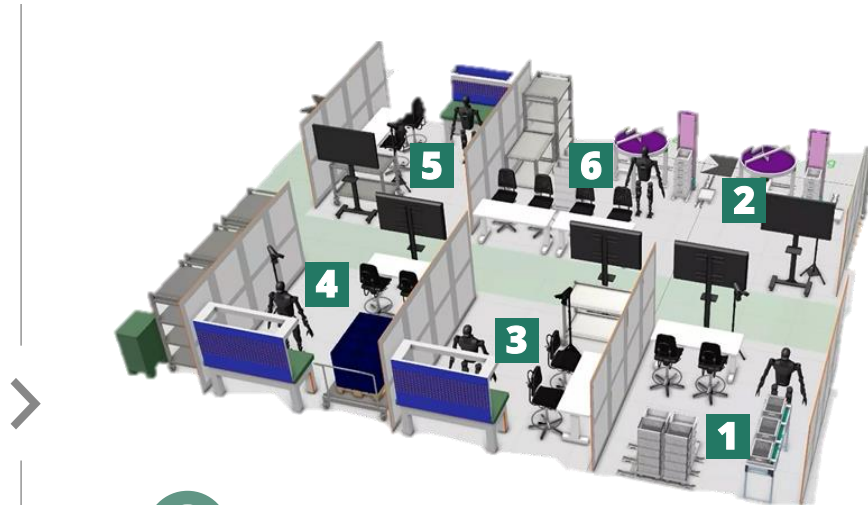
More technology partnerships expected in all regions to further strengthening Schaeffler's position in the Humanoid ecosystem

Schaeffler Humanoid Gym with six "golden" use cases, enabling realistic and efficient training and skill development

Schaeffler Humanoid Gym with the potential to optimize 25.000 work stations



Humanoid robots will increase industrial productivity by a factor of 10



Data Collection



Humanoid Robot Training



Humanoid Robot Benchmark



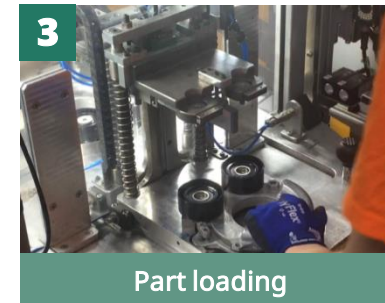
Preparation for deployment



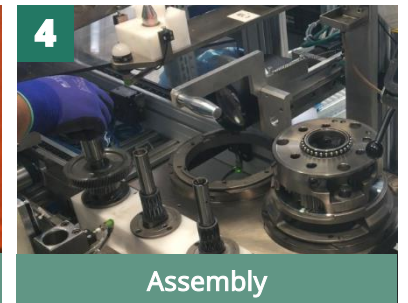
Box & Tote Handling



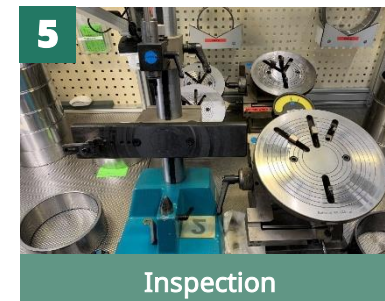
Feeding



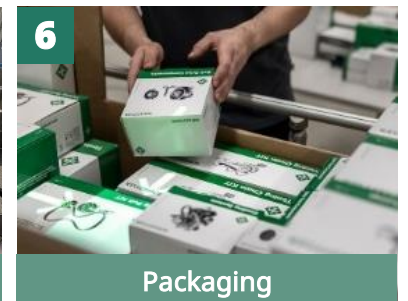
Part loading



Assembly



Inspection



Packaging

Schaeffler very well equipped to establish itself in the humanoid market

- 1** Humanoids are the next smart phone moment. 2 reasons: Physical AI is technically possible and the world needs artificial labor
- 2** Schaeffler is the Motion Technology company and humanoid robots is about motion and precision
- 3** Schaeffler will accelerate the market introduction of humanoids with intelligent actuators and the ability to scale at best costs
- 4** Schaeffler will broaden business models for humanoid: high volume deliveries as a supplier, integration and service business as user, digital platform business as industrialization partner and circular business as aftermarket / services
- 5** Schaeffler is highly engaged in product development for all relevant humanoid players in all regions
- 6** Schaeffler has the most real data needed for foundation models
- 7** Schaeffler will be the market share leader worldwide for > 50% of the content of the BOM

SCHAEFFLER