CKD

SM—470967—A

INSTRUCTION MANUAL

SPEED CONTROL VALVE WITH ADJUSTING DIAL

DVL

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

Safety precautions

When designing and manufacturing a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

- Device mechanism
- Pneumatic or water control circuit
- Electric control that controls the above

It is important to select, use, handle, and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

1. **This product is designed and manufactured as a general industrial machine part. It must be handled by someone having sufficient knowledge and experience.**

2. **Use this product within its specifications.**

   This product cannot be used beyond its specifications. Additionally, the product must not be modified or machined.
   This product is intended for use in general industrial devices and parts. Use beyond such conditions is not considered. Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environments. In any case, measures for safety shall be provided when the vavle malfunctions.

   ① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
   ② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. **Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.**

   ISO4414, JIS B 8370 (pneumatic system rules)
   JFPS2008 (principles for pneumatic cylinder selection and use)
   Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, standards and regulations, etc.

4. **Do not handle, pipe, or remove devices before confirming safety.**

   ① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
   ② Note that there may be hot or charged sections even after operation is stopped.
   ③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Release any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
   ④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that system safety, such as pop-out prevention measures, is secured.

5. **Observe warnings and cautions on the pages below to prevent accidents.**

■The safety cautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

⚠ **DANGER** : When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency to a warning.

⚠ **WARNING** : When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

⚠ **CAUTION** : When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

- **Guarantee period**

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

- **Guarantee coverage**

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
⑤ Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

- **Confirmation of product compatibility**

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

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DVL series

Speed control valve with adjusting dial

Manual No. SM−470967−A

1. PRODUCT

1.1 Specification

●Needle valve with adjusting dial, check valve type DVL-S

Descriptions			DVL-S-06					DVL-S-08		DVL-S-10		
			020		080		160	240		400		
Applicable tube outer diameter		mm	Φ4	Φ6	Φ4	Φ6	Φ6	Φ6	Φ8	Φ8	Φ10	Φ12
Working fluid			Compressed air									
Max. working pressure		MPa	1.0									
Min. working pressure		MPa	0.1 (Note 3)									
Withstanding pressure		MPa	1.5									
Fluid temperature		°C	5 to 60 (no freezing Note 2)									
Ambient temperature		°C	0 to 60 (no freezing)									
Product weight		g	54	48	54	48	48	60	61	82	86	88
Needle control range			1 to 12 rotations					1 to 13 rotations				
Free flow	Flow	ℓ/min (ANR)	170	300	170	300	300	400	550	900	1100	1200
	Effective sectional area	mm^2	2.5	4.5	2.5	4.5	4.5	6	8	13.5	16.5	18
Controlled flow	Flow	ℓ/min (ANR)	18		80		160	240		440		
	Effective sectional area	mm^2	0.15		1.2		2.4	3.6		6.6		

Note 1: The flow is the atmospheric pressure conversion value at pressure 0.5MPa.
Note 2: Freezing could occur by adiabatic expansion depended with air quality (dew point).
Note 3: Vacuum up to –100 kpa is possible only when a free flow direction is selected. The needle cannot be controlled.

●Needle valve with adjusting dial, needle valve/oil-prohibition type DVL-N

Descriptions		DVL-N-06					DVL-N-08		DVL-N-10		
		020		080		160	240		400		
Applicable tube outer diameter	mm	Φ4	Φ6	Φ4	Φ6	Φ6	Φ6	Φ8	Φ8	Φ10	Φ12
Working fluid		Compressed air/N2 gas/low vacuum									
Max. working pressure	MPa	0.7									
Negative pressure	kPa	-100									
Withstanding pressure	MPa	1.5									
Fluid temperature	°C	5 to 60 (no freezing Note 2)									
Ambient temperature	°C	0 to 60 (no freezing)									
Product weight	g	54	48	54	48	48	60	61	82	86	88
Needle control range		1 to 12 rotations					1 to 13 rotations				
Flow	ℓ/min (ANR)	18		80		160	240		440		
Effective sectional area	mm^2	0.15		1.2		2.4	3.6		6.6		

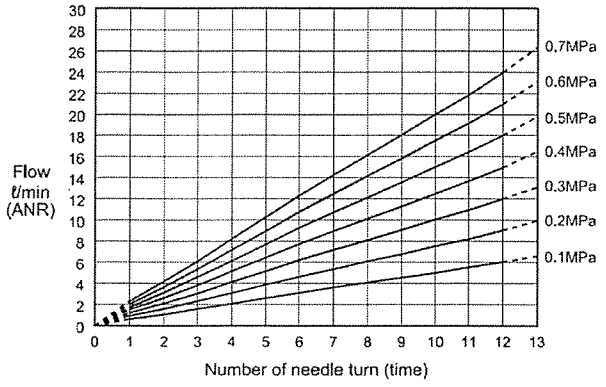
Note 1: The flow is the atmospheric pressure conversion value at pressure 0.5MPa.
Note 2: Freezing could occur by adiabatic expansion depended with air quality (dew point).

1.2 Flow characteristics

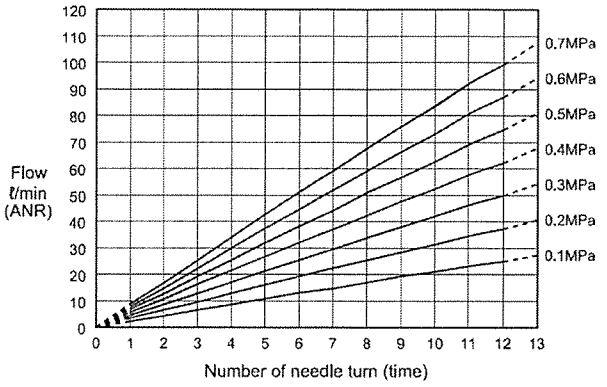
Flow characteristics

*The flow characteristic graph is for reference. The value is not guaranteed.

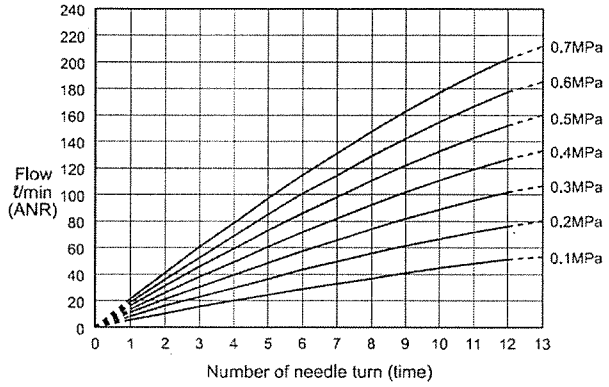
●DVL-*-020



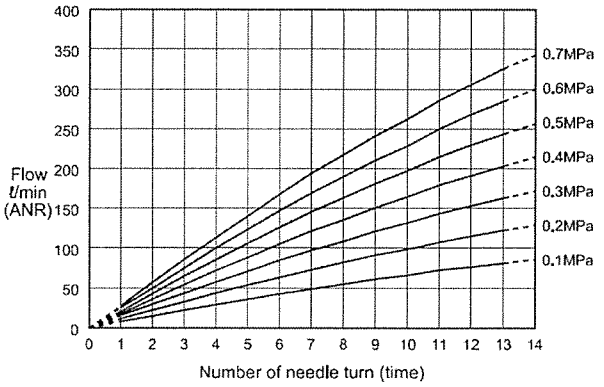
●DVL-*-080



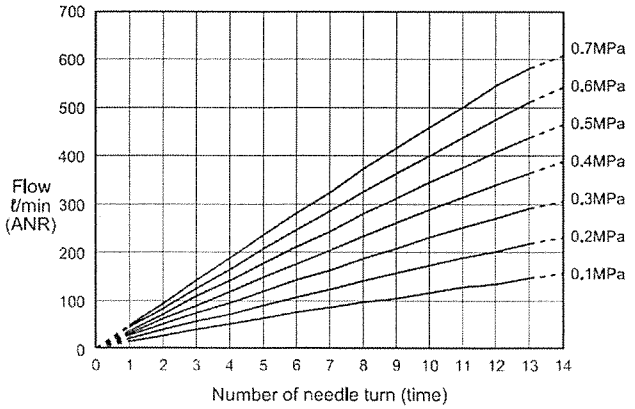
●DVL-*-160



●DVL-*-240



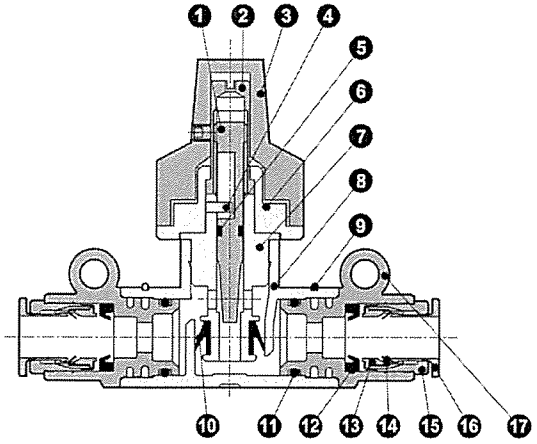
●DVL-*-400



1.3 Internal structure and part list

Internal structure and parts list

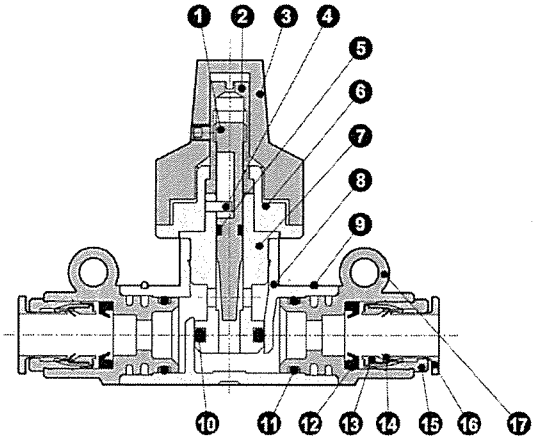
● DVL-S



No.	Parts name	Material
1	Needle	Brass
2	Rotary shaft	Brass
3	Dial	Aluminum alloy, polyamide, other
4	Parallel pin	Stainless steel
5	O ring	Nitrile rubber
6	Guide bush	Brass
7	Check bracket	Brass
8	Body	PBT
9	Stopper ring	Stainless steel
10	Check packing seal	Hydrogen nitrile rubber
11	O ring	Nitrile rubber
12	Packing seal	Nitrile rubber
13	Holder	Brass
14	Chuck	Stainless steel
15	Outer ring	Brass
16	Push ring	PBT
17	Joint case	PBT

Note 1: All the brass parts are plated with electroless nickeling.
Note 2: Some sections' structures differ depended with model no. (No material changed)

● DVL-N

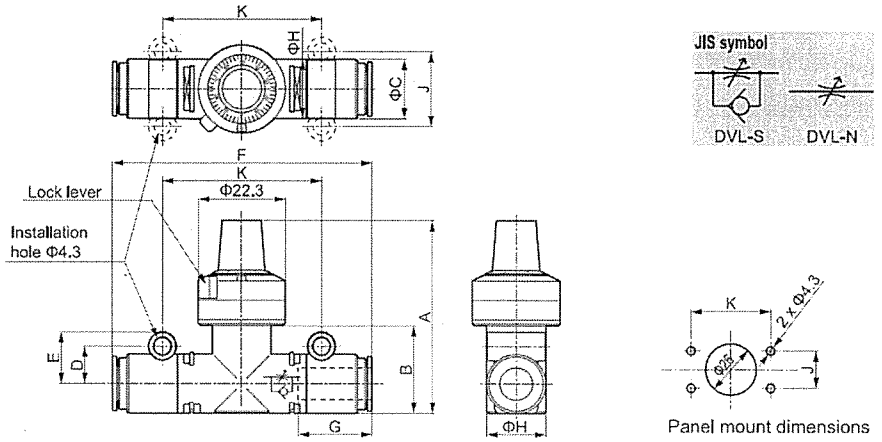


No.	Parts name	Material
1	Needle	Brass
2	Rotary shaft	Brass
3	Dial	Aluminum alloy, polyamide, other
4	Parallel pin	Stainless steel
5	O ring	Fluoro rubber
6	Guide bush	Brass
7	Check bracket	Brass
8	Body	PBT
9	Stopper ring	Stainless steel
10	O ring	Hydrogen nitrile rubber
11	O ring	Hydrogen nitrile rubber
12	Packing seal	Hydrogen nitrile rubber
13	Holder	Brass
14	Chuck	Stainless steel
15	Outer ring	Brass
16	Push ring	PBT
17	Joint case	PBT

Note 1: All the brass parts are plated with electroless nickeling.
Note 2: Some sections' structures differ depended with model no. (No material changed)

1.4 Envelope dimensions and JIS symbol

Dimensions

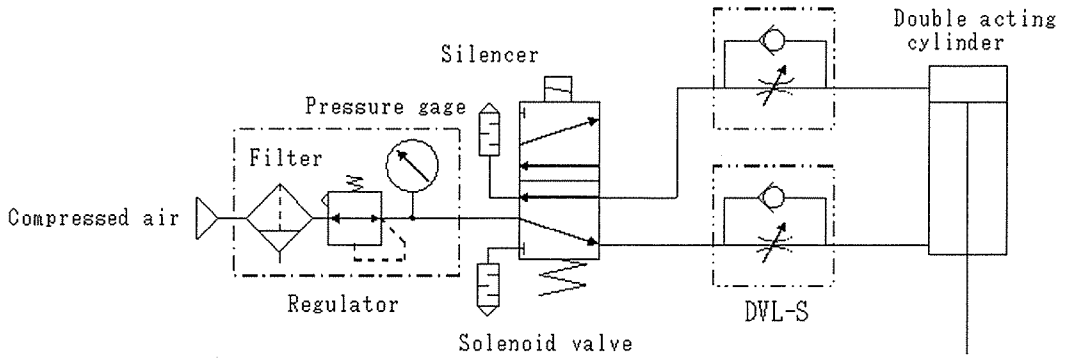


Model no.	Applicable tube outer diameter	A	B	C	D	E	F	H	J	K	G (Tube insertion length)
DVL-*-06-H44-*	Φ4	45.5	17	12	8.1	11.6	55	12	16.2	30.8	12.9
DVL-*-06-H66-*	Φ6						49.5				13.7
DVL-*-08-H66-*	Φ6	50	22.5	13	9.5	13.1	64	15	19	41	18
DVL-*-08-H88-*	Φ8			15			66.5				19
DVL-*-10-H88-*	Φ8	58	29		11.5	15.5	71	20	23	47	
DVL-*-10-H1010-*	Φ10			18		15.1	75				21
DVL-*-10-H1212-*	Φ12			20.4			79				22

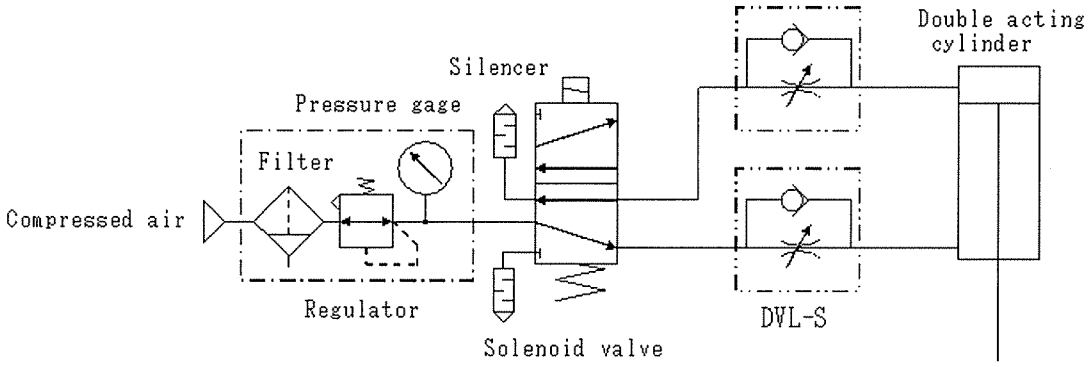
1.5 Fundamental circuit diagram

The fundamental circuit diagram of controlling Cylinder speed using DVL-S (check valve type) is as per shown below.

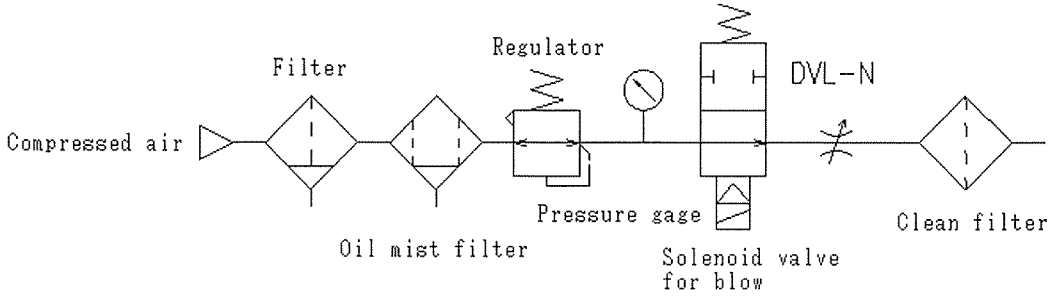
(Meter-out connection)



(Meter-in connection)



The fundamental circuit diagram of a blow circuit using DVL-N (needle valve oil-prohibited type) is as per shown below.



2. SAFETY PRECAUTIONS FOR INSTALLATION AND REPLACEMENT

⚠ WARNING :

1) Always use the product under the specified conditions.
2) This product is used with compressed air and N_2 gas. Avoid use in other fluids.
3) Before starting the maintenance work, stop the air flow completely and make sure that no residual pressure remains inside the product.
4) When connecting a tube to the joint, insert the tube firmly until it makes contact with the tube end piece of the joint. Make sure that the tube will not come out of the joint before running the system.
5) When installing this product, always observe the flow direction. If the product is installed in the incorrect orientation, the speed cannot be controlled, causing the actuator to be projected.

3. CAUTION

Design & Selection

⚠CAUTION

■ **This valve can not be used as a stop valve that has no leakage.**
Due to structure, a few leakage could occur.

■ **Care must be taken because the flow varies from the characteristics value on page 5 depending on the piping conditions before or after the product and temperature.**

■ **The particle occurrence in the flow path is not zero.**
Even when using oil-prohibited models, install a final clean filter if dust could be a problem with the circuit.

■ **Oil-prohibition specifications apply for fluid passage section only.**
Do not wash this product because grease is used for internal parts other than wetted sections.

■ **Do not use this valve in circuits where ozone is generated intentionally.**
Ozone resistance is sufficient for naturally generated ambient ozone. Packing deteriorates if ozone levels are high.

■ **Use this product in accordance with the specifications range.**
Consult with CKD when using the product for special applications.
- Use with exceeding the specifications range may result in insufficient performance, and safety can not be secured.
- Could not use in special applications and environment. For example, use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.

■ **Confirm that the product will withstand the working environment.**
- This product cannot be used in environments where functional obstacles could occur.
  Special environments reaching high temperatures, having chemical atmospheres, or having chemicals, vibration, humidity, moisture, dripping, or gas are present. Environments where ozone is generated.
- Do not use the product in the place that the product could directly contact with coolant or spatter, etc.

Installation & Adjustment

⚠CAUTION

■ **When adjusting the flow rate, turn the dial clockwise to open the valve and counterclockwise to close it.**

■ **After adjusting the flow rate, fix the dial with the sliding lock lever.**

■ **The flow rate is controlled from 1 to 12 or 13 on the dial rotation indicator.**
Avoid flow rate control exceeding this range. If the dial is forcibly fully closed or open, faults could occur and flow rate properties deviate.

■ **Even when the needle is fully closed, the dial indication is not 0.**
The flow rate in the dial indication is calibrated when the needle is not fully closed. Note that 0 is not necessarily indicated when the needle is fully closed.
When 0 is exceeded, 19 or nothing may be displayed.

■ **Do not remove the dial from the main body.**
Removing the dial may prevent the flow rate from being readjusted or calibrated.

■ **Install an air filter in front of the circuit.**
The flow varies depending on clogging or foreign matters adhered in the orifice.

3
CAUTION

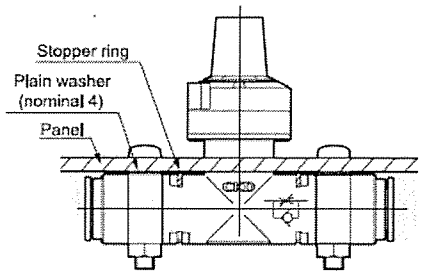
Installation & Adjustment

■ **With the DVL-N, dial rotation may be stiff.**
Because of oil-prohibited specifications, dial movement may be slightly stiffer than with the DVL-S.

■ **Rotate the mounting hole section at no pressurized state.**

■ **With the DVL-N, turning in the mounting hole may be slightly stiff.**
Because of oil-prohibited specifications, movement of the rotary mounting hole will be stiffer than for the DVL-S.

■ **When installing on a panel, the stopper ring will interfere with the panel, so insert a flat washer between the mounting hole and panel.**



■ **When piping, fix the product with bolts or Insulock ties, etc.**
If the product moves or twists, the tube could be dislocated.

■ **Tighten the bolt on the mounting hole with a torque of 0.8 N.m or less.**

■ **There is no direction for needle valve piping.**

■ **Before replacing tubing, stop the air flow and confirm that no pressure remains.**

■ **Handling push-in joint/tube**
Refer to "Pneumatic, vacuum and auxiliary components (No. CB-24SA)" for warnings and cautions of joint/tube.

■ **When supplying compressed air for the first time after connecting pipes, do not apply high pressure suddenly.**
Piping connection could be dislocated or the piping tube fly off, leading to accidents.

■ **After connecting piping, check pipe connections for air leaks before supplying compressed air.**
Apply a leakage detection agent on pipe connections with a brush, and check for air leaks.

■ **Pipe so that piping connections do not become dislocated due to device movement, vibration, or tension.**

■ **Ensure space around the pneumatic component for installation, removal, wiring, and piping work.**

■ **Avoid use in applications involving continuous turning or swaying.**
Otherwise the joint could be damaged.

■ **Avoid use in areas with high vibration or impact.**

When using for actuator speed control

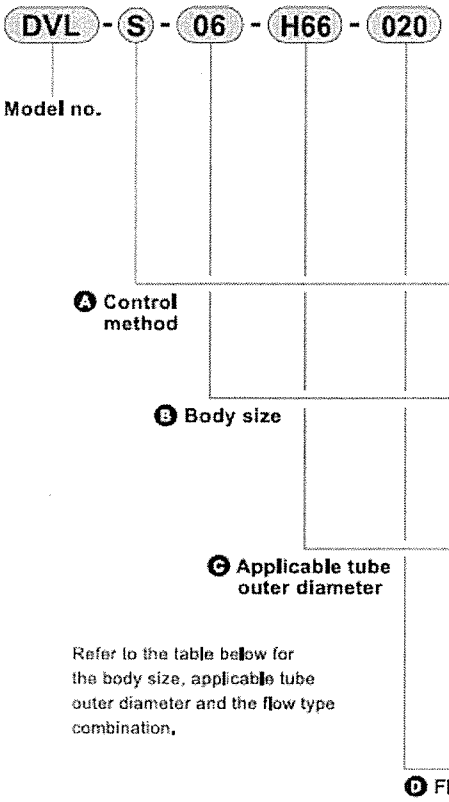
■ **Final speed must be adjusted as necessary.**
Speed differs greatly depending on product differences, working conditions, actuator differences, and temperature, so confirm the final speed as necessary. Aging of the actuator may cause speed to fluctuate greatly.

■ **Check flow direction with JIS symbol.**
If installed in reverse, speed adjustment will not be applied and the actuator could pop out, creating a hazard.

■ **Adjust speed by opening when the needle is nearly closed.**
The actuator could suddenly pop out if the needle is open.

■ **Understand compressed air features before designing a pneumatic circuit.**

4. HOW TO ORDER



Symbol	Descriptions
Ⓐ Control method (oil removing)	
S	Check valve type
N	Needle valve (oil-prohibition type)
Ⓑ Body size	
06	1/8 screw or equivalent
08	1/4 screw or equivalent
10	3/8 screw or equivalent
Ⓒ Applicable tube outer diameter	
H44	Φ4
H66	Φ6
H88	Φ8
H1010	Φ10
H1212	Φ12
Ⓓ Flow type	**Note 1**
020	18 ℓ/min. (ANR)
080	80 ℓ/min. (ANR)
160	160 ℓ/min. (ANR)
240	240 ℓ/min. (ANR)
400	440 ℓ/min. (ANR)

⚠ Note on model no. selection

Note 1: The flow indicates the reference flow at 0.5 MPa.
Note 2: DVL-S and DVL-N can be distinguished by push ring color.
DVL-S: White
DVL-N: Blue

Body size, applicable tube outer diameter and flow type combination

	Ⓑ Body size						
	06		08		10		
Ⓒ Applicable tube outer diameter / Ⓓ Flow type	H44	H66	H66	H88	H88	H1010	H1212
020	●	●					
080	●	●					
160		●					
240			●	●			
400					●	●	●