Discontinue

SM-10503-A

INSTRUCTION MANUAL

FOR

High vacuum air-operated valve

AVP

CKD Corporation

FOR SAFETY USE

The Product is to be used by those who has a basic knowledge about material, fluid, piping electricity regarding Control Valves (solenoid valves, motor valves, air operated valves and so on.)

Never use this Product by those who have no knowledge or are not well trained about Control Valves.

Should be any trouble or accident caused by a wrong selection and/or wrong use of the Product even by a person of basic knowledge about Control Valves, we are not responsible therefore.

Since any customer of the Product have a variety of its application, we are not in a position to get all the information on how and where the Product is used. There may be the cases where that the Product may not meet customers' requirement or may cause any trouble or accident, by fluid, piping or other condition that are not within the specifications of the Product.
Under such a circumstance, select with their responsibility the most suitable application and use of the Product according to the customers' requirements.

The Product incorporates a various safety arrangement, however miss-handling of the product may lead to any trouble or accident on customers side. **To avoid any possible trouble, read this INSTRUCTION MANUAL carefully and understand it fully.**

Pay your attention to the items described in this Text, as well as the items indicated below.

⚠ CAUTIONS

- **When energized, heat is generated at coil portion of solenoid valves and motor valves particularly "Class H" coil where may have a high temperature.**

- **There my have electric shock when wire connecting portion of solenoid valves or motor valves are touched. In case of disassembly or inspection, turn off power supply beforehand. Don't touch live portion by wet hands.**

- **Make piping so as not to have leakage and check for no leakage before use, because in case of control valves for high temperature fluid like steam, leakage may cause heat injury.**

We would like to thank you for your purchase of the CKD "AVP Series" high vacuum air-operated valve.

This product is a high vacuum, air-operated valve developed for use in the wafer process on semiconductor manufacturing lines.

Please read this instruction manual thoroughly before use.

Please be assured that all CKD equipment undergoes the strictest of quality control procedures during manufacture.

TABLE OF CONTENTS

1. MAIN PRODUCT FEATURES

1. Good sealing & Long life

   Double O-ring and grease cup realize excellent sealing and long life.

2. Allowable back pressure

   Connect to the vaccum pump in any direction needed.
   (Except for AVP71 and AVP81)

3. Identical configuration for NC, NO and double-action type.

4. Various options

   A valve shutter cylinder switch that can be retrofit and a pilot operation solenoid valve *1 are available as options.
   (Pilot solenoid cannot be installed on double-action type.)

5. Smooth flow passage configuration by use of bulge piping
   (BA finish treatment)

6. Clean-pack delivery

   Merchandise is delivered absolutely free of moisture and free of oil thanks to packaging in a static-free polyethylene bag.

*1 : However cylinder part replacement is needed when retrofitting to the type NO. Please consult with our company or your dealer regarding this.

2. MODEL CODE EXPLANATION

Reading the lot number

Model change ‖ Option

AVP ⓐ ⓑ 2 - ⓒ - ⓓ - ⓔ ⓕ ⓖ - ⓗ

ⓐ Series	
2	1/4"
5	25A
6	40A
7	50A
8	80A

ⓑ Operating category	
1	NC
2	NO
3	Double-action

ⓒ Connection diameter	
8T	1/4" tube
25K	NW25
40K	NW40
50K	NW50
80K	NW80

ⓓ Coil	
2C	Grommet coil
2G	DIN terminal box

ⓔ Switch number	
H	Open valve sensor
R	Close valve sensor
D	Open/closed valve sensor

ⓕ Switch type	
C2	Non-contact 2 line type
C3	Non-contact 3 line type

ⓖ Line length	
None	1m
3	3m
5	5m

ⓗ Rated voltage(pilot solenoid)	
AC100V	AC100V(50/60Hz) AC110V(50Hz)
3	AC200V(50/60Hz) AC220V(50Hz)
5	DC24V

Note : 1. The AVP-2 type is only set for AVP21-8T
(No setting for option)

2. The pilot solenoid valve cannot be attached to the douuble-action type.

Discontinue

3. Specifications

	Model / Item		AVP21-8T	AVP512-25K	AVP612-40K	AVP712-50K	AVP812-80K
NC	Media		Vacuum and inert gas				
	Working Pressure Range	(Pa)	1.3×10^{-6}(abs) ~2.5×10^{5}(abs)	1.3×10^{-6}(abs) ~1.5×10^{5}(abs)	1.3×10^{-6}(abs)~1×10^{5}(abs)		1.3×10^{-6}~1×10^{5}
		(Torr,kgf/cm^2)	1×10^{-8}~1.5	1×10^{-8}~0.5	1×10^{-8} ~ Atomospheric Pressure		
	MAX. Operating Pressure Differential	(MPa)	0.25	0.15	0.1	0.1 (Not allowed Back Pressure)	
		(kgf/cm^2)	2.5	1.5	1.0	1.0 (Not allowed Back Pressure)	
	Orifice	(mm)	5	24	40	50	80
	Stroke	(mm)	3	15	20	22	32
	Operating Pressure	(MPa)	0.3~0.5 {3~5kgf/cm^2}				
	Fluid Temperature	(℃)	5~60				
	Ambient Temperature	(℃)	0~60				
	Leakage	(Pa · m^2/s)	Below 1.3×10^{-9} {1×10^{-8}Torr · ℓ/s}				
	External Leakage	(Pa · m^2/s)	Below 1.3×10^{-8} {1×10^{-7}Torr · ℓ/s}				Below 1.3×10^{-8} {1×10^{-7}Torr · ℓ/s}
	Shape of Joint		1/4" tubing	NW25	NW40	NW50	NW80
	Weight	(N)	2.5 {0.25kgf}	16 {1.6kgf}	26 {2.6kgf}	38 {3.8kgf}	104 {10.4kgf}

	Model / Item		AVP522-25K	AVP622-40K	AVP722-50K	AVP822-80K
NO	Media		Vacuum and inert gas			
	Working Pressure Range	(Pa)	1.3×10^{-6}(abs) ~1.5×10^{59}abs)	1.3×10^{-6}(abs)~1×10^{5}(abs)		1×10^{-6}~1.5×10^{5}
		(Torr,kgf/cm^2)	1×10^{-8}~0.5	1×10^{-8}~Atomospheric Pressure		1×10^{-8}~0.5
	MAX. Operating Pressure Differential	(MPa)	0.15	0.1		0.15
		(kgf/cm^2)	1.5	1.0		1.5
	Orifice	(mm)	24	40	50	80
	Stroke	(mm)	15	20	22	32
	Operating Pressure	(MPa)	0.3~0.5 {3~5kgf/cm^2}			
	Fluid Temperature	(℃)	5~60			
	Ambient Temperature	(℃)	0~60			
	Leakage	(Pa · m^2/s)	Below 1.3×10^{-9} {1×10^{-8}Torr · ℓ/s}			
	Leakage	(Pa · m^2/s)	Below 1.3×10^{-8} {1×10^{-7}Torr · ℓ/s}			
	Shape of Joint		NW25	NW40	NW50	NW80
	Weight	(N)	16 {1.6kgf}	26 {2.6kgf}	38 {3.8kgf}	104 {10.4kgf}

Discontinue

	Model / Item		AVP523-25K	AVP623-40K	AVP723-50K	AVP823-80K
	Media		Vacuum and inert gas			
	Working Pressure Range	(Pa)	1.3×10^{-6}(abs)~2×10^{5}(abs)			
		(Torr,kgf/cm^2)	1×10^{-8}~1kgf/cm^2			
	MAX. Operating Pressure Differential	(MPa)	0.2			
		(kgf/cm^2)	2.0			
Double Acting	Orifice	(mm)	24	40	50	80
	Stroke	(mm)	15	20	22	32
	Operating Pressure	(MPa)	0.3~0.5 {3~5kgf/cm^2}			
	Fluid Temperature	(℃)	5~60			
	Ambient Temperature	(℃)	0~60			
	Leakage	(Pa · m^2/s)	Below 1.3×10^{-9} {1×10^{-8}Torr · ℓ/s}			
	External Leakage	(Pa · m^2/s)	Below 1.3×10^{-8} {1×10^{-7}Torr · ℓ/s}			
	Shape of Joint		NW25	NW40	NW50	NW80
	Weight	(N)	14{1.4kgf}	25{2.5kgf}	33{3.3kgf}	99{9.9kgf}

Options

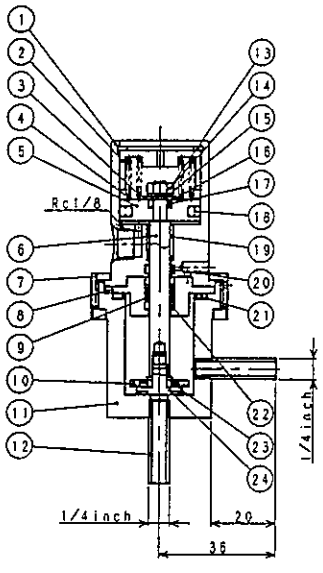
Valve Electrical Specifications		
Roted Voltage		AC100V (50/60Hz) AC110V (60Hz) AC200V (50/60Hz) AC220V (60Hz) DC24V
Apparent Power	at Starting	3.3VA(50Hz) 2.8VA(60Hz)
	at Holding	6.6VA(50Hz) 5.6VA(60Hz)
Consumption Power	AC	2.2W(50Hz) 2.0W(60Hz)
	DC	4.0W
Insuration Class		B Class

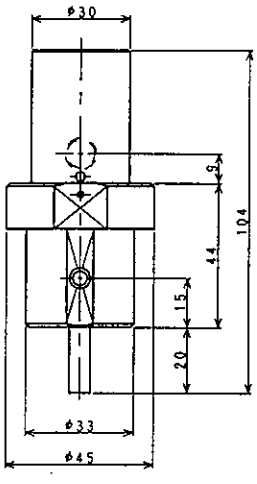
Switch Specifications	C2	C3
Application	Programmable Controller	Programmable Controller Relay , IC Circuit , Miniature Solenoid Valve
Power Supply Voltage		DC10~28V
LOad Voltage · Current	DC10~30V , 5~30mA	Below DC30V , 150mA
Indicator Light	Light Emitting Diode	
Max. Shock Resistance	30G	

4. DIMENSIONS

Internal Structure and DIMENSIONS

AVP21-8T

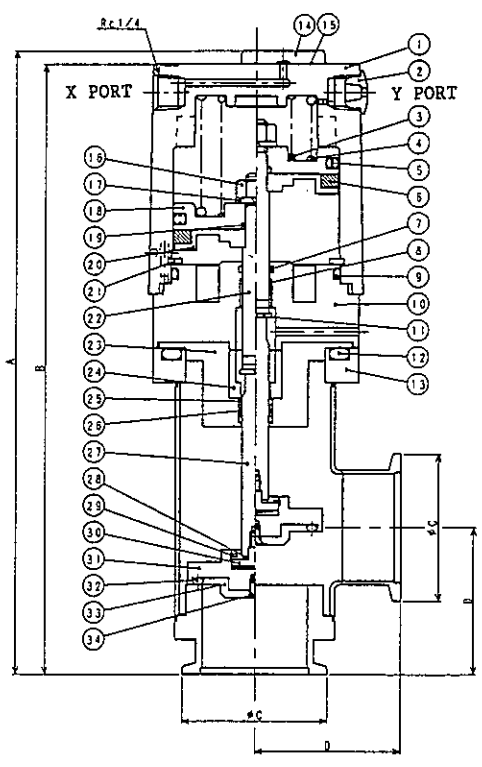


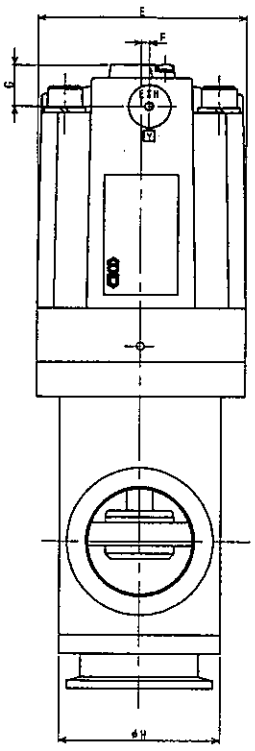


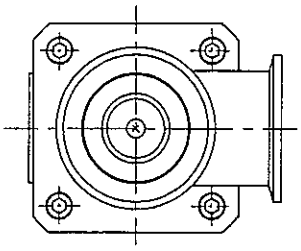
AVP21 has no cylinder switch and solenoid valve.
Operation division is NC only.

24	VALVE DISC A	FKM, SUS303
23	O-RING	FKM
22	O-RING	FKM
21	O-RING	FKM
20	O-RING	NBR
19	BUSHING	
18	PSD PACKING	NBR
17	O-RING	NBR
16	PLAIN WASHER	SUS304
15	SPRING WASHER	SUS304
14	HEX. NUT	SUS304
13	C-TYPE RING	SUS304
12	PIPING	SUS304
11	BODY	SUS304
10	VALVE DISC B	SUS304
9	GREASE CUP	SUS304
8	O-RING HOLDER	SUS304
7	RING	C3604
6	ROD	SUS304
5	PISTON	A5056
4	SPRING B	SWP
3	SPRING A	SWP
2	STOPPER	A5056
1	CYLINDER	A5056

AVP5, 6, 7







Material of piston spacer for AVP5 is polyacetal.

Character / model	A	B	C	D	E	F	G	H
AVP502-25K	193	188	40 (NW25)	50	63	3	15	60.5
AVP602-40K	233	228	50 (NW40)	55	78	3	15.5	60.5
AVP702-50K	271	266	75 (NW50)	70	78	3	15.5	76.3
AVP802-80K	359	354	144 (NW80)	95	155	8	15.5	100

34	CROSS RECESSED ROUND HEAD SCREW	SUS304
33	VALVE DISC B	SUS316
32	O-RING	FKM
31	VALVE DISC A	SUS316
30	ROD PIECE	SUS304
29	C-TYPE RING	SUS304
28	SPRING WASHER	SUS304
27	VALVE ROD	SUS316
26	GREASE CUP	SUS304
25	O-RING	FKM
24	O-RING PRESSURE	A5056
23	O-RING HOLDER	SUS316
22	CYLINDER ROD	SUS316
21	C-TYPE RING	SUS304
20	PISTON SPACER	A5056
19	O-RING	NBR
18	PISTON	A2017
17	SPRING WASHER	SUS304
16	HEX. NUT	SUS304
15	O-RING	NBR
14	CAP	ADC12
13	BODY	SUS316
12	O-RING	FKM
11	SPRING WASHER	SUS304
10	CYLINDER ADAPTER	A5056
9	O-RING	NBR
8	BUSHING	
7	O-RING	NBR
6	MAGNET	
5	PSD PACKING	NBR
4	SPRING B	SWP
3	SPRING A	SWP
2	EXH. CAP	CR
1	CYLINDER COVER	

5. CAUTIONS DURING OPERATION

(1)This valve was developed for high vacuum control functions. When using anything other than inert nitrogen gas, ensure BEFORE USE, that it will not cause harm to the valve material at points where it makes contact.

(2)During operation, use only within the gas flow temperature range as listed in the specifications.

(3)Gas pressure should be within the range as listed in the specifications. Use outside of this pressure range can result in operational malfunctions and internal/external leaks.

(4)Avoid disassembly as much as possible during disassembly of this equipment because after reassembly, the equipment may not meet original specifications. If disassembly of the equipment is necessary, then use the disassembly procedures described later.

(5)The portions of the chart below marked with a dash-dot-dash line are essential to the high vacuum seal function so take adequate precautions to prevent their being damaged or scratched, etc.

(6)Ensure that no dust or foreign objects enter or adhere to the inner portion of the pipes during their installation. (This may cause internal leaks to occur.)

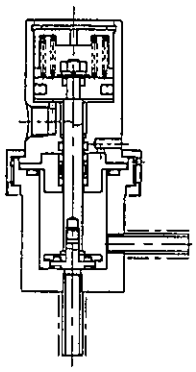
≪ Cylinder Switch ≫

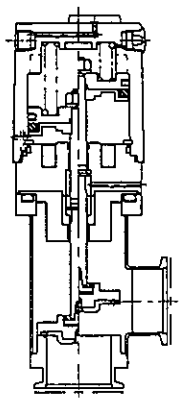
(7)The cylinder switch is set at full-open and full-close sensing, before shipment. (Prior to shipment, the D type is set for valve full-open/full close, the R type for valve close, and the H type for valve open sensing.)

(8)Comply with the color coding of the wires when making connections. (Refer to attached sheet for details.)

(9)Make sure power is OFF before making connections.

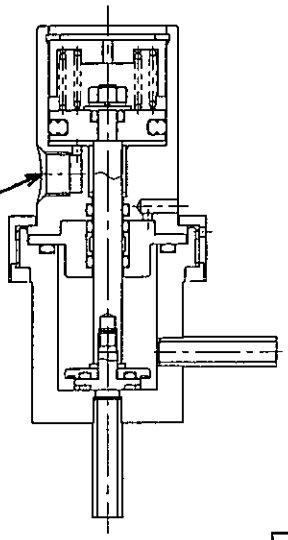
(10)Do not locate this product near locations with strong magnetic fields as operating malfunctions may result. Consult with our company or the dealer when placement near strong magnetic fields is unavoidable.





6. OPERATING PROCEDURES

＜AVP2＞



Port 1
(Rc1/8)

0.3~0.5MPa

(Connection procedure-from tube)

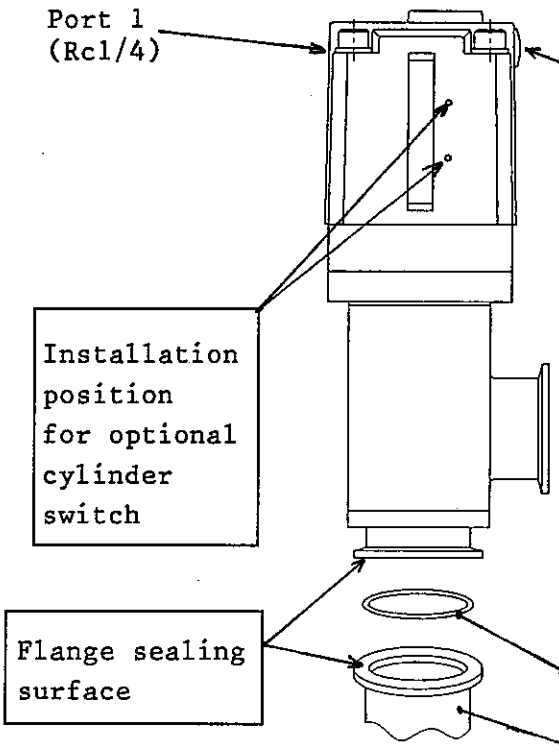
・2 layer grip coupling

・Ultra-torr(CAJON)
(Tighten the screw of the knurled section inserted into the tube)

・Weld(automatic welding)

＜AVP5, 6, 7, 8＞

Installation position for optional solenoid valve

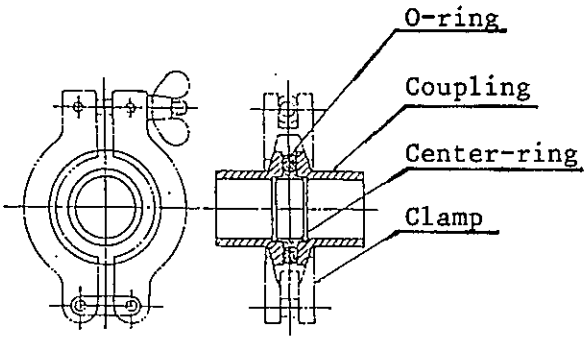


Ports

Operating Category / Port position	NC	NO	Double-action
Port 1	Opening X port	Closing Y port	Closing Y port
Port 2	Exhaust Y port	Exhaust X port	Opening X port

Use an operating pressure of 0.3 to 0.5 MPa.

≪ Tightened coupling ≫



Note

Check before installation that no dust , etc. has adhered to the sealing surfaces of the O-ring and flange.

Use an item that conforms to JIS standards for the matching flange.
(JIS standards ··· JIS B8365)

The sealing connection of the flange (NW) for this valve unit, with the matching flange, can be made with a quick-clamp coupling for the center-ring guided O-ring, and by simply tightening the wings nut gripping the flanges from both sides.
(Please consult with our company or your dealer for parts procurement and additional information on the quick-clamp coupling, center-ring and O-ring, etc.

7. MAINTENANCE INSPECTIONS

7.1 PERIODIC INSPECTIONS

Make periodic inspections of the valve once or twice a year to ensure optimum operation.

7.2 DISASSEMBLY

If at all possible carry out disassembly in a Clean Room (or location where dust, etc. is not present).
Note : NEVER disassemble the valve unless circumstances such as dust or grit grinding into the the valve seat, causing leaks make it absolutely necessary.

≪ AVP2 ≫ (refer to disassembly chart on separate seat)

1. Set an air supply load of 0.35MPa from the port.
2. Remove the ring (7) shown on the drawing.
3. Secure the body so it does not move, and pull out the actuator.

≪ AVP5 AVP6 AVP7 ≫ (refer to disassembly chart on attached sheet)

1. Set an air supply load of 0.35 MPa from the X port when using the NC type (AVP □2-).
   (Do not apply a load in the case of NO or double-action types.)
2. Remove the 4 hex (recessed head) bolts (1).(DO NOT remove the hex bolts at the upper portion of the actuator.)
3. Secure the body (6) so it does not move, grasp the actuator (7) and pull it out of the body.
4. Remove the countersunk screws (2) attached to the lower part of the valve disk A, and pull out the valve disk B (3).
   (Take care not to damage or scratch the O-ring.)

Disassembly of the gas contact section can be done with the above procedure.
A safeguard mechanism is in place to prevent the spring from flying out during disassembly but for safety, avoid disassembly as much as possible.

7.3 Assembly

Reassemble, in the sequence ①④③② using the steps in the above disassembly procedure. Please take note of the following precautions during reassembly.

1. Check that no dust or grit, etc. has adhered to the internal seal O-ring ④ or to the external seal O-ring ⑤. < AVP5 AVP6 AVP7 >

2. Check that there is no dust, grit, or scratches on the O-rings ⑩, ⑱ and ⑲ (body O-ring groove, valve seat O-ring groove). < AVP2 >

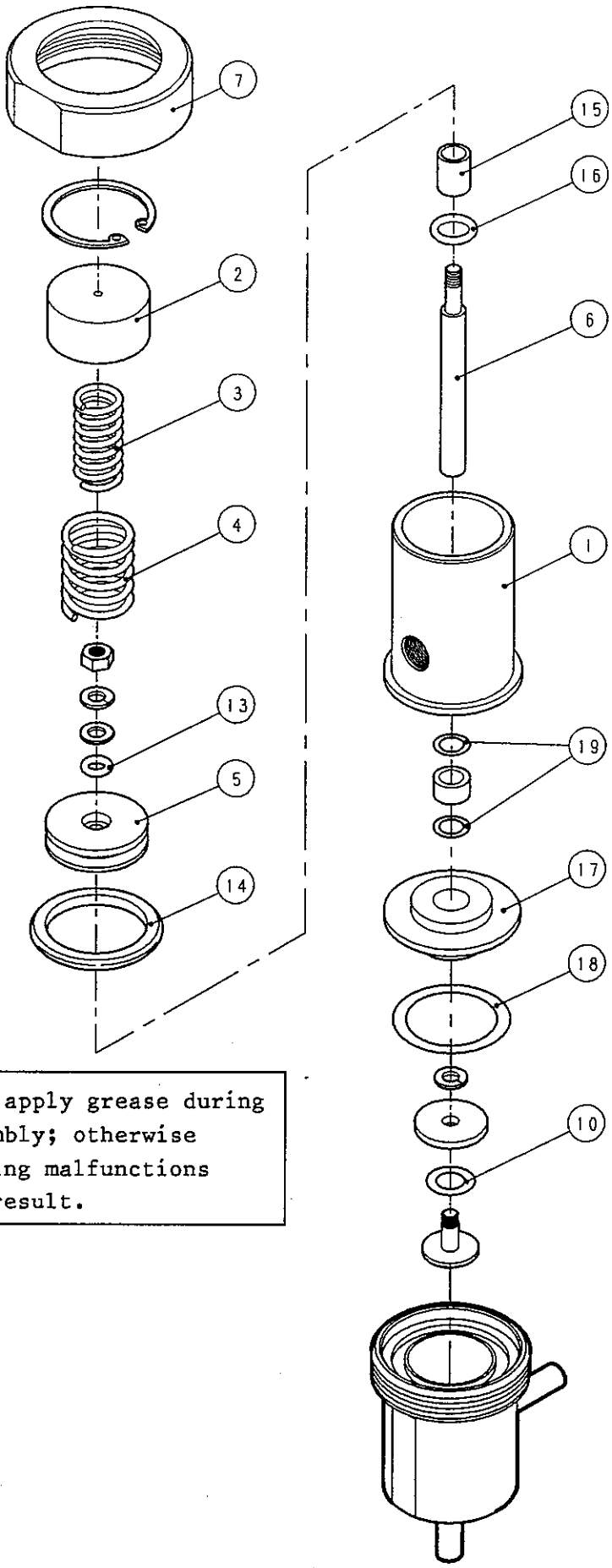
3. Tighten the cross recessed-head machine screw ② with a torque of 2.5 N·m or greater. <AVP5 AVP6 AVP7 >

4. The hex recessed bolts ① are tightened with a torque of 6 N·m or greater. Tighten so that the 4 bolts all have an equal torque. < AVP5 AVP6 AVP7 >

5. Tighten the ring ① with a torque of 25 N·m.< AVP2 >

Discontinue

AVP21



Tighten within a torque range of 20 to 25 N·m.

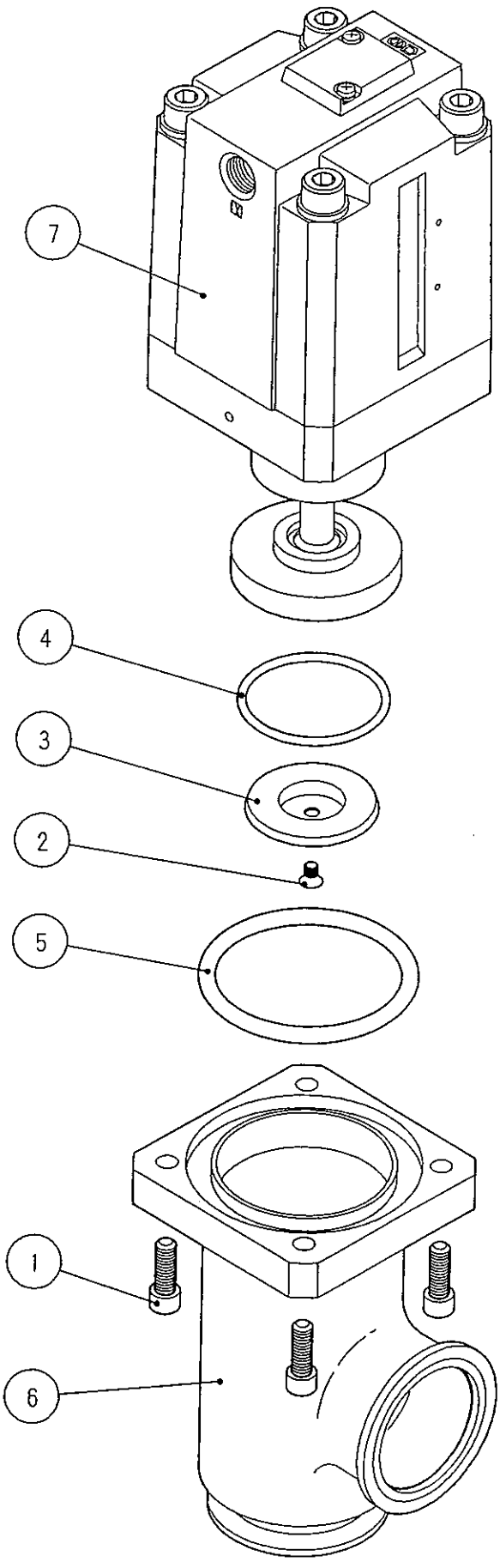
Always apply grease during reassembly; otherwise operating malfunctions could result.

Check that no dust or grit has adhered to the O-ring.

Take care to avoid damaging, scratching or letting dust adhere to the O-ring seal.

When the O-ring has to be inserted into the groove, make sure it is entirely contained within the groove; otherwise internal leaks could result.

AVP 5, 6, 7, 8



≪NOTE≫
Perform reassembly and disassembly with the valve open.

Avoid disassembly as much as possible since this section can be hazardous at times.

Take care to avoid damaging, scratching or letting dust adhere to the O-ring seal.

During reassembly wipe off any dust or grit adhering to the O-ring, using alcohol, etc.(Otherwise internal and external leaks could result.)

Tighten with a torque of 2.5 to 2.8 N·m.

Tighten with a torque of 6 to 10 N·m.

Take care to avoid damaging, scratching or letting dust adhere to the O-ring seal and flange portions.

8. OPTIONS

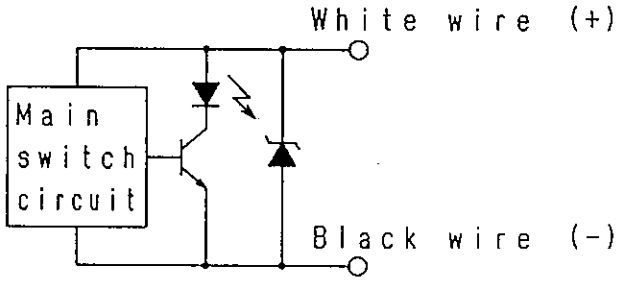
8-1. Switch Specifications

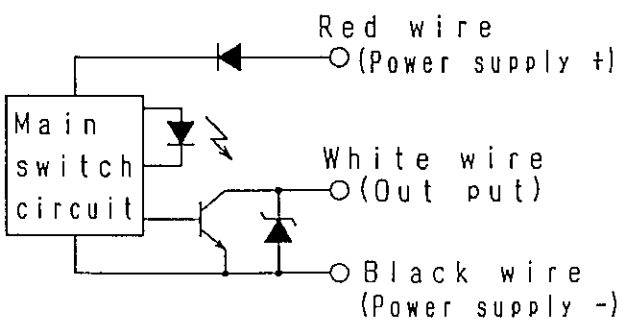
Item \ Type·Model No.	NAB－C2	NAB－C3
Application	Programmable controller	Programmable controller, relay, IC circuit compact solenoid valve.
Power supply voltage	———	10-28 volts DC
Load voltage · current	10-30 volts DC at 5-30 mA	30 volts DC at 150 mA maximum
Power consumption	———	15 mA maximum at 24 volts DC (when on)
Internal voltage drop	4 volts maximum	0.5 volts maximum LED(lights up when on)
Lamps	LED(lights up when on)	
Leakage current	1 mA maximum	10 μA maximum
Lead wire length (Note 1)	Oil resistant vinyl, 1m(round shaped, 2 wire cores 0.2mm²)	Oil resistant vinyl, 1m(round shaped, 3 wire cores 0.15mm²)
Maximum impact	30G	
Insulation resistance	Shall show a minimum of 100 MΩ with a DC 500 volt megohmmeter.	
Insulation voltage test	Shall withstand 1,000 volts AC for 1 minute with no abnormalities.	
Ambient temp. range	-10°C to +60°C	
Protective structure	ICE standards IP67, 68, JIS C0920(non-penetrative type) oil-resistant NAB-C3	

Note : Lead wires with lengths of 3 m or 5 m can be prepared as options.

8-2. Internal Circuit Diagram

NON-CONTACT 2 LINE TYPE	NON-CONTACT 3 LINE TYPE
●C2	●C3



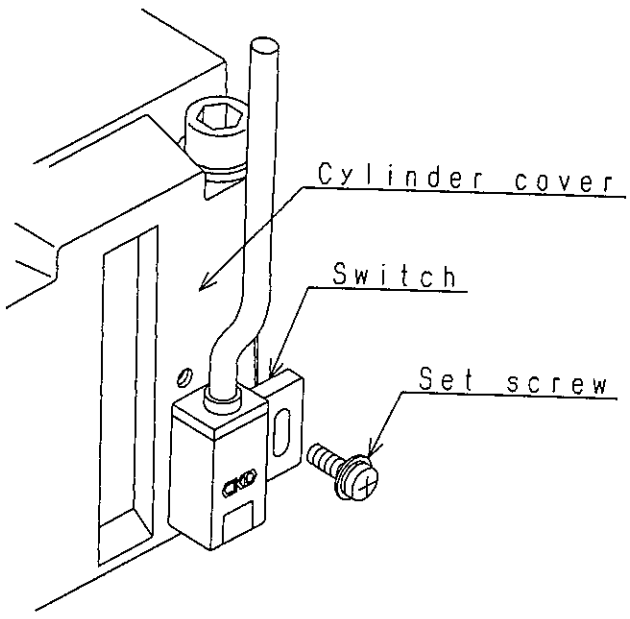


8-3. Switch Application Chart

Model	NAB－C2	NAB－C3
Load/application	——	○
DC compact relay	——	○
DC mid-size relay	——	○
DC compact solenoid valve	——	○
Digital IC	——	○
Programmable controller (Synchronized input)	○	○
Programmable controller (Source load input)	○	——

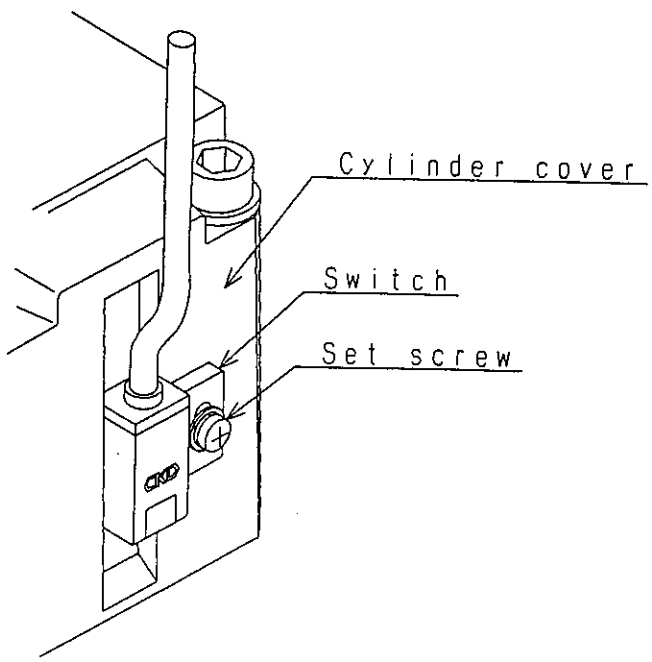
8-4. Switch Insullation and Position Adjustment

① Switch Installation procedure



Set the switch onto the groove of the cylinder cover and secure it with the set screw (M3×8 spring washer and small Phillips recessed pan head screw {W/round polished toothed washer} SUS304).
Tighten with a torque of 0.5 to 0.7N·m.

② Installation position shift method



Loosen the set screw (M3×8 spring washer and small phillips recessed pan head screw {W/round polished toothed washer} SUS304) and move the switch as needed along the groove in the cylinder cover.
After adjusting, tighten the set screw to a torque of 0.5 to 0.7N·m.

8-5. Precautions During Operation

a. Connecting the lead wires

① C2 connection

Make sure the white wire is connected to the positive (+) side and the black wire to the ground (-) negative side.
However do not connect the wires directly to the power supply, always apply a load in series in the circuit.

② C3 connection

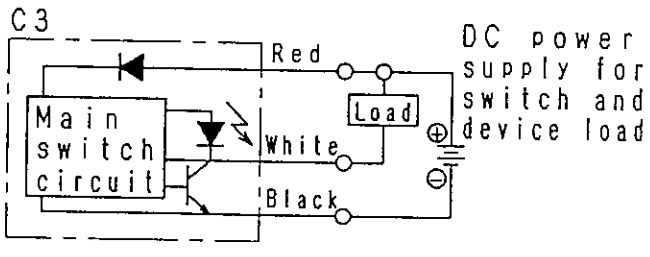
Make sure the red wire is connected to the positive (+) side and the black wire to the ground (-) negative side.
Do not connect the white wire directly to the power supply, always apply a load in series in the circuit. At such times always make sure the power supply connected to the circuit is turned OFF.

The C3 switch is ···

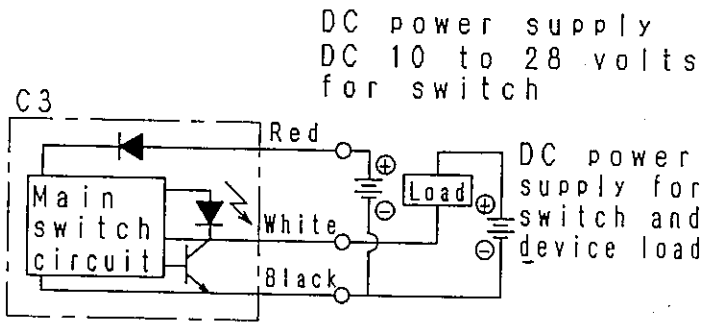
A wiring error causing an electrical short circuit will damage not only the switch, but also the electrical circuit which is the load.
Take adequate precautions to avoid wiring errors and avoid short circuiting the load (device).

Work done with the power applied can, depending on the job sequence, may damage the switch and electrical circuit load evev if no wiring errors occur.

<C3 wiring connections>



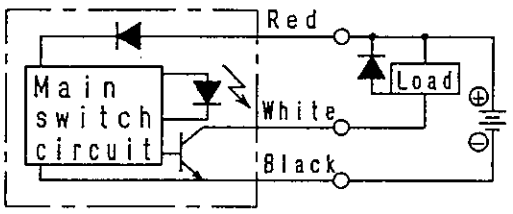
Basic Circuit
(When switching and load power supplies are the same)



Basic Circuit
(When switching and load power supplies differ)

b. Load Connections

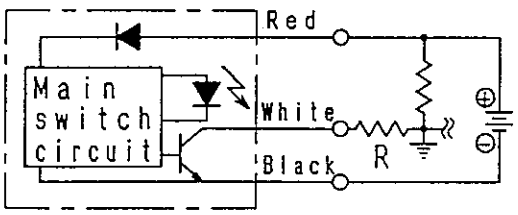
The C2 switch is designed exclusively for use with the programmable controller. Since it is the 2 wire type, either a synch load input or a source load input can be connected.
A digital IC, microcomputer, programmable controller, relay, solenoid or solenoid valve, etc. can be connected to the C3 switch as a load.
During desigh and selection of circuit components and performance, consideration should be given to the load to ensure rated switch values for voltage, etc. are not exceeded, not just during normal operation, with static characteristics but also at times when circuit overloads may occur (excess current when switched on, voltage surge when switched off, etc.). If there is a danger that device ratings may be exceeded then some sort of safety circuit should be provided such as surge protector or current limiting resistor, etc.



Surge protector device used with inductive load

● Diode

D = HITACHI Ltd. VO6C or equivalent

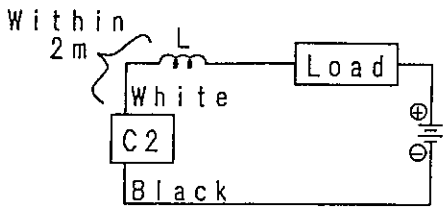


Current limiting resistor used with capacitive load.
Use the following formula to find the resistor value for this kind of circuit arrangement.

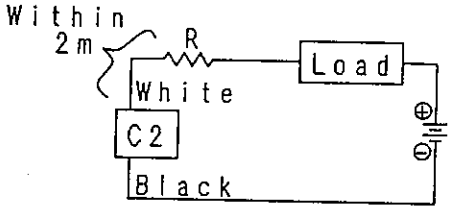
$$\frac{V}{0.15} = R(\Omega)$$

c. Lead wire length

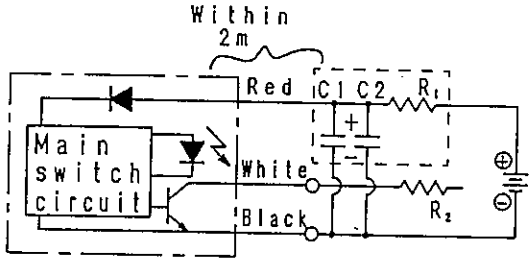
A long wire length may cause a current surge when the device is switched on, making it prone to pickup external noise due to excess capacitance.
Take the following measures when wire length exceeds 10 m.



- Choke coil L = Use a coil of some 300 μH to several mH with excellent high frequency characteristics
- Keep wiring near switch (2 m or less)



- Current limiting resistor R = Use as large a resistor as the circuit load permits.
- Keep wiring near switch (2 m or less)

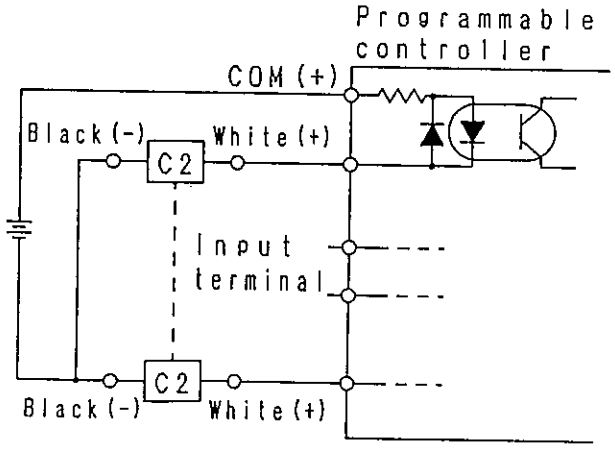


- Power supply noise filter circuit
  C1 = 20 to 50 μF
  Electrolytic condenser (Withstand voltage of 50 volts or more)
- C2 = 0.01 to 0.1 μF ceramic condenser
  R1 = 20 to 30 Ω
- Current limiting resistor
  R2 = Use as large a resistor as the circuit load permits.
- Keep wiring near switch (2 m or less)

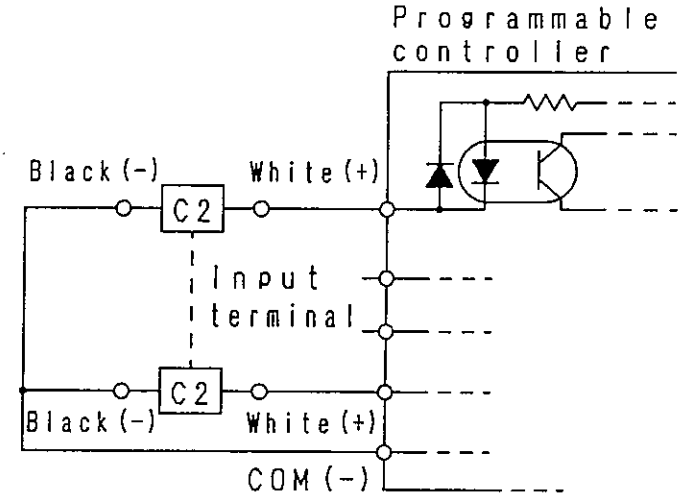
d. Connection to programmable controller

Connection method varies according to the configuration of the programmable controller.
Use the following circuits for making connections.

① C2 connection

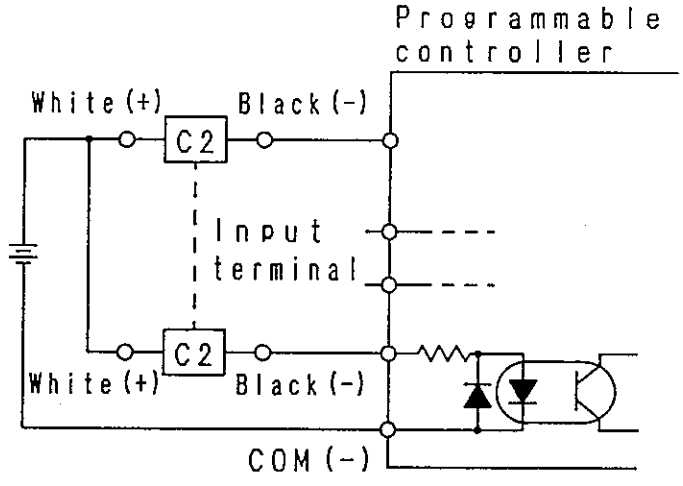


* This synch load is often used in card or unit type formats for input to typical programmable controllers.
The + wire from the power supply connects to the COM terminal.
(The + is also COM for nonpolarized card inputs.)



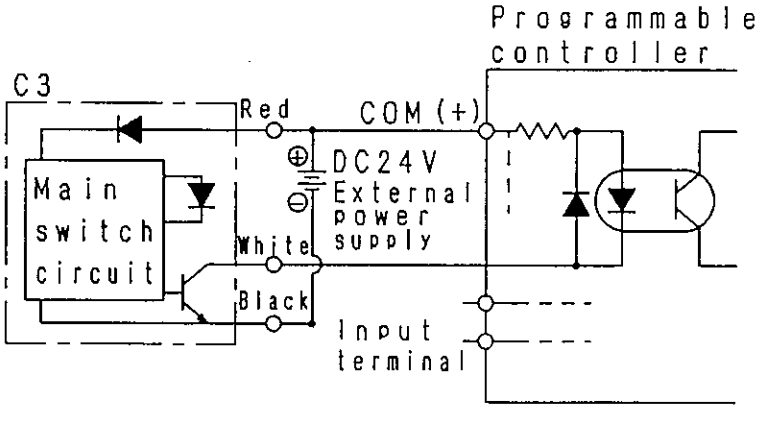
* This is a synch load input often seen in compact programmable controllers incorporating a power supply.

* The - wire from the power supply connects to the COM terminal.

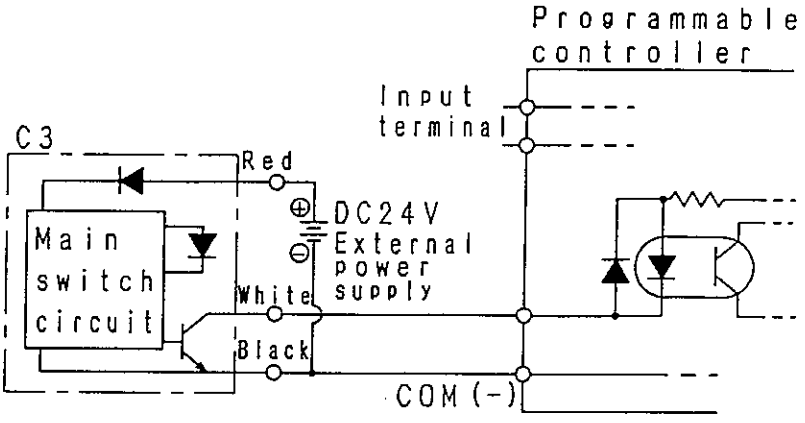


* This is a source load input used for card and unit type inputs.

② C3 connection

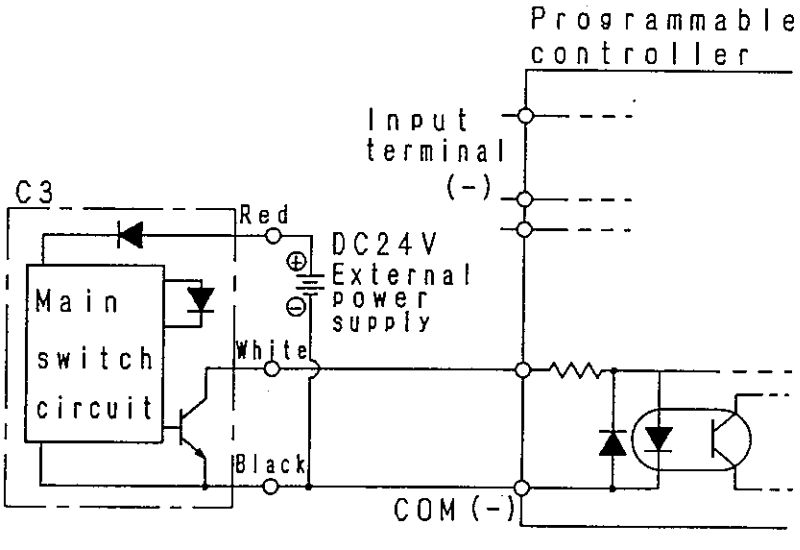


* This synch load is often used in card or unit type formats for input to a typical programmable controller.
The + wire from the power supply connects to the COM terminal.
(The + is also COM for nonpolarized card inputs.)



* This is a synch load input often seen in compact programmable controllers incorporating a power supply.
The - wire from the power supply connects to the COM terminal.

Note that the source load input type cannot be used with C3. The C2 configuration must be used.



e. Series Connections

When connecting several C2 switches in serise, the voltage drop is the sum of the voltage drops across all the switches.
Ex : The voltage drop across two C2 switches connected in series is :
4 volts × 2 = 8 volts.
Since the voltage drop across each switch is subtracted from the power supply voltage when determining the load, check the specifications listed for input loads on the programmable controller when deciding how many switches to connect into the circuit.
Please consult with us when it is necessary to connect several C3 switches in series.

f. Parallel Connections

Electrical current leakage increases when several C2 switches are connected in parallel.
Ex : When 3 C2 switches are connected in parallel the leakage current is
1 mA × 3 = 3 mA.
When deciding on the number of switches to be connected into the circuit, check the circuit specifications of the programmable controller to confirm the allowable input load. According to the load imposed, the lamp may darken or not light up at all.
Although the output current leakage increases with the number of C3 switches connected in parallel into the circuit, and thus restricts the number of switches, this leakage current is in fact extremely slight (10mA), and in most cases it presents no problem. So unless a critical load is imposed, the lamp will not darken and the lamp will not go out.

g. Magnetic Fields

Avoid placing the valve in places near strong magnetic fields or large electrical current flow (large size magnets, spot welders etc.). When the cylinder with switch is installed in parallel with such devices, interference may occur in the cylinder or in the magnetic device and this may also affect the sensing precision.

h. Installing the Wiring

Give ample consideration to routing the wiring to avoid loops, bends or stretched portions which might place stress on the wiring. Movable portions of the wiring, such as for robot cables should be of a wire gage and type that can withstand repetitive bending stress.
In environments subject to interference from noise, wiring such as for switches should be isolated from power lines such as for electrical motors, or shielded cable should be used to block out noise.

i. Operating Temperature

Do not use at high temperatures (60°C or higher).
Use of magnetic parts or electronic components at high temperatures should also be avoided as their performance/electrical characteristics may be deteriorate or change due to heat.

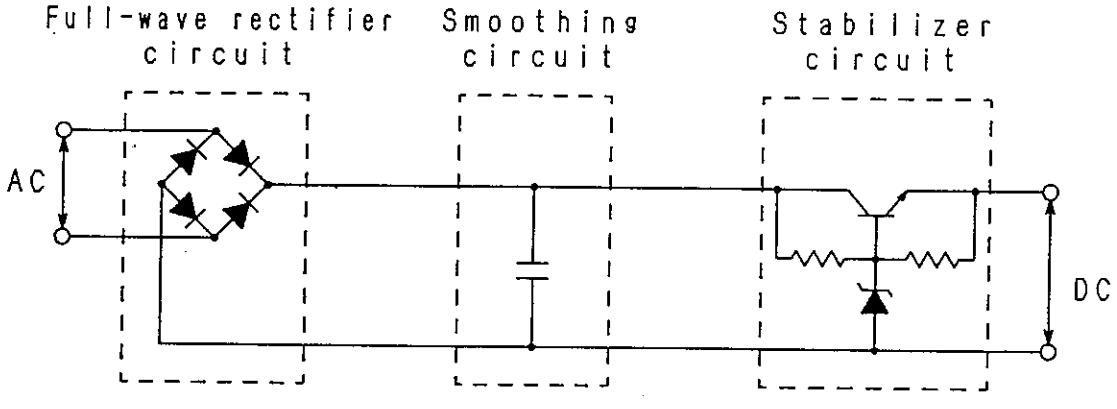
j. Shocks and Impacts

Take sufficient caution not to apply large vibrations, shocks or impacts to the cylinder valve during transportation, installation of the switch or when making adjustments.

k. Power Supply

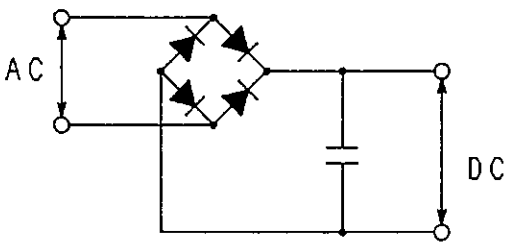
The C2 switch is used within a voltage supply range of 10 to 30 volts.
The C3 switch is used within a voltage supply range of 10 to 28 volts.
The switch may not function if the voltage falls below this range.
If the voltage exceeds this range the internal circuitry may be damaged.
Therefore ALWAYS make sure the voltage is within the proper range before applying power to the switch.
Also note the circuit diagrams (1) through (3) below.

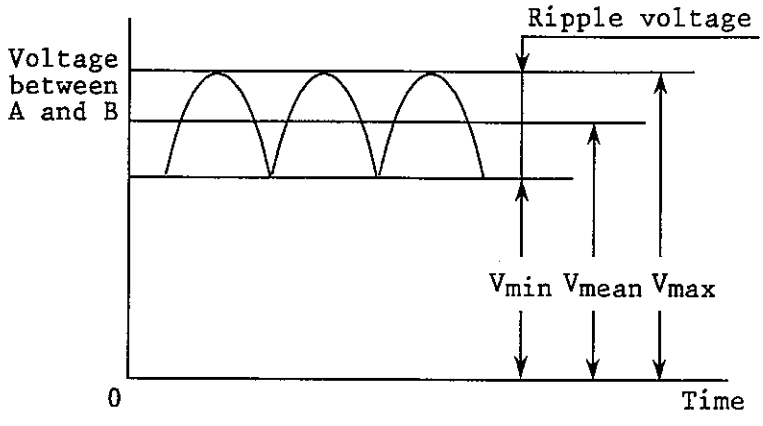
① Use a stabilized power supply for a DC source.



Stabilized DC Power Supply

② In the event you use a non-stable DC power supply such as shown below, even if 24 volts is shown on the meter, the actual power applied may be greater and exceed the safe voltage range of the switch. In such cases, connect an oscilloscope and measure the size of the waveform to confirm power supply output is within a safe voltage range.

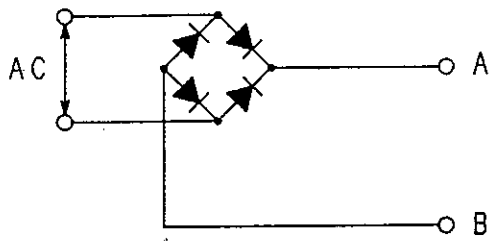


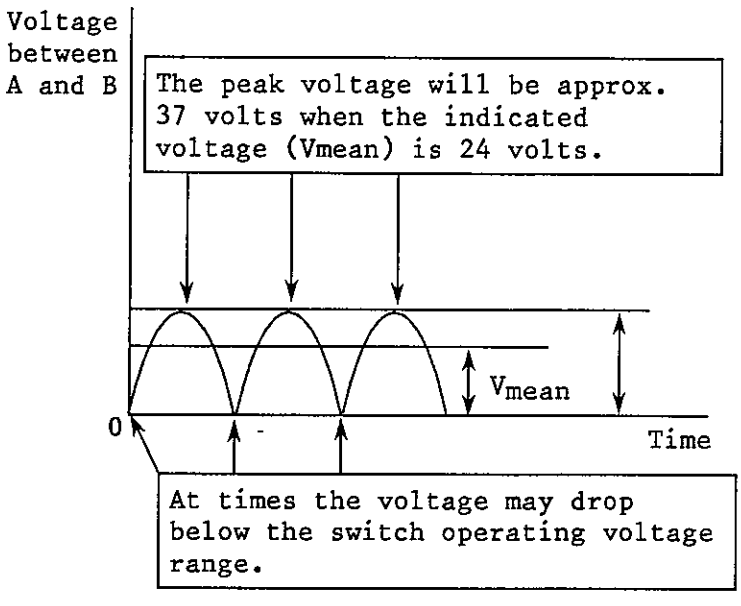


Voltage waveform between A and B

* Peak voltage : V max is 30 volts or less for C2.
V max is 28 volts or less for C3.
Ripple voltage : If the Vmax - Vmin is within 0.5 volts, the power supply can be used to operate the switch.

③ The full-wave rectifier circuit shown in the figure below will cause malfunctions in switch operation and damage the internal circuitry of the switch.





Voltage waveform between A - B