Advanced Mobile Valves – CMA/T

Powering Business Worldwide

Advanced Controls

Mobile Sectional Valve Portfolio

Performance & Capability

CLS

- OC, CS, Load Sense
- Priority Flow Sharing
- Manual, Pilot & EH Control

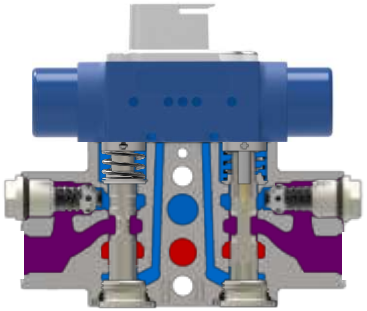
CMT

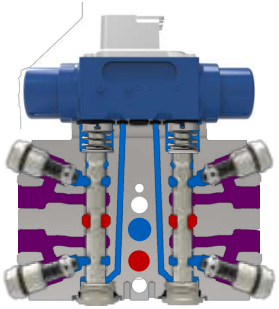
+ CANBus
+ Two (2) services in one (1) section
+ Sensors / Diagnostics / Telematics
+ Stackable with CMA90

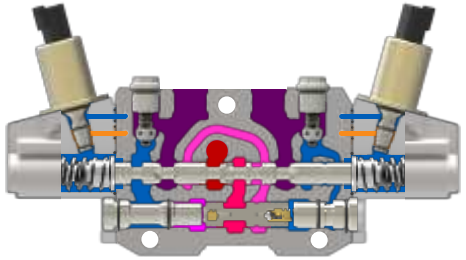
CMA

+ Independent Metering
+ Advanced Software Functions

Advanced Controls
Mobile Sectional Valve Portfolio

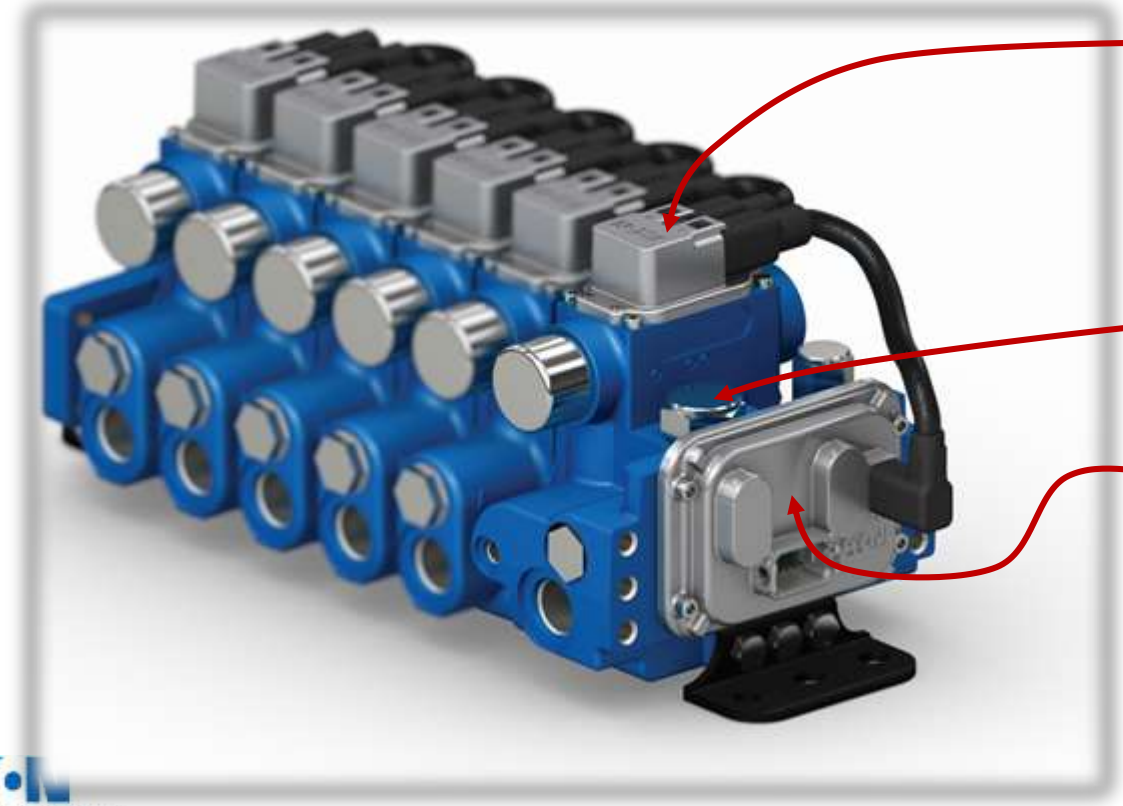






Product	CMA90/200	CMT90	CLS100/180
Architecture	Highly dynamic, twin independent metering spools.	Twin traditional spools. **Two** functions / section.	Single traditional spool. One function/section.
Compensation	Electronic using spool position (LVDT) and ΔP (pressure sensor).	Pre-compensated.	CLS100 Pre/Post Compensated. CLS180 Post Compensated.
Spool Control	CAN with on-board electronics. Manual override available.	CAN with on-board electronics. Manual override available.	EH current control, hydraulic pilot, manual. Manual override available.
Sectional Flow	CMA90: 90 lpm @ 14 bar CMA200: 200 lpm @ 14 bar	CMT90: 90 lpm @ 14 bar	CLS100: 100 lpm at 14 bar CLS180: 180 lpm at 14 bar
Pressure	380 Bar Cont. 440 bar Max.	380 Bar Cont. 440 bar Max.	350 Bar Cont.

CMA Key Components
Intelligent Inlet



CV
- “Conditioning Valve”
- Reads P, T, LS pressures
- Controls hyd. LS signal

Fixed-Displacement Conversion Valve

VSM
- “Valve System Module”
- Single CAN Gateway to CMA
- Stores backup data
- Supplies power to Pilot Valves

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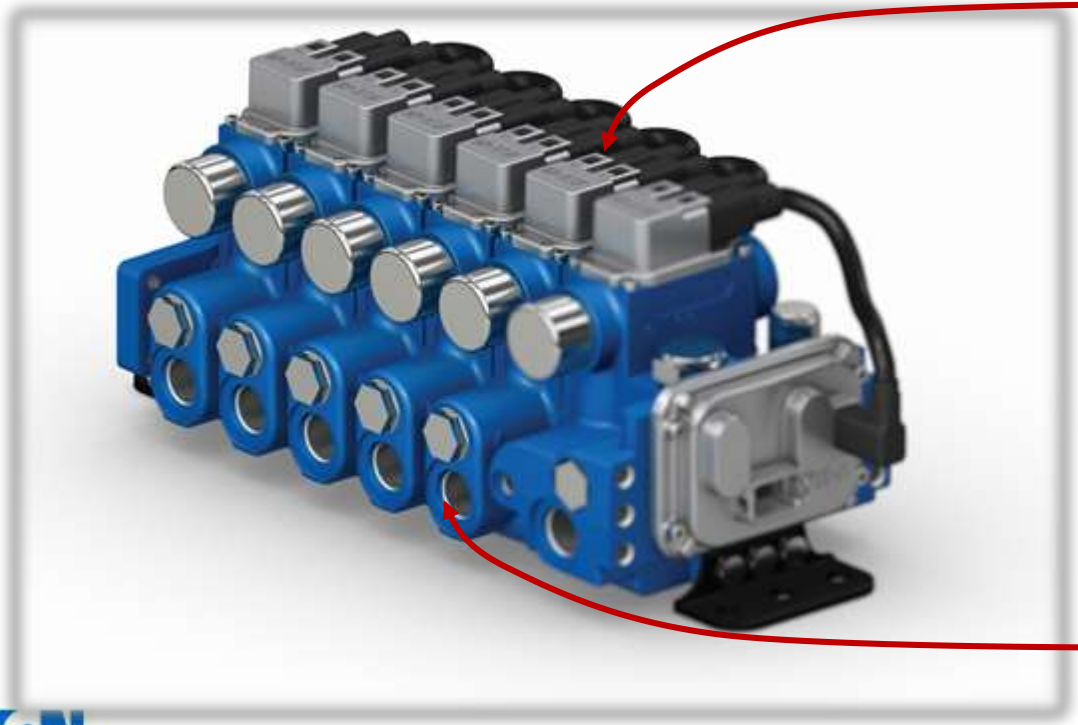
CMA Key Components
Work Section



PV
- “Pilot Valve”
- Reads WPA, WPB pressures
- Controls flow to work ports
- Daisy chained together

Main Stage
- Houses main stage spools and aux valves

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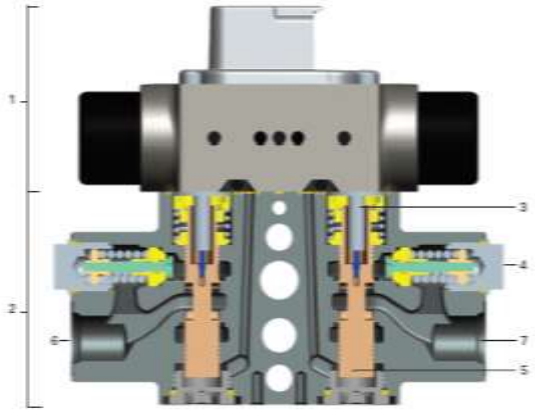
CMZ and CMT
Cross Sections

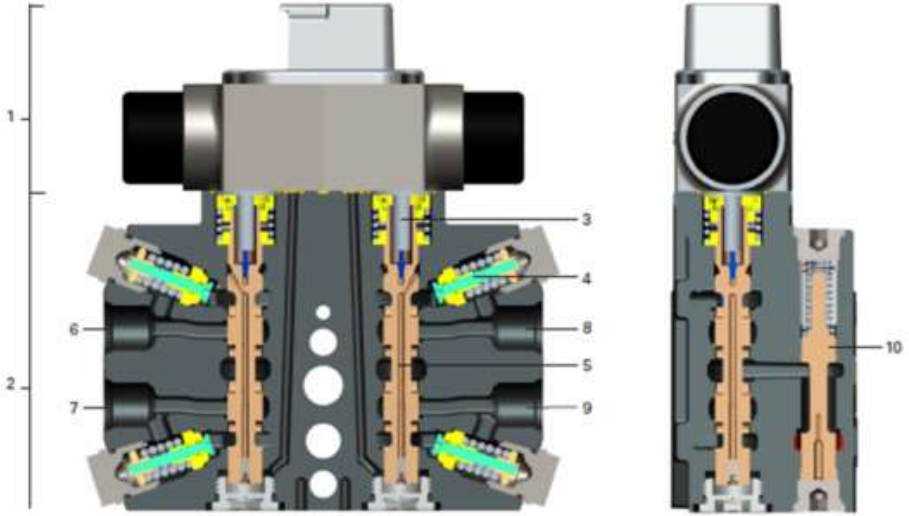
CMA090 Advanced sectional mobile valves
CMZ Cross section

Valve cross section:
1. Pilot Valve
2. Main Stage
3. Linear Position Sensor
4. Port Reliefs / Anti-Cavs
5. Main Metering Spools
6. Work Port A
7. Work Port B

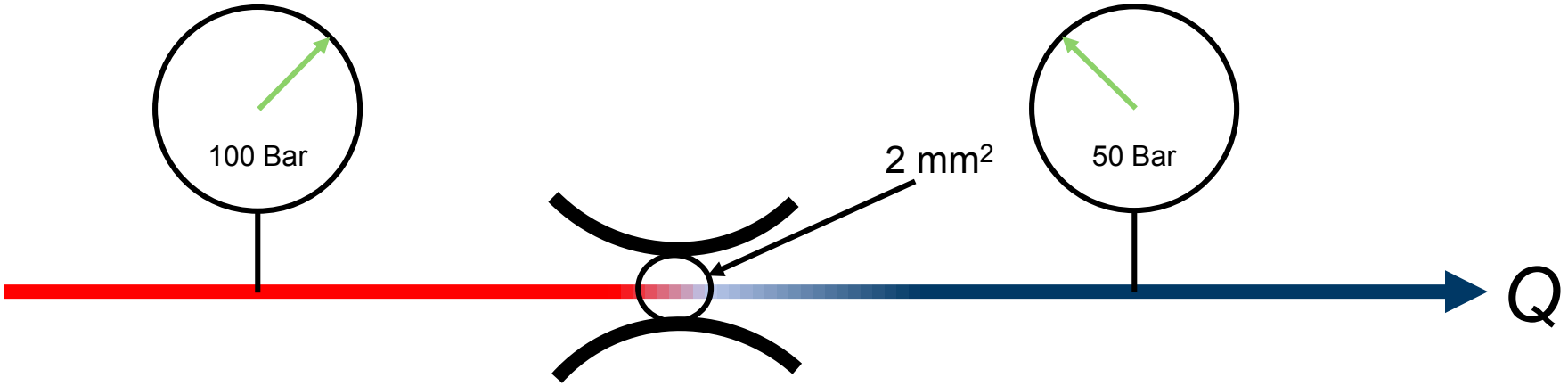


CMA090 Advanced sectional mobile valves
CMT Cross section

Valve cross section:
1. Pilot Valve
2. Main Stage
3. Linear Position Sensor
4. Port Reliefs / Anti-Cavs
5. Main Metering Spools
6. Work Port A1
7. Work Port B1
8. Work port A2
9. Work port B2
10. Pre-Compensator spool



Principles of Operation
Independent Metering



$$Q = kA\sqrt{\Delta P}$$

If you know:

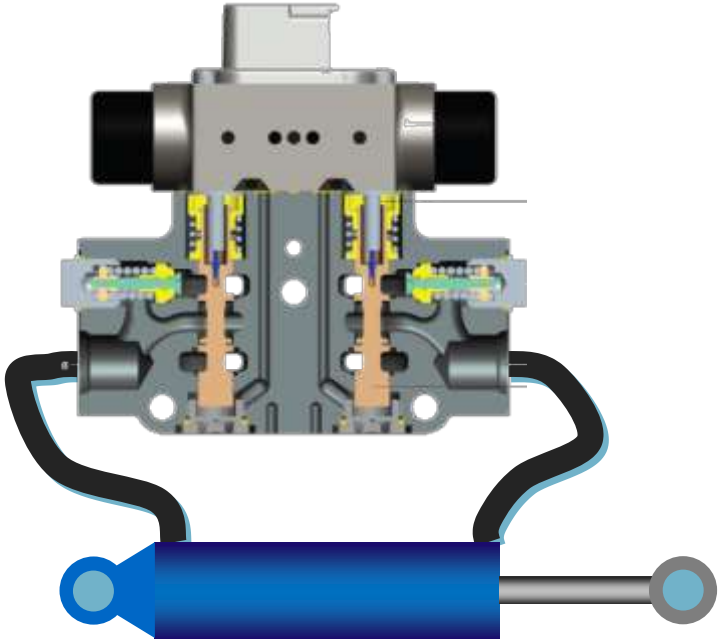
Area of orifice

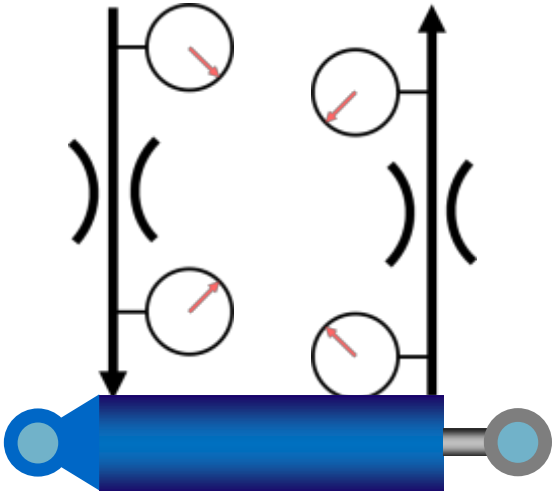
Pressure Upstream

Pressure Downstream

You can calculate the ***Flow*** through the orifice

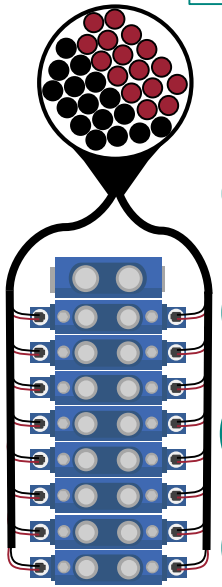
Principles of Operation
Independent Metering





Transitioning to CAN

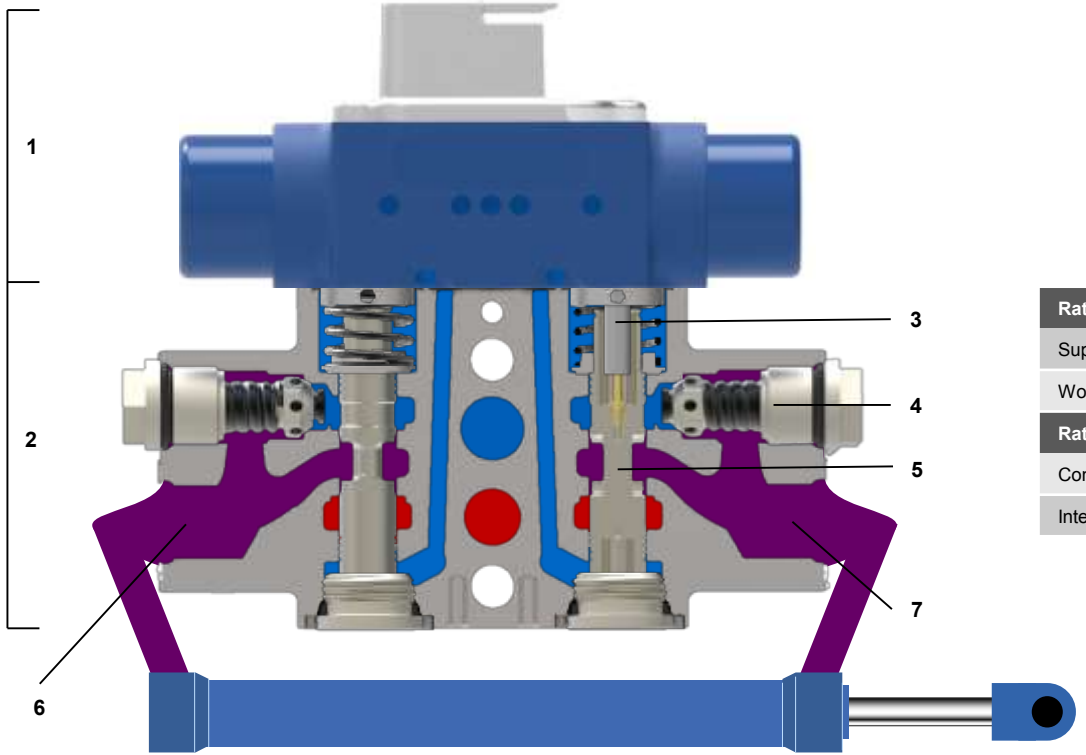
8 Sections	Standard EH Valve		CMA	8 Sections
32 Wires	2 Connectors/4 wires/4 pins per section		1 Connector/4 wires/4 pins per bank	4 Wires
16 Outputs	2 Controller outputs per section		Controlled via CANBUS	CAN
8 Amps	1 A required per section		Voice coil technology reduces required power: 0.2 to 0.375A/Section	4 Amps
0 Sensors	N/A		5 available on-board sensors per section: Pressure, Temperature, Position (CV&PV)	81 Sensors
0 DM's	N/A		The valve enables sensor transmission on demand with up to 6 ms intervall	15 CH's



CMA Mobile Sectional Valve

CMZ Cross section

1. Pilot Valve
2. Main Stage
3. Linear position sensor
4. Port Reliefs / Anti-Cav
5. Main Metering Spools
6. Work Port A
7. Work Port B



Rated Flow	CMA90/200
Supply (lpm)	200/400
Work port (lpm)	90/200
Rated Pressure	
Continuous (bar)	380
Intermittent (bar)	440

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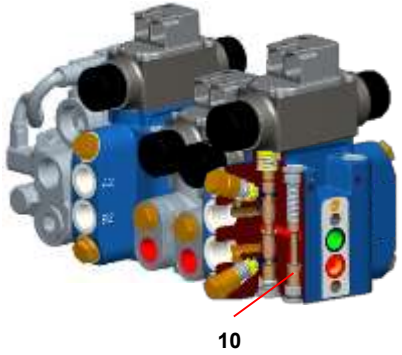
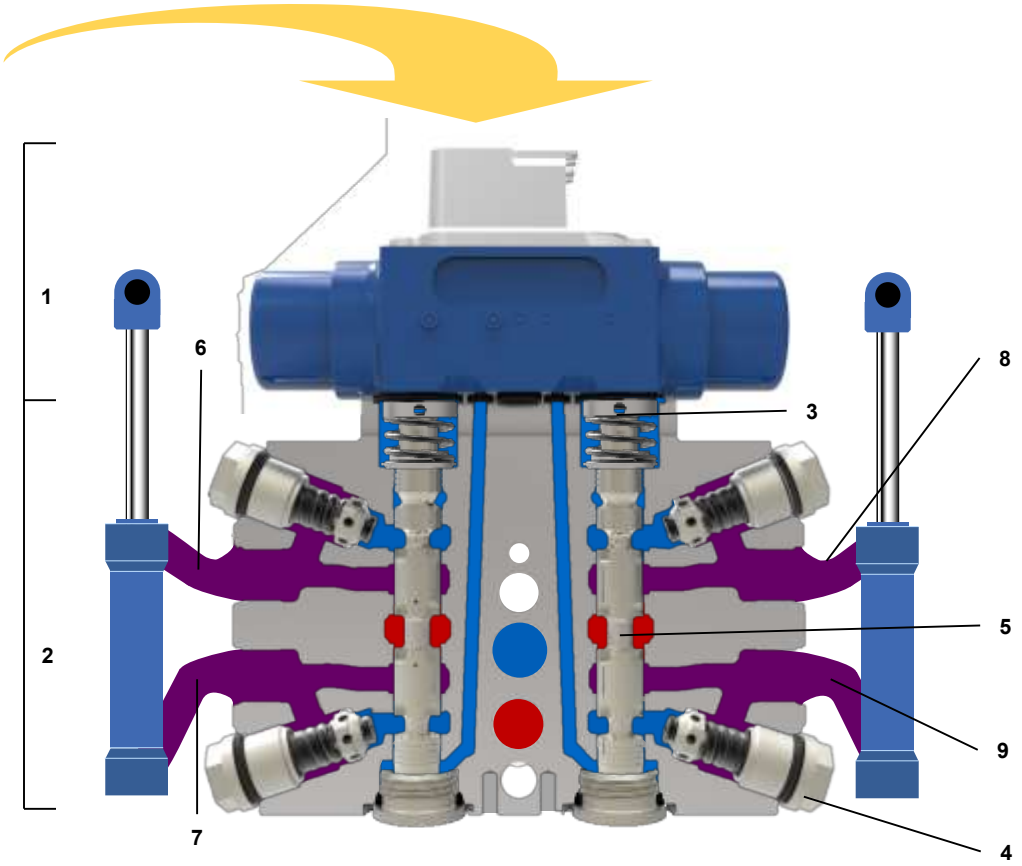
CMT Mobile Sectional Valve



CMT Cross section

1. Pilot Valve
2. Main Stage
3. Linear position sensor
4. Port Reliefs / Anti-Cav
5. Main Metering Spools
6. Work Port A1
7. Work Port B1
8. Work Port A2
9. Work Port B2
10. Pre-compensated spool



Rated Flow	CMT90
Supply (lpm)	200
Work port (lpm)	90
Rated Pressure	
Continuous (bar)	380
Intermittent (bar)	440

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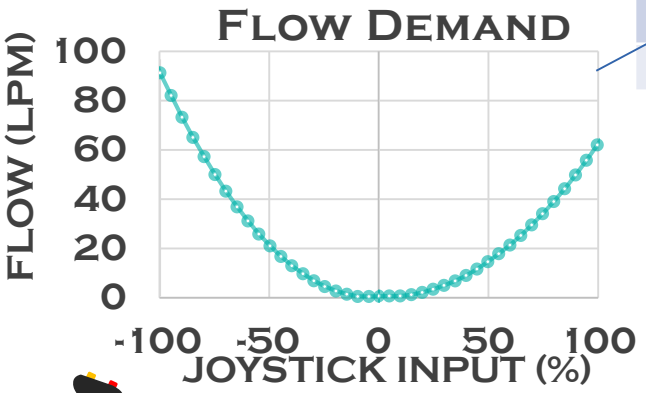
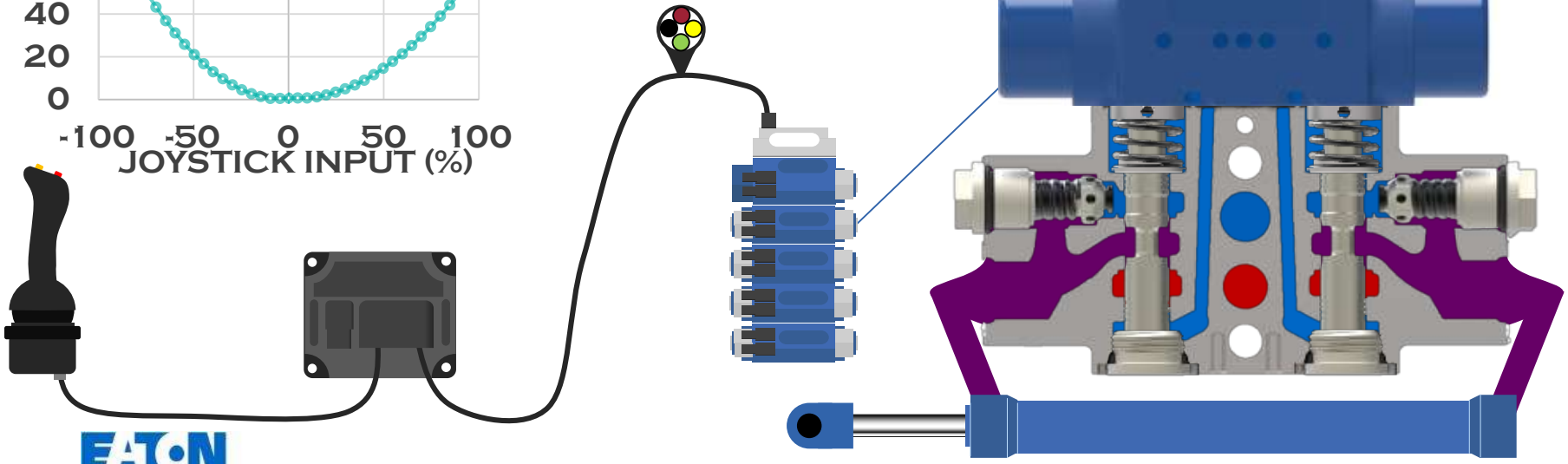
CMA Example Control Architecture

Byte	7	6	5	4	3	2	1	0
1	Device		Message Index: 8 (TS Flow)					
2	Flow		Flow Mode: 0			Index: 1 (PV1)		
3	Demand: (1/8 lpm)							
4	LS Enable: 1(Active)							

Flow Direction: 0(Flow A to B)





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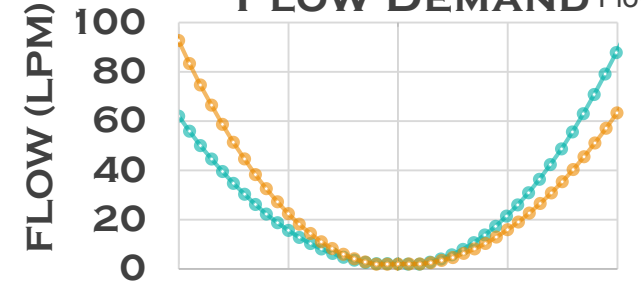
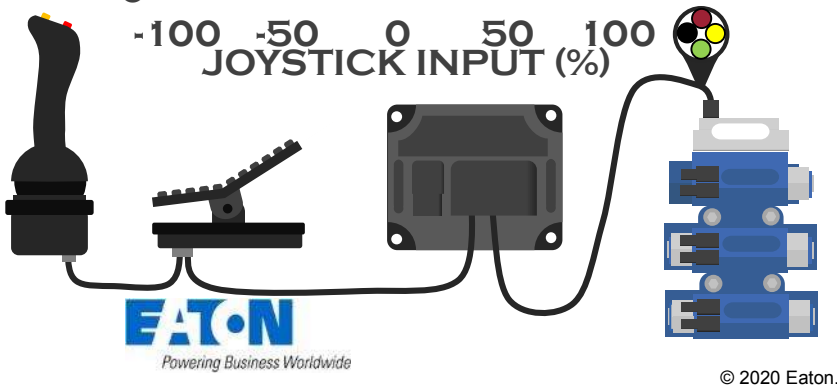
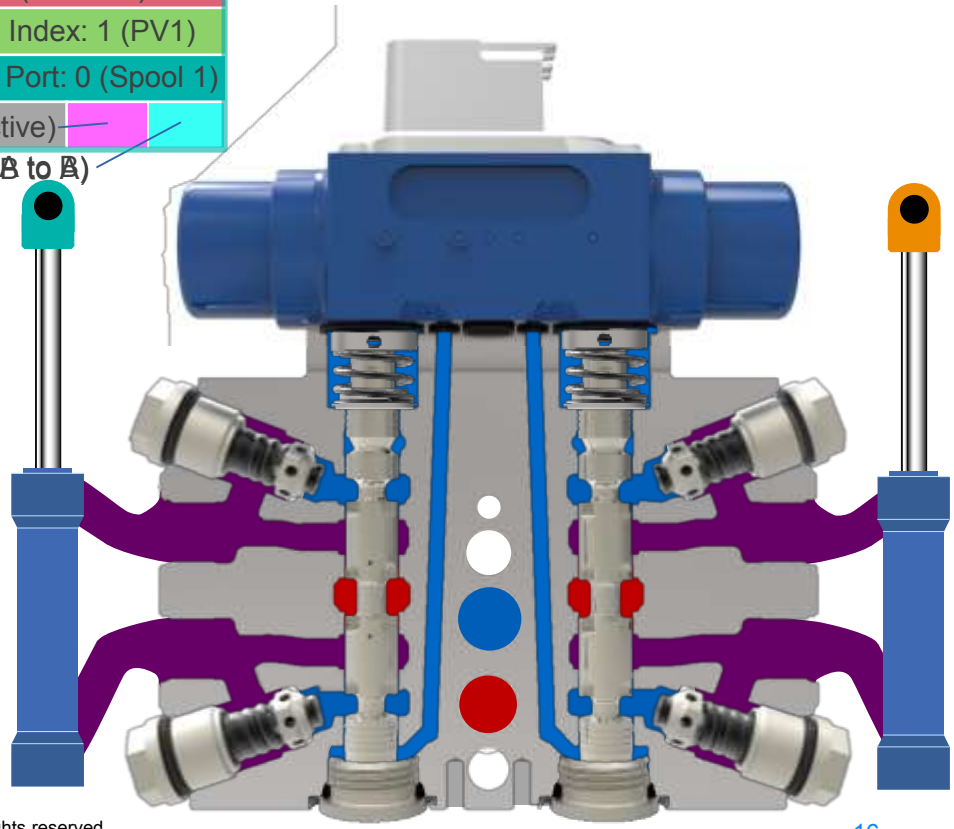
CMT Example Control Architecture

Byte	7	6	5	4	3	2	1	0
1	Device				Message Index: 8 (SS Flow)			
2	Flow					Index: 1 (PV1)		
3	Demand: (1/8 lpm)					Work Port: 0 (Spool 1)		
4	LS Enable: 1(Active)							

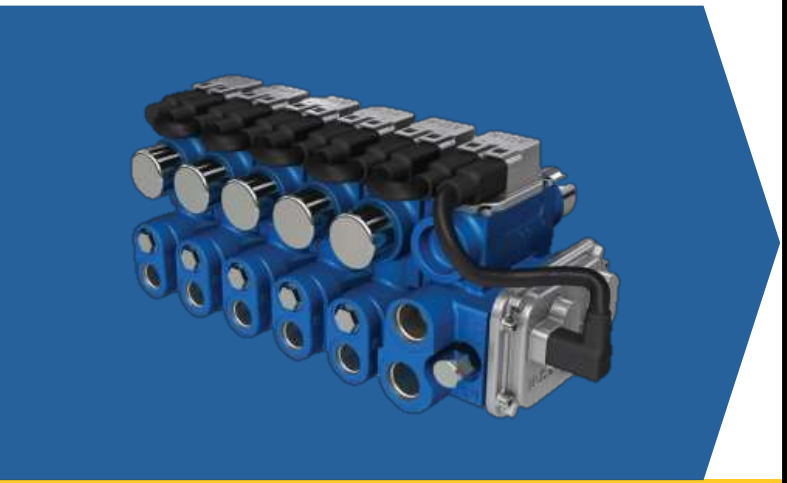
FLOW DEMAND Flow Direction: 0 (Flow A to B)



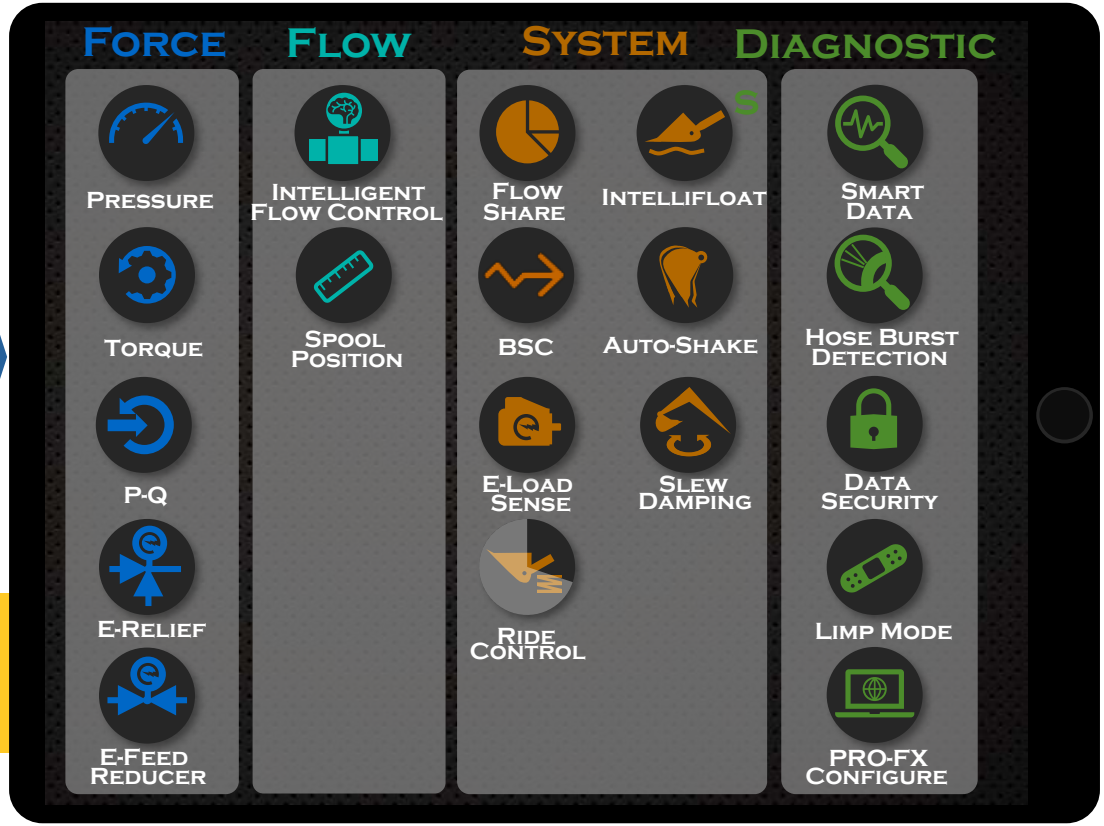




CMA Integrated Control Applications



A New Level of Control



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IFC passive/overrunning settings

BASIC ADVANCED

Twin Spool Controller Modes

TWIN SPOOL CONTROL MODE IFC

INTELLIGENT FLOW CONTROLLER (IFC) UNIVERSAL FLOW CONTROLLER (UFC) DELTA PRESSURE CONTROLLER (DPC)

Backpressure

IFC PRESSURE SETPOINT - PASSIVE LOAD

Less More

1000 cbar SET TO DEFAULT

IFC PRESSURE SETPOINT - OVERRUNNING LOAD

Less More

1000 cbar SET TO DEFAULT

BASIC ADVANCED

Flow Pressure

Zero Flow

Pressure Limit Enable for Zero Flow ON OFF

Load Transitions

PASSIVE TO OVERRUNNING MARGIN

Earlier Later

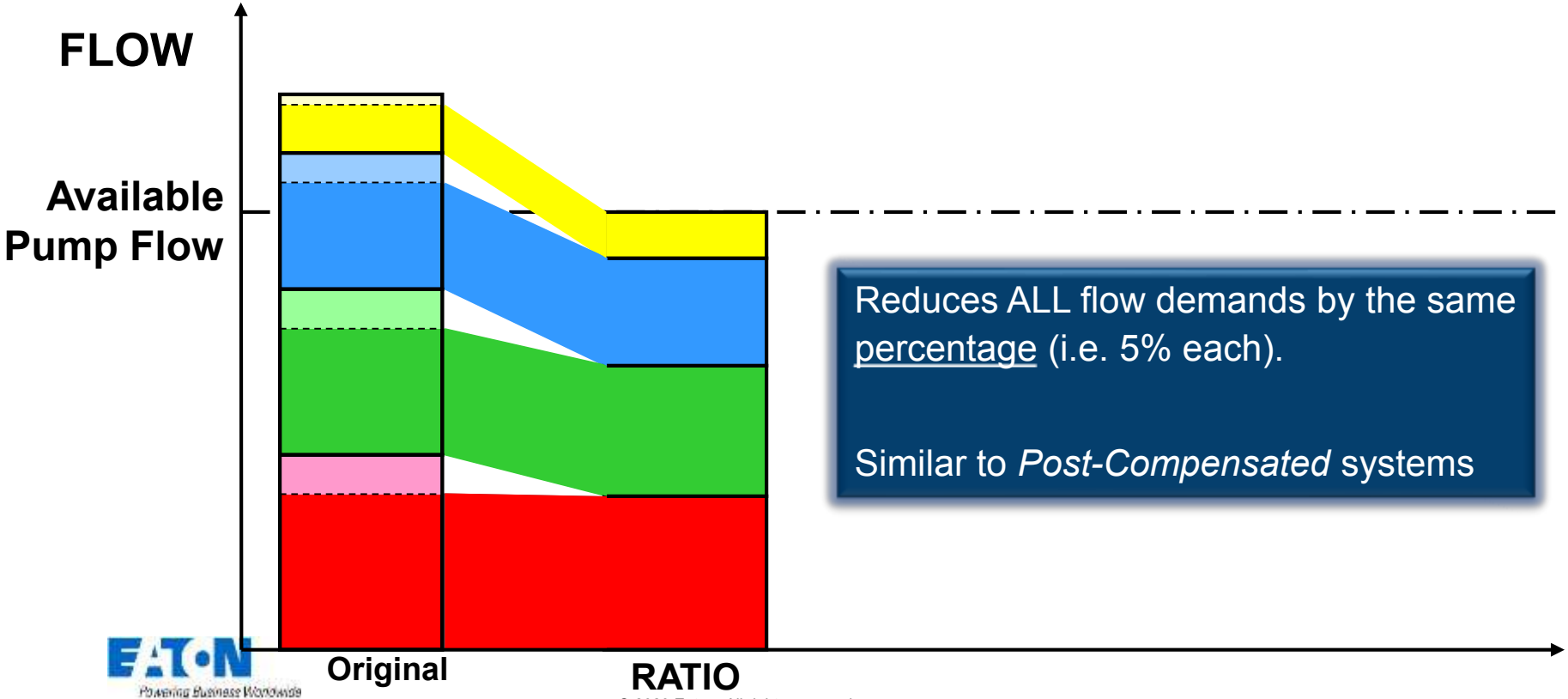
1500 cbar SET TO DEFAULT

OVERRUNNING TO PASSIVE MARGIN

Earlier Later

500 cbar SET TO DEFAULT

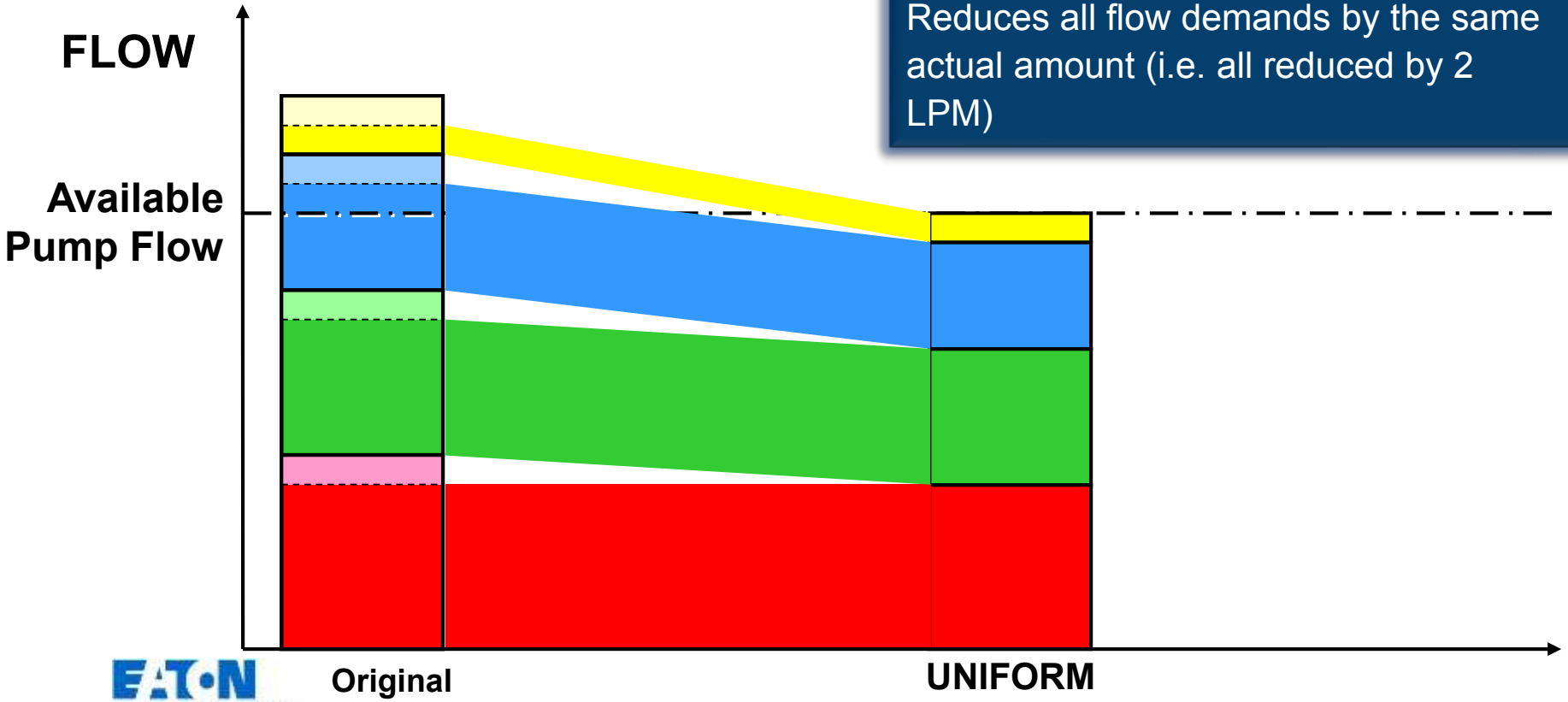
Flow Sharing
Ratio



Reduces ALL flow demands by the same percentage (i.e. 5% each).

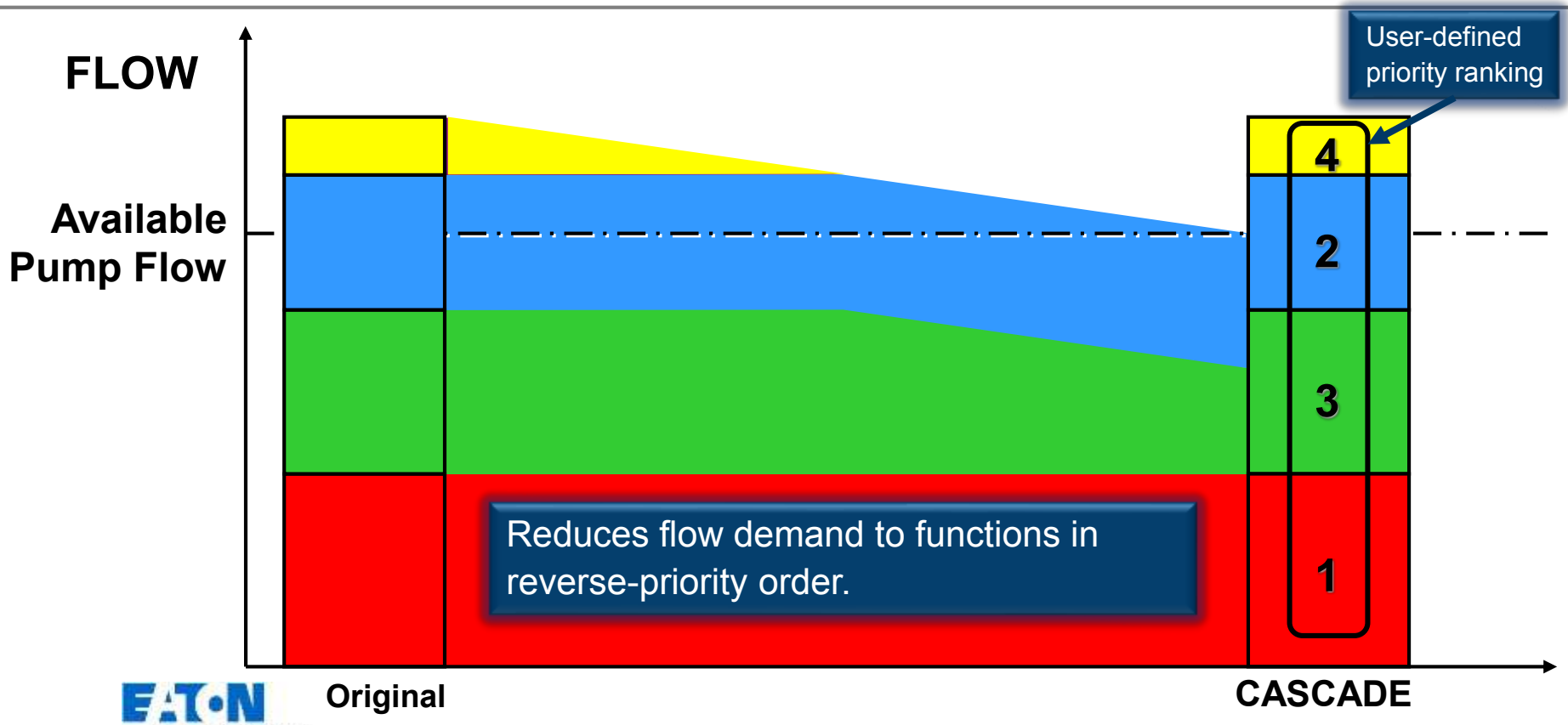
Similar to *Post-Compensated* systems

Flow sharing
Uniform



Reduces all flow demands by the same actual amount (i.e. all reduced by 2 LPM)

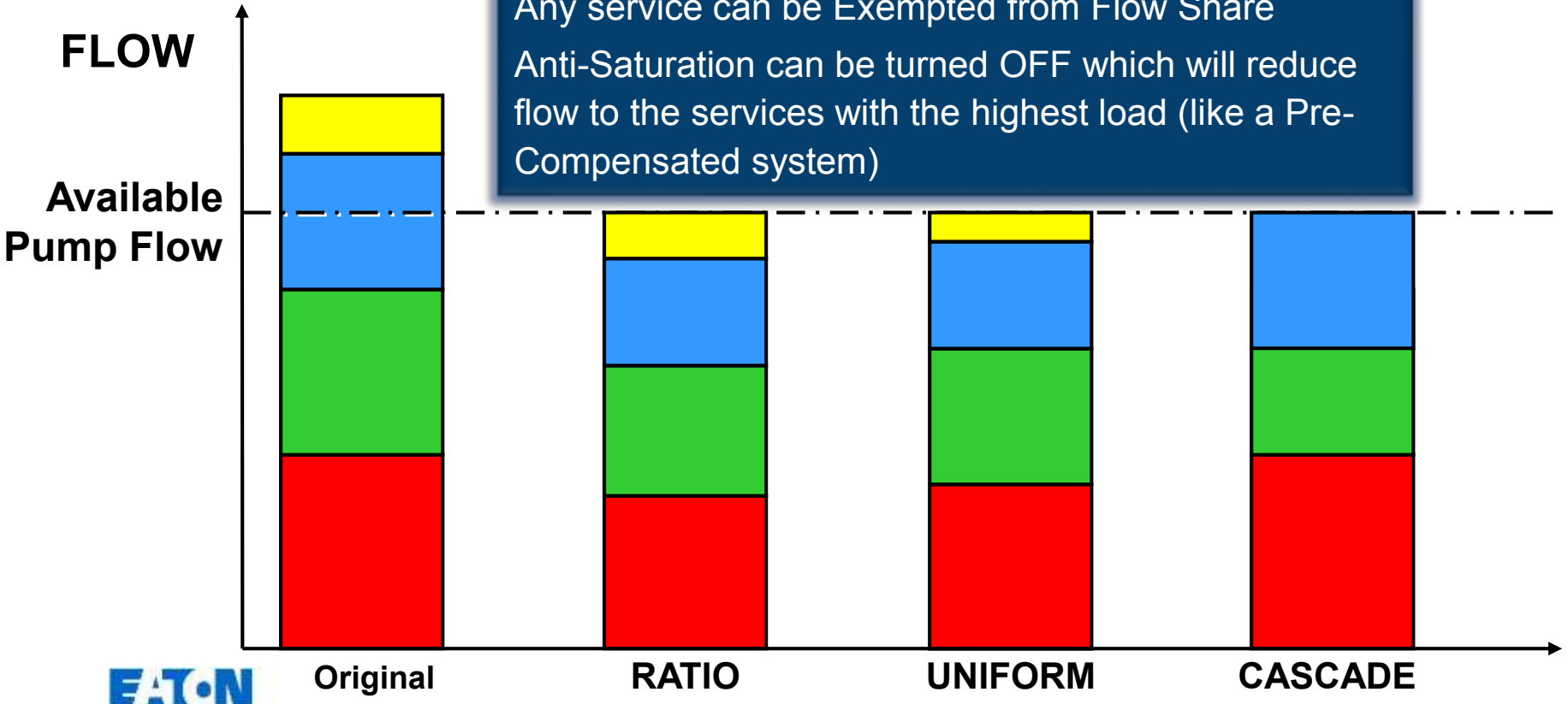
Flow sharing
Cascade



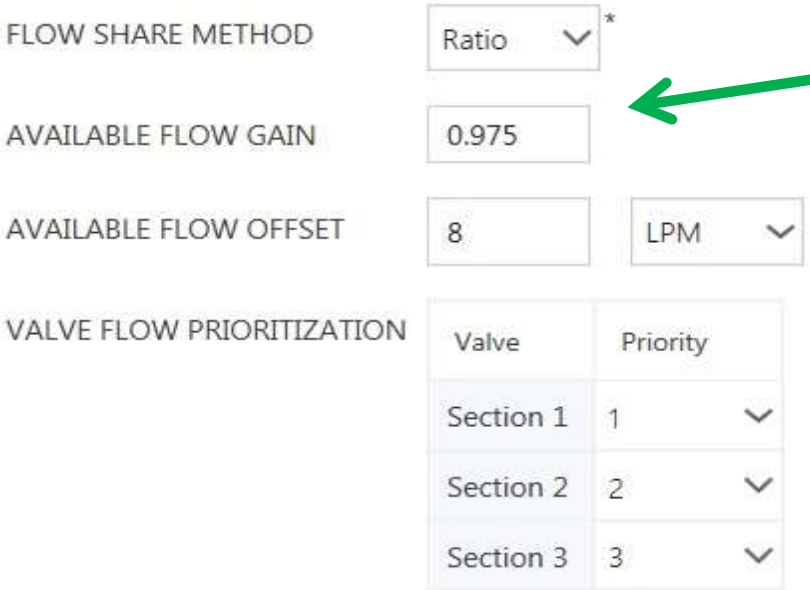
Flow sharing
Summary

Any service can be Exempted from Flow Share

Anti-Saturation can be turned OFF which will reduce flow to the services with the highest load (like a Pre-Compensated system)



Flow Sharing



Multiplier to adjust flow due to inaccuracies

Offset to adjust for flow inaccuracies

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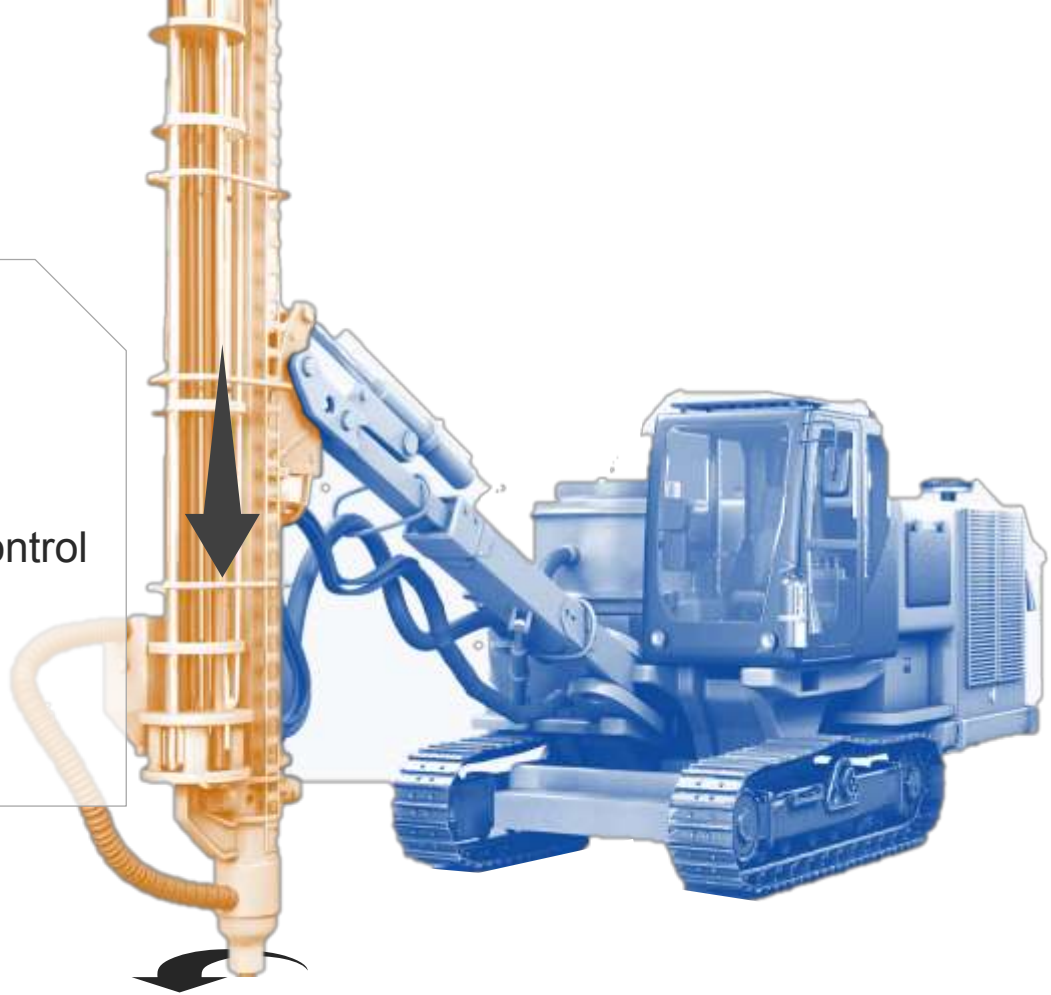
Generic Rotary Drill
Baseline

Current State

- High speed without damage
- Drill rotation, feed, & mud pump
- Pre-Compensated with pressure control
- Duty, density, and location vary
- Rugged and reliable



Generic Rotary Drill
Challenges/Trends

Productivity

- Optimizing Drill Speeds
- Reduce Jamming/Breakage

Complexity

- Simplify System Harnesses
- Closed & Open Circuit Systems

Connectivity

- Productivity & Duty Cycle Information
- Field Diagnostics & Troubleshooting

Generic Rotary Drill
Eaton System Solution

Productivity

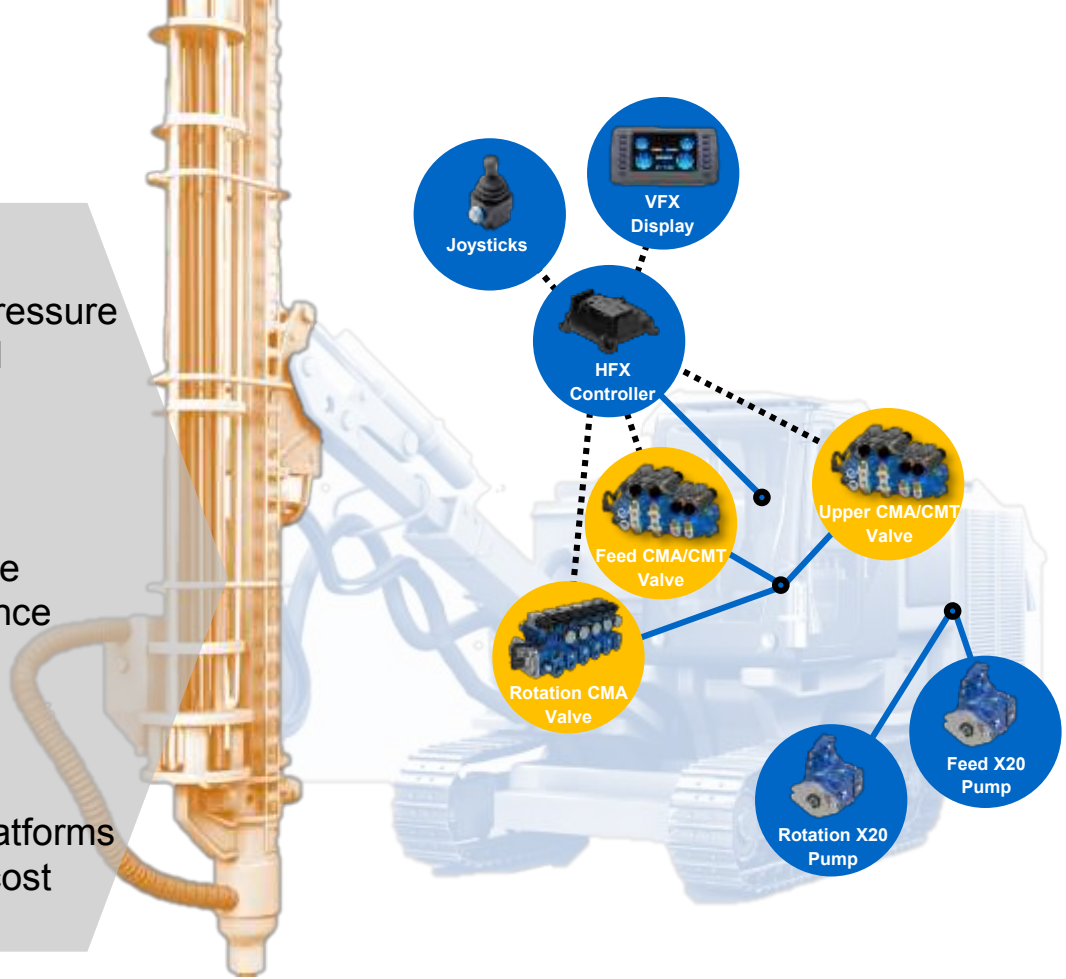
Optimizes drill rotational speed & pressure feed to increase drilling speeds and reduce component failures.

Connectivity

Real-time performance and machine diagnostics for predictive maintenance and operator training.

Streamline

Common valve hardware across platforms and CAN communication reduces cost and field serviceability.



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CMA unique system benefits

Communication
- CAN communication to Machine controller via single node messaging
- CAN-D (Deterministic CAN for highest data integrity and system safety.
- J1939 or CAN Open up to 500kbps
- Strong support to Logset Machines and Cloud IoT sevices.

Efficiency
- Proven energy consumption reduction.
- Reduced current consumption < 9W/section
- Configurable margins per function.
- Overall approximately ~ 10% Savings

Minimized Downtime
- Active Hose Burst detection (minimizes leaks).
- Active Fault Monitoring and four different severity levels
- System/valve Prognostics and Diagnostic capabilities in communication with Machine ECU.
- Limp modes.(strategy/user configurable)
- Automatic Pilot, CV and VSM replacement strategies

Reliability and Serviceability
- Automatic inlet calibration vs. Pump caracteristics (Training)
- Highest Quality Sensors for longest Life Cycle
- Eventual downtime reduced by a true "plug and play" pilot replacement strategy.
- 100% functionality rated for temp range of -40º to +105º C
- Data plotting functionality => 15ms x 10 channels

Controls Flexibility
- Soft Actuation functionality (End Stops/Entries/Landing)
- Mode Change Detection (Passive/Overrunning)
- Regen (positive or negative) Switcheable.
- Fully independant meetered main stage => dual single acting functions.
- Float Mode for Improved Serviceability and Functionality
- Library of pre-developed Control Strategies

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Distributor Case Study

Large drill rig

Challenge

- The distributor supports a customer who has a fleet of large drill rigs in operation around the world.
- Each rig has 43 unique valve sections.
- The customer requires 24 hour availability of spares for each section.

CMA Solution

Traditional valves require unique hardware for each section resulting in an inventory nightmare. Eaton's CMA valve is completely software configurable, making the distributors inventory flexible, reducing working capital, and ensuring availability for their customer.

OEM Case Study

Agricultural Harvester

Challenge

- Meet growing industry trend of telematics and functionality, while trying to find a cost effective solution

CMA Solution

- CAN system greatly reduces the wiring requirements.
- Data feedback to incorporate more telematics and functionality.
- Versatility of the valve
- Build safety and control into the machine via the software.
- Hose burst detection/reaction is valuable in eco-sensitive environments.
- Pressure and position sensing in the valve - provides more precise control of functions like the digger nose depth while operating in varying ground conditions.

OEM Case Study

Marine Steering

Challenge

- Steering system with leading technology and easy set up. Future diagnostics / prognostics

CMA Solution

- Simplify system
- Ease of set up of the system – ProFX Configure / Control

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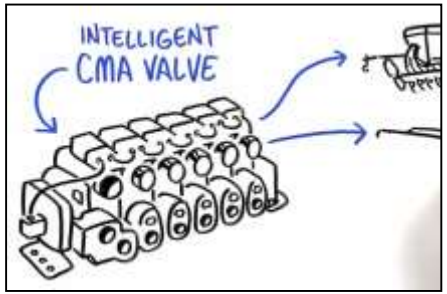
CMA/CMT Resource Center

- ✓ Brochure
- ✓ Technical article
- ✓ Battle card
- ✓ Integrated control applications reference guide
- ✓ Catalog
- ✓ Eaton Tech Talk recording: CMA and CMT

To learn more about the CMA/T mobile valve section, please refer Eaton.com/CMT



Boom Stability Control – Concrete Pump

Link here

Boom Stability Control – Forwarder 1

Link here

Boom Stability Control – Forwarder 2

Link here

Hose Burst Detection

Link here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