CMA200
Advanced
Independent-Metering Mobile Valve

200LPM
440 bar
CAN Bus

Powering Business Worldwide

Contents

Introduction

The CMA200 is an advanced CAN-Enabled electro-hydraulic sectional mobile valve with independent metering that utilizes pressure and position sensors, on board electronics, and advanced software control algorithms. Where conventional mobile valves often compromise on precision or response, the CMA delivers both. The CMA offers high performance with sub micron hysteresis, closed loop control over the spool position, and repeatable performance.

CMA offers customers the next generation in advanced mobile valves with unlimited possibilities to differentiate your machine capabilities.

Key Benefits of this advanced mobile valve include:

- Precise control maintained for all load conditions
- Reduction in metering losses / energy management
- High valve responsiveness
- Flow Sharing – Pre and Post Comp Capabilities
- Flexibility in configuration / easily change parameters
- Command factory-calibrated flow or pressure from either work port
- Easier communication with the valve
- Reduced load on the Vehicle CAN bus
- Advanced Diagnostics for improved reliability and productivity
  - Hose Burst Detection
  - Limp mode
  - Diagnostics on the inlet, tank, load sense, work port pressures, spool position, consumed flow, and oil temperature.
- Platform can support future software development for future product development.
- Reliable performance across a broad temperature range

CMA200 Specifications and Performance

Pressures	
Inlet Rated and Work Port	380 bar (5511 psi)
Inlet Max and Work Port	440 bar (6382 psi)
Tank*	Max 30 bar (435 psi)

Flow	
Work Port (max with high flow spools, measured with internal pressure sensors)	200 lpm (53 gpm) @ 16 bar Δ P
Max inlet flow when two sections are fully open.	400 lpm (106 gpm) @ 35 bar P-T

Leakage**	
Max Leakage without Work Port Valves	30 cc @100 bar @ 21 cst
Max Leakage with Work Port Valves	40 cc @100 bar @ 21 cst

Construction	
Sectional	Up to 8 sections per block
	Up to 15 sections per VSM

Port Types	
SAE	P1 & P2 = 1 1/16"-12 UN (SAE-12), T = 1 5/16"- 12 UN (SAE-16), LS = 7/16"-20 UNF (SAE-04), A&B = 3/4"-16 UNF (SAE-08) OR 7/8"-14 UNF (SAE-10) OR 1 1/16"-12 UN (SAE-12)
BSP	P1 & P2=G 3/4, T=G 1, LS=G 1/4, A&B = G 1/2 OR G 3/4

Inlet section options	
	Variable Displacement (Load Sensing)
	Fixed Displacement

Work section options	
Low Flow Spools	100 lpm (26 gpm)
High Flow Spools	200 lpm (53 gpm)
Work Port Valves	Anti-Cavitation Port Relief & Anti-Caviation Port Relief

Compensation type	
Digital	On meter-in and meter-out

Actuation	
Primary	CAN
Emergency	Mechanical Override

Control modes	
	Flow
	Pressure
	Spool Position
	Float

Temperatures	
Ambient (operating)	-40°C to 105°C
Standard Oil (operating)*****	-40°C to 85°C
Extended Oil (operating)	-20°C to 105°C
Storage	-40°C to 105°C

Filtration	
ISO 4406	18/16/13
Pressure Reducing Valve	75 micron
Pilot Valve	100 micron

Electromagnetic protection	
EMC Directive 2014/30/EC ***	
Earth Moving	ISO 13766: 2006
Construction	EN 13309: 2010
Agriculture	ISO 14982:2009

Electrical environmental****	
Ingress Protection	IP67
Thermal Cycling	-40C to 105C for 1000 cycles
Mechanical Shock	50G ½ sine wave, 11ms pulse
Random Vibration	
Method	MIL STD 202G, Method 214-1
Limits	Test Condition A
Duration	8 hrs/axis
# Of Axis	3 separately
Profile	Reference Appendix

Oil Temperature viscosity	
Recommended Viscosity	85 to 10 cSt
Absolute Maximum Viscosity	2250 cSt
Absolute Minimum Viscosity	7 cSt

Electrical	
Input Voltage	9 - 32 VDC
Power Consumption Range	Reference Appendix
CAN Interface	J1939 2.0B, CAN Open

Electrical interface connectors	
Deutsch (VSM)	DT06-12SB-P012
Deutsch (VSE)	DT06-12SA-P012

Dynamic performance	
Loop Time for Internal CAN	3ms
Typical Step Response	24 ms @ 15 cSt
Typical Frequency Response	17.5 Hz @ 15 cSt

*With manual override, tank limited to 10 bar (145 psi) maximum. Max 30 bar is at constant rate.

**Data taken from work port to tank and supply

***Electronics are designed to power down and recover automatically under various power conditions (ie.. Load Dump, Ignition Cranking, Disconnection of Inductive Loads). CE testing with J1939 at 250 kb/s

****Additional Electrical Environmental tests were performed. Contact Eaton for additional details, if desired.

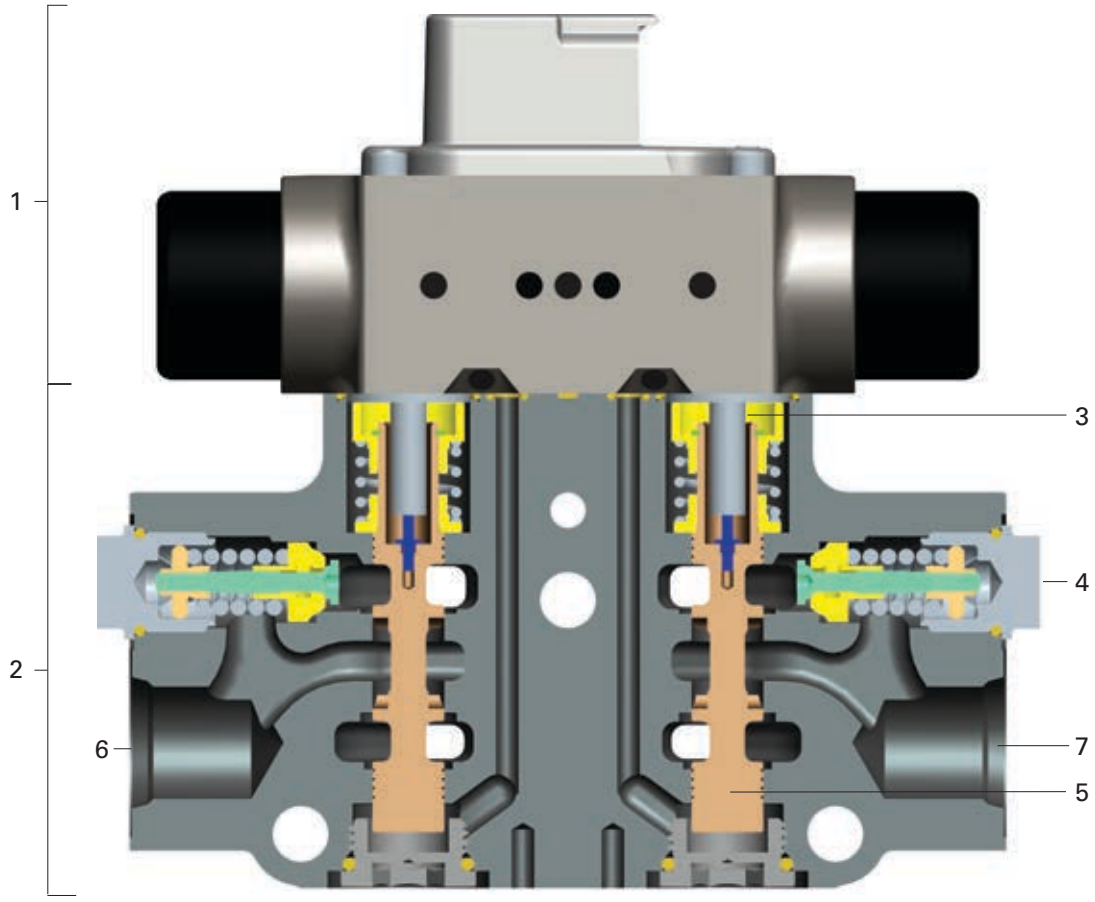
*****It is recommended that the CMA valves not be subjected to a thermal difference of greater than 50°F (28°C).

CMA200 Advanced Sectional Mobile Valves

Cross Sections

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



Principles of Operation

The work section is comprised of two independent spools that act as a pair working to control double acting services, or alternatively as single spools controlling a single acting service (2 single axis services can be controlled from any work section).

Demands to each work section are transmitted over a CAN Bus and power is provided to each work section via a single daisy chain cable arrangement. Each work section has a single pilot valve comprised of on-board electronics, embedded sensors, and two independent 3 position 4 way pilot spools driven by a low power embedded micro controller.

The independent pilot spools control the mainstage spools. Closed loop control of each work section is done locally by leveraging the on-board electronics and sensors.

Each mainstage spool has its own position sensor enabling closed loop position control of the mainstage spool.

Further, a pressure sensor is located in each work port, pressure line and tank line.

With the up and downstream pressure information known at any time, flow delivered to the service can be controlled by moving the spools to create the appropriate orifice area for the desired flow rate.

Figure 1: CMA system with Load-Sensing Inlet & a single work-section

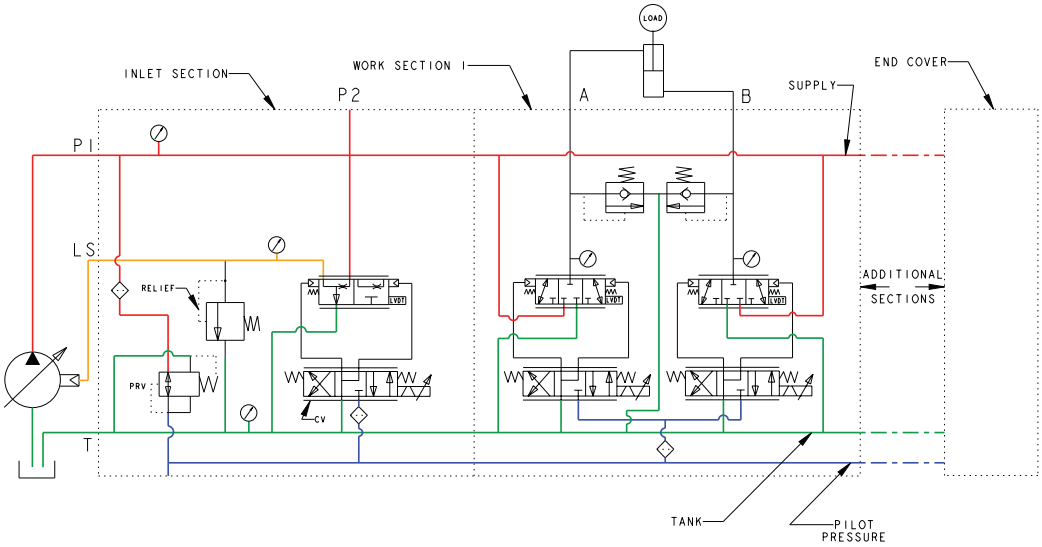


Figure 2: CMA system with Fixed Displacement Inlet & a single work-section

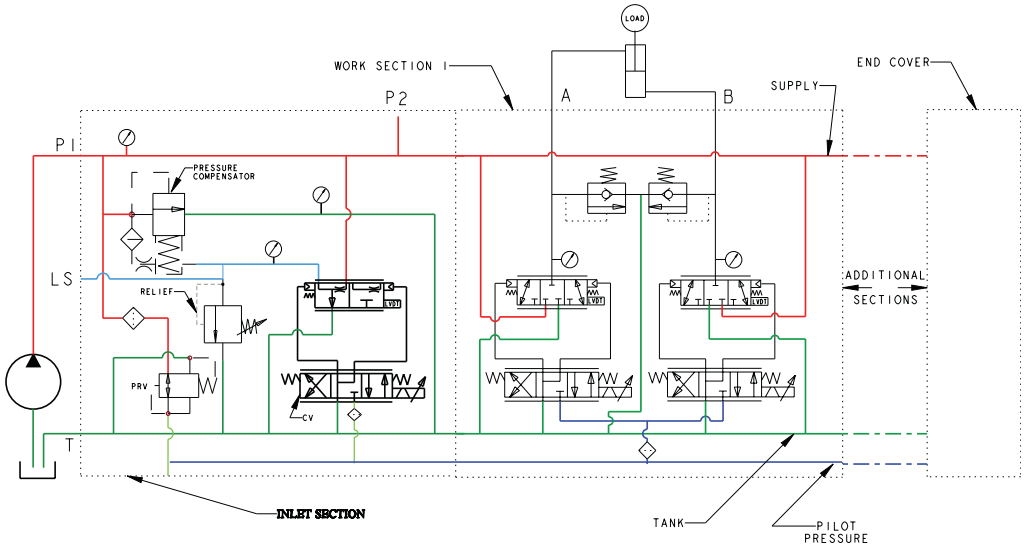
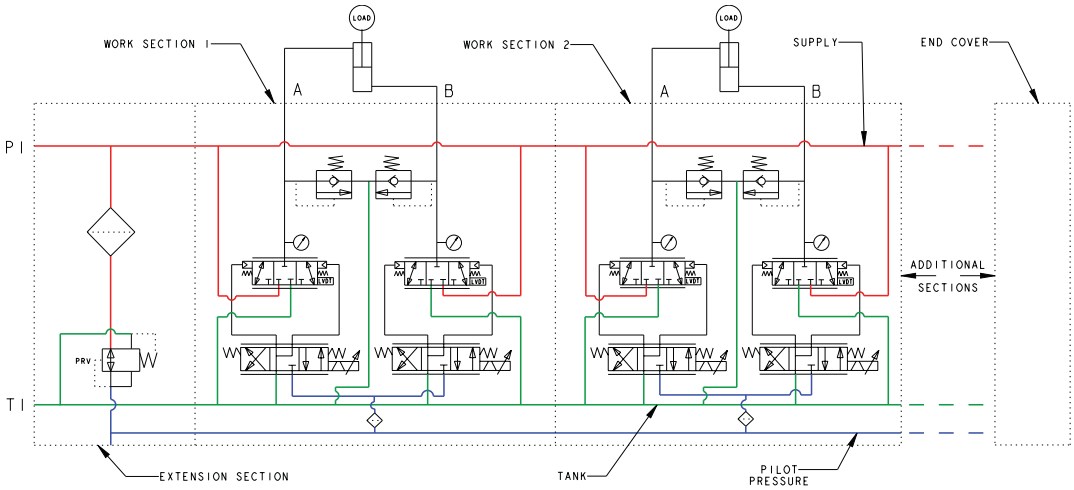


Figure 3: Extension Inlet



CMA Wiring Harness Details

There are multiple interconnection options for the CMA200 valve systems.

The following illustrates possible system configuration options. Configuration is dependent on application requirement and is constrained by the following rules:

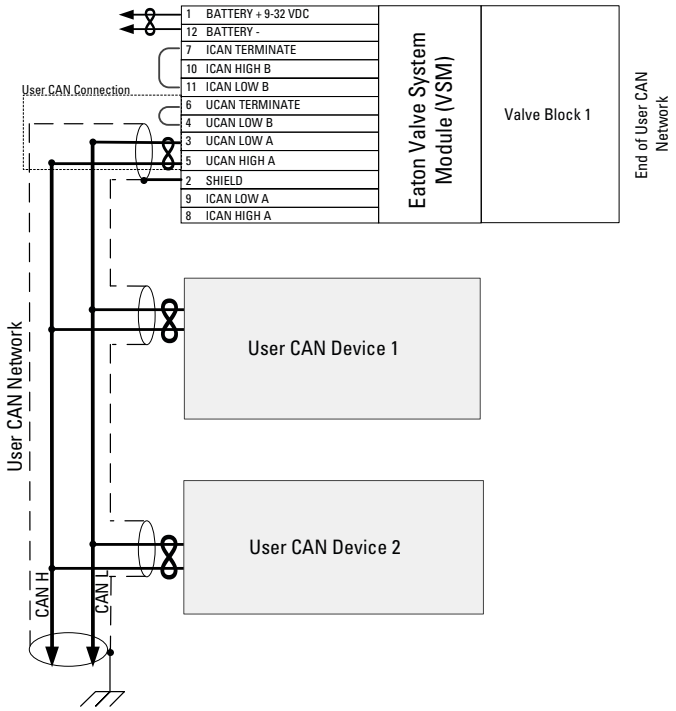
- Sectional construction with up to 8 sections per bank
- Maximum 15 sections per Valve System Module (VSM)
- One VSM and CV required per system
- If distance between an extension valve bank and the VSM or VSE is less than 6 meters, they can be connected using a daisy chain extension cable. See options on page 12
- If distance between valve banks is greater than 6 meters, they must be connected using a VSE and external wiring harness. Max distance between a VSM and VSE is 30 meters. See page Total Interconnect CAN(ICAN) Wiring Lengths
- No more than two (2) valve system extenders (VSE) per system
- If more than 15 work sections are required, this can by accomplished by using additional CMA systems and their corresponding VSM. Additional VSMs will appear as another Node on the User CAN Network.
- If application specific Electromagnetic Compatibility testing indicates CAN cable shielding is needed, connect CAN shield as shown

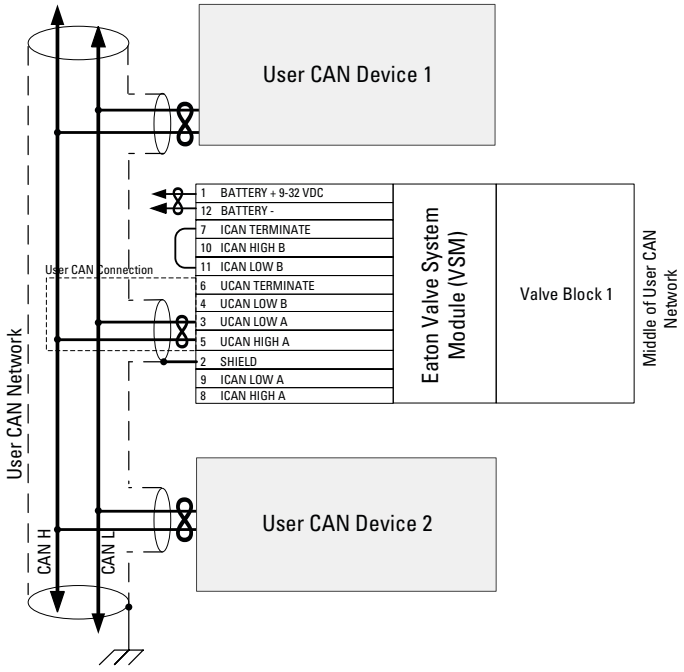
User Cables Termination

User CAN, or UCAN, is the machine's CAN network that communicates with the VSM.

If the VSM is at the end of the UCAN network, a 120 ohm termination resistor built into the VSM can be used to terminate the UCAN with the installation of a wire jumper, as shown in the left figure below.

If the VSM is in the middle of the bus, no UCAN termination is necessary. The UCAN lines to the VSM must be a stub off of the main CAN harness, as shown in the right figure below.

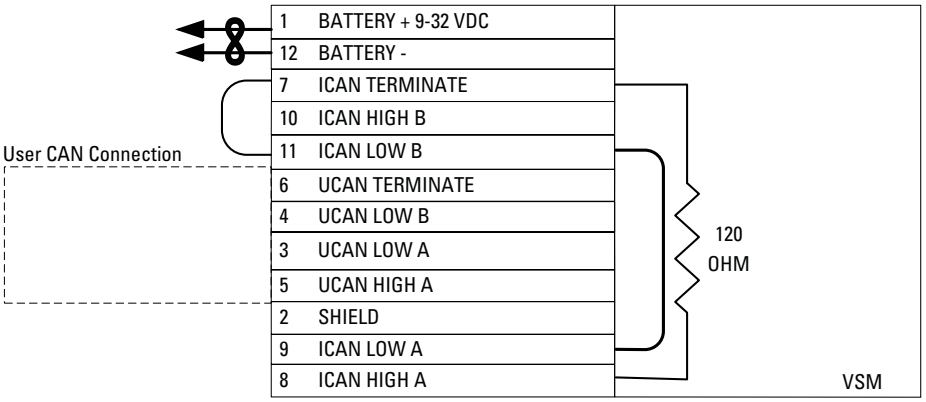




Note: Symbol 8 is used to represent twisted pair wires. If application specific Electromagnetic Compatibility testing indicates CAN cable shielding is needed, connect CAN shield as shown.

CMA Wiring Harness Details

Single block system

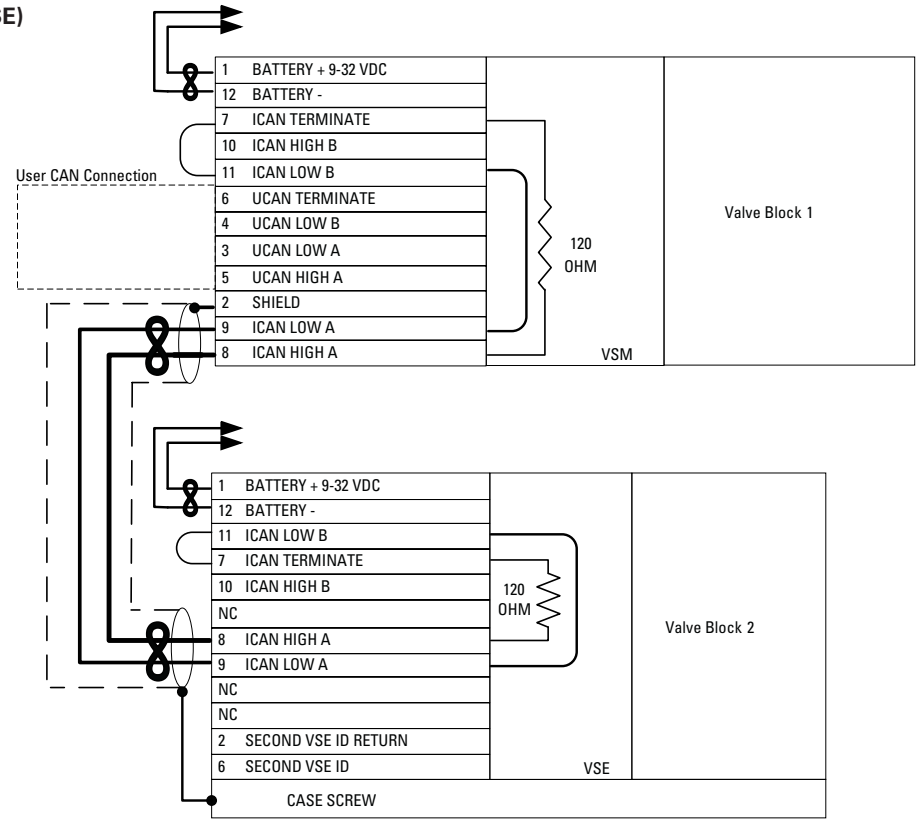


Interconnect CAN Termination

Interconnect CAN, or ICAN, is the CAN network between the VSM and VSE's.

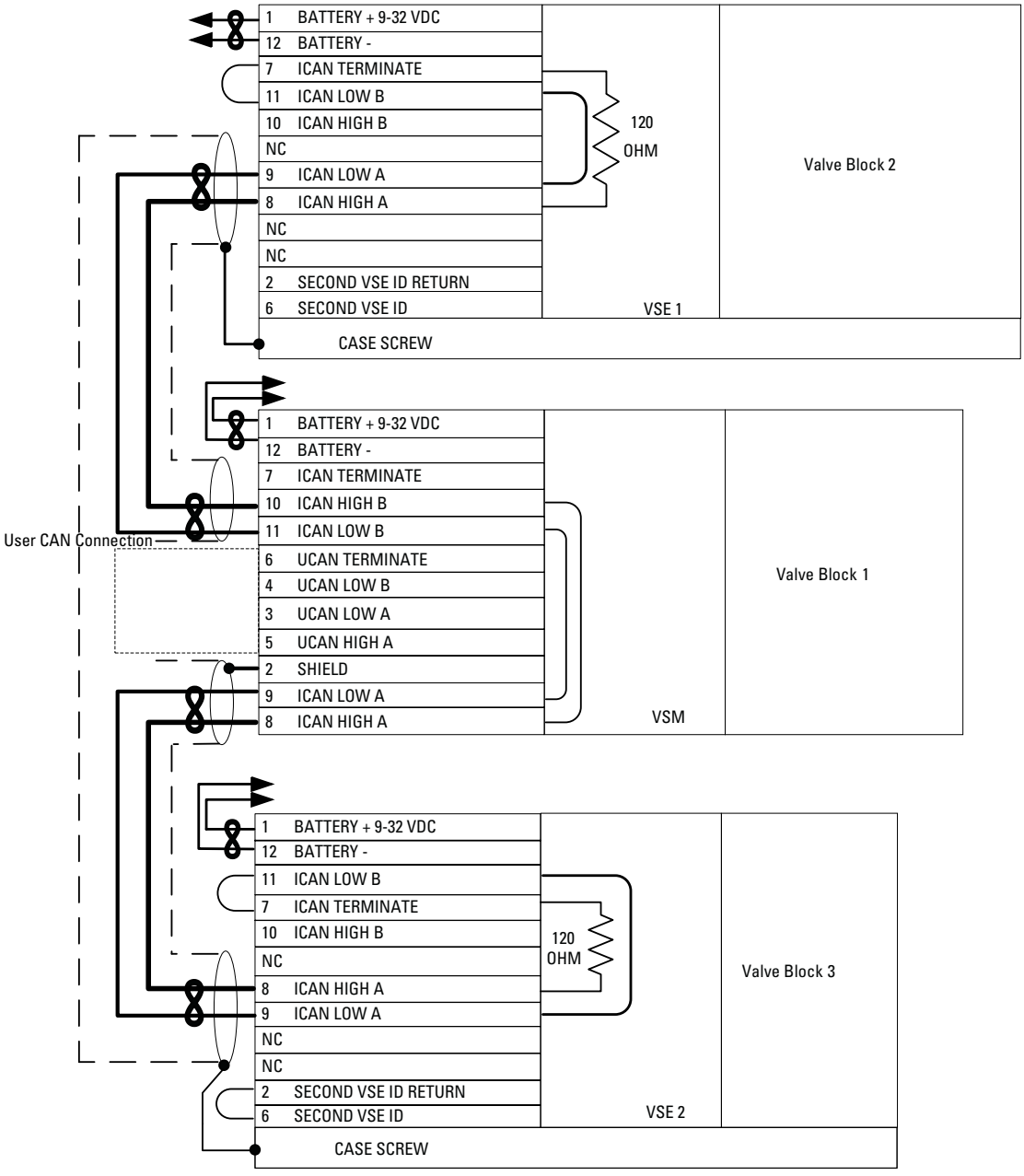
120 ohm termination resistors in the VSM and VSE's circuits can be connected with the installation of wire jumpers each device. Two sets of ICAN pins are available in a VSM or VSE to allow daisy chaining ICAN if a VSM/VSE is in the middle of the CMA system. If no VSE's exist in a system, it is still necessary to install a jumper to activate one 120 ohm termination resistor on the ICAN bus.

Double block system with valve system extender (VSE)



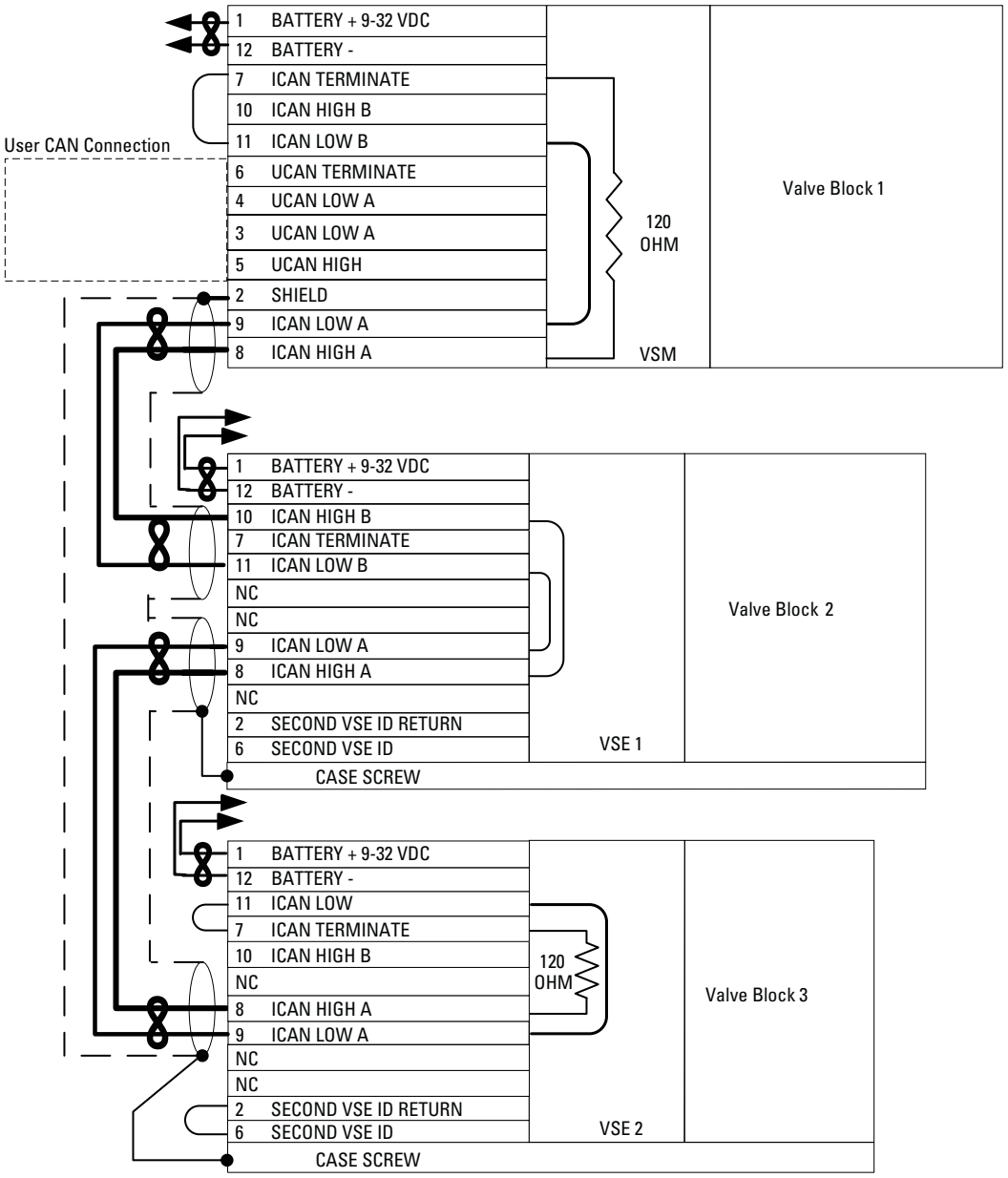
CMA Wiring Harness Details

Triple block system with VSM between VSEs



CMA Wiring Harness Details

Triple valve block system with VSM at the start of the system



Work Section Options – Software Versions

A - Standard software control features

Software	Description
Pressure compensated flow control	Load-independent flow control
Flow compensated pressure control	Single service pressure control while either sinking or sourcing flow.
Intelli float	Lowers the load at a configurable rate and then enters full float mode
Standard ratio flow share (with priority capability)	Pre or post comp capabilities in one valve block. All service flow demands are reduced by the same ratio. Can also exempt services from flow-sharing to maintain priority. This feature prevents the pump from saturating when flow demands to the valve sum to be larger than the pump can provide.
Intelligent twin spool flow control (IFC)	Versatile flow controller which maintains the desired flow independent of transitions between passive and overrunning loads
Load damping	A feature of IFC and UFC which reduces service oscillation induced by moving large structures, such as a boom.
Electronic load sense enabled	Enables operation with a compatible pump or when multiple CMA systems are present on the same CAN network
Electronic work port relief valve	Configurable electronically controlled relief valve against externally applied loads
Electronic work port pressure limit (feed reducer)	Configurable electronically controlled pressure limit applied to user flow demands without consuming additional pump flow
Single spool flow control	Sink or source flow on individual service ports
Single spool position control	Direct spool position control on each spool
Smart Data	Diagnostics on all on-board sensors. Inlet, Tank, LS, Work Port pressures, Spool Positions, oil temperature sensor data availability.

U – Advanced control package

Software	Description
Torque Control	Advanced force or torque control for double-acting cylinders or motors
Data control package	Broadcast of each spool's flow consumption
Cascade and Uniform Flow Share	Cascade: maintains demanded flow to selected high priority services by reducing flow to lowest priority services
	Uniform: All flow demands are reduced by the same absolute amount (i.e. all reduced by 1 lpm)

V – Advanced service package

Software	Description
Hose burst detection	Prevents major oil spill events by monitoring flow consumption on each service and closing the spools for that circuit if a major leak is detected
Limp mode	If a sensor fails, the valve will continue to work with reduced performance until the machine can be serviced

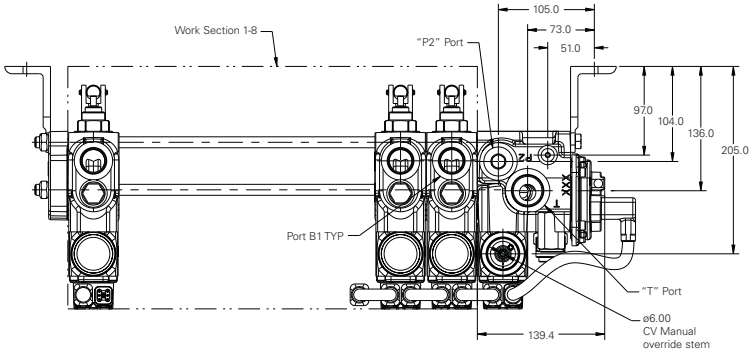
T – All Packages

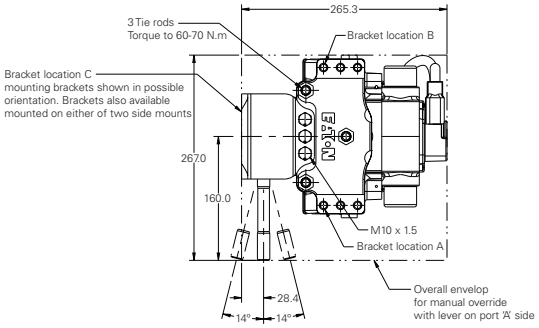
Includes Standard, Advanced Control, and Advanced Service packages

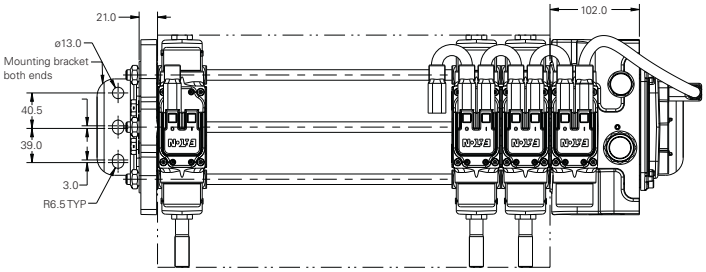
CMA200 Advanced Sectional Mobile Valve

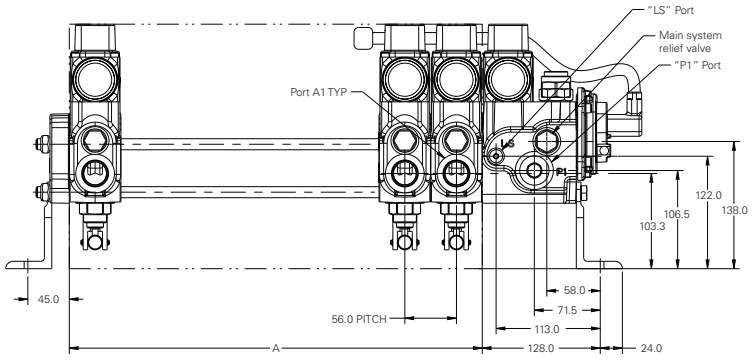
CMA200 Installation Views: 8 Section Inlet Block With Manual Override

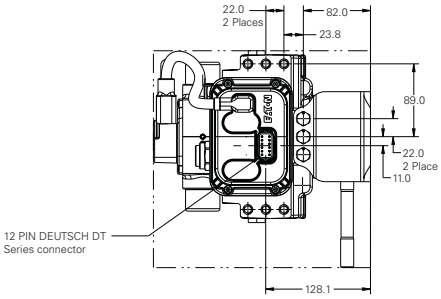
Units: mm











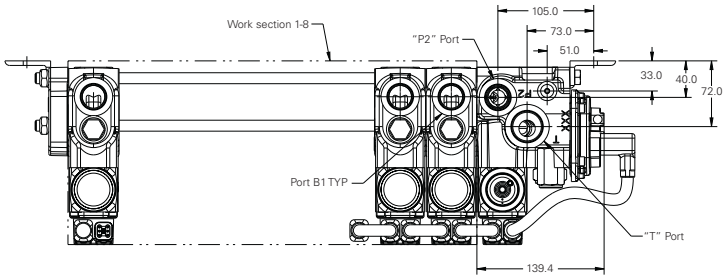
Number of sections

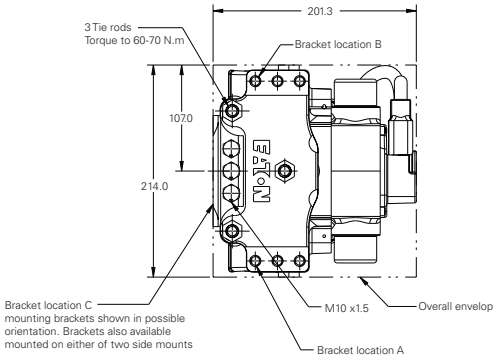
Dimension	/1	/2	/3	/4	/5	/6	/7	/8
A (mm)	56.0	112.0	168.0	224.0	280.0	336.0	392.0	448.0
Weights (kg)	26.5	34.6	42.8	50.9	59.1	67.3	75.4	83.6

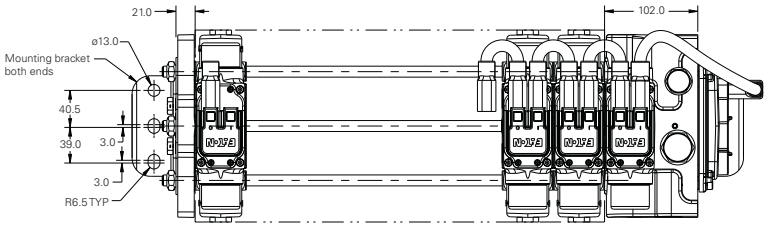
CMA200 Advanced Sectional Mobile Valve

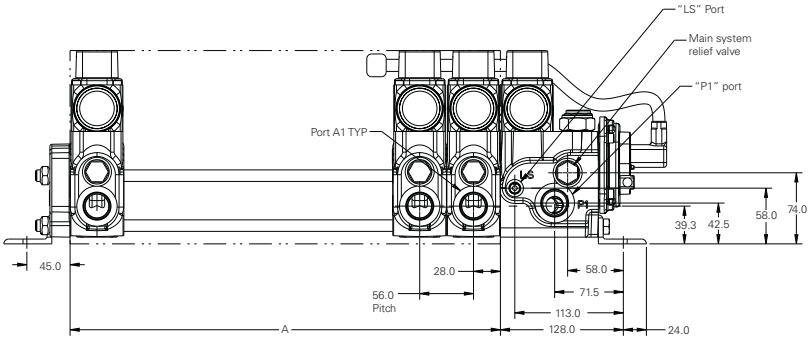
CMA200 Installation Views: 8 Section Inlet Block Without Manual Override

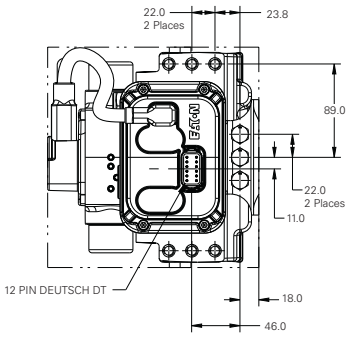
Units: mm











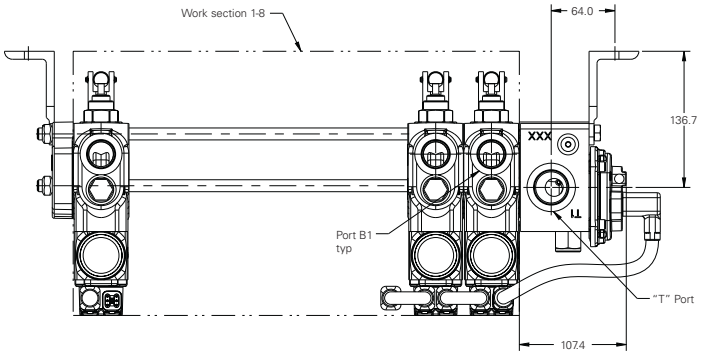
Number of sections

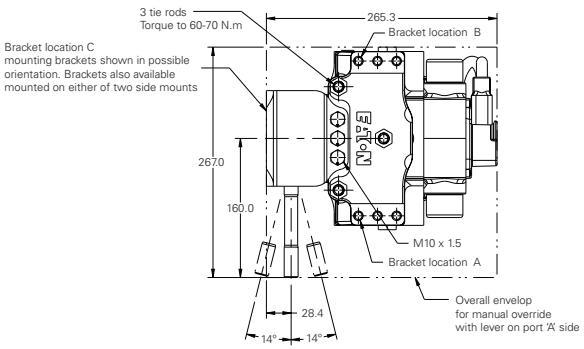
Dimension	/1	/2	/3	/4	/5	/6	/7	/8
A (mm)	56.0	112.0	168.0	224.0	280.0	336.0	392.0	448.0
Weights (kg)	24.7	32.3	39.8	47.3	54.8	62.3	69.8	77.4

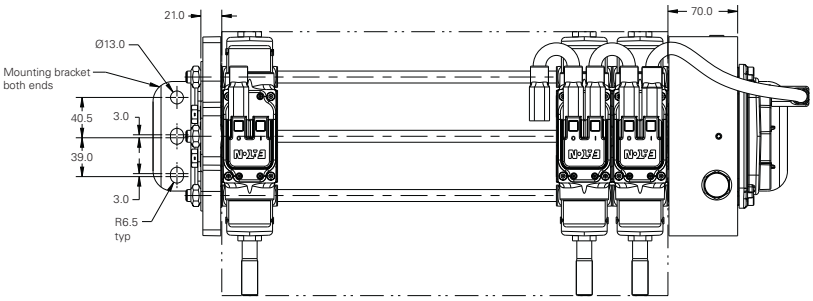
CMA200 Advanced Sectional Mobile Valve

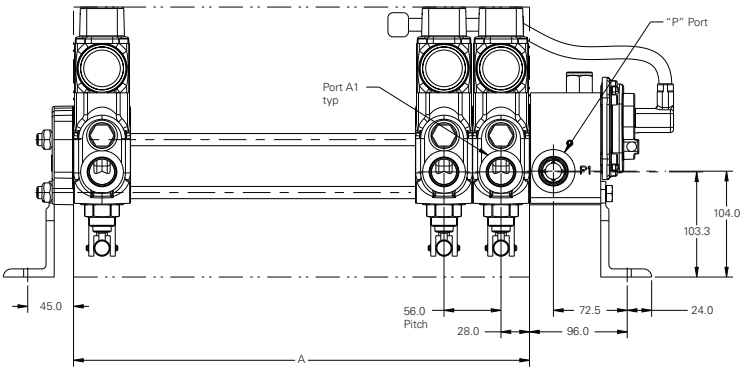
CMA200 Installation Views: 8 Section Extension Block With Manual Override

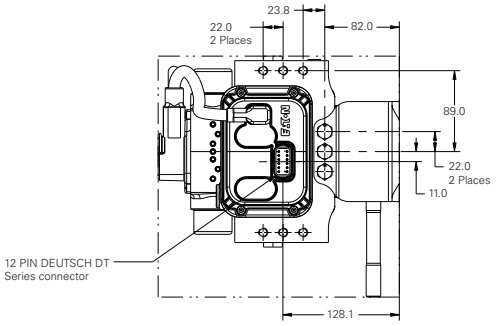
Units: mm











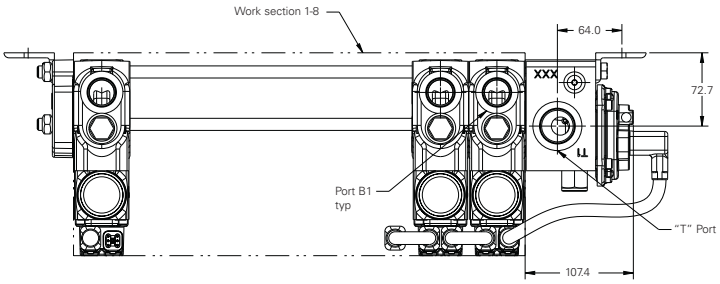
Number of sections

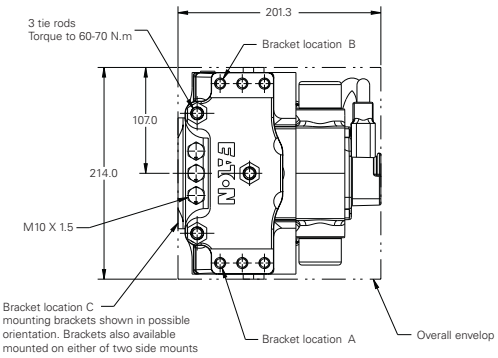
Dimension	/1	/2	/3	/4	/5	/6	/7	/8
A (mm)	56.0	112.0	168.0	224.0	280.0	336.0	392.0	448.0
Weights (kg)	24.3	32.4	40.6	48.7	56.9	65.1	73.2	81.4

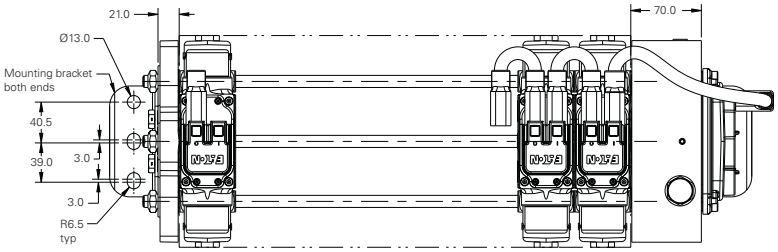
CMA200 Advanced Sectional Mobile Valve

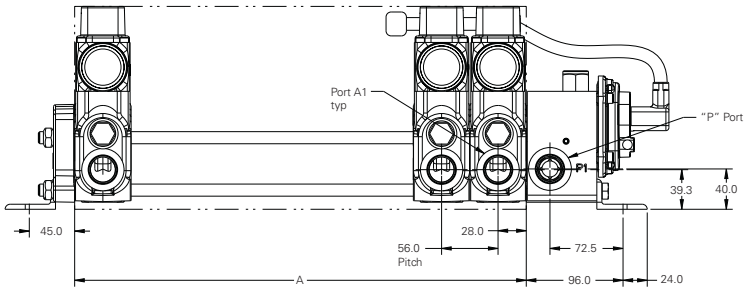
CMA200 Installation Views: 8 Section Extension Block Without Manual Override

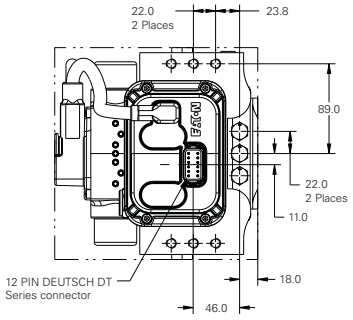
Units: mm











Number of sections

Dimension	/1	/2	/3	/4	/5	/6	/7	/8
A (mm)	56.0	112.0	168.0	224.0	280.0	336.0	392.0	448.0
Weights (kg)	22.5	30.1	37.6	45.1	52.6	60.1	67.6	75.1

Model Code For Inlet Section

CMA200 * * * * * * *** * * ** *** **

1 2 3 4 5 6 7 8 9 10 11 12 13

1 CMA200 Series

2 Communication Protocol
- J J1939
- C CAN OPEN
- 0 None

3 Interface Module
- M VSM
- E VSE
- 0 None

4 Port Types
- S SAE P1 = 1 1/16"-12 UN (SAE-12)
  P2 = 1 1/16"-12 UN (SAE-12)
  T = 1 5/16"- 12 UN (SAE-16)
  LS = 7/16"-20 UNF (SAE-04)
- B BSP P1= G 3/4
  P2= G 3/4
  T = G 1
  LS= G 1/4

5 Inlet Pressure Controller
- V Variable Displacement
- F Fixed Displacement
- 0 none, Used on VSE or extension block

6 Active Pressure Port
- 1 P1
- 3 P1 & P2

7 Manual Override
- 0 None
- M Manual Override on CV

8 Main Relief Setting (In bar)

000 = None

155	293
172	310
190	328
207	345
224	362
241	379
259	397
276	414

9 Paint Type
- K Std. Flat Black

10 Seals
- 1 Default

11 Special Features
- 00 None

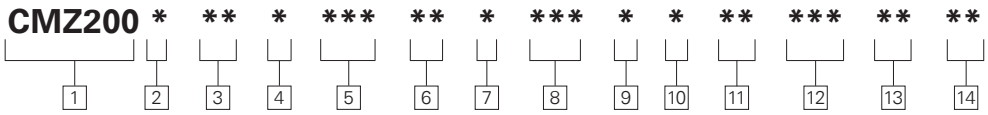
12 Software Version
- XXA Standard Software

13 Design Code
- 10 Design Code

Note: A pressure limit can be set on the valve in software to any value in increments of 0.01 bar using available configuration software suite. This applies to both inlet and work port settings.

Note: No relief valve is available for extension inlets.

Model Code – Work Section



1 CMZ200 Series

2 Body Port Thread Sizes
- A 3/4" 16 UNF (SAE-8)
- B 7/8" 14 UNF (SAE-10)
- C 1-1/16" 12 UN (SAE-12)
- D G 1/2"
- E G 3/4"

3 Spool Type at Position A
- HC 200 lpm, biased to center
- HT 200 lpm, biased to tank
- HP 200 lpm, biased to pressure
- LC 100 lpm, biased to center
- LT 100 lpm, biased to tank
- LP 100 lpm, biased to pressure

4 Valve Option at A
- 0 None
- B Anti-cavitation valve with relief valve
- C Anti-cavitation valve
- S Relief valve

5 Relief Setting at Position A

RV Setting in Bar

000 = None

155	293
172	310
190	328
207	345
224	362
241	379
259	397
276	414

6 Spool Type at Position B
- HC 200 lpm, biased to center
- HT 200 lpm, biased to tank
- HP 200 lpm, biased to pressure
- LC 100 lpm, biased to center
- LT 100 lpm, biased to tank
- LP 100 lpm, biased to pressure

7 Valve Option at B
- 0 None
- B Anti-cavitation valve with relief valve
- C Anti-cavitation valve
- S Relief valve

8 Relief Setting at Position B

RV Setting in Bar

000 = None

155	293
172	310
190	328
207	345
224	362
241	379
259	397
276	414

9 Manual Override Type
- 0 None
- A Lever-handle toward port A
- B Lever-handle toward port B

10 Paint Type
- K Std. Flat Black

11 Seal
- 1 Default (NBR)

12 Special Features
- 00 None

13 Software Version
- XXA Standard Software
- XXU Advanced Control Package
- XXV Advanced Service Package
- XXT All Packages (Standard plus all Advanced Packages)

14 Design Code
- 10 Design Code

Note: A pressure limit can be set on the valve in software to any value in increments of 0.01 bar using available configuration software suite. This applies to both inlet and work port settings.

Note: If an option without a relief is selected for port A or B, no relief valve setting should be selected in corresponding Relief Setting position (i.e., select 000). Likewise, when selecting a valve option with a relief, make sure to select a corresponding relief setting.

Note: High flow or low flow spools must be selected for both work ports. They cannot be mixed (i.e. a high flow spool on work port A and low flow spool on work port B).

Notes

Eaton
Hydraulics Group USA
14615 Lone Oak Road
Eden Prairie, MN 55344
USA
Tel: 952-937-9800
Fax: 952-294-7722
www.eaton.com/hydraulics

Eaton
Hydraulics Group Europe
Route de la Longeraie 7
1110 Morges
Switzerland
Tel: +41 (0) 21 811 4600
Fax: +41 (0) 21 811 4601

Eaton
Hydraulics Group Asia Pacific
Eaton Building
No.7 Lane 280 Linhong Road
Changning District,
Shanghai 200335
China
Tel: (+86 21) 5200 0099
Fax: (+86 21) 2230 7240

Powering Business Worldwide

Printed in USA
Document No. E-VLMB-BB002-E1
September 2016