



THE PERFORMANCE EDGE

Metal forming and presses

MOTION CONTROL SOLUTIONS THAT DRIVE MACHINE PERFORMANCE

Around the world, machine builders in the metal forming and presses industry are under more pressure than ever before. Today's tough competitive environment and uncertain economic conditions mean design engineers must continually increase the efficiency and reliability of their machines. They must offer better ways of boosting manufacturing productivity, ensuring safety and providing ever higher parts quality for new generation machines. And provide smart solutions for cost-effective retrofits that add significant value to existing machines.

For more than four decades, Moog has been a pioneer in the advancement of motion control technologies for a wide range of metal forming and press applications. Our high-performance solutions, collaborative expertise and proactive approach to tailoring technology to specific applications give customers a unique competitive advantage. Moog solutions are found in virtually every type of metal forming and presses market, from automotive manufacturing to white goods, computer and recreational vehicle manufacturing, to job shop stamping and forming.

Specific applications that benefit from our wide range of electric and hydraulic motion control solutions include:

- Deep draw presses
- Powder metal presses
- Scrap and recycling presses
- Transfer presses
- Forging
- Punch presses
- Tube bending
- Metal bending

As the industry transforms to meet today's evolving challenges, Moog experts are at work wherever high-performance metal forming and press applications are found, delivering flexibility, innovation and trusted solutions that help shape the future.

EXPERTISE AND INNOVATION ACROSS A RANGE OF METAL FORMING AND PRESS CHALLENGES

From top global automotive manufacturing facilities to small, specialized job shops, you'll find Moog motion control solutions that increase productivity, minimize operating costs and improve finished part quality while ensuring operator safety.

Through close customer collaboration, we move your design ideas forward and help you solve your toughest engineering challenges. Our hydraulic servo valves, controllers and radial piston pumps are industry standards, while our groundbreaking work in electric servo motors, servo drives and actuator technologies is redefining the limits of machine versatility, reliability and performance.

Here are a few of the key industry challenges that our global teams are working to meet:

Developing energy-efficient solutions

The rising costs of energy combined with increasing regulatory pressures mean more machine builders are exploring all-electric solutions for both new builds and retrofit applications. Moog has long been a pioneer in the development of cleaner, more cost-effective electric motion control solutions—from brushless servo motors and servo drives to high-performance electric servo actuators.

Improving machine reliability

Our expertise in the design and production of the key components inside digital valves and radial piston pumps helps minimize downtime and ensure machine availability in critical manufacturing applications. And because Moog engineers work closely with customers, our motion control solutions are tailored to meet the machine's specific performance requirements whether it is a press that is three stories tall or a small punch press.

Ensuring process repeatability

Sophisticated force control and positioning accuracy are the key to improved product output, shorter cycle times and greater process repeatability. Moog solutions and intelligent system control offer unsurpassed precision for more cost-effective and productive metal forming and manufacturing. For example, Moog has been instrumental in helping press manufacturers optimize active die-cushion systems to improve the forming of high-quality auto body panels.

Delivering preventive maintenance

Minimizing costly downtime begins with getting the most out of your presses and manufacturing equipment. Moog systems and solutions feature sophisticated diagnostics designed to prevent disruption or machine failure. We complement such technology with a team of experts who can help you get the most out of your machine investment through careful machine set-up and ongoing preventive maintenance programs.

Maximizing equipment longevity

One of our core capabilities is retrofitting older machines to provide enhanced performance, more cost-effective operation and longer life. We work with customers across the globe in this area, providing technology-independent know-how about specific components, using hydraulic, hybrid or fully electric systems to improve operator safety. Moog engineers have the technical expertise and resources to handle virtually any retrofit challenge involving metal forming equipment.

A MACHINE FOR THE FUTURE

An Italian manufacturer of leading, high-end systems for machining sheet metal already used electric motion control technology and sought to develop a next-generation machine with even higher performance. The company turned to Moog for an electric solution that maximizes productivity and sets a new standard for future machines.

The request

Develop a state-of-the-art machine that incorporates electric motion control technology with less wiring and an Ethernet-based high-speed serial link.

The solution

To achieve the customer's vision, Moog engineers pioneered the first-ever use of real-time, high-speed Ethernet communication between the servo drive and the motion



controller. This breakthrough affords better management of machine operations by allowing access to real-time data through the serial link. In addition, the machine's design incorporates a customized servo drive integrated with motion controller and software, and reduces wiring/cabling requirements by more than 50% compared to hydraulic machines.

The result

Moog's customized solution helped the customer reinforce its position as a global, forward-looking manufacturer of high quality machines. In fact, the Ethernet-based design gave the customer a full five-year technology edge over their competition. End users report a more user-friendly solution with software updates and troubleshooting available online from the manufacturer.

WORLD-CLASS PERFORMANCE IN EVERY PRODUCT

Moog has long been a leader in motion control for metal forming and press applications. When Bill Moog invented the first commercially viable servo valve, his name became synonymous with high performance and versatility. Today, our company provides a vast array of best-in-class hydraulic and electric products and systems for your most challenging machine applications.

These “building blocks” are at the heart of all our motion control solutions. Our solutions-based approach means we

have the expertise and technology to design anything from customizing components to full actuation systems that fulfill all safety requirements.

What's more, we can help you create a unique solution that is precisely tailored to your specialized needs—whether it's hydraulic, electric or even a hybrid solution that merges both technologies. Here is a quick overview of some of the products and systems that design engineers and machine builders count on for reliability, precision and performance.

SERVO VALVES AND PROPORTIONAL VALVES

Moog Servo Valves and Proportional Valves are well-recognized as the preferred choice in high-performance motion control for a variety of metal forming machines. Their rugged design is ideal for the most demanding environments. Unique technical features improve dynamics and flow in high-force applications. And with a choice of digital or analog technology, Moog Servo Valves

maximize productivity in a wide range of machine designs. Several Fieldbuses such as EtherCAT, PROFIBUS-DP and others are available, offering high-speed advanced control and remote diagnostics for straightforward troubleshooting.



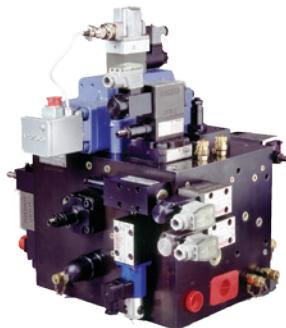
RADIAL PISTON PUMPS

The Moog Radial Piston Pump Series RKP meets industry demands for long life and lower noise, offering high performance in a range of rugged environments. The

design offers an optimized pump housing design incorporating nine pistons that help to improve fluid delivery and reduce hydraulic flow pulsation. As a result, the RKP is one of the quietest and long-lasting pumps available. The pump can also be equipped with digital onboard electronics for precise control of pressure and flow.



INTEGRATED HYDRAULIC MANIFOLD SYSTEMS



Our Integrated Hydraulic Manifold Systems are self-contained systems, designed for each application. The circuit logic and functionality can be engineered to meet your exact performance, safety and mounting requirements. Our

systems offer many advantages including reduced size, weight and cost. They also provide a cleaner, leak-free and more reliable solution without the need for hard or flexible piping, connectors and clamps.

CONTROLLERS



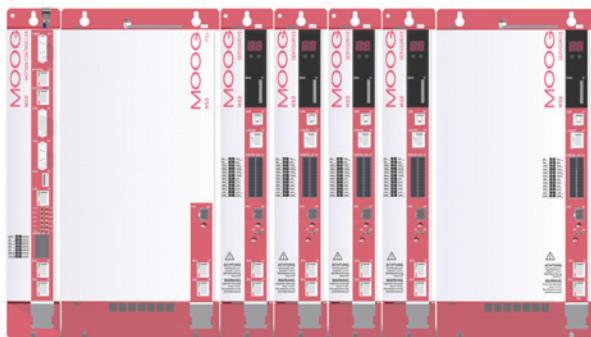
Moog Motion Controllers offer PLC functionality capable of handling complex multi-axis functions and are freely programmable within the Moog Axis Control Software development environment. They provide advanced digital motion control for highly accurate closed-loop control (position, speed, force) of hydraulic and electric machines. Faster cycle times ensure higher machine productivity while the flexible hardware and easy-to-use software platforms save both time and money in installation and operation.

SERVO MOTORS



Moog Servo Motors are built to provide the exact torque, speed and power your application requires. Each model delivers high dynamics and reliability, smooth low-speed performance, simple installation and characteristics matched to optimize their performance.

PROGRAMMABLE MULTI-AXIS SERVO DRIVE SYSTEM (MSD)



The MSD is a new generation of servo drives that provides the highest levels of dynamic response, smooth performance and application versatility. The MSD includes modular servo drives powered by a shared power supply and a motion controller to coordinate motion across multiple axes. Moog's MSD product offering also includes single axis modules with integrated power supply. The MSD reduces cycle times, provides precise motion control for higher accuracy and is available with optional advanced control algorithms and field weakening to extend servo motor performance.

Here are a few key examples of Moog solutions at work. The flexibility and high performance of Moog solutions are ideal for a wide range of metal forming and press applications beyond those shown here.

APPLICATION	CHALLENGE	MOOG SOLUTION
Transfer Press	<ul style="list-style-type: none">Increase throughput of quality parts for entire systemMaintain safety controlAccurate control of blank holder force profile	<ul style="list-style-type: none">Control of die-cushions in presses using modular manifold systems equipped with high-performance servo valves
Deep Draw Press	<ul style="list-style-type: none">Provide better positioning accuracy at higher speeds while maintaining quality and lowering installation costs	<ul style="list-style-type: none">High-performance Servo Valves and controls increase throughput and accuracyModular integrated hydraulic manifold systems provides excellent pressure and velocity control; designed to fulfill press safety regulations according to EN ISO 13849
Punch Machine	<ul style="list-style-type: none">Provide increased speed and improved position accuracy for the X-Y sheet metal movementSupports highest demands in velocity and position accuracy to boost punch head productivity	<ul style="list-style-type: none">Exact motion control of punch head for higher dynamics, improved qualityHigh-performance electric servo motors and drives provide accurate X-Y table positioning for faster processing speedCompact servo motors and drives for total design flexibilityProven supply of complete axis control for hydraulic punch heads, using Moog high-performance Servo Valves to generate the highest productivity rates
Powder Metal Press	<ul style="list-style-type: none">Provide better positioning accuracy and pressure control at higher speeds for improved quality and lower installation costs	<ul style="list-style-type: none">High-performance Servo Valves enable manufacturers to achieve superior performance and resultsCompact design of integrated hydraulic manifold system uses active cartridge, reducing leakage points

MOOG GLOBAL SUPPORT

Whether you are developing a new generation machine or need ideas and support for a retrofit, Moog is here to help you find the best electric or hydraulic solution.

Our trained engineers, based in more than 25 countries around the world, bring a dynamic and collaborative approach to helping you solve your engineering challenges. Rather than starting with a product, we start with a thorough understanding of your application, your technical needs, and your overall objectives. By focusing on your specific requirements, we are able to provide high-performance solutions that realize your machine's potential.

Our commitment to you goes beyond the initial collaboration. In fact, Global Support is as reliable and flexible as our products. Our service technicians worldwide ensure timely and precise repair of your Moog components should service be required. And we can tailor a maintenance program that is ideal for your particular needs.

Contact your nearest Moog representative to see how our world-class solutions, technical expertise and proactive support can help you design and deliver better machines today.



DESIGNING A MORE PRECISE PRESS

When a top European provider of automobile body parts sought a higher level of precision for its high-performance metal press, it partnered with the hydraulic motion control experts at Moog. Through close collaboration, Moog tailored a solution that provides optimal performance and key innovations.

The request

Improve precision forming for metal parts while increasing cycle time and reducing overall energy consumption.

The solution

Together, Moog and the customer developed a servo control solution that features a high-performance hydraulic system with unique enhancements. The system utilizes Moog Servo Valves with digital integrated electronics



equipped with fieldbus interface (EtherCAT) to achieve high precision control velocity and pressure control. Compact manifolds and monitored safety functions conform to European Safety Directives while Moog Cartridge Valves and additional Servo Valves enable high-response changes in velocity and pressure profile.

The result

The Moog solution provides up to 50 % energy savings while ensuring higher productivity and more consistent press operation for significantly lower scrap rates and improved system uptime.

TAKE A CLOSER LOOK.

Moog solutions for metal forming and presses are only a click away. Visit our Web site for more information and the Moog facility nearest you.

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