

# OUR CONTROLLERS ARE OPEN TO NEW TASKS



OPEN CONCEPTS IN COMPACT CASINGS

**EPSON**<sup>®</sup>  
EXCEED YOUR VISION

# ABOUT EPSON

## CONTROLLERS

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Epson, a subsidiary of Seiko Corporation, launched the first robots in the 1980ies. Those were used for precise and fast assembly of Seiko watches. Soon Epson industrial robots and controllers started to conquer markets all over the world. Today, Epson Factory Automation is one of the leading companies producing high-quality robot systems with branches on all five continents.

- In-house Research and Development department for automation processes
- 1984 first freely available Epson SCARA robot in Japan
- One of the most comprehensive SCARA model ranges worldwide
- 1997 first PC-based controller
- Inventor of the RS3 Spider: a unique SCARA robot with a 360° work envelope



# EPSON ROBOT SYSTEMS – TO SPEED UP YOUR PRODUCTION RUN

Our robots palletise, saw, mill, drill, grind, mount, move and assemble. They work precisely and at breathtaking speed in these and many other applications – often up to 24 hours a day.

As one of the pioneers in robotics we know exactly what the main feature of the combination of kinematics and intelligent control must be apart from speed and precision: Reliability! That is because the standstill of an installation resulting in a loss of production is expensive, very expensive. Therefore to us, innovation means more than just up-to-date robot technology. Every day, our development engineers strive to make our robot systems even more economical, flexible and reliable – under all conditions.

### Integrated automation

We offer you a flexibly expandable range of products with different integrated components. Among these are a great number of SCARA robots and 6-axis robots for diverse applications as well as controllers and software. Everything engages perfectly and is easy to operate.

## SERVICE AND SUPPORT

Our service and support program helps you to tap the full potential of your Epson robot systems.

### Feasibility studies

Instead of theoretical simulations we offer cycle time tests with real robots. There are many ways in which you benefit from those studies. Prior to your investment you are provided with optimal robot configuration and installation site as well as precise cycle times. That is how you get maximum planning and project security.

### Pre-sales support

How can a robot system be efficiently integrated into an installation? How can cycle times be optimised? How can the robot program be integrated into external software? Our application engineers advise you during planning as well as during implementation.

### Training

Whether you need introductory seminars, or programming, maintenance or operator trainings – our experts share their knowledge with you and your employees.

### After-sales support

Hotline service, repair service on site, inspection and individual maintenance concepts as well as spare part packages tailored to your needs are only some examples of how we do everything to have your production running non-stop.

### Central spare part stocking

All spare parts are rapidly delivered from our central warehouse in Meerbusch, Germany.

# THE EPSON ECONOMIC CONTROLLERS

They control manipulators and peripheral equipment fast, precisely and highly reliably. They offer high power — in most confined spaces. They are based on a robust, integrated system and are open on all sides. All in all, they are real controllers with respect to cost efficiency: The Epson RC180 slave controller and the PC-based RC620 master controller.

## RC180 and RC620: For everything you can ask for

Both controllers are suitable for all Epson kinematics — for SCARA robots, 6-axis robots or the one and only Epson Spider with its 360° work envelope. You can move the individual axes synchronously, asynchronously or clocked in the most diverse applications.

Thanks to the open design, apart from manipulators, they also control peripheral equipment and thus also carry out motion control tasks. They can easily be integrated into your existing system and thus ensure cost-effective system design as well as fast start-up.

The functions of both controllers can be flexibly expanded with different options and adapted to your individual requirements.

## The Epson controller concept at a glance

- Easy-to-maintain motion controllers for high throughput and optimum availability
- Energy-efficient due to minimum power consumption
- Consistent control system from a single source
- Compact dimensions
- Quick and easy operation
- Structured and intuitive programming
- Remote control for diagnostics, troubleshooting and program control
- Communication via serial interfaces with common fieldbus systems, such as Profibus, as well as via Ethernet network
- Worldwide use and certified safety: CE, UL and CSA



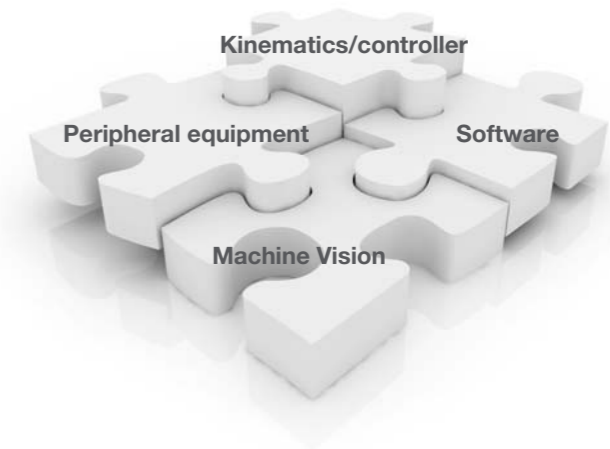
**Epson RC180**

The slave controller — compact, smart and powerful



**Epson RC620**

The master for the use of several kinematics and for complex installation control



## Integrated automation — made by Epson

All main automation components are made by Epson. They are developed in our research centres, produced in our quality-certified production facilities and used to manufacture Seiko/Epson products.

How do you benefit? In many ways, since at Epson you can be sure that hardware and software perfectly match. You can reliably and smoothly integrate Epson robot systems into your production and visualise, program and control all required functions. Moreover, you benefit from the reassuring certainty that you have a particularly economical and future-oriented complete solution for your automation which is tailored to your application.

## The Green Way — conserving resources, saving costs

Energy is not free and is a genuine competitive factor including aspects such as costs, quality and availability. Since 1995, Epson has implemented an environmental management system based on this holistic approach.

Epson consistently strives to develop particularly reliable, failsafe products which consume less and less energy. Already in the production process we conserve dwindling natural resources by a drastic reduction in CO<sub>2</sub> emissions, recycling of material and the use of energy from renewable sources. Management in harmony with nature is financially viable. And will become even more so in the future.

Better Products for a Better Future™

# RC180: WORKS ON COMMAND

EPSON RC180

With a base area only slightly larger than an A4-sheet, the RC180 is incredibly small and yet extremely powerful. The small smart one of extremely good value was mainly designed for slave network operation.

The RC180 controller has an operating system optimised for Epson robots and can be easily programmed via USB from an external PC. Programming via network is also possible which is ideal for projects led by several development engineers and administrators.

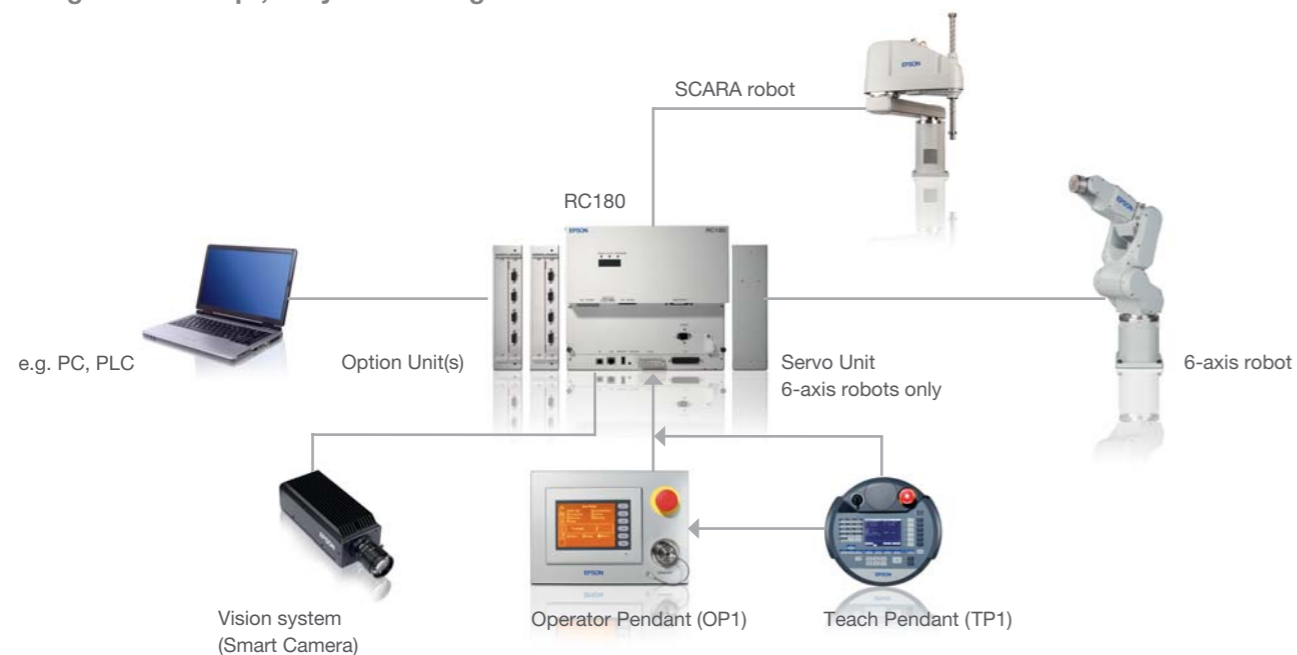
There are numerous interesting options for the Epson RC180. Among them are fieldbus cards for easy I/O communication with higher-level control units such as PLC or PC, the innovative Epson Smart Vision system as well as the operating and display devices adjusted to the controller.

Further information on the RC180 is provided on pages 8 and following.

## Features & advantages

- Powerful and compact slave controller
- Graded safety systems (safety door circuit/emergency stop circuit)
- Among the smallest 6-axis controllers worldwide
- Easy operation thanks to well-established Epson RC+ development environment
- Servo system for maximum robot power
- Remote control
- Comprehensive diagnostics system
- Machine Vision with Epson Vision Guide 5.0 software
- Extended communication due to fieldbus, RS-232C and I/O
- USB backup
- Standard I/O

## Integrated concept, easy networking



# RC620: HAS IT ALL UNDER CONTROL

EPSON RC620

The compact RC620 is designed as a central controller for several robots in one cell; it can control up to 20 axes. Of course you can also use the RC620 as slave – the controller is as flexible as required.

Due to its open system design – a Windows-based industrial PC with standard interfaces such as USB, Ethernet, RS-232C as well as standard PCI and special slots – it can be smoothly integrated into existing production processes and can easily be combined with individual expansion cards and software.

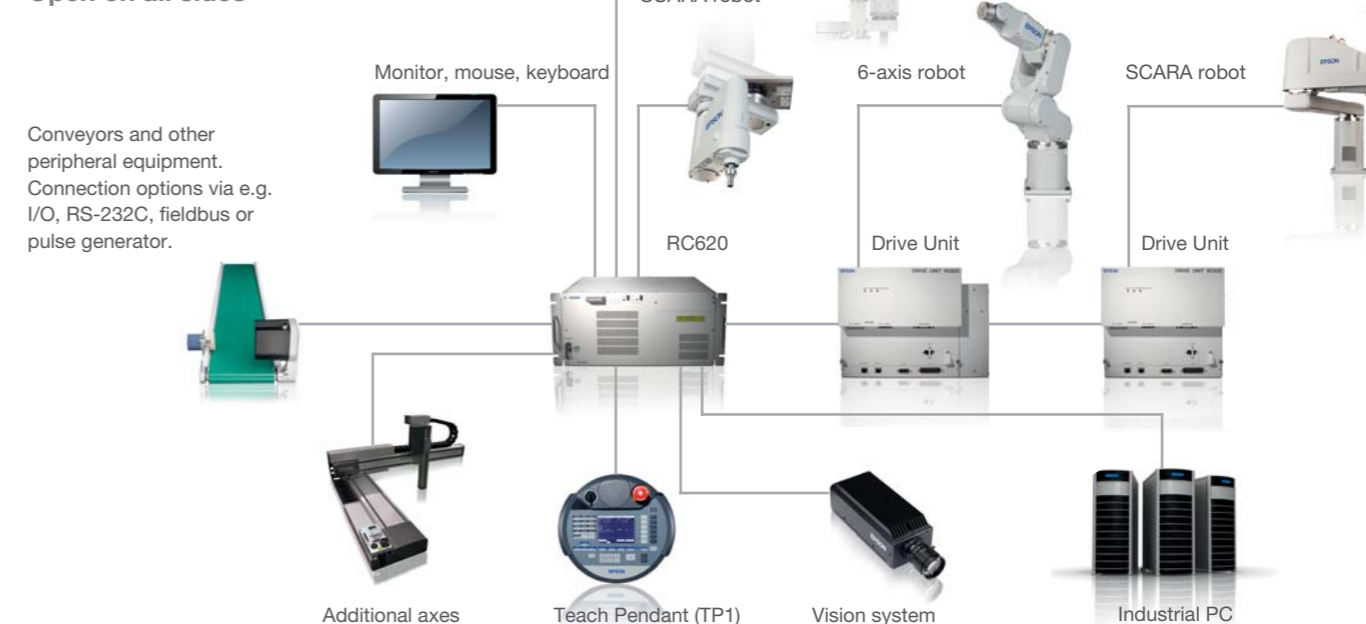
Fieldbus systems, Conveyor Tracking, Machine Vision or GUI Builder to design your own operator interface for external systems and integrate them into the robot controller – the RC620 is perfectly equipped for all tasks and offers new visions for the future.

Further information on the RC620 is provided on pages 20 and following.

## Features & advantages

- Powerful master controller for up to 20 axes
- Multitasking
- Current Windows Embedded version: unlimited possibilities and easy operation
- Supports Conveyor Tracking
- Remote control
- Comprehensive diagnostics system
- Diverse Machine Vision options
- Support of most diverse bus protocols and interface expansion
- GUI builder to design your own operator interfaces
- USB backup
- Standard I/O

## Open on all sides



# RC180: SO MUCH IS POSSIBLE — IN THE SMALLEST SPACE

The Epson RC180 is the most compact and light-weight controller of its performance class on the market. It is particularly flexible since the compact slave controller can be used for SCARA as well as for 6-axis robots. Apart from that the Option Units, which are designed like a modular system, provide further interfaces and technology modules.



#### Option Unit(s)

for expansion I/O boards, fieldbus I/O boards and RS-232C boards

#### Controller

#### Servo system

for Epson 6-axis robot

#### It just works — mounting options

With its compact dimensions, the RC180 can be installed in a control cabinet. Thanks to the embedded system with no hard disk, the slave controller is robust and can be mounted in different positions, e.g. horizontally or vertically on floor, ceiling or wall. Suitable mounting brackets are supplied for all installation directions.

#### Plug-and-produce

Up to two Option Units can be installed for every RC180. Thus, per Option Unit, there are two slots for expansion cards which allow maximum flexibility for your application at minimum configuration effort.



#### Lightweight

Base Unit for SCARA robots: 7.5 kg  
Base Unit for 6-axis robots: 9 kg  
Option Unit: 1 kg

#### High availability — low maintenance

It must be fast and easy: the installation. It is the first step towards high system availability. That is why all interfaces on the RC180 are on the front for user-friendly access so you can connect the controller in almost no time as well as for easy access for maintenance and repair. The number of assemblies is reduced to a minimum to increase reliability. All components can be replaced without special tools.

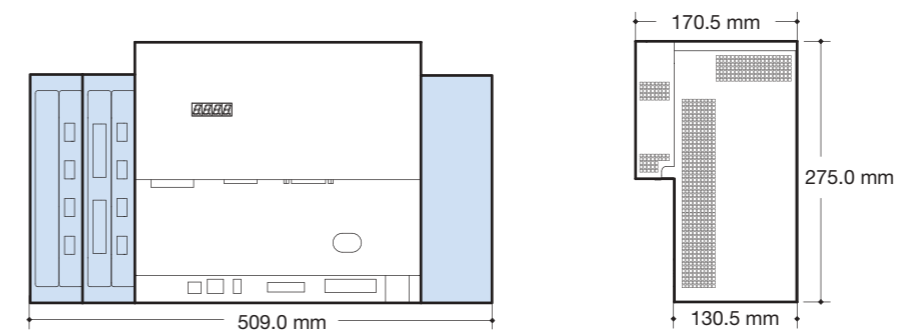
All Epson machines are known for robustness even under demanding operating conditions. However, sometimes repair is necessary. But we also ensure high availability in this field: Via remote diagnostics, our engineers can detect possible faults and provide support for troubleshooting.

#### Complete network compatibility at no extra charge

To access the controller from your desk, for example, via the integrated Ethernet interface you can connect the RC180 with further Epson robot systems or company networks at no extra charge.

#### Trigger button for backup

You wish to back up your controller status any time? Here you go — the status can even be saved on an external memory, such as a USB stick, during operation at the push of a button. Possible error conditions can be easily analysed, offline on your PC or by sending data to Epson for analysis.



#### Volume

The volume is 12.5 dm<sup>3</sup>

# EXCELLENT CONNECTIONS

EPSON RC180

The expansion cards for communication with external devices and for integration into fieldbus networks can flexibly expand your system according to your requirements at a low cost.

## RS-232C serial interfaces

There are still some devices which only have the serial interface for communication. With the serial expansion card you can use up to four of those interfaces.

## Expansion I/O cards

If the 24 standard inputs and 16 outputs are not enough and you do not want to set up a fieldbus network, 32 inputs and 32 outputs per card can be added to your system. You can use a total of up to four expansion cards.

## Fieldbus card

Is your installation already provided with a fieldbus system or do you wish to reduce the effort for establishing further connections? Then you can use the following slave card options for the RC180: Profibus, DeviceNet, CC-Link and Ethernet IP.



### RS-232C

- Serial interface for communication with external accessories
- Four channels per card (up to 2 expansion cards for a total of 8 channels)



### I/O expansion

- 32 further inputs and outputs for every expansion card (up to 4 expansion cards for a total of 152 inputs and 144 outputs)
- Optical decoupling of I/O cards
- Protection against external influences such as overload or electrostatic discharge



### Fieldbus slave e.g. Profibus slave

- Profibus protocol stacks at no PC load
- 256 inputs and 256 outputs
- Direct access to process data in dual-port memory
- Easy function control via LED status indicators
- Storage of configuration files in internal flash

# THE TOOLS YOU NEED

EPSON RC180

With the portable TP1 operating and display device or the OP1 operator pendant for operation and visualisation tasks, you have an eye on everything and everything under control.

## TP1 Teach Pendant – ergonomic and comfortable

The portable operating and display device fulfils all tasks regarding monitoring, operation and parametrisation for SCARA and 6-axis robots. The Teach Pendant can execute different commands, including motor on/off. Left-handed as well as right-handed persons can operate the teach pendant so that it can be handled free from fatigue.

## OP1 Operator Pendant – the external operating unit with five screens

The pendant is designed for operation and visualisation tasks even in complex installations. There are five function-specific screens which you can easily access. The freely editable user dialogues can be set up comfortably with the Epson programming language.



### TP1

- Graphic display
- Teaching and editing of robot positions
- Robust casing and ergonomic shape
- Powder-coated black wall bracket for stationary operation or to place the TP1 (option)



### OP1

- Program execution: indication of robot status and program selection
- Task monitor: monitoring of current task status
- I/O monitor: display of inputs and outputs as well as memory I/O
- System history: display of system history (errors, warnings and events)
- Applications: display of application programs
- Connection of TP1



### Conversion kit

- Adapter module for installation in control cabinet doors
- Connection of TP1 to RC180/RC620 controller with cabinet door closed

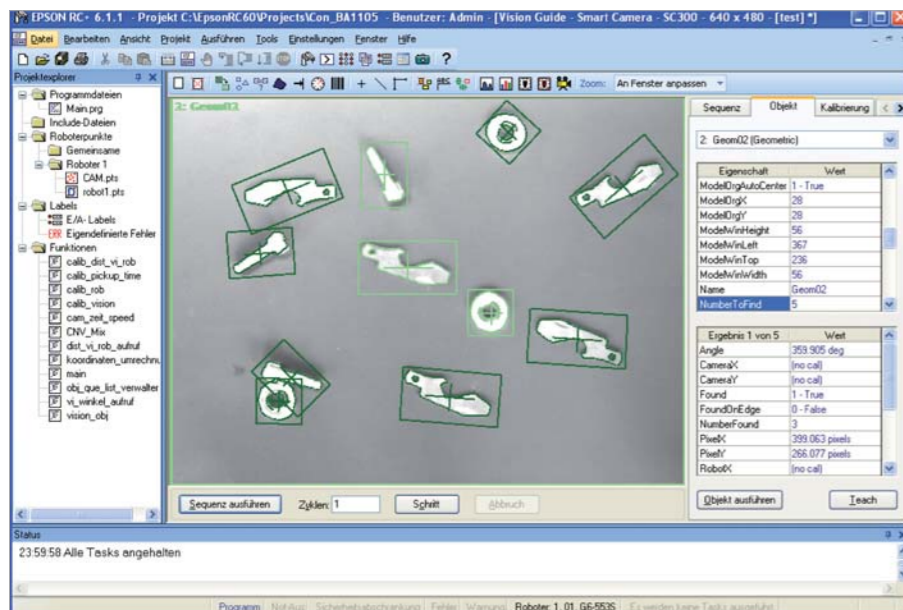
# FOR ROBOTS WITH EYE CONTACT

Tolerances are becoming smaller. That's why you need a powerful vision system which reliably detects and positions parts even in case of manufacturing deviations or part changes. At Epson, we have the hardware and software you need — perfectly adapted to each other. That is the integration you need for high productivity!

## The innovative vision control system Epson Smart Vision

The Epson Vision Guide 5.0 is not just the connection between Machine Vision and RC180. It is closely integrated into the Epson RC+ development environment so that setup times are considerably shortened and vision sequences can be created with a few mouse clicks.

Thanks to the common programming environment, no time is wasted connecting robot and vision system. Easy commands and the intuitive interface with graphic objects allow completing the tasks of flexible automation by means of simple parametrisation.



## Features & advantages

- High-speed communication between robot and Machine Vision within milliseconds
- Shorter development time due to integration into RC+ development environment
- Easy and comfortable drag-and-drop programming without additional complicated editors
- Finding of parts even in varying light conditions thanks to different tools such as Blob Analysis, Geometric and Polar Search and many more

# SIMPLY SMART — OUR CAMERAS

Permanently installed and mobile, with different resolutions, with lenses of different focal lengths, integrated or with remote lens system — Epson Smart Cameras really leave nothing to be desired. No matter which one you choose, combined with the Epson Vision Guide 5.0 software you can only make the right choice to quickly and easily realise complex machine vision-assisted applications.

## Intelligent solutions

Epson Smart Cameras have an integrated Machine Vision processor and are therefore separated from the robot controller. They can be used as stand-alone cameras or in a network of several cameras. You can expand the system any time.



### Stationary camera

SC300 Smart Camera:  
resolution 640 x 480  
SC1200 Smart Camera:  
resolution 1,280 x 1,024

### Mobile camera

SC300M Smart Camera:  
resolution 640 x 480  
SC1200M Smart Camera:  
resolution 1,280 x 1,024



Integrated calibration wizards allow fast and easy calibration — with no special tools or difficult training.

## Specifications

SMART CAMERA MODEL	SC300 AND SC1200 (STATIONARY CAMERAS)		SC300M AND SC1200M (MOBILE CAMERAS)	
RESOLUTION (PIXELS)	SC300: 640 x 480	SC1200: 1,280 x 1,024	SC300M: 640 x 480	SC1200M: 1,280 x 1,024
SENSOR TYPE	1/4" progressive scan	1/2" progressive scan	1/4" progressive scan	1/2" progressive scan
LENS	CS-mount		CS-mount	
INTERFACE	Ethernet 10/100			
CAMERA CABLE	—			
ACCESSORIES (OPTIONAL)	1 x set of mounting brackets, lenses 8, 16, 25, 50 mm separately or set, 1 x set of extension tubes, Ethernet connection kit, power connection kit			
DIMENSIONS (MM)	154.13 (L) x 48.26 (H) x 60.05 (W)		main unit: 150.19 (L) x 51.31 (H) x 60.55 (W) Mobile head: 44.25 (L) x 48.77 (H) x 68.17 (W)	
WEIGHT (KG)	0.435		main unit: 0.435     Mobile head: 0.185	
AMBIENT TEMPERATURE	0–45 °C			
POWER CONSUMPTION	375 mA @ 24 V DC (9 W power rating)			
PORTS	RJ45 for voltage supply; RJ45 for Ethernet		RJ45 for voltage supply; RJ45 for Ethernet	

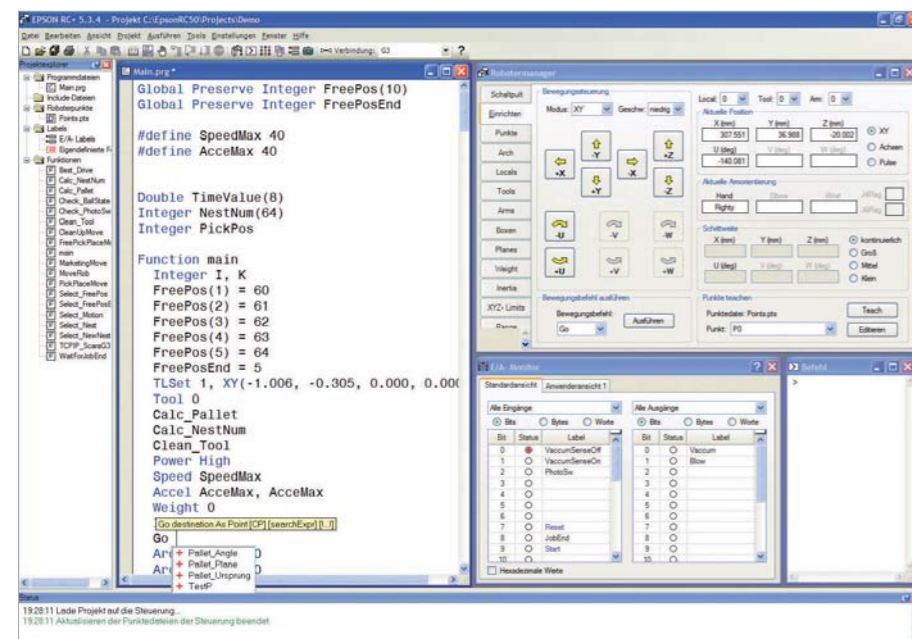
With the „Geometric Object“ software tool objects are detected faster and more reliably than with conventional pattern or edge detection. Commands are selected from a well-arranged library which further processes the robot position. There is no complicated, slow and error-prone linking of several command sequences.

# MORE THAN YOU THINK: EPSON RC+ 5.0

With the Epson RC+ 5.0 development environment you have all tools for fast and efficient programming at hand. The project management and development environment runs under the current Windows versions and communicates with the RC180 controller via USB and Ethernet. The open design also allows connection to external programming environments.

## Configuration Epson RC+ 5.0 and RC180 controller

Usually, the RC180 is used as a slave controller of a higher-level cell controller, e.g. PLC or PC. Your project is compiled in the RC+ environment and loaded to the controller. After that, you do not need a PC anymore — the RC180 is now controlled by the higher-level controller.



## Features & advantages

- Development environment for applications with the Epson SPEL+ robot language
- Parallel operation of several RC+ 5.0 applications possible (one PC accesses several robot controllers parallelly)
- Integrated project management system for fast project development
- Intuitive operator interface
- Machine Vision integrated into interface
- Diverse interface connection: Ethernet I/O, Profibus, DeviceNet, serial interface, TCP/IP, I/O handshake directly or available as an option
- Programming environment in German, English and French languages

## Windows interface

Syntax Colouring, Debugger, input assistance and a freely definable interface assist you during development.

## We speak an easy language: SPEL+

Not only is our programming language SPEL+ very powerful but also easy to learn and use. The BASIC-like programming language runs under Epson controllers RC180 and RC620. You want to control other peripheral equipment in addition to robots? No problem, SPEL+ supports multitasking so that you can control those devices with own tasks simultaneously running.

## Complex motion control

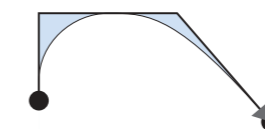
In addition to PTP (point-to-point), linear motions, CP (continuous path) and more, SPEL+ also includes a number of further specific commands such as Jump and Pallet.

## Jump command

With the Jump statement you can program motion sequences in a single command which normally consist of three individual steps. By looping, the cycle time is shortened and the throughput increased.



Jump for SCARA robots

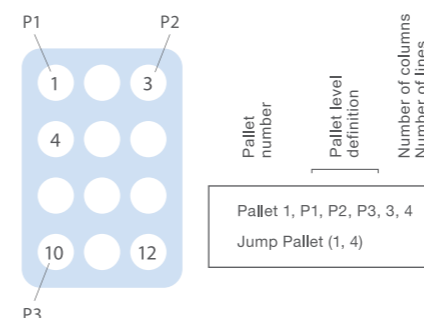


Jump3 — particularly suitable for 6-axis robots

## Pallet command

Even complex pallet positions can be easily set up and executed by means of the Pallet command. You save time and gain safety since not every single net must be taught.

## Simple program example



The Pallet command creates pallet No 1 with three columns and four lines over points P1, P2 and P3. In this example, with Jump the fourth net is approached in pallet 1.

## Features & advantages

- Line-oriented, structured and intuitive high-level language for fast program execution
- Integrated source code debugger
- Syntax Colouring
- Macro and label editor
- Safety and flexibility e.g. due to integrated error handlers and programmable reaction to Interrupt condition
- Easy data backup
- Online help
- All manuals online

## We make it easy for you!

Upon input of e.g. motion and I/O statements, known labels are displayed in drop-down menus so that programming is considerably easier.

With the F1 help key known from Windows, you can access a comprehensive help system. Every command has its parameters. Apart from that, links to related commands and examples which can be copied into your project with copy and paste are displayed.



# FOR YOU TO WORK WITH

EPSON RC180

It's great to see how complex projects become simple: The tools for the Epson RC+ 5.0 development environment are all you need to efficiently program your applications.

## Our software tool box

### Robot Manager — control also via TP1

Contains all robot-related information and controls in well-arranged windows: Jog & Teach, process points, loop parameters, work piece and robot coordinate systems, payload and inertia. At the Robot Control Panel, for example, motors can be switched on and off, a reset and homing can be executed.

### I/O label editor

Editing labels for memory I/O / fieldbus I/O for bit, byte and word data widths.

### I/O monitor

Display of the status of memory I/O / fieldbus I/O for bit, byte and word data widths. Special user displays can be created.

### Task Manager

Display of called multitasks and their status, display of current program line

### Command

Single-line command editor

### Macro editor

Creation of a SPEL+ program as program help

### Maintenance manager

Creation/input/display of backups, controller reset

### Error editor

Creation of own application-specific error messages

### Debugger

Program with breakpoints/jog mode

### Editor

Creation of SPEL+ sequence programs

- Online help
- Syntax Check
- Label lists
- Detection and colour mode of keywords, parameters and comments
- Parameter list
- Defined jump

### Variable editor

Display/editing of current variable values

### Stack editor

Display of program branching

### System history

Recording of errors, events, warnings (diagnostics)

### Compiler

Check of sequence programs (syntax, definition, value range and much more)

# SOFTWARE OPTIONS MADE TO MEASURE

EPSON RC180

You can use the Epson software options to expand your applications as required. All modules are fully integrated into the Epson development environment. Programming has never been so easy, comfortable and fast.

### Vision Guide 5.0 — makes Epson robots see

Powerful, innovative tools and the combination with intelligent Epson Smart Cameras allow the robot to see.

The tool library includes the following features and more:

- **Integrated calibration routines** which support several camera orientations and calibrations
- **Point-and-click interface** for fast prototyping
- **Blob Analysis tools** which measure size, shape and position of objects with variations
- **Search function** for geometric patterns based on geometric part features
- **Normalised correlation search tool** which locates objects under varying light conditions using an advanced template-matching technology
- **Edge detection tool** which locates a specific edge with sub-pixel accuracy
- **Polar Search** is a high-speed angular search tool which quickly measures the rotation of complex objects
- **Line and point tools** to draw and measure lines between points
- **Object reference mechanism** to align one vision tool based on another vision tool's result
- **Histogram charts** for a closer look at pixel data as well as for defining limit values for tools
- **Statistic calculations and evaluations** for every vision tool
- **Automatic compensation** of minor defects of the camera lens and the camera itself for angular deviations of the object

### VB Guide Lite — for integration into external software

Via ActiveX control, you can easily and comfortably integrate your applications into external software, set up user interfaces and use databases with VB Guide Lite. VB Guide Lite supports .NET technology and allows to use Microsoft Visual Basic or another language. During development, they run parallel to RC+ 5.0. The following are some of the windows and dialogues of VB Guide Lite: Robot Manager, Command Window, I/O Monitor, Task Manager, Maintenance dialogue and System Configuration.

### External Control Point (ECP) — specify coordinates

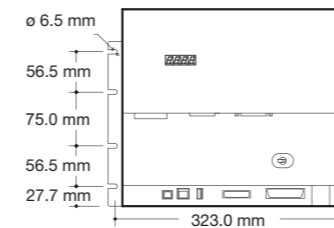
Usually, the tool centre point is always defined relating to the robot flange. For applications such as deburring or dosing, however, during which the work piece is guided by the robot, the tool coordinate system is permanently anchored. To solve that problem, there is Epson ECP. ECP allows to comfortably and precisely guide the work piece contour along an external point. And you also get the following advantages:

- Teaching corner travelling is much easier since orientation changes of the work piece relate to the point of current processing.
- For curve travels, very few positions must be taught.
- Speed defined in the program relates to the relative motion between work piece and external work piece working point so that e.g. dosing is also executed evenly at different speeds.

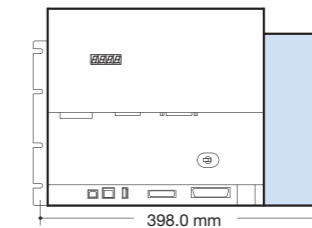
## Specifications

	<b>RC180</b>
<b>CPU</b>	32-bit ultra-low voltage processor
<b>INTERFACES</b>	1 x USB memory, 1 x USB device 1 x 10/100 base T-Ethernet, 24/16 standard I/O channels (8/8 as remote I/O)
<b>OPTIONS</b>	<b>HARDWARE OPTIONS (CARDS)</b> Expansion I/O (32/32, up to 4 additional cards) Fieldbus I/O slave (DeviceNet, Profibus, CC-Link, Ethernet IP, 1 additional card each possible) RS-232C (4 channels per card, up to 2 additional cards) <b>TEACH PENDANT, OPERATOR PENDANT, MACHINE VISION</b> (Version Guide 5.0) <b>SOFTWARE OPTIONS</b> VB Guide Lite External Control Point Motion (ECP)
<b>DEVELOPMENT ENVIRONMENT</b>	EPSON RC+ 5.0
<b>PROGRAMMING LANGUAGE</b>	Epson SPEL+ (multitasking possible)
<b>SAFETY FEATURES</b>	EMERGENCY STOP switch, safety door input, low power mode, dynamic brake, error detection: encoder cable disconnection, detection: motor overload detections: irregular motor torque (out-of-control manipulator), motor speed error, positioning overflow, servo error, speed overflow, irregular CPU, memory check-sum error, overheat condition inside a motor driver module, relay deposition, over-voltage, AC power supply voltage drop, temperature anomaly, fan malfunction
<b>SUPPLY VOLTAGE</b>	AC 200 V to AC 240 V, single-phase 50/60 Hz
<b>POWER CONSUMPTION</b>	up to 2,500 VA (depending on manipulator model)
<b>AMBIENT TEMPERATURE</b>	5–40 °C
<b>RELATIVE HUMIDITY</b>	20 % to 80 % (no condensation)
<b>WEIGHT</b>	Base Unit + Drive Unit for 6-axis robot: 9 kg Base Unit SCARA robot: 7.5 kg Option unit: 1 kg (with two installed option cards)
<b>DIMENSIONS</b>	Base unit: (W x D x H) 302 x 240 x 170.5 mm Drive unit for 6-axis robot: 75 x 240 x 130.5 Option unit: 55 x 240 x 130.5
<b>CERTIFICATIONS</b>	CE ANSI RIA R15.06-1999 UL1740-1998

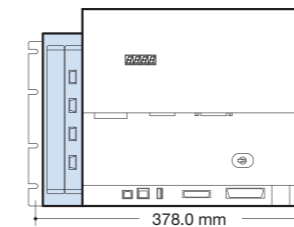
Base Unit RC180  
(SCARA robot)



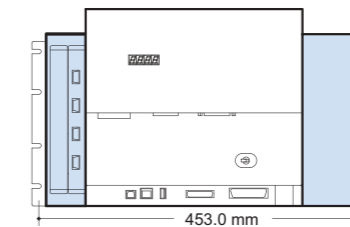
Base Unit RC180 with  
Drive Unit (6-axis robot)



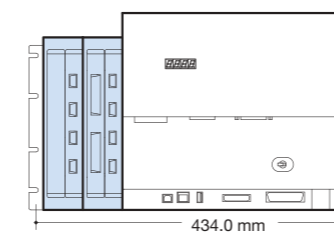
Base Unit RC180  
(SCARA robot)  
with one Option Unit



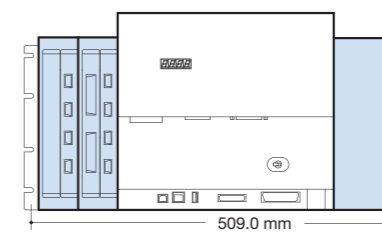
Base Unit RC180 with  
Drive Unit (6-axis robot)  
with one Option Unit



Base Unit RC180  
(SCARA robot)  
with two Option Units



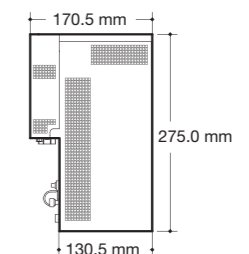
Base Unit RC180 with  
Drive Unit (6-axis robot)  
with two Option Units



## Scope of delivery

- 1 pc. TP/OP bypass plug (installed before shipment)
- 2 sets of controller mounting metal hasp
- 1 set of EMERGENCY connector
- 1 set of I/O connector
- 1 USB programming cable
- 1 Epson RC+ 5.0 installation program CD
- 1 manuals update CD
- 1 installation/safety manual

**Ventilation flow**  
is from left to right.  
A spacing of 100 mm  
in all directions should  
be observed.



# RC620: THE CELL CONTROLLER

You need to operate and control several robots and most diverse peripheral equipment in a complex production line — without an additional sequencer such as a PLC?

You need to integrate a powerful controller into your production processes which controls the entire work cell and can be expanded according to your individual requirements? Then, PC-based cell controller RC620 is the perfect choice!

### Tells everyone what to do

Due to the open system design, the RC620 can communicate with conventional fieldbus systems and is open to the connection of lower-/higher-level controllers, sensors, actuators and conveyors. That means, the RC620 takes over all functions of robot control, motion control and sequencer. The gist of this intelligent concept: Less interfaces for higher productivity.

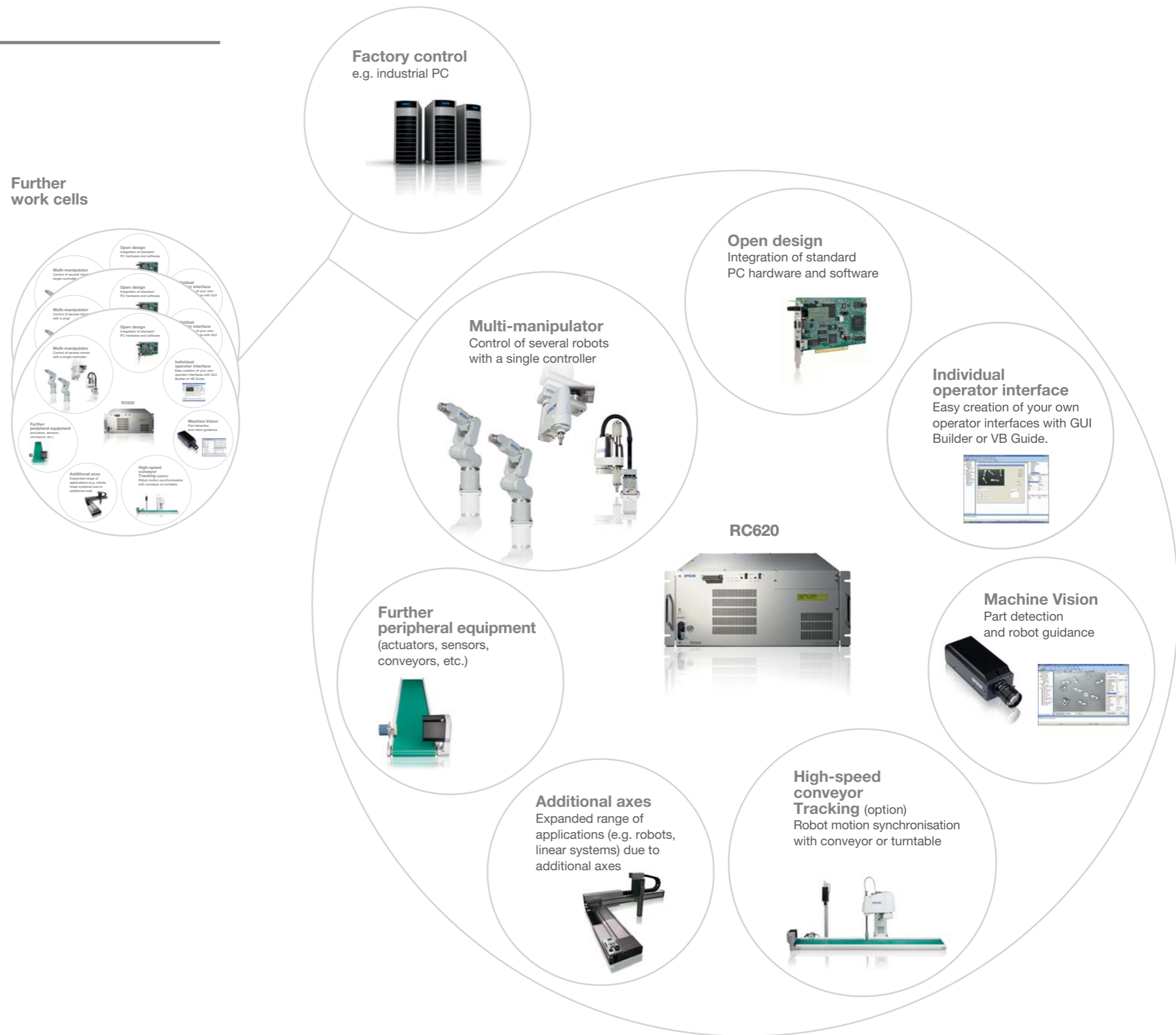
### The multitasking specialist

If several robots are connected to the controller, you benefit from the multitasking of the RC620 to use your system much more effectively while being less error-prone. Synchronisation is carried out via simple memory I/O without increased programming or wiring effort.

The RC620 can perform up to 48 tasks simultaneously, 16 of which can run in the background even if robot programs are interrupted. Multitasking is also used to control peripheral equipment or all processes of a cell.

### Perfect integration

Compatible with your PC world: Thanks to the industry PC standard, the RC620 can be smoothly integrated into your system ensuring a perfect adaptation to higher-level structures, e.g. via Ethernet. Mutual integration: Since the master controller is itself a PC, conventional PC cards can be integrated into the RC620.



# SO MUCH POWER — AND YET SO COMPACT

Real greatness in a confined space — that is the Epson RC620. That is the definite end of controllers the size of control cabinets which only consume space!

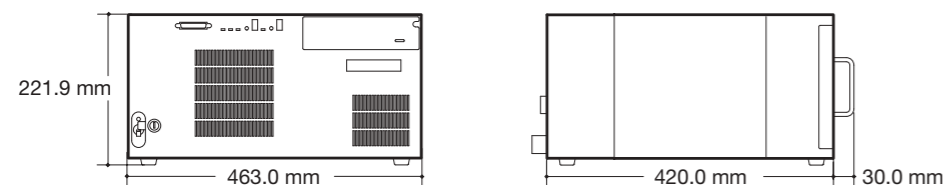
The PC-based RC620 is extremely versatile since it not only directs an entire work cell but is also an all-rounder simultaneously controlling 20 axes and executing 48 tasks. Given that performance, it is not surprising at all that it can also smoothly integrate fieldbus systems, Conveyor Tracking, expansion cards, vision systems and more.

## Separation for united power

The RC620 has several processors that execute different tasks. On the one hand, a real-time operating system controls the connected robots and communicates with the outside world. On the other hand, the interface to the user is created via Windows. With this separation, robot motion and I/O communication, for example, do not interfere with other processes.

## Features & advantages

- Control of an entire work cell
- Simultaneous control of up to 20 axes
- Multitasking: execution of 48 tasks simultaneously
- Integration of different peripheral equipment
- System design — Windows-based industrial PC with standard interfaces (PCI, USB, Ethernet, RS-232C)
- USB backup
- Standard I/O



## Small and lightweight

Weight depending on configuration about 23 kg

## High availability — low maintenance

Guaranteeing the availability of our machines is part of the Epson company philosophy. That includes quality-certified production, constant testing as well as the comprehensive services we offer. Sometimes apparently tiny details make the difference. For the RC620, there is the innovative RAID option. A possible loss of data resulting from hard disk failure is prevented since all data is automatically mirrored to a second hard disk — at no manual effort.

## Multi-manipulator — higher power, lower costs

The controller allows easy parallel control of 20 axes. You can easily synchronise robots of the same envelope with tasks and memory I/O and efficiently interlock ranges.

That several manipulators access the same option, such as a vision system, saves costs and also avoids interface problems. The Epson concept: Maximum performance and considerable increase in efficiency with reduced complexity!

## Trigger button for backup

You can use the trigger button to back up the status to a USB stick, for example, at any time, even during operation, at the push of a button. Possible error conditions can then be easily analysed.

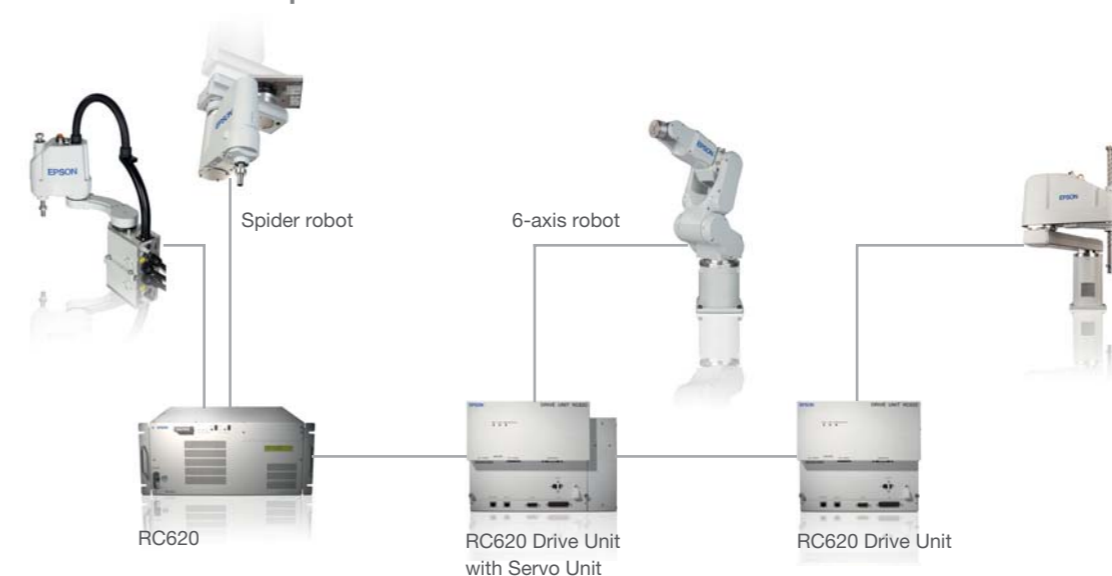
## Parallel conversations

Also from the interfaces you can see that the RC620 is a master. The standard RC620 has two integrated Ethernet interfaces so that it can communicate in two directions without restrictions or additional cost — with the Epson Vision Guide 6.0 vision system and a higher-level company network at the same time.

## The power plus: RC 620+

The Epson RC620+ is perfectly suitable for applications with a very high demand of system resources, such as fieldbus masters, or the integration of external .dll files since it features a higher-performance processor and an even greater memory expansion.

## RC620 — multi-manipulator controller



# CONTROLLER SEEKS CONNECTION

Communication with external equipment or integration of fieldbus networks — the expansion cards provide diverse options to flexibly expand your system according to your requirements and at a low cost.

## RS-232C serial interfaces

The standard controller is equipped with an RS-232C port. For expansion, we offer a further serial expansion card with four additional interfaces.

## Expansion I/O cards

If the 24 standard inputs and 16 outputs are not enough and you do not want to set up a fieldbus network, 32 inputs and outputs can be added to your system for every card. You can use a total of up to four expansion cards.

## Fieldbus card

Is your installation already provided with a fieldbus system or do you wish to reduce the effort for establishing further connections? Then you can use the following master and slave card options for different bus systems: Profibus, DeviceNet, CC-Link and Ethernet IP. Depending on your requirements they can also be combined.



### RS-232C

- Serial interface for communication with external equipment
- Four channels per card



### I/O expansion

- 32 further inputs and outputs for every expansion card (up to 4 expansion cards for a total of 152 inputs and 144 outputs)
- Optical decoupling of I/O cards
- Protection against external influences such as overload or electrostatic discharge



### Fieldbus slave, e.g. Profibus slave

- Profibus protocol stacks at no PC load
- Direct access to process data in dual-port memory
- Easy function control via LED status indicators
- Storage of configuration files in internal flash
- 256 inputs and 256 outputs

EPSON RC620



### Fieldbus master, e.g. Profibus master

- Detection and control of all stations of the Profibus DP network
- Network configuration, maintenance and diagnostics
- Configuration as a slave possible
- Support of Profibus baud rates from 9.6 to 12 Mbit/s
- Control of up to 126 Profibus DP slaves
- Control of up to 1,024 inputs and 1,024 outputs (free configuration)

# EFFICIENCY NON-STOP

EPSON RC620

In many fields of robot-assisted automation, Conveyor Tracking has become indispensable. The reason is obvious: With a vision system, objects on conveyors are detected even in chaotic positions so that the robot can pick them up while the conveyor keeps running. To allow that, Machine Vision, Conveyor Tracking and robot must be one unit without any interface problems. A real Epson challenge.

## More flexibility

An encoder constantly measures the conveyor motion. Even if speed changes between detection and handling of an object, the robot can accurately grip or position the object.

Multi-conveyor and multi-robot: The RC620 supports up to 16 conveyors which can be freely combined with all robots connected to the control in Conveyor Tracking. Another advantage: Objects found on the conveyors are arranged in intelligent queues. These are then handled by multiple robots and there is no need for the operator to interfere.

## Sensor Tracking

Sensor Tracking is another, cost-effective possibility for Conveyor Tracking if all parts are on a zero track on the conveyor. Instead of detecting the object position by camera, Conveyor Tracking is triggered by a sensor, e.g. a light barrier. When the object enters the robot pick-up area, the robot can accurately pick it up.

## Pulse generator

The PG board mainly serves to read conveyor speed for Conveyor or Sensor Tracking via an encoder. In combination with corresponding further software options it can also be used to control kinematics not consisting of Epson components. Stepper as well as servo motors are supported.

## Possible applications for Conveyor Tracking

- Food industry
- Pharmacy
- Electronics
- Optics
- Solar technology
- Packaging industry
- Automotive industry
- Whiteware



### PG board

- 4 channels per card
- Up to 4 cards

# BUILD YOUR OWN FACTORY

You need a user interface to “communicate” with the software. And you can only enjoy that communication if the interface has an appealing design adapted to your specific needs and if intuitive operation is possible. Since we know that, we have developed the GUI Builder to allow you to design your own graphical user interface.

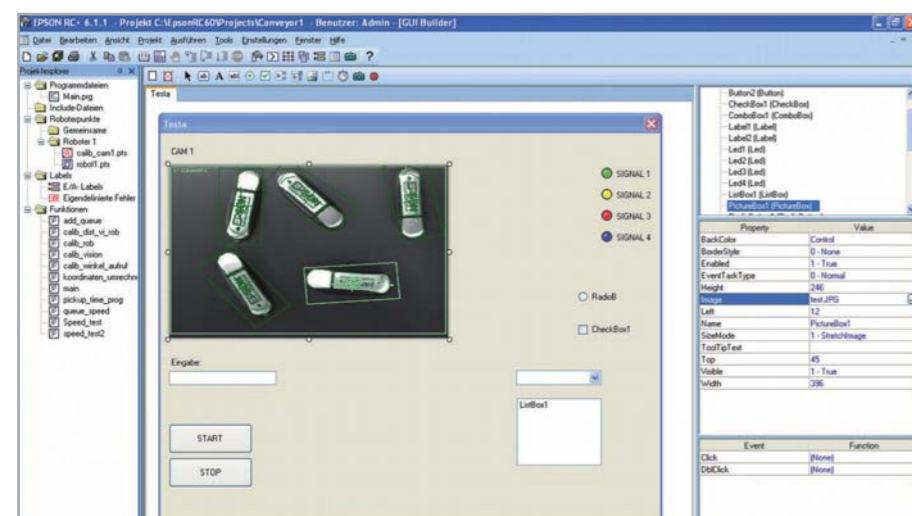
## More than attractive — effective!

With the GUI Builder (graphical user interface) you can design your own user interface fast and easy, based on the Epson SPEL+ programming language. The GUI Builder is fully integrated into the EPSON RC+ development environment so that you can access all robot control functions such as setup, debugging and display as required. Non-Epson tools are not required.

This tool is so user-friendly that even users with no experience in designing interfaces can easily create their own interface.

## Integrated into external universes

For rather complex operator interfaces on external PCs you can also use the VB Guide 6.0 Epson RC+ option. It allows you to integrate your user interface to the robot controller into the Microsoft .NET programming environments.



## TP1 Teach Pendant — ergonomic and comfortable

The portable operating and display device fulfils all tasks regarding monitoring, operation and parametrisation for SCARA and 6-axis robots. The Teach Pendant can execute different commands, including motor on/off.

Left-handed as well as right-handed persons can operate the TP1 so that it can be handled free from fatigue.



- Graphic display
- Teaching and editing of robot positions
- Robust casing and ergonomic shape
- Powder-coated black wall bracket for stationary operation or to place the TP1 (option)

The GUI Builder provides different standard controls such as Button, Label and Textbox. In addition, there are controls for displaying video, variable status and I/O status.

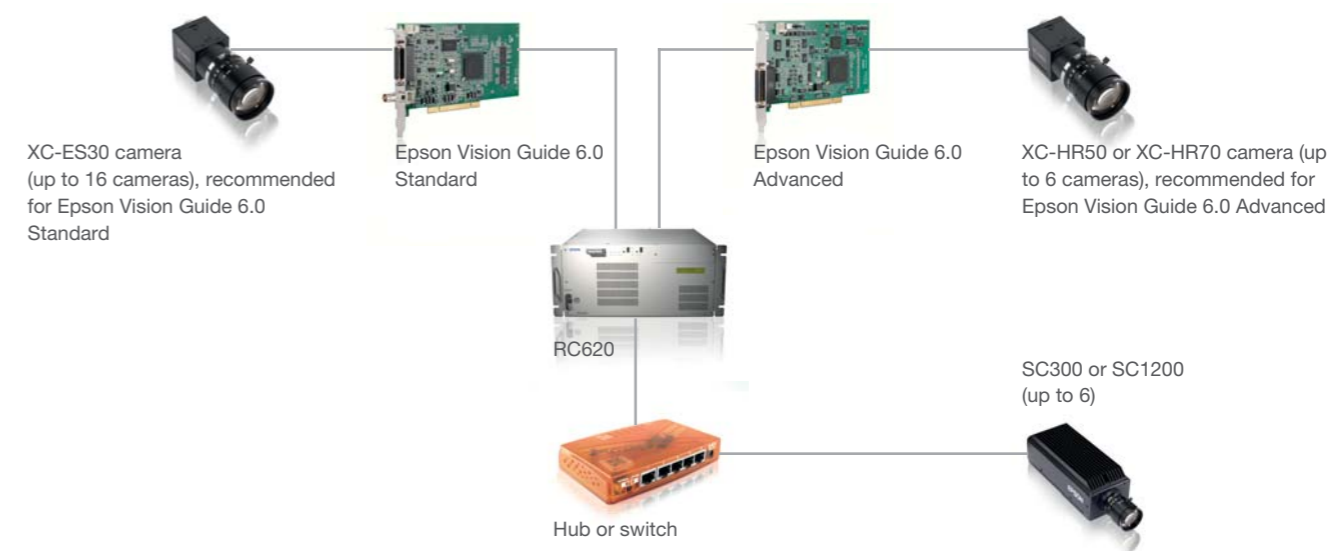
# ALL AT A GLANCE

A powerful and integrated vision system which reliably detects and positions parts — even in case of manufacturing deviations, part changes or varying light conditions. Hardware and software perfectly adapted to each other so that robot and Machine Vision communicate within milliseconds. A great choice for your application. That is the Epson state-of-the-art vision system.

Epson Vision Guide 6.0 is not just the connection of Machine Vision to the RC620. It is closely interlinked with the Epson RC+ development environment so that setup times are considerably shortened and vision sequences can be created with few mouse clicks.

## It's your choice!

The RC620 controller can be configured with different hardware for Machine Vision. The first option are Epson smart cameras connected via Ethernet. The second option are two frame grabber cards with external cameras. If required for your application, these two options can also be combined.



## Features & advantages

- High-speed communication between robot and Machine Vision within milliseconds
- Shorter development time due to integration into RC+ development environment
- Easy and comfortable drag-and-drop programming without additional complicated editors
- Finding of parts even in varying light conditions thanks to different tools such as Blob Analysis, Geometric and Polar Search and many more
- Integrated Code and Character Recognition

# SIMPLY SMART — OUR CAMERAS

EPSON RC620

Permanently installed and mobile, with different resolutions, with lenses of different focal lengths, integrated or with remote lens system — Epson Smart Cameras really leave nothing to be desired. No matter which one you choose, combined with the Epson Vision Guide software you can only make the right choice to quickly and easily implement complex machine vision-assisted applications.

**Intelligent solutions**  
Epson Smart Cameras have an integrated Machine Vision processor and are therefore separated from the robot controller. They can be used as stand-alone cameras or in a network of several cameras. You can expand the system any time.



**Stationary camera**  
SC300 Smart Camera: resolution 640 x 480  
SC1200 Smart Camera: resolution 1,280 x 1,024

**Mobile camera**  
SC300M Smart Camera: resolution 640 x 480  
SC1200M Smart Camera: resolution 1,280 x 1,024



Integrated calibration wizards allow fast and easy calibration — with no special tools or difficult training.

**Specifications**

SMART CAMERA MODEL	SC300 AND SC1200 (STATIONARY CAMERAS)		SC300M AND SC1200M (MOBILE CAMERAS)	
	SC300: 640 x 480	SC1200: 1,280 x 1,024	SC300M: 640 x 480	SC1200M: 1,280 x 1,024
RESOLUTION (PIXELS)	640 x 480	1,280 x 1,024	640 x 480	1,280 x 1,024
SENSOR TYPE	1/4" progressive scan	1/2" progressive scan	1/4" progressive scan	1/2" progressive scan
LENS	CS-mount		CS-mount	
INTERFACE	Ethernet 10/100		Ethernet 10/100	
CAMERA CABLE	—		5 metres (camera connection)	
ACCESSORIES (OPTIONAL)	1 x set of mounting brackets, lenses 8, 16, 25, 50 mm separately or set, 1 x set of extension tubes, Ethernet connection kit, power connection kit			
DIMENSIONS (MM)	154.13 (L) x 48.26 (H) x 60.05 (W)		main unit: 150.19 (L) x 51.31 (H) x 60.55 (W) Mobile head: 44.25 (L) x 48.77 (H) x 68.17 (W)	
WEIGHT (KG)	0.435		main unit: 0.435    Mobile head: 0.185	
AMBIENT TEMPERATURE	0–45°C		0–45°C	
POWER CONSUMPTION	375 mA @ 24 V DC (9 W power rating)		375 mA @ 24 V DC (9 W power rating)	
PORTS	RJ45 for voltage supply, RJ45 for Ethernet		RJ45 for voltage supply, RJ45 for Ethernet	

# INCREASED VISION, INCREASED PERFORMANCE

If you are looking for a cost-effective alternative to connect several cameras to the vision system, we recommend you go for Epson Vision Guide 6.0. Further features and software tools such as Save Image, Code Reading, Optical Character Recognition and Colour Machine Vision are included.

**Epson Standard: Code Reading**  
Vision Guide 6.0 can identify bar codes and two-dimensional data matrix codes without explicit teaching.

**Optical character recognition**  
With OCR (Optical Character Recognition) written text and icons are reliably recognised and the inscription is controlled — even under adverse conditions of use such as changing backgrounds or high clock rates.

Epson Vision Guide 6.0 Standard is the best choice for conventional machine vision-assisted robot guidance. Up to 16 cameras can be connected. Recommended camera type: XC-ES30.

For Conveyor Tracking, Epson Vision Guide 6.0 Advanced is the best choice. This version supports up to 6 progressive scan cameras. Recommended camera types: XC-HR50 as well as XC-HR70 for high resolution.

**Your assistants: wizards**  
For many functions, there are wizards which allow easier setup and handling of the vision system.



Frame grabber card for Epson Vision Guide 6.0 Standard



Frame grabber card for Epson Vision Guide 6.0 Advanced



XC-HR50 camera

**Specifications**

CAMERA MODEL	EPSON VISION GUIDE 6.0 STANDARD		EPSON VISION GUIDE 6.0 ADVANCED	
	XC-ES30	XC-HR50	XC-HR70	XC-HR70
RESOLUTION (PIXELS)	640 x 480	648 x 494	1,280 x 768	1,280 x 768
SENSOR TYPE	1/3" IT CCD	1/3" progressive scan	1/3" progressive scan	1/3" progressive scan
LENS	C-mount		C-mount	
MOUNTING OPTIONS	Static or movably fastened to the robot		Static or movably fastened to the robot	
CAMERA CABLE	5 or 10 metres (camera connection)		5 or 10 metres (camera connection)	
ACCESSORIES (OPTIONAL)	lenses 8, 16, 25, 50mm separately or set, 1 x set of extension tubes			
DIMENSIONS (MM)	30 (L) x 29 (H) x 29 (W) without lens		30 (L) x 29 (H) x 29 (W) without lens	
WEIGHT (KG)	0.05 without lens		0.05 without lens	
OPERATING TEMPERATURE	0–45°C		0–45°C	
POWER CONSUMPTION	DC 12 V (+9 to +16 V) 1.4 W		DC 12 V (+10.5 V to +15 V) XC-HR50: 1.8 W XC-HR70: 2 W	

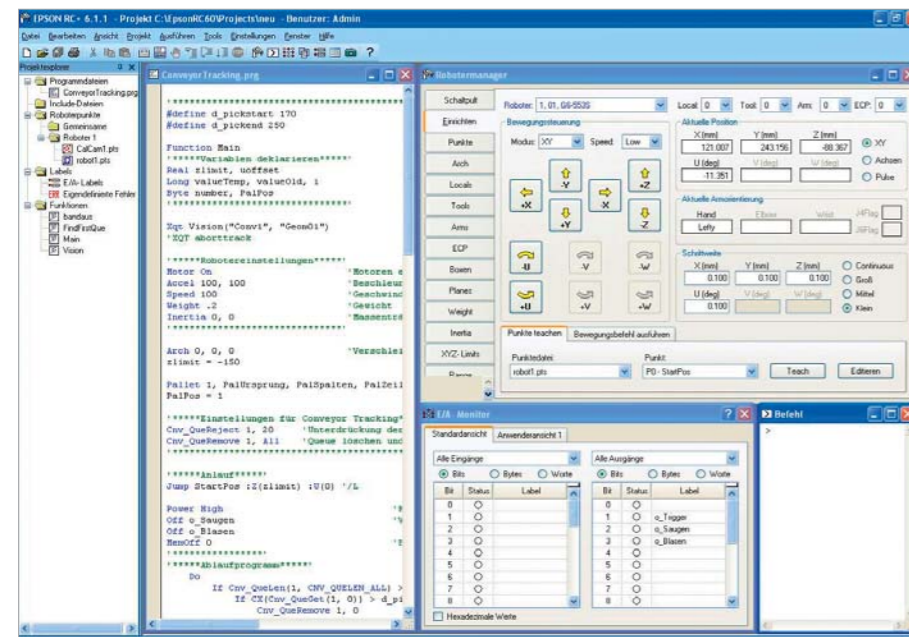
# MORE THAN YOU THINK: EPSON RC+ 6.0

With the Epson RC+ 6.0 development environment you have all tools for fast and efficient programming at hand. The project management and development environment with the entire help range is directly available at the RC620 controller. The open design also allows the integration of external programming environments.

## Configuration Epson RC+ 6.0 and RC620 controller

Usually, your project is created and managed at the RC620 master controller. A separate programming PC is not required. However, you can of course program your project offline, if you wish to, and transfer it to the RC620.

On the installed industry hard disk, your project and all files are permanently stored. You can also create a file or database from the robot program and edit it. That is ideal to document quality features or characteristics to be stored permanently.



## Features & advantages

- Development environment for applications with the Epson SPEL+ robot language
- Integrated project management system for fast project development
- Intuitive operator interface
- Machine Vision integrated into interface
- Diverse interface connection: Ethernet I/O, Profibus, DeviceNet, serial interface, TCP/IP, I/O handshake directly or available as an option
- Comprehensive multi-manipulator commands
- Import of .dll files
- Special fieldbus commands
- File handling
- Programming environment in German, English and French languages

Syntax Colouring, Debugger, input assistance and a freely definable interface assist you during development.

## We speak an easy language: SPEL+

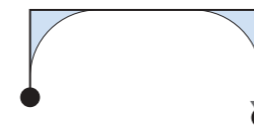
Not only is our programming language SPEL+ very powerful but also easy to learn and use. The BASIC-like programming language runs under Epson controllers RC180 and RC620. You want to control other peripheral equipment in addition to robots? No problem, SPEL+ supports multitasking so that you can control those devices with own tasks simultaneously running.

## Complex motion control

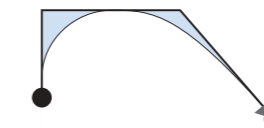
In addition to PTP (point-to-point), linear motions, CP (continuous path) and more, SPEL+ also includes a number of further specific commands such as Jump and Pallet.

## Jump command

With the Jump statement you can program motion sequences in a single command which normally consist of three individual steps. By looping, the cycle time is shortened and the throughput increased.



Jump for SCARA robots

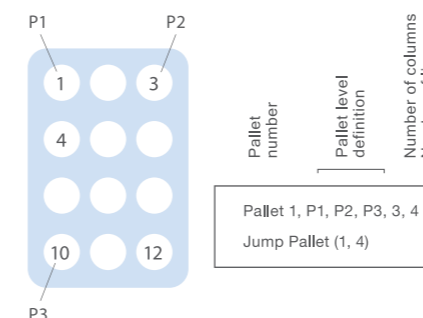


Jump3 — particularly suitable for 6-axis robots

## Pallet command

Even complex pallet positions can be easily set up and executed by means of the Pallet command. You save time and gain safety since not every single net must be taught.

## Simple program example



The Pallet command creates pallet No 1 with three columns and four lines over points P1, P2 and P3. In this example, with Jump the fourth net is approached in pallet 1.

## Features & advantages

- Line-oriented, structured and intuitive high-level language for fast program execution
- Integrated source code debugger
- Syntax Colouring
- Macro and label editor
- Safety and flexibility e.g. due to integrated error handlers and programmable reaction to Interrupt condition
- Easy data backup
- Online help
- All manuals online

## We make it easy for you!

Upon input of e.g. motion and I/O statements, known labels are displayed in drop-down menus so that programming is considerably easier.

With the F1 help key known from Windows, you can access a comprehensive help system. Every command has its parameters. Apart from that, links to related commands and examples which can be copied into your project with copy and paste are displayed.



# FOR YOU TO WORK WITH

EPSON RC620

It's great to see how complex projects become simple: The tools for the Epson RC+ 6.0 development environment are all you need to efficiently program your applications.

## Our software tool box

### Robot Manager — control also via TP1

Contains all robot-related information and controls in well-arranged windows: Jog & Teach, process points, loop parameters, work piece and robot coordinate systems, payload and inertia.

At the Robot Control Panel, for example, motors can be switched on and off, a reset and homing can be executed.

### I/O label editor

Editing labels for memory I/O / fieldbus I/O for bit, byte and word data widths.

### I/O monitor

Display of the status of memory I/O / fieldbus I/O for bit, byte and word data widths. Special user displays can be created.

### Task Manager

Display of called multitasks and their status, display of current program line

### Command

Single-line command editor

### Macro editor

Creation of a SPEL+ program as program help

### Maintenance manager

Creation/input/display of backups, controller reset

### Error editor

Creation of own application-specific error messages

### Debugger

Program with breakpoints/jog mode

### Editor

Creation of SPEL+ sequence programs: Online Help, Syntax Check, label lists, detection and colour mode of keywords, parameters and comments, parameter list, defined jump

### Variable editor

Display/editing of current variable values

### Stack editor

Display of program branching

### System history

Recording of errors, events, warnings (diagnostics)

### Compiler

Check of sequence programs (syntax, definition, value range and much more)

### Traps

Monitoring of system events

### File handling

Creation of and access to files and databases (Excel, Access, SQL)

### DLL functions

Access to external DLL functions

# SOFTWARE OPTIONS MADE TO MEASURE

EPSON RC620

You can use the Epson software options to expand your applications as required. All modules are fully integrated into the Epson development environment. Programming has never been so easy, comfortable and fast.

## Vision Guide 6.0 — makes Epson robots see

Powerful, innovative tools and the combination with intelligent Epson Smart Cameras allow the robot to see.

The tool library includes the following features and more:

- **Integrated calibration routines** which support several camera orientations and calibrations
- **Point-and-click interface** for fast prototyping
- **Blob Analysis tools** which measure size, shape and position of objects with variations
- **Search function** for geometric patterns based on geometric part features
- **Normalised correlation search tool** which locates objects under varying light conditions using an advanced template-matching technology
- **Edge detection tool** which locates a specific edge with sub-pixel accuracy
- **Polar Search** is a high-speed angular search tool which quickly measures the rotation of complex objects
- **Line and point tools** to draw and measure lines between points
- **Object reference mechanism** to align one vision tool based on another vision tool's result
- **Histogram charts** for a closer look at pixel data as well as for defining limit values for tools
- **Statistic calculations and evaluations** for every vision tool
- **Automatic compensation** of minor defects of the camera lens and the camera itself for angular deviations of the object

## VB Guide 6.0 — for integration into external software

Via ActiveX control, you can easily and comfortably integrate your applications into external software, set up user interfaces and use databases with VB Guide 6.0. VB Guide 6.0 supports .NET technology and allows to use Microsoft Visual Basic or another language.

### Better secure

The security option allows you to administer all EPSON RC+ users on your system. With usage monitoring, you can track how many hours the system was used and if changes were made.

## External Control Point (ECP) — specify coordinates

Usually, the tool centre point is always defined relating to the robot flange. For applications such as deburring or dosing, however, during which the work piece is guided by the robot, the tool coordinate system is permanently anchored. To solve that problem, there is Epson ECP.

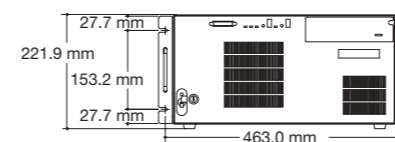
ECP allows to comfortably and precisely guide the work piece contour along an external point. And you also get the following advantages:

- Teaching corner travelling is much easier since orientation changes of the work piece relate to the point of current processing.
- For curve travels, very few positions must be taught.
- Speed defined in the program relates to the relative motion between work piece and external work piece working point so that e.g. dosing is also executed evenly at different speeds.

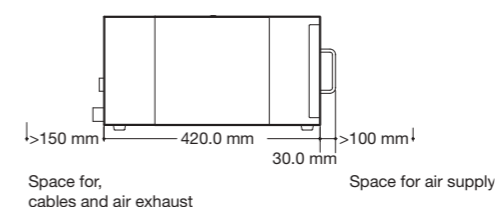
## Specifications

	<b>RC620/RC620+</b>
<b>CPU</b>	Standard: Intel Celeron M processor High-speed (optional): Intel Core Duo processor DRAM: 512 MB (expandable to 2 GB) HDD: 40 GB or 120 GB
<b>INTERFACES</b>	1 x USB memory, 1 x USB device 2 x 10/100 base T-Ethernet, Standard: 1 x RS-232C High-speed (optional): 2 x RS-232C 24/16 standard I/O channels (expandable)
<b>FLOPPY</b>	DVD drive (optional)
<b>OPTIONS</b>	<b>HARDWARE OPTIONS (CARDS)</b> Expansion I/O (32/32, up to 4 additional cards) Fieldbus I/O master (DeviceNet, Profibus, Ethernet/IP, 1 additional card each possible) Fieldbus I/O slave (DeviceNet, Profibus, CC-Link, Ethernet/IP, 1 additional card each possible) RS-232C (4 channels per card, up to 2 additional cards) Vision Guide 5.0 and Vision Guide 6.0 (Smart Camera, analogue camera), RAID option <b>TEACH PENDANT, MACHINE VISION</b> <b>SOFTWARE OPTIONS</b> Code Reading (OCR recognition) Conveyor Tracking, VB Guide, GUI Builder, Security Option External Control Point Motion (ECP)
<b>DEVELOPMENT ENVIRONMENT</b>	EPSON RC+ 6.0
<b>PROGRAMMING LANGUAGE</b>	Epson SPEL+ (multitasking possible)
<b>SAFETY FEATURES</b>	EMERGENCY STOP switch, safety door input, low power mode, dynamic brake, error detection: encoder cable disconnection, detection: motor overload detections: irregular motor torque (out-of-control manipulator), motor speed error, positioning overflow — servo error, speed overflow — servo error, irregular CPU, memory check-sum error, overheat condition inside a motor driver module, relay deposition, over-voltage, AC power supply voltage drop, temperature anomaly, fan malfunction
<b>SUPPLY VOLTAGE</b>	AC 200 V to AC 240 V, single-phase 50/60 Hz
<b>POWER CONSUMPTION</b>	up to 2,500 VA (depends on connected manipulators, without external drive unit)
<b>AMBIENT TEMPERATURE</b>	5–40 °C
<b>RELATIVE HUMIDITY</b>	20 % to 80 % (no condensation)
<b>WEIGHT</b>	RC620: 24.5 kg (6-axis robot) RC620: 22.5 kg (SCARA robot) Drive Unit: 9 kg (SCARA robot)
<b>DIMENSIONS</b>	RC620: (W x D x H) 430 x 420 x 210 mm Drive Unit: (W x D x H) 376 x 170.5 x 275 mm
<b>CASING/MODEL</b>	19" industrial PC
<b>CERTIFICATIONS</b>	CE
	ANSI RIA R15.06-1999 UL1740-1998

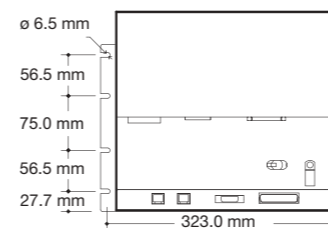
RC620 controller



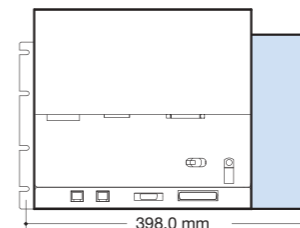
RC620 controller



RC620 Drive Unit (SCARA robot)

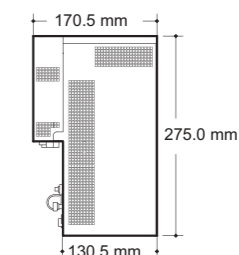


RC620 Drive Unit (6-axis robot)



## Scope of delivery

- 1 pc. TP/OP bypass plug (installed before shipment)
- 2 pcs. lockout keys
- 1 set of EMERGENCY connector
- 1 set of I/O connector
- 1 PS/2 cable
- 1 IDE cable
- 1 power cable (3 m)
- 1 Epson RC+ 6.0 installation program DVD
- 1 manuals update CD



**Ventilation flow**  
is from front to rear.



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