ENGINEERING
TOMORROW

Application Guide

PVG 32

Improve stability in open center systems by reducing pressure spikes



Revision history

Table of revisions

Date	Changed	Rev
Feb 2017	First edition	0101

About this document

References

Related literature: *PVG 32 Proportional Valve Group Technical Information*, 520L0344, BC00000038

Terms and definitions

Term	Definition
OC	Open Center
P_{LS}	Load Sense Pressure
PVE	Proportional Valve Electrohydraulic actuator
PVG	Proportional Valve Group
PVP	Proportional Valve Pump side module
T0	Low Pressure Tank Line

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Warning Xxxxx	Identifies information about practices or circumstances that can cause a hazardous situation, which may lead to personal injury or death, damage or economic loss.
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Note	Identifies information that is critical for successful application and understanding of the product. Identifies a typical use of a functionality or parameter value. Use recommendations as a starting point for the final configuration process of the system.

Application overview

When using a small orifice in the load sense line within an open center (OC) system, there will be rapid changes from high pressure to low pressure in the load sense signal due to the quick return of the main spool to its neutral position.

In this document you can read about the difference of using a small orifice in the load sense line and using a combined orifice and check valve. The purpose is to show why and how using the combined orifice and check valve can lead to reduced pressure peaks and thereby improved stability.

Explanation of the rapid pressure drop

When you are using a PVG valve together with a fixed displacement pump, the pump module is configured to run in an open center mode. This means that the pressure adjustment spool leads the flow across to a tank connection that determines the pump stand-by pressure when no work sections are actuated. When pressure is needed at a work section to perform a task, this tank connection is partially or fully closed by the internal load sense network.

The force of the neutral adjustment spring causes the main spool of a working section to quickly return to its neutral position. This causes the load sense signal to rapidly switch from high pressure to low pressure. When the load sense signal changes the pressure adjustment spool in the PVG inlet module, the spool must return to neutral and the tank connection will then reopen and relieve the pressure. The fast change in the load sense signal will create a pressure peak. This peak is especially undesirable when using a PVE in a valve stack that is not configured with T0.

These pressure peaks in the tank line can be reduced by replacing the small orifice in the load sense line from the work sections with a combined orifice and check valve as seen in the following figure.

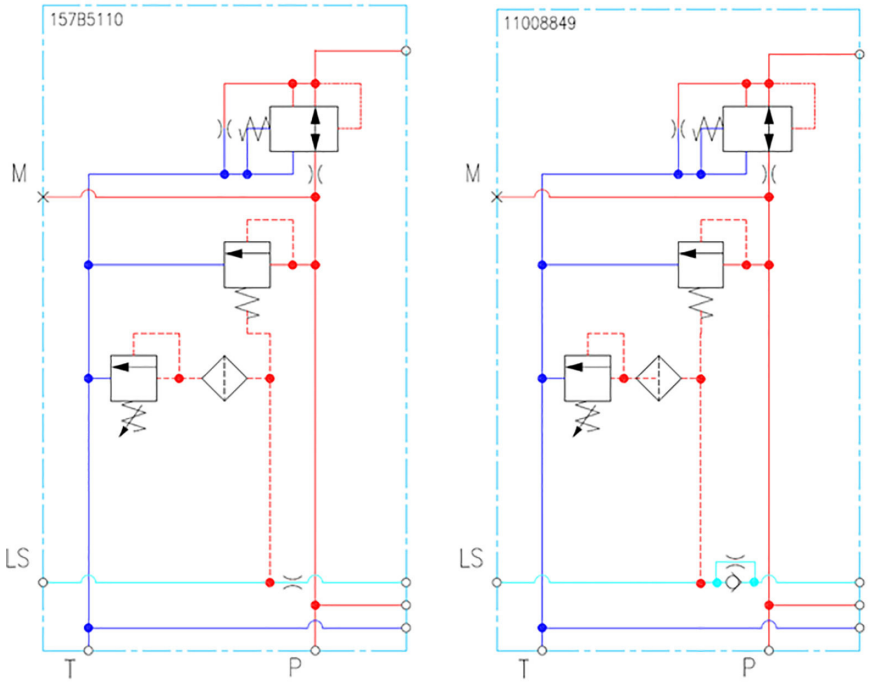
Combined orifice and check valve



Comparison of modules on page 6 shows a module with small orifice and a module with combined orifice and check valve.

Explanation of the rapid pressure drop

Comparison of modules



Left schematic	Default OC PVP with orifice
Right schematic	Special OC PVP with combined orifice and check valve

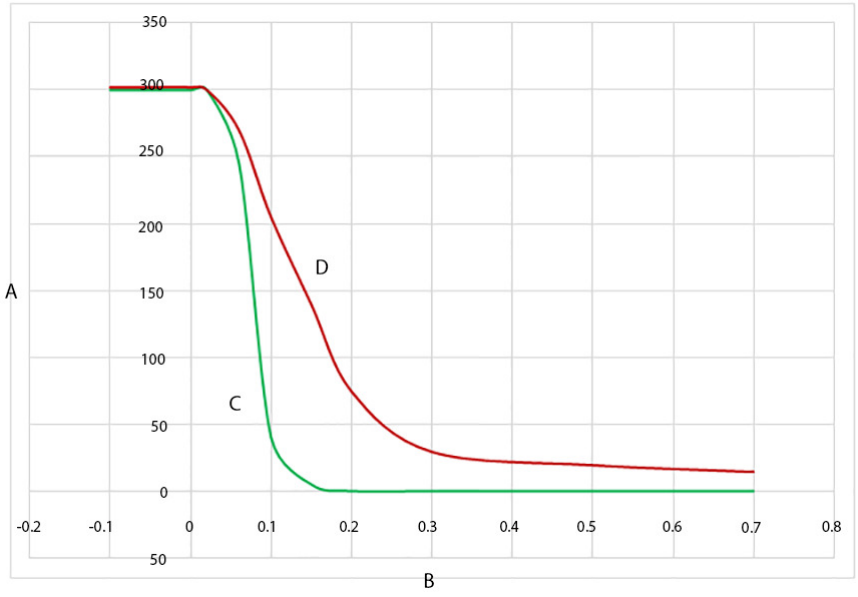
Pressure drop comparison

In a module with a small orifice, the load sense signal will be relieved to tank in approximately 150 ms through the Ø1-mm orifice when the work sections are moved to neutral position.

In a module with a combined orifice and check valve, the load sense signal will be relieved to tank in approximately 350 ms through the combined check valve and Ø1-mm orifice.

See the following comparison of the pressure drop in the two different modules.

Pressure drop comparison



A Pressure (bar)

B Time (seconds)

C PLS orifice only

D PLS orifice and check valve

When the time to relieve the load sense signal to tank is increased, there will also be an increased possibility that pressure peaks will be created in the pump line.

This scenario is especially important to consider if the valve uses full pump flow, and if the valve is not ramped back to neutral but shifts suddenly due to the force of the neutral adjustment spring in the main spool.

In addition, you should consider whether the connection leaves enough flexibility to absorb the pressure peaks. For example, there might not be enough flexibility if you use a rigid connection between the pump and P-port of the pump module, or if you place the valve stack close to the pump with a very small connection of any sort. As a result, the pressure peaks will be transferred to the pump and possibly increase wear.

Our recommendation is to use a relatively long hose connection between the pump and the P-port of the pump module. The flexibility of this hose connection will absorb the pressure peaks.

Summary

Using an open center inlet module with a combined orifice and check valve will increase the time it takes to relieve the load sense pressure in the tank line. This will lead to reduced pressure peaks in the tank line. However, this will also increase the possibility of pressure peaks in the pump line. But with a relatively long hose connection between the pump and the P-port of the pump module, these pressure peaks will be absorbed. Combining an open center inlet module with a combined orifice and check valve together with a relatively long hose connection has been used to increase stability with great results.

For test purposes, you can acquire a combined check valve and orifice by ordering part number 155L5230.

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