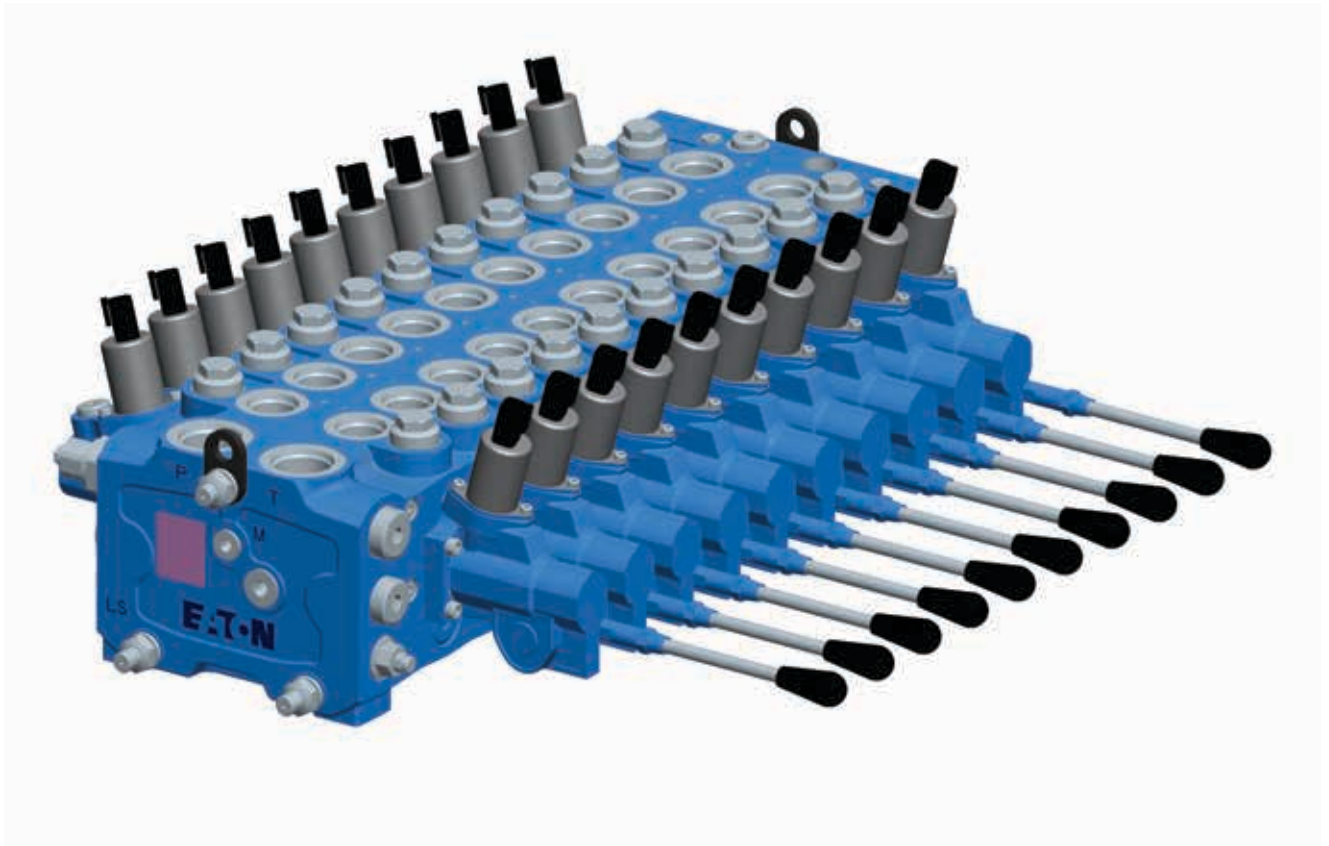


## Mobile Valves

Proportional - Load sensing  
Model CLS180

350 bar  
180 L/min

Up to 10 sections  
Eaton Pro-FX™ Ready



*Powering Business Worldwide*

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# Eaton's CLS Load Sense Sectional Mobile Valve

Eaton's new CLS180 load sensing sectional mobile valve is a post compensated valve with a highly versatile design. This modularity is demonstrated through the availability of valve banks with up to 10 sections, a number of spool types and actuation options, mid-inlets, custom inlet manifolds and transition plates. With this flexibility, you can design your valve to meet the requirements of your machine.

Improve your machine performance with the newest load sensing valve to market, Eaton's CLS180.

## Features and benefits

- Load sense circuit design is a parallel circuit with closed center spools. Available with inlet options to support both fixed and variable displacement pumps
- Flexible design with up to 10 sections
- Electro-proportional spool control achieved through a PWM proportional pressure reducing solenoid valve controlling pilot pressure to spool ends to maintain spool position
- Optional manual, hydraulic and electrohydraulic controls with lever overrides
- Special features available for additional design flexibility:
  - Local load sense relief on sections
  - Adjustable spool stroke limiting device
  - Parallel connection of multiple valve banks
  - Work port relief with or without anti cavitation

## Typical applications

- Excavator – multiple sizes
- Forestry
- Refuse trucks
- Forklift
- Agricultural machinery
- Truck mounted cranes
- Marine



# Specifications and performance

## CLS180 Load Sense Sectional Mobile Valve

Rated pressure	Inlet	350 bar (5076 psi)
	Work port	350 bar (5076 psi)
	Tank port	10 bar (145 psi)
	Pilot Drain Port (D1/D2)	5 bar (73 psi)
Rated inlet flow		220 lpm (58.1 gpm)
Rated workport flow		180 lpm (47.6 gpm) @ 17 bar at differential pressure
Fluid cleanliness and viscosity		See Hydraulic Fluid Recommendations Bulletin 03-401
Ambient operating temperature range		-40°C / 60°C (-40°F / 140°F)
Oil temperature operating range		-25°C / 80°C (-13°F / 176°F)
Construction		Sectional
Work sections		1-10
Maximum leakage, cylinder workport to tank		12 cc per minute at 100 bar (1450 psi)
Port types	Inlet and Tank	SAE-16 or BSP G1
	Work ports A and B	SAE-12 or BSP G3/4
	Inlet Pr Gauge port "M",	SAE-6 or BSP G1/4
	LS port and Drain port	SAE-6 or BSP G1/4
	Hydraulic Pilot	SAE-6 or BSP G1/4
	Pneumatic Port	NPT 1/8" or BSP G1/8
Work section options	Spools	Double Acting (4 way) Cylinder Bi-Directional (4 way) Motor, Full Open to Tank in Neutral
	Actuation	Hydraulic with Top Ports Hydraulic with End Ports Hydraulic with Top Ports and Lever override Electrohydraulic with Lever Override Electrohydraulic Only Manual with Enclosed Lever Box Manual with Exposed Spool Connection Manual with Pneumatic Pilot, Pneumatic Ports Downward Manual with Pneumatic Pilot, Pneumatic Top Ports
Coil voltages		12 Volt DC
		24 Volt DC
Coil connectors		Integral Deutsch DT04-2P Amp Jr. Timer 106462-1
Electrohydraulic interface		Eaton HFX programmable controllers and Pro-FX™ application software

<b>General specifications</b>	<b>CLS100 (Post/pre)</b>	<b>CLS180 (Post)</b>
Max number of working sections	10	10
Sectional nominal thickness (mm)	38	46
Spool stroke (mm)	7/6	7
<b>Rated flow</b>		
Pump flow rate (l/min)	150	220
A/B work port flow rate (l/min)	100/65	180
Working pressure inlet port P (bar)	350	350
<b>Back pressure max</b>		
Max pressure outlet port T (bar) (Under special conditions back pressure can be lower)	10	10
<b>Compensation type</b>		
Pre compensation	•	
Post compensation	•	•
<b>Option chart</b>		
LS Signal pressure relief valve	•	•
Full flow pressure relief valve	•	•
LS signal dump valve (electric 12/24 Vdc)	•	•
Full flow dump valve (electric 12/24 Vdc)	•	•
<b>Spool types</b>		
Double Acting (4 way) Cylinder	•	•
Double Acting (4 way) Cylinder with 4th Position Float	•	
Bi-Directional (4 Way) Motor, Full Open to Tank in Neutral	•	•
<b>Spool actuation</b>		
Hydraulic with top ports	•	•
Hydraulic with end ports	•	•
Hydraulic with stroke limiter	•	•
Hydraulic with lever actuation	•	•
Hydraulic with lever actuation with stroke limiter	•	•
Electrohydraulic with lever override	•	•
Electrohydraulic with lever override and stroke limiter	•	•
Electrohydraulic only	•	•
Electrohydraulic with stroke limiter	•	•
Electrohydraulic with hydraulic ports and lever override	•	
Electrohydraulic with hydraulic ports	•	
Manual with enclosed lever box	•	•
Manual with exposed spool connection	•	•
<b>Port relief valve</b>		
Relief valve		•
Anticavitation valve	•	•
Combined relief and anticavitation valve	•	•
Cavity machined and plugged	•	•
<b>Special features</b>		
Spools position sensor	•	•
Spool stroke limiter	•	•
Section flow limiter	•	
Section load sense pressure limiting relief*	•	•
Section remote load sense pressure limiting relief*	•	•

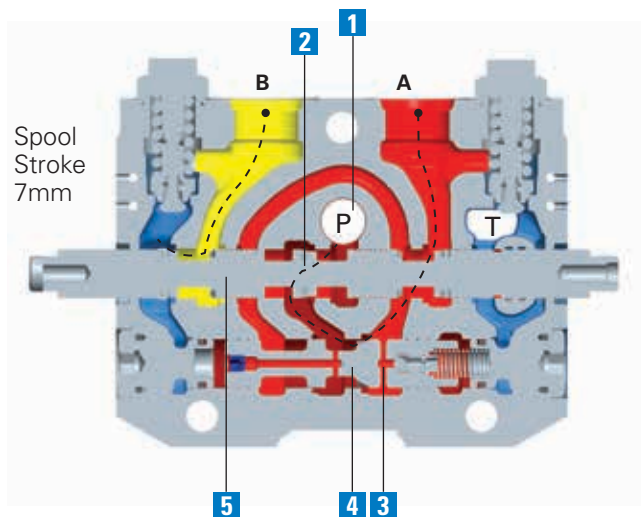
\*Applies to local work ports both A and B

# CLS Load Sense Sectional Mobile Valve

## Product overview

### Operating principle (Post Comp)

The CLS valve, completely pressure compensated, guarantees great controllability to all actuations, making workport flow dependent only on metering area (spool position). When flow saturation occurs the system reacts by implementing an equal reduction of pressure margin across all spools, generating a proportional reduction of workport flow.



#### Legend:

- 1 Inlet line (high pressure)
- 2 Metering notches
- 3 Load sensing line
- 4 Local compensator
- 5 Metering spool

### Single section

Referencing the picture to the left reveals some aspects of system functionality. From the inlet line, the high pressure flow passes across the metering area and down to the local compensator. The metering area, according to the pressure margin, controls the total amount of flow to the work-port selected by the main spool.

The load sensing signal, picked up downstream of the local compensator, feeds the common load-sensing line. When a single section is actuated, the local compensator fully opens to the left side, reaching its complete balanced position. The control of the LS system is achieved by the inlet compensator for fixed displacement pumps or the pump compensator for variable displacement pumps.

### Multi-section

When two or more sections are actuated, only the function characterized by the highest pressure (dominant) is involved in the LS signal transmission. The other functions become directly dependent on it (slaves). The common LS line transfers the signal from the dominant local compensator to all dependent compensators. Driven by the LS signal, the unbalanced slave compensators activate the pressure compensation creating an artificial pressure drop able to keep pressure margin nominally the same on all the spools. Work-port flow becomes only a function of metering area making the system totally load independent.

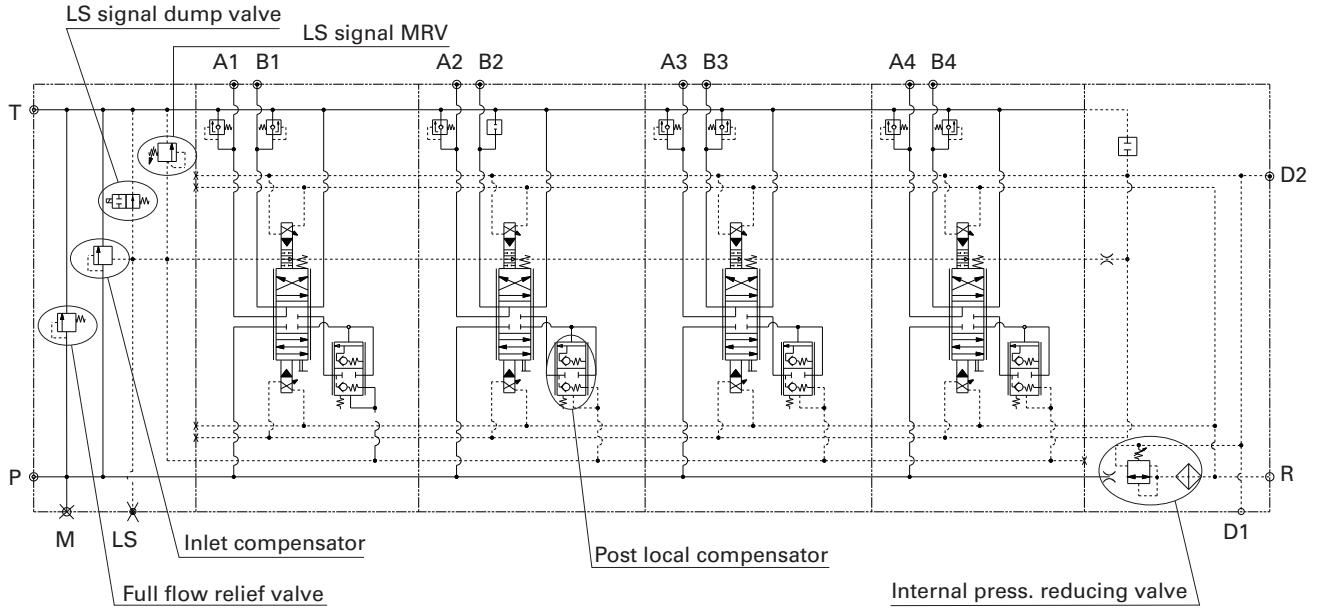
### Flow sharing section

Saturation occurs when the total amount of flow required by the valve bank is greater than the maximum pump flow rate. In this condition the system is not able to maintain the nominal pressure margin, reducing the margin according to real flow demand. As a result all the local section compensators experience the same LS signal and the same pressure drop is applied to different metering areas, reducing work-port flows proportionally in order to keep all actuations completely under control.

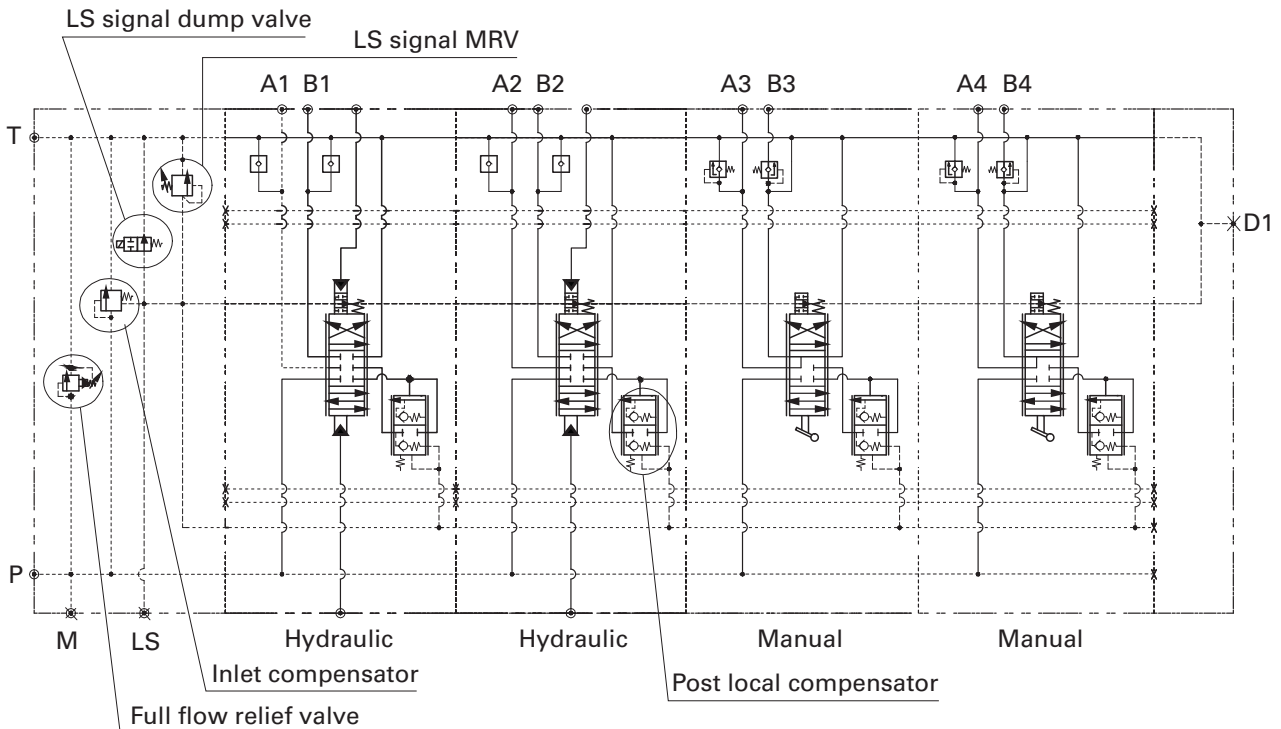
# CLS Load Sense Sectional Mobile Valve

Product overview

## Post-compensated system (Electrohydraulic actuation)



## Post-compensated system (Hydraulic and manual actuation)



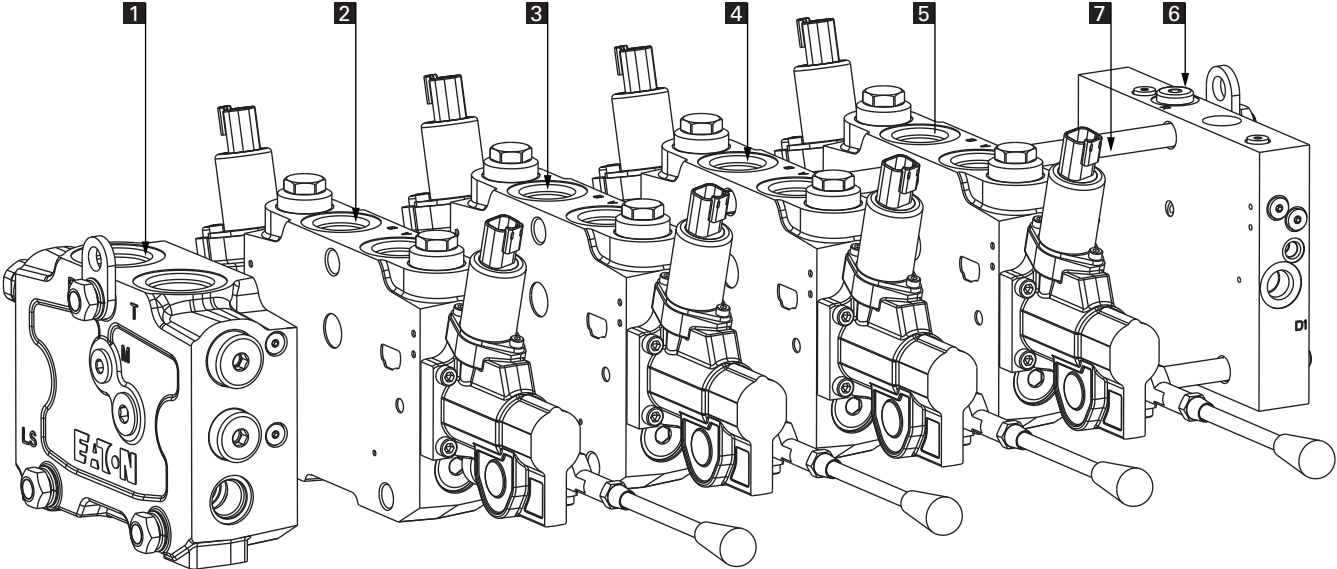
# CLS180 Load Sense Sectional Mobile Valve

Ordering example

### Valve bank order example

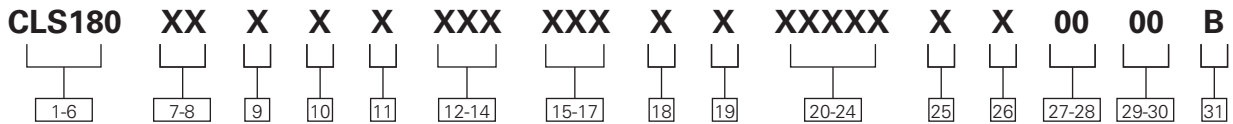
1. Inlet	CLS180LSL210000ZZ00B
2. Section 1	CLS181PESHA180180DZ000Z000Z000ZZL00B
3. Section 2	CLS181PESHA180180DZ000Z000Z000ZZL00B
4. Section 3	CLS181PESHA180180DZ000Z000Z000ZZL00B
5. Section 4	CLS181PESHA180180DZ000Z000Z000ZZL00B
6. End cover	CLS182FS00B
7. CLS180/4 Tie rod kit	6042926-004
8. Paint	00

**Note:** Repeat section model code for additional sections.





# Model code for valve bank



## 1-6 Product series

**CLS180** – Load sense sectional mobile valve: standard valve bank inlet

## 7-8 Number Of Sections

**XX** – Replace XX with number of sections (e.g. 01 or 02,....up to 10 ) This number will vary as per requirement of work sections in bank assembly

## 9 Inlet type

**L** – Load Sensing (Variable disp. pumps)

**U** – Unload for Open Center (fixed disp. pumps)

## 10 Inlet ports

**B** – BSP (G1 P&T, G1/4 LS&M)

**S** – SAE (-16 P&T, -6 LS&M)

## 11 Inlet reliefs\*

**D** – LS & Full Flow Reliefs

**L** – LS Relief Only

**R** – Full Flow Relief Only \*

**Z** – No Reliefs

## 12-14 Load sense relief\* setting

**XXX** – 3 digit load sense relief setting in 5 bar increments, code 000 if none

## 15-17 Full flow relief\* setting

**XXX** – 3 digit full flow relief setting in 5 bar increments, code 000 if none

## 18 Inlet dump valve

**F** – Full flow dump valve

**L** – LS dump valve

**Z** – No dump valve

## 19 Inlet coil

**A** – 12V Coil with DIN connector

**B** – 24V Coil with DIN connector

**C** – 12V Coil Deutsch connector

**D** – 24V Coil Deutsch connector

**E** – 12V Coil AmpJr connector

**F** – 24V Coil AmpJr connector

**Z** – No coil

## 20-24

**XXXXX** – 5 Digit work section part number (Assigned by Eaton engineering) Repeat these 5 digit work section part number as per build requirement. Total number of digits for 10 section bank for referring here are 50 digits.

## 25 End cover\*\*

**F** – Electrohydraulic with external end drain

**G** – Electrohydraulic with external side drain

**H** – Hydraulic or manual with internal drain

**K** – Hydraulic or manual with external drain

**N** – Electrohydraulic with internal drain

## 26 End cover ports

**B** – BSP (G1/4 pilot drain)

**S** – SAE (-6 pilot drain)

## 27-28 Paint/Coating \*\*\*

**00** – None

**0B** – Glossy Black

**AU** – Standard Flat Black

**BD** – Yellow

**0C** – Red

**CD** – Eaton Blue (Primer)

**0K** – Green

## 29-30 Special features

**00** – No special features

## 31 Design level

**B** – Latest design

**Notes:** \*Refer page-16 for more details of Inlet model code.

\*\*Refer page-31 for more details of end cover model code.

\*\*\*All paint is finish coat with exception to Eaton Blue, which is a primer coat.

# CLS180 Load Sense Sectional Mobile Valve

## Tie Rod Kits

Tie rod kits are required to complete a valve bank assembly. Tie rod length depends on the number of

sections in the bank. Each tie rod kit includes three (3) tie rods, six (6) nuts and six (6) washers.

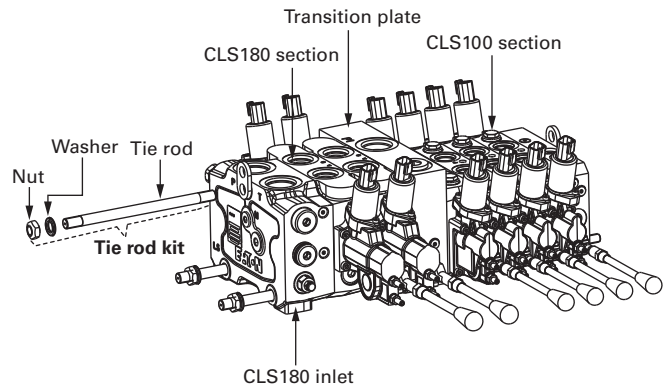
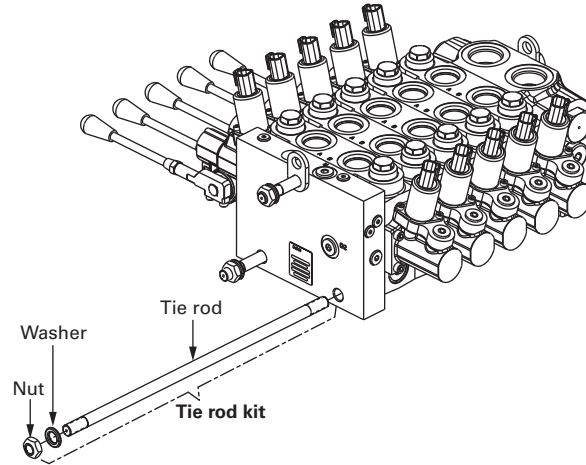
Tie rod kit	Desc.	PN	Length (mm)	Clamping torque (Nm)
CLS180/1	1 Sect.	6042926-001	183	70
CLS180/2	2 Sect.	6042926-002	229	
CLS180/3	3 Sect.	6042926-003	275	
CLS180/4	4 Sect.	6042926-004	321	
CLS180/5	5 Sect.	6042926-005	368	
CLS180/6	6 Sect.	6042926-006	414	
CLS180/7	7 Sect.	6042926-007	460	
CLS180/8	8 Sect.	6042926-008	507	
CLS180/9	9 Sect.	6042926-009	553	
CLS180/10	10 Sect.	6042926-010	599	

### Transition plates

Frame size	Type	P/N
CLS250/180	Transition plate	6037811-001
CLS180/100	Transition plate	6038098-001

### Tie rod kits for CLS180 sections for CLS180 to CLS100 transition plate part #6038098-001

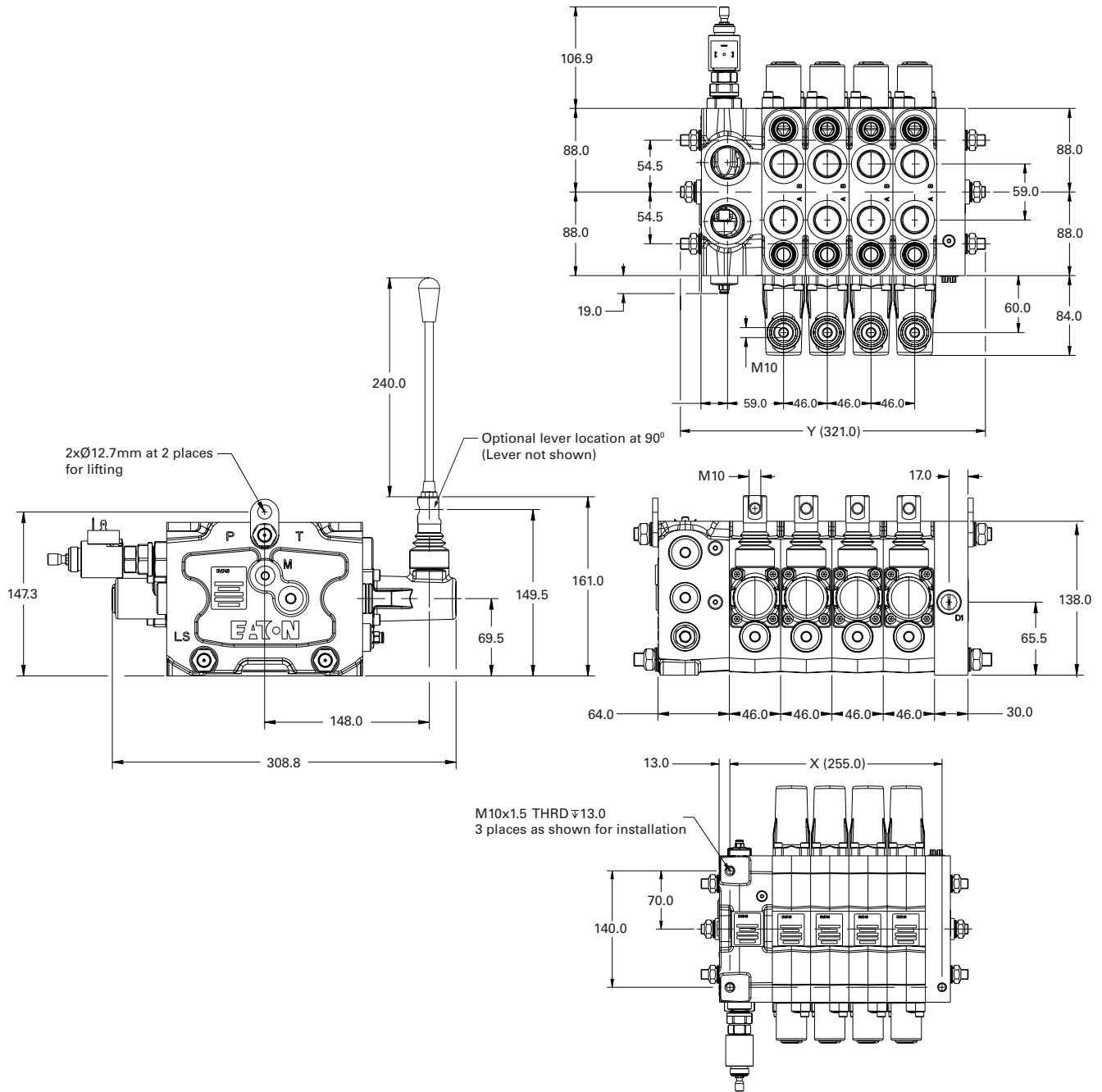
Tie rod kit	Desc.	PN	Length (mm)	Clamping torque (Nm)
CLS180/1	Tie rod kit - transition plate	6044401-001	156	70
CLS180/2	Tie rod kit - transition plate	6044401-002	202	
CLS180/3	Tie rod kit - transition plate	6044401-003	249	
CLS180/4	Tie rod kit - transition plate	6044401-004	295	
CLS180/5	Tie rod kit - transition plate	6044401-005	341	
CLS180/6	Tie rod kit - transition plate	6044401-006	387	
CLS180/7	Tie rod kit - transition plate	6044401-007	434	
CLS180/8	Tie rod kit - transition plate	6044401-008	480	
CLS180/9	Tie rod kit - transition plate	6044401-009	526	



# CLS180 Load Sense Sectional Mobile Valve

CLS180 with manual actuation and enclosed lever box

Units: mm

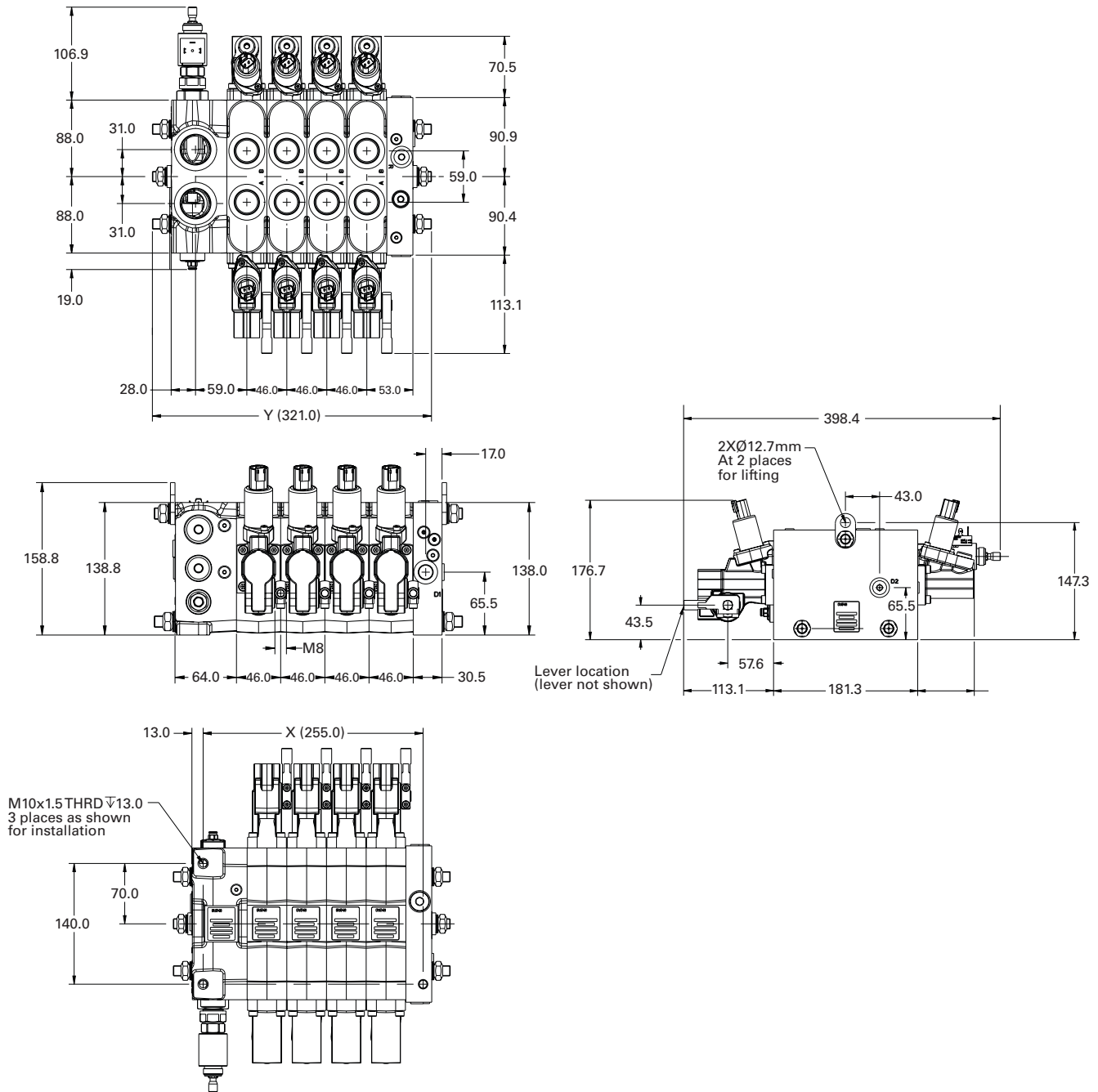


Dimension	Number of sections									
	/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
X (mm)	117	163	209	255	301	347	393	439	485	531
Y (mm)	183	229	275	321	368	414	460	507	553	599
Weights (kg)	23.8	30	36.2	42.4	48.6	54.8	61	67.2	74.3	79.6

# CLS180 Load Sense Sectional Mobile Valve

CLS180 with electrohydraulic actuation

Units: mm



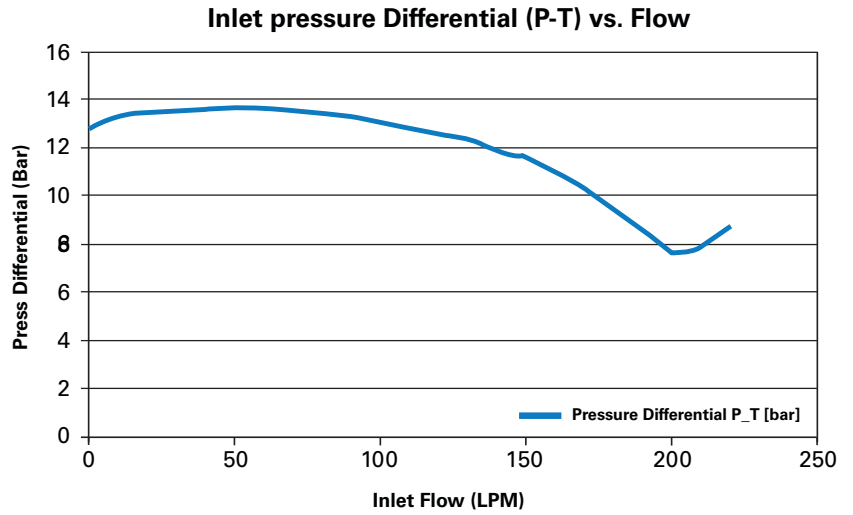
Dimension	Number of sections									
	/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
X (mm)	117	163	209	255	301	347	393	439	485	531
Y (mm)	183	229	275	321	368	414	460	507	553	599
Weights (kg)	23.8	30	36.2	42.4	48.6	54.8	61	67.2	74.3	79.6

# CLS180 Load Sense Sectional Mobile Valve

Typical curves for inlet

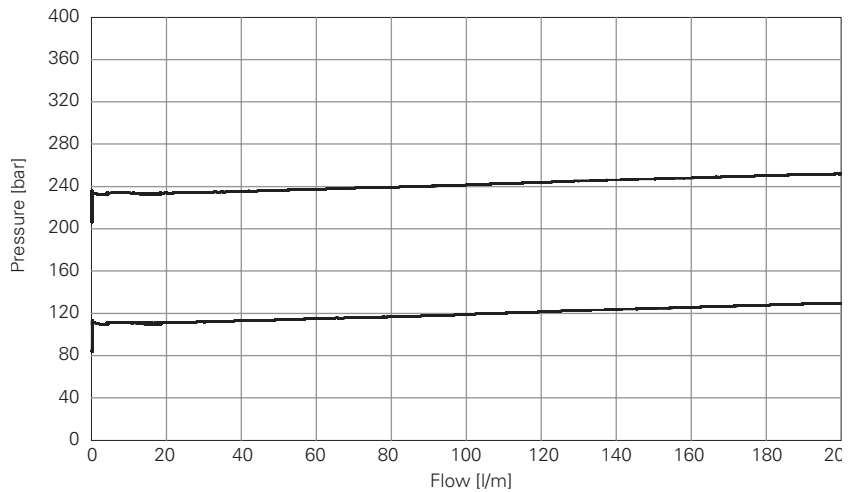
## Inlet compensator pressure drop (P-T)

Fixed displacement system: pressure drop across the inlet compensator as function of pump flow



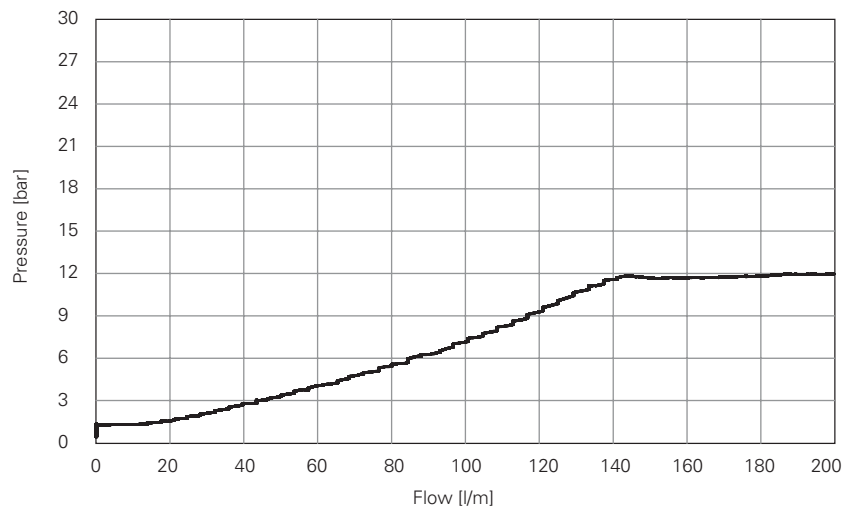
## LS Signal pressure relief valve

Fixed displacement system: LS Signal pressure relief valve characteristic



## Full flow dump valve

Fixed displacement systems: pressure drop across open electric dump valve as function of pump flow



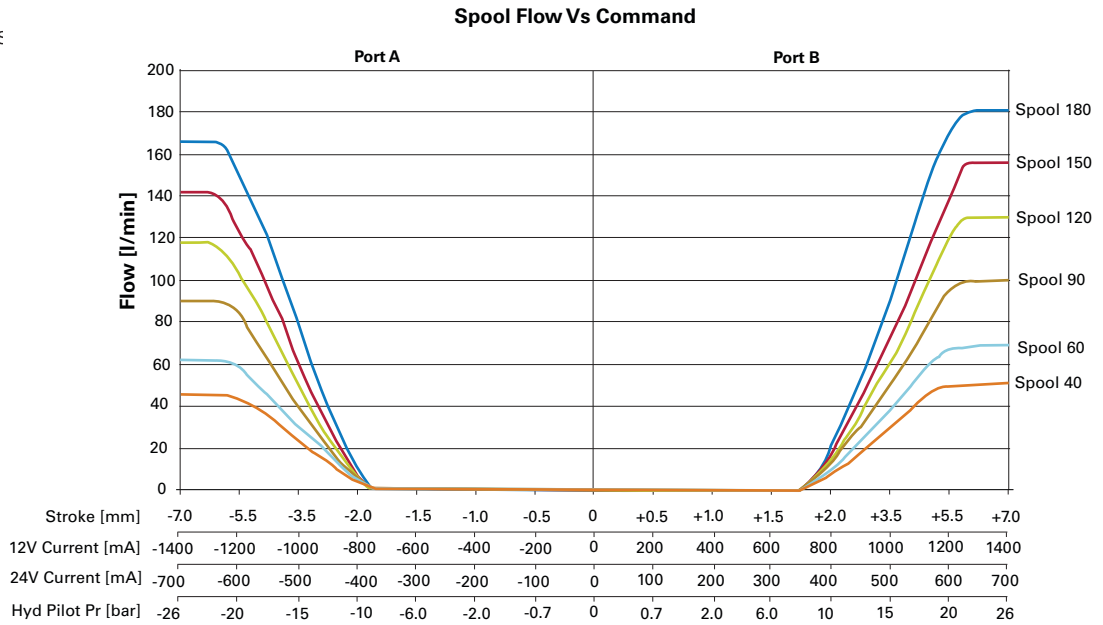
# CLS180 Load Sense Sectional Mobile Valve

Typical curves for work section

## Post compensated spool flow characteristic

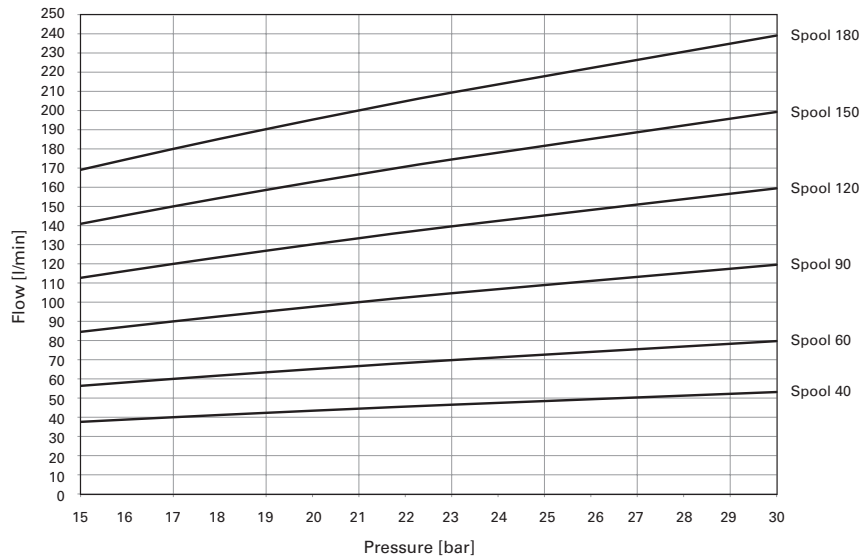
Fixed displacement systems: flow on ports A and B as function of spool stroke, pilot pressure, control current Inlet flow: 220 l/min

Pump inlet compensator at 17 bar  $\Delta p$



## Post compensated spool flow with variable displacement pumps

Variable displacement systems: spools maximum delivered flow as function of pump  $\Delta P$  setting

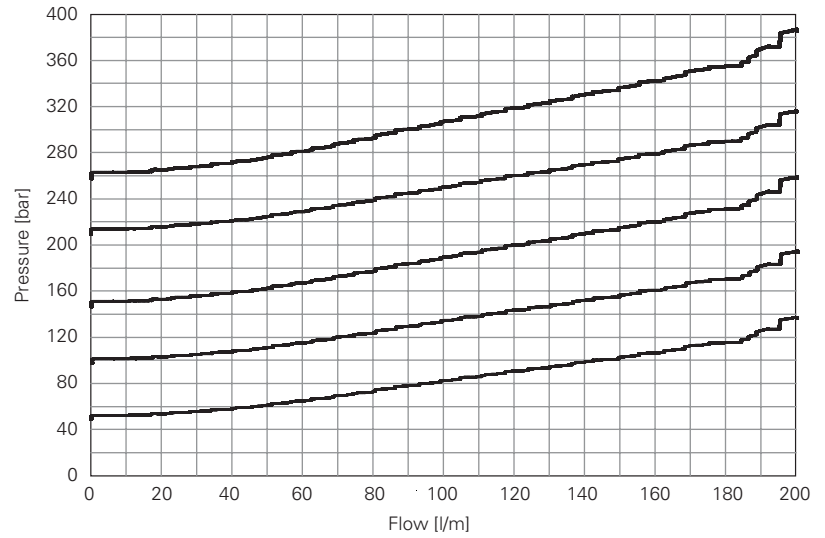


# CLS180 Load Sense Sectional Mobile Valve

Typical work port auxiliary valve curves

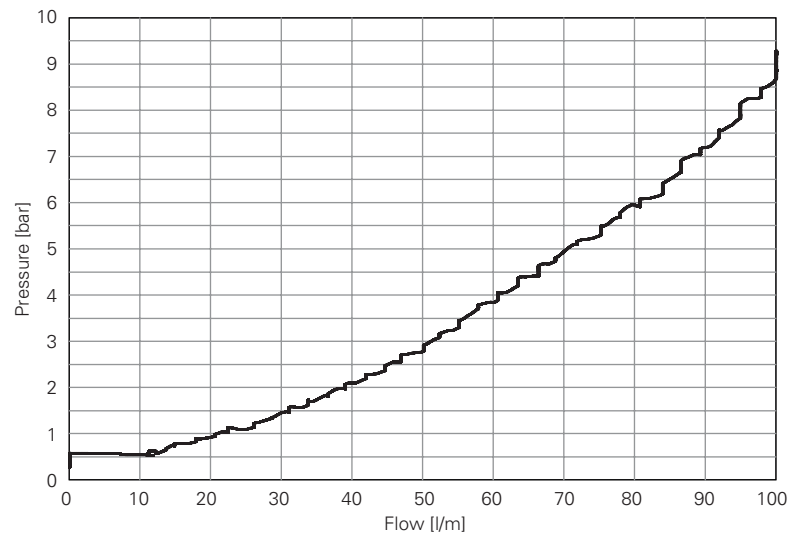
## Combined valves (relieving function)

Pressure characteristic as function of flow

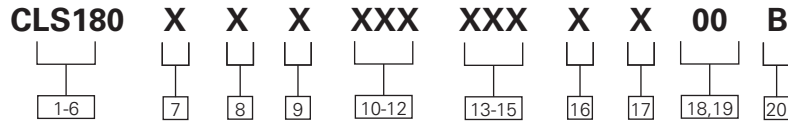


## Combined valves (anticavitation function)

Opening and pressure characteristic as function of flow



# Model code for valve bank inlet



## 1-6 Product series

**CLS180** – Load sense sectional mobile valve: standard valve bank inlet

## 7 Inlet type

- L** – Load sensing (Variable disp. pumps)
- U** – Unload for open center (fixed disp. pumps)

## 8 Inlet ports

- B** – BSP (G1 P&T, G1/4 LS & M)
- S** – SAE (-16 P&T, -6 LS & M)

## 9 Inlet reliefs

- D** – LS & Full flow reliefs
- L** – LS Relief Only
- R** – Full flow relief only\*
- Z** – No Reliefs

## 10-12 Load sense relief setting

- XXX** – 3 digit load sense relief setting in 5 bar increments, code 000 if none  
**Note:** 50-350 bar LS Relief setting should be minimum 40 Bar lesser than Full flow relief setting. Anything above 350 bar is rated for intermittent operation. Consult engineering for duty cycle acceptance above 350 bar.

\* R - Full flow relief only option is not recommended, Inlet LS relief is recommended, which limits system pressure and gives better efficiency.

## 13-15 Full flow relief setting

- XXX** – 3 digit full flow relief setting in 5 bar increments, code 000 if none  
**Note:** 90-350 bar “Settings above 350 bar should only be used with approval of duty cycle”

## 16 Inlet dump valve

- F** – Full flow dump valve
- L** – LS dump valve
- Z** – No dump valve

## 17 Inlet coil

- A** – 12V Coil with DIN connector
- B** – 24V Coil with DIN connector
- C** – 12V Coil Deutsch connector
- D** – 24V Coil Deutsch connector
- E** – 12V Coil AmpJr connector
- F** – 24V Coil AmpJr connector
- Z** – No coil

## 18-19 Special features

- 00** No special features

## 20 Design level

- B** – Latest design

**Notes:** 1) Cannot have full flow relief valve and full flow dump valve in same inlet.  
 2) Transition plates and mid-inlets are available on request.



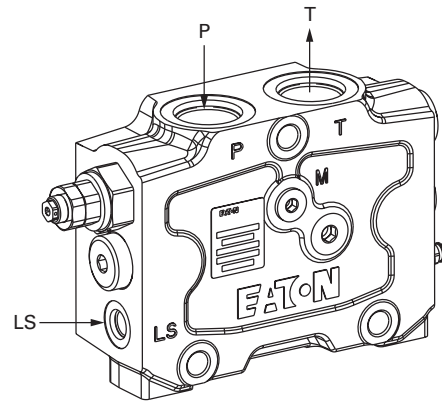
# CLS inlet - Configuration

Dimensions and configurations for model code position 7

## L - Load sensing

Closed center inlet section for variable displacement pumps

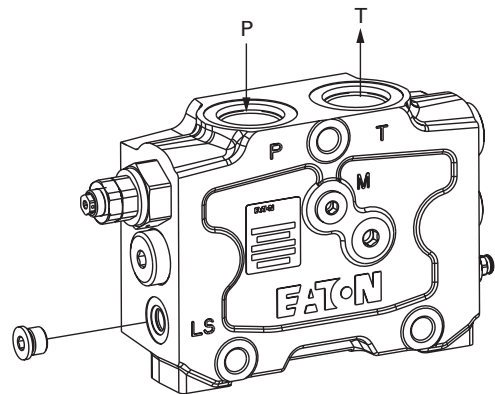
The inlet section with L configuration enables control valve usage with variable displacement pumps. With this configuration the presence of LS relief valve (A) is suitable to adjust the system maximum pressure. LS electric dump valve (C) can also be added as safety device. An additional full flow relief valve can be added to protect the system from pump regulator failures. An additional solution for variable displacement pumps is available on request to allow a constant reduced free flow in stand by condition through the system: this is sometimes required to guarantee a stand by flow for oil cooling.



## U - Unload for open center

Open center inlet section for fixed displacement pumps

The inlet section with U configuration enables control valve usage with fixed displacement pumps. With this configuration the presence of LS relief valve (A) is suitable to adjust the system maximum pressure. Full flow electric dump valve (C) can also be added as safety device.



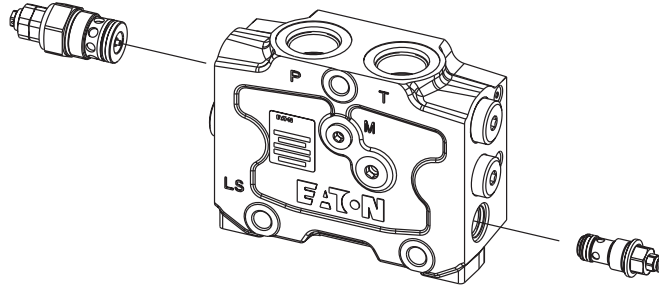
# CLS inlet - Relief valve options

Schematics and configurations for model code position 9

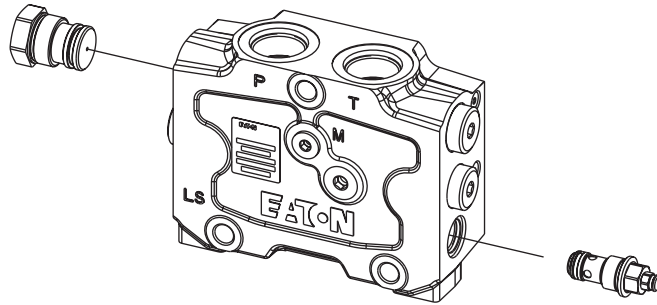
## D - LS and full flow reliefs

**Note:**

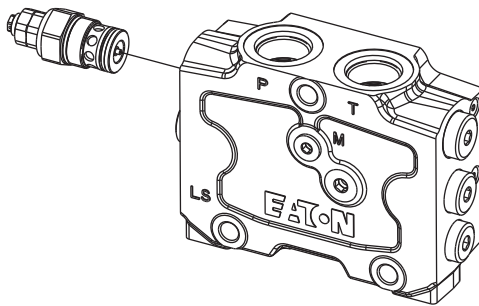
This combination requires that the Full Flow Relief be set at least 40 bar higher than the LS Relief.



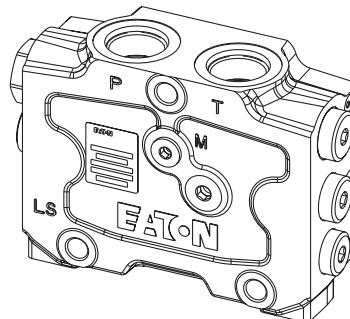
## L - LS relief only



## R - Full flow relief only

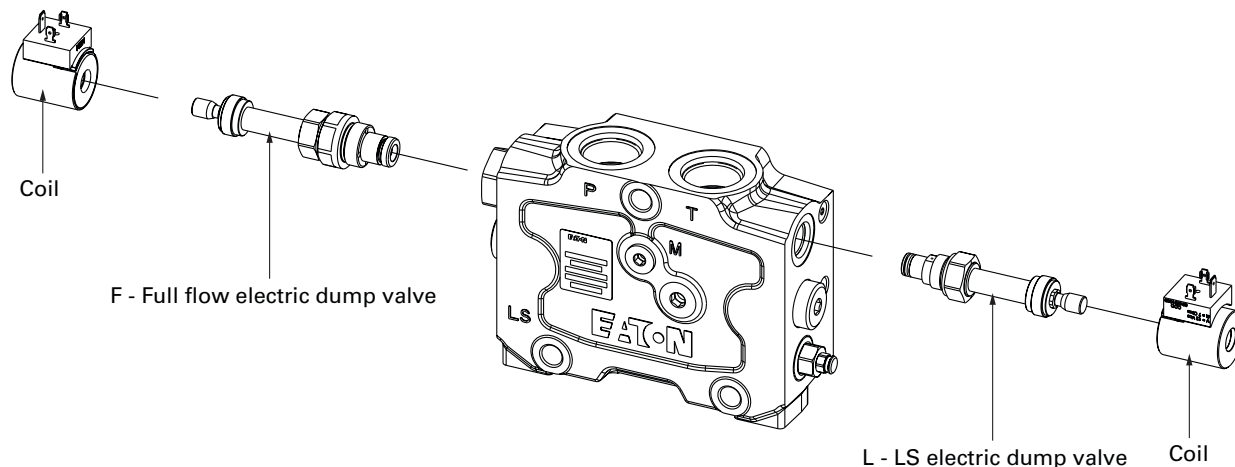


## Z - No reliefs



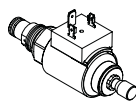
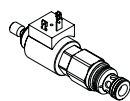
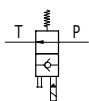
# CLS inlet - Dump valve options

Model code positions 16 & 17



## F - Full Flow Dump Valve

## L - LS Electric Dump Valve



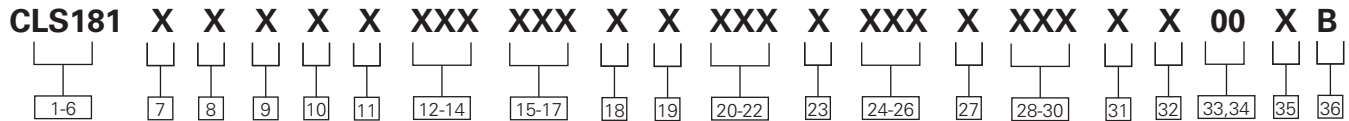
## Coil and Connectors specifications for inlet section

Option	Connector types (Deutsch/Amp Jr)	Ingress rating	Coil resistance R20 (Ω)	Connector material	Coil body	Duty cycle	Coil insulation	Power
A	A - 12V Coil with DIN Connector	IP 65	7	Nylon	Zinc plated steel	ED 100%	Class H coil - IEC 85 Standard	20.5 W
B	B - 24V Coil with DIN Connector	IP 65	28					
C	C - 12V Coil with Detuch Connector	IP 67	7					
D	D - 24V Coil with Detuch Connector	IP 67	28					
E	E - 12V Coil with AmpJr Connector	IP 65	7					
F	F - 24V Coil with AmpJr Connector	IP 65	28					

# Model code for sections

The following 36 digit coding system has been developed to identify preferred feature options for the CLS180 Load Sense Sectional Mobile Valve series. Use this code to

specify a valve with the desired features. All 36-digits of the code must be present to release a new product number for ordering.



## 1-6 Product series

**CLS181** – Load sense sectional mobile valves

## 7 Compensation

**P** – Post-compensated

## 8 Actuation

- A** – Hydraulic with top ports
- B** – Hydraulic with top ports and lever override
- C** – Hydraulic with end ports
- E** – Electrohydraulic with lever override
- F** – Electrohydraulic only
- L** – Manual with enclosed lever box
- M** – Manual with exposed spool connection
- N** – Pneumatic with port downward with enclosed lever box
- P** – Pneumatic with top port with enclosed lever box
- R** – Pneumatic with port downward with exposed spool connection
- S** – Pneumatic with top port with exposed spool connection

## 9 Port type

- B** – G3/4 BSP (G1/4 Pilot if Hyd., G1/8 if Pneumatic)
- S** – SAE, -12 (SAE -6 Pilot if Hyd., 1/8 NPTF if Pneumatic)

## 10 Spool type

- D** – Double acting (4 way) cylinder
- H** – Bi-directional (4 way) motor, full open to tank in neutral

## 11 Spool action

- A** – Spring centered to neutral
- B** – Detent “in” and “out” \* Both ports A and B
- C** – Detent in port “A” \*
- D** – Detent in port “B” \*

## 12-14 Port A spool flow

- 040** – 40 l/m
- 060** – 60 l/m
- 090** – 90 l/m
- 120** – 120 l/m
- 150** – 150 l/m
- 180** – 180 l/m

## 15-17 Port B spool flow

- 040** – 40 l/m
- 060** – 60 l/m
- 090** – 90 l/m
- 120** – 120 l/m
- 150** – 150 l/m
- 180** – 180 l/m

## 18 Coil type

- C** – 12V coil Deutsch connector
- D** – 24V coil Deutsch connector
- E** – 12V coil AmpJr connector
- F** – 24V coil AmpJr connector
- Z** – No coil

## 19 Port A option function

- A** – Anti-cav
- R** – Relief/Anti-cav
- P** – Plugged - work port cavities machined and plugged
- N** – Port relief without anti-cavitation
- Z** – None - no work port or LS relief machining

## 20-22 Port A option setting

- XXX** – 040-350 (3 digit, in 10 bar increments), relief valve pressure setting, port A

## 23 Port B option function

- A** – Anti-cav
- R** – Relief/Anti-cav
- P** – Plugged - work port cavities machined and plugged
- N** – Port relief without anti-cavitation
- Z** – None - no work port or LS relief machining

## 24-26 Port B option setting

- XXX** – 040-350 (3 digit, in 10 bar increments), relief valve pressure setting, port B

## 27 Local LS relief option

- P** – Post comp - section load sense relief (applies to both A and B ports)
- R** – Post Comp - SAE -4 or G1/8 port for remote load sense relief (applies to both A and B Ports)
- Z** – No LS relief

## 28-30 LS relief setting

- XXX** – 3 digit section LS Relief Setting in 5 bar increments from 50-350 bar (000 if not Present or if Using Remote LS Relief)

## 31 Spool stroke limiter or position indicator

- A** – Electrohydraulic section w/spool stroke limiter
- B** – Hydraulic section w/spool stroke limiter
- P** – Electrohydraulic spool position indicator
- Z** – None

## 32 Lever kits

- A** – 135mm (5.3”) lever kit#
- B** – 210mm (8.2”) lever kit#
- C** – 140mm (5.5”) lever kit\*
- D** – 240mm (9.4”) lever kit\*
- Z** – None

## 33 Build type

- R** Right hand
- L** Left hand

## 34,35 Special features

- 00** No special features

## 36 Design level

- B** – Latest design

**Notes:** \*Available with Manual Actuation only  
#Available for EH with lever override option only

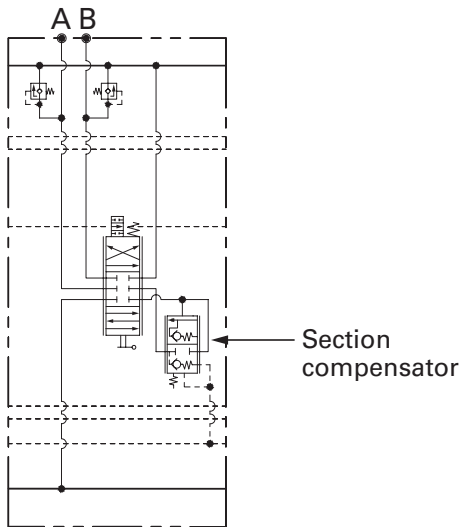
# Valve section options - Compensation

Model code position 7

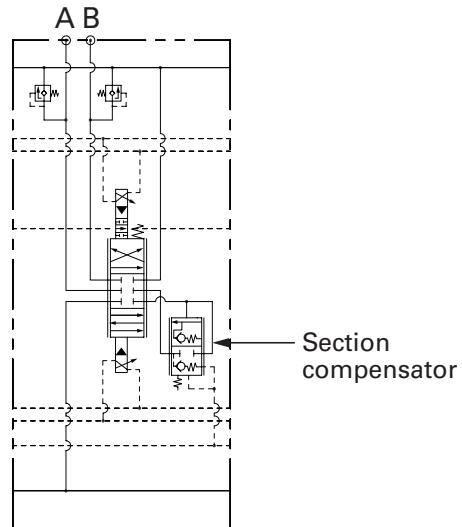
## P - Post-compensated (flow sharing)

Available with or without auxiliary valve cavities

**Note:** Shown with auxiliary valves



Mechanical lever acuation



Electrohydraulic acuation

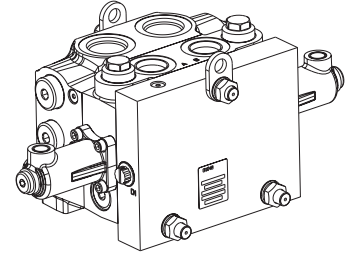
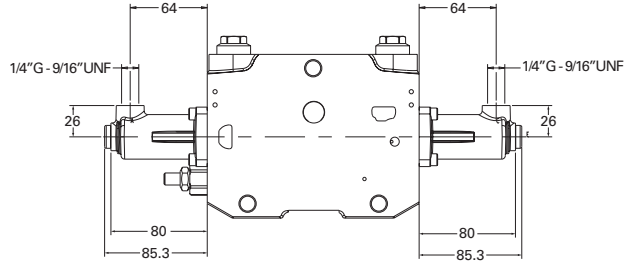
# Valve section options - Actuation for hydraulic control

Dimensions and configurations for model code position 8

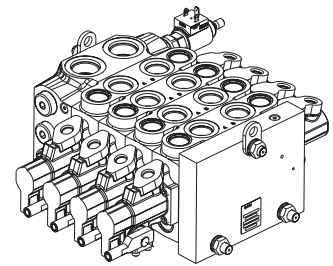
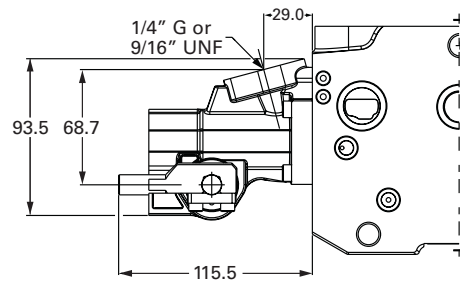
Units: mm

## A - Hydraulic with top ports

Hydraulic actuation (pilot ports on the top) (Only with manual and hydraulic section body)

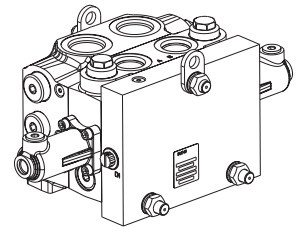
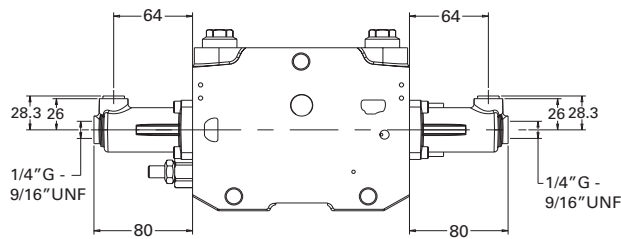


## B - Hydraulic with top ports and lever override



## C - Hydraulic with end ports

Hydraulic actuation (pilot ports on the sides) (Only with manual and hydraulic section body)



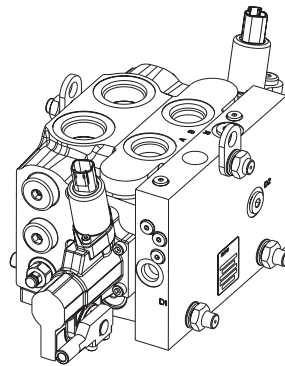
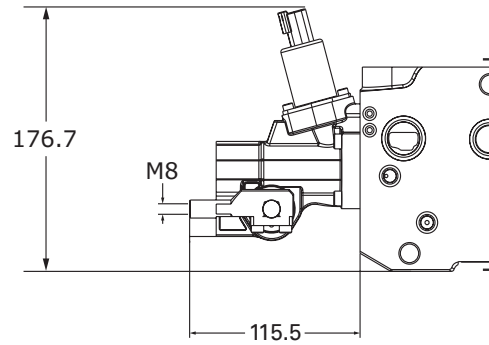
# Valve section options - Actuation for electrohydraulic control

Dimensions and configurations for model code position 8

Units: mm

## E - Electrohydraulic with lever override

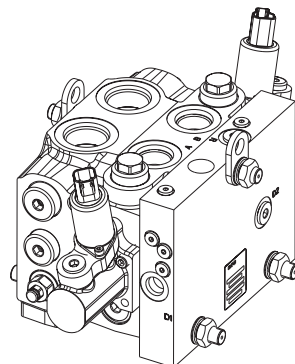
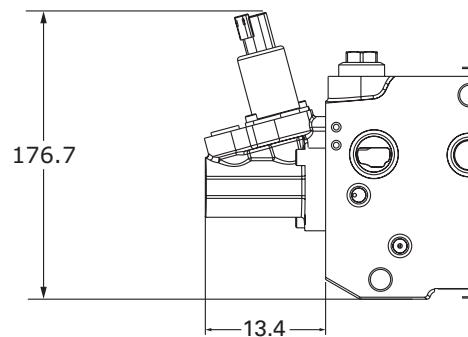
**Note:** Includes solenoid operated pilot valve



## F - Electrohydraulic only

Without Lever

**Note:** Includes solenoid operated pilot valve



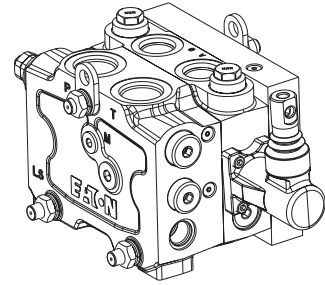
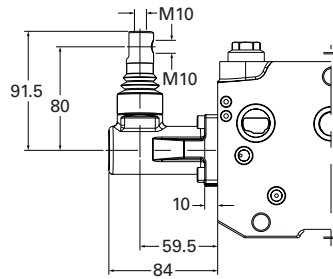
# Valve section options - Actuation for manual control

Dimensions and Configurations for Model Code Position 8

Units: mm

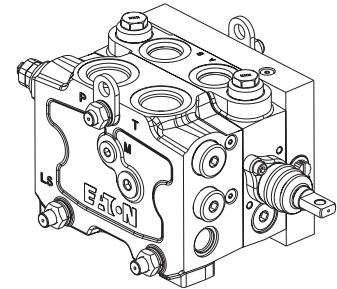
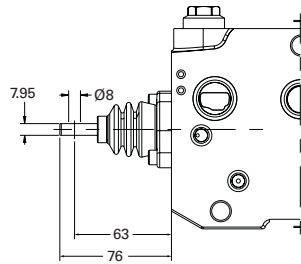
## L - Manual with enclosed lever box

Lever actuation (Only with manual and hydraulic section body)



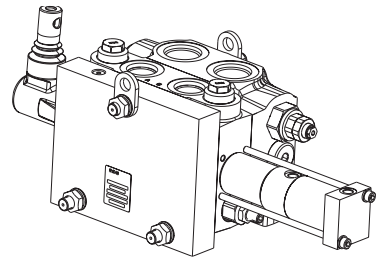
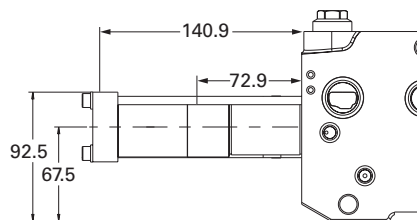
## M - Manual with exposed spool connection

Without lever actuation (Only with manual and hydraulic section body)



## N - Pneumatic with ports downward with enclosed lever box

## P - Pneumatic with top ports with enclosed lever box



## R - Pneumatic with ports downward with exposed spool connection

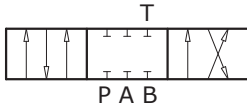
## S - Pneumatic with top ports with exposed spool connection



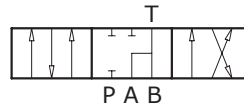
# Valve section options - Spool type

Model code position 10

## D - Double acting (4 way) cylinder



## H - Bi-directional (4 way) motor, full open to tank in neutral



# Valve section options - Port A and Port B spool flows

Model code positions 12-14 (Port A) &

Model code positions 15-17 (Port B)

## Post-compensated section

Spool type	Flow rates (l/min)					
	040	060	090	120	150	180
D	•	•	•	•	•	•
H	•	•	•	•	•	•

**Note:** Rated flows are defined for 17 bar  $\Delta p$ .

Listed flows are for symmetrical spools; for questions regarding asymmetric spools please contact your sales representative.

# Valve section options - Coil voltage and connector

Model Code Position 18

## Coil and connector specifications

Option	Supply voltage (Vdc)	Connector	Ingress rating	Coil resistance R20 (Ω)	Feeding reducing pressure	Prop. current control (mA)	On-off current control (mA)	PWM suggested frequency (hz)
C	12	Deutsch DT4	IP 67	4.7	40 bar	600-1300	2500	70-90
D	24	Deutsch DT4	IP 67	20.8		300-650	1150	
E	12	Amp Jr	IP 65	4.7		600-1300	2500	
F	24	Amp Jr	IP 65	20.8		300-650	1150	

# Valve section options - Port A and Port B functions and settings

Model code positions 19-26

## A - Anti-Cav



## R - Relief/Anti-Cav

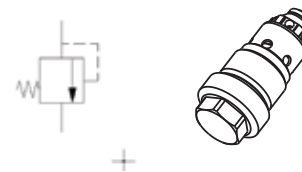


**Note:** Factory setting 40-350 bar

## P - Plugged - Work port relief cavities machined and plugged



## N - Port relief without anti-cavitation

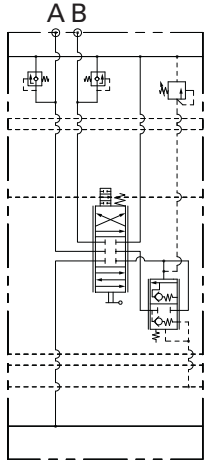


# Valve section options - Load sense relief setting

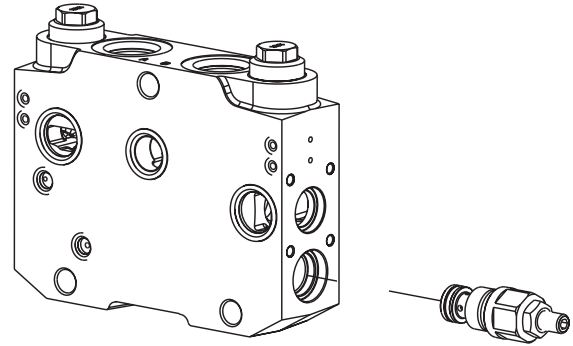
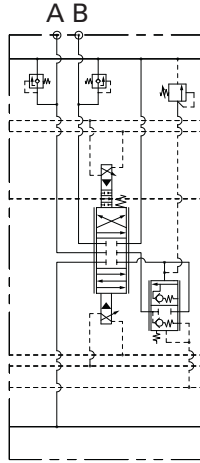
Model code position 27

## P - Post-compensated - Section load sense relief (Applies to both A & B ports)

Schematic for manual control



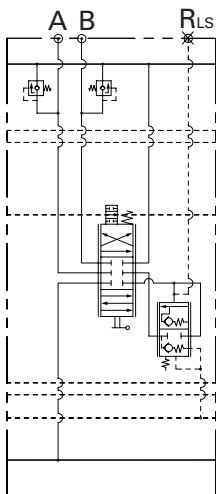
Schematic for electrohydraulic control



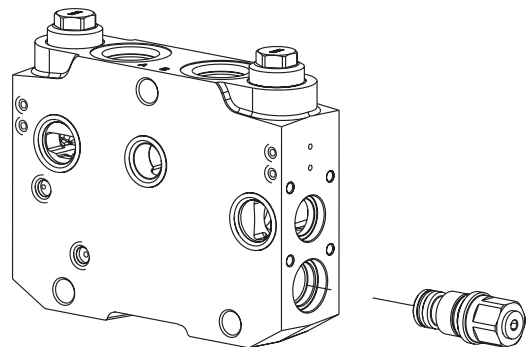
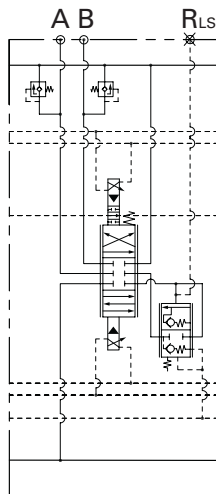
**Note:** Post-comp load sense relief range is 0-350 bar.

## R - Post-comp - Port for remote load sense relief (Applies to both A & B Ports)

Schematic for manual control



Schematic for electrohydraulic control



# Valve section options – Spool stroke limiter or position indicator

Dimensions and configurations for model code position 31

Spool position indication is achieved using a Hall effect sensor device used in conjunction with spool position transducer kits available for CLS100. After the final assembly of the valve a computer assisted calibration procedure is performed that compensates for mechanical inaccuracies and uncertainties allowing to attain high accuracy and linearity in spool position detection. Spool position is output as an analog voltage signal in the 0.5 - 4.5V range. The unit works in 12V and 24V environments and is protected against load-dump and other major electrical faults. Fault signalling is carried out through the output signal.

## Technical specifications

### Electrical

Operating voltage	6 - 30 Vdc
Max current consumption	20.5 mA

### Output

Output voltage spanning	0.5 - 4.5 Vdc
Quiescent voltage	2.5 Vdc
Output current	-1 - +1 mA
Minimum output load resistance	4.5 kOhm
Overall accuracy	± 2.5%
Resolution	12 bit
Fault signalling levels	4.8V < Vout < 0.2 Vdc
Protections	short circuit protection, reverse, battery protection, thermal shutdown, overvoltage, undervoltage, load-dump
EM Immunity	> 60 Vdc/m

### Mechanical, Environmental

Operating temperature	-40 / +85 °C
Ingress protection rating	IP 65
Dimensions	28 x 18 x 23 mm (L x W x H)

### Connections

I/O	DIN 43650-C male
PIN 1	Vout
PIN 2	Vcc
PIN 3	OV
PIN 4	Chassis (connected to valve body)

### Applied standards

Immunity for industrial environments	EN 61000-6-2
Emission standard for residential commercial and light-industrial environments	EN 61000-6-3
EMC - Agricultural and forestry machines	EN 14982
EMC - Earth-moving machinery	ISO 13766

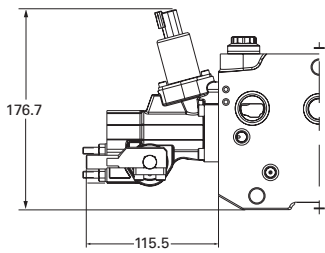
# Valve section options - Spool stroke limiter or position indicator

Dimensions and configurations for model code position 31

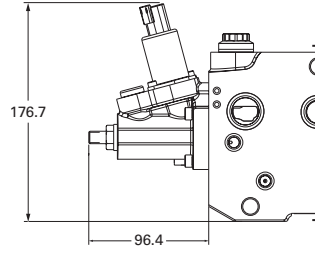
Units: mm

## A - Electrohydraulic section with spool stroke limiter

With lever override



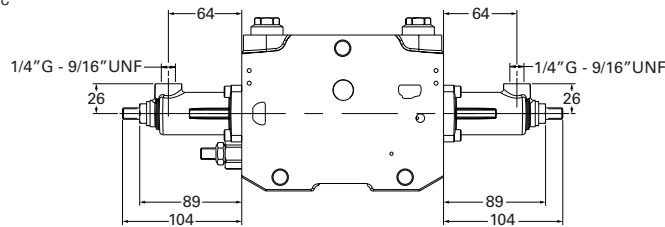
Without lever override



## B - Hydraulic section with spool stroke limiter

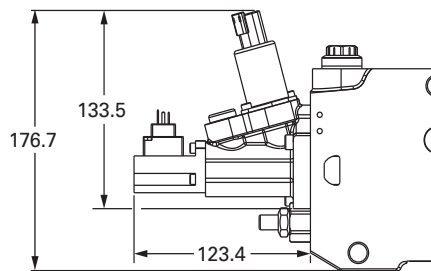
Hydraulic actuation with stroke limiter

**Note:** Not shown in the graphic but also available with manual override



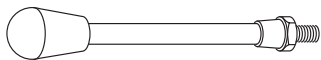
## P - Electro-hydraulic with spool position indicator

**Note:** Not shown in the graphic but also available with manual override



# Valve section options - Lever kits

Model code position 32



## For EH Actuation

### A - 135 Lever Kit

Lever with knob - 135mm (5.3")

### B - 210 Lever Kit

Lever with knob - 210mm (8.2")

## For Manual Actuation

### C - 140 Lever Kit

Lever with knob - 140mm (5.5")

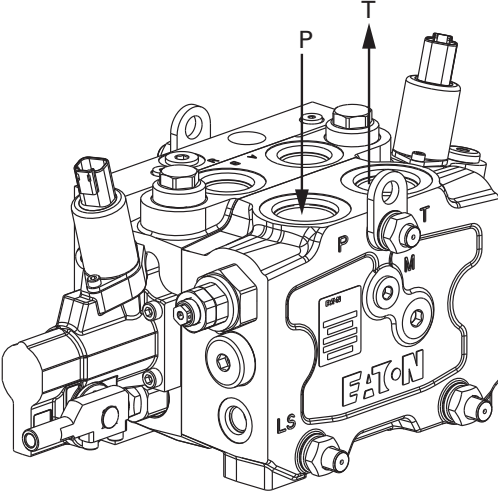
### D - 240 Lever Kit

Lever with knob - 240mm (9.4")

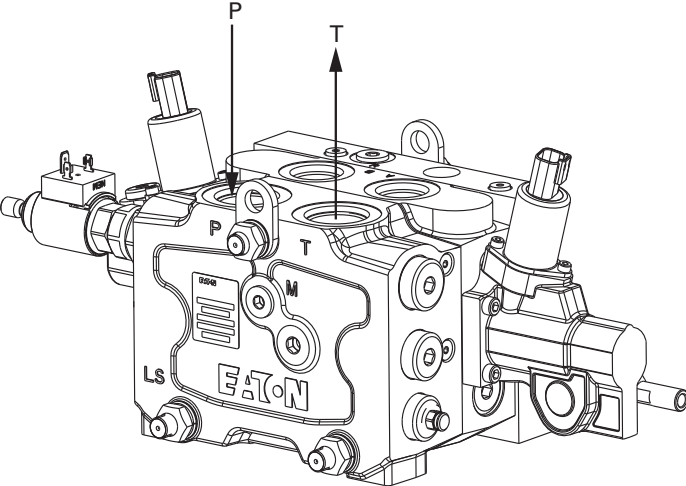
# Section build type

Model code position 33

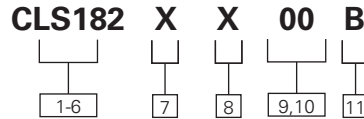
## R - Right hand build



## L - Left hand build



# Model code for valve bank end cover



**1-6 Product series**

**CLS182** – load sense sectional mobile valves

**7 End cover**

- F** – Electrohydraulic with external end drain#
- G** – Electrohydraulic with external side drain#
- H** – Hydraulic or manual with internal drain
- K** – Hydraulic or manual with external drain
- N** – Electrohydraulic with internal drain\*

**8 End cover ports**

- B** – BSP (G1/4 pilot drain)
- S** – SAE (-6 pilot drain)

**11 Design level**

- B** – Latest design

**9,10 Special features**

- 00** No special features

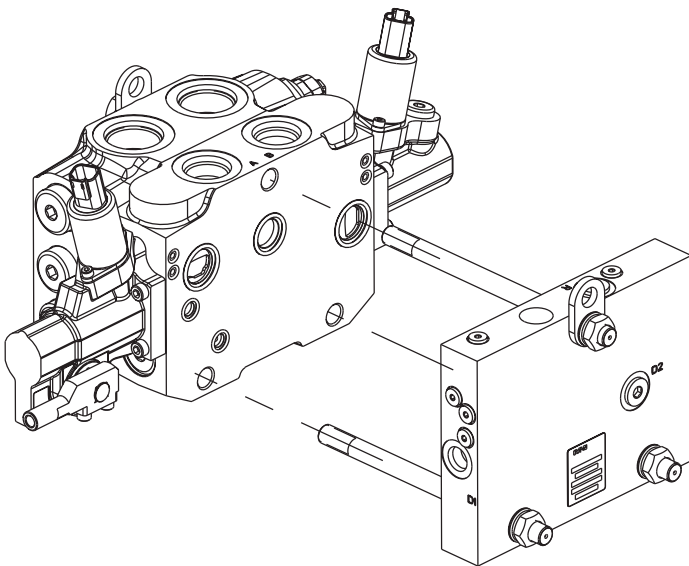
There are two types of End Covers:

**Manual and Hydraulic actuation version**

To be used when no electrohydraulic controls are present in the valve bank. This cover is simply collecting the LS signal drain that can be connected to tank internally or externally.

**Electrohydraulic version**

To be used when at least one section in the valve bank has electrohydraulic actuation. This cover is collecting LS signal and electrohydraulic pilot control drain and is providing electrohydraulic actuation by way of a pressure reducing valve.



**IMPORTANT:**

With electrohydraulic actuation, plumb external drain directly to reservoir, not to tank or tank line. Drain pressure shall remain below 5 BAR.

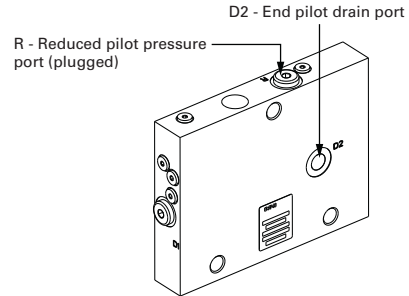
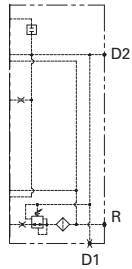
# Side port (D1) or End port (D2) should be used as drain port.

\* When EH with internal drain option is used, care should be taken to ensure pressure in inlet "T" port should not exceed 5 bar.

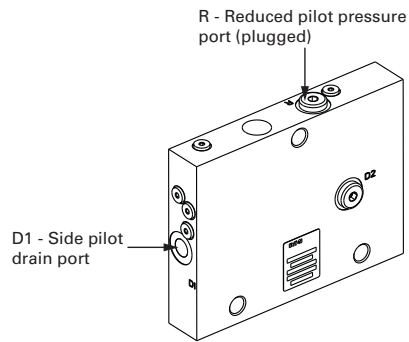
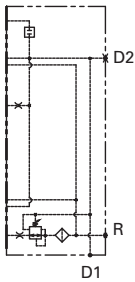
# CLS assembly- End covers

Schematics and configurations for model code position 7

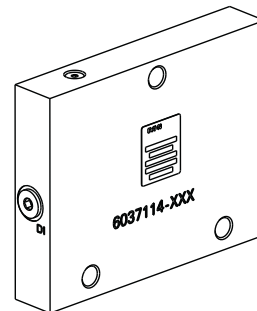
## F - Electrohydraulic with external end drain



## G - Electrohydraulic with external side drain

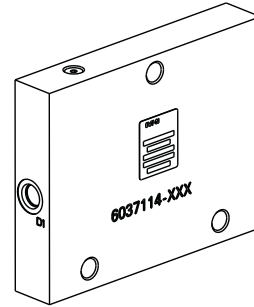


## H - Hydraulic or manual with internal drain

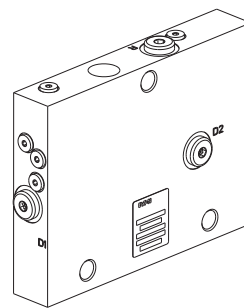
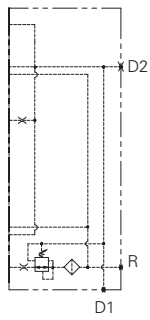




**K - Hydraulic or manual with external drain**



**N - Electrohydraulic with internal drain**



# Mid-Inlet and transition plates

The CLS mobile valve family offers standard mid-inlet and transition plates for options of split or combined flow. With the ability to combine CLS models, you can simplify the valve assembly for minimal space utilization and lower cost for machines that require a range of various flows. Eaton offers the following standard mid-inlet and transition plates for the CLS mobile valve family.

<b>Frame size</b>	<b>Type.</b>	<b>P/N#</b>
CLS250-180	INTERFACE PLATE	6037811-001
CLS180-100	INTERFACE PLATE	6038098-001
CLS250-100	INTERFACE PLATE	6040359-001

**Special End plates**

CLS100 End plate with O-ring groove		6036449-001
CLS100 Hyd/Manual internal drain end plate with additional PRV		6037180-001

# Hydraulic fluid recommendations

## Introduction

Oil in hydraulic systems performs the dual function of lubrication and transmission of power. It is a vital element in a hydraulic system, and careful selection should be made with the assistance of a reputable supplier. Proper selection of oil assures satisfactory life and operation of system components, especially hydraulic pumps and motors.

Generally, oil selected for use with pumps and motors is acceptable for use with valves. Critical servo valves may need special consideration.

When selecting oil for use in an industrial hydraulic system, be sure the oil:

- Contains the necessary additives to ensure excellent anti-wear characteristics
- Has proper viscosity to maintain adequate sealing and lubrication at the expected operating temperature of the hydraulic system
- Includes rust and oxidation inhibitors for satisfactory system operation

## Types of hydraulic fluids

Hydraulic fluids are classified by the type of base stock used. Some fluids are further classified by fluid formulation and performance.

### Anti-wear hydraulic fluids

For general hydraulic service, Eaton recommends the use of mineral base anti-wear (AW) hydraulic oils meeting Eaton specification

E-FDGN-TB002-E.

Eaton requests that fluid suppliers test newly developed lubricants on Eaton 35VQ25A high pressure vane pump, according to Eaton ATS-373 test procedure, ASTM D 6973 test method and meet other requirements of the Eaton specification E-FDGN-TB002- E. Lubricants meeting the Eaton specification are considered good quality anti-wear hydraulic fluids that can be used with Eaton components at maximum allowable operating conditions. They offer superior protection against pump wear and long service life.

### Crank case oils

Automotive-type crankcase oils with American Petroleum Institute (API) letter designation SE, SF, SG, SH or higher per SAE J183 classes of oils are recommended for hydraulic service. The “detergent” additive tends to hold water in a tight emulsion and prevents separation of water.

Automotive type crankcase oils generally exhibit less shear stability, which can result in higher loss of viscosity during service life.

Multiple-viscosity, industrial grade hydraulic fluids with better shear stability will provide improved viscosity control. Other mineral oil based lubricants commonly used in hydraulic systems are automatic transmission fluids (ATFs) and universal tractor transmission oils (UTTOs).

### Synthetic hydrocarbon

Synthetic hydrocarbon base stocks, such as polyalphaolefins (PAOs), are also used to formulate AW hydraulic fluids, crankcase oils, ATFs and UTTOs.

### Environmentally friendly hydraulic fluids

Eco-friendly characteristics is becoming a critical need, and a number of biodegradable hydraulic fluids are being used more and more in environmentally sensitive areas.

Biodegradable hydraulic fluids are generally classified as vegetable oil based (HETG), synthetic ester (HEES), polyalkylene glycol (HEPG) and polyalphaolefin (HEPR). In addition, special water glycol hydraulic fluids are used in applications in which water miscibility is necessary, along with biodegradable properties.

### Fire-resistant hydraulic fluids

Fire-resistant fluids are classified as water containing fluids or synthetic anhydrous fluids. Water acts as the fire retarding agent in water containing fluids. The chemical structure of synthetic anhydrous fluids provides fire resistance. Many applications that are prone to fire hazard, such as steel mills, foundries, die casting, mines, etc., require the use of fire resistant hydraulic fluid for improved fire safety. Fire resistant fluids may not be fireproof, but they have better fire resistance compared to mineral oil.

The alternative fluids are recommended when specific properties, such as fire resistance, biodegradability etc., are necessary for the application. Keep in mind that alternative fluids may differ from AW petroleum fluids in properties such as pressure viscosity coefficient, specific gravity, lubricity etc. Hence certain pumps / motors may need to be de-rated, some can be operated under full ratings and others are not rated. Be sure to confirm product ratings with the specific fluid in the intended application.

### Viscosity

Viscosity is the measure of a selection of hydraulic fluid with a specific viscosity range should be based on the needs of the system, limitations of critical components, or proper performance of specific types of units. At system startup and during operation, Eaton recommends maintaining the fluid's maximum and minimum viscosity ranges (see chart). Very high viscosities at startup temperatures can cause noise and cavitation damage to pumps.

Continuous operation at moderately high viscosities will tend to hold air in suspension in the fluid, as well as generate higher operating temperatures. This can cause noise, early failure of pumps and motors and erosion of valves. Low viscosities result in decreased system efficiency and impairment of dynamic lubrication, causing wear.

# Hydraulic fluid recommendations

It is important to choose the proper fluid viscosity for your particular system in order to achieve the startup viscosity and running viscosity range (see chart) over the entire temperature range encountered. Confirm with your fluid supplier that the fluid viscosity will not be less than the minimum recommended at the maximum fluid temperature of your application.

A number of anti-wear hydraulic fluids containing polymeric thickeners (Viscosity Index Improvers [VII]) are available for use in low temperature applications. Temporary or permanent viscosity loss of some of these fluids at operating temperature may adversely affect the life and performance of components. Before using polymer containing fluids, check the extent of viscosity loss (shear stability) to avoid hydraulic service below the recommended minimum viscosity. A fluid with good shear stability is recommended for low temperature applications.

Multi-grade engine oils, ATFs, UTTOs etc., also contain VIIs, and viscosity loss will be encountered during use.

## Cleanliness

Fluid cleanliness is extremely important in hydraulic systems. More than 70% of all failures are caused by contamination, which can reduce hydraulic system efficiency up to 20% before system malfunction may be recognized. Different hydraulic components require different cleanliness levels. The cleanliness of a hydraulic system is dictated by the cleanliness requirement of the most stringent component in the system. OEMs and distributors should provide their customers with cleanliness requirements for Eaton hydraulic components used in their system designs. Refer to Eaton product catalogs for specific cleanliness requirements of individual components.

## Fluid maintenance

The condition of a fluid has a direct bearing on the performance and reliability of the system. Maintaining proper fluid viscosity, cleanliness level, water content, and additive level is essential for excellent hydraulic system performance. In order to maintain a healthy fluid, Eaton recommends performing periodic checks on the condition of the fluid.

## System design considerations

When designing a hydraulic system, the specific gravity of the hydraulic fluid needs to be taken into consideration. If the specific gravity of the fluid is higher than that of mineral oil, be sure the reservoir fluid level is adequately above the pump inlet to meet the recommended inlet operating condition of minimum 1.0 bar absolute pressure at the pump inlet.

## Filters

Proper filter type and size, which vary depending on the type of fluid used in a system, are essential for healthy system function. The primary types of filter materials are paper, cellulose, synthetic fiber, and metal.

Filter media, adhesive, and seals must be compatible with the fluid used in the system. To lengthen fluid change out intervals, special absorbent filter media may be used to remove moisture and acids from phosphate esters.

## Seals/Elastomers

Select seal/elastomer materials that are suitable for the application, minimum and maximum operating temperature, and compatibility with the type of fluid used

in the hydraulic system. The effect of hydraulic fluid on a particular elastomer depends on the constituents of the fluid, temperature range, and level of contaminants.

## Replacing hydraulic fluid

Although sometimes valid, arbitrary hydraulic fluid change-outs can result in wasting good fluid and unnecessary machine downtime.

A regularly scheduled oil analysis program is recommended to determine when fluid should be replaced. The program should include inspection of the fluid's color, odor, water content, solid contaminants, wear metals, additive elements, and oxidation products. Clean the system thoroughly and flush with fresh, new fluid to avoid any contamination with the previous fluid/lubricant. Replace all seals and filters with new, compatible parts. Mixing two different fluids in the same system is not recommended.

Contact your Eaton representative with questions concerning hydraulic fluid recommendations.

# Viscosity requirements

<b>Product Line</b>	<b>Minimum</b>	<b>Optimum range</b>	<b>Maximum allowed - startup</b>	<b>Cleanliness requirement (ISO 4406:99)</b>
CMX, CML, and CLS Proportional control valves	6 cSt (45 SUS)	20-43 cSt (100-200 SUS)	2158 cSt (10,000 SUS)	18/16/14





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