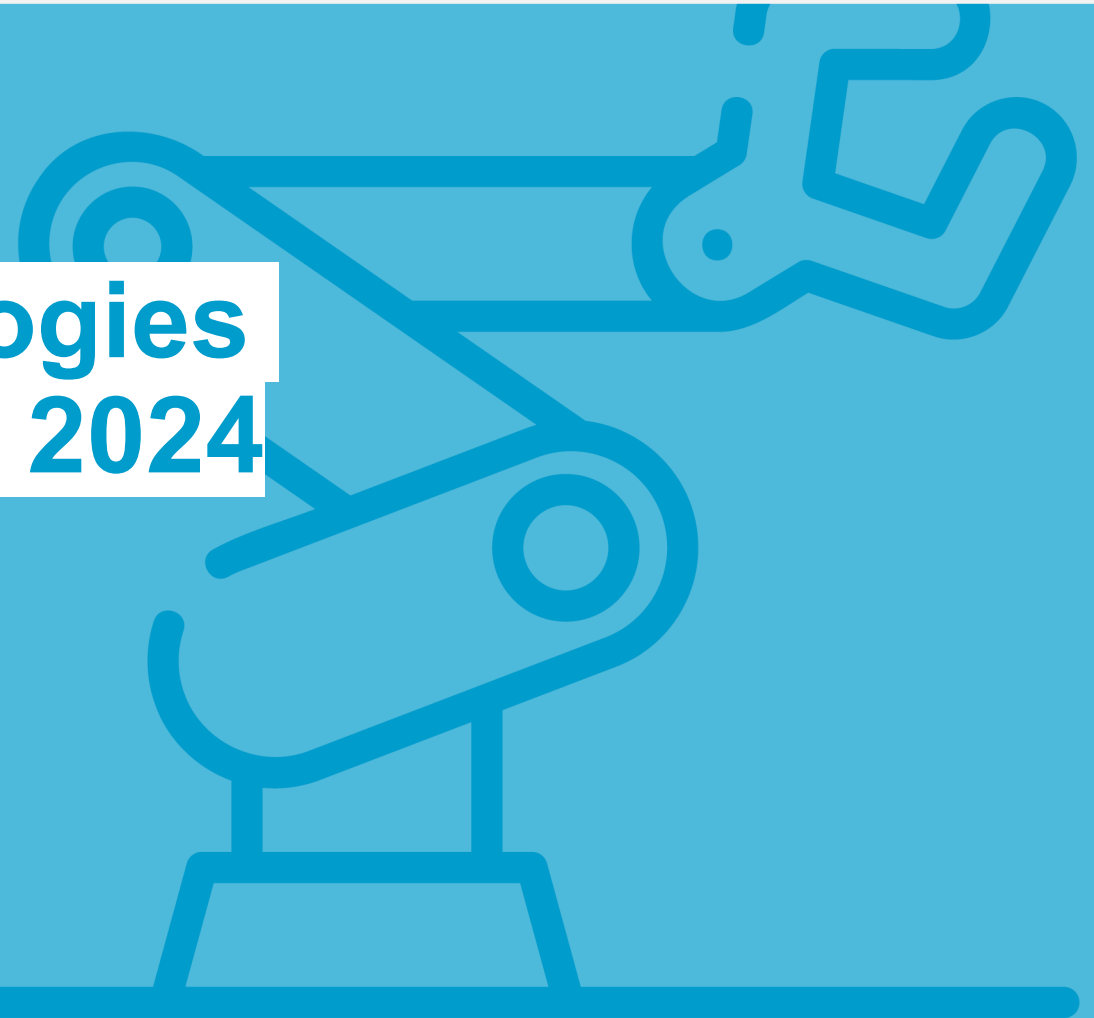


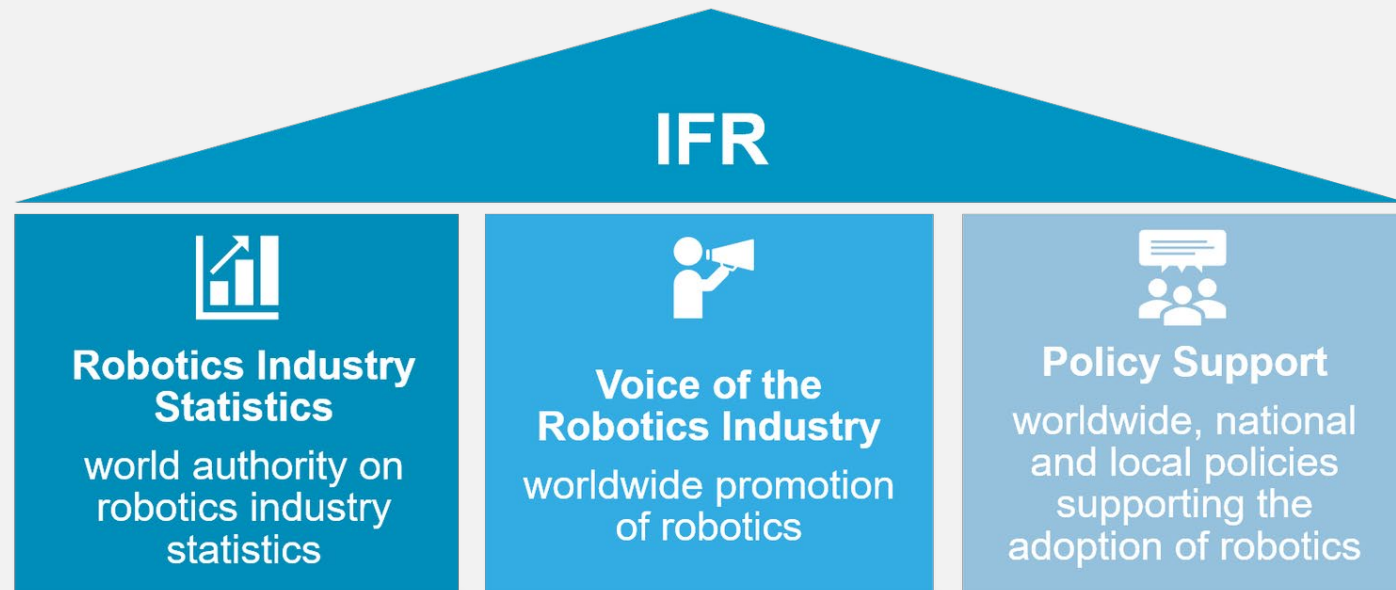
IFR Robotics Executive Roundtable  
on 8 May 2024

# The Trends & Technologies Driving the Industry in 2024

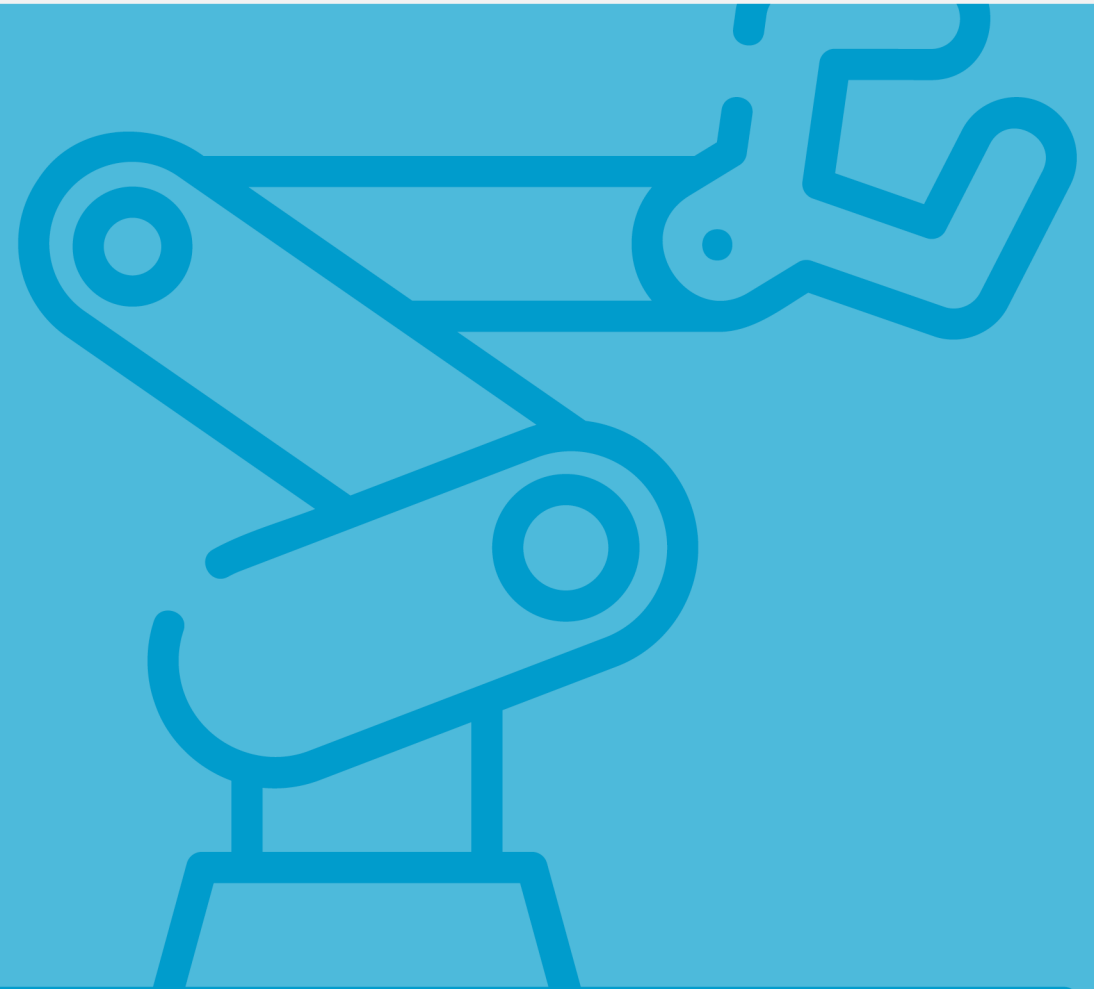


# International Federation of Robotics

- **Global non-profit organization** – active for the robotics sector since 1987
- IFR represent **more than 3,000 organizations** from **30 countries**
  - Robot manufacturers, national robotics associations, universities, start-ups worldwide
- Annual global **robotics turnover \$50 billion** (robot systems including software & peripherals)



# The Status of the Global Robotics Market



# IFR statistics 2023: preliminary results and World Robotics

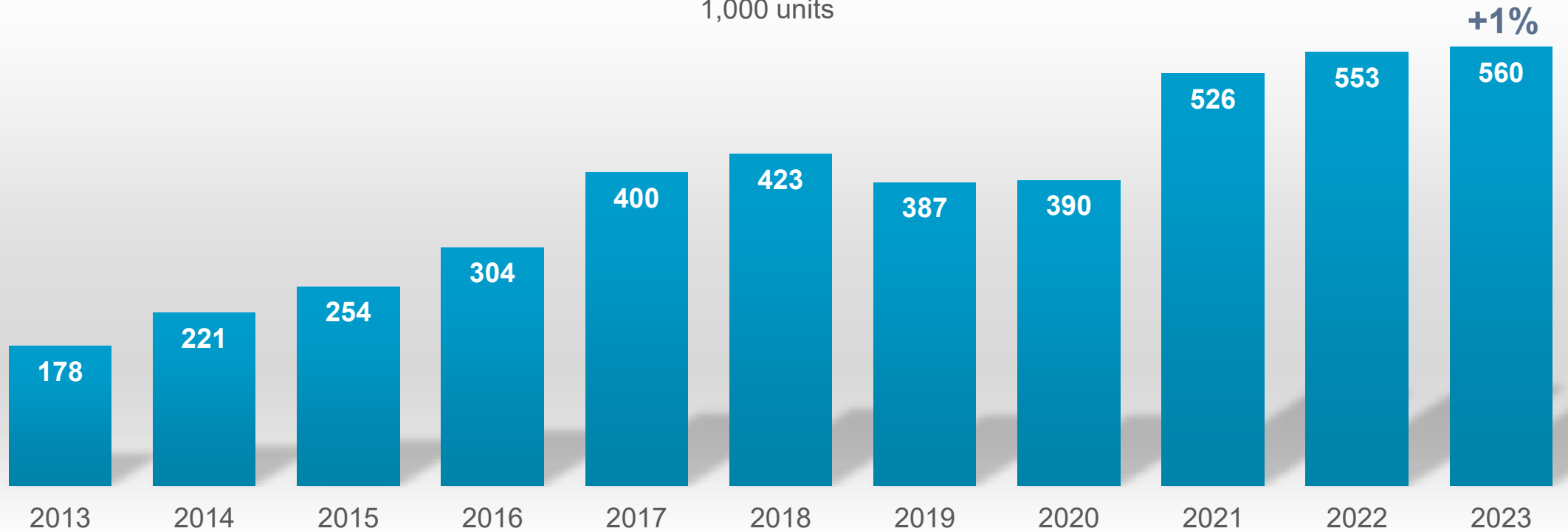
- Numbers presented here are **preliminary** as of April 2024
- Final results most likely are subject to changes
- They will be published in World Robotics 2024
- Available 24 September 2024



# Preliminary global installations 2023: 560,000 units (+1%)

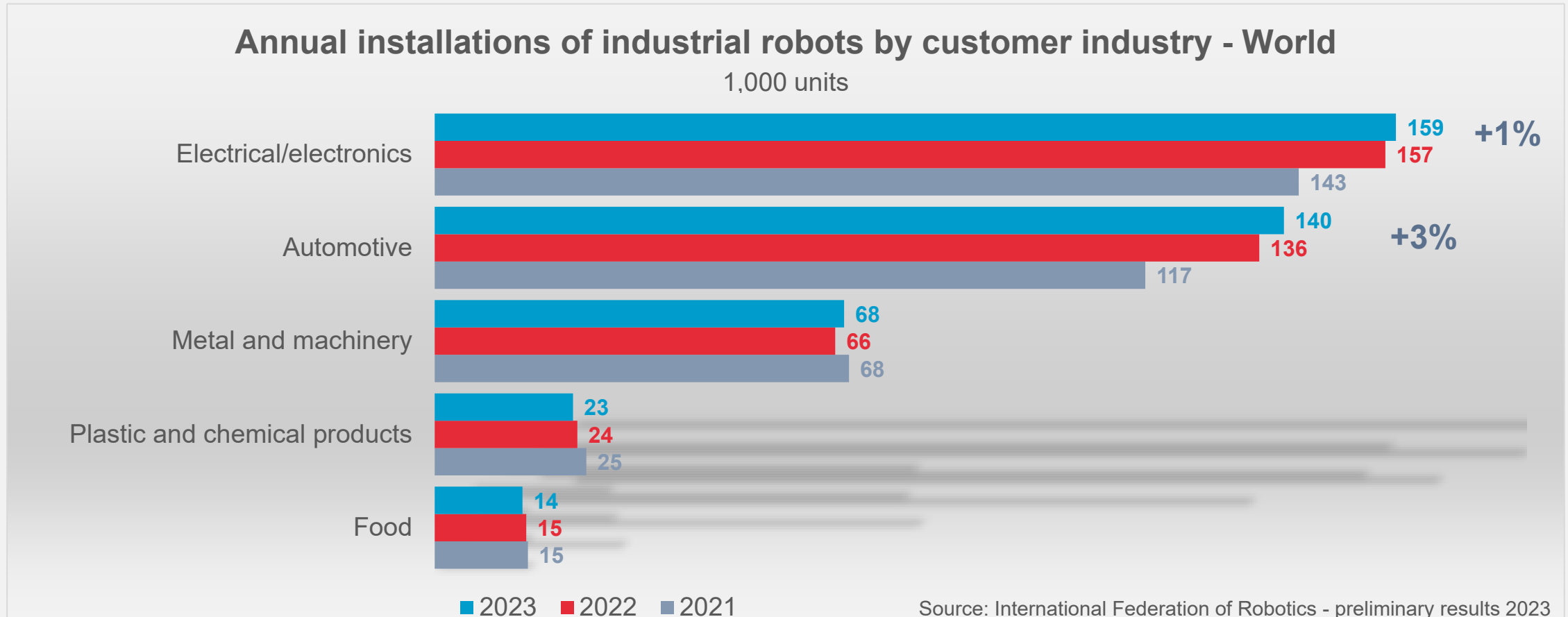
## Annual installations of industrial robots - World

1,000 units

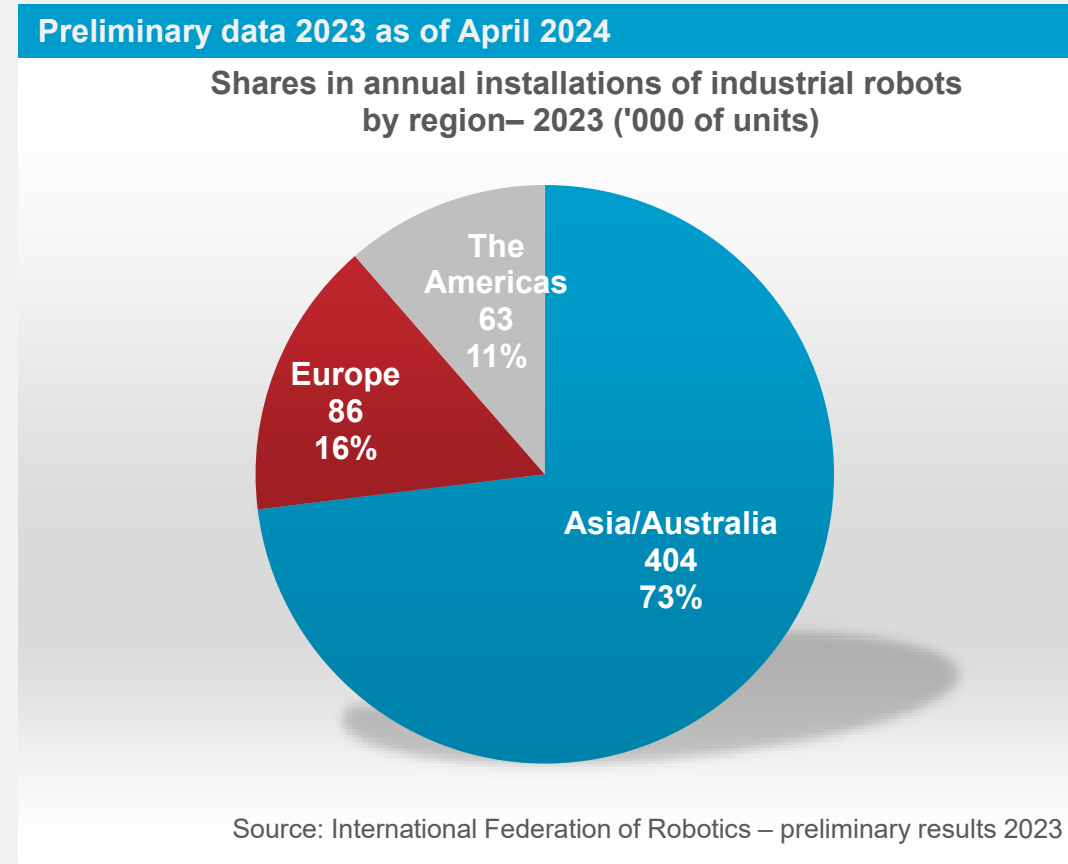
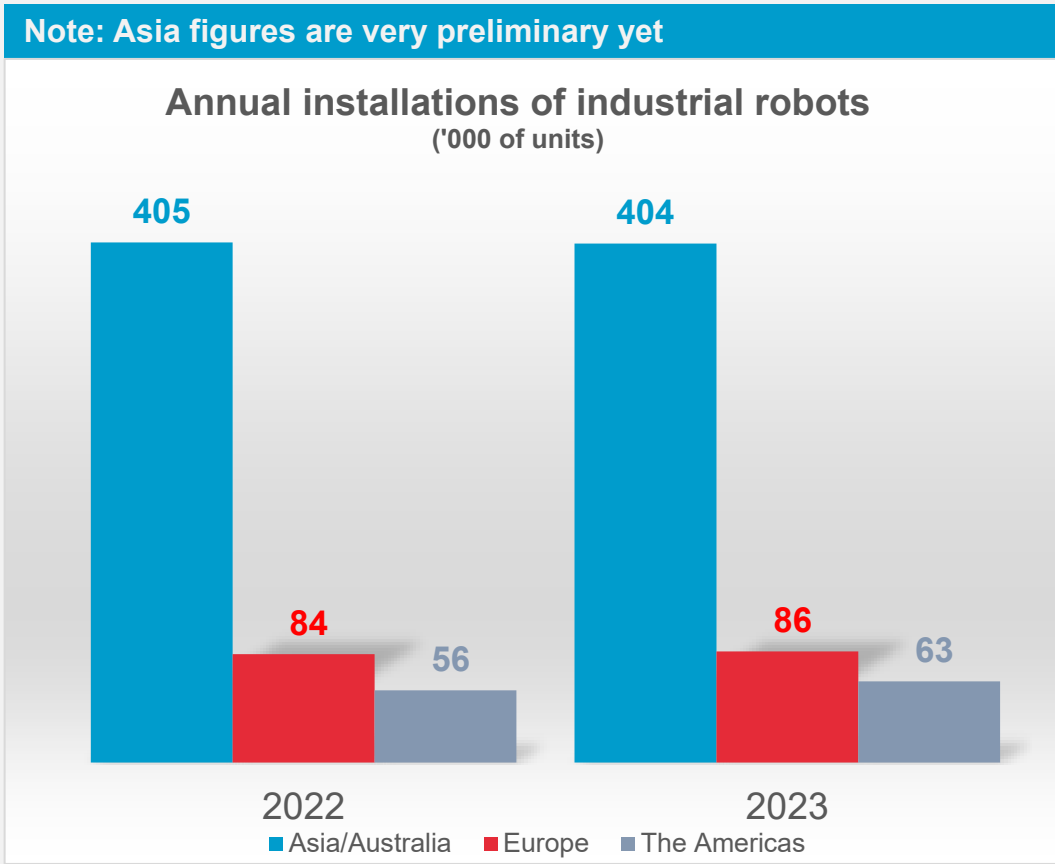


Source: International Federation of Robotics - preliminary results 2023

# Electronics is largest customer



# Asia's share in installations at 73%

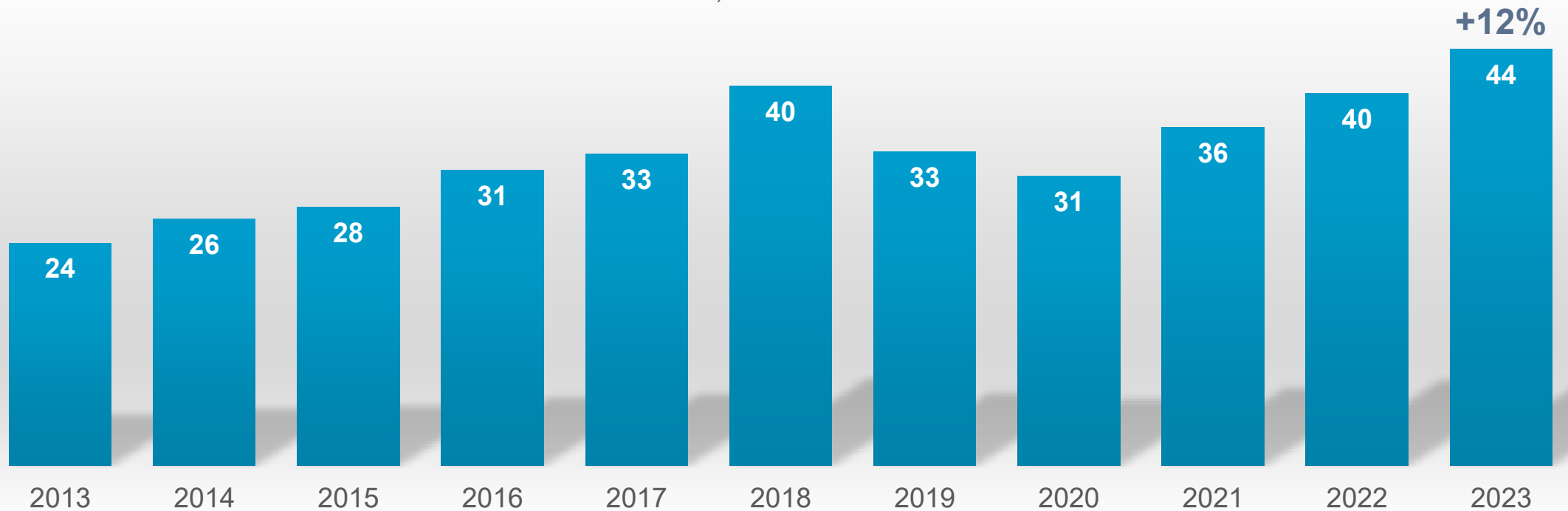


Source: International Federation of Robotics – preliminary results 2023

# United States growing +12% on record level

## Annual installations of industrial robots - United States

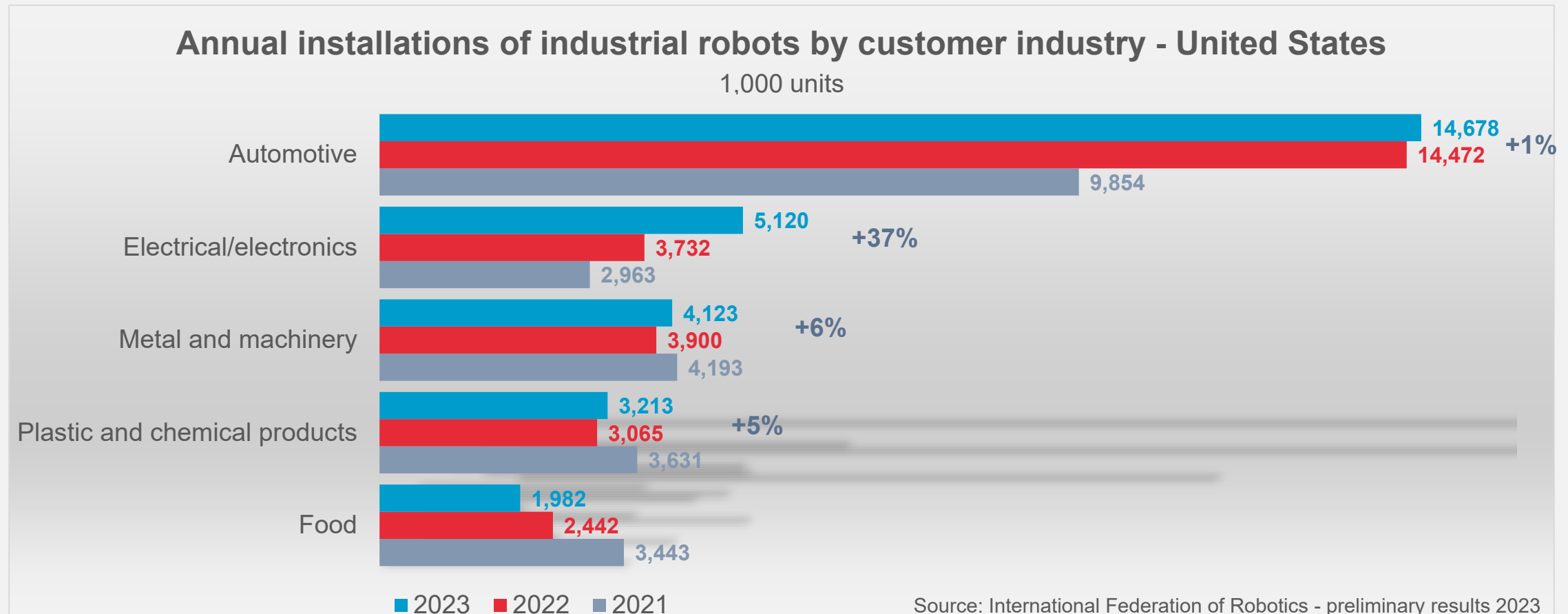
1,000 units



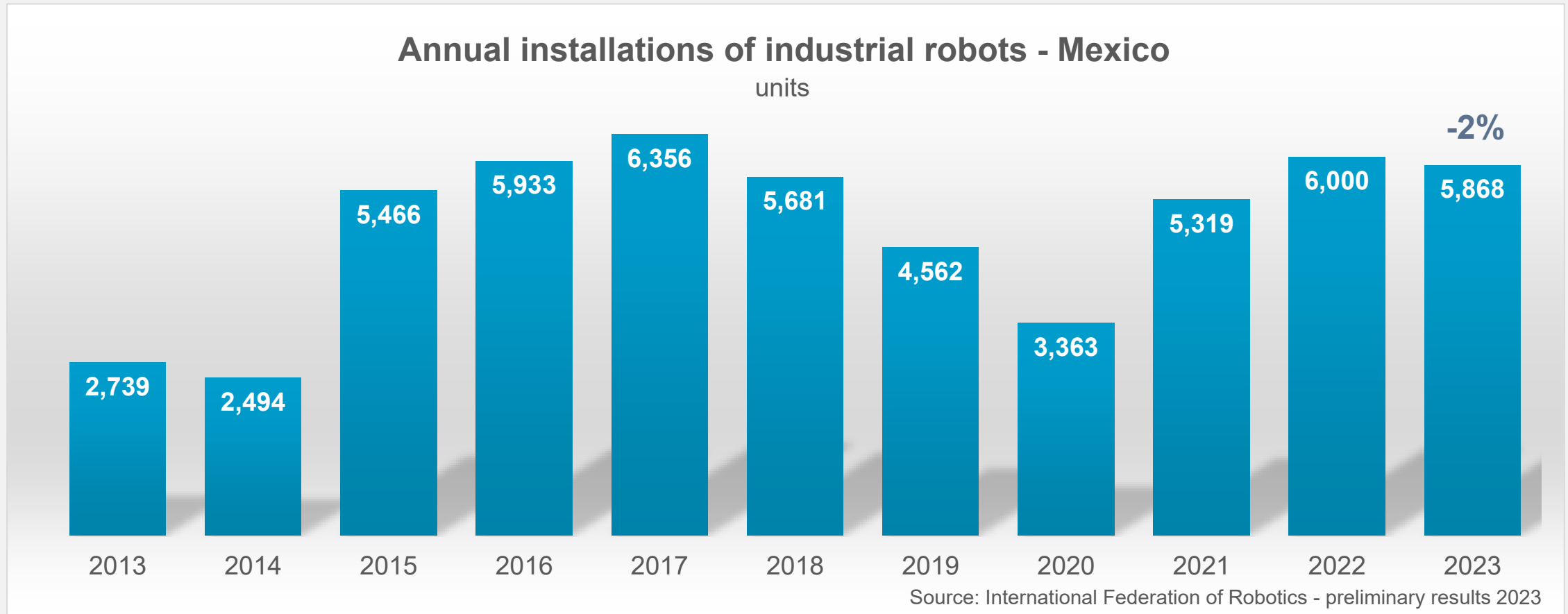
Source: International Federation of Robotics - preliminary results 2023



# Automotive industry is the pillar of US robot demand

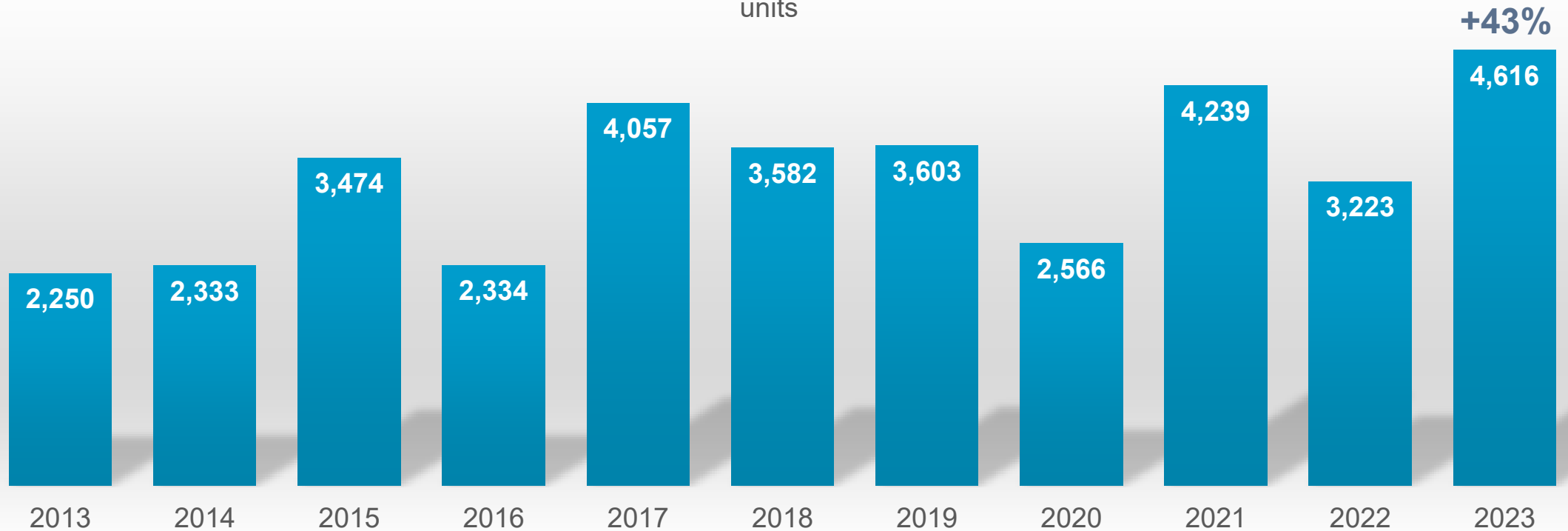


# Mexico: Unchanged at a high level



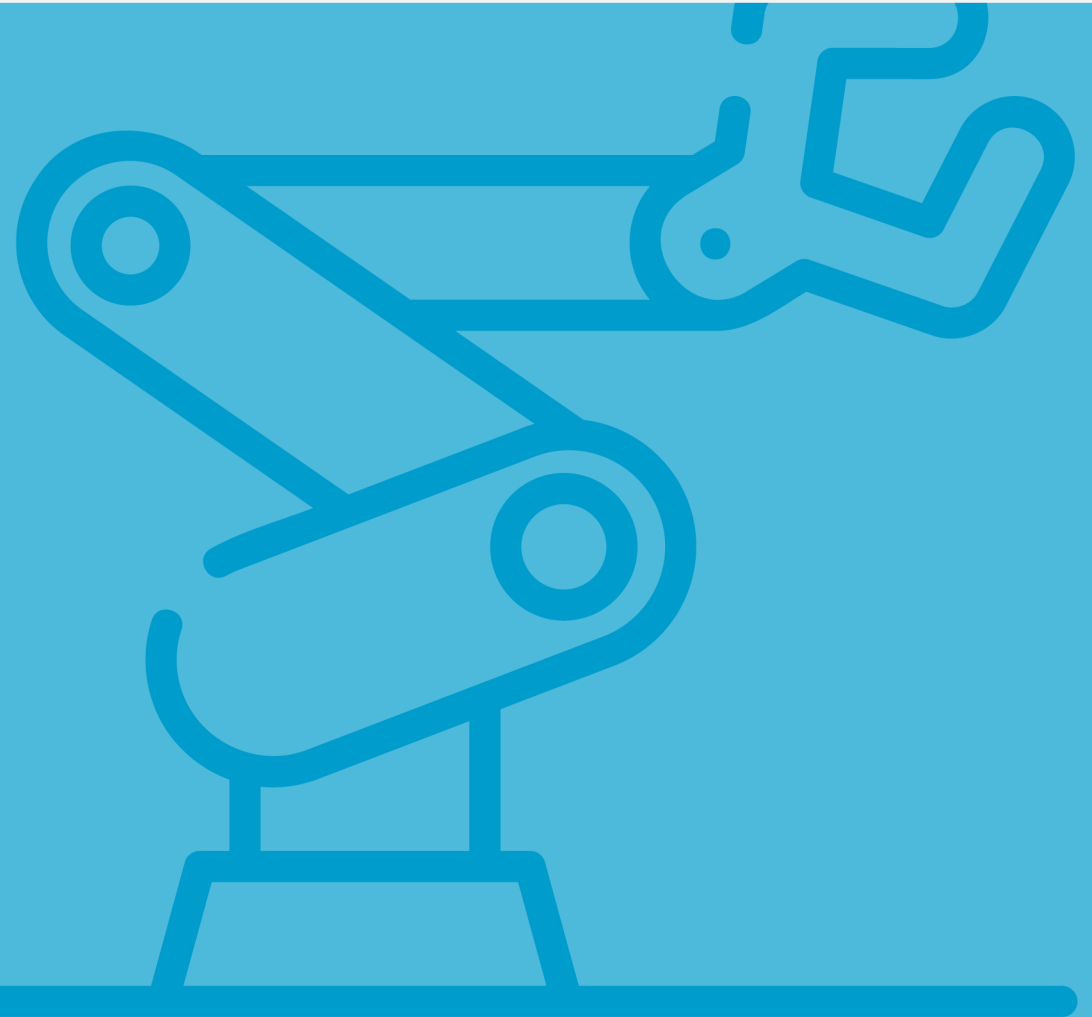
# Canada: New record due to strong demand from automotive industry

Annual installations of industrial robots - Canada  
units



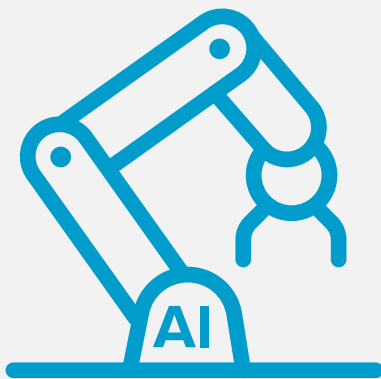
Source: International Federation of Robotics - preliminary results 2023

# Global Trends and Outlook

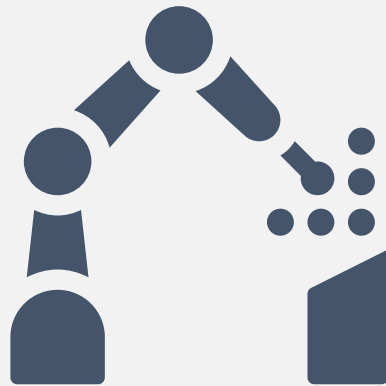


# TOP 5 Global Robotics Trends in 2024

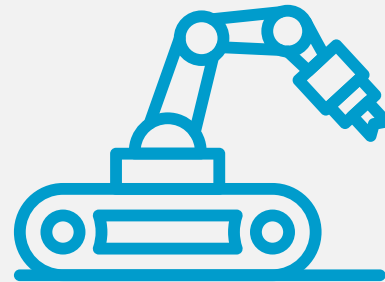
## AI AND MACHINE LEARNING



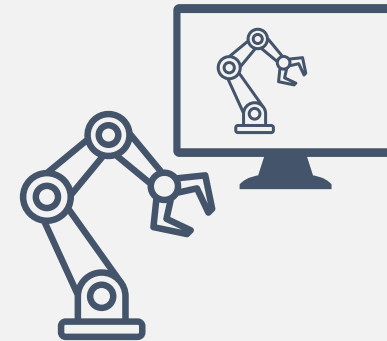
## COBOTS IN NEW APPLICATIONS



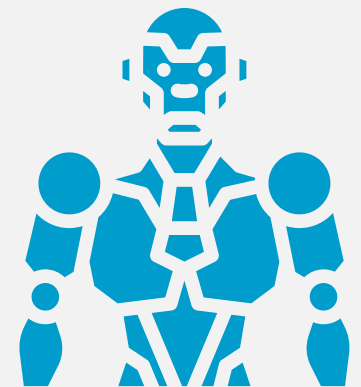
## MOBILE MANIPULATORS



## DIGITAL TWIN



## HUMANOIDS



# AI and Machine Learning



- **Growing adoption in commercial applications**
- Machine learning and vision helps robots to respond to real environment
- Machine learning algorithms analyzing data for process optimization
- Predictive AI analyzing robot performance data
- Generative AI allows more intuitive programming by natural language
- **Helps to manage variability and unpredictability**

# Cobots in new Applications



Image: Schunk

- **Ease of use** main benefit for collaborative robots today with **intuitive and simple programming**
- **Ecosystems** emerging
- The range of collaborative applications continues to expand – e.g. cobot welding
- Collaborative robots complement investments in traditional industrial robots
- **AI will allow for further cognitive collaboration with humans**

# Mobile Manipulators



Image: Omron

- Combine the **mobility** of robotic platforms (AMRs) with the **dexterity** of manipulator arms
- Mobile manipulators (mobile cobots) offer **new use cases** that could expand the demand for collaborative robots substantially.
  - Used to automate material handling tasks in industry
  - Opening up new use cases also in service applications
- **Currently still at a moderate volume, but high growth potential**



# Virtual Simulation and Digital Twin



Image: KUKA

- Robots are more and more digitally integrated in factories
- Simulation is used to check performance before the physical world itself is touched.
- Digital twins can use their real-world operational data to run simulations and predict likely outcomes.
- The twin exists purely as a computer model, it can be stress-tested and modified with no safety implications while saving costs.
- **Digital twins bridge the gap between digital and physical worlds.**

# Humanoid robots



Image: PAL Robotics

- Human-like design - can be used flexibly in work environments that were actually created for humans
- Potential impact on various sectors, e.g. warehouses.
- Humanoids recently receive tremendous attention, e.g. China's MIIT announcement on detailed goals for the country's ambitions to mass-produce humanoids by 2025
- **Mass market adoption remains a complex challenge.**



## ■ Outlook for Asia

- 2024 will be challenging
- Order intake in Asia declined in the second half of 2023\*\*
- Foreign Direct Investments in China hit a 30-year low\*

## ■ Outlook for Europe

- European economy generally promising, while Germany is challenging
- Order intake growing in the single-digits in Q4/2023.\*\*

Sources: \* VDMA Machinery & Equipment in China Q4/2023  
\*\* IFR Quarterly Survey

## Signs of a cyclical downswing in 2024 for North America

- Turnover moving sideways in North America in Q4/2023\*
- Double-digit contraction of order intake in Q4/2023\*



Source:

\* IFR Quarterly Survey and A3