

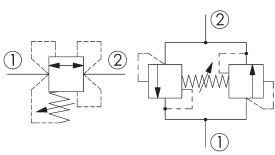
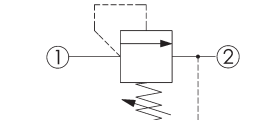
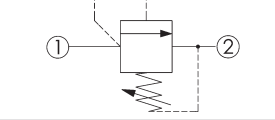
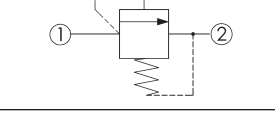
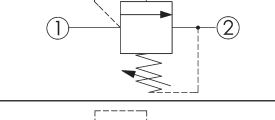
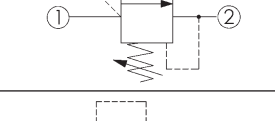
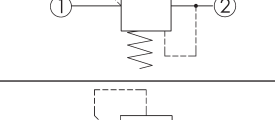
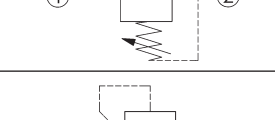
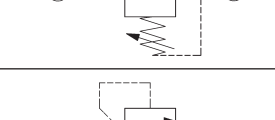
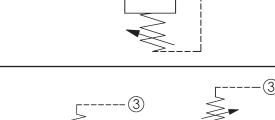
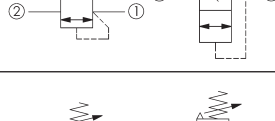
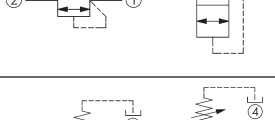
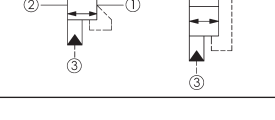


PRESSURE RELIEF VALVE SERIES

Reliable Overpressure Protection
for Mobile and Industrial Equipment

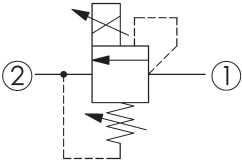
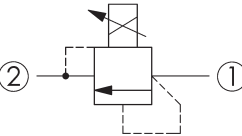
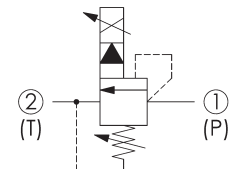
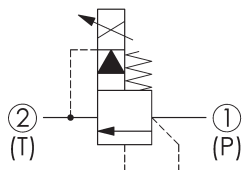
- Pressure Control up to 420 bar (6,000 psi) ◆
- Fast Response for Superior System Protection ◆
- Pilot-Operated & Direct-Acting Designs ◆
- Flow Capacity up to 760 L/min ◆
- 100% Factory Tested for Guaranteed Performance ◆

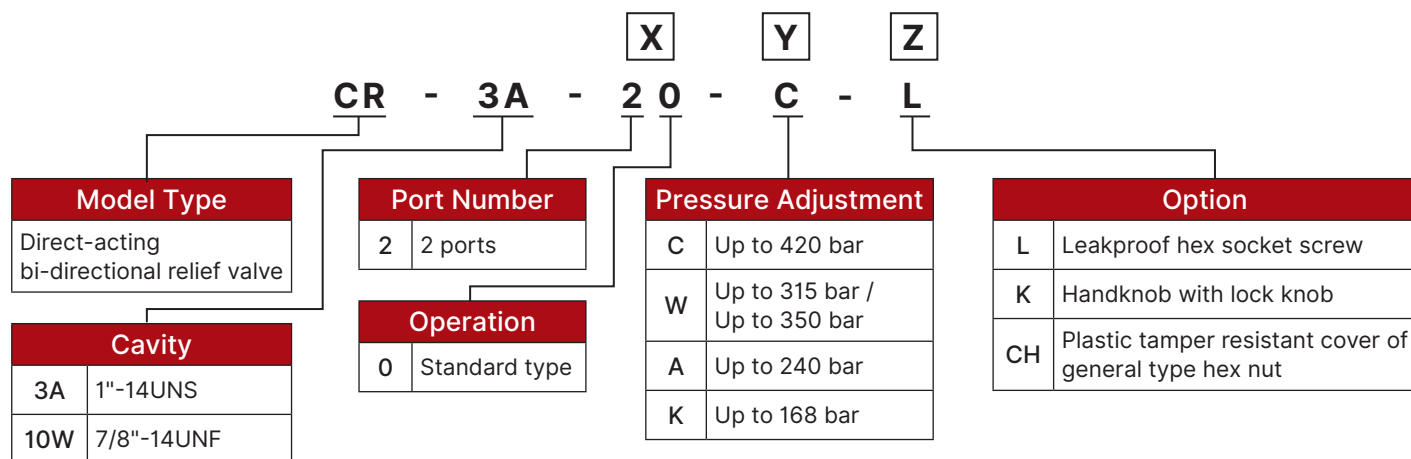


Series Code	Symbols	Description	Rated Flow	Max. Pressure	Features
Direct-Acting					
CR		Direct-acting bi-directional relief valve	Up to 120 LPM	350 bar	• Bi-directional pressure protection • Protects both work ports in either flow direction • Compact cartridge design • Ideal for hydrostatic and bi-directional circuits
RB		Direct-acting pilot stage relief valve	Up to 10 LPM	350 bar	• Precise pilot pressure control • Fast response • Suitable for pilot-operated valve assemblies
RD		Direct-acting, poppet type/ guide poppet relief valve (X=20, 22, 23, 24, 2S)	Up to 120 LPM	420 bar	• Near-zero leakage poppet design • Excellent pressure stability • Fast response to pressure spikes
RD		Direct-acting, poppet type, fixed setting relief valve (X=20 and Z=N)	Up to 120 LPM	350 bar	• Factory-set pressure • Tamper-resistant design • Reduced maintenance requirements • Consistent pressure protection
RD		Direct-acting, pilot stage relief valve (X=21)	1 LPM	350 bar	• Precise pilot pressure control • Fast response • Suitable for pilot-operated valve assemblies
RD		Direct-acting, poppet type relief valve (X=25)	Up to 760 LPM	350 bar	• Dirt-tolerant poppet construction • Near-zero leakage • High flow capacity
RD		Direct-acting, poppet type, fixed setting relief valve (X=25 and Z=N)	Up to 45 LPM	350 bar	• Factory-set pressure • Tamper-resistant design • Reduced maintenance requirements • Consistent pressure protection
RD		Direct-acting, spool type relief valve (X=27)	Up to 60 LPM	350 bar	• Smooth pressure modulation • Stable operation in dynamic systems
RD		Direct-acting, differential area, poppet type relief valve (X=2A)	Up to 75 LPM	350 bar	• Improved pressure accuracy • Lower hysteresis • High pressure capability
RD		Direct-acting, differential area, compact designed poppet type relief valve (X=2A and suffix 1)	Up to 30 LPM	240 bar	• Space-saving cartridge construction • Near-zero internal leakage • Fast response • Suitable for compact manifolds
SD		Direct-acting sequence valve without reverse flow check (X=30)	Up to 480 LPM	350 bar	• Compact direct-acting design • Accurate sequence pressure control • Fast response characteristics • Ideal for simple sequencing circuits
SD		Atmospherically referenced, direct-acting, sequence valve without reverse flow check (X=20)	60 LPM	350 bar	• Unaffected by downstream backpressure • Stable sequencing performance • Suitable for varying return-line conditions
SD		Direct-acting sequence valve without reverse flow check, with relief function (X=4C)	60 LPM	350 bar	• Combines sequence and relief functions • Provides overpressure protection • Simplifies hydraulic circuit design • Compact, space-saving solution

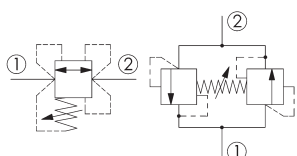
Series Code	Symbols	Description	Rated Flow	Max. Pressure	Features
Pilot-Operated Relief Valve					
RC		Pilot-operated, balanced poppet relief with reverse flow check (X=2G)	Up to 200 LPM	350 bar	- Pilot-operated balanced poppet design - Integrated reverse-flow check valve - Excellent load holding capability
RC		Pilot-operated, balanced poppet relief with reverse flow check, main stage with integral 8A-2 control cavity (X=2G and suffix 8)	Up to 200 LPM	350 bar	- Stable pressure regulation - Excellent sealing and low leakage - High flow capacity in a compact cartridge - Fast response to pressure transients - Reliable system overpressure protection
RH		Pilot-operated, dual pressure relief valve (X=30)	Up to 60 LPM	210 bar	- Dual-pressure relief function - Two selectable pressure settings - Reduced energy consumption - Suitable for high/low pressure cycles
RQ		Pilot-operated, kick-down, balanced piston relief valve (X=20)	Up to 760 LPM	350 bar	- Kick-down relief characteristic - Rapid pressure unloading after cracking - Reduced heat generation - Ideal for cyclic systems
RP		Pilot-operated, balanced piston relief valve (X=20, 26)	Up to 760 LPM	350 bar	- High-flow pilot-operated relief valve - Stable pressure regulation - Suitable for industrial power units
RP		Pilot-operated, balanced piston, fast-acting relief valve (X=22)	Up to 760 LPM	350 bar	- Faster transient response - Improved shock protection - Reduced pressure peaks - High-flow capability
RP		Pilot-operated, balanced poppet relief valve (X=2G)	Up to 760 LPM	350 bar	- Near-zero leakage - High pressure stability - Ideal for load-sensitive systems
RP		Pilot-operated, balanced piston relief valve, main stage with integral 8A-2 control cavity (X=20, 26, 2S and suffix 8)	Up to 760 LPM	350 bar	- Better modulation characteristics - Smooth pressure relief action - More tolerant of contamination - Preferred for pump protection and general hydraulic systems
RP		Pilot-operated, balanced poppet relief valve, main stage with integral 8A-2 control cavity (X=2G and suffix 8)	Up to 760 LPM	350 bar	- Near-zero leakage - Higher pressure holding capability - Better pressure retention under static conditions
RT		Pilot-operated, anti-shock, ventable, balanced piston relief valve (X=3G)	Up to 480 LPM	350 bar	- Anti-shock relief valve - Excellent surge protection - Protects pumps and actuators from pressure spikes

Series Code	Symbols	Description	Rated Flow	Max. Pressure	Features
Pilot-Operated					
RV		Pilot-operated, balanced piston, ventable relief valve (X=30)	Up to 480 LPM	350 bar	- Remote venting capability - Multiple control options - Easy system unloading - Suitable for accumulator and pump unloading circuits
RV		Pilot-operated, balanced piston, ventable, fast-acting relief valve (X=30 and suffix 85)	Up to 480 LPM	350 bar	- Fast response to pressure spikes - Ventable for remote unloading - Enhanced system shock protection - Stable high-flow performance
RV		Pilot-operated, ventable, balanced piston relief valve, main stage with integral 8A-2 control cavity (X=30 and suffix 8)	Up to 480 LPM	350 bar	- Smooth pressure regulation - Ventable for remote control and unloading - High flow capacity
RV		Pilot-operated, ventable, balanced poppet relief valve (X=3G)	Up to 480 LPM	350 bar	- Near-zero internal leakage - Ventable for remote unloading - Stable pressure control - Excellent load-holding performance
RV		Pilot-operated, ventable, balanced poppet, fast-acting relief valve (X=3G and suffix 85)	Up to 480 LPM	350 bar	- Near-zero internal leakage - Fast-acting pressure protection - Ventable for remote control - Excellent load-holding and pressure stability
RV		Pilot-operated, ventable, balanced poppet relief valve, main stage with integral 8A-2/ 08W-2 control cavity (X=3G and suffix 8/8W)	Up to 480 LPM	350 bar	- Near-zero internal leakage - Fast-acting pressure protection - Ventable for remote control - Excellent load-holding and pressure stability
RV		Pilot-operated, ventable, balanced piston relief valve with external drain (X=40, 45)	Up to 480 LPM	350 bar	- Independent drain line - Unaffected by tank line back-pressure - Improved pressure accuracy - Recommended for high-backpressure circuits
RV		Pilot-operated, ventable, balanced piston relief valve with external drain, with integral 8A-2 control cavity (X=40 and suffix 8)	Up to 240 LPM	350 bar	- Set pressure unaffected by outlet back-pressure - Independent spring-chamber drain; eliminates back-pressure affect on pressure setting
RV		Pilot-operated, spool type relief valve, modulating element (X=3B)	Up to 320 LPM	350 bar	- Modulating relief element - Smooth pressure transition - Reduced noise and vibration - Stable dynamic performance

Series Code	Symbols	Description	Rated Flow	Max. Pressure	Features
Proportional Direct-Acting					
PRA		Pilot capacity inverse direct-acting proportional relief valve, high-pressure setting at no command. (Pressure-decreasing type)	1 LPM	350 bar	• High-pressure setting at zero command • Electronic pressure control • Excellent controllability for closed-loop systems
PRB		Pilot capacity standard direct-acting proportional relief valve, low-pressure setting at no command. (Pressure-increasing type)	1 LPM	350 bar	• Low-pressure setting at zero command • Fast electronic adjustment • Suitable for energy-saving control strategies
Proportional Pilot-Operated					
PRP--A		Pilot-operated, inverse balanced relief valve, high pressure at no command. (Pressure-decreasing type)	Up to 95 LPM	350 bar	• Inverse proportional pilot-operated relief valve • High pressure at zero command
PRP--B		Pilot-operated, standard balanced relief valve, low-pressure at no command. (Pressure-increasing type)	Up to 300 LPM	350 bar	• Proportional pilot-operated relief valve • Low pressure at zero command • Wide controllable pressure range • Suitable for electro-hydraulic systems



Symbol



A direct-acting relief valve providing pressure relief in both flow directions within a single cartridge, eliminating the need for two separate valves. Ideal for hydraulic motor circuits and oscillating-load applications requiring bi-directional overload protection.

- Bi-directional protection
- Single cartridge replaces two valves
- Hydrostatic & bi-directional circuits

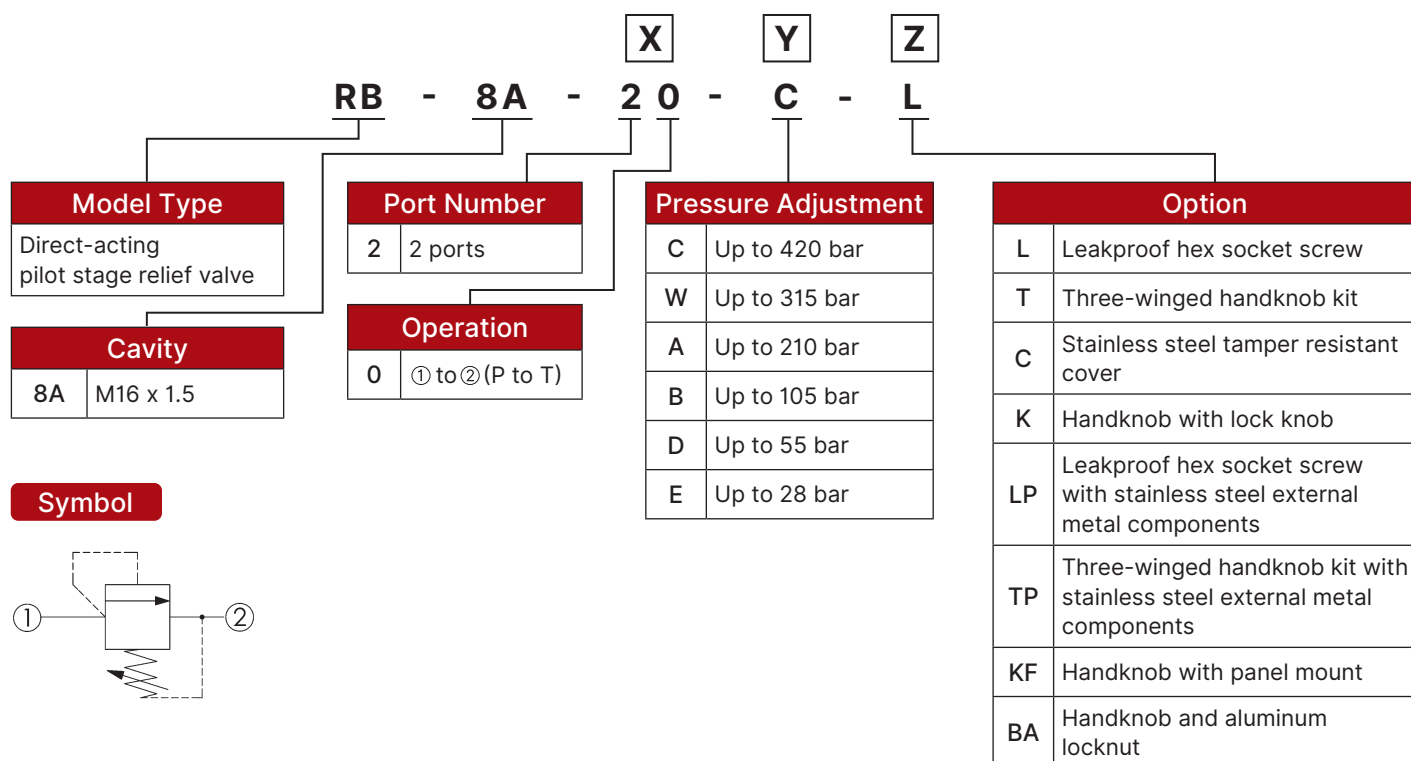
APPLICATIONS

Hydraulic motor circuits

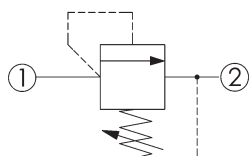
Oscillating loads

Bi-directional circuits

Hydrostatic drives



Symbol



A compact, direct-acting pilot stage valve for use as the pressure-setting element in pilot-operated circuits. It provides simple and reliable pilot pressure control with straightforward direct-acting construction.

- Precise pilot pressure control
- Fast response time

APPLICATIONS

Pilot stage control

Pressure setting element

Compact manifolds

RD		- 08W		- 20		- C		- L		-		Last digit reserved for special customer specifications	
Model Type		Port Number		Pressure Adjustment (Poppet/ Guide Poppet)		Option							
Direct-acting relief valve		2 2 ports		C Up to 420 bar		L Leakproof hex socket screw							
Cavity		Structure		W Up to 350 bar / Up to 315 bar / Up to 250 bar /		T Three-winged handknob kit							
08W 3/4"-16UNF		0 Standard design ① to ② (P to T)		A Up to 210 bar		C Stainless steel tamper resistant cover							
10W 7/8"-14UNF		1 Direct-acting pilot stage (1 LPM), ① to ② (P to T)		K Up to 155 bar		K Handknob with lock knob							
30R M30 x 1.5		2 Direct-acting guide poppet type ① to ② (P to T)		B Up to 105 bar		F Handknob and locknut							
19E 3/4"-16UNF		3 Direct-acting poppet-type (3 LPM), ① to ② (P to T)		D Up to 55 bar		J Control kit, max. setting limiter							
28M M28 x 1.5		4 Direct-acting, special poppet design, ① to ② (P to T)		E Up to 28 bar		D Plastic cover							
35M M35 x 1.5		5 Differential area poppet-type ① to ② (P to T)		S Up to 14 bar		LP Leakproof hex socket screw with stainless steel external metal components							
8A M16 x 1.5		7 Direct-acting spool-type * ① to ② (P to T)		Pressure Adjustment (Spool-type, X=27)		LS Leakproof hex socket screw with all stainless steel metal components							
162A M16 x 1.5		A Differential area poppet-type ② to ① (P to T)		70 Up to 7.0 bar (std. setting 3 bar)		CP Stainless steel tamper resistant cover with stainless steel external components							
10A M20 x 1.5		S Direct-acting, guide poppet type (short spindle type) ① to ② (P to T)		35 Up to 3.5 bar (std. setting 1 bar)		CB Plastic tamper resistant cover							
13A M20 x 1.5				Cracking Pressure (Fixed Setting)		BA Handknob and aluminum locknut							
3A 1"-14UNS				220 220 - 240 bar (at 1.8 LPM)		KF Handknob with panel mount							
16A M36 x 2.0				0413 28.5 - 31.5 bar (413 - 457 psi)		N Non-adjustable (only for fixed setting)							
18A M48 x 2.0				0500 34.5 - 40 bar (500 - 580 psi)									
				2450 170 - 185 bar (2450 - 2650 psi)									
				2750 192 - 210 bar (2750 - 3000 psi)									
				3000 210 - 225 bar (3000 - 3200 psi)									
				3200 225 - 245 bar (3200 - 3500 psi)									

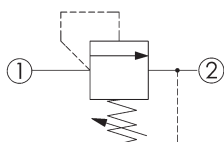
* Low pressure adjustment with stable, high flow capacity.

* Slight internal leakage may occur due to spool clearances.

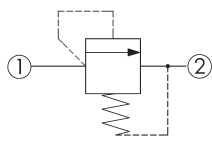
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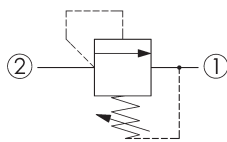
Symbol



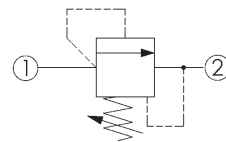
RD series direct-acting pilot stage/ poppet type/guide poppet/ spool-type relief valve; pressure adjustment type (X=20, 21, 22, 23, 24, 27, 2S)



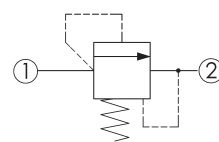
RD series direct-acting guide poppet fixed setting relief valve (X=20 and Z=N)



RD series direct-acting differential area poppet-type relief valve (X=2A), ② to ① (P to T); pressure adjustment type



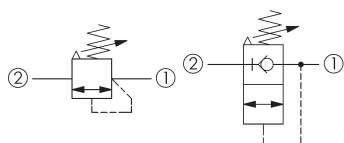
RD series direct-acting differential area, poppet-type relief valve (X=25) pressure adjustment type



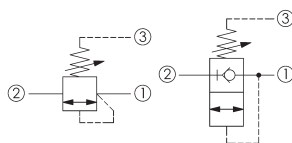
RD series direct-acting differential area poppet-type fixed setting relief valve (X=25 and Z=N)

				X				Y				Z				Last digit reserved for special customer specifications	
SD		- 11A		- 20		- C		- L		-							
Model Type		Port Number		Pressure Adjustment		Option											
Direct-acting sequence valve without reverse flow check		2	2 ports	C	Up to 420 bar	L	Leakproof hex socket screw										
		3	3 ports	W	Up to 315 bar	C	Stainless steel tamper resistant cover										
		4	4 ports	H	Up to 280 bar	K	Handknob with lock knob										
Cavity		Structure															
11A	M20 x 1.5	0	Standard design	A	Up to 210 bar	LP	Leakproof hex socket screw with stainless steel external metal components										
2A	1"-14UNS	C	3:1 (with sealed pilot)	B	Up to 105 bar	CB	Plastic tamper resistant cover										
17A	M36 x 2.0			D	Up to 55 bar												
19A	M48 x 2.0			E	Up to 28 bar												
13A	M20 x 1.5																
21A	M20 x 1.5																

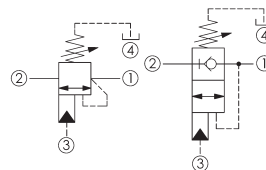
Symbol



Atmospherically referenced sequence valve without reverse flow check (X=20)



Sequence valve without reverse flow check (X=30)



Sequence valve without reverse flow check, with relief function (X=4C)

A direct-acting, atmospherically referenced poppet-type sequence valve that functions as a highly accurate relief valve. Because the spring chamber vents to atmosphere rather than referencing the downstream port, the pressure setting remains independent of back pressure variations. With a typical 2 ms response time and near-zero leakage (~0.7 cc/min), it is well suited to precision relief and overload protection in clamping, sequencing, or back-pressure-sensitive circuits.

- Back-pressure independent
- Fast response time
- Near-zero leakage

APPLICATIONS

Clamping circuits

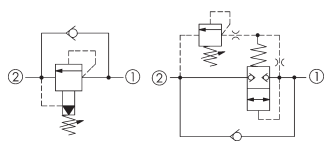
High back-pressure environments

Overload protection

RC		10A		2		G		C		L			
Model Type		Port Number		Pressure Adjustment		Option							
Pilot-operated, balanced poppet relief with reverse flow check		2 2 ports		C Up to 420 bar		L Leakproof hex socket screw							
				A Up to 210 bar		T Three-winged handknob kit							
				B Up to 105 bar		C Stainless steel tamper resistant cover							
				D Up to 55 bar		K Handknob with lock knob							
				E Up to 28 bar		CB Plastic tamper resistant cover							

Last digit reserved for special customer specifications

Symbol



Winner's patented pilot-operated, poppet-type relief valve with an integrated reverse flow check. Relieves from port 1 to port 2 at the set pressure, then allows free reverse flow from port 2 to port 1 (~2 bar cracking pressure) without a separate check valve. Near-zero leakage when closed makes it ideal for brake circuit cross-port relief and anti-cavitation protection.

APPLICATIONS

Brake circuits

Cross-port relief

Anti-cavitation

Load holding

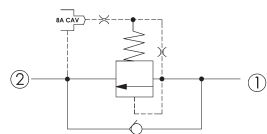
RC		10A		2		G		D		8			
Model Type		Port Number		Structure		Spring							
Pilot-operated, balanced poppet relief with reverse flow check, main stage with integral 8A-2 control cavity		2 2 ports		G Balanced poppet									

Cavity	
10A	M20 x 1.5
3A	1"-14UNS

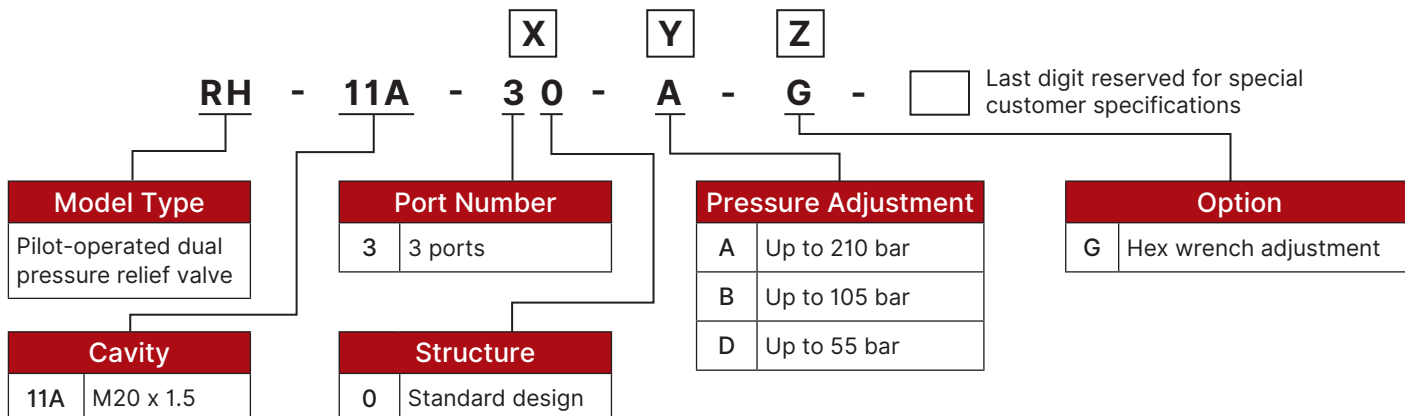
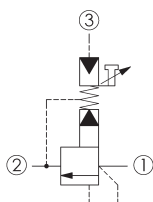
Spring		
	Minimum Control Pressure	Check Valve Cracking Pressure
D	1.7 bar	0.3 bar
B	3.5 bar	0.3 bar
W	7 bar	0.3 bar

* Winner offers a wide range of options, such as check valve cracking pressure of 2.0 bar.

Symbol



Adds an integral 8A-2 control cavity for direct mounting of PRB8A or PRA8A proportional pilot valves, enabling programmable pressure control of the relief setting without additional manifold cavities or external pilot connections. Reverse flow check function is retained.

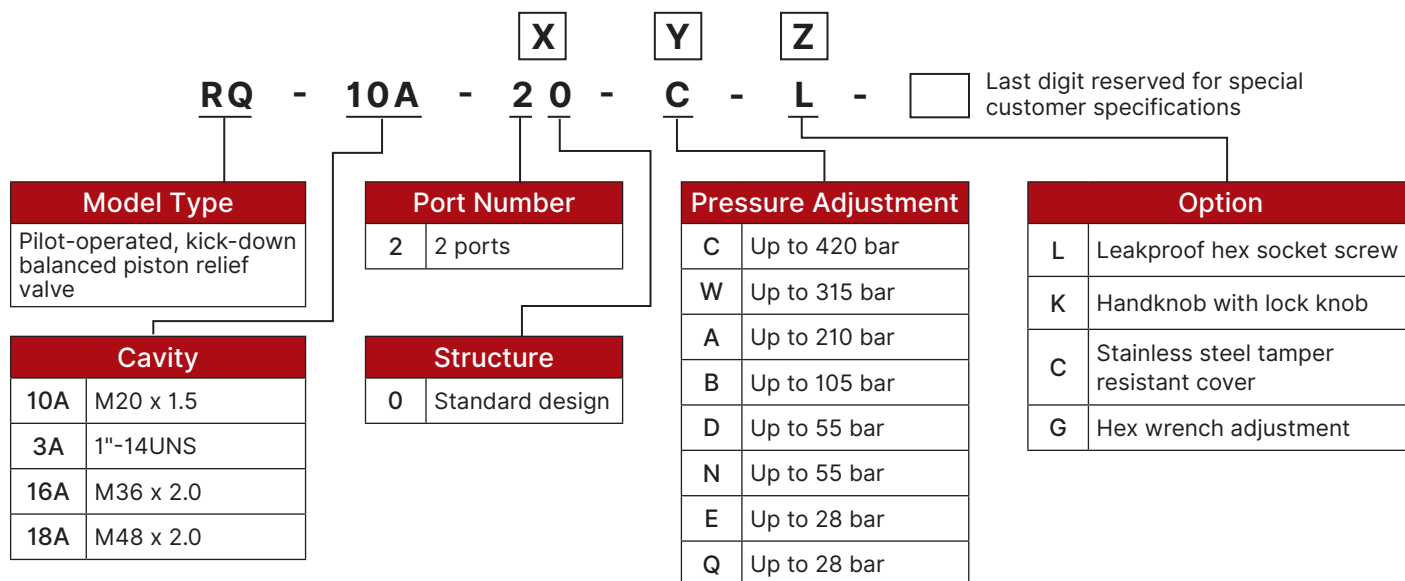
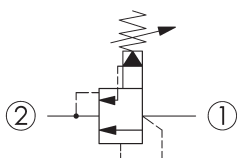
**Symbol**

Two independent pressure settings in one 3-port cartridge. Low-pressure setting is field-adjustable and active when port 3 carries no pilot signal. Applying >11 bar to port 3 (pilot ratio 28:1) switches to a factory-preset high-pressure setting.

APPLICATIONS

Two-pressure systems

Energy saving

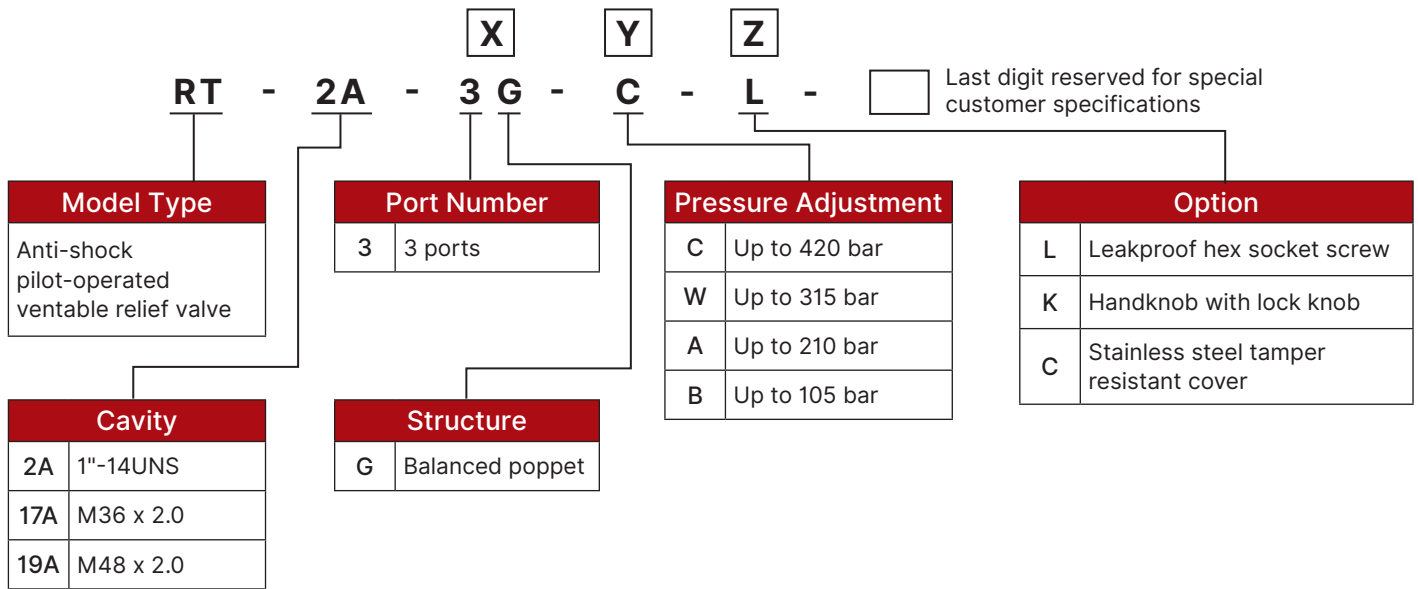
**Symbol**

Functions like a hydraulic circuit breaker. Once inlet pressure at port 1 reaches the set point, the main piston opens and latches the circuit in a low-pressure state until the system is deliberately reset. Ideal for overload protection and safety circuits where sustained high pressure must be actively cleared before resuming.

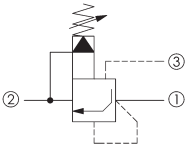
APPLICATIONS

Safety circuits

Cyclic systems



Symbol



A 3-port ventable, pilot-operated balanced poppet relief valve with built-in anti-shock protection to absorb pressure spikes and surge loads. The vent port enables remote circuit unloading for energy-efficient pump unload operation. Well suited for mobile equipment, slewing circuits, and other high-cycle, shock-prone applications.

- Anti-shock protection
- Excellent surge protection
- Ventable for remote unloading
- Mobile equipment

APPLICATIONS

Mobile equipment

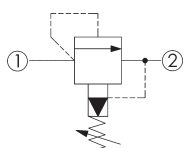
Slewing circuits

High-cycle systems

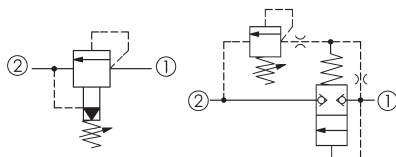
Model Type		Port Number		Pressure Adjustment		Option	
RP - 10W - 20 - C - L - 		2 2 ports		C Up to 420 bar		L Leakproof hex socket screw	
10W 7/8"-14UNF		2 Balanced piston fast-acting ① to ② (P to T)		W Up to 315 bar		L-7 Leakproof hex socket screw with double back-up rings	
12W 1-1/16"-12UN		6 Balanced piston ① to ② (P to T)		A Up to 210 bar		K Handknob with lock knob	
12WA 1-1/16"-12UN		G Balanced poppet ① to ② (P to T)		H Up to 210 bar		C Stainless steel tamper resistant cover	
16W 1-5/16"-12UN				B Up to 105 bar		G Wrench adjustment	
22MA M22 x 1.5				D Up to 55 bar		LP Leakproof hex socket screw with stainless steel external metal components	
33MC M33 x 2.0				N Up to 55 bar		LF Leakproof hex socket screw with panel mount	
162A M16 x 1.5				E Up to 28 bar		KF Handknob with panel mount	
10A M20 x 1.5				Q Up to 28 bar		GA Socket head set screw with cap	
3A 1"-14UNS						BA Handknob and aluminum locknut	
16A M36 x 2.0							
18A M48 x 2.0							

Last digit reserved for special customer specifications

Symbol



Balanced piston relief valve (X=20, 22, 26)



Balanced poppet relief valve (X=2G)

Balanced Piston (X=20, 26)

A pilot-operated relief valve delivering fast 10 ms response for continuous duty applications. The balanced piston construction offers better contamination tolerance and smooth pressure relief action, making it the preferred choice for pump protection and general industrial hydraulic systems. The pilot port is protected by a stainless-steel filter screen.

- 10 ms response time
- Contamination tolerant
- Smooth pressure relief
- Pump protection

Balanced Piston Fast-Acting (X=22)

Enhanced variant with faster transient response for dynamic systems requiring rapid pressure spike absorption. Delivers improved shock protection and reduced pressure peaks at the same high-flow capability as the standard variant.

Balanced Poppet (X=2G)

Near-zero leakage (~0.7 cc/min at reseal) and quiet operation for applications with high pressure drops. Ideal for load-sensitive systems where internal leakage must be minimized under static conditions.

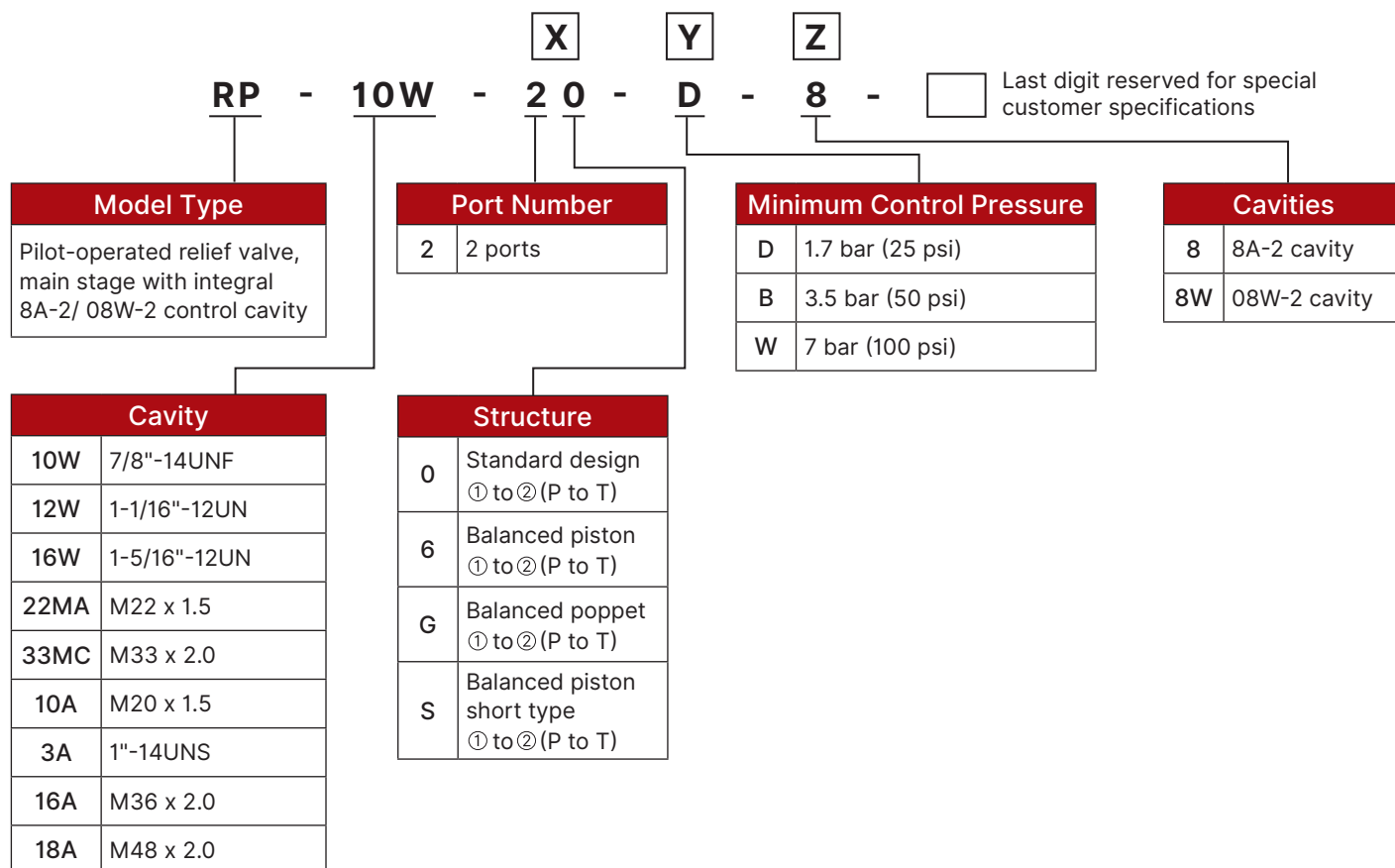
APPLICATIONS

Industrial power units

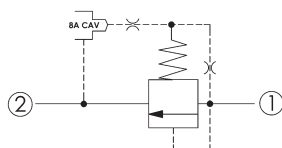
Pump protection

Load-sensitive circuits

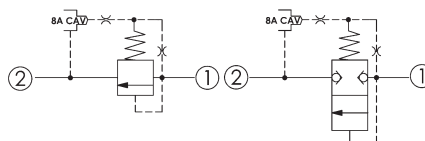
Proportional control



Symbol



Balanced piston relief valve, main stage with integral 8A-2/08W-2 control cavity (X=20, 26, 2S)

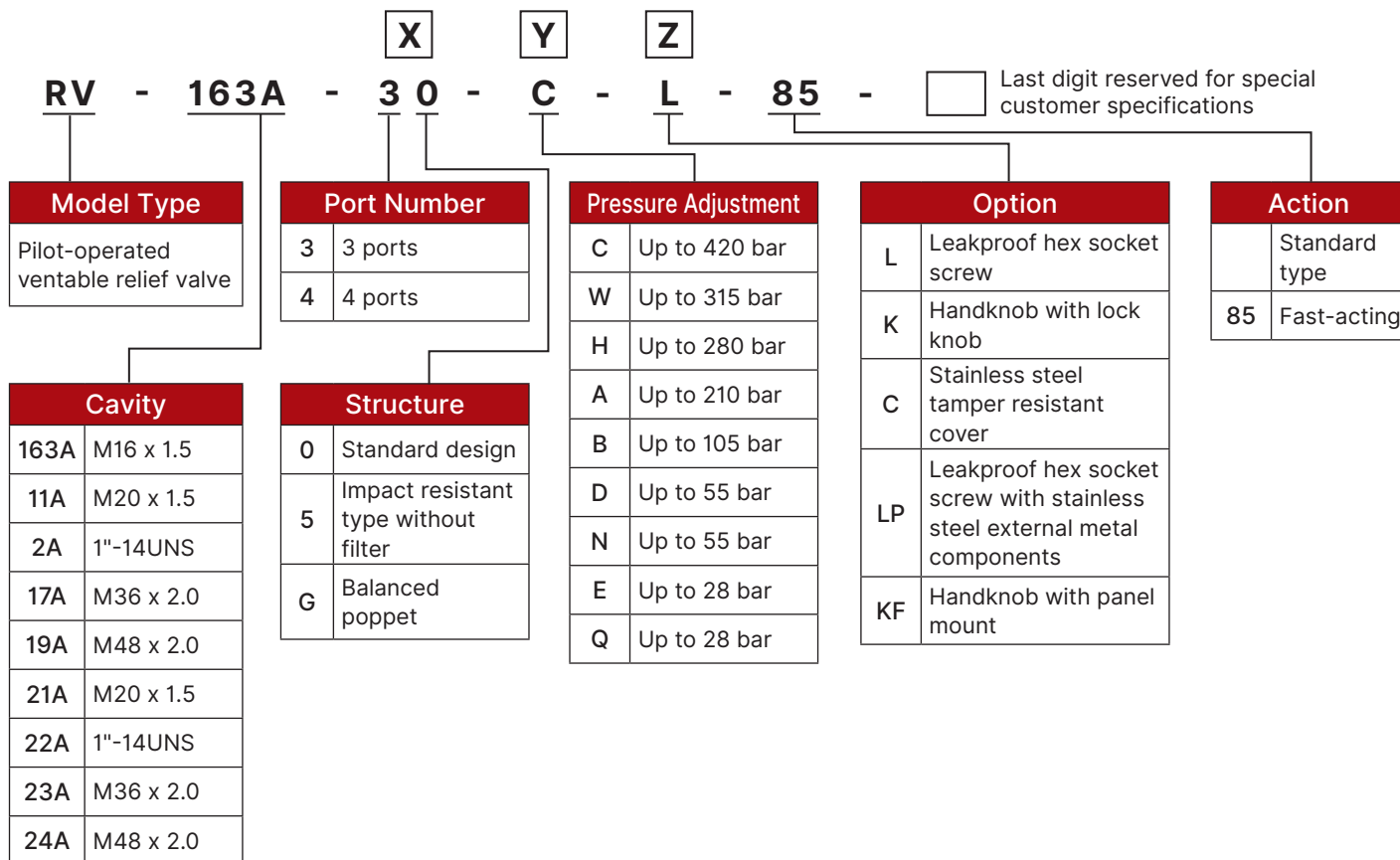


Balanced poppet relief valve, main stage with integral 8A-2/08W-2 control cavity (X=2G)

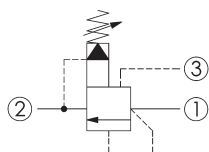
RP with Integral 8A Control Cavity (X=20, 26, 2S, 2G suffix 8)

Adds an integral 8A-2 or 08W-2 control cavity on the main stage body for direct mounting of a solenoid or proportional pilot valve, eliminating external pilot plumbing. Available in balanced piston (X=20, 26, 2S) and balanced poppet (X=2G) configurations. Ideal for remote unloading, two-pressure switching, or proportional pressure control in compact installations.

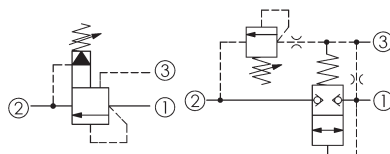
- Eliminates external pilot plumbing
- Remote unloading capability
- Two-pressure switching
- Proportional pressure control



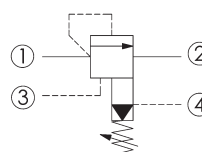
Symbol



Ventable, balanced piston relief valve (X=30, fast-acting: suffix 85)



Ventable, balanced poppet relief valve (X=3G, fast-acting: suffix 85)



Ventable, balanced piston relief valve with external drain (X=40, 45)

Balanced Piston / Poppet (X=30, X=3G)

A 3-port pilot-operated relief valve with a vent port for remote unloading. Available in balanced piston (X=30) and balanced poppet (X=3G) configurations. Fast-acting variants (suffix 85) suit dynamic pressure-transition applications.

With External Drain (X=40, 45)

The external drain variant vents the spring chamber independently, making the pressure setting completely unaffected by outlet back-pressure. Recommended for high back-pressure circuits.

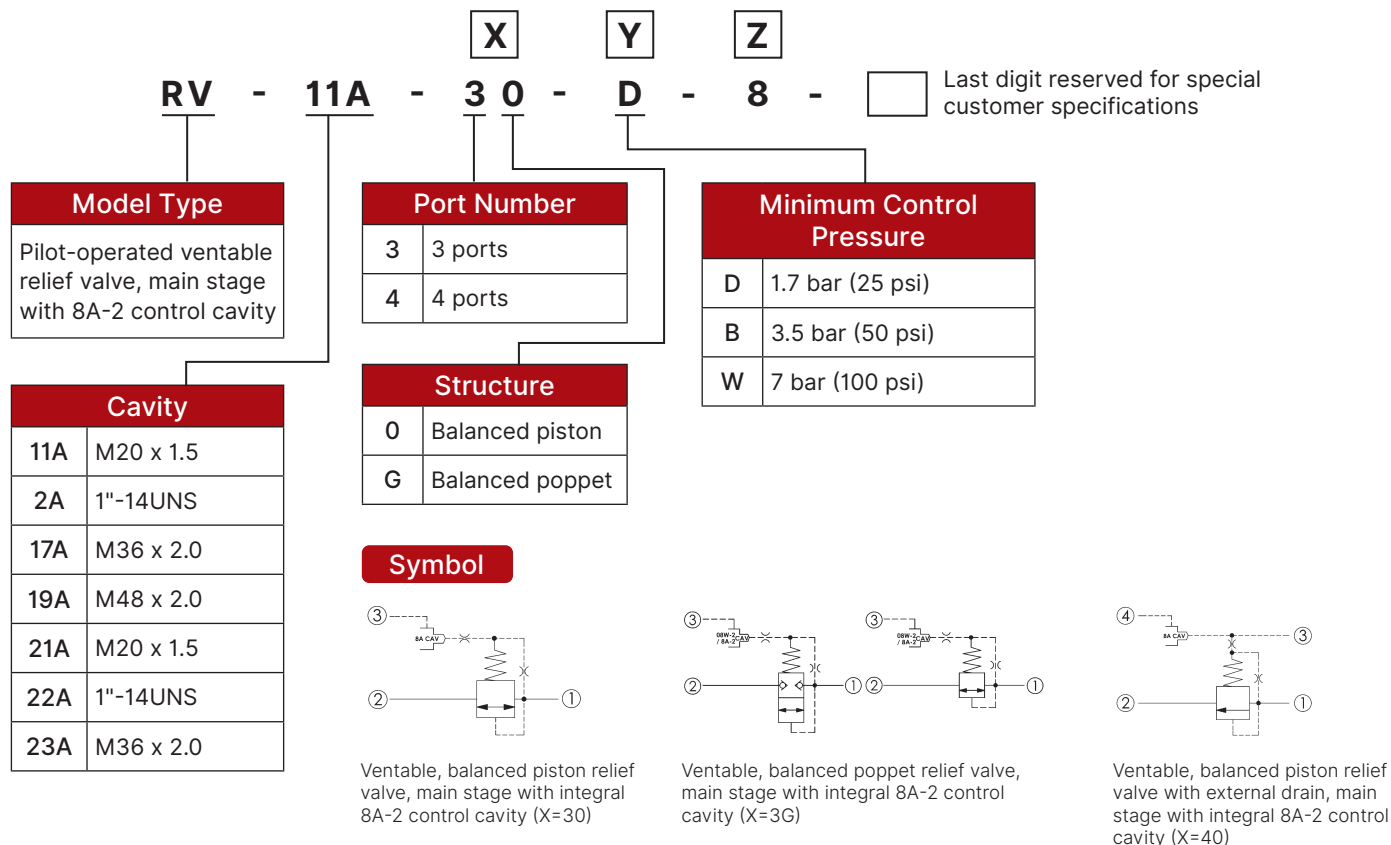
APPLICATIONS

Pump unloading

Accumulator circuits

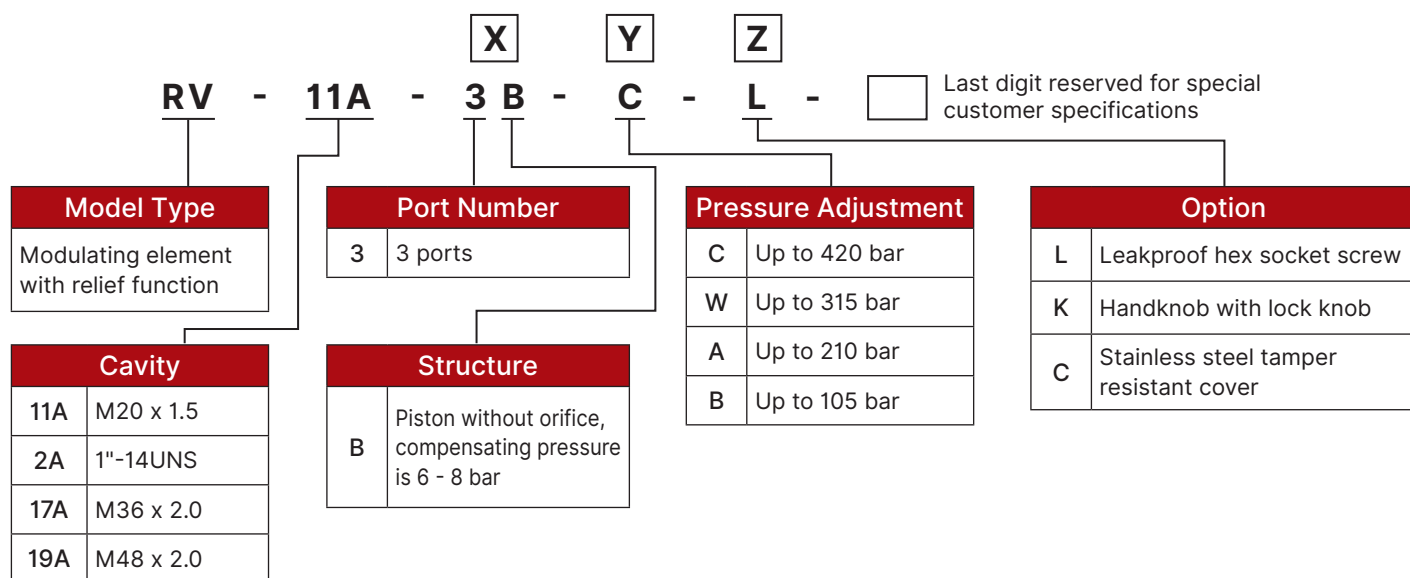
Electro-hydraulic systems

Load sensing

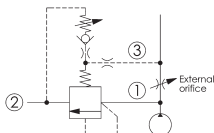


Integrates an 8A-2 or 08W-2 control cavity on the main stage for proportional valve mounting, enabling remote-controlled venting or proportional pressure adjustment without additional manifold space. Note: the external drain variant with 8A cavity (X=40 suffix 8) has a reduced rated flow of up to 240 L/min.

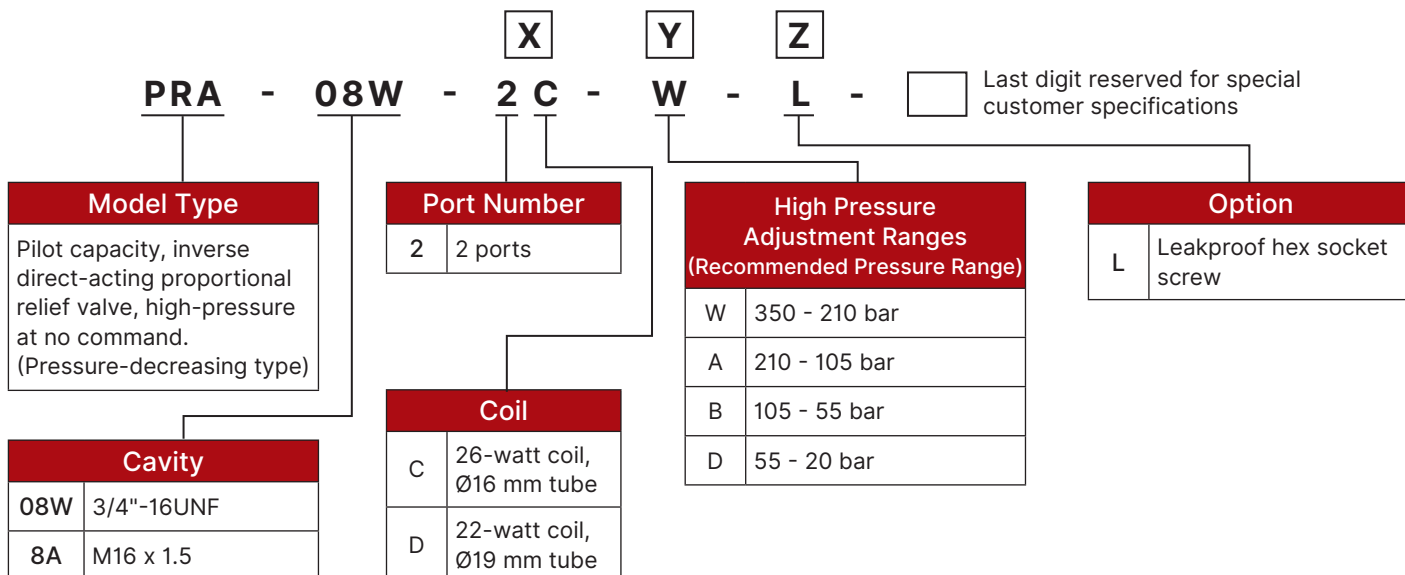
- Remote-controlled venting
- Proportional pressure control



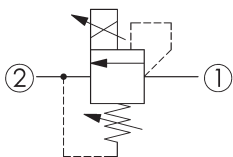
Symbol



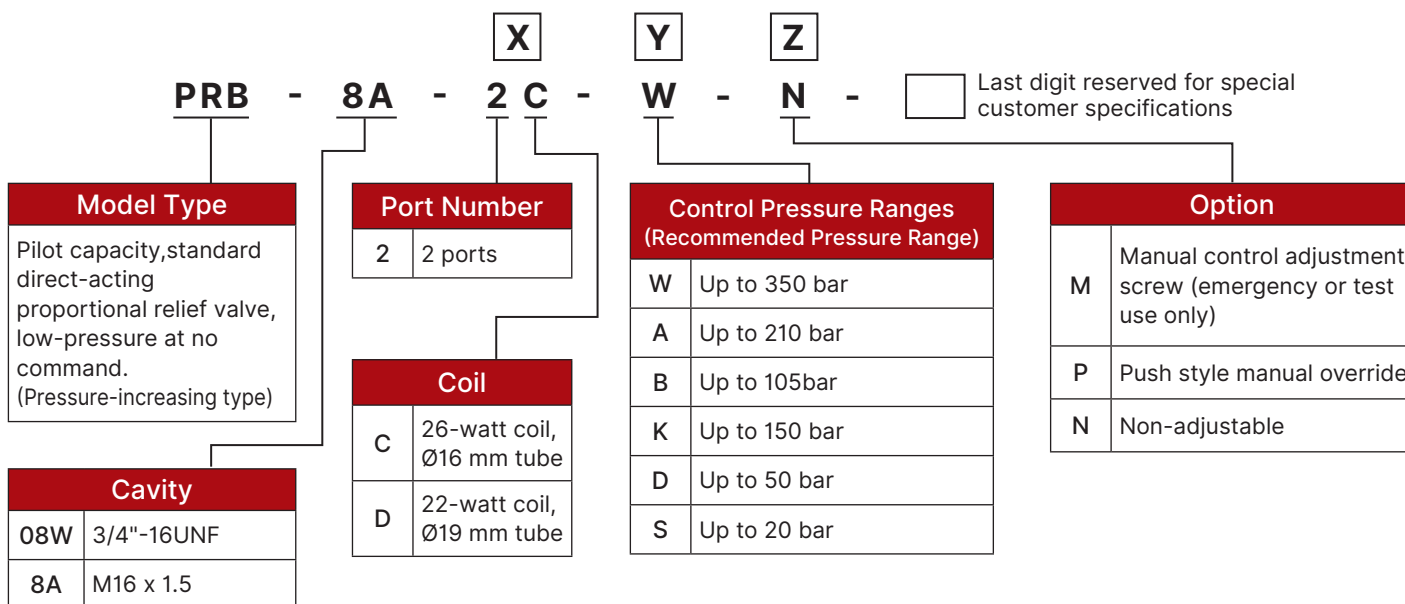
The modulating element version (X=3B) allows the valve to function as a proportional modulating element in addition to conventional pressure relief, expanding its range to electro-hydraulic and load-sensing circuit applications.



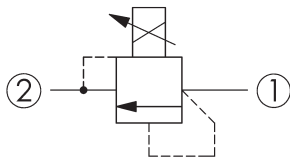
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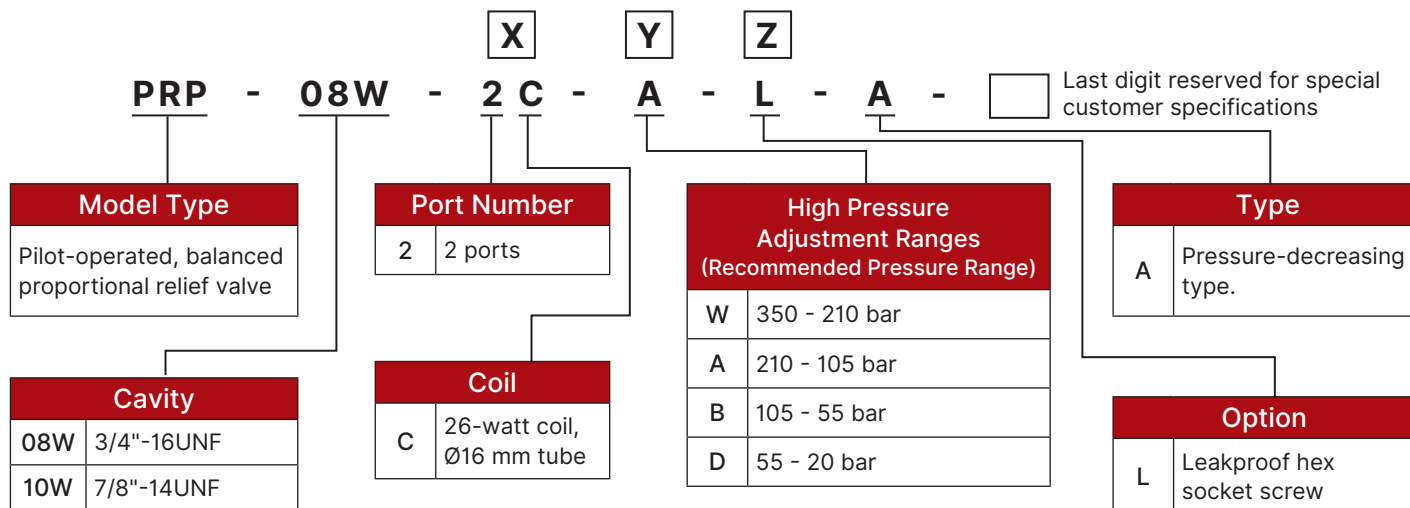
This is a pressure-reducing type valve, spring-biased to its highest pressure at zero command. Increasing coil current proportionally lowers the pressure setting. Ideal for brake release, load holding, and clamping circuits where loss of power must maintain maximum system pressure. Available in four pressure ranges up to 350 bar.



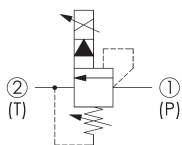
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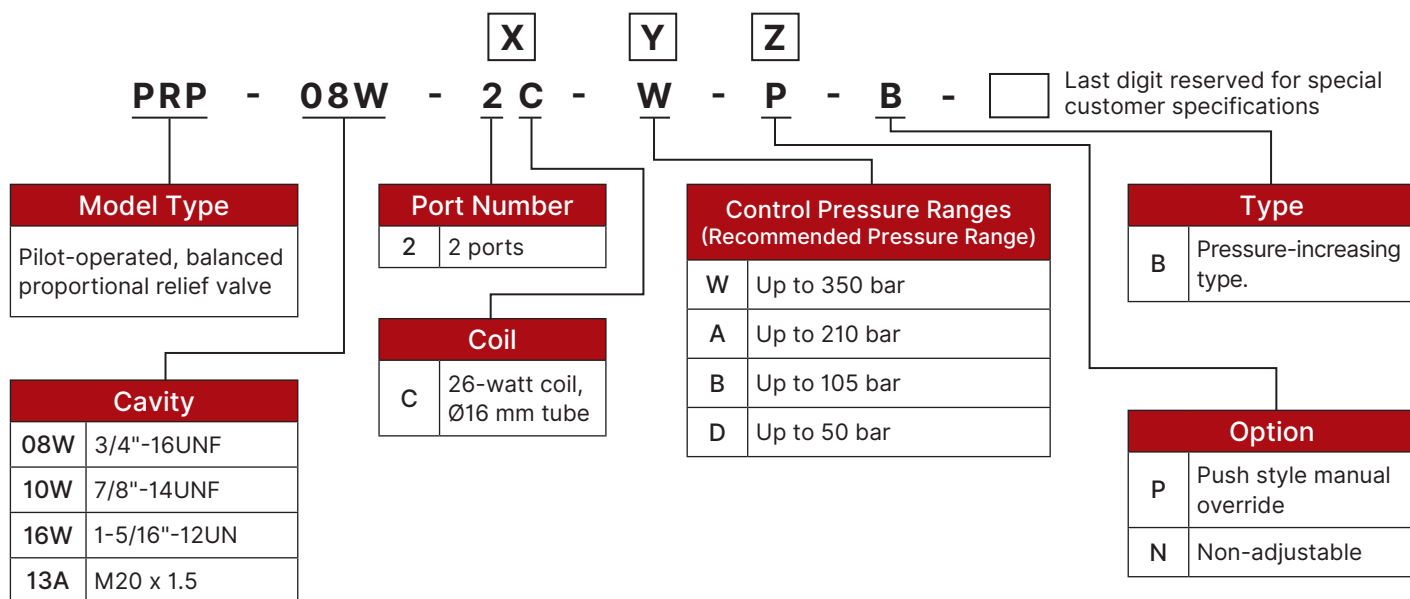
A direct-acting, poppet-type proportional pilot-stage valve mounting into the 8A-2 control cavity of a compatible main stage (RC, RV, RP). Features a pressure-increasing design with minimum pressure at zero command signal; pressure rises proportionally with increasing coil current.



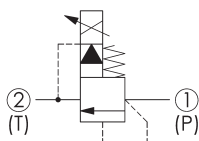
Symbol



This is a pressure-reducing type valve, defaulting to highest pressure at zero command. Increasing coil current progressively lowers the pressure setting — ideal for brake release and load-holding circuits.



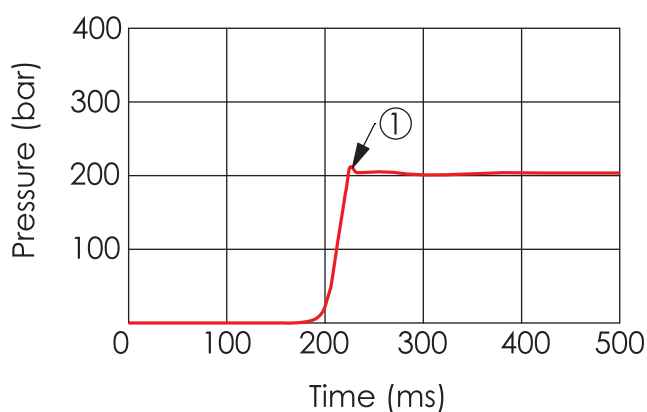
Symbol



A self-contained pilot-operated proportional relief valve combining pilot solenoid and main stage in a single cartridge. Defaults to lowest pressure at zero command. Pressure rises proportionally with coil current.

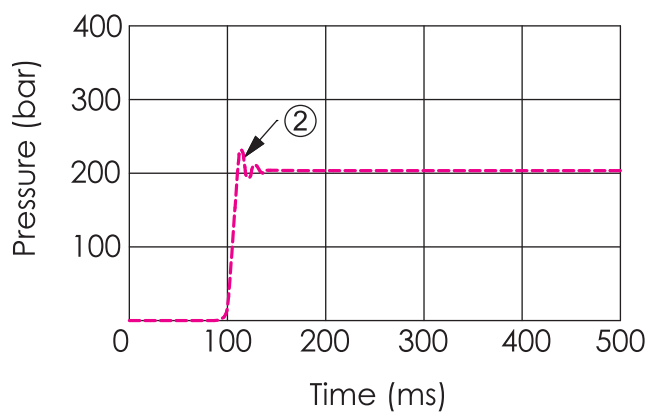
Response time is a critical performance characteristic for relief valves, directly impacting how quickly a valve can protect the system from overpressure events. The charts below compare the transient response behavior of Winner's major valve structures.

Direct-acting differential area poppet-type RD - * - 25 - Y - Z



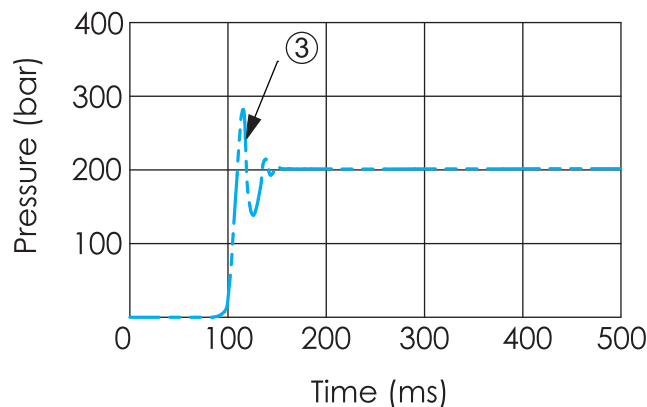
Fastest cracking response. Typically under 5 ms. Best for applications with rapid pressure spikes requiring immediate protection.

Pilot-operated, balanced poppet RP - * - 2G - Y - Z



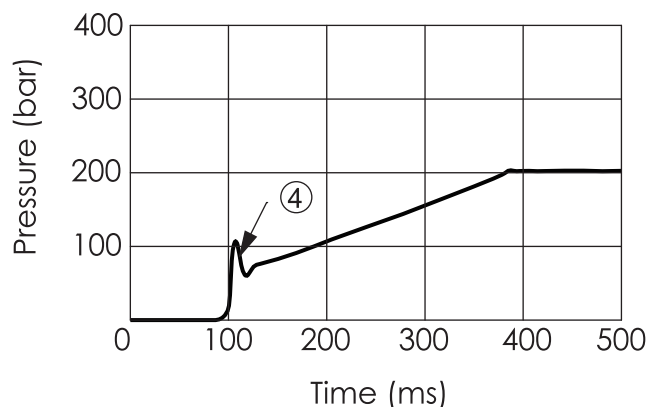
Near-zero leakage behavior with smooth cracking profile. Optimal for load-sensitive and static holding circuits.

Pilot-operated, balanced piston RP - * - 20 - Y - Z



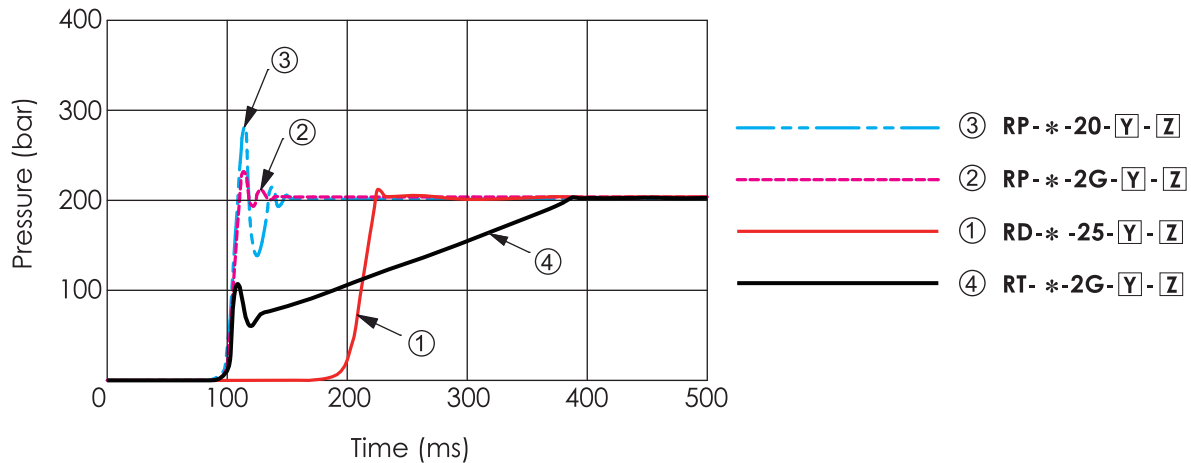
10 ms typical. Slower initial response than direct-acting, but excellent stability and modulation for continuous duty applications.

Pilot-operated, anti-shock, ventable, balanced piston RT - * - 3G - Y - Z



Gradual shock-absorbing response profile. Designed to dampen rather than abruptly limit pressure — protects actuators from surge damage.

Relationship Between Relief Valve Structure and Response Speed



Based on the transient response charts, each curve represents the performance of a specific relief valve structure under a sudden pressure spike. These structures reflect different design priorities balancing response speed, pressure peak control (shock protection), and stability.

The detailed relationship between each structure and its response characteristics is explained below:

① Direct-Acting Relief Valve

- **Structure & Response Relationship:** Delivers the fastest cracking response. As shown in the chart, when the system pressure reaches the setting (200 bar), the valve opens almost vertically and immediately, typically responding in under 5 ms. Furthermore, its pressure overshoot is minimal, tightly maintaining the pressure near the set limit.
- **Ideal Applications:** Best for applications with rapid pressure spikes requiring immediate protection to prevent component damage.

② Balanced Poppet Relief Valve

- **Structure & Response Relationship:** The poppet construction inherently provides near-zero leakage behavior for excellent sealing. In terms of pressure response, its cracking action is also extremely rapid (rising instantly after the 100 ms trigger point), though it is followed by minor pressure fluctuations (oscillations) before stabilizing. Overall, it achieves an optimal balance between maintaining static pressure tightness and dynamic response.
- **Ideal Applications:** Optimal for load-sensitive and static holding circuits.

③ Balanced Piston Relief Valve

- **Structure & Response Relationship:** This is the most standard pilot-operated relief valve configuration. Because the piston movement requires pilot oil circuit pressure to build up first, its initial response is slightly slower than direct-acting variants. The chart clearly displays an initial pressure peak overshoot (reaching approx. 280 bar) and subsequent modulation waves, settling into excellent steady-state control within about 10 ms (from peak to stabilization).
- **Ideal Applications:** Although it experiences a higher initial pressure peak, it offers excellent stability and contamination tolerance during continuous operations, making it the preferred choice for general industrial hydraulic systems and pump protection.

④ Anti-Shock Relief Valve

- **Structure & Response Relationship:** This structure incorporates a special internal damping or cushioning mechanism. The chart clearly shows that after generating a tiny initial wave at around 100 bar (at the 110 ms mark), it exhibits a highly gradual, progressive pressure response curve, extending all the way to approximately 400 ms before fully reaching the 200 bar setting. Its primary purpose is not to abruptly limit pressure, but rather to dampen and absorb shock. This gradual characteristic protects actuators (such as swing motors and mobile equipment) from severe damage caused by sudden pressure surges (surges/waves).

Summary:

Speed & Immediacy of Protection: ① (Direct-Acting) > ② (Pilot-Operated Balanced Poppet) > ③ (Pilot-Operated Balanced Piston).

Shock Absorption & Smoothness: ④ (Anti-Shock Type) displays the smoothest modulation profile.

Although it takes the longest to reach maximum pressure, it minimizes mechanical shock to the system.

Winner Hydraulics

Precision. Reliability. Durability.

For decades, Winner Hydraulics Corp. has been a trusted global manufacturer of high-performance hydraulic cartridge valves serving industrial, mobile, and marine applications worldwide. Every valve is 100% functionally tested before shipment, with working parts heat-treated and precision-ground to the tightest tolerances.

SERIES AT A GLANCE

CR Direct-Acting Bi-directional	RB Direct-Acting Pilot Stage	RD Direct-Acting Multi-Type
SD Sequence Valve with Relief Function	RC Relief with Reverse Check	RH Dual Pressure
RQ Kick-Down	RP Pilot-Operated	RT Anti-Shock
RV Vented Pilot-Operated	PRA Direct-Acting, High Pressure at No Command	PRB Direct-Acting, Low Pressure at No Command
PRP--A Pilot-Operated, High Pressure at No Command	PRP--B Pilot-Operated, Low Pressure at No Command	

Contact Us



+886-4-7865118



+886-4-7873915



sales@winnerhyd.com



www.winnerhydraulics.com

