Operation maintenance manual

Gate Valves

Table of contents

1. Generalities

The following operation instructions are valid for F & M - Gate valves of figure no.

030,031,032,033,034,035,036,
037,052,066,067,072,074,075,076

which serve to shut the flow of liquids, gases and steams in pipelines, and of course to let it through, whenever they are in OPEN status.

F & M Valves are subjected to the rules according to DIN EN standards as well as the technical regulations AD2000 A4 and PED 2014/68/EU in their development and construction.

By a correct assembling, maintenance or repair we guarantee an activity free of troubles.

The manufacturer carries no responsibility for efficiency and safety of the valves, whenever these operating instructions are not observed and followed accurately.

The valves are marked, according to DIN/EN 19 (ISO 5209) as follows: nominal diameter (DN), nominal pressure (PN), body material, heat-no or specimen-no, manufacturer brand and factory number, and if necessary, flow direction arrow, admissible operating temperature and admissible operating pressure (bar).

By affixing the CE mark to the fittings, we also declare conformity according to DRGL 2014/68 / EU

ATTENTION! The valves must not be activated beyond the limits and rules indicated in the different documents (such as operation rules, purchase documents, type sheets). Operations beyond the indicated limits lead to overstrain which cannot be sustained by the valves.

A non-observance of this warning can cause injuries to persons and defects of the machines, such as:

- Injuries caused by escaped medium (cold/hot, toxic, under pressure),
- Affect in activity or damage of the valve.

The descriptions and rules included in this operation instruction refer to standard types but are also valid for alternatives.

These operation instructions do not take into consideration:
- Any accident and incident which can arise by assembling, operation or commissioning of the valves.
- Any safety rule in relation with the place where the valve is installed. The operator is responsible for the observation of the safety rules, - also by the assembling staff.

The connected loads prescribed for driven valves, as well as the instructions for assembling, commissioning and operation have absolutely to be observed.

ATTENTION! It is essential that the valves are handled by skilled staff that must be aware of the interactions between the valves and the system in which they are installed.

An incorrect use of a valve may cause strong consequences to the complete system, such as:
- Escape of medium
- Stop of the unit
- Affects, decreases or increases of operation or work of a system or unit.

For any further inquiries or in case of damage, please contact F & M Armaturen.

In case of local inquiries or orders, especially for spare parts, please indicate the production or factory serial number, the type, the model version and possibly also the year of construction.

The technical data referring to the valves can be found in their technical documentations (paragraph 4).

In case of a return transport it must be proceeded as explained in paragraph 3 <Transport>.

2. Safety

These operation instructions contain essential information that has to be observed by assembling, operation and commissioning of the valves.

For this reason, they have to be read by the assembling staff, by the skilled staff and by the operator before the valve is assembled and put into operation and they should always be kept in the proximity of the valve.

Not only the general safety rules indicated in this main paragraph have to be observed, but also the other ones indicated in other paragraphs.

2.1 Indication of notes in the operation instructions

The safety warnings contained in this operation instruction, which have to be observed in order to avoid injuries to persons, are indicated by the following general and particular picot-graphs:

Warning!

Security signal acc. to DIN 4844 W 9

Beware of the electrical tension!

Security signal acc. to DIN 4844 - W 8

In order to avoid defects of valve efficiency and of its accesso-ries the following warning mark has to be observed:

ATTENTION!

The signs marked directly on the valve (such as DN) have absolutely to be considered and kept in a readable condition.

2.2 Dangers that can result if safety instruct - tions are not observed.

If the safety instructions are not observed injuries to persons, environment and valve, or system can arise, and the indemnity rights get lost.

In particular the non-observance of the safety notes can cause dangers such as:
- Break down of important functions of the valve or unit
- Failure of prescribed methods of commissioning and handling
- Danger to persons caused by electrical, mechanical and chemical impacts.
- Environmental injuries caused by a leakage of dangerous materials.

2.3 Working with safety consciousness

The safety instructions included in this paper, the national regulations for prevention of accidents, as well as the internal regulations referring to work, operation and safety have to be observed by the operator.

2.4 Safety instructions for the operator / user

- When ever some hot or cold valve parts (f. ex. Casing parts or handwheel) may cause any danger, these parts have to be constructed in a way that they are protected from contacts.
- The contact protection for moving parts (such as coupling) must not be taken away while the machine is working.
- Leakages (f. ex. in spindle gaskets) of dangerous conveyed materials (explosive, toxic, hot) have to be removed in a way that no danger to persons or environment can arise. Legal determinations must be respected.
- Injuries by electrical energy have to be excluded (please find details to this point in the VDE and local power supply enterprise regulations).

2.5 Safety instructions for commissioning, inspection and assembly works.

It must be provided that all commissioning, inspection and assembly works are executed by skilled staff, who must have previously studied these operation instructions.

Basically, when any kind of work on a valve is executed, the valve has to be cooled down and free of pressure and the evaporation temperature of the medium must be lower than the temperature of all parts it gets in contact with.

Also, basically, works on a valve have to be executed when it is stopped. The procedure to stop a valve operation is described in this paper and has absolutely to be observed.

Valves which get in touch with health injuring media have to be decontaminated.

Immediately after the work is done, all safety and protection devices have to be put into position or operation again. Before putting the valve into operation again, the points referring to paragraph 6 <putting into operation> have to be observed.

2.6 Arbitrary reconstruction and manufacture of spare parts

Reconstructions or modifications of the valve are only acceptable under agreement with the manufacturer. The use of original spare parts and by the manufacturer authorized accessories promotes safety. If any damage is caused by using other parts the liability for the consequences can be cancelled.

2.7 Inadmissible operation modes

A safe operation is only guaranteed if the valve is used according to the determinations included in the „generalities“ of this operation instruction. The limits included in the technical documentation must not be exceeded.

3. Protection, Transport and storage

3.1 Corrosion protection

3.2 Carbon steel valves

Valves made out of unalloyed or low alloyed cast steel are painted with a hard-sticking primer made of a 2-components color based on epoxy resin paint. The minimum film thickness is 70 µm. The inner surfaces are free of paint and only coated with a temporary corrosion protection (e.g. oil). Machined flange facings are protected against outside influences with a strippable vanish.

3.2.1 Stainless steel valves

Valves made out of stainless steel will be delivered without coating.

3.2 Transport

The valves are delivered in a closed condition and its connecting holes are shut up by cover caps.

Valves will be supplied as ready for operation.

ATTENTION! During transportation and storage valve have to be closed. Connecting holes have to be shut up by suitable means (cover caps, foils) in order to avoid any damage to the valve seats.

ATTENTION! In order to avoid damages the valves must not be hanging on the handwheel, or on a possible connected motor or on any other accessory.

Valve weights are indicated in the corresponding manufacturer documents (type sheets ☞ paragraph 4.1 <corresponding documents> acknowledgement)

After delivery, respectively before assembly the valves have to be inspected in order to exclude any transportation damage.

3.3 Storage

The storage has to be effected in a way that it can work perfectly even after a longer storage period.

For this purpose, it is necessary
- To keep the valve closed (in order to protect the seat facings)
- To take measures against soiling (dust, sand, mortar, respectively building materials), frost and corrosion using plastic foils.

When storing valves with soft gaskets (of elastomer) the storage regulations for elastomer (DIN 7716) have to be observed:
- The store must be dry, free of dust and moderately ventilated. Store temperature should not go over 25°C.,
- stocks on hand have to be used up in order to avoid long storage periods,
- As already mentioned above, the valves have to be in ”closed“ position during the storage. However, the soft closure elements should be shut with little power, in order to avoid a rush aging of the elastomer.

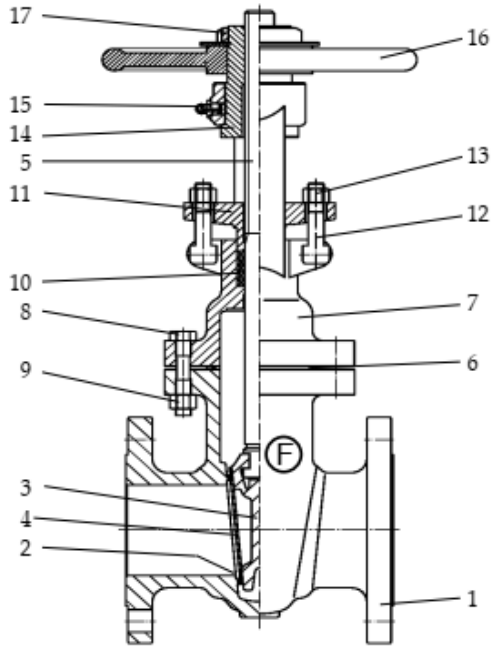
4. Description / documents

The following pictures represent some examples for the principle valve construction. Pictures and information referring to particular construction series can be found in the corresponding type sheets.

4.1 General view: documents

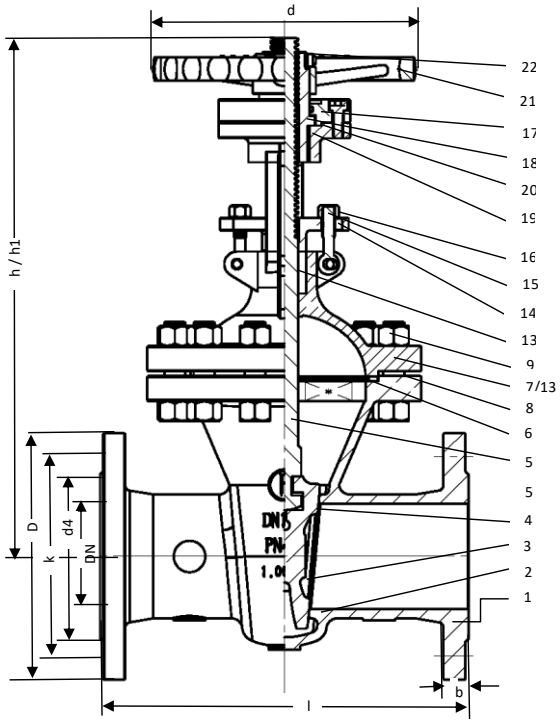
4.1.1 Gate valve with flexible wedge

bolted bonnet,
outside screw and yoke,
rising stem,
non-rising handwheel,
stem seal stuffing box,
back seat,
flanges acc. to EN 1092-1,
facing acc. to EN 1092-1
length acc. to EN 558, R14



4.1.2 Gate valve with flexible wedge

bolted bonnet,
outside screw and yoke,
rising stem,
non-rising handwheel,
stem seal stuffing box,
back seat,
flanges acc. to EN 1092-1,
facing acc. to EN 1092-1
length acc. to EN 558, R15, R26, R27



Pos.	Benennung	Designation	Material	WNr./DIN
1	Gehäuse	body	GP240GH+N	1.0619N
2	Dichtfläche gehäuse	body seat	13% Cr	/
3	Keil	wedge	GP240GH+N	1.0619N
4	Dichtfläche Keil	wedge seat	13% Cr	/
5	Spindel	stem	X20Cr13	1.4021
6	Dichtung	gasket	graphite/SS	/
7	Haube	bonnet	GP240GH+N	1.0619N
8	Gewindebolzen	stud bolt	25CrMo4	1.7218
9	Skt.-Mutter	hexagon nut	25CrMo4	1.7218
10	Packung	packing	graphite	/
11	Gewindebolzen ≥ DN125	stud bolt	25CrMo4	1.7218
12	Skt.-Mutter ≥ DN125	hexagon nut	25CrMo4	1.7218
13	Bügelaufsatz ≥ DN125	yoke	GP240GH+N	1.0619N
14	Stopfbuchsbrille	gland flange	GP240GH+N	1.0619N
15	Klappschraube	hinged screw	GP240GH+N	1.0619N
16	Skt.-Mutter	hexagon nut	Ck35	1.1181
17	ISO-Flansch	ISO-flange	C25	1.0406
18	Gewindebuchse	threaded bush	GJS-400-15	0.7040
19	Lager ≥ DN125	bearing	/	/
20	Schmiernippel ≥ DN125	lubricating nipple	/	/
21	Handrad	handwheel	C-stahl	1.0036
22	Handradmutter	handwheel nut	C35E	1.1181

4.3 Function mode

Gate valves consist of the pressure leading parts: body (1), bonnet (7) and working unit. Starting from the nominal diameter DN 1 5 0 (Fig. no.052, 072), respectively DN 200, the yoke (13) is bolted together with the bonnet (7).

Body (1) and bonnet (7) are connected by the stud bolts (8) and hex. nuts (9) and are sealed up outside by the gasket (6).

The closure unit consist essentially of:

- in gate valves with one single wedge: wedge (3), stem (5) and the driving element handwheel (21).

The passage of the stem (5) through the bonnet (7) is sealed up by a packing ring (10) which is tighten by 2 nuts (16) with the stuffing box glands (11/14).

The seal seats of body (1) and wedge (3), are of rustproof materials.

4.4 Applications limits

ATTENTION! Depending on the materials the pressure temperature graduations (rating tables) of the respective materials are to be taken in consideration. Moreover, application is limited depending on the choice of the seal material and it is influenced by the material combination of the connecting elements (bolts and nuts).

4.5 Alternatives / accessories

Stem seal:

a) Stuffing box with lantern and testing and flushing connection

b) Spring loaded stuffing box (centralized or decentralized set of springs)

c) Bellow seal with additional security stuffing box

Pressure relief device:

d) Hole in body or on one side of the closing device

e) By-pass (connection of the pressure chamber on the entry with the pressure chamber overhead of the stop device) with, respectively without overpressure valve

- Extended bonnet
- Stem protection
- Position Indicator
- By-pass

5. Installation

5.1 Generalities

ATTENTION! The pipeline has to be installed in a way that injurious shearing and bending forces during installation and activity are kept away from the valve bodies (1). This is to avoid leakiness and destruction of the body.

ATTENTION! Before installation the cover caps have to be removed from the connecting holes.

The flange facings must be clean and undamaged.

The flange gaskets must be well centralized.

Only bolts and gaskets of admissible materials may be used. For the flange connection all flange drill holes have to be used.

When varnishing the pipelines, no bolts and nuts, stems, stuffing boxes and accessories must be painted (function affects). During any construction work the valves have to be protected from dust,

sand and any other construction material. (Please cover with suitable means).

Valve hand wheels, by-passes and all other adjacent parts must not be used as steps.

Valves and pipelines working in high temperatures (>50°C) or low (<0°C) must be protect from touch by insulating. Alternatively, the danger must be indicated by warning boards on the valve side.

ATTENTION! If in air-conditioning, cooling and refrigerating systems any condensation water, respectively danger of icing appears, a specialistic and diffusion-tight insulation of the whole valve, if necessary, including the handwheel, has to be provided Icing causes a blocking of the valve operation capabilities.

If a gate valve is mounted in a pipeline as an end valve it has to be secured by convenient measures from an unauthorized or unintended opening. It can also be shut by a blind flange on the exit side, in order to prevent any injury to parts and / or persons.

5.2 Installation position

Gate valves should preferably be installed with a vertical, upward-pointing spindle. Deviating installation positions must be agreed with F & M Armaturen.

The direction of flow is not prescribed for gate valves. They can also be used with changing flow directions.

Exception: If pressure relief devices are installed, the direction of flow is prescribed and marked accordingly with a flow direction arrow.

5.3 Avoiding excessive pressures

F & M Armaturen are generally only suitable for operating conditions that are shown in the associated pressure / temperature tables. Appropriate measures must be taken to ensure that there are no impermissible loads on the fittings, the arrangement in the pipelines or unfavorable operating conditions.

Should it e.g. in terms of system technology or because of the mode of operation, that the heated medium enclosed in the third valve room when the valve is closed causes an impermissibly high pressure, the system planner or operator must provide appropriate safety devices such as provide a pressure relief hole or the like.

5.4 Welding instructions / pipeline assembly

For welding works on the valves, the pipeline manufacturer is responsible.

ATTENTION! Whenever the valves are welded with butt welding ends or socket weld ends and the pipe line is welded with valves that are already installed (pipe line assembly), it has to be taken care that no impurity get inside of the body or even stay there, otherwise the seat facings and the stem thread can be damaged.

ATTENTION! During welding works valves have to be as wide open as to exclude any contact between the sealing parts, otherwise the seats can get fused.

ATTENTION! If welding works are done in the proximity of soft seal valves, it has to be taken care that the valve is not warmed up over the temperature limit indicated in the type sheet. (Reason: damage of the seat surfaces.)

ATTENTION! The welding cable (opposite pole) must be attached by no means to any functioning parts of the valve, otherwise scorching can be caused.

The insert depth of valves with socket weld ends has to be observed accordingly to the referring standard. A gap between pipe end and sleeve ground serve as prevention from inadmissible welding seam strain.

5.5 Valves with motor

The rules according to VDE 0100 and VDE 0165 (ex-protection) have to be observed. All electric devices such as adjusters, switch boxes, magnetic valves, end switches, etc., have to be installed in dry rooms and safe from overflow. Tension and frequency have to correspond to the data on the factory label.

6. Operation/putting into and out of operation

(see also indications in paragraph 5 <installation>)

6.1 Operation / putting into operation

6.1.1 Generalities

Before putting the valve into operation its material, pressure and temperature data have to be compared with the operation terms of the pipeline.

Eventually appearing shock pressures (water hammer) should not exceed the maximal admissible pressure. Protective measures have to be provided.

The line system of new plants and especially after repair works has to be flushed in order to remove harmful solid matters, respectively bead of weld.

6.1.2 Operation

Looked at from above the valves can be closed by a clockwise rotation of the handwheel and opened by a counterclockwise rotation. Relative symbols are to be seen on the handwheel top.

ATTENTION! The use of any auxiliary lever to turn the hand- wheel is not admitted. Too big forces could be injurious especially for soft seal valves because their seat seals could be squeezed.

Gate valves are applied in a way that they are either completely open or completely closed.

ATTENTION! When throttling it can happen that a too high noise grows, and an unwanted wear or destruction of the valve is caused by cavitation's.

6.1.3 Function check up

The following functions have to be checked up:

The shutting function of the installed valve must be checked up opening and closing it several times.

The stuffing box packing efficiency has to be checked up before the first loading by full operation pressure and temperature. If necessary, the nuts on the stuffing box glands, respectively the stuffing box have to be evenly tightened.

The sealing efficiency of the bolted bonnet connections with the flat seal must be examined after the first loading/warming up of the valve. (Maintenance-free valves too!) If necessary, the bolts connections have to be gently, crosswise and evenly tightened.

ATTENTION! Before tightening the bolts, the gate valve has to be opened by approximately two handwheel turns. (Prevention of tensions).

6.1.4 Valves with motor

The regulating ways and forces of valves with electric / pneumatic / hydraulic motors have to be limited.

Electric switches must be:

- Valve position "CLOSED": torque-dependent
- Valve position "OPEN": stroke-dependent

6.2 Putting out of operation

During longer standstill periods liquids whose form can change in concentration due to polymerization, crystallization, solidification or the like, have to be let out of the line system. If necessary, the line system has to be rinsed by completely open valve.

7. Commissioning / maintenance

7.1 Safety notes

During all commissioning and maintenance works on the valves the following safety notes as well as the general indications under paragraph 2 <safety> must be observed.

ATTENTION! In any case, also in emergency, only suitable spare parts and tools have to be used, otherwise a perfect function is not guaranteed.

7.1.1 Valve disassembly

Before dismounting from the pipeline or before commissioning and repair works are made directly on the valve, more precisely:

- before loosing the bolted bonnet
- before loosing the gland bolts, respectively the stem bushes or the stem nuts
- before opening the yoke top for commissioning the bearing
- before dismounting the bonnet, respectively the yoke
- before disassembling a directly on the yoke connected motor
- before loosing shutting, opening and pressure release threaded plugs
- before removing the ring nut for repair

the valve has to be completely discharged from pressure and has to be cooled up until the evaporation temperature of the medium is lower than all the chambers getting in contact with it. Then any scald can be excluded.

Opening a valve under pressure is a lethal danger!

In case those toxic or easily inflammable mediums are conveyed, or mediums the residues of which in contact with humidity of the air can lead to corrosion damages, the valve has to be drained and flushed, respectively ventilated.

If necessary protecting clothes and protective masks have to be worn.

Due to the installation position the residual liquid possibly remained in the valve have to be drained off and correctly disposed.

Before a possible transportation, the valves have to be carefully emptied and flushed.

7.1.2 Motor dismounting

In case that stray supplied motors (electric, pneumatic, hydraulic) have to be dismounted from the valves, the stray energy supply must be switched out at first and the warnings under paragraphs 2, 7.1.1 as well as the motor operation instructions have to be observed.

Actuators with an integrated spring load cannot be dismounted.

Attention: prestressed springs!

For any further information please contact F & M Armaturen

7.2 Maintenance

The valves are constructed in almost all their parts maintenance free. Materials for sliding parts are chosen which cause a very minimal wear. In order to improve operation safety and to minimize repair costs, all valves, specially those ones which are seldom put into operation or are hard to get to, should be regularly tested, that means, put into operation (OPEN – CLOSED) at least once or twice a year.

The operator is responsible to determine the convenient test and maintenance intervals depending on the application of the valve.

The durability of maintenance-free valves and not can be extended if:

- the stem and stuffing chamber surfaces are kept clean and undamaged;
- the mobile parts, such as stems and stuffing box bolts are greased (except oxygen valves) by using standard lubricants acc. to DIN 51825;
- the stuffing box is punctually additionally packed or the packing is renewed;
- the gasket is punctually renewed;

The safety warnings in par. 2, 7.1 and in par. 8 must be observed.

7.3 Valve mounting

After reassembling and before putting into operation the valves have to be subjected to a strength- and tightness-test acc. to EN 12266

8. Troubles and their elimination

8.1 Generalities

All repair and maintenance works have to be done with suitable tools and original spare parts.

The safety notes in par. 2 and 7 have to be observed.

8.2 Troubles / Elimination

Porosity of closing device

In hard sealing valves:

renew the seat facings of the disc, respectively wedge and body by means of suitable grinding devices after bolts have been dismounted. Body and disc respectively wedge seat facings must be grinded so long until their facings show a bearing and continuous moulding.

In soft sealing valves:

- renew the wedge sealing ring after the cover screw has been dismounted.

Leakage of gasket

- Tighten up the cover bolts
- Renew the gasket after the bolts have been dismounted.

Before inserting a new packing ring, respectively a new gasket the facings of bonnet and body must be carefully flushed.

ATTENTION! No additional auxiliary sealing means have to be used for sealing rings free of asbestos. For non-sticking coating only means explicitly recommended by the seal manufacturer have to be used.

For any further information please contact F & M Armaturen.

Leakage of stuffing box packing

- Tighten the stuffing box packing with the nuts to the stuffing box glands, respectively with the stuffing box connections or stem nuts. Hereby it has to be taken care that the friction force does not increase very much.
- Additionally packing the stuffing box: loosen the nuts and lift the stuffing box glands, respectively loosen the stuffing box connections or stem box.

Before repacking, the stuffing box chamber has to be carefully cleaned.

Slotted packing rings have to be inserted with the cut located in opposite position between one ring and the other, precisely 120°-180°.

Lifting a valve for installation on horizontal pipelines (examples)

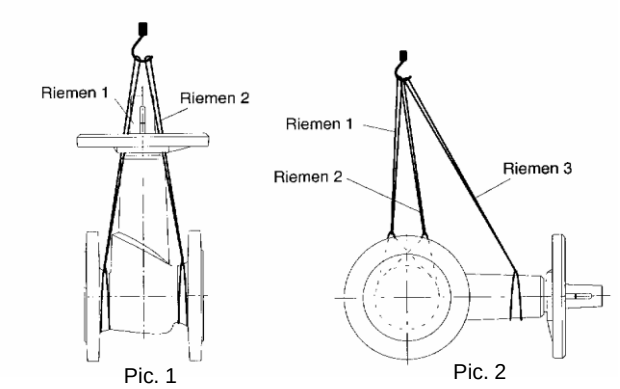
Picture 1

The lifting belts 1 und 2 must be twisted round the body. In order to keep the valve in the shown position and to prevent falling vertically, the two lifting belts should lead to the hook through the handwheel arms.

Picture 2

The lifting belts 1 and 2 must be twisted round the body. Lifting belt 3 serves to hold the valve in horizontal position.

Valves must not be lifted by the handwheel!



Pic. 1 Pic. 2