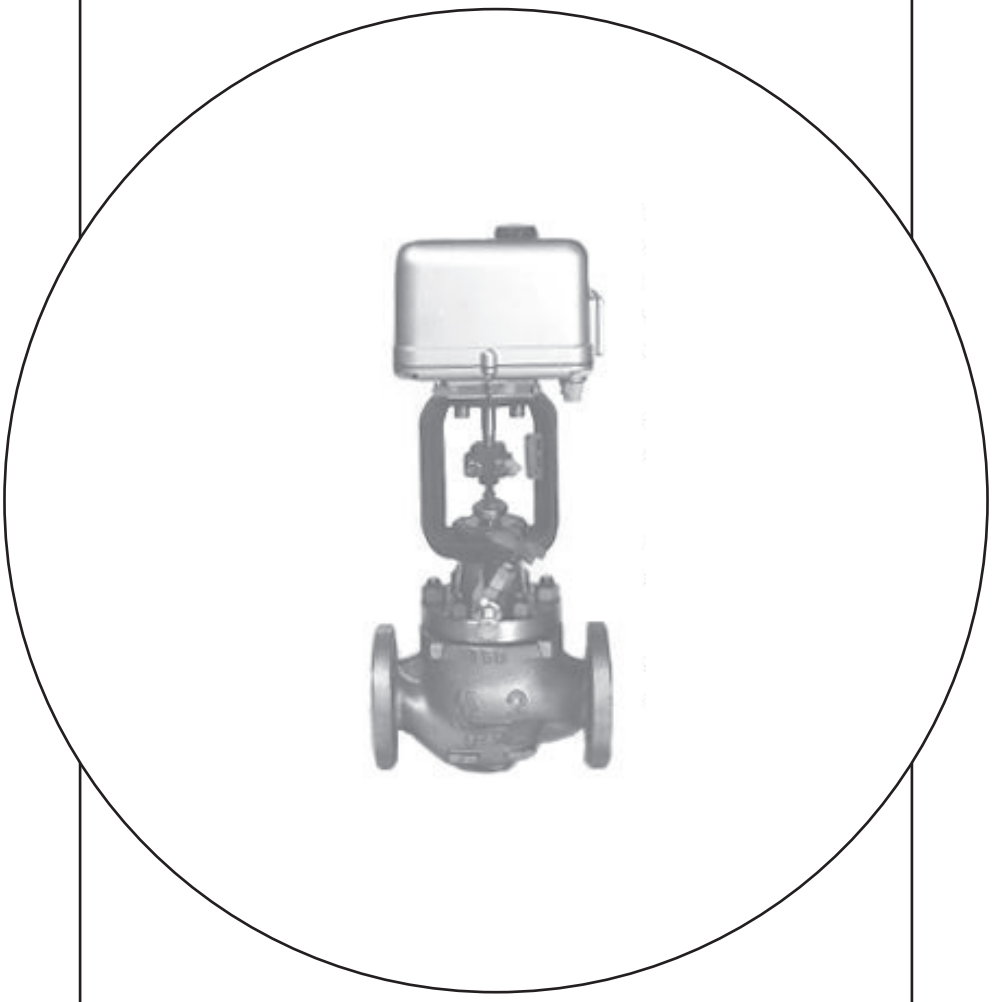
azbil

OM2-8114-0200

CV3000 Series
Electric Control Valves
Model : HLS/HTS/HCB
User's Manual



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1. GENERAL

1.1 Scope

This manual is for Model HLS Small-seat Single-seat Control Valves, Model HTS Top-guided Single-seat Control Valves and Model HCB Pressure-balanced Cage-type Control Valves of CV 3000 Series. (The valve bodies themselves of these control valves can be used irrespective of whether the actuators are of a pneumatic type or of an electric type.)

The actuators are of an electric type. Each actuator operates on an electrical power and an electronic control signal. The type of action can be converted between direct action type and reverse action type. The fail-safe action against input control signal failure is selectable for the fully closed position, for the currently existing position, or for the full open position.

The actuator also has the function for sencitivity adjustment.

1.2 Major Components of Control Valve

Each control valve consists primarily of a valve body section and an actuator. To best suit various uses, different control valves can be realized by different combinations of valve bodies and actuators. The factors selectable are valve size, pressure rating, type of connection, type of material, and actuator size.

1.3 Structures

The structures of typical ones of these models of control valves are shown in Fig. 1.1 through 1.3.

The valve body section makes up a pressure vessel. The bonnet is fixed to the valve body with stud bolts and nuts and with gasket to seal the process fluid. The valve plug is guided by a guide ring or a cage, and is driven by the actuator to the position corresponding to the input control signal.

The actuator is of a motor-driven type and consists primarily of an electric motor, a motion converting machanism, a feedback mechanism, and a control unit. The motor is a reversible type of AC capacitor motor. The motion converting mechanism converts the rotational motion of the motor into a linear stroke motion with which to position the valve plug. Disk springs are provided on top of the actuator output shaft, in order to provide a shut off load for fully closing the valve. The actuator has a stroke limiter (on the full-open side), an output torque limiter*, and a thermal limiter**. For detailed structure of the actuator, see "Appendix" at the end of this manual.

*: The output torque limiter turns off the input power of the actuator when the torque load applied to the motor has become higher than a certain limit.

**: The thermal limiter turns off the input power of the actuator when the motor temperature has become higher than a certain limit. It automatically resets when the motor temperature has become lower than the limit.

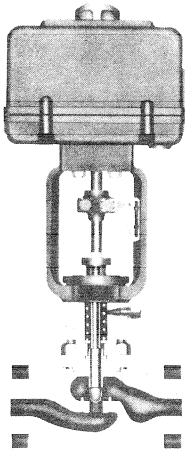


Fig. 1.1. Model HLS Small-size Single-seat Control Valve

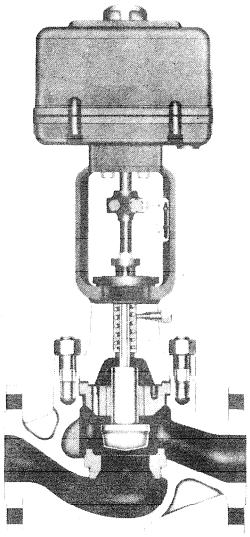


Fig. 1.2. Model HTS Top-guided Control Valve

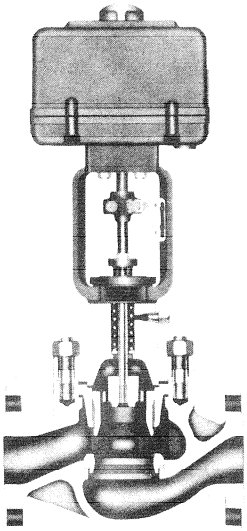


Fig. 1.3. Model HCB Pressure-balanced Cage-type Control Valve

1.4 Nameplate

A nameplate as shown in Fig. 1.4 is posted on each control valve. The nameplate 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 conform with the conditions of use. The nameplate of the actuator indicates its major specifications, including the power supply voltage and the type of input signal. The nameplate indicates also the product number (PROD. NO.) of the control valve. Please mention this number also when consulting your Azbil Corporation agent for replacement of parts or other modification of the control valve.

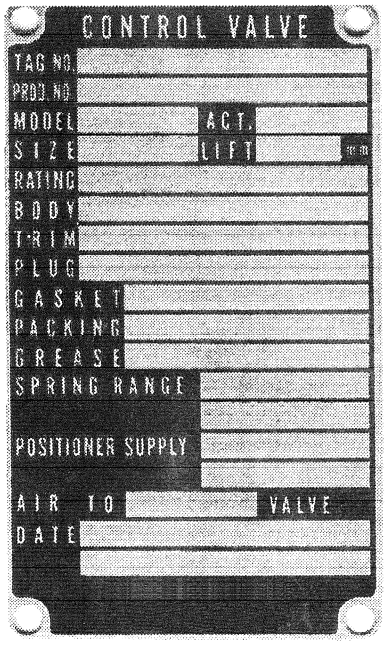


Fig. 1.4. Nameplate of Control Valve

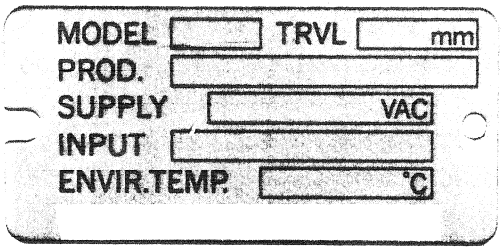


Fig. 1.5. Nameplate of Actuator

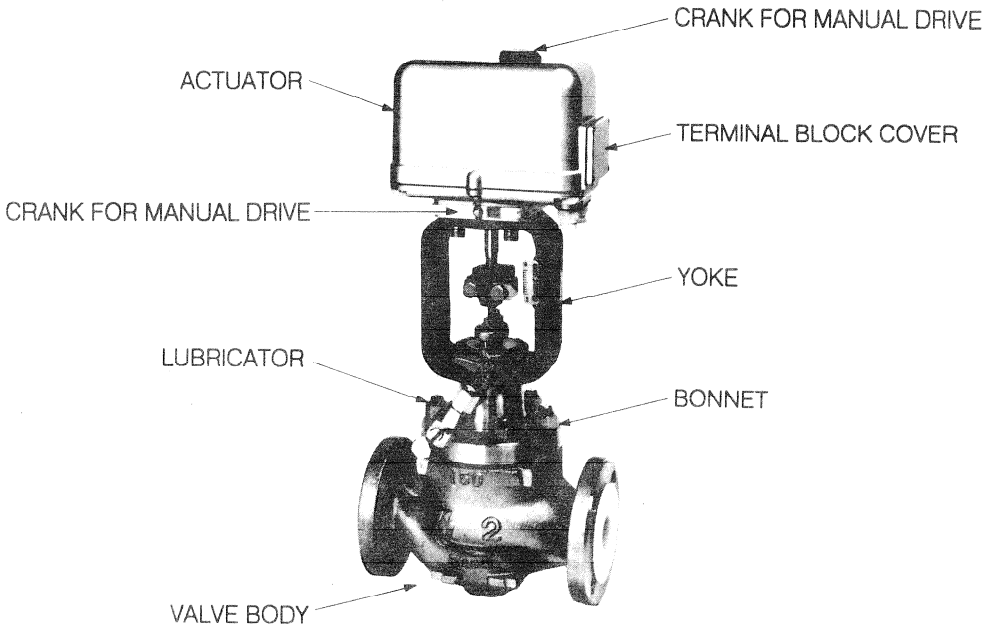


Fig. 1.6. Overall View of Control Valve

2. INSTALLATION

2.1 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 and downstream sides of the process pipe.

(2) Confirm that the direction of process fluid flow conforms with that of the arrowhead mark provided on the valve body.

(3) Pay attention so that the pipe connection gaskets do not protrude into the process pipe inside. Be sure to use gaskets made of material which is suitable for the process fluid. The welding type of valves employ no gaskets.

(4) Pay attention so that no excessively large stress is conveyed from the process pipe to the valve body. Uniformly tighten the bolts of the process pipe connection flanges. The high pressure type of valves have no flanges, since they are connected to the process by welding.

(5) Do not install any heating or cooling provisions on the bonnet.

(6) As a general rule, the process pipe on which the control valve is to be installed should be horizontal.

(7) Support the cable at a position close to the actuator in order that no large strains or stresses are applied to the cable connections by the weight of the cable itself.

2.2 Electrical Cable Connection

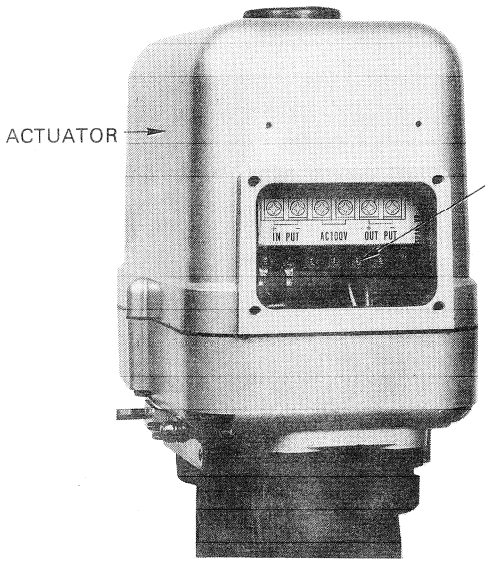
To gain access to the electrical cable connection terminals, remove the cover of the terminal block (See Fig. 1.6). Connect the signal wires correctly observing the polarity. The power supply wires can be connected irrespective of polarity.

A 250-ohm resistor is connected to the control signal input circuit as shown in Fig. 6.3. Remove the resistor when the input control signal is of the voltage type (1 – 5 V).

For leading-in of the external cables into the actuator, use a method which will keep the actuator watertight (use cabtire cables or a conduit, for examples). Refer to Item 6 for the setting controller parameters. After the cable connection is over, replace and securely fix the cover of the terminal block in its original position.

Note 1: The terminal block has no ground terminal since no grounding is necessary at this point.

Note 2: For the cabtire cables, use ones whose outside diameter is 11 mm and core cross section is 0.75 mm^2.



OUT± ..... Output signal for external use
(4 – 20 mADC)

AC100V ..... AC power supply
(100 V, 50/60 Hz AC)

IN± ..... Input control signal
(4 – 20 mADC or 1 – 5 VDC)

Fig. 2.1. Terminal Block (with Cover Removed)

Note 3: For the sealing agent for the soldered sections of the cables when in replacement, use a type of agent which do not cause corrosion of metals. The following type of sealing agent is recommended:

Type TB1208C Silicone-base Liquid Gasket
(Manufacture by THREEBOND)

2.3 Items to be Checked After Installation and Before Starting Operation

(1) Be sure that the electrical connections are correctly done. Check that the terminal screws are not loose.

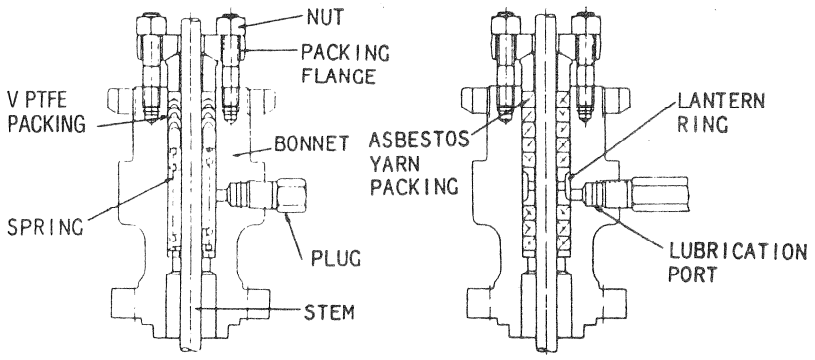
Precaution: Be sure that the DIP switches for fail-safe actions are correctly set. See Section 6.2.

(2) Tighten the packing flange nuts to prevent leak from the glad packing section. Standard tightening torques are as shown in Table 2.1.

Table 2.1. Tightening Torques of Packing Flange Nuts

Valve Stem Diameter (mm)	Asbestos Yarn Packing (N·m {kgf-cm})	Metallic Filament Reinforced Asbestos Yarn Packing (N·m {kgf-cm})	V PTFE Packing (N·m {kgf-cm})
10	3 {30}	7 {70}	0.8 {8}
13	5 {50}	12 {120}	0.8 {8}
16	8 {80}	18 {180}	0.8 {8}
20	10 {100}	25 {250}	0.8 {8}
25	15 {150}	40 {400}	0.8 {8}
30	20 {200}	50 {500}	0.8 {8}

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



V PTFE Packing Asbestos Yarn Packing

Fig. 2.2. Gland Section

(3) If the valve is provided with a lubricator as shown in Fig. 2.3, check whether the bonnet section has been lubricated or not. To do this, loosen the lubricator handwheel and turn the squeeze screw. If the squeeze screw turns lightly, follow the lubricating procedure mentioned below. (If the squeeze screw turns heavily, this means that grease has been applied.)

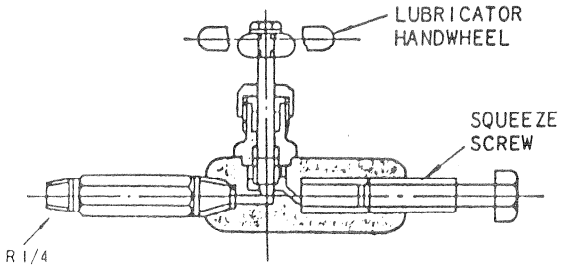


Fig. 2.3. Lubricator (Class 600 or under)

〈 Lubricating Procedure 〉

(a) Prepare grease of the type indicated on the nameplate.

(b) Tightly close the lubricator handwheel.

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

(d) Loosen the lubricator handwheel and drive grease by turning the squeeze screw.

(e) Repeat the procedure of (b), (c) and (d) until turning of the squeeze screw becomes heavier. Tightly close the lubricator handwheel.

(4) Pressurizing the valve, check that there is no leak from the gasket sections for connection to the valve body and process pipe. If leak is found, tighten the nuts. (Especially when the process fluid temperature is 400°C or higher, tighten the nuts again after raising temperature of the valve in order that it may serve for a longer period without requiring immediate maintenance service.)

(5) When raising temperature of a valve which is used for high temperature service, raise temperature gradually (standard rate is 100°C per hour) and do not operate the valve when its temperature is being raised.

3. MAINTENANCE

Render routine and periodical maintenance service for the control valve as described in this section.

(1) Tightening and Lubrication of Gland Packing

Check the gland section of the valve body for loose nuts and running short of grease. For the tightening procedure and lubrication procedure, refer to Section 2.3. A recommendable frequency of service is every six months, although this may differ depending on the conditions of use. For early periods after initially installing the control valve, more frequent service is recommended.

(2) Check of Valve Positioning (Valve Stroke)

Check that the valve positioning action (valve stroke action) is normal, without any unstable or other abnormal movement of the valve stem. See Section 8 "TROUBLESHOOTING."

(3) Check for Noise and Vibration

Check that the control valve is not generating any abnormal noise or is not subjected to vibration.

(4) Lubrication of Actuator

Check the actuator for lubrication. The section to be lubricated is as shown in Fig. 3.1. A recommendable service frequency is once in every two years. A recommendable type of grease is as follows:

"SUMICO" lubrication grease with molybdenum disulfide
(manufactured by SUMICO JUNKATSUZAI CO.)

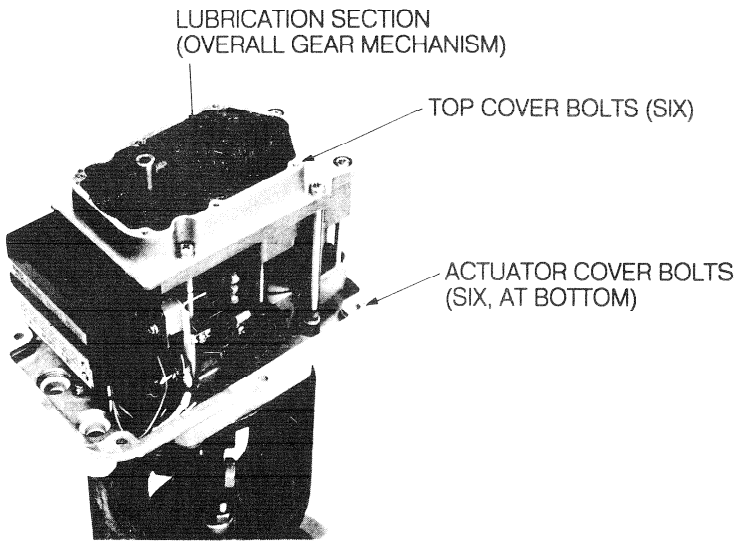


Fig. 3.1. Location of Gear Mechanism to be Lubricated

4. DISASSEMBLY AND ASSEMBLY

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

4.1 Detaching Actuator from Valve Body

(1) Apply to the actuator a current input so that the valve position pointer is at a point of 10% – 20% above the fully closed point.

(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: For detaching the actuator from the valve body which is kept installed in the process pipe, be sure to shut down the process and release the process pressure before detaching the actuator.

4.2 Disassembly and Assembly of Valve Body

To disassemble or assemble the valve body, refer to Fig. 4.1 through 4.5 and proceed as described below.

(For handling of the bellow sealed type (optional type) of valves, see Section 5.)

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 rotating the plug. When doing this, exercise care not to damage the valve stem.

(4) Model HTS

For Model HTS valve, remove the guide ring. The seat ring is fixed to the valve body by threading. To remove the seat ring, special tools (optional) are necessary.

(Model HLS valve has no guide ring and in its stead the valve has a guide bushing pressed in the bonnet.)

For Model HCB valve, pull out the plug and then pull out the cage from the valve body.

Inspection

Inspect the disassembled parts for damage. If any damage is found, replace the parts. (When ordering parts, mention also the Prod. No. of the valve which is indicated on the nameplate.)

(1) Check that the seating surfaces of plug and seat ring are not damaged.

(2) Check that the gasket-contacting surfaces of valve body, bonnet and guide ring are not damaged. Do not re-use the removed gasket. Use fresh gasket when assembling the valve.

(3) Check that the plug guide section, the stem, and the internal guiding sections of guide bushing are not damaged

Assembly Procedure

- Model HLS

(1) Securely fix the seat ring onto the valve body with threads, using the special tools (optional). For the tightening torque, see Table 3.1.

(2) Set the plug on the seat ring. (Apply lubricant "Neverseize" to the threaded sections, except those of the oil-inhibited 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, paying attention so that they are not tightened unevenly (tighten alternately the ones located at symmetrical positions). For the tightening torque, see Table 3.2.

(4) Insert the gland packing as shown in Fig. 2.2.

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

(5) Do not re-use the removed gland packing. Use fresh packing when assembling the valve. Be sure to install the packing in the correct manner, especially when the valve is for vacuum service.

(6) Place the packing follower and packing flange, and tighten the nuts. For the tightening torques, see Table 2.1.

- Model HTS

(1) Securely fix the seat ring onto the valve body with threads, using the special tools (optional). For the tightening torque, see Table 3.1.

(2) Set the plug on the seat ring. (Refer to the Disassembly Procedures.)

(3) Put a sheet of gasket (2) on the valve body side and place the guide ring in a manner of covering the plug. (Apply lubricant "Neverseize" to the gaskets, except those of the oil-inhibited valves.)

(4) Put the gasket (1) on the guide ring. (Apply lubricant "Neverseize" to the gaskets, except those of the oil-inhibited valves.)

(5) 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, paying attention so that they are not tightened unevenly (tighten alternately the ones located at symmetrical positions). For the tightening torque, see Table 3.2.

(6) Insert the gland packing as shown in Fig. 2.2.

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 2.1.

- Model HCB

(1) For an integral-type cage valve, put a spiral gasket in the valve body. For a split-type cage valve, securely fix the seat ring onto the valve body with threads, using the special tools. (Apply lubricant "Neverseize" to the gasket, except those of the oil-inhibited valves.

(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 and check that the bonnet is correctly mated with the indented section of the valve body. Tighten the nuts uniformly, paying attention so that they are not tightened unevenly (tighten alternately the ones located at symmetrical positions). For the tightening torque, see Table 3.2.

(6) Insert the gland packing as shown in Fig. 2.2.

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 2.1.

Table 3.1. Seat Ring Tightening Torques

Size (in.)	Torque (N·m {kgf-cm})
1½	260 {2,600}
2	390 {3,900}
2½	520 {5,200}
3	650 {6,500}
4	800 {8,000}
6	1,200 {12,000}
8	1,500 {15,000}
1,¾	180 {1,800}

Table 3.2. Tightening Torque of Bonnet Stud Bolts

BOLT	Torque (N·m {kgf-cm})
M12	60 {600}
M16	100 {1,000}
M20	150 {1,500}
M22	200 {2,000}
M24	250 {2,500}
M27	350 {3,500}
M30	500 {5,000}
M33	660 {6,600}
M36	850 {8,500}
M39	1,000 {10,000}
M42	1,200 {12,000}
M45	1,400 {14,000}

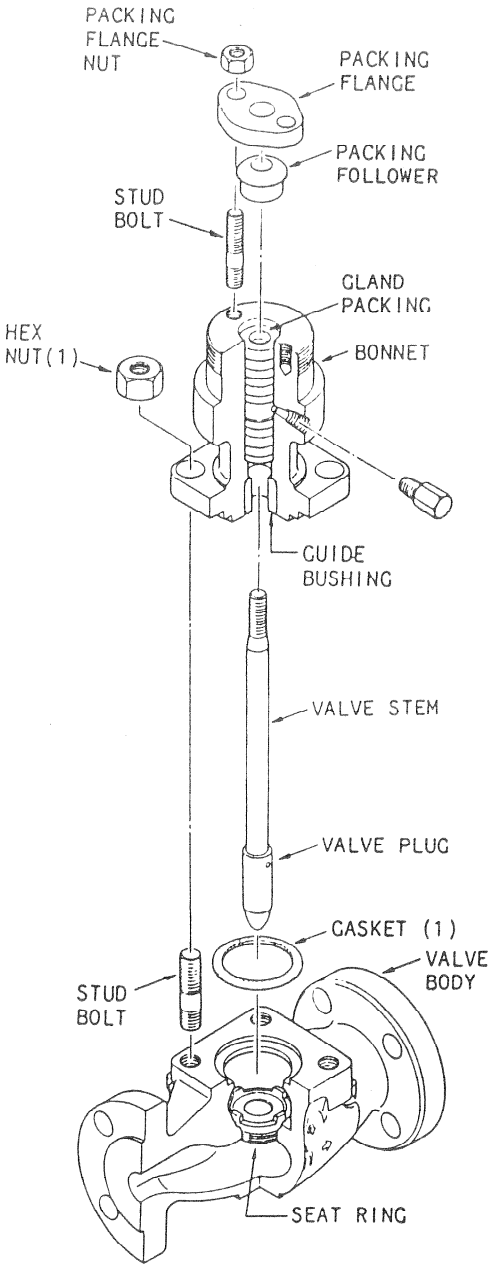


Fig. 4.1.1. Normal Temperature Type

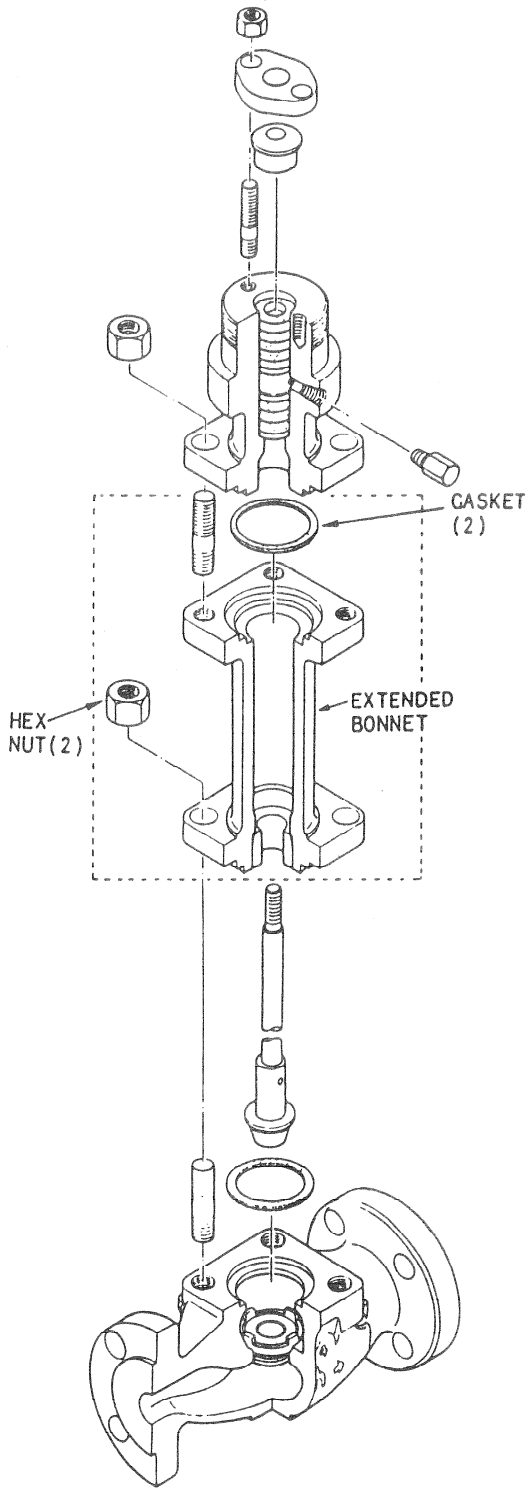


Fig. 4.1.2. High Temperature Type (Extended Bonnet Type)

Fig. 4.1. Model HLS Control Valves

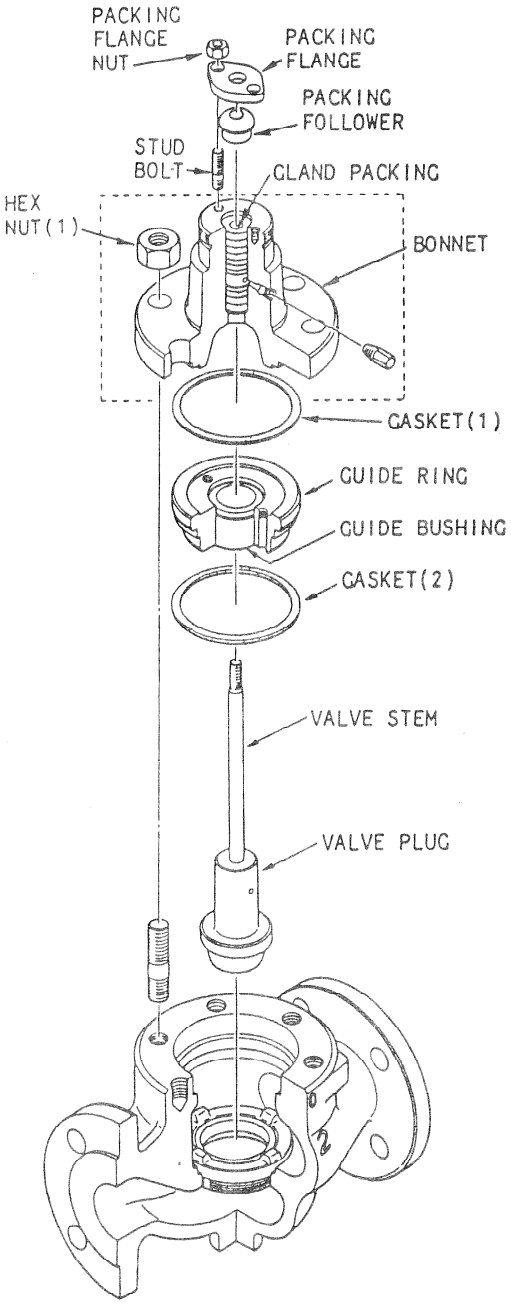


Fig. 4.2.1. Normal Temperature Type

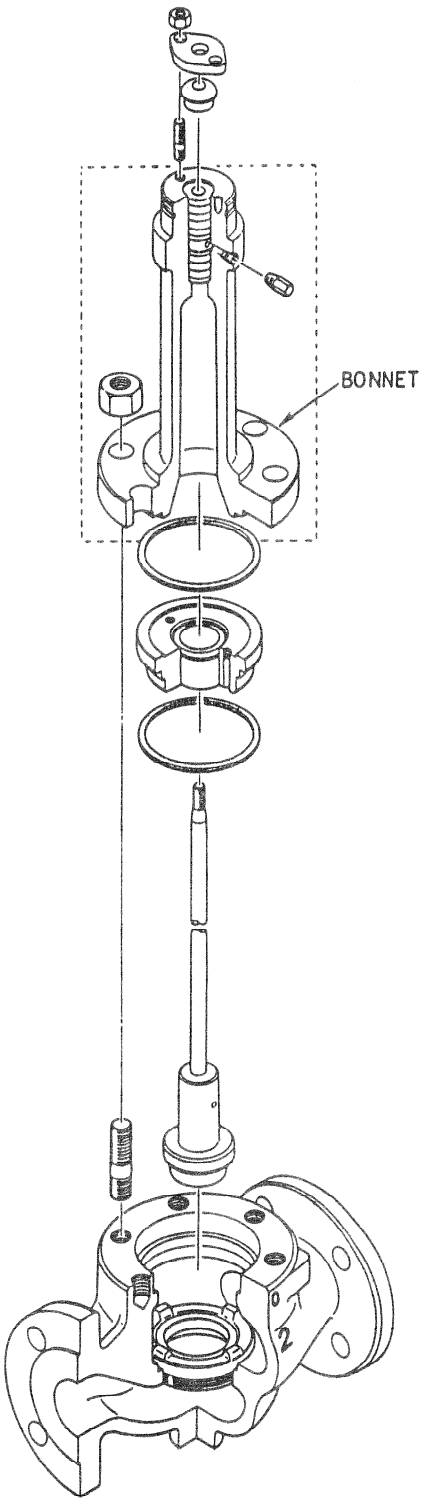


Fig. 4.2.2. High Temperature Type (Extended Bonnet Type)

Fig. 4.2. Model HTS Control Valves

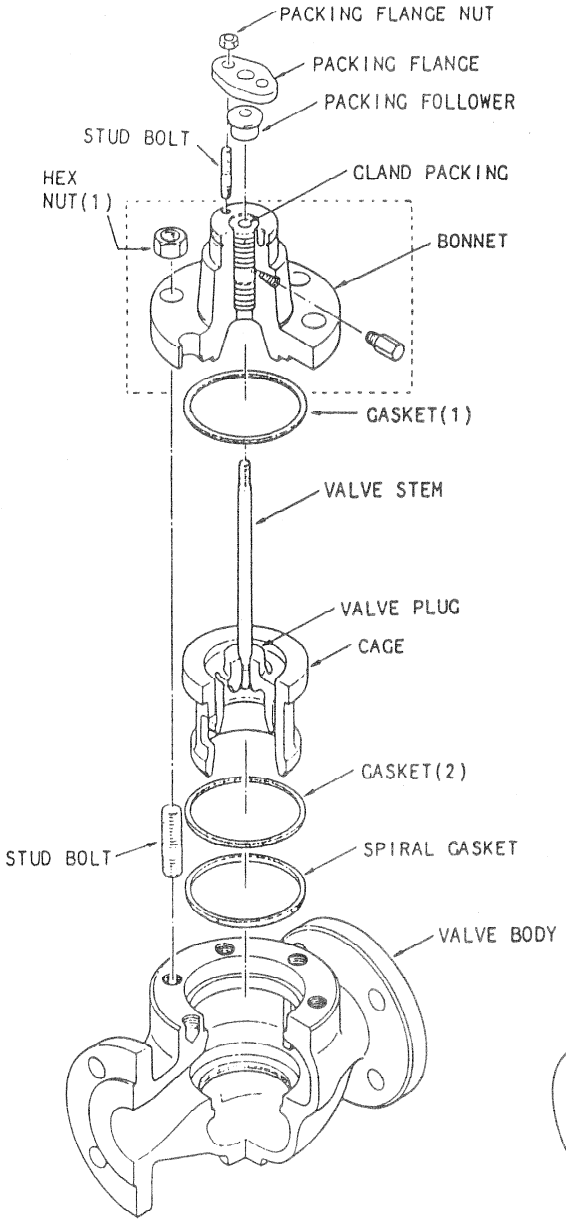


Fig. 4.3.1. Normal Temperature Type

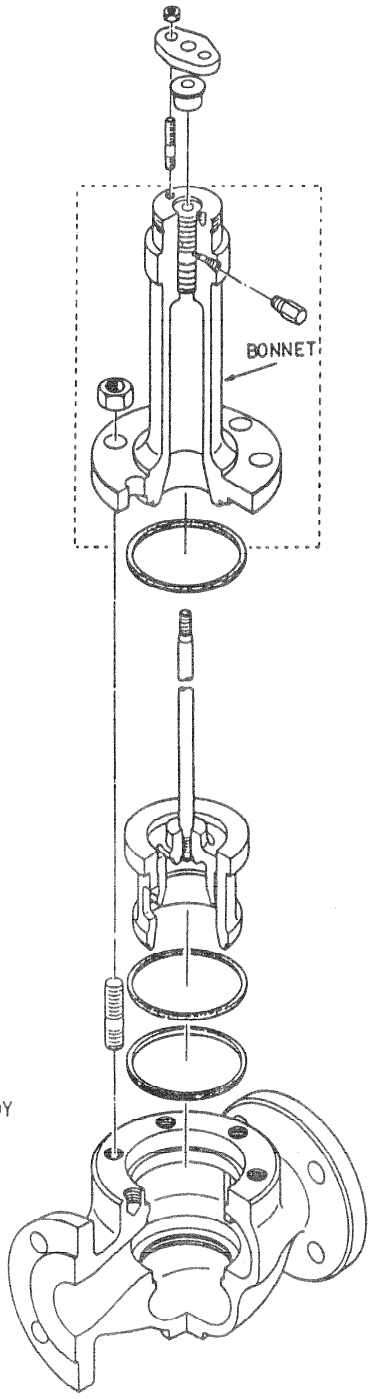


Fig. 4.3.2. High Temperature Type (Extended Bonnet Type)

Fig. 4.3. Model HCB Control Valves

5. INSTRUCTIONS FOR BELLOWS SEALED TYPE OF CONTROL VALVES

The bellows sealed type of control valves differ from other control valves in that the former employ a bellows for seal. This section covers primarily the particular items related to the bellows sealed type of control valves.

Note: The bellows seal assembly should be replaced periodically. The frequency of replacements depends on the conditions of use. When handling a mechanism which as a bellows seal assembly, exercise care so that the mechanism is not twisted. Note that the bellows is not highly resistant against torsion.

5.1 Model HLS Control Valves

5.1.1 Structures

The handling methods of Model HLS Control Valves differ as the shapes of their ports differ depending on Cv values and on whether they are provided with a teflon insert or not. The structures of typical valves are shown in Figs. 5.1 and 5.2.

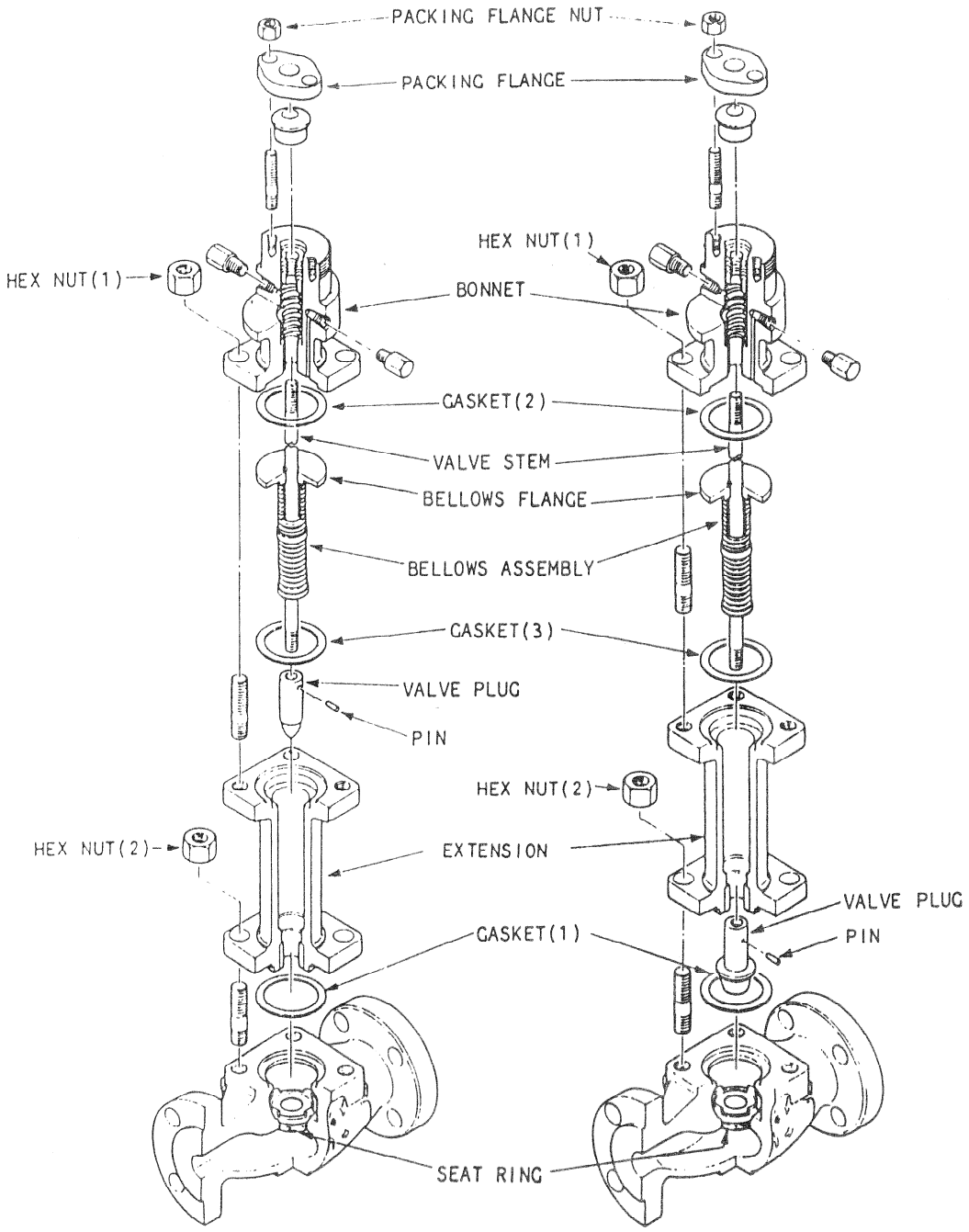


Fig. 5.1. Valve with Cv ≦ 4

Fig. 5.2. Valve with Cv ≧ 6.3 and with Teflon Insert

5.1.2 Disassembly and Assembly

(1) Detach the actuator from the valve as described in Section 4.1.

(2) Loosen the packing flange nut.

(3) Loosen the hex nut (1) of the bonnet, using the wrench.

(4) Raise the bonnet and remove the gasket (2).

Note: When raising the bonnet, press down the stem so that it will not come up together with the bonnet.

(5) Remove the hex nut (2) which fixes the extension, using the wrench. Detach the extension together with the stem from the valve body.

Note: The stem section has the valve plug, bellows flange, bellows assembly and pin, assembled together.

(6) The procedure of this step differs depending on Cv value and presence/absence of the teflon insert as described in Steps (6)-1 and (6)-2.

(6)-1. For Valves with Cv $\leqq$ 4 (See Fig. 5-1.)

- Remove the stem from the extension.
- Holding the valve plug using a vice or other tool, remove the pin by using a chisel. Detach the stem from the valve plug by turning the stem counterclockwise.

Note: To turn the stem, put back the stem connector onto the stem.

(6)-2. For Valves with Cv $\geqq$ 6.3 and with PTFE Insert (See Fig. 5.2.)

- Hold the valve plug with a vise or other tool, pull out the valve plug until the pin comes out of the extension, remove the pin by using a chisel or other tool, and then detach the stem (together with the extension) by turning the stem counterclockwise.

Note: To turn the stem, put back the stem connector onto the stem.

(7) Remove the gasket and seat ring. (See Section 4.1.)

For assembly of the control valve, follow the disassembly procedure in the reverse order.

5.2 Model HTS, HCB Control Valves

5.2.1 Structures

The structures of Models HTS and HCB Control Valves are shown in Fig. 5.3 and Fig. 5.4.

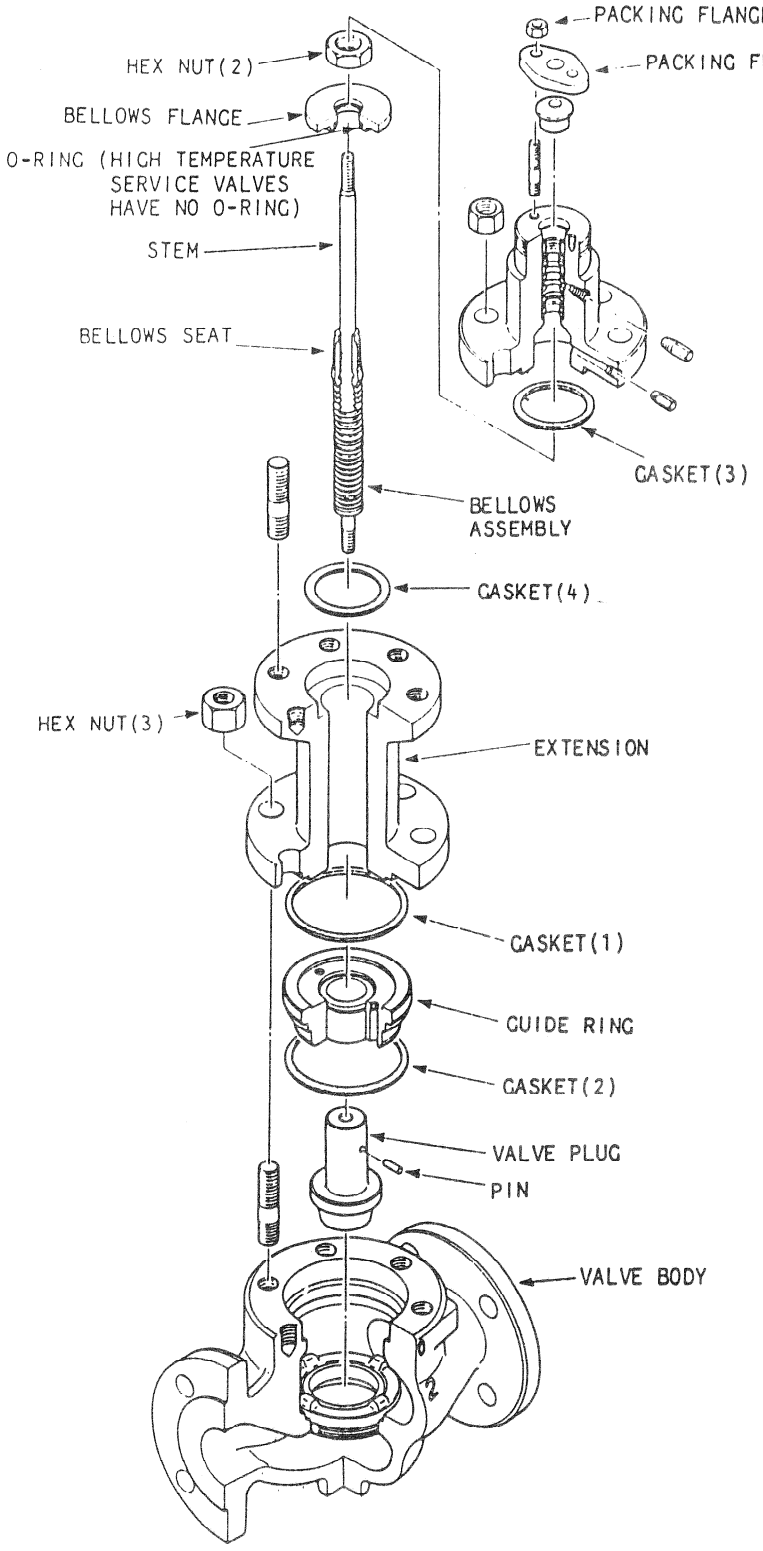


Fig. 5.3. Model HTS Control Valve

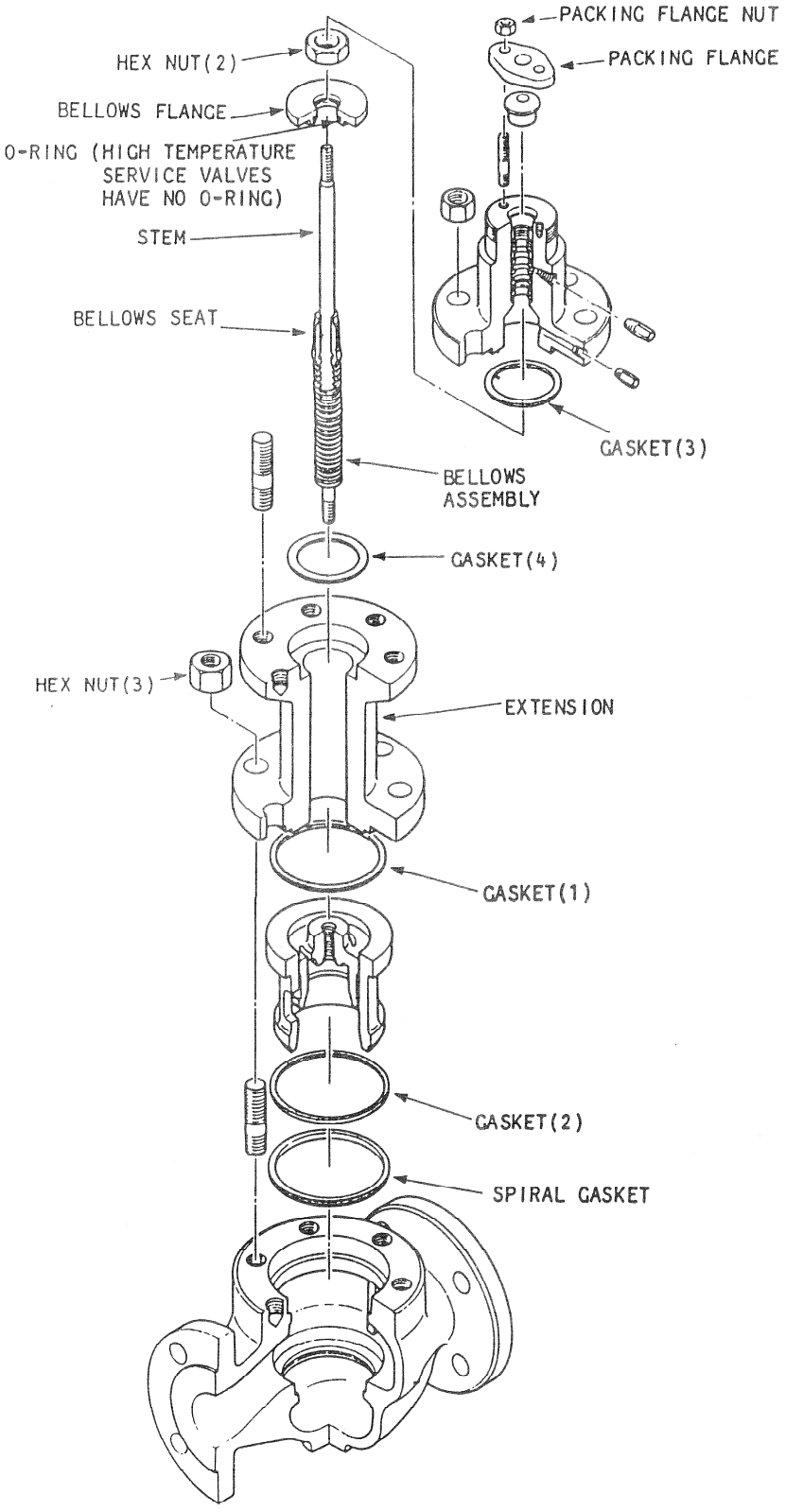


Fig. 5.4. Model HCB Control Valve

5.2.2 Disassembly and Assembly

(1) Detach the actuator from the valve as described in Section 4.1.

(2) Loosen the packing flange nut.

(3) Loosen the hex nut (1) of the bonnet, using the wrench.

(4) Raise the bonnet and remove the gasket (3).

Note: When raising the bonnet, press down the stem so that it will not come up together with the bonnet.

(5) Remove the hex nut (2) which fixes the bellows flange and bellows seat.

Note: When loosening the nut, hold stationary the bellows seat so that no unreasonably large torsion is applied to the bellows, which is not highly resistant against torsion.

(6) Remove the bellows flange and gasket (4).

Note: The bellows seat can be readily detached by lightly hitting its top. (The most effective method is to hit it by passing a pipe onto the stem.)

(7) Remove the hex nut (3) which fixes the extension, by using a wrench. Detach the extension from the valve body.

- For Model HTS

(8) Remove the gasket (1), guide ring and stem, together.

Note: The stem section has the valve plug, bellows seat, bellows assembly and pin, assembled together.

(9) Remove the gasket (2).

(10) Holding the valve plug with a vise or other tool, remove the pin by using a chisel. Detach the stem from the valve plug by turning the stem counterclockwise.

Note: To turn the stem, put back the stem connector onto the stem.

For assembly of the control valve, follow the disassembly procedure in the reverse order.

- For Model HCB

(8) Remove the stem.

Note: The stem section has a valve plug, bellows seat and bellows assembly, welded together.

(9) Remove the gasket (1) and pull up the cage. If the cage does not come up easily, use the special tool (optional).

(10) Remove the gasket (2) and the spiral gasket.

Note: Of the split cage type of valve, the seat ring is fixed to the valve body by threading. To remove the seat ring, the special tool (optional) is needed.

For assembly of the control valve, follow the disassembly procedure in the reverse order.

6. ADJUSTMENT

Prior to operation, be sure to set the full close signal to 20.2 mA or greater for the direct action and to 3.9 mA or less for the reverse action.

When a control valve is assembled after being separated into a valve body and an actuator for servicing or any other purpose, adjust and check the control valve as described in this section.

6.1 Stroke Adjustment (ZERO and SPAN Adjustment) and Sensitivity Adjustment

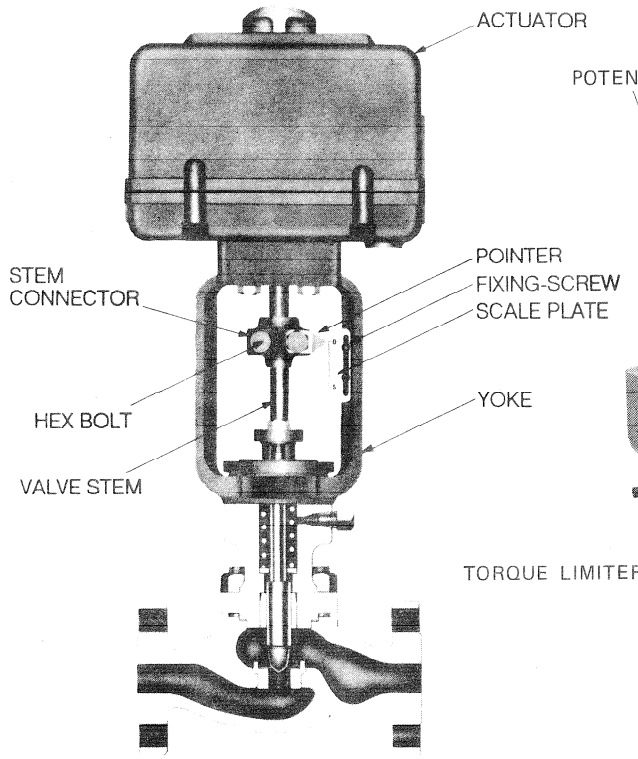


Fig. 6.1. Yoke Section

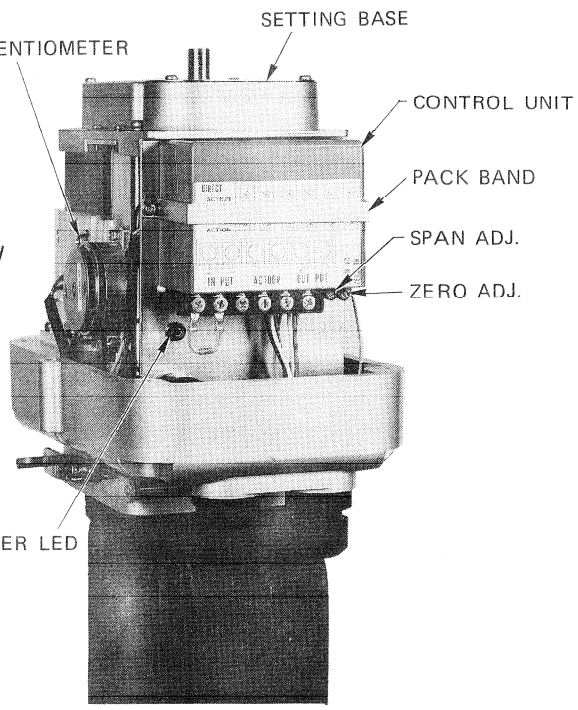


Fig. 6.2. Control Unit

(1) By referring to the nameplate on the yoke, confirm the type of action (direct or reverse), the range of stroke travel, the type of control signal, and the mode for fail-safe action (fully closed, full open, or hold).

(2) Remove the cover of the terminal block. Connect the power cable and the signal cable (from a signal source of 4 – 20 mADC) to the terminals.

(3) Fully push down the valve stem until the valve plug is seated on the valve seat.

(4) Set the ZERO ADJ potentiometer to an approximate center position of its full adjustment range, from the terminal block section of the actuator.

(5) Apply to the actuator a control signal corresponding to the fully closed position (20 mADC for the direct action type or 4 mADC for the reverse action type).

(6) Connect the actuator stem to the valve stem with the stem connector. For this connection, let the threads of the stems engaged and securely tighten the connector with the hex bolt.

(7) Align the zero position of the scale plate installed on the yoke to the pointer installed on the stem connector. To do this, slide the scale plate by loosening its fixing-screw.

(8) Apply to the actuator a control signal corresponding to the full open position (4 mADC for the direct action type or 20 mADC for the reverse action type).

(9) Check that the pointer indicates the full span position of the scale. Adjust the pointer to this position with the SPAN ADJ potentiometer of the controller, from the terminal block section.

(10) Repeat the procedures of (5), (8) and (9) until both zero and span requirements are met at the same time.

(11) By applying a control signal of 20.1 – 20.4 mADC for the direct action type or 3.9 – 3.6 mADC for the reverse action type, check that the pilot lamp illuminates indicating that the valve plug is seated on the plug seat. If the lamp is left unlit, further adjust the signal in the closing direction. When the lamp is lit, readjust the zero and span. If the lamp is still left unlit even by varying the signal, remove the stem connector and then start readjustment from Item 2.

(12) After the above adjustment and check are over, cut off the input signal and check that the control valve is driven into the fail-safe action mode as described in Section 6.2. (Refer to Section 2.3 (1).)

(13) If hunting occurs due to unstable process condition, or if the control signal varies significantly, adjust the sensitivity for the purpose of damping (See Fig. 6.3.). The adjustment differs depending upon the situation although usually not required.

(14) The sensitivity is factory-set to 0.5%. Lower the sensitivity when controller's output varies remarkably.

The sensitivity improves when the control is turned clockwise and lowers when turned counter-clockwise.

6.2 Fail-safe Action Mode

The control valve must be driven in the direction safer for the process when the input control signal of the control valve has failed (has become lower than 2 mA or 5 V). Therefore carefully set the output of the controller or the manual loader.

The safer direction may be toward the fully closed position (CLOSE mode), full-open position (OPEN mode), or to stop in the currently existing position (STOP mode). Any one of these mode is selectable with the selector switches located at the bottom of the control unit. The location of the selector switches is shown in Fig. 6.3. The relationship between switch setting and fail-safe mode is as shown in Fig. 6.4 and Table 6.1.

Set the switches referring to Table 6.1.

- Operation Mode

  OPEN: Set the valve opening fully opened.

  STOP: Set the opening just before the input signal fails.

  CLOSE: Set the opening fully closed.

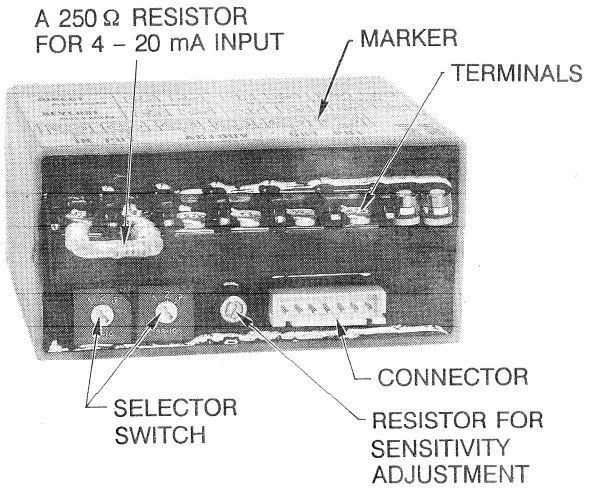


Fig. 6.3. Bottom of Control Unit

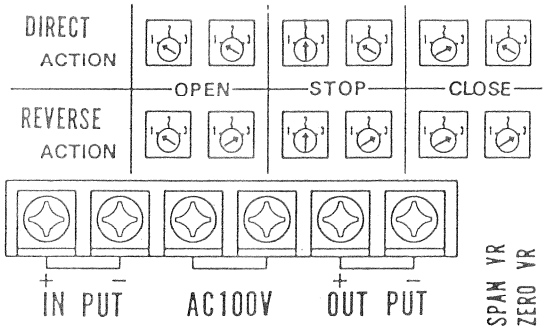


Fig. 6.4. Marker on the Control Unit Front

Table 6.1. Designation of Valve Action and Access to Selector Switch Position

Valve Action	Input Signal		When input has failed	Access to Switches
	4 mA	20 mA		
DIRECT ACTION	Open	Close	OPEN	OPEN MODE
			STOP	STOP MODE
			CLOSE	CLOSE MODE
REVERSE ACTION	Close	Open	OPEN	OPEN MODE
			STOP	STOP MODE
			CLOSE	CLOSE MODE

NOTE: Left side switches 1: OPEN 2: STOP 3: CLOSE
Right side switches 1: DIRECT 3: REVERSE

7. MANUAL OPERATION WITH CRANK

The control valve can be manually driven with the hand crank. To do this, proceed as described in the following.

Be sure that the power supply of the actuator is turned off. (Although it is possible to manually drive the valve even when it is operating in the automatic mode, note that reactions from the automatic operation will be conveyed to the crank).

Remove the cap on top of the casing, insert the crank in the manual drive hole (hex hole), and turn the crank. The valve is driven in the closing or opening direction as you turn the crank clockwise or counterclockwise, respectively.

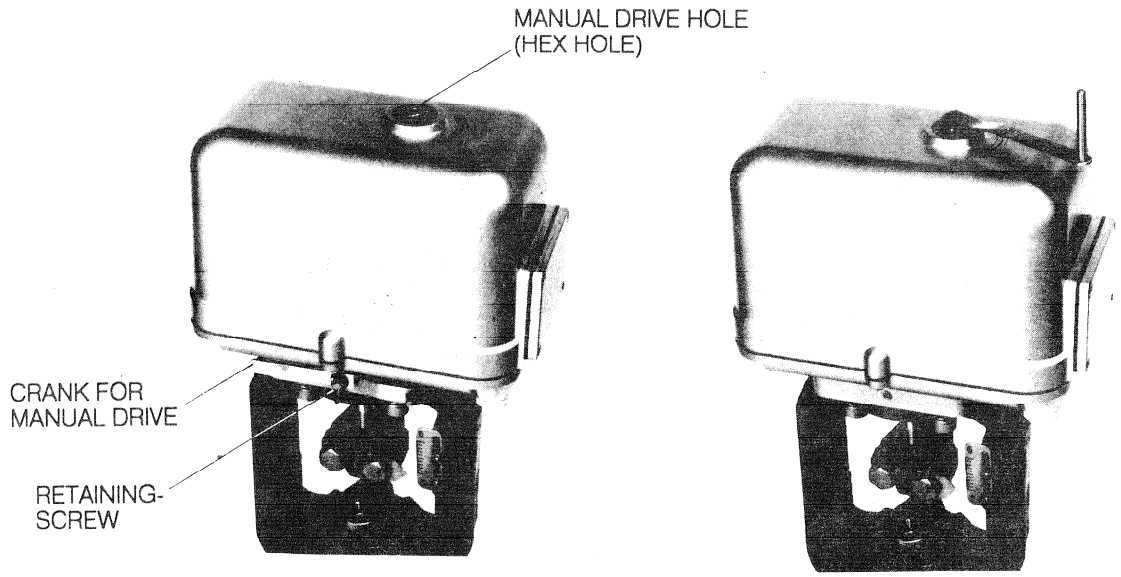


Fig. 7.1. Manual Drive with CRANK

Precautions: When in the manual operation with the crank, drive the valve within the stroke range of the stem as indicated by the scale on the actuator yoke. Do not apply any unreasonably large force when the stroke is beyond the fully closed or full open position.

8. TROUBLESHOOTING

Symptom	Probable Cause (Remedy)
The motor does not run.	• No power is supplied to the actuator. • No control signal is fed to the actuator. • An electrical cable is open-circuited. • A wire is disconnected from its terminal. • The supply voltage is incorrect. • The thermal switch has tripped. (Turn off the power supply.) • The capacitor has failed. • No input resistor is provided for the input current signal. (Provide an input resistor, 250 ohms for the 4 – 20 mADC signal.)
The stem moves unstably.	• The potentiometer has failed. • The input control signal is unstable.
No output signal for valve position is delivered. The output signal for the full-open position cannot be attained. The output signal for the fully-closed position cannot be attained.	• The wiring for the output signal is open. • The control unit has failed. • The SPAN setting is incorrect. (Adjust the full span position.) • The ZERO setting is incorrect. (Adjust the zero position.)
Hunting	• Lower the sensitivity. (See (14), Item 6.1)

Note 1: The output signal maintains, for the same valve position, a relationship of 1:1 with respect to the valve position (by auto-tuning function).

Note 2: The relationship between the output signal and the valve position is such that the signal is 4 mA for the bottom position and 20 mA for the top position, irrespective of whether the valve is in the direct or reverse action mode.

9. REPLACEMENT OF WEARABLE PARTS AND COMPONENTS

This section provides information on replacement of wearable parts and components.

9.1 Replacement of Wearable Parts of Valve Body Section

The gland packing and the gaskets are wearable parts. Do not re-use them when you have disassembled the valve for overhaul. For the disassembly and assembly procedures, refer to Section 5.

The bellows seal assembly* of the bellow-seal control valve also is a wearable item. The life expectancy of the bellows assembly is 10,000 vertical strokes, although it may differ by temperature, pressure and other conditions of use.

*: The bellows seal assembly consists of a seal bellows and a valve stem (including a bellows seat).

9.2 Replacement Procedure of Control Unit

To remove the control unit, proceed as follows:

(1) Remove the cover from the base, by loosening the fixing-screws (M5 × 15) of the cover.

(2) Disconnect the power supply and signal cables from the terminal block of the control unit.

(3) Remove the fixing-screws (M3 × 6) of the control unit band.

(4) Disconnect the connectors for internal wiring.

(5) Remove the control unit from the control unit support.

To install the control unit, follow the removing procedure in the reverse order.

Note

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