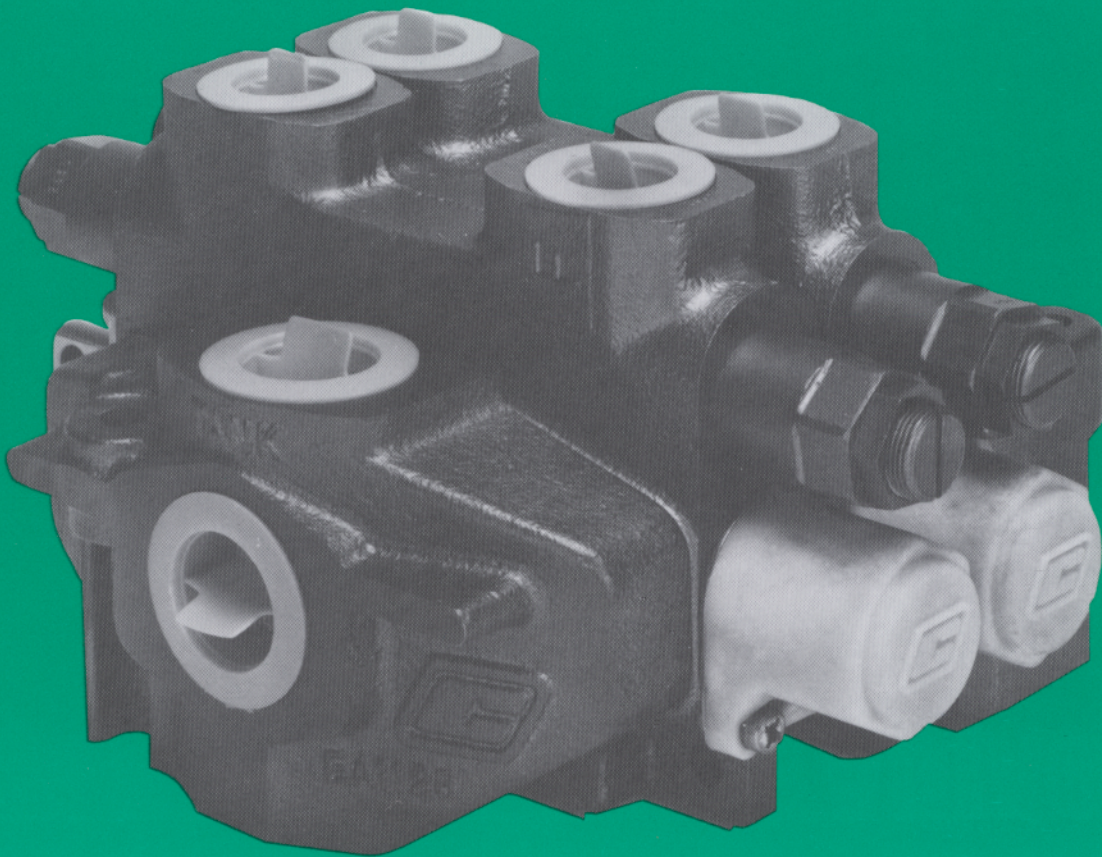


VA20/35 • VG20/35 OIL HYDRAULIC DIRECTIONAL CONTROL VALVES

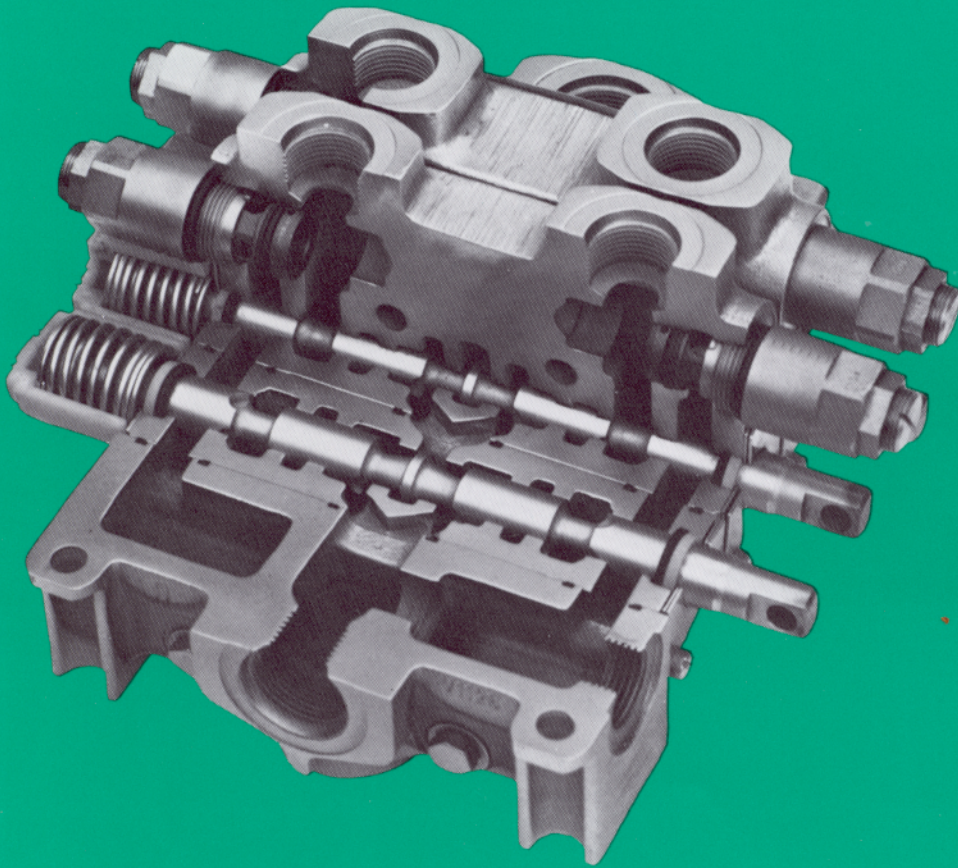
- 2500 psi/3500 psi
- 40 gpm/70 gpm
- parallel and series circuit
- choice of ten types of operation

®  **Commercial
Intertech**



VA20/35 VG20/35

DIRECTIONAL CONTROL VALVES



Commercial's VA and VG model valves are contemporary versions of our well-proven A20/A35 units which have provided reliable control of fluid power for over 20 years. The VG models are cast from compacted graphite, a high strength iron alloy that allows us to rate the valves to 3500 psi. VA models are cast from gray iron and are rated at 2500 psi.

Both models are produced under Commercial's Statistical Process Control program. SPC assures you of top quality because all manufacturing processes are constantly monitored to be sure they're within tolerances. SPC is just one method Commercial is using to maintain quality, improve delivery and control costs.

As a worldwide supplier of high quality hydraulic components, we build to the same designs at all of our plants. This assures you that wherever you manufacture or wherever your equipment is used, service parts are readily available.

you get more efficient control of fluid power distribution with Commercial valves because of these important features:

- Built-in, full-flow relief valves
- Parallel and series circuits in one bank
- Manual, hydraulic, electric or pneumatic operation
- Sectional construction for maximum flexibility
- Spool changeover capability for right- or left-hand valve assemblies
- Low spool effort — improved metering

Several features are offered as standard on VA20/35 and VG20/35 valves that contribute to their outstanding performance. Symmetrical timing makes changeover from left-to right-hand operation simply a matter of removing the spool and re-inserting it in the opposite direction. Spool seals are fitted in counter bores for easier maintenance and smoother spool operation. These features, combined with the extensive range of available spool functions and options, make these valves among the most versatile obtainable.

These features, and there are many more, offer advantages to the equipment manufacturer which result in superior control and equipment performance. These valves show a greatly reduced internal pressure drop under all conditions of operation.

low internal pressure drop

All valves present resistance to flow which results in pressure drop. Commercial's valves VA20/35 and VG20/35 are designed with large internal passages with uniform cross sections and smooth wall surfaces which provide flow paths free of abrupt angles. More useful fluid power is available because there is minimal internal pressure drop and less energy wasted in heat generation. Performance data for all operating conditions is plotted in tables and charts on pages 6 and 7. You can use these tables to determine the proper size valve to best meet your specific requirement.

sectional construction

These valves are of sectional, stack type, construction assembled with one or more work sections capped by inlet and outlet sections. Working sections are offered in many functional types. Special mid-inlet sections may be added in the valve bank to introduce the flow from additional pumps. Working sections with series or parallel type circuits can be assembled in thousands of combinations to tailor these valves to your needs.

pressure compensation

VA35 or VG35 parallel circuit sections can have the benefits of outlet pressure compensation. A special pressure compensation out-

let automatically maintains a selected flow through any one of the valve's parallel section. The outlet's metering spool responds to changing pressure providing precise control of machine functions regardless of the level of the operator's skill.

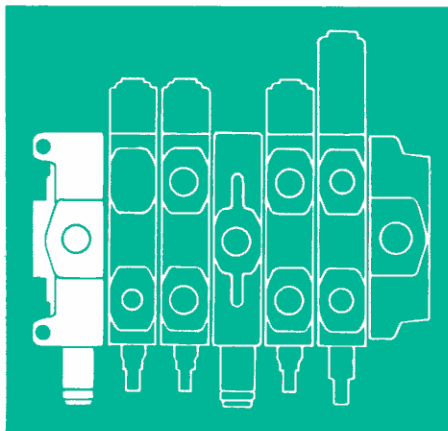
Pressure compensated outlets may be used in mixed bank (series and parallel) assemblies if the series work sections are upstream of the pressure compensated parallel sections.

full-flow relief valve protection

Full-flow system relief valves may be installed in the end inlet section.

Work sections can be provided with full-flow relief valves in either or both work ports. Port relief valves can be pilot operated with anti-cavitation checks or differential area, full-flow relief valves without anti-cavitation checks. (See graphs on pages 10 and 11.) Crossover relief valves are available.

principle components and their functions



inlet sections

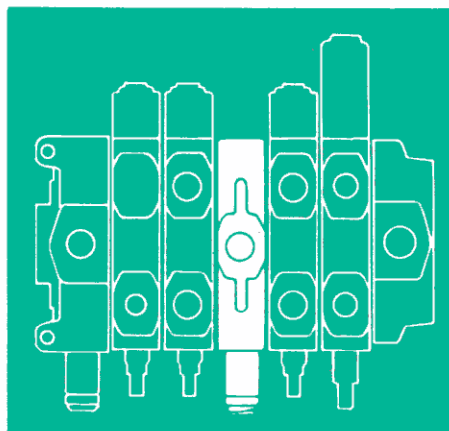
Pump flow is plumbed to stack-type directional control valves through a port placed in an inlet section. Inlet sections, are available with or without full-flow system relief valves.

end inlet

End inlets cap the valve bank at the upstream end and receive the primary pump flow. A port is placed in the top or side of the inlet to provide for piping connection.

end inlet, tank return

This style of end inlet section caps the valve bank at the upstream end and receives the primary pump discharge through a top or side port. An additional port, placed in the bottom, provides a route for low-pressure return oil to flow directly to tank. Inlet unloaders are also available. See page 26.



mid-inlet sections

mid-inlet section for split flow

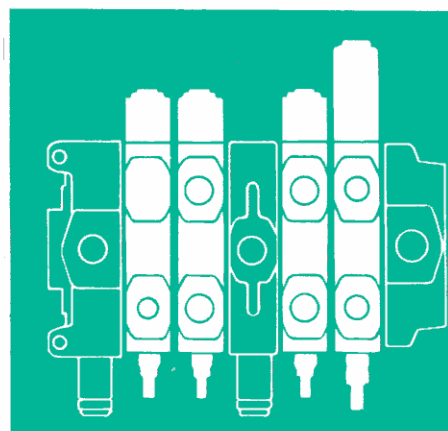
This section allows you to combine two or more independent circuits in one valve bank simplifying plumbing and installation. A split flow, mid-inlet section, positioned between two working sections, provides a method of feeding a secondary pump's flow into a valve bank and acts as an outlet for the primary pump. The secondary pump's flow is directed to that portion of the valve bank downstream from the mid-inlet. The primary pump's flow is not combined with that of the secondary pump within the valve bank. A built-in full-flow relief valve can be provided. Split flow mid-inlets with power beyond capability are also available.

for combined flow

A combined flow, mid-inlet section can be positioned between two working sections to introduce flow from a secondary pump into the valve bank. The secondary pump's flow is added to that of the primary pump to feed all downstream working sections. The primary pump flow is interrupted when an upstream section is activated but flow from secondary pump remains available. Total discharge (gpm) from primary and secondary pumps may not exceed the flow capacity of the valve bank.

for combination split or combined flow (manual selection)

This combination mid-inlet section has an integral, manually operated, two-position spool. In the split-flow position, the valve directs secondary pump flow to the downstream portion of the valve bank and directs the primary pump's discharge to tank. In the combined flow position, the two pump flows are combined at the end inlet and made available to all working sections. Combined discharge (gpm) from primary and secondary pumps may not exceed maximum flow capacity of the valve bank.



working sections

Lo-Boy sections are protected in working position by a full flow relief valve in the valve's inlet (standard valve). Hi-Boy sections can be ordered with built-in, work port relief valves in either or both ports. Hi-Boy work sections have necessarily higher profiles to accommodate the port relief valves.

Parallel and series circuits can be combined in the same valve bank and are available in both Hi-Boy and Lo-Boy sections. While both circuit types permit actuation of several machine functions, it is important to remember the primary difference between the two types.

parallel circuits

Parallel circuits are the most commonly used because more than one function can be operated simultaneously and at random. However, if two or more spools are fully operated at the same time the one with the lightest load will operate first. An operator can easily overcome this by metering back the valve controlling the lightest load.

series circuits

If more than one spool is operated, the one closest to the inlet will operate first. Return flow is directed to the open center for use by the next work section, etc. The sum of the pressures is additive and can not exceed the system pressure.

3-way • 3-position type

(work port blocked when spool in neutral)
(parallel circuitry only)

In neutral, flow passes through the valve's center flow to another valve bank. This flow is the spool directs all flow out of the one port. Shifting in the opposite direction permits oil to return to tank through the same port. Use with single-acting cylinders or single-direction motors plumbed to tank.

4-way • 3-position type

(work ports blocked when spool in neutral)

Used in parallel or series circuits, both ports are opened (one for outgoing oil, one for returning oil) when the spool is shifted in either direction. Return oil goes downstream through the open center in series circuits or the tank return passage in parallel circuits. Work ports are blocked in neutral. This section controls double-acting cylinders.

4-way • 3-position type

(work ports open when spool in neutral)

This section works the same as the 4-way 3-position cylinder type except that both work ports are connected internally to tank and blocked to pump flow when the spool is in neutral. This section is used in motor circuits.

4-way • 4-position type

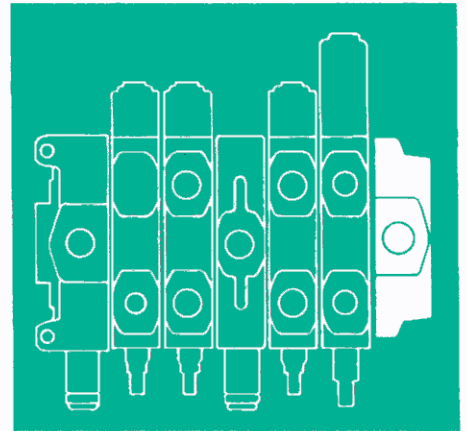
(work ports blocked when spool in neutral — open in float position) (parallel circuitry only)

This type valve section stops all return flow in neutral thus stopping the motor or cylinder. The fourth spool position connects the work ports to tank which lets the operator free-wheel the motor or float the cylinder.

4-way • 4-position type

(work ports blocked when spool in neutral — regenerative flow in fourth position) (parallel circuitry only)

When the valve spool is moved into a work position, all of the flow is directed to one work port. At the same time, the other work port is opened to return flow to tank. In the regenerative position, return flow from the rod end of the cylinder is combined with flow from the pump and the additive flow is directed to cylinder's base end. Both work ports are blocked in neutral.



outlet sections

Pump flow leaves the valve through ports placed in an outlet section which caps the valve bank at the downstream end. Outlet sections are available as tank return, pressure beyond or combination types.

tank return type

Ports in the side and top of this outlet permit flow to be piped to tank. Connections can be made to either port. The port not being used must be plugged.

pressure beyond type

Two outlet ports are located in the side or top. The port nearest the centerline directs open center flow to another valve bank. This flow is available to the second bank only when all upstream work sections are in neutral. The second outlet port must be plumbed to tank.

tank return or pressure beyond (convertible)

This outlet can be converted from a tank return type to pressure beyond by inserting a special cartridge plug in the side port. This feature is useful if you anticipate the possible addition of an accessory valve after the machine is built.

tank return priority outlet type (divided flow)

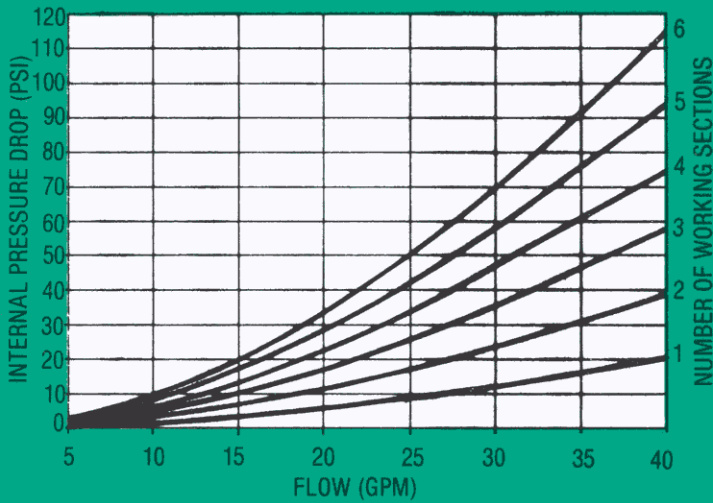
This outlet provides ports to both the tank and pressure beyond circuits. A built-in flow divider spool directs a selected portion of the flow to the pressure beyond circuit at all times and the remaining flow to tank.

VA20/VG20 performance data

parallel circuit

inlet to outlet

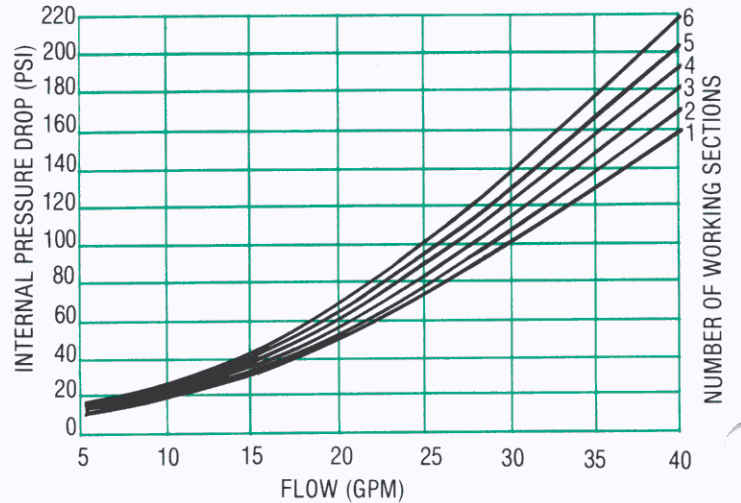
(SAE-16 inlet and outlet)



parallel circuit

inlet to work port, work port to outlet

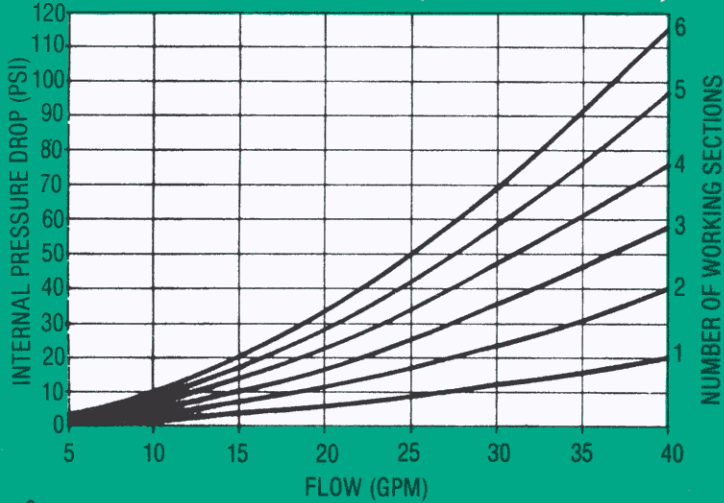
(SAE-16 inlet to SAE-12)
(work ports to SAE-16 outlet)



series circuit

inlet to outlet

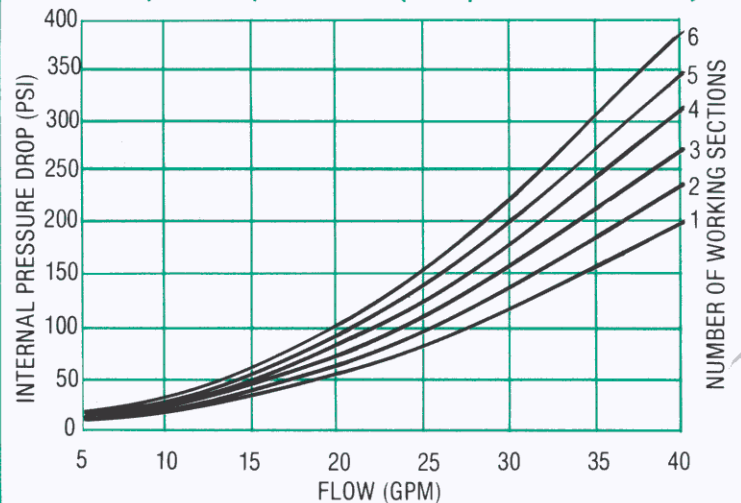
(SAE 16 inlet and outlet)



series circuit

inlet to work port, work port to outlet

(SAE-16 inlet to SAE-12)
(work ports to SAE-16 outlet)



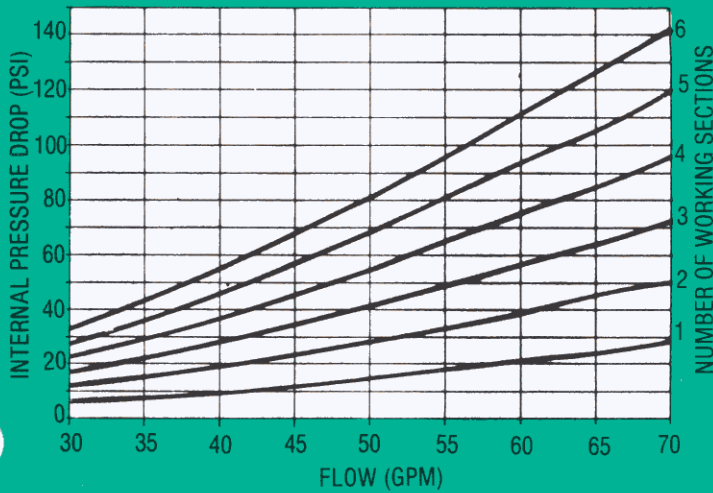
VA35/VG35

performance data

parallel circuit

inlet to outlet

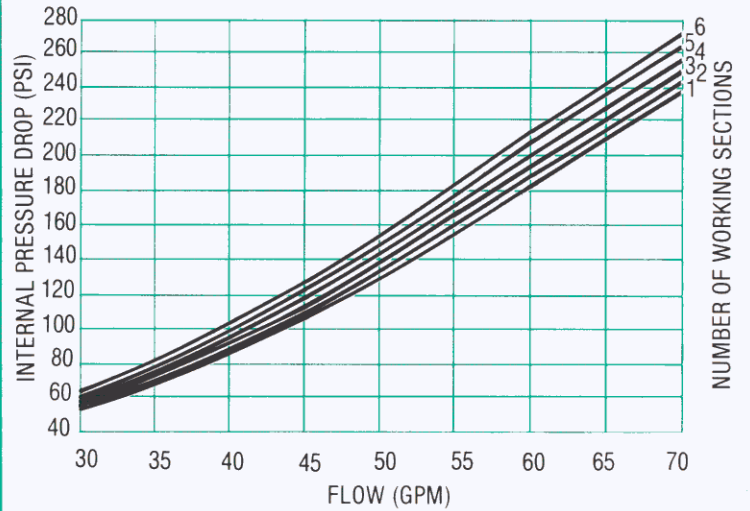
(SAE-20 inlet to SAE-16 work port to SAE-20 outlet)



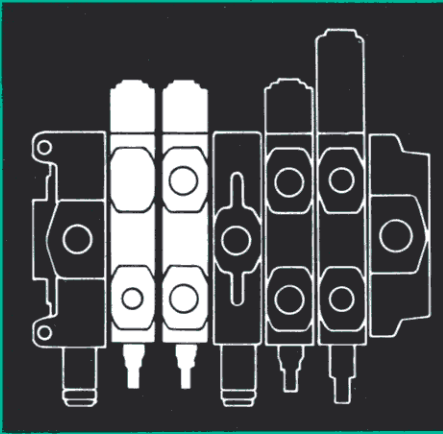
parallel circuit

inlet to work port, work port to outlet

(SAE-20 inlet and outlet)

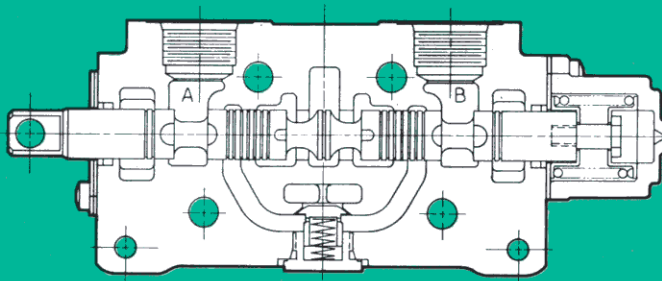


NOTE: VA models are constructed of grey iron and are rated for 2500 psi in 40 gpm (VA20) and 70 gpm (VA35) sizes. VG models are constructed of compacted graphite and are rated for 3500 psi service in corresponding gallonage sizes.

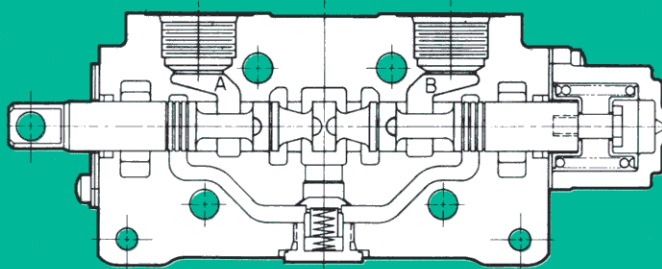


LO-BOY Working Sections

parallel



series

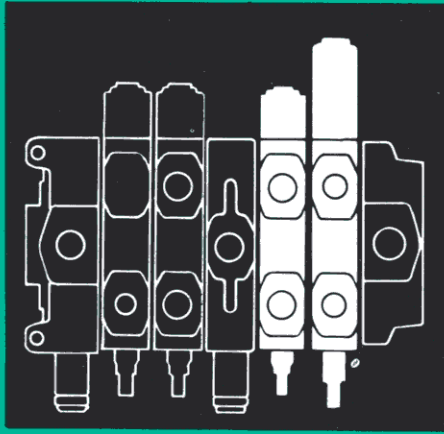


Commercial's VA and VG models are open-center, stack type valves designed primarily for heavy-duty mobile equipment applications. They work equally well with fixed or variable displacement pumps.

VA and VG valves may be used as closed center units with pressure compensated pumps. Valves are made closed center by using a power beyond outlet and plugging the high pressure port.

VA and VG valves are available in two types of work sections called Hi-Boys and Lo-Boys. Parallel or series circuits are available.

Lo-Boys can be used in most circuits requiring only the main relief valve protection provided by a cartridge relief at the inlet. Their lower profile is well suited to applications requiring compact banks such as subsurface mining equipment. Lo-Boy sections, because they require less material and machining, cost less than their Hi-Boy counterparts.



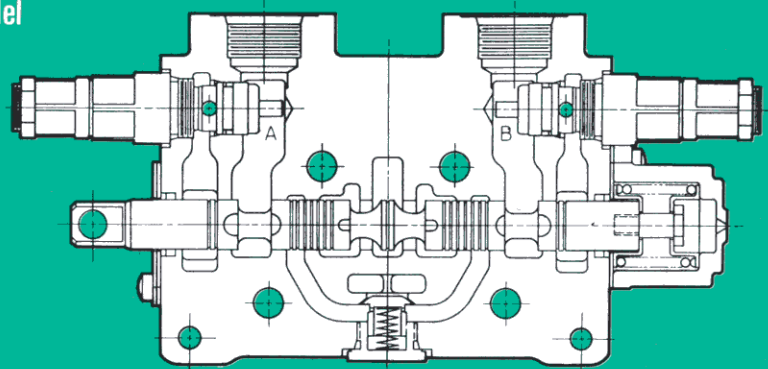
HI-BOY Working Sections

Hi-Boys, as their name implies, are made taller from top to bottom to provide room for optional port accessories. Full-flow, pilot operated relief valves with anti-cavitation checks, differential area relief valves, crossover relief valves for motors and plain anti-cavitation checks can be built into the Hi-Boy sections.

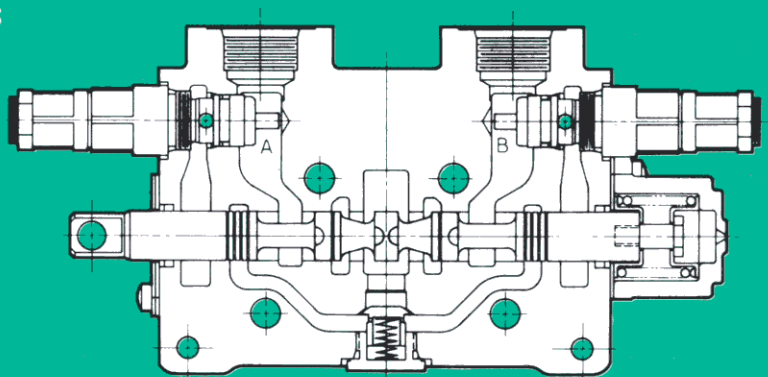
Hi-Boy and Lo-Boy sections can be assembled together in one valve bank so that sections requiring port relief valves, crossover relief or anti-cavitation checks can be inserted as needed for greater economy.

Both Hi-Boy and Lo-Boy sections are rated for 2500 psi in gray iron or 3500 psi in compacted graphite. The full range of spool actuators including electric, hydraulic, electrohydraulic, pneumatic and others shown on pages 12 and 13 can be used with either configuration.

parallel

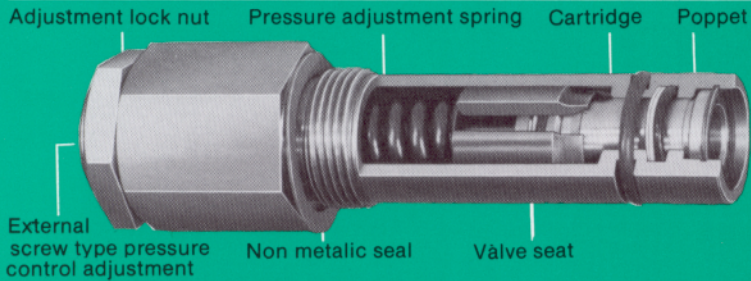


series



auxiliary valves

relief valves



main system relief valve

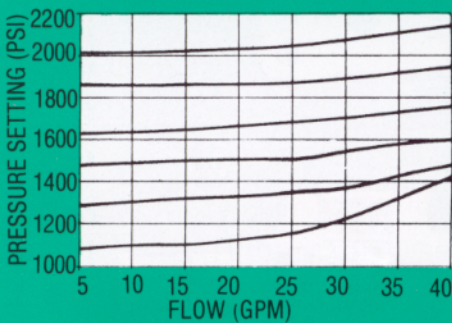
Three types of relief valves are offered to protect VA- and VG-Line valves against pressure overloads. These include a pilot-operated, full-flow port relief with built-in anti-cavitation feature; a full-flow differential area port relief without anti-cavitation feature and a full-flow inlet or mid-inlet system relief.

Inlet and mid-inlet relief valve protects all downstream work sections. Port reliefs, available in Hi-Boy sections only, offer complete overload protection to each port. These

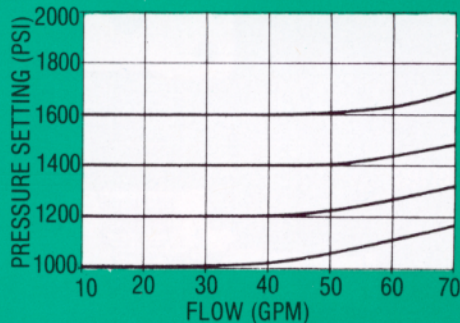
are particularly useful in sections subject to overloading even in neutral position. An excavator traveling over uneven terrain with its boom extended, for example, could create hydraulic shock loads in the cylinders. Such loads should be relieved at the port to prevent damage to components.

Consistent accuracy in providing adequate pressure relief protection is the hallmark of Commercial's relief valves as shown in the performance graphs below.

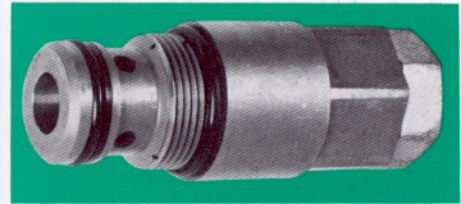
VA20/VG20 main relief valve performance



VA35/VG35 main relief valve performance



NOTE: Unless otherwise specified main relief valves will be screw adjusted.

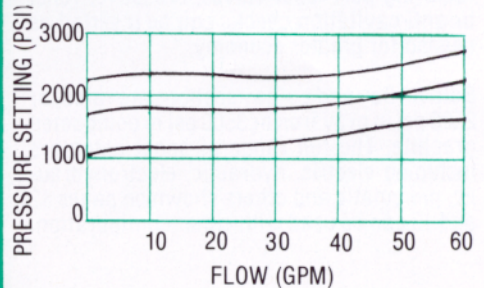


standard port relief (slug adjusted)

Full-flow, differential area type relief valves are the standard port relief valves offered for use in VG and VA valves. Available in Hi-Boy sections only.

The port relief protects the cylinder or motor to which it is plumbed against overload damage. Generally set at a higher pressure than the main system relief valve, the overload port relief functions only when the valve is in neutral. Because of their full-flow capability, they can provide relief valve protection to individual ports which must be operated at pressures below the relief valve setting for the bank assembly.

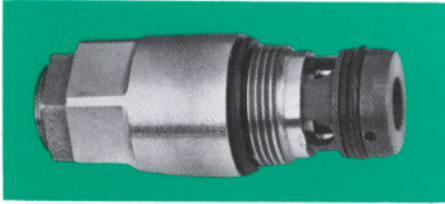
standard port relief valve performance



NOTE:

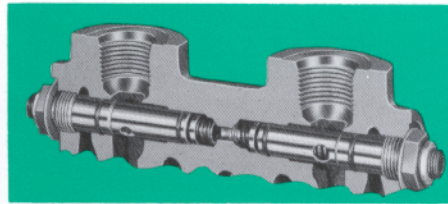
Also available

- Vented anti-cavitation checks
- Lockout relief valves
- Dual-pressure relief valves



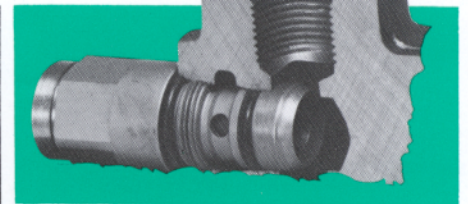
optional port relief (screw adjusted)

Full-flow, pilot-operated relief valves with built-in, anti-cavitation checks are available as port relief valves in VG and VA Hi-Boy models.



crossover relief valves (screw adjusted)

These allow high pressure to be bled from one work port to the other when the spool is in neutral to prevent an over-running motor from acting as a pump and pressurizing the system beyond its designed load. They also provide anti-cavitation protection to the opposite port.

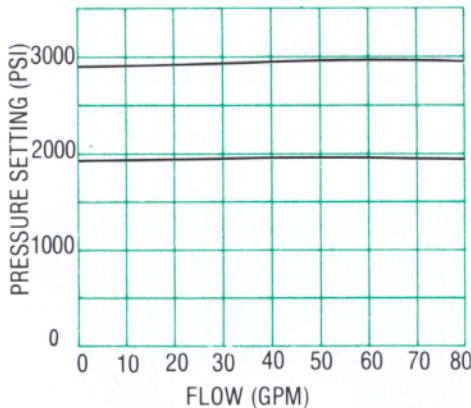


anti-cavitation vacuum check

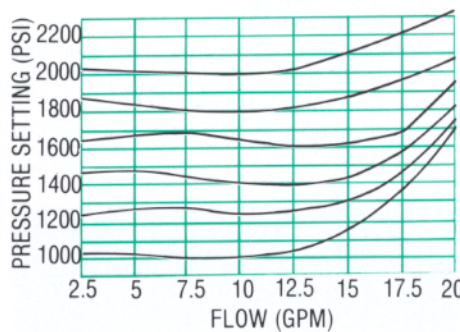
These checks are available as a built-in feature of the full-flow port relief valves or as separate units to eliminate cavitation beyond the work port. Anti-cavitation checks are available only in Hi-Boy sections.

Cavitation occurs any time an actuator under load demands more flow than the pump can supply. The anti-cavitation check bleeds oil from the tank return passage, feeding it to the low-pressure side of the actuator to fill the vacuum thus preventing cavitation. Anti-cavitation checks function when the valve is in a work position or in neutral.

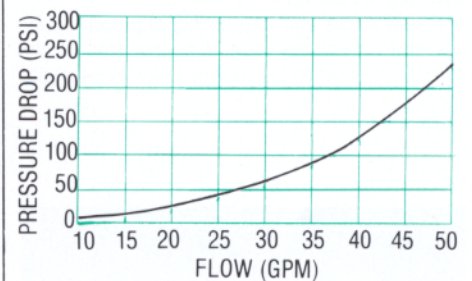
optional port relief valve performance



crossover relief valve performance

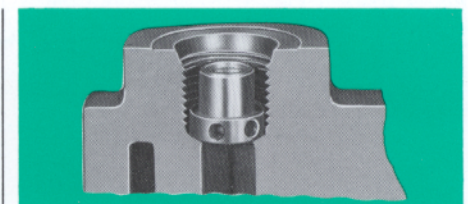


anti-cavitation check performance



transition check

Transition checks block pressurized return flow while the work section spool is shifted. This momentary holding action permits smoother cylinder or motor operation. The check blocks pressurized return flow until forced open by pressure in the parallel passage. Transition checks are standard on all cylinder work sections. Transition checks are not load-hold checks.



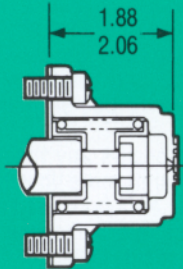
flow restrictor port check

Installed in either work port, these checks reduce return flow to a specified rate determined by the need of the application. They may be used, for example, to slow retraction of a cylinder under load.

Choice of operators

dimensional data, inches $\frac{VA20/VG20}{VA35/VG35}$

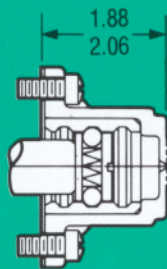
Code A



spring return

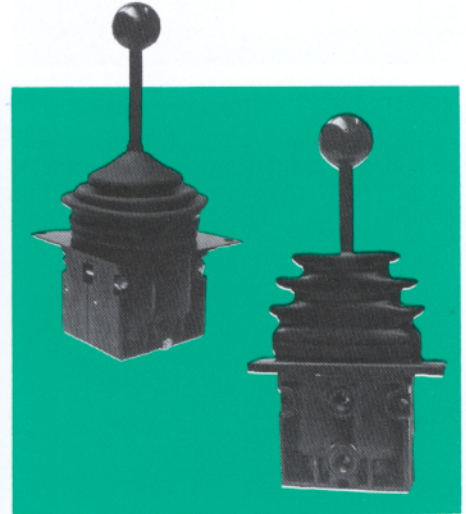
A spring in the end cap of this standard spool operator returns the spool to neutral from either work position when the control handle is released.

Code B



3-position detent

This option allows the spool to be detented in any of three positions. Spool movement from one position to another or to neutral is done manually.



pneumatic remote controllers

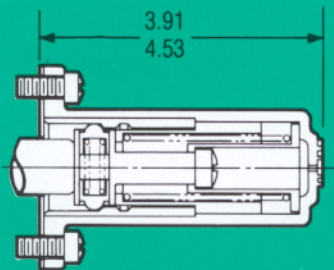
Stackable and joystick models are available. They require 11.7 cfm at 100 psi. Max operating pressure is 142 psi. These lightweight units can be ordered with a variety of handle configurations to make operation of stackable sections easier. Ask for catalog H111.



VA/VG valve handles

Stamped steel handles fit either Hi-Boy or Low-Boy models with or without port reliefs. Handle height may be adjusted by varying the length of threaded rod portion. Standard heights are 6", 8" and 10".

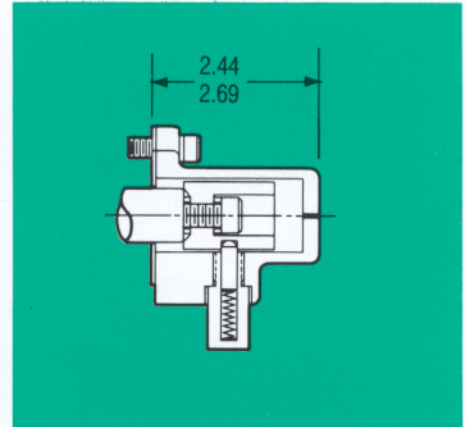
Code C



detent with spring return

When used with a float section, the spool may be detented in the float position to allow a cylinder to float or a motor to freewheel until manually shifted.

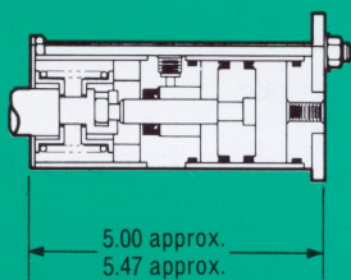
Spring action returns the spool to neutral from work positions.



rotary back cap

Rotating the control handle, instead of pushing or pulling it, actuates this spool. The handle will hold in any position between 0° and 90° either side of center to provide a continuous flow of metered oil. These units are available with stainless steel parts for marine winch applications. Buyer must supply handle.

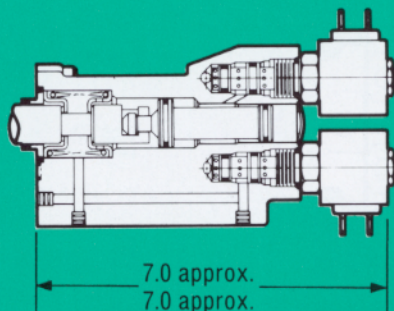
Code V



single ended pneumatic

This option uses a 100 psi pneumatic pilot, plumbed to double-acting piston on one end of the spool. This piston shifts the spool in either direction thus freeing the opposite spool end to accept a handle operator which may be used as an override.

Code K



solenoid operated

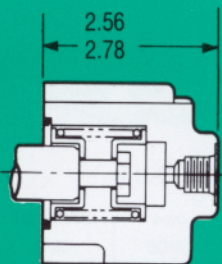
End cap mounted solenoids with equal area pistons utilize a 300 psi pilot signal to shift the spool. Pilot supply connections are internal to the valve. The equal area solenoid pistons prevent ghosting. This operator can be adjusted to control the spool's rate of travel. Contact Commercial for solenoid applications.



oil hydraulic remote controller

Joystick type remote controllers provide precise control of two directional control valve sections. These units require 3-5 gpm pilot flow at up to 500 psi. Joystick models can be equipped with electrical switches and manual or electro-magnetic detents. Ask for catalog H-68R.

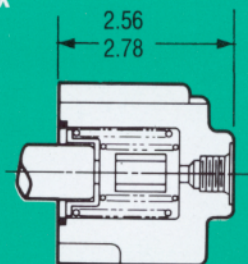
Code XP



pilot operated

This option uses a 100 psi pilot signal to shift the spool in either direction. As caps are required on both ends, manual actuation is not possible.

Code X



remote operated back cap

These sections may be matched with Commercial's oil hydraulic remote controllers for precisely metered remote valve control when manual operation is impractical. Pressure is bled from the main system or provided by an auxiliary circuit.



oil hydraulic remote controller

Single axis remote controllers operate one directional control valve section. They require 3-5 gpm pilot flow at up to 500 psi. Single axis models can be stacked in several configurations and are available with a foot pedal. Ask for catalog H-68.