

CMT mobile valve section

Eaton CMA advanced mobile valve family



Two services from one section: Introducing the CMT section for the CMA advanced mobile valve

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In early 2020, Eaton launched the CMT mobile valve section, a streamlined new section option for the CMA advanced mobile valve portfolio. With the capability to control two bi-directional services from one section—an industry first—the CMT valve section increases design flexibility and reduces CMA valve bank size, weight and overall system cost.

CMA background

The CMT mobile valve section is an extension of Eaton's CMA advanced mobile valve family. CMA is a CAN-enabled, electro-hydraulic mobile valve that enables original equipment manufacturers (OEMs) to deliver a new level of machine performance and operator productivity. Featuring onboard electronics and advanced software algorithms, the CMA valve provides flexible configuration, real-time communication and precise control.

The CMA advanced mobile valve features a sectional configuration. CMA valve banks can be configured with CMA sections (also known as CMZ sections) and CMT sections. CMA sections feature independent metering, which uses two spools to control the supply and return flow for a single bi-directional actuator. CMT sections utilize the twin-spool architecture to control two services instead of one. While CMA is available in 90 L/min and 200 L/min work port flows, CMT is currently offered only in 90 L/min work port flows.

CMT basics

A single CMT section can control two separate machine functions independently. This can be a cost-effective way to control services that do not require the flexibility and capability of CMA's independent metering, while reducing valve bank size and simplifying inventory. The CMT section can be integrated into a CMA valve stack that utilizes CMA 90 sections (also called CMZ 90 sections) without any system modifications. The CMT uses the same pilot valve as CMA sections, thus providing the same control and flow accuracy on meter-in as CMA sections. In short, CMT sections provide accurate meter-in flow control on functions that don't require individual meter-out control.



Figure 1: CMA advanced mobile valve with inlet section, two CMT sections and two CMA sections.

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CMT construction

A CMT valve section contains two three-position, four-way spools. Each section is pre-compensated, allowing for consistent flow regardless of load. The CMT also has flow sharing capability leveraging the same flow-sharing algorithm standard on CMA.

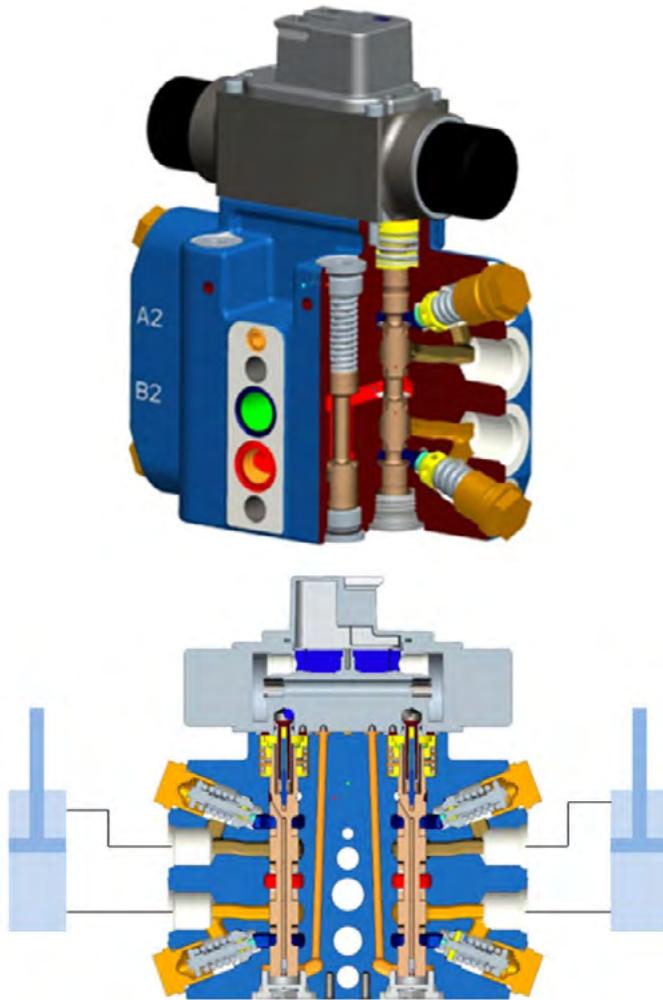


Figure 2: Cross section of the CMT valve section.

Each section contains two linear variable differential transformers (LVDTs) that monitor the position of each spool. Additionally, there are two pressure sensors that read the meter-in pressure for each function. The LVDT, pressure sensor and closed-loop position control provide accurate and repeatable flow control, while essentially eliminating hysteresis. OEM end-of-line valve calibration is not necessary with CMT as all sections will be calibrated for flow accuracy coming from the Eaton factory. The meter-out portion of the CMT spool is controlled via standard spool notching; several notch configurations are available to meet application-specific meter-out control requirements.

CMA valve banks are controlled by an external machine controller, such as Eaton's HFX controller. These machine-level controllers communicate with the valve bank via controller area network (CAN). Unlike traditional electrohydraulic valves, CMA valves require only four wires to operate: 9-32V power, ground, CAN-High and CAN-Low. Additionally, Eaton has developed specific CMA function blocks within the Pro-FX Control platform that can be used to control both CMA and CMT sections. These blocks simplify the OEM controls integration effort and accelerate machine development cycle.

Applying CMT sections

A CMA valve bank can comprise CMA sections, CMT sections, or a combination of CMA and CMT sections. This configuration flexibility

provides a tailored valve solution that matches the appropriate performance and capability with the specific machine function. Functions that require independent metering capabilities or more advanced control strategies will use CMA, while functions that still require high performance and meter-in flow control capabilities with a more standard meter-out option will leverage CMT.

Because CMA and CMT sections utilize a common pilot valve, the control architectures are the same. The primary difference is that CMT will not use the twin-spool control methodology of the CMA. The CMT operates in single-spool mode, as it can control both work ports from the three-position, four-way spool. The CMT is capable of actuating both spools at the same time; the command sent will be two single-spool commands to the pilot valve, commanding actuator 1 and 2.

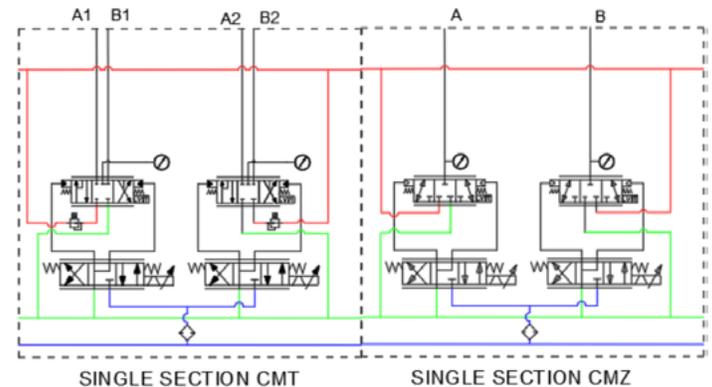


Figure 3: Schematic showing one CMT section and one CMA (CMZ) section.

Benefits of CMT

There are many benefits of implementing a CMT solution:

Sensors and software

When commanded to a specified flow, the CMT's closed-loop position control in the onboard electronics provides accurate and repeatable meter-in flow control. Additionally, the CMT is factory calibrated, allowing OEMs to eliminate their own end-of-line valve calibration.

Pressure/force limiting

Clamp-holding functions or reducing pressure relief losses when a cylinder reaches end of stroke are examples where a basic force control is required. To address these challenges, the CMT's onboard sensors and algorithms allow it to provide a pressure-limiting function without any additional hardware. When pressure limiting is enabled, the CMT will reduce/stop flow to the actuator when the specified pressure limit is achieved. The CMT will then revert to the standard flow command when the pressure drops below the pressure limit. The pressure limit can be adjusted electronically to any desired setting within the valve specification.

Compact and efficient package

The ability to control two separate functions from one section leads to a reduction in valve bank cost, size and weight. Instead of needing 10 sections to control 10 functions, the OEM will need as few as 5 sections to control those 10 functions. Additionally, the electronics required to run the valve are reduced from a 10 I/O controller with 20 wires (power and ground) for a traditional valve, to a simple CAN controller with 4 wires (power, ground, CAN-H, CAN-L) for CMT.

Intelligent load sense control

The CMA and CMT leverage the same inlet, which generates the load sense signal to the pump via an onboard electronic valve. The load sense can operate in an automatic mode, which communicates the highest load pressure based on sensors in the CMT sections, or it can be commanded to a set pressure. If a platform has multiple CMA/CMT valve stacks, the load sense pressure information is conveyed electronically to the main inlet, which eliminates the load

sense shuttling required for traditional load sense valves. Electronic load sense generation also offers the ability to set custom margins between sections to aid in situations where a function needs more flow (which requires a higher margin) or needs more pressure (which requires a lower margin).

Serviceability

If a section needs to be serviced, the replacement algorithm in the onboard electronics can copy the mechanical and application data to the new section. This means the technician won't need to reprogram the section, but simply run the replacement algorithm.

Conclusion

The CMT mobile valve section is an extension of Eaton's CMA advanced mobile valve family. A single CMT section can control two separate machine functions independently, providing a cost-effective way to control services that do not require the flexibility and capability of CMA's independent metering, while reducing valve bank size and simplifying inventory.

Overall, CMT provides a new level of performance and control compared to traditional load sensing valves. The CMT is the first step in the realm of Eaton's CAN-based digital valves and, like CMA, provides several benefits, including onboard sensing, integrated control algorithms and architecture simplification. Additionally, when coupled with CMA sections, CMT provides the configuration flexibility to create a tailored valve solution that matches the appropriate performance and capability with the specific machine function.

Additional resources

For more information on the Eaton CMT mobile valve section, please visit Eaton.com/CMT or download the following resources:

- [Integrated control applications reference guide](#)
- [Catalog](#)
- [Brochure](#)

For access to the following materials, please log in to www.eatonpowersource.com and visit the CMA sales kit, or contact your Eaton sales representative:

- Application developer's guides
- User manual
- Service manual
- Firmware