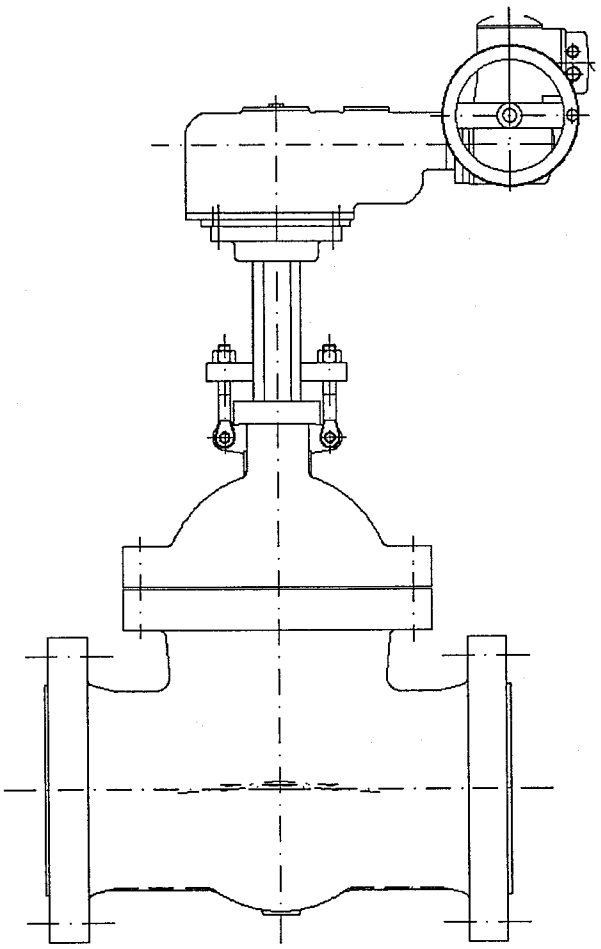
KLAUS UNION

# GATE VALVES

## Installation, Operation and Maintenace Manual



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This Installation, Operation and Maintenance instruction manual, which will be supplied on request together with the Klaus Union valves, has been prepared and written KU Technical Department for the purpose of facilitating the storage, handling, installation and both routine and special maintenance of valves.

KLAUS UNION

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## 1. INSTRUCTIONS

Since valves represent a significant investment in the construction cost of refineries, petrochemical plants, offshore production platforms, pipelines and power plants, both in capital and maintenance expenditure, the greatest attention should be paid to correct installation and servicing, in order to obtain the maximum possible service life.

Despite their robust external appearance and the fact that they have been manufactured and tested to international standards, all valves, whatever their type, have internal parts which have been precision machined to close tolerances and can, therefore, suffer damage resulting in leakage as consequence of inadequate storage, incorrect installation or defective start-up procedures.

The purpose of KU , therefore, in supplying this Maintenance, Operation and Installation Instruction Manual together with the valve is to prevent, whenever the instructions contained in it are closely followed, any valve malfunction which may otherwise appear.

## 2. HANDLING AND STORAGE

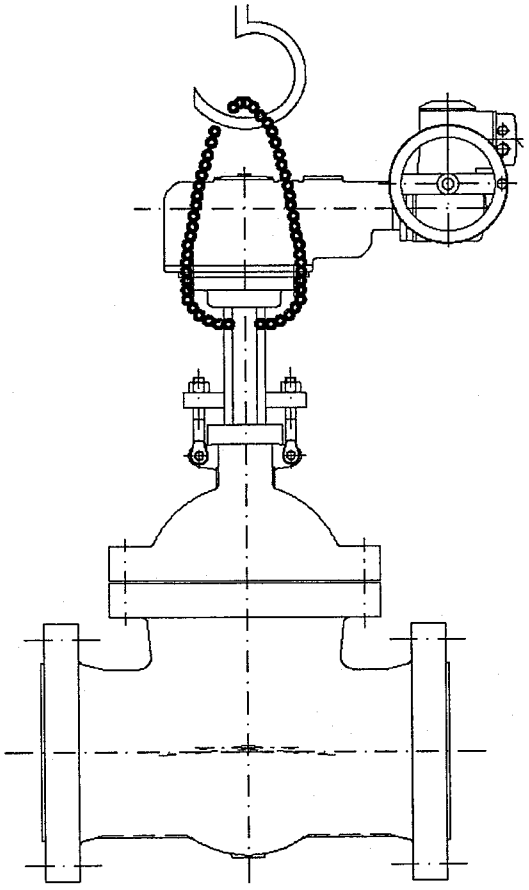
Unless specified otherwise, the valve is dispatched from Klaus Union, in a closed position and is properly protected against external physical damage. If the valve is to be stored on site for any period before use, it is advisable to note the following suggestions:

### 2.1. HANDLING

There are no handling problems when the valve, normally at customer' s specific request, is packed in a crate or case.

When the valve is dispatched loose on a pallet, and is being transported from the store to the plant, special care should be taken to avoid damage during handling.

The valve should never be lifted by the handwheel, reduction gear, stem or actuator, but as it can be seen on figure next page.



In order not to damage any part of the valve, it should be remembered that avoid the contact with any important part of the valve. Since the most sensitive part of the valve is the stem, it is advisable to avoid its contact with the sling.

Furthermore, obviously special care must be taken in not hitting the valve in any way, during the handling of it. Therefore, the chosen sling should be an adequate one considering the weight of the valve to be handled. Consequently, in case the valve weighs under 500 Kg., it may be lifted by a steel wire sling of suitable diameter passed through the bonnet yoke. Should the valve weigh more than 500 Kg., it must be always lifted at three points, i.e. under each body flange and the bonnet yoke near the stuffing box.

It should not be forgotten that the valve must never be hooked by the handwheel, in case it had one, or dashpot, pneumatic actuator or any other part likely to be damaged.

The valve should also remain in the closed position until it is installed.

As far as stainless steel valves are concerned, where brushing is necessary, it should be carried out using a brush of stainless steel.

Besides, no halogenated solvents are allowed on either stainless steel valves or stainless steel parts of valves. Whenever these valves have to be moved by means of bars, etc., these should be also of stainless steel. Furthermore, any metallic material in contact with stainless steel valves should be corrosion resistant, being especially important the fact that these materials must not produce galvanic corrosion in the contact area.

Eventually, another important fact to be considered is that all protections the valve is supplied with, are to be maintained until its installation is going to be carried out. Besides, the handwheel should be never operated by bars, wrenches, keys or similar.

## 2.2. STORAGE UNDER COVER

Ensure that the valve is completely closed and that the sides are sealed by ***Klaus Union*** plastic, hardboard or wooden covers which should be securely attached to the body, to prevent any cover damage during transit. Check also that the exposed area of the valve stem is well lubricated and protected with Packing paper or adhesive tape.

## 2.3. OUTDOOR STORAGE

Where this is unavoidable the greatest attention should be paid to the protection of internal and critical areas of the valve so as to prevent sand, water or foreign bodies from seeping in, as any of these could damage the seating surface, when the valve is operated for the first time.

The storage and handling procedures already outlined should be closely followed with the valve closed and the body parts and stem cover completely sealed.

It should also be remembered that any long term storage, especially outdoor storage, can lead to the deterioration of the gland Packing, graphite gaskets or non-asbestos packing, i.e. graphite/grafoil, etc. These items should therefore be replaced on any valve subjected to long-term storage before installation and plant service.

## 3. INSTALLATION

A defective installation of a valve can lead to serious consequences, giving as a result possible malfunctions which could need big and costly repairs. Therefore, the following recommendations should be closely followed, with which an optimum performance of the valve after the installation can be assured.

It is of the most importance to take all necessary precautions to avoid the entrance of foreign elements inside the valve, which could lead to serious damage of the seating surfaces, either before or after the installation. Consequently, when valve is withdrawn from storage and before it is taken for installation, the protective covers are removed from the valve parts to allow the sealing surfaces to be thoroughly cleaned by water washing or air blasting. Under no circumstance should any attempt be made to put the valve on work prior to this cleaning operation.

It is also essential to clean the pipeline which the valve is installed at, before the unit comes into operation. As a matter of fact, the welding drops, dirt, small metal pieces inside the lines, can render the valve seats damaged and produce leakage as result.

During installation of the valve, either flanged or buttwelded, it should be remembered that the thermal stresses of the pipe system and the weight of the fluid it carries impart considerable mechanical stress to the valve, which can cause distortion of the valve body resulting in maladjustment of the seats and consequent leakage.

In case of buttwelded valves, during the procedure of welding to the line, special care should be taken to avoid dropping of elements that could damage the valve seating surfaces. It is also to be considered that an excess heat could deform the valve seat. Besides, the welding and post weld heat treatment procedures are to be in accordance with the applicable Code or Norms.

When installed, the seating surface of the valve is still vulnerable to damage from foreign bodies such as sand, rust scale and weld spatter in the pipework system and it is normal practice for the system to be thoroughly flushed through, with all valves open before the plant is put into operation.

When the valve is installed in high temperature systems it is advisable to check the tightness of flange, bonnet and gland Packing bolts after a short period of initial operation of the plant, to avoid operational problems in the future.

## 3.1. CONNECTION OF THE FLANGED VALVE

Before positioning the valve on the line, ensure that the pipe flanges are in coaxial and parallel alignment. When this has been checked and the valve is in position, the valve and pipe flanges are brought together by even and partial tightening of the bolts in pairs, diametrically opposite and at right angles all around the flanges until they are perfectly matched around the whole circumference. Then, following the same procedure, the bolts can be securely tightened. In this way, distortion of the valve will be avoided.

## 3.2. CONNECTION OF THE BUTTWELDED VALVE

More attention should even be paid in this case, since the valve must be supported and both ends correctly aligned with the pipe. Circumferential welding of the valve to the pipe can then be carried out, taking care to avoid a high heat input which could set up thermal stresses and deform the valve body and seating surfaces.

## 4. ROUTINE OF MAINTENANCE

To ignore a valve in service until it has to be replaced is uneconomical in terms of both: the replacement cost of the valve and the losses of processed fluid from leakage. Instead, careful systematically programmed and periodic maintenance can detect potential problems and therefore extend the service life of the valve.

Consequently, a program of periodical revisions of maintenance should be prepared by corresponding Department and/or its Engineering. Such program is to be fulfilled with the frequency of the revisions according to the valve performance, fluid influence, etc.

Therefore, and after all exposed above, ***Klaus Union,*** proposes the parts of the valve advisable to be inspectioned, leaving the frequency of revisions to the election of the customer and/or its Engineering Department.

### 4.1. STUFFING BOX

Stuffing box leakage is the most common problem occurring when the valve is under pressure, so regular inspection will avoid leakage through the gland Packing which can damage the valve stem. Such leakage can normally be stopped by tightening the gland bolts a little.

Since gland Packing is soft and the internal pressure will assist sealing, tightening of the gland bolts should be stopped immediately once the leakage has been eliminated, to avoid overtightening.

## 4.2. BOLTING

Pipework systems in most plants are subject to some degree of vibration which can loosen bolting, so that all valve bolts should be regularly inspected and tightened where necessary.

## 4.3. STEM NUT, LANTERN, STEM THREAD, EYES BOLTS.

These parts of the valve should be lubricated regularly to avoid mechanical damage due to seizing. Grease nipples are generally provided at the yoke of the valve to facilitate lubrication.

Lubricate the handwheel as often as necessary, so it turns freely, since excessive force in closing the valve can result in rupture of the seating surfaces. Wear on stem Packing can be minimized by lightly lubricating the stem. Exposed stem threads should also receive occasional lubrication.

## 4.4. ADDITIONAL EQUIPMENT

Where the valve is fitted with reduction gear, electric actuator, chain drive, interlock systems, etc., these should be lubricated regularly, so that they operate efficiently.

## 4.5. BEARING

In case the valve has the bearing incorporated, it should be greased every six months.

## 5. SPECIAL MAINTENANCE

All special maintenance, with the exception of gland repacking, must be carried out only while there is no pressure in the valves. This can by checked by careful and slow loosening of the gland bolts to note any flow of fluid through the Packing.

### 5.1. STEM NUT RENEWAL

As previously mentioned, ensure that no pressure exists within the valve. Close the valve until full contact is made with the seat, but avoid using force. Unscrew the handwheel nut and remove the handwheel. Loosen the yoke bushing bolts sufficiently to enable removal of it and remove the ball bearing from the valve. Finally, unscrew the stem nut from the stem.

Reassemble by reversing the above procedure, i.e. screw stem nut to the stem and valve yoke, replace any ball bearing previously removed, replace yoke bushing and tighten the seat. Replace the handwheel and tighten the handwheel nut.

## 5.2. REPLACING THE VALVE STEM

After prolonged service it may be necessary to remove the stem from the valve to replace it because it is worn or because the point at which the stem passes through the stuffing box needs regrinding.

## 5.3. REPLACING THE BODY - BONNET GASKET

If leakage from the body - bonnet flanges occurs, first tighten the bonnet bolts. If leakage persists, the gasket needs replacing. This must be done only with a pressure - free valve as previously explained.

When it is free of internal pressure, open the valve to three quarters of the stem travel and remove all bonnets bolts. Lift out the bonnet assembly and disc or wedge to be replaced and make sure to mark its original position, as any change in the position of the disc could cause leakage past the seat due to differential wear in service. Remove the old gasket and carefully clean the bonnet and body sealing surfaces. Fit on the new gasket, lower the bonnet assembly and disc or wedge and replace the bonnet bolting. Tighten the bonnet bolts, using the diagonal procedure described earlier for flanged valve installation to achieve parallel body - bonnet flanges with no distortion.

## 5.4. REPACKING

The frequency of Packing change is directly related to the service conditions, either type of fluid or frequency of operation, etc.

On the other hand, and as a Practice Norm, it should be taken into account that when losses can be detected as far as Packing is concerned, this should be retightened on the nuts of the gland bolts. This tightening must be uniform, in such a way that the gland is maintained perpendicularly to the stem. Nevertheless, if after several retightenings losses keep on being detected through of the Packing, its replacement is recommended.

If fluid leakage from the stuffing box can not be stopped by tightening the bolts, repacking would be necessary.

Repacking of a valve in service and under pressure always carries an element of risk, but if carried out by experienced personnel, this can be performed with safety by making sure that the valve is fully open and that the stem backseat is tight against the bonnet nut. To repack, proceed as follows:

- Open the valve fully to the back seat and gradually loosen each gland bolt alternatively. Ensure there is no pressure in the stuffing box and raise the gland flange and the bush to the stem nut. Remove the old Packing using a hooked metal wire or proper tool, taking care not to scratch the stem. Raise the lantern ring if there is one and remove the bottom Packing.

Select new Packing ring of the correct section and length, and curve this to the same diameter as the stem. Ensure that the ends are beveled at *45* degrees, (not square cut). Place the same number of bottom rings as have been removed, replace any lantern ring previously removed and complete the Packing ensuring that beveled ends of consecutive rings are not in the same vertical line. Lower the gland bush and flange, reposition the gland eye bolts and nuts and tighten alternatively. Partially close the gland bolts further if any leaking occurs.

## 5.5 SEAT LEAKAGE

After prolonged use, leakage can occur through the valve seat due to normal wear of the disc and seat sealing surfaces. If ignored, irreparable damage can occur on this surface due to erosion but if attended to immediately when leakage is detected, the sealing surfaces can be restored by hand or machine grinding.

When damage to the seating surfaces is not severe, hand grinding can be carried out using grinding paste and disc equipped with suitable handles.

Once grinding has been completed and all parts have been thoroughly cleaned, the correct mating of the discs and seats can be checked by coating the discs faces with "engineer's blue" or light machine oil and by lowering them into place between the seats with a light blow. On carefully removing the discs, an immediate visual indication of the mating of surfaces will be apparent. If the mating of surfaces is correct, the valve can be reassembled.

When reassembled, the seating should be checked by air testing at 5.5 BAR pressure introduced through a tapped hole made in the valve bonnet and with the valve immersed in a water tank. Even at this relatively low pressure, leakage will occur if the seating is not perfect. By applying air pressure through the bonnet of the closed valve it is also possible to check the sealing of the stem Packing and body .bonnet at the same time. With this test successfully completed, there can be no doubt that the valve is safe for subsequent use.

## 5.6. PERIODICAL REVISIONS

Inspections of the most important parts of the valves shall be done according to the corresponding Maintenance Program.

Where the dismounting of the valve is necessary, care should be taken to carry out such operation in the open position of the valve.

Notwithstanding, when a valve is dismantled, the body - bonnet gasket and Packing should compulsorily be changed.

## 6. CONCLUSION

For more extensive overhauls involving the replacement of severely worn parts or leaking castings, the valve, wherever possible, should be returned to the place of the manufacturer where any necessary work will be carried out and from where the refurbished valve will be returned for further service.