

Smart MechatroniX:

Smart Solution Packages

For the Factory Of The Future

Flexibility
& Sustainability

Intelligence
& Connectivity

Transparency
& Profitability

Discover how Bosch Rexroth's innovative Smart MechatroniX portfolio is launching a new era with intelligent mechatronic systems that are more sophisticated, yet easier to specify, order and deploy.

Mechatronic systems are becoming more essential to today's modern manufacturing landscape — extending and expanding the value of linear motion and automation technology. The integration of linear components, electronic controls, software, electric motors and sensors provides a versatile toolbox for machine builders to engineer and commission complete manufacturing systems for demanding applications.

Mechatronics can also play a vital role in making the Factory of the Future a reality. A new concept of “smart mechatronics” focuses on intelligent systems that are more sophisticated, yet easier to specify, order and deploy. Building on 30 years of leadership in linear motion technology with more than a million ready-to-install linear axes sold, Bosch Rexroth is advancing this vision of mechatronics with its new Smart MechatroniX platform.

Introducing Smart MechatroniX...

Bosch Rexroth has created a new Smart MechatroniX platform to meet these current and emerging needs, with an offering of mechatronic systems that blend simplicity of selecting, ordering, commissioning and operation with sophisticated performance and IoT capabilities. This new Smart MechatroniX platform includes:

- **Smart Function Kit for Pressing – a combination of linear motion and electric drive and control components coupled with advanced software, specifically designed to accommodate a broad range of common assembly operations**
- **Smart Function Kit for Handling – a single- or multi-axis material transport and handling solution, with mechanical hardware, software and control components specifically for Cartesian systems**
- **Smart Flex Effector – a new placement unit with advanced kinematics and six degrees of motion**

These systems are the first in a planned family of mechatronic solutions that will be expanded with new offerings based on the constantly evolving application needs of industry.

Plug-and-produce, perform and proceed

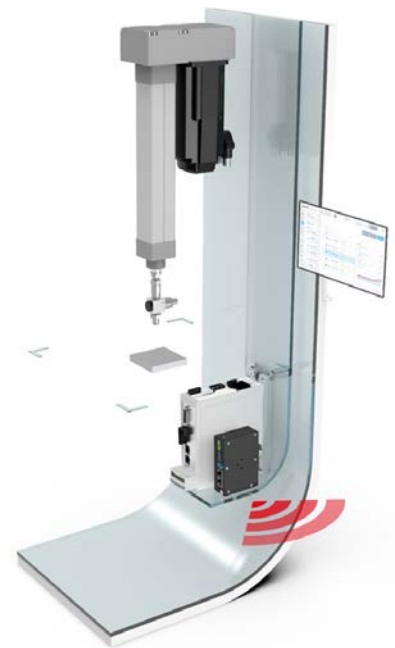
The intelligence and capabilities in the latest generation of digital electronics are helping move mechatronics to the next level: smarter systems that allow users to “plug-and-produce, perform and proceed.”

This outcome is driven, in part, by manufacturers who are demanding production machinery that offers both versatility and simplicity. The goal is to achieve quicker time to market by simplifying the engineering task for systems that can quickly shift to make different variants on the same production line.

Engineers want to streamline how they specify, purchase and commission mechatronic components, using online tools that deliver complete, intelligent systems ready to operate “out of the box” with minimal or zero machine programming. At the same time, next-level mechatronics must support transparent production processes, with features that enable real-time condition monitoring and predictive maintenance.

Finally, today’s machine builders and end users not only want precise control and execution of motion sequences, but also automated tracking of production data and easy connectivity with machine-level and plant-wide production management systems.

Preconfigured software makes it possible to start using the Smart Function Kit for Pressing “out of the box.”



Smart Function Kit for Pressing

Bosch Rexroth’s Smart Function Kit (SFK) for Pressing is the first offering in the company’s Smart MechatroniX platform. The SFK for Pressing is a complete, single-source mechatronic system that seamlessly integrates multiple Rexroth products and solutions, including an electromechanical cylinder (EMC), force sensor, servo motor and drive, motion controller, industrial PC and browser-based HMI software leveraging HTML 5.



Smart MechatroniX solutions such as the Smart Function Kit for Pressing leverage online tools and drag-and-drop programming to make system ordering and commissioning fast and simple.

SFK for Pressing solves a fundamental challenge that Bosch Rexroth is addressing with its Smart MechatroniX solutions. In a common industry scenario, users will try and develop their own mechatronic assemblies by ordering and integrating separate components – linear actuators, controllers, power supplies, end effectors and more. This process is often cumbersome and time-consuming.

For example, at some companies or system integrators, the mechanical engineering group is responsible for specifying and ordering one set of components while the electrical group orders its components. Not only is this more challenging for the purchasing department, the engineering staff is then tasked to make it all fit together physically and program it to ensure it works as specified.

Smart ordering + simplified commissioning

SFK for Pressing eliminates that complexity, providing a complete realization of the plug-and-produce concept. The system is designed for a wide range of application-specific industrial assembly and forming processes such as press-fitting, bonding, crimping, inserting and more.

Configuring the SFK for Pressing is simple. Using Bosch Rexroth sizing and configurator prompts, all the components for a complete pressing or joining tool can be specified in a single process. Users can enter parameters such as stroke, workpiece weight and cycle time, which

then generates an output that can be verified in the CAD environment. In this way, a complete SFK for Pressing system can be ordered as one part number with a single mouse click and shipped with preprogrammed motion sequences ready for implementation.

Available system variations include different stroke lengths from 30 to 400 millimeters and forces ranging from two to 30 kilonewtons. As with the other Smart MechatroniX offerings, one of the most critical advantages of the SFK for Pressing is that all its components – Rexroth EMC, control elements, motor and motion control software – come from a single drive and control supplier. And all of these items are production-proven, used for years in other real-world mechatronic applications.

The SFK for Pressing is delivered with preinstalled operating software and automatic parameterization of the servo drive, so no motion control programming knowledge is needed to bring it online. It features a drag-and-drop graphical user interface that lets operators build production sequences – e.g., for a function such as pressing ball bearings into a housing – simply and intuitively.

Standard sensors in the SFK for Pressing system can also measure and track its operation. For example, in a bearing press application, the actuator moves in precisely controlled sequences with the exact force to insert each ball bearing into the housing. As this sequence is typically repeated hundreds or even thousands of times per hour, the system's controller can measure and record each motion cycle for quality control purposes.

Leveraging SFK for Pressing in new applications

Bosch Rexroth's initial SFK for Pressing system targets widespread industrial applications. However, the simplicity built into the company's online tools and user interface makes it extremely well-suited for rapid prototyping and creation of solutions for a wider range of applications.

Mattress testing: In one example, a mattress manufacturer used the precision motion sequences, force control and data tracking capabilities from the SFK for Pressing tool in a special test rig. This adaptation led to an entirely new application used for quality control in confirming finished mattress firmness and springiness.

Adapted for medical device development: In another unique example, Bosch Rexroth linear motion engineers worked with medical personnel to explore how the SFK for Pressing tool could be adapted to create a temporary respiratory assist device for patients experiencing breathing difficulties. Within this application, the system's linear actuator manipulates an artificial manual breathing bag in a controlled fashion to deliver air to the patient.

The user interface was able to be modified to track patient respiratory data coming from a variety of sensors feeding information to the SFK's controller software, allowing key respiratory parameters to be set, monitored and changed through simple adjustments. And, because the software can be accessed and operated remotely from existing computers or a mobile tablet via a web browser, medical personnel can monitor patients locally from the device or remotely from a central work area.



Smart MechatroniX provides a platform for innovation and fast development of new and unconventional applications, such as this prototype respiratory assist device built around the Smart Function Kit for Pressing.

Although the respirator assist device is not in production, the innovation behind the device was made possible by the capabilities and ability to easily adapt features and software used in industrial pressing applications to serve urgent medical needs.

**Plug-and-produce
is the future
of automation.**

Next: Expanding the Smart MechatroniX offering

Smart Function Kit for Handling. Bosch Rexroth's next Smart MechatroniX system offering is the Smart Function Kit for Handling. It will provide a single- or multi-axis material transport and handling solution for Cartesian systems. Automation OEMs and end users will be able to use the Bosch Rexroth LinSelect selection and sizing tool, or alternative dimensioning tool, to size and select all the key linear, motion control, drives, motors, cabling and end effectors to create a complete Cartesian handling solution – all ordered and delivered as a single product, with a CAD model provided as a “digital twin.”

Building on the proven capabilities of the pressing system, SFK for Handling will use the same commissioning software with drag-and-drop motion sequences to configure a range of common pick-and-place functions – with the same ability to record and track the handling system's performance while giving operators the ability to modify sequences or add new ones as needed.

Like SFK for Pressing, that data can then be exported via interfaces such as OPC UA to provide valuable productivity and quality information. This “programming” doesn't require engineering expertise. Operators can be trained to set and manage control limits for a given part, modify tolerances and generate reports on production runs. This leverages the sophistication of the SFK software to simplify operations and share real-time process data with ease – all critical goals in a Factory of the Future operation.

Smart Flex Effector. In addition, one of the most innovative new Smart MechatroniX systems soon to be offered is the Smart Flex Effector – a sensor-based compensation unit with independent kinematics in six degrees of motion. As sensitive as the human hand, yet as precise in transport and placement as a robot, the innovative, tactile technology reduces errors and saves time and costs in commissioning and operation for many current or even new applications.



The first three solutions in the Bosch Rexroth Smart MechatroniX platform are the Smart Function Kit for Pressing, Smart Function Kit for Handling and Smart Flex Effector placement unit.

Innovation drives Smart MechatroniX potential

These solutions demonstrate a fundamental advantage in Bosch Rexroth’s approach to innovation: pulling from all facets of the company to develop plug-and-produce technology for new business solutions and challenging ourselves with inventive systems that demonstrate real value.

It’s why we continue to invest in innovation, solidifying our leadership in linear technology for three decades and backed by the Bosch family of companies. In fact, as reported by [Forbes magazine](#), our Bosch parent company was recently named in Boston Consulting Group’s list of The 50 Most Innovative Companies – recognizing the company’s commitment to innovation and prioritizing advanced analytics, digital design and technology platforms to strengthen initiatives and create new ventures.

Advancing the value of linear technology

As a technology leader, Bosch Rexroth has been setting linear motion milestones for decades, enabling customers to benefit from our wealth of experience – both as a leading provider and a leading user of industrial systems. We’re committed to moving mechatronics to the next level with the Smart MechatroniX platform of solutions. The SFK for Pressing, SFK for Handling and the Smart Flex Effector are just a few examples of how sophisticated components, advanced sensors, online configurators and other digital technologies can be applied to simplify and expand the potential applications and long-term value of mechatronics technology.

Bosch Rexroth is ready to help you expand how you use mechatronics technology to solve the challenges you face. Visit www.boschrexroth-us.com/smartfunctionkit for more information on Smart MechatroniX and for one-on-one applications and technical support.




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