

G3

**Next Generation
Control Solutions
for Transmissions,
Pilot Systems,
Diesel Engine and
Powertrain Systems**



**Solenoid Valves
Proportional Valves
Manifold Systems**

 **HYDRAFORCE**
POWER FORWARD

www.hydraforce.com



Next Generation Control Solutions for Transmissions, Pilot Systems, Diesel Engine and Powertrain Systems

Ongoing fuel efficiency and emissions reduction standards continue to drive the demand for more efficient, reliable powertrain systems. HydraForce meets the demand by providing the next generation of precise, customizable controls. Drawing from a solid history of engineering and manufacturing expertise, HydraForce offers innovative, proprietary powertrain solutions that meet high standards for reliability, efficiency, performance, emissions compliance and fuel economy.

Next Generation (G3) Cartridge Valves

HydraForce has a complete range of control solutions for Transmissions, Pilot Systems, Diesel Engine and Powertrains Systems.

- Durable actuator construction with superior magnetic force
- Low current draw improves efficiency and reduces power consumption
- All G3 control valves are zinc-nickel plated for protection in severe environments
- High on/off force for maximum flow capacity
- IP69K moisture protection ensures long life and durability
- Low hysteresis for precise, responsive, repeatable performance
- Top-mounted connectors are more compact and easy to fit into tight engine compartments
- Steel, aluminum, cast or ductile iron housing options available

HydraForce control solutions for the powertrain market encompass variable flow pump control, fuel and oil controls, turbocharger controls, engine brake controls and SCRIEGR emission and exhaust controls.

G3 valves are best used in applications running lower hydraulic pressures, such as:

- Braking
- Piloting for pumps, motors, directional valves
- Transmission
- PTO
- Diesel
- Lubrication
- Cooling

Suggested Equipment

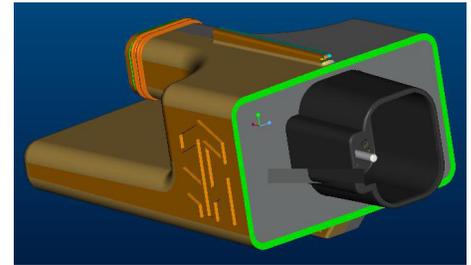
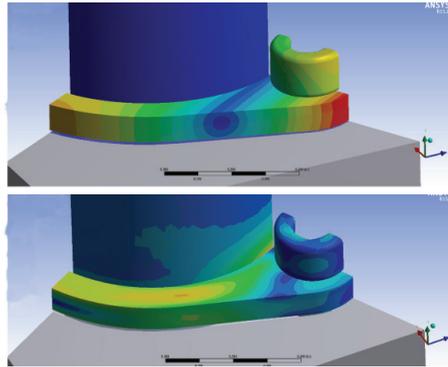
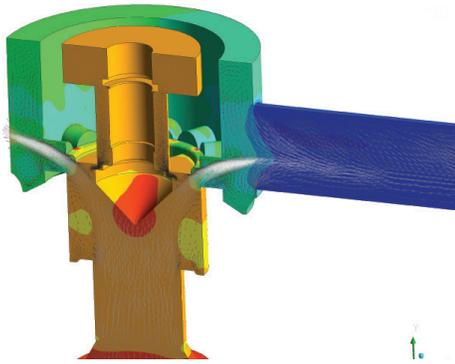
G3 valves can be used on these types of hydraulically powered equipment:

- Agricultural equipment, including tractors, combines, sprayers, and other self-propelled equipment
- Material handling equipment, including forklifts, mobile cranes, and telehandlers
- Construction equipment, including excavators, wheel loaders, loader backhoes and attachments
- Diesel engines, powertrain and transmission systems, including fuel/oil controls, clutch fill, valve and pump controls



Better Performance Comes from Working Together

G3



G3 products were developed with the use of CFD and FEA modelling.

To develop the G3 valves, HydraForce engineers made extensive use of theoretical modeling, including Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD) and magnetic modeling. With these powerful tools, HydraForce was able to optimize the magnetic efficiency of the G3 valves, focusing on actuator size and forces while keeping the valves compact and robust.

- G3 solenoid valves have the same coil size as previous models but generate two to three times the magnetic force with less current draw.
- G3 proportional valves have the same coil force but with a smaller coil that draws up to 30 percent less current.

Driven by Applications

Several features of the G3 valves came in response to customer requests.

- Top-mounted solenoid connector allows tighter spacing between valves and easier access to attach the wiring harness. The compact G3 valve conserves valuable space in tighter engine compartments.
- Flexibility to adapt to variety of cavities for retrofitting.

- Flange-style mounting plate can be used with existing mounting holes to provide full backward compatibility and allow connector to be rotated in any direction.
- Round flange expands options for coil orientation, as coil terminations can be oriented for any mounting configuration.
- Rated for higher tank line pressures.
- Robust enough to withstand pressure ripples and shock loads

Electronic Control

HydraForce provides additional value by offering the option for electronic control. G3 valves can integrate with electronics using the HydraForce line of EXDR proportional valve drivers or your own electronics.

These versatile valve drivers can be configured for any application with an easy-to-use *HF-Impulse* configuration software developed by HydraForce that eliminates the need for complex programming.

HydraForce's full range of CAN capable drivers can enable smart and efficient systems.



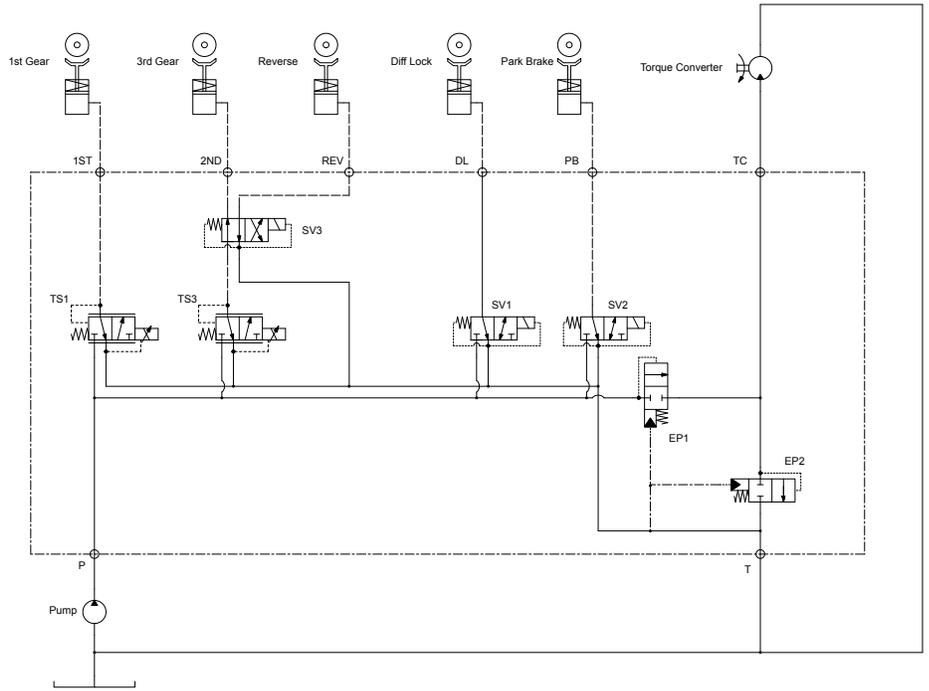


Solenoid Style G3 Valves - Model SV

HydraForce offers several solenoid style G3 valves for 3- or 4-way directional control of powertrain functions. All are rated for flow of 30 lpm (8 gpm) and pressures of 45 bar (652 psi) at all ports, including tank port. The SV98-G38 and SV90-G39 are 3-way valves that can be bidirectional when energized. The SV90-G40R is a 4-way valve.

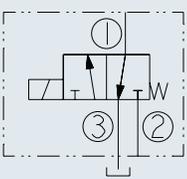
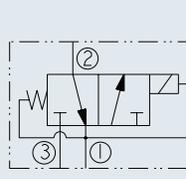
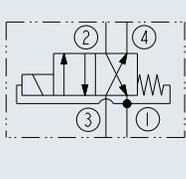
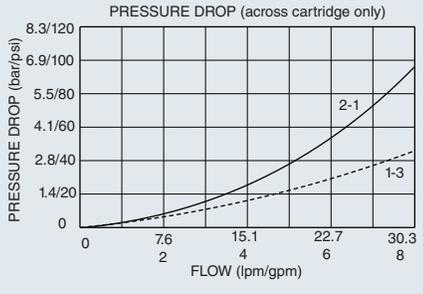
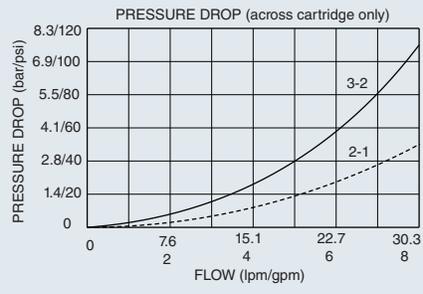
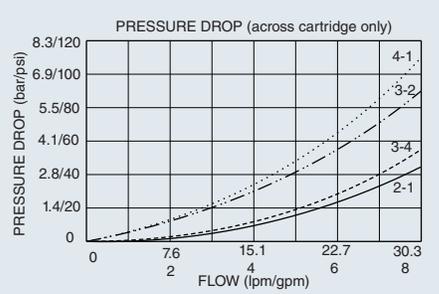
Features

- 3-way or 4-way directional control options.
- Continuous duty pull-in at 120° C and 75% of coil voltage.
- Higher actuator force with smaller valve armature improves cold temperature response resistance to contamination.
- Improved pressure drop
- Response time of 30 milliseconds
- Flange mount allows connector to be rotated in any direction
- Choice of connectors - Deutsch, Metri-Pack, AMP Junior Timer, plus integral diode option. Other connector options are available upon request.



This sample circuit shows how the G3 valves could be applied for control of a transmission. For application engineering assistance, contact your HydraForce representative or email sales@hydraforce.com.

- For contamination-sensitive applications there is an inlet port screen option.
- 1000-hour salt spray rating
- RoHS-compliant
- Rated for 10 million cycles
- IP69K environmental rating

SV98-G38	SV90-G39	SV90-G40R
3-Way, 2-Position Solenoid	3-Way, 2-Position Solenoid	4-Way, 2-Position Solenoid
Flow Rating: 30 lpm/8 gpm Pressure Rating (all ports): 45 bar/652 psi 	Flow Rating: 30 lpm/8 gpm Pressure Rating (all ports): 45 bar/652 psi 	Flow Rating: 30 lpm/8 gpm Pressure Rating (all ports): 45 bar/652 psi 
		



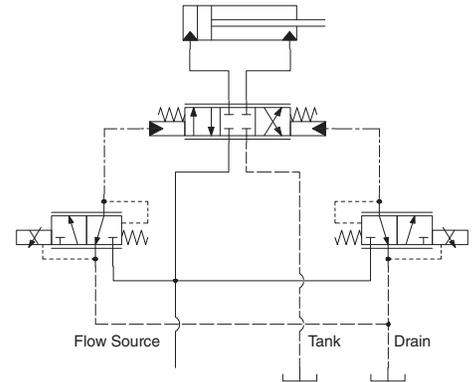
Proportional Pressure Reducing/Relieving G3 Valves - Model EHPR

Directing-acting EHPR-type G3 valves are proportional pressure reducing/relieving valves with low leakage. EHPR G3 valves are available for low flows of 4 lpm (1 gpm) for piloting applications or high flows of up to 30 lpm (8 gpm) for direct-acting applications.

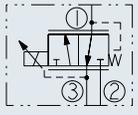
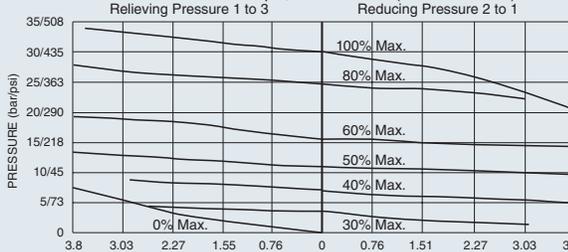
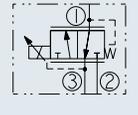
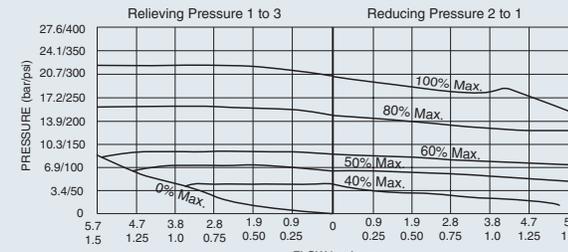
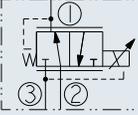
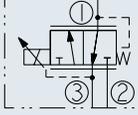
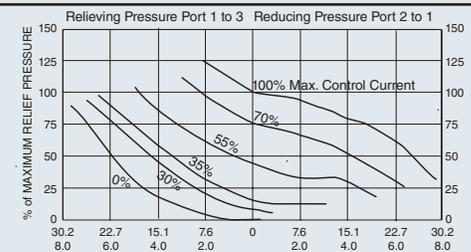
Features

- Continuous duty I_{max} of 85% of nominal coil voltage at 120° C
- In lower temperature environments, increased regulated pressure rating
- Two flow ranges - 4-6 lpm (1-1.5 gpm) for piloting applications and up to 23 lpm (6 gpm) for direct-acting applications

- Improved response times from significantly smaller armature size
- Hysteresis at 100 Hz 4%
- Choice of connectors - Deutsch, Metri-Pack, or AMP Junior Timer, plus an integral diode option.
- Round flange allows flexibility in mounting - coils can be oriented with respect to mounting holes.
- For contamination-sensitive applications there is an inlet port screen option.
- IP69K environmental rating
- 1000-hour salt spray rating
- RoHS-compliant
- Rated for 10 million cycles



An example of a directional control circuit using G3 valves with a three position, 4-way directional valve. For application engineering assistance, contact your HydraForce representative or sales@hydraforce.com.

Model	Description	Reducing/Relieving Pressure vs. Flow @ Various % Current
EHPR98-G33  Pilot Valve Direct-Acting Proportional, Reducing/Relieving Flow Rating: 4 lpm/1 gpm Pressure Rating: 45 bar (650 psi) at all ports Proof Pressure: 54 bar (780 psi) at port 3; 345 bar (5000 psi) at ports 1 and 2 Optional Higher Inlet Pressure G33A: 104-241 bar (1500-3500 psi)		
EHPR98-G35  Low Flow, Direct-Acting Proportional, Reducing/Relieving Flow Rating: 6 lpm/1.5 gpm Pressure Rating: 45 bar (650 psi) at all ports Proof Pressure: 54 bar (780 psi) at port 3; 345 bar (5000 psi) at ports 1 and 2 Optional Higher Inlet Pressure G35A: 104-241 bar (1500-3500 psi)		
EHPR98-G37  High Flow, Direct-Acting Proportional, Reducing/Relieving, Inverse Logic Flow Rating: 18 lpm/4.7 gpm Pressure Rating: 45 bar (650 psi) at all ports Max Setting when De-energized: 30 bar/435 psi	<p style="text-align: center;">Testing still in progress for EHPR98-G37. For the latest information on G3 valves, visit www.hydraforce.com.</p>	
EHPR98-G38  High Flow, Direct-Acting Proportional, Reducing/Relieving Flow Rating: 23 lpm/6 gpm Pressure Rating: 35 bar (500 psi) at all ports Regulated Pressure: A - 21 bar (305 psi) B - 25 bar/363 psi C - 30 bar (435 psi)		

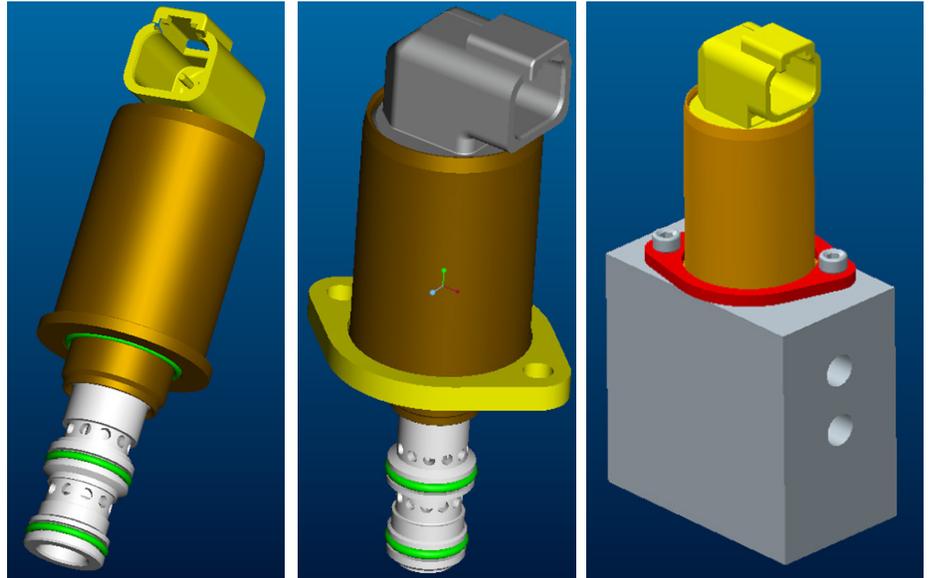


Proportional Pressure Reducing/Relieving G3 Valves - Model TS

The pilot-operated TS model is a pressure control valve that can be specified with several different pressure settings. It can handle high flows of up to 38 lpm (10 gpm) and regulated pressure up to 30 bar (435 psi).

Features

- Several pressure range settings: 14 bar (203 psi); 20 bar (290 psi) and 30 bar (435 psi)
- Connectors are mounted on top of the valve rather than on the side, which creates a more compact profile.
- Choice of connectors - Deutsch, Metri-Pack, or AMP Junior Timer, plus an integral diode option.
- Flange mount allows connector to be rotated in any orientation.



The flexibility of the G3 valve is shown in this series of illustrations (left to right) G3 valve with space-saving, top-mounted connector; G3 valve with flange; G3 valve shown flange-mounted to a housing or manifold.

- For contamination-sensitive applications there is an inlet port screen option.
- IP69K environmental rating
- 1000-hour salt spray rating
- RoHS-compliant
- Rated for 10 million cycles

TS90-G34	TS92-G34	TS98-G21
High Flow, Pilot-Operated, Proportional, Reducing/Relieving	High Flow, Pilot-Operated, Proportional, Reducing/Relieving	Low Flow, Direct-Acting, Proportional, Pressure Relieving, Inverse Logic
Flow Rating: 38 lpm/10 gpm	Flow Rating: 60 lpm/16 gpm	Flow Rating: 7 lpm/1.5 gpm
Regulated Pressure: A- 14 bar/203 psi B- 20 bar/290 psi C- 30 bar/435 psi	Regulated Pressure: 30 bar/435 psi	Regulated Pressure: 30 bar/435 psi
	<p>Testing still in progress for TS92-G34. For the latest information on G3 valves, visit www.hydraforce.com.</p>	<p>Testing still in progress for TS98-G21. For the latest information on G3 valves, visit www.hydraforce.com.</p>



Packaging Options - Manifolds, Housings, and Engineering Support

G3 valves can be packaged to suit the needs of the application - in a housing, manifold or casting. At HydraForce we believe that better performance comes from working together, and our engineers and field representatives will work with you to design your hydraulic control system. We understand that optimizing the performance of your machine starts with creative circuits, and when you work with HydraForce, you can select from the broadest range of cartridge valves in the industry.

Our design staff will collaborate with you and verify your design prior to manufacturing a prototype. Then we'll make any necessary refinements and engineer your product to meet your exact specifications. With proprietary innovations like our i-Design manifold tool, designing your hydraulic control schematic is easier than ever. The result is a performance- and configuration-optimized hydraulic solution that is designed exclusively for you.

All manifolds are 100% circuit logic and function-tested.

HydraForce can provide the following options for your custom hydraulic control system manifold:

- Steel, aluminum, cast or ductile iron manifold blocks.
- Anodized or zinc plating for protection in severe environments.
- Industry-common valve cavities.



- Fittings, CETOP valves and accessory components can be included.
- "FastTrak" service for quick delivery of a working prototype.
- i-Design hydraulic system design software available free of charge to qualified users.



Every HydraForce manifold is hydraulic function-tested to a documented customer/product-specific test procedure. Manifolds produced at our U.S. and U.K. facilities conform to the requirements of the ISO 9001 Certified Standard. HydraForce will mount customer specified fittings or other components not of our manufacture on request. Users of PRO-E and SolidWorks can download HydraForce's library of STEP models, which are optimized for easy import. Easy to download, accurate, and adaptable to your own assemblies, our STEP model library includes HydraForce's complete offering of valves and accessory components.

Rapid Prototyping

HydraForce has prototyping capabilities that range from making 3D-printed components for fit and form to custom fabrication and multi-axis machining of actual metal parts for field testing.



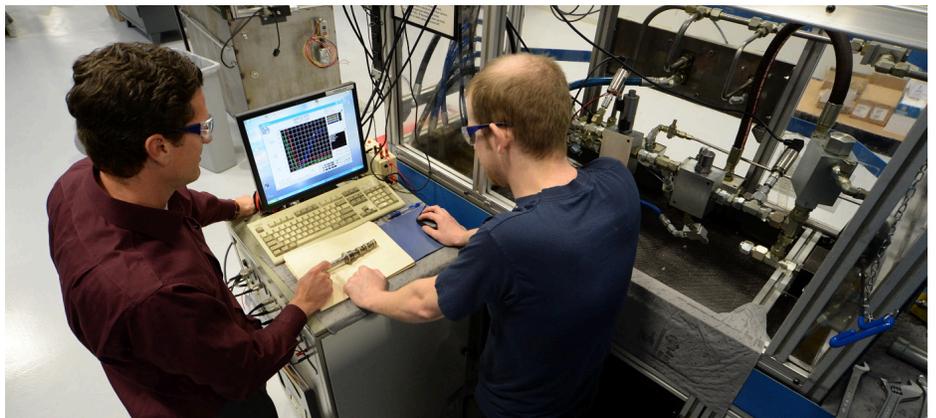
3-D printing can be used to determine fit and footprint for your HydraForce hydraulic control solution.

High Quality, Precision Manufacturing

HydraForce uses advanced equipment and processes for machining and assembly, to maintain precise control of the fit and finish of critical valve subassemblies.

Product Qualification

HydraForce's product qualification policy includes fatigue and pressure testing in accordance with the rigorous NFPA T2.6.1 standard for verifying rated fatigue and burst pressure. Standard products are tested for at least one-million cycle capability. Environmental testing for extreme cold and vibration is also done on site in the Innovation and Technology Center.





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RoHS COMPLIANT HydraForce valve and manifold products comply with the European Council and Parliament RoHS directive 2002/95/EC limiting the use of hazardous substances. For all other products, consult factory.