CIROS®
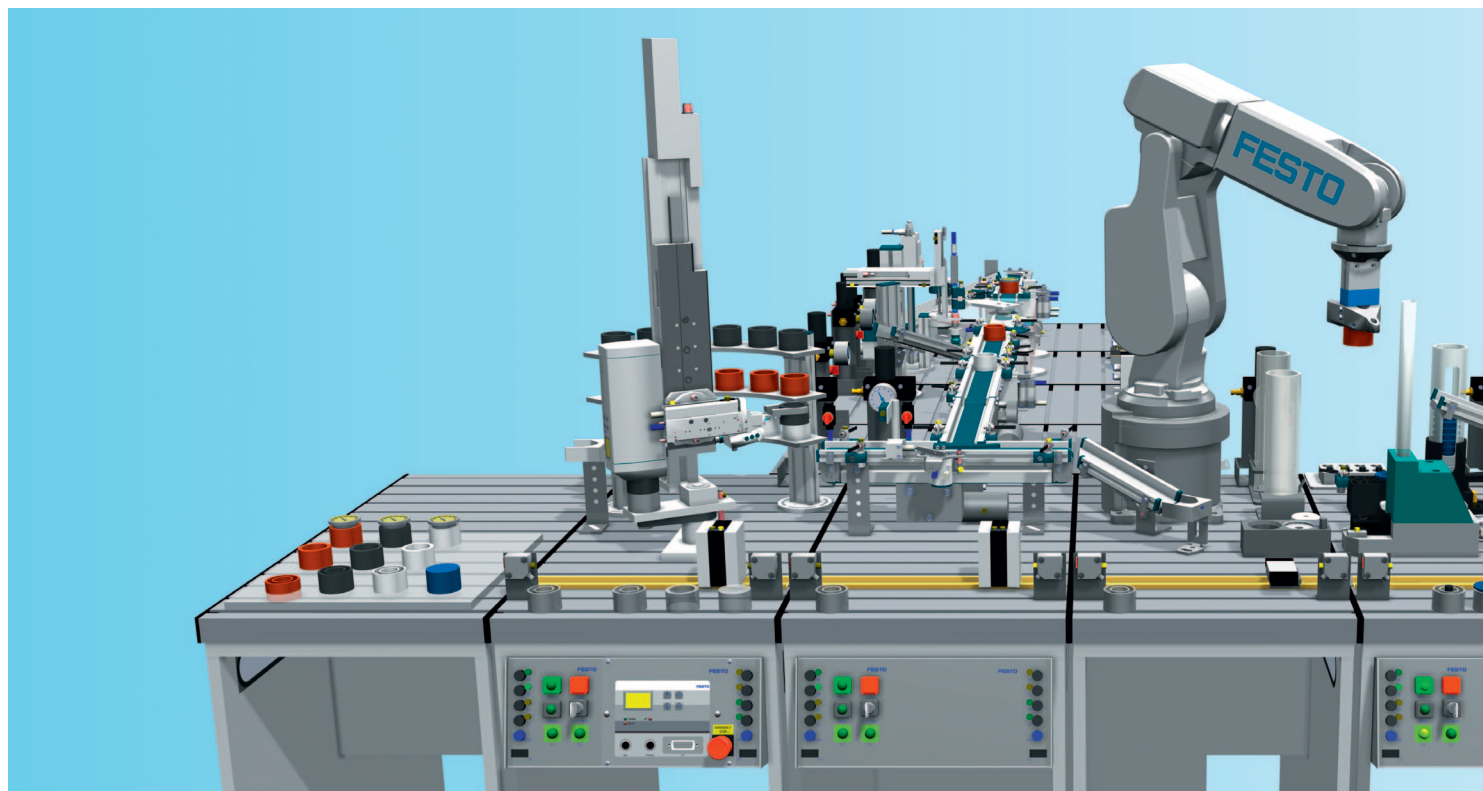## Professional training in virtual learning environments


The fascination of 3D simulation

Modern PC technology allows us to create realistic 3D simulations even for the most complex of automation systems. The participants discover the kinetic dynamism of mechatronic systems using virtual reality – without any risk to human or machine. This allows us to take a step into automation technology without any worries, providing a great motivational boost.

The ways we work and learn have changed – and CIROS® supports these new methods. The focus is placed on understanding things visually: the attractive representation on the PC motivates and encourages the learning process.
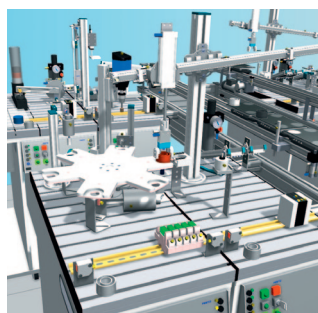

Industrial practice
Today, simulation represents an important tool in production and product development for analysing new solutions, methods and processes in a quick and low-cost manner. Depending on the task in question, simulation systems come into play which differ from each other in terms of the level of detail of the information to be obtained and the way in which they calculate this information.
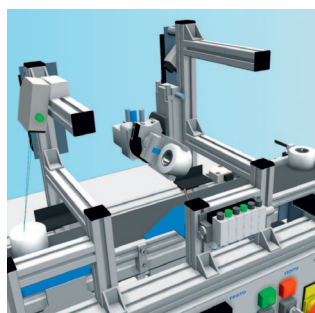

Flexible learning
Realistic simulated learning systems broaden the possibilities in training situations where real automation systems would be stretched to their limits. They allow new training content and scenarios to be covered using simulation.
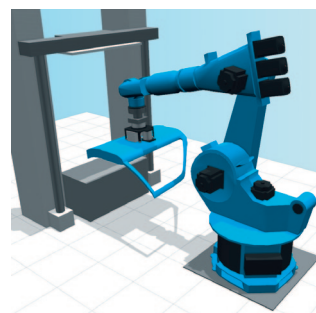

Safe commissioning
Large, fast and cost-intensive equipment is used in mechatronic systems. Despite this, robots, linear axes and transport systems can be explored and commissioned within the simulated production environment without posing any risk whatsoever to students or the installation.
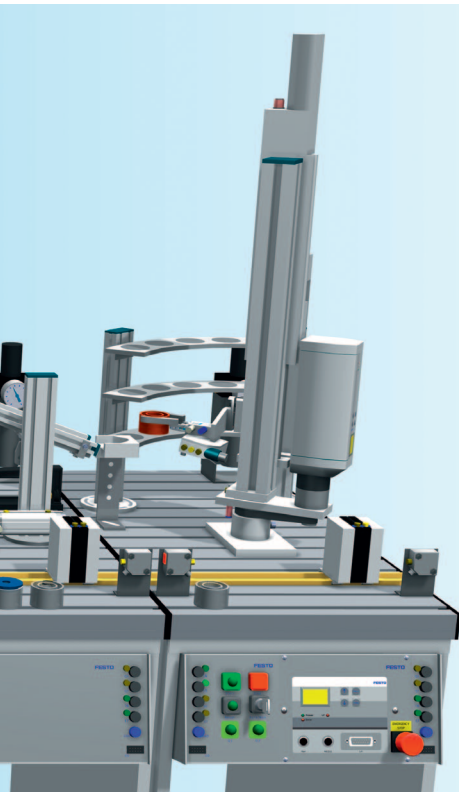
**CIROS® –
the universal 3D simulation system
made in Germany**

The flexibility provided by CIROS®
makes it suitable for many different
fields of application. It is available in
a variety of price ranges with differ-
ent options and configurations, and
is efficient and convenient to use on
a daily basis.

CIROS® covers a great number of
applications: ranging from the use
of 3D simulation in basic and further
training, through the implementa-
tion of the digital factory in indus-
trial companies and right up to real-
time simulations of complex virtual
worlds.
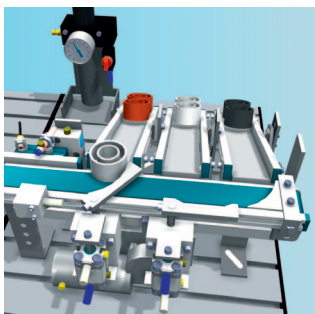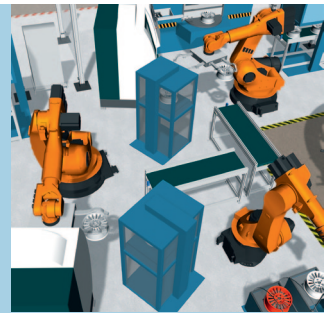
Faults made easy
A simple click of the mouse in the
simulation is all that is needed to put
a pneumatic cylinder or an inductive
sensor into a fault state. This opens
up new learning situations in which
students can be trained in systemati-
cally searching for faults.

Putting simulation to use
While virtually commissioning in-
dustry control systems and robots,
students are able to use the system
simulation to develop sequencing
and motion programs which can then
be transferred to the control systems
actually in place.
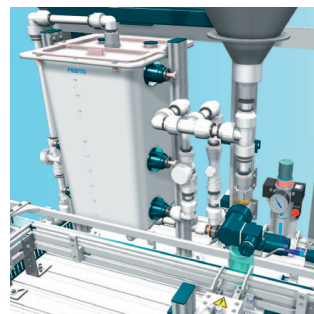
Unlimited use
Nowadays, any student can use a
simulation program with minimum
effort. At the same time, full func-
tionality of the simulated systems is
guaranteed at all times. As a result,
simulation helps save costs and con-
tributes to ensuring that the same
conditions apply for all students.
What's more, simulation technol-
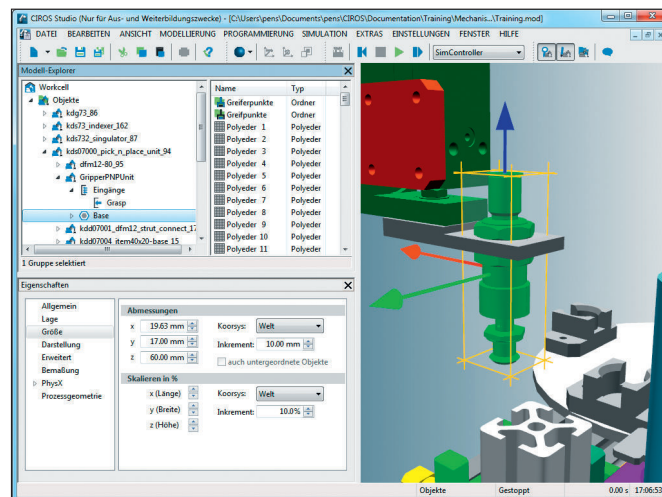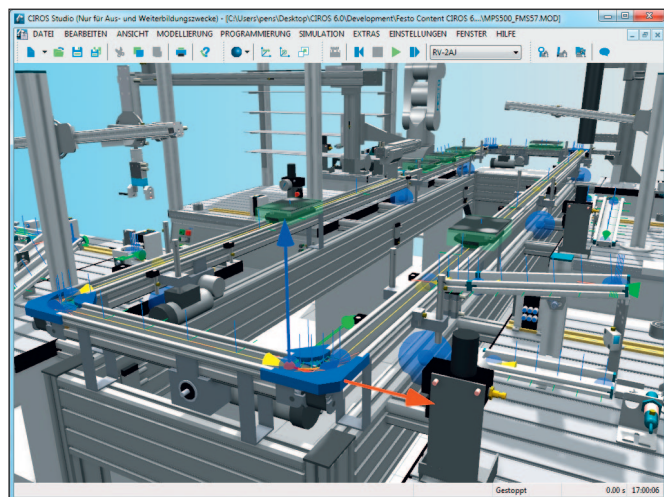ogy can be used for almost any ap-
plication.
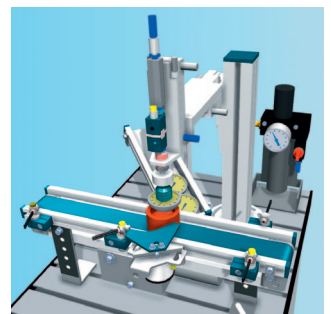
Ready to use immediately
After installing CIROS®, you can
utilise one of the over 150 included
simulation models from the factory
and process automation sector for
teaching and use the comprehensive
model documentation.

CIROS® Studio
Creating virtual learning environments

New

CIROS® Studio is the professional tool for creating simulation models. The industrially utilised, powerful development platform unites the three tools Simulation, Modelling and Programming under one common interface.

3D modelling based on standardised import filters for external CAD systems:
– Import filters for STEP, IGES, VRML and STL
– Basic CAD functions
– Definition of local coordinate systems (Master Frames) for simple relative positioning of objects
– Modelling through parametrisation of the geometry, the kinematics, and the material and physical characteristics
– Libraries with industrial robot systems and numerous automation components
– Library with powerful automation mechanisms
– Export filters for DXF, STEP, IGES, VRML and STL

3D real-time simulation including simulation of physical effects, transport simulation, simulation of hose connections and energy chains, error simulation, sensor simulation. All 3D objects are controlled by an integrated virtual control systems via mechanical or electrical interfaces. This allows realistic experiments and analyses:
– Transport simulation is a very powerful extension to the 3D simulation core. It is used for the flexible design of any transport processes.
– Collision detection through colour change or warning messages with/without acknowledgement. Simple selection of the objects that are to be checked for collision.
– Sensor simulation: Almost all sensors, from the inductive sensor to the camera are reproduced with their physical characteristics.
– Error simulation: Creation of error scenarios as learning scenarios for strategic troubleshooting and rectification of operating errors.
– Multitasking of virtual control systems: Process models can be controlled in parallel by a number of robots and/or PLCs.
– OPC client with configuration menu for communication with any number of OPC servicers for connection of any number of PLCs.

Robot programming that supports different programming languages:
– IRL (DIN 66312)
– Movemaster Command, MELFA BASIC III, IV and V for Mitsubishi robots
– KRL for KUKA robots
– RAPID for ABB robots
– V+ for Adept and Stäubli robots
– Programming assistant with syntax checking and program editor with syntax highlighting
– RCI Explorer for Mitsubishi robots: powerful interface to the Mitsubishi robot control systems via Ethernet TCP/IP, USB or a serial interface. With a convenient program editor, program downloads and uploads, online visualisation of robot system data, program tracking in individual step mode and automatic mode, project backups.

It contains both the virtual human with 30 independently controllable degrees of freedom and simulation of the Robotino® mobile robot platform.

System requirements
Applicable for CIROS® Studio and CIROS® Education:
– Intel Core Duo 2.2 GHz processor
– 2 GB main memory (RAM)
– 20 GB disk space
– Windows 7 or Windows 8 (32 or 64 bit) with Internet Explorer
– Graphic card with 3D acceleration and full OpenGL support, e.g. NVIDIA 7800GTX, 512 MB RAM or better
– USB interface for licence dongle or Ethernet interface for PC network when using a licence server
– Adobe Acrobat Reader version 6.0 or higher
– When using a licence server: Standard PC with USB and Ethernet interface for licence server
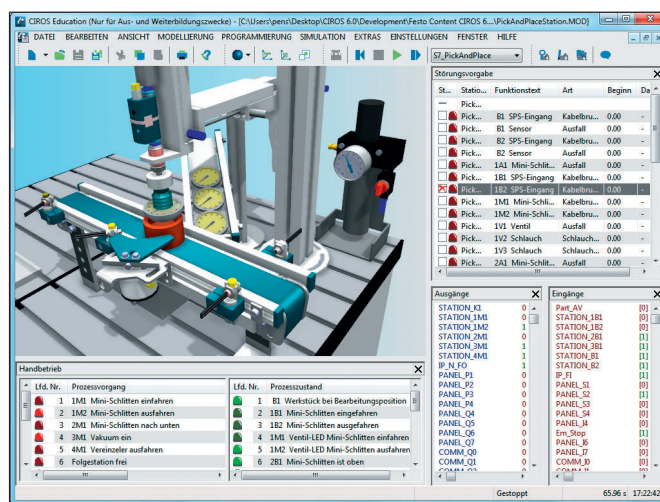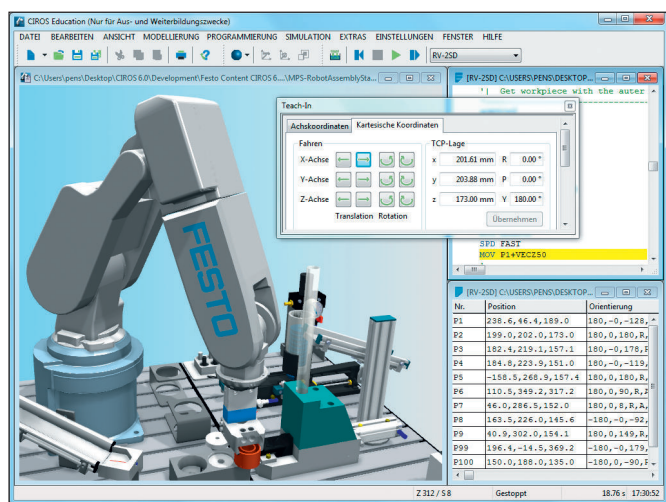
Single licence

Order no.	8038980-SSL

Licence extension

Order no.	8038980-SLE

CIROS® Education
Applying virtual learning environments

New

CIROS® Education offers all functions of CIROS® Studio without the abilities of creating new models and connecting robot control systems. The main areas of application of CIROS® Education are training in:
– Robot programming
– PLC programming
– Troubleshooting
– Production planning and production control

Training in robot programming
CIROS® Education is ideally suited for learning how to program and commission industrial robot systems. For this purpose, the program offers an integrated training program and a variety of different robot models.
– All the required basics for automation with robots are conveyed by the integrated CIROS® Robotics Assistant offering numerous graphics and animations to explain technical terms and facts, videos on a large number of industrial applications involving robots, sample programs for every model, technical documentation including instructions on processing.
– The model library with over 25 prepared robot work cells gives direct access to commissioning and programming robot applications: ranging from simple pick & place tasks right up to plants with numerous robot systems.

Training in PLC programming
CIROS® Education is the virtual learning environment for mechatronics with a focus on PLC controlled systems. It offers an ideal working environment for PLC programming based on Siemens S7 and other manufacturers' control systems. Includes virtual learning environment for the mechatronic training system MPS®.
– The complex model library contains more than 30 process models of selected MPS® stations, various conveyor systems and an automatic warehouse.
– The models can be activated immediately from the integrated virtual S7 PLC, from STEP 7 or the TIA portal of the simulated SIMATIC Controller S7-PLCSIM or via the EasyPort from any other external hardware PLC.
– Distributed control concept: Each station has its own virtual control system with a separate program that can be modified or created from scratch at any point in time.
– Commissioning of distributed control systems: The stations can work in manual operating mode. That allows you to gradually commission the control programs in the individual stations.

Training in production planning and production control
CIROS® allows you to link the simulation and the higher-order controller of real systems. The planning of production plants, the intralogistics, design and optimisation of Manufacturing Executing Systems (MES) as well as production management are the focus here. In CIROS®, the 3D models of your production line are created from library elements.
– The library delivers numerous manufacturing, assembly, warehouse and measuring stations for setting up an iCIM production line.
– The 3D simulation comprises all the most important components of a manufacturing system from flexible material flow up to individual sensors, and uses the complex functionality of CIROS® Studio.
– The layout module allows you to create the layout of future production lines with only a few clicks of the mouse as well as the simulation model at the same time.

CIROS® Supervision allows you to automatically create a basic version of an MES system (Manufacturing Executing System) for your production line at the push of a button. For this, the functions of a manufacturing control board with graphic process tracking and a link to the production database are used. CIROS® Supervision is supplied with CIROS® Education.

Troubleshooting training
The powerful error simulation in CIROS® with varied error scenarios in adjustment errors for sensors. Setting errors is password-protected. Finding and rectifying errors can be logged to evaluate the results subsequently. That allows you to design an effective training for systematic commissioning and repair in the event of malfunctions within the simulation environment.

Single licence

Order no.	8038980-ESL

Licence extension

Order no.	8038980-ELE

12-user licence

Order no.	8038980-EL12

25-user licence

Order no.	8038980-EL25

CIROS®
Robotics applications

What do you need?

As typical equipment for a robotics laboratory we recommend real robot work cells, for example the MPS® Robot station with optional equipment levels, as well as CIROS® Education and CIROS® Studio as a virtual learning environment for simulating a wide range of applications in industrial robotics.

For all of the users training in your laboratory at any given time you generally use a licence from CIROS® Education, which is available at the relevant student workstations. A CIROS® Studio licence is also required for the connection of real controllers for robots from Mitsubishi Electric.

Industrial robotics for everyone

The more than 25 ready-made simulation models of robot work cells in CIROS® Education are executable immediately after installation. The entry-level models, which represent simple Pick & Place tasks, are suitable for beginners to robot programming. They provide users with a hands-on and safe environment for learning about the fundamentals of robotics.

The other models include applications for industrial robots in the areas of dismantling, laboratory automation, packaging and welding. Robots from different manufacturers are used here. You can specify the programming languages for each model.

Quick commissioning

Anyone who uses an MPS® Robot station in the laboratory will be able to find a suitable simulation model in CIROS® Education. The program for the real station can be developed by the user in CIROS® Education and be optimised with regard to cycle time, for example.

At the robot workstations, the real robot controller should preferably be linked to the simulation and control computer using an Ethernet connection. CIROS® Studio uses the online connection to the robot controller to transfer the program created using CIROS® Education to the robot controller. The user then checks the robot positions in the real station, adapts them if necessary and runs in his program, initially with the robot at controlled speed.

Individual expansion

All of the simulation models supplied provide a template for building a virtual learning environment with CIROS® Studio. If you already have a robot work cell, you can remodel it using the available robot libraries. You can use the CAD import and modelling functions in CIROS® Studio to help you.

CIROS®
Automation technology applications

From hardware-in-the-loop to completely virtual

CIROS® supports different scenarios for PLC simulation and offline programming for PLC-controlled automation technology installations. A real PLC can be coupled with CIROS® via EasyPort. In this scenario, CIROS® receives the PLC initial values, simulates the controlled process and transfers the current sensor values back to the PLC inputs via EasyPort. Alternatively, various software controllers such as the S7-PLCSIM or a Codesys® SoftPLC can be used to control the simulated sequence without any hardware. CIROS® also supports the connection of controllers via an OPC server.

The entire world of automation technology

In the collection of CIROS® models supplied you will find suitable simulation models that can be used immediately for virtually all Festo Didactic learning systems in the area of factory and process automation. The range of models includes the components, modules and stations of the Modular Production System MPS®. With CIROS® Studio you can also create your own process models or build your own systems based on the available models of the MPS® stations.

Which PLC should you use for your application?

Given the wide range of options for connecting a PLC to CIROS®, it is generally possible to use any PLC to control the simulated model. Select the PLC manufacturer and type and we will recommend the best means of connecting it to the virtual learning environment.