ONE FOR ALL.

Open control concept for a wide range of applications.
ONE OF THE MAIN CRITERIA OF INTELLIGENCE IS THE ABILITY TO ADAPT

Compact. Powerful. And as flexible as you need to meet your demands. The new Epson RC700-A controller is a universal genius and can demonstrate its ability as a stand-alone or integrated system. If it is extended to create a multi-manipulator controller, the Epson RC700-A can control several robots and various peripherals in a complex system. The automation of the future starts with Epson.

The Epson RC700-A is designed for the new generation of robots featuring Epson QMEMS® sensor technology. Thanks to QMEMS vibrations by the kinematic system are considerably reduced even at high starting speeds or when decelerating. This improves production throughput and ensures stable quality for assembly work even at high speeds.

The Epson RC700-A can be used with the SCARA robots from the G and RS series and the 6-axis robots from the C4 series as well as with the future generations of robots.

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FEATURES & ADVANTAGES

- Powerful universal controller, can be expanded into a multi-manipulator controller
- Multi-tasking
- Compact design
- Low power consumption
- Low power loss
- Graded safety systems (Safety door circuits / Emergency Stop circuits)
- Remote control and maintenance possible using additional PC
- Standard industrial inputs/outputs
- One/Two-phase connectability
- TCP-IP connection
- RS-232 connection
- Real-time inputs/outputs
- Integrated motor circuit-breaker
- Status indicator

The Epson RC700-A can be used with the SCARA robots from the G and RS series and the 6-axis robots from the C4 series as well as with the future generations of robots.
OPEN SYSTEM ARCHITECTURE

The Epson RC700-A can communicate with all conventional field bus systems and is open for the connection of lower and higher level controllers, sensors, actors, conveyor belts and other peripherals. This means that the RC700-A can take over all robot control, motion control and process control functions — without the need for a PLC.

MULTI-TASKING SPECIALIST

If several robots and peripherals are connected to the controller, the RC700-A’s multi-tasking ability enables you to use your system more effectively and with less susceptibility to problems. Synchronisation takes place using markers and without additional wiring being required.

The RC700-A can process 48 multi-tasks. Of these 16 tasks can be used as background tasks — even if the robot program is interrupted. This multi-tasking ability means that even complex processes can be controlled easily within the work cell.

NETWORKING AT NO EXTRA COST

Using the integral Ethernet port the RC700-A can be connected to other Epson robot systems or company networks at no extra cost, enabling you to access the controller from your desk.

RC700-A DRIVE UNITS — THE PLUS FOR MANIPULATORS

Would you like to increase the number of manipulators in your system which are controlled with a single controller? The RC700-A drive units can be used to control up to 4 manipulators with ease. This enables you to synchronise robots which work together in a working environment easily using tasks and markers.

The RC700-A drive units are available in two versions:
• RC700-A DU4 for additional 4-axis robots
• RC700-A DU6 for additional 6-axis robots

VARIOUS ASSEMBLY SCENARIOS

Its compact dimensions enable the Epson RC700-A to be fitted in a control cabinet. It can also be installed in various positions — horizontal or vertical, on the floor, on the ceiling or on the wall.

FAST INSTALLATION

All the ports are located on one side to make it easier for you to connect the controller quickly whilst also ensuring easy access for maintenance and repair work. The number of assemblies has been minimised which increases reliability. All components can be replaced without the need for special tools.

TRIGGER KEY FOR BACKUP

The trigger key enables you to save a complete backup including system status to a USB stick at any time whilst the system is running. This allows simple offline error analysis.
ERGONOMIC, CONVENIENT AND INTUITIVE—
THE PORTABLE CONTROL AND DISPLAY DEVICES

The RC700-A supports up to 16 conveyor belts which can be combined with all the robots connected to the controller in the conveyor tracking system. The objects found on the conveyor belts are placed in intelligent queues and processed in parallel by several robots without the operator having to intervene.

SENSOR TRACKING
Instead of detecting the position of the object with a camera, the conveyor tracking system is triggered by a sensor such as a light barrier. If the object enters the pick up range of the robot, it can pick it up precisely.

MULTI-CONVEYOR AND MULTI-ROBOT
The RC700-A supports up to 16 conveyor belts which can be combined with all the robots connected to the controller in the conveyor tracking system. The objects found on the conveyor belts are placed in intelligent queues and processed in parallel by several robots without the operator having to intervene.

HIGH-SPEED CONVEYOR TRACKING
Enables high precision synchronisation with moving objects.

An image processing system allows objects to be detected on the conveyor belt both in the linear direction or in a circular direction on a turntable. The robot picks them up without stopping the belt. An encoder measures the conveyor belt movement permanently. Even if the speed changed between detecting and handling an object, the robot can pick up and put it down precisely.

FIELD BUS CARDS
Would you like to use a field bus system in your system or minimise wiring work? In that case you can use the following slave cards with the RC700-A:
- Profinet, DeviceNet, CC-Link, Profinet and Ethernet IP.
- And as a new card: EtherCAT—the real-time Ethernet technology with nearly unlimited network expansion.

In addition you can fit master cards, such as a Profinet master in your PC which records all the stations of the Profinet DP network and completed the configuration, maintenance and diagnostic work for the network.

EXPANSION I/O CARD
If the standard 24 inputs and 16 outputs are not enough, but you do not want to create a field bus network, your system can be expanded by a further 24 inputs and 16 outputs per card. In total you can fit up to four expansion cards.

EXPANSION I/O CARD
- Galvanic separation of the inputs and outputs
- An additional 24 inputs and 16 outputs per expansion card
- Optical decoupling of the I/O cards
- Protection against external influences such as excess voltage and electrostatic discharge

The expansion cards for communicating with external devices and for integration in field bus networks enable you to expand your system to exactly the configuration you need for your application—from a simple handling task to complete machine and robot control.

RS-232C SERIAL PORT CARD
The Epson RC700-A has a serial port for communicating with external accessories as standard. The serial expansion card enables you to use two additional channels (max. two expansion cards) so that a total of five channels are available.

- Max. two expansion cards
- Two channels per card

FIELD BUS CARDS
- Prollbus protocol stacks without loading the PC
- Direct access to the process data in the dual port memory
- Simple function control using LED status indicators
- Save the configuration files to the internal flash
- Provides 256 inputs and 256 outputs
- Controls up to 1,024 inputs and 1,024 outputs (freely configurable) as Prollbus master
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FLEXIBLE EXPANSION
TO MEET YOUR REQUIREMENTS

The powerful universal device performs all of the tasks pertaining to operation, display and teaching. Equipped with a high-contrast 4.0" TFT display.

Teach Pendant TP1
- The powerful universal device performs all of the tasks pertaining to operation, display and teaching. Equipped with a high-contrast 4.0" TFT display.

Teach Pendant TP2
- The cost-effective introductory model is compact and easy to operate.

Teach Pendant TP3
- The mobile terminal features an ergonomic housing with a brilliant and high-contrast 10" TFT-LCD display. Thanks to fast processors, it is perfectly suited for demanding visualization and operating applications.

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**PACKAGE**
- 1 Epson RC700-A controller
- 1 Epson RC+ program CD including simulator
- 1 Set of mounting brackets for the robot controller
- 1 Set of 3m motor and signal cables
- 1 Plug for Emergency Stop
- 1 Plug for standard I/O
- 1 USB programming cable
- Manuals on CD
- 1 Installation / Safety manual

**A gap of 200 mm at the front and 100 mm in all other directions should be left clear for the air flow and the outgoing cables.**

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### TECHNICAL DATA

**Ports**
- 1x USB memory, 1x USB device
- 1x 10/100 base T-Ethernet
- 24/16 Standard I/O channels—8/8 as remote
- RS-232C Standard 1x channel

**CPU**
- 32-bit microprocessor

**Hardware options**
- Control and display devices
  - Teach Pendant 1 (TP1), Teach Pendant 2 (TP2), Teach Pendant 3 (TP3)
- Drive Unit
  - 1 Robot manipulator per drive unit, 2 additional drive units possible

**I/O expansion**
- 24/16, 4 additional cards possible

**I/O field bus master cards**
- Profinet, DeviceNet, Ethernet/IP, 1 additional card of each type possible

**I/O slave field bus cards**
- Profinet, DeviceNet, Ethernet/IP, Profinet, CC-Link, EtherCAT
- 1 additional card of each type possible

**Expansion card options**
- RS-232C serial port
  - 2 channels per card, 2 additional cards possible
- Pulse generator motion card
  - 4 channels per card, 4 additional cards possible

**Software options**
- RC+ API 7.0 previously VB Guide
- External Control Point Motion (ECP)
- GUI Builder 7.0
- Force Sensing
- Security Option

**Development environment**
- Epson RC+ 7.0

**Programming language**
- Epson SPEL+ 7.0 multitasking-capable

**Connection values**
- One-phase
  - AC 200 V to 240 V
- Two-phase
  - AC 110 V to 120V, 50/60 Hz

**Power consumption**
- Up to 2,500 VA—depending on manipulator model

**Ambient temperature**
- 5–40°C

**Relative humidity**
- 20% to 80%—non condensing

**Safety equipment**
- Emergency stop button, safety door entry, low power mode, generator brake
- Error detection
  - Encoder cable break
  - Detectors
- Motor overload, motor speed error, irregular motor torque (manipulator out of control), overheating of a motor driver module, positioning overrun—servo error, speed overrun—servo error, CPU error, memory checksum error, relay drop-out, excess voltage, mains voltage outage, temperature deviation, fan error

**Certifications**
- CE
- ANSI RIA R15.06-1999
- EC Machinery Directive 2006/42/EC

**Dimensions**
- 380 x 350 x 170 mm

**Weight**
- 11 kg
NEW FUNCTIONS

SIMULATION OF IMAGE PROCESSING

The Vision Simulation function is ideal for simulating sequences of image processing before building the robot system so that they can be tested easily. Not only does it reduce the set-up times for the entire Epson system with robot and image processing system but the simulation system can also provide valuable experience in the operating environment for first time users.

CATCH-ON-FLY RECORDING AND EVALUATION DURING THE ROBOT MOTION AT HIGH SPEEDS

The Catch-On-Fly function enables the robot controller to record and evaluate an image without having to stop the robot over the camera. This allows corrections to a workpiece relative to a grab to be found very quickly.

DEFECT INSPECTION FOR CHECKING SPECIFICATIONS AND SAMPLES

The defect detection function can be used to identify differences in comparisons with the specification image very quickly. Thanks to a newly developed algorithm the problem that edge images are wrongly identified as defective by conventional image processing systems occurs much more rarely.

SUPPORT FOR COLOUR CAMERAS

This new function facilitates the selection of various coloured or transparent workpieces and the assessment of the front and rear.

SUPPORT FOR HIGH RESOLUTION CAMERAS (2 MP/ 5 MP)

These cameras now mean a vastly increased search area with the same precision. Alternatively details can be shown in higher resolution with the same size search area.

TOOL LIBRARY

• Integrated calibration routines which support various camera alignments and calibrations
• Point-and-click interface for fast prototyping
• Blob analysis tools which measure the size, form and position of objects with changes
• Search function for geometric figures based on geometric part elements
• Normalised correlation search which detects objects using a normalised template matching technique in varying light conditions
• Edge search function which detects a certain edge precisely at sub-pixel level
• Polar search, an angle search function which measures the rotation of complex objects fast
• Line and point tools to draw and measure lines between points
• Object reference mechanism to align a vision tool at the result of another vision tool
• Histograms for looking more closely at pixel data and to define limit values for tools
• Statistical calculations and evaluations for every vision tool
• Automatic compensation of small defects on the camera lenses and the camera itself for object angle deviations
• Catch-on-fly motion control via I/O function without stopping the robot
• Vision simulation for simulating complete motions including image processing
• Defect inspection for comparison with template images
• Code reading for the identification of barcodes or two-dimensional data matrix codes without them having to be explicitly learned
• Support for colour cameras and high resolution cameras
**EPSON COMPACT VISION (CV1)**
**FLEXIBLE AND COMPACT, WITHOUT PC**

- Flexible and compact, without PC
- Support for up to 8 Gigabit Ethernet cameras
- Support for USB (or Ethernet)
- Optional PoE Ethernet Switch
- Support for up to 2 USB cameras per CV1

**EPSON PC VISION (PV1)**
**POWERFUL, PC-SUPPORTED**

- Powerful, PC-supported
- Ideal for customers who do not always use a computer for image processing
- Support for up to 8 standard or high-resolution USB cameras, permanent or mobile installation
- Objects in various focal lengths, integrated or with offset lens

**EPSON COMPACT VISION (CV2)**
**HIGH PROCESSOR SPEED, WITHOUT PC**

- No computer is required to process images
- For requirements such as cycle times and an extremely high camera resolution (more than 1.3 MP)
- Combine with up to 4 GigE cameras and 2 USB cameras, mobile or stationary
- Option of high-speed communication via GigeEthernet
- Two variants: CV2-S and CV2-H for particularly high speeds

**INDIVIDUAL REQUIREMENTS, FLEXIBLE EXPANSIONS**

- Individual requirements, flexible expansions
- Requires the provision of a computer for image processing
- For requirements such as cycle times and an extremely high camera resolution (more than 1.3 MP)
- Combine with up to 8 GigE cameras, mobile or stationary
- Option of high-speed communication via GigeEthernet
**EPSON COMPACT VISION**

**CV1**
- Processor: Intel Pentium G2120
- Ports: Ethernet, USB, monitor, mouse, keyboard
- Camera connections: Max. 2 USB cameras
- Dimensions: 190 x 63 x 197 mm
- Power consumption: DC 24V ±5%
- Weight: 1.5 kg

**CV2-S**
- Processor: Intel Core-i7 3770
- Ports: Ethernet, USB 2.0, monitor, mouse, keyboard
- Camera connections: Up to 4 GigE cameras and 2 USB cameras (Max. 6 cameras)
- Dimensions: 232 x 70 x 175 mm
- Power consumption: DC 24V ±5%
- Weight: 1.5 kg

**CV2-H**
- Processor: Intel Pentium G2120
- Ports: Ethernet, USB, monitor, mouse, keyboard
- Camera connections: Max. 2 USB cameras
- Dimensions: 190 x 63 x 197 mm
- Power consumption: DC 24V ±5%
- Weight: 1.5 kg

**EPSON USB CAMERAS FOR COMPACT VISION (CV1 AND CV2)**

**CV1**
- Resolution: 640 x 480 Pixel
- Sensor Types: CMOS – 1/3" Progressive Scan
- Lens mounting: C- / CS mount
- Camera use: Stationary camera 5m USB cable
- Accessories (optional): Lenses 8, 12, 16, 25, 50 mm standard and high resolution, available singly or in a set, 1x Set of mounting brackets
- Dimensions without lens: 33 x 30,5 x 30 mm
- Weight: 50 g

**CV2**
- Resolution: 1.280 x 1.024 Pixel
- Sensor Types: CMOS – 1/1,8" Progressive Scan
- Lens mounting: C- / CS mount
- Camera use: Mobile camera 5m USB high flex cable
- Accessories (optional): Lenses 8, 12, 16, 25, 50 mm standard and high resolution, available singly or in a set, 1x Set of intermediate rings
- Dimensions without lens: 33 x 30,5 x 30 mm
- Weight: 50 g

**EPSON GIGE CAMERAS FOR COMPACT VISION (CV1 AND CV2)**

**CV1**
- Resolution: 640 x 480 Pixel
- Sensor Types: CCD – 1/4" Progressive Scan
- Lens mounting: C- / CS mount
- Camera use: Stationary camera 5m Gigabit Ethernet cable
- Accessories (optional): Lenses 8, 12, 16, 25, 50 mm standard and high resolution, available singly or in a set, 1x Set of mounting brackets
- Dimensions without lens: 42 x 29 x 29 mm
- Weight: 90 g

**CV2-S**
- Resolution: 1.600 x 1.200 Pixel
- Sensor Types: CCD – 1/1,8" Progressive Scan
- Lens mounting: C- / CS mount
- Camera use: Mobile camera 5m Gigabit Ethernet high flex cable
- Accessories (optional): Lenses 8, 12, 16, 25, 50 mm standard and high resolution, available singly or in a set, 1x Set of intermediate rings
- Dimensions without lens: 42 x 29 x 29 mm
- Weight: 90 g

**CV2-H**
- Resolution: 2.560 x 1.920 Pixel
- Sensor Types: CMOS – 1/2,25" Progressive Scan
- Lens mounting: C- / CS mount
- Camera use: Stationary camera 5m Gigabit Ethernet cable
- Accessories (optional): Lenses 8, 12, 16, 25, 50 mm standard and high resolution, available singly or in a set, 1x Set of mounting brackets
- Dimensions without lens: 42 x 29 x 29 mm
- Weight: 90 g
The powerful Epson RC+ 7.0 project management and development environment is ideal for the straightforward programming of your applications with its intuitive Windows interface, open structure and integrated image processing.

The software is capable of controlling all types of robots and functions. It also supports a graphic 3D environment which enables you to simulate the robot program almost completely and visualise robot motions.

**POWERFUL, EFFICIENT, INTUITIVE: EPSON RC+ 7.0 DEVELOPMENT ENVIRONMENT**

**FEATURES & ADVANTAGES**

- Can run in Microsoft Windows XP, Windows Vista and Windows 7
- Integrated project management system for fast project development
- Communicates with the controller via USB or Ethernet
- Enables you to connect one computer to multiple controllers
- Parallel operation of multiple RC+ 7.0 applications possible (one computer accesses multiple control units in parallel)

- SPEL+ programming language: powerful, easy to learn and use
- Intuitive control
- Image processing integrated in the interface
- Wide-ranging port connection: Ethernet I/O, Profibus, DeviceNet, Profinet, serial port, TCP/IP, I/O Handshake direct or available as an option
- Programming environment available in German, English, French, Japanese and Chinese
- Background tasks for complete system control
- Extensive multi-manipulator commands
- Integration of DLL functions
- Simulator
- File management

**NEW FUNCTIONS**

The Epson RC+ 7.0 is the successor to the Epson RC 5.0 and RC 6.0 featuring lots of new functions such as

- Vision simulation to simulate and test image processing sequences
- Catch-on-fly for recording and evaluating images without stopping the robot over the camera
- Defect inspection image processing function to identify defective parts
- Support for colour cameras and high resolution cameras
- CAD-to-Point to convert CAD data to robot points
- Test mode such as running the program with the safety door open using the enable key
- Support for Epson QMEMS® sensor technology

**SUITABLE FOR THE COMPLETE SOFTWARE LIFECYCLE IN AUTOMATION**

- Designing
- Editing
- Stabilising
- Setting up
- Maintaining
**COMPETE HIGH LANGUAGE**

**SPEL+**

- **Fast and secure**
  SPEL+ is translated into a robot code by a compiler. This is carried out faster than using an interpreter and the syntax can also be checked before the program is run.

- **More flexibility**
  The extensive range of commands for various applications means short programming time with many fewer errors. You can add your own commands using the SPEL+ syntax.

- **Clearly structured**
  In addition to program structure commands you can also use sub-program techniques, multi-tasking and interrupt commands to write programs which are easy to read and easy to enhance and expand.

- **Communicative**
  Whether it is for easy handling of inputs and outputs, communication via the serial TCP/IP port or exchange data in a field bus system—SPEL+ minimises the programming work.

- **Intuitive to learn**
  SPEL+ has no cryptic codes and uses real values.

- **Simple to transfer**
  SPEL+ syntax can be transferred to various .Net products. It also has an interface to Labview.

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**PHASE 1 DESIGN**

You can plan your robot cell in full size in advance and assess the expected cycle time for your application. This verifies feasibility before a single part for the system has been made. Later system expansions can be prepared in the simulation system so as to reduce down times to the bare minimum.

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**PHASE 2 INTEGRATION**

The program validation process is completed offline before the robots are delivered. This enables you to create programs at the same time with the system capable of displaying and evaluating even complex motions. Collision risks are identified and equipment damage prevented.

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**PHASE 3 OPERATING AND MAINTENANCE**

Troubleshooting or program modifications can be carried out conveniently from your desk. Collision detection, reachability checks and robot motions can be visualised in a 3D layout.

---

**WE SPEAK SPEL!**

The line-based SPEL+ script language specially developed by Epson is not only powerful but also easy to learn. Its range of commands enables you to program a very wide range of robot motions – from a simple pick & place application to complex multi-manipulator line control.
SOFTWARE TOOLS FOR THE EPSON RC+ 7.0 DEVELOPMENT ENVIRONMENT

Isn’t it great when even complex projects are simple. The tools for the Epson RC+ 7.0 development environment provide everything you need to program your application efficiently.

COMMAND
One-line commend editor

COMPILER
Check the programs (syntax, definition, value range, etc.)

DEBUGGER
Program with stop points / step-mode

DLL-FUNKTIONEN
Access to external DLL functions

EDITOR
Create SPEL+ programs:
Online help, syntax check, label lists, detection and colour display of keywords, parameters and comments, parameter list, definition jump

ERROR TEXT EDITOR
Creation of your own error messages for the specific application

FILE MANAGEMENT
Create and access files and databases (Excel, Access, SQL)

IO LABELEDITOR
Edit names for I/O / markers / field bus I/O for the data sizes bits, byte and word

IO MONITOR
Display the status of I/O / markers / field bus I/O for the data sizes bits, byte and word.
Special application displays can be created

MACROEDITOR
Create a SPEL+ program as a programming aid

ROBOT MANAGER
Contains all information and control elements relevant to robots—inserted in clear windows:
Set-up, edit points, loop parameters, tool and robot coordinate systems, load capacity and moment of inertia. The robot trip points can be used to switch motors on and off, complete a reset or complete a home run

STACKEDITOR
Display the program branches

SYSTEM HISTORY
Recording of errors, events and warnings (diagnostics)

TASK MANAGER
Display of the opens multi-tasks, traps and their status, display the current program line

VARIABLE EDITOR
Display / Edit the current variable values

MAINTENANCE MANAGER
Create / Load / Display backups, controller reset

SIMULATOR
Planning and visualisation of processes, program validation

SOFTWARE OPTIONS

CONVEYOR TRACKING
Position synchronisation whilst the conveyor is running.

EXTERNAL CONTROL POINT (ECP)
You decide the coordinates. With ECP you can guide the workpiece contour easily and precisely along an external point.

FORCE SENSING
Allows the force of the robot to be measured in real-time.

GUI BUILDER
For the fast, easy creation of your own user interface based on Epson programming language SPEL+.

OPTICAL CHARACTER RECOGNITION (OCR)
OCR allows fonts and symbols to be detected reliably and the print checked—even in difficult conditions.

PG MOTION SYSTEM
Read conveyor speeds via encoders.

RC+ API
RC+ API enables you to integrate your application in external software, develop user interfaces and use databases.

SECURITY OPTION
Greater security by user management and usage control.

VISION GUIDE 7.0
Efficient Epson image processing system (see pages 10/11).
Epson Factory Automation is only one of the leading suppliers of high tech robot systems which are renowned all over the world as a result of their reliability.

In addition to 6-axis robots, the Epson product range also includes Epson SCARA robots, Epson spiders with overhead assembly, controllers and software.

Epson Factory Automation has its own Research and Development Department for robotics and offers its customers the widest ranges of robot models in the world.

2013 saw the first use of the revolutionary Epson QMems® sensor technology in robotics—to control kinematic system vibrations at high starting speeds or decelerating.

Other milestones:
- 1982: Market launch of the SCARA robot by Epson
- 1986: First class 1 clean room robot in the world
- 1997: First PC-based robot controller
- 2008: Inventor of the right or left arm-enhanced SCARA robot
- 2009: Inventor of the spider—a unique SCARA robot with a working range of 450°—with no dead zones

Pre- and after-sales support:
- Feasibility studies for planning and project security
- Support for planning and implementation
- Introductory seminars, programming/maintenance courses, operator training
- Inspection and individual maintenance concepts
- Hotline service, on site repair service
- Central spare part stocking
- Global support
Experience all our Epson robots in action. In a workshop cell you can build, simulate and improve your automation application with help from our experts. The cell can be controlled and networked using all conventional field bus systems. In addition we can supply you with modern peripherals such as a vision and conveyor tracking system.

WOULD YOU LIKE TO ARRANGE AN APPOINTMENT?

CALL US ON
+49 2159 538 1800

OR SEND AN EMAIL TO
robot.infos@epson.de

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