Mobile Valves
Proportional - Load Sensing
Model CLS100

350 bar
100 L/min
Up to 10 sections
Eaton Pro-FX™ Compliant
## Table of contents

<table>
<thead>
<tr>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications and performance</td>
<td>4–7</td>
</tr>
<tr>
<td>Specifications and performance</td>
<td>4</td>
</tr>
<tr>
<td>Product overview</td>
<td>5-7</td>
</tr>
<tr>
<td><strong>CLS load sense sectional mobile valve</strong></td>
<td>8-16</td>
</tr>
<tr>
<td>Ordering example</td>
<td>8</td>
</tr>
<tr>
<td>Model code for valve bank</td>
<td>9</td>
</tr>
<tr>
<td>Tie Rod Kits</td>
<td>10</td>
</tr>
<tr>
<td>CLS100 with manual actuation and enclosed lever box - Installation view</td>
<td>11</td>
</tr>
<tr>
<td>CLS100 with electrohydraulic actuation - Installation view</td>
<td>12</td>
</tr>
<tr>
<td>Typical curves</td>
<td>13-16</td>
</tr>
<tr>
<td>Typical work port auxiliary valve curves</td>
<td>17</td>
</tr>
<tr>
<td><strong>Model code for valve bank inlet</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>CLS inlet – Configuration</strong></td>
<td>19</td>
</tr>
<tr>
<td><strong>CLS inlet – Relief valve options</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>CLS inlet – Dump valve options</strong></td>
<td>21</td>
</tr>
<tr>
<td><strong>Model code for sections</strong></td>
<td>22</td>
</tr>
<tr>
<td><strong>Features compatibility table</strong></td>
<td>23</td>
</tr>
<tr>
<td><strong>Valve section options – Compensation</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>Valve section options – Actuation for hydraulic control</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Valve section options – Actuation for electrohydraulic control</strong></td>
<td>26</td>
</tr>
<tr>
<td><strong>Valve section options – Actuation for manual control</strong></td>
<td>27</td>
</tr>
<tr>
<td><strong>Valve section options – Spool type and spool return action</strong></td>
<td>28</td>
</tr>
<tr>
<td><strong>Valve Section options – Port A and Port B spool flows and coil type</strong></td>
<td>29</td>
</tr>
<tr>
<td><strong>Valve section options – Port A and Port B functions and settings</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Valve section options – Load sense relief options and setting</strong></td>
<td>31-32</td>
</tr>
<tr>
<td><strong>Valve section options – Spool stroke limiter or position indicator and lever kit</strong></td>
<td>33-34</td>
</tr>
<tr>
<td><strong>Valve section options – Build type</strong></td>
<td>35</td>
</tr>
<tr>
<td><strong>Model code for valve bank end cover</strong></td>
<td>36</td>
</tr>
<tr>
<td><strong>CLS assembly – End covers</strong></td>
<td>37-38</td>
</tr>
<tr>
<td><strong>Mid-Inlet and transition plates</strong></td>
<td>39</td>
</tr>
<tr>
<td><strong>Hydraulic fluid recommendations</strong></td>
<td>40-41</td>
</tr>
<tr>
<td><strong>Viscosity and cleanliness requirements</strong></td>
<td>42</td>
</tr>
</tbody>
</table>
Eaton’s CLS Load Sense Sectional Mobile Valve

Eaton’s new CLS100 Load Sensing Sectional Mobile Valve is a pre and post compensated mobile 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. Add in the ability to install both pre and post compensated sections in the same valve bank; the CLS100 allows you to prioritize work functions to accelerate productivity, improve machine efficiency, and enhance the safety characteristics of the machine.

Improve your machine performance with the newest load sensing valve to market, the Eaton CLS100.

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
- Both pre and post comp sections available in same valve assembly
- 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 Electro-hydraulic controls with lever overrides
- Special features available for additional design flexibility:
  - Sectional load sense relief on pre and post compensated sections
  - Adjustable spool stroke limiting device
  - Parallel connection of multiple valve banks
  - Work port relief with anti cavitation
  - Available fourth position float

Typical applications

- Excavator – Multiple sizes
- Forestry
- Refuse trucks
- Forklift
- Agricultural machinery
- Truck mounted cranes
- Marine
## Specifications and performance

### CLS100 Load Sense Sectional Mobile Valve

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated pressure</strong></td>
<td></td>
</tr>
<tr>
<td>Inlet</td>
<td>350 bar (5076 psi)</td>
</tr>
<tr>
<td>Work port</td>
<td>350 bar (5076 psi)</td>
</tr>
<tr>
<td>Tank port</td>
<td>10 bar (145 psi)</td>
</tr>
<tr>
<td>Pilot Drain Port (D1/D2)</td>
<td>5 bar (73 psi)</td>
</tr>
<tr>
<td><strong>Rated inlet flow</strong></td>
<td>150 lpm (39.6 gpm)</td>
</tr>
<tr>
<td><strong>Rated workport flow</strong></td>
<td></td>
</tr>
<tr>
<td>Post Compensated</td>
<td>100 lpm (26.4 gpm) @ 14 bar differential pressure</td>
</tr>
<tr>
<td>Pre Compensated</td>
<td>80 lpm (21.1 gpm) @ 14 bar differential pressure</td>
</tr>
<tr>
<td>Pre Compensated</td>
<td>100 lpm (26.4 gpm) @ 17 bar differential pressure</td>
</tr>
<tr>
<td><strong>Fluid cleanliness and viscosity</strong></td>
<td>See Hydraulic Fluid Recommendations Bulletin 03-401</td>
</tr>
<tr>
<td><strong>Ambient operating temperature range</strong></td>
<td>-40°C / 60°C (-40°F / 140°F)</td>
</tr>
<tr>
<td><strong>Oil temperature operating range</strong></td>
<td>-25°C / 80°C (-13°F / 176°F)</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>Sectional</td>
</tr>
<tr>
<td><strong>Work sections</strong></td>
<td>1-10</td>
</tr>
<tr>
<td><strong>Maximum leakage, cylinder workport to tank</strong></td>
<td>11 cc per minute at 100 bar (1450 psi)</td>
</tr>
<tr>
<td><strong>Port types</strong></td>
<td></td>
</tr>
<tr>
<td>Inlet and Tank</td>
<td>SAE-12 or BSP G 3/4</td>
</tr>
<tr>
<td>Work Ports A and B</td>
<td>SAE-10 or BSP G 1/2</td>
</tr>
<tr>
<td>Inlet Pr Gauge port “M”, LS port and Drain port</td>
<td>SAE-6 or BSP G 1/4</td>
</tr>
<tr>
<td>Hydraulic Pilot</td>
<td>SAE-6 or BSP G 1/4</td>
</tr>
<tr>
<td><strong>Work section options</strong></td>
<td></td>
</tr>
<tr>
<td>Spools</td>
<td>Double acting (4 way) cylinder</td>
</tr>
<tr>
<td>Double acting (4 way) cylinder with 4th position float</td>
<td></td>
</tr>
<tr>
<td>Bi-directional (4 way) motor, full open to tank in neutral</td>
<td></td>
</tr>
<tr>
<td><strong>Actuation</strong></td>
<td>Hydraulic with top ports</td>
</tr>
<tr>
<td>Hydraulic with end ports</td>
<td></td>
</tr>
<tr>
<td>Hydraulic with end ports, lever override, and configured for EH pilot valve installation</td>
<td></td>
</tr>
<tr>
<td>Electrohydraulic with lever override</td>
<td></td>
</tr>
<tr>
<td>Electrohydraulic only</td>
<td></td>
</tr>
<tr>
<td>Electrohydraulic with hydraulic ports and lever override</td>
<td></td>
</tr>
<tr>
<td>Electrohydraulic with hydraulic ports</td>
<td></td>
</tr>
<tr>
<td>Manual with enclosed lever box</td>
<td></td>
</tr>
<tr>
<td>Manual with exposed spool connection</td>
<td></td>
</tr>
<tr>
<td><strong>Coil voltages</strong></td>
<td>12 Volt DC</td>
</tr>
<tr>
<td>24 Volt DC</td>
<td></td>
</tr>
<tr>
<td><strong>Coil connectors</strong></td>
<td>Integral Deutsch DT04-2P</td>
</tr>
<tr>
<td>Amp Jr. Timer connector 106462-1</td>
<td></td>
</tr>
<tr>
<td><strong>Electrohydraulic interface</strong></td>
<td>Eaton HFX programmable controllers and Pro-FX™ application software</td>
</tr>
</tbody>
</table>
**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.

![Diagram of CLS Load Sense Sectional Mobile Valve](image)

**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.
**Operating principle (Pre Comp Section)**

The unique design of CLS valves allows one or more precompensated sections to be designed into a normally configured valve. The advantage of having a precompensated section available within a post-compensated system (a rather unique configuration among flow sharing systems) lies in the fact that a priority flow function can be guaranteed.

In a saturation condition, all post compensated sections will proportionally reduce their delivered flows, while the pre-compensated section will keep a constant delivered flow in order to guarantee the priority of the function.

---

**Single section**

Referencing the picture to the left reveals some aspects of system functionality. From the inlet line, the high pressure flow passes across section compensator where the spring provides sectional margin pressure which is addition to the inlet compensator spring pressure. The metering area comes into picture after the sectional compensator as this being pre compensation. The metering area, according to the pressure margin, controls the total amount of flow to the work-port selected by the main spool.

Pressure differential acting on the compensator spool is picked from either side of the main metering orifice. Compensator spools references the load sense signal picked up before the load sense shuttle. Pump to load sense pressure differential is controlled by compensator springs.

---

**Multi-Section**

When flow demand exceeds flow supply the lowest loaded section takes priority over the highest loaded section.

---

**Flow Priority**

CLS100 offers a precious additional feature: The possibility to mix pre and post compensated technologies in single bank, to improve the control capabilities and manage flows with different priorities.

---

**Legend:**

1. Inlet line (high pressure)
2. Metering notches
3. Load sensing line
4. Local compensator
5. Metering spool
The CLS100 valve line allows the customer the ability to combine pre and post compensated valve sections in the same valve bank. The pre compensated section acts as a priority flow sharing function by diverting flow to the pre compensated function first, then to the remaining sections in the bank.

The following schematics show an example of an all post-compensated system, and a system with an integrated pre compensated section.

**Post compensated system**

**Pre compensated system**
### Valve bank order example

1. **Inlet**
   - CLS100LSL125000ZZ00B

2. **Section 1**
   - CLS101PESDA040040CP000P000Z000ZBL00B

3. **Section 2**
   - CLS101PESDA040040CP000P000Z000ZBL00B

4. **Section 3**
   - CLS101PESDA040040CP000P000Z000ZBL00B

5. **End Cover**
   - CLS10ZG00B

6. **CLS100/3 Tie Rod Kit**
   - 6042571-003

7. **Paint**
   - 00- None
   - 0B- Glossy Blank
   - AU- Standard Flat Black
   - BD- Yellow
   - 0C- Red
   - CD- Eaton Blue (Primer)
   - 0K- Green

**Note:** Repeat section model code for additional sections.
Model code for valve bank

1-6  Product Series
CLS100 – 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 (G3/4 P&T, G1/4 LS&M)
S – SAE (-12 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  Sections #,@
XXXX – 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 Inlet model code for detail, Page 18
** Refer End cover model code for detail, Page 36
*** All paint is finish coat with exception to Eaton Blue, which is a primer coat.
# Position for sections can vary from 20 to 69 digits as per number of sections required in bank assembly.
   Based on this next features position will change.
© When selecting Actuation sequence for work section for LH build it is required to have A,C,L should be stacked first near inlet section and to be followed by B,D,E, & G to avoid interference between section
   When selecting Actuation sequence for work section for RH build it is required to have B,D,E & G should be stacked first near inlet section and to be followed by A,C,L to avoid interference between section
CLS 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, three (3) nuts and three (3) washers.

**Tie rod kits for CLS100 bank assembly**

<table>
<thead>
<tr>
<th>Tie Rod Kit</th>
<th>Desc.</th>
<th>Tie Rod Kit</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS100/1</td>
<td>1 Sect.</td>
<td>6042571-001</td>
<td>102</td>
</tr>
<tr>
<td>CLS100/2</td>
<td>2 Sect.</td>
<td>6042571-002</td>
<td>140</td>
</tr>
<tr>
<td>CLS100/3</td>
<td>3 Sect.</td>
<td>6042571-003</td>
<td>178</td>
</tr>
<tr>
<td>CLS100/4</td>
<td>4 Sect.</td>
<td>6042571-004</td>
<td>217</td>
</tr>
<tr>
<td>CLS100/5</td>
<td>5 Sect.</td>
<td>6042571-005</td>
<td>255</td>
</tr>
<tr>
<td>CLS100/6</td>
<td>6 Sect.</td>
<td>6042571-006</td>
<td>293</td>
</tr>
<tr>
<td>CLS100/7</td>
<td>7 Sect.</td>
<td>6042571-007</td>
<td>331</td>
</tr>
<tr>
<td>CLS100/8</td>
<td>8 Sect.</td>
<td>6042571-008</td>
<td>370</td>
</tr>
<tr>
<td>CLS100/9</td>
<td>9 Sect.</td>
<td>6042571-009</td>
<td>408</td>
</tr>
<tr>
<td>CLS100/10</td>
<td>10 Sect.</td>
<td>6042571-010</td>
<td>445</td>
</tr>
</tbody>
</table>

Tightening: 40 Nm

**Tie rod kits for CLS180 sections for CLS180 to CLS100 transition plate part #6045191-001**

<table>
<thead>
<tr>
<th>Tie Rod Kit</th>
<th>Desc.</th>
<th>Tie Rod Kit</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS180/1</td>
<td>1 Sect.</td>
<td>6044401-001</td>
<td>156</td>
</tr>
<tr>
<td>CLS180/2</td>
<td>2 Sect.</td>
<td>6044401-002</td>
<td>202</td>
</tr>
<tr>
<td>CLS180/3</td>
<td>3 Sect.</td>
<td>6044401-003</td>
<td>249</td>
</tr>
<tr>
<td>CLS180/4</td>
<td>4 Sect.</td>
<td>6044401-004</td>
<td>295</td>
</tr>
<tr>
<td>CLS180/5</td>
<td>5 Sect.</td>
<td>6044401-005</td>
<td>341</td>
</tr>
<tr>
<td>CLS180/6</td>
<td>6 Sect.</td>
<td>6044401-006</td>
<td>387</td>
</tr>
<tr>
<td>CLS180/7</td>
<td>7 Sect.</td>
<td>6044401-007</td>
<td>434</td>
</tr>
<tr>
<td>CLS180/8</td>
<td>8 Sect.</td>
<td>6044401-008</td>
<td>480</td>
</tr>
<tr>
<td>CLS180/9</td>
<td>9 Sect.</td>
<td>6044401-009</td>
<td>526</td>
</tr>
</tbody>
</table>

Tightening Torque: 70 Nm

**Note:**

This kit includes 3 tie rods, 3 nuts, 3 washers and used on CLS180 side interface.
CLS Load Sense Sectional Mobile Valve
CLS100 with manual actuation and enclosed lever box

Units: mm

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Number of sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>1/1 1/2 1/3 1/4 1/5 1/6 1/7 1/8 1/9 1/10</td>
</tr>
<tr>
<td></td>
<td>95 133 171 209 247 285 323 361 399 437</td>
</tr>
<tr>
<td>Y (mm) Max</td>
<td>157 195 233 272 310 348 386 425 463 500</td>
</tr>
<tr>
<td>Weights (kg)</td>
<td>14.5 18.5 22.5 26.5 30.5 34.5 38.5 42.5 46.6 50.5</td>
</tr>
</tbody>
</table>
CLS Load Sense Sectional Mobile Valve

CLS100 with electrohydraulic actuation

Units: mm

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Number of sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>/1  /2  /3  /4  /5  /6  /7  /8  /9  /10</td>
</tr>
<tr>
<td>Y (mm) Max</td>
<td>163  201  239  278  316  354  392  431  469  506</td>
</tr>
<tr>
<td>Weights (kg)</td>
<td>15  19.5  24.0  28.5  33.0  37.5  42.0  46.5  51.0  55.5</td>
</tr>
</tbody>
</table>

M10 X 1.5 mm at 3 places for mounting

Ø 12.5 mm for lifting at 2 places

Lever location (lever not shown)
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
**Post compensated spool flow characteristic**

Flow on ports A and B as function of spool stroke, pilot pressure, control current.

**Spool flow versus delta pressure**

With post comp, maximum flow is a function of the delta P created by the variable displacement pump.
**CLS Load Sense Sectional Mobile Valve**

*Typical curves*

**Pre compensated spool flow characteristic**

Flow on ports A and B as function of spool stroke, pilot pressure, control current.

14 bar \( \Delta p \) between load sense and inlet pressure

---

**80 lpm**

Rated flow requires 14 bar \( \Delta P \) between inlet and load sense & requires special section compensator spring

**100 lpm**

Rated flow requires 17 bar \( \Delta P \) between inlet and load sense & requires special section compensator spring (need special inlet with 17 bar margin spring when used with open centre inlet)
Post compensated four position float spool characteristic

Flow and float position as function of spool stroke, pilot pressure, control current

Typical curves
**Work Port Relief Valve (relief mode)**
Pressure characteristic as function of flow

![Graph showing pressure characteristic as function of flow for a work port relief valve in relief mode.]

**Work Port Relief Valve (anti-cav mode)**
Opening and pressure characteristic as function of flow

![Graph showing opening and pressure characteristic as function of flow for a work port relief valve in anti-cav mode.]

**CLS Load Sense Sectional Mobile Valve**
Typical work port auxiliary valve curves
### Inlet Reliefs

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>LS &amp; Full Flow Reliefs</td>
</tr>
<tr>
<td>L</td>
<td>LS Relief Only</td>
</tr>
<tr>
<td>R</td>
<td>Full flow relief only*</td>
</tr>
<tr>
<td>Z</td>
<td>No Reliefs</td>
</tr>
</tbody>
</table>

#### Load Sense Relief Setting

- 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.

### Full Flow Relief Setting

- 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.

### Inlet Dump Valve

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Full Flow Dump Valve</td>
</tr>
<tr>
<td>L</td>
<td>LS Dump Valve</td>
</tr>
<tr>
<td>Z</td>
<td>No Dump Valve</td>
</tr>
</tbody>
</table>

### Inlet Coil

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12V Coil with DIN Connector</td>
</tr>
<tr>
<td>B</td>
<td>24V Coil with DIN Connector</td>
</tr>
<tr>
<td>C</td>
<td>12V Coil Deutsch Connector</td>
</tr>
<tr>
<td>D</td>
<td>24V Coil Deutsch Connector</td>
</tr>
<tr>
<td>E</td>
<td>12V Coil AmpJr Connector</td>
</tr>
<tr>
<td>F</td>
<td>24V Coil AmpJr Connector</td>
</tr>
<tr>
<td>Z</td>
<td>No Coil</td>
</tr>
</tbody>
</table>

### Special Features

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>No special features</td>
</tr>
</tbody>
</table>

### Design Level

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Latest design</td>
</tr>
</tbody>
</table>

### Notes:

1. Cannot have full flow relief valve and full flow dump valve in same inlet. Full flow relief valve and full flow dump valve cavities are different, so these are not interchangeable.

2. Transition plates and mid-inlets are available on request.
CLS inlet – Configuration
Model code positions 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 is suitable to adjust the system maximum pressure. LS electric dump valve can also be added as safety device. An additional full flow relief valve can be added to protect the system from pump regulator failures.

![SCHEMATIC FOR LOAD SENSING INLET](image)

**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 is suitable to adjust the system maximum pressure. Full flow electric dump valve can also be added as safety device.

![SCHEMATIC OF UNLOAD FOR OPEN CENTER INLET](image)
CLS inlet – Relief valve options
Model code position 9

**D - LS & 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

<table>
<thead>
<tr>
<th>Option</th>
<th>Connector types (Deutsch/Amp Jr)</th>
<th>Ingress Rating</th>
<th>Coil Resistance R20 (Ω)</th>
<th>Connector Material</th>
<th>Coil Body</th>
<th>Duty Cycle</th>
<th>Coil Insulation</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A - 12V Coil with DIN Connector</td>
<td>IP 65</td>
<td>7</td>
<td>Nylon</td>
<td>Zinc platted steel</td>
<td>100%</td>
<td>Class H coil - IEC B5 Standard</td>
<td>20.5 W</td>
</tr>
<tr>
<td>B</td>
<td>B - 24V Coil with DIN Connector</td>
<td>IP 65</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>C - 12V Coil with Deutsch Connector</td>
<td>IP 67</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>D - 24V Coil with Deutsch Connector</td>
<td>IP 67</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>E - 12V Coil with AmpJr Connector</td>
<td>IP 65</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>F - 24V Coil with AmpJr Connector</td>
<td>IP 65</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Model code for sections

The following 36 digit coding system has been developed to identify preferred feature options for the CLS100 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.

### CLS101 – Load Sense Sectional Mobile Valves

**Product Series**

<table>
<thead>
<tr>
<th>1-6</th>
<th>Spool Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>G1/2 BSP (G1/4 Pilot if Hyd.,)</td>
</tr>
<tr>
<td>S</td>
<td>SAE, -10 (SAE -6 Pilot if Hyd.,)</td>
</tr>
</tbody>
</table>

**Compensation**

<table>
<thead>
<tr>
<th>7</th>
<th>Spool Stroke Limiter or Position Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Post-compensated</td>
</tr>
<tr>
<td>L</td>
<td>Pre-compensated</td>
</tr>
<tr>
<td>R</td>
<td>Post-compensated with Local flow Limiter***</td>
</tr>
<tr>
<td>N</td>
<td>Non-compensated Section</td>
</tr>
</tbody>
</table>

**Actuation**

<table>
<thead>
<tr>
<th>8</th>
<th>LS Relief Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Electrohydraulic Section w/Spool Stroke Limiter</td>
</tr>
<tr>
<td>B</td>
<td>Hydraulic Section w/Spool Stroke Limiter</td>
</tr>
<tr>
<td>P</td>
<td>Electrohydraulic Spool Position Indicator</td>
</tr>
</tbody>
</table>

**Port Type**

<table>
<thead>
<tr>
<th>9</th>
<th>Special Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>No special features</td>
</tr>
</tbody>
</table>

**Build Type**

<table>
<thead>
<tr>
<th>10</th>
<th>Design Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Latest Design</td>
</tr>
</tbody>
</table>

**Coil Type**

<table>
<thead>
<tr>
<th>11</th>
<th>Port B Spool Stroke Limiter Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>12V coil Deutsch connector</td>
</tr>
<tr>
<td>D</td>
<td>24V coil Deutsch connector</td>
</tr>
<tr>
<td>E</td>
<td>12V coil AmpJr connector</td>
</tr>
<tr>
<td>F</td>
<td>24V coil AmpJr connector</td>
</tr>
<tr>
<td>Z</td>
<td>No coil</td>
</tr>
</tbody>
</table>

**Spool Action**

<table>
<thead>
<tr>
<th>12-14</th>
<th>Port A Spool Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Spring Centered to Neutral</td>
</tr>
<tr>
<td>B</td>
<td>Detent “In” and “Out”*</td>
</tr>
<tr>
<td>C</td>
<td>Fourth Position Float #</td>
</tr>
<tr>
<td>E</td>
<td>Fourth Position Float Detent* #</td>
</tr>
<tr>
<td>F</td>
<td>Friction - Hold in Position*</td>
</tr>
</tbody>
</table>

**Port A Option Function**

<table>
<thead>
<tr>
<th>15-17</th>
<th>Port B Spool Stroke Limiter Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Anti-Cav</td>
</tr>
<tr>
<td>R</td>
<td>Relief/Anti-Cav</td>
</tr>
<tr>
<td>P</td>
<td>Plugged - Work port Cavities Machined and Plugged</td>
</tr>
<tr>
<td>Z</td>
<td>None - Option Port No Machining</td>
</tr>
<tr>
<td>T</td>
<td>Transducer Port Adaptor For Work Port Pressure Sensing (Plugged option:G1/8 BSP or SAE 4)</td>
</tr>
</tbody>
</table>

**Port B Option Function**

<table>
<thead>
<tr>
<th>18</th>
<th>Sectional LS Relief Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Sectional Load Sense Relief valve (Applies to Both A &amp; B Ports)**##</td>
</tr>
<tr>
<td>Y</td>
<td>SAE -4 or G1/8 Port Sectional Remote Load Sense Relief valve (Applies to Both A &amp; B Ports)$</td>
</tr>
<tr>
<td>Z</td>
<td>No LS Relief</td>
</tr>
</tbody>
</table>

**LS Relief Setting**

<table>
<thead>
<tr>
<th>19</th>
<th>Sectional LS Relief Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXX</td>
<td>3 Digit Section LS Relief Setting in 5 bar increments from 50-350 bar (000 if not Present or if Using Remote LS Relief)</td>
</tr>
</tbody>
</table>

**Note:** © Pre/Post compensation spools offer varying flows, please refer page 29 on applicable spool flow

* Available with Manual Actuation only
** Post comp Sectional LS relief comes with LH build
Pre comp Sectional LS relief comes with RH build
*** Available with RH build only
# Available with RH build and post comp option only
## Sectional LS relief option not available for EH float actuation
$ Available for pre comp option only

---

**Modified on:** January 2021

**EATON CLS100 Load Sense Sectional Mobile Valves E-VLM-CC001-E4 January 2021**
### Features compatibility table

#### Compatibility chart for spool action options with compensation type

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RH Build</td>
<td>LH Build</td>
<td>RH Build</td>
<td>LH Build</td>
<td>RH Build</td>
</tr>
<tr>
<td>Compensation (Model code position-7)</td>
<td>Post comp</td>
<td>With Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>W/O Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Post comp with local flow limiter</td>
<td>With Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>W/O Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>Pre comp</td>
<td>With Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>W/O Sectional LS relief</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

#### Compatibility chart for hydraulic and electrohydraulic actuations having manual override option

<table>
<thead>
<tr>
<th>Combination</th>
<th>Actuation (Model code position-8)</th>
<th>B – Hydraulic with top ports and lever override</th>
<th>D - Hydraulic with end ports, lever override and configured for LH pilot valve installation</th>
<th>E - Electrohydraulic with lever override</th>
<th>F – Electrohydraulic only</th>
<th>G - Electrohydraulic with hydraulic ports and lever override</th>
<th>H - Electrohydraulic with hydraulic ports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RH Build</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td>LH Build</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>
Valve section options – Compensation
Model code position 7

The CLS family offers an unique additional feature: the ability to mix pre and post compensated technologies, to improve the control capabilities and manage flows with different priorities. The following schematics show an example for the two systems.

**P - Post compensated (flow sharing)**
Available with or without auxiliary valve cavities
Note: Shown with auxiliary valves

**L - Pre compensated**
Available with or without auxiliary valve cavities
Note: Shown with auxiliary valves

---

**R - Post compensated (flow sharing) with local flow limiter**
Available with or without auxiliary valve cavities
Note: Shown with auxiliary valves
Available with RH build only.
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 ports and lever override*
Lever actuation and hydraulic actuation
(Only with EH type body)

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

D - Hydraulic with End ports, lever override, and configured for EH pilot valve installation*
Lever and hydraulic actuation with electrohydraulic arrangement
Valve section options – Actuation for electrohydraulic control
Dimensions and configurations for model code position 8

Units: mm

E - Electrohydraulic with lever override

F - Electrohydraulic only
Without lever

G - Electrohydraulic with hydraulic ports and lever override*
Lever, hydraulic, and electrohydraulic actuation

H - Electrohydraulic with hydraulic ports*
Without lever, hydraulic, and electrohydraulic actuation

Note: * Plastic shipping plugs fitted on hydraulic ports.
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)

Note: Only available on post compensated sections
Valve section options – Spool type
Model code position 10

D - Double acting (4 way) cylinder

F - Double acting (4 way) cylinder with 4th position float*

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

Note: Spool F requires additional valve body machining and special 4th position detent selection

* Available with RH build and post comp option only
Valve Section Options – Port A and Port B spool flows
Model code positions 12-14 (port A) and Model code positions 15-17 (port B)

Post compensated section

<table>
<thead>
<tr>
<th>Spool Type</th>
<th>Flow Rates (l/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>005</td>
</tr>
<tr>
<td>D</td>
<td>•</td>
</tr>
<tr>
<td>H</td>
<td>•</td>
</tr>
<tr>
<td>F</td>
<td>•</td>
</tr>
</tbody>
</table>

Pre compensated section

<table>
<thead>
<tr>
<th>Spool Type</th>
<th>Flow Rates (l/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>010</td>
</tr>
<tr>
<td>D</td>
<td>•</td>
</tr>
<tr>
<td>H</td>
<td>•</td>
</tr>
</tbody>
</table>

Note: Rated flows are defined for 14 bar Δp.
Listed flows are for symmetrical spools; for questions regarding asymmetric spools please contact your sales representative

* Rated flow is defined at 14 bar Δp & requires special section compensator spring
** Rated flow is defined at 17 bar Δp & requires special section compensator spring.
(For open center inlet 100 lpm spool needs special inlet compensator with 17 bar margin)

Valve section options – Coil Voltage and Connector
Model code position 18

Coil and connector specifications

<table>
<thead>
<tr>
<th>Option</th>
<th>Supply voltage (VDC)</th>
<th>Connector</th>
<th>Ingress Rating</th>
<th>Coil resistance $R_{coil}$ (Ω)</th>
<th>Feeding Reducing Pressure</th>
<th>Prop. current control (mA)</th>
<th>On-Off current control (mA)</th>
<th>PWM Suggested frequency (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>12</td>
<td>Deutsch DT4</td>
<td>IP 67</td>
<td>4.7</td>
<td>Feeding Reducing Pressure</td>
<td>600-1300</td>
<td>2500</td>
<td>70-90</td>
</tr>
<tr>
<td>D</td>
<td>24</td>
<td>Deutsch DT4</td>
<td>IP 67</td>
<td>20.8</td>
<td>Feeding Reducing Pressure</td>
<td>300-650</td>
<td>1150</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>12</td>
<td>Amp Jr</td>
<td>IP 65</td>
<td>4.7</td>
<td>Feeding Reducing Pressure</td>
<td>600-1300</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>24</td>
<td>Amp Jr</td>
<td>IP 65</td>
<td>20.8</td>
<td>Feeding Reducing Pressure</td>
<td>300-650</td>
<td>1150</td>
<td></td>
</tr>
</tbody>
</table>
Valve section options – Port A and Port B functions and settings
Model code positions 19-26

A - anti-cav

R - relief/anti-cav

P - Plugged - work port valve cavities machined and plugged

Note: Factory setting 40-350 bar in 10 bar increments
Valve section options –
Load sense relief setting
Model code position 27-30

L-Sectional Load Sense Relief Valve (Applies to Both & B Ports)

Post compensated - section load sense relief

Schematic for manual control

Schematic for electrohydraulic control

Sectional LS relief valve

Note: Available with LH build only
No interchangeability of Parts Worksection, Plug & LSRV due to Design change after January 2021

Pre compensated - section load sense relief

Schematic for manual control

Schematic for electrohydraulic control

Sectional LS relief valve

Note: Pre comp load sense relief range is 50-350 bar.
Available with RH build only.
Valve section options –
Load sense relief setting
Model code position 27-30

Y - SAE-4 or G1/8 port Sectional Remote Load Sense Relief Valve (applies to Both A & B Port)

Schematic for manual control

Schematic for electrohydraulic control

Sectional LS relief valve

Note: Available with RH build only.
Available for precomp option only.
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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>6 - 30 Vdc</td>
</tr>
<tr>
<td>Max current consumption</td>
<td>20.5 mA</td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage spanning</td>
<td>0.5 - 4.5 Vdc</td>
</tr>
<tr>
<td>Quiescent voltage</td>
<td>2.5 Vdc</td>
</tr>
<tr>
<td>Output current</td>
<td>-1 - +1 mA</td>
</tr>
<tr>
<td>Minimum output load resistance</td>
<td>4.5 kOhm</td>
</tr>
<tr>
<td>Overall accuracy</td>
<td>± 2.5%</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit</td>
</tr>
<tr>
<td>Fault signalling levels</td>
<td>4.8V &lt; Vout &lt; 0.2 Vdc</td>
</tr>
</tbody>
</table>

**Specifications:**
- short circuit protection
- reverse, battery protection
- thermal shutdown
- overvoltage, undervoltage
- load-dump

**EM Immunity:** > 60 Vdc/m

#### Mechanical, Environmental

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-40 / +85 °C</td>
</tr>
<tr>
<td>Ingress Protection Rating</td>
<td>IP 65</td>
</tr>
<tr>
<td>Dimensions</td>
<td>28 x 18 x 23 mm (L x W x H)</td>
</tr>
</tbody>
</table>

#### Connections

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O</td>
<td>DIN 43650-C male</td>
</tr>
<tr>
<td>PIN 1</td>
<td>Vout</td>
</tr>
<tr>
<td>PIN 2</td>
<td>Vcc</td>
</tr>
<tr>
<td>PIN 3</td>
<td>OV</td>
</tr>
<tr>
<td>PIN 4</td>
<td>Chassis (connected to valve body)</td>
</tr>
</tbody>
</table>

#### Applied standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunity for industrial environments</td>
<td>EN 61000-6-2</td>
</tr>
<tr>
<td>Emission standard for residential commercial and light-industrial environments</td>
<td>EN 61000-6-3</td>
</tr>
<tr>
<td>EMC - Agricultural and forestry machines</td>
<td>EN 14982</td>
</tr>
<tr>
<td>EMC - Earth-moving machinery</td>
<td>ISO 13766</td>
</tr>
</tbody>
</table>
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

A - 135 Lever kit
Lever with knob - 135mm (5.5”)

B - 210 Lever kit
Lever with knob - 210mm (8.5”)
Section Build Type

Model code position 33

R - Right hand build (Standard build for Pre comp section)

L - Left hand build (Standard build for Post comp section)
Model code for valve bank end cover

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
CLS assembly – End covers
Schematics and configurations for model code position 7

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.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Type</th>
<th>P/N#</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS180-100</td>
<td>TRANSITION PLATE ASSEMBLY</td>
<td>6045191-001</td>
</tr>
<tr>
<td>CLS100-CLS100</td>
<td>MID-INLET BODY WITH O-RING GROOVES</td>
<td>6048082-001</td>
</tr>
</tbody>
</table>

**Special End plates**

| CLS100 End plate with O-ring groove | 6048083-001 |
| CLS100 Hyd/Manual internal drain end plate with additional PRV | 6048084-001 |
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, ATF's 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.

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...
Hydraulic fluid recommendations

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 [VIIs]) 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 and cleanliness requirements

<table>
<thead>
<tr>
<th>Minimum viscosity (cSt)</th>
<th>Optimum range viscosity (cSt)</th>
<th>Maximum allowed - startup viscosity (cSt)</th>
<th>Cleanliness requirement (ISO 4406:99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>20-43</td>
<td>2158</td>
<td>18/16/14</td>
</tr>
<tr>
<td>(46 SUS)</td>
<td>(100-200 SUS)</td>
<td>(10,000 SUS)</td>
<td></td>
</tr>
</tbody>
</table>