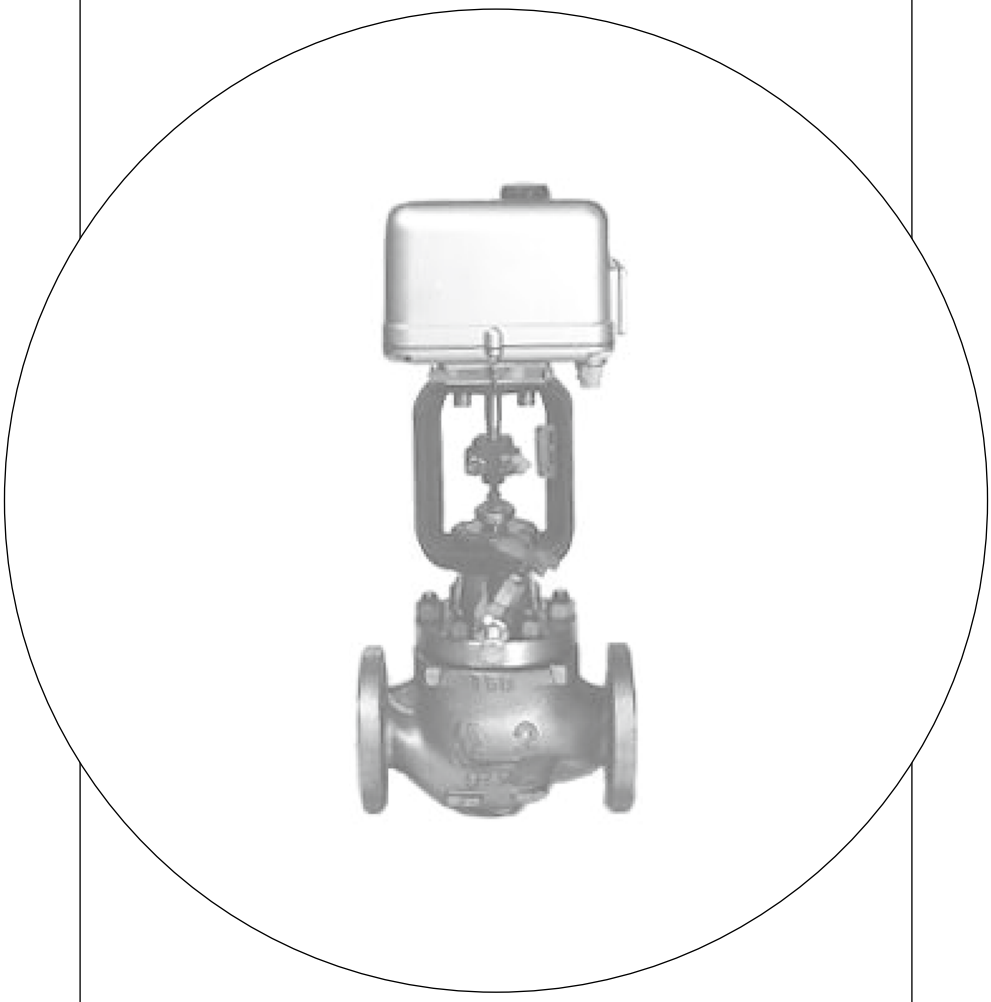
azbil

OM2-8114-0200

Electric Control Valves

Model: HLS/HTS/HCB

User's Manual



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Chapter 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 Fig. 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 mechanism, 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.

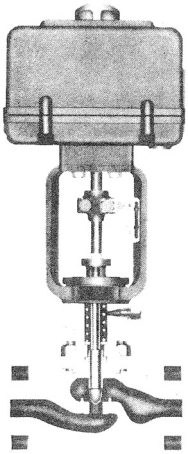


Fig. 1-1. Model HLS Small-size Single-seat Control Valve

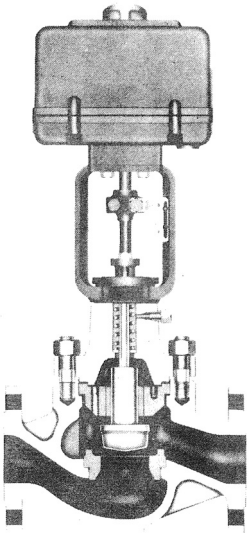


Fig. 1-2. Model HTS Top-guided Control Valve

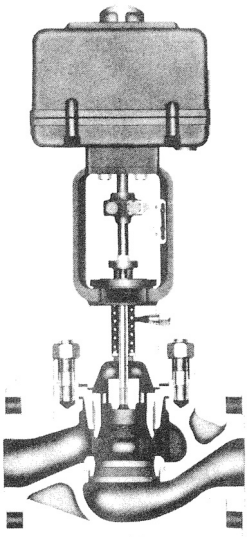


Fig. 1-3. Model HCB Pressure-balanced Cage-type Control Valve

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.

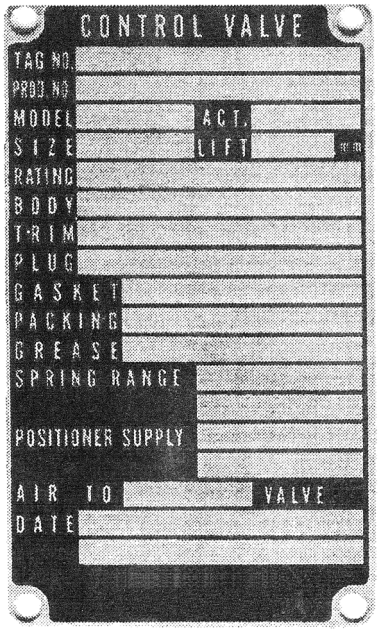


Fig. 1-4. Nameplate of Control Valve

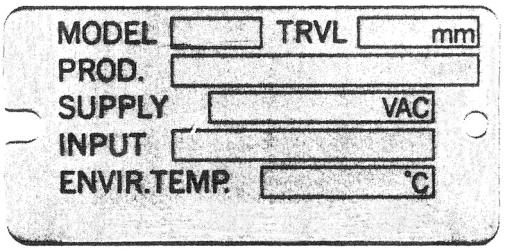


Fig. 1-5. Nameplate of Actuator

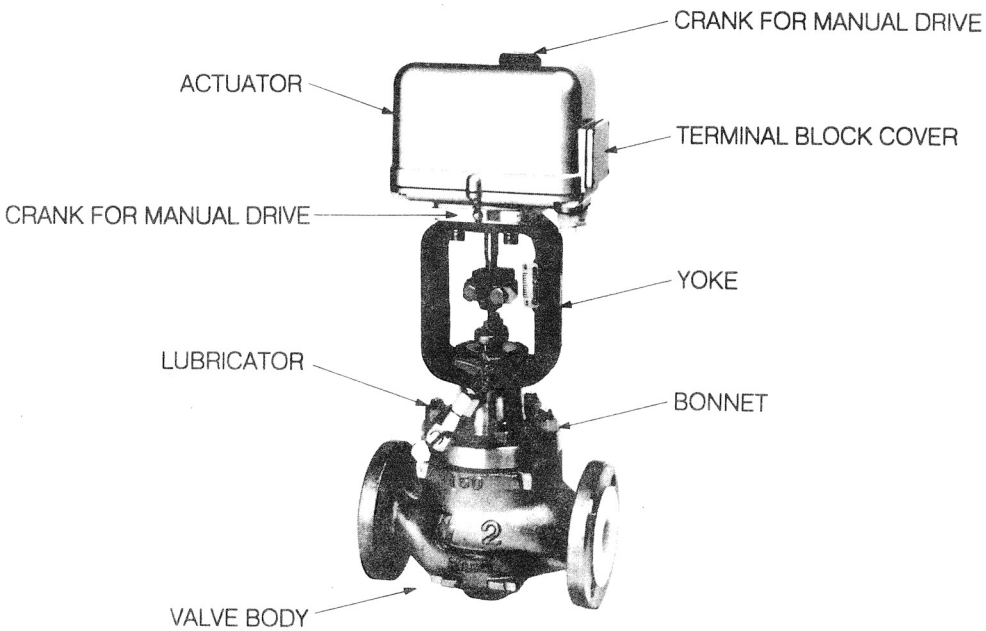


Fig. 1-6. Overall View of Control Valve

Chapter 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.

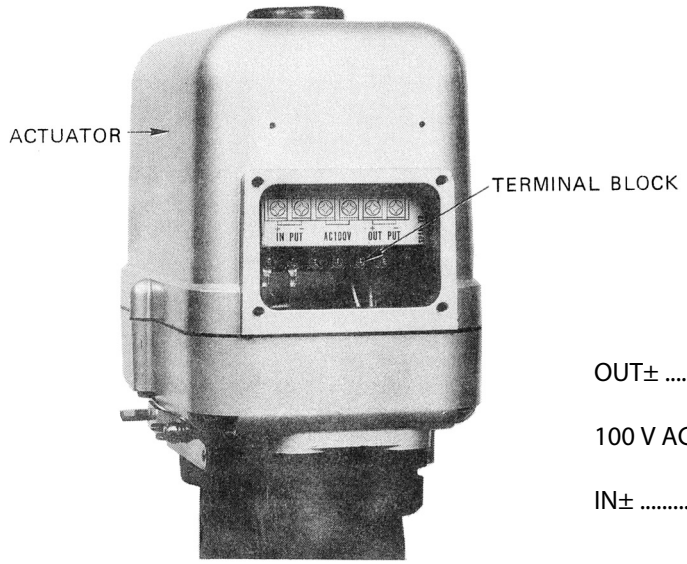
(7) Support the cable at a position close to the actuator in order that no large strains or stresses are applied to the cable connections by the weight of the cable itself.

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 mA DC)
100 V AC ..... AC power supply
(100 V, 50/60 Hz AC)
IN± ..... Input control signal
(4- 20 mA DC or 1-5 V DC)

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.

[!] Handling Precautions:

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 {kgt-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.

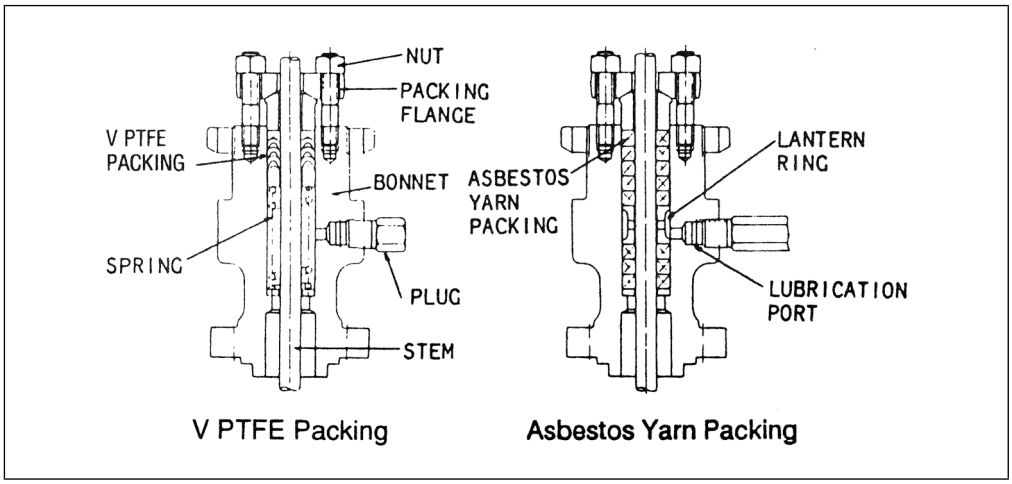


Fig. 2-2. Gland Section

(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.)

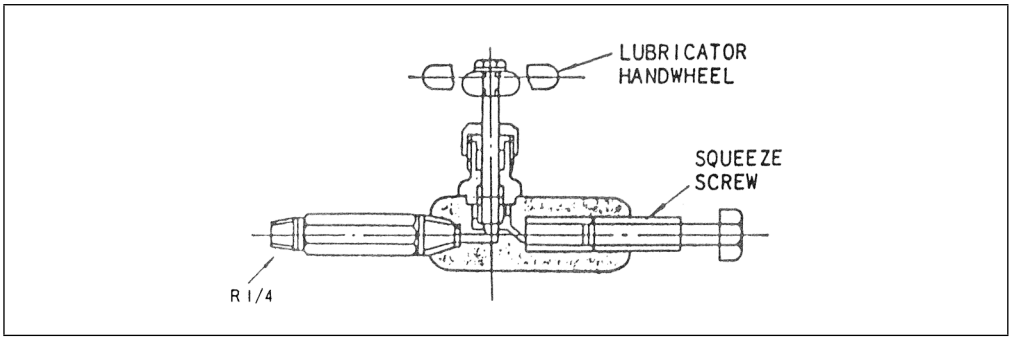


Fig. 2-3. Lubricator (Class 600 or under)

[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.

Chapter 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 Chapter 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.)

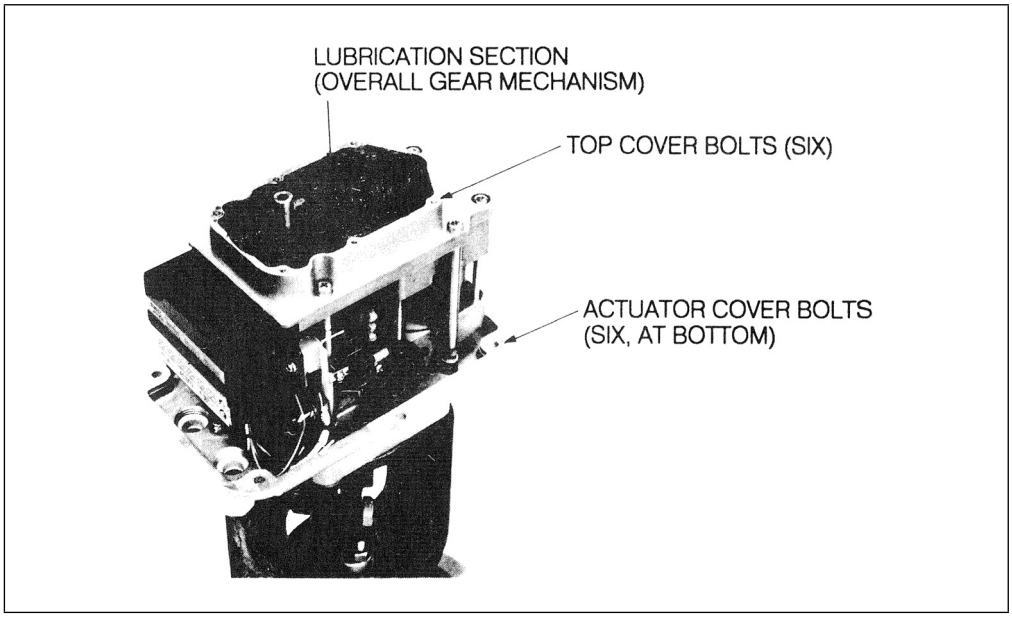


Fig. 3-1. Location of Gear Mechanism to be Lubricated

Chapter 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 damping-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.

[!] Handling 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 Fig. 4-3 and proceed as described below.
(For handling of the bellow sealed type (optional type) of valves, see Chapter 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.

[!] Handling 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 Procedures

- 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 4-1.

(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 4-2.

(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 4-1.

(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 4-2.

(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 4-2.

(6) Insert the gland packing as shown in Fig. 2-2.

Note: When yarn packing sheets arc 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 4-1. 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 4-2. 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}

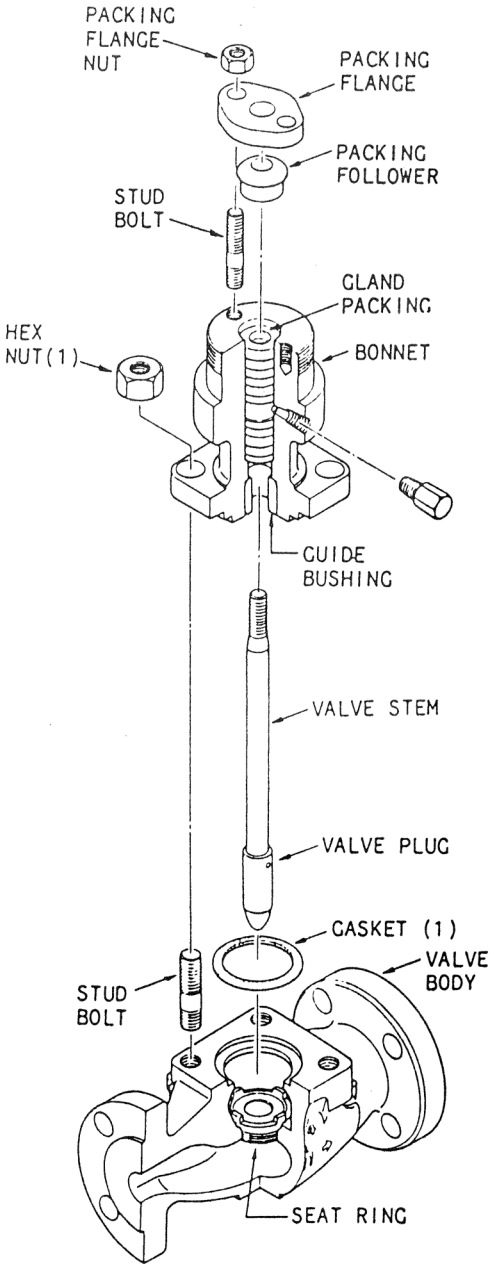


Fig. 4-1-1. Normal Temperature Type

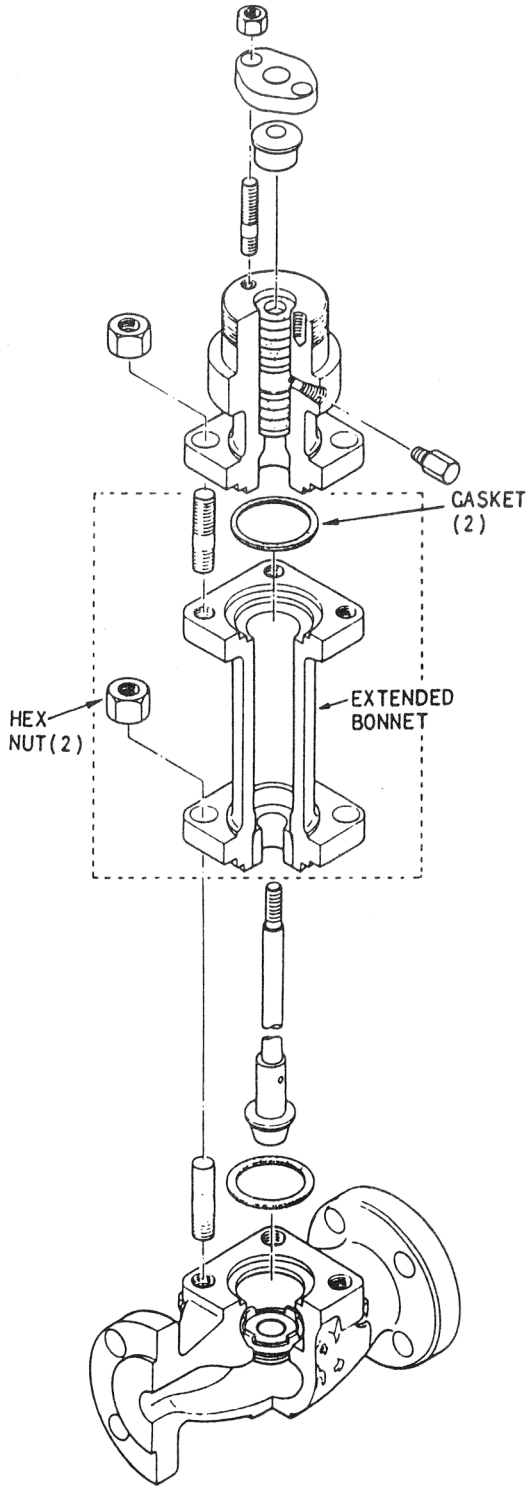


Fig. 4-1-2. High Temperature Type (Extended Bonnet Type)

Fig. 4-1. Model HLS Control Valves

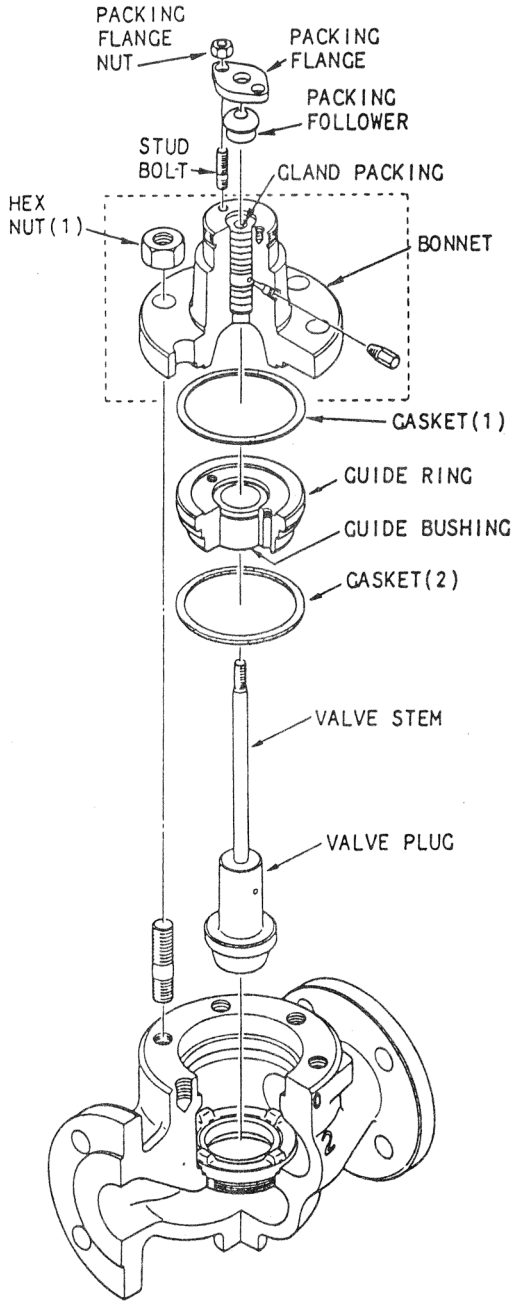


Fig. 4-2-1. Normal Temperature Type

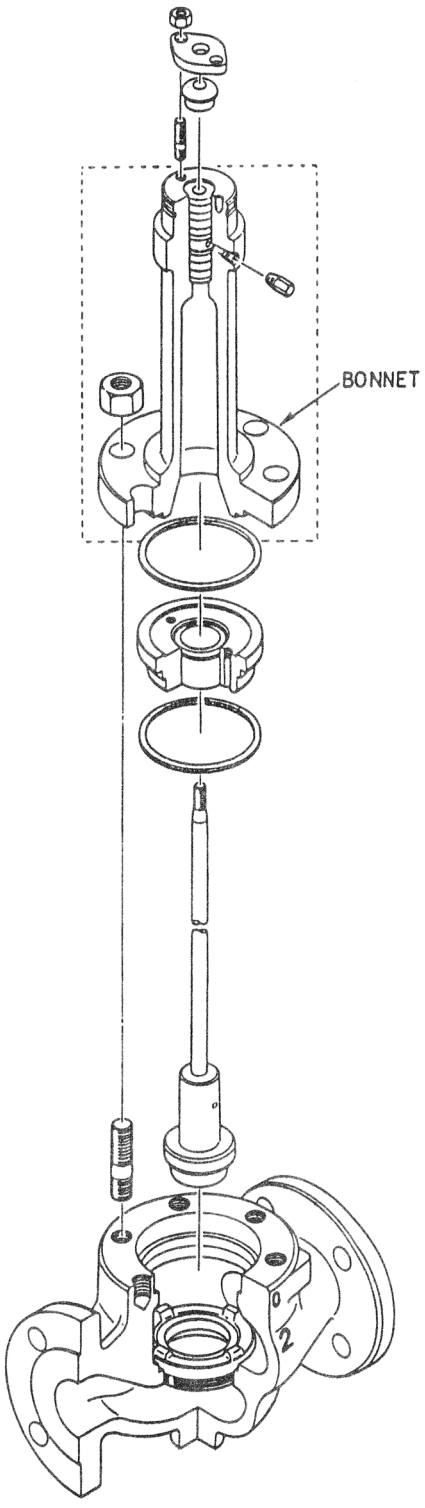


Fig. 4-2-2. High Temperature Type
(Extended Bonnet Type)

Fig. 4-2. Model HTS Control Valves

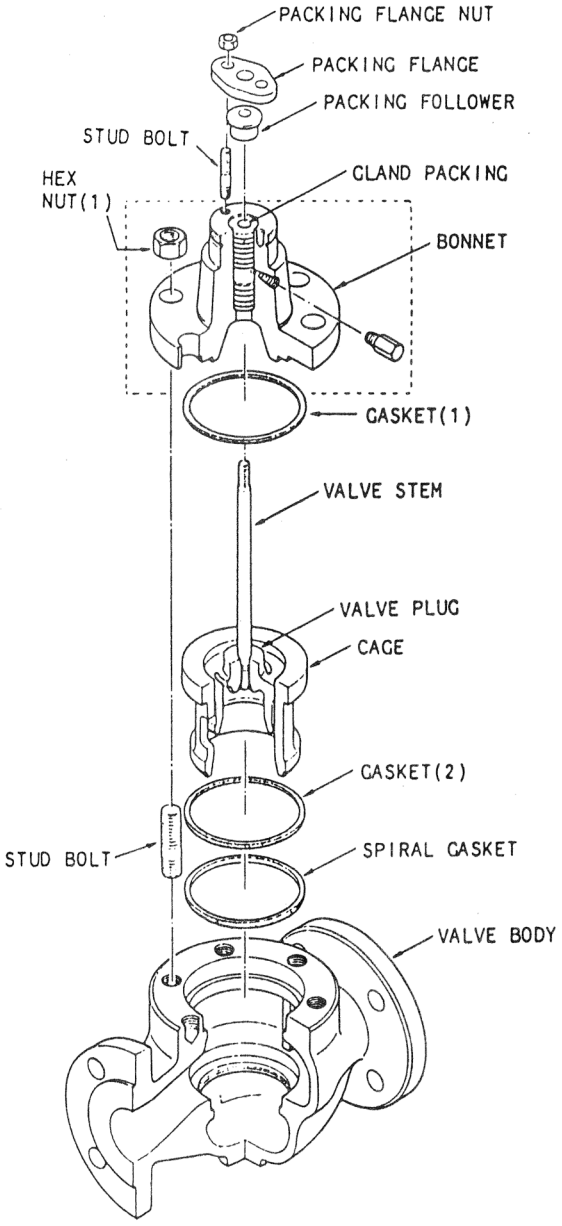


Fig. 4-3-1. Normal Temperature Type

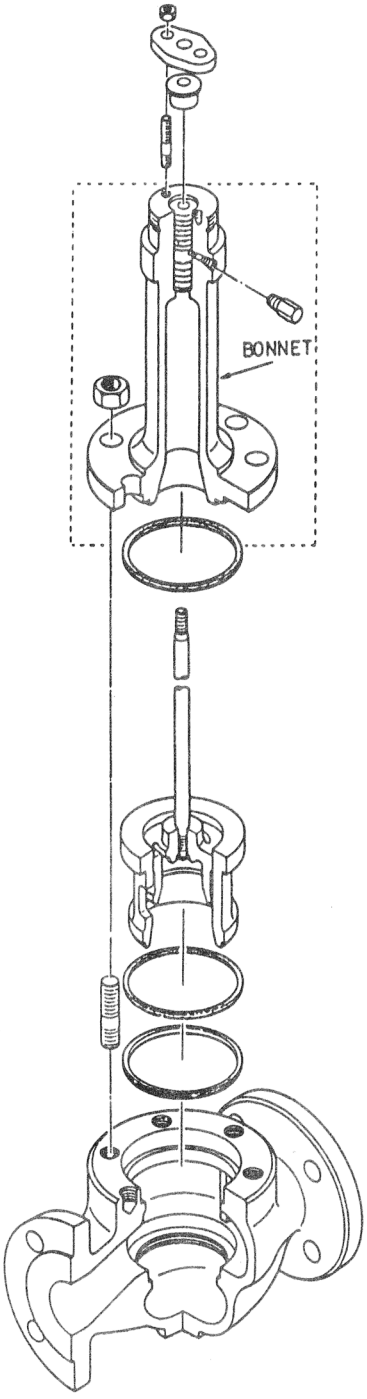


Fig. 4-3-2. High Temperature Type (Extended Bonnet Type)

Fig. 4-3. Model HCB Control Valves

Chapter 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 Fig. 5-1 and Fig. 5-2.

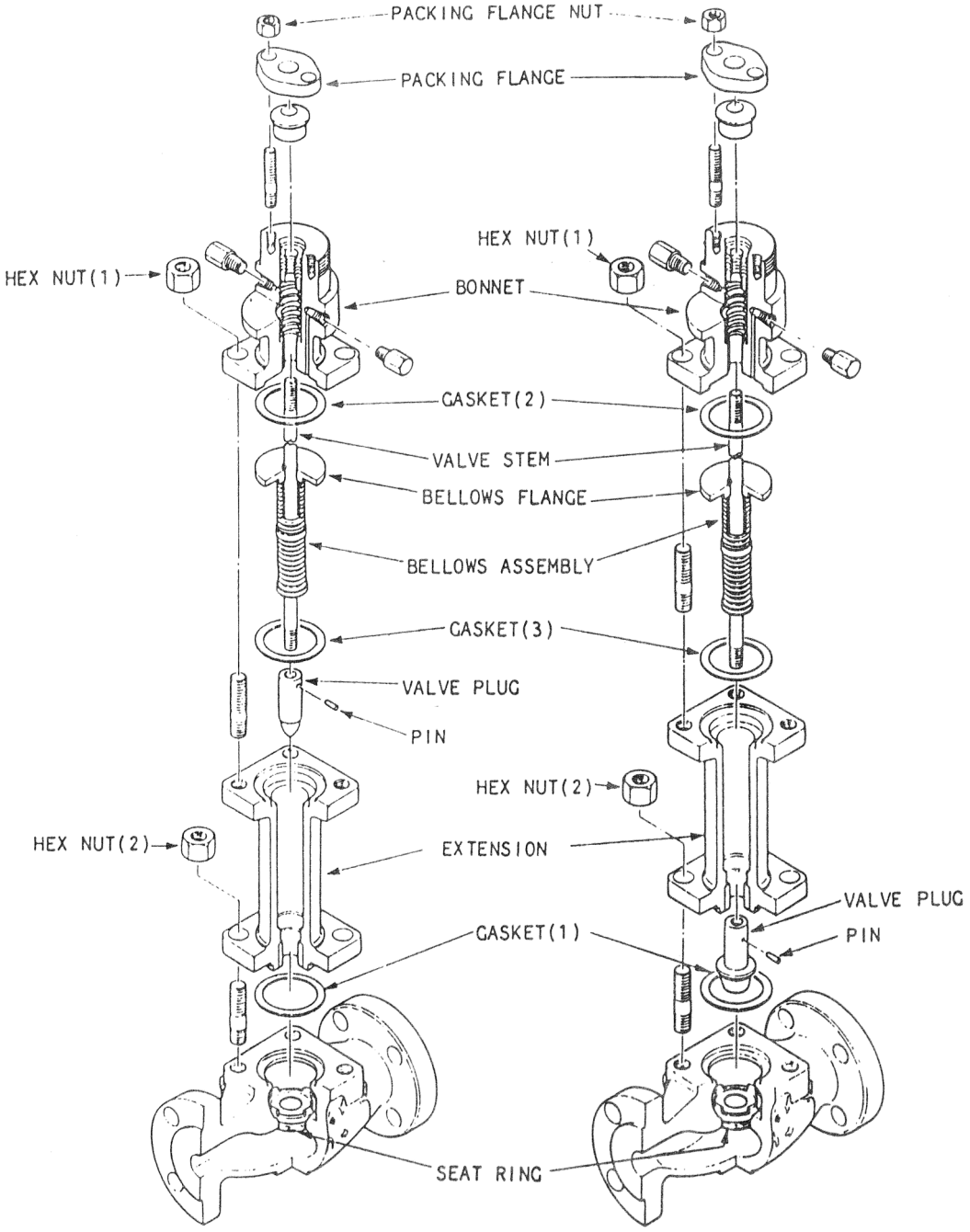


Fig. 5-1. Valve with Cv ≤ 4

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 ≤ 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 ≥ 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 counter-clockwise.

  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.

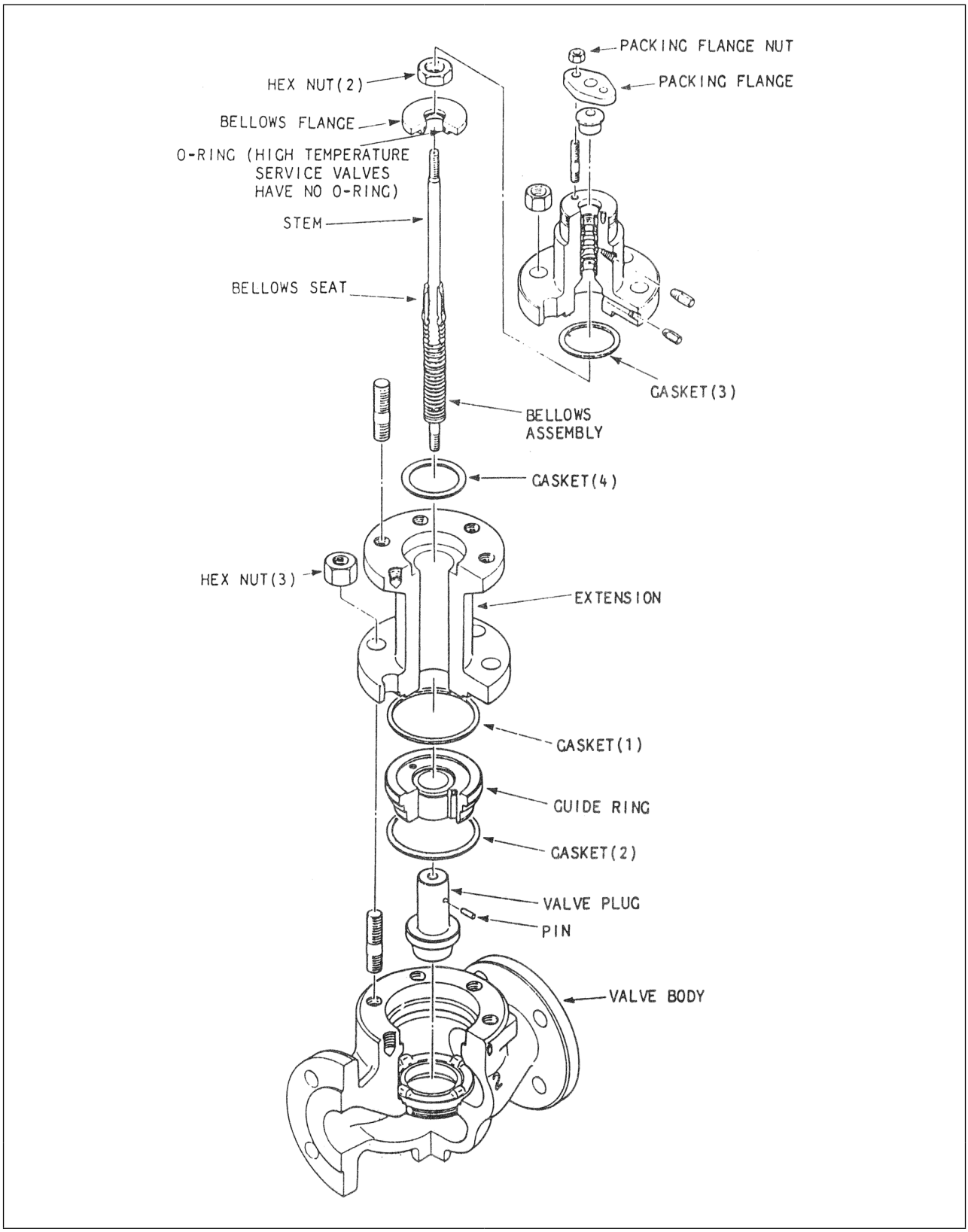


Fig. 5-3. Model HTS Control Valve

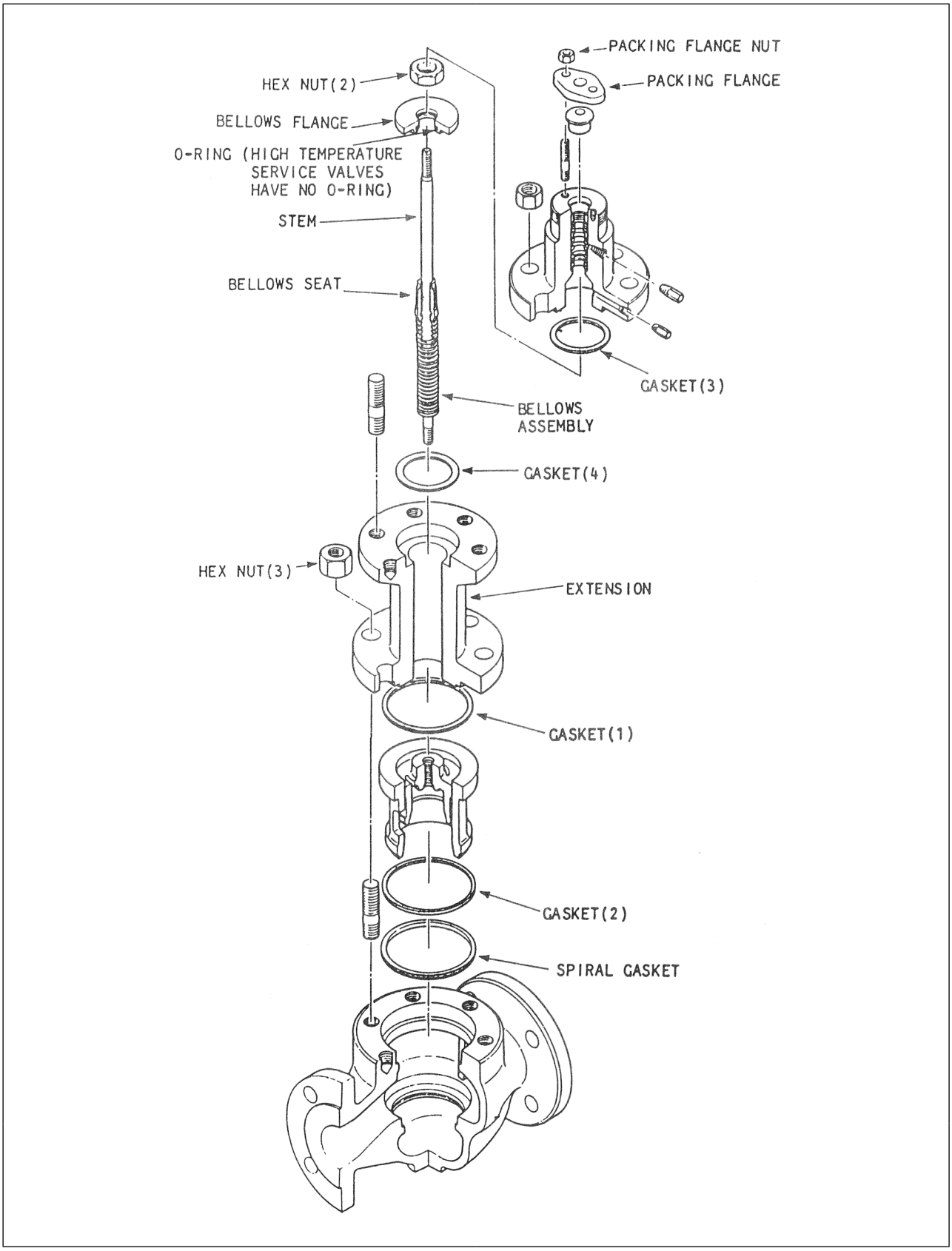


Fig. 5-4. Model HCB Control Valve

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.

Chapter 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

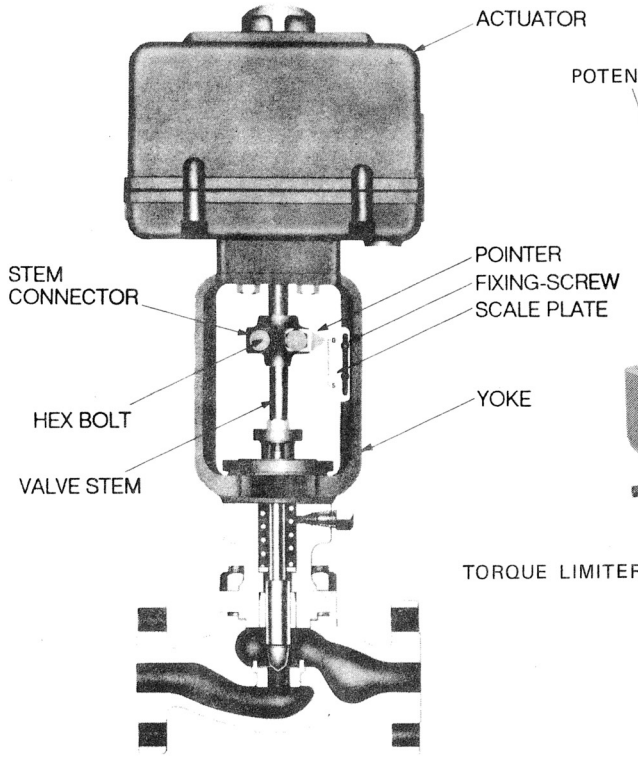


Fig. 6-1. Yoke Section

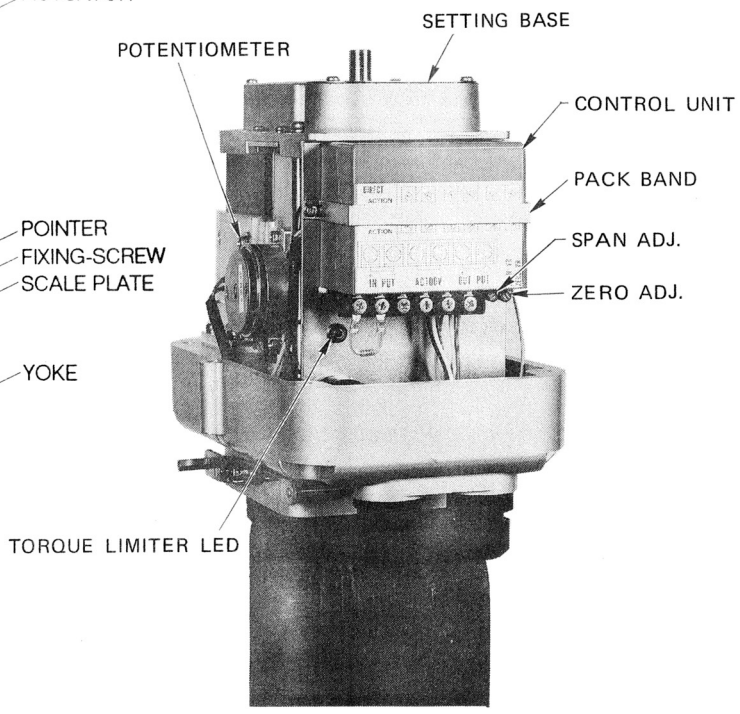


Fig. 6-2. Control Unit

(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 mA DC) 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 mA DC for the direct action type or 4 mA DC 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 mA DC for the direct action type or 20 mA DC 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 mA DC for the direct action type or 3.9 - 3.6 mA DC 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 counterclockwise.

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.

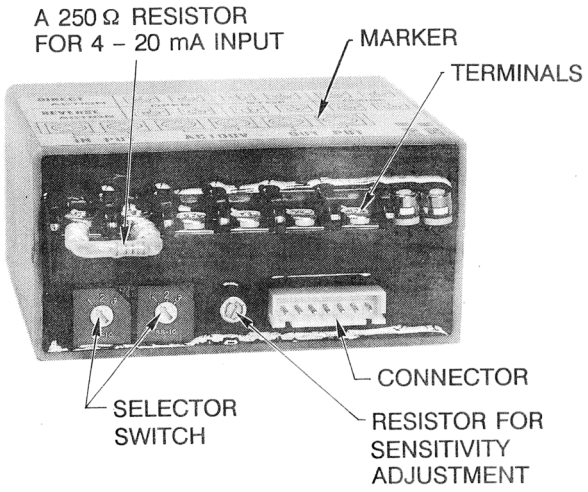


Fig. 6-3. Bottom of Control Unit

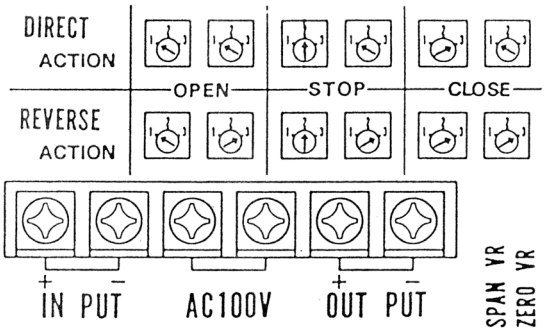
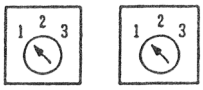
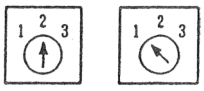
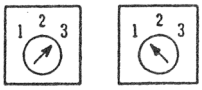
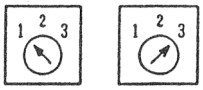
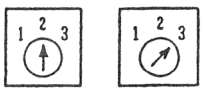
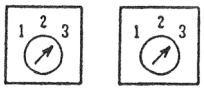


Fig. 6-4. Marker on the Control Unit Front

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

Chapter 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.

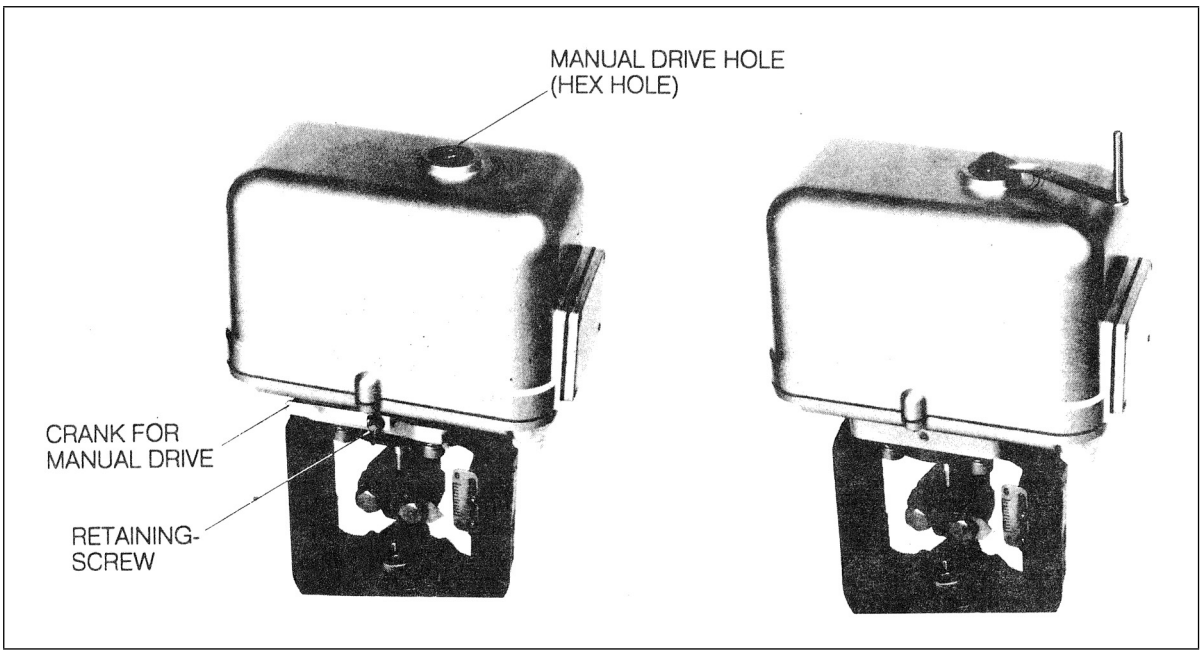


Fig. 7-1. Manual Drive with CRANK

! Handling 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.

Chapter 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 mA DC 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. Tho 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.

Chapter 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 Chapter 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:

(l) 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.

Chapter 10. ENVIRONMENTAL COMPLIANCE

Administrative Measures for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (China RoHS)

The motor of this device complies with the China RoHS regulations.

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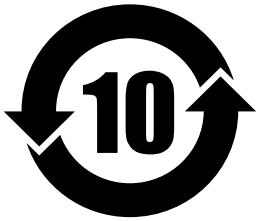
产品名称	产品编号・型号
电动执行器	EA1,EA2,EA3 EA4,EA5



产品中有害物质的名称及含有的信息表										
部件名称										
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚	邻苯二甲酸二(2-乙基)己酯	邻苯二甲酸丁基苄酯	邻苯二甲酸二正丁酯	邻苯二甲酸二异丁酯
	(Pb)	(Hg)	(Cd)	(Cr(VI))	(PBB)	(PBDE)	(DEHP)	(BBP)	(DBP)	(DIBP)
致动器	O	O	O	O	O	O	O	O	O	O
机组	×	O	O	O	O	O	O	O	O	O
扭矩限制器机组	×	O	O	O	O	O	O	O	O	O
印刷电路板	O	O	O	O	O	O	O	O	O	O
控制包	O	O	O	O	O	O	O	O	O	O
盖子类	O	O	O	O	O	O	O	O	O	O
注1：O：表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。 ×：表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。 注2：以上未列出的部件，表明其有害物质含量均不超出电器电子产品有害物质限制使用国家标准要求。										

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

   1.1 Warranty period

   Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

   1.2 Warranty scope

   In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

   (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
   (2) Failure caused for other reasons than Azbil Corporation's product;
   (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
   (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
   (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
   (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

   Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

   You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

   (1) Regulations and standards or laws that your Equipment is to comply with.
   (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
   (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
   Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

   *1. A design that is safe even if the user makes an error.
   *2. A design that is safe even if the device fails.
   *3. Avoidance of device failure by using highly reliable components, etc.
   *4. The use of redundancy.

3. Precautions and restrictions on application

   3.1 Restrictions on application

   Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

   *5. Nuclear power quality: compliance with JEAG 4121 required
   *6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
   *7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

   Any Azbil Corporation's products shall not be used for/with medical equipment.

   The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

   3.2 Precautions on application

   you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [When used outside a radiation controlled area and where nuclear power quality is not required]
      [When the limit switch for nuclear power is used]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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Date:	5th edition: Nov. 2025
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