Thank you for choosing KITZ products.

For safe and trouble-free function and performance of the product, make sure to read and understand all items in this manual before handling the product.

Keep this manual accessible to all valve operating personnel.
This manual applies to the KITZ electric compact proportionate control valve, RDH Series.

**CAUTION AND WARNING**

For the safe use of the product, read all of the safety precautions listed in this manual before handling the product.

The safety precautions in this manual are determined to ensure safe and proper use of the product and to prevent personal injury and property damage. This manual uses two terms, "**Warning**" and "**Caution**", according to the hazard level, to clearly indicate the extent and severity of the risk.

---

**NOTES TO USERS**

"This manual is designed to show an appropriate usage of the products for transportation, storage, installation, operation and maintenance. Be sure to read through this manual before handling the products."

"This manual does not cover the whole scope of conceivable usage of the products for transportation, storage, installation, operation and maintenance. If technical assistance beyond the scope of this manual is required, contact KITZ Corporation or its distributor."

"The specifications have been determined with safety considerations. Do not use the products beyond the specifications."

"The illustrations given in this manual do not show all the details. If more detailed information is required, refer to the relevant approved drawings."

"Any information provided in this operation manual is subject to change without prior notice."
Construction and Function

1. Features
2. Product Coding
3. Appearance and Dimensions
4. Parts Name
5. Actuator-Valve Assembly
6. Specifications
7. Electric Wiring

Transportation and Storage

1. Precautions

Installation, Piping and Wiring

1. Precautions
2. Piping
3. Wiring

Operation

1. Function
1.1 Setting Value
1.2 Setting Method
2. Operation
2.1 Automatic Operation
2.2 Manual Operation
2.3 Position Indicator
2.4 Output of Valve Position
2.5 Error Detection
3. Protective Function

Maintenance and Inspection

1. Precautions
2. Dismantling and Reinstallation
3. Troubleshooting

Warranty
1. Features

(1) Designed for 24VDC
(2) Wide applicability to various kinds of fluids
KITZ compact ball valves are made of bronze, copper or stainless steel.
(3) Low pressure loss
KITZ compact ball valves provide a lower pressure loss compared with that of solenoid valves.
(4) Excellent sealing performance
Precision machined ball disc and resin ball seats guarantee high sealing performance and smooth valve operation.

2. Product Coding

<table>
<thead>
<tr>
<th>Product Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDH 1 24</td>
</tr>
</tbody>
</table>

Valve size (*)
Valve type (*)
Power supply voltage: 24VDC
1: Operation panel
Actuator type (rotary control type)

*Refer to the KITZ catalog for applicable valve types and sizes.
3. Appearance and Dimensions

4. Parts Name

- **Fig. 1**: 3-M3 screw
- **Fig. 2**: Position indicator
- **Fig. 3**: SHUT switch, OPEN switch, AUTO/MANUAL switch, ERROR lamp (red), RUN lamp (green), AUTO operation indicator lamp (The upper portion flashes.), Manual operation indicator lamp (The lower portion flashes.), Gasket for terminal box, Terminal box cover, Set screw
**WARNING**

- DO NOT install the product in any explosive or corrosive environment. This product is not an explosion-proof type.
- DO NOT perform wiring nor remove the actuator cover while the power is on. There is a risk of electric shock.
- DO NOT disassemble the actuator from the valve while the power is on. It may damage the product.
- DO NOT put your finger or any object into the valve port for valve position check. It may cause personal injury.
- Reduce the pipe internal pressure to atmospheric and release the fluid from the pipe to prevent an explosion due to residual pressure or fluid.
- DO NOT disassemble the actuator from the valve. It may cause a malfunction or leakage.
- This operation manual mainly covers how to handle the valve actuator. Refer to the KITZ catalog for details of the electric proportionate control valves.

**CAUTION**

- Follow the instructions in this operation manual for piping and wiring of this product. Otherwise, it may cause an accident or failure.
- Use of a metallic ball valve on plastic piping may cause a failure due to excessive load during manual operation.
### Specifications

The actuator receives a control signal and controls the valve operation in real time. Power supply is cut off when the valve has reached its designated position. When the valve open position is shifted due to an external force, the valve open position is corrected by the actuator.

<table>
<thead>
<tr>
<th>Type of Actuator</th>
<th>RDH 124-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>24VDC</td>
</tr>
<tr>
<td>Rated current</td>
<td>During operation: 1A  When stopping: 0.1A</td>
</tr>
<tr>
<td>Rated torque</td>
<td>8N·m</td>
</tr>
<tr>
<td>Closing/Opening time</td>
<td>Selectable between 3 to 20 seconds (per 1 second) (Default: 3 seconds)</td>
</tr>
<tr>
<td>Resolution</td>
<td>Selectable between 10 to 200 per every 10 seconds (Default: 200)</td>
</tr>
<tr>
<td>Insulation class</td>
<td>JIS Class E</td>
</tr>
<tr>
<td>Protection rate</td>
<td>IP55</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>500VDC  10MΩ or above</td>
</tr>
<tr>
<td>Insulation strength</td>
<td>1 minutes for 250VAC or 1 second for 300VAC Leakage current: 1mA or below</td>
</tr>
<tr>
<td>Control input signal</td>
<td>4 to 20mA DC 1 to 5V DC 2 to 10V DC</td>
</tr>
<tr>
<td>Impedance</td>
<td>250Ω</td>
</tr>
<tr>
<td>Wiring</td>
<td>Terminal connection 8 pins</td>
</tr>
<tr>
<td>Service environment</td>
<td>-10 to 50 °C  RH30 to 85% (Indoor use only with no direct sunlight)</td>
</tr>
<tr>
<td>Position indicator</td>
<td>output signal 4 to 20mA DC 1 to 5V DC (Load resistance Max. 500Ω) (Load resistance Min. 100kΩ)</td>
</tr>
<tr>
<td>Error output</td>
<td>Open corrector output 30VDC 100mA or below</td>
</tr>
<tr>
<td>Manual operation</td>
<td>Operation panel Position indicator LED (4 digits)</td>
</tr>
<tr>
<td>Action</td>
<td>Selectable between direct action and reverse action (Default: Reverse action)</td>
</tr>
<tr>
<td>Operation signal interruption</td>
<td>Selectable from Fully closed/Fully open/Stop (Default: Fully closed)</td>
</tr>
<tr>
<td>Operation after power recovery</td>
<td>Control starts from where the power was cut off.</td>
</tr>
<tr>
<td>*1 Refer to the nameplate on the valve body for the designated signal at the time of purchase.</td>
<td></td>
</tr>
<tr>
<td>*2 Option setting is available through the panel operation. See “1.2 Setting Method” in “Operation”.</td>
<td></td>
</tr>
<tr>
<td>*3 See “2.1 Automatic Operation” in “Operation” for inching motion.</td>
<td></td>
</tr>
<tr>
<td>*4 See “2.2 Manual Operation” in “Operation”.</td>
<td></td>
</tr>
</tbody>
</table>
Electric Wiring

1) Make sure to connect FG to earth ground.
2) Terminal 1, 2 and Terminal 3 through 8 are internally insulated.
3) Terminal 4 [control input signal (\(\sim\))], Terminal 6 [open position output signal (\(\sim\))], and Terminal 8 [alarm output (\(\sim\))] have the same electric potential.
4) Control input signal and open position output are the signals selected at the time of purchase. (Standard setting: 4-20mA)

**CAUTION**

- Do not operate the actuator with an output beyond the rated voltage. Overloading the actuator may damage it.
- Ensure the control input signal is within the specified range. Operating the actuator with a signal outside the allowed range may cause malfunction.

![Diagram of Actuator Connection](image)

Fig. 5 Example of Connection of Plural Actuators

- When more than one RDH actuators are controlled by the same power supply and the same signal source, it may cause a malfunction.
- When more than one RDH actuators are operated with one controller, the input signals of the actuators shall be 1-5V or 2-10V and connected in parallel.

**Control input signal**
- 4-20mADC / 1-5VDC / 2-10VDC

**Scope of supply**

- 24VDC
- Error output
- Open corrector output 30VDC/100mA or below

**Valve position output**
- 4-20mADC / DC 1-5VDC

![Diagram of Actuator Connection](image)
‡U Transportation and Storage
## Precautions

- **DO NOT** make any excessive impact on the product by throwing, dropping or dragging. (Fig. 7)
- **DO NOT** apply excessive load to the product. Overloading may cause malfunction.
- **DO NOT** store the product in a place subject to rainwater or high humidity. It may result in corrosion of the product.
- **DO NOT** store the product out of the package. Keep the product in the package to prevent foreign particles from entering the inside of the product. Take the product out of the package just before the installation.
- **DO NOT** disassemble the product. Otherwise, it may cause a malfunction and damage.
- Keep the valve in the fully open position during storage. Storing the valve in the partially open position for a long time may deform the ball seats and cause internal leakage. Foreign objects will stick to the ball surface if the valve is stored in the fully closed position, resulting in damage of the ball or the ball seats.
- **DO NOT** store the product in a place with high humidity and corrosive gas.
- **DO NOT** store the product indoors, avoiding direct sunlight and dust.
1. Precautions
- DO NOT use the product in an environment where there is flammable gas or corrosive gas. This product is not an explosion-proof type. There is a risk of explosion.
- DO NOT install the product in a place where there is a danger of submergence.
- DO NOT install the product in a place subject to external forces such as vibration which may affect the function of the product. Take appropriate measures, such as use of a vibration absorber, if installation in such a place cannot be avoided.
- DO NOT install the product in a corrosive environment with high humidity and temperature.
- DO NOT install the product outdoors. Direct sunlight shall be avoided by using a sunshade, etc. even if it is installed indoors.
- Ensure a sufficient space necessary for installation, maintenance and operation.
- Take protective measures, such as use of a heat shield plate, against radiant heat from the peripheral equipment.
- Take appropriate measures, such as putting a protective fence, if the product is installed near a passageway.

2. Piping
- Check the flow direction of unidirectional valves, such as V-cut valves and three-way valves before installation.
- As shown in Fig. 8-1, apply a wrench to the valve end on the piping side when mounting the valve. If the valve is screwed into the pipe by applying a wrench on the opposite end, rotating force may deform the valve body and damage the valve (Fig. 8-2).
- Use support stands as appropriate to avoid excessive load to the pipe. (Securely support the both ends of the valve when a metallic ball valve is installed on plastic piping systems.)
- Provide a filtering device such as a strainer on the upstream side of the valve if foreign objects such as sands and metallic particles are contained in the fluid.
- This product is delivered with the valve in the fully open position. Upon start of the operation, the valve automatically opens to the predetermined position.
<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- DO NOT apply too much sealing material for piping. Excessive sealing materials may get into the valve interior and cause an operational failure such as seat leakage. Leave one or two threads of the pipe end free from sealing material when a sealing material is applied.</td>
</tr>
<tr>
<td>- DO NOT excessively tighten the valve using a wrench (Fig. 9-1) or DO NOT forcibly adjust the actuator position by hand (Fig. 9-2).</td>
</tr>
<tr>
<td>- DO NOT excessively thread a valve into a pipe (Fig. 10). It will damage or distort the valve interior, leading to external leakage or operational failure.</td>
</tr>
<tr>
<td>- DO NOT apply an external force to the counterclockwise direction when piping the product. It may cause external leakage from the threaded portion.</td>
</tr>
<tr>
<td>- DO NOT hold the valve with a vice. It may deform or damage the valve, leading to external leakage or operational failure (Fig. 11).</td>
</tr>
</tbody>
</table>

![Diagram of valve installation and handling precautions](image-url)
DO NOT mount the product with the actuator on the lower side. Intrusion of water into the actuator shall be prevented. When the product is installed, the actuator shall be oriented within 90 degrees from the upright position. The connection port of the terminal box must not face upward.

DO NOT apply excessive load to the product or step on the product. It may cause leakage or an operational failure (Fig. 13).

DO NOT open or close the valve while being flushed after installation. Foreign objects flowing through the pipe may damage the valve seat.

Do not apply any excessive bending moment to the product. It may deform the valve body and cause a functional failure.
1. Before installation, check that the design specifications of the product satisfy all the service conditions.

2. Remove dusts, scales and other foreign objects from the valve end threads and the inside of the pipe.

3. Check the thread type and the standard of valve threads with a gauge. Make sure that the required number of the effective threads is provided.

4. To screw the valve into the pipe, apply a wrench to the hexagon portion of the valve end which is joined with a pipe.

5. For installation of bronze or brass valves, use the appropriate tightening torque shown in the table below.

<table>
<thead>
<tr>
<th>Valve Size</th>
<th>1/2</th>
<th>3/4</th>
<th>1</th>
<th>1 1/4</th>
<th>1 1/2</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tightening Torque N-m</td>
<td>20 to 29</td>
<td>39 to 49</td>
<td>49 to 59</td>
<td>59 to 69</td>
<td>69 to 78</td>
<td>78 to 88</td>
</tr>
</tbody>
</table>

6. To threaded ends, apply a sealing material suitable to the service fluid and temperature.

7. After completing the installation of the product, perform flushing with the valve in the fully open position to remove foreign objects from the pipeline.

8. Use of a flexible tube to the "C" side is recommended for installation of 3-way ball valves.

![Flexible tube for 3-way valve](image-url)
### WARNING

- Turn off the power supply before performing electric wiring.
- After completing wiring, close the terminal box cover by tightening the screws.
- Perform electric wiring in a place not subject to splashing of rainwater.
- DO NOT forcibly pull the connecting cables and wires as they may get disconnected and cause electric shock. Allow some slack in the cable when connecting the actuator to the power source (Fig. 15).
- DO NOT perform wiring in a place with high humidity.
- DO NOT modify the product. It may result in a functional failure.
- DO NOT separate the actuator from the valve. It may damage the actuator.
- DO NOT lose the seal gasket (made of chloroprene rubber) installed in the terminal box cover for dust prevention.
- DO NOT scratch the contact surface of the seal gasket. It will impair the sealing performance.
- DO NOT lose the set screws used for the terminal box cover.
- Wiring work must be performed by a licensed electrician or a skilled engineer.
- This product is designed for 24VDC. Check that the power supply is suitable for use with this product.
- Perform wiring work properly to prevent accidents caused by short-circuit, etc.
- Follow the instructions on the nameplate when performing a wiring work. Incorrect wiring may damage the electrical components.
- Make sure to thoroughly seal the cable connector, cable gland, terminal box conduit port to prevent water intrusion to the actuator and the terminal box. Insufficient sealing may result in corrosion and malfunction, etc.
- Perform wiring away from load inductor and high voltage devices.
- Insulate the core wire by cutting the edge of the core wire to prevent electric shock, short circuit, etc.
- Keep other power supply cables and power cables away from the cables of this product to prevent a malfunction caused by noise.
- Take appropriate measures for noise and adjust the instruction output period of the controller. Otherwise, it may lead to short life of the product.

### CAUTION

- DO NOT forcibly pull on the connecting cables and wires as they may get disconnected and cause electric shock. Allow some slack in the cable when connecting the actuator to the power source (Fig. 15).
- DO NOT perform wiring in a place with high humidity.
- DO NOT modify the product. It may result in a functional failure.
- DO NOT separate the actuator from the valve. It may damage the actuator.
- DO NOT lose the seal gasket (made of chloroprene rubber) installed in the terminal box cover for dust prevention.
- DO NOT scratch the contact surface of the seal gasket. It will impair the sealing performance.
- DO NOT lose the set screws used for the terminal box cover.
- Wiring work must be performed by a licensed electrician or a skilled engineer.
- This product is designed for 24VDC. Check that the power supply is suitable for use with this product.
- Perform wiring work properly to prevent accidents caused by short-circuit, etc.
- Follow the instructions on the nameplate when performing a wiring work. Incorrect wiring may damage the electrical components.
- Make sure to thoroughly seal the cable connector, cable gland, terminal box conduit port to prevent water intrusion to the actuator and the terminal box. Insufficient sealing may result in corrosion and malfunction, etc.
- Perform wiring away from load inductor and high voltage devices.
- Insulate the core wire by cutting the edge of the core wire to prevent electric shock, short circuit, etc.
- Keep other power supply cables and power cables away from the cables of this product to prevent a malfunction caused by noise.
- Take appropriate measures for noise and adjust the instruction output period of the controller. Otherwise, it may lead to short life of the product.
Control the surge generation by using surge killer, spark killer, etc.

Connect the shielding wire to earth ground on the controller side when shielding wire is used.

Make sure to connect FG to earth ground.

(1) Actuator Cables

<table>
<thead>
<tr>
<th>Number of Wire Cores</th>
<th>Applicable Electric Wire</th>
<th>Solid Wire</th>
<th>Flexible Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 AWG</td>
<td>28 to AWG20</td>
<td>0.08 to 0.5mm²</td>
<td>0.25mm²</td>
</tr>
</tbody>
</table>

(2) Wiring Method of Terminal Block

‡@ Prepare the cables shown in (1) and remove the coating of the tip of the cable.
‡A Refer to Fig. 16 and move the clamp on the terminal block to the direction where the wire insertion port opens.
‡B Insert the cable into the cable insertion port until it reaches the end.
‡C While keeping the cable as in ‡B, move the clamp on the terminal block to the direction where the cable insertion port closes.
‡D Repeat ‡@ through ‡C for the applicable terminal block No.

*To open and close the insertion port easily, insert the tip of a flat-head screwdriver (2-3mm) in the dent on the clamp center and slide the clamp.

(3) Specifications of Cable Lead-In Port

Cable connector shall be applicable to the cable with outer diameter of 10.5 to 14.5mm. Screw for thick steel conduit pipe shall be G16. (PF1/2B for screw for the cable lead-in port of the terminal box.)

(4) Burnout of the circuit can be prevented by the protection circuit when the power supply is reversely connected and energized.
1. Function

1.1 Setting Value

Setup values of resolution, open/close operating time, operation upon signal interruption, direct and reverse actions are selectable.

(1) Setting of resolution: 10 to 200 (incremented by 10) (Initial value: 200)

Stopping positions during automatic operation are selectable in the range of 0 to 90 degrees.

LED indication: \(10 \text{ to } 200\)

(2) Setting of open/close operation time: 3 seconds to 20 seconds (incremented by 1 second) (Initial value: 3 seconds)

Operation time from fully closed position to fully open position is selectable during automatic operation.

Continuous operation is performed when it is set to 3 seconds and inching operation is performed when it is set to 4 seconds or longer.

LED indication: \(3 \text{ to } 20\)

(3) Operation setting for signal interruption: Fully open/Fully closed/Stop (Initial setting: Fully closed)

Actuator operation is selectable for the control input signal below 3.9mA during automatic operation.

LED indication: \(\text{OPn} \text{ for Fully open, CLS for Fully closed, StP for Stop}\)

(4) Setting of direct action and reverse action: Direct/Reverse action (Initial Value: Reverse action)

Opening or closing direction during automatic operation is selectable.

Output signal is not affected by the setting of direct action or reverse action. (See the table below.)

LED indication: \(\text{PoS for Direct action, rEv for Reverse action}\)

<table>
<thead>
<tr>
<th>Input of 4mA</th>
<th>Input of 20mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V/10V</td>
<td>1V/2V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation Angle</th>
<th>Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct action</td>
<td>90° valve position indicator 100 % 20mA 5V/10V 0° valve position indicator 0 % 4mA (1V/2V)</td>
</tr>
<tr>
<td>Reverse action</td>
<td>0° valve position indicator 0 % 4mA (1V/2V) 90° valve position indicator 100 % 20mA (5V/10V)</td>
</tr>
</tbody>
</table>

1.2 Setting Method

(1) While the operation is in the stop state, hold down the OPEN switch and the SHUT switch simultaneously on the current valve position display screen.

(2) After holding down the OPEN and SHUT switches for at least 3 seconds, Setting Selection Mode appears and resolution value is indicated.

This display shows 56.5% of valve opening position and the valve is in the stop state. While the valve is opening or closing, this setting is not available.

8.200
In the Setting Selection Mode, the setting item changes every time you press the [OPEN] switch or the [SHUT] switch. By pressing the [AUTO/MANUAL] switch of each setting item, the Setting Change Mode display screen appears and you can change the setting value.

Setting of Resolution

Change the setting item by pressing [OPEN] or [SHUT] on the Setting Selection Mode display screen to display the resolution value. (The last three digits show the currently set value.)

Example: The currently-set resolution value is "200".

When [AUTO/MANUAL] is pressed once, it changes to Setting Change Mode and "A" flashes.

Press [OPEN] to increase the value and [SHUT] to decrease the value between 10 and 200. The displayed value changes in 10 increments every time the switch is pressed.

Example: Resolution value is 100.

By pressing [AUTO/MANUAL] once, the resolution value is determined and the display returns to Setting Selection Mode.

Example: Resolution has been set to 100.

Set the resolution properly according to the service environment. When hunting phenomenon occurs due to a fluctuation of input signals, the problem may be solved by reducing the resolution value.

---

**CAUTION**

- Set the resolution properly according to the service environment. When hunting phenomenon occurs due to a fluctuation of input signals, the problem may be solved by reducing the resolution value.
Setting of "Open/Close Operation Time"

‡@Change the setting item by pressing [OPEN] or [SHUT] on the "Setting Selection Mode" display screen to display close/open operation time. (The last three digits show the currently set value.)

Example: Currently-set open/close operation time is 3.

‡AWhen [AUTO/MANUAL] is pressed once, it changes to "Setting Change Mode" and """ flashes.
‡BPress [OPEN] to increase the value and [SHUT] to decrease the value between 3 and 20.

The displayed value changes in 1 increment every time the switch is pressed.

Example: Open/Close operation time is 10 seconds.

‡CBy pressing [AUTO/MANUAL] once, the resolution value is determined and the display returns to "Setting Selection Mode".

Example: Open/Close operation time has been set to 10 seconds.

Setting of "Action upon Signal Interruption"

‡@Change the setting item by pressing [OPEN] or [SHUT] on the "Setting Selection Mode" display screen to display the action upon signal interruption. (The last three digits show the currently set value.)

Example: [Fully Closed] upon signal interruption

‡AWhen [AUTO/MANUAL] is pressed once, it changes to "Setting Change Mode" and "c" flashes.
‡BPress [OPEN] or [SHUT] to change the setting to the desired action upon signal interruption.

‡CBy pressing [AUTO/MANUAL] once, the action upon signal interruption is determined and the display returns to "Setting Selection Mode".

Example: [Stop Immediately] has been set.
### Setting of "Direct/Reverse Action"

- Change the setting item by pressing [OPEN] or [SHUT] on the "Setting Selection Mode" display screen to display the direct or reverse action. (The last three digits show the currently set value.)

**Example:** The currently set action is [Reverse Action].

- When [AUTO/MANUAL] is pressed once, it changes to "Setting Change Mode" and " <-> " flashes.

- Press [OPEN] or [SHUT] to change the setting to the desired action.

- By pressing [AUTO/MANUAL] once, the action is determined and the display returns to "Setting Selection Mode".

**Example:** Direct action has been set.

(4) After holding down [OPEN] and [SHUT] for at least 3 seconds on "Setting Selection Mode", the display returns to the [Current Valve Position] display screen.

**Note 1:** During "Setting Selection Mode" or "Setting Change Mode", the operation is stopped and the valve open/close operation is not available.

**Note 2:** If power supply is cut off during "Setting Change Mode", the set value cannot be saved.

**Note 3:** After the elapse of 15 seconds in the idle state during "Setting Selection Mode" or "Setting Change Mode", it returns to the [Current Valve Position] display screen. In this case, the changed value is not saved.
Fig. 17

O: OPEN switch
S: SHUT switch

Setting Change Mode (a, b, c or d on the far left flashes.)

Elapse of 15 seconds in idle state

Hold down OPEN and SHUT for 3 sec.

Setting Selection Mode

Open/Close

Time

Direct or Reverse

Resolution

Current Valve Position

Signal

Interruption

Kitz Corporation
2. Operation

See "4. Parts Name" in "Construction and Function" for the name of each switch and construction.

2.1 Automatic Operation

(1) Check that the upper side of the AUTO/MANUAL switch is turned on. If it is not turned on, press the AUTO/MANUAL switch.

(2) The control is changed by the setting value. See "1.1 Setting Value" for each setting value. Check the nameplate of the product for the signals which were specified at the time of purchase.

* The operating movement of the actuator differs depending on the setting of the open/close operation time.
* When the open/close operation time is set to 3 seconds, the continuous action is performed.
* When the open/close operation time is set between 4 seconds and 20 seconds, an inching motion is performed. The inching motion and the stopping time differ depending on the valve load, etc. (Fig. 18)

The below is the example of an inching motion, three times of actuation and two times of stopping. The inching motion differs depending on the service environment, valve open position, load applied to the valve, etc.

---

**Fig. 18**

This portion of the switch is turned on.

Inching Motion

Continuous Operation

Valve Open Position

Specified valve open position

Valve open position at the start

Time

Action

Stop

Action

Stop

Action
2.2 Manual Operation

(1) Check that the lower portion of the AUTO/MANUAL switch is turned on. If it is not turned on, press the AUTO/MANUAL switch to turn it on. Setting values in 1.1 are not applicable to the manual operation.

(2) The valve opens by 0.5% by pressing the OPEN switch once. When the OPEN switch is kept pressed, the valve operates in the opening direction and automatically stops at 100%. The opening movement stops when the switch is released.

(3) The valve closes by 0.5% by pressing the SHUT switch once. When the SHUT switch is kept pressed, the valve operates in the closing direction and automatically stops at 0%. The closing movement stops when the switch is released.

2.3 Position Indicator

The current position of the actuator output axis (valve) during automatic or manual operation is indicated. Valve open positions are indicated as follows.

<table>
<thead>
<tr>
<th>Valve Position Indication</th>
<th>Actuator Output Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully Closed 0%</td>
<td></td>
</tr>
<tr>
<td>Fully Open 100%</td>
<td></td>
</tr>
</tbody>
</table>

This portion is turned on.
2.4 Output of Valve Position

The signal is output from the terminal block. Output of the valve position is not affected by 1.1 Setting Values.

Check the nameplate of the product for the output of the valve position which was specified at the time of purchase.

<table>
<thead>
<tr>
<th>Output Signal</th>
<th>Valve Position</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4-20mA</td>
<td>1-5V</td>
</tr>
<tr>
<td>Fully Closed</td>
<td>0%</td>
<td>4mA</td>
</tr>
<tr>
<td>Fully Open</td>
<td>100%</td>
<td>20mA</td>
</tr>
<tr>
<td></td>
<td>5V</td>
<td></td>
</tr>
</tbody>
</table>

2.5 Error Detection

(1) Hunting Error

When a continuous action continues 1.5 times the set time, it is judged as in the hunting state. The operation is still available by the control input signal. If hunting occurs due to any unexpected external factors, it may shorten the life of the motor. Take preventive measure by referring to 3 Wiring in ‡V Installation, Piping, Wiring. The actuator operates as follows when a hunting error is detected.

- ERROR lamp is turned on.
- CURRENT VALVE POSITION on the valve position indicator flashes.

(2) Constraint Error

It is judged that the valve is in the constraint state if the valve does not reach the target position even after 1.5 times the set time elapsed after inputting the command to open the valve. When the valve is in the constraint state, all the operations other than resetting cannot be performed. Perform a reset operation and restore the actuator to the normal state referring to 3 Protective Function in ‡W Operation.

When a constraint error is detected, the actuator is in the following state.

- Power supply to the motor is cut off.
- Error lamp is turned on.
- Open Corrector is output from the terminal block (30VDC /100mA or below).
- L.O.C. on the position indicator flashes.

Remove the cause of the constraint state before performing a reset operation to the normal state. Otherwise, it may damage the actuator and the valve.

⚠️ CAUTION

- Be sure not to attempt any repair by unauthorized personnel. Ensure that only qualified personnel perform the repair work.
- Contact KITZ CORPORATION for repair services or other assistance.

KITZ CORPORATION
3. Protective Function

This product incorporates various protective functions which stop the operation and output error signals to protect the actuator and the valve. If any abnormality is found, remove the cause immediately and perform the reset operation as follows.

(1) Reset operation

Press the OPEN, SHUT and AUTO/MANUAL switches simultaneously for at least 5 seconds to restore the operation to the normal state. Reset operation can be also performed by cutting the power supply to the actuator for 2 seconds or longer.

(2) Protection of motor against burnout due to the constraint of valve caused by foreign objects

If the valve does not reach the target position even after 1.5 times the set time after inputting the command, the power supply to the motor is cut off and the error lamp is turned on.

(3) Protection of motor against overcurrent

Current limiting circuit is incorporated to protect the motor from burning.

(4) Protection against reverse connection of power supply

Protective circuit for reverse connection of power supply is incorporated.

(5) Protection against lightning surge

Surge absorber is incorporated to protect the product from a momentary overvoltage such as switching surge in the power line and induction lightning surge.
Protection against inputting the control input signal with excessive or insufficient voltage/current

4 to 20mA
When a control input signal higher than the upper limit of 20mA is supplied, the control input signal is cut off at 20mA. Please do not supply 25mA or higher.

1 to 5V
When a control input signal higher than the upper limit of 5V is supplied, the control input signal is cut off at 5V. Please do not supply 6.25V or higher.

2 to 10V
When a control input signal higher than the upper limit of 10V is supplied, the control input signal is cut off at 10V. Please do not supply 12.5V or higher.

Example: 4-20mA

![Graph showing control input signal (mA) with upper and lower limits marked.]
Maintenance and Inspection
Precautions

- Foreign objects stuck to the valve seats may result in the generation of abnormal noise. Make sure to remove the foreign objects immediately to prevent valve seats and malfunction.
- Abnormal vibration of the pipeline may cause a failure or malfunction. Support the pipeline firmly.
- The valve body and the actuator are designed lubricant free.
- Inspect the product periodically, as often as possible, for defects while it is operating.

1) Fully closing and opening operation
2) Leakage from the valve
3) Vibration during operation
4) Loose bolts and nuts

Dismantling and Reinstallation

- DO NOT disassemble the actuator and the valve while the power is on. It may damage the valve and cause an accident.
- DO NOT put your finger or any object in the valve port. It may cause injury or damage.
- Reduce the line pressure to atmospheric and remove the residual fluid. Otherwise, an explosion accident may occur.
- DO NOT disassemble the actuator from the valve for replacement as the valve-actuator assembly is completed at the factory for its best performance.
- When installing a three-way valve, check that the ball port direction (fluid flow direction) and the operation direction on the control circuit are matched.

When removing the product from the pipe, make sure that there is no fluid remained in the pipe. Use two wrenches as shown in Fig. 20.

When reinstalling the product, see "2. Installation" in "V. Piping".

Hold the valve firmly so that the valve does not rotate.
Hold the pipe firmly so that the pipe does not rotate.
Troubleshooting

The table below provides the general guidance for troubleshooting of electric compact ball valves. For further technical assistance, contact KITZ.

<table>
<thead>
<tr>
<th>Main Cause</th>
<th>Cause</th>
<th>Remedial Measure</th>
<th>Preventive Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control circuit failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incorrect power supply</td>
<td>Replace the product if excessive voltage was applied.</td>
<td>Check the voltage specification.</td>
</tr>
<tr>
<td></td>
<td>Incorrect control circuit</td>
<td>Replace the product if there is still any abnormality.</td>
<td>Check the circuit with this manual and make sure that the wiring is correctly performed.</td>
</tr>
<tr>
<td>Failure of Actuator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damage or deterioration of internal parts</td>
<td>Intrusion of water</td>
<td>Replace the product.</td>
<td>Avoid installing the product at the place where danger of submerging is predictable.</td>
</tr>
<tr>
<td></td>
<td>Submergence of the actuator</td>
<td>Replace the product.</td>
<td>Correct the orientation of the product.</td>
</tr>
<tr>
<td></td>
<td>Improper installation direction</td>
<td>Replace the product.</td>
<td>Waterproof the cable connections to prevent water from entering the actuator due to capillarity.</td>
</tr>
<tr>
<td></td>
<td>Improper waterproofing</td>
<td>Replace the product.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive pressure rise (valve cavity and pipeline)</td>
<td>Replace the product if</td>
<td>Refer to the corrective measure against excessive pressure rise.</td>
</tr>
<tr>
<td></td>
<td>Deformation of valve due to excessively screwing the pipe into the valve.</td>
<td>Replace the product.</td>
<td>Apply proper torque to screw the valve.</td>
</tr>
<tr>
<td></td>
<td>Adherence of pipe sealing material to the seat</td>
<td>Replace the product.</td>
<td>Apply proper amount of sealing material.</td>
</tr>
<tr>
<td></td>
<td>Inclusion of foreign particles into the ball seat area</td>
<td>Replace the product.</td>
<td>Install the strainer on the upstream side.</td>
</tr>
<tr>
<td></td>
<td>Corrosion of the ball</td>
<td>Replace the product.</td>
<td>Reselect the appropriate valve material suitable for the service fluid.</td>
</tr>
<tr>
<td>No valve actuation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure of Valve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessively high valve operation torque</td>
<td>Galling of the stem shaft</td>
<td>Replace the product.</td>
<td>Reselect the appropriate valve material suitable for the service fluid.</td>
</tr>
<tr>
<td></td>
<td>High frequency of closing/opening operation</td>
<td>Replace the product if the error persists under the correct specification.</td>
<td>Place sufficient intervals between the close-open operations.</td>
</tr>
<tr>
<td>Out of specifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessively high or low service temperature</td>
<td>Replace the product if the error persists under the correct specification.</td>
<td>Make sure the service temperatures are controlled within the specified range.</td>
</tr>
</tbody>
</table>

Note: Take appropriate preventive measures to avoid recurrence of internal damage which may result in the replacement of the product.
If a failure not due to the following matters occurs within 18 months after delivery or within 12 months after trial operation, whichever is shorter, we will repair or replace the product free of charge.

- A case where the product is used outside the specification for the product concerned, and failures and damage which occur as a result of disregard of the precautions shown in this operation manual.
- Failures and damage which occur as a result of inappropriate use of the product, careless use, etc.
- Failures and damage which occur as a result of acts of providence, such as fire, flood damage, earthquake and lightning strike.
- Failures and damage which occur as a result of modification/addition carried out by persons other than KITZ employees and service engineers designated by KITZ.
- Failures and damage which occur as a result of aged deterioration (rusting, color fading, chemical change, etc.).

Repair of failures and damage due to the above-mentioned reasons and replacement of consumables will be at the expense of the customer.