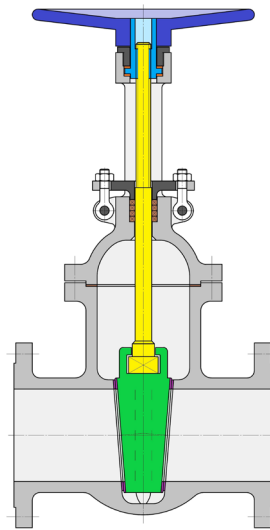
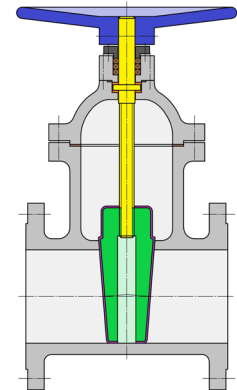


Wedge-Gate Valve, internal stem
metal seated



Wedge-Gate Valve, external stem
metal seated

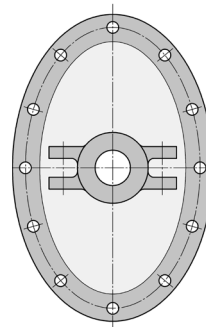
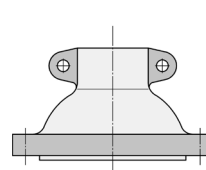


Wedge-Gate Valve, internal stem
soft seated

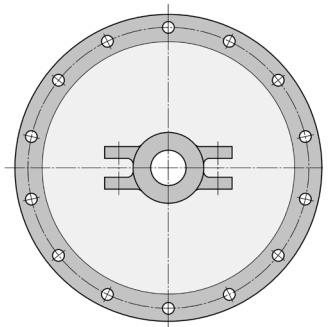
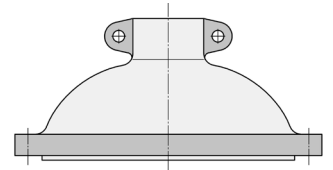
WEDGE GATE VALVE, WEDGE OVAL GATE VALVE, WEDGE ROUND GATE VALVE

The designations wedge gate valve, wedge oval gate valve and wedge round gate valve date back to the early days of valve design. On the one hand, they refer to the overall lengths: Wedge gate valves have a much shorter (= flat) overall length than wedge oval or wedge round gate valves. In the past, they could only be manufactured for the low-pressure range in PN 6 to max. PN 10. Today, this is possible for the water / and wastewater range up to PN 25.

On the other hand, wedge oval and wedge round gate valves were designated according to their body design. When viewed from above, oval wedge gate valves have an oval-shaped bonnet, while round wedge gate valves have a round bonnet. The initially available wedge oval gate valves were manufactured for the medium pressure range PN 10 and PN 16/25. For the higher pressure ranges, from PN 25 upwards, the upper part of the valve had to be made more stable, which is why the usual oval design was abandoned and a round upper part was used.



Oval shape



Round shape

These valves are sealed by means of a wedge-shaped shut-off element - hence the name wedge gate valve (See also types of shut-off wedges).

Due to their design, wedge gate valves can have flow in both directions and seal on both sides. However, they are not suitable for control and are only used as shut-off valves in the open or closed position (On/Off). In intermediate positions, the sealing wedge begins to flutter, causing turbulence and increased material wear on the wedge, body and sealing surfaces.

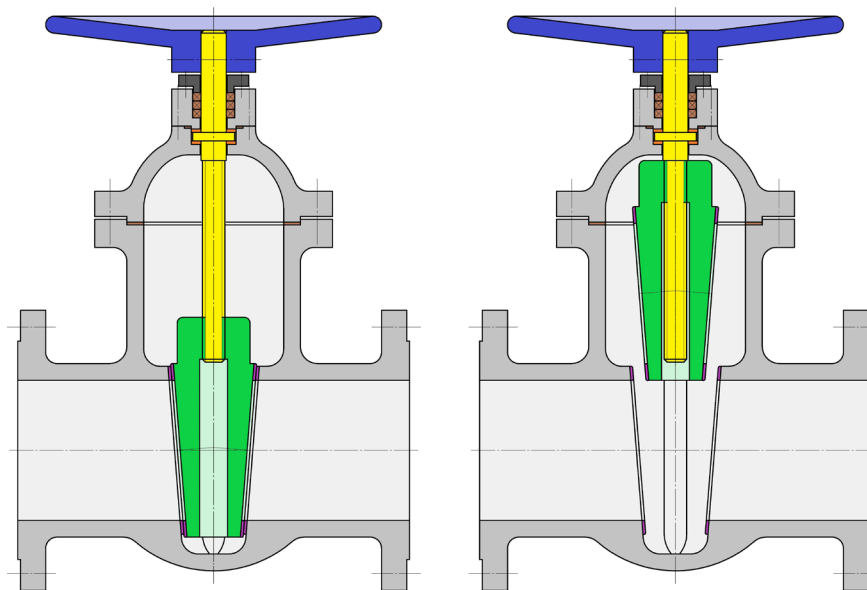
INTERNAL / EXTERNAL STEM

The most common type of gate valve used today is the internal stem type, where the threaded portion of the stem is located inside the gate valve body. This compact design allows for a low bonnet and is less expensive to manufacture than gate valves with an external stem.

When the stem is actuated, it rotates into the threaded portion inside the gate wedge. This pulls the gate wedge up into the gate bonnet and the gate opens. Turning in the opposite direction closes the gate valve again.

The stem sealing can either be done by an adjustable packing gland or by several O-rings, which are almost maintenance-free.

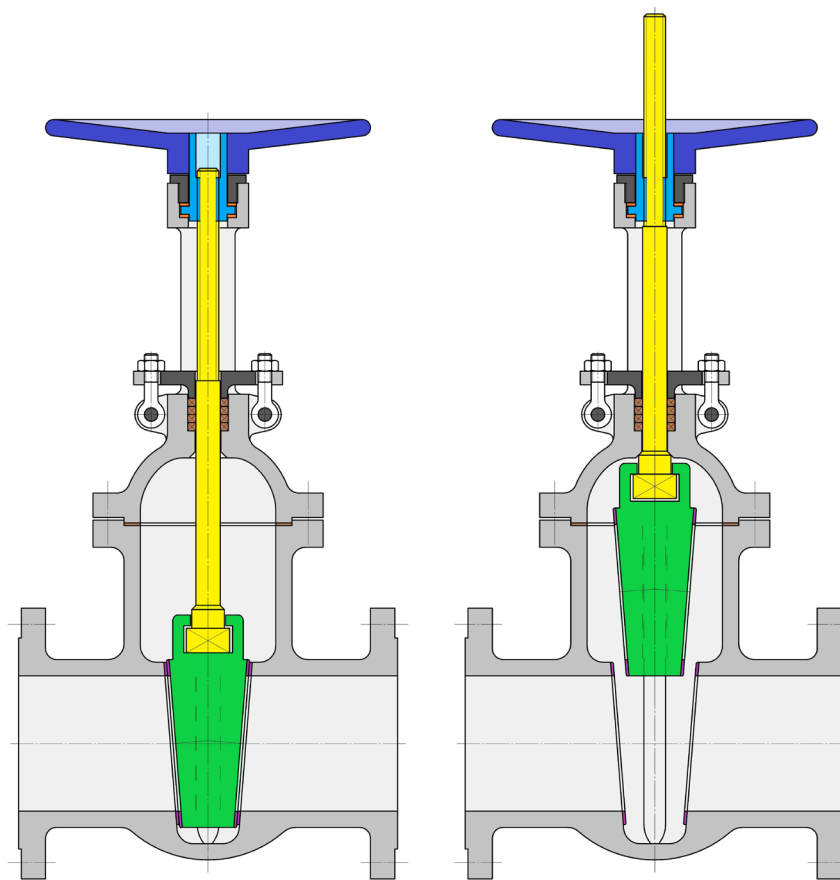
Gate valves with internal stem are only suitable for non-aggressive liquids and gases. Because the stem thread is exposed to the media flow, the use of aggressive media can lead to contamination and subsequent „seizure“ of the thread.



Internal (non-rising) stem,
metallic seated

On gate valves with external stem, the threaded portion of the gate stem is not located inside the body, but at the top, outside the gate bonnet. The smooth section of the stem sits inside the body and is positively connected to the gate wedge. The spindle nut is mounted in the so-called yoke above the bonnet. When the valve is actuated, the spindle nut is rotated and thus „pulls“ the spindle including the wedge upwards and the valve is opened.

The advantage over gate valves with internal stem is that they are also suitable for aggressive media. Both the stem thread and the stem seal (packing) are outside the media flow, which means that „seizure“ of the stem thread is almost impossible. The position of the spindle can also be used to quickly determine whether the valve is open or closed.



External (rising) stem,
metallic seated

RISING / NON-RISING STEM

Rising stem = always on the outside, see above

Non-rising stem = always inside, see above

TYPES OF SHUT-OFF WEDGES (GATES)

SOLID WEDGE AND FLEXI WEDGE

The shut-off element of a gate valve is wedge-shaped and usually consists of two plates joined together.

If the two wedge plates are firmly connected (welded), they are completely rigid, and this is called a solid wedge. The two sides of the wedge and the „counterparts“ in the body, the body seats, must each be machined very accurately and flat to ensure a reliable seal of the gate against the medium.

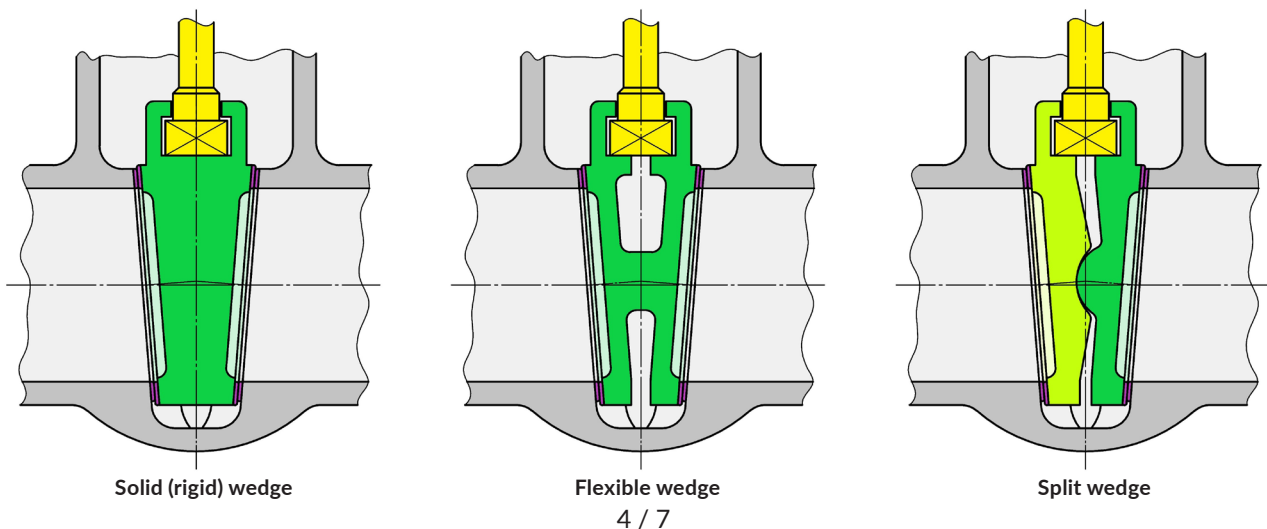
For small gate valves below DN 40 and for very large gate valves, the rigid wedge is usually made from one piece (forged material, casting). Especially in the case of large nominal diameters, it is very heavy or difficult to move and thus correspondingly cost-intensive.

With the flexi wedge, the two gate plates are not rigidly connected, but only joined together by a web in the middle. As a result, the two plate sides are elastic (flexible) to a certain extent and can thus adapt more precisely to the housing seats. The achievable tightness is much higher than with a gate valve with a solid wedge.

Due to its good sealing properties and low weight, most gate valves today are manufactured with flexi wedges. Exceptions to this are the soft-seated gate valves, which are mainly used in the water / wastewater sector. In these gate valves, the solid wedge is completely vulcanized with NBR or EPDM and thus achieves a high degree of tightness.

SPLIT WEDGE

The two sealing plates are movably connected, e.g. by ball segments and ball cups or by a spring mechanism. Since they are self-adjusting, a high degree of tightness is achieved and the gate valves can be opened and closed with less force. Due to the complex and cost-intensive production, split wedge gate valves are mostly used for high-pressure applications in power plants as main gate valves at the main steam outlet or on steam generators.



METAL-SEATED GATE VALVES

The classic gate valves are very versatile: for liquid and gaseous media, as well as for media loaded with dust or hard particles, for aggressive or abrasive media, in the high temperature and high pressure range. Of course, the materials used and the design (internal or external stem) must be adapted to the respective operating medium.

In all metal-seated gate valves, the sealing seats / sealing rings in the body and on the wedge are made of metallic materials. To achieve higher tightness, wear resistance and / or corrosion resistance, sealing rings made of a wide variety of materials can be used.

A major disadvantage of metal-seated gate valves is that impurities (e.g. sand, lime) present in the medium settle in the lower part of the body (the gate bag). These deposits can prevent the wedge from closing completely, which then leads to leakage.

STELLITE SEAT

Stellite™ is a hard alloy based on cobalt-chromium and serves as protection against high wear loads caused by the operating medium. In the gate valve, the body seats and, if necessary, the wedge as well as the stem are stellite when exposed to aggressive media or superheated steam. Unprotected, standard materials such as 1.4021 or 1.4571 would not withstand the high loads for long. This coating can be applied by buildup welding or flame spraying.

SOFT-SEATED GATE VALVES

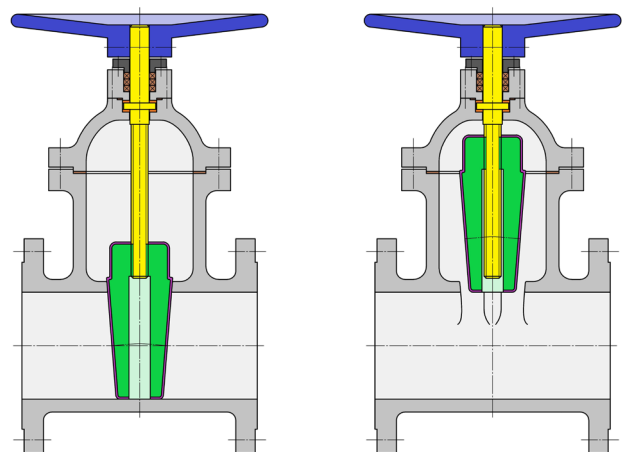
Soft-seated gate valves are mainly used in the water / wastewater sector. Since the stem is sealed maintenance-free by O-rings, soft-seated gate valves are also suitable for use with gas (natural gas, biogas).

Unlike the classic, metal-seated gate valves, they have a smooth, full passage without a gate pocket. This offers the advantage that the gate valves can be pigged and the pipeline can be completely cleaned if necessary.

(A so-called pig is a cleaning or inspection device that is forced through the pipeline using pressure).

Another advantage is the high tightness of the gate valves in the passage. The gate valve wedge is vulcanized with NBR or EPDM and thus achieves a tightness according to DIN EN 12 266-1, leakage rate A! Furthermore, these gate valves are conditionally suitable for vacuum.

Due to the rubber coating, soft-seated gate valves are not suitable for high temperatures, high operating pressures and abrasive media. Like all gate valves, they are „only“ suitable for shutting off a pipeline, not for regulating the operating medium.



Soft seated, solid gate,
non-rising stem

BOLTED / WELDED COVER

This refers to the way in which the valve body is connected to the bonnet.

In the case of a bolted cover, as the name implies, the body and bonnet are bolted together. The connection is detachable so that, for example, the internal parts of the gate valve can be machined or replaced at any time for maintenance or repair purposes.

If a gate valve is difficult to access or is to be installed underground, the version with a welded cover is usually used. Unintentional loosening of the cover screws, e.g., due to vibrations during operation, thermal expansion, wear of the cover gasket, etc., is thus precluded and tightness to the outside is ensured. In case of repair or maintenance, however, the valve must be completely removed from the line and the cover connection must be separated in a workshop.

ACTUATOR TYPES

The classic drive form for gate valves is the handwheel. The international standard is that the gate valve is closed by turning the handwheel clockwise and opened by turning it counterclockwise.

In addition, there are also the following types of actuation:

Gearbox with handwheel:

If the required actuating forces are too high, a reduction gearbox with handwheel can be used.

Quick-acting lever:

Instead of the handwheel, a bearing block with a lever is attached to the upper part of the slide gate; by pulling upwards, the slide gate is opened instantly, and by pressing down the lever, it is closed.

Chain wheel:

If the slide gate is installed at a greater height, a chain wheel can be used for operation. A chain is placed over the chain wheel and secured against dropping with a guide bracket. By pulling the chain, the slide gate is opened or closed from the ground.

Operating key:

Instead of the handwheel, a square is attached to the end of the slide gate spindle. The slide gate can then be operated with an open-end wrench or (in the case of buried installation) from above with a T-wrench.

AUTOMATICALLY OPERATED GATE VALVES

Electric actuators:

Electric actuators can be adapted exactly to the requirements of the gate valve and can be operated with either three-phase current, alternating current or direct current. Although they are expensive to purchase, they have a long service life and only low maintenance costs (simple installation, no energy consumption during switching pauses, easy to maintain). The switching times can be variably selected to suit the application, between approx. 20 seconds and several minutes.

Pneumatic actuators:

They are operated with compressed air, are less expensive than electric drives, have short switching times and are easy to maintain. However, a compressed air supply line is required as well as a solenoid valve for control.

A distinction is made between double-acting and single-acting pneumatic actuators.

Double-acting means that the actuator requires compressed air to open the gate and also to close it.

Single-acting means that the compressed air is required either to open or to close. Reset is then automatic via a spring.

Hydraulic actuators:

The same principle as pneumatic actuators. However, these actuators are operated with oil or water-based fluids (flame retardant).

REMOTELY OPERATED GATE VALVES

Gate valves cannot always be operated directly at the installation site, e.g. when installed in a pit, under water or in the ground. They are then operated manually via a drive linkage or spindle extension, or by an electric, pneumatic or hydraulic drive. Depending on the site conditions, it may be necessary to install additional diverters with two or more cardan or ball joints, as well as a corridor column with handwheel or drive.

INSTALLATION SET

Water and sewer lines, including their gate valves, are often installed underground. To be able to operate the gate valves, a built-in set is used. The installation set consists of an extension rod that is firmly connected to the gate valve spindle. To protect it from contamination by seepage water and the soil surrounding it, the linkage is encased in a PE pipe. The upper end of the extension is provided with a square on which the so-called T-key is placed, which is used to operate the gate valve. A street cap forms the ground level end as well as the visible indication of the paving set underneath.