



# ITT

## Industrial Process

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# Installation, Operation, and Maintenance Manual

## CF37 Conventional Knife Gate Valve



*Engineered for life*

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# Introduction and Safety

## Safety message levels

### Definitions

Safety message level	Indication
 <p><b>DANGER:</b></p>	A hazardous situation which, if not avoided, will result in death or serious injury
 <p><b>WARNING:</b></p>	A hazardous situation which, if not avoided, could result in death or serious injury
 <p><b>CAUTION:</b></p>	A hazardous situation which, if not avoided, could result in minor or moderate injury
 <p><b>Electrical Hazard:</b></p>	The possibility of electrical risks if instructions are not followed in a proper manner
<b>NOTICE:</b>	<ul style="list-style-type: none"> <li>• A potential situation which, if not avoided, could result in an undesirable result or state</li> <li>• A practice not related to personal injury</li> </ul>

## User health and safety

### General precautions

This product is designed and manufactured using good workmanship and materials, and meets all applicable industry standards. This product should be used only as recommended by an IIT engineer.



### WARNING:

- Misapplication of the valve can result in injury or property damage. Select valves and valve components of the proper materials and make sure that they are consistent with your specific performance requirements. Incorrect application of this product includes but is not limited to:
  - Exceeding the pressure or temperature rating
  - Failing to maintain this product according to the recommendations
  - Using this product to contain or control media that is incompatible with the materials of construction

### Qualifications and training

The personnel responsible for the assembly, operation, inspection, and maintenance of the valve must be appropriately qualified. The operating company must do the following tasks:

- Define the responsibilities and competency of all personnel handling this equipment.
- Provide instruction and training.
- Ensure that the contents of the operating instructions have been fully understood by the personnel.

Instruction and training can be carried out by either ITT or the reseller of the valve by order of the operating company.

**Non-compliance risks**

Failure to comply with all safety precautions can result in the following conditions:

- Death or serious injury due to electrical, mechanical, and chemical influences
- Environmental damage due to the leakage of dangerous materials
- Product damage
- Property damage
- Loss of all claims for damages

**Operational safety precautions**

Be aware of these safety precautions when operating this product:

- Do not leave hot or cold components of the product unsecured against contact if they are a source of danger.
- Do not remove the contact guard for moving parts when the product is in operation. Never operate the product without the contact guard installed.
- Do not hang items from the product. Any accessories must be firmly or permanently attached.
- Do not use the product as a step or hand hold.
- Do not paint over the identification tag, warnings, notices, or other identification marks associated with the product.

**Maintenance safety precautions**

Be aware of these safety precautions when performing maintenance on this product:

- You must decontaminate the product if it has been exposed to harmful substances such as caustic chemicals.
- You must immediately fit or reactivate all safety and protective equipment upon completion of work.
- You must use the appropriate lock-out procedures to isolate the valve from all power sources before performing maintenance on externally actuated valves.

**Use of unauthorized parts**

Reconstruction or modification of the product is only permissible after consultation with ITT. Genuine spare parts and accessories authorized by ITT serve to maintain safety. Use of non-genuine ITT parts can annul liability of the manufacturer for the consequences. ITT parts are not to be used in conjunction with products not supplied by ITT as this improper use can annul all liability for the consequences.

**Unacceptable modes of operation**

The operational reliability of this product is only guaranteed when it is used as designated. The operating limits given on the identification tag and in the data sheet may not be exceeded under any circumstances. If the identification tag is missing or worn, contact ITT for specific instructions.

# Transportation and Storage

## Handling and unpacking guidelines



**CAUTION:**

Always observe the applicable standards and regulations regarding the prevention of accidents when handling the product.

**Handling guidelines**

Follow these guidelines when handling the product to prevent damage:

- Use care when handling the product.
- Leave protective caps and covers on the product until installation.

**Unpacking guidelines**

Follow these guidelines when unpacking the product:

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. If anything is out of order, file a claim with the shipping company.

## Lift the valve



**WARNING:**

Never tamper with the fasteners on the cylinder. Serious injury could result if the nuts on the cylinder tie rods are either tightened or loosened.

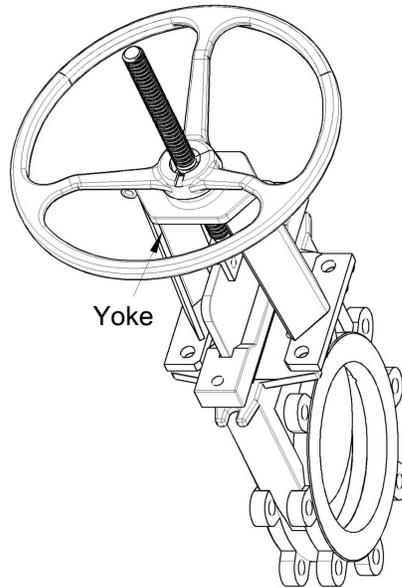


**CAUTION:**

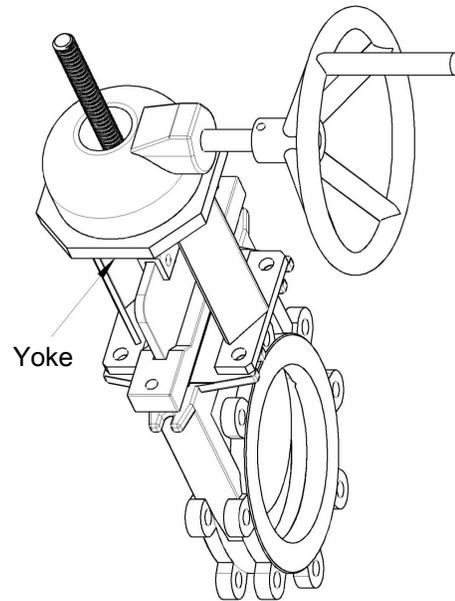
- Personal injury or valve damage could occur if the valve is lifted by any part of the bevel gear assembly. The bevel gear assembly is not designed to support the weight of the valve.
- One person should not attempt to lift cylinder-operated valves larger than 6.00 in. (15.24 cm) or handwheel-operated valves larger than 12.00 in. (30.48 cm).
- Use lifting equipment rated for the weight of the valve assembly.
- Do not lift the valve by the handwheel.

1. Raise the valve into a vertical position.  
To lift larger valves, loop a lifting strap around one of the yoke legs.
2. Prepare the valve for lifting:

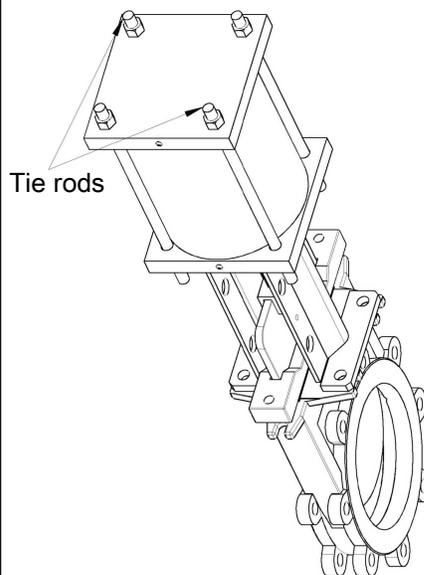
If your valve is...	Then...
Handwheel-operated	Loop the lifting strap under the yoke. Take care that the lifting strap does not bind or tighten against any part of the handwheel. Refer to the Handwheel-operated valve figure below.
Bevel gear-operated	Loop the lifting strap(s) under the yoke. Refer to the Bevel gear-operated valve figure below.
Cylinder-operated	Attach two lifting eyes to the portion of the cylinder tie rods that extend above the top plate of the cylinder. Tie rod thread designations can be found in the Fabri-Valve GV Cylinder manual. Attach lifting hooks to the lifting eyes. Take care that all chains are free and not bound before you lift the valve. Refer to the Cylinder-operated valve figure below.



**Figure 1: Handwheel-operated valve**



**Figure 2: Bevel gear-operated valve**



**Figure 3: Cylinder-operated valve**

3. Slowly take up the slack in the lifting straps to ensure that the straps are clear and not binding against the valve or valve top-works.



**WARNING:**

Do not adjust or remove the cylinder nuts. Cylinder failure may result from improperly tightened fasteners.

## Storage, disposal, and return requirements

### Storage

The package is designed to protect the valve only during shipping. If you are not installing the valve immediately after delivery, then you must store it according to these requirements.

This table describes requirements for short-term and long-term valve storage.

**Table 1: Storage period**

Storage period	Requirements
Less than 6 months	<ul style="list-style-type: none"> <li>• Do not expose the valve to direct sunlight.</li> <li>• Do not expose the valve to weather conditions.</li> <li>• Do not expose the valve to temperature extremes.</li> <li>• Do not stack the valves on top of each other.</li> <li>• Make sure the gate is in the full-open position.</li> </ul>
More than 6 months	<ul style="list-style-type: none"> <li>• Store in accordance with the short-term action items.</li> <li>• Store in accordance with ITT's Long Term Storage Procedure. Contact ITT to obtain this procedure.</li> </ul>

### Disposal

Dispose of this product and associated components in compliance with federal, state, and local regulations.

### Return

Ensure these requirements are met before you return a product to ITT:

- Contact ITT for specific instructions on how to return the product.
- Clean the valve of all hazardous material.
- Complete a Material Safety Data Sheet or Process Data Sheet for any process fluid that could remain on the valve.
- Obtain a Return Material Authorization from the factory.

# Product Description

## General description

### Design Overview

The valves through 24" (excluding 5") feature a heavy duty, rugged one-piece cast body, chest and flanges. Valves larger than 24" and 5" are fabricated heavy plate.

Contact ITT to request a maintenance manual for another manufacturer's actuator, limit switch, positioner, controller, or other accessory.

### Features

This valve has the following features:

- S series CF37 valves feature all stainless parts.
- R series CF37 valves feature alloy steel wetted parts and carbon steel external parts.
- R series and S series CF37 valves have the same solid cast body for sizes 1.5" through 24". Sizes larger than 24" feature fabricated bodies configured to service conditions.
- Available with the widest range of seats in the industry including: integral metal, replaceable hardfaced metal, rubber "D" ring, replaceable rubber, polyurethane, UHMW-P, and PTFE.

# Installation

## Preinstallation

### Precautions



#### WARNING:

- Air cylinders, when provided, are sized for a specified input pressure. Excessive pressure could result in serious personal injury or may cause damage to the valve and cylinder. Air regulators and air filters are available from your IIT distributor.
- Always wear protective clothing and equipment to safeguard the eyes, face, hands, skin, and lungs from the particular fluid in the line.

#### NOTICE:

- Weld any flanges or pipelines before you install the valves. If this is impossible, protect the valve from excessive heat.
- Remove all weld slag, rods, debris, and tools from the pipeline before valves are installed or cycled.
- Always use studs in tapped holes to ensure full thread engagement of flange fasteners.
- Do not over-tighten a machine bolt that has bottomed out. Valve damage may result, preventing proper operation.
- Always use appropriate fasteners for the service, in compliance with applicable piping codes and standards.

### Recommended fasteners

Mating flange gaskets are required.

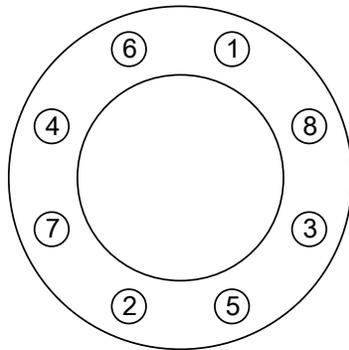
Valve size (in.)	Valve size (DN)	Fastener diameter and thread	Total number of fasteners	Number of tapped holes in valve chest	Minimum stud length, in. (mm)
2	50	5/8 – 11 UNC	8	4	3.25 (82.5)
3	80	5/8 – 11 UNC	8	4	3.75 (95.3)
4	100	5/8 – 11 UNC	16	4	3.75 (95.3)
6	150	3/4 – 10 UNC	16	4	3.75 (95.3)
8	200	3/4 – 10 UNC	16	4	4.25 (108)
10	250	7/8 – 9 UNC	24	8	4.75 (120.7)
12	300	7/8 – 9 UNC	24	8	4.75 (120.7)
14	350	1–8 UNC	24	8	5.25 (133.4)
16	400	1–8 UNC	32	12	5.5 (140)
18	450	1 1/8 – 7 UNC	32	12	6 (152.4)
20	500	1 1/8 – 7 UNC	40	16	6.25 (158.8)
24	600	1 1/4 – 7 UNC	40	16	7 (177.8)
30	750	1 1/4 – 7 UNC	56	20	8 (203.2)
36	900	1 1/2 – 6 UNC	64	24	9 (228.6)

## Install the valve

Determine the required torque necessary to tighten the fasteners by considering the type of gasket, line pressure, bolt material, and lubrication.

1. Slightly open the gate.

2. Install the valve with the seat side downstream or with the flow and pressure in the direction that pushes the gate against the seat when the valve is closed.  
To identify the seat side look for the word "SEAT" that is cast on the seat side of the valve body's chest area.
3. If you install a valve with an actuator in a horizontal position, then you may need to support the actuator. Consult ITT for technical advice.  
If the valve is double seated and bi-directional, then it can be installed in either orientation.
4. Bolt the valve to the mating flange using the proper size fasteners.  
See the Recommended fasteners table in this section.  
ITT recommends you use studs to ensure the full thread engagement of tapped holes.  
  - a) Cut the gasket to fit the raised face of the valve. If the valve is supplied with a non-metallic replaceable seal, then do not use a gasket on the replaceable seal side.  
Use a gasket material suitable for the pressure, temperature, and media.
  - b) Lubricate stainless steel fasteners to prevent galling.
  - c) Adjust fastener length to adjust for mating flange thickness, gaskets, and support rings.
5. Tighten the flange bolts in an alternating sequence.



6. Prepare the valve for hydrotesting:

If your valve is ...	Then ...
Handwheel-operated or Bevel gear-operated	Requires no further action
Cylinder-operated	Connect air supply for appropriate cylinder type (air or hydraulic)
Electric-operated	Connect electric supply according to manufacturers instructions

7. Hydrotest the system.
8. If the valve is leaking, then Adjust the packing.  
For more information, see Adjust the packing in the Maintenance section.

# Maintenance

## Precautions



**WARNING:**

- All procedures must be performed by qualified personnel.
- When the process fluid is hazardous, thermal (hot or cold), or corrosive, take extra precautions. Employ the appropriate safety devices and be prepared to control a process media leak.
- Always wear protective clothing and equipment to safeguard the eyes, face, hands, skin, and lungs from the particular fluid in the line.



**CAUTION:**

- Disconnect electrical, pneumatic, and hydraulic power before servicing actuator or automation components.

**NOTICE:**

Make sure that travel limits are set for both open and closed positions on electrically operated valves.

## Inspection

Inspection area	What to look for	Action if problem is found
External valve parts	Excessive wear or corrosion	<ul style="list-style-type: none"> <li>• Replace the affected parts</li> <li>• Contact ITT to obtain replacement parts or for specific instructions</li> </ul>

## Lubrication requirements

### Lubrication schedule

The stem and stem nut of the knife gate valve are lubricated at the factory before shipment.

Lubricate the stem and stem nut periodically to prevent wear and to minimize operating forces.

### Acceptable lubricants

Brand	Lubricant type
Chevron	Industrial Grease-Medium
Fel-Pro	C5-A Compound
Moly	XL 47-F2-75
Texaco	Molytex Grease #2

## Adjust the packing

The packing may require some adjusting after the line pressure is up to normal.

1. Stroke the valve a few times.
2. Tighten the packing gland bolts just enough to stop the leakage.

Over tightening the packing may cause undue pressure against the gate making the valve difficult to operate and causing packing wear.

## Repack the stuffing box



### CAUTION:

Do not repack the valve under pressure.

1. Disconnect the actuation by removing the stem assembly bolts.
2. Raise the stem.
3. Remove the packing gland nuts and the packing gland.
4. Remove the old packing and clean the packing chamber.
5. Install the new packing:
  - a) Cut the packing length to fit around the gate.  
See Packing dimensions table in this section.
  - b) Cut each end of the packing at a 45° bevel.
  - c) Stagger the joints on opposite sides of the gate.
6. Replace the packing gland and packing gland nuts:
  - a) Ensure that the gate is centered and against the valve body seat.
  - b) Replace the packing gland.

### NOTICE:

Position the packing gland so it is centered on the gate, but not touching the gate. Improper installation may result in premature packing failure.

- c) Replace the packing gland nuts and tighten them so that the packing gland sets the packing.

### NOTICE:

Do not tighten the packing gland nuts completely. Overtightening may result in premature packing failure.

7. Lower the stem and reconnect it to the gate.
8. Pressurize the valve to the working pressure and tighten the packing gland nuts evenly from side to side until the leakage stops.  
Do not over tighten.

## Packing dimensions

Valve size (in)	Valve size (DN)	Number of rows	Packing size (in)	Packing size (cm)	Packing length (in)	Packing length (cm)
2	50	3	1/4	.635	6 3/4	17.145
3	75	3	1/4	.635	8 3/4	22.225
4	100	3	1/4	.635	10 3/4	27.305
6	150	3	3/8	.953	15 7/8	40.323
8	200	3	3/8	.953	20 1/2	52.070
10	250	3	3/8	.953	25 1/8	63.818
12	300	3	3/8	.953	30 3/8	77.153
14	350	3	1/2	1.270	32 3/4	83.185
16	400	3	1/2	1.270	37 1/2	95.250
18	450	3	1/2	1.270	41 1/2	105.410
20	500	3	1/2	1.270	45	114.300

Valve size (in)	Valve size (DN)	Number of rows	Packing size (in)	Packing size (cm)	Packing length (in)	Packing length (cm)
24	600	3	1/2	1.270	53 1/4	135.255

## Set the stroke

**NOTICE:**

Always adjust the closed position properly. Improper adjustment may cause leakage, damage, or premature failure of the seat or gate.

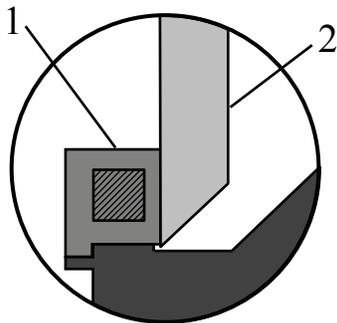
1. Is the valve handwheel-actuated or bevel gear-actuated?
  - If no: Proceed to step 2.
  - If yes: No adjustment is necessary. The stroke is set at the factory.
2. Is the valve cylinder-actuated?
  - If no: Consult the factory for instructions on other actuation.
  - If yes: Adjust the gate clamp until the following three conditions are met:
    - In the closed position the gate tip applies pressure to the wedges and the seat.
    - In the open position the gate tip is not protruding into the port of the valve.
    - In the open position the gate tip is not stroked so far to cause the gate tip to no longer contact the seat face.
3. If the valve has a lockout pin, then follow the steps below:
  - a) Close the valve.
  - b) Check the lockout pin.

If the valve is ...	Then ...
2–4 in. (50–100 DN)	Does the lockout pin pass through the gate clamp?
6 in. (DN 150) and above	Does the lockout pin pass over the top of the gate?

- If yes: Procedure is complete.
- If no: Consult the factory.

## Replace the seat

1. Remove the valve from the pipeline.
2. Open the gate.



1. Seat
2. Gate
3. Remove the seat from the outlet flange of the valve.  
You may need to drive out the seat with a piece of wood from the inlet side.
4. Inspect the seat surface for wear.

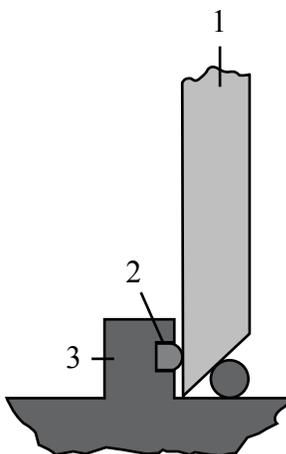
If wear appears on a ...	Then ...
Small area	Rotate the seat to put the wear point toward the top of the port
Large area	Replace the seat

5. Clean the recess where the seat fits.
6. Install the seat:

If the seat is ...	Then install ...
Non-metallic	The new or rotated seat
Metallic	The new or rotated seat with a new 1/16 in. (1.59 mm) thick gasket between the body and seat.

## Replace the d-ring seal

1. Remove the valve from the line.
2. Disassemble the valve.
3. Remove the old d-ring seal from the groove.



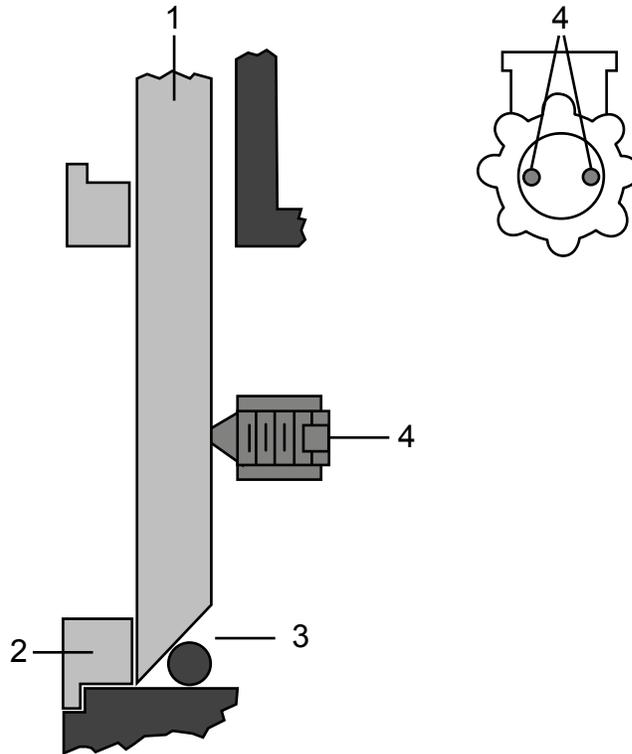
1. Gate
2. D-ring seal
3. Seat
4. Clean and dry the groove.
5. Roughen and clean the flat, bottom surface of the new d-ring seal.
6. Lay the d-ring seal on a flat surface with the flat side up.
7. Apply a layer of adhesive (.003 in. to .005 in. or .072 mm to .127 mm thick) to the flat surface of the d-ring seal.  
Black Max adhesive #38050 is available from the factory (part number F137900).
8. Install the new d-ring seal:
  - a) Place the d-ring seal in the body groove flat side down.
  - b) Keeping the d-ring seal smooth and flat, press it into the groove first at the top, then at the bottom, and then at the sides.  
The d-ring seal will be stretched slightly to fit.
9. Wipe off any excess adhesive.
10. Allow the adhesive to dry for a minimum of 8 hours for full bond strength.
11. Reassemble the valve.
12. Repack the stuffing box.

For more information, see [Repack the stuffing box](#) (page 11).

## Adjust the centerline buttons

Centerline buttons are set screws installed at the horizontal centerline of the valve to optimize shutoff in low  $\Delta P$  applications. They are standard on all single seated knife gate valves in sizes 30 in. (DN 750) and larger.

1. Close the valve so the gate is seated against the wedges.



1. Gate
  2. Seat
  3. Wedge
  4. Centerline buttons
2. Insert the centerline buttons into the housing, using a few drops of thread locking compound (Loctite 271).
  3. Adjust the centerline buttons to fit snug against the gate.  
The hardened tip of the centerline buttons in service will make shallow score marks on the backside of the gate. With adjustment the score marks may become deeper.

## Adjust the chest buttons

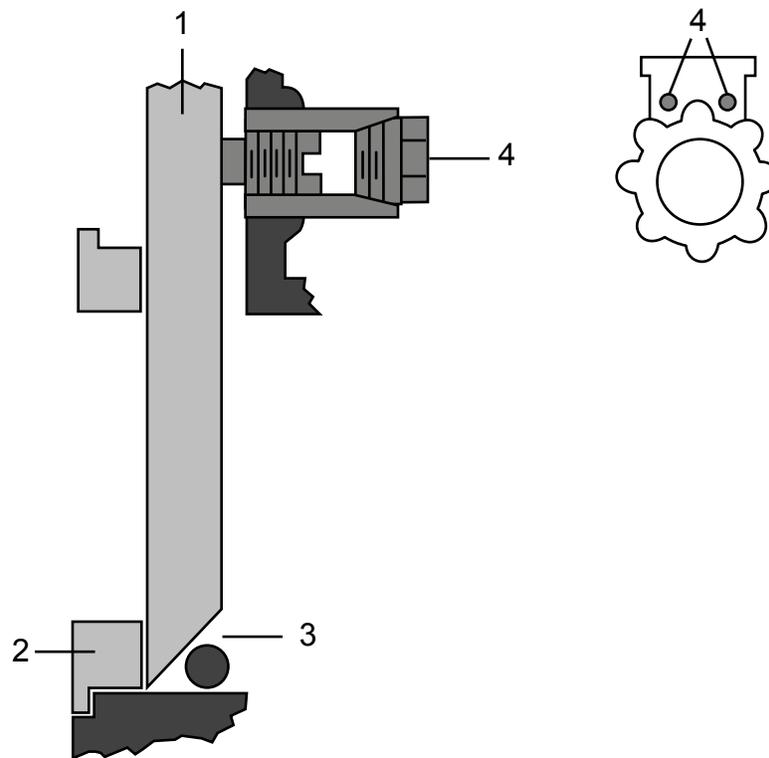


### CAUTION:

Do not adjust the chest buttons while the valve is under pressure.

Chest buttons are set screws installed in the chest of knife gate valve to optimize shutoff in low  $\Delta P$  applications or to install the valve in a vertical pipe with the gate underneath the seat. They are standard on all single resilient seated knife gate valves in sizes 30 in. (DN 750) and larger (except Fabri-Valve 37L).

1. Close the valve so the gate is seated against the wedges.



1. Gate
  2. Seat
  3. Wedge
  4. Chest buttons
2. Remove the pipe plug from the chest button housing.
  3. Adjust the chest buttons so they are just seated against the backside of the gate.
  4. Replace the pipe plug seal.

# Troubleshooting

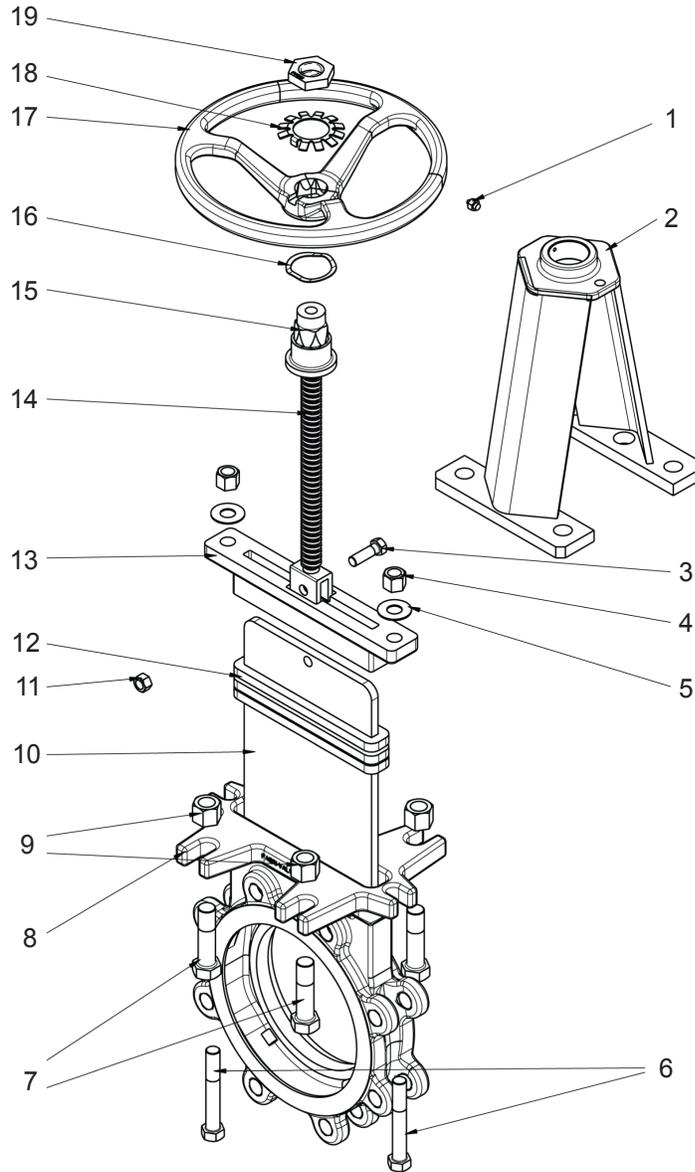
## Knife gate valve operation troubleshooting

Symptom	Cause	Remedy
There is seepage past the packing upon installation.	<ul style="list-style-type: none"> <li>The valve may have been subject to wide temperature variations during shipment.</li> <li>There is normal packing wear.</li> </ul>	Adjust the packing by tightening the packing screws.
The fully-closed valve is leaking past the seat.	The seat or gate is damaged.	Replace the seat or gate with a genuine ITT replacement.
The fully-closed valve is leaking past the seat.	The seat is worn.	Replace the seat.
The fully-closed valve is leaking past the seat.	The d-ring seal is worn.	Replace the d-ring seal.
Excessive force is required to open and close the valve.	The valve is not lubricated properly.	See Lubrication requirements in the Maintenance section.
Excessive force is required to open and close the valve.	There is misalignment between stem and gate.	<ol style="list-style-type: none"> <li>Loosen the actuator and yoke.</li> <li>Check the alignment.</li> <li>Retighten the hardware.</li> </ol>
Excessive force is required to open and close the valve.	The packing is too tight.	Consult the factory.
The centerline button is not contacting the gate	The centerline button is loose.	Adjust the centerline button.
The chest button is not contacting the back side of the gate	The chest button is loose.	Adjust the chest button.

# Parts Listings and Cross-Sectional Drawings

## Drawing and parts list

Exploded view



### Parts list

Item	Description	Material	
		S' Series	R' Series
1	Grease fitting	Mild steel plated	
2	Yoke assembly	Stainless steel	Carbon steel
3	Stem assembly bolt	Stainless steel	Mild steel plated
4	Packing gland nuts	Stainless steel	Mild steel plated
5	Packing gland washers	Stainless steel	Mild steel plated

Item	Description	Material	
		S' Series	R' Series
6	Packing gland bolts	Stainless steel	Mild steel plated
7	Yoke bolts	Stainless steel	Mild steel plated
8	Body	Stainless steel	Stainless steel or carbon steel
9	Yoke nuts	Stainless steel	Mild steel plated
10	Gate	Stainless steel	
11	Stem assembly nut	Stainless steel	Mild steel plated
12	Packing	PTFE/Graphite, acrylic/PTFE	
13	Packing gland	Stainless steel or ductile iron	
14	Stem assembly	Stainless steel	Stainless steel/carbon steel
15	Stem nut	Brass	
16	Wave spring	Stainless steel	
17	Handwheel	Ductile iron	
18	Retaining washer	Stainless steel	
19	Retaining nut	Stainless steel	Plated steel



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