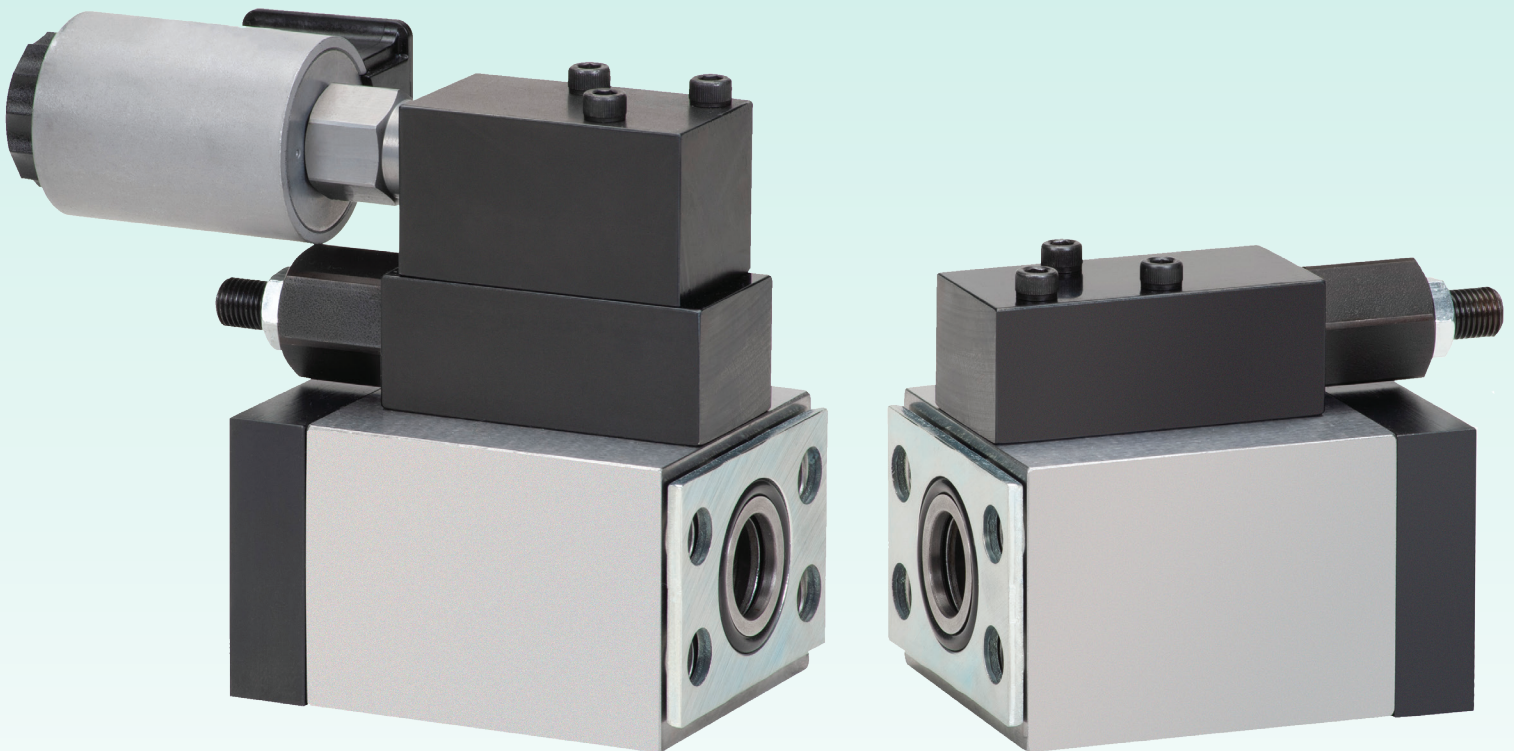


IN-LINE CONTROL MODULE-FLANGE TYPE, RELIEF FUNCTION

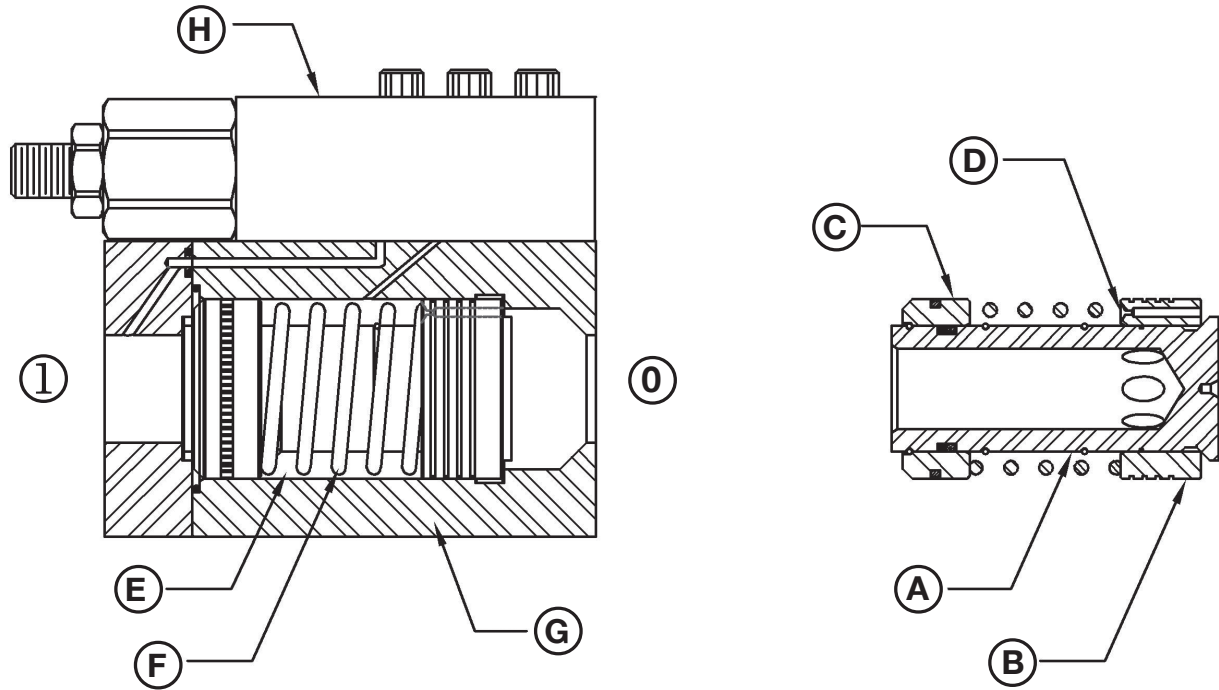
The **ico™ inline control Optimizer™** Module, Flange Type, is a versatile alternative to traditional hydraulic cartridge and 2/2 logic elements. A combination of main and pilot stages can result in many different functions. Forward flow is controlled, with free flow in the reverse direction.

The valve is supplied complete in an SAE J518 compatible flange body, with the pilot section to provide the desired function.

Valve flow passages are large for a given nominal flow compared with traditional hydraulic cartridge valves. This results in favorable valve performance characteristics. Inlet and outlet flow paths are co-axial, not right angle as is typical of hydraulic cartridge and 2/2 logic valves.



US: 9,091,355 and 9,482,355
EPO: 2971876
Other patents pending

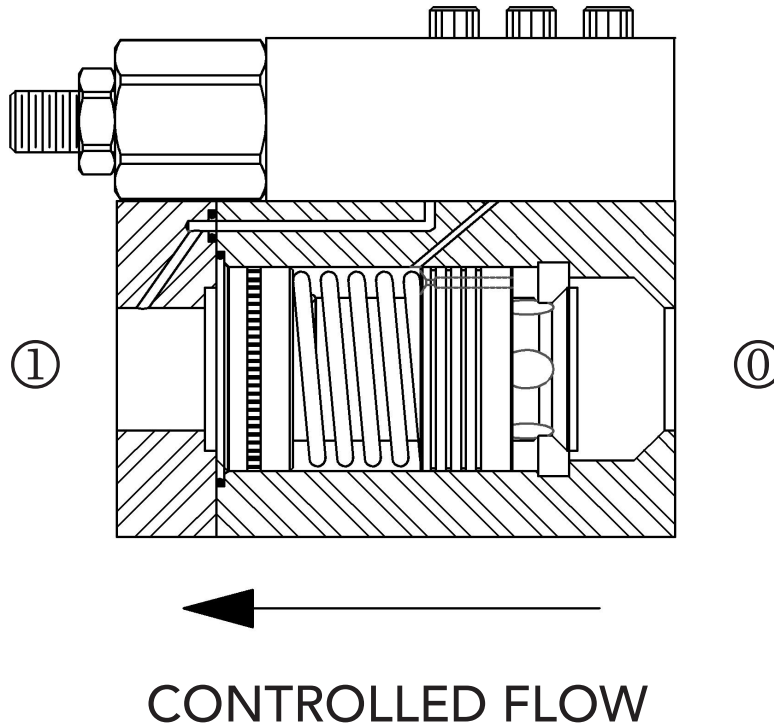


The In-Line Control Cartridge consists of a Tubular Poppet (A), a Control Sleeve (B), and a Seal Ring (C). Depending on the intended function of the assembly, the Control Sleeve may be provided with an Orifice (D) that allows communication between the region upstream of the cartridge, and a Control Volume (E). The geometry of the example shown is consistent with a pilot operated relief valve. The position of the Control Sleeve is determined by a balance of forces. Upstream pressure and fluid momentum tends to move the Control Sleeve away from its corresponding seat on the Tubular Poppet and expose radially oriented Flow Channels (not depicted). This permits flow from the upstream region 0, through the Flow Channels, into the central bore of the Tubular Poppet, and out to the downstream region 1. The Control Chamber pressure, and the force exerted by the Main Spring (F) tend to urge the Control Sleeve against the corresponding seat on the Poppet, and cover the Flow Channels, thereby extinguishing flow. In the example shown here, the valve is in the closed position, and flow is not permitted between the upstream 0 and downstream 1 portions of the valve.

The pilot valve(s) (H) mounted on the flange body (G) functions (function) to control the pressure in the Control Chamber.

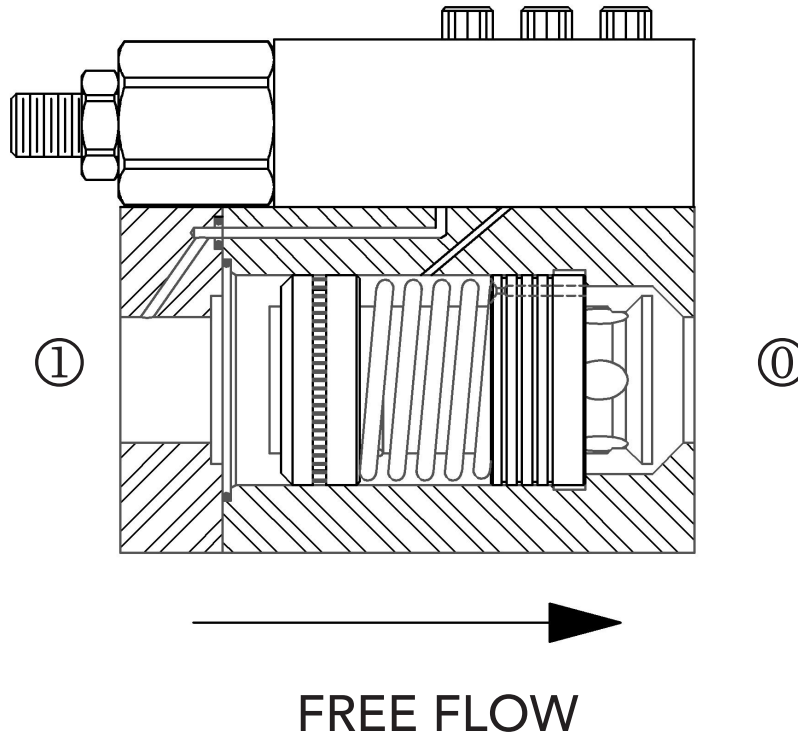
The ratio of areas of the inlet and Control Chamber sides of the Control Sleeve is about 1:1.

Although a metal-to-metal seal exists between the Control Sleeve and the Tubular Poppet, in certain valve configurations such as the relief valve configuration shown, a leakage path exists between the Control Chamber and the Outlet (1). This is secondary to a small diametral clearance between the ID of the Control Sleeve, and the OD of the Tubular Poppet. For certain valve configurations (such as Counterbalance Valve configuration), a seal is provided to eliminate this leakage path.



This example shows the result when the force on the Control Sleeve exerted by the inlet pressure urging the valve open exceeds the forces urging the Control Sleeve closed (Main Spring force and force secondary to the pressure in the Control Chamber). For the pilot operated relief function depicted, this would occur when the upstream pressure at 0 results in a force on the forward face of the Control Sleeve that exceeds the sum of the opposing forces of the spring and the pilot determined pressure on the rearward face of the Control Sleeve. The Control Sleeve comes off of its seat on the Tubular Poppet, and the flow channels in the Tubular Poppet are exposed. Flow is permitted between the upstream and the downstream regions of the valve.

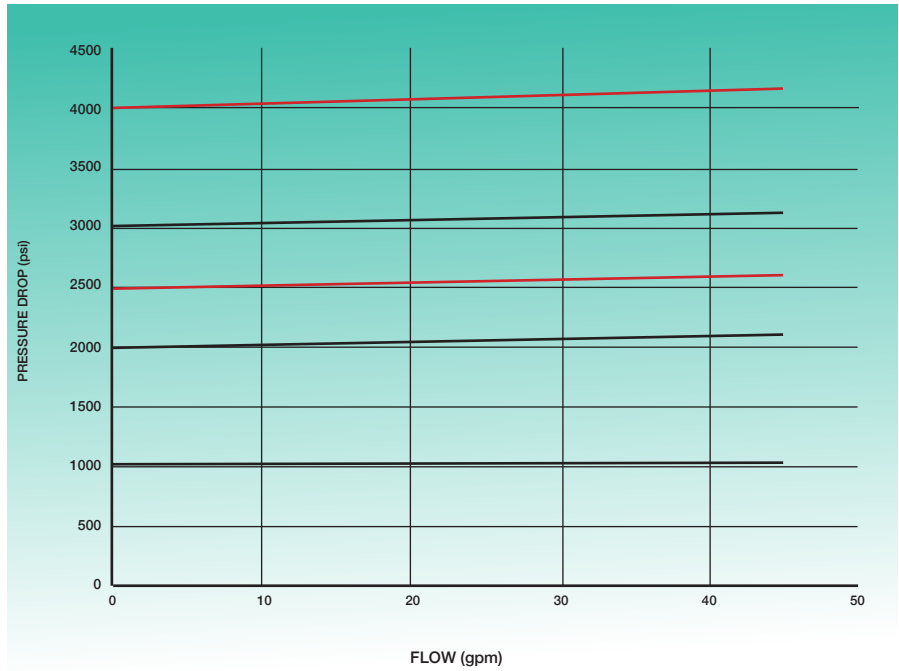
With forward (controlled) flow, the Control Sleeve moves relative to the Flanged Valve Body, while the position of the Tubular Poppet remains fixed.



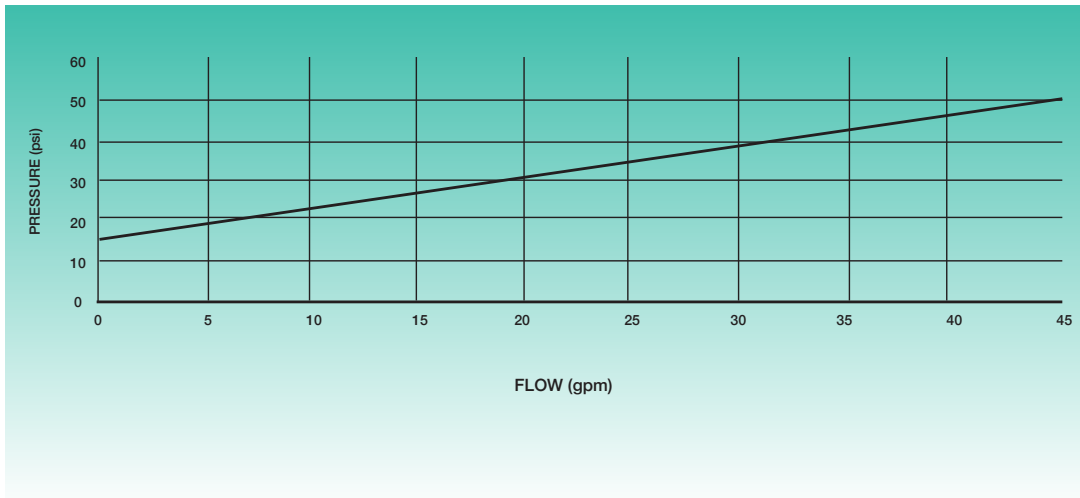
Should the pressure at valve region 1 exceed the pressure at valve region 0, pressure on the Seal Ring and Tubular Poppet urges the Tubular Poppet away from the Control Sleeve, with the Control Sleeve constrained from moving toward the valve inlet. The flow channels are exposed, and reverse flow from the valve outlet region to the valve inlet region results (reverse free flow). The net result is controlled fluid flow in the forward direction, and free flow in the reverse direction.

- Mounting Position: Optional
- Maximum Working Pressure: 5000 psi
- Temperature Range: -22°F (-30°C) to 175°F (80°C)
- Typical Valve Reseat Pressure: 85% of Pressure Setting
- Typical Leakage: Less than 2 in³/min at 85% of pressure setting
- Reverse flow cracking pressure: 15 psi
- Typical Pressure Overshoot at Nominal Flow - Less than 150 psi
- Performance curves generated using ISO 68 oil at 100F.

CAUTION: Care must be exercised when installing valve to insure that free flow and continuous flow paths are correct for the system in which it is installed.



- Pressure Override Curves 800-3000 PSI Pilot Valve Spring
- Pressure Override Curves 2500-5000 PSI Pilot Valve Spring



Reverse Flow Pressure Drop Curve

ORDERING INFORMATION

ICO - RP1A - A - 6112 - N - A1

IN-LINE CONTROL
MODULE,
FLANGE TYPE

FUNCTIONAL TYPE
See Pages 7 - 10

DESIGN CODE

FLANGE PATTERN
61 - SAE J518-1

NOMINAL SIZE
12 - 3/4"
(nominal capacity 40 gpm)

MATERIAL and FINISH
FLANGE VALVE BODY 6405-15
DUCTILE IRON-CLEAR ZINC
PILOT BODY AND END CAP-STEEL
WITH BLACK OXIDE

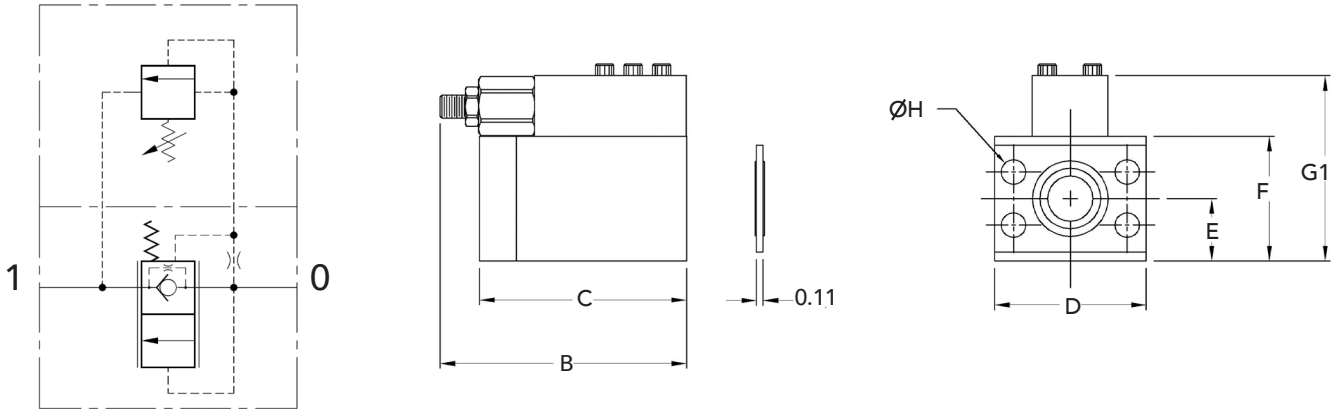
SEAL MATERIAL
N - BUNA
V - VITON

SOLENOIDS SUPPLIED SEPARATELY

FUNCTIONAL TYPE RELIEF

RP1A, RP1B

RP1*- PILOT OPERATED RELIEF WITH REVERSE FREE FLOW, INTERNAL PILOT, INTERNAL DRAIN



RP1A, RP1B

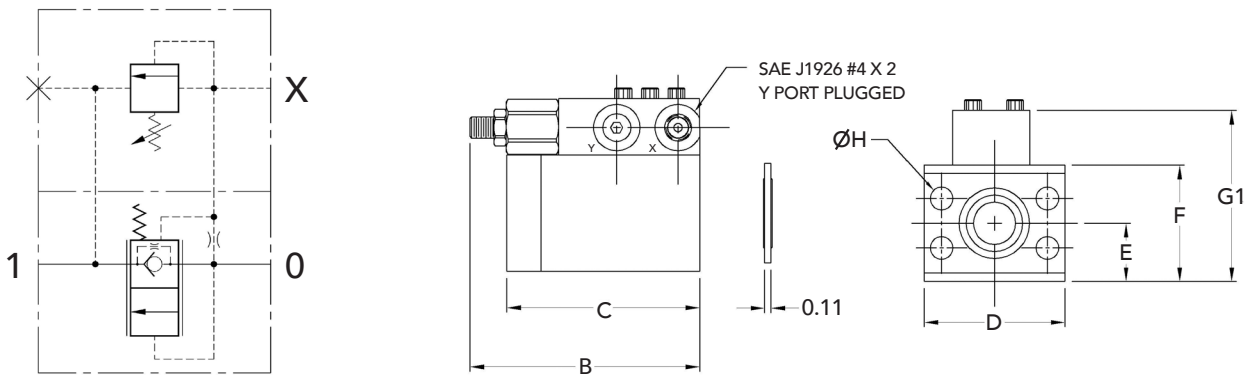
RP1A, RP1B

***A - ADJUSTABLE 800-3000 PSI

***B - ADJUSTABLE 2500-5000 PSI

RP1C, RP1D

RP1*- PILOT OPERATED RELIEF WITH REVERSE FREE FLOW, REMOTE CONTROL, INTERNAL DRAIN



RP1C, RP1D

RP1C, RP1D

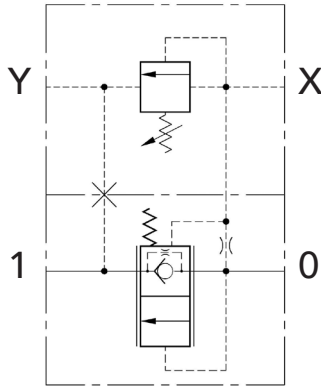
***C - ADJUSTABLE 800-3000 PSI
REMOTE CONTROL, INTERNAL DRAIN

***D - ADJUSTABLE 2500-5000 PSI,
REMOTE CONTROL, INTERNAL DRAIN

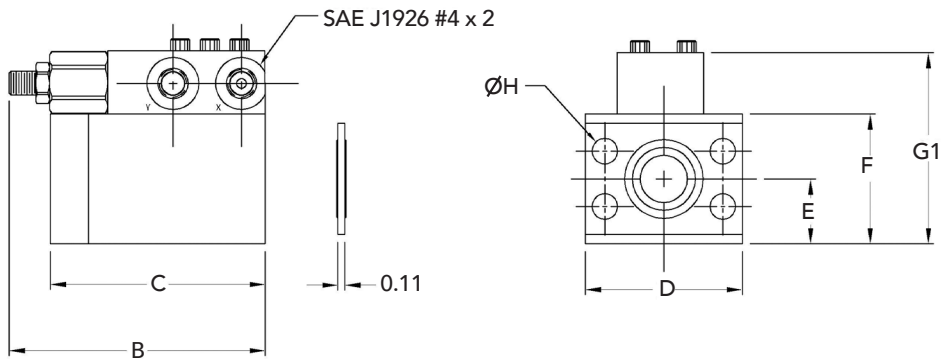
RELIEF

RP1E, RP1F

RP1*- PILOT OPERATED RELIEF WITH REVERSE FREE FLOW, REMOTE CONTROL, EXTERNAL DRAIN



RP1E, RP1F



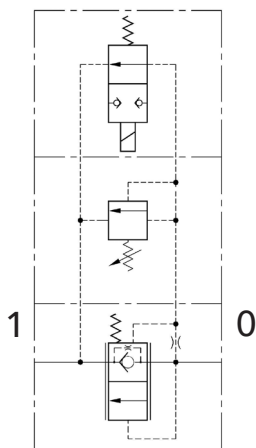
RP1E, RP1F

***E- ADJUSTABLE 800-3000 PSI,
REMOTE CONTROL EXTERNAL DRAIN

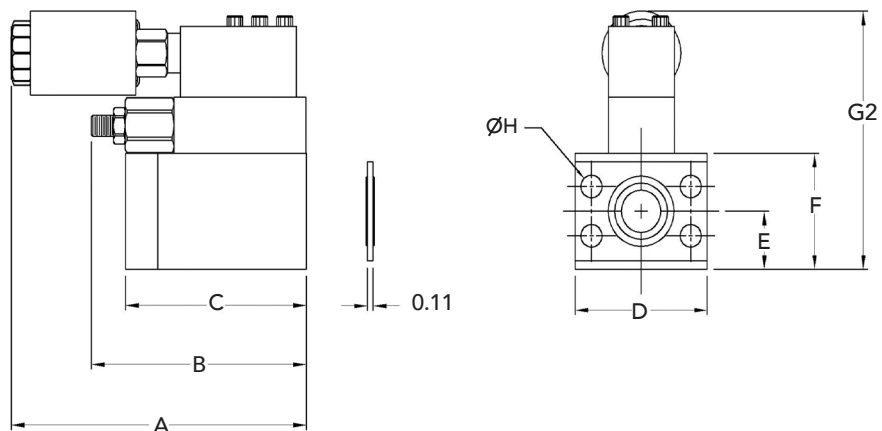
***F- ADJUSTABLE 2500-5000 PSI,
REMOTE CONTROL, EXTERNAL DRAIN

RP1G, RP1H

RP1*- PILOT OPERATED RELIEF WITH REVERSE FREE FLOW, INTERNAL PILOT, INTERNAL DRAIN, WITH SOLENOID OPERATED VENT



RP1G, RP1H



RP1G, RP1H, RP1J, RP1K

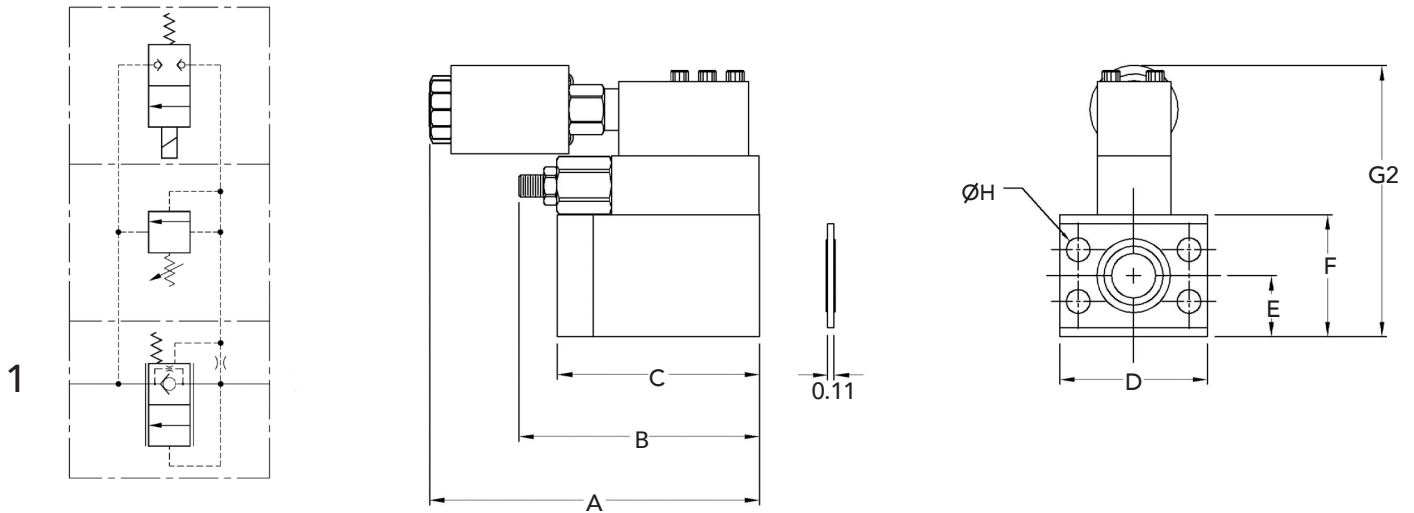
***G- ADJUSTABLE 800-3000 PSI,
VENTED, NORMALLY OPEN

***H- ADJUSTABLE 2500-5000 PSI,
VENTED, NORMALLY OPEN

RELIEF

RP1J, RP1K

RP1*- PILOT OPERATED RELIEF WITH REVERSE FREE FLOW, INTERNAL PILOT, INTERNAL DRAIN, WITH SOLENOID OPERATED VENT



RP1J, RP1K

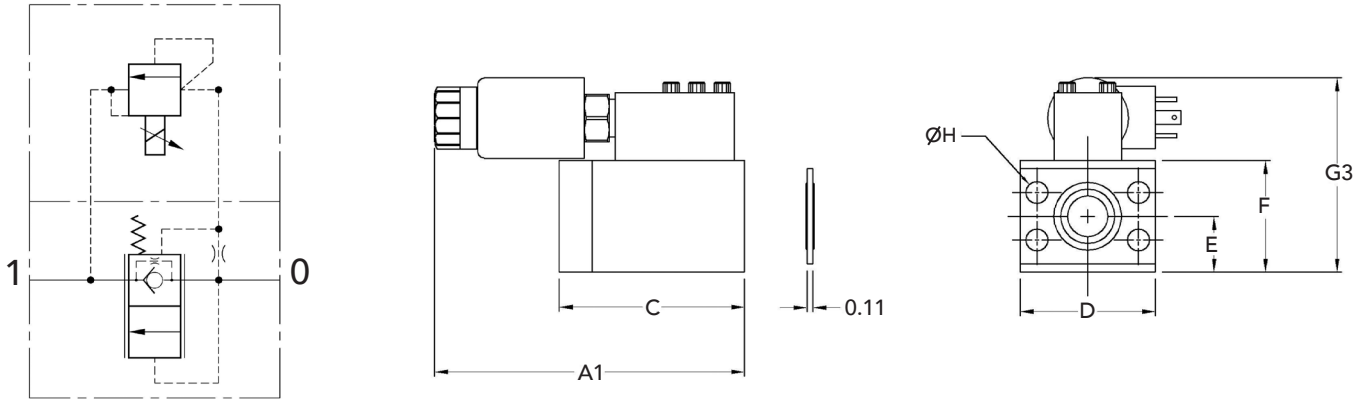
- ***J- ADJUSTABLE 800-3000 PSI,
VENTED, NORMALLY CLOSED
- ***K- ADJUSTABLE 2500-5000 PSI,
VENTED, NORMALLY CLOSED

RP1G, RP1H, RP1J, RP1K

- Adjustable 800-3000 psi pilot section factory set at 1000 psi.
- Adjustable 2500-5000 psi pilot section factory set at 3000 psi.

RELIEF

RP1*- PROPORTIONAL RELIEF WITH REVERSE FREE FLOW

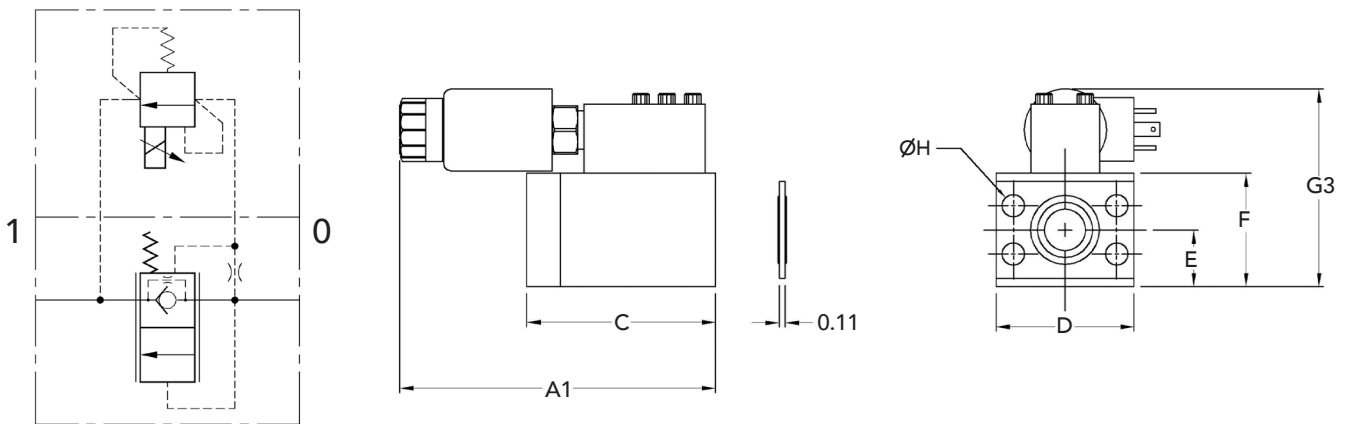


RP1T, RP1U

RP1T, RP1U, RP1V, RP1W

***T- ELECTROPROPORTIONAL MODULE, 300-3000 PSI
FALLING SETTING WITH INCREASING SIGNAL

***U- ELECTROPROPORTIONAL MODULE, 500-5000 PSI
FALLING SETTING WITH INCREASING SIGNAL



RP1V, RP1W

RP1T, RP1U, RP1V, RP1W

***V- ELECTROPROPORTIONAL MODULE, 300-3000 PSI
INCREASING SETTING WITH INCREASING SIGNAL

***W- ELECTROPROPORTIONAL MODULE, 500-5000 PSI
INCREASING SETTING WITH INCREASING SIGNAL

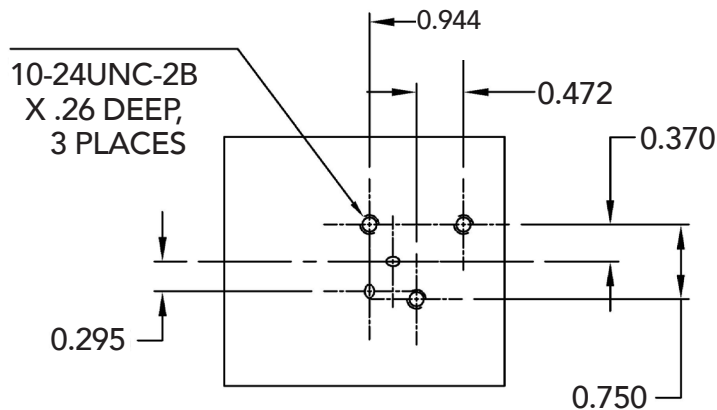
RELIEF

size	A	A1	B	C	D	E	F	G1	G2	G3
6112	5.61	5.73	4.18	3.42	2.56	1.03	2.06	3.06	4.58	3.59

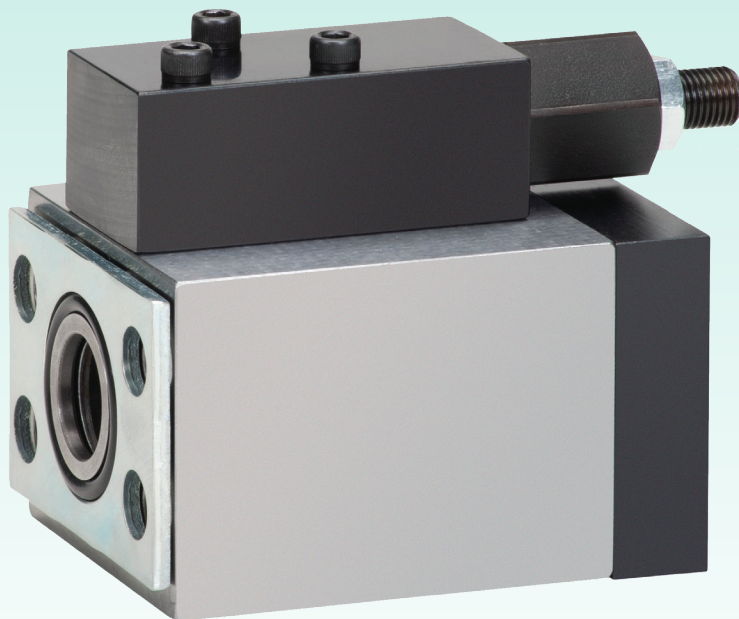
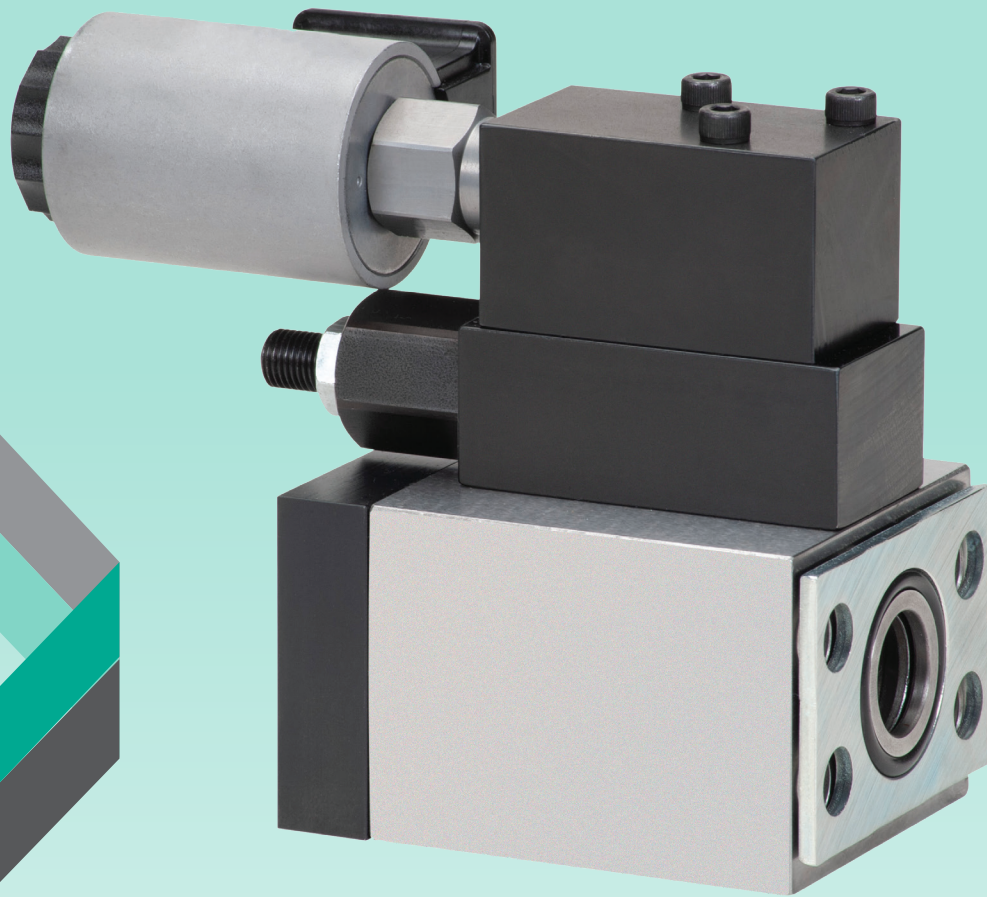
Solenoid pilot valve assemblies supplied with the following cartridge valves:

- RP1G, RP1H: DTAF-XH* (SUN Hydraulics)
- RP1J, RP1K: DTAF-XC* (SUN Hydraulics)
- RP1T: RBAP-XA* (SUN Hydraulics)
- RP1U: RBAP-XW* (SUN Hydraulics)
- RP1V: RBAN-XA* (SUN Hydraulics)
- RP1W: RBAN-XW* (SUN Hydraulics)

Solenoids supplied separately.



MOUNTING PATTERN, PILOT VALVE
(RELIEF, COUNTERBALANCE, PRESSURE
REDUCING, P.O. CHECK, UNLOADING &
SEQUENCE FUNCTIONS)



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