Fundamentals for ball valves, hand operated
Ball valve type 546, DN10 - DN50
Operating instructions of type 546 incl. multifunctional handle, DN10 - DN50
General information

Several hazard notices are used in this manual to warn you of possible injuries or damages to property. Please read and observe these warnings at all times!

Imminent acute danger!
Failure to comply could result in death or extremely serious injury

Danger

Possible acute danger!
Failure to comply could result in serious injury.

Warning

Dangerous situation!
Failure to comply could lead to injury or damage to property.

Caution

Abbreviations	
Type 546	Ball valve type 546
MF handle	Lockable multifunctional handle
MF module	Multifunctional module
PN	Nominal pressure

Safety information

The same safety guidelines apply for ball valves as for the piping system into which they are built.

The type 546 ball valve is intended exclusively for shutting off, conducting or controlling the flow of allowed media within the permissible pressure and temperature ranges in the piping system into which it has been installed. The maximum service life is 25 years.

Please note that the max. working pressure of the whole valve is determined by the maximum permissible nominal pressure of the connecting part.

Anyone involved with the mounting, dismounting, operation, handling and maintenance (inspection, service and repair) of the valve at the plant where it has been installed must have read and understood the complete instruction manual, and in particular this paragraph pertaining to safety information.
We recommend having this confirmed in writing.

Furthermore:

- Use only perfectly functioning valves and always observe these safety guidelines.
- Keep this documentation readily available in the vicinity of the valve.

It is the responsibility of the piping systems engineer / installer and the operator of such systems into which the ball valve has been built to warrant that

- the piping system has been installed correctly by professionals and its functionality is checked periodically.
- only qualified and authorised personnel mounts, operates, services and repairs the ball valve. Employees must be instructed on a regular basis in all aspects of work safety and environmental protection as indicated by the applicable local regulations – especially those pertaining to pressure-bearing piping systems.
- the valve is only used according to the specifications for which it has been intended, as indicated in this paragraph on safety.
- installation positions and locations in which manipulations can occur unintentionally must be avoided.

Hazardous situations

Do not use ball valves for media containing solids.
Avoid cavitation in control operations.

This could lead to damages/leakage caused by abrasion.

Removing the type 546 from the pipeline.

If the pressure has not been released completely, the medium can exit uncontrollably.

Depending on the type of medium, injury may occur.

Before dismounting, release all pressure from piping system. For hazardous, flammable or explosive media, the piping system must be completely emptied and rinsed before the valve may be dismounted. (Attention: there could still be residue.)

Medium needs to be tapped from a type 546, which is used as an end valve in a pressure-bearing piping system.

The medium can exit / splash uncontrollably.

Depending on the type of medium, injury may occur.

Make certain that the medium is caught safely with the appropriate measures (e. g. connecting a vessel to collect the exiting medium.)

The type 546 is to be stored or dismantled after removal from the piping system.

Residual media can exit uncontrollably.

Depending on the type of medium, injury may occur.

Open the dismounted valve type 546 halfway (45 ° position) and let it drain in a vertical position – catch the medium in an appropriate vessel.

Transport and storage

The ball valve type 546 must be handled, transported and stored with care. Please note the following:

- The type 546 should be transported and / or stored in its original, unopened packaging.
- The ball valve must be protected from harmful physical influence such as light, dust, heat, (humidity) and UV radiation.
- The connecting parts of the ball valve, in particular, must not be damaged by mechanical or thermal influences.
- The ball valve should be stored with the lever in the open position (as it was supplied).

Prior to installation of type 546

To begin with, the ball valve should be inspected for transport damages. Damaged valves must not be installed.

A function test – close the ball valve by hand and open it again – should be done. Ball valves which do not function properly must not be installed.

The ball valve must always be built into the system in the opened position.

Only ball valves whose pressure rating, type of connection and dimensions correspond to the operating conditions may be installed.

For fusion and cementing connections, only join identical materials with one another.

Installation of type 546

The installation dimensions, connections and union nuts of the type 546 have been modified from the type 346.

The use of components and installation dimensions other than those prescribed for the type 546 can cause damage to the piping system.

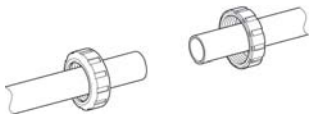
Compare the installation dimensions and specifications in the technical documentation with those of the components at hand.

We recommend only taking the ball valve out of its original packaging just before installation.

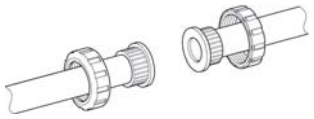
The ball valve and the pipe must be aligned so that the valve is kept free of mechanical stress.

The specific jointing instructions for solvent cementing, fusion, or screw connection methods must be adhered to when installing the valve into a piping system. More information can be found in the operating instructions of the fusion machines or the cementing instructions of the adhesive manufacturer.

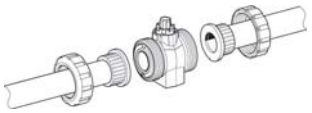
The tightening torque of the flange bolt and other useful information can be found in the chapter Guidelines for fastening bolts.



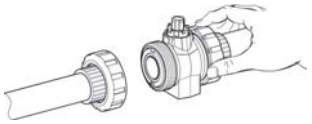
Open the union nuts and slide them onto the pipe ends.



Join the valve ends according to the material and your valve ends (fusion, cementing, thread, flange).



Place the ball valve between the connecting parts.



Screw the union nuts onto the connecting thread of the ball valve body and tighten by hand.

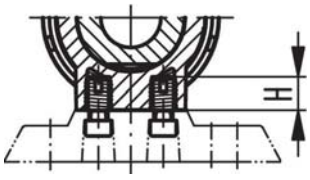
The union nuts of the type 546 must be hand tightened – without the use of additional tools.

If other tools, such as pliers, are used, the material of the union nuts could be damaged. There is also the danger of damaging the thread if they are tightened too strongly.

Operation of the valve causes reactive forces in the pipe to which it is connected. It is therefore necessary to mount the ball valve with its integrated / separate fastener (if available) or to reinforce the corresponding piping directly before or after the ball valve with suitable supports.

If you are using the integrated fastening system in the base of the type 546, please take note of the max. insertion depth H of the screws. Failure to comply can lead to damage of the ball valve housing. The pressure load on a damaged housing can cause breakage.

Max. insertion depth of the screws in the ball



DN	10/15	20/25	32/40	50
Screw	M6	M6	M8	M8
Max. insertion depth H (mm)	12	12	15	15

In piping systems with temperature fluctuations, bending and longitudinal forces can occur if thermal expansion is hindered. So as not to impair functioning of the valve, these forces must be absorbed by implementing suitable fixed points in front of or behind the valve.

Pressure testing

Ball valve pressure testing is subject to the same regulations as apply to the piping system. Detailed information can be found in the «GF Planning Fundamentals» chapter on **Handling and Installation**.

Also applicable:

- Check that all valves are in the required open or closed position
- Fill the piping system and deaerate carefully.

The test pressure on a valve **must not exceed the value 1.5 x PN, (maximum PN + 5 bar).** The components with the lowest PN determine the maximum allowable test pressure in the piping section.

Check the valves and connections for leaks during the pressure test. Record your results.

Intended use

When the leak test has been completed successfully, the test medium may be removed. The system can now be used as intended.

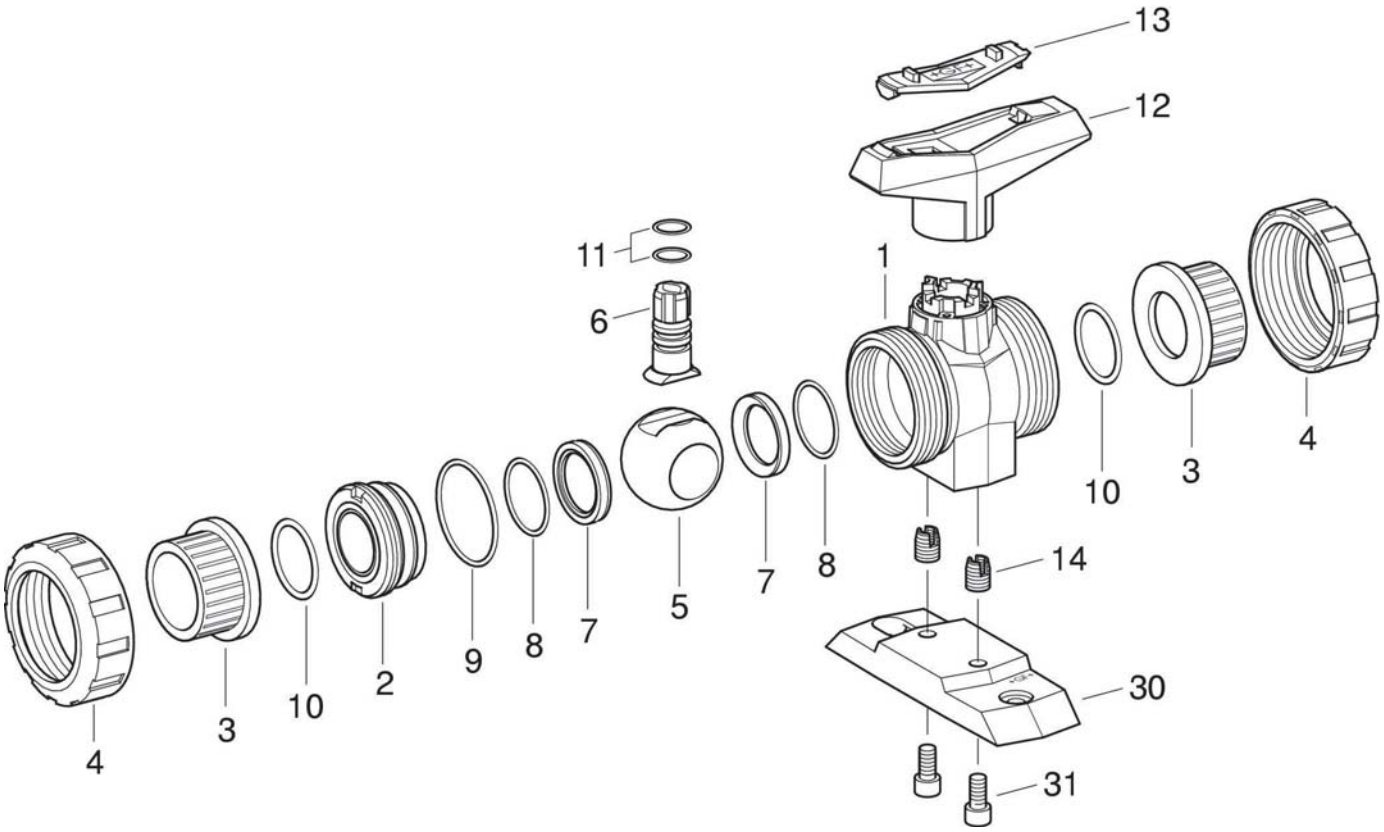
Service - Maintenance

Ball valves require no maintenance under normal working conditions. Periodic inspection to make sure that no medium is leaking is sufficient. Should leakage or other malfunctions occur, follow the instructions given under Safety Information, Hazardous Situations.

We recommend a function test for ball valves which are kept permanently in the same position 1-2x a year to check its operation.

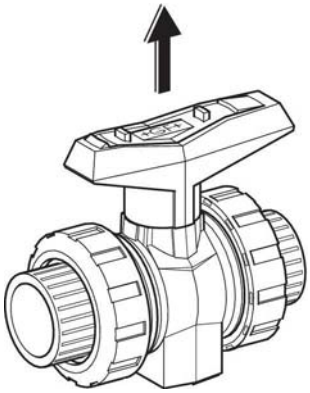
For frequent control operations e. g. valve automation, or due to chemical attack on the sealing material, it may become necessary to replace parts inside the valve. For this purpose, the valve must be removed from the piping system, while adhering to the instructions given under the section Hazardous Situations.

Exploded drawing of manual valve:

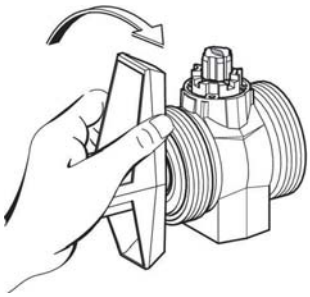


1 Body
2 Union bush
3 Connecting part / valve end
4 Union nut
5 Ball
6 Stem
7 Ball seal
8 Backing seal
9 Body seal
10 Union seal
11 Stem seals
12 Standard handle
13 Handle clip
14 Mounting insert
30 Mounting plate
31 Fastening screws

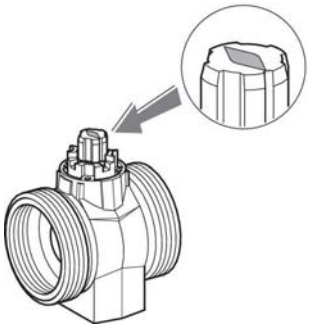
Once the ball valve has been removed from the pipe by loosening the union nut (4) and preparations have been made for drainage, dismantle the valve by following these steps:



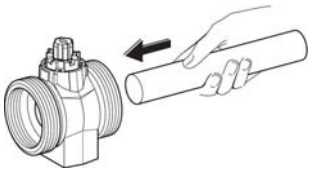
Pull the handle off the stem. The handle can now be used as a tool.



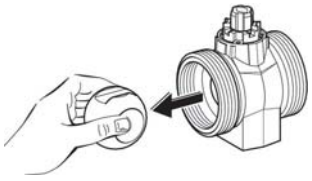
By using the handle clip (13) , the union bush (2) can be unscrewed (Attention: left handed thread).

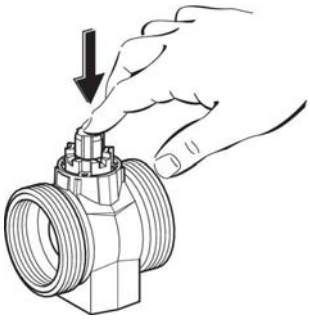


The mark on the spigot must now be at a right angle to the flow direction (closed ball position).



The ball can be pushed out with a rod in a soft material (plastic or wood).





Push the stem down into the valve body and take it out.

The sealing elements, as well as the ball, stem and union bush, can be replaced. Spare parts are available from GF.

Only original GF spare parts designed specifically for this valve may be used for replacement purposes. Orders for spare parts for the 546 valve should include all the details given on the typeplate.

Seals

All the seals (made of e. g. EPDM, FPM) are organic materials which react to environmental influences. They must therefore be kept in their original packaging and stored cool, dry and dark. Seals should be checked for damages from ageing, such as fissures and hardening, before mounting.

Do not use defective spare parts.

Lubricants

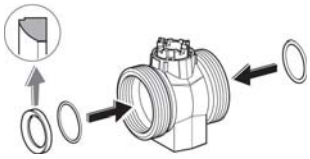
Using the wrong lubricants can damage the material of the ball valve or the seals.

Never use petroleum-based greases or Vaseline (Perolatum).

For silicone-free ball valves, please consult the special manufacturer's instructions.

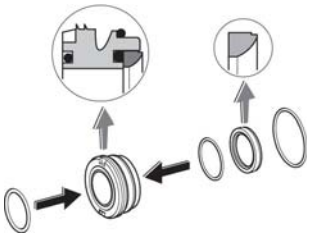
All the seals must be lubricated with a silicone or polyglycol-based grease.

To assemble the individual parts, please proceed according to the following steps:

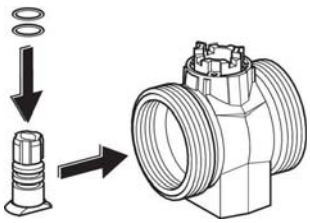


Insert the backing seal (8) and the ball seal (7) in the groove provided for this purpose on the inner side of the stop or the union bush.

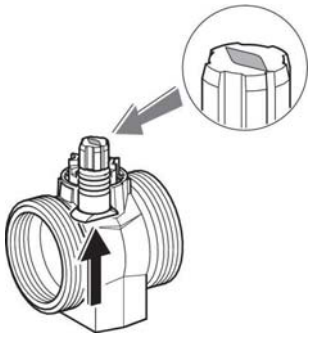
Pull the body seal (9) onto the collar of the union bush (2).



Place the union seals (10) in the groove of the union bush (2) and the fixed housing stop (1).

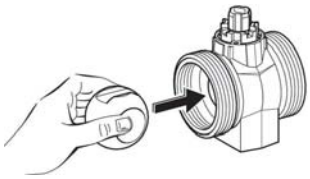


Insert the two lubricated (see Selection of lubricants) stem seals (11) in the grooves of the stem (6).

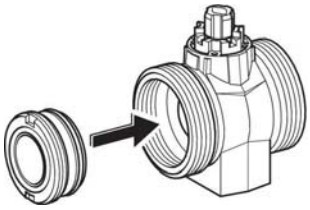


Slide the prepared stem (6) into the body (1) from the inside. The stem is correctly positioned when pushed against the stop from the inside.

Attention: The marks on the spigot must be at a right angle to the flow direction (closed ball position).

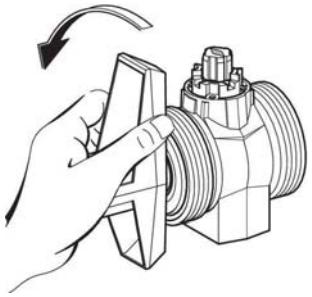


Put the ball (5) through the outlet in the body (1) into the stem guide.

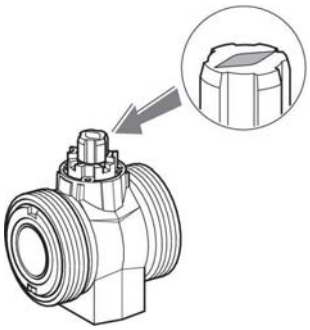


Screw the assembled union bush (2) into the valve body (1) (**Attention**: left-hand thread).

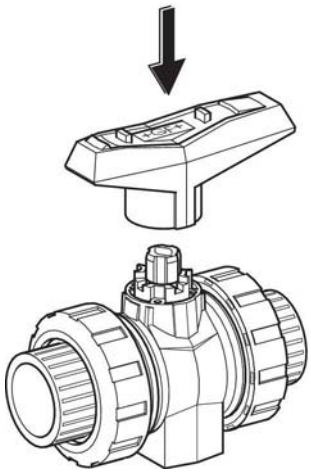
The cams on the handle clip (13) can be used like a tool.



Tighten so that the ball moves snugly.



Attention: The marks on the spigot must now be parallel to the flow direction (open ball position).

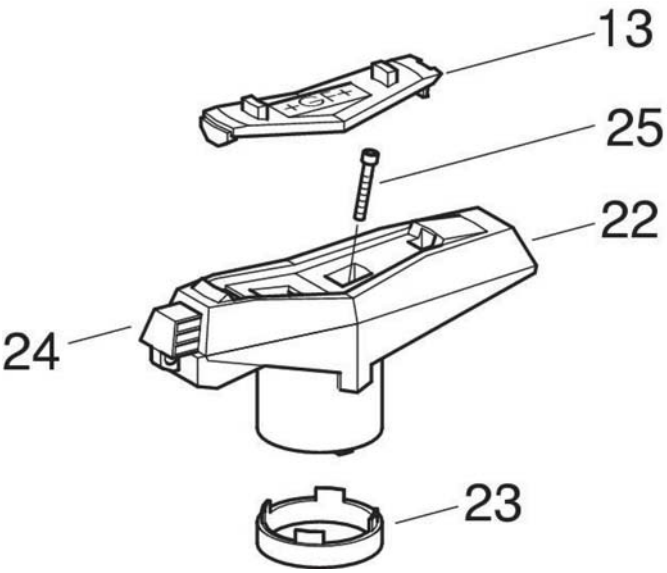


Place the standard handle (12) on the stem (6). The ball valve is now ready for use.

Mounting and using the multifunctional handle

As an alternative to the standard handle, you can use a lockable multifunctional handle (MF handle) with the ball valve type 546.

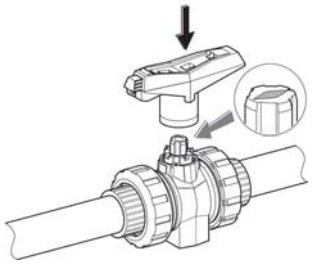
Exploded drawing of the multifunctional handle



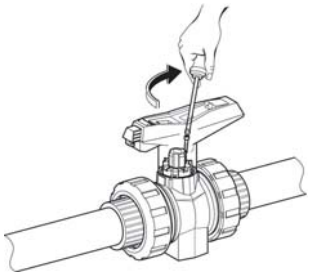
13 Handle clip
22 Multifunctional handle
23 Spacer
24 Unlocking latch
25 Fastening screw (Torx)

To assemble the multifunctional handle, please proceed according to the following steps:

Remove the handle clip (13) with the help of a screwdriver.

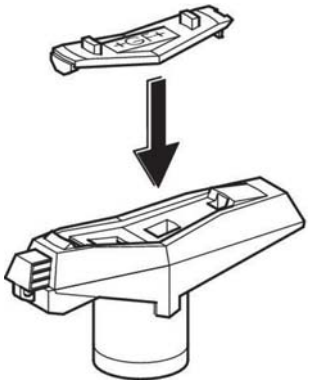


Position the stem according to the illustration. Place the handle on the stem.

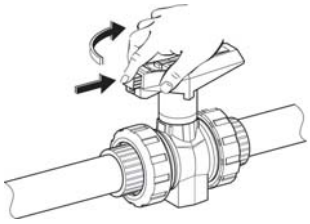


Attach the handle by tightening the pre-assembled screw (25) inside the handle.

At the bottom of the handle shaft there is a spacer (23). Make sure that it is positioned correctly in the shaft (catch).



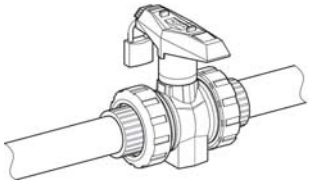
Set the handle clip (13) on the handle again.



Press the unlocking latch (24) into the handle.

Hold the latch in this position and the handle can be rotated 90°.

Working with the MF handle:

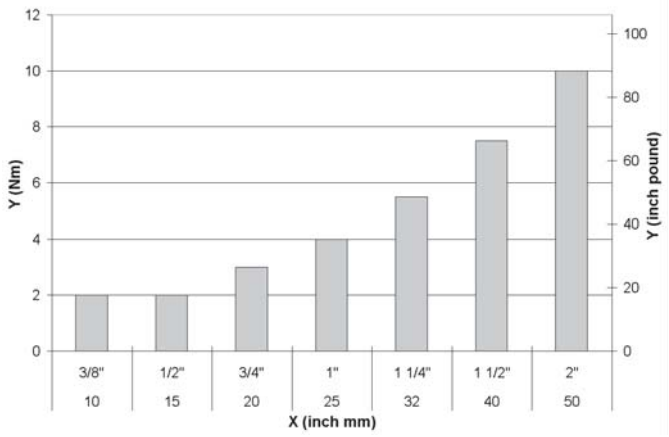


When the latch is released the handle will lock in the respective position and can be secured in this position with a padlock, protecting it from unauthorised access.

Fundamentals for ball valves, hand operated
Ball valve type 546, DN10 - DN50

Technical data of type 546, DN10 - DN50

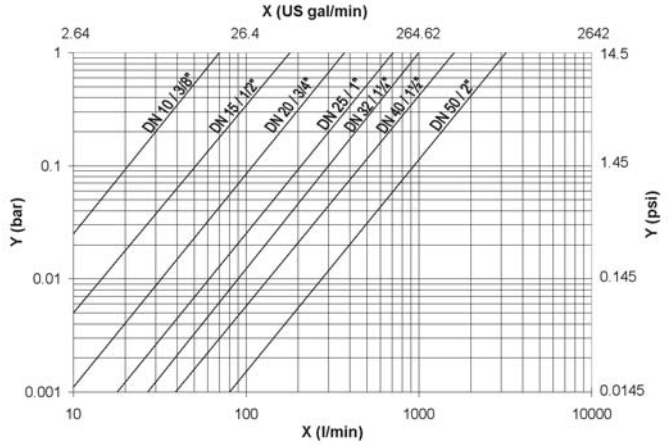
Operating torque



X Size DN (mm, inch)
Y Torque (Nm, inch pound)

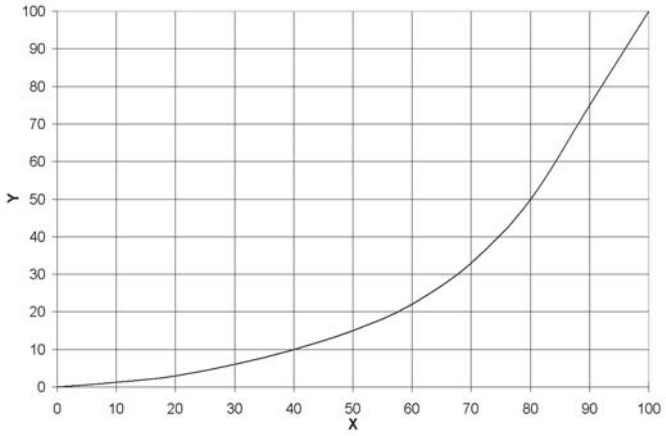
Average values at nominal pressure.
Depending on the application (e. g. operating speed, fluid, temperature, etc.) about 2 times the operating torque should be taken for sizing actuators.

Pressure loss



Medium: water, 20 °C
X Flow rate (l/min), (US gal/min)
Y Pressure loss Δp (bar), (psi)

Flow characteristics



X Open angle (%)
Y Flow factor kv, cv (%)

kv 100 values

DN mm	DN inch	d mm	k_v 100 l/min (Δp=1 bar)	C_v 100 US gal./min (Δp=1 psi)	k_v 100 m³/h (Δp=1 bar)
10	⅜	16	70	4.9	4.2
15	½	20	185	12.9	11.1
20	¾	25	350	24.5	21
25	1	32	700	49.0	42
32	1¼	40	1000	70.0	60
40	1½	50	1600	112.0	96
50	2	63	3100	217.1	186

The kv values for each intermediate valve position can be determined using the flow value characteristic and the k_v 100 values.

Tightening torque of type 546, DN10 - DN50

Flanged joints with flange gaskets or flat gaskets

d mm	DN mm	DN Inch	Total number of screws (for 2 flanged joints) standard nut (height 0.8 x d) [1]	Torque (average values) Profile gasket [2]		Torque (average values) Flat gasket	
				in Nm	in In lbf	in Nm	in In lbf
20	15	½	8 x M12 x 50	10	89	10	89
25	20	¾	8 x M12 x 55	10	89	10	89
32	25	1	8 x M12 x 60	10	89	15	133
40	32	1¼	8 x M16 x 70	15	133	20	177
50	40	1½	8 x M16 x 70	15	133	25	222
63	50	2	8 x M16 x 80	20	177	35	310

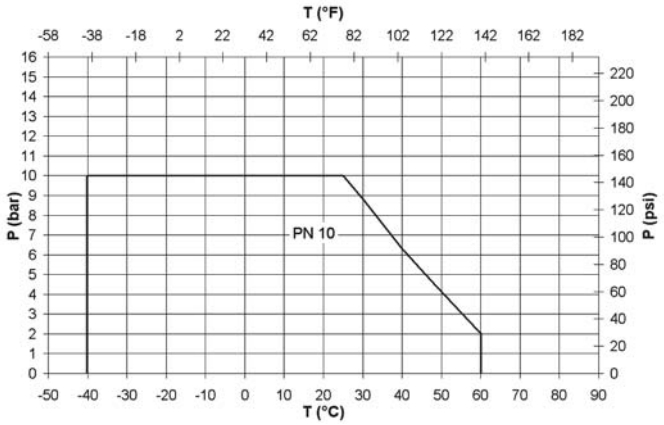
[1] for valve ends type 546 in PP-H in combination with backing flanges, use half of the standard nut height
[2] preferred (plastics-oriented) gasket type

Attention: For more information on the use of the different gasket types, see Chapter: Jointing Technology → Mechanical Joints

Fundamentals for ball valves, hand operated
Ball valve type 546, DN10 - DN50
Pressure-temperature diagrams, type 546 DN10 - DN50

The following pressure temperature diagrams are based on a lifetime of 25 years and the medium water or similar media.

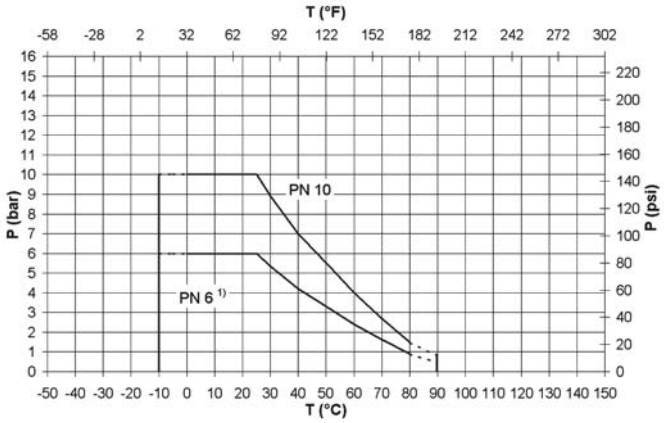
ABS



p Permissible pressure in bar, psi

T Temperature in °C, °F

PP-H



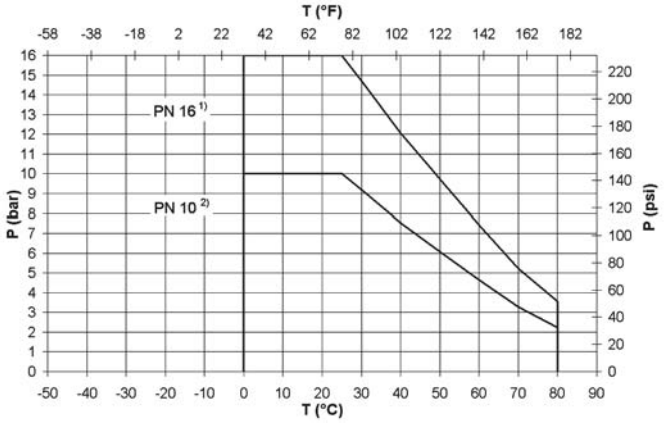
1) E. g. ball valve with PP-H or PE 100 spigot end, SDR 17

p Permissible pressure in bar, psi

T Temperature in °C, °F

For applications with temperatures in the range of the dotted lines, please contact your GF representative.

PVC-C



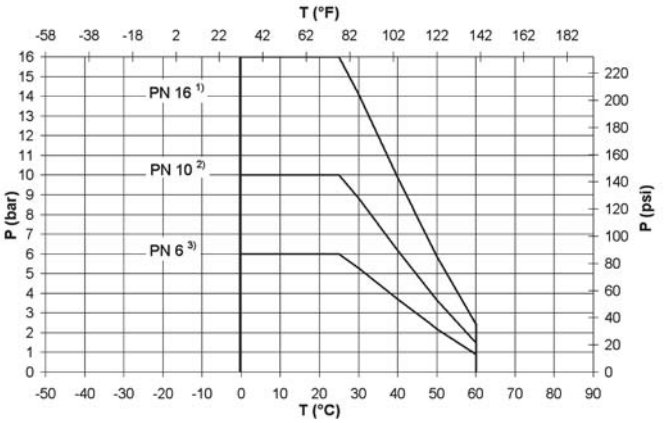
1) The central part of ball valve is designed for the nominal pressure PN 16

2) Depending on the valve end, the nominal pressure is reduced to PN 10

p Permissible pressure in bar, psi

T Temperature in °C, °F

PVC-U



1) The central part of ball valve is designed for the nominal pressure PN 16

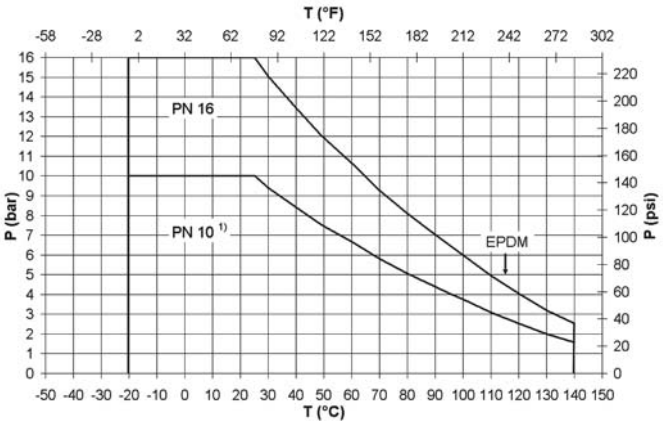
2) Depending on the valve end, the nominal pressure is reduced to PN 10

3) Depending on the valve end, the nominal pressure is reduced to PN 6

p Permissible pressure in bar, psi

T Temperature in °C, °F

PVDF



1) E. g. ball valve with threaded sockets
EPDM seal, max. 100 °C

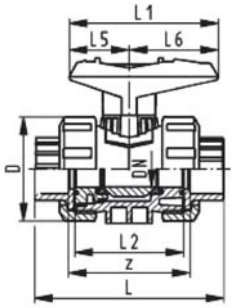
p Permissible pressure in bar, psi

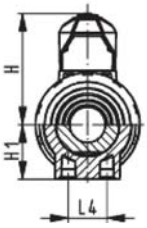
T Temperature in °C, °F

GF Piping Systems
Datasheet

valid from:
8/16/05

Ball valves





Ball valve type 546 PVC-U
With solvent cement sockets Inch BS

Model:

- For easy installation and removal
- z-dimension, valve end and valve nut are **not compatible** with type 346
- Ball seals PTFE
- Without mounting inserts

Option:

- Individual configuration of the valve (see form)
- Multifunctional module with integrated limit switches
- Pneumatic or electric actuators from +GF+

Inch	DN [mm]	PN	kv-value (Δp=1 bar) [l/min]	EPDM Code	FPM Code	kg
⅜	10	16	71	**161 546 201**	**161 546 211**	0.150
½	15	16	185	**161 546 202**	**161 546 212**	0.150
¾	20	16	350	**161 546 203**	**161 546 213**	0.230
1	25	16	700	**161 546 204**	**161 546 214**	0.330
1 ¼	32	16	1000	**161 546 205**	**161 546 215**	0.585
1 ½	40	16	1600	**161 546 206**	**161 546 216**	0.815
2	50	16	3100	**161 546 207**	**161 546 217**	1.490

Inch	D [mm]	H [mm]	H1 [mm]	L [mm]	L1 [mm]	L2 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	z [mm]
⅜	50	57	27	92	77	56	25	32	45	60
½	50	57	27	95	77	56	25	32	45	60
¾	58	67	30	110	97	65	25	39	58	69
1	68	73	36	123	97	71	25	39	58	75
1 ¼	84	90	44	146	128	85	45	54	74	89
1 ½	97	97	51	157	128	89	45	54	74	97
2	124	116	64	183	152	101	45	66	87	110

Georg Fischer Rohrleitungssysteme AG, Postfach, CH-8201 Schaffhausen/Switzerland
Phone +41 -(0)52-631 1111
e-mail: info@piping.georgfischer.com
Internet: http://www.piping.georgfischer.com