



Dexterous and Intelligent

# RIZON

ADAPTIVE ROBOT

FLEXIV LTD.



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**Dexterous and Intelligent**

The adaptive robot deeply fusing industrial-grade force control,  
computer vision and AI technology

# CONTENT

Make people's work and life more creative and enjoyable with human-centered technology.

<b>ABOUT FLEXIV</b>	<b>01-02</b>	<b>ROBOT OPERATING SYSTEM</b>	<b>15-16</b>
<b>ADAPTIVE ROBOT</b>	<b>05-08</b>	<b>AI SYSTEM</b>	<b>17-18</b>
<b>TECHNICAL DATA</b>	<b>09-10</b>	<b>APPLICATION</b>	<b>21-24</b>
<b>PERIPHERAL ACCESSORY</b>	<b>11-12</b>	<b>CASE STUDY</b>	<b>25-32</b>
<b>KEY FEATURE</b>	<b>13-14</b>	<b>CUSTOMER SERVICE</b>	<b>33</b>



## ABOUT FLEXIV

Flexiv Ltd. is a global leading general-purpose robotics company, focusing on developing and manufacturing adaptive robots which integrate industrial-grade force control, computer vision and AI technologies. Flexiv provides innovative turnkey solutions and services based on Flexiv robotic systems to customers in multiple industries.

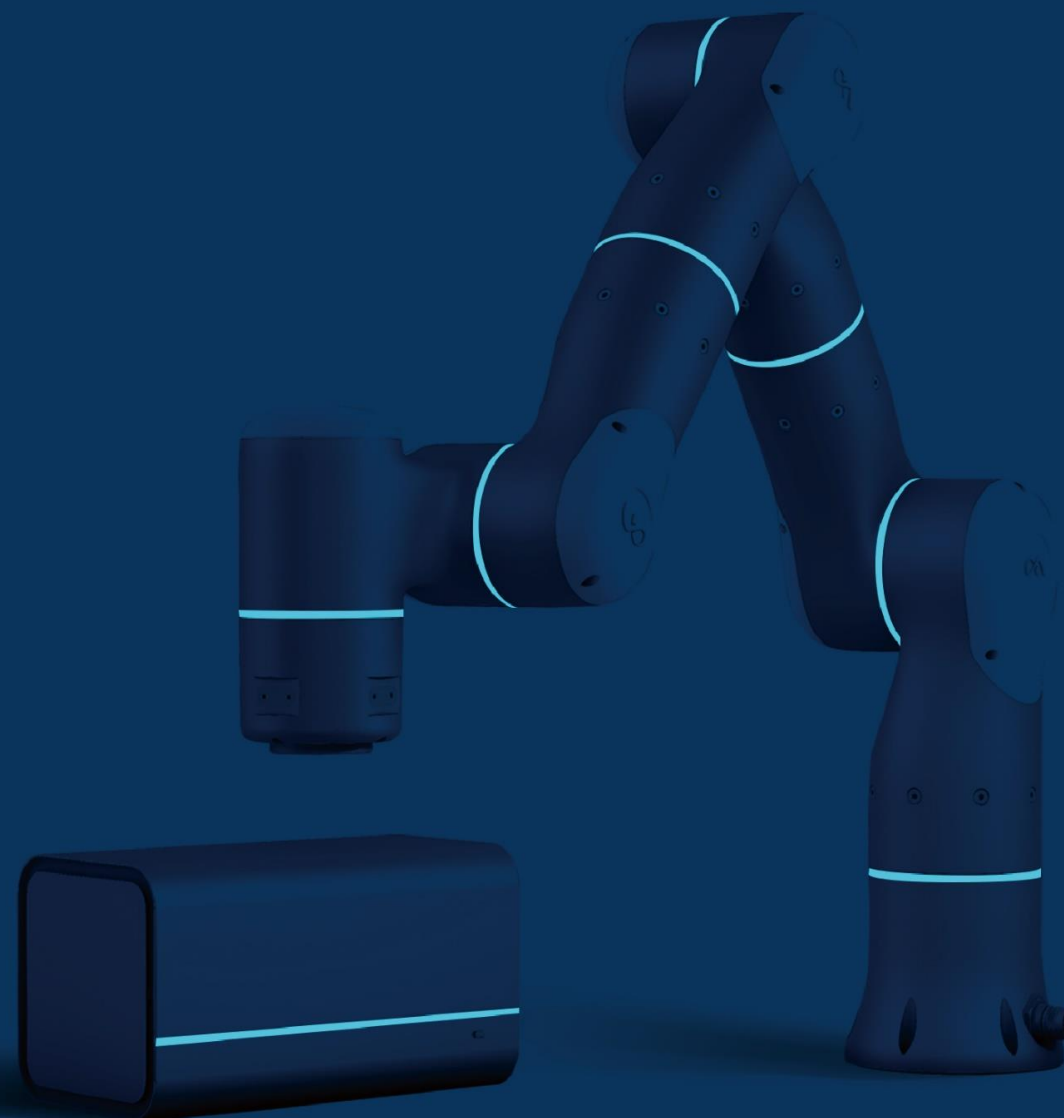
Founded in 2016, Flexiv has established offices in Santa Clara, Shanghai, Shenzhen, Beijing, Foshan, Singapore and Taiwan.

Robotics technology is evolving rapidly, particularly over the past few years. However, the existing robotic technology framework limits robots' flexibility and universality, as well as the application scope, that is, common restrictions exist in actual automation projects, such as fixed trajectory, preset task, structured environment and so on. Consequently, A great number of tasks still rely on manual work, and how to make robots be equipped with dexterity, intelligence, flexibility and universality like human would be the key to the robotics development.



**FLEXIV**

**Adaptive Robot and System**





# WHAT IS ADAPTIVE ROBOT?

Adapting to changing and uncertain environments, automating complex tasks with 'hand-eye' coordination like human



Adaptive Robot | Rizon



## High Tolerance for Position Variance

Adapt to Objects

Ability to perform tasks despite uncertainty in position. (e.g. manufacture or mounting tolerance of workpieces, accumulated position error in production line)



## Great Disturbance Rejection

Adapt to Environments

Ability to maintain performance even amid significant changes in the environment. (e.g. floating base, vibration, human interference)



## Transferable Intelligence

Adapt to Tasks

Can handle wide variation of similar tasks and support rapid redeployment to new tasks.



# WHY ADAPTIVE ROBOT?

## Accomplish More Applications

Sophisticated hand-eye coordination like human  
Adapt to more complex tasks  
Adapt to more open and uncertain environments

## Upgrade The Flexibility of Production Lines

Adapt to different types of workpieces for better compatibility of the production line  
  
Improve overall success rate, changeover efficiency and device reuse rate of the production line

## Optimize The Total Cost of Ownership

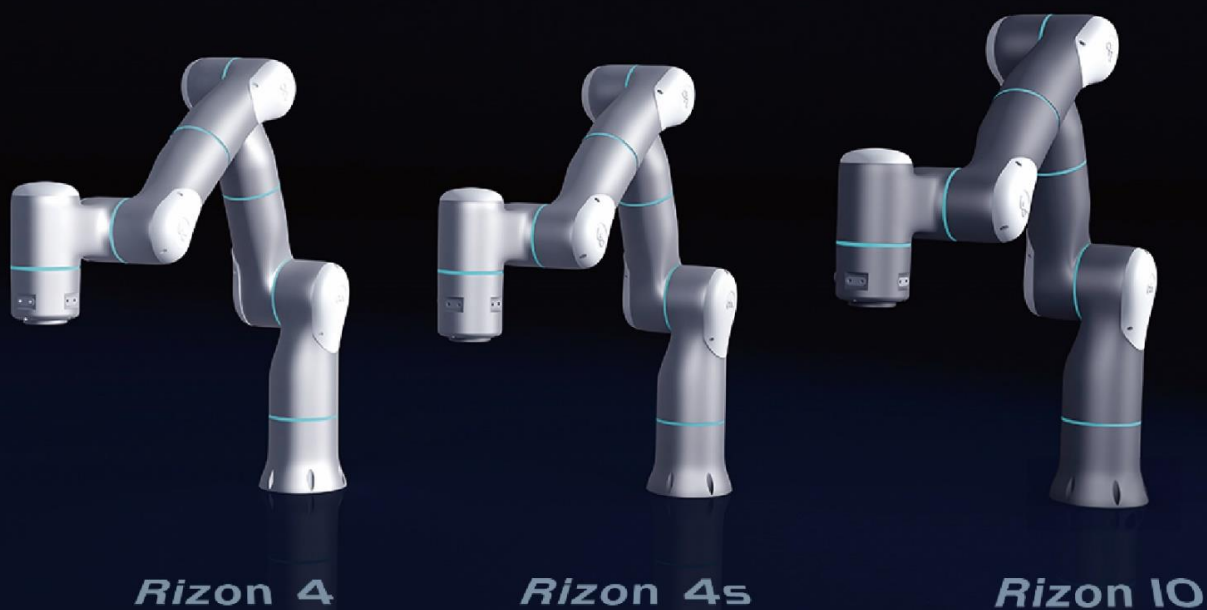
Lower the initial automation investment  
Lower the deployment cost  
Lower the maintenance cost

Adaptive Robot | Rizon





# TECHNICAL DATA



Robot	Rizon 4	Rizon 4s	Rizon 10
Degrees of Freedom	7	7	7
Payload	4kg	3.5kg	10kg
Weight	20kg	20kg	33kg
Reach / Max Reach	780 / 955mm	780 / 990mm	840mm / 1015mm
End Effector Force Accuracy	0.1N	0.03N	0.1N
End Effector Force Accuracy (static/dynamic)	±0.1N / ±0.5N	±0.1N / ±0.5N	±0.1N / ±0.5N
Whole-body Force Control Frequency	1kHz	1kHz	1kHz
Repeatability (ISO 9283)	±0.1mm	±0.1mm	±0.1mm
IP Classification	IP65	IP65	IP65
Installation Position	Any	Any	Any
Operating Temperature	0-+45°C	0-+45°C	0-+45°C
Air Humidity	20 % to 80 % non-condensing	20 % to 80 % non-condensing	20 % to 80 % non-condensing

Control Box	Hesper
Size	423 x 230 x 230mm
Payload	11kg
IP Classification	IP20
Power supply	100-240VAC,50-60Hz

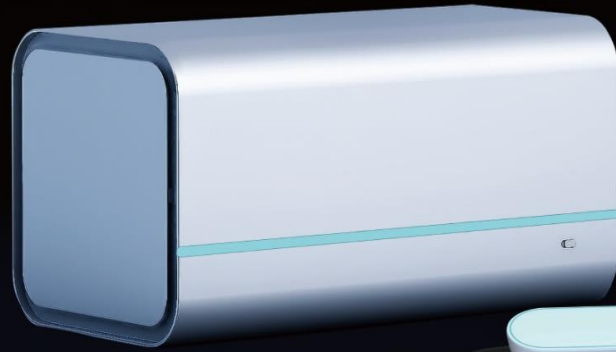
\*Please contact Flexiv team for more details





# PERIPHERAL ACCESSORY

### Control Box Hesper



### Teach Pendant



### Motion Bar



### End Tool



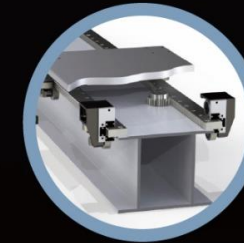
### Camera Module



### Dress Kit



### Mobile Workbench



### External Axis



### AMR



ISO-13849, PL=d



ISO-10218



ISO/TS-15066



UL-1740



## KEY FEATURES

### ■ **Powerful Versatility**

Innovative human-inspired product design concept defines the new-generation robot that can be versatile in application scenarios like industrial, service, home and replace the manual work used to be hard to automate.

### ■ **Extreme Product Performance**

Comprehensive industrial-grade product testing (including environment reliability, EMC, collision detection, etc.), and continuous iteration in real scenarios ensuring the stability and extreme dynamic performance of the adaptive robot.

### ■ **Superior Industrial-grade Force Control**

Proprietary force/torque sensing technology, joint and whole-arm design, low-level force control system, and advanced whole-body force control algorithm to equip the adaptive robot with superior capacities of real-time force control planning, hybrid motion/force control, disturbance rejection, multi-contact force control, etc.

### ■ **Advanced Hierarchical Intelligence**

Hierarchical intelligence system with dedicated processor powered by advanced AI and robotics algorithms to provide sophisticated perception, force-guided manipulation, and flexible task planning with real-time adaptiveness.

### ■ **High-quality Product Delivery**

Precise manufacturing process, tens of millions reliability tests of core modules, and the comprehensive outgoing quality control for high-functioning, high-quality product delivery.

### ■ **Intrinsic Safety**

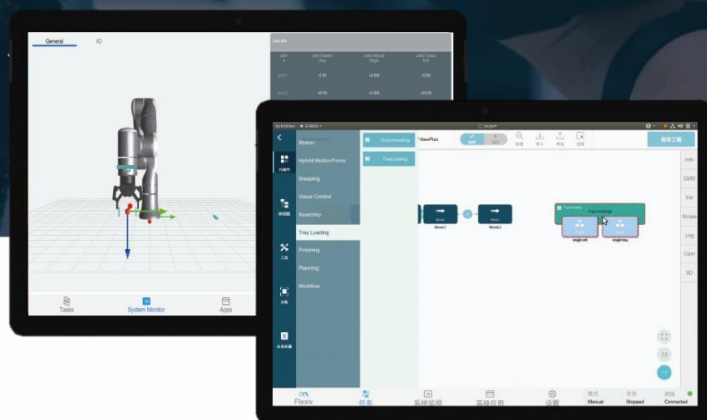
Hardware architect with dual channel redundancy and torque-based control framework for intrinsically safe interaction in uncertain environments. CE and ETL certifications have been achieved.

### ■ **Great Usability**

With the easy-to-use graphical task editor and powerful functions, the robot operation system assists users to easily automate complex force-based tasks or to do the secondary development. Several cutting-edge embedded AI algorithms help lower the deployment cost and improve the overall performance.



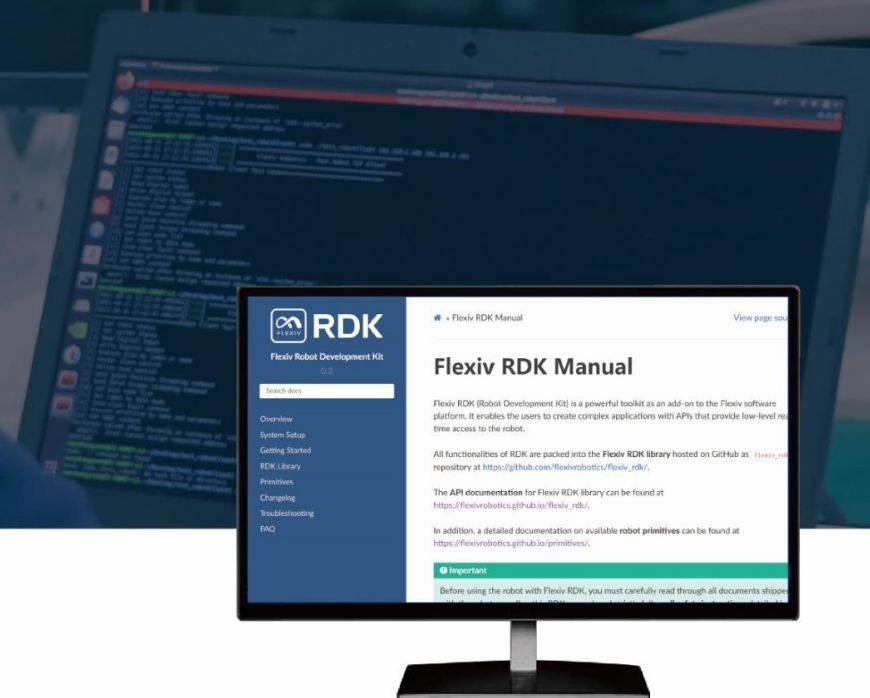
# ROBOT OPERATING SYSTEM



## FLEXIV ELEMENTS

### Task Editing System for Engineers

- Drag-and-drop visual programming, easy to learn and operate
- Embedded advanced semi-autonomous programming modules, more convenient to program for complex tasks
- Effortless implementation of flexible force-control based automation
- Novel human-robot interface, user-friendly visual design  
WLAN connect and one-to-many configuration are supported

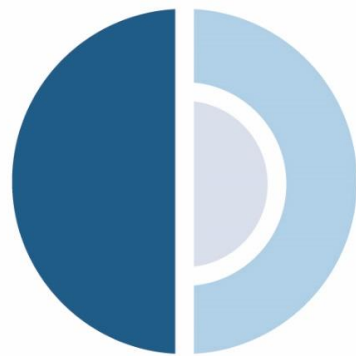


## FLEXIV RDK

### Development Toolkit for Developers

- Invoke the robot's various fundamental capacities and upper-level skills
- Real-time position/force control
- Execute the robotic program and monitor the robot status in real time
- Complete technical documentation to assist development
- Ethernet communication, C++/Python is supported





**N O E M A**

NOEMA is the general-purpose AI system developed by Flexiv, a general-purpose intelligent robotic brain that is cloud-edge-end adapted for all industries. Based on Noema's full perception capacity (vision, force, tactus, etc.), AI algorithms and according solutions can be developed and applied.

## KEY TECHNICAL FEATURES



**Full Perception Capacity**



**Embedded Knowledge Engine**



**Advanced Programming Framework & Algorithms**

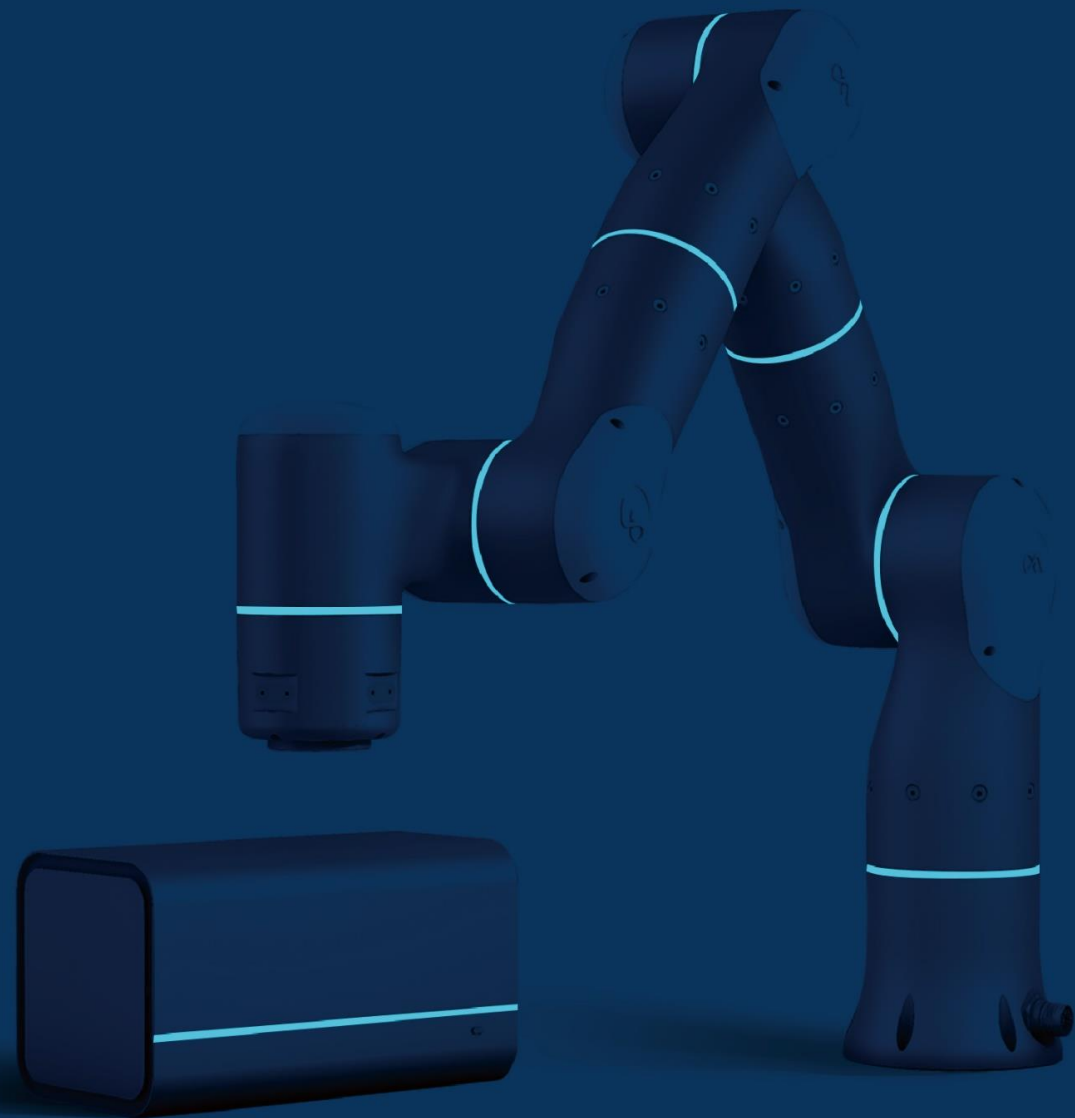
## INTEGRATED CUTTING-EDGE ALGORITHMS

- Complex Pose Estimation
- Semantic Point Cloud Segmentation
- One-shot Learning
- SOTA-level General Grasping
- Force Perception Fusion
- Human Analysis
- .....



**FLEXIV**

**Adaptive Robot Application**





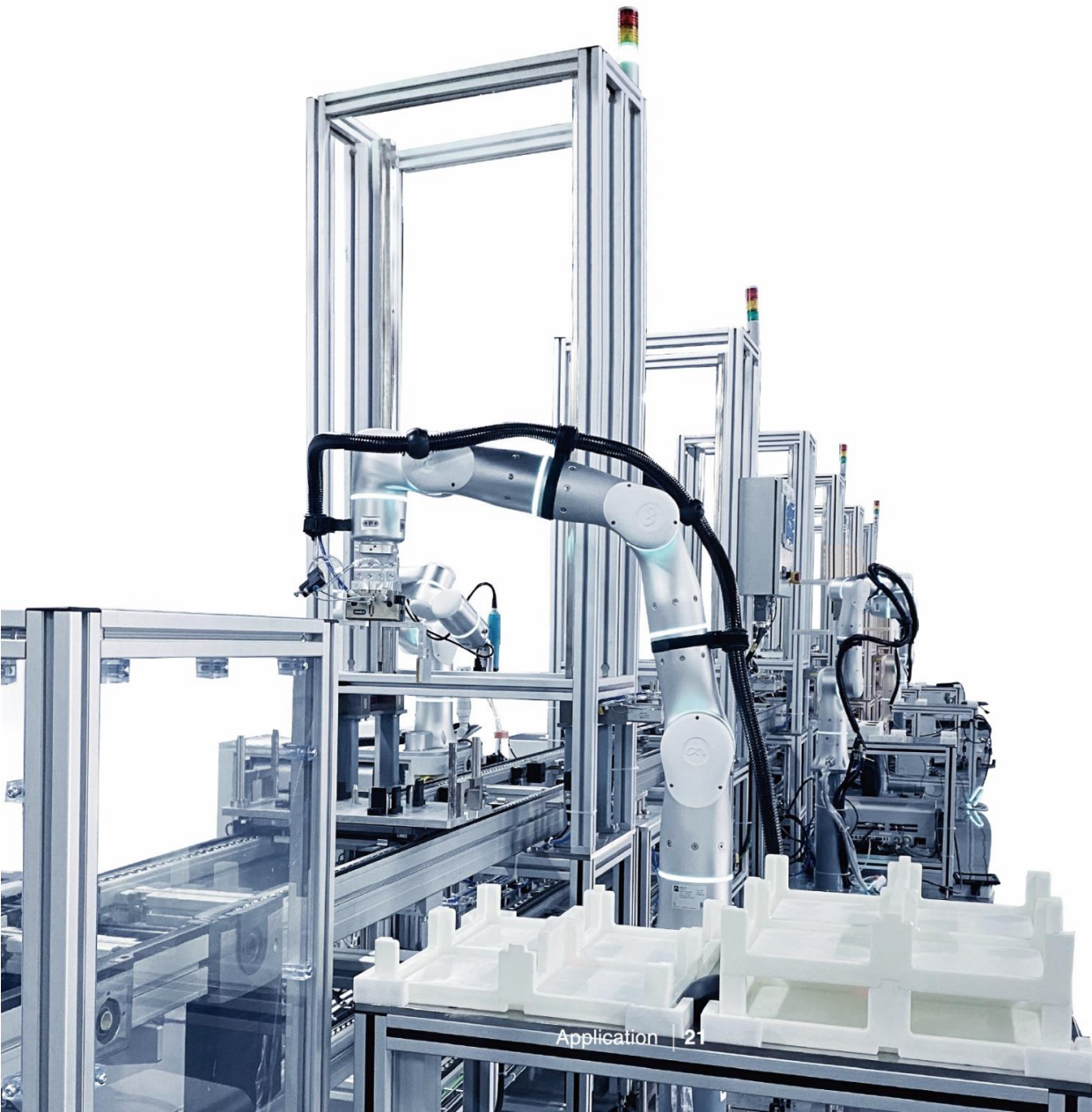


## CORE MANUFACTURING APPLICATIONS

Replace the manual work that used to be hard to automate

Upgrade existing low-flexibility automated production lines

Improve equipment's cross-process reuse rate



### General Assembly

The adaptive robot is versatile enough to automate common assembly tasks in manufacturing, including but not limited to loading and unloading, fastening, installing, plugging, pasting, tidying, etc., which can effectively lower the automation complexity and improve the production flexibility.

### Surface Treatment

The adaptive robot can be applied in surface treatment scenarios such as curved-surface polishing and edge trimming. Its advanced hybrid motion/force control ability directly ensures the real-time fitting for workpiece surface and stable dynamic force control to achieve great polishing performance.

### Precision Manipulation

Equipped with fine force sensing and control accuracy, the adaptive robot can deal with the assembly of small-size, high-precision force control required workpieces, such as the FPC connecting, precise screw locking and fastening. The manipulation can avoid workpiece's damage and guarantee the success rate as well as the efficiency.

### Mobile Operation

Combined with mobile platforms like AGV/AMR/external axis, the adaptive robot turns to be an operation system with more degrees of freedom to realize applications in broader space. It can automatically tolerate position errors brought by mobile platforms, visual positioning, environment changes, vibrations to achieve stable manipulations.



Automotive



3C



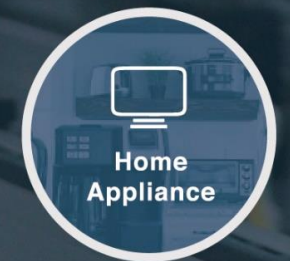
New Energy



Aerospace



Furniture

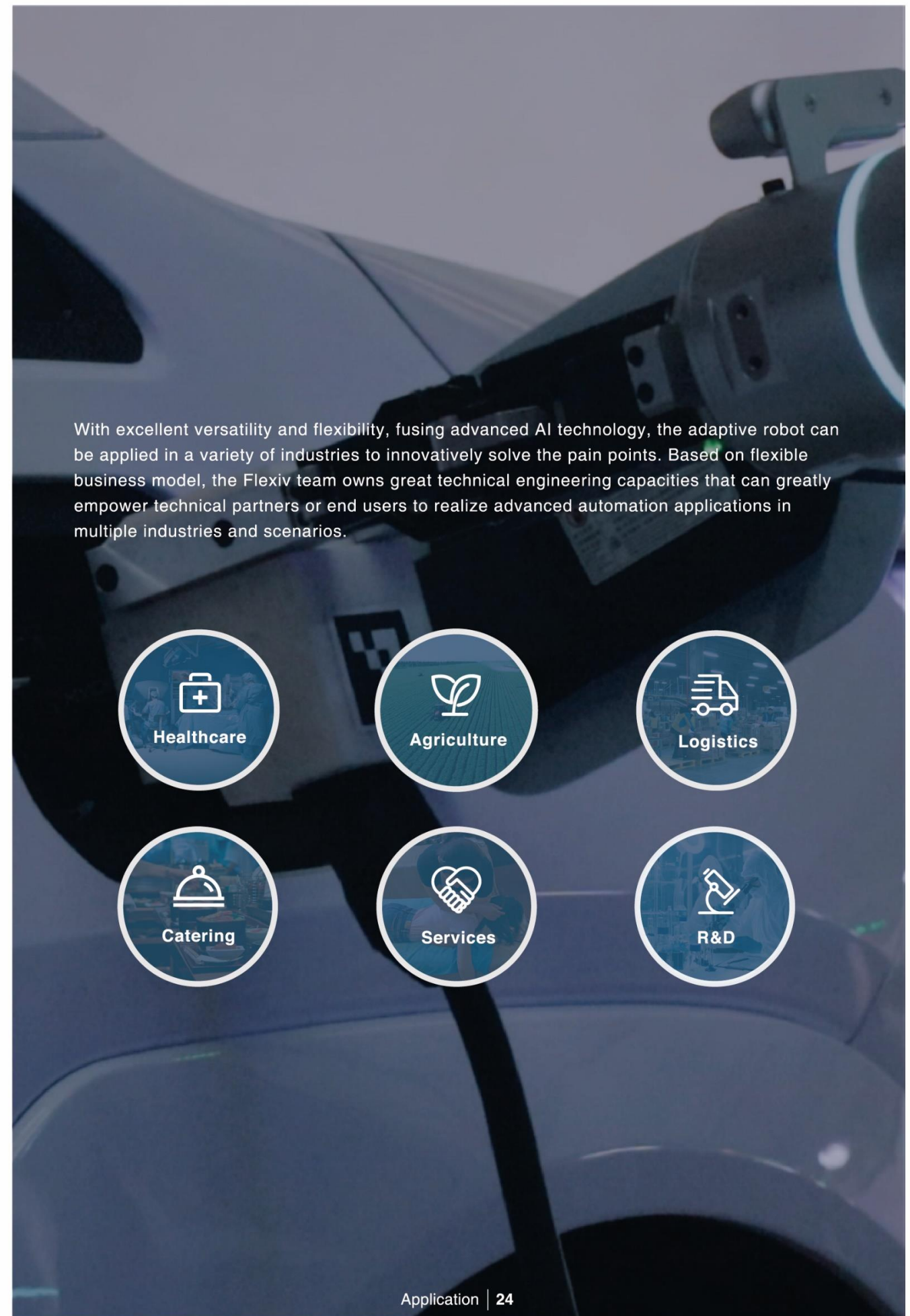


Home Appliance





## SERVICE & INNOVATION APPLICATIONS



With excellent versatility and flexibility, fusing advanced AI technology, the adaptive robot can be applied in a variety of industries to innovatively solve the pain points. Based on flexible business model, the Flexiv team owns great technical engineering capacities that can greatly empower technical partners or end users to realize advanced automation applications in multiple industries and scenarios.





# Flexible CNC Loading & Unloading by The Adaptive Robot

A famous precision component manufacturer

### Background

Previously, the loading and unloading of CNC precision components have always been completed by manual, however, the yield could not be improved because of the harsh working environment and scratches caused by workers sometimes. Thus, the customer actively searches for automated alternatives.

### Traditional Solution

Most of the automated solutions in the market now are based on position control, meaning the accuracy of every point in the loading & unloading trajectory must be guaranteed every time, which is difficult and costly.

### Flexiv Solution with The Adaptive Robot

Thanks to the fine force sensing and advanced force control algorithm, the adaptive robot can make real-time adjustments of its positions and poses to ensure the part is precisely put onto the mandrel. The assembly of single side 0.01mm clearance can be achieved flexibly, and its manipulation performance as well as the cycle time precedes the manual. Moreover, the adaptive robot can automatically tolerate the position errors brought by the AGV/AMR to realize that one mobile robot responsible for multiple machine tools and hereby the ROI time is shortened.

### Benefits

- The industrial-grade high precision resolution and high frequency force control make sure there's almost no scratch on the workpiece, improving the success rate to 99.8% and overall assembly performance
- Through graphical task editor and dragging robot to teach, users can complete the task programming of grasping and loading quickly within 30s
- Mature hole searching and positioning technology enables the precise positioning within 1s when the position error is less than 5mm





# Automated Blind Rivet Mounting by The Adaptive Robot

A major electronic OEM

## Background

As one of the commonly used connectors of desktop computer cases, blind rivets are widely used. With the continuous increase of comprehensive labor cost in recent years, the customer proposes the automation demand for the production process with high repeatability represented by the blind rivet mounting of computer cases.

## Traditional Solution

In the related OEM industry, the riveting is usually manipulated by workers using the riveting gun, at the same time, solutions by traditional robots and cobots are also applied, but the scenarios are very limited for these solutions highly subject to errors of workpieces and positioning and not performing well in dealing with complex problems such as the hole misalignment and riveting leakage.

## Flexiv Solution with The Adaptive Robot

In the automatic blind rivet mounting application, based on fine force sensing and output, the adaptive robot takes advantage of its great tolerance of position variance to use same tools to adapt to the position errors of holes and workpieces like human. Therefore, the flexibility of the whole system is largely improved.

## Benefits

- Able to realize the hole searching and positioning when there's hole misalignment
- Complete the hole searching within 2s when the position error is under 10mm
- Adapt to the hole position error within 2mm of adjacent layers of objects
- Equipped with the automatic riveting gun, the typical mounting efficiency can reach 5s/pcs and the success rate can be 99%





# Vehicle Interior Polishing by The Adaptive Robot

A major auto parts manufacturer

## Background

Grinding plays a very important role in spraying operations. To eliminate the particles, or rough, uneven areas on the workpiece surface, as well as enhancing the mechanical adhesion between the coating, the polishing process is often introduced into the primer and middle spraying. At present, most of the electrophoretic and middle polishing of the car body are completed manually. In recent years, with the continuous increase of labor costs, the demand for grinding automation is also increasing day by day.

## Traditional Solution

Due to much uncertainty existing in the manufacturing field, such as tolerance of the car body, velocity fluctuation of conveying lines, and positioning error, plans with traditional industrial robots or cobots based on position and trajectory control cannot effectively deal with these problems and realize real flexible polishing automation.

## Flexiv Solution with The Adaptive Robot

Fexiv's adaptive polishing solution is capable of fitting high-curved surface based on the robot's fine force/motion hybrid control, which can ensure the constant normal force when fits the curved surface and realize multi-types of float polishing without any constant-force float grinding tools or complex trajectory teaching. Meanwhile, with the unique line-body following techniques, the solution can achieve the remolding of prime and middle polishing with lowest cost and add value to end users.

## Benefits

- Fine end force control, high response frequency, no need for additional force-control equipment
- Simple task programming, quickly accomplish the polishing setting by trajectory dragging and teaching, only 30 seconds needed for workpiece change
- Intelligently avoid over-cutting, with the rejection rate decrease by 3%



# 3C Electronic Parts Assembly by The Adaptive Robot

A leading 3C electronic parts supplier

## Background

With the development of electronic and mobile technology, various and small-size electronic parts are also quickly evolved. The upstream production of high-precision components has been highly automated; however, the assembly of these components remains to rely on the manual work. The customer wants flexible automated assembly lines of these parts to promote the company's intelligent manufacturing.

## Traditional Solution

Most of the precision parts are small, easy to be deformed, and not in uniform shapes, all of which require complex assembly process and great force control technology, leading to its manual work based traditional production lines. Besides, some automation solutions based on position control cannot adapt to the uncertainty or inconsistency of supplied materials, causing high workpiece damage rate.

## Flexiv Solution with The Adaptive Robot

With industrial-grade force control and AI technology, the adaptive robot can adapt well to the uncertainty of supplied materials, enhance the assembly consistency, and decrease the materials rejection rate by 'hand-eye coordination' like human. Moreover, the production line using adaptive robots is compatible of multiple product types, which also meets the customer's needs.

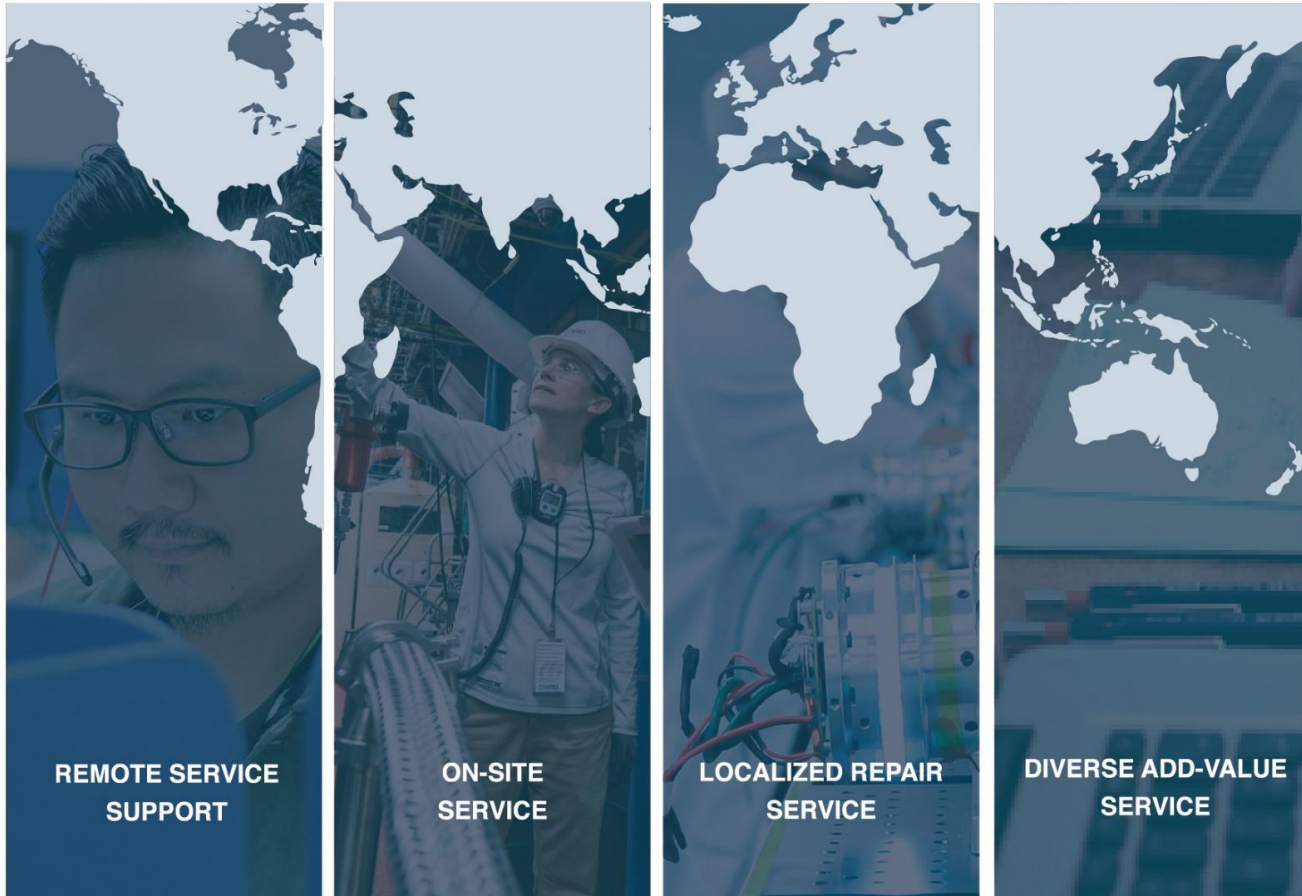
## Benefits

- One Rizon completely replaces two skilled workers, the average cycle time has raised from 8.4s/pcs to 4.5s/pcs
- The material rejection rate has decreased to be 1% (3% in the past), manifesting the success of cost saving
- The accurate force feedback largely improves the assembly consistency
- Robots can be manually set and controlled with easy manipulations
- Easy to change the materials and tools and compatible of all existing sizes of products





# CUSTOMER SERVICE



For more information on how you can benefit from adding Flexiv into your business, please contact us by official channels.



7x24  
Multi-channels



Independent Spare  
Parts Warehouse



Cloud Service



Customized Service  
Management



Graded Maintenance  
Model