

Gate Valve

ECOLINE GT 40

Operating Manual



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Operating Manual ECOLINE GT 40

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Glossary

DN

Nominal size; numeric designation of size of the components in a piping system

PN

Nominal pressure; a characteristic upon which standards regarding piping, piping components, valves, etc., are based

Pressure Equipment Directive (PED)

The 2014/68/EU Directive sets out the requirements to be met by pressure equipment intended to be placed on the market in the European economic area.

1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

In the event of damage, immediately contact your nearest KSB sales organisation responsible to maintain the right to claim under warranty.

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Installation at Site. (⇒ Section 5, Page 16)

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Type series booklet	Valve description
Flow characteristics ¹⁾	Information on Kv and zeta values
General assembly drawing ²⁾	Sectional drawing of the valve
Sub-supplier product literature ³⁾	Operating manuals and other product literature for the accessories

Observe the relevant manufacturer's product literature for the accessories.

1.5 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇄	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

¹ If any

² If inclusion in the scope of supply has been agreed; otherwise refer to the type series booklet.

³ If inclusion in the scope of supply has been agreed.



2 Safety

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
 - Manufacturer
 - Type designation
 - Nominal pressure
 - Nominal size
 - Flow direction arrow
 - Year of construction
 - Valve body material
- The operator is responsible for ensuring compliance with all local regulations not taken into account.
- The design, manufacture and testing of the valve are subject to a QM system to DIN EN ISO 9001 as well as the current European Pressure Equipment Directive.

- Bear in mind that valves exposed to creep-rupture conditions have a limited service life and have to meet the applicable regulations stipulated in the technical codes.
- In the case of customised special variants, further restrictions may apply with regard to the operating mode and service life. Refer to the relevant sales documentation for applicable limitations.
- The operator is responsible for ensuring compliance with all local regulations not taken into account.
- The operator is responsible for any eventualities or incidents which may occur during installation performed by the customer, operation and maintenance.

2.3 Intended use

- Only operate valves which are in perfect technical condition.
- Do not operate the valve in partially assembled condition.
- Only use the valve for fluids specified in the product literature. Take the design and material variant into account.
- Only operate the valve within the operating limits described in the other applicable documents.
- The valve's design and rating are based on predominantly static loading in accordance with the codes applied. Consult the manufacturer if the valve is subjected to dynamic loads or any other additional influences.
- Consult the manufacturer about any other modes of operation not described in the product literature.
- Do not use the valve as a foothold.

2.3.1 Prevention of foreseeable misuse

- Never exceed the permissible operating limits (temperature, etc.) specified in the data sheet or product literature.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and training

- All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the product this manual refers to and be fully aware of the interaction between the valve and the system.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the valve must always be supervised by specialist technical personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this operating manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.7 Safety information for the operator/user

Actuator-operated valves are intended for use in areas which cannot be accessed by unauthorised persons. Operation of these valves in areas which can be accessed by unauthorised persons is only permitted if appropriate protective devices are fitted at the site. This must be ensured by the operator.

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly. Do not touch rotating parts.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain any leakage of hazardous fluids (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the valve require the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the valve during standstill only.
- The valve body must have cooled down to ambient temperature.
- The pressure in the valve body must have been released and the valve must have been drained.
- When taking the valve out of service always adhere to the procedure described in the manual.
- Decontaminate valves which handle fluids posing a health hazard.
- Protect the valve body and body bonnet/cover from any impacts.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning.

2.9 Unauthorised modes of operation

- The valve is operated outside the limits stated in the operating manual.
- The valve is not operated in accordance with the intended use.
- Use gate valves exclusively for fully open or fully closed service. An intermediate position (throttling function) is not permitted.

3 Transport/Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer and the insurer about the damage in writing immediately.

3.2 Transport

Transport the valve in the closed position.

	 DANGER
	<p>The valve could slip out of the suspension arrangement Danger to life from falling parts!</p> <ul style="list-style-type: none"> ▷ Only transport the valve in the specified position. ▷ Never attach lifting accessories to the handwheel. ▷ Observe the information on weights, centre of gravity and fastening points. ▷ Observe the applicable local accident prevention regulations. ▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs. ▷ For actuated valves observe the relevant actuator operating manual. Transport aids on the actuator are not suitable for suspending the entire valve/actuator assembly.

To transport the valve, suspend it from the lifting tackle as illustrated.

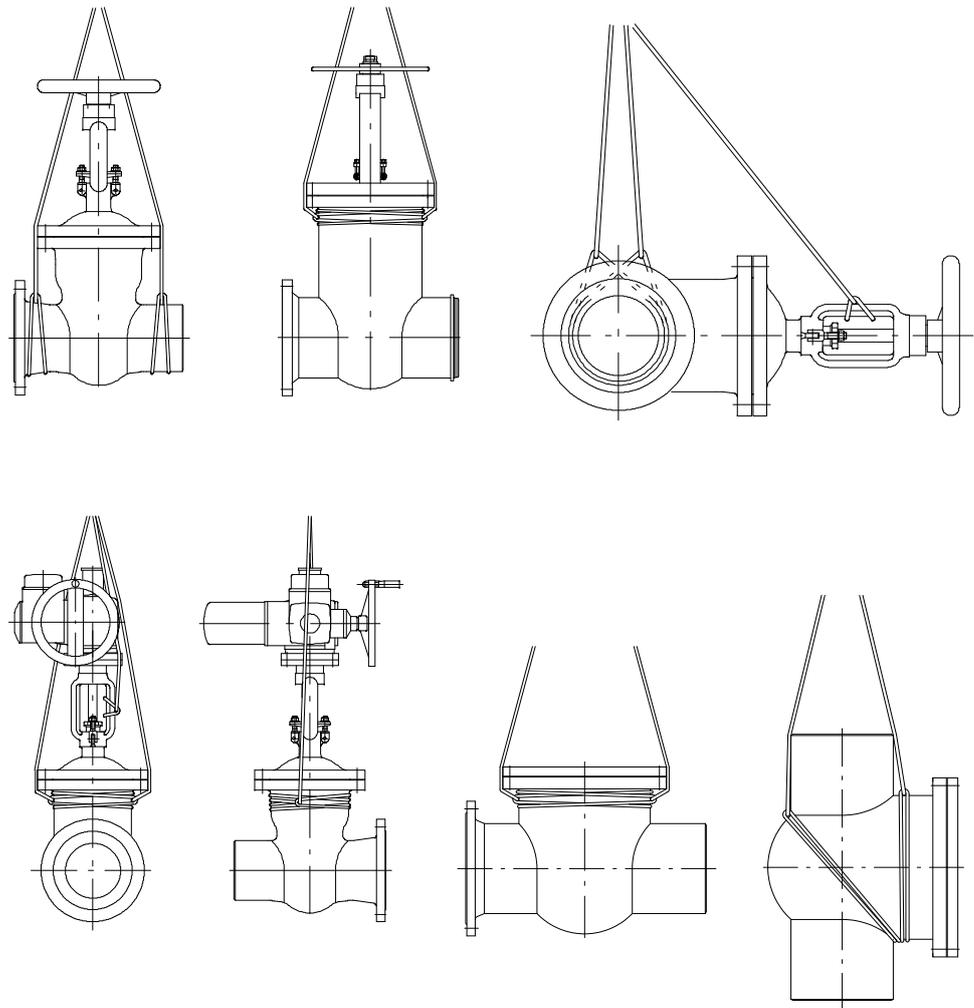


Fig. 1: Transporting the valve

3.3 Storage/preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for storing the valve:

	CAUTION
	<p>Incorrect storage Damage due to dirt, corrosion, humidity and/or frost!</p> <ul style="list-style-type: none"> ▷ Close the valve using little force and store in the closed position. ▷ Store the valve in a frost-proof room where the atmospheric humidity is as constant as possible. ▷ Protect the valve from dust during storage, e.g. with suitable caps or foils. ▷ Protect the valve from contact with solvents, lubricants, fuels or other chemicals. ▷ Store the valve in vibration-free conditions.

Storage and/or temporary storage of the valves must ensure that even after a prolonged period of storage the valves' function is not impaired.

The temperature in the storage room must not exceed +40 °C.

If properly stored indoors, the equipment is protected for a maximum of 12 months.

For storing a valve which has already been operated, observe the measures to be taken for shutdown. (⇒ Section 6.3, Page 24)

	NOTE
	<p>If the valves are fitted with actuators, ensure that the actuator's operating manual is also observed.</p>

3.4 Return to supplier

1. Drain the valve as described in the manual.
2. Flush and clean the valve, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the valve has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen also neutralise the valve and blow through with anhydrous inert gas to ensure drying.
4. When returning valves used for handling Fluids in Group 1 always complete and enclose a certificate of decontamination.
Indicate any safety measures and decontamination measures taken.

	NOTE
	<p>If required, a blank certificate of decontamination can be downloaded from the following web site: www.ksb.com/certificate_of_decontamination</p>

3.5 Disposal

	⚠ WARNING
	<p>Fluids handled, consumables and supplies which are hot or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▶ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▶ Wear safety clothing and a protective mask if required. ▶ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the valve.
Collect greases and other lubricants during dismantling.
2. Separate and sort the valve materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Valve Description

4.1 General description

- Gate valve with bolted bonnet

Valve for shutting off fluids in industrial plant, process engineering, and shipbuilding.

4.2 Product information

4.2.1 Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see <http://www.ksb.com/reach>.

4.2.2 Product information as per Pressure Equipment Directive 2014/68/EU (PED)

The valves satisfy the safety requirements of Annex I of the European Pressure Equipment Directive 2014/68/EU (PED) for fluids in Groups 1 and 2.

4.2.3 Product information as per Directive 2014/34/EU (ATEX)

The valves do not have a potential internal source of ignition and can be used in potentially explosive atmospheres, Group II, category 2 (zones 1+21) and category 3 (zones 2+22) to ATEX 2014/34/EU.

4.3 Marking

Table 4: General marking

Nominal size	DN ...
Nominal pressure class or max. permissible pressure/temperature	PN ... / ... bar / ... °C
Manufacturer	KSB
Type series/model or order number	ECOLINE...
Year of construction	20..
Material
Traceability of the material
CE marking PED	
Identification number of the notified body	0036
Customer's marking	e.g. plant/ system No., etc.

In accordance with the current European Pressure Equipment Directive (PED) the valves are marked as shown in the following table:

Fluids in Groups 1 and 2

Class	PN	DN											
		≤25	32	40	50	65	80	100	125	150	≥200		
150	10												
	16												
≥300	25												
	≥40												

Fig. 2: Fluids in Groups 1 and 2

Fluid groups In accordance with Article 13 Para. 1 of the European Pressure Equipment Directive (PED) 2014/68/EU, Group 1 comprises all fluids posing physical or health hazards, e.g. fluids defined as

- Explosive
- Extremely flammable
- Highly flammable
- Very toxic
- Toxic
- Oxidising

Group 2 comprises all other fluids not referred to in Group 1.

4.4 Design details

Design

- Bolted bonnet
- Non-rotating stem with external screw
- Back seat
- Flexible wedge
- Yoke head suitable for mounting electric actuators (DIN ISO 5210)

Variants

- Stem protecting tube
- Stem protecting tube with position indicator
- Stem protecting tube with position switch
- Bypass
- Installation kit for electric actuators to EN ISO 5210 Type A
- Spur gear
- Bevel gear
- Electric actuators
- Body seating surfaces made of wear and corrosion resistant Stellite.
- Other flange designs
- Other butt weld end versions
- Version in compliance with TA-Luft (German Clean Air Act) to VDI 2440 for temperatures up to 400 °C

4.5 Information on the mechanical components

4.5.1 Moving parts

The valve/actuator combination comprises moving parts which are not fully enclosed. Depending on the type and design, these include the following:

- Stem
- Limit switches
- Coupling
- Other force-transmitting equipment

Depending on the actuator type and design, further moving parts may be present, e.g. emergency handwheels turning along with the actuator.

4.5.2 Self-locking function

As standard, the trapezoidal stem thread is self-locking. For special designs, e.g. multiple threads, the self-locking function is taken over by the actuator assembly. The self-locking effect may be reduced over time due to wear.

4.5.3 Uncontrolled movements

In the following cases, the valve disc's position may change in an uncontrolled manner due to the system's pressure with resultant effects on the plant:

- Control failure
- Signal error
- Power supply failure during operation
- Incorrect actuator setting
- De-activation of the position switches in the actuator

4.6 Function

Design The gate valve consists of the pressure-retaining parts, i.e. body 100 and yoke 166, the functional unit (stem 200 and flexible wedge 361), and the actuating element.

Sealing Body 100 and yoke 166 are joined by studs 902.1 and hexagon nuts 920.1, and the joint is sealed off by a joint ring 411.

The functional unit mainly consists of flexible wedge 361, stem 200 and the actuating element, i.e. handwheel 961 or actuator.

The seating faces of body 100 and of flexible wedge 361 are hard-faced. Gland packing 461, which seals off stem 200, is tightened via gland follower 452 by means of eyebolts 900 and hexagon nuts 920.2.

4.7 Scope of supply

The following items are included in the scope of supply:

- Valve
- Valve operating manual

4.8 Noise characteristic

When operated within the operating conditions documented in the order confirmation and/or characteristic curves booklets, the valve will not exceed a sound pressure level of 80 dB in acc. with IEC 60534-8-4. Unfavourable piping layouts or off-design operating conditions may give rise to physical phenomena like cavitation, resulting in significantly higher sound pressure levels.

5 Installation at Site

5.1 General information/Safety regulations

The consultant, construction company or operator are responsible for positioning and installing the valves. Planning errors and installation errors may impair the reliable function of the valves and pose a substantial safety hazard.

	<p>⚠ DANGER</p> <p>Dead-end valve High-pressure hazard! Risk of burns!</p> <ul style="list-style-type: none"> ▸ Protect the valve against unauthorised and/or unintentional opening.
	<p>⚠ WARNING</p> <p>Exposed rotating parts Risk of injury!</p> <ul style="list-style-type: none"> ▸ Do not touch rotating parts. ▸ When the equipment is in operation, perform any work with utmost caution. ▸ Take suitable precautions, e.g. provide safety covers.
	<p>CAUTION</p> <p>Improper installation Damage to the valve!</p> <ul style="list-style-type: none"> ▸ Protect the body and body bonnet/cover from any impacts.

5.2 Installation position and location

For gate valves installed in horizontal pipes a vertical stem position is recommended (handwheel or actuator on top, see position (a) shown below). Installation with the stem in an inclined or horizontal position, e.g. in vertical pipes (positions b, c, g, h) is permitted. In this case, however, the actuator must be adequately supported at the site. Avoid any installation positions with the actuator hanging downward (positions d, e, f – risk of dirt ingress into the packing area via the back seat).

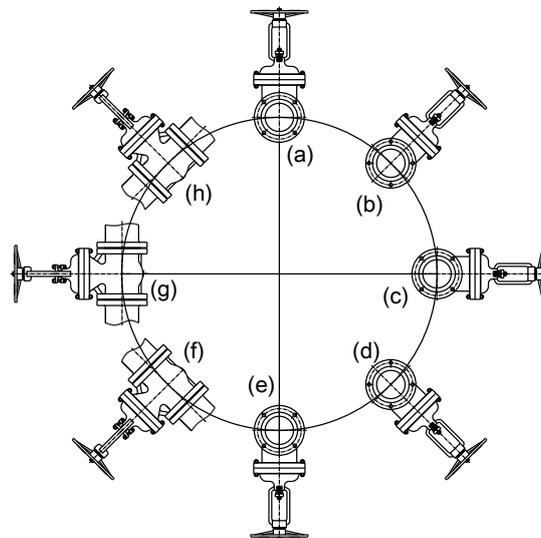


Fig. 3: Gate valve installation positions

Make sure that the non-rising handwheel can be operated and that there is sufficient clearance available for the rising stem.

The position and flow direction must be in accordance with the manufacturer's data.

The valve must not be fitted downstream of tees and level or three-dimensional double bends.

	NOTE
	For the valves to reach the documented Kv values, the flow direction must correspond to the flow direction arrow.

5.3 Preparing the valve

	CAUTION
	<p>Outdoor installation Damage due to corrosion!</p> <ul style="list-style-type: none"> ▷ Provide weather-proof protection to protect the valve against moisture.

1. Thoroughly clean, flush and blow through all vessels, piping and connections.
2. Remove the valve's flange covers before installing it in the piping.
3. Check that the inside of the valve is free from any foreign objects. Remove any foreign objects.
4. If required, install a strainer in the piping.

5.4 Piping

	CAUTION
	<p>Painting of the piping Valve function impaired! Loss of important information provided on the valve!</p> <ul style="list-style-type: none"> ▷ Protect stem and plastic components prior to applying paint. ▷ Protect printed name plates prior to applying paint.

- Lay the piping in such a way that detrimental thrust forces and bending forces are kept away from the valve body.
- For any further work (e.g. construction work, cleaning measures) protect the piping against contamination (e.g. by covering it with a tarpaulin).

5.4.1 Flange connection

Fasteners Only use fasteners (e.g. to DIN EN 1515-4) and flange gaskets (e.g. to DIN EN 1514) made of materials approved for the respective nominal valve size. Always use all flange bolt holes provided when connecting the valve to the pipe.

- Flange connection**
- ✓ The mating flange faces are clean and undamaged.
 - ✓ Verify that the piping is correctly aligned and the flanges are parallel.
 1. Align the valve between the pipe flanges.
 2. Use an appropriate tool to evenly tighten the fasteners crosswise.

5.4.2 Welding the valve into the piping

Responsibility for welding the valve into the piping and for any heat treatment required lies with the commissioned construction company or the plant operator.

	<p>CAUTION</p> <p>Weld beads, scale and other impurities Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Take suitable measures to protect the valve against impurities. ▷ Remove any impurities from the piping. ▷ If necessary, install a strainer.
	<p>CAUTION</p> <p>Incorrect earthing during welding work on the piping Damage to the valve (scorching)!</p> <ul style="list-style-type: none"> ▷ Fully open the valve during welding. If the valve is equipped with a back seat, run the obturator to an intermediate position. ▷ Never earth the electric welding equipment on the valve's functional parts.
	<p>CAUTION</p> <p>Non-compliance with the max. permissible application temperature Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Complete the weld seam in several steps to ensure that the temperature in the middle of the body does not exceed the max. permissible application temperature.
	<p>NOTE</p> <p>For valves with socket weld ends, comply with the insertion depth given in the applicable technical code. A gap between the pipe end and the base of the weld socket prevents impermissible stress on the weld.</p>

- Provide sufficient clearance for removal of the valve and, if necessary, the actuator.
- Maintain cleanliness when welding the valve into the piping. No contaminants must enter the inside of the valve body; otherwise the seat/disc interface may become damaged.
- ✓ The valve is installed in accordance with the appropriate pipeline isometry.
- ✓ Comply with the welding processes, filler metals and welding data laid down in the documented welding procedure.
- ✓ The weld ends of valve and pipes have been centred.
 1. Run the valve disc to the middle position prior to welding.
 2. Check that the butt weld ends are clean and undamaged. Clean them if necessary.
 3. Weld the valve into the piping in such a way that the valve/pipe welds are not subjected to stresses, strains or torsion. During the welding process, ensure constancy of the gap to the pipeline without radial offset.
 4. When installing the valve with the stem in a horizontal position, adequately support the weight of the actuator or gearbox.

5.5 Valves with actuator

	⚠ WARNING
	<p>Impermissible loads resulting from operating conditions, add-on parts and valve-mounted components, e.g. actuators</p> <p>Leakage from or rupture of the valve body!</p> <ul style="list-style-type: none"> ▷ Lay the piping in such a way that detrimental thrust forces and bending forces are kept away from the valve body. ▷ Additional loads, e.g. traffic, wind or earthquakes are not taken into account for standard variants; these require a separate design. ▷ Support the valve including add-on parts and valve-mounted components.

Electric actuators

	⚠ DANGER
	<p>Unqualified personnel performing work on valves with actuator</p> <p>Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Ensure that connection to the power supply and the process control system is performed by a trained electrician. ▷ Observe regulations IEC 60364 and, for explosion-proof models, .

	⚠ WARNING
	<p>Incorrect connection to the mains</p> <p>Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.

	CAUTION
	<p>Change of limit switch points</p> <p>Impairment of the functional reliability!</p> <p>Damage to the actuator!</p> <ul style="list-style-type: none"> ▷ Never change the pre-set limit switch points.

Mounted actuators are factory-set and ready for operation.

Electric actuators are factory-set ready for operation and wired as follows:

- Valve CLOSED: travel-dependent
- Valve OPEN: travel-dependent

The circuit diagrams are located in the terminal boxes.

Depending on the mass to be accelerated, electric actuators may be subject to a corresponding overtravel effect. Take into account this overtravel effect when setting the actuator.

	NOTE
	<p>If the valves are fitted with actuators, ensure that the actuator's operating manual is also observed.</p>

5.6 Insulation

	<p>WARNING</p> <p>Cold/hot piping and/or valve Risk of thermal injury!</p> <ul style="list-style-type: none"> ▷ Insulate the valve. ▷ Fit warning signs.
	<p>CAUTION</p> <p>Condensation forming in air-conditioning systems, cooling systems and refrigerating systems Ice forming! Actuating element blockage! Damage due to corrosion!</p> <ul style="list-style-type: none"> ▷ Insulate the valve to prevent diffusion.
	<p>CAUTION</p> <p>Outdoor installation Damage due to corrosion!</p> <ul style="list-style-type: none"> ▷ Provide weather-proof protection to protect the valve against moisture.

For any insulation fitted on the valve observe the following:

- The valve's function must not be impaired.
- The sealing areas at the bonnet/cover joint and at the stem passage (gland packing) must be directly accessible and visible.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

	CAUTION
	<p>Welding beads, scale and other impurities in the piping Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Remove any impurities from the piping, e.g. by flushing the pipe with the valve in fully open position. ▷ If necessary, install a strainer.
	! DANGER
	<p>All work performed on the actuator: Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe the actuator's operating manual.

6.1.1 Prerequisites for commissioning/start-up

	! DANGER
	<p>Surge pressure/water hammer potentially occurring at high temperatures Danger to life caused by burns or scalds!</p> <ul style="list-style-type: none"> ▷ Do not exceed the valve's maximum permissible pressure. ▷ Use valves made of nodular cast iron or steel. ▷ The operator shall provide general safety measures for the system.
	CAUTION
	<p>Overloading of valve Damage to the valve!</p> <ul style="list-style-type: none"> ▷ The nominal pressure classes only apply at room temperature. Refer to the pressure/temperature ratings tables for higher temperature values. . Using the valve in conditions deviating from those specified will lead to overload which the valve cannot withstand.
	CAUTION
	<p>Aggressive flushing liquids and pickling agents Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Ensure that cleaning procedure and duration match the valve body materials and seal materials when performing flushing and pickling. ▷ Responsibility for the compatibility of the pickling media used and the pickling procedure itself lies with the pickling company.

Before commissioning/start-up of the valve ensure that the following requirements are met:

- The valve has been connected to the piping at both ends.
- The shut-off function of the installed valve has been checked by opening and closing it several times.
- Gland packing 461 has been checked for leakage before it is subjected to load conditions for the first time. If gland follower 452 has loosened, re-tighten nuts 920.2 evenly and alternately (crosswise). There must be no metal-to-metal contact between gland follower 452 and blade 360.

- The actuator has been connected to the power supply in accordance with the actuator's operating manual.
- The piping has been flushed.
- For valves with electric or pneumatic actuators travel limits have been set.
- The material, pressure data and temperature data of the valve are compatible with the operating conditions of the piping. (⇒ Section 6.2, Page 23)
- The material's chemical resistance and stability under load have been checked.

6.1.2 Actuation/operation

	CAUTION
	<p>Excessively long idle periods Damage to the valve!</p> <p>▷ Check the function by opening and closing the valve at least once or twice a year.</p>

6.1.2.1 Actuating element – handwheel

Viewed from above, the valve is opened by turning the handwheel in counter-clockwise direction, and closed by turning the handwheel in clockwise direction. Direction symbols are marked on the top of the handwheel.

6.1.3 Functional test

Visual inspection Check the following functions:

1. After the valve has been subjected to load conditions or heated up for the first time check the joint between the body and the bonnet/cover established by bolting 902.1/920.1 and joint ring 411 for tightness.
2. To avoid stress or distortion, open the valve by approx. two full counter-clockwise handwheel turns.
3. If bonnet/cover bolting 902.1/920.1 has loosened, evenly re-tighten it crosswise.

	NOTE
	<p>Re-tightening the bonnet/cover bolting is particularly important for valves operated at temperatures exceeding 200 °C.</p>

6.1.4 Information on the mechanical components

6.1.4.1 Moving parts

The valve/actuator combination comprises moving parts which are not fully enclosed. Depending on the type and design, these include the following:

- Stem
- Stop
- Position switches
- Coupling
- Other force-transmitting equipment

Depending on the actuator type and design, further moving parts may be present, e.g. emergency handwheels turning along with the actuator.

Valve commissioning/start-up is not permitted until both valve ends have been connected to the pipeline and any risk of injuries can be ruled out.

6.1.4.2 Electric actuator overtravel

Depending on the mass to be accelerated, electric actuators may be subject to a corresponding overtravel effect. Take into account this overtravel effect when setting the actuator.

	NOTE
	If the valves are fitted with actuators, ensure that the actuator's operating manual is also observed.

6.1.4.3 Self-locking function

As standard, the trapezoidal stem thread is self-locking. For special designs, e.g. multiple threads, the self-locking function is taken over by the actuator assembly. The self-locking effect may be reduced over time due to wear.

6.1.4.4 Uncontrolled movements

In the following cases, the valve disc's position may change in an uncontrolled manner due to the system's pressure with resultant effects on the plant:

- Control failure
- Signal error
- Power supply failure during operation
- Incorrect actuator setting
- De-activation of the position switches in the actuator

6.2 Operating limits

6.2.1 Pressure/temperature ratings

Table 5: Permissible operating pressure [bar] (to EN 1092-1)

PN	Material	[°C]							
		RT ⁴⁾	100	150	200	250	300	350	400
10	GP 240 GH	10,0	9,2	8,8	8,3	7,6	6,9	6,4	5,9
16		16,0	14,8	14,0	13,3	12,1	11,0	10,2	9,5
25		25,0	23,2	22,0	20,8	19,0	17,2	16,0	14,8
40		40,0	37,1	35,2	33,3	30,4	27,6	25,7	23,8

Table 6: Test pressure

PN	Shell and leak test (body)	Leak test (back seat)	Leak test (seat)
	With water		With air
	Tests P10 and P11 to DIN EN 12266-1	Testing to API 598	Test P12, leakage rate A to DIN EN 12266-1
	[bar]	[bar]	[bar]
10	15	11	6
16	24	17,6	6
25	38	27,5	6
40	60	44	6

⁴ RT: room temperature (-10 °C to +50 °C)

6.3 Shutdown

6.3.1 Measures to be taken for shutdown

During prolonged shutdown periods, ensure that the following conditions are met:

1. Drain fluids which change their physical condition due to changes in concentration, polymerisation, crystallisation, solidification, etc. from the piping.
2. If required, flush the piping with the valves fully opened.

6.4 Returning to service

For returning the equipment to service, observe the sections on commissioning/start-up and the operating limits (⇒ Section 6.2, Page 23) .

In addition, carry out all servicing/maintenance operations before returning the valve to service. (⇒ Section 7, Page 25)

7 Servicing/Maintenance

7.1 Safety regulations

	DANGER
	<p>Valve under pressure Risk of injury! Leakage of hot and/or toxic fluids! Risk of burns!</p> <ul style="list-style-type: none"> ▷ Depressurise the valve and its surrounding system prior to any maintenance work and installation work. ▷ If there is fluid leakage, depressurise the valve. ▷ Allow the valve to cool down until the temperature of the fluid in all the valve's chambers is lower than the fluid's vaporisation temperature. ▷ Never vent the valve by removing the bonnet bolting or gland packing. ▷ Use original spare parts and appropriate tools, even in emergencies.

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	WARNING
	<p>Fluids handled, consumables and supplies which are hot and/or pose a health hazard Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ When draining the fluid take appropriate measures to protect persons and the environment. ▷ Decontaminate valves used in fluids posing a health hazard.

	NOTE
<p>Before removing the valve from the piping, ensure that the pipe has been taken out of service and released for repair/maintenance work.</p>	

	NOTE
<p>All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit "www.ksb.com/contact" on the Internet.</p>	

Never use force when dismantling and reassembling the valve.

Original spare parts are only ready for operation following assembly/installation and subsequent shell and leak testing of the valve.

7.2 Servicing/Inspection

7.2.1 Supervision of operation

The service life can be extended by taking the following measures:

- Checking the function by actuating the valve at least twice a year
- Regularly greasing the moving parts (⇒ Section 4.5.1, Page 14)
- Adding or replacing packing rings in good time
- Re-tightening or replacing bonnet/cover gasket 411 in good time

7.2.2 Tools required

- Packing extractor
- If required, assembly sleeve (split sleeve design) with the following characteristics:
 - Inside diameter of sleeve equals stem diameter + 0.5 mm.
 - Outside diameter of sleeve equals outside diameter of gland packing chamber + 0.5 mm.
 - Height of sleeve equals height of gland packing chamber as a minimum.

7.2.3 Dismantling the valve

7.2.3.1 General information/Safety regulations

	<p>! WARNING</p>
	<p>Hot surface Risk of injury!</p> <p>▷ Allow the valve to cool down to ambient temperature.</p>
	<p>! WARNING</p>
	<p>Unqualified personnel performing work on the valve Risk of injury!</p> <p>▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.</p>

Always observe the safety instructions and information. (⇒ Section 7, Page 25)
In the event of damage you can always contact KSB Service.

7.2.3.2 Preparing the valve

1. Move the valve to the open position.
2. For valves with actuators, interrupt energy supply and make sure it cannot be switched on again unintentionally.
3. Depressurise and drain the valve.

7.2.3.3 Removing the graphite gland packing

	<p>CAUTION</p>
	<p>Damage to the stem! Leakage at the valve!</p> <p>▷ Work very carefully to avoid damage during assembly/dismantling.</p>

- ✓ The notes and steps stated in (⇒ Section 7.2.3.1, Page 26) to (⇒ Section 7.2.3.2, Page 26) have been observed or carried out.
1. Undo and remove stuffing box nuts 920.2.
 2. Take off gland follower 452.
 3. Remove gland bush 456.
 4. Using the packing extractor, remove packing rings 461.1 and packing end rings 461.2.

7.2.3.4 Removing the bonnet/cover gasket

1. Undo bonnet/cover nuts 920.3.
2. Pull the bonnet with the valve trim out of the body.
3. Completely remove bonnet/cover gasket 411.

7.2.4 Assembling the valve

7.2.4.1 General information/Safety regulations

	CAUTION
	<p>Improper reassembly Damage to the valve!</p> <ul style="list-style-type: none"> ▷ Reassemble the valve in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.

Tightening torques Use an appropriate tool to tighten the fasteners crosswise.

7.2.4.2 Fitting the graphite gland packing

- ✓ The spare parts required are available.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.
- ✓ The stem is in the open position.
- ✓ Stem 200 and gland packing chamber are dry and free from grease. For packing replacement, stem 200 is free from tarnish and deposits.
- ✓ The gland packing chamber is free from foreign matter.
 1. Measure the height of the gland packing chamber.
 2. Place the first packing end ring 461.2 flush onto the base of the gland packing chamber by hand (use assembly sleeve if necessary).
 3. Place packing rings 461.1 flush onto the fitted packing end ring by hand (use assembly sleeve if necessary).
 4. Place the second packing end ring 461.2 on top of the fitted packing rings by hand.
 5. Check that packing end rings 461.2 and packing rings 461.1 are positioned flush against each other in the gland packing chamber.
 6. Guide gland bush 456 into the gland packing chamber.
 7. Fit gland follower 452.
 8. Tighten the stuffing box nuts 920.2 by hand. Align gland follower 452 at a right angle to the stem axis. Make sure that there is a uniform gap between gland bush 456 and the stem.
 9. Pre-compress the gland packing by evenly tightening stuffing box nuts 920.2 crosswise. Establish an initial pre-compression (by displacement) of 0.08 times the total packing height in uncompressed condition, approx. 8 %.
 10. Move the stem to the open position and closed position several times.
 11. Then compress by another 0.02 times the total packing height in uncompressed condition, approx. 2 %.

7.2.4.3 Shell testing and seat tightness testing following gland packing installation

1. Fill the valve with test fluid.
2. Apply test pressure for shell testing.

3. If leakage occurs, tighten the nuts at the gland follower until leakage stops.
4. Reduce the pressure for seat tightness testing.

7.2.4.4 Fitting the bonnet/cover gasket

- ✓ The spare parts required are available.
 - ✓ All dismantled parts have been cleaned and checked for wear.
 - ✓ Any damaged or worn parts have been replaced by original spare parts.
1. Insert a new joint ring 411 into the groove.
 2. Fit the bonnet with the valve trim.
 3. Tighten bonnet/cover nuts 920.3 crosswise to the specified tightening torque (⇒ Section 7.3, Page 28) .

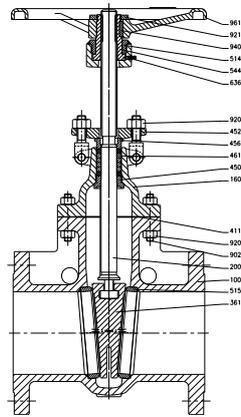
7.3 Tightening torques
Table 7: Bolt tightening torques [kg/m]

Metric size		Material	
Inch	Metric	B7/B16/&L7	B8/B8M
5-16 - 18 UNC	M8 x 1,25	2,0	2,0
3/8 - 16 UNC	M10 x 1,5	2,8	2,8
7/16 - 14 UNC	-	4,2	4,2
1/2 - 13 UNC	M12 x 1,75	7,0	6,3
9/16 - 12 UNC	-	9,7	8,6
5/8 - 11 UNC	M16 x 2	13,2	11,8
3/4 - 10 UNC	M20 x 2,5	23,6	20,8
7/8 - 9 UNC	M22 x 2,5	37,5	33,3
1 - 8 UNC	M24 x 3	56,8	49,9
1 - 1/8 - 8 UN	M30 x 3,5	83,2	74,2
1 - 1/4 - 7 UN	M33 x 3,5	117,2	104,0
1 - 3/8 - 8 UN	M36 x 4	159,4	141,4
1 - 1/2 - 8 UN	M39 x 4	210,6	187,1
1 - 5/8 - 8 UN	M42 x 4,5	270,9	241,1
1 - 3/4 - 8 UN	M45 x 4,5	342,9	304,8
1 - 7/8 - 8 UN	M48 x 5	425,1	379,0
2 - 8 UN	M50 x 1,5	521,7	463,5
2 - 1/8 - 8 UN	-	623,5	560,5
2 - 1/4 - 8 UN	M56 x 5,5	753,7	669,9
2 - 1/2 - 8 UN	M64 x 5	1045,4	929,7

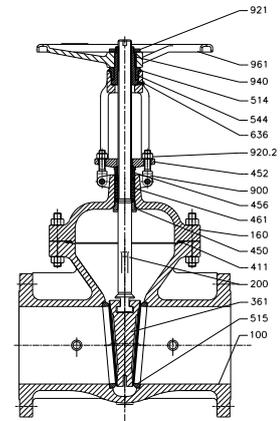
8 Related Documents

8.1 General assembly drawing with list of components

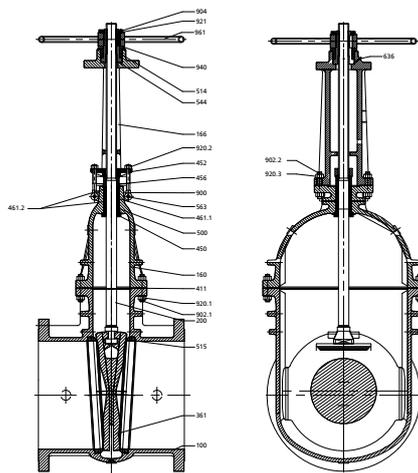
Model with flanged ends



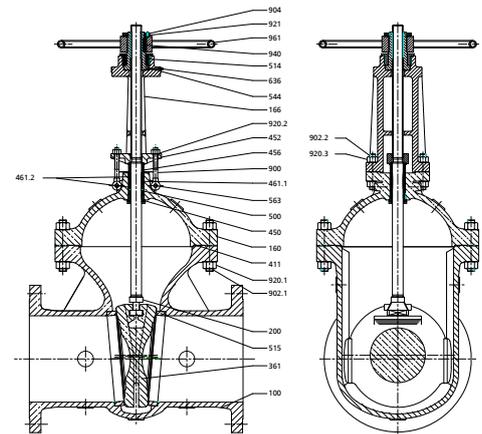
PN 10 - 25
DN 50 - 300



PN 40
DN 50 - 300

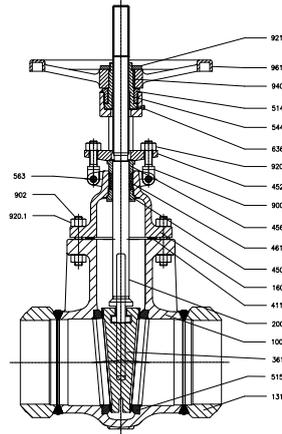


PN 10 - 25
DN 350 - 400

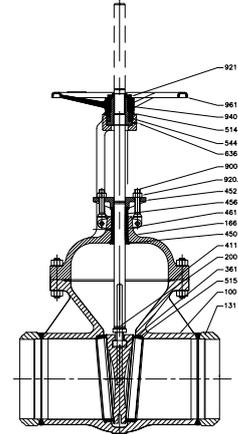


PN 40
DN 350 - 400

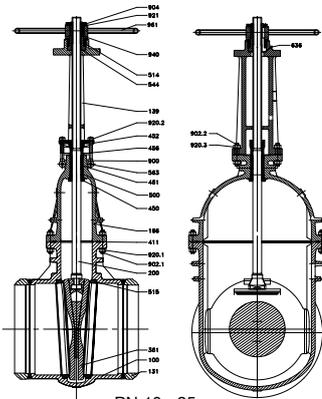
Model with butt weld ends



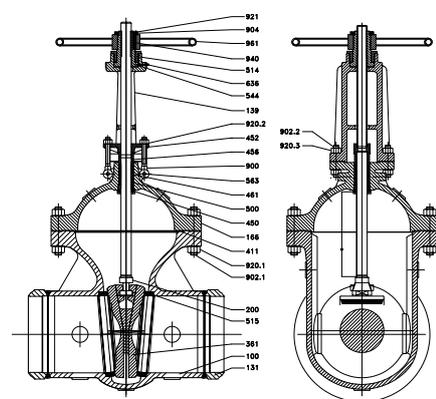
PN 10 - 25
DN 50 - 300



PN 40
DN 50 - 300



PN 10 - 25
DN 350 - 600



PN 40
DN 350 - 400

Table 8: Parts list

Part No.	Description	Material	Material number	Note
100	Body	GP 240 GH	1.0619	-
131	Connection branch	P 265 GH	1.0425	-
160	Bonnet	GP 240 GH	1.0619	-
166	Yoke	A216 WCB	-	Equivalent DIN material: GP 240 GH
200	Stem	A182 F6A	-	Equivalent DIN material: X 10 Cr 13
361	Flexible wedge	A216 WCB	-	Equivalent DIN material: GP 240 GH
Seat/disc interface	Body	Stellite 6	-	-
	Wedge discs	13 % Cr	-	-
411	Joint ring	SS316 graphite	-	-
450	Back seat	A276 410	-	Equivalent DIN material: X 12 Cr 13
452	Gland follower	A216 WCB	-	Equivalent DIN material: GP 240 GH
456	Gland packing	A276 410	-	Equivalent DIN material: X 12 Cr 13
461.1	Packing ring	Graphite	-	-
461.2		Graphite	-	Packing end ring
500	Neck ring	A276 410	-	≥ DN 400

Part No.	Description	Material	Material number	Note
514	Yoke bush	A29 M 1035	-	Equivalent DIN material: C 35
515	Seat ring	A105	-	P 250 GH
544	Threaded bush	A439 D-2	-	Free from non-ferrous metals
563	Grooved pin	A29 M 1035	-	Equivalent DIN material: C 35
636	Lubricating nipple	SS304	-	-
900	Eyebolt	A307-B	-	Equivalent DIN material: St 50.11
902.1/.2	Stud	A193 B7	-	Equivalent DIN material: 24 CrMo 5
904	Grub screw	-	-	-
920.1/.2/.3	Hexagon nut	A194 2H	-	Equivalent DIN material: C 35
921	Slotted round nut	A29 M 1035	-	Equivalent DIN material: C 35
940	Key	A29 M 1035	-	Equivalent DIN material: C 35
961	Handwheel	QT400-18	-	≤ DN 350, nodular cast iron
		A29 M 1020	-	> DN 350 Equivalent DIN material: C 22

8.2 Dimensions and weights

For dimensions and weights please refer to the type series booklet.

8.3 Installation instructions

The gate valves are designed for a max. differential pressure equal to the permissible operating pressure.

If a bypass line is required or requested for other reasons, an ECOLINE GLF 800 globe valve as per type series booklet 7361.14 is used as bypass valve. The nominal size of the globe valve depends on the gate valve nominal size (see table).

Table 9: Nominal size of bypass valve

Nominal size of gate valve	Nominal size of bypass valve
DN 150 - 200	DN 15
DN 250 - 350	DN 25
DN 400 - 600	DN 40

Flow may pass a gate valve in either direction.

Table 10: Differential pressures and torques

PN	DN	Handwheel ⁵⁾	Max. torque ⁶⁾	Max. Δp of handwheel ⁷⁾	Max. Δp of gearbox ⁸⁾⁷⁾
	[mm]	[mm]	[Nm]	[bar]	
10	50	203	6	10	10
	65	254	9	10	10
	80	254	10	10	10
	100	254	15	10	10
	125	356	24	10	10
	150	356	29	10	10
	200	356	47	10	10
250	457	75	10	10	

PN	DN	Handwheel ⁵⁾	Max. torque ⁶⁾	Max. Δp of handwheel ⁷⁾	Max. Δp of gearbox ⁸⁾⁷⁾
	[mm]	[mm]	[Nm]	[bar]	
10	300	508	112	10	10
	350	508	146	10	10
	400	610	197	10	10
	450	700	258	10	10
	500	800	337	10	10
	600	800	557	8	10
16	50	203	7	16	16
	65	254	11	16	16
	80	254	12	16	16
	100	254	20	16	16
	125	356	32	16	16
	150	356	40	16	16
	200	356	67	16	16
	250	457	111	16	16
	300	508	166	16	16
	350	508	219	16	16
	400	610	298	16	16
	450	700	394	15,3	16
	500	800	514	13,4	16
	600	800	852	7,8	16
25	50	203	9	25	25
	65	254	13	25	25
	80	254	16	25	25
	100	254	27	25	25
	125	356	44	25	25
	150	356	56	25	25
	200	356	98	25	25
	250	457	164	25	25
	300	508	246	25	25
	350	508	327	20,4	25
	400	610	450	17,7	25
	450	700	597	15,1	25
	500	800	779	13,2	25
	600	800	1295	7,7	25
40	50	203	12	40	40
	65	254	19	40	40
	80	254	23	40	40
	100	254	42	40	40
	125	356	78	40	40
	150	356	101	40	40
	200	457	176	40	40
	250	508	282	40	40
	300	508	414	26,6	40
	350	610	530	23,3	40

PN	DN	Handwheel ⁵⁾	Max. torque ⁶⁾	Max. Δp of handwheel ⁷⁾	Max. Δp of gearbox ⁸⁾⁷⁾
	[mm]	[mm]	[Nm]	[bar]	
40	400	700	726	19,4	40

- The above ΔP shut-off pressures are the values permitted in the installation for different actuation methods.
- The max. differential pressure is calculated on the basis of a max. handwheel rim force as per DIN EN 12570.
- The seat test pressure shall be 1.1 times the above value.
- Select the options based on the shut-off pressure specified by the customer.
- If the value of ΔP selected from the table is less than the maximum working pressure as per DIN EN 1092-1, the shut-off pressure selected and the corresponding seat test pressure (1.1 times the selected value) must be approved by the customer to avoid confusion during third-party inspection.

⁵ Handwheel diameters not applicable for valves with gearboxes

⁶ The maximum torque must not be exceeded.

⁷ The maximum differential pressure must not be exceeded.

⁸ For detailed information on selecting the suitable gearbox version please contact your KSB sales houses or KSB contact.

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