DAIKIN

DAIKIN OIL HYDRAULIC EQUIPMENT

Safety precautions

- Before using products, please read “Safety precautions for the oil hydraulic equipment and systems” carefully and use those properly.
- Above caution items are divided into three categories shown below. All the cautions listed below are important to ensure safety, and must be followed entirely.

⚠ **DANGER**	: Items that may cause imminent and dangerous situationleading to a death or a serious injury when not followed as instructed.
⚠ **WARNING**	: Items that may lead to serious accident such as a death and an injury when not followed as instructed.
⚠ **CAUTION**	: Items that may lead to an injury and/or property damage when not followed as instructed.

Be sure to follow these cautions any time, because these are the important cautions to use the products safely and to avoid a serious accident or a fatal accident.

* These “Danger” “Warning” and “Caution” don't cover all things. When you meet to handle the products, read the manual securely and understand it completely, then start to handle the products or systems.

* Be sure to comply with the law or regulation shown below, for the sake of safety use of the products.
- High pressure gas control law
- The OSHA
- The fire service Act

■ Caution for working oil

- Improper working oil may cause a malfunction or a trouble.

[⚠ Caution] Use the designated oil only.
[⚠ Caution] Prohibit mixing a different kind working oil or mixing the working oil with lubricant.
[⚠ Caution] Use the working oil in a proper range of viscosity indicated in the specifications.
[⚠ Caution] Maintain the contamination level of the working oil cleanliness within a range in specification. A machine may get trouble and be damaged if the machine will be used continuously in a condition that the working oil is contaminated.
[⚠ Caution] Working oil deteriorates as being used. Working oil should be replaced in a certain interval.
[⚠ Caution] Supply oil into the unit from an oil supply port not so as to mix up with foreign substance or moisture.
[⚠ Caution] The extreme descend of oil level may cause a trouble or malfunction. Maintain the oil level within a range between the max. and the min..
[⚠ Caution] Clean the oil attached on your skin away by a soap or so. If oil sticks on a skin, according to a circumstance, a rough skin may happen. So, be care full not to spread oil out onto somebody.
[⚠ Caution] There will be a fear of getting burnt in case of high oil temperature. Exchange of oil after the oil temperature will descend.
[⚠ Danger] As many working oil has hazard of catching fire, prohibit welding and using fire around systems and machines. It may cause a trouble of fire.

Caution in use of oil hydraulic machines and systems

■ Cautions in use of a pump/motor

● Before using a pump/motor, please read the operation manual carefully and use the product properly.

Use a product the model is properly chosen

[⚠ Caution] Oil hydraulic equipment has many similar products of which appearance is the same or resembles. Make sure if the pump/motor are the goods which are properly chosen by checking up the name plate or the carved seal when you need to install the pump/motor.

[⚠ Danger] Don't use a product in the atmosphere explosive or dangerous to fire except the product to be sited for the atmosphere.

Handling products

[⚠ Caution] When you handle a pump/motor, you will be sometimes injured. Wear protectors depending on the situation.

[⚠ Caution] As there are many cases that pump and motor are heavy products, it may cause to catch one's finger in the products or hurt one's waist according to working posture. So, take care for the working procedure sufficiently.

[⚠ Caution] Don't put a external force on the products such as riding on a product, hammering it or dropping it. These may cause malfunction, destruction and oil leak.

[⚠ Caution] Wipe out entirely the oil stuck on the products or floor. It may cause someone to drop products or lead to slip and be wounded.

Setting, removal, wiring and piping of pump/motor

[⚠ Caution] Keep clean for a base or set hole of pump/motor. Insufficient tightening of bolts and seal break may cause destruction and oil leak.

[⚠ Caution] When pump/motor are installed, use regular bolts and tighten these with regulated torque. If a irregular method is applied, it may cause malfunction, destruction and/or oil leak.

[⚠ Caution] Specialists should do the works of mounting, dismantling, and piping of pump and motor.

[⚠ Caution] The works of pump/motor's mounting, dismantling, piping and wiring should be carried out after the power supply is cut off and confirm that motor or engine etc. stops securely. Besides, relies the pressure and confirm pressure is not left in the oil circuit.

Wiring and combining rotational part

[⚠ Warning] Wiring should be done by just qualified persons.

[⚠ Warning] Wiring should be done after power is cut off, otherwise it is likely that electric shock will happen.

[⚠ Warning] The combined part of pump/motor should have a secure fixing method not so as to be out of place or scatter. Be sure to provide a protection cover in order to prevent winding up of hands or clothes into the pump/motor.

Installation of pump/motor

[⚠ Caution] Have enough rigidity for a base on which pump/motor are mounted.

[⚠ Caution] Don't give the shafts of pump/motor a shock by a hammer. It may cause a destruction of product.

[⚠ Caution] Confirm if the whirling amplitude and surface amplitude are within the permissible range.

[⚠ Caution] Install a pump after confirming the revolution direction of a pump and a motor or an engine to match to each other through an arrow mark on a name plate or a carved seal.

[⚠ Caution] When a pump/motor requires drain piping, make the drain piping so that the internal pressure doesn't exceed the level regulated. Besides, even if pump/motor stops for a long time, make the drain piping so that working oil in the casing doesn't drop.

Max. pressure regulation

[⚠ Warning] When a pump except ones with pressure compensation function (with max. pressure adjustment) is used, be sure to install a relief valve, regulating the max. pressure on the oil hydraulic circuit, near by the discharge side of the pump.

In case to operate a pump/motor

[⚠ Warning] Before starting operation of a system which mounts a pomp/motor, confirm if the oil circuit and wiring are properly done and do not have any part loosen. Check up especially on the combination or connection between a electrical control circuit and a solenoid valve. Turn on electricity to each solenoid operated valve and verify that each solenoid works as indicated.

[⚠ Warning] System starting must be conducted under the conditions the pressure setting of a pressure control device including a relief valve descends, and confirm the pressure surely descends through a pressure gauge. After confirming that this operation condition is properly proceeding, start a normal operation and check up the operation pressure keeps a normal one.

[⚠ Warning] Don't operate a pump/motor as the cover of rotation part is removed.

[⚠ Warning] Prohibit touching a rotation part as paying attention to clothes or ornaments not so as to be wound up into the rotation part.

[⚠ Warning] Check up by means of an ammeter if excess load is not onto the unit. Operate the unit after solving a problem of a malfunction as a improper installation or seizure can be considered for the cause in case of excess load.

[⚠ Caution] In several cases, such as starting a pump/motor with a oiling port on the casing for the first time, checking and amending an oil circuit, or stopping for a long time, supply clean working oil to fill the casing.

[⚠ Caution] Repeat an inching operation till a pump surely absorbs oil. Nevertheless it doesn't absorb oil, then do the work of air purging from the piping (through an air bleed valve or so). As soon as foam or working oil is purged out from the air purging plug, or pump operating sound changes, close the air purging plug and keep operation about five minutes without load as it is.

[⚠ Caution] Make a motor start in low load condition and make sure the revolution is chosen to the correct direction.

[⚠ Caution] Operate a pump within the suction pressure range indicated.

[⚠ Caution] Make sure the drain line's pressure of a pump/motor is within the permissible range.

[⚠ Caution] In case that the operation sound of a pump is louder than normal one, cavitation possibly happens. Accordingly check up the tank oil level, clogging of a suction strainer or a filter or loosen suction piping. Make sure especially that surge pressure arising at ON/OFF or at the procedure of speed transfer is within the permissible range. (If the operation sound is different from the normal one, malfunction or failure may take place. It is important for you to find abnormality urgently as you remember the normal operation sound.

[⚠ Caution] Operate a pump/motor properly in accordance with the specifications including pressure, flow rate, revolution speed, kind of oil, oil temperature, and viscosity, which are listed on the operation manual, catalogue, drawing and specification table.

[⚠ Caution] Don't touch a casing of a pump/motor directly by hand, because the casing sometimes leads to high temperature.

[⚠ Caution] Stop operation and take necessary measures as soon as abnormal phenomena on a pump/motor, such as abnormal noise, abnormal heat emission, abnormal vibration, oil leak, arising smoke or abnormal smell, happens. It is recommended to attach a sensor detecting such abnormalities. Otherwise, it will lead to damage, fire and injury.

Management of working oil (working fluid)

[⚠ Caution] Operate in a circuit structure so that the contamination level of the working oil can be always kept within the manufacture's recommended value and check up periodically a filter and a contaminated level. Moreover, periodically inspect the characteristics of oxidation, deterioration and moisture contents of the working oil, and replace the working oil when those characteristics exceed the value the manufacture recommends.

[⚠ Caution] When working oil used is changed, do it after sufficient flushing, while avoiding mixture with different kinds of oil.

Treatment of maintenance

[⚠ Warning] Prohibit remodeling, disassembling and reassembling. Otherwise, It can not exhibit the performance expected and leads to a cause of a failure or an accident.

Treatment of maintenance/custody

[⚠ Caution] Contact the manufacturer in case that it is unavoidable to do remodeling, disassembling and reassembling.

[⚠ Caution] Maintain a dust-proofing and a rust-proofing characteristics while paying attention to the environment conditions such as ambient temperature and humidity, when a pump/motor is transferred and preserved.

[⚠ Caution] The replacement of the kinds of seal sometimes is required in case that a pump/motor is used after a long time custody.

■ Caution in use of oil hydraulic valve

- Before using a pump/motor, please read the operation manual carefully and use the product properly.

Overall valves

[⚠ Warning] Use it within the max. working pressure regulated.
[⚠ Caution] Use it in the range regulated of flow rate, temperature, working oil and viscosity.
[⚠ Warning] Tighten set bolts of a valve or piping screws with the torque regulated.
[⚠ Warning] Connect properly a connection port of valve with indicated piping or so.
[⚠ Caution] Maintain working oil in the contamination level recommended.
[⚠ Caution] Don't operate a valve manually and quickly.

Solenoid valve

[⚠ Warning] Prohibit using a valve out of the permissible supply voltage.
[⚠ Caution] Don't use a valve at more than the max. switching frequency.
[⚠ Danger] Prohibit using a valve in the atmosphere explosive or easy to fire except the products coping with the atmosphere.
[⚠ Caution] Use the product to match the environment, if the product is used under the environment necessary for water proof.
[⚠ Warning] Prohibit wiring under conditions that electricity keeps turning on or valve and hydraulic circuit are pressurized.
[⚠ Caution] Don't touch a surface of solenoid directly by hand, because the solenoid sometimes leads to high temperature.
[⚠ Caution] Use wires of the kinds and diameter which suit the product.
[⚠ Caution] Have a proper ground wiring to the terminal where the grounding is indicated.
[⚠ Caution] Don't supply power to twin-solenoid at the same time.
[⚠ Caution] In case of AC solenoid valve (except a valve with a rectifier), seizure (or snapping of a wire) of solenoid coil may happen when malfunction such that a foreign subject is blocked in a spool or so takes place. Solenoid coil itself is molded with fire-proofing plastics and there will not be dangerous to fire normally, but if the mold has been deteriorated in long time use, risk of catching fire can be expected. The use of DC type solenoid operated valve is recommended, wishing safer condition, under the circumstance that there are many combustible things around the site easy to catch fire.

Installation and removal

[⚠ Caution] Don't remove a cap (protective plug) on a valve port just before using (installation or piping) it. Pay attention so that dust or so will not enter the inside of the valve during piping work or installation work.
[⚠ Caution] Put covers on the valve port, valve setting face and pipes removed not so as to invade foreign subjects into the valve when the valve is removed. Don't remove these covers before the reassemble.
[⚠ Caution] Make sure the kind and cleanliness of the oil before supplying working oil.
[⚠ Caution] Concerning a valve with manual handling mechanism, make sure if it can be properly switched by hand or confirm the manual settings, before starting long term operation or restarting after no use for a long time.
[⚠ Caution] Tighten rock nuts of the valve that the setting has been completed. If a cap or a cover is attached, set it on the port.
[⚠ Caution] Don't use a valve for a foot step. Otherwise, it may cause a damage to a valve.
[⚠ Caution] External force should not be loaded onto a valve like striking or dropping valve.
[⚠ Caution] Treat wires and connectors gently not so as to load unnatural force.
[⚠ Caution] Pay attention to pressure remained in a oil circuit when the removal of pipes and valves is needed. Remove those after making sure that the pressure is entirely purged. If the pressure remains, it may lead to injury by splashing oil. If you touch high pressure oil and the oil invades into your skin, see a doctor immediately.
[⚠ Caution] Do an overhaul of a valve in accordance with the handling manual of the manufacturer. Some valves are prohibited overhauling. In that case, never overhaul the valve.
[⚠ Caution] Use new parts for a gasket or a O ring when installing or reassembling a valve.
[⚠ Caution] Do the work of checking, adjusting and overhauling after oil, dust or moisture stuck around a valve or a connector has been cleaned away not so as to invade foreign subjects into a valve or a connector.
[⚠ Caution] Be sure to supply oil up to the regulated level and do the several works such as air purging in the oil circuit, checking up oil leak and seasoning operation, when the unit starts to operate for the first time after the installation, or after checking, adjusting, amending, or after no use for a long time.

■ Caution in use of oil-con

- Before using a oil-con, please read the operation manual carefully and use the product properly.

General cautions

[⚠ Warning] Be sure to follow the several cautions stated in this chapter and comply with the laws and regulation mentioned below.
1. The OSHA 2. The Fire Service Act 3. JIS B 8361 hydraulic system general regulation

[⚠ Caution] When you handle a product, you will be sometimes injured. Wear protectors depending on the situation.

[⚠ Caution] The site work may cause to catch one's finger in the products or hurt one's waist according to the working posture or the product's weight. So, take care for the working procedure sufficiently.

[⚠ Caution] Wipe out entirely the oil stuck on the products or floor. It may cause someone to lead to slip and be wounded.

[⚠ Caution] Specialists should do the works of transportation, installation, piping and wiring.

At the transportation

[⚠ Caution] Don't incline products more than 30° at the transportation. If a product is inclined more than 30°, it may cause a compressor trouble.

[⚠ Caution] Hang up a product by using surely eye-plate attached or all eye-bolt attached. If a product is hung up by other methods like only by a single eye-plate or so, it may cause a product to drop down.

[⚠ Caution] Don't put a external force on the products such as riding on a product, hammering it or dropping it. These may cause malfunction, destruction and oil leak.

At the installation

[⚠ Caution] Install a product on a place with a little vibration, horizontal, and rigidity, and then fix a product securely by bolts.

[⚠ Warning] Prohibit splashing water or variety of liquid onto a product directly. Otherwise, it may lead to electric shock or failure.

[⚠ Danger] Prohibit using a product in such dangerous circumstance as explosive or easy to catch fire.

[⚠ Caution] Install a product on such place with a few dust, trash, fine particles, moisture and oil mist.

At the piping or wiring work

[⚠ Caution] Be sure to provide piping to a oil drain pan.

[⚠ Warning] Be sure to begin working after electricity turns off.

[⚠ Caution] Be sure to provide breakers, well matching the capacity, on the power source. (refer to the whole model's specification tables).

At the test operation

[⚠ Caution] Make sure that the oil piping and electric wiring are properly done and there is no loosening on the part tighten, and then start operating.

At the operation

[⚠ Danger] Never remove a cover (external casing) during operation. Otherwise, it may get an electric shock and injure by a revolution part like a fan system or so.

[⚠ Warning] As soon as abnormal situation happens, manage it with necessary remedy.

[⚠ Caution] Don't use products by means of other specifications than the ones listed on catalogue, drawing, or specification table.

[⚠ Caution] As exhausting air temperature rises during operation, keep out the exhausting grille or duct. Besides, don't put something in front of the exhausting grille.

At the maintenance and inspection

[⚠ Caution] Don't disassemble and/or assemble a product without any notice. The product cannot exhibit the expected performance, resulting in the cause of trouble or accident. Contact the manufacturer in case that it is unavoidable to do overhauling and reassembling.

[⚠ Danger] Never work in a hermetically sealed space. Otherwise, it may lead to suffocation caused by a leak of refrigerant.

[⚠ Warning] Be sure to turn off a power supply and make sure that each motor stops operation, and then start the works of disassembling or assembling.

[⚠ Danger] When fire is required to use, take the surrounding atmosphere, the kinds of cooking liquid sufficiently into consideration and then deal with a necessary remedy. After all, start working.

[⚠ Caution] Never do remodeling of products by messieurs customers.

■ Caution in use of oil hydraulic equipment

- Before using oil hydraulic equipment, please read the operation manual carefully and use the product properly.
- Please use oil hydraulic equipment within each specification range of structured parts.

Safety device and control circuit

[⚠ Caution] The person in charge should hold keys of switches like safety devices.
[⚠ Warning] Don't remodel a safety device or a machine without permission. The remodeling may lead to cause an accident unexpected, malfunction or a failure.
[⚠ Warning] Prohibit removing the safety devices or the cover, or changing the set position.
[⚠ Warning] Don't remodel an oil hydraulic system or control circuit without permission.
[⚠ Warning] Prohibit changing the set values of pressure or flow rate adjusting equipment.

Operation of oil hydraulic equipment

[⚠ Warning] Make sure that there are no other workers or obstacles before starting operation.
[⚠ Warning] Make sure if each control switch is OFF when electric power turns on.
[⚠ Warning] Make sure if each stop valve acts open/close properly before starting operation. Especially pay attention to a suction line and return line.
[⚠ Warning] Prohibit operating as a cover on a rotation part is removed or kept open.
[⚠ Warning] Operator educated should handle and maintain the system and machine.
[⚠ Warning] Prohibit accessing to systems or machines except persons in charge.
[⚠ Warning] As soon as oil leak is found on systems or machines, amend it quickly. Moreover, when any abnormality is found, eliminate the cause after the systems and machines are stopped.
[⚠ Warning] When cleaning or inspection for maintenance is needed, do it after turning off the power supply. Moreover, be sure to turn off the main power supply before opening a door or a cover of a control panel.

Accumulator

[⚠ Warning] Prohibit charging gas to a system except nitrogen gas in case an accumulator is used.
[⚠ Warning] Begin to work of removing devices for a oil hydraulic system in which an accumulator is built after purging a pressurized oil and closing a main valve. Follow the same manner in case of removing an accumulator.
[⚠ Warning] Prohibit remodeling an accumulator with manners of machine processing, welding or others.

Disassembling and inspection

[⚠ Warning] Begin to work of disassembling and inspection of hydraulic systems after purging pressure in the circuit to make the actuator to be no load condition so that pressure will not arise.
[⚠ Caution] Move all actuators several times slowly in order to purge air inside oil circuit out. Do an air purge through an air vent valve in as low pressure as possible. As oil splashes out in high pressure together with air, it is required to take into consideration to put a cloth on the valve in advance.
[⚠ Caution] There are portions to become hot on a system or a machine (such as on a pump, a relief valve, a motor, a solenoid). Wear work groves when treating a hot portion. Besides, don't use a piping as a foot step or a ladder.

Pump and motor

[⚠ Caution] Fill a pump/motor with oil through a oil charge port of a pump and then be sure to put a plug on it after filling out.
[⚠ Caution] Make sure the revolution direction of a pump at the starting.

Hose

[⚠ Caution] Don't bend a hose with less than the recommended min. bending radius.
[⚠ Caution] Don't set a hose extremely twisted or bent.
[⚠ Caution] The broken hose used is very dangerous and may lead to big accident. Read the hose handling manual first, and then begin to use.

Filter

[⚠ Caution] Pay attention to a clogging of a filter at all times and replace or clean up the filter if it becomes dirty.

CONTENTS

Piston pumps

Whole models

	Model No.	Piping direction	Control method									
			A	A-RC	CH	CH-RC	CJ	CJ-RC	D	D-RC	SA	SAJS
V series	V8	Side port	R	—	—	—	—	—	—	—	—	—
	V15	Side port	R (L)	R (L)	R	R	R	R	R	R	R (L)	—
		Axial port	R (L)	R (L)	—	—	—	—	—	—	R (L)	—
	V23	Side port	R (L)	R (L)	R	R	R	R	R	R	R (L)	R
		Axial port	R (L)	R (L)	—	—	—	—	—	—	R (L)	—
	V38	Side port	R (L)	R (L)	R	R	R	R	R	R	R (L)	R (L)
		Axial port	R (L)	R (L)	—	—	—	—	—	—	R (L)	—
	V50	Side port	R (L)	R (L)	—	—	—	—	—	—	R (L)	R (L)
	V70	Side port	R (L)	R (L)	R	—	—	—	—	—	R (L)	R
VZ series	VZ50	Side port	R	R	R	—	R	—	—	—	—	—
	VZ63	Side port	R	R	R	—	R	—	—	—	—	—
	VZ80	Side port	R	R	R	—	R	—	—	—	—	—
	VZ100	Side port	R	R	R	—	R	—	—	—	—	—
	VZ130	Side port	R	R	—	—	—	—	—	—	—	—

Note) In the table above, “R” and “L” stand for the direction of the rotation “Clockwise” and “Counterclockwise” with the view point from the shaft end, respectively.

Models applied for incombustible working oil

Model No.	Working oil	Control method									
		A	A-RC	CH	CH-RC	CJ	CJ-RC	D	D-RC	SA	SAJS
V8	Working oil with water/glycol (W)	—	—	—	—	—	—	—	—	—	—
	Working oil with phosphoric acid ester (F)	—	—	—	—	—	—	—	—	—	—
V15	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○	—
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○	—
V23	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○	—
V38	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○	—
V50	Working oil with water/glycol (W)	○	○	—	—	—	—	—	—	○	○
	Working oil with phosphoric acid ester (F)	○	○	—	—	—	—	—	—	○	—
V70	Working oil with water/glycol (W)	○	○	○	—	—	—	—	—	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	—	—	—	—	—	○	—

Note) There is no models applied for incombustible working oil in the VZ series.
Contact us for the applied conditions.

V series piston pump

Features

- **Low noise**
  - ○ Realized low noise operation in overall pressure area on each series.
- **High efficiency**
  - ○ Oil temperature rise can be reduced due to the less power-loss. Accordingly, it is possible to design the tank in small size.
- **High reliability**
  - ○ High response, high stability, and long life make it possible to increase the reliability of the main machine.

Nomenclature

- **Pressure compensator control**

*	-	V	**	A	*	*	*	-	**	**
1		2	3	4	5	12	15		16	17

- **Combination control (Self pressure method)**

*	-	V	**	C	*	*	R	H	X	-	**	**
1		2	3	4	7	8	12	13	15		16	17

- **Combination control(Solenoid operated method)**

*	-	V	**	C	*	*	R	J	*	X	-	**	**
1		2	3	4	7	8	12	13	14	15		16	17

- **Dual pressure control**

*	-	V	**	D	*	*	R	*	X	-	**	**
1		2	3	4	9	10	12	14	15		16	17

- **Power-match control**

*	-	V	**	SA	*	*	*	*	-	**
1		2	3	4	6	11	12	15		16

(1) Nomenclature of applied fluid (refer to page 1 for the applied models)
No mark : Working oil with petroleum contents
W : Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
V : V series piston pump

(3) Displacement volume
8 : 8.0cm³/rev
15 : 14.8cm³/rev
23 : 23.0cm³/rev
38 : 37.7cm³/rev
50 : 51.6cm³/rev
70 : 69.8cm³/rev

(4) Control method I (refer to page 1 for the applied models)
A : Pressure compensator control
C : Combination control
D : Dual pressure control
SA : Power match control

(5)(6) Pressure adjusting range (refer to the pressure adjusting range table)

(7)(9) Low pressure adjusting range (refer to the pressure adjusting range table)

(8)(10) High pressure adjusting range (refer to the pressure adjusting table)

(11) FC valve pressure differential
A : 0.7MPa {7kgf/cm²}
B : 1.4MPa {14kgf/cm²}
C : 2.1MPa {21kgf/cm²}

(12) Direction of the rotation from the view of the shaft end (refer to page 1 for the applied models)
R : Clockwise (rightward)
L : Counterclockwise (leftward)
* Impossible to exchange “clockwise” to “counterclockwise”.

(13) Control method II
H : Self pressure method
J : Solenoid operated method

(14) Voltage for the solenoid operated valve
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
N : DC12V
P : DC24V

(15) Piping direction (refer to page 1 for the applied models)
No mark : Axial port
X : Side port

(16) Design number (the design number is subject to change)
20 : Pump model No. V8, V50
95 : Pump model No. V15, V38
30 : Pump model No. V23
<In case that the control method is A, CH, or SA>
35 : Pump model No. V23
<In case that the control method I is CJ or D>
60 : Pump model No. V70

(17) Control method III
No mark : Without remote control system
RC : With remote control system

Pressure adjusting range table

● Pressure compensator control

(5) Pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	Without remote controller system						With remote controller system				
		V8	V15	V23	V38	V50	V70	V15	V23	V38	V50	V70
1	0.8~7 {8~70}	○	○	○	○	—	—	—	—	—	—	—
1	1.5~7 {15~70}	—	—	—	—	○	○	—	—	—	—	—
2	1.5~14 {15~140}	—	○	○	○	○	○	—	—	—	—	—
3	1.5~21 {15~210}	—	—	—	—	—	—	○	○	○	—	—
3	2~21 {20~210}	—	—	—	—	—	—	—	—	—	○	○
3	3.5~21 {35~210}	—	○	○	○	○	○	—	—	—	—	—
4	1.5~25 {15~250}	—	—	—	—	—	—	—	○	○	—	—
4	3.5~25 {35~250}	—	—	○	○	—	—	—	—	—	—	—

● Combination control

(7) Low pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	Self pressure method				Solenoid operated valve method		
		V15	V23	V38	V70	V15	V23	V38
1	1.5~7 {15~70}	—	—	—	○	○	○	○
1	2.5~7 {25~70)	○	○	○	—	—	—	—
2	1.5~14 {15~140}	—	—	—	○	○	○	○
2	2.5~14 {25~140}	○	○	○	—	—	—	—

(8) High pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	Self pressure method				Solenoid operated valve method		
		V15	V23	V38	V70	V15	V23	V38
1	1.5~7 {15~70}	—	—	—	○	○	○	○
1	2.5~7 {25~70}	○	○	○	—	—	—	—
2	1.5~14 {15~140}	—	—	—	○	○	○	○
2	2.5~14 {25~140}	○	○	○	—	—	—	—
3	3.5~21 {35~210}	○	○	○	○	○	○	○
4	3.5~25 {35~250}	—	○	○	—	—	○	○

● Dual pressure control

(9) Low pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	V15	V23	V38
1	1.5~7 {15~70}	○	○	○
2	1.5~14 {15~140}	○	○	○

Note) If both low and high pressure adjusting range are the pattern 1, the addjusting pressure range becomes 0.8~7MPa {8~70kgf/cm²}.

(10) High pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	V15	V23	V38
1	1.5~7 {15~70}	○	○	○
2	1.5~14 {15~140}	○	○	○
3	3.5~21 {35~210}	○	○	○
4	3.5~25 {35~250}	—	○	○

● Power match control

(6) Pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	V15	V23	V38	V50	V70
1	0.8~7 {8~70}	○	○	○	—	—
1	1.5~7 {15~70}	—	—	—	○	○
2	1.5~14 {15~140}	○	○	○	○	○
3	3.5~21 {35~210}	○	○	○	○	○
4	3.5~25 {35~250}	—	○	○	—	—

Nomenclature

*	-	V	**	SAJS	-	*	*	X	-	**
1		2	3	4		5	6	7		8

(1) Fluid mark applied
No mark : Working oil with petroleum contents
W : Working oil with water/glycol

(2) Model No.
V : V series piston pump

(3) Displacement volume
23 : 23.0cm³/rev
38 : 37.7cm³/rev
50 : 51.6cm³/rev
70 : 69.8cm³/rev

(4) Control method
SAJS : Power match control

(5) Pressure adjusting range
A :*~14 MPa {140kgf/cm²}
B :*~17.5 MPa {175kgf/cm²}
C :*~21 MPa {210kgf/cm²}
* The lowest adjusting pressure is different from model by model.

(6) Direction of the rotation from the view of the shaft end (refer to page 1 for the applied models)
R : Clockwise (rightward)
L : Counterclockwise (leftward)

(7) Piping direction
X : Side port

(8) Design number (the design number is subject to change)
30 : Model No. V23
95 : Model No. V38
20 : Model No. V50
60 : Model No. V70

*	-	V	15	A	1	R	Y	-	95
1		2	3	4	5	6	7		8

(1) Nomenclature of applied fluid (refer to page 1 for the models applied)
No mark : Working oil with petroleum contents
W : Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
V : V series piston pump

(3) Displacement volume
15 : 14.8cm³/rev

(4) Control method
A : Pressure compensation control

(5) Pressure adjusting range
1 : 0.8~7MPa {8~70kgf/cm²}

(6) Direction of the rotation (from the view of the shaft end)
R : Clockwise (rightward)

(7) Piping connection
Y : Suction connection : Flange
Discharge connection : Taper screw for tube use

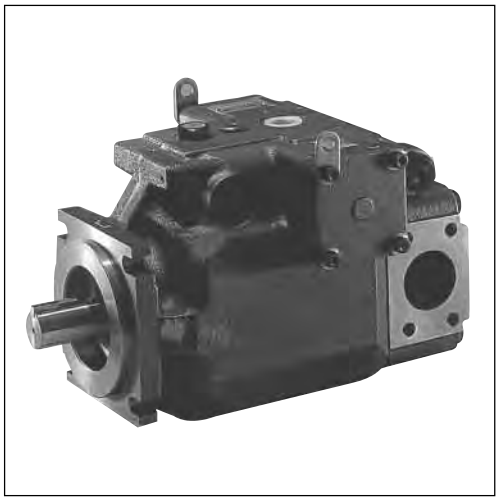
(8) Design number (the design number is subject to change)

Specifications

Model No.	Theoretical displacement cm³/rev	Operating pressure MPa {kgf/cm²}		Permissible rotation speed min⁻¹	Displacement adjusting range 1800min⁻¹ L/min	Weight (with control method A) kg	
		Max.	Rating			Axial port	Side port
V8	8.0	7 {70}	7 {70}	500~1800	4~14.4	—	8.9
V15	14.8	21 {210}	14 {140}	500~1800	5.6~26.6	12.8	14.5
V15 (Y type)	14.8	7 {70}	7 {70}	500~1800	5.6~26.6	13.5	
V23	23.0	25 {250}	17.5 {175}	500~1800	11~41.4	18.4	21.5
V38	37.7	25 {250}	17.5 {175}	500~1800	28~68	24.4	26
V50	51.6	21 {210}	14 {140}	500~1800	0~93	—	50
V70	69.8	21 {210}	14 {140}	500~1800	20~126	—	55

Note) JR-G(T)02 and JRP-G02 are recommended for the relief valve of the remote control system.
When the vent port is blocked, the pressure compensation structure doesn't work, and it comes to be a fixed pump state.
●Since foot is not attached to the pump, you might order it separately in at your use.

VZ series piston pump



Features

- **High density of displacement**
  The adoption of a cradle swash plate makes it possible to cope with both compactness and high pressure. Accordingly, the output per an unit weight has been increased.
- **Low operation noise**
  The increased stiffness of the swash structure and the housing shape, which has been developed by the latest measurement and analysis technologies, make the operation noise reduce extremely.
- **High efficiency**
  The spherical valve plate and the suitable oil pressure balance enable it to keep a steady state under the broad range of the operative conditions, resulting in high efficiency.
- **Long life**
  The adoption of the spherical valve plate with a superior abrasion resistance makes it possible to strengthen anti-contaminant characteristics.

Nomenclature

- **Pressure compensator control**

VZ	***	A	*	R	X	-	10	**
1	2	3	4	7	10		11	12

- **Combination control**

VZ	***	C	*	*	R	*	*	X	—	10
1	2	3	5	6	7	8	9	10		11

(1) Model No.
VZ : VZ series piston pump

(2) Displacement volume
50 : 50.2cm³/rev
63 : 63.0cm³/rev
80 : 79.6cm³/rev
100 : 104.6cm³/rev
130 : 135.9cm³/rev

(3) Control method I (refer to page 1 for the models applied)
A : Pressure compensator control
C : Combination control

(4) Pressure adjusting range
1 : 1.5~7MPa {15~70kgf/cm²}
2 : 1.5~14MPa {15~140kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}
4 : 3.5~28MPa {35~280kgf/cm²} ★1

(5) Low pressure adjusting range
1 : 1.5~7MPa {15~70kgf/cm²}
2 : 1.5~14MPa {15~140kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}
4 : 3.5~28MPa {35~280kgf/cm²} ★1

(6) High pressure adjusting range
1 : 1.5~7MPa {15~70kgf/cm²}
2 : 1.5~14MPa {15~140kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}
4 : 3.5~28MPa {35~280kgf/cm²} ★1

(7) Direction of the rotation (from the view of the shaft end)
R : Clockwise (rightward)

(8) Control method II
H : Self pressure method
J : Solenoid operated valve method

(9) Voltage mark for the solenoid operated valve
< Only be applied for the case that the control method II is J >
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
P : DC24V

(10) Piping direction X : Side port

(11) Design number (design number is subject to change)

(12) Control method III
No mark : Without remote control system
RC : With remote control system ★2
<Only be applied for the case that the control method I is A>

Note) ★1 The 4th pattern of the pressure adjusting range (3.5~28MPa {35~280kg/cm²}) is only applied for VZ50, 63, 80, 100.
★2 The pressure adjusting range with remote control system is the 4th pattern only (but 3rd pattern for VZ130).

Specifications

Model No.	Theoretical displacement cm³/rev	Operating pressure MPa {kgf/cm²} Max.	Operating pressure MPa {kgf/cm²} Rated	Permissible rotation speed min⁻¹	Displacement adjusting range 1800min⁻¹ L/min	Weight (control method : A) kg
VZ50	50.2	28 {280}	25 {250}	500~1800	0~90	40
VZ63	63.0	28 {280}	25 {250}	500~1800	0~113	47
VZ80	79.6	28 {280}	25 {250}	500~1800	0~143	55
VZ100	104.6	28 {280}	25 {250}	500~1800	0~188	75
VZ130	135.9	21 {210}	17.5 {175}	500~1800	0~244	105

Motor pumps

Whole models

Model No.	Piping direction	Control method								
		A	A-RC	CH	CH-RC	CJ	CJ-RC	D	D-RC	SA
M8	Side port	○	—	—	—	—	—	—	—	—
M15	Side port	○	○	○	○	○	○	○	○	○
	Axial port	○	○	—	—	—	—	—	—	○
M23	Side port	○	○	○	○	○	○	○	○	○
	Axial port	○	○	—	—	—	—	—	—	○
M38	Side port	○	○	○	○	○	○	○	○	○
	Axial port	○	○	—	—	—	—	—	—	○

Models applied for incombustible working oil

Model No.	Working oil	Control method								
		A	A-RC	CH	CH-RC	CJ	CJ-RC	D	D-RC	SA
M8	Working oil with water/glycol (W)	—	—	—	—	—	—	—	—	—
	Working oil with phosphoric acid ester (F)	—	—	—	—	—	—	—	—	—
M15	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○
M23	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○
M38	Working oil with water/glycol (W)	○	○	○	○	○	○	○	○	○
	Working oil with phosphoric acid ester (F)	○	○	○	○	○	○	○	○	○

Note) Contact us for the applied conditions.

M series motor pump

Nomenclature

- **Pressure compensator control**

*	-	M	**	A	*	*	-	**	-	**	-	**
1		2	3	4	5	15		17		12		16

- **Combination control (Self pressure method)**

*	-	M	**	C	*	*	H	X	-	**	-	**	-	**
1		2	3	4	7	8	13	15		17		12		16

- **Combination control (Solenoid operated valve)**

*	-	M	**	C	*	*	J	*	X	-	**	-	**	-	**
1		2	3	4	7	8	13	14	15		17		12		16

- **Dual pressure control**

*	-	M	**	D	*	*	*	X	-	**	-	**	-	**
1		2	3	4	9	10	14	15		17		12		16

- **Power-match control**

*	-	M	**	SA	*	*	*	-	**	-	**
1		2	3	4	6	11	15		12		16

(1) Nomenclature of applied fluid (refer to page 6 for the models applied)
No mark : Working oil with petroleum contents
W : Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
M : M series motor pump

(3) Displacement volume
8 : V8 (8.0cm³/rev)
15 : V15 (14.8cm³/rev)
23 : V23 (23.0cm³/rev)
38 : V38 (37.7cm³/rev)

(4) Control method I (refer to page 6 for the applied models)
A : Pressure compensator control
C : Combination control
D : Dual pressure control
SA : Power-match control

(5)(6) Pressure adjusting range (refer to the pressure adjusting range table)

(7)(9) Low pressure adjusting range (refer to the pressure adjusting range table)

(8)(10) High pressure adjusting range (refer to the pressure adjusting range table)

(11) FC valve differential pressure
A : 0.7MPa {7kgf/cm²}
B : 1.4MPa {14kgf/cm²}
C : 2.1MPa {21kgf/cm²}

(12) Power output mark of motor (refer to the specifications of motor)

(13) Control method II
H : Self pressure method
J : Solenoid operated valve method

(14) Voltage mark for solenoid operated valve
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
N : DC12V
P : DC24V

(15) Piping direction (refer to page 6 for the applied models)
No mark : Axial port
X : Side port

(16) Design number (the design number is subject to change)
50 : Motor type M8
90 : Pump type M15
60 : Pump type M23
70 : Pump type M38

(17) Control method III (refer to page 6 for the applied models)
No mark : Without remote control system
RC : With remote control system

Pressure adjusting range table

● Pressure compensator control

(5) Pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	Without remote control system				With remote control system		
		M8	M15	M23	M38	M15	M23	M38
1	0.8~7 {8~70}	○	○	○	○	—	—	—
2	1.5~14 {15~140}	—	○	○	○	—	—	—
3	1.5~21 {15~210}	—	—	—	—	○	○	○
3	3.5~21 {35~210}	—	○	○	○	—	—	—

● Combination control

(7) Low pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	Self pressure method			Solenoid operated valve method		
		M15	M23	M38	M15	M23	M38
1	1.5~7 {15~70}	—	—	—	○	○	○
1	2.5~7 {25~70}	○	○	○	—	—	—
2	1.5~14 {15~140}	—	—	—	○	○	○
2	2.5~14 {25~140}	○	○	○	—	—	—

(8) High pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/ cm²}	Self pressure method			Solenoid operated valve method		
		M15	M23	M38	M15	M23	M38
1	1.5~7 {15~70}	—	—	—	○	○	○
1	2.5~7 {25~70}	○	○	○	—	—	—
2	1.5~14 {15~140}	—	—	—	○	○	○
2	2.5~14 {25~140}	○	○	○	—	—	—
3	3.5~21 {35~210}	○	○	○	○	○	○

● High pressure adjusting range

(9) Low pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	M15	M23	M38
1	1.5~7 {15~70}	○	○	○
2	1.5~14 {15~140}	○	○	○

(10) High pressure adjusting range

Mark	Pressure adjusting range MPa {kgf/cm²}	M15	M23	M38
1	1.5~7 {15~70}	○	○	○
2	1.5~14 {15~140}	○	○	○
3	3.5~21 {35~210}	○	○	○

Note) If both low and high pressure adjusting range are the pattern 1, the adjusting pressure range becomes 0.8~7MPa {8~70kgf/cm²}.

● Power-match control

(6) Pressure adjusting range

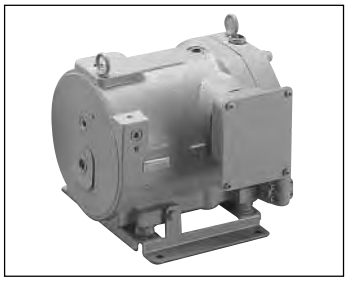
Mark	Pressure adjusting range MPa {kgf/cm²}	M15	M23	M38
1	0.8~7 {8~70}	○	○	○
2	1.5~14 {15~140}	○	○	○
3	3.5~21 {35~210}	○	○	○

(12) : Motor output and specifications

Mark	Output/Pole number kW/4P	Motor rated ampere A			Applied models				Weight kg
		200V (50Hz)	200V (60Hz)	220V (60Hz)	M8	M15	M23	M38	
05	0.4	2.2	2.0	2.0	○	—	—	—	9
1	0.75	3.8	3.4	3.4	○	○	—	—	14.5
2	1.5	6.8	6.2	6.0	○	○	—	—	23.5
3	2.2	9.3	8.8	8.3	—	○	—	—	32
		8.9	8.5	7.9	—	—	○	○	
5	3.7	15.0	14.0	13.2	—	○	—	—	44
		15.0	14.0	13.0	—	—	○	○	45
7	5.5	22.0	20.0	20.0	—	—	○	○	67
10	7.5	28.0	28.0	26.0	—	—	○	○	77

RP series rotor pump

- **Variable displacement pump integrated in electric motor.**



Features

- **Low Noise**
  The adoption of our own low noise technology realizes to reduce the operation noise so great as 10~15dB (in comparison with our own products) and improve the sound quality.
- **Compactness**
  The one housing structure enables it to shorten the length so much as 40% in comparison with our existing models. It results in easy handling and compactness of the machine.
- **Low pulsation**
  The pulsation has reduced by 50% in comparison with our existing models.
- **High reliability**
  Because of the hermetic structure such that the shaft is not out of the casing, it doesn't need an oil seal and no oil leak will happen. Besides, the temperature rise in the motor coil is small due to the motor oil cooling structure. Consequently, the structure makes it possible to operate pumps in a long term overload conditions.
- **Coping with CE**
  Since these models are equipped with the terminal box of IP54 based on the International Standards (IEC34-1 and others), the models are the best suited for coping with the Europe safety standards (CE).

Nomenclature

- **Pressure compensator control**

RP	**	A	*	-	**	*	-	30	**	-	*
1	2	3	4		9	10		11	12		13

- **Combination control (Self pressure method)**

RP	**	C	*	*	H	-	**	*	-	30
1	2	3	5	6	7		9	10		11

- **Combination control (Self operated valve method)**

RP	**	C	*	*	J	*	-	**	*	-	30
1	2	3	5	6	7	8		9	10		11

(1) Model No.
RP : RP series rotor pumps

(2) Displacement volume
08 : 8.0cm³/rev
15 : 14.8cm³/rev
23 : 24.4cm³/rev
38 : 37.7cm³/rev

(3) Control method I
A : Pressure compensator control
C : Combination control

(4) Pressure adjusting range
(refer to the pressure adjusting range table)

(5) Low pressure adjusting range
1 : 2.5~7MPa {25~70kgf/cm²}
2 : 2.5~14MPa {25~140kgf/cm²}

(6) High pressure adjusting range
1 : 2.5~7MPa {25~70kgf/cm²}
2 : 2.5~14MPa {25~140kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}

(7) Control method II
H : Self pressure method
J : Solenoid operated valve method

(8) Voltage for the solenoid operated valve
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
P : DC24V

(9) Motor output (refer to the motor specifications)

(10) Voltage specifications
No mark : AC200V (50/60Hz), AC220V (60Hz)
X : AC230V (50Hz)
Y : AC380V (50Hz), AC400V (50/60Hz)
AC415V (50Hz), AC440V (60Hz)
AC460V (60Hz)

(11) Design number (design number is subject to change)

(12) Control method III
No mark : Without remote control system
RC : With remote control system

(13) Pump installations
No mark : Foot installation
T : Vertical installation ★1

Note) ★1 The type of the vertical installation is only applied to RP08 or RP15.
★1 Since the vertical installation type doesn't effectively use antivibration pads, you might let the installation space have a sufficient stiffness so as to apply the structure absorbing vibration. The insufficient stiffness may cause noise or vibration, etc..

(4) : Pressure adjusting range table (pressure compensator control)

Mark	Pressure adjusting range MPa {kgf/cm²}	Without remote control system				With remote control system			
		RP08	RP15	RP23	RP38	RP08	RP15	RP23	RP38
1	1.5~7 {15~70}	○	○	○	○	—	—	—	—
1	2.0~7 {20~70}	—	—	—	—	○	—	—	—
2	1.5~14 {15~140}	○	○	○	○	—	—	—	—
2	2.0~14 {20~140}	—	—	—	—	○	○★1	○★2	○
3	2.0~21 {20~210}	—	—	—	—	—	○★2	○★3	○★4
3	3.5~21 {35~210}	—	○★2	○★3	○★4	—	—	—	—

Note) ★1 Applied only to a electrical motor output 1.5 kW.
★2 Applied only to a electrical motor output 2.2 kW.
★3 Applied only to a electrical motor output 3.7 kW.
★4 Applied only to a electrical motor output 5.5 kW.

(9) : Electrical motor output

Mark	Output/Pole number kW/4P	Insulation type	Models applied			
			RP08	RP15	RP23	RP38
07	0.75	E type	○	—	—	—
15	1.5		—	○	—	—
22	2.2		—	○	○	—
37	3.7		—	—	○	○
55	5.5		—	—	—	○

Specifications

Model code	Pumps			Motor				Weight kg
	Theoretical displacement cm³/rev	Max. operating pressure MPa {kgf/cm²}	Displacement adjusting range 60Hz L/min	Out/Pole number kW/4P	Rating amperes A			
					200V (50HZ)	200V (60HZ)	220V (60HZ)	
RP08A*-07-30 (RC)	8.0	14 {140} ★1	4.8~14.0	0.75	3.8	3.4	3.4	30
RP15A*-15-30 (RC)	14.8	14 {140}	12.0~25.0	1.5	6.8	6.0	5.8	45
RP15A*-22-30 (RC)		21 {210}		2.2	9.6	8.8	8.4	
RP15C**H (J)-15-30		21 {210}	Large capacity adjusting range 12.0 ~ 25.0 Small capacity adjusting range 1.0 ~ 10.0	1.5	6.8	6.0	5.8	H:50 (J:52)
RP15C**H (J)-22-30				2.2	9.6	8.8	8.4	
RP23A*-22-30 (RC)	24.4	14 {140}	20.0~42.0	2.2	10.0	9.2	8.7	67
RP23A*-37-30 (RC)		21 {210}		3.7	15.1	14.7	13.4	73
RP23C**H (J)-22-30		21 {210}	A	2.2	10.0	9.2	8.7	H:70 (J:72)
RP23C**H (J)-37-30			B	3.7	15.1	14.7	13.4	H:76 (J:78)
RP38A*-37-30 (RC)	37.7	14 {140}	20.0~64.0	3.7	15.1	14.7	13.4	73
RP38A*-55-30 (RC)		21 {210}		5.5	22.0	21.2	19.6	87
RP38C**H (J)-37-30		21 {210}	Large capacity adjusting range 30.0 ~ 64.0 Small capacity adjusting range 1.0 ~ 25.0	3.7	15.1	14.7	13.4	H:76 (J:78)
RP38C**H (J)-55-30				5.5	22.0	21.2	19.6	H:90 (J:92)

Note) ★1 There is a restriction of application condition for using in a range of 7~14MPa (70~140kgf/cm²).
○ JR-G (T) 02 and JRP-G02 are recommended for a relief valve of remote control system.
When the vent port is blocked, the pressure compensation structure doesn't work, and it comes to be a fixed pump state. So, a relief valve should be connected at the discharge of the pump.
A : RP23-22 Large capacity adjusting range 20.0~42.0 Small capacity adjusting range 1.0~15.0
B : RP23-37 Large capacity adjusting range 30.0~42.0 Small capacity adjusting range 1.0~25.0

Compact type single stage vane pump

Features

- **Low noise**
  Since the size of the suction port is wide enough, small resistance through suction port enables to realize low noise.
- **High efficiency**
  The side clearance is always kept constant by the cushion plate system. Accordingly, the pump can maintain stable and high efficiency without seizure and abrasion.
- **Low pulsation**
  Since the cam ring can minimize the displacement variation, the operation sound is quiet and the pulsation is small, resulting in gaining the stable performance.

Nomenclature

*	-	DS	**	P	-	20	-	*
1		2	3	2		4		5

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents,
Working oil with water/glycol contents
Working oil with W/O emulsion contents
F : Working oil with phosphoric acid ester

(2) Model No.
DS_P : Compact type single stage vane pumps

(3) Pump capacity code
11 : DS 11 type
12 : DS 12 type
13 : DS 13 type
14 : DS 14 type

(4) Design number (the design number is subject to change)

(5) Direction of the rotation from the view of the shaft end
No mark : Clockwise (rightward)
L : Counterclockwise (leftward)

* Impossible to exchange “clockwise” with “counterclockwise”.

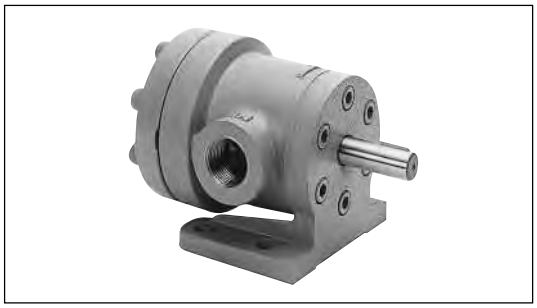
Specifications

Model No.	[Conditions] Input revolving speed: 1800min^{-1} Working oil : Equivalent to ISO VG32 Oil temp: 40˚C								
	Displacement L/min				Shaft power input kW				
	0.4MPa {4kgf/cm²}	3MPa {30kgf/cm²}	5MPa {50kgf/cm²}	7MPa {70kgf/cm²}	0.4MPa {4kgf/cm²}	1MPa {10kgf/cm²}	3MPa {30kgf/cm²}	5MPa {50kgf/cm²}	7MPa {70kgf/cm²}
DS 11P	5.0	4.5	4.1	3.9	0.15	0.28	0.55	0.82	1.1
DS 12P	7.7	7.2	6.7	6.5	0.20	0.40	0.75	1.12	1.5
DS 13P	12.6	11.8	11.5	11.0	0.25	0.50	1.05	1.55	2.1
DS 14P	22.1	21.2	20.5	20.0	0.35	0.77	1.65	2.50	3.4

Weight (kg)

Pump's type	Flange connection type	Foot mounting type
DS1※P	3	4.4

Single stage vane pump



Features

- **Low noise and low pulsation**
  Since the cam ring which enables to minimize the displacement variation, the operation sound is quiet and the pulsation is small, resulting in gaining the stable performance.
- **High reliability**
  Good pressure balance can be kept due to the structure which maintains complete oil equalization. As a result, a long life is promised because an eccentric load will not be on the shaft and bearing.

Nomenclature

*	-	DV	*	*	-	*	V	-	20	-	*
1		2	3	4		5		6		7	

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents,
Working oil with water/glycol contents
Working oil with W/O emulsion contents
F : Working oil with phosphoric acid ester

(2) Model No.
DV : Single stage vane pump

(3) Pump capacity code
S : Small type
M : Middle type
L : Large type

(4) Connection types
F : Flange connection type
B : Foot mounting type

(5) Displacement mark (refer to the specification table)

(6) Design number (the design number is subject to change)

(7) Direction of the rotation from the view of the shaft end
No mark : Clockwise (rightward)
L : Counterclockwise (leftward)

Note) DVL*type: Flanges for the connection to suction and to discharge, and O-rings and bolts are attached to pumps.

Specifications

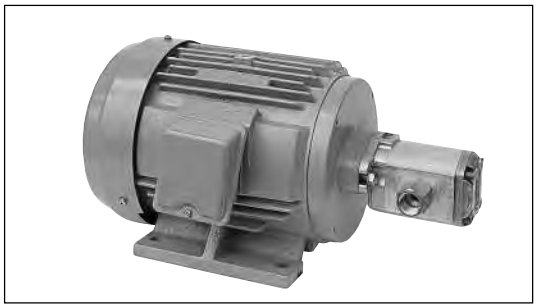
Model No.	[Conditions] Power input revolving speed: 1200min^{-1} Working oil : Equivalent to ISO VG32 Oil temp: 40˚C								
	Displacement L/min				Shaft power input kW				
	0.4MPa {4kgf/cm²}	3MPa {30kgf/cm²}	5MPa {50kgf/cm²}	7MPa {70kgf/cm²}	0.4MPa {4kgf/cm²}	1MPa {10kgf/cm²}	3MPa {30kgf/cm²}	5MPa {50kgf/cm²}	7MPa {70kgf/cm²}
DVS*-1V	6.4	5.9	5.4	5.0	0.2	0.3	0.7	1.0	1.4
DVS*-2V	9.0	8.4	8.0	7.5	0.2	0.4	0.8	1.3	1.7
DVS*-3V	13.5	12.6	12.3	12.0	0.22	0.5	1.1	1.7	2.4
DVS*-4V	19.5	18.8	18.4	18.0	0.25	0.6	1.4	2.3	3.2
DVS*-5V	33.0	32.2	31.6	31.0	0.33	1.0	2.3	3.6	4.9
DVS*-6V	43.0	42.2	41.6	41.0	0.45	1.3	2.9	4.5	6.2
DVM*-1V	57.0	55.5	53.8	52.0	0.5	1.6	3.8	6.0	8.5
DVM*-2V	72.0	70.0	68.5	67.0	0.8	2.2	4.8	7.7	10.5
DVM*-3V	87.0	85.0	83.5	82.0	1.2	2.7	6.2	9.6	13.0
DVM*-4V	108.0	106.0	104.5	103.0	1.6	3.6	7.8	11.9	16.0
DVM*-5V	140.0	137.0	135.5	134.0	2.1	4.6	9.5	14.3	19.0
DVL*-2V	164.0	157.0	152.0	148.0	3.2	6.2	11.6	17.3	23.0
DVL*-3V	207.0	200.0	196.0	192.0	3.8	7.5	15.0	22.5	28.3
DVL*-4V	226.0	219.0	216.0	208.0	4.8	8.8	16.7	24.8	31.5

Weight (kg)

Pump's type	Flange connection type	Foot mounting type
DVS *	10	11
DVM *	26	28
DVL *	107	110

Note) Weight of DVL* includes piping connection flange and bolts.

MFP100 series motor pump



- This is a motor pump that TFP type gear pump and electrical motor are built in one body.

Nomenclature

MFP100 /	**	-	2	-	*	-	10
1	2		3		4		5

(1) Model No.
MFP100 : MFP100 series motor pump

(2) Displacement volume
1.2 : 1.2cm³/rev
1.7 : 1.7cm³/rev
2.2 : 2.2cm³/rev
2.6 : 2.6cm³/rev
3.2 : 3.2cm³/rev
3.8 : 3.8cm³/rev
4.3 : 4.3cm³/rev
7.8 : 7.8cm³/rev

(3) Voltage specifications
2 : AC200V (50/60Hz), AC220V (60Hz)

(4) Motor power output
0.4 : 0.4kW/4P
0.75 : 0.75kW/4P
1.5 : 1.5kW/4P
2.2 : 2.2kW/4P

(5) Design number (the design number is subject to change)

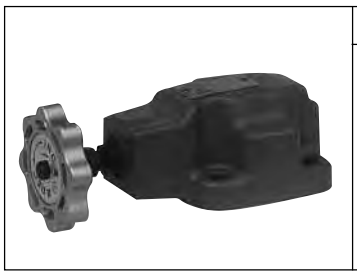
Specifications

Model code	Gear pump type	Motor kW/4P				Operating pressure MPa {kgf/cm²}		Theoretical displacement cm³/rev
		0.4	0.75	1.5	2.2	Max.	Rated	
MFP 100/1.2-2-*-10	TFP 100/1.2DCI06	○	○	○	—	21{210}	14 {140}	1.2
MFP 100/1.7-2-*-10	TFP 100/1.7DCI06	○	○	○	—			1.7
MFP 100/2.2-2-*-10	TFP 100/2.2DCI06	○	○	○	○			2.2
MFP 100/2.6-2-*-10	TFP 100/2.6DCI06	○	○	○	○			2.6
MFP 100/3.2-2-*-10	TFP 100/3.2DCI06	○	○	○	○			3.2
MFP 100/3.8-2-*-10	TFP 100/3.8DCI06	○	○	○	○			3.8
MFP 100/4.3-2-*-10	TFP 100/4.3DCI06	○	○	○	○			4.3
MFP 100/7.8-2-*-10	TFP 100/7.8DCI06	—	○	○	○	18 {180}	10.5 {105}	7.8

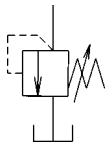
(4) : Motor power output/Specifications

Mark	Output/Pole number kW/4p	Motor rated amperes A		
		200V (50Hz)	200V (60Hz)	220V (60Hz)
0.4	0.4	2.4	2.1	2.1
0.75	0.75	3.7	3.4	3.3
1.5	1.5	6.8	6.2	6.3
2.2	2.2	9.6	9.0	8.4

Direct operated relief valve (for remote control)



JIS symbols



Features

- This valve is used in remote control mode after connecting to a vent port of a pilot operated pressure control valve such as a relief valve, a reducing valve, etc..

Nomenclature

*	-	JR	-	*	02	-	*	-	22	-	*
1		2		3	4		5		6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working fluid with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JR : J series direct operating relief valve

(3) Connections
G : Gasket attached type
T : Screw connection type

(4) Nominal diameter
02 : 1/4

(5) Pressure adjusting range
1 : 0.8~7MPa {8~70kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}

(6) Design number (the design number is subject to change)

(7) Option mark
No mark : Pressure adjusting handle type
T : Pressure adjusting bolt type ★1

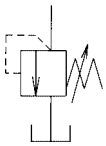
Note) ★1 The pressure adjusting type is only applied to the Gasket attached type (G).

Specifications

Model code	Nom. Dia.	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
JR-G02-1-22	1/4	0.8~7 {8~70}	1.2	1.5
JR-G02-3-22		3.5~21 {35~210}		
JR-T02-1-22		0.8~7 {8~70}		
JR-T02-3-22		3.5~21 {35~210}		

Direct operated relief valve

JIS symbols



Features

- As the override pressure is small, this valve has almost equivalent performance to a pilot operated type.
- The vibration proof structure makes it possible to prevent chattering even in high pressure.
- Broad range of adjusting is possible and pressure adjusting in low pressure area is easy to do.

Nomenclature

SR	-	*	03	-	1	-	**
1		2	3		4		5

(1) Model No.
SR : S series direct operating relief valves

(2) Connections
G : Gasket attached type
T : Screw connection type

(3) Nominal diameter
03 : 3/8

(4) Pressure adjusting range
1 : 0.3~7MPa {3~70kgf/cm²}

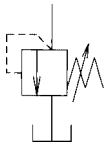
(5) Design number (design number is subject to change)
12 : Screw connection type (T)
13 : Gasket attached type (G)

Specifications

Model code	Nom. Dia.	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
SR-G03-1-13	3/8	0.3~7 {3~70}	30	2.5
SR-T03-1-12				2

Direct operated relief valve

JIS symbols



Features

- As the override pressure is small, this valve has an almost equivalent performance to a pilot operated type.
- The vibration proof structure makes it possible to prevent chattering even in high pressure.

Nomenclature

*	-	HDRIR	-	*	02	-	*
1		2		3	4		5

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
HDRIR : H series direct operating relief valve

(3) Connections
G : Gasket attached type
T : Screw connection type

(4) Nominal diameter
02 : 1/4

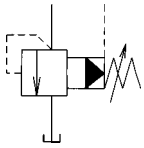
(5) Pressure adjusting range
1 : 0.9~7MPa {9~70kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}

Specifications

Model code	Nom. Dia.	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
HDRIR-G02-1	1/4	0.9~7 {9~70}	12	2.6
HDRIR-G02-3		3.5~21 {35~210}		
HDRIR-T02-1		0.9~7 {9~70}		1.8
HDRIR-T02-3		3.5~21 {35~210}		

Pilot operated relief valve

JIS symbols



Features

- The broad flow rate range enables the steady pressure control and this valve actuates as a safety valve.
- If a remote control relief valve is connected to a vent port, the main circuit pressure can be controlled by a remote controller.
- This valve will have a function of an unloading valve, if a vent port is used.
- Option for high vent type is available.

Nomenclature

*	-	HDRI	-	*	03	-	*	*
1		2		3	4		5	6

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
HDRI : H series pilot operated relief valve

(3) Connections
G : Gasket attached type
T : Screw connection type

(4) Nominal diameter
03 : 3/8

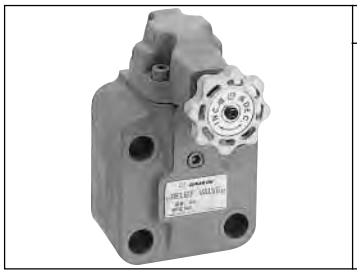
(5) Pressure adjusting range
1 : 0.5~7MPa {5~70kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}

(6) Vent mark
No mark : Low vent type
V : High vent type

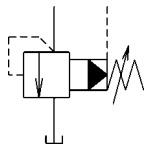
Specifications

Model code	Nom. Dia.	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
HDRI-G03-1	3/8	0.5~7 {5~70}	30	3.5
HDRI-G03-3		3.5~21 {35~210}		
HDRI-T03-1		0.5~7 {5~70}		2.9
HDRI-T03-3		3.5~21 {35~210}		

Pilot operated relief valve



JIS symbols



Features

- The broad flow rate range enables the steady pressure control and this valve actuates as a safety valve.
- If a remote control relief valve is connected to a vent port, the main circuit pressure can be controlled by a remote controller.
- This valve will have a function of an unloading valve, if a vent port is used.
- Option as high vent type is available.

Nomenclature

*	-	JRB	-	*	**	-	*	*	-	**
1		2		3	4		5	6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JRB : J series pilot operated relief valve

(3) Connections
G : Gasket attached type
T : Screw connection type
F : Flange connection type

(4) Nominal diameter
06 : 3/4
10 : 1 1/4
16 : 2

(5) Pressure adjusting range
1 : *~7MPa {*~70kgf/cm²}
3 : *~21MPa {*~210kgf/cm²}

(6) Vent mark
No mark : Low vent type
V : High vent type

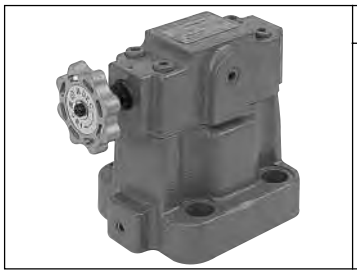
(7) Design number (the design number is subject to change)
12 : Nominal diameter 16 (2)
13 : Nominal diameter 06 (3/4), 10 (1 1/4)

Specifications

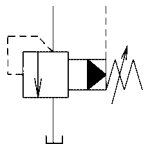
Model code	Nom. Dia.	Pressure adjusting range ★1 MPa{kgf/cm²}	Max. flow rate L/min	Weight kg
JRB-G06-1-13	3/4	*~7 {*~70}	170	6
JRB-G06-3-13		*~21 {*~210}		
JRB-T06-1-13		*~7 {*~70}		4.6
JRB-T06-3-13		*~21 {*~210}		
JRB-F06-1-13		*~7 {*~70}		
JRB-F06-3-13		*~21 {*~210}		
JRB-G10-1-13	1 1/4	*~7 {*~70}	380	9
JRB-G10-3-13		*~21 {*~210}		
JRB-T10-1-13		*~7 {*~70}		8.5
JRB-T10-3-13		*~21 {*~210}		
JRB-F10-1-13		*~7 {*~70}		
JRB-F10-3-13		*~21 {*~210}		
JRB-F16-1-12	2	*~7 {*~70}	700	20
JRB-F16-3-12		*~21 {*~210}		

Note) ★1 As min. adjusting pressure differs from flow rate to flow rate, you might contact us separately.

Pilot operated relief valve



JIS symbols



Features

- Low noise models with high characteristics against noise.
- The broad flow rate range enables the steady pressure control and this valve actuates as a safety valve.
- If a remote control relief valve is connected to a vent port, the main circuit pressure can be controlled by a remote controller.
- This valve will have a function of an unloading valve, if a vent port is used.
- Option as high vent type is available.

Nomenclature

*	-	JRBS	-	G	**	-	*	*	-	30	-	*
1		2		3	4		5	6		7		8

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JRBS : J series pilot operated relief valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
03 : 3/8
06 : 3/4

(5) Pressure adjusting range
1 : *~7MPa {*~70kgf/cm²}
2 : *~16MPa {*~160kgf/cm²}
3 : *~25MPa {*~250kgf/cm²}

(6) Vent mark
No mark : Low vent type
V : High vent type

(7) Design number (design number is subject to change)

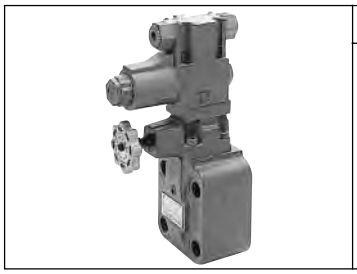
(8) Option mark
No mark : Pressure adjusting handle type
F : Screw adjusting type with a cap
T : Pressure adjusting bolt type

Specifications

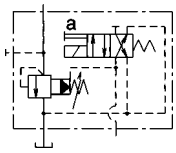
Model code	Nom. Dia.	Pressure adjusting range ★1 MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
JRBS-G03-1-30	3/8	*~7 {*~70}	200	4.7
JRBS-G03-2-30		*~16 {*~160}		
JRBS-G03-3-30		*~25 {*~250}		
JRBS-G06-1-30	3/4	*~7 {*~70}	300	5.8
JRBS-G06-2-30		*~16 {*~160}		
JRBS-G06-3-30		*~25 {*~250}		

Note) ★1 As the min. adjusting pressure differs from flow rate to flow rate, you might contact us separately.

Relief valve with solenoid operated valve



JIS symbols



Features

- The broad flow rate range enables the steady pressure control and this valve actuates as a safety valve.
- As this valve itself has a function as an unloading valve, an unloading circuit becomes no need.
- Option for high vent type is available.

Nomenclature

*	-	JRS	-	*	06	-	*	*	-	*	*	-	40
1		2		3	4		5	6		7	8		9

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
H : Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
JRS : J series relief valve with solenoid operated valve

(3) Connections
G : Gasket attached type
T : Screw connection type

(4) Nominal diameter
06 : 3/4

(5) Pressure adjusting range
1 : *~7MPa {*~70kgf/cm^2}
3 : *~21MPa {*~210kgf/cm^2}

(6) Vent mark
No mark : Low vent type
V : High vent type

(7) Circuit mark
A : Normal closed type (On-load at demagnetizing)
B : Normal open type (Unload at demagnetizing)

(8) Solenoid operated valve's voltage mark
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
P : DC24V

(9) Design number (design number is subject to change)

Specifications

Model code	Nom. Dia.	Pressure adjusting range ★1 MPa {kgf/cm^2}	Max. flow rate L/min	Weight kg
JRS-G06-1-**-40	3/4	*~7 {*~70}	170	8.1
JRS-G06-3-**-40		*~21 {*~210}		
JRS-T06-1-**-40		*~7 {*~70}		6.7
JRS-T06-3-**-40		*~21 {*~210}		

Model Mark	Model name of solenoid operated valve applied
JRS-*06-*	KSO-G02-2A*-30 (*: Voltage mark)

Note) ★1 As the min. adjusting pressure differs from flow rate to flow rate, you might contact us separately.

Refer to KSO-G02 (page 29) for the specification of solenoid operated valve.

Relief valves with a solenoid valve

JIS symbols
Refer to next page

Features

- Low noise models with high characteristics against noise.
- The switching of the solenoid operated valve enables the circuit unloading, dual pressure control and triple pressure control.
- The broad flow rate range enables the steady pressure control. This valve will have a function of an unloading valve, if a vent port is used.
- Option for high vent type is available.

Nomenclature

*	-	JRSS	-	G	**	-	*	*	-	*	*	*	*	-	50	-	*	*	-	*
1		2		3	4		5	6		7	8	9	10		11		12	13		14

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
H : Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
JRSS : J series relief valve with solenoid operated valve (Low noise type)

(3) Connections
G : Gasket attached type

(4) Nominal diameter
03 : 3/8
06 : 3/4

(5) Pressure adjusting range
1 : *~7MPa {*~70kgf/cm²}
2 : *~16MPa {*~160kgf/cm²}
3 : *~25MPa {*~250kgf/cm²}

(6) Vent mark
No mark : Low vent type
V : High vent type

(7) Circuit mark
A : Single pressure control (On-load at demagnetizing, Normal closed type)
B : Single pressure control (Unload at demagnetizing, Normal open type)
C : Dual pressure control (High pressure at demagnetizing)
D : Dual pressure control (Low pressure at demagnetizing)
E : Dual pressure control (Unload at demagnetizing)
F : Triple pressure control

(8) Max. adjusting pressureI(MRV valve, adjusting toward right)
<It is applied when the circuit mark is C, D, E or F>
1 : 7MPa {70kgf/cm²}
2 : 16MPa {160kgf/cm²}
3 : 25MPa {250kgf/cm²}

(9) Max. adjusting pressureII (MRV valve, adjusting toward left)
<It is applied when the circuit mark is just F>
1 : 7MPa {70kgf/cm²}
2 : 16MPa {160kgf/cm²}
3 : 25MPa {250kgf/cm²}

(10) Solenoid operated valve's voltage mark
A : AC100V (50/60Hz), AC110V (60Hz)
B : AC200V (50/60Hz), AC220V (60Hz)
P : DC24V

(11) Design number (design number is subject to change)

(12) Option mark
No mark : Pressure adjusting handle type
F : Screw adjusting type with a cap
T : Pressure adjusting bolt type

(13) Drain mark
No mark : Internal drain type
X : Internal drain type ★1

(14) Pilot solenoid operated valve option mark ★1
Refer to the option mark table on page 29.

Note) ★1 The drain mark is "X" when the pilot solenoid operated valve's option is equipped with earth terminal (mark; E, EN, ENR etc.) in internal drain type.

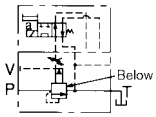
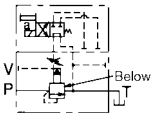
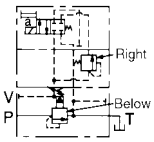
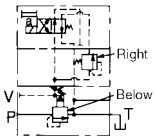
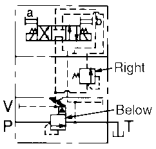
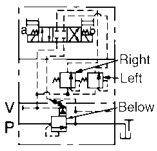
Specification

Model code	Nom. Dia.	Pressure adjusting range ★2 MPa {kgf/cm²}	Max. flow rate L/min	Max. switching frequency Cycle/min
JRSS-G03-1-****-50	3/8	*~7 {*~70}	200	120
JRSS-G03-2-****-50		*~16 {*~160}		
JRSS-G03-3-****-50		*~25 {*~250}		
JRSS-G06-1-****-50	3/4	*~7 {*~70}	300	
JRSS-G06-2-****-50		*~16 {*~160}		
JRSS-G06-3-****-50		*~25 {*~250}		

Note) ★2 As the min. adjusting pressure differs from flow rate to flow rate, you might contact us separately.

Refer to KSO-G02 (page 29) for the specification of solenoid operated valve.

(7) : JIS hydraulic symbols

Circuit mark		A		B		C		D		E			F		
JIS hydraulic symbols															
Model of solenoid operated valve * Voltage mark		KSO-G02-3A * -30-66H		KSO-G02-3A * -30-T66		KSO-G02-2A * -30-H2		KSO-G02-2A * -30-M		KSO-G02-66C * -30			KSO-G02-2C * -30		
Model of MRV valve		—		—		MRV-S2-*-10		MRV-S2-*-10		MRV-S2-*-10			MRV-W1-**-10		
Solenoid valve in excited state	SOL.a	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
	SOL.b	—	—	—	—	—	—	—	—	OFF	OFF	ON	OFF	OFF	ON
Working state		Set pressure (Below)	Unload	Unload	Set pressure (Below)	Set pressure (Below)	Set pressure (Right)	Set pressure (Right)	Set pressure (Below)	Unload	Set pressure (Below)	Set pressure (Right)	Set pressure (Below)	Set pressure (Left)	Set pressure (Right)

Note) “Below”, “Right” and “Left” in above table stand for the handle position of pressure adjusting in the exterior dimension’s drawing.
“Below”: Main valve’s pressure adjusting handle
“Right” : MRV valve’s pressure adjusting handle (applied for dual or triple pressure control)
“Left” : MRV valve’s pressure adjusting handle (applied only for triple pressure conrol)

Weight

Model code	Nom. Dia.	Weight kg	Model code	Nom. Dia.	Weight kg
JRSS-G03-**-A	3/8	6.4	JRSS-G06-**-A	3/4	7.5
JRSS-G03-**-B			JRSS-G06-**-B		
JRSS-G03-**-C		7.9	JRSS-G06-**-C		9
JRSS-G03-**-D			JRSS-G06-**-D		
JRSS-G03-**-E		8.2	JRSS-G06-**-E		9.3
JRSS-G03-**-F		8.8	JRSS-G06-**-F		9.9

Pressure control valve

JIS symbols
Refer to next page

Features

- This is a direct acting type pressure control valve which can be used for a sequence valve, an unload valve, a counter balance valve and a relief valve in a combination of either internal or external pilot and drain.

Nomenclature

*	-	JQ	*	-	*	**	-	*	*	-	**	-	*
1		2	3		4	5		6	7		8		9

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
JQ : JQ type pressure control valve

(3) Check valve mark
No mark : Without check valve
C : With check valve

(4) Connections
G : Gasket attached type
T : Screw connection type
F : Flange connection type

(5) Nominal diameter
03 : 3/8
06 : 3/4
10 : 1 1/4
16 : 2

(6) Function mark (refer to JIS hydraulic symbols) ★1
1, 2, 3, 4

(7) Pressure adjusting range
A : 0.25~0.85MPa {2.5~8.5kgf/cm²}
C : 0.85~3.5MPa {8.5~35kgf/cm²}
E : 3.5~14MPa {35~140kgf/cm²}
D : 1.75~7MPa {17.5~70kgf/cm²} ★2

(8) Design number (design number is subject to change)
12 : Gasket attached type (G), Screw connection type (T)
20 : Flange connection type (F)
<In case of nominal diameter; 06 (3/4), 10 (1 1/4)>
21 : Flange connection type (F)
<In case that nominal diameter; 16 (2)>

(9) Option number
No mark : Single pilot type (Internal or external pilot type)
W : Double pilot type (Internal and external pilot type)

Note) ★1 2nd type is supplied as the standard products. If type 1,3, or 4 type is necessary, you might exchange it in accordance with exchange manual attached in the product. After exchanging, make an correction of the carved seal on the name plate of model code.
★2 Pressure adjusting range: D type is just applied to the case with a nominal diameter 16 (2).

Specification

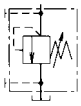
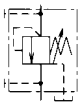
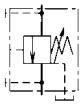
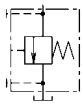
Model code			Nom.	Max. operating pressure	Pressure adjusting range	Max.flow rate
Gasket attached type(G)	Screw connection type(T)	Flange connection type(F)	Dia.	MPa {kgf/cm²}	MPa {kgf/cm²}	L/min
JQ(C)-G03-*A-12	JQ(C)-T03-*A-12	—	3/8	21 {210}	0.25~0.85 {2.5~8.5}	50
JQ(C)-G03-*C-12-(W)	JQ(C)-T03-*C-12-(W)	—			0.85~3.5 {8.5~35}	
JQ(C)-G03-*E-12-(W)	JQ(C)-T03-*E-12-(W)	—			3.5~14 {35~140}	
JQ(C)-G06-*A-12	JQ(C)-T06-*A-12	JQC-F06-*A-20	3/4		0.25~0.85 {2.5~8.5}	120
JQ(C)-G06-*C-12-(W)	JQ(C)-T06-*C-12-(W)	JQC-F06-*C-20-(W)			0.85~3.5 {8.5~35}	
JQ(C)-G06-*E-12-(W)	JQ(C)-T06-*E-12-(W)	JQC-F06-*E-20-(W)			3.5~14 {35~140}	
JQ(C)-G10-*A-12	JQ(C)-T10-*A-12	JQC-F10-*A-20	1 1/4		0.25~0.85 {2.5~8.5}	280
JQ(C)-G10-*C-12-(W)	JQ(C)-T10-*C-12-(W)	JQC-F10-*C-20-(W)			0.85~3.5 {8.5~35}	
JQ(C)-G10-*E-12-(W)	JQ(C)-T10-*E-12-(W)	JQC-F10-*E-20-(W)			3.5~14 {35~140}	
—	—	JQC-F16-*D-21	2		1.75~7 {17.5~70}	500
—	—	JQC-F16-*E-21			3.5~14 {35~140}	

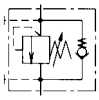
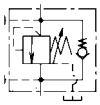
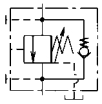
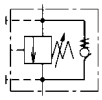
Weight (kg)

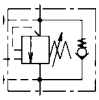
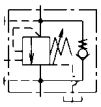
Model No.	①	②	③	Model No.	①	②	③	Model No.	②	③
JQ(C)-G03	3.5	3.8	4.3	JQ(C)-T03	2.9	3.1	3.6	JQC-F06	6.2	7.1
JQ(C)-G06	6	6.5	7.4	JQ(C)-T06	5	5.4	6.3	JQC-F10	3.5	15.2
JQ(C)-G10	11.5	12.8	14.5	JQ(C)-T10	9.8	11.1	12.8	JQC-F16	38.8	—

Note) Weight ① Single pilot type without check valve
② Single pilot type with check valve
③ Double pilot type with check valve

(6) : JIS hydraulic symbols

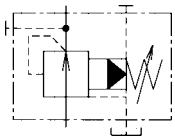
Model code	JQ-***-1*	JQ-***-2*	JQ-***-3*	JQ-***-4*
Name	Relief	Sequence valve	Sequence valve	Unload valve
Pilot method	Internal pilot type	Internal pilot type	External pilot type	External pilot type
Drain method	Internal drain type	External drain type	External drain type	Internal drain type
JIS hydraulic symbols				

Model code	JQC-***-1*	JQC-***-2*	JQC-***-3*	JQC-***-4*
Name	Counter balance valve	Sequence valve with check valve	Sequence valve with check valve	Counter balance valve
Pilot method	Internal pilot type	Internal pilot type	External pilot type	External pilot type
Drain method	Internal drain type	External drain type	External drain type	Internal drain type
JIS hydraulic symbols				

Model code	JQC-***-1*-W	JQC-***-2*-W
Name	Counter balance valve	Counter balance valve
Pilot method	Internal · External pilot type	Internal · External pilot type
Drain method	Internal drain type	External drain type
JIS hydraulic symbols		

Low pressure reducing valve

JIS symbols



Features

- Used when pressure in a partial oil circuit is set lower than a main circuit.
- Even if the primary main circuit varies, the secondary pressure can be kept constant.
- If a remote control relief valve is connected to a vent port, the branch circuit pressure can be controlled.
- The structure to prevent surge pressure is available as option.

Nomenclature

*	-	SGB	-	G	03	-	1	-	20	-	**
1		2		3	4		5		6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No. SGB : S series low pressure reducing valve

(3) Connections G : Gasket attached type

(4) Nominal diameter 03 : 3/8

(5) Pressure adjusting range
1 : 0.15~0.7MPa {1.5~70kgf/cm²}

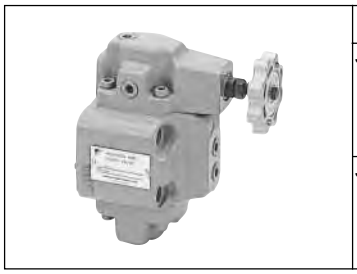
(6) Design number (design number is subject to change)

(7) Option mark
No mark : Without surge pressure prevention structure
SP : With surge pressure prevention structure

Specifications

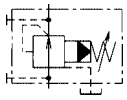
Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
SGB-G03-1-20	3/8	14 {140}	0.15~7 {1.5~70}	30	3.5

Reducing valve/Reducing valve with check valve

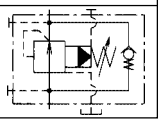


JIS symbols

JGB



JGBC



Features

- Used when pressure in a partial oil circuit is set lower than a main circuit.
- Even if the primary main circuit varies, the secondary pressure can be kept constant.
- If a remote control relief valve is connected to a vent port, the branch circuit pressure can be controlled.

Nomenclature

*	-	JGB	*	-	*	**	-	*	-	**
1		2	3		4	5		6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
JGB : J series reducing valve

(3) Check valve mark
No mark : Without check valve
C : With check valve

(4) Connections
G : Gasket attached type
T : Screw connection type
F : Flange connection type

(5) Nominal diameter
03 : 3/8
06 : 3/4
10 : 1 1/4
16 : 2

(6) Pressure adjusting range
1 : 0.8~7MPa {8~70kgf/cm²}
3 : 3.5~21MPa {35~210kgf/cm²}

(7) Design number (design number is subject to change)
10 : Gasket attached type (G), Screw connection type (T)
<In case of nominal diameter 03 (3/8)>
11 : Gasket attached type (G), Screw connection type (T)
<In case of nominal diameter 06 (3/4), 10 (1 1/4)>
20 : Flange connection type (F)
<In case of nominal diameter 06 (3/4), 10 (1 1/4)>
21 : Flange connection type (F)
<In case of nominal diameter 16 (2)>

Specifications (kg)

Model code			Nom.	Max. operating pressure	Pressure adjusting range	Max.flow rate	Drain rate
Gasket attached type (G)	Screw connection type (T)	Flange connection type (F)	Dia.	MPa {kgf/cm²}	MPa {kgf/cm²}	L/min	L/min
JGB(C)-G03-1-10	JGB(C)-T03-1-10	—	3/8	21 {210}	0.8~7 {8~70}	50	0.8~1
JGB(C)-G03-3-10	JGB(C)-T03-3-10	—			3.5~21 {35~210}		
JGB(C)-G06-1-11	JGB(C)-T06-1-11	JGBC-F06-1-20	3/4		0.8~7 {8~70}	120	0.9~1.1
JGB(C)-G06-3-11	JGB(C)-T06-3-11	JGBC-F06-3-20			3.5~21 {35~210}		
JGB(C)-G10-1-11	JGB(C)-T10-1-11	JGBC-F10-1-20	1 1/4		0.8~7 {8~70}	280	1.2~1.5
JGB(C)-G10-3-11	JGB(C)-T10-3-11	JGBC-F10-3-20			3.5~21 {35~210}		
—	—	JGBC-F16-1-21	2		0.8~7 {8~70}	500	2~2.4
—	—	JGBC-F16-3-21			3.5~21 {35~210}		

Weight (kg)

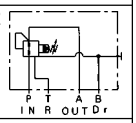
Model No.	①	②	Model No.	①	②	Model No.	②
JGB(C)-G03	3.9	4.2	JGB(C)-T03	3.3	3.6	JGBC-F06	6.8
JGB(C)-G06	6.2	6.6	JGB(C)-T06	5.7	6.1	JGBC-F10	13.8
JGB(C)-G10	11.8	13.1	JGB(C)-T10	10	11.3	JGBC-F16	37.7

Note) Weight ① without check valve ② with check valve

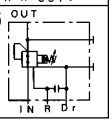
Relief reducing valve (Balancing valve)

JIS symbols

SGR-G02



SGR-G03, 06



Features

- The combination circuit with a reducing valve, a relief valve and check valve controlled a system, but this relief valve gets together all these three valves into one unit and functions as a balancing valve.
- As the pressure variation corresponding to a load flow rate variation is small, the control accuracy increases.
- Pressure can be regulated by the handle.
- As it is a external drain type, the back pressure in the return line doesn't influence the performance.

Nomenclature

*	-	SGR	-	G	**	-	*	-	10
1		2		3	4		5		6

SGR	-	G	02	-	2	-	10	-	46
2		3	4		5		6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
SGR : S series relief reducing valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
02 : 1/4
03 : 3/8
06 : 3/4

(5) Pressure adjusting range
1 : 0.7~7MPa {7~70kgf/cm²}
2 : 1.2~16MPa {12~160kgf/cm²}

(6) Design number (design number is subject to change)

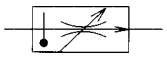
(7) Management mark

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Pressure adjusting range MPa {kgf/cm²}	Max. flow rate L/min	Drain rate L/min	Weight kg
SGR-G02-1-10	1/4	10.5 {105}	0.7~7 {7~70}	20	0.6~0.7	2.2
SGR-G02-2-10-46		17.5 {175}	1.2~16 {12~160}			
SGR-G03-1-10	3/8	10.5 {105}	0.7~7 {7~70}	40		3.3
SGR-G06-1-10	3/4	17.5 {175}	0.7~7 {7~70}	100	0.9~1.3	6.5
SGR-G06-2-10			1.2~16 {12~160}		1.1~1.6	

Flow control valve (with compensation of pressure · temperature)

JIS symbols



Features

- Since the compensation of pressure and temperature are equipped, the set flow rate is kept constant, even if load pressure and oil temperature vary.
- The flow control level is possible to regulate so small value as 0.01L/min.
- The structure to minimize a jumping phenomena.

Nomenclature

*	-	SF	-	G	02	-	***	-	15
1		2		3	4		5		6

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
SF : S series flow control valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
02 : 1/4

(5) Max. regulating flow
002 : 0.2L/min
006 : 0.6L/min
030 : 3 L/min
060 : 6 L/min
150 : 15 L/min

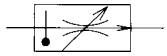
(6) Design number (design number is subject to change)

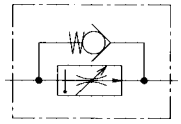
Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Flow regulating range L/min	Weight kg
SF-G02-002-15	1/4	7 {70}	0.01~0.2	0.8
SF-G02-006-15			0.01~0.6	
SF-G02-030-15			0.01~3	
SF-G02-060-15			0.01~6	
SF-G02-150-15			0.01~15	

Flow control valves · Flow control valve with check valve (with compensation of pressure and temperature)

JIS symbols





Features

- Since the compensation of pressure and temperature are equipped, the set flow rate is kept constant, even if load pressure and oil temperature vary.
- Possible to regulate very small to large amount.
- As flow regulating handle can be rotate 4 cycles, small adjusting and resetting is easily conducted.
- Options like a handle rocking key or a structure to prevent jumping are available.

Nomenclature

*	-	JF	*	-	G	**	-	***	-	**	-	*	*
1		2	3		4	5		6		7		8	9

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water/glycol
F : Working oil with phosphoric acid ester

(2) Model No.
JF : J series flow control valve

(3) Check valve mark
No mark : Without check valve
C : With check valve

(4) Connections
G : Gasket attached type

(5) Nominal diameter
02 : 1/4 03 : 3/8

(6) Max. regulating flow
30 : 30L/min 105 : 105L/min

(7) Design number (design number is subject to change)
15 : Model No. JF-G02, JFC-G02
16 : Model No. JF-G03
17 : Model No. JFC-G03

(8) Option mark I
No mark : Without a flow regulating handle rock key
L : With a flow regulating handle rock key

(9) Option mark II
No mark : Without a structure to prevent jumping
N : With a structure to prevent jumping

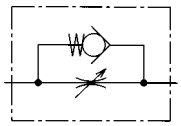
Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Flow regulating range★1 L/min	Free flow L/min	Check valve clacking pressure MPa {kgf/cm²}	Weight kg
JF-G02-30-15	1/4	21 {210}	*~30	30	0.035 {0.35}	3.9
JFC-G02-30-15						
JF-G03-105-16	3/8		*~105	105		8.3
JFC-G03-105-17						

Note) ★1 The minimal regulating flow rate is differs from the pressure differentials between the inlet and outlet. Contact us separately.

Small size throttle valves with a check valve

JIS symbols



Features

- As a check valve is built in, one way stream is the regulating flow and the reverse stream is free flow.
- As a leak from the check valve is little, a very small flow regulating is possible up to entire close.

Nomenclature

TSC - * 01 - **

1 | 2 | 3 | 4

(1) Model No.
TSC : Small size throttle valve with a check valve.

(2) Connections
G : Gasket attached type
T : Screw connection type

(3) Nominal diameter
01 : 1/8

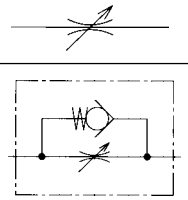
(4) Design number (design number is subject to change)
No mark : Connections screw connection type (T)
11 : Connections Gasket attached type (G)

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. regulating flow rate L/min	Check valve clacking pressure MPa {kgf/cm²}	Weight kg
TSC-G01-11	1/8	7 {70}	Refer to the performance curve	0.1 {1}	0.2
TSC-T01				0.08 {0.8}	0.1

Throttle valves · Throttle valves with check valve

JIS symbols



Features

- A structure with good balance of pressure makes it possible to operate a handle easily.
- Compact design enables to reduce a installation space.
- Easy adjusting of small amount flow rate.

Nomenclature

*** - HDFT * - * ****

1 | 2 | 3 | 4 | 5

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol
F : Working oil with phosphoric acid ester

(2) Model No.
HDFT : H series throttle valve

(3) Check valve mark
No mark : Without check valve
C : With check valve

(4) Connections
G : Gasket attached type
T : Screw connection type
F : Flange connection type

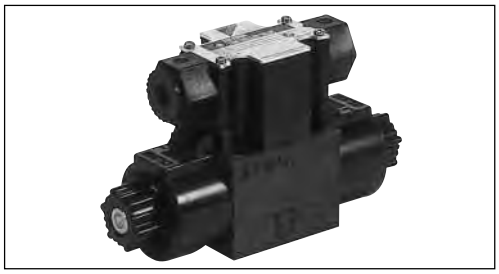
(5) Nominal diameter
03 : 3/8
06 : 3/4
10 : $1^1/_4$
16 : 2

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. regulating flow rate L/min	Check valve clacking pressure MPa {kgf/cm²}	Weight kg
HDFT (C)-G03	3/8	21 {210}	30	0.2 {2}	2.7
HDFT (C)-T03					1.5
HDFT (C)-G06	3/4		75		4.2
HDFT (C)-T06					3.6
HDFT (C)-F06					9.5
HDFT (C)-G10	$1^1/_4$		190	0.15 {1.5}	11
HDFT (C)-T10					9.4
HDFT (C)-F10					11★1
HDFT (C)-F16	2		470	0.2 {2}	21★1

Note) ★1 The weight of a flange connection type includes flange and bolts.

Low watt type solenoid operated valve



Features

- A solenoid valve adopting low watt coil (DC: 5W, AC: 12W).
- Possible to drive directly by means of programable sequence controller due to the low current characteristics.

Nomenclature

*	-	LS	-	G	02	-	**	*	*	-	30	-	***
1		2		3	4		5	6	7		8		9

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
F : Working oil with phosphoric acid ester

(2) Model No.
LS : Low watt type solenoid operated valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
02 : 1/4

(5) Spool symbol (refer to model list)

(6) Spool operating systems
C : Spring center type
A : Spring off-set type (with SOLa)
B : Spring off-set type (with SOLb)
N : No spring type (without detente)
D : No spring type (with detente)

(7) Voltage mark (refer to solenoid specifications table)

(8) Design number (the design number is subject to change)

(9) Option mark ★1
C : DIN connector type (without lamp)
CL : DIN connector type (with lamp)
CI : DIN connector without plug
N : with surge killer ★2
E : with earth terminal (coping with CE standards) ★3

Note) ★1 When more than two options are doubled, line up in the alphabetical order.
★2 Surge killer is only applied to a terminal box type.
★3 A product coping with CE standards with an earth terminals is only the case that the voltage mark is A or P. (Spool operating systems except A or P don't cope with CE standards)

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate ★4 L/min	Permissible back pressure MPa {kgf/cm²}	Max. switching frequency cycle/min
LS-G02	1/4	7 {70}	30 (15)	7 {70}	240

Note) ★4 Spool method : Max. flow rate at 66C of working method is 15L/min.

(7) : Solenoid specifications

Voltage mark	Power supply voltage	Starting current A	Holding current A	Holding watt W	Permissible volt variation %
A	AC100V(50Hz)	1.13	0.31	12.0	80~110
	AC100V(60Hz)	1.02	0.22	8.5	90~121
	AC110V(60Hz)	1.13	0.26	11.2	82~110
B	AC200V(50Hz)	1.13	0.31	12.0	80~110
	AC200V(60Hz)	1.02	0.22	8.5	90~121
	AC220V(60Hz)	1.13	0.26	11.2	82~110
P	DC24V	—	0.216	5.2	90~110

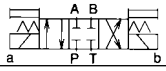
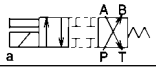
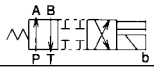
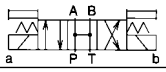
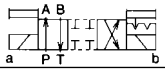
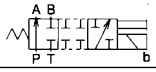
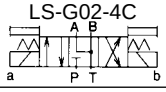
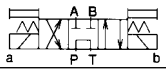
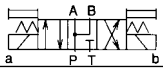
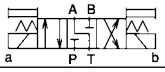
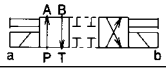
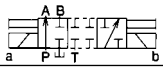
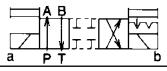
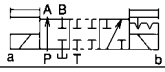
Time rating	Insluation resist.	Dielectric spec.	Insulation level.
Continuous	50 MΩ	AC1500V 1min	B class

Note) ○The current and watts are at 20°C.
○The starting current is the value when the moving iron core is at farthest place from the rigid iron core.

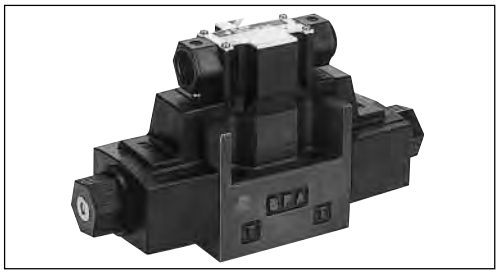
Weight (kg)

Double solenoid		Single solenoid	
AC	DC	AC	DC
1.6	2.2	1.3	1.6

(5) : Model list

Model code JIS hydraulic symbols		
Spool operating method		
C,N,D type	A type	B type
LS-G02-2C 	LS-G02-2A 	LS-G02-2B 
LS-G02-3C 	LS-G02-20A 	LS-G02-20B 
LS-G02-4C 	—	—
LS-G02-44C 	—	—
LS-G02-66C 	—	—
LS-G02-7C 	—	—
LS-G02-8C 	—	—
LS-G02-9C 	—	—
LS-G02-2N 	—	—
LS-G02-20N 	—	—
LS-G02-2D 	—	—
LS-G02-20D 	—	—

Solenoid operated valve



Features

- Realized high pressure and large flow rate such as 35MPa {350kgf/cm²}, 100L/min. (G02), 160L/min. (G03).
- Mostly suits for the structure not only with dust-proof and water-proof complying with IEC Pub529 IP65, but also coping with Europe safety standards (CE).

Nomenclature

*	-	KSO	-	G	**	-	**	*	*	-	**	-	***	-	***
1		2		3	4		5	6	7		8		9		10

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
H : Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
KSO : K series solenoid operated valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
02 : 1/4
03 : 3/8

(5) Spool method (refer to model list)

(6) Spool operating systems
C : Spring center type
A : Spring off-set type (with SOLa)
B : Spring off-set type (with SOLb)
N : No spring type (without detente)
D : No spring type (with detente)

(7) Voltage mark (refer to solenoid specifications table)

(8) Design number (design number is subject to change)
20 : Nominal diameter 03 (3/8)
30 : Nominal diameter 02 (1/4)

(9) Option mark (refer to the option mark list)

(10) Auxiliary spool symbol (refer to the model list)

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Max. switching frequency			Insulation skin
					AC, DC	With rectifier	Surge killer built-in DIN connector with lump	
KSO-G02	1/4	35 {350}	100	17.5 {175}	240	120	100	IEC Pub529 IP65
KSO-G03	3/8	(25 {250}) ★1	160 (DC), 130 (AC)	16 {160}			60	

Note) ★1 Max. operating pressure: Spool symbol/operating method 5C, 66C or 51C is 25MPa {250kgf/cm²}.

(7) : Solenoid specifications

● KSO-G02

Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %	Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %
A	AC100V (50Hz)	2.42	0.51	21.5	80~110	M	AC230V (50Hz)	1.05	0.22	21.5	80~110
	AC100V (60Hz)	2.14	0.37	18	90~121		AC230V (60Hz)	0.93	0.16	18	90~120
	AC110V (60Hz)	2.35	0.44	22.5	82~110						
B	AC200V (50Hz)	1.21	0.26	21.5	80~110	N	DC12V	—	2.35	28.2	90~110
	AC200V (60Hz)	1.07	0.19	18	90~121	P	DC24V	—	1.22	29.2	90~110
	AC220V (60Hz)	1.18	0.22	22.5	82~110	Q	DC48V	—	0.61	29.3	90~110
C	AC110V (50Hz)	2.2	0.46	21.5	80~110	R	DC100V	—	0.35	34.8	90~110
D	AC220V (50Hz)	1.1	0.23	21.5	80~110	S	DC110V	—	0.32	35	90~110
J	AC240V (50Hz)	1.01	0.21	21.5	80~110	T	DC200V	—	0.18	35.4	90~110
	AC240V (60Hz)	0.89	0.15	18	90~120	U	DC220V	—	0.15	33.6	90~110
K	AC120V (50Hz)	2.02	0.43	21.5	80~110	E	AC100V with rectifier	—	0.38	33.5	90~110
	AC120V (60Hz)	1.78	0.31	18	90~120	F	AC110V with rectifier	—	0.34	32.8	90~110
L	AC115V (50Hz)	2.1	0.44	21.5	80~110	G	AC200V with rectifier	—	0.2	36.8	90~110
	AC115V (60Hz)	1.86	0.32	18	90~120	H	AC220V with rectifier	—	0.17	34	90~110

(7) : Solenoid specification table

● KSO-G03

Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %	Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %
A	AC100V (50Hz)	5.7	0.88	37	80~110	M	AC230V (50Hz)	2.5	0.35	37	80~110
	AC100V (60Hz)	4.9	0.64	33	90~121		AC230V (60Hz)	2.1	0.26	33	90~120
	AC110V (60Hz)	5.4	0.77	41	82~110						
B	AC200V (50Hz)	2.9	0.44	37	80~110	N	DC 12V	—	3.08	37	90~110
	AC200V (60Hz)	2.4	0.32	33	90~121	P	DC 24V	—	1.6	38	90~110
	AC220V (60Hz)	2.7	0.39	41	82~110	Q	DC 48V	—	0.77	37	90~110
C	AC110V (50Hz)	5.2	0.74	37	80~110	R	DC 100V	—	0.37	37	90~110
D	AC220V (50Hz)	2.6	0.37	37	80~110	S	DC 110V	—	0.34	37	90~110
J	AC240V (50Hz)	2.4	0.34	37	80~110	T	DC 200V	—	0.19	38	90~110
	AC240V (60Hz)	2	0.25	33	90~120	U	DC 220V	—	0.17	38	90~110
K	AC120V (50Hz)	4.8	0.68	37	80~110	E	AC100V with rectifier	—	0.42	37	90~110
	AC120V (60Hz)	4.1	0.5	33	90~120	F	AC110V with rectifier	—	0.39	38	90~110
L	AC115V (50Hz)	5	0.7	37	80~110	G	AC200V with rectifier	—	0.2	36	90~110
	AC115V (60Hz)	4.3	0.52	33	90~120	H	AC220V with rectifier	—	0.19	37	90~110

Note) ○Current and power are at 20°C.
○The starting current is the value when the moving iron core is at farthest place.

Time rating	Dielectric resistance	Dielectric characteristics	Insulation class	
			KSO-G02	KSO-G03
Continuous	50 MΩ	AC1500V one min	B class (Coils: AC: H class, DC: F class)	B class (Coils: H class)

(9) : Option mark table

Option mark	Option' contents					KSO-G02	KSO-G03	Note
No mark	Terminal box type	With lump	Without earth terminal		Without surge killer	○	○	
N					With surge killer	○	○	
NR					Surge killer with resistance	○	○	★2
E			With earth terminal	Coping with CE standards	Without surge killer	○	○	★3
EN					With surge killer	○	○	★3
ENR					Surge killer with resistance	○	○	★2, 3
QR			With quick return circuit built-in rectifier			—	○	★4
C	DIN connector type	Without lump	With earth terminal		Without surge killer	○	○	
CE				Coping with CE standards		○	○	★3
CL		With lump				○	○	
CLE				Coping with CE standards		○	○	★3
N-CL					With surge killer	○	—	
N-CLE				Coping with CE standards		○	—	★3
CI	DIN connector type	With quick return circuit built-in rectifier				○	○	
L	Lead wire type	Without lump	Without earth terminal		Without surge killer	○	○	
8		Set bolts: M8				—	○	

Note) ★2 Applies only when the voltage mark is P.
★3 Products coping with CE standards are applied only when the voltage mark is A or P.
★4 Applies when the voltage mark is E, F, G, or H. Exclusive use driver is attached for this option. (One driver is attached to one solenoid).
Model : SSQ-101 (Voltage mark : E, F)
Model : SSQ-201 (Voltage mark : G, H)
○If the options are doubled more than two, line up them in the alphabetical order.

Weight (kg)

Application		KSO-G02		KSO-G03	
		AC	DC, with rectifier	AC	DC, with rectifier
Terminal box type	Double solenoid	1.8	2.2	4.4	5.8
	Single solenoid	1.5	1.7	3.7	4.4
DIN connector type	Double solenoid	1.8	2.1	4.3	5.7
	Single solenoid	1.4	1.6	3.6	4.3
Lead wire type	Double solenoid	1.7	2	4.3	5.7
	Single solenoid	1.4	1.5	3.6	4.3

(5)(10) : Model list

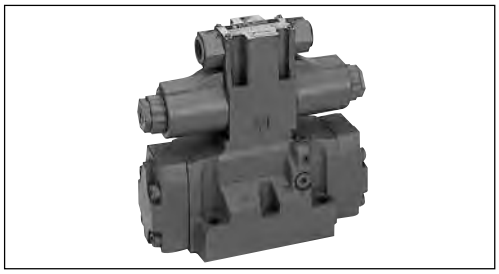
● KSO-G02

Model code JIS hydraulic symbols		
Spool operating method		
C, N, D type	A type	B type
KSO-G02-2C	KSO-G02-2A-H2	KSO-G02-2B-2T
KSO-G02-3C	KSO-G02-3A-H3	KSO-G02-3B-3T
KSO-G02-4C	KSO-G02-81A-H4	KSO-G02-8B-4T
KSO-G02-44C	KSO-G02-81A-H44	KSO-G02-8B-44T
KSO-G02-5C	KSO-G02-3A-T5	KSO-G02-3B-5H
KSO-G02-66C	KSO-G02-3A-T66	KSO-G02-3B-66H
KSO-G02-7C	KSO-G02-9A-H7	KSO-G02-91B-7T
KSO-G02-8C	KSO-G02-2A-H8	KSO-G02-8B-8T
KSO-G02-9C	KSO-G02-9A-H9	KSO-G02-2B-9T
KSO-G02-2N	—	KSO-G02-2B
KSO-G02-20N	—	KSO-G02-3B
KSO-G02-2D	—	KSO-G02-20B
KSO-G02-20D	—	—

● KSO-G03

Model code JIS hydraulic symbols		
Spool operating method		
C, D type	A type	B type
KSO-G03-2C	KSO-G03-2A-H2	KSO-G03-2B-2T
KSO-G03-3C	KSO-G03-3A-H3	KSO-G03-3B-3T
KSO-G03-4C	KSO-G03-81A-H4	KSO-G03-8B-4T
KSO-G03-44C	KSO-G03-81A-H44	KSO-G03-8B-44T
KSO-G03-5C	KSO-G03-3A-T5	KSO-G03-3B-5H
KSO-G03-66C	KSO-G03-3A-T66	KSO-G03-3B-66H
KSO-G03-7C	KSO-G03-9A-H7	KSO-G03-91B-7T
KSO-G03-8C	KSO-G03-2A-H8	KSO-G03-8B-8T
KSO-G03-9C	KSO-G03-9A-H9	KSO-G03-2B-9T
KSO-G03-2D	—	KSO-G03-2B
KSO-G03-20D	—	KSO-G03-3B
—	—	KSO-G03-20B

Solenoid controlled pilot operated directional control valve



Features

- Realize high pressure and large flow rate such as 35MPa {350kgf/cm²}, 300L/min.
- Mostly suits for the structure not only with dust-proof and water-proof complying with IEC Pub529 IP65, but also coping with Europe safety standards (CE).
- Since check valve built-in type for pilot pressure is available, a resistance valve for raising pilot pressure is not necessary.
- A hydro-center type is required, when a main valve spool will be demanded to return to the neutral securely.

Nomenclature

*	-	KSH	-	G	04	-	**	*	*	-	20	-	*	*	-	*
1		2		3	4		5	6	7		8		9	10		11

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents.
H : Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
KSH : K series solenoid controlled pilot operated directional control valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
04 : 1/2

(5) Spool method (refer to model list)

(6) Spool operating systems
C : Spring center type
B : Spring off-set type (with SOLb)
D : No spring type (with detente)
H : Hydro-center type

(7) Voltage mark (refer to solenoid specifications table)

(8) Design number (design number is subject to change)

(9) Main valve's option mark (refer to the mark table)

(10) Pilot solenoid operated valve's option mark
Refer to the option mark table KSO-G02 (page 29).

(11) Pilot stack valve mark (refer to the option mark table)

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Pilot pressure★1 MPa {kgf/cm²}		Permissible back pressure MPa {kgf/cm²}		Max. switching frequency cycle/min.
						External drain type	Internal drain type	
KSH-G04	1/2	35 {350}	300	①	0.8~25 {8~250}	21 {210}	16 {160}	120★2
				②	1.2~25 {12~250}			
				③	0.44~25 {4.4~250}			

Note) ★1 The pilot pressure differs depending on the following structure.

Spool operating system	Exhausting oil volume at spool switching cm³
C type	4
B, D type	8
H type	6

①	Spool operating system : C,B, and D type
②	Spool operating system : H type
③	With a check valve for pilot pressure (spool method: 3,5,6,66)

Note) ★2 Max. switching frequency of the surge killer built-in DIN connector type (option mark : N-CL (E)) is100 times/min.
Refer to KSO-G02 on page 29 for the solenoid operated valve's specifications.

(7) : Voltage mark table

Voltage mark	Supply voltage	Voltage mark	Supply voltage
A	AC100V (50/60Hz), AC110V (60Hz)	N	DC12V
B	AC200V (50/60Hz), AC220V (60Hz)	P	DC24V
C	AC110V (50Hz)	Q	DC48V
D	AC220V (50Hz)	R	DC100V
J	AC240V (50/60Hz)	S	DC110V
K	AC120V (50/60Hz)	T	DC200V
L	AC115V (50/60Hz)	U	DC220V
M	AC230V (50/60Hz)	E	AC100V (50/60Hz) with rectifier
		F	AC110V (50/60Hz) with rectifier
		G	AC200V (50/60Hz) with rectifier
		H	AC220V (50/60Hz) with rectifier

Refer to the solenoid specifications KSO-G02 on page 29 for the solenoid specifications.

(9)(11) : Option mark table

(9)Mark	Option contents
No mark	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
S	With stroke adjusting mechanism ★3
T	With check valve for pilot pressure

(11)Mark	Option contents ★4
No mark	Without stack valve
W	With MT-02W-60
R	With MG-02P-1-60-S02
RR	With MG-02P-1-60-R02
G	With MT-02W-60, MG-02P-1-60-S02
GR	With MT-02W-60, MG-02P-1-60-R02

Note) ○When option marks will be doubled by more than two, after separating (9) with (10), line up them in alphabetical order.
○TY and TZ will never be doubled.
★3 The valve with stroke regulating structure cannot cope with hydro-center.
★4 With MT-02W-60 : Use this If a shock of switching is required.
With MG-02P-1-60-*02 : Use this if the operating pressure is over 25MPa {250kgf/m^2}.

Weight (kg)

Application		AC	DC, with rectifier
Terminal box type	Double solenoid	9	9.4
	Single solenoid	8.7	8.9
DIN connector type	Double solenoid	9	9.3
	Single solenoid	8.6	8.8
Lead wire type	Double solenoid	8.9	9.2
	Single solenoid	8.6	8.7

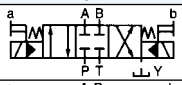
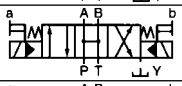
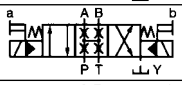
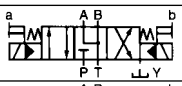
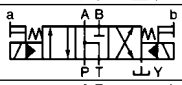
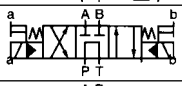
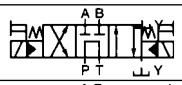
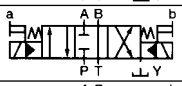
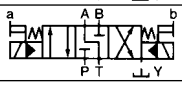
Note) If the following option is used, the weight becomes heavier corresponding to the weight in the table below.

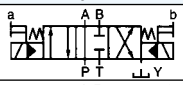
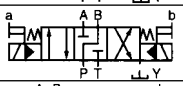
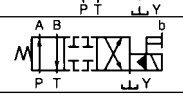
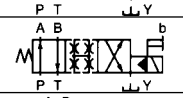
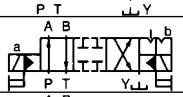
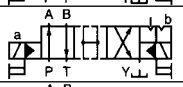
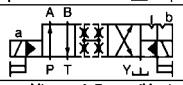
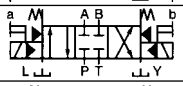
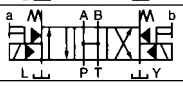
Application	Mark	Weight kg
Hydro-center type	H	1.3
With stroke adjusting mechanism	S	2.2
With MT-02W-60	W	1.4
With MG-02P-1-60-*02	R, RR	1.3
With MT-02W-60, MG-02P-1-60-*02	G, GR	2.7

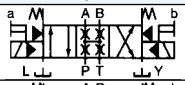
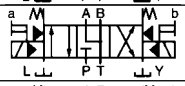
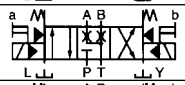
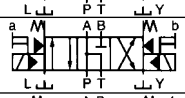
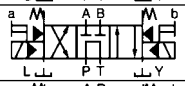
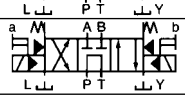
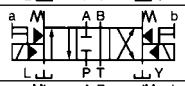
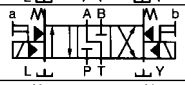
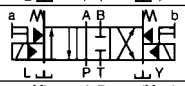
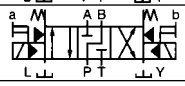
Pilot solenoid operated valve model code

Model code	Solenoid operated model code (*Voltage mark)
KSH-G04-**C*-20	KSO-G02-4C*-30
KSH-G04-**B*-20	KSO-G02-2B*-30
KSH-G04-**D*-20	KSO-G02-2D*-30
KSH-G04-**H*-20	KSO-G02-7C*-30

(5) : Model list

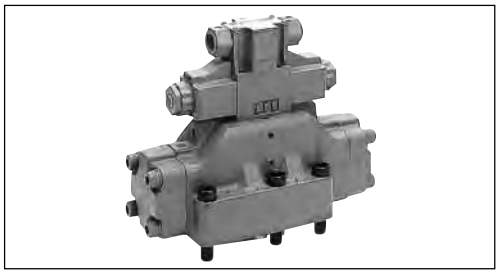
Model code	JIS symbols
KSH-G04-2C	
KSH-G04-3C	
KSH-G04-33C	
KSH-G04-4C	
KSH-G04-44C	
KSH-G04-5C	
KSH-G04-6C	
KSH-G04-66C	
KSH-G04-8C	
KSH-G04-81C	

Model code	JIS symbols
KSH-G04-9C	
KSH-G04-91C	
KSH-G04-2B	
KSH-G04-3B	
KSH-G04-33B	
KSH-G04-2D	
KSH-G04-3D	
KSH-G04-33D	
KSH-G04-2H	
KSH-G04-3H	

Model code	JIS symbols
KKSH-G04-33H	
KSH-G04-4H	
KSH-G04-44H	
KSH-G04-5H	
KSH-G04-6H	
KSH-G04-66H	
KSH-G04-8H	
KSH-G04-81H	
KSH-G04-9H	
KSH-G04-91H	

Note) ○In a transient period of spool method 6, all ports are blocked and "66" is at all ports open.

Solenoid controlled pilot operated directional control valve



Features

- As a polot valve adopts a high reliable KSO-G02, it polongs a life and can get secure operated.
- In addition to dust-proof and water-proof structure compliying with IEC Pu529 and Ip65, it best suits the products coping with The Europe safety standards (CE).

Nomenclature

*	-	JS	-	G	06	-	**	*	*	-	**	-	*
1		2		3	4		5	6	7		8		9

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
H : Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JS : J series solenoid controlled pilot operated directional control valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
06 : 3/4

(5) Spool method (refer to model list)

(6) Spool operating systems
C : Spring center type
B : Spring off-set type (with SOLb)
N : No spring type (without detente)

(7) Voltage mark (refer to solenoid specifications table)

(8) Design number (design number is subject to change)
75 : < In case of 21MPa {210kgf/cm²} >
85 : < In case of 25MPa {250kgf/cm²} >

(9) Option mark (refer to mark table)

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Pilot pressure MPa {kgf/cm²}	Permissible back pressure MPa {kgf/cm²}		Exhausting oil spool switching cm³		
					External drain type	Internal drain type	①	②	③
JS-G06 75	3/4	21 {210}	300	0.45~21 {4.5~210}	21 {210}	10 {100}	8.8	10.7	17.6
JS-G06 85		25 {250}		0.45~25 {4.5~250}	25 {250}	16 {160}			

Note) Pilot oil exhaust volume
① Spool operating method : C type (In case spool type · operating type are except 6C)
② Spool operating method : C type (In case spool type · operating type are 6C)
③ Spool operating method : B, N type

Refer to KSO-G02 (page 29) for the solenoid operated valve.

(7) : Voltage mark table

Voltage mark	Supply voltage	Voltage mark	Supply voltage
A	AC100V (50/60Hz), AC110V (60Hz)	N	DC12V
B	AC200V (50/60Hz), AC220V (60Hz)	P	DC24V
C	AC110V (50Hz)	Q	DC48V
D	AC220V (50Hz)	R	DC100V
J	AC240V (50/60Hz)	S	DC110V
K	AC120V (50/60Hz)	T	DC200V
L	AC115V (50/60Hz)	U	DC220V
M	AC230V (50/60Hz)	E	AC100V (50/60Hz) with rectifier
		F	AC110V (50/60Hz) with rectifier
		G	AC200V (50/60Hz) with rectifier
		H	AC220V (50/60Hz) with rectifier

Refer to KSO-G02 (page 29) solenoid specifications.

(9) : Option mark table

Mark	Option contents
No mark	Internal pilot, external drain type
X	Internal pilot, internal drain type
Y	External pilot, external drain type
Z	External pilot, internal drain type
D	No spring type (with detente)
P	With spool rock mechanism (solenoid operated valve)

Pilot solenoid operated valve model No.

Model code	Adopted solenoid valve model code (*: voltage mark)
JS-G06-**C-**	KSO-G02-4C*-30
JS-G06-**B-**	KSO-G02-2A*-30
JS-G06-**N-**	KSO-G02-2N*-30
JS-G06-**N-**-D	KSO-G02-2D*-30

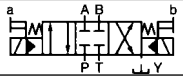
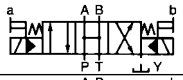
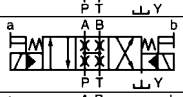
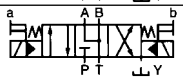
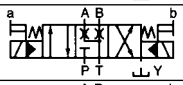
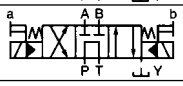
Refer to KSO-G02 (page 29) option mark for the pilot solenoid operated valve's option.

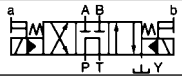
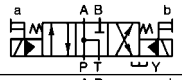
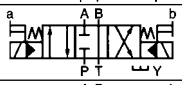
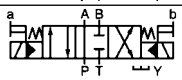
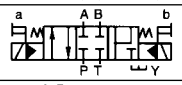
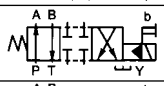
Note) ○If the options are doubled more than two, line up them in the alphabetical order.

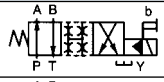
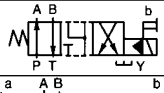
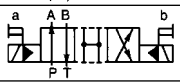
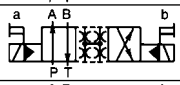
Weight (kg)

Application		JS-G06	
		AC	DC, with rectifier
Terminal box type	Double solenoid	13.3	13.7
	Single solenoid	13	13.2
DIN connector	Double solenoid	13.3	13.6
	Single solenoid	12.9	13.1
Lead wire type	Double solenoid	13.2	13.5
	Single solenoid	12.9	13.1

(5) : Model list

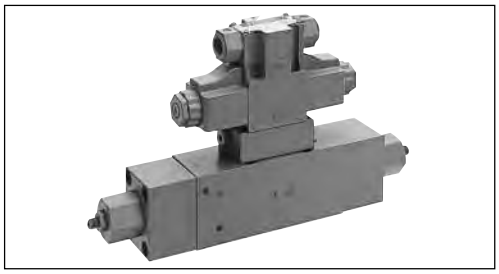
Model code	JIS symbols
JS-G06-2C	
JS-G06-3C	
JS-G06-33C	
JS-G06-4C	
JS-G06-44C	
JS-G06-5C	
JS-G06-6C	

Model code	JIS symbols
JS-G06-66C	
JS-G06-7C	
JS-G06-8C	
JS-G06-9C	
JS-G06-27C	
JS-G06-2B	
JS-G06-3B	

Model code	JIS symbols
JS-G06-33B	
JS-G06-4B	
JS-G06-2N	
JS-G06-3N	
JS-G06-33N	
JS-G06-4N	

Note) ○In a transient period of spool method 6, all ports are blocked and "66" is at all ports open.

Solenoid controlled pilot operated directional control valve



Features

- The combined application with pressure compensation valve (MUV, MDM) makes it possible to gain the flow characteristics with pressure compensation corresponding to the regulating amount of the flow adjusting screw.
- This valve by itself has a shock-less effect as a solenoid pilot switching valve. If 02 size stack valve (throttle valve, reducing valve) is used for a pilot system, more efficient shock-less effect can be expected.
- Possible to stack in multiple linking to a solenoid proportional switching valve and multiple types.

Nomenclature

*	-	MEP	**	*	*	*	*	*	*	-	60	-	*	*
1		2	3	4	5	6	7	8	9		10		11	12

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
H : Working oil with water/glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
MEP :Solenoid controlled pilot operated directional control valve

(3) Nominal diameter
12 :1/2
16 : 3/4
20 : 1
25 : $1^1/_4$
32 : $1^1/_2$

(4) Spool symbol (refer to model list)

(5) Flow type (refer to the specifications)
1 : Q1 flow
2 : Q2 flow
3 : QMAX flow

(6) Spool operating systems
C : Spring center type
B : Spring off-set type (with SOLb)
N : No spring type (without detente)

(7) Voltage mark (refer to solenoid specifications table)

(8) Pilot · Drain mark
X : Internal pilot, internal drain type
Y : External pilot, internal drain type
Z : External pilot, internal drain type
N : Internal pilot, external drain type

*The combination of a pilot and drain cannot be changed.

(9) Pilot stack valve mark
O : Without stack valve
W : with MT-02W-55
P : with MG-02P-1-55
G : with MT-02W-55, MG-02P-1-55

(10) Design number (design number is subject to change)

(11) Spool differential pressure mark
No mark : Differential pressure 0.6MPa {6kgf/cm²}
3 : Differential pressure 0.3MPa {3kgf/cm²}

(12) Option mark of pilot solenoid operated valve ★1
No mark : Terminal box type
D : No spring type (with detente)

Regarding options except above options, refer to KSO-G02 (page 29) option mark table.

Specifications

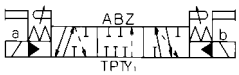
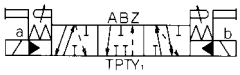
Model No.	Nom. Dia.	Connections	Max. operating pressure★1 MPa {kgf/cm²}	Max. flow rate L/min			Pilot pressure★1 MPa {kgf/cm₂}	Permissible back pressure MPa {kgf/cm²}	Exhausting oil volume at spool switching cm³
				Q1	Q2	QMAX			
MEP12	12	1/2	21 {210}	25	50	75	8~14 {80~140}	10 {100}	1.4
MEP16	16	3/4		50	100	130			3.1
MEP20	20	1		80	160	200			5.9
MEP25	25	$1^1/_4$		125	250	300			9.9
MEP32	32	$1^1/_2$		200	400	500			15.4

Note) ★1 When the max. operating pressure exceeds 14MPa {140kgf/cm²}, choose an external pilot type with pilot pressure in 14Mpa {140kgf/cm²} or less. In case that the pressure in an internal pilot exceeds 14MPa {140kgf/cm²}, choose an option with MG-02P-1-55 (Option mark: P).

★2 The max. flow rate Q1 and Q2 show the case with inlet valve block having a spring for a differential pressure 0.6MPa {6kgf/cm²} or 0.3MPa {3kgf/cm²}, and QMAX. means the case with a inlet valve block having a spring for a differential pressure MPa {6kgf/cm²}. When applying multiple linkage with a pressure compensation valve, there will be a case that the flow rate will not reach the maximum flow rate in the second link or later. Have a guideline in the 3rd link with 80% of the max. flow rate.

Refer to KSO-G02 (page 29) for the solenoid operated valve's specifications.

(4) : Spool type table

Spool method meter in spool ★3	JIS hydraulic symbols	Spool type meter out spool ★4	JIS hydraulic symbols
A		P	
B		Q	
C		R	
D		S	
F			

Note) ★3 Although the max. open levels from P to A, from P to B depend on Q1, Q2, or QMAX, the open levels from A to T, from B to T is only influenced by QMAX.

★4 Although the max. open level from A to T and from B to T differ depending on Q1, Q2 and QMAX, the open level of either from P to A, and from P to B corresponds to three times of QMAX only.

○ Spool corresponds to a solenoid proportional switching valve (MEV).

(7) : Voltage mark table

Voltage mark	Supply voltage	Voltage mark	Supply voltage
A	AC100V (50/60Hz), AC110V (60Hz)	N	DC12V
B	AC200V (50/60Hz), AC220V (60Hz)	P	DC24V
C	AC110V (50Hz)	Q	DC48V
D	AC220V (50Hz)	R	DC100V
J	AC240V (50/60Hz)	S	DC110V
K	AC120V (50/60Hz)	T	DC200V
L	AC115V (50/60Hz)	U	DC220V
M	AC230V (50/60Hz)	E	AC100V (50/60Hz) with rectifier
		F	AC110V (50/60Hz) with rectifier
		G	AC200V (50/60Hz) with rectifier
		H	AC220V (50/60Hz) with rectifier

Refer to KSO-G02(page 29) solenoid specifications for the solenoid specs.

Weight (kg)

Model No.	①	②	③	④
MEP12	6.5	7.9	7.8	9.2
MEP16	9	10.4	10.3	11.7
MEP20	14.4	15.8	15.7	17.1
MEP25	19.1	20.5	20.4	21.8
MEP32	27.9	29.3	29.2	30.6

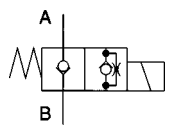
Note) Weight
①Pilot stack valve mark: O (without stack valve)
②Pilot stack valve mark: W (with MT-02W-55)
③Pilot stack valve mark: P (with MG-02P-1-55)
④Pilot stack valve mark: G (with MT-02W-55, MG-02P-1-55)

Pilot solenoid operated valve model No.

Model code	Adopted solenoid valve model code (*: voltage mark)
MEP****C***-60-**	KSO-G02-4C*-30
MEP****B***-60-**	KSO-G02-8B*-30-4T
MEP****N***-60-**	KSO-G02-2N*-30
MEP****N***-60-*D	KSO-G02-2D*-30

Seat style solenoid operated valve

JIS symbols



Features

- Fluid adhering phenomena will never happen even if it is used for long time in pressurized condition.

Nomenclature

*	-	JSC	-	*	01	-	2	*	-	10	-	*
1		2		3	4		5	6		7		8

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents
F : Working oil with phosphoric acid ester

(2) Model No.
JSC : J series seat style solenoid operated valve

(3) Connections
G : Gasket attached type
C : Cartridge attached type

(4) Nominal diameter
01 : 1/8

(5) Max. operating pressure
2 : 25Mpa {250 kgf/cm^2}

(6) Voltage mark (refer to solenoid specifications table)

(7) Design number (design number is subject to change)

(8) Option mark (refer to mark table)
No mark : Lead wire type
C : DIN connector type (without lump)
CL : DIN connector type (with lump)

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm^2}	Max. flow rate L/min	Max. switching frequency. cycle/min	Leak amount cm^3/min	Weight kg	
						Gasket attached type (G)	Cartridge attached type (C)
JSC-*01	1/8	25 {250}	15	240	0.25 or less	0.97	0.27

(6) : Solenoid specifications table

Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %	Voltage mark	Supply voltage	Starting amperes A	Holding current A	Holding power W	Permissible volts variation %
A	AC100V (50Hz)	0.362	0.258	17	80~110	D	AC220V (50Hz)				
	AC100V (60Hz)	0.318	0.208	14	90~121		AC230V(60Hz)				
	AC110V (60Hz)	0.356	0.244	18	82~110		AC240V(60Hz)				
B	AC200V (50Hz)	0.183	0.13	17	80~110	N	DC 12V	—	1.48	17.8	90~110
	AC200V (60Hz)	0.158	0.104	14	90~121	P	DC 24V	—	0.74	17.8	90~110
	AC220V (60Hz)	0.178	0.121	18	82~110	Q	DC 48V	—			90~110
C	AC110V (50Hz)					R	DC 100V	—			90~110
	AC115V (60Hz)					S	DC 110V	—			90~110
	AC120V (60Hz)					T	DC 200V	—			90~110
J	AC240V (50Hz)					U	DC 220V	—			90~110

Note) Current or power are at 20°C.

Time ratings	Insulation resistance	Dielectric voltage	Insulation class
Continuous	50 MΩ	AC1500V one minute	B class (H class for coils)

Manually operated valve

Features

- Direction control valve to switch the oil flow direction by handling a spool with a manual arm directly.
- Combining with 02 size stack valve, possible to make structure of many kind of circuit.

Nomenclature

*	-	JM	-	G	02	-	*	*	-	20	-	*
1		2		3	4		5	6		7		8

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JM : J series manually operated valve

(3) Connections
G : Gasket attached type

(4) Nominal diameter
02 : 1/4

(5) Spool type (refer to model list)

(6) Spool operating systems
C : Spring center type
B : Spring off-set type (with SOLb)
N : No spring type (without detente) 3 positions valve
E : No spring type (with detente) 2 positions valve

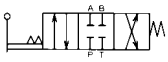
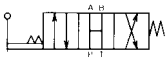
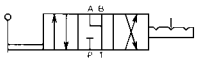
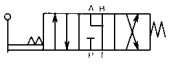
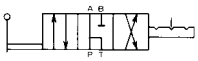
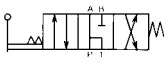
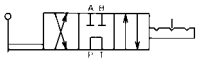
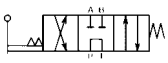
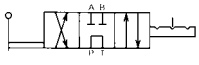
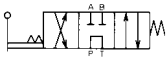
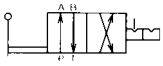
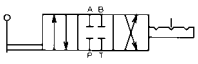
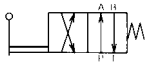
(7) Design number (design number is subject to change)

(8) Option mark
No mark : Lever A at port side
G : Lever B at port side

Specifications

Model No.	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Permissible back pressure MPa {kgf/cm²}	Weight kg
JM-G02	1/4	21 {210}	30	7 {70}	1.4

(5) : Model list

Model code	JIS symbols	Model code	JIS symbols
JM-G02-2C		JM-G02-3N	
JM-G02-3C		JM-G02-4N	
JM-G02-4C		JM-G02-5N	
JM-G02-5C		JM-G02-6N	
JM-G02-6C		JM-G02-66N	
JM-G02-66C		JM-G02-2E	
JM-G02-2N		JM-G02-2B	

Note) In the switching transient period of spool model and operating method 6C and 6N, all ports are blocked and in case of 66C and 66N, all port are opened.

Inline check valve

JIS symbols

Features

- Since when it is built in the line, if its reaches a clacking pressure, it lets a check valve push to open and flow oil to one direction, preventing a reverse stream.

Nomenclature

*	-	HDIN	-	*	**	-	**
1		2		3	4		5

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol contents
F : Working oil with phosphoric acid ester ★1

(2) Model No.
HDIN : J series inline check valve

(3) Connections
T : Screw connections
F : Flange connection

(4) Nominal diameter
03 : 3/8
06 : 3/4
10 : 1 1/4
12 : 1 1/2
16 : 2
24 : 3

(5) Clacking pressure mark ★2
05 : 0.05MPa {0.5kgf/cm²}
45 : 0.45MPa {4.5kgf/cm²}

Note) ★1 "F" is not necessary even for phosphoric acid ester oil in case of a screw connection.
★2 Regarding clacking pressure except above mentioned pressure, refer to clacking pressure tables.

(5) : Clacking pressure table

Mark	0	01	015	02	10	12	15	20	25	30	35	56	60	90
Model No.	Clacking pressure MPa {kgf/cm²}													
	0 {0}	0.01 {0.1}	0.015 {0.15}	0.02 {0.2}	0.1 {1}	0.12 {1.2}	0.15 {1.5}	0.2 {2}	0.25 {2.5}	0.3 {3}	0.35 {3.5}	0.56 {5.6}	0.6 {6}	0.9 {9}
HDIN-T03	○	—	—	○	○	—	○	○	—	—	○	○	○	○
HDIN-T06	○	—	○	○	○	—	○	○	—	—	○	○	○	○
HDIN-F06	○	—	○	○	○	—	○	○	—	—	○	○	○	○
HDIN-T10	○	—	—	○	○	○	○	○	○	○	○	—	○	—
HDIN-F10	○	—	—	○	○	○	○	○	○	○	○	—	○	—
HDIN-F12	○	—	—	—	○	—	○	○	—	—	○	—	—	—
HDIN-F16	○	—	—	○	○	—	○	○	○	—	○	—	○	—
HDIN-F24	○	○	—	—	○	—	—	○	—	—	○	—	—	—

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
HDIN-T03-**	3/8	21 {210}	30	0.3
HDIN-T06-**	3/4		75	0.7
HDIN-F06-**				3.2
HDIN-T10-**	1 1/4		190	2.7
HDIN-F10-**				6.9
HDIN-F12-**	1 1/2		240	13
HDIN-F16-**	2		370	16
HDIN-F24-**	3		1060	43

Note) The weight of flange connection type (F) includes flange and bolts.

Light angle check valve

JIS symbols

Features

- Since when it is built in the line, if its reaches a clacking pressure, it lets a check valve push to open and flow oil to one direction, preventing a reverse stream.

Nomenclature

*	-	JCA	-	*	**	-	**	-	20
1		2		3	4		5		6

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JCA : J series light angle check valve

(3) Connections
G : Gasket attached type
T : Screw connections
F : Flange connection

(4) Nominal diameter
03 : 3/8
06 : 3/4
10 : 1 1/4
16 : 2
24 : 3

(5) Clacking pressure mark ★1
04 : 0.04MPa {0.4kgf/cm²}
50 : 0.5MPa {5kgf/cm²}

(6) Design number (design number is subject to change)

Note) ★1 Refer to the clacking pressure table for the clacking pressure other than the above mention.

Specifications

Model code	Nom. Dia.	Max. Operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
JCA-G03-**-20	3/8	25 {250}	60	1.7
JCA-T03-**-20				0.9
JCA-G06-**-20	3/4		200	2.9
JCA-T06-**-20				1.7
JCA-F06-**-20				3.7
JCA-G10-**-20	1 1/4		400	5.5
JCA-T10-**-20				5.6
JCA-F10-**-20			500	7.6
JCA-F16-**-20	2		800	20
JCA-F24-**-20	3		1000	62.5

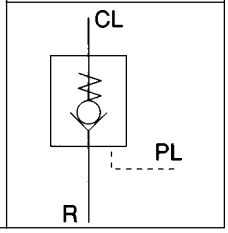
Note) The weight of flange connection type (F) includes flange and bolts.

(5) : Clacking pressure table

Mark	0	01	02	20	35
Model No.	Clacking pressure MPa {kgf/cm²}				
	0 {0}	0.01 {0.1}	0.02 {0.2}	0.2 {2}	0.35 {3.5}
JCA-*03	○	○	○	○	○
JCA-*06	○	○	—	○	○
JCA-*10	○	—	—	○	○
JCA-F16	○	—	—	○	○
JCA-F24	○	—	—	○	○

Pilot check valve

JIS symbols



Features

- When the pressure reaches a clacking pressure, it pushes a check valve to open and let oil flow only to one direction. Besides, oil can flow to reverse direction by pushing up the check valve caused by external pilot pressure.
- Decompression type, which opens a small check valve before a main valve will open, is available.

Nomenclature

*	-	JCP	*	-	*	**	-	**	-	20	-	*
1		2	3		4	5		6		7		8

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
JCP : J series pilot check valve

(3) Decompression mark
No mark : Direct operating type
D : Decompression type

(4) Connections
G : Gasket attached type
T : Screw connections
F : Flange connection

(5) Nominal diameter
03 : 3/8
06 : 3/4
10 : 1 1/4
16 : 2

(6) Clacking pressure mark
04 : 0.04MPa {0.4kgf/cm²}
20 : 0.2MPa {2kgf/cm²}
35 : 0.35MPa {3.5kgf/cm²}
50 : 0.5MPa {5kgf/cm²}

(7) Design number (design number is subject to change)

(8) Drain mark
No mark : External drain type
Z : Internal drain type

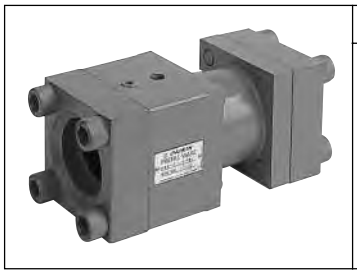
*The combination of external drain type and internal drain type cannot be exchanged.

Specifications

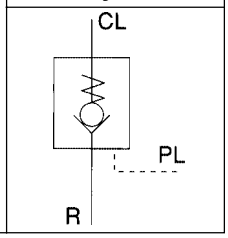
Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Area rate ★1	Weight kg
JCP(D)-G03-**-20	3/8	25 {250}	60	①2.47:1 ②30.25:1	3.3
JCP(D)-T03-**-20					3
JCP(D)-G06-**-20	3/4		200	①2.46:1 ②31.36:1	5.4
JCP(D)-T06-**-20					5.5
JCP(D)-F06-**-20					6.6
JCP(D)-G10-**-20	1 1/4		400	①2.50:1 ②29.47:1	8.5
JCP(D)-T10-**-20		21 {210}			9.6
JCP(D)-F10-**-20		25 {250}			11.6
JCP(D)-F16-**-20	2		800	①2.48:1 ②27.56:1	31.9

Note) ★1 Area rate
① Pilot piston: Large check valve
② Pilot piston: Small check valve (Decompression type)

Prefill valve



JIS symbols



Features

- This valve is used as a suction/exhaust valve between an oil hydraulic cylinder and a tank. In a quick forward stroke of a large press machine, this valve sucks oil from a tank to an oil hydraulic cylinder, while in an pressurization process, it obstructs a reverse flow from a hydraulic cylinder to a tank , and in a return process, exhausting oil from a hydraulic cylinder to a tank.

Nomenclature

*	-	HPF	-	F	**	-	*	-	**	-	*
1		2		3	4		5		6		7

(1) Nomenclature of applied fluid
No mark : Working oil with petroleum contents, Working oil with water / glycol contents
F : Working oil with phosphoric acid ester

(2) Model No.
HPF : H series pre-fill valve

(3) Connections
F : Flange connection

(4) Nominal diameter
16 : 2
20 : $2^1/_2$
24 : 3
32 : 4

(5) Clacking pressure mark
1 : 0.005MPa {0.05kgf/cm^2}
2 : 0.015MPa {0.15kgf/cm^2}

(6) Design number (design number is subject to change)
10 : Nominal diameter 16 (2), 24 (3), 32 (4)
20 : Nominal diameter 20 ($2^1/_2$)

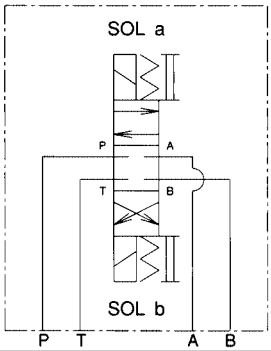
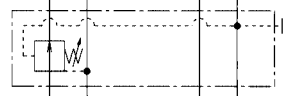
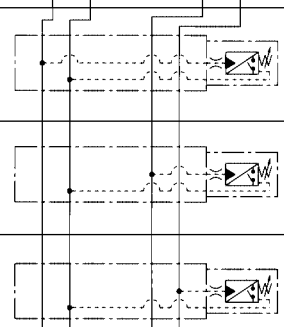
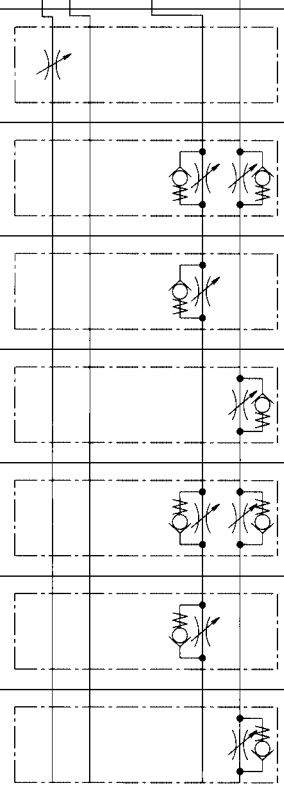
(7) Option mark
No mark : with flange ★1
N : without flange
Note) ★1 In case that flange is attached, R side flange or CL side flange is attached to the nominal diameter 16, 20 and 24, while R side flange is attached to the nominal diameter 32.

Specifications

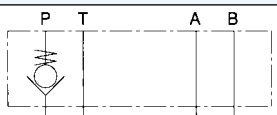
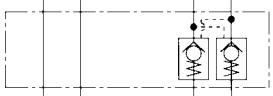
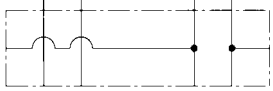
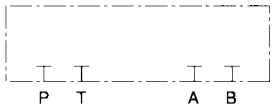
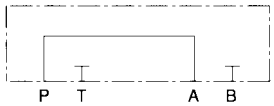
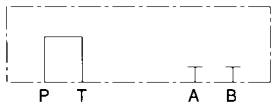
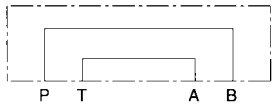
Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm^2}			Max. flow rate L/min		Area ratio	Weight ★2
		CL side	R side	Pilot pressure	R→CL	CL→R	Seat: Pilot piston	kg
HPF-F16-*-10	2	25 {250}	2 {20}	25 {250}	160	320	1.66:1	6.1
HPF-F20-*-20	$2^1/_2$				320	640	2.37:1	12
HPF-F24-*-10	3				500	1000	2.93:1	15.5
HPF-F32-*-10	4				900	1800	3.05:1	18.9

Note) ★2 It doesn't include weights of flange and bolts.

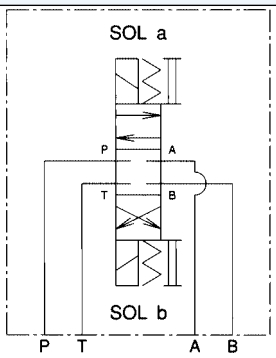
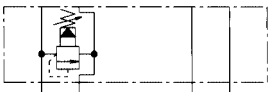
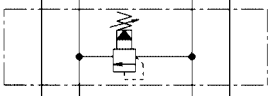
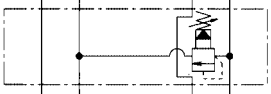
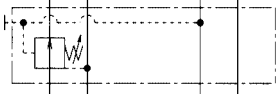
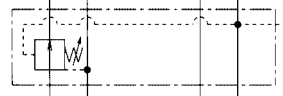
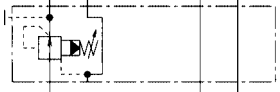
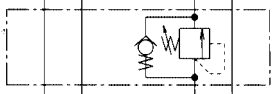
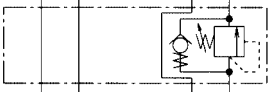
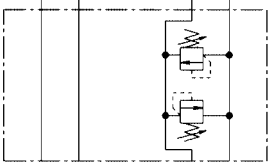
01 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	Solenoid operated valves	MS-G01		7 {70}	9	—	—	—
Pressure control valves	P port reducing valves	MG-01P-**-10		7 {70}	9	30	0.47	Pressure adjusting range 03:0.3~3.5 {3~35} 1:0.8~7 {8~70}
	A port reducing valves	MG-01A-**-10						
	B port reducing valves	MG-01B-**-10						
	P port pressure switches	MPS-01P-**-10		16 {160}	9	35	1.2	Pressure adjusting range 1:0.5~7 {5~70} 2:0.5~16 {5~160}
	A port pressure switches	MPS-01A-**-10						
	B port pressure switches	MPS-01B-**-10						
Flow control valves	P port throttle valves	MT-01P-10		7 {70}	9	30	0.42	—
	Meter out AB port throttle valves	MT-01W-10					0.46	Check valve Clacking pressure 0.05 {0.5}
	Meter out A port throttle valves	MT-01A-10					0.43	
	Meter out B port throttle valves	MT-01B-10						
	Meter in AB port throttle valves	MT-01Wi-10					0.46	
	Meter in A port throttle valves	MT-01Ai-10					0.43	
	Meter in B port throttle valves	MT-01Bi-10						

01 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	P port check valves	MC-01P-**-10		7 {70}	9	30	0.4	Check valve Clacking pressure 10:0.1 {1} 50:0.5 {5}
	T port check valves	MC-01T-**-10						
	AB port pilot check valves	MP-01W-**-10					0.42	Check valve Clacking pressure 20:0.2 {2} 50:0.5 {5}
	A port pilot check valves	MP-01A-**-10						
	B port pilot check valves	MP-01B-**-10						
Blocks/set bolts	P port Pressure take out blocks	BG-01P-10		7 {70}	9	30	0.4	—
	A, B, port pressure take out blocks	BG-01AB-10						
	Blocking blocks	BS-01-10			—	36	0.48	
	Bypass blocks	BD-01PA-10			9			
	Bypass blocks	BD-01PT-10						
	Bypass blocks	BE-01-10						
	Manifold blocks	BT-*01-10	—			70	—	*Linkage number (1~6 linkages)
	Set bolts	HB010*	—	—	—	—	—	Hexagonal bolts with a hole: M5

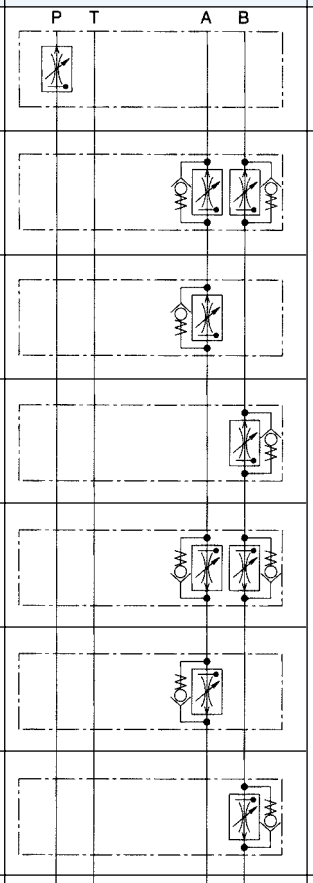
02 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	Solenoid operated valves	KSO-G02		35 {350}	100	—	—	—
Pressure control valves	P port relief valves	MR-02P-*-55		25 {250}	40	40	1.4	Pressure adjusting range 1:*~7 {*~70} 2:3.5~16 {35~160} 3:3.5~25 {35~250}
	A port relief valves	MR-02A-*-55						
	B port relief valves	MR-02B-*-55						
	P port reducing valves	MG-02P-**-55					1.1	Pressure adjusting range 03:0.3~3.5 {3~35} 1:0.7~7 {7~70} 2:3.5~16 {35~160}
	A port reducing valves	MG-02A-**-55						
	B port reducing valves	MG-02B-**-55						
	P port low pressure reducing valves	MGB-02P-03-55		7 {70}	20		1.4	Pressure adjusting range 03:0.15~3.5 {1.5~35}
	A port low pressure reducing valves	MGB-02A-03-55						
	B port low pressure reducing valves	MGB-02B-03-55						
	P port sequence valves	MQ-02P-2*-55		25 {250}	40		1.1	Pressure adjusting range 1:0.8~7 {8~70} 3:3.5~21 {35~210}
	A port counter balance valves	MQC-02A-2-55					1.4	Pressure adjusting range 2:0.7~14 {7~140} check valve clacking pressure 0.05 {0.5}
	B port counter balance valves	MQC-02B-2-55						
	Brake valves	MB-02W-*-65		35 {350}	20		1.5	Pressure adjusting range 1:0.8~7 {8~70} 3:3.5~21 {35~210}

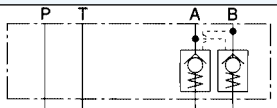
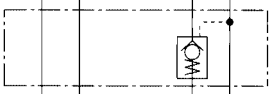
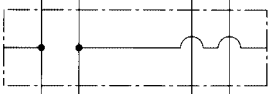
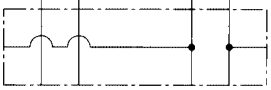
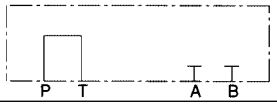
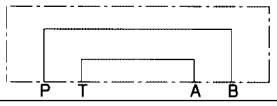
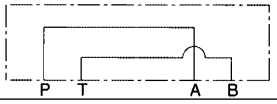
02 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Pressure control valves	P port pressure switch	MPS-02P-**-60	P T A B		40	40	1.8	Pressure adjusting range 1:0.5~7 {5~70} 2:0.5~16 {5~160} 3:0.8~25 {8~250}
	AB port pressure switch	MPS-02W-**-60						
	A port pressure switch	MPS-02A-**-60						
	B port pressure switch	MPS-02B-**-60						
Flow control valves	P port throttle valves	MT-02P-65		35 {350}	40	40	0.9	—
	T port throttle valves	MT-02T-65						
	P port throttle valves with check valve	MTC-02P-55		25 {250}			1.0	Check valve Clacking pressure 0.04 {0.4}
	Meter out AB port throttle valves	MT-02W-55					1.3	Check valve Clacking pressure 0.08 {0.8}
	Meter out A port throttle valves	MT-02A-55					1.0	
	Meter out B port throttle valves	MT-02B-55						
	Meter in AB port throttle valves	MT-02Wi-55					1.3	
	Meter in A port throttle valves	MT-02Ai-55					1.0	
	Meter in B port throttle valves	MT-02Bi-55						
	Meter out AB port throttle valves	MT-02W-55-32 MT-02W-55-33					1.4	

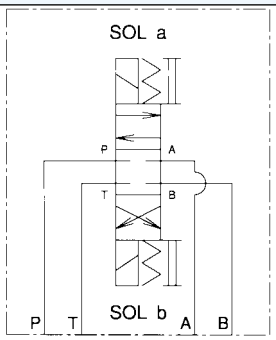
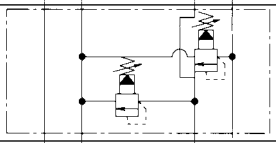
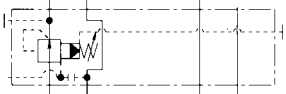
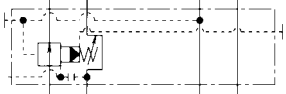
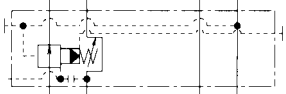
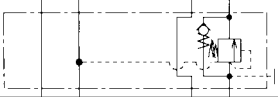
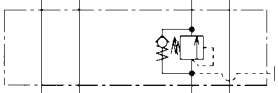
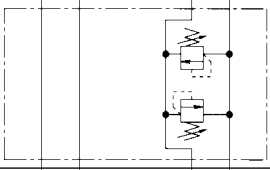
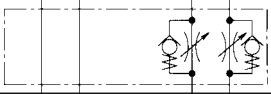
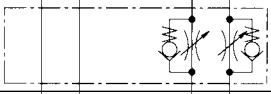
02 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Flow control valves	P port flow adjusting valve	MF-02P-45		21 {210}	20	40	1.2	—
	Meter out AB port flow adjusting valve	MF-02W-50		25 {250}	40		2	Check valve Clacking pressure 0.08 {0.8}
	Meter out A port flow adjusting valve	MF-02A-50					1.8	
	Meter out B port flow adjusting valve	MF-02B-50						
	Meter in AB port flow adjusting valve	MF-02Wi-50					2	
	Meter in A port flow adjusting valve	MF-02Ai-50					1.8	
	Meter in B port flow adjusting valve	MF-02Bi-50						
Direction control valves	P port check valve	MC-02P-**-65		35 {350}	40	40	0.9	Check valve Clacking pressure 05:0.05 {0.5} 50:0.5 {5}
	A port check valve	MC-02A-**-65						
	B port check valve	MC-02B-**-65						
	T port check valve	MC-02T-**-65						
	P-A port check valve	MC-02PA-**-65						
	P-B port check valve	MC-02PB-**-65						
	AB port check valve	MC-02AB-**-55		25 {250}			1.1	Check valve Clacking pressure 05:0.05 {0.5} 50:0.5 {5}
	Vacuum check valve	MC-02W-55					1	Check valve Clacking pressure 0.015 {0.15}

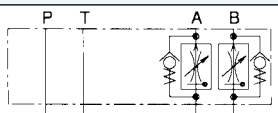
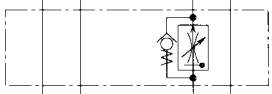
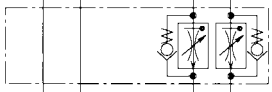
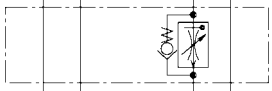
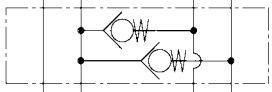
02 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	AB port pilot check valve	MP-02W-**-55		25 {250}	40	40	1.1	Check valve Clacking pressure 20:0.2 {2} 50:0.5 {5}
	A port pilot check valve	MP-02A-**-55						
	B port pilot check valve	MP-02B-**-55						
	AB port decompression type pilot check valve	MPD-02W-**-55						
	A port decompression type pilot check valve	MPD-02A-**-55						
	B port decompression type pilot check valve	MPD-02B-**-55						
Block/Set bolts	PT port pressure take-out block	BG-02PT-55		25 {250}	40	40	1	—
	AB port pressure take-out block	BG-02AB-55						
	Blocking block	BS-02-55			—			
	Bypass block	BD-02PA-55			40			
	Bypass block	BD-02PT-55						
	Bypass block	BE-02-55						
	Bypass block	BF-02-55						
	Bypass block	BH-02-55						
	Manifold block	BT-*02-50	—			72	—	*: Link number (1~6 linkage)
	Set bolts	HB10*	—	—	—	—	—	Hexagonal bolts with a hole: M5

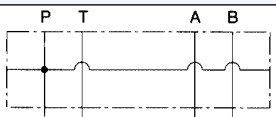
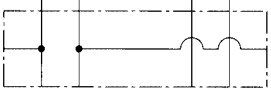
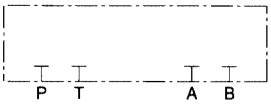
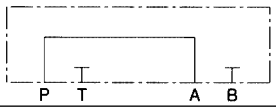
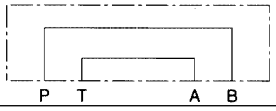
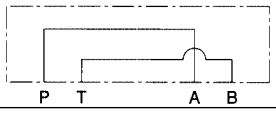
03 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	Solenoid operated valve	KSO-G03		35 {350}	130 (AC) 160 (DC)	—	—	—
Pressure control valves	P port relief valve	MR-03P-*-40		25 {250}	80	55	3.4	Pressure adjusting range 1:0.7~7 {7~70} 3:3.5~25 {35~250}
	AB port relief valve	MR-03W-*-45					3.9	Pressure adjusting range 1:0.8~7 {8~70} 3:3.5~25 {35~250}
	P port reducing valve	MG-03P-**-40		25 {250} 16 {160}			4	Pressure adjusting range 03:0.3~7 {3~70} 1:0.7~7 {7~70} 3:3.5~25 {35~250}
	A port reducing valve	MG-03A-**-40						
	B port reducing valve	MG-03B-**-40						
	P port sequence valve	MQ-03P-2*-40		25 {250}			3.9	Pressure adjusting range A:0.25~0.85 {2.5~8.5} C:0.5~3.5 {5~35} E:2~14 {20~140} MQC-03* Check valve Clacking pressure 0.05 {0.5}
	B port counter balance valve	MQ-03B-1*-40						
	A port counter balance valve	MQC-03A-1*-40						
	B port counter balance valve	MQC-03B-1*-40						
	Break valve	MB-03W-*-45			30		4.8	Pressure adjusting range 1:0.8~7 {8~70} 3:3.5~21 {35~210}
Flow control valves	P port throttle valve	MT-03P-40		25 {250}	80	55	2.3	—
	Meter out AB port throttle valve	MT-03W-40					3.1	Check valve Clacking pressure 0.16 {1.6}
	Meter in AB port throttle valve	MT-03Wi-40						
	P port flow adjusting valve	MF-03P-45			60			—

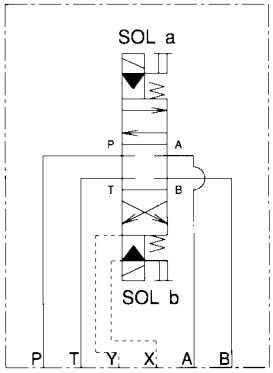
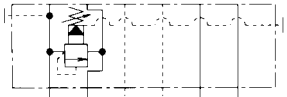
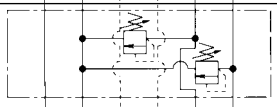
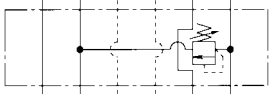
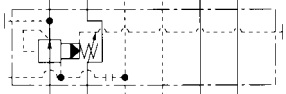
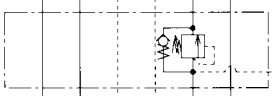
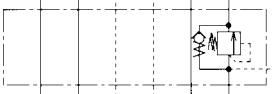
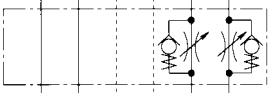
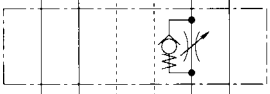
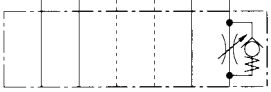
03 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Flow control valves	Meter out AB port flow adjusting valve	MF-03W-45		25 {250}	60	55	5	Check valve Clacking pressure 0.1 {1}
	Meter out A port flow adjusting valve	MF-03A-45					4.6	
	Meter out B port flow adjusting valve	MF-03B-45						
	Meter in AB port flow adjusting valve	MF-03Wi-45					5	
	Meter in A port flow adjusting valve	MF-03Ai-45					4.6	
	Meter in B port flow adjusting valve	MF-03Bi-45						
Direction control valves	P port check valve	MC-03P-**-40		25 {250}	80	55	2.1	Check valve Clacking pressure 05:0.05 {0.5} 45:0.45 {4.5}
	A port check valve	MC-03A-**-40						
	B port check valve	MC-03B-**-40						
	T port check valve	MC-03T-**-40					2.9	
	AB port check valve	MC-03AB-**-40					3.5	
	Vacuum check valve	MC-03W-40-56					4.5	Check valve Clacking pressure 0.01 {0.1}
	AB port pilot check valve	MP-03W-**-40					3.5	Check valve Clacking pressure 20:0.2 {2} 50:0.5 {5}
	A port pilot check valve	MP-03A-**-40						
	B port pilot check valve	MP-03B-**-40						

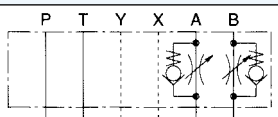
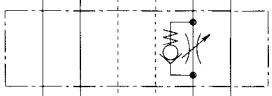
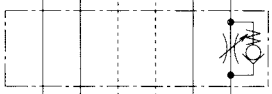
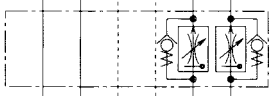
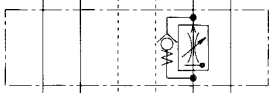
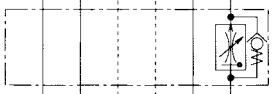
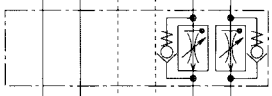
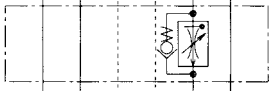
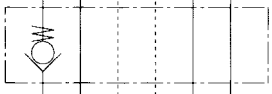
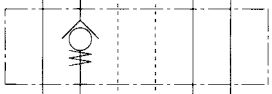
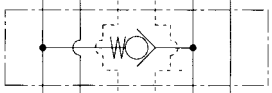
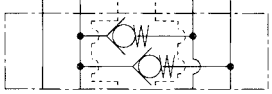
03 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Block/Set bolts	P port pressure take-out block	BG-03PP-40-40		25 {250}	80	55	2.6	—
	PT port pressure take-out block	BS-03PT-40-70						
	Blocking block	BS-03-40			—	26.5	2.6	—
	Bypass block	BD-03PA-40			80	32	1.4	—
	Bypass block	BE-03-40						
	Bypass block	BH-03-40						
	Manifold block	BT-*03-40	—			95		*: Link number (1~6 linkage)
	Set bolts	HB30* SB30*	—	—	—	—	—	Hexagonal bolts with a hole : M6 Stud bolts : M6

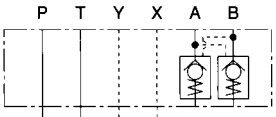
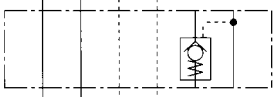
04 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	Solenoid pilot switching valve	KSH-G04		35 {350}	300	—	—	—
Pressure control valves	P port relief valve	MR-04P-*-10		35 {350}	300	70	7	Pressure adjusting range 1:*~7 {*~70} 2:2~16 {20~160} 3:3.5~25 {35~250}
	AB port direct operating relief valve	MRD-04W-*-10			50 (300)		6.5	Pressure adjusting range 1:0.8~7 {8~70} 3:3.5~25 {35~250} 4:7~35 {70~350}
	A port direct operating relief valve	MRD-04A-*-10						
	B port direct operating relief valve	MRD-04B-*-10						
	P port reducing valve	MG-04P-*-10			300		8	Pressure adjusting range 1:0.8~7 {8~70} 2:2~16 {20~160} 3:3.5~25 {35~250}
	A port reducing valve	MG-04A-*-10						
	B port reducing valve	MG-04B-*-10						
	A port counter balancing valve	MQC-04A-1*-10						Pressure adjusting range A:0.25~0.85 {2.5~8.5} C:0.5~3.5 {5~35} E:2~14 {20~140}
	B port counter balancing valve	MQC-04B-1*-10						
Flow control valves	Meter out AB port throttle valve	MT-04W-10		35 {350}	300	70	6.5	Check valve Clacking pressure 0.1 {1}
	Meter out A port throttle valve	MT-04A-10						
	Meter out B port throttle valve	MT-04B-10						

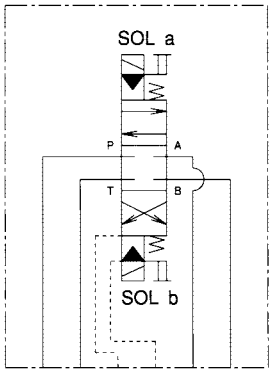
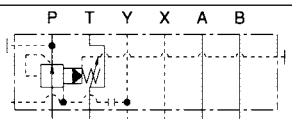
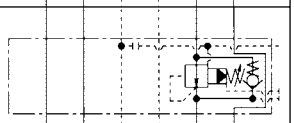
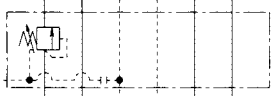
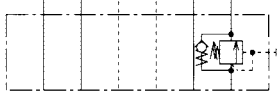
04 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Flow control valves	Meter in AB port throttle valve	MT-04Wi-10		35 {350}	300	70	6.5	Check valve Clacking pressure 0.1 {1}
	Meter in A port throttle valve	MT-04Ai-10						
	Meter in B port throttle valve	MT-04Bi-10						
	P port throttle valve with check valve	MTC-04P-10					4.5	Check valve Clacking pressure 0.04 {0.4}
	Meter out AB port flow adjusting valve	MF-04W-**-10				85	11	Check valve Clacking pressure 0.1 {1}
	Meter out A port flow adjusting valve	MF-04A-**-10						
	Meter out B port flow adjusting valve	MF-04B-**-10						
	Meter in AB port flow adjusting valve	MF-04Wi-**-10						
	Meter in A port flow adjusting valve	MF-04Ai-**-10						
	Meter in B port flow adjusting valve	MF-04Bi-**-10						
Direction control valves	P port check valve	MC-04P-**-10		35 {350}	300	70	4.5	Check valve Clacking pressure 04:0.04 {0.4} 10:0.1 {1} 20:0.2 {2} 35:0.35 {3.5} 50:0.5 {5} 60: 0.6 {6}
	A port check valve	MC-04A-**-10						
	T port check valve	MC-04T-**-10					6	
	PA port check valve	MC-04PA-**-10					4.5	
	Vacuum check valve	MC-04W-01-10					6	Check valve Clacking pressure 01:001 {0.1}

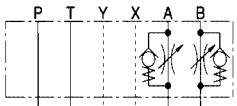
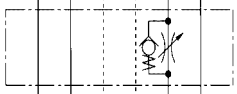
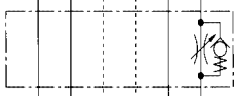
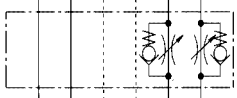
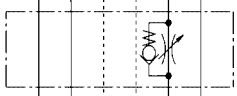
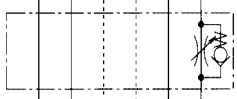
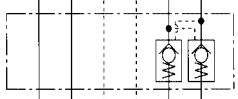
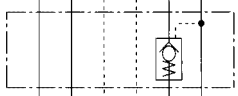
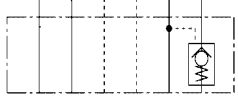
04 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	AB port pilot check valve	MPD-04W-**-10		35 {350}	300	70	6.8	Check valve Clacking pressure 20:0.2 {2} 50:0.5 {5}
	A port pilot check valve	MPD-04A-**-10						
	B port pilot check valve	MPD-04B-**-10						
Set bolts	Set bolts	HB104**** HB064**** SB104**** SB064****	—	—	—	—	—	Hexagonal bolts with a hole: M10 Hexagonal bolts with a hole: M6 Stud bolts: M10 Stud bolts: M6

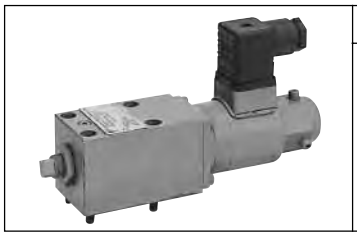
06 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Direction control valves	Solenoid operated valve	JS-G06		25 {250}	300	—	—	—
Pressure control valves	P port reducing valve	MG-06P-*-11		21 {210}	120	88.9	11.6	Pressure adjusting range 1:0.8~7 {8~70} 2:3.5~14 {35~140} 3:10.5~21 {105~210}
	B port reducing valve	MG-06B-*-11				70	13.3	
	P port sequence valve	MQ-06P-2*-11				88.9	11	Pressure adjusting range A:0.25~0.85 {2.5~8.5} B:0.5~1.75 {5~17.5} C:0.85~3.5 {8.5~35} D:1.75~7 {17.5~70} E:3.5~14 {35~140}
	B port counter balance valve	MQ-06B-1*-11				101.6	12.8	

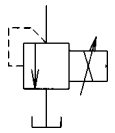
06 Series modular stack valve model list

Kinds	Name	Model code	JIS symbols	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Height mm	Weight kg	Pressure adjusting range Clacking pressure MPa {kgf/cm²}
Flow control valves	Meter out AB port throttle valves	MT-06W-20		31.5 {315}	500	90	13.6	Check valve Clacking pressure 0.15 {1.5}
	Meter out A port throttle valves	MT-06A-20						
	Meter out B port throttle valves	MT-06B-20						
	Meter in AB port throttle valves	MT-06Wi-20						
	Meter in A port throttle valves	MT-06Ai-20						
	Meter in B port throttle valves	MT-06Bi-20						
Direction control valves	P port check valves	MC-06P-**-10		21 {210}	120	88.9	10.5	1:0.8~7 {8~70} 3:3.5~21 {35~210}
	AB port pilot check valves	MPD-06W-**-20		31.5 {315}	500	90	13.6	Check valve Clacking pressure 20:0.2 {2} 50:0.5 {5}
	A port pilot check valves	MPD-06A-**-20						
	B port pilot check valves	MPD-06B-**-20						

Solenoid proportional pilot relief valve



JIS symbols



Features

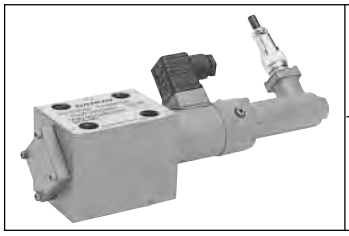
- Applied for remote control operations as a pilot valve of a variable displacement piston pump or as a pilot operating type pressure control valve such as a relief valve or a reducing valve.

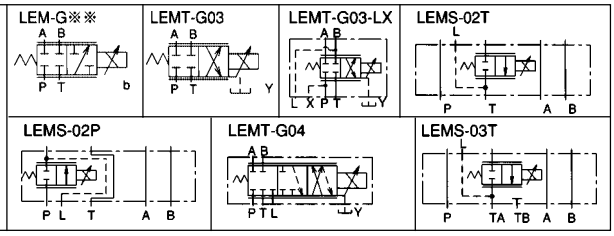
Specifications

Model code	Nom. Dia.	Pressure adjusting range ★1 MPa {kgf/cm²}	Max. flow rate L/min	Hysteresis	Repeated characteristics	Weight kg
JRP-G02-03-*-30	1/4	*~3.5 {*~35}	1	Less than 3% of the max. adjusting pressure	Less than 1% of the max. adjusting pressure	1.8
JRP-G02-1-*-30		*~7 {*~70}				
JRP-G02-2-*-30		*~16 {*~160}				
JRP-G02-3-*-30		*~25 {*~250}				

Note) ★1 As the minimum adjusting pressure varies depending on the flow rate, contact us separately.
○ When using as a pilot valve for a main valve, the lowest adjusting pressure differs depending on the main valve.

Direct type solenoid proportional throttle valve





Features

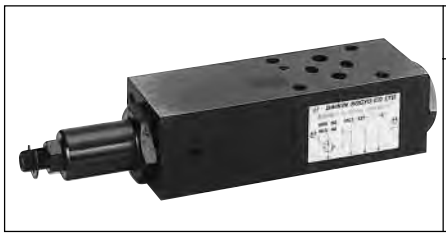
- Proportional throttle switching valve to carry out feed-back control of spool position by detecting the variation of the spool with a differential transformer, as the proportional solenoid directly drives the spool.
- A combination of a pressure compensation valve and an exclusive driver makes it possible to create a proportional flow control in high accuracy.
- LEMS valve is stack type one and can carry out the T port 's meter-out control in a proportional flow control system in high accuracy by means of attaching stack under a solenoid operated valve in combination of an exclusive reducing type pressure compensation valve.

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Rated flow rate ★1 L/min	T port permissible back pressure MPa {kgf/cm²}	18- Hysteresis resolution power repeated characteristics	Coil resistance (20˚C) Ω	Initial current (Nominal) mA	Rated flow current (Nominal) mA
LEM -G02-F-20	1/4	21 {210}	25	2.5 {25}	Less than 1 % or less to the rated input voltage.	26	300	700
LEM -G03-F-20	3/8		50					
LEMT-G03-F-20	3/8			21 {210}				
LEMT-G04-F-20	1/2		130			13	500	1540
LEMS-02* -30	1/4		25	2.5 {25}		26	300	700
LEMS-03T -20	3/8	16 {160}	50					

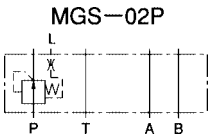
Note) ★1 The rated flow rate is the one in combination of a pressure compensation valve (pressure differentials: 0.6MPa {6kgf/cm²}).

Stack type reducing type pressure compensation valve (LEMS use)

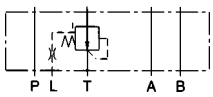


JIS symbols

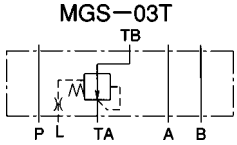
MGS—02P



MGS—02T



MGS—03T



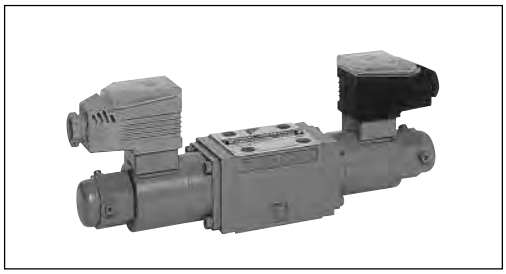
Features

- The combination use with LEMS valve enables proportional flow rate control with reducing type pressure compensation.

Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Weight kg
MGS-02P-20	1/4	21 {210}	25	1.2
MGS-02T-20				
MGS-03T-10	3/8	16 {160}	50	3.4

Direct type solenoid proportional switching valve



Features

- The valve switching four directions enables the control of the actuator's round process.
- This valve itself can be used for a shock-less switching valve.
- With a differential transformer
  - ○ A proportional solenoid directly drives a spool and detects the variation of the position, carrying out a feed back control for the spool position.
  - ○ The combination of a pressure compensation valve and an exclusive driver makes it possible to do a proportional flow control in high accuracy.
- Without differential transformer
  - ○ Mounts an exclusive driver (ZDN-2-10).
  - ○ The combination with a pressure compensation valve enables it to use as an easy type flow control valve.

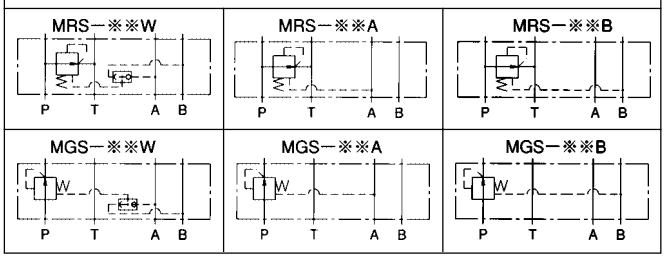
Specifications

Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Rated flow rate ★1 L/min	Permissible back pressure MPa {kgf/cm²}	Hysteresis resolution power repeated characteristics	Weight kg	
						Double solenoid	Double solenoid
KSP-G02-**1-10	1/4	35 {350}	10	2.5 {25}	5% or less	2.7	2.1
KSP-G02-**2-10			18				
KSP-G02-**1-10-M			10		0.5% or less	3.1	2.5
KSP-G02-**2-10-M			18				
KSP-G02-**3-10-M			30				
KSP-G03-**4-10	3/8		40	16 {160}	8% or less	6.5	4.8
KSP-G03-**5-10			50				

Note) ★1 The rated flow rate is the one under differential pressure; ΔP= 1MPa {10kgf/cm²}.

Stack type pressure compensation valve (KSP use)

JIS symbols



Features

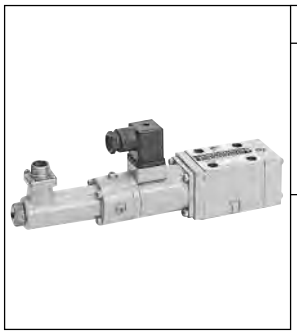
- The combination with KPS vale enables it to carry out a proportional flow control with pressure compensation.

Specifications

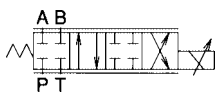
Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Max. flow rate L/min	Weight kg	
				①	②
MRS-02W-**-70	1/4	35 {350}	35	1.8	2
MRS-02A (B)-**-70				1.6	1.8
MGS-02W-**-70				1.8	2
MGS-02A (B)-**-70				1.6	1.8
MGS-03W-**-70	3/8		68	4	4.4
MGS-03A (B)-**-70				3.9	4.3

Note) Weight ① Differential pressure mark 05
② Differential pressure mark 10, 15

Direct type servo valve



JIS symbols



Features

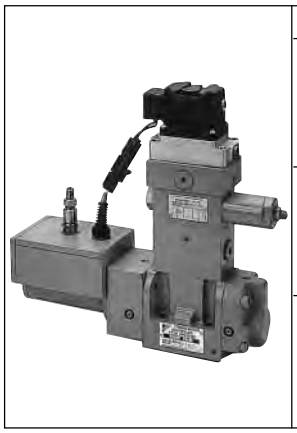
- In combination with exclusive driver, it can have a high response and suits the closed loop controls of position , speed and pressure for a main machine's actuator. (Frequency response: 130Hz/-3dB±10% amplitude)
- Since a proportional solenoid directly drives a spool, the leak volume can keep a least value compared to a nozzle flapper type servo valve.
- When an exclusive driver is used, it becomes all port block (fail safefunction) at power off.

Specifications

Model code	Max. operating pressure MPa {kgf/cm²}	Rated flow rate ★1 L/min	T-port permissible back pressure MPa {kgf/cm²}	Pressure gain	Hysteresis resolution power repeated characteristics	Solenoid rated voltage v	Max. current mA	Weight kg
KSPS-G02-1*-10	35 {350}	10	2.5 {25}	1 type: 2% or less 2 type: 4% or less	1% or less	DC12	1700	2.5
KSPS-G02-2*-10		20						
KSPS-G02-4*-10		40						
KSPS-G02-1*-10-E		10	16 {160}					
KSPS-G02-2*-10-E		20						
KSPS-G02-4*-10-E		40						

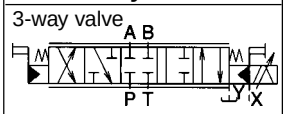
Note) ★1 The rated flow rate is the one at 1 land differential pressure: ΔP = 3.5 MPa {35kgf/cm²}.

Solenoid pilot type servo valve

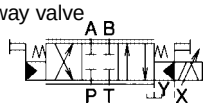


JIS symbols

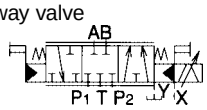
3-way valve



4-way valve



5-way valve



Features

- Suits a closed loop control of position, speed and pressure of main machine's actuator.
- As a pilot valve adopts large sized orifice nozzle for a nozzle flapper type,anti-contaminant characteristics is strengthen.
- A driver is mounted on a valve.
- As option with pressure sensor is provided, closed loop control can be easily performed.

Specifications

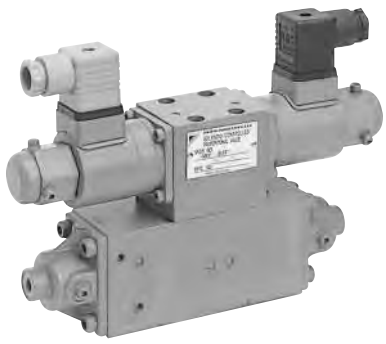
Model code	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Rated flow rate ★1 L/min	Drain line permissible back pressure MPa {kgf/cm²}	Hysteresis resolution power repeated characteristics	Pilot valve			Weight kg
						Supply pressure MPa {kgf/cm²}	Required flow rate L/min	Saturated amperes mA	
JSES-G03-3-20	3/8	21 {210}	190	1.4 {14}	0.5% or less	3~5 {30~50}	2.7~3.5	250	9.9
JSES-G03-41-20			45						
JSES-G03-42-20			95						
JSES-G03-43-20			190						
JSES-G03-5-20			360						
JSES-G04-3-20	1/2		540			3~7 {30~70}	4.2~6.5		11.5
JSES-G04-4-20			500						

Note) ★1 The rated flow rate is the one under the conditions bellow.

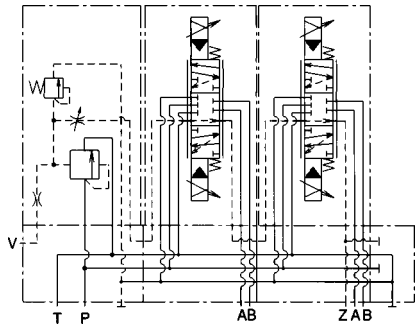
○ Servo type 3,5 : 1 land differential pressure ΔP = 3.5 MPa {35kgf/cm²}
(For servo type 5, it is a value when P1→A and P2→B join together.)

○ Servo type 4 : Valve differential pressure ΔP = 7MPa {70kgf/cm²}

Solenoid controlled proportional valve (with pressure compensation • multiple linking)



Oil hydraulic circuit (Example)



Features

- A stack type control valve with proportional flow characteristics of a pressure compensation type. The current and flow rate are proportional in spite of the load size.
- Possible to make a structure of a power-much circuit outputting the required pressure and flow rate in combination of variable volume type pumps.
- Possible to control the flow rate at A port and B port individually.
- As assembled in the order of an inlet valve block and a solenoid proportional valve, each valve block is mounted on a manifold block. The manifold block and sub-block are separated by every valve, and tightened with the through bolts together with the end plate corresponding to the required switching valve's linkage number (Max. eight links).—(Block-built system).

Specifications

Port size	Nom. Dia.	Max. operating pressure MPa {kgf/cm²}	Rated flow rate r/min		Max. flow rate L/min	T-port permissible back pressure MPa {kgf/cm²}	Relief valve · unload valve	
			Q1	Q2	QMAX		Pressure adjusting range MPa {kgf/cm²}	Unload pressure MPa {kgf/cm²}
12	1/2	21 {210}	25	50	75	2.5 {25}	3 type:0.3~21 {3~210} 6 type:0.6~21 {6~210}	3 type:0.3 {3} 6 type:0.6 {6}
16	3/4		50	100	130			
20	1		80	160	200			
25	1¼		125	250	300			
32	1½		200	400	500			

Port size	Pilot pressure MPa {kgf/cm²}	Pilot exhausting oil cm³	Initial current (nominal) mA		Max. flow current (nominal) mA		Coil resistance (20˚C) Ω
			DC24V solenoid	DC12V solenoid	DC24V solenoid	DC12V solenoid	
12	1.2~21 {12~210}	1.4	300	600	700	1400	DC24V solenoid 26 DC12V solenoid 6.5
16		3.1					
20		5.9					
25		9.9					
32		15.4					

Open loop control method driver (AC use)

Features

- Controls a solenoid proportional control valve of a open loop control system to an optimum condition.
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency , amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM(pulse width modulation) method, heat generation from driver is restrained to be the smallest.
- As the function (response time adjusting function) to vary the output current slowly for the variation of step like command input is provided, it enables the oil output to vary in shock-less. (for either build-up or pull-down process, each process can be independently adjusted).

Specifications

Model code		KC-6-10
Supply voltage		AC100V, AC200V, AC220V(50/60Hz)
Applied load		Proportional solenoid (DC24V)
Command input		DC0~5V or 1kΩ potentiometer
Output current		0~850mA (Mean value indication)
Power consumption		Max. 32VA
Input impedance		50 kΩ
Trimmer adjusting	MIN	0~400 mA or more (at input 0V)
	MAX	850~300 mA or less (at input 5V)
Dither choice		Five kinds (by replacement of internal socket pin)
Response time	TMU	less than 0.05 ~ more than 3.5 seconds (at max. output)
	TMD	less than 0.05 ~ more than 3.5 seconds (at max. output)
Surrounding temperature		0~55˚C
Surrounding humidity		25~90%RH
Weight		1.8 kg

Open loop control method driver (for DC current)

Features

- Controls a solenoid proportional control valve of a open loop control system to an optimum condition.
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency , amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM (pulse width modulation) method, heat generation from driver is restrained to be the smallest.
- As the function (response time adjusting function) to vary the output current slowly for the variation of step like command input is provided, it enables the oil output to vary in shock-less. (for either build-up or pull-down process, each process can be independently adjusted).

Specifications

Model code		ZH-6-10
Supply voltage		DC24V
Permissible voltage variation		-20~+ 30% (including ripple)
Applied load		Proportional solenoid (DC12V)
Command input		DC0~5V or 1kΩ potentiometer
Output current		0~1700mA (mean value indication)
Power consumption		Max. 52VA
Input impedance		72 kΩ
Trimmer adjusting	MIN	0~600mA or more (Input min.)
	MAX	1700~600mA or less (Input max.)
Dither choice		Four kinds (by replacement of internal socket pin)
Response time	TMU	0.05~3 seconds or more (at max. output)
	TMD	0.05~3 seconds or more (at max. output)
Surrounding temperature		-20~55˚C
Surrounding humidity		25~95%RH
Vibration resistant		6.8G (66.6 m/s^2) Total amplitude: 3mm Frequency: 33.3Hz Vertical direction: 4h Front and rear, left and right :2h
Weight		0.4kg

Minor loop control method driver (for AC current)

Features

- Controls LEM* valve which detects the spool position by a differential transformer to carry out a feed back control (minor feed back).
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency , amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM (pulse width modulation) method, heat generation from driver is restrained to be the smallest.

Specifications

Model code		KF-5-10	KFH-5-10
Supply voltage		AC100V, AC200V, AC220V (50/60Hz)	
Permissible volts variation		-10~+10%	
Applied load		Proportional solenoid (DC24V)	
Command indication		DC0~5V or 1kΩ potentiometer	
Output current		0~850mA	0~1700mA
Power consumption		Max. 55W	Max. 78W
Input impedance		70±5 kΩ	
Trimmer adjustment	MIN	0~2 V or more: Variable	
	MAX	5~1.9 V or less: Variable	
Dither choice		Choose among three kinds; high, mid and low based on the terminal connection	
Surrounding temperature		0~55˚C	
Surrounding humidity		25~90%RH	
Weight		3kg	3.3kg

DIN terminal type driver for KSP-G02

Features

- Controls KSP-G02 in optimum conditions.
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency , amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM (pulse width modulation) method, heat generation from driver is restrained to be the smallest.
- As the function (response time adjusting function) to vary the output current slowly for the variation of step like command input is provided, it enables the oil output to vary in shock-less. (for either build-up or pull-down process, each process can be independently adjusted).

Specifications

Model code	ZDN-2-10
Supply voltage	DC24V (Capacity 1.2A or more)
Permissible volts variation	-20~+20%
Applied load	Proportioal solenoid (DC12V)
Command indication	DC0~5V
Output current	0~1400mA
Power consumption	Max. 22VA
Dither	Adjusted at the delivery
Response time	0.05~3 seconds or more (at the max. output)
Surrounding temperature	-10~50˚C
Surrounding humidity	10~90%RH
Vibration resistant	6.8G (66.6m/sec^2) Frequency:11.7~200Hz 1 cycle: 15min 3 directions: each 2h
Weight	0.3kg

Open loop control method Euro-card type driver

Features

- Controls KSP valve of an open loop control system to optimum conditions.
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency, amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM (pulse width modulation) method, heat generation from driver is restrained to be the smallest.
- As the function (response time adjusting function) to vary the output current slowly for the variation of step like command input is provided, it enables the oil output to vary in shock-less. (for either build-up or pull-down process, each process can be independently adjusted).

Specifications

Model code	EPD-02-10	EPK-02-10	EPD-03-10	EPK-03-10
Supply voltage	DC24V (2A or more)			
Permissible voltage variation	-10~+10%			
Applied load	Proportional solenoid (DC12V)			
Command input	DC0~±5V or DC0~±10V	DC0~5V or DC0~10V	DC0~±5V or DC0~±10V	DC0~5V or DC0~10V
Output current	0~1600mA		0~1800mA	
Power consumption	Max. 50VA			
Input impedance	Approx. 30 kΩ			Approx. 15 kΩ
Dither	Finished the adjusting at the delivery			
Response time	0.05~3 seconds or more (at the max. output)			
Surrounding temperature	0~50˚C			
Surrounding humidity	20~90%RH			
Vibration resistant	1G (9.8m/sec²) Frequency: 11.7~100Hz 1 cycle: 15 min 3 directions: each 2h			
Weight	0.5 kg			0.3 kg

Miner loop control method Euro-card type driver

Features

- Controls LEM valve which detects the spool position by a differential transformer to carry out a feed back control (minor feed back).
- Owing to the constant-current characteristics, the variations of supply voltage and of output current by a solenoid temperature rise rarely happen.
- The output radio wave corrugation (dither frequency , amplitude) is set up so that hysteresis of a solenoid proportional control valve and a resolution power can get the best values.
- Since the current is controlled by PWM (pulse width modulation) method, heat generation from driver is restrained to be the smallest.
- As the function (response time adjusting function) to vary the output current slowly for the variation of step like command input is provided, it enables the oil output to vary in shock-less. (for either build-up or pull-down process, each process can be independently adjusted).

Specifications

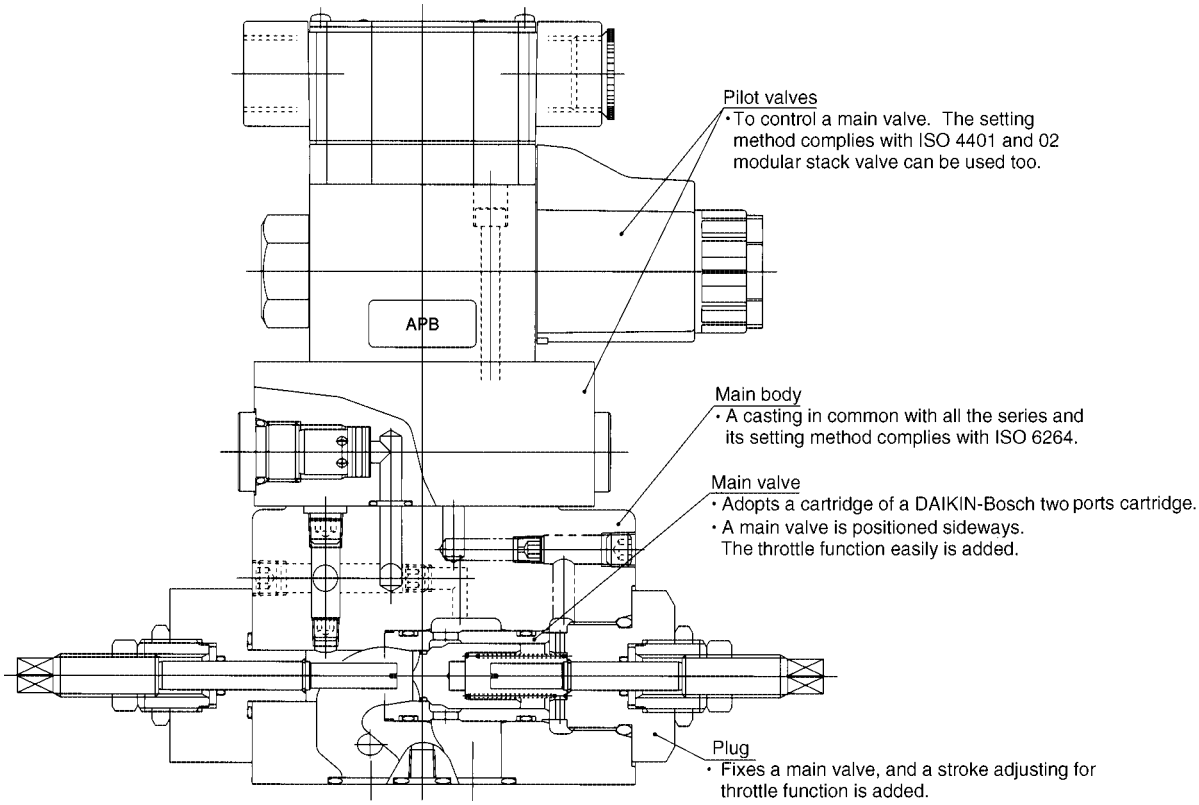
Model code	EPKD-02-10	EPKF-02-10
Supply voltage	DC24V (2A or more)	
Permissible voltage variation	-10~+10%	
Applied load	Proportional solenoid (DC12V)	
Command input	DC0~±5V or DC0~±10V	DC0~5V or DC0~10V
Output current	0~1600mA	
Power consumption	Max. 50VA	Max. 45VA
Input impedance	Approx. 30 kΩ	
Dither	Finished the adjusting at the delivery	
Response time	0.05 ~ 3 seconds or more (at the max. output)	
Surrounding temperature	0~50˚C	
Surrounding humidity	20~90%RH	
Vibration resistant	1G (9.8m/sec²) Frequency: 11.7~100Hz 1 cycle: 15 min 3 directions: each 2h	
Weight	0.5 kg	0.3 kg

Two ports, four ports multiple purpose valve

Features

- Adopts DAIKIN-Bosch two port cartridge valve, which has many results and complies with international standards, for the main valve. Accordingly, the reliability is outstanding.
- The setting dimensions comply with ISO 6264 (C2 type) and ISO 4401 (C4 type).
- The compounding , which plural functions are packed into one valve, enables a system to create compactness.
- The series are expanding the almost existing valve functions and further the new valve functions which have never been found are being developed.
  (1) C2 type low pressure relief valve [C2RL*] possible to adjust pressure from 0Mpa {0kgf/cm^2}.
  (2) C2 type low pressure reducing valve [C2GL*] possible to adjust pressure from 0Mpa {0kgf/cm^2} and has a good response of descending pressure.
  (3) C2type solenoid operated valve (with two speed throttle function) [C2S*] possible to use for a speed acceleration and reduction valve.
  (4) C4 type solenoid operated valve condensing four functions; differential circuit necessary at press circuit construction, counter balance valve, decompression function and throttling functions, into one valve.

Basic structure

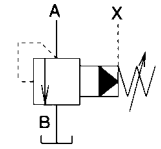
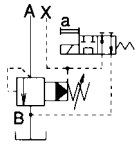
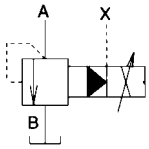
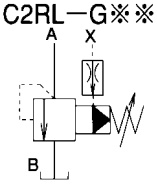
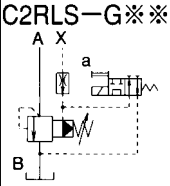
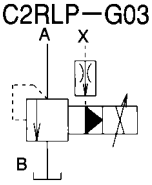
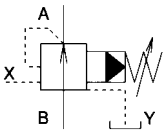
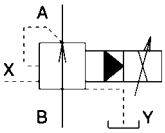
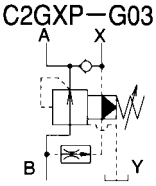
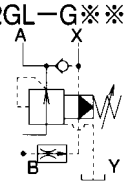
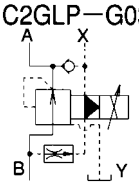


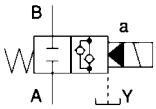
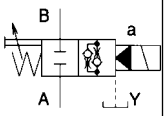
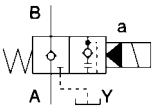
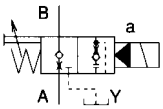
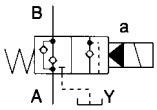
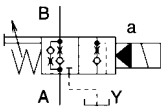
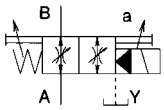
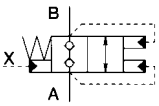
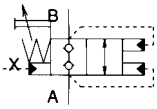
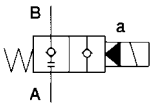
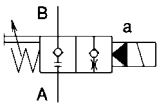
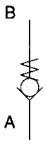
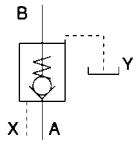
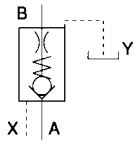
Specifications

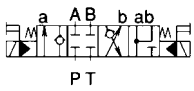
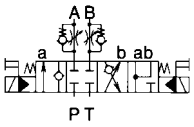
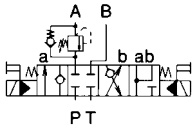
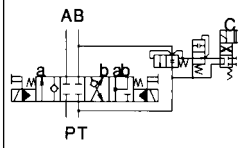
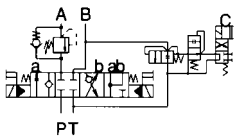
Model code	Max. operating pressure MPa {kgf/cm^2}	Max. flow rate L/min
C2**-G03	25 {250}	200
C2**-G06		500
C4 S*-G06		400
C4 S*-G10		800

Note) Pay attention to what pressure, flow specifications, handling differ depending on the valve functions.

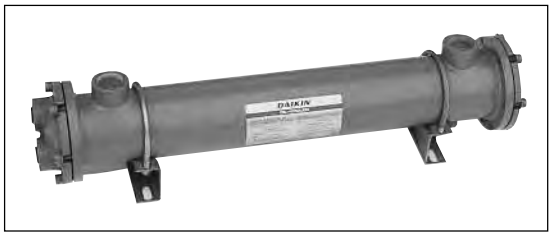
Model expansion

Two port pressure control valve	C2 type relief valve	Basic function	With solenoid operated valve	Solenoid proportional control	C2 type low pressure relief valve	Basic function	With solenoid operated valve	Solenoid proportional control
		C2R−G※※	C2RS−G※※	C2RP−G※※		C2RL−G※※	C2RLS−G※※	C2RLP−G03
								
	C2 type reducing valve	Basic function	Solenoid proportional control	Solenoid proportional control big flow rate type	C2 type low pressure reducing valve	Basic function	Solenoid proportional control	
		C2G−G※※	C2GP−G03	C2GXP−G03		C2GL−G※※	C2GLP−G03	
								

Two ports flow / direction control valve	C2 type solenoid operated valve	Basic function	With throttle function	With a series check valve	With a series check valve/throttle function	With a parallel check valve function	With a parallel check valve/throttle function	Two speed throttling function
		C2S−G※※	C2ST−G※※	C2SCS−G※※	C2SCST−G※※	C2SCH−G※※	C2SCHT−G※※	C2SW−G※※
								
	C2 type pilot operated switching valve	Basic function	With throttle function	C2 type solenoid operated valve	Basic function	With throttle function	C2 type check valve	Basic function	With throttle function
		C2H−G※※	C2HT−G※※		C2SL−G※※	C2SLT−G※※		C2C−G※※	C2CT−G※※
									
	C2 type pilot check valve	Basic function	with throttle function						
		C2P−G※※	C2PT−G※※						
									

4 ports directions control valve	C4 type solenoid pilot valve	Basic function	With throttle function	With A port counter balance valve function	With B port decompression function	With A port counter balance valve and a B port decompression function
		C4S−G※※	C4ST−G※※	C4S※−G※※−Q	C4S※−G※※−※D	C4S※−G※※−※QD
						

Oil cooling equipment (LT cooler-water cooled type)



- LT type oil cooler exhibiting the bigger cooling capacity with the less water quantity.

Nomenclature

LT	****	A	-	10
1	2	3		4

(1) Model No.
LT : oil cooler

(2) Capacity code

0403	1515
0504	2020
0707	3030
1010	5060

(3) Applicable water
A : for spring water, industrial water
(Prohibition using sea water)

(4) Design number (design number is subject to change)

Model code	Heat transfer area (m^2)	Max. oil flow rate (L/min)	Weight (kg)
LT0403	0.3	40	7
LT0504	0.4	50	9
LT0707	0.7	75	13
LT1010	1.0	100	16
LT1515	1.4	150	20
LT2020	2.0	200	24
LT3030	3.4	300	33
LT5060	6.3	500	56

Oil cooling equipment (Oil-con, air cooled refrigeration type)

Products series		Products outline	Usable liquid				Compressor output HP				
Type	Series		Lubricant	Petroleum hydraulic press. work. oil	Aqueous cutting and grinding liquid	Non-aqueous cutting and grinding oil	1/3	1/2	1	2	3
AKZ	"6"	High accuracy and high response type with compressor's inverter control Circulation type oil-con Built in circulation pump Closed (hermetic type) cooler	◎	◎	—	—	—	—	106	206	306
AKS	"5" ("3")	Circulation type oil-con Built in circulation pump Closed (hermetic type) cooler	◎	◎	—	—	35AK	55AK	105AK	205K	303AK (3 series)
	"1"	Immersion type oil-con (Direct mounting on the tank side) Without circulation pump (1) Open type cooler made of copper Without tank (1)	◎	◎	—	—	31	51	—	—	—
AKJ (H)	"6"	Immersion type oil-con (Direct mounting on the tank top) Without circulation pump (1) Open type cooler made of stainless steel Without tank (1) With heater function for AKJH	◎	◎	◎	◎	—	56	106	206	306

Note) .mark means usable liquid.
1 Provide it in the customers side.

Oil cooling unit AKZ**6

Features

1. **High accuracy oil temperature control**
   Realized high level oil temperature control by 0.1°C, because optimum oil temperature control software (our own development) is applied.
2. **Digital setting**
   The adoption of liquid crystal display digital controller makes it possible to set temperature so delicate as 0.1°C, and the handling characteristics increases as temperature setting accuracy increases.
3. **Mounted a machine interface (under patent pending)**
   Since equipped as a standard accessory with a communication function (machine interface) to be able to set temperature through a talk to a machine tool, the alteration of many kinds of operation modes through signals from a machine is possible.
4. **New design in a slim style**
   The new design with a compactness and a slim style makes it possible to realize the installation area reduction.
5. **Equipped with operation monitor function.**
   Adopting a liquid crystal display panel easy to see, the operation state always can be monitored.

Specifications

Model name			AKZ106	AKZ206	AKZ306
Max. cooling capacity (50/60Hz)	kW		3.8/4.2	5.9/6.2	8.7/9.5
	kcal/h		3300/3600	5100/5300	7500/8200
Power supply	Main circuit (50/60Hz)		Three phase 200/200·220V		
	Control circuit (50/60Hz)		Single phase 200/200·220V		
	Capacity (200/220V) kVA		2.3/2.6	4.7/5.0	9.7/10.3
Exterior color			Ivory (5Y 7.5/1)		
External dimensions (H W D)	mm		1020 360 450	1220 430 500	1220 560 620
Compressor (hermetic rotary type)			0.75kW, 2P	1.5kW, 2P	2.2kW, 2P
Evaporator			Shell and coil type		
Condenser			Cross-fin coil type		
Fan			Propeller fan		
Motor	Oil pump		0.4kW, 4P	0.75kW, 4P	
	Fan		Common use with oil pump	66W, 4P 2 pieces	80W, 4P 2 pieces
Oil pump displacement volume (50/60Hz)L/min			24/29	34.5/41.5	
Temp. control (Selectable)	Tuned type Note)2		Inlet oil temperature or outlet oil temperature against room temperature -10~+10℃ (factory set value: inlet oil temperature control, 0℃)		
	Fixed type		Inlet oil temperature or outlet oil temperature 5~50℃		
Refrigerant control			Electronic expansion valve		
Protection devices			Over current relay (motor for pump), high pressure switch, compressor protection thermostat, reverse circle protector, restart protection timer, low room temperature protection thermostat, high oil temperature protection thermostat, low oil temperature protection thermostat, relief valve for pump, inverter protection devices assembly		
Refrigerant	Name		R22		
	Charged volume	kg	0.92	1.64	1.67
Refrigeration oil	Name		SUNISO 4GS Di		
	Charged volume	L	0.5	0.63	1.1
Application range	Room temperature	℃	5~45		
	Inlet oil temperature	℃	5~50		
	Oil viscosity	mm^2/s	4~200		
	External pressure loss	Discharge side	0.3MPa {3.0kgf/cm^2} or less		
		Suction side	-30.7~0kPa {-230~0mmHg}		
Usable oil			Lubricant, petroleum oil hydraulic working oil		
Weight		kg	70	105	150
Transport vibration performance			Vertical 1 G×7.5h (but 10~100 Hz sweeping, 5min/cycle)		
Rated current of wiring circuit breaker Note)3		A	15		30

Note) 1. The max. cooling capacity shows the max. value in an applied range of ISO VG32.
2. The separate arrangement of optional parts makes it possible to use in a machine tuning.
3. Provide the most suitable wiring circuit breaker corresponding to the supply capacity of above mentioned models for the power supply.
4. Contact us if any special specification is included.

Oil cooling unit AKS**5, AKS**3

Features

1. **Wide range of applied temperature (No.1 among Industries)**
   Possible to use in wide range of applied temperature such as 5~45°C for room temperature and 5~50°C for oil temperature. (see*note).
   Coping with intensive temperature conditions under winter and summer, it exhibits steady cooling capacity.
2. **Multiple function's microcomputer is mounted**
   Multiple function's microcomputer pursuing easy use is mounted.
   - One touch choice is possible for oil temperature control method (room temperature tuning type, fixed temperature type)
   - LED displays abnormal situations of individual nine kinds or seven levels of inlet oil temperatures.
   - Turnover switch enables the operation switch to do fool-safe operated and to prevent ceased operation.
3. **Slim and compactness**
   Realized the slim and compactness design matching to the main machine, and it makes it possible to save space.
4. **To put importance on the characteristics of installation and maintenance**
   Front suction and upper exhausting system keep superiority for installation and maintenance works.
5. **Enriched self & safety functions**
   Eleven protection devices give you freedom from cares.
   (*Note: Refer to the specification table below for AKS303AK.)

Specifications

Model name			"5"series				"3"series
			AKS35AK	AKS55AK	AKS105AK	AKS205K	AKS303AK
Max. cooling capacity (50/60Hz)		kW	0.93/0.95	1.7/1.8	2.8/3.1	5.9/6.3	9.9/10.7
		kcal/h	800/820	1500/1570	2400/2700	5100/5400	8500/9200
Power supply	Main circuit (50/60Hz)		Three phase 200/200·220V				
	Control circuit (50/60Hz)		Single phase 200/200·220V				
	Capacity (200/220V) kVA		1.2/1.3	1.7/1.9	2.3/2.6	4.7/5.0	9.0/10.0
Exterior color			Ivory (5Y 7.5/1)				
External dimensions (H×W×D)		mm	640×360×440	640×360×440	790×360×440	1100×475×545	1530×630×730
Compressor (hermetic rotary type)			0.25kW, 2P	0.4kW, 2P	0.6kW, 2P	1.5kW, 2P	2.2kW, 2P Note)3
Evaporator			Shell and coil type				Shell & Tube type
Condenser			Cross-fin coil type				
Fan			Propeller fan				
Motor	Oil pump		0.4kW, 4P			0.75kW, 4P	1.5kW, 4P
	Fan		Common use with oil pump			66W, 4P×2 pieces	160W, 4P
Oil pump displacement volume (50/60Hz)		L/min	4.5/5.4	12.1/14.4	24.0/29.0	34.5/41.5	46.0/55.0
Temp. control (Selectable)	Tuned type Note)2		Inlet oil temperature or outlet oil temperature for room temperature -10~+10˚C (factory set value: inlet oil temperature control, 0˚C)				
	Fixed type		Inlet oil temperature 10~50˚C note) 5				
Refrigerant control			Capillary tube				
Protection devices			Over-current relay (for compressor and pump motor), high pressure switch, compressor protection thermostat, (discharge gas temperature detector for AKS303AK), reverse phase protector, restart protector, low room temperature protector (except for AKS303AK), high temperature oil protection thermostat, low oil temperature protection thermostat, pump relief valve, fuse (circuit protector for AKS303AK)				
Refrigerant	Name		R22				
	Charged volume	kg	0.47	0.40	0.50	1.23	3.4
Refrigeration oil	Name		SUNISO 4GS Di				
	Charged volume	L	0.4			0.85	1.2
Application range	Room temperature	˚C	5~45				10~45
	Inlet oil temperature	˚C	5~50				10~50
	Oil viscosity	mm²/s	4~200				
	External pressure loss	Discharge side	0.3MPa {3.0kgf/cm²} or less				
		Suction side	-30.7~0kPa {-230~0mmHg}				
Usable oil			Lubricant, petroleum oil hydraulic working oil.				
Weight		kg	43		48	105	250
Transport vibration performance Note)8			B			A	
Rated current of wiring circuit breaker Note)6		A	15				30

Note) 1. The max. cooling capacity shows the max. value in an applied range of ISO VG32.
2. The separate arrangement of optional parts makes it possible to use in a machine tuning.
3. Compressor for AKS303AK is totally hermetic reciprocating type.
4. "-10~+10°C for room temperature" in a column of "temperature control" stands for the temperature differential in between the inlet oil temperature based on a room temperature.
(ex. Oil temperature can be set in a range of -10~+10°C of your own accord)
5. Fixed type of AKS303AK should be coped with the optional parts [AKS103AK-OP1]
6. Provide the most suitable wiring circuit breaker corresponding to the supply capacity of above mentioned models for the power supply.
7. Contact us if any special specification is included.
8. Among the transport vibration performance, A means vertical 1G×7.5h (but 10~100 Hz sweeping, 5 min/cycle) and B means vertical 1.5G×2.5h (but, 10~100 Hz sweeping, 5 min/cycle).

Oil cooling unit AKJ (H)**6

Features

Existing AKJ "0" series has been fully changed to the new line-up AKJ (H) "6" series. It realizes enriched line-up with both performance and functions.

1. **Enriched line-up**
   The new four HP model is added to the existing 1/2, 1, 1.2 HP. It becomes the new line-up with 4 models in total.
2. **Standardization of the attached heater timer specs**
   In addition to existing [cooling only AKJ type], [heater timer] (AKJH type) is specked in as standard specification.
3. **Expansion of the viscosity range**
   The usable viscosity range is expanded from "up to ISO VG2" of existing value to "up to VG32" for the new.
4. **Widen range of usable temperature range (No.1 in the industry)**
   The usable range in either room temperature or liquid temperature is expanded as from 10~40°C to 5~45°C or from10~40°C to 5~50°C respectively.
5. **Mounted a micro computer with multiply function**
   Liquid crystal display is adopted on a control panel. It is possible to display many types of displays like a digital of operation mode, many variety of monitor and individual self-diagnosis alarm. Besides, thermometer and timer functions are provided as standard accessories, resulting in easy utility.
6. **Slim for new design**
   Slim and compactness realizes a space saving for installations.
7. **To put importance on the characteristics of installation and maintenance**
   Front suction and upper exhausting system keep superiority for installation and maintenance works.

Specifications

Model name		AKJ56	AKJH56	AKJ106	AKJH106	AKJ206	AKJH206	AKJ306	AKJH306
Max. cooling capacity (50/60Hz)	kW	1.5/1.6		2.7/2.8		5.3/5.8		8.4/9.3	
	kcal/h	1280/1350		2300/2400		4600/5000		7200/8000	
Heating capacity with heater	kW {kcal/h}	—	1 {860}	—	1 {860}	—	2 {1720}	—	4 {3440}
Power supply	Main circuit (50/60Hz)	Three phase 200/200·220V							
	Control circuit (50/60Hz)	Single phase 24V							
	Capacity (200/220V) kVA	1.4/1.5	2.4/2.5	1.8/2.0	2.8/3.0	3.8/4.2	5.8/6.2	6.0/6.6	8.5/9.0
Exterior color		Ivory (5Y 7.5/1)							
External dimensions (H×W×D)	mm	610(960)×360×395		760(1110)×360×395		995(1415)×475×545		950(1370)×620×625	
Compressor (hermetic rotary type)		0.4kW, 2P		0.6kW, 2P		1.5kW, 2P		2.2kW, 2P	
Evaporator		Open coil type							
Condenser		Cross fin coil type							
Fan		Propeller fan							
Motor	Fan	40/40W, 4P		56/66W, 4P		56/66W, 4P×2		80/115W, 4P×2	
	Stirrer	50W, 4P				50W, 4P×2		75W, 4P×2	
Heater	kW	—	1	—	1	—	2	—	2×2 pieces
Temp. control (Selectable)	Tuned type	Inlet oil temperature or outlet oil temperature for room temperature -10~+10˚C (factory set value: inlet oil temperature control, 0˚C)							
	Fixed type	Tank liquid temperature 5~50˚C							
Refrigerant control		Capillary tube							
Protection devices		Over-current relay (stirrer's motor), over current protector (compressor), high pressure switch, compressor protection thermostat, reverse phase protector, restart protection timer, low room temperature protection thermostat, high oil temperature protection thermostat, low oil temperature protection thermostat, fuse, heater vacant boiling protection thermostat*							
Refrigerant	Name	R22							
	Charged volume kg	0.42		0.68		1.7		3.1	
Refrigeration oil	Name	SUNISO 4GS Di							
	Charged volume L	0.4				0.85		1.50	
Application range	Room temperature ˚C	5~45							
	Tank oil temperature ˚C	5~50							
	Oil viscosity mm^2/s	0.5~200							
Usable oil		Aqueous cutting and grinding liquid Lubricant, cutting oil , grinding oil, lubricant, petroleum hydraulic working oil							
Weight	kg	35	37	43	45	85	90	120	130
Transport vibration performance		Vertical 1 G×7.5h (but 10~100 Hz sweeping, 5 min/cycle)							
Rated current of wiring circuit breaker Note)3	A	15						30	
Tank		Note)4 (Depth; 400 mm or deeper)				Note)4 (Depth; 470 mm or deeper)			

Note) 1. The max. cooling capacity shows the max. value in an applied range of ISO VG32.
2. Vacant boiling protection thermostat with mark* is only applied for AKJH type.
3. Provide the most suitable wiring circuit breaker corresponding to the supply capacity of above mentioned models for the power supply.
4. Provide it in your local.
5. Contact us if any special specification is included.

Positioning motor (TM series)

< Applications >

Machining center ATC system
NC lahte's edged tool base
Auto-loader Pallet changer
Steady dimension's forwarding device

Features

- **Oil hydraulic mechanism**
  The system deciding a revolution's position of hydraulic mechanism developed by our own technologies based on the orbit motor of low speed with high torque and low noise.
- **Small & compact**
  Built in the mechanism concerning to a revolution, reducing speed and deciding position of revolution. The small sized unit that all components are integrated into one equipment without piping.
- **Indexing shorten time**
  With the good response of the built-up process and with the adoption of the reduction speed cam and the mechanic valve, the precise speed reduction can be obtained. Accordingly, the shock-less cease can be done in a short time without miss-index.
- **High accuracy positioning**
  There are three kinds indexing number 1/rev, 2/rev, 3/rev, while there are two kinds of groove shapes for positioning, V groove with high accuracy (±0.1°) and R groove with loose angle for an auxiliary positioning urpose.
- **Simple control & Simple handling**
  Since it is actuated only by ON/OFF of solenoid valve, the control and handling is vary simple.
- **Any choice of forwarding pitch**
  The any choice of forwarding pitch makes it possible to carry out a smooth pitch forwarding.

Nomenclature

TM ** * * - * * * * - ** * * - 10

1	2	3	4	5	6	7	8	9	10	11	12

(1) Model No.
TM : TM positioning motor

(2) Motor capacity
05 : 54cm³/rev
10 : 96cm³/rev
13 : 129cm³/rev
19 : 184cm³/rev

(3) Flange
A : SAE A
B : SAE B
F : Flange piping

(4) Shaft diameter
S : ϕ20.0 (key width: 6.00 mm) ★1
M : ϕ25.0 (key width: 7.00 mm)
I : ϕ25.4 (key width: 6.35 mm)

(5) Indexing number
1 : 1 index/rev.
2 : 2 index/rev.
3 : 3 index/rev.

(6) Cam groove
R : R groove (auxiliary positioning with loose angle)
V : V groove (positioning accuracy: ±0.1°)

(7) Control port
0 : None
2 : With UN, CL
3 : With UN, CL, CO

(8) Operating pressure
1 : 3.5 MPa {35kgf/cm²} or less
2 : 3.6~5 MPa {36~50kgf/cm²}
3 : 5.1~7 MPa {51~70kgf/cm²}

(9) Solenoid operated valve method ★2

Mark	For revolution	For pulling out pins
AT	KSO-G02-2CA-30-EN	KSO-G02-9CA-30-EN
AF	KSO-G02-2CA-30-CE	KSO-G02-9CA-30-CE
BT	KSO-G02-2CB-30-N	KSO-G02-9CB-30-N
PT	KSO-G02-2CP-30-EN	KSO-G02-9CP-30-EN
XT	LS-G02-2CA-20-EN	LS-G02-9CA-20-EN
XF	LS-G02-2CA-20-CE	LS-G02-9CA-20-CE

(10) CL-port throttling mark
0 : ϕ1.0 1 : ϕ2.0
2 : ϕ1.2 3 : ϕ2.2
4 : ϕ1.4 5 : ϕ2.4
6 : ϕ1.6
8 : ϕ1.8 N : None

(11) Proximity switch
K : Provided
N : None
S : None (with detection rod)

(12) Design number (the design number is subject to change)

Note) ★1 Shaft diameter : S is only applied for TM05.
★2 Refer to LS-G02 (page 27) and KSO-G02 (page 29) for the specifications of solenoid operated valves.

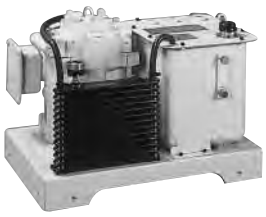
Specifications

Model No.	TM05			TM10			TM13			TM19		
Motor capacity cm^3/rev	54			96			129			184		
Max. load kg · m^2 (GD2: N · m^2 {kgf · m^2})	0.125 (5 {0.5})			0.50 (20 {2})			0.75 (30 {3})			1.25 (50 {5})		1 (40 {4})
Index number rev^{-1}	1	2	3	1	2	3	1	2	3	1	2	3
Max. revolution speed min^{-1}	200		150	200		150	150			100		
Required oil volume L/min	13		10	22		17	22			21		
Index time s ★3	0.50	0.35	0.30	0.70	0.50	0.40	0.80	0.60	0.50	1.00	0.70	0.60
Speed reduction signal emitting angle	120° on this side.		100° on this side.	120° on this side.		100° on this side.	120° on this side.		100° on this side.	90° on this side.		
Rated pressure MPa {kgf/cm^2}	1st type : 3.5 {35} 2nd type : 5 {50} 3rd type : 7 {70}											
Permissible back pressure MPa {kgf/cm^2}	1 {10}											
Rated flow rate L/min	20											
Indexing accuracy	±0.1°											
loose angle	R groove: ±0.1° V groove: 0°											
Radial load kN {kgf}	2.25 {225}			4.5 {450}								
Thrust load kN {kgf}	2.25 {225}			3.5 {350}								
Lowest operating pressure MPa {kgf/cm^2}	1.5 {15}											
Holding torque N · m {kgf · m}	160 {16}											

Note) ★3 The index time is the one at the pressure 3.5MPa {35kgf/cm^2}.

NDR series rotor pack


NDR151 (Vertical type)


NDR151 (Horizontal type)


NDR231

Features

- **Low noise**
  Achieved the noise level to lower than 60 Hz (A). The hydraulic noise is not offended even in factories in residential street.
- **Compact design**
  Either a vertical type or a horizontal type is a minimum sized unit. There is no choice of place to install.
- **High reliability**
  No need of pump seal's replacement. It is carefree for oil leakage from a pump.
- **Low oil temperature rise**
  Suppressing the oil temperature rise lower than +15°C machine's heat strain is eliminated.
- **Possibility of mounting solenoid operated valve**
  A solenoid valve can be mounted on NDR081 and NDR151.

Specifications

NDR ** 1 - ** * * - 30 - * *

1	2	3	4	5	6	7	8	9

(1) Model No.
NDR : Rotor back

(2) Displacement volume
08 : 8.0cm³/rev
15 : 14.8cm³/rev
23 : 24.4cm³/rev
38 : 37.7cm³/rev

(3) Max. operating pressure
1 : 7MPa {70kgf/cm²}

(4) Tank volume
07 : 7L<Applied only for NDR08>
10 : 10L<Applied only for NDR15>
20 : 20L<Applied only for NDR23>
30 : 30L<Applied for NDR23 and 38>

(5) Motor capacity
1 : 0.75 kW/4P <Applied only for NDR08>
2 : 1.5 kW/4P <Applied only for NDR15>
3 : 2.2 kW/4P <Applied for NDR15 and 23>
5 : 3.7 kW/4P <Applied for NDR23 and 38>

(6) Pack shape
No mark : NDR23, NDR38
H : Vertical type <Applied for NDR08 and 15>
L : Horizontal type <Applied for NDR08 and 15>

(7) Design number (design number is subject to change)

(8) Option mark I
No mark : Standard product
R : with return filter
<Applied for NDR23 and 38>

(9) Option mark II
No mark : Standard product
E : Product coping with CE standards

Specifications

Model code	Displacement volume cm³/rev	Motor capacity Output /Pole No. kW/4P	Tank volume L	Max. operating pressure MPa {kgf/cm²}	Displacement volume at factory set L/min		Pressure at factory set MPa {kgf/cm²}	Oil cooler motor input W
					50Hz	60Hz		
NDR081-071*-30	8	0.75	7	7 {70}	11.7	14	3.5 {35}	16/17.6
NDR151-102*-30	14.8	1.5	10		20.8	25		
NDR151-103*-30		2.2					7 {70}	
NDR231-203 -30	24.4		20		35	42	3.5 {35}	35.5/39.1
NDR231-305 -30		3.7	30				7 {70}	
NDR381-305 -30	37.7				53.5	64	3.5 {35}	

Note) ○ Power supply : ACϕ3 200V (50Hz), 200V (60Hz), 220 (60Hz)
○ Oil cooler power supply : ACϕ1 200V (50Hz), 200V (60Hz), 220 (60Hz)

Oil cooler (for drain pump cooling)

Nomenclature

DCR	**	B	-	10
1	2	3		4

(1) Model No.
DCR : Oil cooler (pump drain cooling)

(2) Cooler capacity
10 : 10 type
20 : 20 type

(3) Piping connections ★1
B : connections Rc 3/8

(4) Design number (design number is subject to change)

Note) ★1 Exclusive oil cooler (DCR10BP-10) with different connection port shape is used for Rotor back NDR08, NDR15 series.

Specifications

Oil used	Petroleum hydraulic working oil
Oil temperature	0~90˚C
Atmosphere	in factory
Applied temperature range	0~40˚C
Applied humidity range	20~85 % RH
Passed oil volume L/min.	Max. 4
Max. Operating pressure MPa {kgf/cm^2}	0.1 {1}
Supply voltage	Single phase AC200V (50Hz), AC200V (60Hz), AC220V (60Hz)
Permissible voltage variations	90~110%

Fan motor electric ratings

Model code	Voltage V	Frequency Hz	Operation amperes A	Input W	Restraint current A	Starting current A	Coil and protection type	Lead wires
DCR10B-10	200	50	0.12	16	0.17	0.17	Shading coil type (with impedance protector)	Heat resisting flat two-core vinyl wire • Length: 1m • Outer diameter: 5.4×2.7 (mm) • Wire diameter : 0.75 mm^2
	200	60	0.11	15	0.15	0.15		
	220	60	0.1	17.6	0.18	0.18		
DCR20B-10	200	50	0.243	35.5	0.315	0.315	Shading coil type (with thermal protector)	• Length: 1 m • Covered PVC tube No.4 • Wire diameter: AWG22 (correspond: 0.3mm^2)
	200	60	0.216	32.4	0.283	0.283		
	220	60	0.239	39.1	0.330	0.330		

Note) Provide a non-fuse breaker of 0.5A ready for accident like a shore-circuit.

NDJ series new DAIPACK

Features

- **Low noise**
  As a pump and a motor are placed inside a tank, the tank itself plays a role of sound attenuater and noise cannot be leaked out.
- **Low oil temperature rise**
  Since a hollow tank with wide area of heat emission is adopted, a motor cooling fan forcedly cools both internal wall of a tank and pump surface to restrain oil temperature rise.
- **Compact design**
  Compact design enables a installation space to reduce.

Nomenclature

NDJ ** * - ** * - **20** - **

1	2	3	4	5	6	7

(1) Model No.
NDJ : New DAIPACK

(2) Pump capacity
8 : V8 used (8 cm^3/rev)
15 : V15 used (14.8cm^3/rev)

(3) Pressure adjusting range
9 : 0.8~3.5MPa {8~35kgf/cm^2}
1 : 0.8~7MPa {8~70kgf/cm^2}

(4) Tank capacity
10 : 10L
15 : 15L

(5) Motor capacity
1 : 0.75kW/4P
2 : 1.5kW/4P

(6) Design number (design number is subject to change)

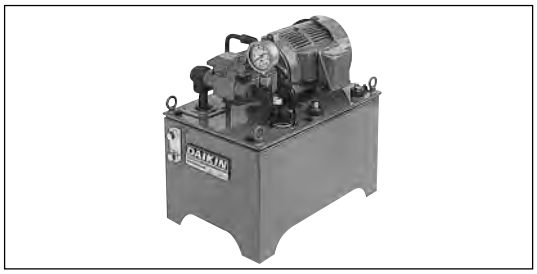
(7) Option mark
No mark : standard (floor mounted type)
LC : Wall mounted type

Specifications

Model code	Displacement volume cm^3/rev	Motor capacity Output /Pole No. kW/4P	Tank volume L	Max. operating pressure MPa {kgf/cm^2}	Pressure adjusting range MPa {kgf/cm^2}	Displacement volume at factory set★1 L/min		Pressure at factory set MPa{kgf/cm^2}	Weight (without oil) kg
						50Hz	60Hz		
NDJ 89-101-20 (-LC)	8	0.75	10	3.5 {35}	0.8~3.5 {8~35}	6~11	7~14	3.5 {35}	35
NDJ 81-152-20 (-LC)		1.5	15	7 {70}	0.8~7 {8~70}			7 {70}	45
NDJ 159-152-20 (-LC)	14.8			3.5 {35}	0.8~3.5 {8~35}	5~21	6~25	3.5 {35}	50

Note) ★1 The displacement volume was set at the delivery from the factory.

ND series Mini-pack



Features

- The best compact sizes (Tank capacity : 20, 30, 45L).
- As V series piston pump is used, it operates quietly and emits soft sound.

Nomenclature

ND	**	*	*	-	*	**	-	40
1	2	3	4		5	6		7

(1) Model No.
ND : mini-pack

(2) Displacement volume
8 : V8 used (8cm³/rev)
15 : V15 used (14.8cm³/rev)

(3) Pressure adjusting range
9 : 0.8~3.5MPa {8~35kgf/cm²}
1 : 0.8~7MPa {8~70kgf/cm²}

(4) Pump type
No mark : V8A1RX
Y : V15A1Y

(5) Tank capacity
2 : 20L
3 : 30L
4 : 45L

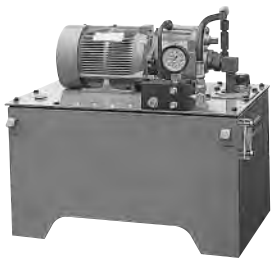
(6) Motor capacity
00 : 0.4kW/4P
01 : 0.75kW/4P
02 : 1.5kW/4P
03 : 2.2kW/4P

(7) Design number (design number is subject to change)

Specifications

Model code	Displacement volume cm³/rev	Motor capacity Output /Pole No. kW/4P	Tank volume L	Max. operating pressure MPa {kgf/cm²}	Pressure adjusting range MPa {kgf/cm²}	Displacement volume at factory set L/min		Pressure at factory set MPa {kgf/cm²}	Weight (without oil) kg
						50Hz	60Hz		
ND 89-200-40	8	0.4	20	3.5 {35}	0.8~3.5 {8~35}	6	7	3.5 {35}	45
ND 89-201-40		0.75				11.5	14		50
ND 81-301-40			30	7 {70}	0.8~7 {8~70}	6	7	7 {70}	53
ND 81-302-40		1.5				11.5	14		57
ND 159Y-302-40	14.8			3.5 {35}	0.8~3.5 {8~35}	21	25	3.5 {35}	60
ND 151Y-403-40		2.2	45	7 {70}	0.8~7 {8~70}	16.6	20	7 {70}	73

ND series New DAIPACK



Features

- The best compact size (Tank capacity : 60L).
- As V series piston pump is used, it operates quietly and emits soft sound.
- Possible to equip 02 sized stack valve and a control system is easily built in a main system (two~six links).

Nomenclature

ND 15 1 - 1 ** - 40

ND	15	1	-	1	**	-	40
1	2	3		4	5		6

(1) Model No.
ND : New DAIPACK

(2) Displacement volume
15 : V15 used (14.8cm³/rev)

(3) Pressure adjusting range
1 : 0.8~7MPa {8~70kgf/cm²}

(4) Tank capacity
1 : 60L

(5) Motor capacity
02 : 1.5kW/4P
03 : 2.2kW/4P

(6) Design number (the design number is subject to change)

Specifications

Model code	Displacement volume cm³/rev	Motor capacity Output /Pole No. kW/4P	Tank volume L	Max. operating pressure MPa{kgf/cm²}	Pressure adjusting range MPa{kgf/cm²}	Displacement volume at factory set★1 L/min		Pressure at factory set MPa{kgf/cm²}	Weight (without oil) kg
						50Hz	60Hz		
ND 151-102-40	14.8	1.5	60	7 {70}	0.8~7 {8~70}	5~21	6~25	3.5 {35}	110
ND 151-103-40		2.2						5.5 {55}	120

Note) ★1 The discharge volume is set to the max. at the delivery from the factory.

SSS-α oil hydraulic unit

Features

- As the rotor pump developed by DAIKIN's own technology is adopted for this unit, aiming at "Low noise , Save energy and Save space", this model is a simple and a standard oil hydraulic unit which has realized "Low price in short delivery" easy to apply broadly to industrial machines.
- Low noise ··· The adoption of a rotor pump makes it possible to realize the never-known low noise. 65dB (A) at13.7MPa {140kgf/cm^2} · 1800min^{-1} RP15A-1.5kW
- Save energy ··· Saving energy unit owing to the adoption of a variable piston pump.
- Compactness ··· Realizes compactness by means of the design with minimum concept. (75% in comparison with our existing model)
- Equipped a plentiful option coping with any sort of needs. Mounting control system, attached any kinds of sensors, electric heater, complying with the fire protection regulation, water cooler, equipping radiator , pump control (remote-control, combination control).

Nomenclature

T***	RP**	*	-	**
1	2	3		4

(1) Tank capacity
60 : 60L
100 : 100L
160 : 160L

(2) Rotor pump displacement
15 : 14.8cm^3/rev
23 : 24.4cm^3/rev
38 : 37.7cm^3/rev

(3) Pump control method
A : Pressure compensator control
CH : Self pressurize combination control (Option)
CJ : Solenoid operated combination control (Option)
RC : Remote control system (Option)

(4) Motor capacity
1.5 : 1.5kW/4P
2.2 : 2.2kW/4P
3.7 : 3.7kW/4P
5.5 : 5.5kW/4P

Whole models

(1) Tank capacity L	Unit type	(2) Displacement volume cm^3/rev	(4) Motor capacity kW/4P			
			1.5	2.2	3.7	5.5
60	T60RP15A-**	14.8	○	○	—	—
	T60RP23A-2.2	24.4	—	○	—	—
100	T100RP15A-2.2	14.8	—	○	—	—
	T100RP23A-**	24.4	—	○	○	—
	T100RP38A-3.7	37.7	—	—	○	—
160	T160RP23A-3.7	24.4	—	—	○	—
	T160RP38A-**	37.7	—	—	○	○

SSS-∑ oil hydraulic unit

Features

- “Standardized high grade oil hydraulic unit” which has been developed with the aim at responding to the broad demands, as well as with "Low noise, saving energy and saving space" of SSS-αseries features.
- Extreme low noise ··· The adoption of a rotor pump and the cavitation free structure due to upper placement of a tank enables it to realize the never known extreme low noise. 65dB (A) at 13.7MPa {140kgf/cm^2} · 1800min^{-1}RP15A-1.5kW
  *The noise level less than 60 dB can be achieved with a sound attenuation cover.
- Cold-resistant characteristics ··· As a tank is located on the upper part, oil head is loaded and the pump starts easily even in low ambient.
- Space saving ··· Minimized floor space owing to the vertical shape. (60% in comparison with the existing model)
- Equipped a plentiful option coping with any sort of needs.
  Mounting control system, attached any kinds of sensors, electric heater, complying with the fire protection regulation, water cooler, equipping radiator, pump control (remote-control, combination control).

Nomenclature

R***	RP**	*	-	**
1	2	3		4

(1) Tank capacity
40 : 40L
60 : 60L
100 : 100L
160 : 160L
250 : 250L

(2) Rotor pump displacement
15 : 14.8cm^3/rev
23 : 24.4cm^3/rev
38 : 37.7cm^3/rev

(3) Pump control method
A : Pressure compensator control
CH : Self pressurize combination control (Option)
CJ : Solenoid operated combination control (Option)
RC : Remote control system (Option)

(4) Motor capacity
1.5 : 1.5kW/4P
2.2 : 2.2kW/4P
3.7 : 3.7kW/4P
5.5 : 5.5kW/4P

Whole models

(1) Tank capacity L	Unit type	(2) Displacement volume cm^3/rev	(4) Motor capacity kW/4P			
			1.5	2.2	3.7	5.5
40	R40RP15A-1.5	14.8	○	—	—	—
60	R60RP15A-**	14.8	○	○	—	—
	R60RP23A-2.2	24.4	—	○	—	—
100	R100RP15A-2.2	14.8	—	○	—	—
	R100RP23A-**	24.4	—	○	○	—
	R100RP38A-3.7	37.7	—	—	○	—
160	R160RP23A-3.7	24.4	—	—	○	—
	R160RP38A-**	37.7	—	—	○	○
250	R250RP38A-5.5	37.7	—	—	—	○

Technical service data

Feasible planing of oil hydraulic equipment

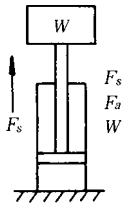
Here is summary of the specification and the calculation basis about the main models which must be cleared for establishing a oil hydraulic unit's plan in advance for your reference.

● Load Analysis

The analysis of general resistance load requires to pursue the max. output through making drawing as written below. However, acceleration force becomes necessary in addition to the resistance load so as to make a substance move.

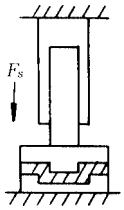
	SI system of units	Engineering system of units
Max. output required for a cylinder F	F=Fs+fd (N) Fs: Resistance load (N) fd : Acceleration force (N) fd=mα=m · V / t (N) m : Mass (kg) α : Acceleration (m/s^2) t : Acceleration time (s) V : Velocity (m/s)	F=Fs+fd (kgf) Fs: Resistance load (kgf) fd : Acceleration force (kgf) fd=mα=W/g · V / t (kgf) m : Mass ($kgf \cdot s^2/m$) α : Acceleration (m/s^2) W: Load (kgf) g : Gravitational acceleration: $9.8m/s^2$ t : Acceleration time (s) V : Velocity (m/s)

Vertical movement



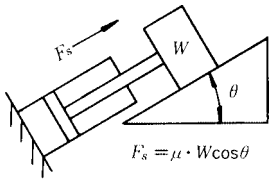
$F_s = W$
F_d : Cylinder output
W : Load

Pressurization

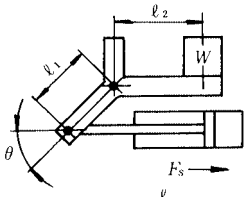


$F_s = P \cdot A$
P : Pressure
A : Cylinder Cross-sectional area

Compound movement

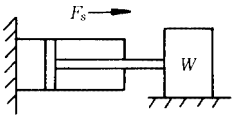


$F_s = \mu \cdot W\cos\theta$



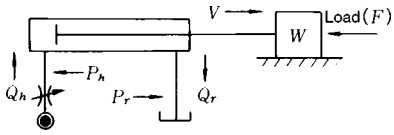
$F_s = \frac{\ell_2}{\ell_1 \sin\theta} \cdot W$

Horizontal movement



$F_s = \mu W \quad F_d = u' W$
μ : Statical friction coefficient
u' : Dynamic friction coefficient

● Calculation of oil hydraulic cylinder

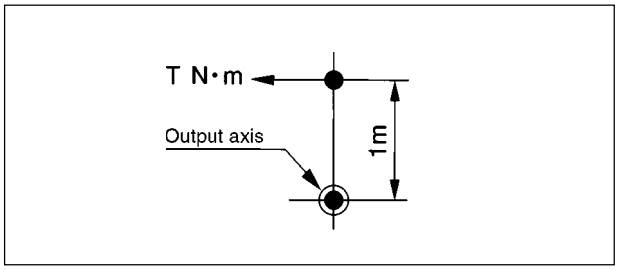


	SI system of units	Engineering system of units
Cylinder net required pressure Pu	Pu=F/A × 10^{-2} (MPa) F: Load (N) A: Pressurized area on a cylinder (cm^2)	Pu=F/A (kg/cm^2) F: Load (kgf) A: Pressurized area on a cylinder (cm^2)
Pump required pressure Pp	Pp=Pu+⊿P (MPa) ⊿P: Pressure loss on a valve/piping (MPa)	Pp=Pu+⊿P (kgf/cm^2) ⊿P: Pressure loss on a valve/piping (kgf/cm^2)
Cylinder net required flow rate Qc	Qc=A · V · 6 (L/min) A: Pressurized area on a cylinder (cm^2) V: Velocity (cm/s)	
Pump required displacement volume Qp	Qp=Qc+ql (L/min) ql: Loss flow rate (L/min) V: (Leak rate on a valve, a cylinder or so)	

Technical service data

● Calculation of oil hydraulic motor

	SI system of units	Engineering system of units
Output torque T	$T=\frac{P\cdot q}{2\cdot\pi\times100}\times\eta t$ (N・m) p : Differential pressure between inlet and outlet (MPa) q : Inflow by the motor's one rev. (cm^3/rev) ηt : Torque efficiency of motor (%)	$T=\frac{P\cdot q}{2\cdot\pi\times10000}\times\eta t$ (kgf・m) p : Differential pressure between inlet and outlet (kgf/cm^2) q : Inflow by the motor's one rev. (cm^3/rev) ηt : Torque efficiency of motor (%)
Brake horsepower L	$L=\frac{2\cdot\pi\cdot N\cdot T}{60000}$ (kW) N : Speed of output axis (min^{-1})	$L=\frac{2\cdot\pi\cdot N\cdot T}{6120}$ (kW) N : Speed of output axis (min^{-1})



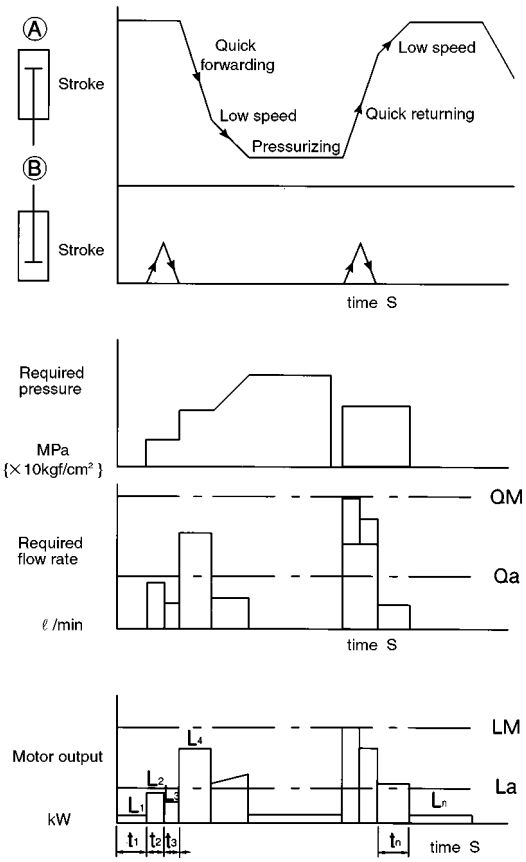
● Calculation of accumulator

The followings show the application purpose of an accumulator.

(1) Accumulation of energy (2) Impact buffering (3) Pulsation absorption
(4) Shock absorber (5) Counter balance (6) Transfer barrier
(7) Pressure holding

○ Energy accumulation

As it is generally used, the pump displacement volume is determined through a calculation of required oil volume based on the working cycle.
Acc supplies the corresponding amount of insufficient oil on a pump. It results in making a pump compact. For this realization, the confirmation ,if the pressure will descend when oil is released or not , or if the pressure accumulation is possible for the cycle or not, is required.
The displacement of a pump will be decided based on the oil volume table which comes out from the working cycle.



Required max. oil volume QM
If the required flow rate is covered only by a pump, big sized pump, big sized motor and oil become necessory.

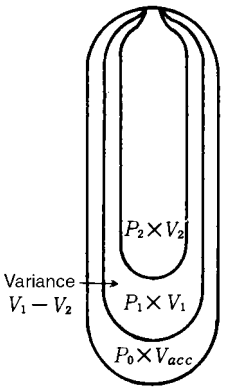
Average oil volume Qa
The portion which exceeds average oil volume will be covered by an accumulator.

Max. motor output LM
Large capacity motor is needed.

Average motor output La
The investigation by means of the square average method makes it possible to achieve compactness. However, according to the regulation JEC37, the over-load at the peak will take place at the stall torque of 160% or more (within 15 seconds).

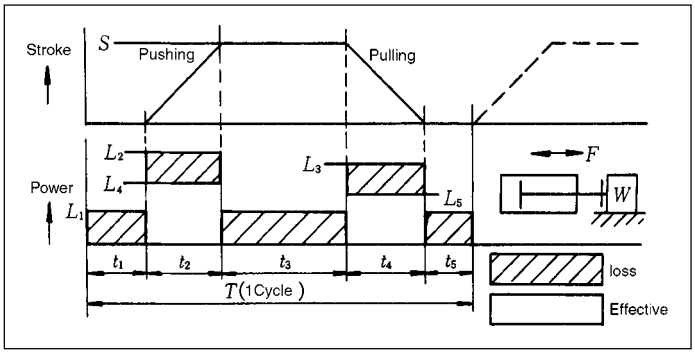
$$La=\sqrt{\frac{(L1^2\times t1)+(L2^2\times t2)+\cdots(Ln^2\times tn)}{t1+t2+\cdots\cdots+tn}}$$

Technical service data

	SI system of units	Engineering system of units
Accumulator required volume Vacc  	$Vacc = \dfrac{V}{\dfrac{P2}{P1} \times \dfrac{\left(\dfrac{P2}{P1}\right)^{1/n} - 1}{\left(\dfrac{P2}{P1}\right)^{1/m}} \times \eta\,acc}$ Po : Enclosed pressure (MPa) P1 : Min. operating pressure (MPa) P2 : Max. operating pressure (MPa) v : Effective discharge volume from P2 to P1 (L) m,n : Polytropic index (1.4~1.9) ηacc : Efficiency of Acc (0.95)	$Vacc = \dfrac{V}{\dfrac{P2}{P1} \times \dfrac{\left(\dfrac{P2}{P1}\right)^{1/n} - 1}{\left(\dfrac{P2}{P1}\right)^{1/m}} \times \eta\,acc}$ Po : Enclosed pressure (kgf/cm^2) P1 : Min. operating pressure (kgf/cm^2) P2 : Max. operating pressure (kgf/cm^2) v : Effective discharge volume from P2 to P1 (L) m,n : Polytropic index (1.4~1.9) ηacc : Efficiency of Acc (0.95)

● Heat balance

○ The power loss on the oil hydraulic equipment entirely changes to heat which raises working oil's temperature. Since it may cause various troubles, the precise control of the working oil to hold in suitable temperature (15~50°C) is an important subject.
If the oil temperature exceeds 60°C, it will influence not only the life of oil, but also to shorten the life of oil hydraulic equipment or to become failure caused by the generated contaminants.



	SI system of units	Engineering system of units
Heat generated He	He=3600 (Li-Lu) (J/h) Li : Axial input (kW) Lu : Effective power (kW) L1 : Axial input at dead head(or at unloading) (kW) (calculated out from a pump catalogue) L2, L3 : Axial input of pump Ln=Pn · Qn/60 + Ls (n) (kW) Pn : Pressure (MPa) Qn : Flow rate (L/min) Ls : Loss power (kW) L4, L5 : Effective work Ln=Fn · Sn Fn : Load (N) Sn : Stroke (m) Average axial input of pump Li=(L1·t1+L2·t2···+L1·t5) / T (kW) Average effective power Lu=(L4+L5)/1000T (kW) T : 1Cycle time (s)	He=860 (Li-Lu) (kcal/h) Li : Axial input (kW) Lu : Effective power (kW) Li : Axial input at dead head(or at unloading) (kW) (calculated out from a pump catalogue) L2, L3 : Axial input of pump Ln=Pn · Qn/612 + Ls (n) (kW) Pn : Pressure (kgf/cm^2) Qn : Flow rate (L/min) Ls : Loss power (kW) L4, L5 : Effective work Ln=Fn · Sn Fn: Load (kgf) Sn: Stroke (m) Average axial input of pump Li=(L1·t1+L2·t2···+L1·t5) / T (kW) Average effective power Lu=(L4+L5)/102T (kW) T : 1Cycle time (s)

Technical service data

	SI system of units	Engineering system of units
Tank heat emission Ho	Ho=A · K · ⊿T (kJ/h) A : Tank surface area (m^2) K : Transfer coefficient 41.9~62.8 (kJ/h · m^2 · ˚C) ⊿T : Oil temperature - Ambient temperature (˚C)	Ho=A · K · ⊿T (kcal/h) A : Tank surface area (m^2) K : Transfer coefficient 10~15 (kcal/h · m^2 · ˚C) ⊿T : Oil temperature - Ambient temperature (˚C)
Heat balance Hc	Hc=He-Ho (kW/h) Hc ≤ 0 : No need of cooler Hc > 0 : Need of cooler	

○ Cautions on the heat balance calculation

· Regarding the tank's oil temperature on the calculation of heat emission, set it below 60°C and 55°C for general working oil and water/glycol working oil , respectively.

· On the calculation procedure of cylinder effective work, pay attention to the fact; the same load with vacant weight either at ascending or descending, and zero or minus work of effective work (given loss power from outside) either without load at ascending or with load at descending.

· Be careful when a valve with a plenty of drain (like a reducing valve or so) is in use even at the full cut-off.

● Caution in planing of oil hydraulic equipment

○ Surrounding conditions

· Temperature 50°C or over : Take notice of heat emission and limit by electric appliance ratings.
0°C or below : Limit of pump suction capacity

· Humidity 95% or over : Limit for electric appliance's endurance for humidity.

· A plenty of dust The countermeasures, like to strengthen a air bleeder or seal it hermetically, become necessary.

○ Standard · Law

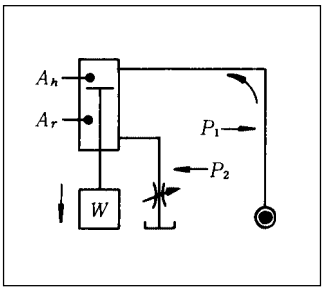
· Tank The Fire Service Act : Comply with the FSA if overall oil volume exceeds 6000 litter in one unit or on the same floor . There would be a case that this rule is applied even in lower condition for a target than the standard stated above.

· Acc No need or need for the high pressure gas control act.

· Regulations JIS, ISO (screws), JEM (Electric appliances)

● **Cautions in designing oil hydraulic circuit**

○ Ascending pressure at a meter-out throttle



The use of a meter-out throttle makes pressure increase as shown on the left figure. Especially when a cylinder is placed with the bottom up and a load hangs on to the cylinder, sometimes pressure in rod side abnormally rises up.

P_2 = (P1·Ah+W) /Ar (MPa {×10kgf/cm^2})

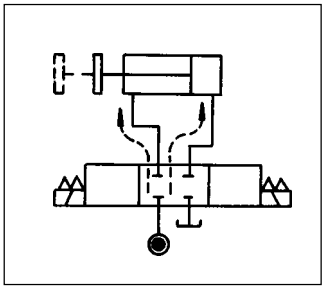
(Remedy)

· Use equipment, piping, and hoses with endurance against high pressure

· Counter balance circuit

· To reduce pressure on the head

○ Self propelling in very slow speed by leak from a switching valve

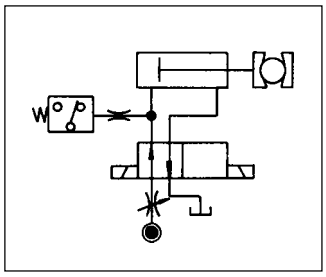


In case that the load is light and line pressure is hold on in the circuit as shown on the left figure, the cylinder would start to do self propelling in very slow speed caused by a leak from the switching valve .

(Remedy) Use a pilot check valve.

● Cautions in designing oil hydraulic circuit

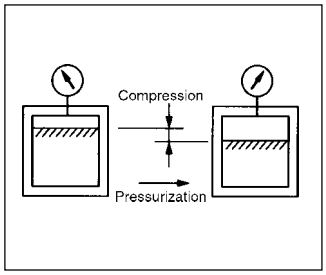
○ Malfunction of pressure switch



When the solenoid operated valve is excited in a circuit like on a figure shown on the left, a pressure switch sometimes malfunctions by surge pressure.

(Remedy)
- · Throttle a gauge damper
- · Interlock a timer with a pressure switch

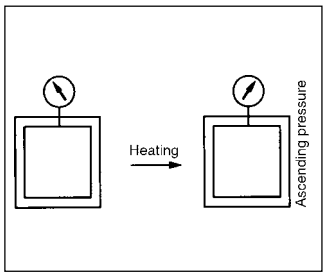
○ Shock- less at pressure releasing



Working oil is small in a compressed volume in comparison with air though, if the oil is pressed by 20 MPa {200 kgf/cm^2} of ressure, the volume is compressed and becomes small by 1% or so. Hence, if the solenoid operated valve is rapidly switched over, shock may be arisen.

(Remedy)
- · Switch the solenoid operated valve slowly.
- · Insert a pressure relief circuit.

○ Ascending pressure by heating (Descending pressure by cooling)



When working oil in a sealed container is heated, it expands and ascends pressure. On the contrary, when cooling it down, it shrinks and descends pressure. The difference of 1°C alters pressure about 1Mpa {10kgf/cm^2}.

(Remedy)
- · Provide a safety valve
- · Insert Acc.

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