# Hydraulic Valve (General)

	Multiple control valve (for v	Single function valve, etc.			
	Serving all three factors of valve control: direction, pressure, and flow rate		Providing one of three functions (directional, pressure, or flow control)I)		
Products included in this catalog	Mono-block type (integrated model) (for excavators and loaders)	Sectional (separated model) and semi-mono-block types (for mini- excavators, forklift trucks, loaders, and general purpose)	Flow control valve (for cylinders)		
KYB products not included in this catalog. (Contact KYB)			Solenoid valve for industrial equipment Cartridge valve (Sterling products) A variety of single function valves		

The multiple control valve mainly provides the directional control function for supplying oil to each actuator, but also has pressure and flow control functions.

● Pressure control valves: relief, pressure reducing, and unloading valves, etc. ● Flow control valves: throttle, flow dividing, and pressure compensation valves, etc. ● Directional control valves: directional change and check valves, etc.

<Classification by body construction>

- One-block type: The circuit and functions are designed for a specific model with simple construction (single-function valves)
- Sectional type: The basic circuit, variations, and the number of spools can be flexibly designed (general purpose and single-function valves)

Semi-mono-block type: With mono-block as basic circuit design, additional valves are arranged to be sectional. (Special-purpose valve)

## Valve: Multiple Control Valve

## Basic construction, operation, and accessory valves





The work port pressure exceeds the pilot spring force, opening the pilot poppet to flow oil to the tank port. The pressure difference between the front- and backsides of the main poppet caused by the flow opens the main poppet to flow oil from the work port to the tank port.

The mechanism enables a compact design and better performance (smaller override) than a direct-type relief valve.

(2) Anti-cavitation (port relief)

When pressure on the port side is decreased lower than one on the tank side by cavitation, etc., the difference of the pressure receptive areas between the tank and work port sides of the main poppet opens the main poppet to let oil flow from the tank side to the port side.

\* The port relief valve of a combination type provides relief and anti-cavitation functions.

## Spool Operation and Return to Neutral Position

- Manual operation: Most small valves are manually operated with levers.
- Pilot operation: Most large-scale valves and multiple-valve-units for excavator and mini-excavator applications use a pilot valve allowing light force or parallel operation.
- Solenoid-operation: On-off or proportional changeover of the spool can be performed using the solenoid-operated valve.

[Return to neutral position]

- Often a return spring is adopted for the return to the neutral position, but a mechanical or electric detent system is also used.
- Various accessory valves: An additional accessory valve may be installed on the inlet port of the pump or on each port.
   The main relief valve is used to control the maximum pressure of the pump.
   The overload relief valve (port relief valve) is used to prevent overload of the actuator.
- The anti-cavitation valve is used to prevent cavitation in the actuator. The shut-off valve is used for plugging when no relief valve or anti-cavitation valve is used.

#### Basic Circuit (parallel, tandem, and series circuits)

Parallel circuit Oil from the pump is supplied to the first, second, and third section in



#### <Characteristics>

- Each machine can be operated independently
- On a simultaneous operation, the lowest-pressure circuit is activated first, followed by the mid-pressure circuit and then by the highestpressure circuit. Simultaneous operation is possible with an adjustment of spools.
- \* The above examples are representative of each model, and multiple circuit models may be combined or a special circuit (e.g. two-pump conflux) may be integrated. Please contact us for circuit configurations.

#### **Basic Characteristics**



Flow rate (L/min.



♦ Cracking pressure: Pressure level to open the relief valve

- Full flow pressure: Pressure and
- flow rate set for operation Override: Pressure difference

between the cracking and full flow



< Spool stroke (operation force characteristic)> (Example of a manually operated KVS65)



## Tandem circuit

Oil from the pump is supplied to the first, second, and third section in this order with the priority placed on the upstream side.



 $\bigcirc$  When the upstream section operates, the downstream section stops. Adjustment of the upstream spool enables the

- downstream section operation.
- the load. Pump pressure is the sum of all sections.

Priority is placed on the upstream section

and the return oil of the upstream section is

A3 B3

A2 B2

A1 B1

A simultaneous operation is possible irrespective of

supplied to the downstream section (s).

Series circuit

Third section

Second section

rst sectior

 $\wedge$ 

Ղ

- % Carry over: Oil from the pump inlet may flow to the next circuit through the outlet of the last section.

For the selection of a multiple control valve, the following characteristics should be examined.

#### [Pressure drop characteristics]

The relationship between pressure drop and flow rate is expressed by the formula:  $\mathsf{P} = \beta \cdot \mathsf{Q}^2 / \mathsf{A}^2$ 

Q: Flow rate, β: Coefficient, A: Valve opening area, and P: Pressure

As pressure increases by the square of the flow rate, make sure not to let the flow rate exceed a rated value even momentarily. As the number of spools increases, the equivalent area becomes smaller and the pressure drop increases.

※ Our products are designed in a compact form to reduce pressure loss.

#### [Relief override performance]

Note 1: Please specify the set pressure as [full flow

MPa at pressure: L/min.

Please contact us when cracking pressure is required to be set.

Note 2: When setting the pressure of main relief valve and port relief valve, remember that pressure difference between the two, exceeding the override pressure is required (over 2 MPa) to prevent pressure interference during a simultaneous operation. X A combination relief valve is supplied as a standard accessory in order to realize a compact design and high performance (static and dynamic characteristics).



Peak pressure on relief operation should be taken into account.

#### [Metering characteristic]

<Spool stroke opening area (flow rate) characteristic >

P to T opening: For opening or closing the flow from the pump to the reservoir in the neutral passage and regulating the partial flow to actuators.

P to C opening: For opening or closing the flow from the valve to the actuator and regulating the flow rates to actuators.

C to T opening: For opening or closing the flow from the actuator to the reservoir and regulating the return flow from the actuator.

- ※ The flow characteristic (----) varies depending on load conditions on the P and C sides. Therefore, some systems require prototype tests.
- Spool opening adjustment (metering) during changeover enables fine-tuning of the equipment or the absorption of lever operation impact.

※ Spool setting adequate for the system is possible by combination of opening area. <Spool stroke (spool effort)>

- $\bigcirc$  Against the spring force returning to the neutral position (----), the friction of the moving part works in the positive direction while moving from neutral to full stroke and in the negative direction while returning from full stroke to neutral. (---)
- The operation force is shown with (----) when the oil does not flow. The hydraulic operation generates" flow force "according to the flow rate and pressure. When flow force is too large, it may prevent the spool from returning or affect fine tuning capacity during pilot operation. This way a decrease in flow force from the spool can ensure smooth performance.
- \* KYB products feature light lever operation and high durability by (1) strict moving part clearance management, 2 use of low-friction sealing and wiper sealing, and 3 adoption of fluid-force-reduction spools.

## Additional functions of the special-purpose valve

#### Additional functions of the single valve

\* Based on our long experience, we have made available necessary additional functions for each machine.

These functions are provided as standard specifications for some models and as options for others. Please contact us regarding your application.

## For Excavator and Mini-excavator

[Refer to both the explanations for (1) to (7) and the circuit diagram on the right]

- % In most cases, more than two pump ports are installed to regulate flows separately for the travel motors (left and right), swing motor, and bucket cylinder. Each boom and arm cylinder requires two sections, such as Boom 1 and 2, and Arm 1 and 2, so as to improve work efficiency. On top of that, a auxiliary section is installed for attachment purposes. In total there are nine sections.
- % Various functions are incorporated to operate all actuators in simultaneous operation.

#### 1) Straight travel circuit

When attachment sections are operated with two travel motors in action, the straight travel valve works to supply oil from P2 pump to other sections and oil from P1 pump to left and right travel motors.

- % Straight travel is possible while operating travel motors and another attachment sections at the same time.
- 2 Conflux circuit

During a boom or arm operation with other actuators not in use, the oil flow to Boom 2 and Arm 2 is added to the oil flow to Boom 1 and Arm 1, causing an increase in the total oil flow.

- % Increasing cylinder speed improves work efficiency.
- ③ Priority in a multiple operation

In a simultaneous operation of actuators with different working pressure, it prevents much oil from flowing into lower pressure line.

- % A simultaneous operation of the swing and arm sections or the boom and arm sections becomes easy.
- ④ Neutral flow cut-off valve

The valve closes the neutral flow of the control valve to raise pump pressure.

- % The valve enables the division of oil from the control valve to additional valves for attachment.
- **(5)** Regeneration circuit

The circuit combines return oil from the actuator with oil from the pump. The circuit is used for arm and boom.

- % Increasing the cylinder speed is useful in preventing cavitation and recycling oil discharged from the pump. (Energy saving effect)
- 6 Anti-drift valve

The poppet valve and the pilot unit for the opening and closing of the poppet valve are incorporated between the flow from the spool and the cylinder port. Better sealing performance with the poppet valve reduces oil leakage. It is also very useful in preventing the boom or arm from falling down.

7 Two-stage main relief valve

Adding signal pressure to the standard main relief valve can raise set pressure.

% It is usable when more driving force is required.

Please contact us for other additional functions such as a spool switch detection function and a pump control signaling function (load sensing, positive/negative control, etc.).

#### [Load sensing valve] (KVSX)

- \* To be used in combination with the LS valve and LS pump. (Load pressure sensing variable displacement pump at page 17.)
- % See page 20 for the working mechanism of the load sensing system.
- (1) By using the valve in conjunction with the pump to provide the discharge for only the required pressure and required flow according to lever operation, a low energy consumption system can be realized easily.
- (2) Since the valve is not influenced by load, it is easy to improve simultaneous operation performance by electronic control.
- (3) A compact design can be made with less piping and no conflux circuit.
- (4) Easy flow setting for each valve section.
- (5) The tuning period can be reduced as the flow characteristic can be easily estimated.



1 Straight travel valve /





Two-stage relief valve



### For forklift truck applications

## [Refer to both explanations for 1) to 5 and the circuit diagram on the right]

- % Two valves for lifting and tilting compose the basic mono-block on which sections for attachments can be added. (KVMF)
- 1 Flow priority valve (VPF)

The pump flow is delivered to the hydraulic power steering system with priority through the PF port.

- A type corresponding to the load sensing steering unit is also available.
- $\ensuremath{\mathbbmm{ \mbox{ \mbo$
- [Various safety mechanisms] \* For securing safe operation
- Lift lock valve

This is a safety valve, prohibiting the lift from falling down. The return line to the cylinder is stopped by solenoid valves.

\* A lever operation in error while the engine is off will not lower the lift.

③ Unloading valve

This is to insure safety by prohibiting the lift raising operation by connecting the pump line to the reservoir line with electric signals to the solenoid valve

- \* A lever operation in error will not raise the lift.
- 4 Tilt lock valve

The supply side pressure opens the return line.

- \* Load drop from the fork due to mast tilting is prevented even when the lever is operated accidentally while the engine is off.
- (5) Flow regulator valve (FRV)
- A safety valve (flow control valve) to limit the maximum lift lowering speed.
- \* The lift lowering speed can be adjusted.

#### For wheel loader application (boom and arm)

#### [Refer to both explanations for 1) to 4 and the circuit diagram on the right]

- % Two valves for the boom and bucket compose a basic mono-block on which sections for attachments can be added. (KVML)
- 1 Boom lowering floating position

In addition to the three positions for Neutral, Lifting, and Lowering of the boom, the fourth position for drifting (lowering by its own weight) is given by connecting the line between the cylinder rod and bottom and the reservior.

- % This position is required for leveling the ground.
- % Traveling is possible while keeping the valve at the detent position.
- 2 Boom lowering detent
- The boom is kept at the drifting position with magnetic detent.
- 3 Boom lifting detent

The boom is kept at the lifting position with magnetic detent.

④ Bucket crowding detent

A mechanism to maintain a bucket crowding position

## For wheel loader application (steering) [KVMT]

% A special valve for articulated wheel loader steering

% A pressure compensation valve is incorporated in the mono-block construction.

※ Light steering force generates great power.

<Operation mechanism>

(1) Manual: Mechanical linkage compatible

(2) Floor amplifier

Main spool switching by means of a stroking adjustment corresponding to supply flow

% Suitable for orbit pump systems.

<Pump method>

Both single- and tandem-pump systems are available.

 $\ensuremath{\mathbbmm}$  Please select the one appropriate for your system.

<Pressure compensator model>

As the supply flow is controlled by the main spool opening, a flow rate adequate for steering can be maintained at both high and low speed.



<KVMF70 Model>





<KVMT-200,400>

# Valve: Multiple Control Valve

A control valve works a single actuator or multiple actuators simultaneously, and may incorporate multiple functions.

KYB provides a wide variety of valves which includes hydraulic control valves, and electro-hydro valves with electric and hydraulic control systems combined.

Multiple mono-block cast products are manufactured by KYB Cadac, one of KYB's affiliated companies.

I	<b>[Model c</b> Example	ode] KV	M     G     270       2     3     4
	1	Multiple Cont	trol Valve
	2	Construction	M: Mono-block or semi-mono-block, and S: Sectional
	3	Application	E, G, and M: for excavators, mini-excavators, and X: for load sensing applications L: Main valve for wheel loaders, and F: for forklift trucks T: For wheel loader steering
	4	Rated flow ra	tte (L/min.), and spool diameter (mm) for KVSX

## KVS and KVM Series

For excavators and mini- excavators



#### Rated flow Max. working rate(L/min.) pressure(MPa) Typical applications Model Type and Feature KVSE-36 40 Sectional 24.5 KVSE-72 70 27.0 Sectional Mini-KVSX-12 40 excavators 24.5 Sectional, for load sensing KVSX-14 80 27.5 Sectional, for load sensing KVMM-80 80 30.6 Mono-block KVMM-160 160 34.3 Mono-block Excavators KVMG-270 270 34.3 Mono-block KVMG-400 400 31.4 Mono-block

\*Various functions required for excavator and mini-excavator are incorporated.

## KVS, KVMF, and KVMT Series

Multiple control valve for forklift trucks, wheel loaders, and other applications



Model	Rated flow rate(L/min.)	Max. working pressure(MPa)	Type and Feature	Typical applications
KVS-31	30	20.6	Sectional	General purpose
KVS-65	65	20.6	Sectional	General purpose
KVMF-70	70	20.6	Semi-mono-block, with flow control incorporated	Forklift trucks
KVS-120	120	20.6	Sectional	General purpose
KVS-200	200	34.3	Sectional	General purpose
KVS-600	600	29.4	Sectional	Excavators and general purpose
KVS-1000	1000	29.4	Sectional	Excavators and general purpose
KVML-200	200	20.6	Semi-mono-block	Wheel loaders and forklift trucks
KVML-270	270	20.6	Semi-mono-block	Wheel loaders
KVMT-200	200	20.6	Steering valve (single unit, flow control incorporated)	Wheel loaders (steering)
KVMT-400	400	29.4	Steering valve (single unit, flow control incorporated)	Wheel loaders (steering)

\*High pressure type KVS-120H (27.5 Mpa) is also available.

## Dimensions (typical example) (unit: mm)

### KVS Series: General purpose

[General purpose KVS-31] Mainly used for mini-excavators, forklift trucks and industrial equipment







## Dimensions (typical example) (unit: mm)

## [General purpose KVS-65PSL]

Mainly used for compact construction equipment, forklift trucks, and industrial equipment





<KVS-65PSL main features>

- Based on KVS-65, operating the spool with the internal pilot type proportional solenoid pressure reducing valve.
- The pressure compensation mechanism (optional) enables stable flow unaffected by load pressure fluctuation.

[General purpose KVS-120] Mainly used for a variety of compact construction equipment, [Optional functions] forklift trucks, and industrial equipment



[General purpose KVS-200] Mainly used for medium- and large-sized construction equipment



[General purpose KVS-600] Mainly used for various large-sized construction equipment



[Optional functions]	
Main relief valve	
Overload relief valve	
Anti-cavitation valve	
Detent	-
Four positions	-
Carryover	-

#### [General purpose KVS-1000] Mainly used for various large-sized construction equipment



Nominal sizes	D	E	F	H (Ref. sizes)	G	
2/4	10.1	47.6	22.2	17.5	$M10 \times 15$	
3/4	19.1	50.8	23.8	19.1	WITU × 1.5	
1	25.4	52.4	26.2	17.5	M10 × 1.5	
1	25.4	57.2	27.8	22.3	M12 × 1.75	
<b>1</b> 1/4	31.8	58.7	30.2	23.8	M12 × 1.75	
		66.7	31.8	20.7	$M14 \times 2$	
1 1/2	38.1	69.8	35.7	22.3	$M14 \times 2$	
		79.4	36.5	30.2	M16 × 2	
2	0	50.0	77.8	42.9	22.3	M14 × 2
	50.8	96.8	44.4	33.4	$M20 \times 2.5$	
2 1/2	63.5	88.9	50.8	25.4	M14 × 2	
		_	—	—	_	

## Split Flange Dimensions



Upper rows: Standard pressure (3000 psi) Lower rows: High pressure (6000 psi)



465

G1/2(PF1/2)

Work port

JIS O-ring boss

Built-in functions	
Straight travel	$\checkmark$
Attachment	*
nternal boom conflux	-
Spool neutral position detecting signal	$\checkmark$
Pump control signal output	-
Verload relief valve	$\checkmark$
Optional functions	
anti-drift valve	$\checkmark$
add-on for spool section	$\checkmark$
dd-on of third pump spec.	$\checkmark$
Regeneration circuit	$\overline{}$
Irm closing variable regeneration	$\checkmark$
wo-staged main relief	$\checkmark$
low priority at multiple operation	$\checkmark$
leutral cut-off valve	-

## KVSE/KVSX Series: Special models for mini- excavators

10

G3/8(PF3/8)

JIS O-ring boss Pump port

10

## Dimensions (typical example) (unit: mm)

[KVSX-12 for mini-excavator load sensing]

% To be used in combination with the LS pump. (See "Load sensing pump" at page 19.)



#### [KVSX-14 for mini-excavator load sensing]

% To be used in combination with the LS pump. (See "Load sensing variable displacement pump" at page 19.)



Neutral cut-off valve

\*

 $\checkmark$ 

# KVMM/KVMG Series: Special models for excavators [KVMM-80] For excavators in the 6-9 ton class range



Built-in functions	
Straight travel	$\checkmark$
Attachment	$\checkmark$
Internal two sections conflux	$\checkmark$
Spool neutral position detecting signal	$\checkmark$
Pump control signal output	-
Overload relief valve	$\checkmark$
Optional functions	
Anti-drift valve	$\checkmark$
Add-on for spool section	$\checkmark$
Add-on of third pump spec.	$\checkmark$
Regeneration circuit	$\checkmark$
Arm closing variable regeneration	-
Two-staged main relief	$\checkmark$
Flow priority at multiple operation	$\checkmark$
Noutral out off value	1

(KVMM-160) For excavators in the 10-16 ton class range



[Built-in functions]	
Straight travel	$\checkmark$
Attachment	$\checkmark$
Internal boom conflux	$\checkmark$
Spool neutral position detecting signal	$\checkmark$
Pump control signal output	$\checkmark$
Overload relief valve	$\checkmark$
[Optional functions]	
Anti-drift valve	$\checkmark$
Add-on for spool section	$\checkmark$
Add-on of third pump spec.	$\checkmark$
Regeneration circuit	$\checkmark$
Arm closing variable regeneration	$\checkmark$
Two-staged main relief	$\checkmark$
Flow priority at multiple operation	$\checkmark$
Neutral cut-off valve	$\checkmark$



[KVMG-400] For excavators in the 40-50 ton class range



[Built-in functions]	
Straight travel	$\checkmark$
Attachment	$\checkmark$
Internal two units conflux	$\checkmark$
Spool neutral position detecting signal	$\checkmark$
Pump control signal output	$\checkmark$
Overload relief valve	$\checkmark$
[Optional functions]	
Anti-drift valve	$\checkmark$
Add-on for spool section	-
Add-on of third pump spec.	-
Regeneration circuit	$\checkmark$
Arm closing variable regeneration	$\checkmark$
Two-staged main relief	$\checkmark$
Priority at multiple operation	$\checkmark$
Neutral cut-off valve	$\checkmark$

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# KVMF Series: Special models for forklift trucks [KVMF-70] For forklift trucks in the 1-3 ton range



[Configuration]			
Circult	Parallel		
Circuit	Tandem	-	
Operation type	Manual		
	Pilot		
Additional sections Add-on			
Overload relief valve			

#### [Features]

Flow priority valve (VPF): Standard accessory
 (Removable on request)
 Flow regulator valve (FRV): Standard accessory
 (Removable on request)
 [Option]
 Lift lock valve
 Tilt lock valve
 Unload valve



## KVML Series: For loaders (main) and forklift trucks

[KVML-200 for loader and forklift trucks] For wheel loaders (2-3.5 m<sup>3</sup>) and forklift trucks (over 7 tons)



[KVML-270 for loader (main)] For wheel loaders in the 2.5-4 m<sup>3</sup> range



[Configuration]			
Circuit	Parallel	$\checkmark$	
Circuit	Tandem	$\checkmark$	
On eventions, there a	Manual	$\checkmark$	
Operation type	Pilot	$\checkmark$	
Additional sections Add-on		$\checkmark$	
Overload relief valve	$\checkmark$		

[Features]

O The boom section is of the fourposition switching type with the drift position added to the lowering position

## KVMT Series: For loader (steering) applications

% A special valve for articulated wheel loader steering

[KVMT-200 for loader (steering)] For wheel loaders in the 2.5-5.5 m<sup>3</sup> range



#### [KVMT-400 for loader (steering)] For wheel loaders in the 6-13 m<sup>3</sup> and over range



(Configuration)				
Circuit	Parallel	_		
Circuit	Tandem	-		
Operation type	Manual	$\checkmark$		
Operation type	Pilot	$\checkmark$		
Additional sections	-			
Overload relief valve	$\checkmark$			

[Features]

- Built-in pressure compensation valve
   Both single- and double-pump types
- Both single- and double-pump types are available
- Carryover circuit provided

 [Configuration]

 Circuit
 Parallel

 Tandem

 Operation type
 Manual

 Pilot
 ✓

 Additional sections
 Add-on

 Overload relief valve
 ✓

#### [Features]

 $\bigcirc$  Built-in pressure compensation valve

O Both single- and double-pump types are available

O Carryover circuit provided

## Valve: Single-function Valve

Please consult us for other models not included in this catalog.

#### Flow Control Valve Max. working pressure (MPa) Controlled flow Max. free flow Weight (kg) Model rate (L/min.) rate (L/min.) F C-03 27~54 18~36 0.5 63~99 F C-04 42~66 20.6 0.9 F C-06 75~115 112~172 1.8 Symbo Flow control valve Pressure-compensated flow control valve (with the free-flow function). Down Safety Valve





Model	Nominal flow rate (L/min.)	Controlled flow rate (L/min.)	Max. working pressure (MPa))	Blocked flow rate (L/min.)	Weight (kg)
D S-03	18~36	0 or 6-12			0.14
D S-04	42~66	0 or 14-22	20.6	Nominal flow	0.4
D S-06	75~115	0 or 25-38		Tale X 1.5	0.6

 $\cdot$  The valve detects an abnormal (excessive) flow rate caused by hydraulic piping damage or other trouble and blocks or reduces the flow.

Symbol





Model	Rated flow rate (L/min.)	Max. working pressure (MPa)	Weight (kg)		
HRV	110		8.3		
HRV	200	34.3	8.9		
HRV	280		8.9		

The valve was developed for hydraulic excavators and is mounted on a hydraulic cylinder.

\* The hose rupture valves are designed for each application considering the equipment and cylinder specifications, and thus the details have been omitted here. (Please contact KYB sales department.)

#### **Flow Control Valve**

#### Features

This is the in-line directional flow control valve with pressure compensation function. The flow is maintained at a fixed rate without being affected by the load fluctuation, and the reverse direction is made to free flow. This valve is suitable for controlling maximum speed and regulating the lowering of speed.

## Performance curve

Hydraulic oil: ISO VG32 / Oil temperature: 40°C



•Free flow pressure decrease characteristic The figures represent sizes and controlled flow rates.



 [Model code]
 FC
 03
 24

 Example
 1
 2
 3
 4

1	Nipple side joint shape No symbol: Parallel pipe male threads-female seat joint FO: Parallel pipe male threads-male seat joint
2	Flow control valve
3	Nominal size
4	Control flow rate

## Dimensions (unit: mm)



Model	L1	L2	А	В	С	φD	E.F.J	G	Н
FC-03	87	100	15	70	12	37	G3/8(PF3/8)	32	18
FC-04	120	120	20	84	16	48	G1/2(PF1/2)	41	20
FC-06	153	153	20	113	18	60	G3/4(PF3/4)	55	22

Note:

E: JIS B8363 parallel pipe male threads-female seat joint

F: JIS B8363 parallel pipe male threads-female sheet joint as well as JIS B2351 O-ring seal type

J: JIS B8363 parallel pipe male threads-male seat joint

### **Down Safety Valve**

## Features

The valve detects hydraulic piping damage or an abnormal (excessive) flow rate and blocks or reduces the flow. The down safety valve is available with "flow blocking" and "flow reduction" types. Mounting one at the actuator port improves work and equipment safety. (The valve functions comply with the Japan Industrial Vehicle Association Standard's safety criteria.)



### Performance curve

Hydraulic oil: ISO VG32 / Oil temperature: 40°C

Pressure drop characteristic







Free flow Free flow F A B C D L1

Dimensions (unit: mm)





With bushing: parallel pipe male threads-male seat joint



Model	L1	А	В	С	D	E	F/G/R	Н	L2	J	Κ	М	Lз	Q	φN
DS-03	49	12	8	12	17	14.5	G3/8(PF3/8)	22	69	41	16	PT3/8	75	18	25
DS-04	67	16	10	16	25	18.2	G1/2(PF1/2)	27	89	55	18	PT1/2	93	20	31
DS-06	_	20	Ι	-	-	—	G3/4(PF3/4)	36	98	58	20	PT3/4	100	22	40

Note:

F: JIS B8363 parallel pipe male threads-female seat joint

G: JIS B2351 parallel threads O-ring seal joint

R: JIS B8363 parallel pipe male threads-male seat joint

M: JIS B0203 pipe tapered threads

## Caution upon handling

- Select a model with sufficient blocked flow against an excessive flow expected during switchover.
- Do not use in applications in which open-close cycles are constantly repeated.
- The following pressures should be retained after blocking:

DS-03: More than 1.8 MPa

DS-04: More than 2.2 MPa

DS-06: More than 1.5 MPa