



ADAPTIVE ROBOTS

Product Overview



ABOUT FLEXIV

Flexiv is a deep-tech company that is committed to developing and manufacturing general-purpose adaptive robots that redefine intelligent automation. Combining advanced robotics and artificial intelligence with human-centered design, Flexiv's robots empower businesses to flexibly automate complex tasks with intuitive and easy-to-use interfaces.

Headquartered in the US, our company has a global presence with offices and partners located in key markets around the world. Our international network of experts and partners are committed to supporting you throughout your automation journey. From planning and design to implementation and maintenance, we offer comprehensive assistance that ensures the successful deployment of your projects.

WHY USE AN ADAPTIVE ROBOT ?

An adaptive robot seamlessly fuses industrial-grade force control with advanced artificial intelligence. This integration has allowed us to create a cutting-edge robotic platform that can efficiently automate difficult or time-consuming tasks, freeing up valuable time and resources for your business.

Assisted by force control and visual perception, our robots are designed with a hand-eye coordination capability which enables them to accomplish tasks in a similar manner to a human. This brings unprecedented versatility, and robust protection against positional errors and external disturbances.



Tolerance to Position Errors

Adapt to the object

Position errors can often arise from a variety of factors such as geometric tolerances of workpieces and their fixtures, deformation, and limitations in calibration accuracy. However, our adaptive robot has the unique capability to accommodate all of these errors while still accomplishing the programmed task.



Disturbance Rejection

Adapt to the environment

In any industrial environment, vibrations are a common occurrence that can originate from a variety of sources such as robot fixtures, mobile bases, and even end-of-arm tooling. These vibrations can cause damage to workpieces and reduce the lifetime of the robot itself. However, with advanced force control technology, an adaptive robot is able to actively compensate for disturbances and maintain stability and precision even in the presence of high levels of vibration.



Transferable Intelligence

Adapt to the task

An adaptive robot is capable of learning from previously completed tasks and assimilating those learned skills into new tasks, allowing for faster deployment with reduced downtime.



Automate More



Increase Flexibility



Reduce Cost

PRODUCT PORTFOLIO



RIZON 4

RIZON 4s

MOONLIGHT

RIZON 10

RIZON 10s (Coming Soon)



Control Box



AI PC



Intuitive drag-and-drop
graphical programming
environment

Compatible with ROS



Software development kits



AI Cloud Platform



AI Edge System



GRAV

**Other
Peripherals**

AGV

Camera

More



TECHNICAL SPECIFICATIONS



ROBOT ARM

Rizon 4

Revolutionary adaptive robot in a compact package.

Rizon 4s

Unmatched precision in both force control and sensing.

Rizon 10

Powerful and sensitive force control technology for wide range of applications.

Degrees of freedom	7	7	7
Payload	4 kg	4 kg*	10 kg
Reach	916 mm	959 mm	941 mm
Weight	20 kg	21 kg	38 kg
Protection rating	IP65	IP65	IP65
Installation position	Any	Any	Any
Operating temperature	0 to 45 °C	0 to 45 °C	0 to 45 °C
Air humidity	20% to 80% non-condensing	20% to 80% non-condensing	20% to 80% non-condensing
Mounting flange	ISO 9409-1-50-4-M6	ISO 9409-1-50-4-M6	ISO 9409-1-50-4-M6
Pose repeatability (ISO9283)	±0.05 mm	±0.05 mm	±0.05 mm
Noise	<70 dB	<70 dB	<70 dB
Typical TCP linear speed	1.0 m/s	1.0 m/s	1.0 m/s
Maximum TCP force	200 N	150 N	350 N
Force sensing accuracy	0.1 N	0.03 N	0.1 N
Joint working range	A1	-160° to +160°	-160° to +160°
	A2	-130° to +130°	-130° to +130°
	A3	-170° to +170°	-170° to +170°
	A4	-107° to +154°	-155° to +155°
	A5	-170° to +170°	-170° to +170°
	A6	-80° to +260°	-80° to +260°
	A7	-170° to +170°	-170° to +170°
Maximum joint speeds	A1 to A2	120 °/s	100 °/s
	A3 to A4	140 °/s	120 °/s
	A5 to A7	280 °/s	220 °/s

* including the weight of force/torque sensor, which is 0.5 kg





TECHNICAL SPECIFICATIONS

PARALLEL ROBOT

Moonlight



World's First Adaptive Parallel Robot

Degrees of freedom		3
Weight		30 kg
Maximum working height		400 mm
Maximum working diameter		800 mm
Installation position		Any
Protection rating		IP65
Repeatability (ISO9283)		±0.03 mm
Robot base		Ø206 mm
Mounting flange		ISO 9409-1-50-4-M6
Operating temperature		0 to 45 °C
Maximum speed with payload	Low payload (5 kg)	1.5 m/s 10.4 m/s^2
	Medium payload (7 kg)	1.5 m/s 7.5 m/s^2
	High payload (12 kg)	1.5 m/s 2.8 m/s^2
Maximum TCP force	No payload	F_xy: 100 N, F_z: 168N
	Low payload (5 kg)	F_xy: 89 N, F_z: 119 N
	Medium payload (7 kg)	F_xy: 81 N, F_z: 99 N
	High payload (12 kg)	F_xy: 47 N, F_z: 50 N

GRIPPER

Grav

Grav Enhanced



Highly Versatile Grasping Solution

Gripping technology	2-finger force-controlled gripping	P-mode: 2-finger force-controlled gripping
		V-mode: gecko-inspired adhesive
Stroke per jaw	50 mm	52 mm
Optimal range of applicable gripping force	1 N to 100 N	1 N to 30/80 N
Gripping speed	1 to 200 mm/s	1 to 200 mm/s
Finger position repeatability	0.1 mm	0.1 mm
Force control accuracy	1 N	1 N
Dimensions	202 mm x 159 mm x 84 mm	V-mode: 211 mm x 180 mm x 84 mm
		P-mode: 211 mm x 210 mm x 84 mm
Weight	0.9 kg	1 kg
Protection rating	IP67	IP67
Operating temperature	-20 to +45	-20 to +45
Communication	Integrated into robot arm	Integrated into robot arm
Mechanical interface	ISO 9409-1-50-4-M6	ISO 9409-1-50-4-M6



TECHNICAL SPECIFICATIONS

CONTROL BOX

Hesper



Motion Bar



Teach Pendant

Weight	11 kg
Power source	100-240VAC 50-60 Hz, 42-72VDC (optional)
Dimensions	423 mm x 230 mm x 230 mm
Power consumption	500 W
I/O ports	16 digital inputs 16 digital outputs
Safety system	All 18 safety functions certified according to EN ISO 13849-1 to Cat. 3, PL d
I/O power supply	24 V, 2 A (box), 24 V, 1 A (tool)
Communication	Master: Modbus TCP (standard), Ethernet TCP/IP (optional) Slave: Modbus TCP (standard), Profinet / EtherNet/IP / CC-link (optional)
Air humidity	20% to 80% non-condensing
Protection rating	IP20
Operating temperature	0 to 45 °C
Cabling	Between manipulator and control box: up to 10 m Between motion bar and control box: 7 m

ACCESSORIES



Camera Module



Dress Kit



External Axis



Mobile Workbench



AMR



End of Arm Tooling



PRODUCT FEATURES



Sensitive & Intelligent

Our robotic joints work responsively to accurately regulate forces at the tool center point (TCP), enabling ultra-precise and real-time force-guided manipulation. Combined with Flexiv's intelligent and intuitive programming interfaces, Flexiv's robots enable flexible task planning and execution through the effective use of accurate visual and tactile feedback, setting a new standard for precision manipulation in the industry



Safe & Reliable

With a robust hardware architecture certified in accordance with EN ISO 13849-1 Cat. 3 PL d, and advanced torque-based control, our robots are inherently reliable and safe. Say goodbye to cages and boundaries and hello to a new level of flexibility and productivity with our solution.



Easy to Program

Thanks to the intuitive graphical user interface, our simple-to-use software empowers users to create ideal workflows to automate complex processes with ease. With our solution, you can leverage the benefits of reusability, optimizing your operations and improving productivity.



Incredibly Versatile

With the ability to accomplish almost any manual labor task, a single adaptive robot can be endlessly repurposed. This enables you to meet seasonal demands and create custom orders without the need to hire additional staff, reducing labor costs and improving operational efficiency.



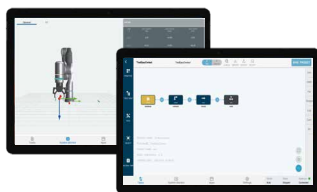
Superior Performance

At Flexiv, we are committed to providing the highest quality adaptive robotic solutions to our customers. Our strict quality control processes, continuous development, and real-world testing ensure that every adaptive robot we create is optimized and ready for deployment, providing our end-users with the reliability and performance they need to succeed.



Fully Supported

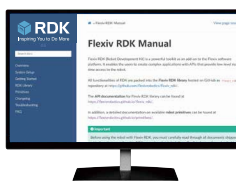
We work closely with all of our customers, either directly or through our distribution network, to create an optimized automation solution that meets their unique needs. From on-demand support to onsite troubleshooting, we are with you every step of the way on your automation journey.



FLEXIV ELEMENTS

Intuitive drag-and-drop
graphical programming
environment

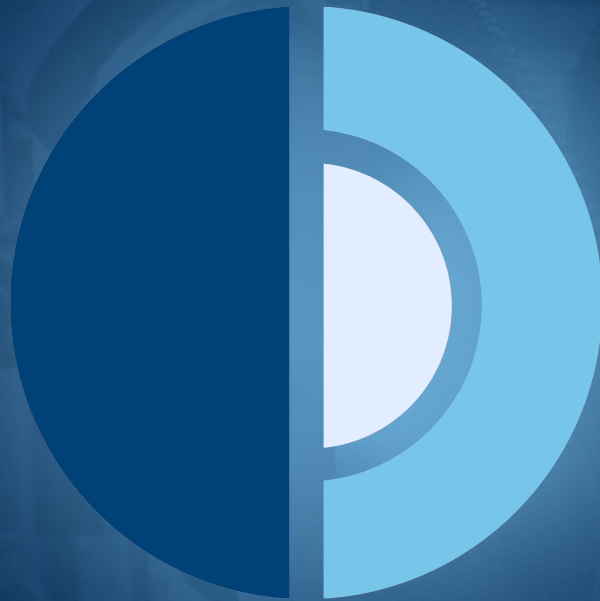
- Elements features a visual and intuitive programming interface environment requiring only simple drag-and-drop operations, making it easier than ever to learn and operate.
- Designed to provide rich guidance to help users, Elements enables users to easily program a wide range of tasks, ranging from simple point-to-point motions to complex surface finishing applications.
- Designed for reusability, users can save time and effort by reusing programs for similar or different tasks. Our customizable plans are developed to meet users' changing demands, increasing their efficiency and reducing their overall costs while optimizing their productivity.



FLEXIV RDK

Software development kits

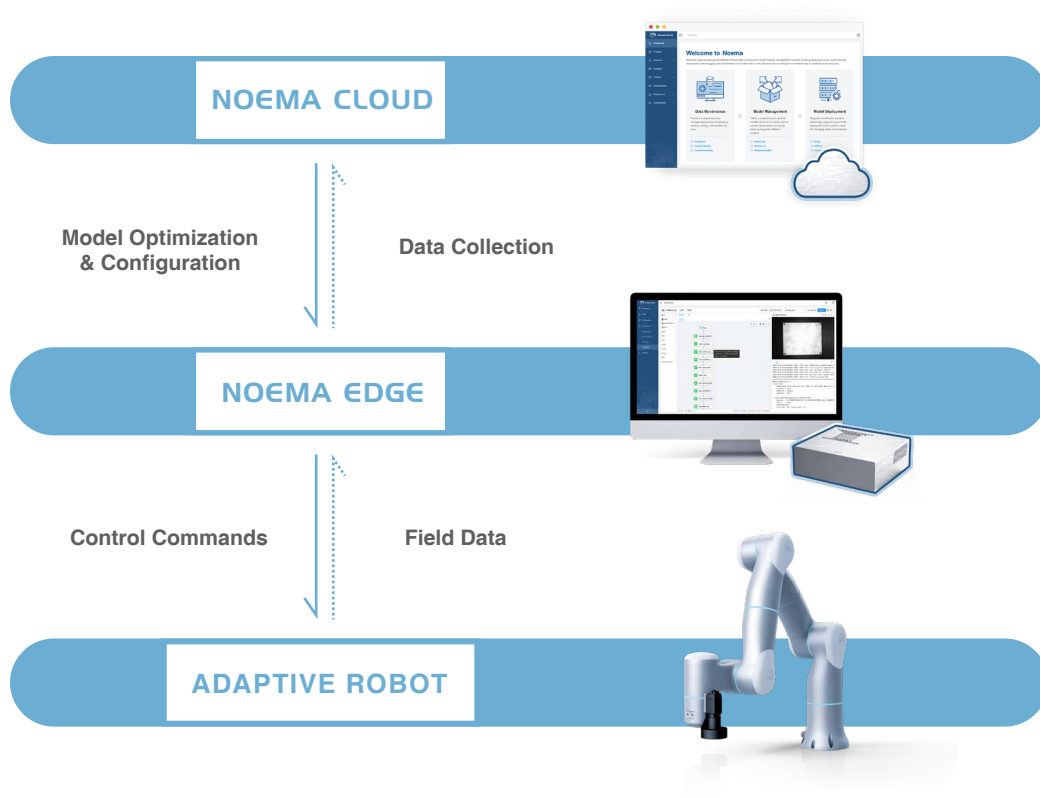
- Issue commands to control the robot's actuators directly or execute complex high-level primitives and task plans. Receive and transmit real-time sensor measurements and control data at 1kHz.
- Comprehensive documentation and technical support are provided to assist users in their custom automation applications. Additionally, ROS 1 and 2 are supported, which allows further extensibility.
- Designed with multi-platform support and powered by the world's most popular programming languages, C++ and Python, RDK enables ease of operation and seamless integration into existing workflows.



NOEMA

Empowering robots to leverage rich perception feedback and "see, think, and act", NOEMA provides advanced AI capabilities for Flexiv's robotic platforms. With NOEMA's perception modules, which include vision, force, and tactile feedback, robots can perform complex tasks intelligently with precision and accuracy. Its cloud-edge processing also ensures that data is secure and processed with minimal latency, allowing for real-time decision making.

Cloud-edge Architecture



Industrial AI Solutions



- High visual recognition accuracy and stability, even in challenging environmental conditions.
- Superior force control reduces the need for costly visual hardware.
- Self-developed AI algorithms enable cost-effective AI solutions to be created.
- Deep learning technology and computer vision work in synergy to create customizable solutions.
- Can be efficiently deployed and integrated across Flexiv's entire product range.



INDUSTRIAL APPLICATIONS

Remove Production Bottlenecks, Maximize Efficiency and Productivity

ASSEMBLY AND TESTING

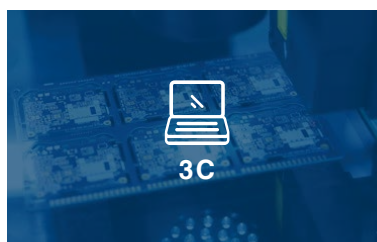
Flexiv's adaptive robots are designed with seven degrees of freedom and integrated force/torque sensors, which enable them to perform intricate assembly tasks such as loading, fastening, plugging, pasting, tidying, FPC header assembly and product testing. Its ability to replicate the dexterity and sensitivity of a human makes it an ideal solution for a wide range of industrial applications.

SURFACE FINISHING

Flexiv's robot's force sensors are class-leading and can measure force down to 0.03 newtons, enabling fully automated surface-finishing tasks like polishing, sanding, trimming, and shaping. The robot can react instantly to curved or uneven surfaces, ensuring that consistent forces are applied for optimal results.

MOBILE MANIPULATION

The use of Flexiv's robots with external axes, be it a linear rail or a mobile base, can significantly enhance their flexibility and overall functionality in demanding applications that require larger workspaces. Moreover, thanks to the adaptivity afforded by force control, Flexiv's robots can operate without high precision localization equipment, resulting in more efficient and cost-effective operations.





EMERGING MARKET APPLICATIONS

SUITABLE FOR ANY SECTOR

The Rizon series of robots are a valuable tool for businesses looking to improve their productivity, safety, and efficiency. With their flexibility, customizability, and advanced capabilities, the Rizon series of robots can help companies in emerging markets to tackle even the most challenging tasks.



HEALTHCARE

Massage and Muscle Therapy
Ultrasound Scanning



AGRICULTURE

Fruit and Vegetable Picking
Food Processing



OTHER

Lab Automation
Electric Vehicle Charging



LOGISTICS

Complex Packaging
Picking and Sorting



CATERING

Beverage Preparation
Ingredient Processing



High-precision Assembly

Flexiv successfully automated the precision assembly process of automotive control modules for a leading automotive component provider. Before the implementation of Flexiv's automation solution, the assembly process was performed manually by hand. However, by integrating multiple adaptive robots into a production line, Flexiv's solution achieved full automation while remaining cost-effective and delivering superior assembly performance. The project, from its initial planning phase to commissioning, achieved a 40% reduction compared to the average deployment time of traditional solutions.

Fully automated

Previously, automating 100% of the control unit assembly process was challenging, as several difficult-to-automate tasks had to be performed manually, leaving room for errors and inefficiencies. However, Flexiv's advanced robotic technologies and expertise allowed for the automation of these tasks, resulting in a fully automated production line.

Reduced cost

The implementation of Flexiv's solution not only improved efficiency and accuracy but also reduced labor costs and increased product quality, ultimately resulting in a significant improvement in overall manufacturing performance, and the new solution is estimated to be 25% more cost-effective.

Improved quality and maintainability

Flexiv's adaptive robots enabled a significant reduction in customized supporting machinery, resulting in a smaller footprint and improved maintainability for the new production line. The utilization of supporting machinery equipment in the production process was reduced from 86% to 30%, leading to a more simplified and effective solution. As a result, output quality and consistency were significantly improved compared to traditional automation solutions. Additionally, the new solution offers improved maintainability, which will help reduce maintenance costs and downtime.



Welding Residue Polishing

Flexiv's team worked with a leading electric vehicle manufacturer, to develop a more capable automated weld residue removal process for car door frames. The solution previously employed by the manufacturer was unable to polish curved surfaces and provided inconsistent results on flat surfaces. To address the client's issues, Flexiv developed a car body polishing solution that fully utilized its innovative force control technology to achieve autonomous surface following while polishing away weld residues. The installed solution surpassed the performance and reliability requirements set forth by the client, while also improving output speed and quality.

Reliable operation

The full system consists of four robots working simultaneously to polish surfaces affected by weld residues. Thanks to the torque-controlled joints' ability to compensate for vibrations caused by polishing, no errors were reported from the initial tests to the deployment at the customer's production site, even under harsh working conditions.

Robust against position errors

As with many other automotive manufacturing plants, car frames are transported on conveyor systems, which may result in significant position uncertainty for automation systems. However, using force control technology, Flexiv's robots are able to actively compensate for any position uncertainty, resulting in consistent and reliable polishing performance.

Robust against tool wear

Polishing can cause significant tool wear and inconsistent material removal. For position-controlled robots, compensating for variations in material removal rate can be challenging, especially when adjusting the tool-to-part distance at high control rates. This challenge is amplified for door frame polishing, where the tool must traverse the entire frame. With Flexiv's force control, a constant tool pressure can be maintained, reducing material removal rate variations. Moreover, Flexiv's robots can apply forces in any direction, enabling constant forces during door frame traversal.



Adaptive Mobile Robot Electric Vehicle Charging

With the rapid advancements in the electric vehicle industry, innovation in public charging stations is also on the rise. In collaboration with a vehicle charging solution provider, we have developed an adaptive mobile robot optimized for electric vehicle charging. The system consists of the adaptive robot Rizon and the mobile platform, which utilize force and visual feedback to compensate for position errors from the mobile base. This solution provides high flexibility while ensuring reliable and precise operation

Fast design iteration

The combination of easy-to-use RDK and intuitive workflow-based Elements programming environment enabled development teams at the client's offices to independently iterate on their system design rapidly. The overall integration work took less than one week, allowing for the prototype to be completed well ahead of the client's planned product launch.

Intuitive and intelligent operation

The system can be commanded with high-level and intuitive instructions and is capable of intelligent and robust movement from its home to the car and subsequently inserting the charger perfectly. Being universal, the system is also able to accommodate vehicles of any make or model.

Robust against environment variations

The electric charging system will be used in various indoor and outdoor environments where lighting variations may be significant. Thanks to the deep learning-based perception module on NOEMA, the system is able to reliably estimate the pose of any vehicle's charge port under various lighting conditions.

Dexterous and Intelligent

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