No. OM-107E

COMPACT TYPE PNEUMATIC ACTUATOR

(ADN & ASN SERIES)

INSTRUCTION MANUAL

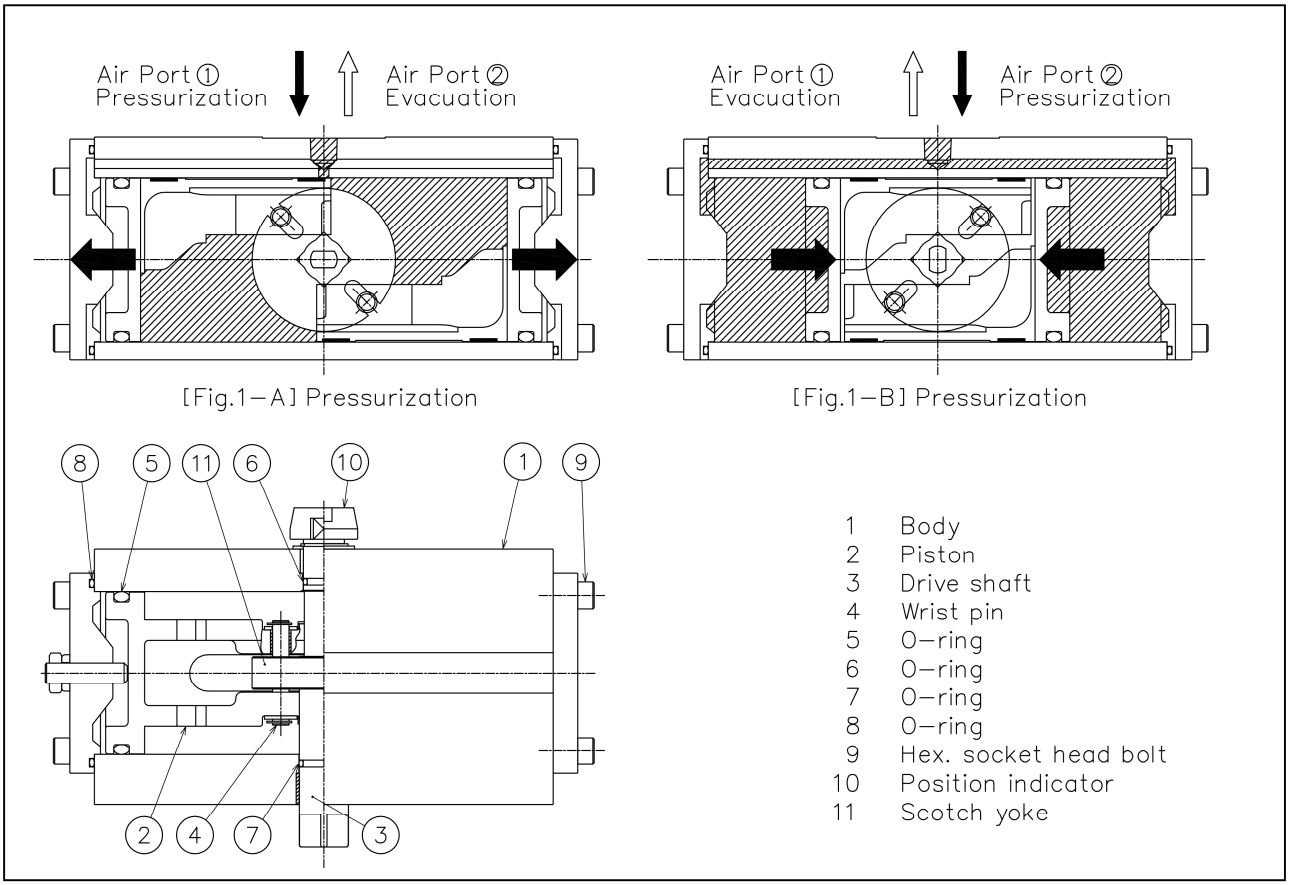
HISAKA WORKS, LTD.
VALVE DIVISION

1. Construction and Principle of Operation

Operating air pressure will press the piston (Part No.2) inside the actuator body to convert the linear motion imparted body the piston movement into the rotary motion of the drive shaft(Part No.3) through the wrist pin (Part No.4) and scotch yoke(Part No.11).

1.1 Double acting type (Type ＡＤＮ)

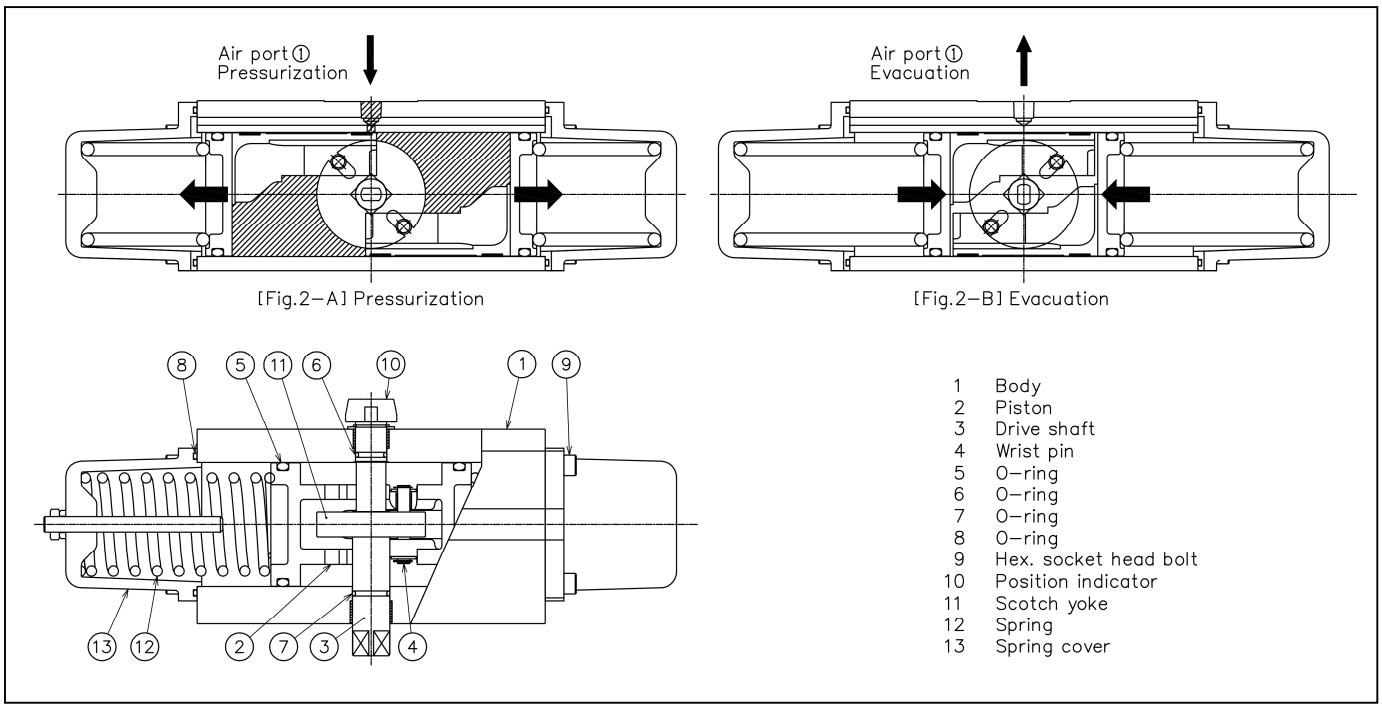
When the operating air pressure from the air port (1) enters the inside of the body ([Fig.1-A] hatched section). The piston moves outward and the drive shaft rotates counter-clockwise, so that the air between the piston outside and the body is evacuated from the air port (2) through the integral piping inside the body. When pressurization is effected from the air port (2), on the other hand, the operating air pressure enters the outside of the body ([Fig.1-B] thus the piston moves inward and the drive shaft rotates clockwise.



[Fig.1] Type ＡＤ０４Ｎ／０５Ｎ／０７Ｎ／０８Ｎ／１０Ｎ

1.2 Single acting type (Type ＡＳＮ)

The spring (part No.12) is incorporated on the outside of the body(part No.1).Where the operation air pressure is introduced from the air port (1), therefore, ([Fig.2-A] hatched section)performs the same action as that of double acting type, thus the drive shaft rotates counter-clockwise and the spring is contracted. When the operating air pressure is released, the drive shaft is rotated clockwise by the restoring force of the spring, so that the state which existed before the air operation is restored. ([Fig.2-B])



[Fig.2] Type ＡＳ０５Ｎ／０７Ｎ／０８Ｎ

２. Operation Air Piping Procedure

2.1 Required air flow rate

Calculate the required air flow before connecting the air pipeline to the actuator.

The supply air flow less than the required rate would cause actuating failure of the valve.

Where an air tank is used, preset the tank pressure to 0.49～0.69MPa.

2.2 Air consumption of cylinder

Air consumption of the cylinder is air discharge rate per minute of the actuator in the case when the actuator actuates around n-cycles per hour.

$$Q = V \times (P + 0.1) / 0.1 \times n \times 1 / 60$$

Q : Air consumption per minute (Nlit/min)

V : Cylinder capacity (lit)[one reciprocal] (see [Attachment-1])

P : Supply pressure (MPa)

n : Cycles of piston moving strokes per hour (１cycle ＝１reciprocation)

Calculate the required capacities of compressor and air receiver with a margin of 30% or more against the normal capacities , considering leakage and loss from the air pipeline and pipe fittings.

2.3 Where installation of instruments at our side is specified;

The standard actuator specifications does not include installation of instrumentation, but the following are optionally offerable ; drip-proof solenoid valve / explosion proof solenoid valve,

drip-proof limit switch / explosion-proof limit switch, silencer, speed controller, and pressure reducing valve with filter.

Specify and order the drip-proof type and explosion-proof type when deemed as necessary according to the operating environment.

Each valve unit is shipped, with the ball valve opened, from our Plant (but the single acting type shipped with its ball valve closed.) You are requested to check if this is per your specification.

2.4 Where instruments are installed at your side;

Perform the related instrument piping in reference to the flow sheets in Fig.3 to 6.

2.5 Precautions for instrument piping

(1) Feed operation air via a proper filter for complete filtration of water content, oil content and other foreign matter.

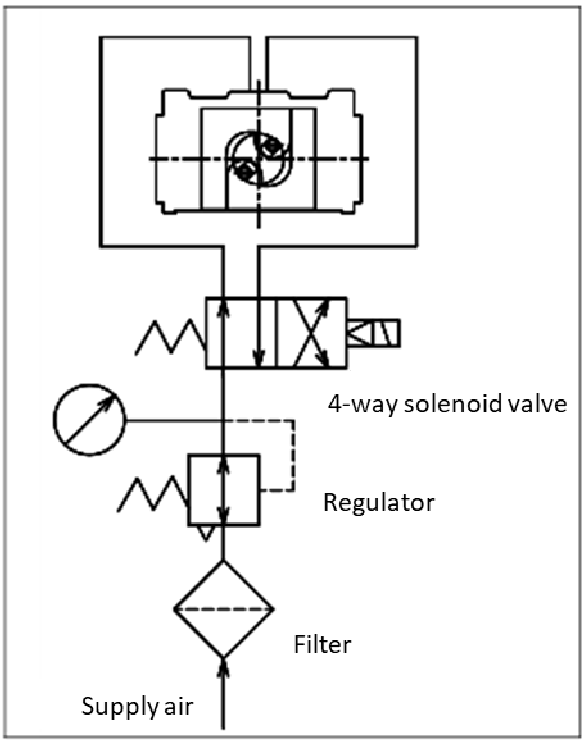
(2) After installation of each device, apply flushing to it for complete removal of dust, mist, chips, etc. therefrom. (Further, the flushing pressure to be applied shall be higher than the maximum operating pressure of each device)

(3) The actuator can be mounted in any direction, but mount filter and oiler in vertical position.

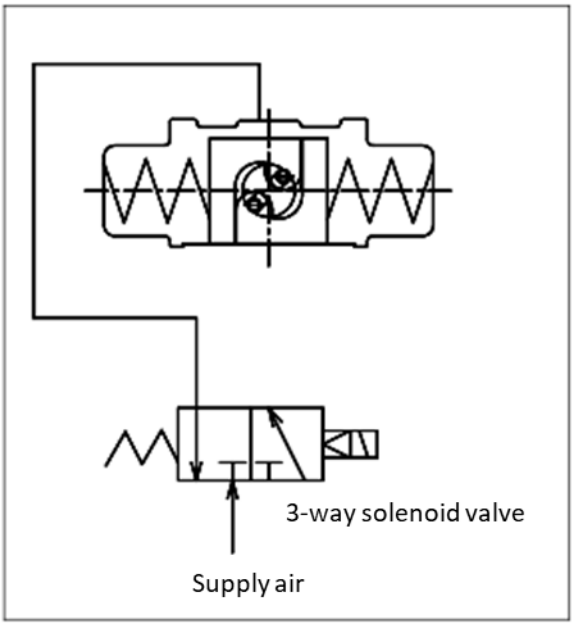
(4) For the solenoid valve intended to change over operation air flow, select a 4-port solenoid valve for the double-acting type and 3-port solenoid valve for the single acting type respectively. (4-port solenoid valve may be used instead of 3-port valve, subject to plugging of one port by a blind plug.)

(5) After piping connection, boost the air pressure to the required operation pressure (standard va lue: ０.３９MPa) from ０MPa by means of pressure reducing valve. And check that each pipe joint is free from air leakage.

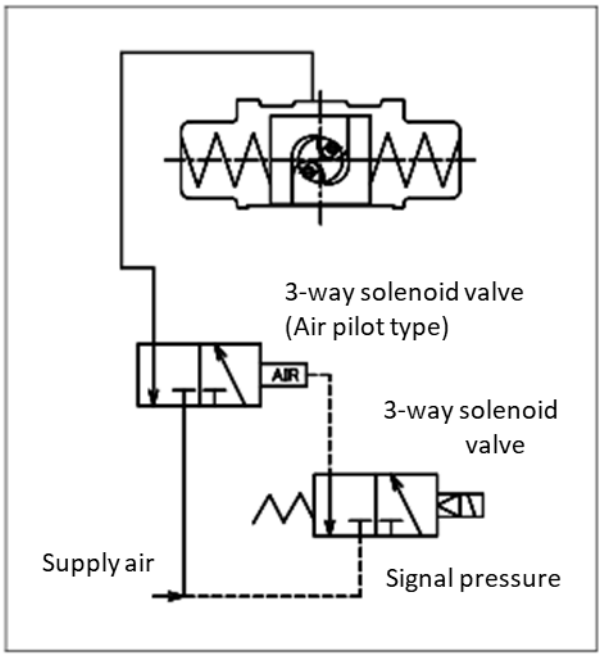
(6) Use each valve under an operating environment where temperature ranges from -20℃ to +80℃.



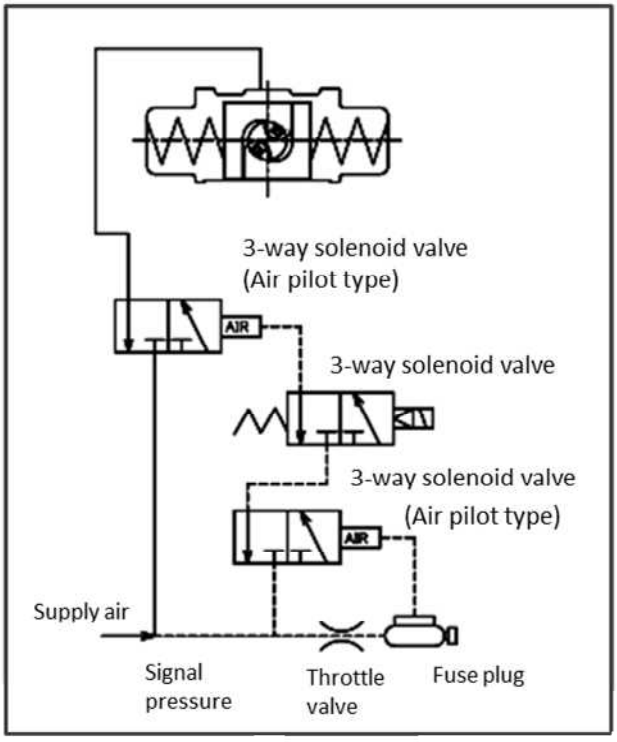
[Fig.3] Double action type
On-Off action



[Fig.4] Single action type
Emergency shut-off system
For electric power cut off



[Fig.5] Single action type
Emergency shut-off system
For electric power cut off
& Air pressure down



[Fig.6] Single action type
Emergency shut-off system
For electric power cut off,
Air pressure down & temp of
circumstance increasing

3. Manual Mode Operation

As the single acting type (Type ＡＳＮ) is internally provided with a spring. Do not operate it manually to prevent dangerous situation. (where manual operation is necessary, place an order for other model which is made available.)

For operation of the double-acting type, follow the sequence given below.

3.1 In the case of solenoid valve with manual button

When supply air is available, open and close the valve using the manual button of the solenoid valve.

When no supply air is available, operate the valve and the connector using a spanner wrench, while operating the manual button of solenoid valve. (In the case of ＡＤ０４Ｎ, operate the drive shaft using a spanner wrench. In the case of ＡＤ０５Ｎ／０７Ｎ／０８Ｎ／１０Ｎ, operate the valve and the connector using a spanner wrench.)

3.2 With no manual button and bypass valve

When no supply air is available, disconnect two air inlet connectors and operate the valve and connectors using a spanner wrench.

4. Starting Precautions

4.1 Double-acting type (Type ＡＤＮ)

(1) Check the ball valve for smooth action by manual operation. (Where manual operation is unavailable, slowly raise the operating pressure to 50～80% of the required pressure.)

(2) Check that the air pressure is as specified (Standard;０．３９MPa) .

4.2 Single-acting type (Type ＡＳＮ)

(1) Check the ball valve for smooth acting while slowly raising the air pressure up to ０．２９MPa. (Further, avoid manual operation of the single acting type (ＡＳＮ type) because it is dangerous due to a spring contained therein.)

(2) Check that the air pressure is as specified (Standard:０．３９MPa) .

5. In operation Cautions Maintenance

(1) Periodically make complete drain out of the air filter.

(2) ＡＤＮ／ＡＳＮ type use lubrication oil, usually requiring no oiler.

(3) Check that the air pressure is as specified. (Standard:０．３９MPa)

(4) Check each component periodically.

6. Overhaul and Reassembly Procedure

When overhauling the actuator for check and repair, follow the sequence given below.

6.1 Double-acting type (ＡＤＮ type)

6.1.1 Overhaul

(1) Do overhaul in a clean room.

(2) Apply a match mark to each of the components and portions to be overhauled.

(3) Where required, overhaul piston (part No.2) and drive shaft (part No.3) in reference to [Fig.1] with good care not to damage the sliding portion and O-ring.

6.1.2 Reassembly

(1) Clean all the components before assembling up.

(2) Do the assembly work in a clean room to avoid inclusion of foreign matter.

(3) Apply coat of lubrication oil (Nippon Grease, kingstar EP-2/Shell Alvania Grease EP-2) to body (part No.1) internal, piston (part No.2), drive shaft(part No.3), scotch yoke(part No.5), and O-ring respectively.

(4) Assemble up the overhauled components in sequence so that the match marks thereon match each other ,in reference to [Fig.1] and with good care not to damage the sliding parts, O-ring, etc. Tighten the hexagon socket head bolt (part No.9) under the appropriate torque. Excessive tightening may lead to a cause of failure of bolts and internal threads of the body.

(5) Check the valve for smooth acting throughout full stroke at pressure of ０.０５MPa.

6.2 single-acting type (ＡＳＮ type)

〈ＷＡＲＮＩＮＧ〉

ＡＳＮ type actuator contains therein a strong as compressed. Overhauling the actuator could result in hazard of jump-out of this spring. Therefore, exercise special care when removing the spring case.

Before overhauling completely purge the air pressure out of the actuator.

6.2.1 Overhaul

(1) Do overhaul in a clean room.

(2) Apply match mark to all the components to be overhauled.

(3) Prepare Hex. socket head bolts and nuts of dimensions as shown in Table on next page.

(4) Unscrew off one Hex. socket head bolt.

(5) Hex. socket head bolts screw with nuts screw in the removed Hex. socket head bolt fix the spring cover with nuts. (See [Fig.7])

(6) Thus, replace four Hex. socket head bolts with Hex. socket head bolts and nuts [Table 1] in sequence and, thereafter, fix the spring cover with nuts.

(7) While fastening the head of Hex. socket head bolt with a spanner so that Hex. socket head bolt does not loosen, Loosen the nuts alternately and, when reaction force of the spring comes to

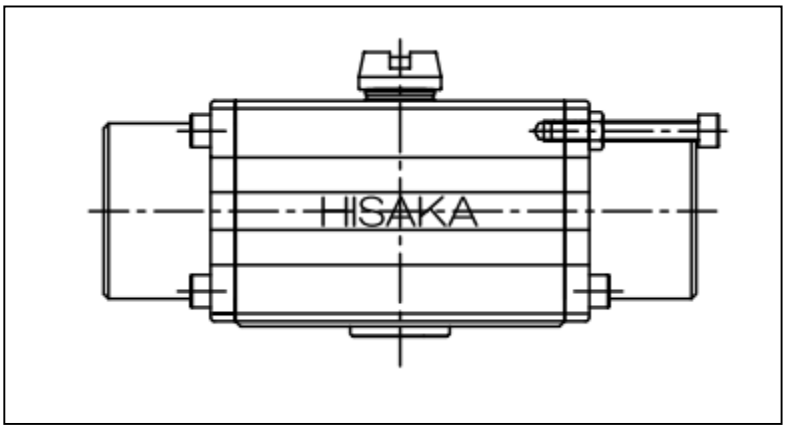
zero, remove Hex. socket head bolts, nuts, spring cover, and spring in sequence.

(8) Remove the other side equally.

(9) Overhaul piston (part No.2) and drive shaft (part No.3) in sequence in reference to [Fig.2] with good care not to damage the sliding portion, O-ring, etc.

[Table 1] List Parts used for overhaul of spring cover

MODEL	SCREW	HEXAGON SOCKET HEAD BOLT		NUT
		long	quantity	quantity
AS05N	M6 P1.0	60	4	4
AS07N	M8 P1.25	80	4	4
AS08N	M8 P1.25	120	4	4



[Fig.7] Single-Acting Type

6.2.2 Reassembly

(1) Clean all the components before assembling up.

(2) Do assembly work at a clean room to prevent inclusion of foreign matter.

(3) Apply coat of lubrication oil (Nippon Grease, kingstar EP-2/Shell Alvania Grease EP-2) to body (part No.1) internal, piston (part No.2), drive shaft (part No.3), scotch yoke (part No.11), and O-ring respectively.

(4) Assemble up the overhauled components in sequence so that the match marks thereon match each other, in reference to [Fig.2]and with good care not to damage the sliding parts, O-ring, etc. Tighten the hexagon socket head bolt (part No.9) under the appropriate torque. Excessive tightening may lead to a cause of failure of bolts and internal threads of the body.

(5) Check the valve for smooth acting throughout full stroke at pressure of ０．２９MPa.

7. Trouble Shooting

Phenomenon	check items or possible causes	Corrective action
① No specified air pressure in actuator	① Compressor,air pipeline,pressure reducing valve,solenoid valve, etc. nomal ?	Repair
② Specified pressure available in actuator,but actuator fails to work	① Inclusion of foreign matter in ball seat ?	Overhaul the valve to replace ball seat.
	② Separate actuator from valve. in case the actuator fails to actuate at 0.05MPa or specific pressure. (Single acting at 0.29MPa)	Overhaul actuator to replace necessary parts. (However,the single type is hazardous because of spring contained therein Follow the overhaul sequence on page 6.)
	③ Separate actuator from valve (but the case the valve actuates st specific actuating torque and less.) (The valve actuating torque differs depending on model,size and fluid. Contact us for the detail.)	Re-adjust valve and actuating mounting yoke.
	④ Separate actuator from valve (but the case the valve fails to actuate at specific operating torque and less)	Overhaul the valve for repair.

[Attachment-１]Cylinder Capacity List

UNIT[cm^3]

MODEL	Air-supply ①	Air-supply ②	1 cycle
	V_1	V_2	$V=V_1+V_2$
AD04N	50	25	75
AD05N	130	65	195
AD07N	340	170	510
AD08N	640	500	1140
AD10N	1400	1020	2420
AS05N	130	Spring acting	130
AS07N	340		340
AS08N	640		640

[Attachment-２]Weight List

UNIT [kg]

Double acting type (AD type)					Single acting type (AS type)		
AD04N	AD05N	AD07N	AD08N	AD10N	AS05N	AS07N	AS08N
0.7	1.3	2.8	5.5	9.2	1.6	3.5	6.9

[Attachment-３]O-ring Size

Parts No.	No. REQD	Use point	AD04N	AD05N / AS05N	AD07N / AS07N	AD08N / AS08N	AD10N
5	2	PISTON	P34	P44	P60	P70	P90
6	1	DRIVE SHAFT	P9	P18	P22A	P16	P21
7	1	DRIVE SHAFT	P14	P24	P34	P20	P26
8	2	END CAP	Special gasket	G60	G80	G90	G110