Efficient Electro-hydraulic Solutions for Machine Engineering
Powering Business Worldwide.

Eaton – a leading energy management company.

The Eaton Corporation produces a diverse range of energy management solutions.

We support our customers in the areas of electrical, vehicle (automotive/truck), hydraulics and aerospace in their efforts to find electrical, hydraulic and mechanical energy that is as safe, efficient and environmentally sustainable as possible.

We are among the global leaders in the following technological fields: electrical components and systems for secure power supply, distribution and control; hydraulic components, systems and services for industrial and mobile equipment; fuel supply, hydraulic magnet systems for trucks and automotive applications for optimal performance, low fuel consumption and safe operation.

Our comprehensive business strategy has kept us on top of our industry for decades through diversified services.

Factbox: Eaton energy management company
- $16 billion net sales in 2011
- Over 73,000 employees in more than 150 countries
- Company celebrated its 100th anniversary in 2011
- Global market leader in electronic and hydraulic components and systems for industrial and mobile applications
- Global distribution network for electrical and hydraulic components
Greater intelligence for greater flexibility.

The machine and plant construction industries are in a difficult situation: rising challenges, rising costs and strong competition that demands technological, strategic and pricing finesse. Automation jobs are growing ever more complex, even as the demands for machines that are quicker and more reliable pour in. To be successful, a solution must cut start-up and process times, reduce production-related energy consumption and yet still increase efficiency.

One exceptional challenge comes through machines that contain hydraulic and pneumatic components alongside the mechanical and electric ones. This necessitates a partner who has mastered the entire spectrum from electrical to hydraulic components and can design targeted structures that keep even complex tasks as direct as possible, with the fewest number of parts possible while maintaining efficiency and reliability.

Sustainable, efficient thinking ensures long-term success in the world of automation. No matter which specific requirements you face in the hydraulics field, Eaton’s innovative technologies will help you speed up your processes and cut overall resource consumption.

Factbox:
Scope of work for customers
- Testing facilities
- Presses
- Punch presses
- Tunnel boring machine
- Die-casting
- Metal processing
- Machine tools
- Cranes
- and much more.
Lean – the New Way To the Efficient Machine

Lean Solution powered by SmartWire-DT™

The response to the increasing dynamics of the corporate world is: value addition. Hidden potentials and reserve savings must be identified and leveraged for the customer’s benefit. From this central principle Eaton has developed the “Lean Philosophy”. The key point of this philosophy is to identify and prevent any form of waste, which includes, for example, expensive processes, long routes, waiting times, overproduction, errors and material waste.

Eaton has developed the SmartWire-DT technology to implement Lean Solution in the machine building sector as holistic machine building solutions. This trend setting technology enables: remote intelligence from the controller to the sensor, for simple and straightline automation structures – Lean Automation; the simple connection of all stations with plug-in connections instead of complex point-to-point wiring – Lean Connectivity; and data transparency about energy consumption and current values for maintenance, diagnostics and energy saving operation – Lean Power.

Lean Solution considerably improves the entire value chain – starting from planning, engineering, production and commissioning right through to trouble-free operation and maintenance of the machine.
Perfect interplay between electrical engineering and hydraulics

We use ‘Lean Solution’ to bring together the worlds of hydraulics and electrical engineering in the field of automation. A fully integrated, electro-hydraulic system represents a complete solution for your machine. Automation components such as HMI/PLCs communicate perfectly via CANopen with intelligent Eaton hydraulic valves.

The brain of the system is the HMI/PLC which combines control, visualization and data management tasks with state-of-the-art communication in a single device. Via a CANopen fieldbus, the HMI/PLC communicates with drives, I/Os and now with the new KBS valves as well, thus providing full control of machine axis movement. The HMI/PLC can also communicate on SmartWire-DT with pushbutton actuators, indicator lights, and switchgear right up to the sensors, thus providing an efficient solution for connectivity.

Eaton’s fully integrated electro-hydraulic system provides across-the-board improvements to the productivity and reliability of the machinery while also reducing the costs associated with wiring, testing and commissioning.
Simplicity in its Cleverest Form.

**HMI/PLC – remote intelligence with SmartWire-DT™**

Lean Solution consisting of SmartWire-DT and HMI/PLC technology is able to ‘cut the fat’ out of control panels, simplify wiring, increase data transparency, reduce engineering and commissioning costs, increase performance and lower overall costs. At the same time it eliminates potential sources of error and promotes greater flexibility in modular machine concepts.

When you examine the changes to automation structures in the last decade, a clear trend toward Lean Automation becomes visible. The following illustrations show how this trend has progressed.
**Concept 1:**
Traditional structure with centralized PLC

The use of touch displays and remote I/Os eliminates the need for complex wiring to the central PLC. For the first time the touch display offers a communication connection to an ERP system. A production manager on site is no longer required, since he can now access machine data remotely. Together with the fieldbus, remote I/Os replace complex machine cabling.

**Concept 2:**
HMI/PLC-distributed intelligence

The touch display PLC replaces the central PLC. A gateway to the fieldbus is no longer required, the SmartWire-DT line is connected directly to the HMI/PLC. Operating data from the motor feeders, such as motor current, thermal motor load, switching states and trip indications are transferred to the HMI/PLC via SmartWire-DT. Servo drives, frequency inverters and also Eaton hydraulic components are integrated via standard fieldbuses. The flexible architecture reduces both downtimes and retrofitting times.

**The vision:**
Distributed intelligence from start to finish with SmartWire-DT

The visionary Lean Automation structure eliminates the need for remote I/Os and any signal wiring to sensors or actuators. Lean Connectivity brings SmartWire technology directly into the devices. The structure consists of an HMI/PLC with integrated SmartWire-DT and intelligent remote components. Starting from the display, SmartWire-DT connects electrical switching devices as well as safety components and electrical drives. LifeSense™ hose monitors the health of hydraulic hose assemblies in real time.

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(1) Lean Safety: SmartWire-DT with integrated functional safety is in development.

A Lean Safety solution with SmartWire-DT is in development.
Complete portfolio for industrial automation.

Easton’s ‘Electrical’ business unit is the global leader for products and services in the area of power supply, power quality, electrical controllers and industrial automation. Our products are designed to fit the customer, providing safe, reliable and efficient power supplies and lean, simple and direct automation.

We also offer reliable, high-efficiency hydraulic systems and components for mobile and industrial applications as a complement to our comprehensive product portfolio for power distribution and industrial applications. For our customers this means one source for both power distribution products and systems and for complete automation solutions.

High-Tech. High Touch.

We offer our customers dynamic, high-efficiency systems that optimally combine the advantages of hydraulic controllers with modern communication technology. They set benchmarks for effectiveness and sustainability – all while delivering high performance, maximum reliability, security and user-friendliness.

Product Highlights for Electrical Components and Hydraulics.

High-Tech. High Touch.

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Controlling and signalling

Command and signal units from Eaton combine modern design with optimal functionality. LED technology ensures the lowest possible energy consumption with maximum reliability and illumination. Our array of emergency stop solutions deliver safe operation based on reliable functionality and ergonomic design.

Recording states

Eaton also offers a comprehensive portfolio of sensors that are capable of recording movements mechanically, inductively, optically or using capacitive technology. This is true for safety switches as well.

Automation and visualization

The core products for lean automation concepts from Eaton are scalable HMI/PLCs that combine both PLC and visualization into one device. Eaton also markets a large catalog of automation concepts, ranging from control relays to remote I/O and modular PLC.

Powering motors

Whether you are working with networkable soft starters, frequency inverters or remote electronic magnet systems, Eaton has a range of solutions for the safe powering and control of electric motors and through them hydraulic pumps, valves and cylinders.

Switching and protecting motors

Remote controlled switching of consumers up to 2,600 A are also primary focuses at Eaton, as is electro-mechanical and electronic wide-range overload protection and thermistor protection of motors. The comprehensive generation of information allows consumers to be pushed to their limits while using diagnostics to avoid failures.

Providing energy effectively

Eaton main switches are a fixed standard for most machines. Switch disconnectors and circuit breakers are preferred components due to the flexibility they provide in terms of actuation and installation. Measuring modules aid in the recording and optimization of energy consumption. Miniature and earth leakage circuit breakers are other core competencies at Eaton.

Safety engineering

Machines and equipment work using movement sequences must be secured at a technical level. Safety mechanisms must be monitored and when warnings are tripped the system must be brought into a safe operating state. Eaton offers high-reliability control and safety relays for these functions.

SmartWire-DT

SmartWire-DT combines up to 99 stations along 600 m. This affordable connection technology reduces wiring costs by up to 85% and promotes efficiency in all areas, from engineering to commissioning. Furthermore it represents an especially powerful communications system that establishes data transparency from the controller to the sensor/actor and facilitates easier maintenance based on diagnostics data.
Open-Circuit Piston Pumps

Featuring robust bearing designs, Eaton medium-duty PVM pumps deliver longer life and reliable operation for CNC machining tools in metal-cutting applications. The pressure/flow-compensated pumps provide dependable component and system operation without costly breakdowns and maintenance. Special design techniques reduce both structure- and fluid-born noise and yield extended pump life.

Tie Rod Cylinders

Eaton’s Vickers and Hydro-Line G, N, I, and L Series cylinders include a broad range of NFPA and ISO hydraulic, pneumatic, and electro-hydraulic styles focused on industrial markets. This comprehensive line features a proven design coupled with the Eaton SureSeal™ system for improved performance and better serviceability. Virtually unlimited options are available.

Proportional Directional Valves

Eaton’s Vickers specially designed injection P/Q valves (D05, D07, D08, and D10) provide precise control of injection velocity, smooth transition from velocity to pressure control, and back pressure control that is highly repeatable to produce parts with tight dimensional accuracy and high quality. The valves are pre-wired with ruggedly constructed onboard electronics. Factory-set adjustments, including gain, spool dead-band compensation, and offset, ensure high valve-to-valve reproducibility.

Hose and Fittings

Eaton offers a wide variety of low-, medium-, and high-pressure braided hose and fittings for all types of injection molding machines. Our spiral hose is designed to meet the most demanding applications, providing maximum durability and long-lasting performance.

Understanding your power management needs

Whether you are a machinery OEM or an end-user, Eaton understands your most critical power management needs in the manufacturing sector. We know you need to reduce your time to market because of faster new model launches. We know you need to reduce your operating costs to remain a valuable, sought-after supplier. We know that, meanwhile, you need to keep a close eye on manufacturing efficiency, reliability, and repeatability. Eaton knows because we listen to OEMs and end-users to find out what concerns them most, and we use that application knowledge to develop solution-based products that are produced with global standards and are globally available.
**Eaton AxisPro™ Proportional Valve**

Eaton AxisPro proportional valves provide integrated programmable control capabilities in sophisticated electro-hydraulic axis control applications. These valves contain both programmable onboard electronics and integral spool Linear Voltage Differential Transformer (LVDT) sensors to provide precise, accurate, responsive axis control capabilities. Their modular design delivers four levels of control ranging from an entry level valve that is quick and easy to configure, right through to a valve that can be customized by uploading application code created by Eaton’s Pro-FX Control software.

**LifeSense™ Hose**

Eaton is an industry leader in developing new hydraulic hose solutions. Our hydraulic hose products are suitable for nearly any application, pressure level, and fluid type. With Eaton’s new LifeSense™ condition-based hydraulic hose monitoring system, hydraulic hose failures will no longer be a major concern. LifeSense hose monitors the health of hydraulic hose assemblies, detects events that have been shown to be symptomatic of the hose beginning to fail, and notifies the user prior to failure with enough time to replace the hose before it fails.

**A New Level of Predictability**

Eaton knows how critical hose is to any hydraulic system. That is why we are at the forefront of innovation.

For example, Eaton’s LifeSense™ technology is a patented hydraulic hose condition monitoring system eliminates guesswork and headaches. Rather than randomly replacing hose or dealing with untimely hose failures, the user gets an advance alert the moment a hose needs attention. No more surprises, promise.
Successfully In Use in Many Industries.

Efficiency and Reliability thanks to SmartWire-DT

Industry:
Tunnel boring machine

Customer:
mts Perforator GmbH

Application:
Infrastructure networks are increasingly moving underground to expand. The mts Perforator company of Valluhn, Germany, are specialists in tunnel boring machines. SmartWire-DT PLC are being used for the new mts tunnel boring machines, including the mts micro tunneling systems designed for worldwide deployment. Because reliability is of the utmost priority, mts Perforator and Confurius opted for RMQ control and indication devices with SmartWire-DT connections from Eaton. SmartWire-DT does more than just significantly reduce engineering, mounting and wiring costs. It also integrates effective anti-manipulation protection by the boring head operator right into the PLC.

Labor costs cut by more than 60%.

Industry:
Woodworking

Customer:
Minda Industrieanlagen GmbH

Application:
For decades in Minden, Germany-based Minda Industrieanlagen GmbH has been a leader in the development of pressing systems for the production of glulam. One new product is a hydraulic pressing system that can be operated from up to 6 remote control panels. Each control panel features an integrated touch-sensitive display, 10 to 60 signaling units and indicator lights, pressure and toggle switches, signalling contacts, an emergency-off switch and an I/O station for third-party SmartWire-DT-compatible sensors. Each control console featuring the traditional setup requires between 3 and 18 hours to wire the sensors. SmartWire-DT cuts the labor associated with that task by more than 60 percent.
Eaton combines hydraulics and electronics to create palm oil

**Industry:**
Processing

**Customer:**
Aneka Hydraulic Systems, Medan (Indonesia)

**Application:**
A large palm oil conditioning facility processes up to 45 tons of fruit per hour. Hydraulic and electric components are installed in environments presenting not just mechanical and thermal challenges, but in some cases chemical ones as well. Eaton is happy to serve here as a partner with the know-how to combine hydraulic and electronic elements. Two worlds, one partner: The result has significantly reduced engineering, installation and commissioning costs. Eaton is proud to offer its services as a complete provider of systems combining electrotechnology, energy distribution, automation engineering and hydraulics.

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Complete Eaton hydraulic and electrotechnical system for sophisticated testing machines

**Industry:**
MOEM

**Customer:**
Poppe + Potthoff Maschinenbau GmbH

**Application:**
Bursting pressure test stand, for testing pipe fittings and hydraulic hose lines

Nobody handles high pressure better than Poppe + Potthoff. From high pressure lines, pipe components and precision components to testing equipment and services, the corporate group develops and produces complicated technical solutions for the automotive and service vehicle industries, as well as for shipbuilding and general industrial use. Its current range of projects includes an Eaton test bench with Eaton hydraulic and electrotechnical components. Over the course of the collaboration, Poppe + Potthoff Maschinenbau gained a strong sense of respect for Eaton’s work and developed real trust in its partner as a one-stop source for components and expertise in both application areas.
Clear Benefits for the Customer

Lean is our philosophy for optimizing processes and preventing waste in the production of machines, plants and services. Lean in automation means simple and straightforward concepts with fewer components, pluggable SmartWire-DT connections and direct communication.

**Planning**
- Reduced planning
- Modular, flexible, seamless concepts
- Secure
- Plausibility check for the cards being used

**Value addition**
Implements the overall cost balance by:
- Use of standard components
- Reduced engineering costs by up to 70%
- Reduced time required for wiring, testing and commissioning by up to 85%
- A uniform software platform
- Copyright protections for the achieved results.

**Performance**
The machine performance is also impressive:
- Minimal downtimes/increased productivity
- Small production batches and high machine cycles
- High reliability
- Intuitive operation
- Easy to expand

**Data transparency**
- Transparency from the controller down to the sensor/actuator
- Simple diagnostic options for current values

**Value Calculator** – calculate the value addition
With our Value Calculator, we will be glad to calculate for your machine the benefits that you can achieve with Eaton’s Lean Connectivity solutions. Contact us for more information.

Realized added value
The Power of Fusion

There is a certain energy at Eaton. It is the power of uniting some of the world’s most respected names to build a brand you can trust to meet every power management need. The energy created supports our commitment to powering business worldwide.

From power distribution to power quality and control, Eaton allows you to proactively manage your complete power system by providing electrical and hydraulic solutions that make your applications safer, more reliable, and highly efficient. Visit www.eaton.com.
Eaton’s Electrical Sector

Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it is needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers’ most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, visit www.eaton.com/electrical.

To contact an Eaton salesperson or local distributor/agent, please visit www.eaton.eu/electrical/customersupport www.eaton.com/hydraulic/customersupport

Eaton’s Hydraulic Sector

Eaton’s Hydraulics business is a worldwide leader in the design, manufacture and marketing of a comprehensive line of reliable, high-efficiency hydraulic systems and components for use in mobile and stationary applications. Mobile and stationary markets include agriculture, alternative energy, construction, forestry, manufacturing, material handling, mining, oil and gas, processing, transportation and utility equipment. Eaton’s Hydraulics Group provides customer-driven solutions under product names such as Aeroquip®, Boston®, Char-Lynn®, Eaton®, Hydrokraft®, Hydrowa®, Hydro-Line®, Integrated Hydraulics®, Synflex®, Vickers®, Walterscheid™, and Weatherhead®. For more information, visit: www.eaton.com/hydraulics.