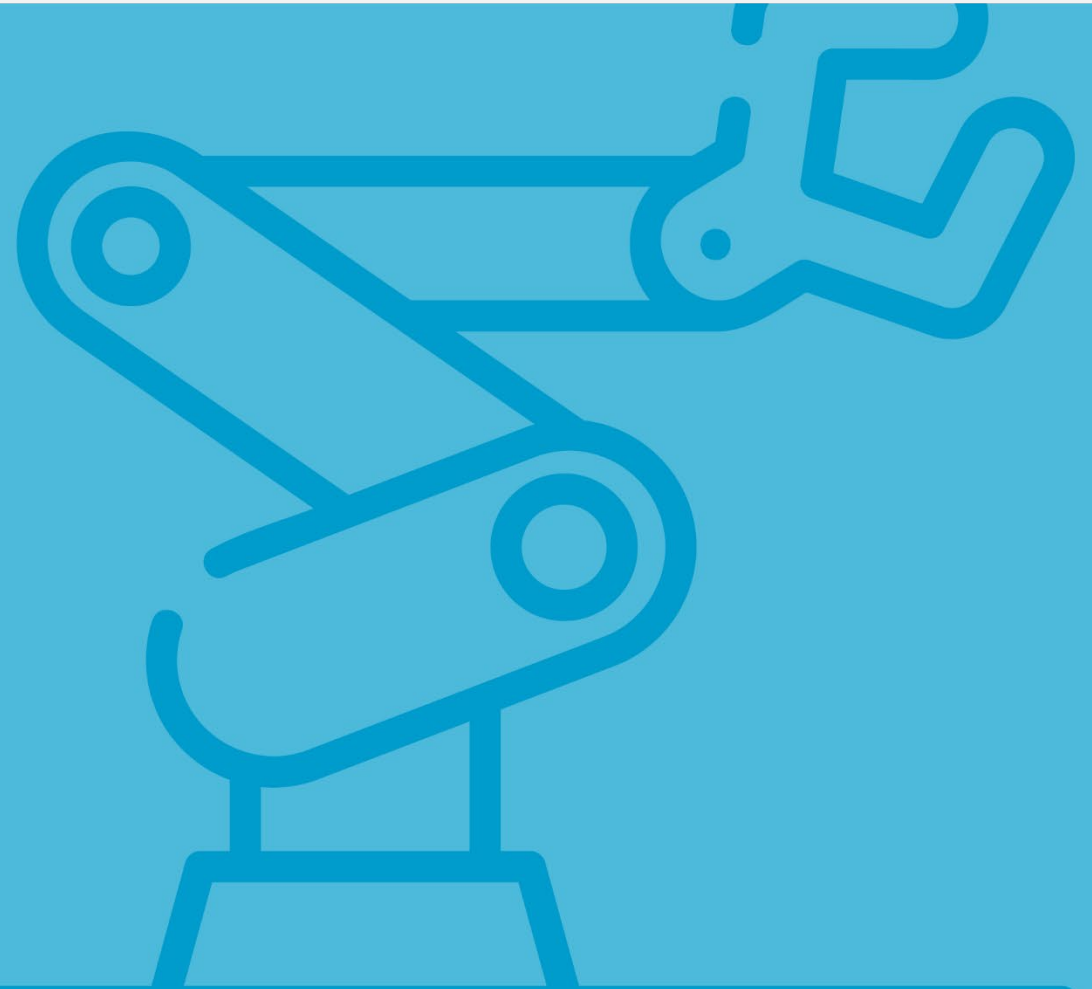


Welcome to the presentation of

World Robotics 2021

28 October 2021, live stream



 #WorldRobotics

For you on the panel



Milton Guerry
IFR President

President Schunk USA



Dr. Christopher Müller
Director Statistical Dpt.

International Federation
of Robotics



Dr. Werner Kraus
Vice Chair IFR Service
Robot Group

Head of Dpt. Robot and
Assistive Systems,
Fraunhofer IPA

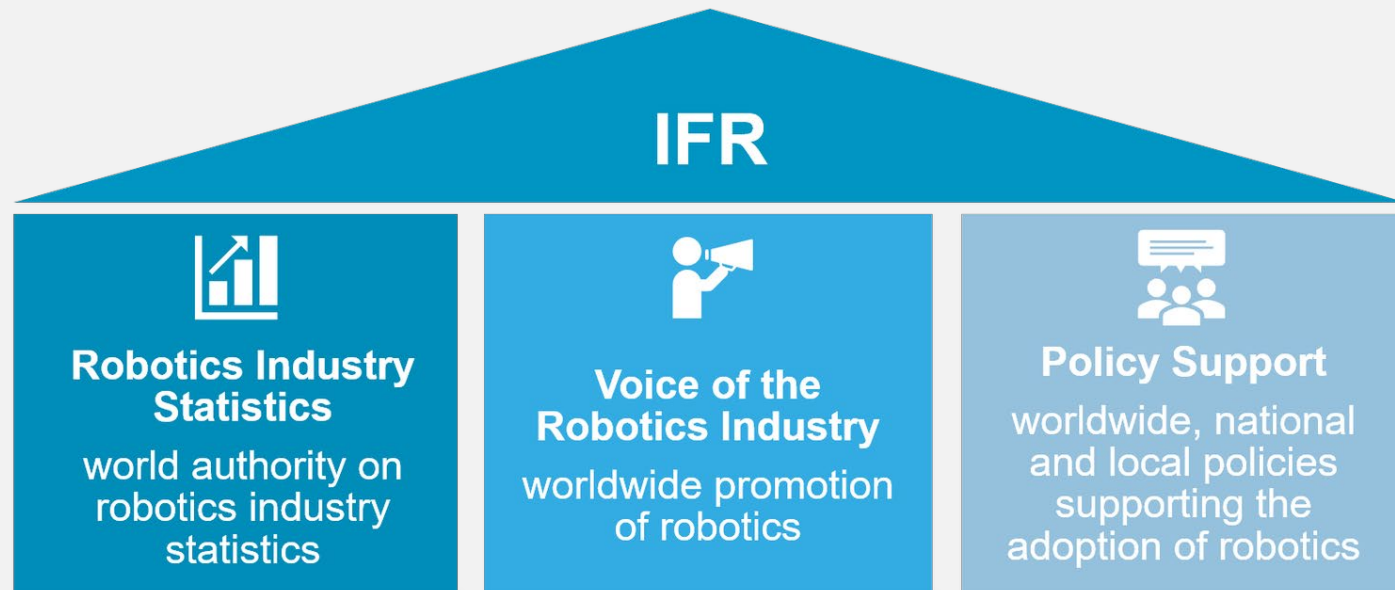


Dr. Susanne Bieller
General Secretary

International Federation
of Robotics

International Federation of Robotics

- **Non-profit organization** since 1987
- IFR represents **more than 2,000 organizations** from **25 countries**
- Robot manufacturers, national robotics associations, universities, start-ups worldwide
- Annual global **robotics turnover \$50 billion** (robot systems including software & peripherals)



What is a robot – and what is not?



Image: Photoneo

- **“Robot”** defined by **International Standards Organization ISO**
- **No robots:**
 - ⊗ software (“bots”, AI, Robotic Process Automation-RPA)
 - ⊗ remote-controlled drones, UAV, UGV, UUV
 - ⊗ voice assistants
 - ⊗ autonomous cars
 - ⊗ ATMs, smart washing machines, etc.

Two types of robots

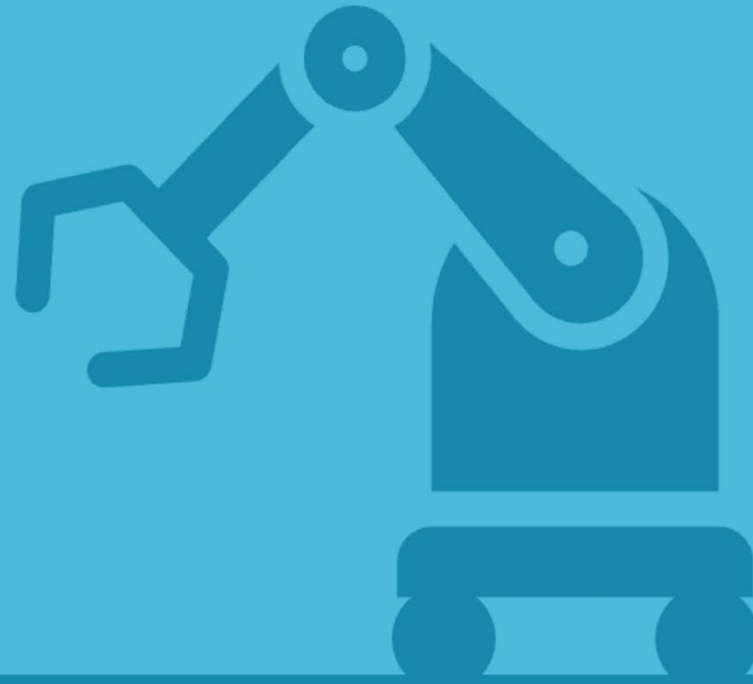
Industrial robots



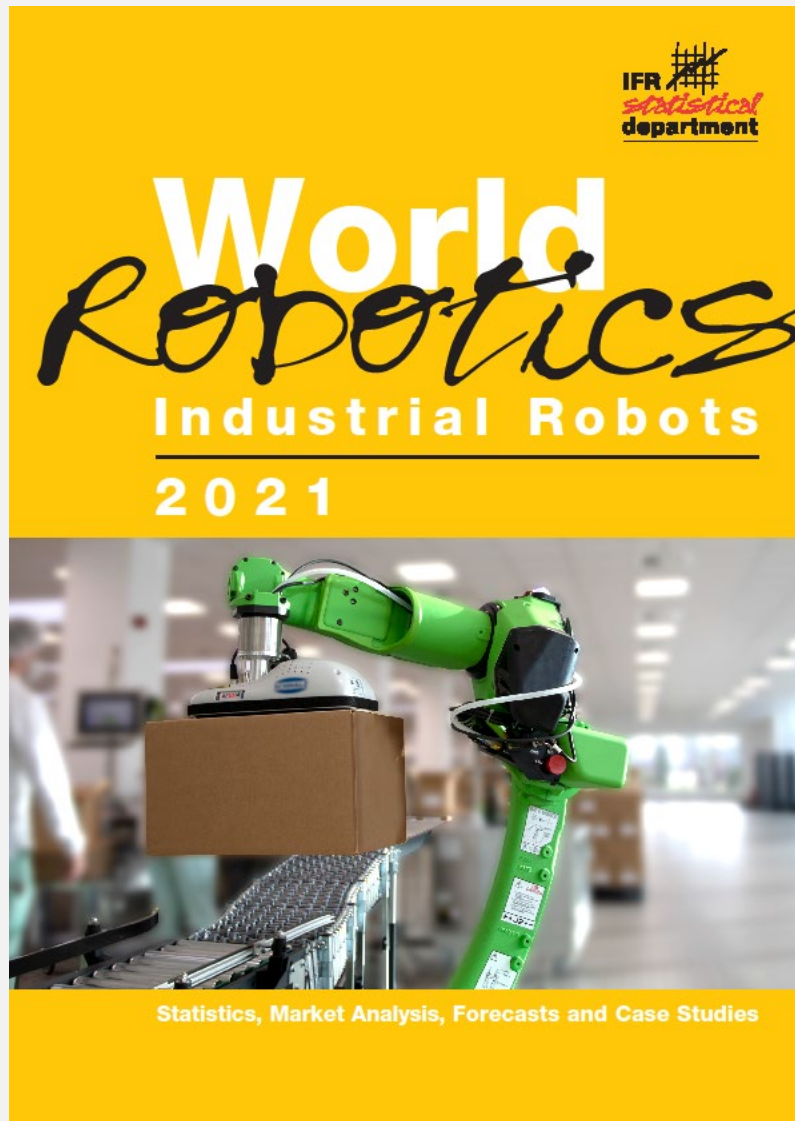
Service robots



3 Presentation of World Robotics 2021



Industrial robots - top findings



2020: Robot Sales Climb Again

Inspiring finish of a challenging year

New robots

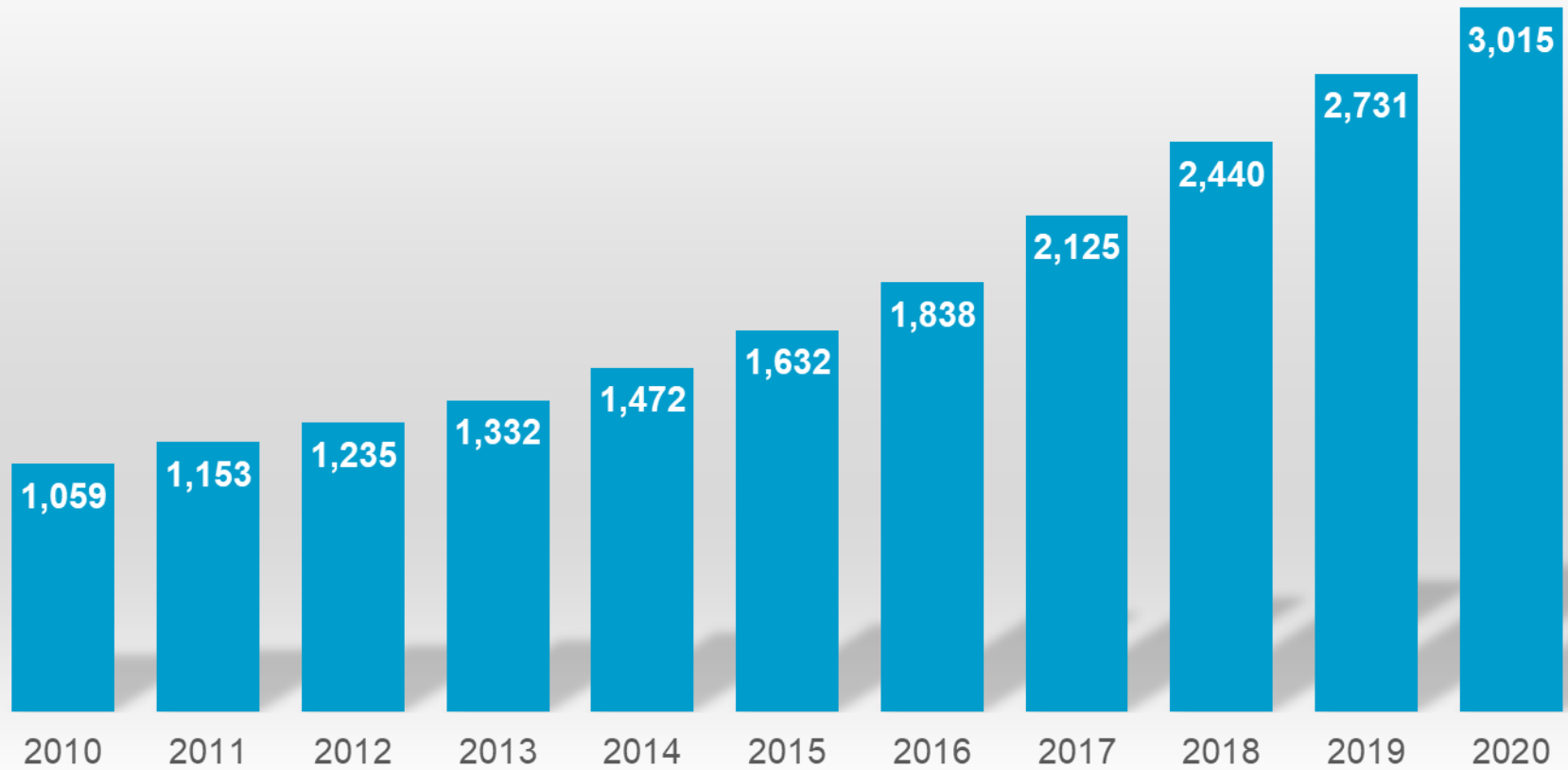
- 383,500 units (+0.5%)
- Third highest number in history
- CAGR 2015-2020: +9%

Robot stock

- 3.0 million units (+10%)
- CAGR 2015-2020: +13%

Operational stock of industrial robots - World

1,000 units



Source: World Robotics 2021

Annual installations of industrial robots - World

1,000 units

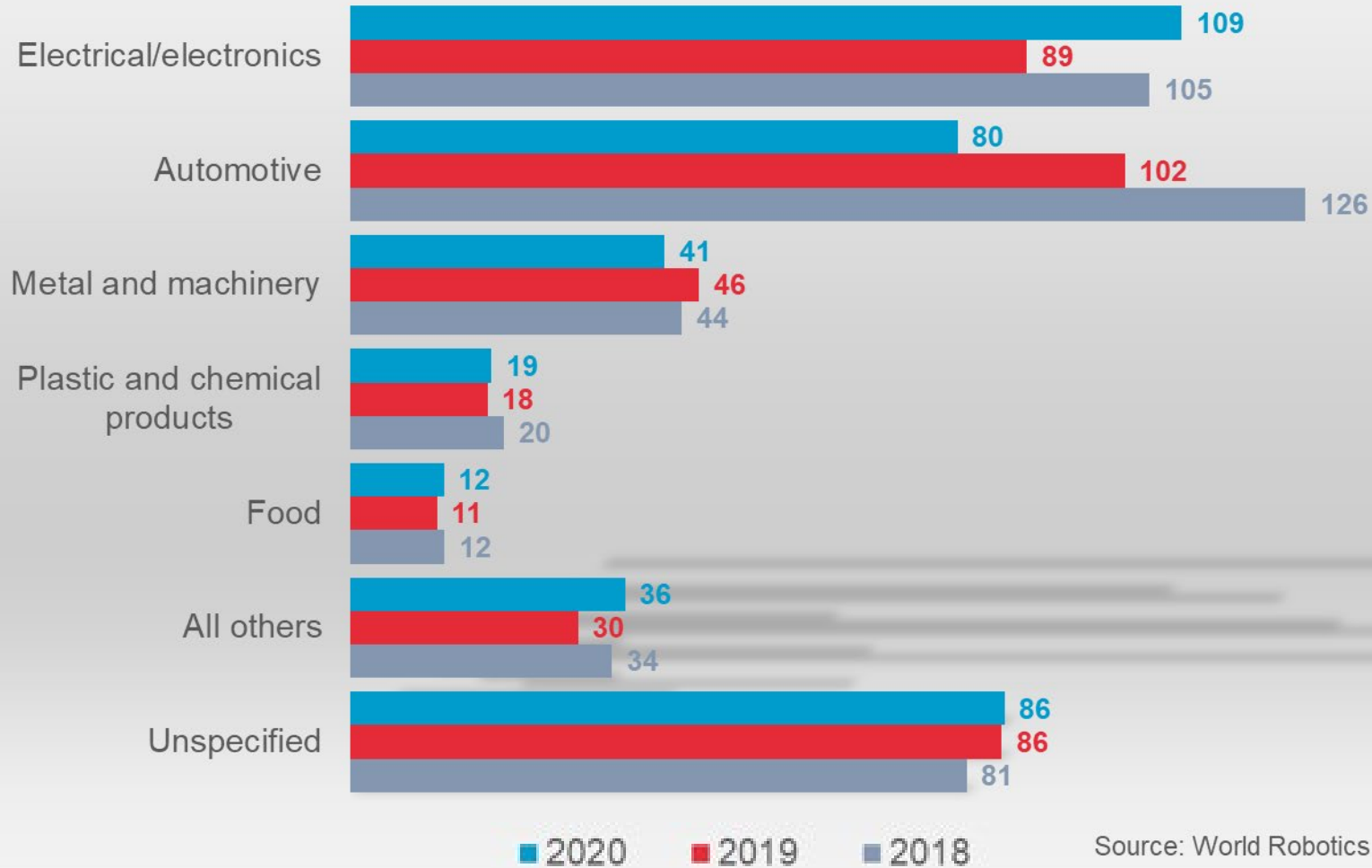


Source: World Robotics 2021

Electronics now major customer of industrial robots

Annual installations of industrial robots by customer industry - World

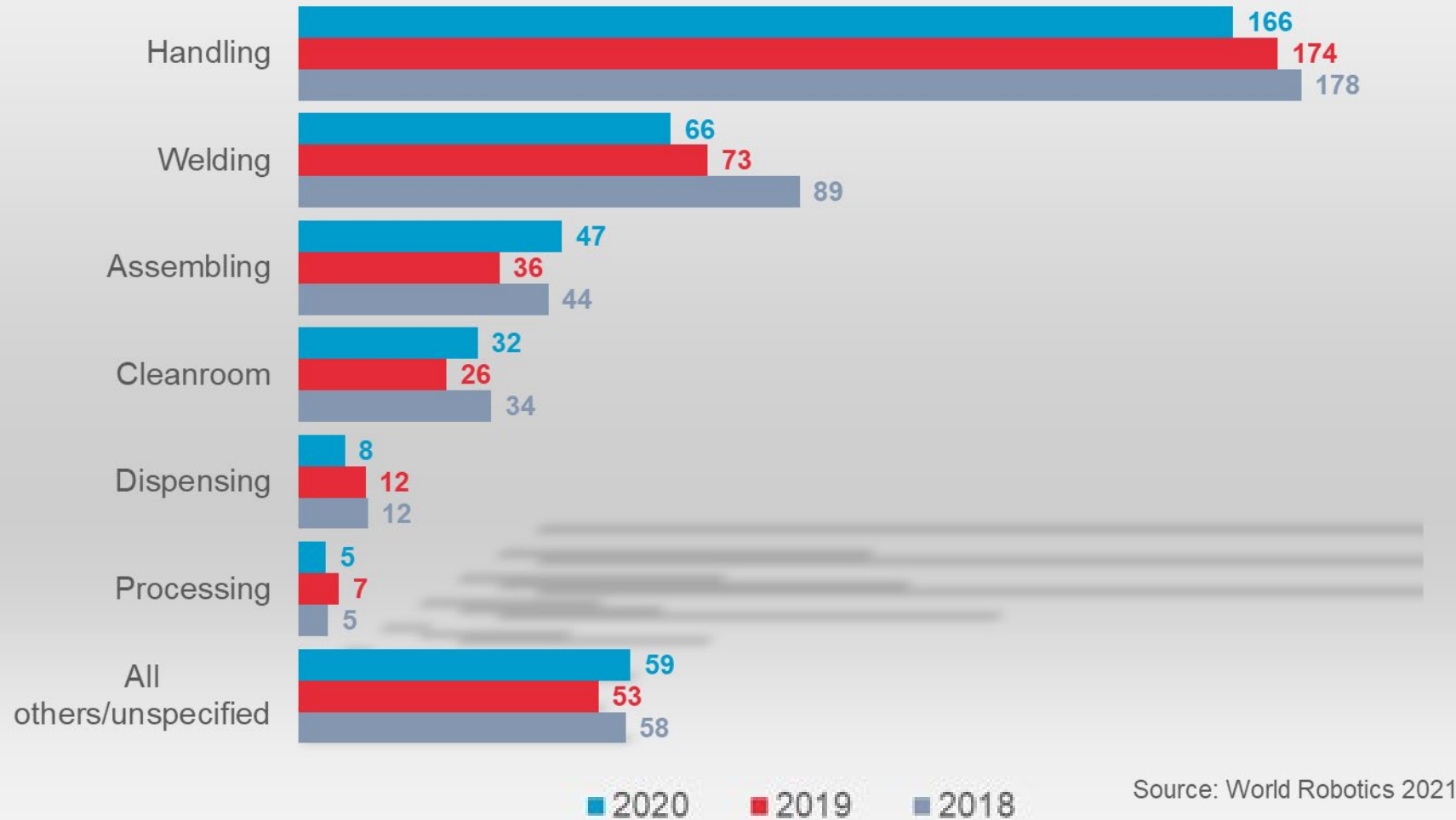
1,000 units



Source: World Robotics 2021

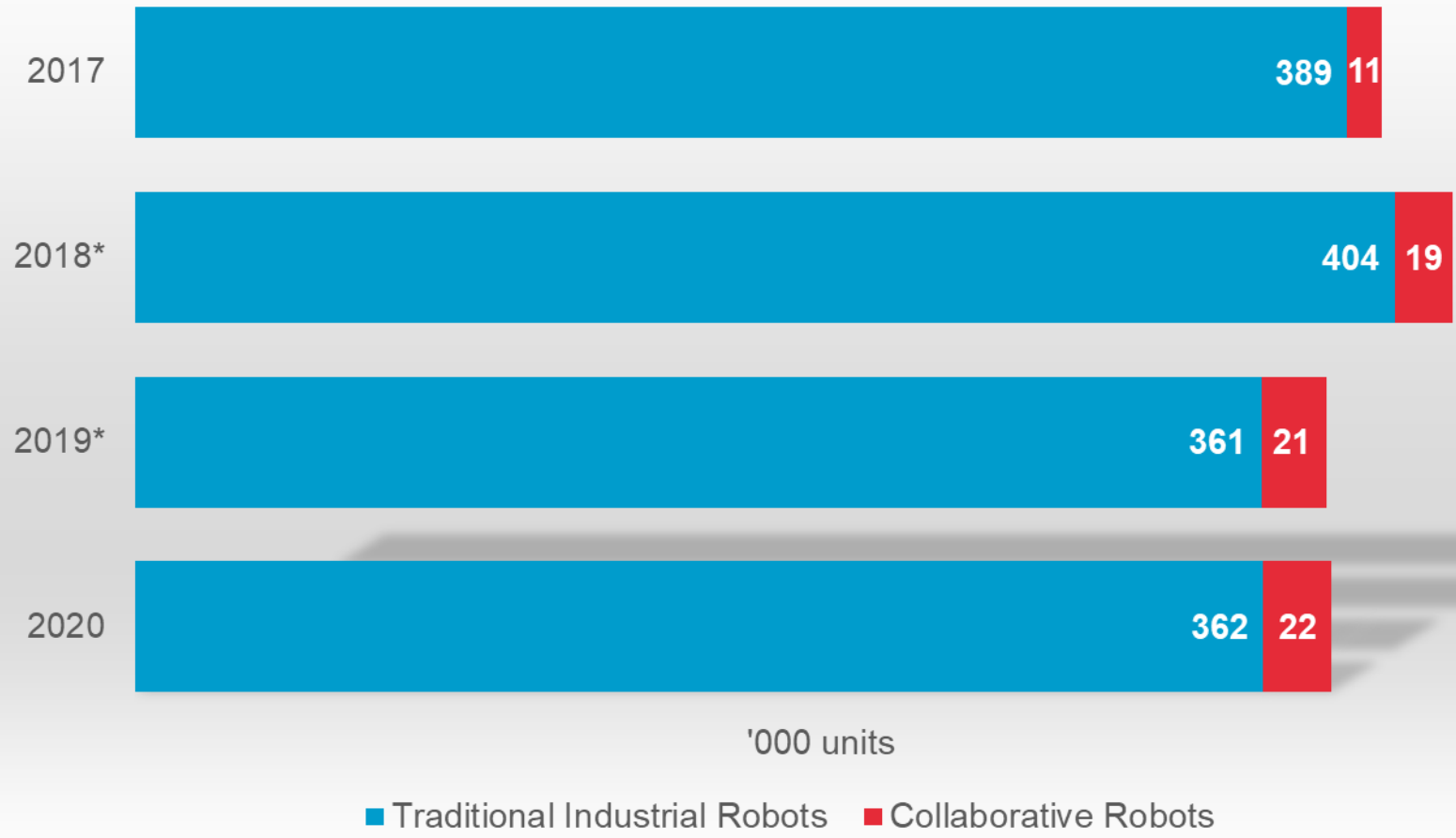
Annual installations of industrial robots by application - World

1,000 units



Collaborative robots: +6%

Collaborative and traditional industrial robots



'000 units

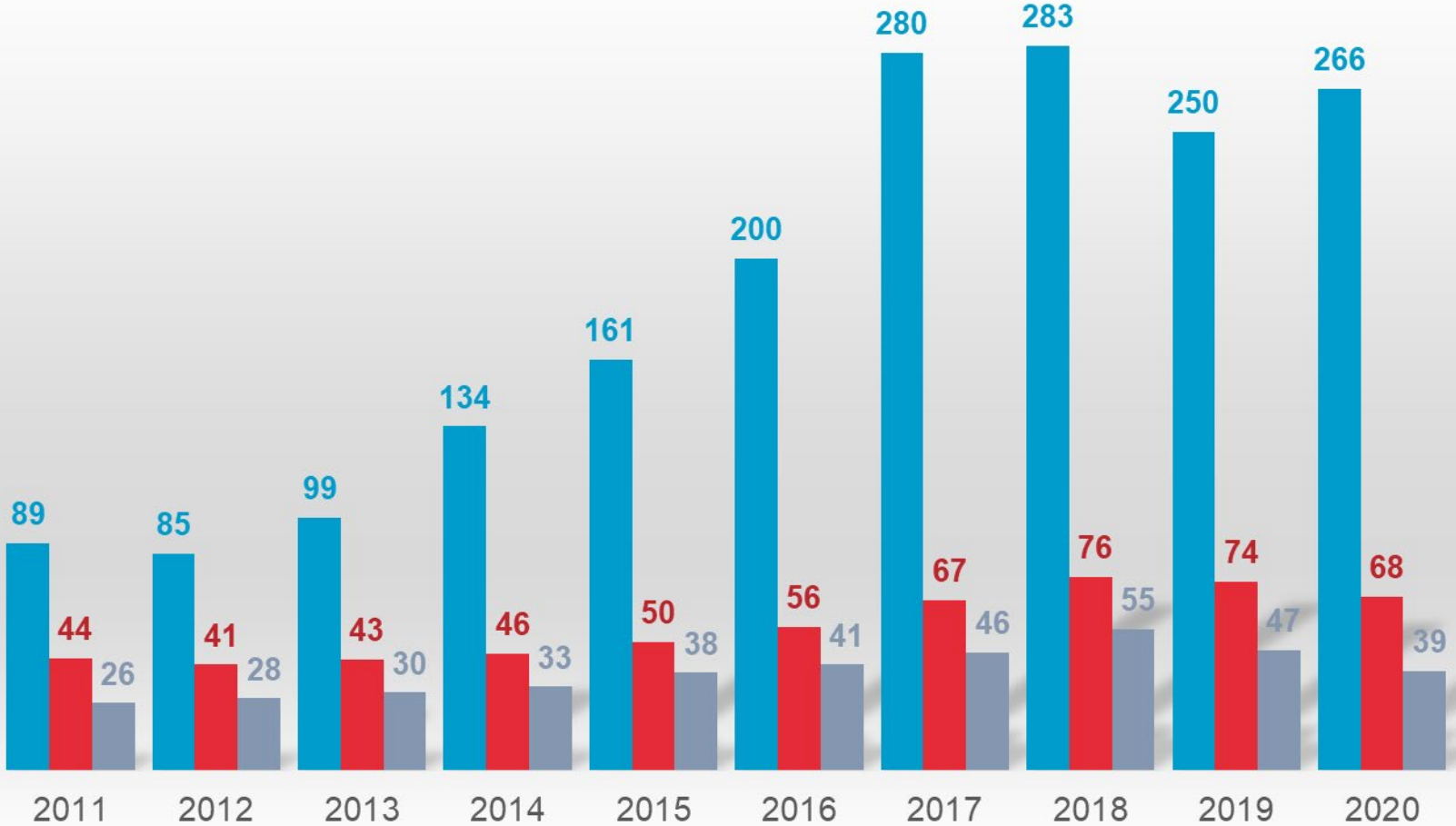
■ Traditional Industrial Robots ■ Collaborative Robots

*revised

Source: International Federation of Robotics

Asia grows while Europe and the Americas decline

Annual installations of industrial robots ('000 of units)

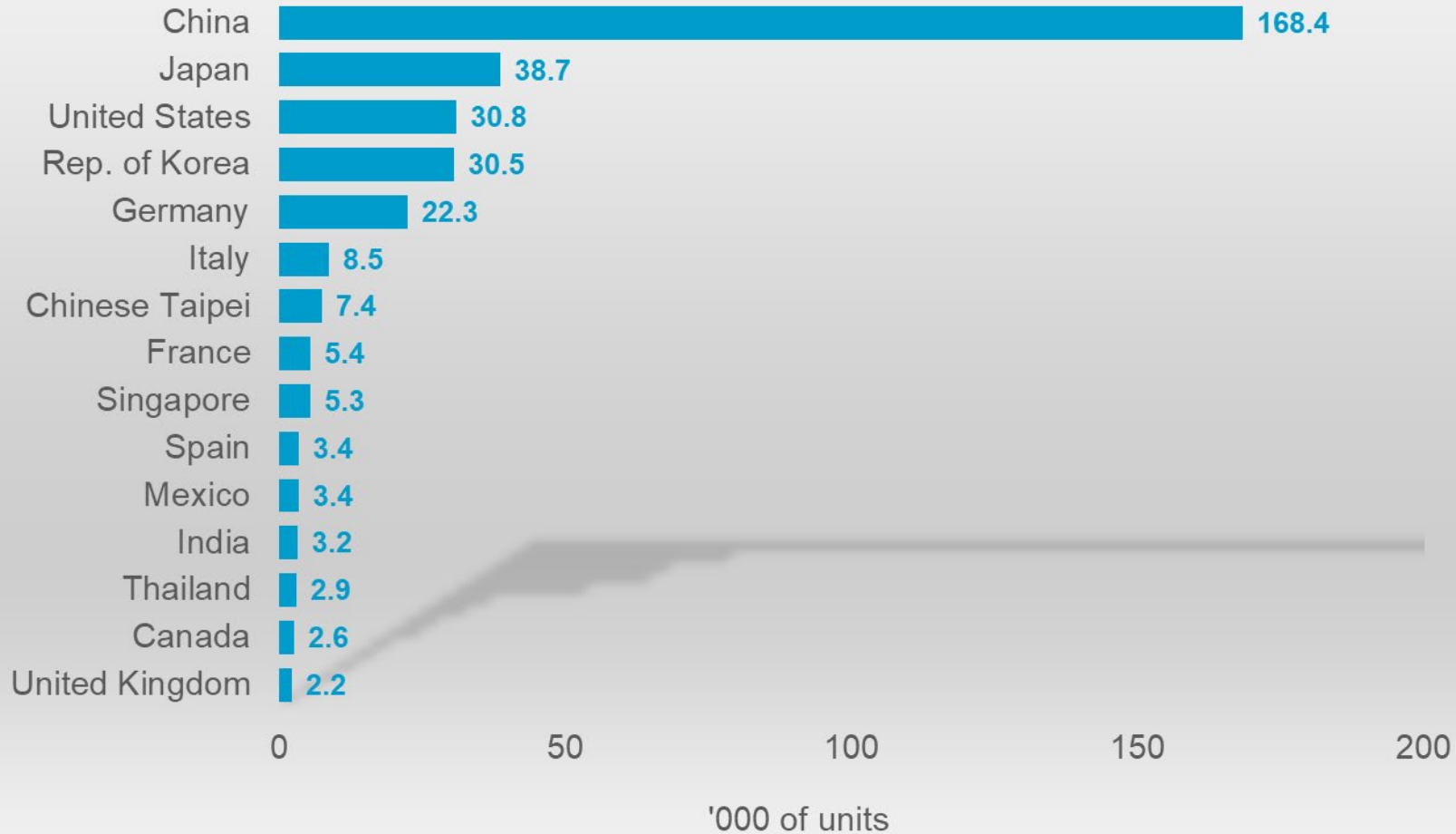


■ Asia/Australia ■ Europe ■ The Americas

Source: World Robotics 2021

China increases its lead

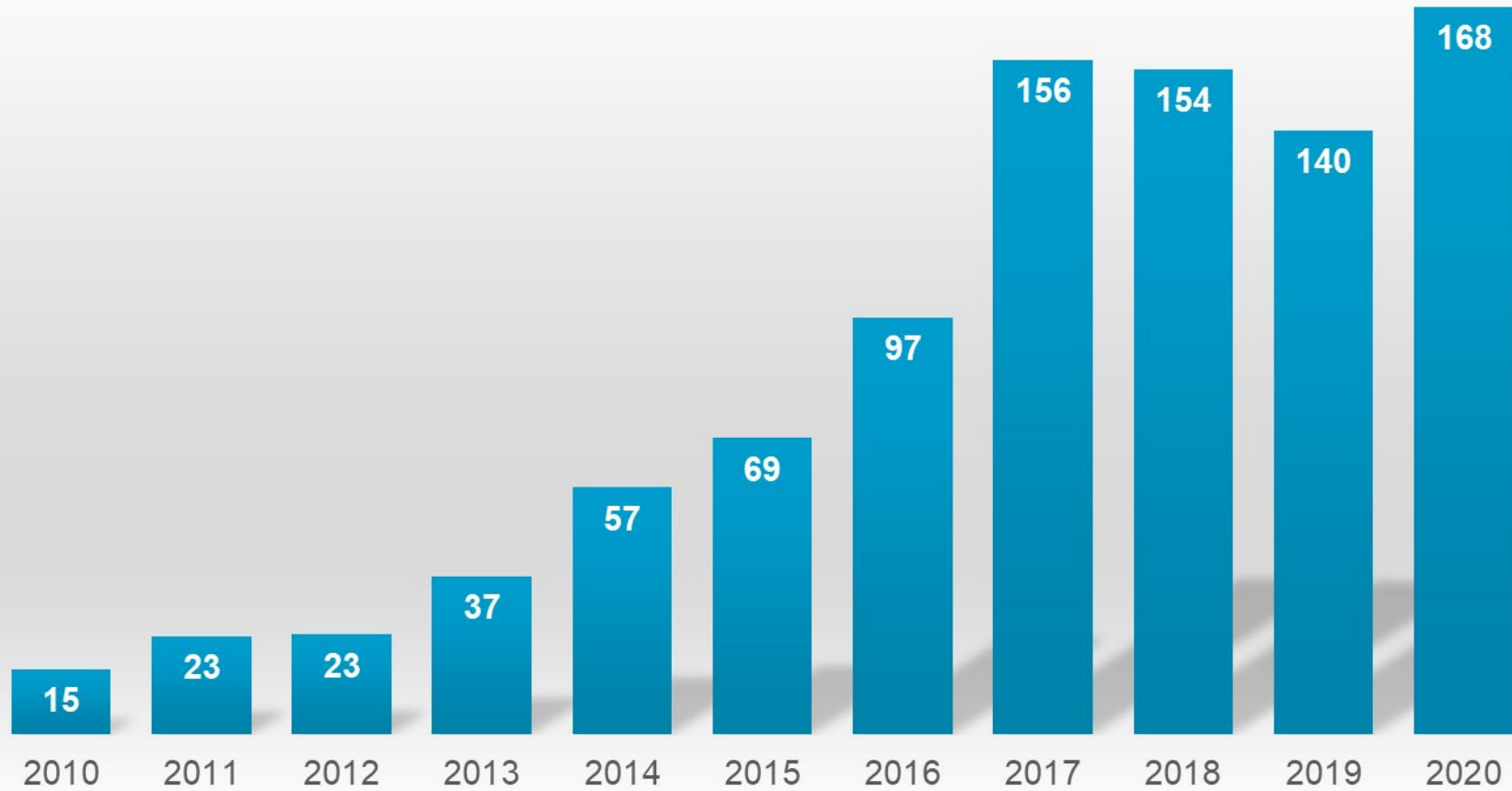
Annual installations of industrial robots
15 largest markets 2020



Source: World Robotics 2021

Annual installations of industrial robots - China

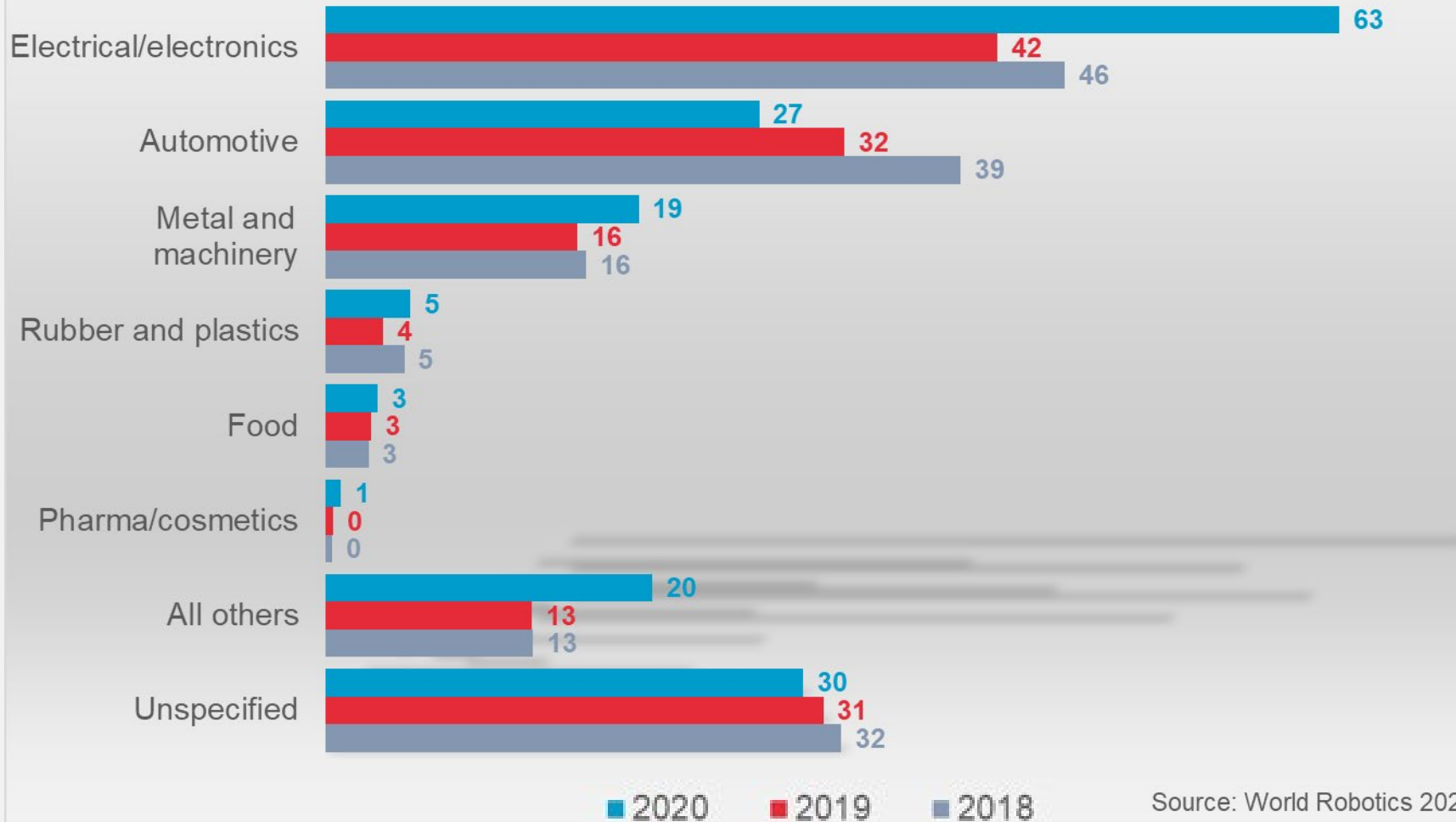
1,000 units



Source: World Robotics 2021

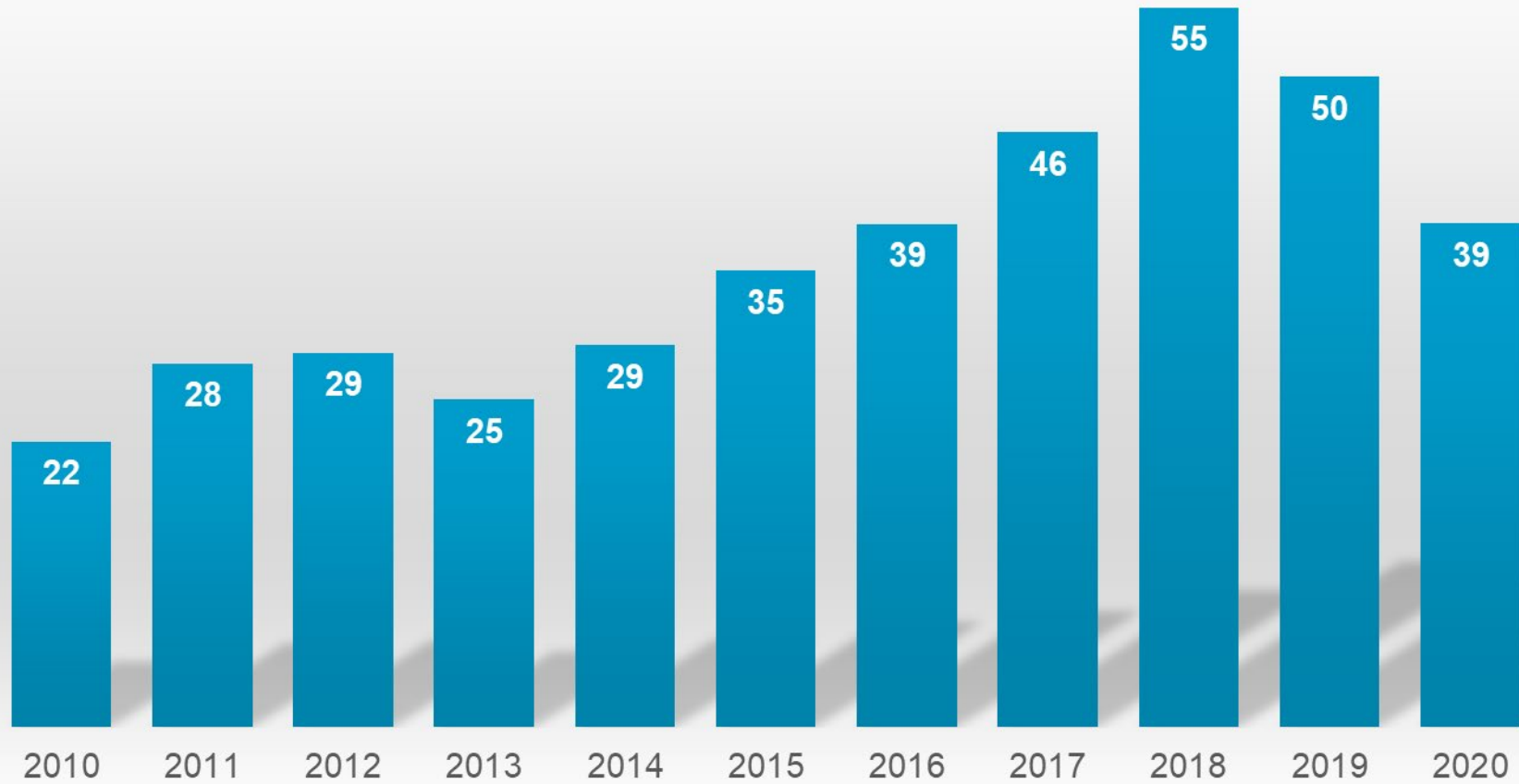
Annual installations of industrial robots by customer industry - China

1,000 units



Annual installations of industrial robots - Japan

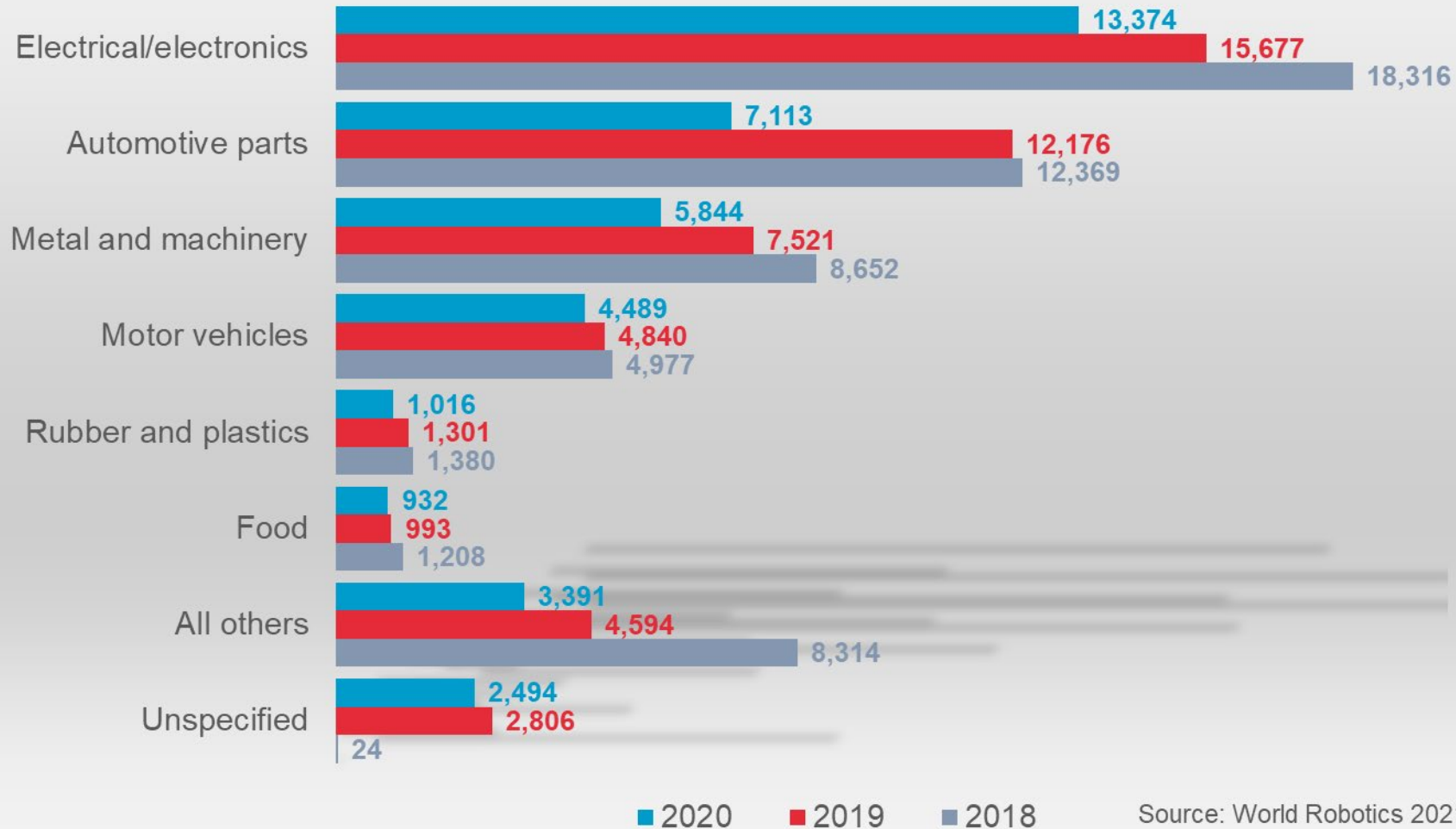
1,000 units



Source: World Robotics 2021

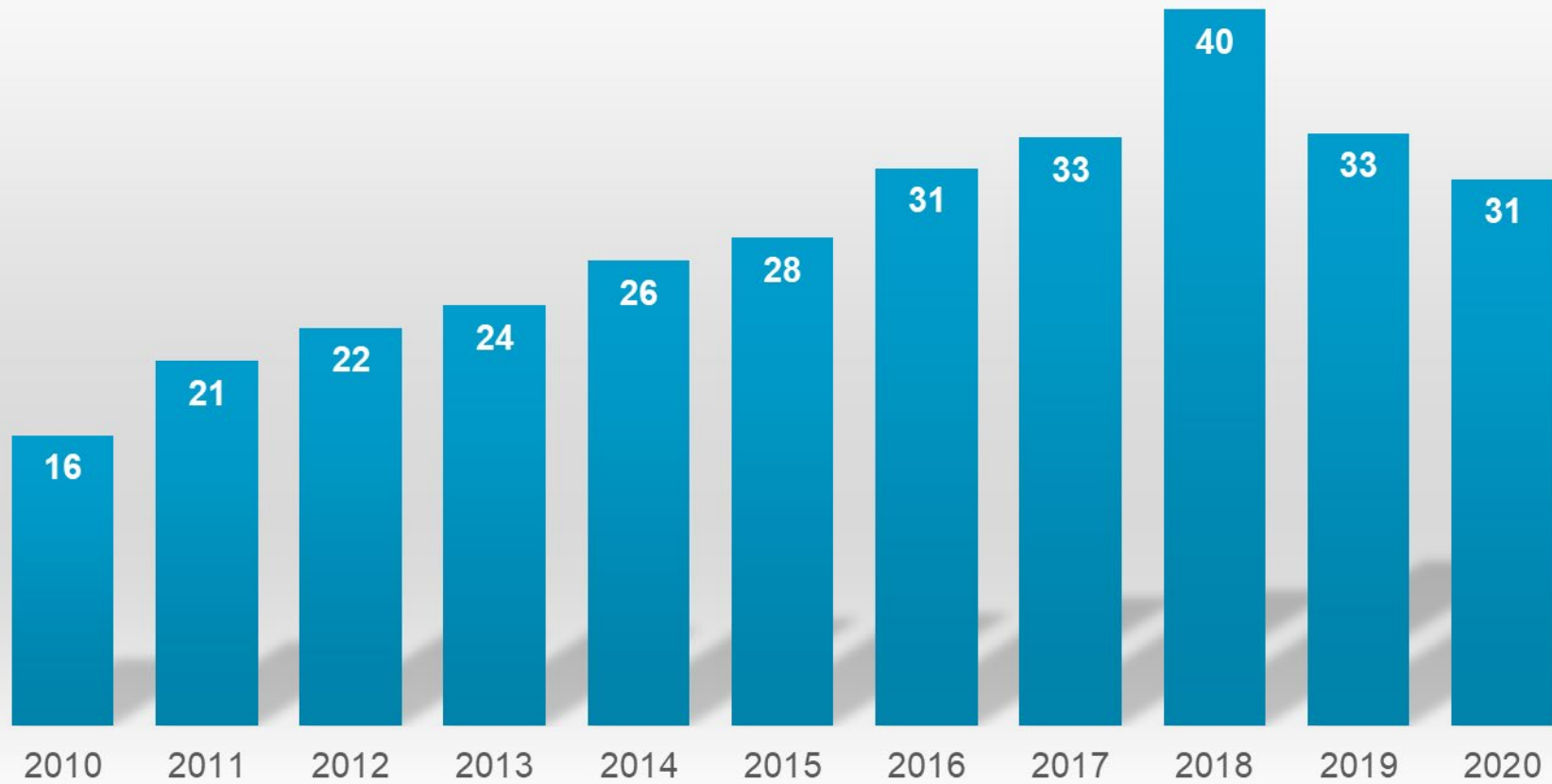
Annual installations of industrial robots by customer industry - Japan

units



Annual installations of industrial robots - United States

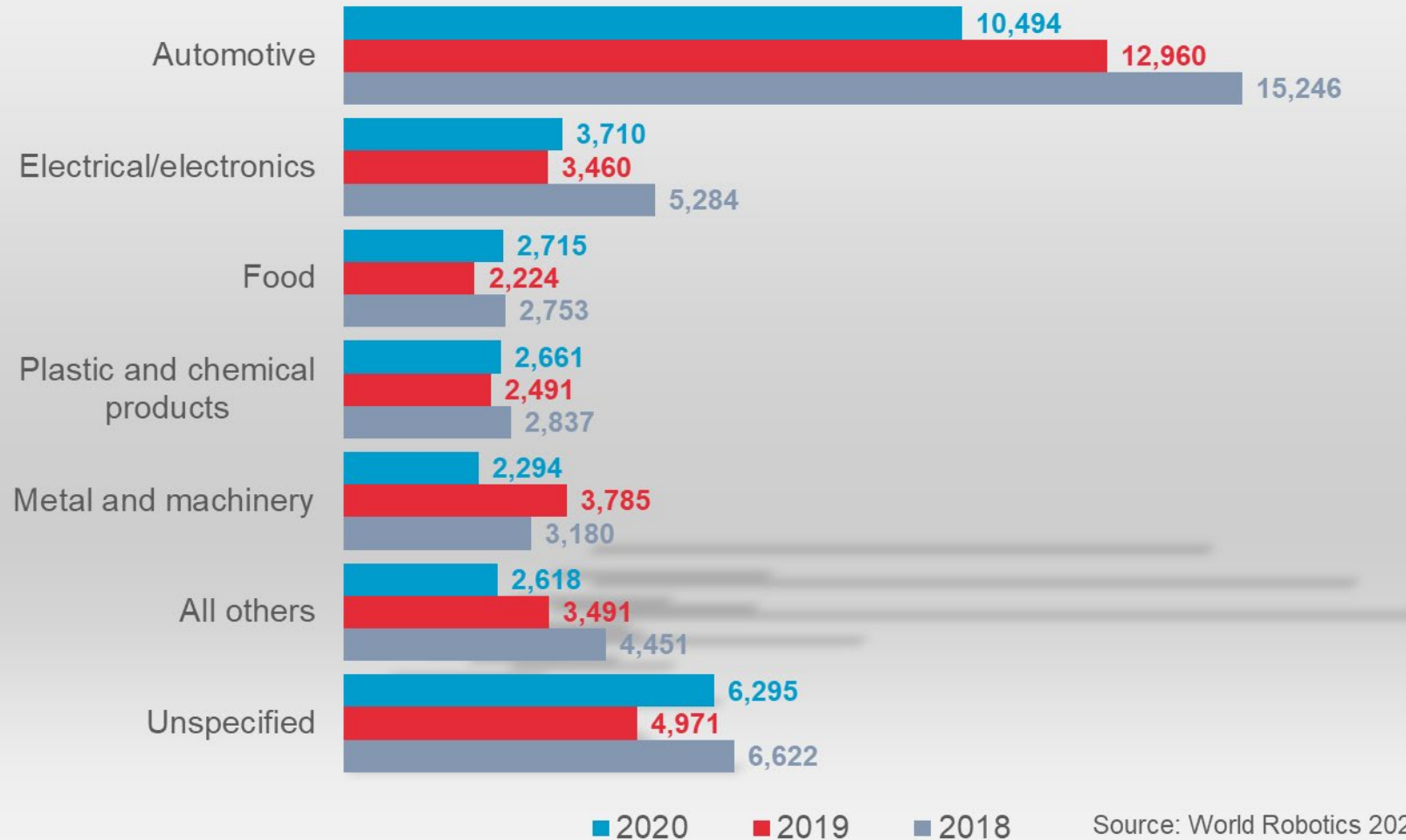
1,000 units



Source: World Robotics 2021

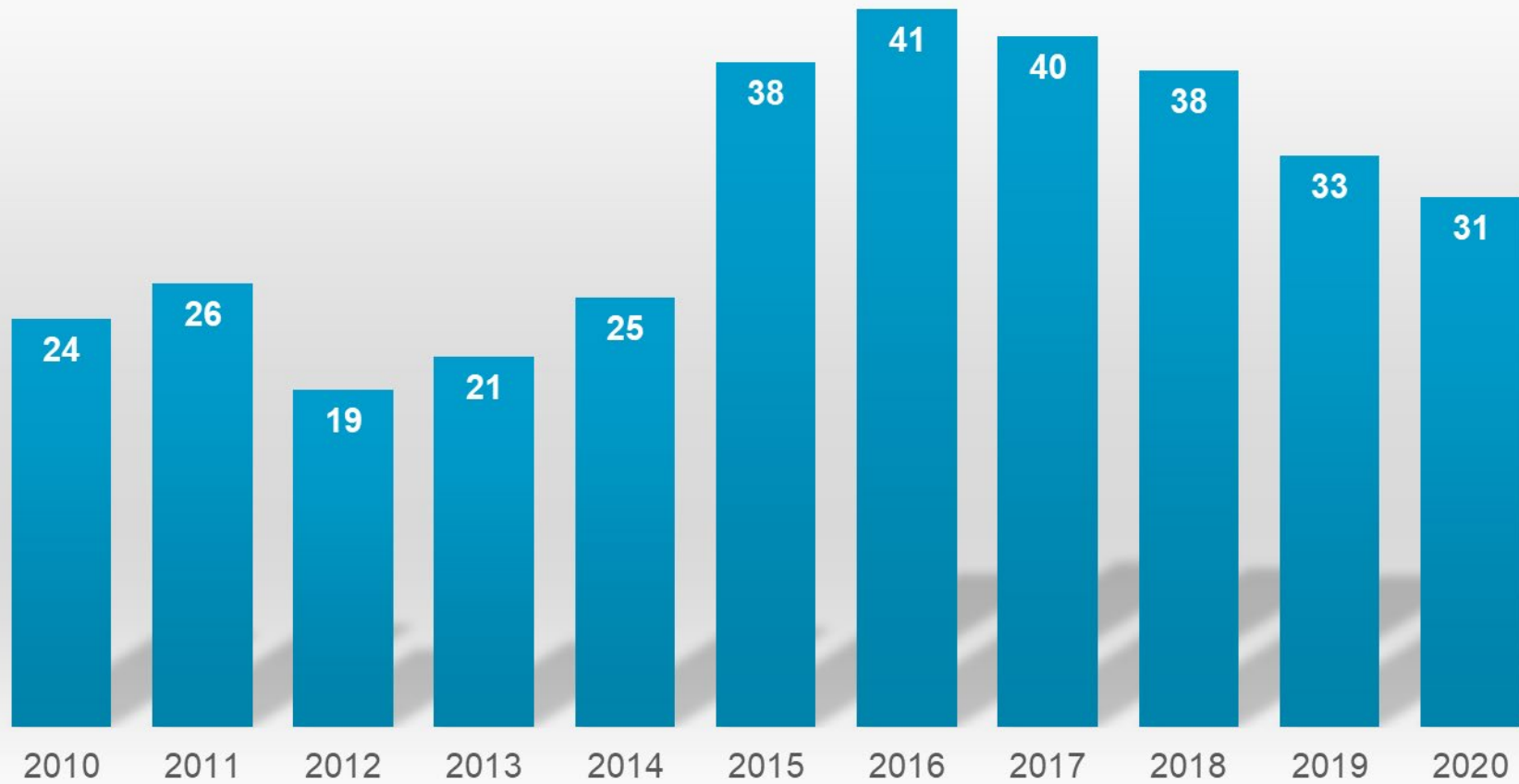
Annual installations of industrial robots by customer industry - United States

units



Annual installations of industrial robots - Rep. of Korea

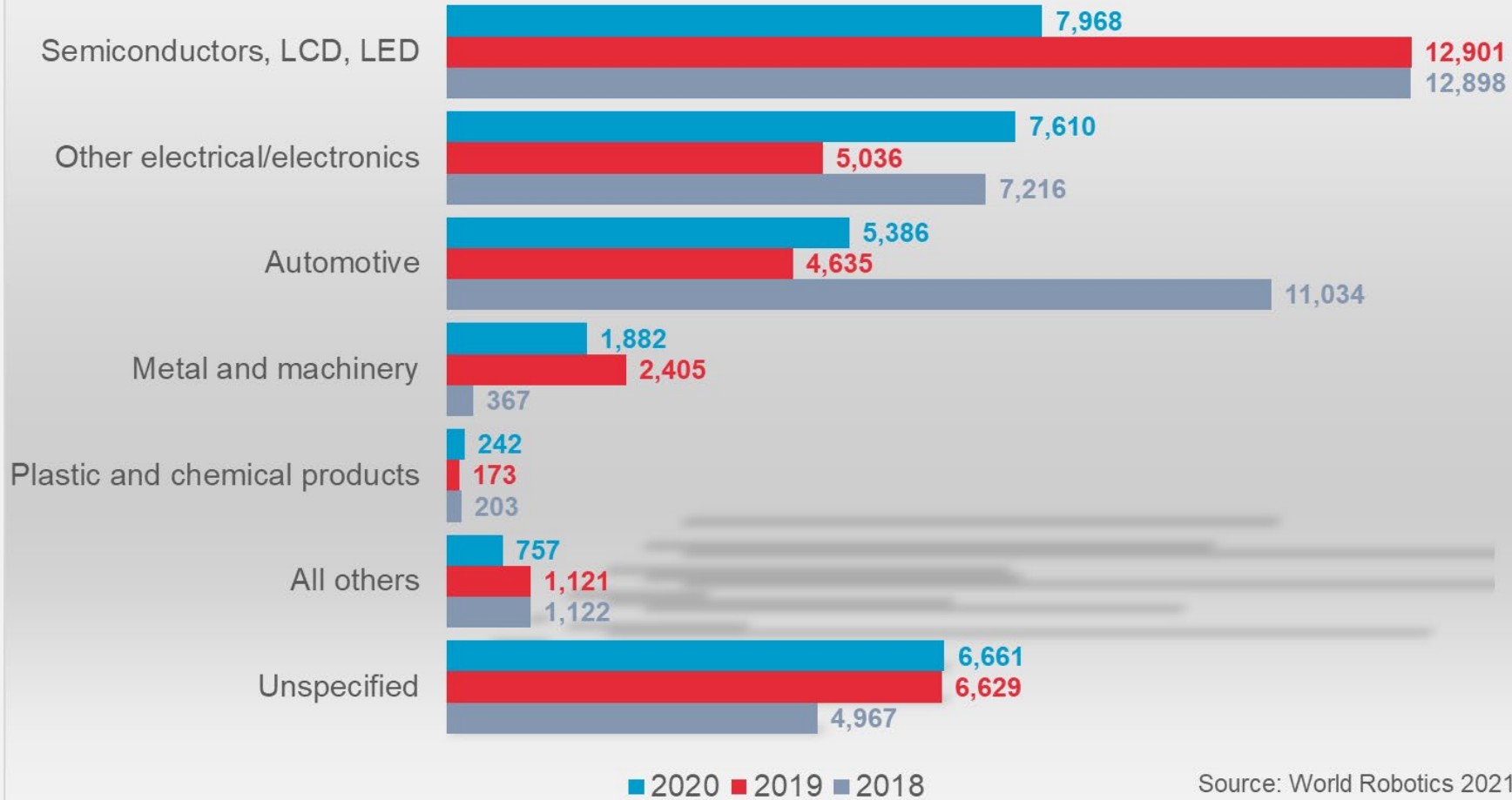
1,000 units



Source: World Robotics 2021

Annual installations of industrial robots by customer industry - Rep. of Korea

units



Annual installations of industrial robots - Germany

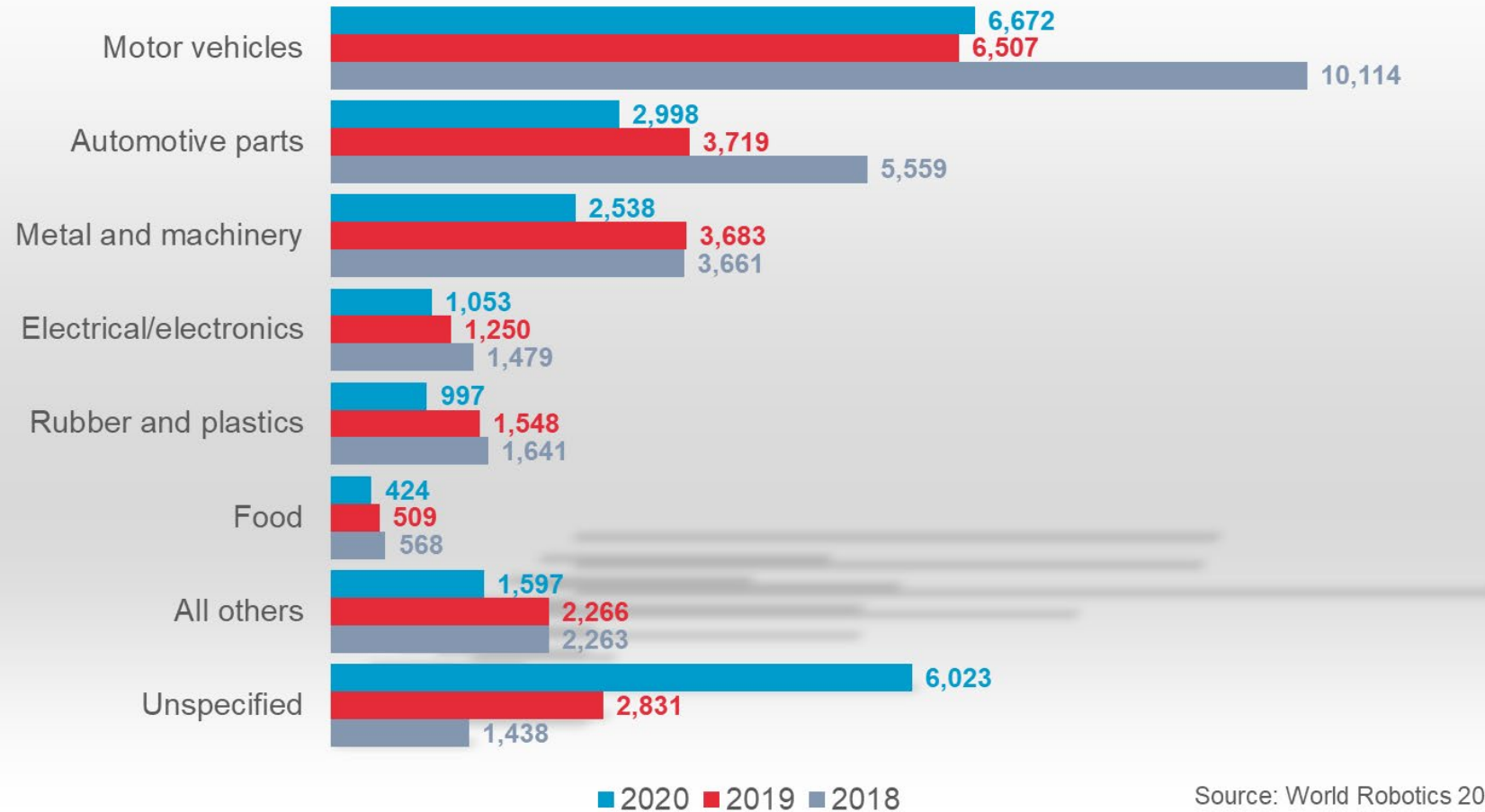
1,000 units



Source: World Robotics 2021

Annual installations of industrial robots by customer industry - Germany

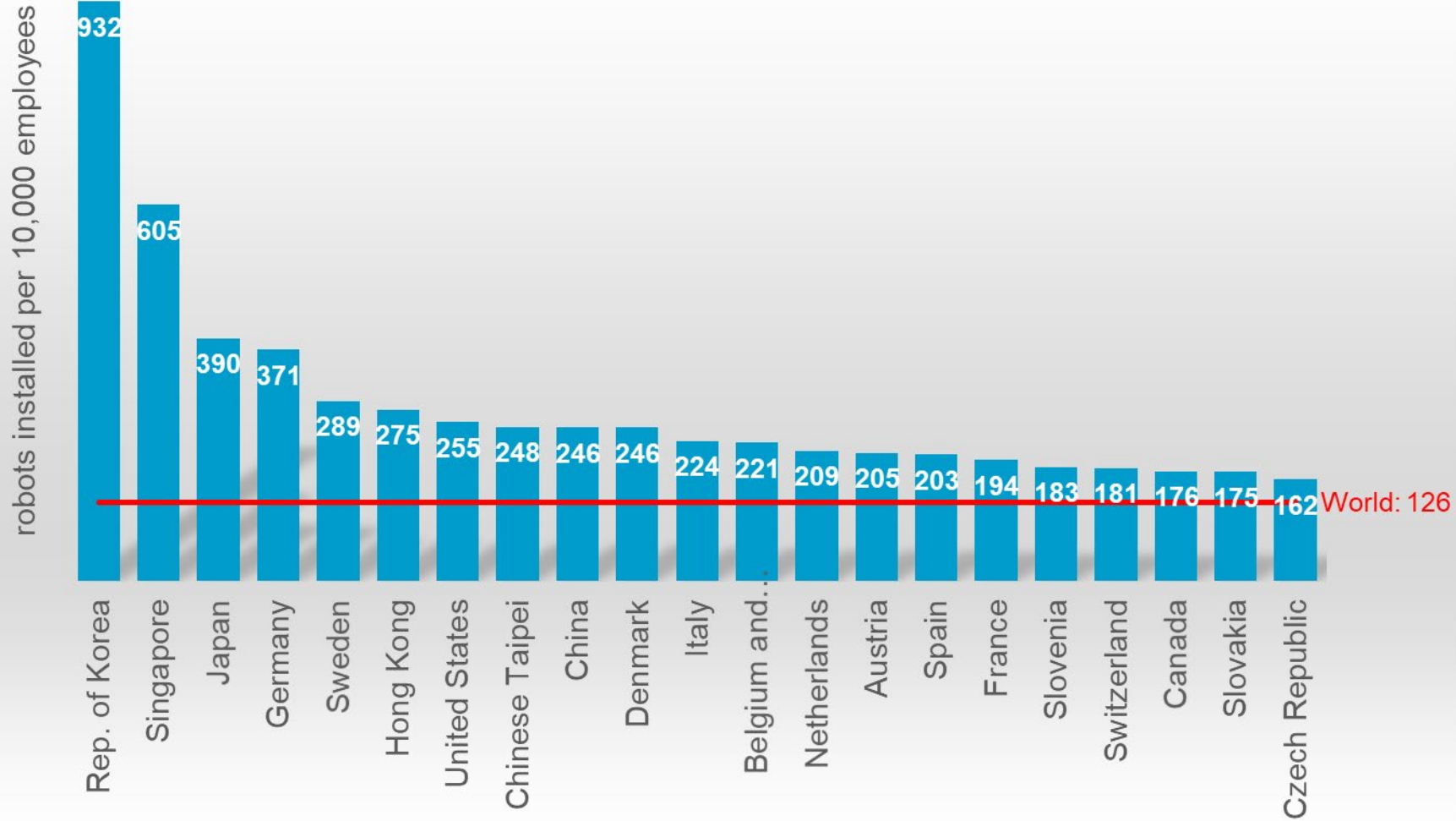
units



Source: World Robotics 2021

Global average robot density grows by 12%

Robot density in the manufacturing industry 2020



Source: World Robotics 2021

Trends and Forecast



Forecast

Annual installations of industrial robots 2015-2020 and 2021*-2024*

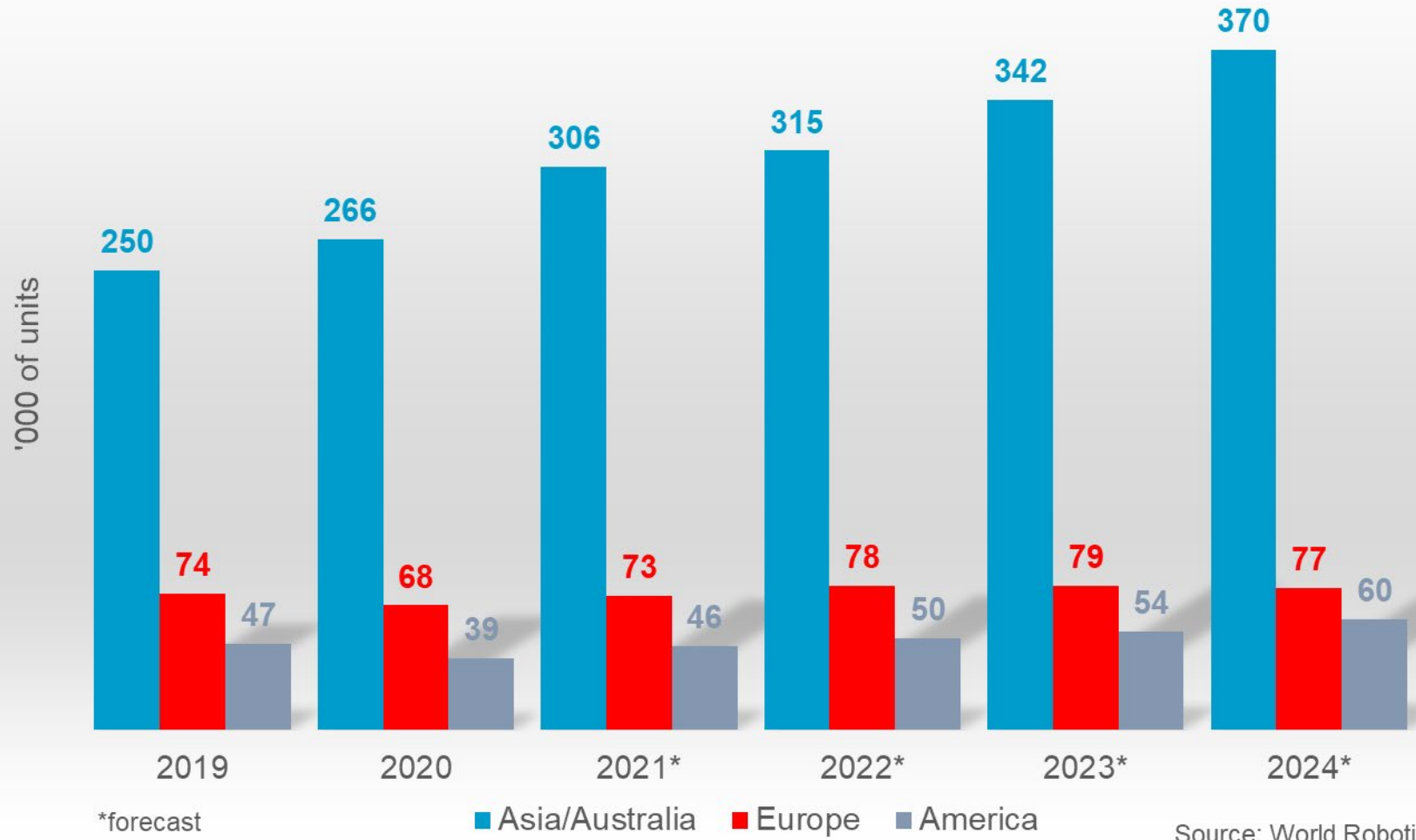


*forecast

Source: World Robotics 2021

Forecast

Annual installations of industrial robots 2019-2020 and 2021*-2024*



Source: World Robotics 2021

Short-term market determinants

- Global economic **recovery**:
 - Strong order intake in 2021, carrying over to 2022
 - Catch-up effects
 - Government incentives (e.g. “NextGenerationEU”)
 - Continued demand from electronics industry
 - High demand for electronic products and components
 - Infrastructure investments (5G)
 - Growing demand for steel and metal products
- **Covid-19** restrictions still hamper global business activities
 - Travel restrictions / quarantine requirements
 - Local outbreaks interrupt supply chains
- Downside of the economic rebound: **Scarcity** of raw materials and intermediate products
 - New shutdowns in the automotive industry
 - Longer lead times / growing order backlog
- Still a lot of uncertainty in the global economy that influences investment plans
 - Including political headwinds

Market trends

- **Localization and regionalization** of supply chains
 - Closer to the customer
 - More resilient (logistics, politics)
- Lower **total costs of ownership**
 - Robots-as-a-Service / Pay-as-you-use models
 - Growing supply of low-cost robots
- **“Batch size 1”**: Customized product variations for a growing number of products
 - Robots support customization at the unit costs of serial production.
 - Fully digitalized production from order intake to delivery.

Technological trends

- Advancements in **adjacent technologies**
 - Cloud computing, 5G networks, new machine vision, and artificial intelligence
 - expand the range of applications
 - improve performance (speed and quality)
- **Human-robot collaboration** is still in its infancy
- **Sustainability**
 - Robots are crucial for cost-efficient production of green technology (e.g. solar panels)
 - Robotic production reduces the share of rejects, thus lowers the carbon footprint by improving the input-output ration
 - Modern robots use less energy
 - Lightweight construction of moving robot components
 - Intelligent power-management, e.g. smart parking positions
 - New, energy-optimized end-of-arm tools, e.g. grippers with almost no energy consumption

Service robots – top findings



2020: Still growing strongly

New professional service robots*

- 131,800 units (+41%)
- Turnover: USD 6.7 billion (+12%)

New consumer service robots

- 19 million units (+6%)
- Turnover: USD 4.4 billion (+16%)

Service Robotics – TOP 5 Application trends

- **AMR and delivery robots**
flexible solutions
- **Cleaning and disinfection**
+ 50 companies due to Covid-19
- **Medical and rehabilitation**
individual support
- **Social robots**
telepresence – particularly during Covid-19
- **Automated restaurant**
staff support, reduce personal contact due to Covid-19



Image: Effidence



Image: Bluebotics



Image: Cyberdyne



Image: Ava Robotics



Image: Miso Robotics

AMR and delivery robots: flexible solutions



Cleaning and disinfection: + 50 companies



Medical and rehabilitation: individual support



Social robots telepresence – particularly during Covid-19

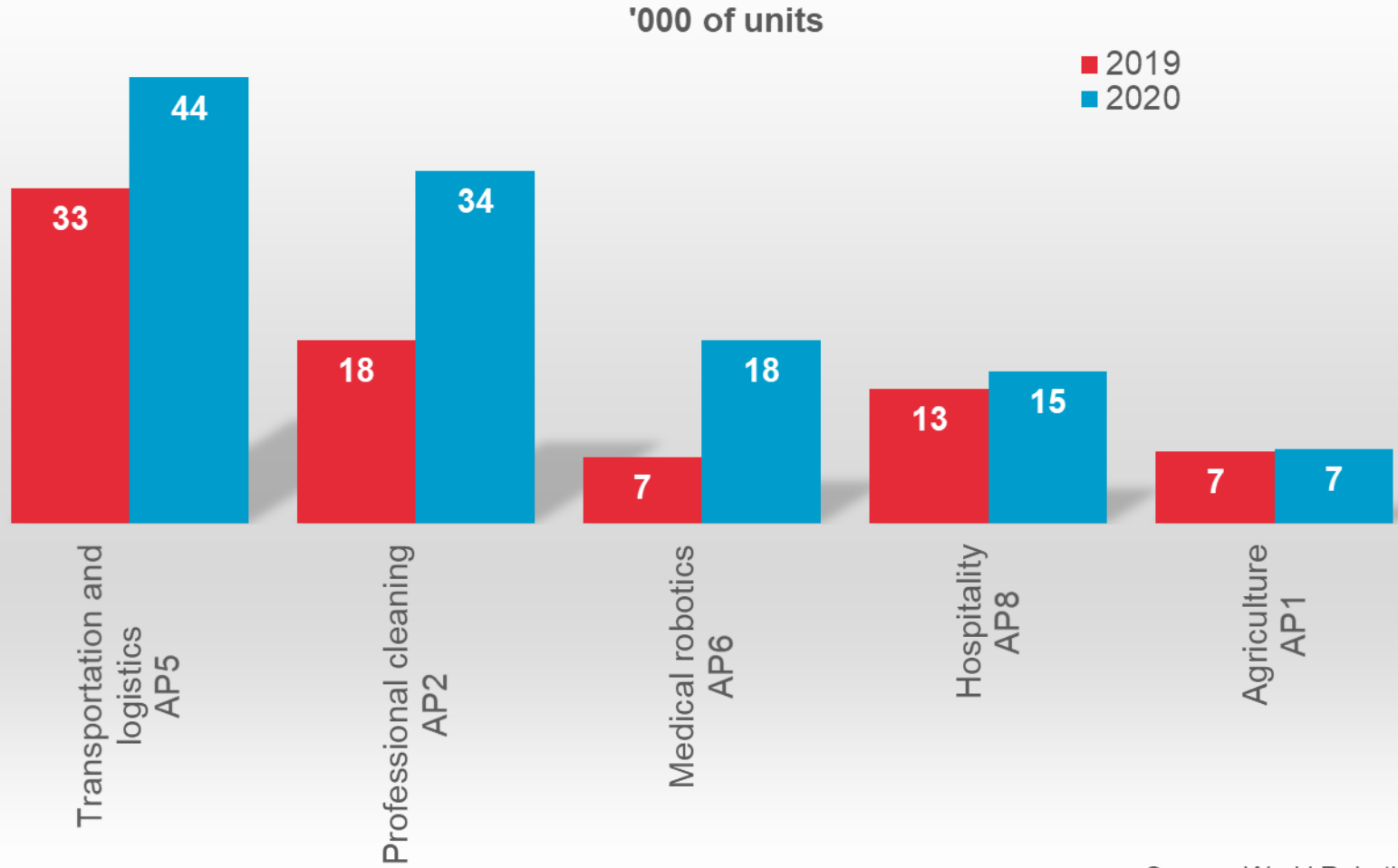


Automated restaurant staff support, reduce personal contact due to Covid-19



Main professional applications

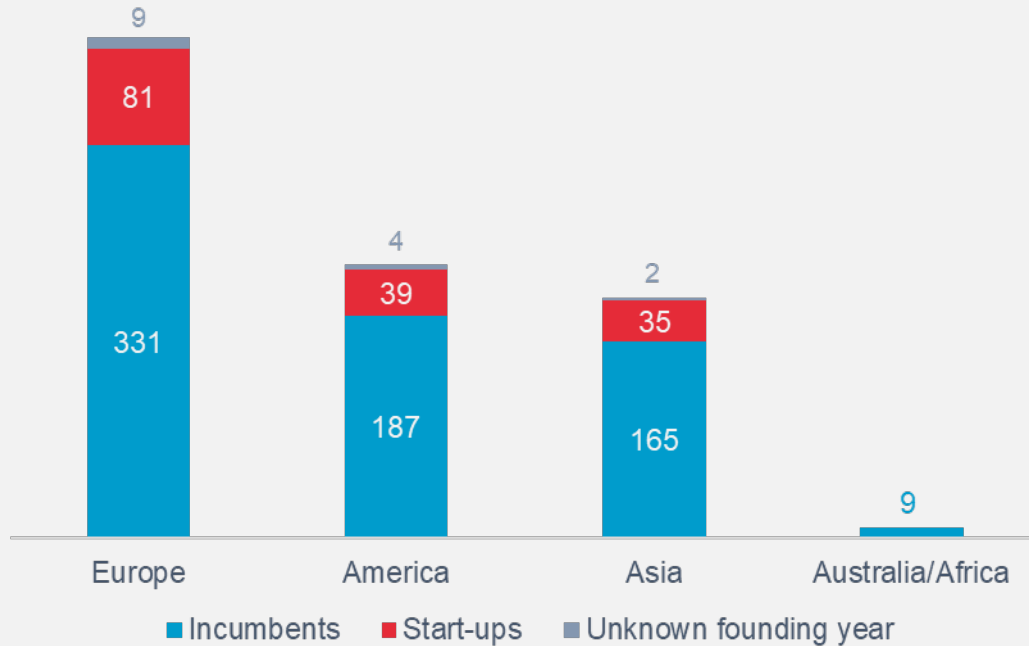
Service robots for professional use. Top 5 applications
Unit sales 2019 and 2020



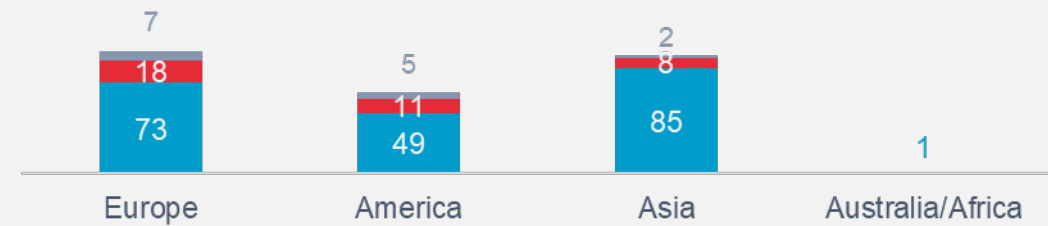
Source: World Robotics 2021

More than 1,000 service robot suppliers worldwide

Number of service robot suppliers by region and age - professional applications



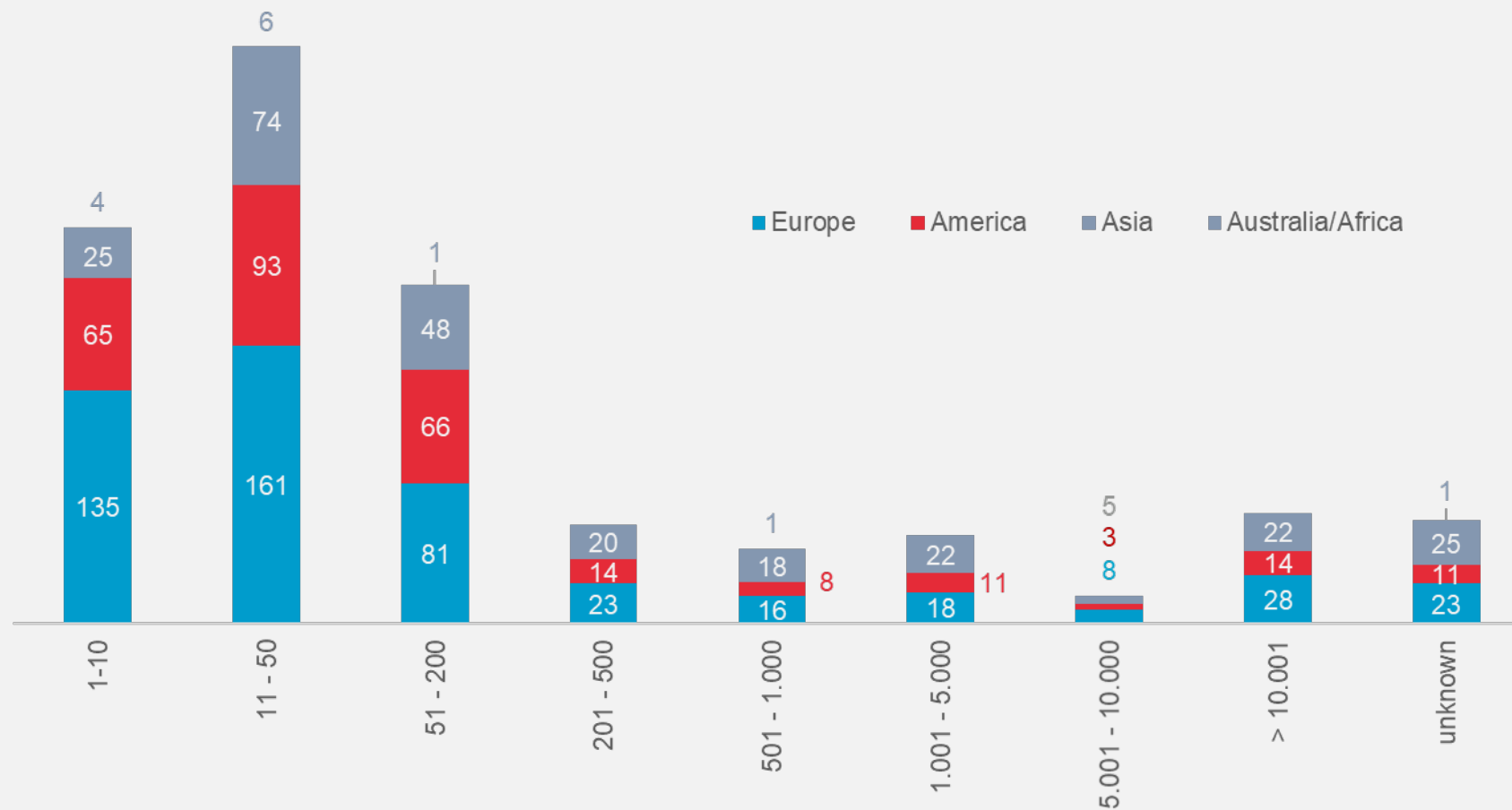
Number of service robot suppliers by region and age - consumer applications



Source: World Robotics 2021

80% of service robot supplier are small-medium sized enterprises (SME with <=500 employees)

Number of service robot manufacturers by business size (employees)



Source: World Robotics 2021

- **Platforms as market place**
- **Safety, security, privacy**
- **Robots enter the open world**



Image: Xito



Image: Mojin
Robotics/Deniz Saylan



Image: Saviok

Thank you for your attention.