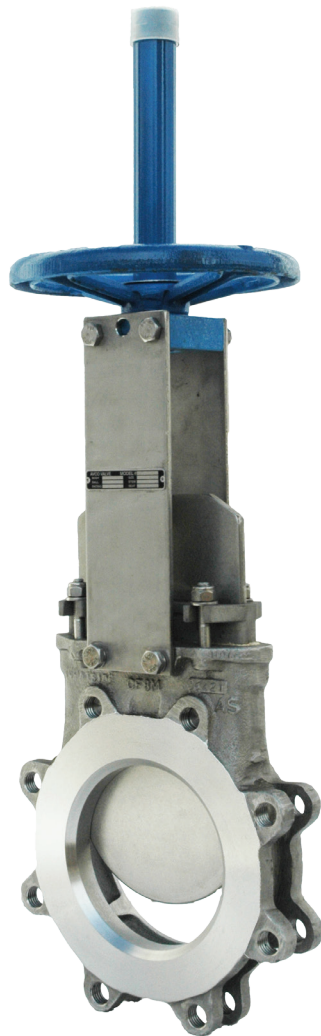


AVCO

Alloy Valves and Control

KNIFEGATE VALVES 6100 SERIES


INSTALLATION, OPERATION & MAINTENANCE MANUAL



This manual covers the installation, operation and maintenance of all AVCO standard 6100 series knifegate valves as described in the current AVCO catalog. Custom made or customer modified versions of the 6100 series may use this manual as a general guide only.

1 Description

- 1.1 The AVCO 6100 series model knifegate is a unidirectional lug type valve designed according to MSS-SP-81 and TAPPI TIS 405-8 standards for industrial service applications.
- 1.2 The 6100 series knifegate valve complies with the following European directives:
- **DIR 2006/42/EC** (machines)
 - **DIR 97/23/EC (PED)** Fluid: Group 1 (b), 2 (Cat. I, mod.A)
- 1.3 It may also comply with the directive:
- **DIR 94/9/EC** (Explosive Atmospheres)

The 6100 series knifegate valve may comply with the directive regarding equipment and protective systems for their use in explosive atmospheres. In these cases, the logotype  shall appear on the identification label of the valve. This label shows the exact classification of the zone where the valve can be used. The user will be liable for its use in any other zone.

This directive only applies in the following atmospheric conditions:

$$0.8 \text{ bar} \leq P \leq 1.2 \text{ bar}$$

$$-20^{\circ}\text{C} < T < 60^{\circ}\text{C}$$

Any increase in temperature due to frictional warmth is negligible, since the relative speed of the moving parts is extremely low.

The risk analysis associated to this directive does not take into account the fluid that goes through the valve, even when such fluid produces an explosive atmosphere. The user must take into account the risks that the fluid generates, such as:

- heating of the valve surface.
- generation of electrostatic charges caused by displacement of the fluid.
- shock waves caused by the installation (water hammer), internal crashes generated by the pellets or the risks due to foreign bodies susceptible of being present in the installation.

2 Handling

- 2.1 The valves are packed according to the appropriate transport standards. If you receive the packing damaged, please inform the transport company in writing and contact your AVCO representative.
- 2.2 When handling an AVCO knifegate valve please pay attention to the following points:
- Do NOT attach lifting gear to the valve actuators or gate guards. They are not designed to bear the weight and could easily be damaged.
 - Do NOT lift the valve by the valve bore. This can cause damage to the seating surfaces and seals.
 - Check that selected lifting gear is rated to carry the weight of the valve.
 - The valve can be handled using eyebolts, soft straps or slings.
 - Eyebolts (Figure 1): make sure the eyebolts have the same thread as the bolt holes and they are all well secured. Ideally when using lifting gear to move an AVCO valve, it should be supported by two or more eyebolts screwed into the tapped fixing holes in the valve body.
 - Soft straps (Figure 2): with the valve in the closed position, the straps should be placed between the gland area and the bore such that the valve is balanced.



Fig. 1
Suggested Handling with Eyebolts

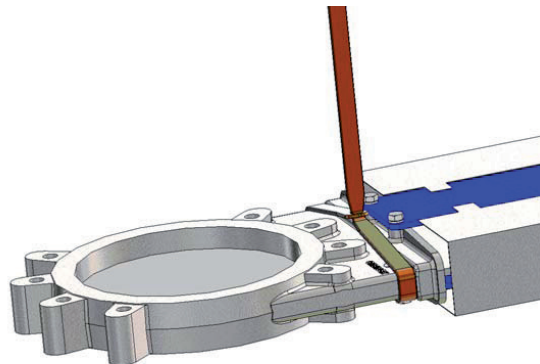


Fig. 2
Suggested Handling with Soft Straps

3 Installation

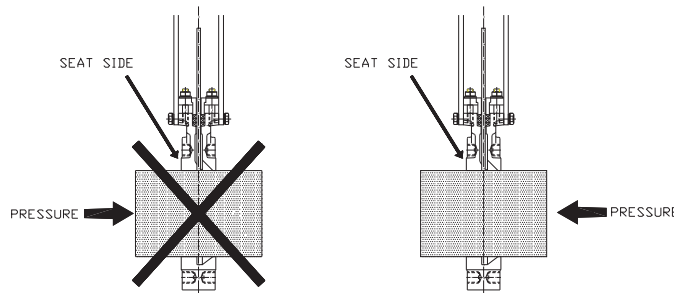
3.1 To avoid personal injury or damage to property from the release of process fluid:

- Those in charge of handling and maintenance of the valve must be qualified and trained in valve operations.
- Use appropriate personal protection equipment (gloves, safety shoes, etc).
- Shut off all operating lines to the valve and place a warning sign.
- Isolate the valve completely from the process.
- Release process pressure.
- Drain the process fluid from the valve.
- According to EN 13463-1 (15), during installation and maintenance operations, use hand tools (non electric) with Working Allowance.

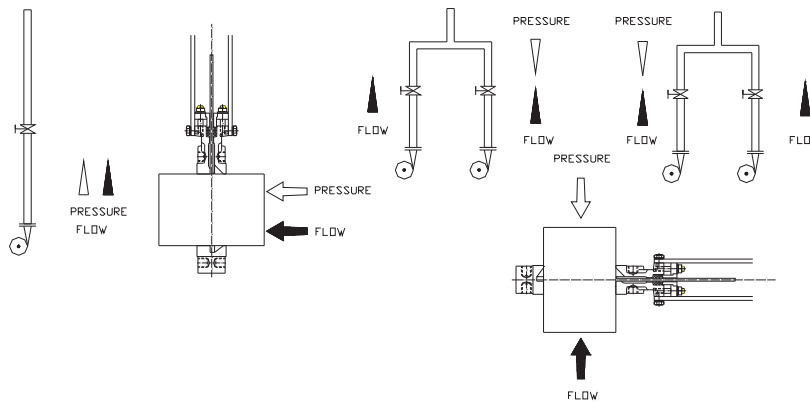
3.2 Before installation, inspect the valve body and components for any damage that may have occurred during shipping or storage. Make sure the internal cavities within the valve body are clean. Inspect the pipeline and mating flanges, making sure the pipe is free of foreign material and that the flanges are clean.

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- 3.3 The valve is unidirectional. It should be installed with pressure exerted against the seat. The words "SEAT SIDE" are marked on the valve body to indicate the position of the valve seat. Installation and the correct orientation with respect to the direction of the flow is the responsibility of the user.



- 3.4 It should be noted that the direction of flow and differential pressure, do not always coincide.



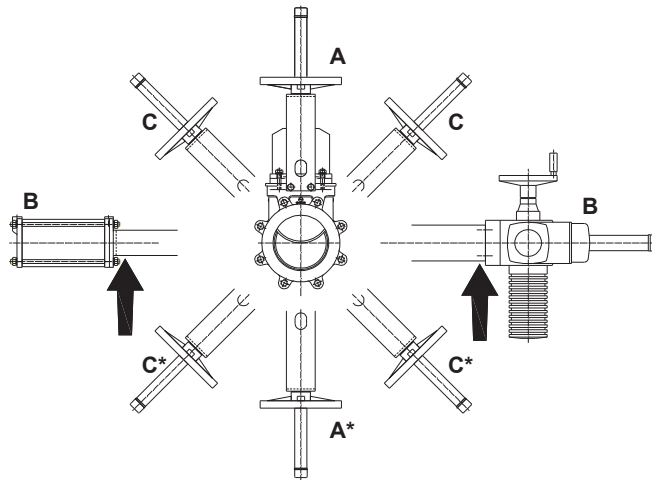
- 3.5 Special care should be taken to maintain the correct distance between the flanges and to ensure that they are parallel to the valve body. Incorrect alignment of the valve can cause deformations, which can lead to difficulties in operation.
- 3.6 The following table gives the maximum torque values for the valve fixing bolts. Also shown is the maximum depth (T) allowed for the tapped blind bolt holes drilled into the valve body.

Size	2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
T (mm)	11	9	9	10	10	10	12	12	12	15	15	22	22	22	32
T (in)	0.44	0.34	0.34	0.38	0.38	0.38	0.47	0.47	0.47	0.59	0.59	0.88	0.88	0.88	1.25
Torque	43	43	43	50	50	50	79	79	108	108	137	137	166	202	202

Fixing Bolt Torque Table (ft.lbs)

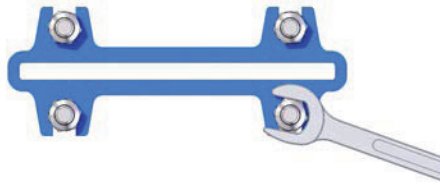
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- 3.7 The valve can be mounted in any position with regard to the pipe. Normally this valve is mounted in horizontal position in a vertical pipeline. In vertical pipelines, the construction of suitable supports will be required (for further questions ask AVCO technicians).
- 3.8 With larger diameters (> 300 mm), heavy actuators (pneumatic, electric, etc.), or with the valve installed horizontally (B) or at an angle (C) on a horizontal pipeline, the installation will require the construction of suitable supports. (See the following diagram and consult the technical department at AVCO).



*** For these positions please consult AVCO**

- 3.9 In vertical pipelines, the construction of suitable supports is always required (for further information please consult the technical department at AVCO).
- 3.10 Once the valve is installed, test that the flanges have been fastened correctly and that all electrical and/or pneumatic connections have been properly made.
- 3.11 These instructions must be observed when installing an AVCO knife gate valve in an ATEX zone:
- Make sure the valve is ATEX marked according to the requested zone and it includes all anti-static devices.
 - Check continuity between the body of the valve and the pipe (test in accordance with EN 12266-2 Standard, annex B, points B.2.2.2. and B.2.3.1).
 - This check must be done every time the valve has been removed from the line, serviced, and put back to the line.
- 3.12 The operation of automated valves is limited only with fitted gate covers.
- 3.13 First, operate the valve with no flow in the pipeline. Then test operation and valve seal with flow. It should be noted that the packing material might settle in shipping/storage, which can cause minor leakage. This can be remedied by tightening the gland follower (5) during installation. The nuts shall be tightened gradually and crosswise until the leakage stops (see the next figure). Check that there is no metal contact between the gland follower (5) and the gate (2).



- 3.14 If the gland follower nuts are pulled to hard, the force needed to operate the valve will increase, the valve function will be affected and the box packing lifetime will be shortened. The table below shows the maximum torque value for tightening the gland follower nuts.

Size	Torque
2" - 4"	175
5" - 8"	265
10" - 36"	310

Gland Follower Nut Torque Table (in.lbs)

- 3.15 Once performance has been tested, the valve can be put into operation.
3.16 Approximate weight of the handwheel operated valve (rising stem).

Size	2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
Weight	15.5	20	24.5	33	40	66	97	128	212	273	370	423	540	1003	1500

Handwheel Operated Weight (lbs)

4 Actuators

4.1 Handwheel

- To open the valve, turn the handwheel (10) counterclockwise. To close, turn the handwheel clockwise.

4.2 Lever

- To operate the valve with this device, first loosen the locking clamp located on the top of the yoke (8). Then either open or close the valve by moving the lever in the desired direction. Finally, fix the position of the lever with the locking clamp.

4.3 Pneumatic

- Valves are usually supplied with a double acting pneumatic actuator although, upon request, we can supply single-acting actuators. In either case the feed pressure can vary between 3,5 and 10 Kg/cm². However, the size of the actuator for each valve has been designed for a feed pressure of 6 Kg/cm².
- It is essential for a good maintenance of the cylinder that air should be well dried, filtered and lubricated.
- It is recommended to actuate the cylinder 3-4 times before the start up, once it is installed in the

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pipeline.

4.4 Electric actuator

- Depending on the type or make of the electric actuator, specific instructions (i.e. a manufacturer's manual) will be supplied.

4.5 ATEX zone actuators

- Allowed actuators for ATEX zones: Hand wheel, Chain Wheel, Bevel Gear, Lever, Pneumatic Actuator (double acting ONLY) and Electric Motor
- Make sure these actuators are ATEX marked according to the requested zone.
- Maximum travel speed of the gate must equal or below 0.05 m/s.

5 Maintenance

5.1 The valve must not undergo any modifications without a previous agreement with AVCO. AVCO shall not be liable for any damages that may arise due to the use of non original parts or components.

5.2 To avoid personal injury or damage to property from the release of process fluid:

- 5.2.1 Those in charge of handling and maintenance of the valve must be qualified and trained in valve operations.
- 5.2.2 Use appropriate personal protection equipment (gloves, safety shoes, etc).
- 5.2.3 Shut off all operating lines to the valve and place a warning sign.
- 5.2.4 Isolate the valve completely from the process.
- 5.2.5 Release process pressure.
- 5.2.6 Drain the process fluid from the valve.
- 5.2.7 Always replace the damaged parts with genuine and recommended AVCO parts.
- 5.2.8 According to EN 13463-1 (15), during installation and maintenance operations, use hand tools (non electric) with Working Allowance.

5.3 The only maintenance required is to change the gland packing (4) or the seal (3) if the valve is a resilient seated type.

5.4 The life of these elements will depend on the working conditions of the valve such as: pressure, temperature, abrasion, chemical action, number of operations, etc.

5.5 Replacement of the gland packing (4):

- 5.5.1 Depressurize the circuit and place the valve in close position.
- 5.5.2 Remove the gate guards (for automatically actuated valves only).
- 5.5.3 Release the spindle or stem (6) from the gate (2). (Photo 1)
- 5.5.4 Loosen the screws of the yoke (8) and remove it (without loosing the actuator).
- 5.5.5 Loosen the nuts of the gland follower (5) and remove it. (Photo 2)
- 5.5.6 Remove the old packing rings (4) and clean the stuffing box.
- 5.5.7 Insert the new packing rings (4), making sure that the ring joints alternate (the first on one side of

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the gate, the next on the other and so on). (Photo 3)

- 5.5.8 Once the necessary packing rings (4) have been inserted, proceed with a steady initial tightening of the gland follower (5).(Photo 2)
- 5.5.9 Place the yoke (8) (with the actuator) and screw it.
- 5.5.10 Fix the stem (6) to the gate (2). (Photo 1)
- 5.5.11 Remount the gate guards.
- 5.5.12 Carry out some operations with a loaded circuit and then re-tighten the gland follower (5) to prevent leakage.

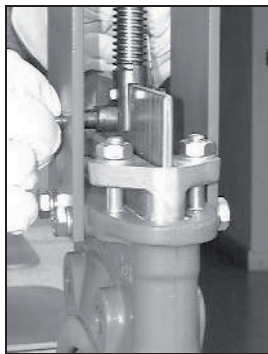


Photo 1

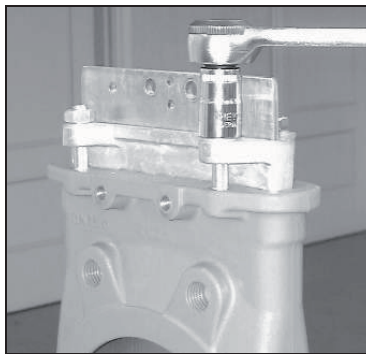


Photo 2

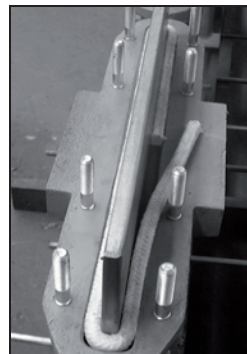


Photo 3

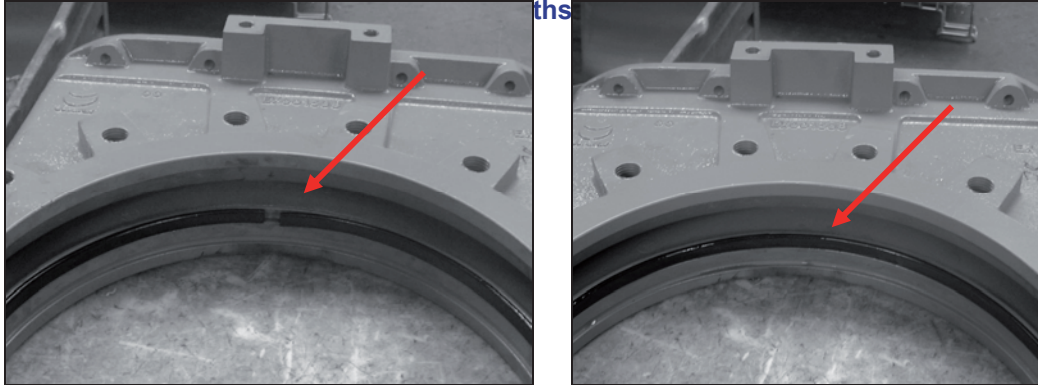
5.6 Replacement of the seal (3) (only applicable to resilient seated valves):

- 5.6.1 Remove the valve from the pipeline.
- 5.6.2 Remove the gate guards (for automatically actuated valves only).
- 5.6.3 Release the spindle or stem (6) from the gate (2).(Photo 1)
- 5.6.4 Loosen the screws of the yoke (8) and remove it (without losing the actuator).
- 5.6.5 Loosen the nuts of the gland follower (5) and remove it. (Photo 2)
- 5.6.6 Remove the old packing (4) and the gate (2) and clean the stuffing box.
- 5.6.7 Remove the seal retainer ring (9) which support the seals (3).
- 5.6.8 Remove the worn seal (3) and clean the seal housing.
- 5.6.9 Once the new seal (3) is cut according to size, insert it into the seat housing (making sure that the union of the seal is at the top). (Photos 4 and 5)

**** If the valve has PTFE seal (3), follow the paragraph 5.7. ****

Size	2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
Weight	200	275	350	415	490	630	780	920	1020	1170	1285	1430	1710	2250	2930

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5.6.10 Insert the seal retainer ring (9) by hammering gently around the edge (Photos 6 and 7).



5.6.11 Remount the gate (2).

5.6.12 Once the necessary packing rings (4) have been inserted, proceed with a steady initial tightening of the gland follower (5) (Photo 2) following the steps in paragraph 5.5.

5.7 Replacement of the PTFE seal (3):

5.7.1 Follow the same procedure as point 4.2 but with following notes:

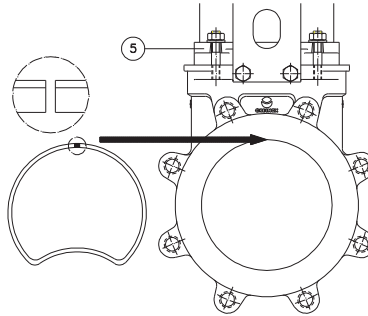
5.7.2 To obtain a tighter shut off in stainless steel valves (CF8M body), the machined housing of the seat is sealed with a plastic glue. This is not necessary in cast iron valves (GG25).

5.7.3 With the seal in this orientation:



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- 5.7.4 Make a circle, joining the ends and making a heart-shaped form (see the following diagram).



- 5.7.5 Insert both ends of the seal in the upper side of the machined housing of the seat (adjacent to the gland follower (5)), push the round part with your finger and insert the seal into the housing. If the diameter of the valve is small (Size $\leq 6''$), a vice can be used.

5.8 Lubrication:

- 5.8.1 Twice a year, it is recommended to remove the protection cap (11) and fill up the stem protector (12) halfway with a calcium-based grease with the following characteristics: highly water resistant, low ash content, and excellent adherence.

5.9 Special requirements for ATEX valves:

- 5.9.1 The maintenance personnel must be made fully aware of the risks of explosion, and it is advisable that they receive specific training regarding ATEX.
- 5.9.2 Periodicity of check and evaluation of graphite packing status and valve electrical conductivity must be determined by end user according to valve working conditions. In any case, once the valve is put into operation, the packing area must be revised after the valve has been stroked 100 times or after 3 months of operation, whatever happens first. After this preliminary check, new checking periods must be determined by end user based on the results of this first check.
- 5.9.3 Clean the valve periodically to prevent dust accumulation. Do not sweep or dump the dust. Always use a vacuum cleaner system.
- 5.9.4 Dead end service is not allowed.
- 5.9.5 Do not apply any new coating to the valve. Should it require new coating, please contact our closest representative.
- 5.9.6 Allowed seals: EPDM, VITON, NITRILE, GRAPHITE and METAL (no seal)
- 5.9.7 Allowed packing: ST and GRAPHITE packing
- 5.9.8 Any other materials but those above are not allowed to be used in ATEX zones.
- 5.9.9 In order to keep the ATEX approval, always use original spares from AVCO.
- 5.9.10 Washer - DIN 6798A (This washer guarantees continuity among carbon steel parts, coated in epoxy, yoke and body and stainless steel guards for coating thicknesses up to 200 microns)

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5.9.11 ST and GR packing:

- AVCO ST: Synthetic packing impregnated with PTFE
- GR: Graphite packing - MONTERO Ecograflex 780R

5.9.12 After any maintenance of ATEX valves, it is mandatory to check that the valve is earthed through the pipe, and there is continuity among the different valve components, such as the body, the gate, the supports, and guards (test in accordance with EN 12266-2 Standard, annex B, points B.2.2.2. and B.2.3.1).

5.10 Maximum Fluid Temperatures

Atmosphere	
Gas/air, steam/air, mist/air	Dust/air
80% of minimum fluid ignition temperature, minus 10°K	2/3 of minimum dust cloud ignition temperature minus 85°K

Note: these maximum fluid temperatures apply to all categories. The differences between categories are the consideration of foreseeable malfunction cases and rare malfunction cases

5.11 Maximum Seal & Packing Temperatures

Max Temperature (°F)	Seal			
	EPDM	Viton	Nitrile	Graphite
	250	400	250	1110

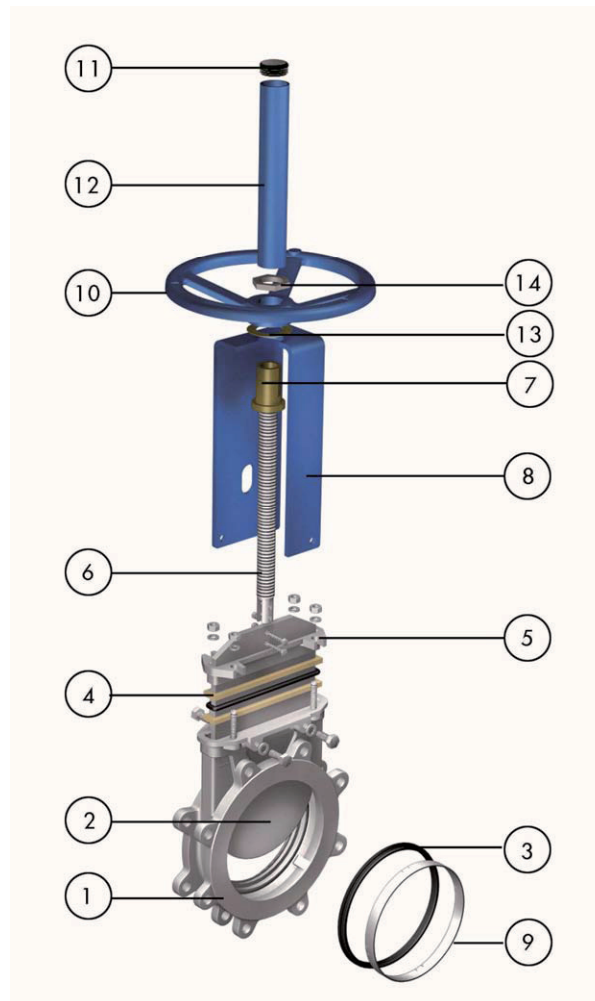
Max Temperature (°F)	Seal	
	ST	Graphite
	465	1110

Note: Most of the times seals maximum temperature capacity is the key limitation factor when evaluating valve maximum working temperatures. In ATEX zones these temperatures must be compared to those above related to limitation of fluids temperatures. Always consider the most restrictive as maximum valve working temperature.

6 Storage

- 6.1 For long storage periods keep the valves indoors in a safe and dry place and protect it from any impact and or vibrations.
- 6.2 Storing temperatures: 15°F to +100°F
- 6.3 Valves must be stored in either full open or full closed position.
- 6.4 For any component installed in the valves, electric motors, solenoid valves, etc, please refer to their own instruction manuals

7 Parts List & Exploded View



- | | |
|--------------------|------------------------|
| 1 - Body | 8 - Yoke |
| 2 - Gate | 9 - Seal Retainer Ring |
| 3 - Seal | 10 - Handwheel |
| 4 - Packing Ring | 11 - Cap |
| 5 - Gland Follower | 12 - Stem Protector |
| 6 - Stem | 13 - Thrust Washer |
| 7 - Stem Nut | 14 - Nut |