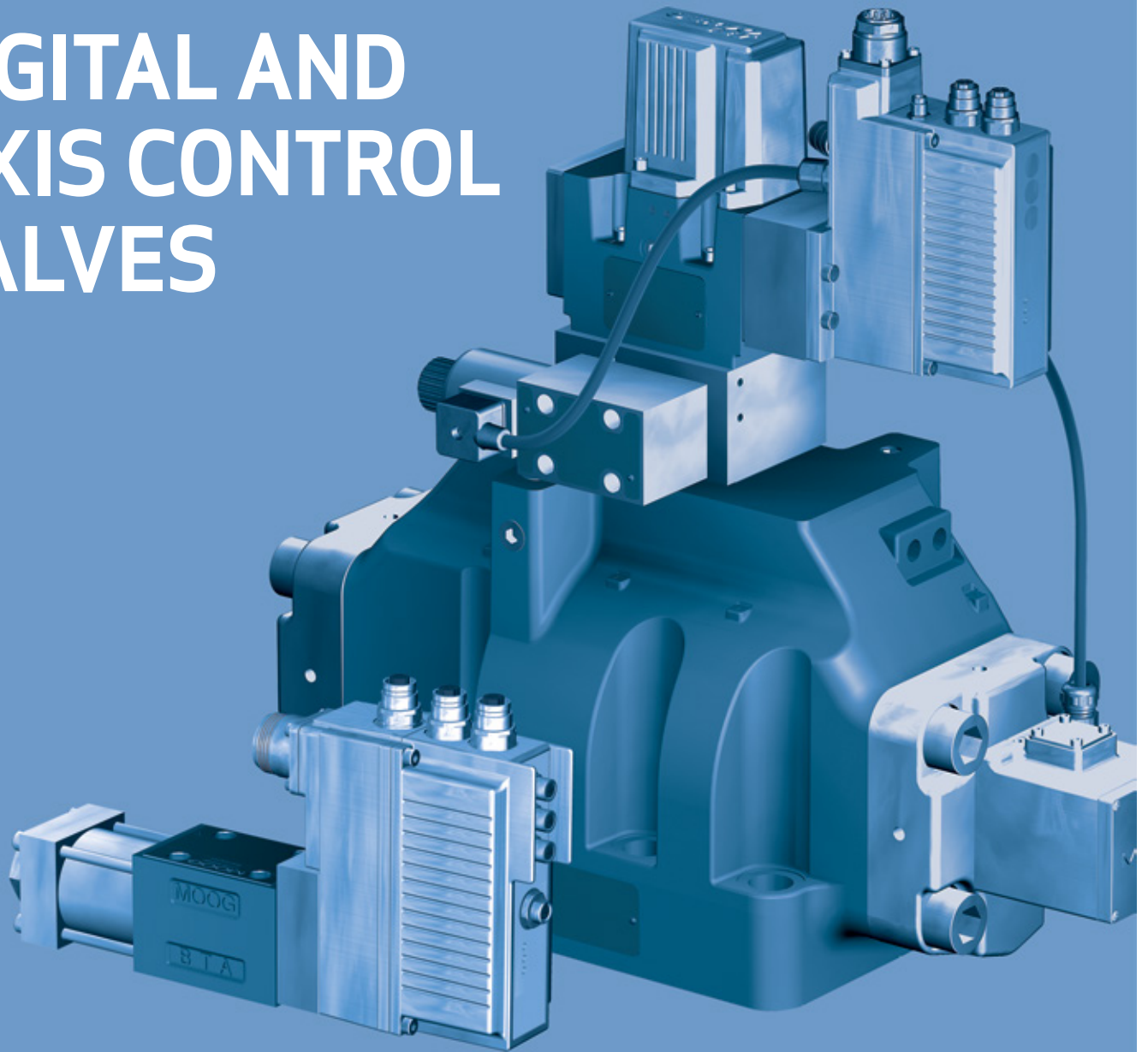


DIGITAL AND AXIS CONTROL VALVES



Rev. A, August 2015

INTELLIGENT SERVO AND PROPORTIONAL VALVES
WITH ANALOG OR FIELDBUS INTERFACES DESIGNED
TO OPTIMIZE MACHINE FUNCTIONALITY

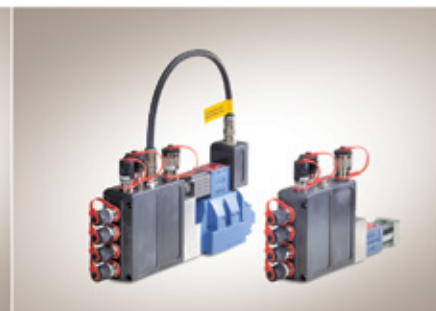
SIMPLIFYING THE INTEGRATION OF DIGITAL CONTROL VALVES INTO A RANGE OF CONTROL LOOP SYSTEMS

Today, machine designers require intelligent support for motion control tasks that incorporate state-of-the-art digital valve electronics for flexible integration, high productivity and simple maintenance. For over 60 years, Moog has earned a reputation for designing and manufacturing world-class motion control products that greatly improve the performance of critical machine applications across a range of industries.

Moog Digital and Axis Control Valves are prime examples of how Moog leads the way in high performance closed-loop hydraulic valves used in the world's most demanding environments and applications.

The Moog family of Digital and Axis Control Valves provide the ability to tailor the valves and tune the software to meet your exact machine requirements for flexibility, production and maintenance.

MOOG DIGITAL AND AXIS CONTROL VALVES



Digital Control Valves (DCV)

Provide the power of intelligent closed-loop motion control with either analog or fieldbus interfaces that are designed to optimize your machine's functionality.

Axis Control Valves (ACV)

Take the power of intelligent closed-loop motion control even further by closing the control loop right in the valve, offering the most advanced functionality for your machine design, including decentralized control, remote diagnostics and machine optimization.

ATEX Digital & Axis Control Valves

If you require a valve certified for use in potentially hazardous environments (ATEX, IECEx), Moog offers both DCV and ACV models to meet your needs.



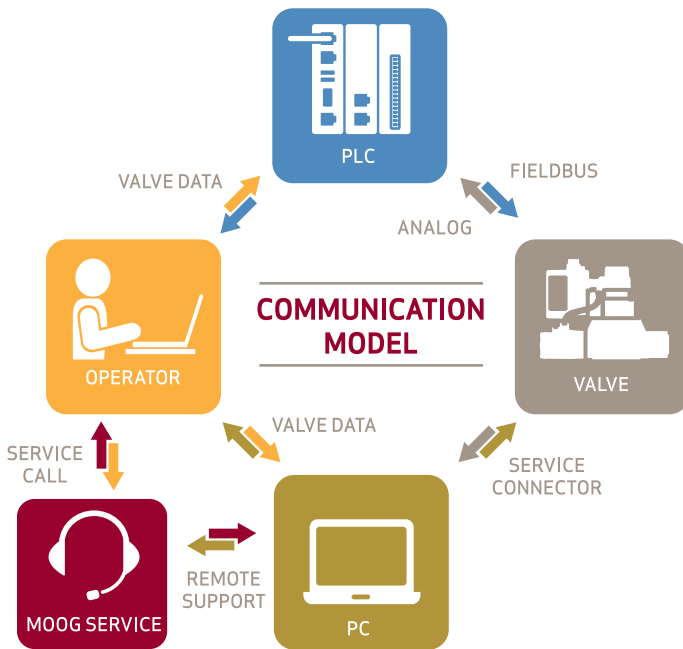
COMMON FEATURES AND ADVANTAGES OF DCV AND ACV

Features	Advantages
Moog offers the ability to exactly tailor hardware, configurations and functionality to meet your specific application need.	This allows you to optimize machine performance to gain competitive advantages in your market.
Moog's robust hardware and electronics are built for extreme environments such as wind turbines and gas turbines. Plus, we have over 10 years of field experience with these products and the largest installed base in a variety of applications.	Product series proven to perform reliably in many industrial applications, minimizing risk of new technology and resulting in higher machine uptime and availability.
Improved dynamics over traditional valve technology due to high performance design of hardware and software.	This increases machine performance in areas such as higher acceleration, improved accuracy and better productivity.
High valve-to-valve repeatability due to: <ul style="list-style-type: none"> • Consistent valve design and quality • Ability to set parameters in the Moog Valve Configuration Software or your own software 	This ensures optimized performance for the life of the machine and ability to support the product with the exact same valve over time.
Moog Global Support and hands-on training delivered by experts in motion control.	Our expertise reduces your downtime and protects your investment.

HIGH PERFORMANCE MOTION CONTROL ACROSS A RANGE OF CRITICAL TASKS

Moog Digital and Axis Control Servo and Proportional Valves offer high performance in applications ranging from basic flow control systems to advanced axis control systems where the valve handles multiple control loops. DCV and ACV can accommodate analog or fieldbus signals. Fieldbus communication is available in CANopen, EtherCAT, PROFIBUS-DP and (coming soon) Ethernet POWERLINK.

CONTROL TASKS	MOOG DIGITAL CONTROL VALVE (DCV)	MOOG AXIS CONTROL VALVE (ACV)
FLOW CONTROL	●	●
PRESSURE CONTROL	●	●
FLOW AND PRESSURE CONTROL (pQ)	●	●
PRESSURE DIFFERENCE CONTROL (Δp)	●	●
PRESSURE COMPENSATED FLOW CONTROL	●	●
POSITION CONTROL		●
FORCE CONTROL		●
VELOCITY CONTROL		●



COMMUNICATION WITH FIELDBUS AND ANALOG INTERFACES

Moog Digital Control Valves enable easier commissioning, parameterization and maintenance. The valves are an integrated part of the automation system, allowing all valve data to be accessed, adjusted, monitored and stored over the fieldbus or via Moog Valve and Pump Configuration Software. Key parameters are preset in the factory, making it possible to get your machine optimized quickly.

MOOG VALVE AND PUMP CONFIGURATION SOFTWARE

While the Digital Control Valves are preset at the factory, you also have the ability to adjust parameters yourself. The Graphical User Interface allows the user to easily configure the valve and optimize performance.

- Fast and convenient commissioning of the valve
- Configuration and tuning for optimal performance
- Diagnostics for troubleshooting to reduce downtime
- Setting parameters accurately for multiple valves is quicker with configuration software as you can save and reuse settings, reducing time and limiting undesirable variations



- Status information, set values and actual values are displayed graphically for quick and easy performance monitoring.
- Free software: www.moogsoftwaredownload.com

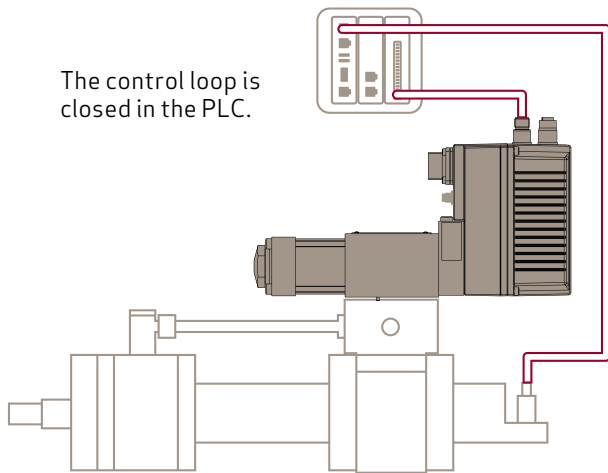
HOW DCV AND ACV WORK IN YOUR MACHINE

The digital valve configurations below show the versatility and ease in which Moog Digital and Axis Control Valves can be designed into a hydraulic motion control application, whether the control loop is closed within the valve or a PLC or motion controller. All Moog Valves with digital electronics are highly versatile with the ability to close a flow, pressure, position or force control loop. For other control task options, see the chart on page 3.

Moog Digital Control Valve

Example: A position control application

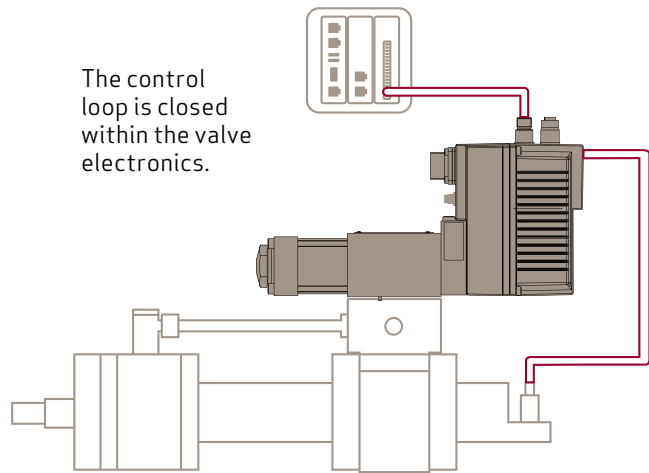
The control loop is closed in the PLC.



Moog Axis Control Valve

Example: A position control application

The control loop is closed within the valve electronics.



WHEN TO CONSIDER DCV OR ACV FOR YOUR MACHINE

Application requirements

- High performance closed-loop control with higher dynamics and faster loop closure than traditional technology
- Advanced centralized or decentralized control for optimized machine performance
- Fieldbus (EtherCAT, PROFIBUS-DP and CANopen) valve communication for easy integration into automation systems
- Diagnostics, remote service and monitoring to improve reliability and troubleshooting
- Availability of specialized failsafe options to provide better machine protection
- High end pressure control including Δp
- Compact machine design (less cabling, less programming)

DCV is best suited for centralized control

Everything on the left plus:

- Control loops closed in a PLC
- Flow, Pressure and Flow and Pressure control applications

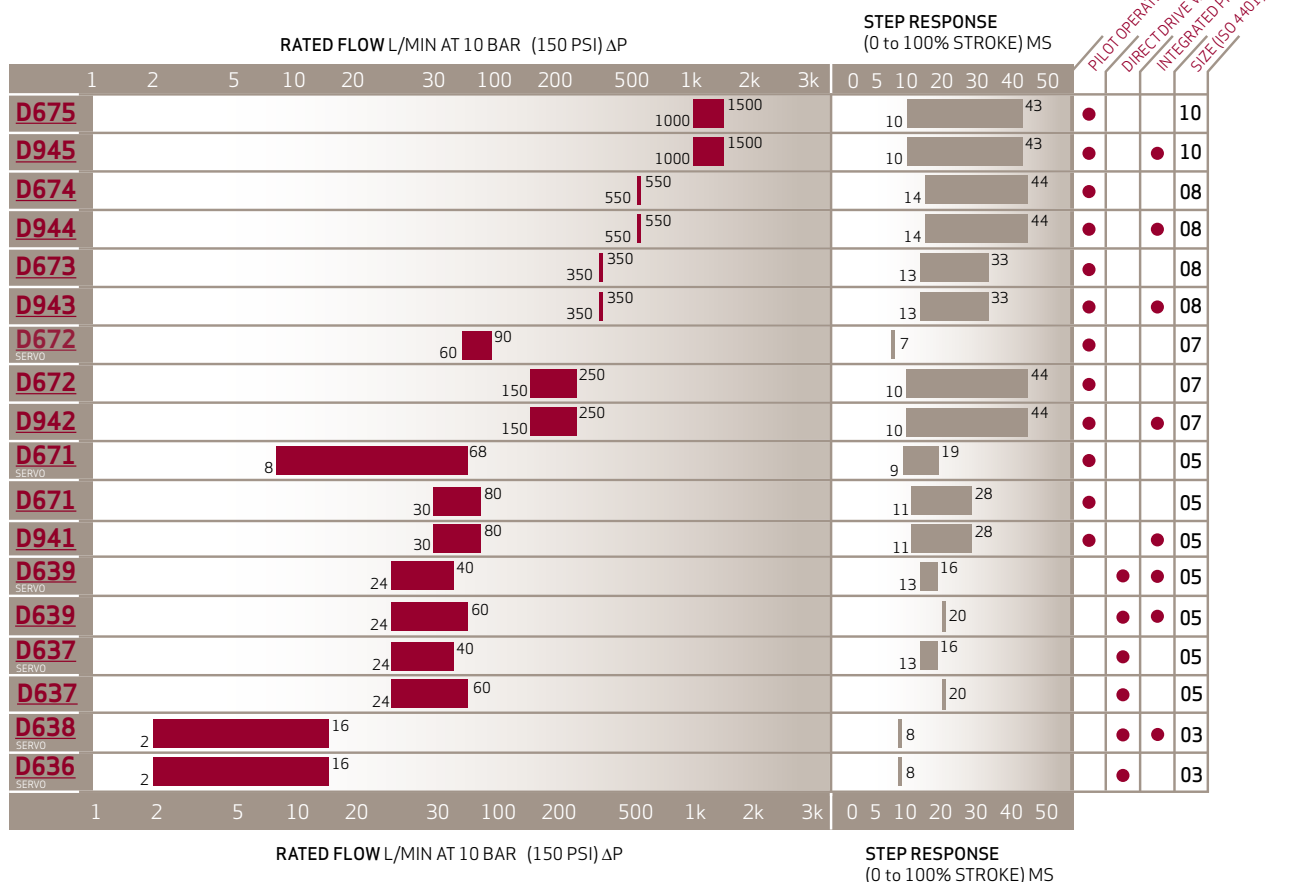
ACV is best suited for decentralized control

Everything on the left plus:

- Control loops closed in the valve
- Can perform autonomous position, velocity, differential pressure, force or acceleration control based on PLC input
- Includes a trajectory generator for smooth movements executed by the valve
- Can scale, evaluate and publish data of any external sensors connected directly to the valve:
 - Three analog inputs (V or A)
 - SSI or encoder
 - Wheatstone Bridge

HIGH PERFORMANCE MOTION CONTROL ACROSS A RANGE OF CRITICAL TASKS

The Moog Digital and Axis Control Valves offer high performance in applications ranging from basic flow control systems to advanced axis control systems where the valve handles multiple control loops. All DCV and ACV shown in the chart below are also available as ATEX and IECEx versions. For more options, contact your Moog sales representative.



MOOG VALVE TYPES EXPLAINED

Moog Servo Valves

Moog Servo Valves are known for their very high accuracy in controlling flow. Our precision manufacturing and design allows for very accurate metering of flow, delivering very high pressure gains and quick reversal of flow. This makes Moog Servo Valves well suited for applications like position control. The servo valves have a bushing spool assembly (BSA) inside the cast iron body.

Moog Proportional Valves

These valves are known for high accuracy and repeatability in controlling flow. A variety of mechanical failsafe options are available that enable the user to implement the best option for the given application. Proportional valves are in general more economical and offer higher rated flow than servo valves of the same size.

Moog Direct Drive Valves (DDV)

DDV control the flow of the valve directly with a linear force motor acting on the end of the control spool. When the valve is in zero position, no energy is consumed by the linear force motor, and there is no appreciable loss of hydraulic power over the main spool. The dynamics of the valve are independent of the supply pressure. The linear force motors used in Moog valves generate higher forces

than solenoids, allowing control of the spool position at higher flow rates. Linear force motors operate in both push and pull operations, unlike solenoid options.

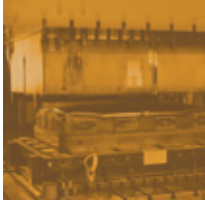
Moog Pilot Operated Valves

These valves allow very high flow rates with a very high dynamic. As a relatively small hydraulic valve, the pilot valve controls the position of the spool in the large main stage. Several pilot stage valve options are offered: ServoJet® and mini Direct Drive Valves. Moog ServoJet® pilot valves are known for their superior ability to follow small signals and their robustness against oil contamination. Mini DDV pilots are known for their fast step response to large signals and for their energy efficiency in hydraulic systems.

Moog Pressure Control and Flow Control Valves

These pQ Valves control the pressure and flow in a working port of the valve. The pressure transducer is integrated in the valve in order to access the optimum sampling position. It is monitored by the on-board electronics in an internal closed loop control to create the pressure control. In combination with the capabilities of the Digital Control Valve, it often enables the user to utilize one valve instead of two, i.e. defining minimum or maximum pressure, while controlling flow or controlling pressure with defined limits to the flow.

DIGITAL SERVO AND PROPORTIONAL VALVE SOLUTIONS FOR A WIDE VARIETY OF APPLICATIONS



Metal Forming and Presses

- High signal-to-noise ratio of fieldbus enables superior motion control to help improve part quality and machine productivity
- Advanced tuning functionality allows machine optimization and tailoring to your exact specifications



Power Generation - Gas, Steam and Hydro Turbines

- Availability of diagnostic and condition monitoring in the valve helps you manage the life cycle of the valve in order to optimize maintenance costs
- Robust hardware and software designed and proven to withstand vibration and heavy use deliver highly reliable performance for greater uptime



Wind Power

(wind turbines with hydraulic pitch control)

- Proven solutions designed to provide highly reliable operation even in extreme environments, whether onshore or offshore
- Remote diagnostic capabilities provide access to real-time data, easier trouble shooting and better informed maintenance decisions that help reduce downtime



Plastics Machinery

- Improved dynamics over traditional valve performance increase machine accuracy, especially for thin-wall products
- Hardware consistency and the ability to set critical parameters in the factory, ensures optimized performance for the life of the machine and the ability to support the machine with the same valve over time



Test and Simulation

- Improved dynamics increase motion control performance and help speed up the testing process
- Ability to adapt valve to flow curves also helps speed up testing, saving users valuable time in getting product to market



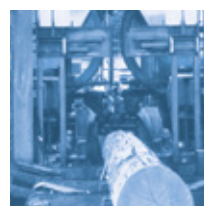
Oil and Gas Exploration and Production

- ATEX and IECEx-approved versions with hot-swappable connectors deliver reliable performance and the proven ability to withstand vibration and heavy use in this hazardous environment
- Advanced tuning functionality such as non-linear flow curves allows machine optimization and tailoring to exact customer specifications



Heavy Industry (Steel Mills)

- Robust valve construction provides highly reliable 24/7 operation, even in the extremely harsh conditions of the steel mill
- Remote monitoring and diagnostics for easier and more efficient commissioning and maintenance



Other Applications and Markets

- Considering the replacement of your old servo valves in your machine? Think about a DCV/ACV retrofit. Ask your local distributor or your Moog sales representative
- Contact Moog about other DCV/ACV applications not shown in this brochure



A COMMITMENT TO SUPPORT

Every day, the demands on your machines continue to grow. Machines must work harder, faster, longer and more cost-effectively than ever before. Yet as productivity demands increase, so does the potential for unforeseen downtime.

That's why we created Moog Global Support. It's our commitment to keeping your critical machines working at peak performance by focusing on high quality servo valve maintenance and support.

Around the globe, local teams of trained Moog technicians are there for you with a variety of services designed to maximize uptime and help you get more from your machine investment.

INFORMATION IS ALWAYS AVAILABLE

Moog offers a wealth of additional information on our Digital and Axis Control Servo and Proportional Valves. Please visit our website for literature including product overviews, catalogs, manuals, installation instructions and installation drawings.

Here is what you will find on our website:



Servo and Proportional Valves with Special Features (Explosion Proof Valves)

Pressure and Flow Control Valves with Fieldbus Interface

Flow Control Valves with Fieldbus Interface



TAKE A CLOSER LOOK.

Moog designs a range of products that complement the performance of those featured in this literature. Visit our website for more information and the Moog facility nearest you.

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