Ⅰ. GENERAL

1. SCOPE

This manual covers the instructions for 1100 Small Port Single-Seated Control valves, 1100 Top Guided Single-Seated Control Valves, 1300 Pressure Balanced Cage Control Valve, 1330 Pressure-Balanced Anti-Cavition Cage Control Valves and 14100 Pressure-Unbalanced SIMPAC Single-Seated Control Valves.

For SP-2000, SP-3000 and SP-2200, SP-2400,SP-2500 Valve Positioners, refer to Operating Manuals No. VMOM-03-010, No.VMOM-03-011 and No.VMOM-03-012, No.VMOM-03-013, VMOM-03-014.

2. MAJOR COMPONENTS OF CONTROL VALVES

Each control valve is comprised of two major components, namely, a valve body assembly and an actuator, Various combinations of valve body assembly and actuator are available to meet various operation conditions with different valve sizes, pressure ratings, types of connections, types of materials, and actuator sizes.

For the details of specifications, refer to the following Specification Sheets No. Page 01.

1100 Small Port (Single-Seated) Control Valves

1100 Top Guided (Single-Seated) Control Valves

1300 Pressure-Balanced Cage Control Valves

1330 Pressure-Balanced Anti-Cavition Cage Control Valves

1410 Pressure-Unbalanced SIMPAC (Single-Seated) Control Valves

3. CONSTRUCTION

The constructions of typical 1000Series Control Valves are shown in Page 1.

The valve body is connected to the bonnet with stud bolts and nuts. Two gaskets are provided at the connection sections to seal against the internal fluid or to let the valve body make up a pressure vessel. The valve plug is supported by the guide ring and cage, and driven by the actuator, The actuator with multiple springs and a diaphragm converts a pneumatic control signal into a mechanical(Positional) control signal, namely, it positions the valve plug in response to the control signal.

4. NAME PLATE

A nameplate is posted on each control valve, I indicates the model number, valve size, pressure rating trim material, date of manufacture and other major specifications of the control valve. Before installing the control valve, make sure that the specifications indicated on the nameplate should conformed with the conditions of service.

Ⅱ.INSTALLATION

1. MAXIMUM LIFTING OF EYE-BOLTS

The diaphragm case has a pair of lifting eye-bolts. These eye-bolts primarily are to lift the actuator alone.

When using the eye-bolts for other purposes, the allowable maximum lifting loads of them as shown in table 1, should Not be exceeded.

Table 1. Maximum Lifting Loads of Eye-bolts.

Actuator	Maximum allowable Lifting load of eyebolts	Actuator weight
500-42	160kg	16kg
500-74	160kg	27kg
500-145	220kg	47kg

Note : The eye bolts may be used to lift the actuator together with its valve body(cast globe valve) of ANSI Class 600. When doing this, be extremely careful so that No shock or other abnormal force is applied to the actuator or the valve body.

2. INSTALLING VALVE IN PROCESS PIPE

[1] Before installing the valve in the process pipe, remove foreign matter (such as scales and welding chips) from both upstream of the process pipe.

[2] The flow arrow on the body must be pointed in the direction of flow.

[3] Care should be exercised to prevent pipe sealing compound from getting into the pipelines. The gaskets should be suitable for the process fluid. 1100 and 1300 high pressure valves employ No. Gaskets since they are welded to the process pipelines.

[4] No. excessive large stress should be conveyed from the process pipe to the valve body. Uniformly tighten the bolts of the process pipe connection flanges. The 1300 high pressure valves have No flanges, since they are welded to the process Pipeline.

[5] Before connecting the air pipes to the actuator and the Positioner, blow the pipes to clean them.

[6] Do Not install any heating or cooling provisions on the bonnet.

3. ITEM TO BE CHECKED BEFORE STARTING OPERATION

[1] Check that there is No. leak from air piping.

[2] Check that the bolts and nuts of the diaphragm case are mot loose. Standard Tightening torques are as follows :

For 500-42, 500-74 (M 8) : 1200N-cm

For 500-74, 500-145 (M 10) : 2800N-cm

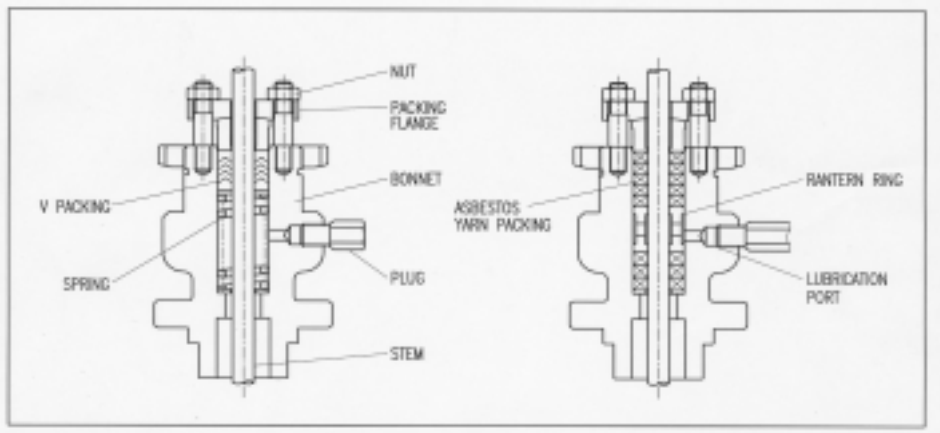
[3] Tighten the packing flange nuts to prevent leak from the gland packing section. Standard tightening torques are as shown in Table 2.

Table 2. Tightening Torque of Packing Flange Nuts

Unit : N · cm

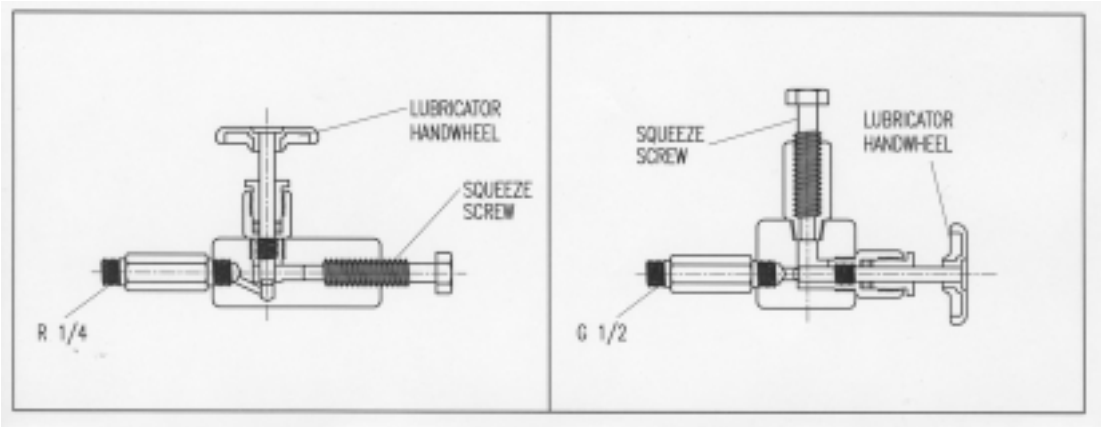
Valve stem Diameter(mm)	Asbestos yarn packing	Metallic filament reinforced asbestos yarn packing	Teflon V-Packing
10	300	700	80
13	500	1200	80
16	800	1800	80
20	1000	2500	80
25	1500	4000	80
30	2000	5000	80

Note : The tightening torques mentioned in the above are only to give you reference values. Tightening torques may vary depending on the type of packing.



[FIG. 1] Teflon V-Packing **[Fig. 2] Asbestos Yarn Packing**

[4] If the valve is provided with a lubricator as shown in Fig. 3, check whether the bonnet section has been lubricated or Not. To de this, loosen the lubricator hand-wheel and turn the squeeze screw. IF the squeeze screw turns lightly, and grease in the procedure mentioned below, If the squeeze screw turns heavily, this means that grease has been applied.



ANSI Class 600(JIS40K) **ANSI Class 900 Over(JIS63K)**

[Fig.3] Lubricator

Lubricating procedures

(a) Prepare the grease indicated on the nameplate.

(b) Tightly close the lubricator hand-wheel.

(c) Remove the squeeze screw, apply grease, and set the squeeze screw.

(d) Loosen the lubricator hand-wheel and drive grease by turning of the squeeze screw becomes heavier.

(e) Repeat the procedures of (b), (c) and (d) until turning of the squeeze screw becomes heavier.

[5] Pressurizing the valve, check that there is No. leak from the gasket connection sections between the valve body and process pipe, If leak is found, tighten the nuts. Especially the process fluid temperature of 400℃ or higher, tighten the nuts again after temperature of the valve is up to 400℃ in order to serve for a longer period without immediate maintenance. Standard tightening torques are shown in Table 3.

[6] When a valve used for high temperature service, raise temperature gradually (standard rate is raising is 100℃ per hour) and do not operate the valve when its temperature is raising.

Ⅲ. INSPECTION AND MAINTENANCE

Inspect and service the actuator as follows:

1. Tightening the gland:

   Tighten the gland once per every 6 months. The tightening procedure is given in Section Ⅱ "INSTALLATION"

2. Lubrication the gland:

   Lubricate the gland once per every 6 months. The lubricating procedure is given in Section Ⅱ "INSTALLATION"

3. Check for hunting of valve-Positioner : Refer to Section X "TROUBLESHOOTING"

4. Check for abnormal noise and vibration : Refer to Section X "TROUBLESHOOTING"

Ⅳ. DISASSEMBLY AND ASSEMBLY

This section covers the disassembly and assembly procedures of the actuator for its overhaul or modification.

1. DETACHING ACTUATOR FRON VALVE BODY

   (1) Apply to the actuator an air pressure so that the valve stem is at a point of 10%-20% above the fully closed position.

   (2) Loosen the clamping bolts of the stem connector, remove the stem connector, and detach the actuator stem from the valve stem.

   (3) Remove the clamping nut of the yoke.

   (4) Raise the actuator to detach it from the valve body. Precautions : Before detaching the actuator from the valve body installed in the process pipe, be sure to shut down the process fluid and to release the process fluid.

2. DISASSEMBLY AND ASSEMBLY OF VALVE BODY

To disassembly or assemble the valve body, refer to Figs. 4-8 and proceed as described below.

(For handling of the bellows-sealed valves, see Section IX)

A. Disassembly procedure

(1) Loosen the hex nuts of the packing flange.

(2) Remove the hex nuts (1) of the bonnet (extension bonnet)

(3) Raise and detach the bonnet from the valve body.

Precautions : If the valve plug comes out together with the bonnet, remove the plug from the bonnet by rotation the plug. When doing this, exercise care Not to damage the valve stem.

(4) 1100Series Control Valves

For 1100Series valves, remove the guide ring. The seat ring is threaded to the valve body. To remove the seat ring, special tools are necessary.

1100Series valve has Not guide ring, but a guide bushing must be pressed in the bonnet.

For 1300Series 1400Series Control valves, pull out the plug and the cage from the valve body.

For 1300Series valve and other split-cage valves, a seat ring is threaded to the valve body.

To remove the seat ring, special tools are necessary.

B. Inspection

Inspect the disassembled parts for damage. If ant damage is found, replace the parts.

(1) Do Not reuse the removed gland packing. Use fresh packing when assembling the valve.

(2) Check that the seating surfaces of plug, seat ting and cage are Not damaged.

(3) Check that the gasket-contacting surfaces among valve body, bonnet, guide ring and cage are Not damaged. Do Not reuse the removed gasket. Use fresh gasket when assembling the valve.

(4) Check that the plug guide section, the stem, and the guide bushing and cage are Not damaged.

C. Assembly procedure

1100Series Control valve

(1) Securely fix the seat ring onto the valve body with threads using the special tools. For the tightening torques, see Table 3.

(2) Set the plug on the seat ring. (Apply lubricant “Never-seize” to the threaded sections, except those of the oil-prohibited valves.)

(3) Put the bonnet on the valve body and check that the bonnet is correctly mated with the indented section of the valve body. Tighten the nuts uniformly, for the tightening torques, see Table 4.

(4) Insert the gland packing as shown in Fig. 4

Note : When yarn packing sheets are used, overlap sheets in such manner that their cut ends are positioned alternately.

(5) Place the packing follower and packing flange, and tighten the nuts. for the tightening torques. See Table 2.

1100Series Control Valves

(1) Securely fix the seat ring onto the valve body with threads, using the special tools (optional). For the tightening torques, see Table 4.

(2) Seat The plug on the seat ring. (Refer to the Disassembly procedures.)

(3) Put a Sheet of gasket on the valve body side and place the guide ring in manner of covering the plug. (Apply lubricant “Never-size” to the gaskets, except those of the oil-prohibited valves.)

(4) Put the gasket on the guide ring, (Apply lubricant “Never-seize” to the gaskets, except those of the oil-prohibited valves.)

(5) Put the bonnet on the valve body and check that the bonnet is correctly mated with he indented section of the valve body. Tighten the nuts uniformly, For the tightening torques, see Table 5.)

(6) Insert the gland packing as shown in [Fig. 1~2]

Note : When yarn packing sheets are used, overlap sheets in such manner that their cut ends are positioned alternately.

(7) Place the packing follower and packing flange, and tighten the nuts. For the tightening torques, see Table 2.

1300 Series, 1400Series, Control Valves

(1) For an integral cage valve, put a spiral gasket in the valve body. For a split cage valve, securely fix the seat ring onto the valve body with threads using the special tools. (Apply lubricant “Never-seize” to the gaskets, except those of the oil-Prohibited valves.) For the tightening torques of 1300 Valve. See Table 4.

(2) Put the gasket (2) in the valve body.

(3) Put the cage in the valve body.

(4) Put the gasket (1) on the cage.

(5) Put the bonnet on the valve Body check that the bonnet is correctly mated with the indented section of the valve body. Tighten the nuts uniformly. For the tightening torques. See Table 5.

(6) Insert the gland packing as shown in [Fig. 1~2]

Note : When yarn packing sheets are used, overlap sheets in such manner that their cut ends are positioned alternately.

(7) Place the packing follower and the packing flange, and tighten the nuts, For the tightening torques, see Table 2.

Table 3. Seat Ring Tightening Torque

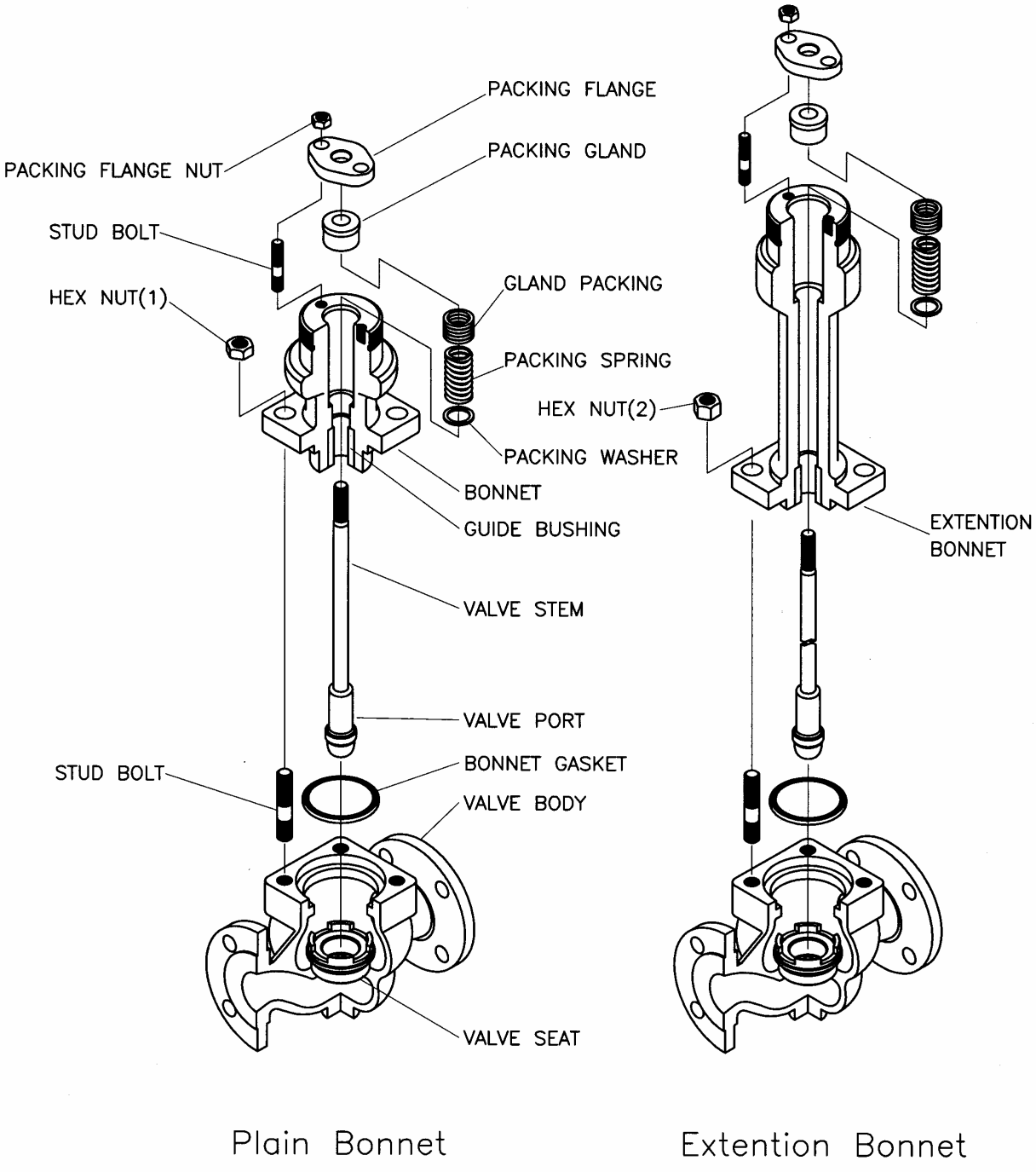
Valve size(mm)	~25	40	50	65	80	100	150	200
Torque(N.m)	180	260	390	520	650	800	1200	1500

Table 4. Seat Ring Tightening Torque of 1300Series And 1100Series Valves

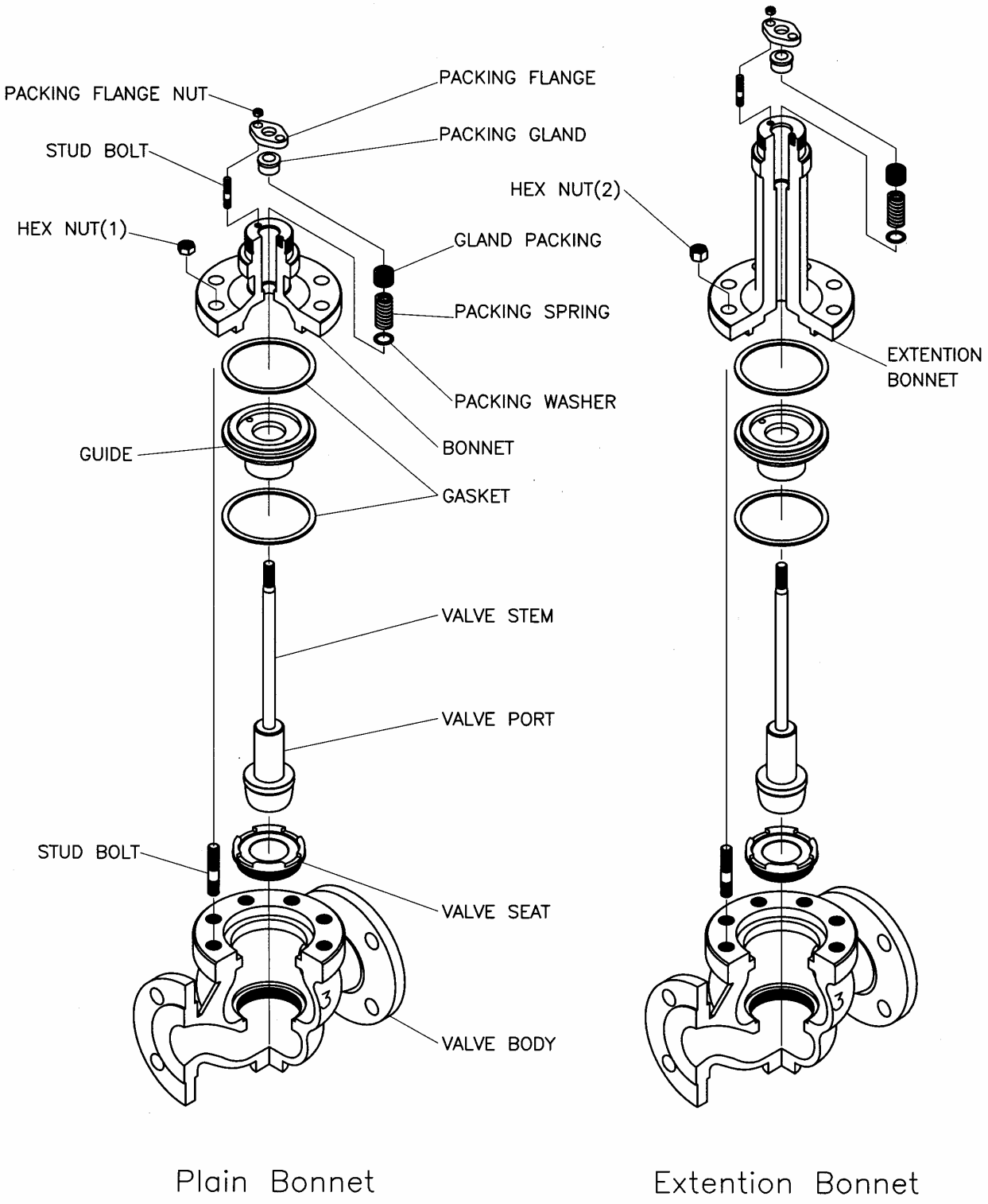
Valve size(mm)	25	40	50	80	100	150	200	80	100	150	200
ANSI Class	900~2500			900~1500				2500			
Torque(N.m)	250	310	570	1100	1800	3750	5500	700	1550	3000	4000

Table 5. Tightening Torque of Bonnet Stud Bolts

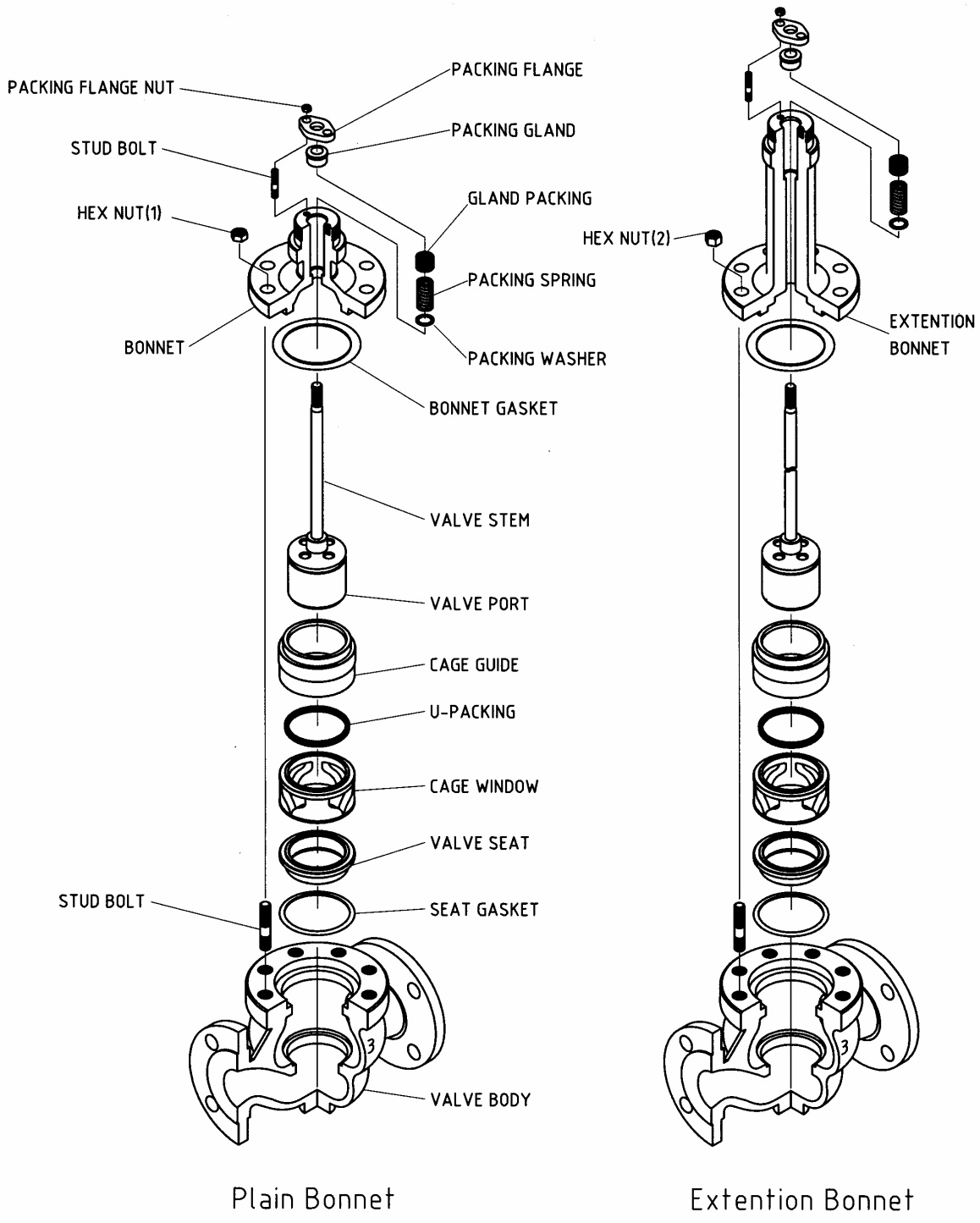
Bolt Size	M12	M16	M20	M22	M24	M27	M30	M33	M36	M39	M42	M45
Torque (N.m)	60	100	150	200	250	350	500	660	850	1000	1200	1400



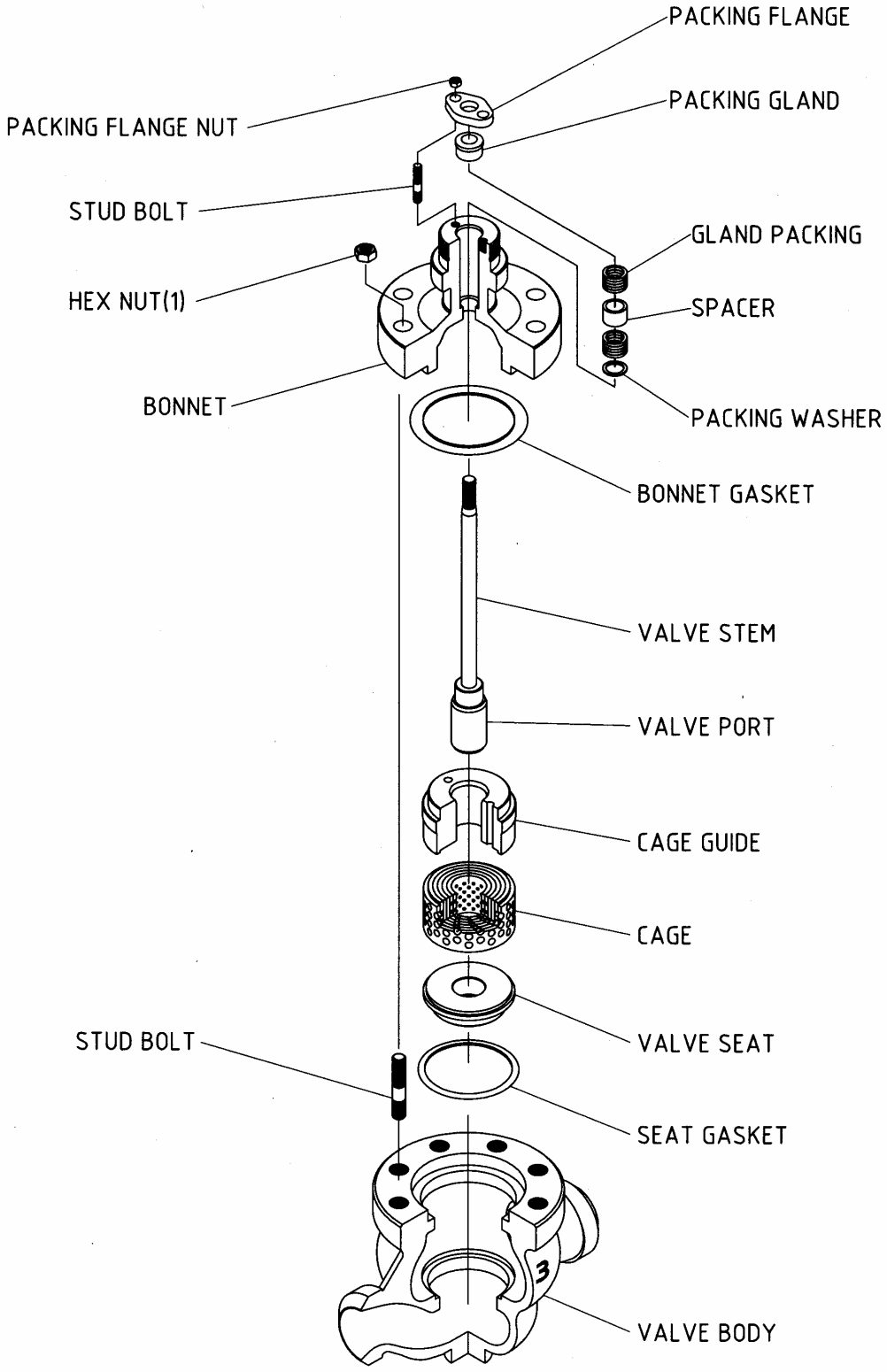
[FIG. 4] 1100Series Small Port (Single-Seated) Control Valve



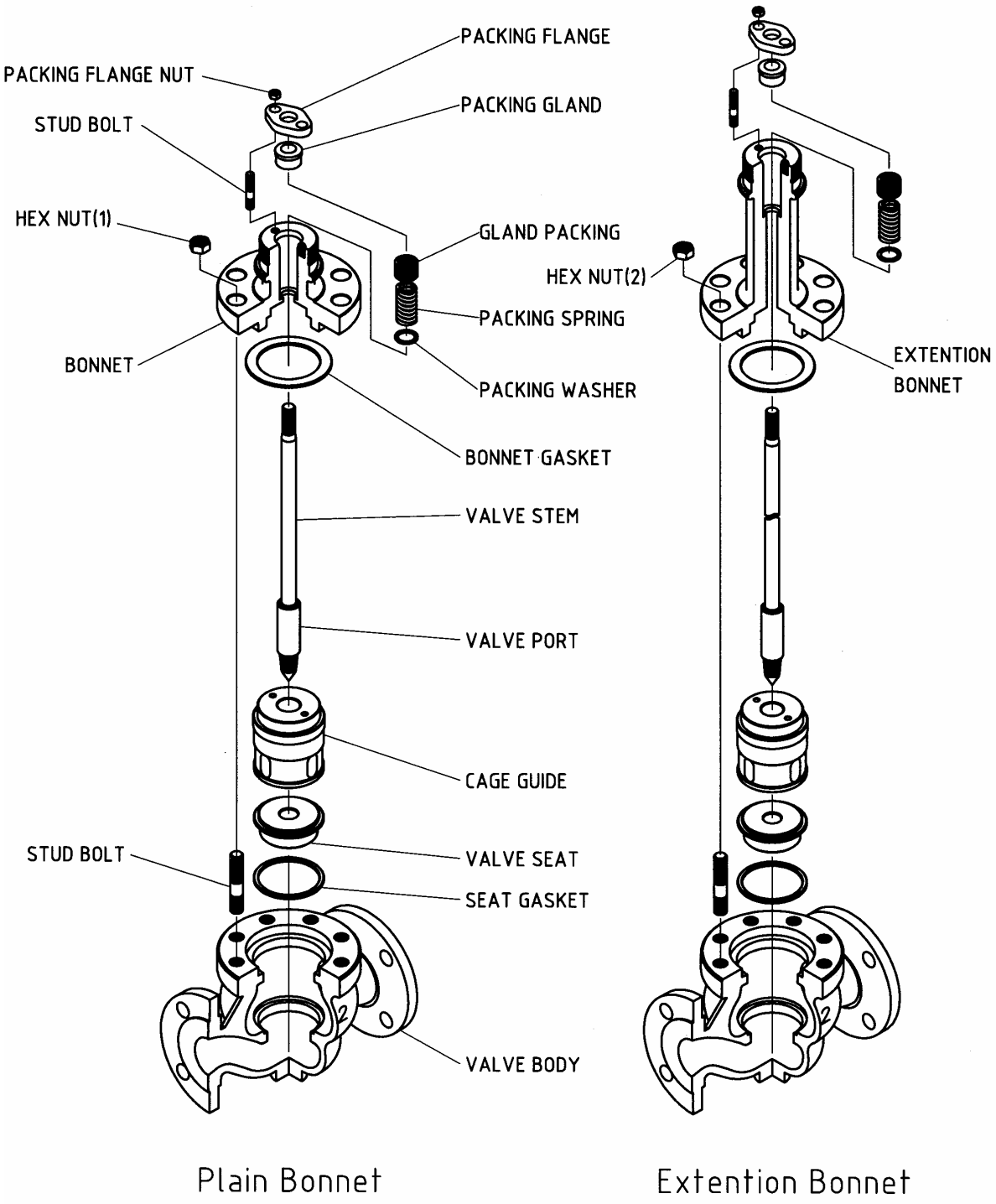
[FIG. 5] 1100Series Top Guide (Single-Seated) Control Valve



[FIG. 6] 1300Series Pressure Balanced Cage Control Valve



[FIG. 7] 1330Series Anti-Cavition Cage Control Valve



[FIG. 8] 1410Series SIMPAC Cage Guide (Single-Seated) Control

3. DISASSEMBLY AND ASSEMBLY OF ACTUATOR

Normally the actuator requires no adjustment. However, it is necessary to adjust the control valve if the valve is disassembled and reassembled for replacing damaged parts or overhaul. This section covers the disassembly and assembly procedures of the actuator for such purposes.

Disassembly

When disassembling the actuator. Keep it in the vertical position. Refer for [Fig.9] Operator's Manual Series 500 Actuator see [Fig. 4-1~7-4], For the tightening torques of Seat Ring and Bonnet Stud Bolts see table 3~5, For the manes of the parts, see [Fig. 4-8].

Note (1) It is recommendable to make locating marks on the top and the bottom diaphragm cases before disassembly. This will help to find easily the air piping connector location.

(2) Store the removed parts in a clean place.

Disassembly procedure

A. Direct acting Actuator

(1) Disconnect the air piping and detach the accessories form the actuator.

(2) Remove the stem connector, the pointer and the lock nut. See [FIG. 9]

(3) Remove the clamping bolts (except the pair of eye bolts) of the diaphragm case.

(4) Loosen evenly and alternately the pair of eye bolts.
(The initial setting of the springs is done by these eye bolts.)

(5) Pull out the actuator stem together with the diaphragm upward.

(6) Take out the springs.

B. Reverse Acting Actuator

(1) Disconnect the air piping and detach the accessories form the actuator.

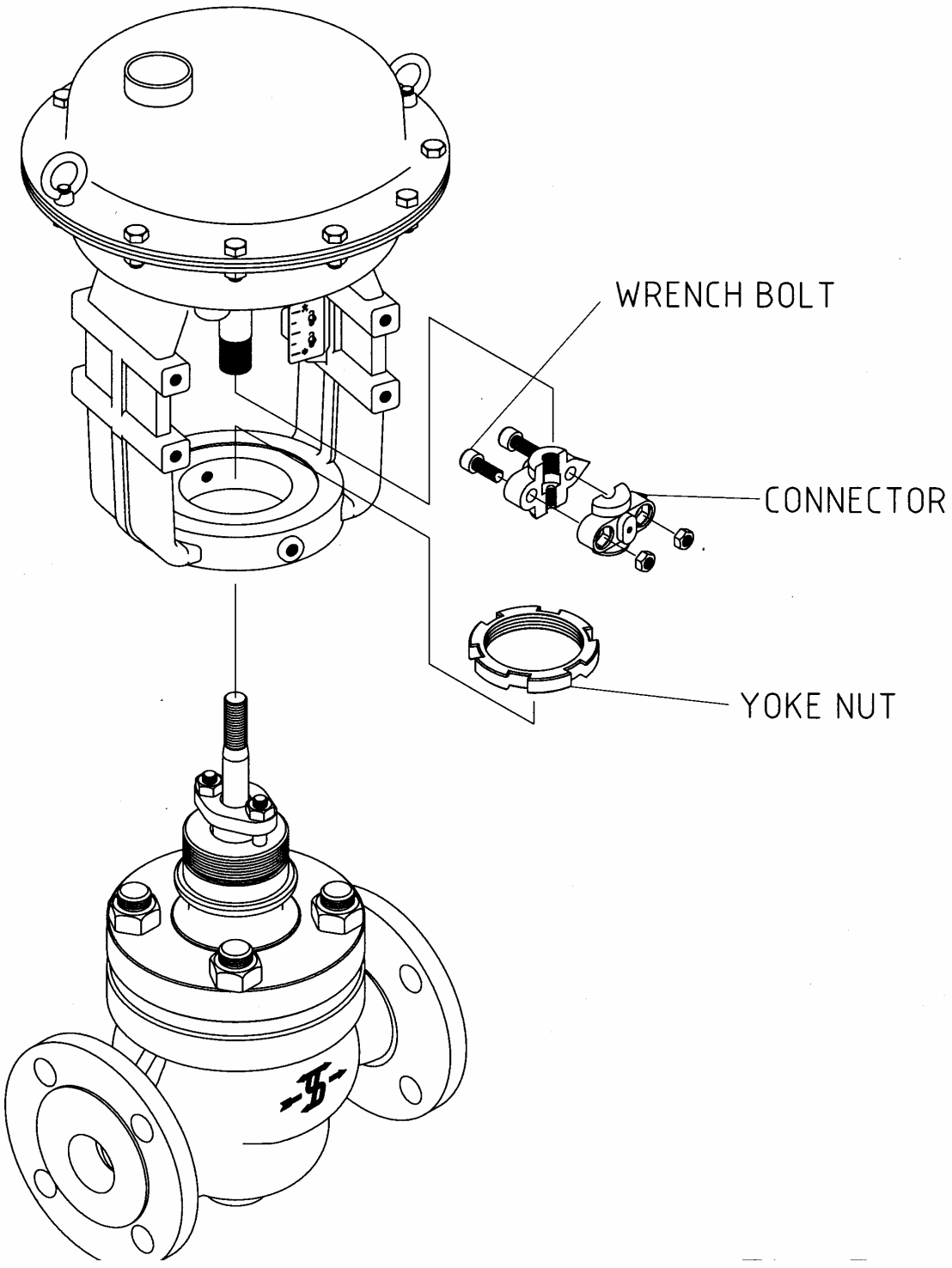
(2) Remove the stem connector, the pointer and the lock nut.

(3) Remove the clamping bolts (Except the pair of eye bolts) of the diaphragm case.

(4) Loosen evenly and alternately the pair of eye bolts.
(The initial setting of the springs is done by these eye bolts.)

(5) Take out the springs.

(6) Pull out the actuator stem together with the diaphragm upward.



[FIG. 9]