DUCTILE IRON
FLANGED GATE VALVES

DN40 – DN300, PN10-16

F.111/112UG

PFA 10 bar
PFA 16 bar

Ductile Iron Flanged Gate - Valves - Instruction Manual			
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1. TECHNICAL DESCRIPTION

1.1. Product name and main features

This manual contains information concerning flanged ductile iron gate valve with the following features:

- Smooth waterway construction with full port diameter waterway
- Rubber-encapsulated ductile iron wedge
- Non rising stem
- Internal thread stem
- Soft sealing of the stem in the bonnet
- Backflow sealing when gate valve is fully open
- Manual or electromechanical gate valve action

1.2. Intended use of a product

The gate valves described as in point 1.1. are designed to close and open the flow of clean liquids, including clean drinking water, non-aggressive sewage, free from solid contaminants, at maximum temperature of the medium up to 70°C and nominal pressure up to 16 bar. The gate valves described above can be installed in underground and aboveground pipelines (horizontal or vertical).

Table 1: Flow speed, pressure and temperature range of gate valves

DN	Size of conenction flanges	Leaktightness test of the shell	Seat tightness test	Maximum water flow speed	Allowable operating temperature
	PN	[bar]		m/s	^{0}C
40 - 300	10	17	11	3	70
	16	25	18	4	

1.3. Construction and principle of operation (Fig.1, Tab.2)

The main parts of the gate valve are shown in Fig.1.
Gate valve's outer shell consists of valve bonnet and body that are bolted together. The sealing is provided by an o-ring or a special profile gasket.

Valve's body is a tee whose opposite outlets (waterway) are circular and the upper outlet has oval shape. The opposite outlets have flanges for connection to a pipeline and the oval outlet has a flange for connection to the bonnet.

Internal diameter of main waterway, sometimes known as the valve nominal diameter, is normalised and denoted by 'DN'. The dimensions of valve body and connecting flanges are also normalised.

The oval outlet consists of a chamber that contains the resilient rubber encapsulated wedge that either opens or closes the valve. The wedge is specially shaped to match the recess that divides the waterway. The chamber on its sides has wedge guides that force and stabilise wedge's sliding motion and also protect the wedge from excessive vibration transferred from the flowing water.

Valve bonnet is of spherical shape with a tubular gland at the top. There is a metal sleeve in the gland. The sleeve stabilises the stem's position and minimises operating torque. All mentioned elements are sealed by o-rings. The sleeve also contains a debris collector ring that protects the stem and other valve elements from dust and dirt.

The stem is made of monolithic stainless steel and has a thrust flange that stabilises the stem's longitudinal position. Section of the stem that is placed inside valve body under the flange has a trapezoidal thread that matches the thread on brass nut embedded in the rubber encapsulated wedge. Section of the stem above valve bonnet is terminated with a square head which can be use for installation a handwheel or a square operating cap. Under and above the stem's flange there are brass washers that reduce operating torque between the flange, gland and sleeve and provide backflow sealing allowing replacement of o-rings and the sleeve under pressure. Rotary motion of the handwheel is transferred to the stem and converted by the wedge nut to linear motion of the wedge. Turning the handwheel clockwise closes the valve while turning it counter-clockwise opens the gate valve. The directions to open/close the valve are marked on the handwheel.

In gate valves designed for underground operation, closing and opening is done by a special 'T' spanner. In this design the stem is extended to ground surface and protected by housing. The stem's head and valve bonnet are inside a street cap. Stem extension, street cap and valve housing are separate parts and can be delivered on customer request.

Note: On customer's request, the gate valve may be produced with optional mechanism that allows closing of the gate valve by counter-clockwise turning of the handwheel.

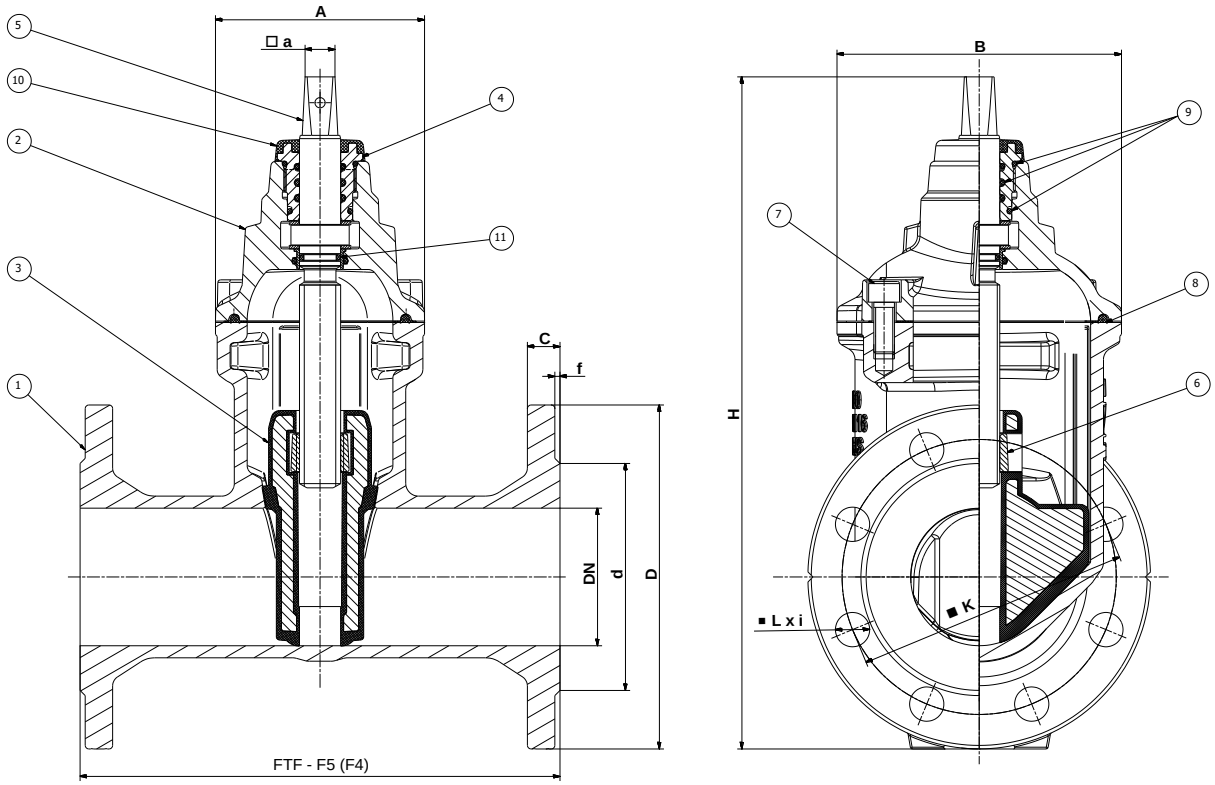


Figure 1: Gate valve cross-sectional drawing

1 – valve body
2 – valve bonnet
3 – resilient wedge
4 – threaded sleeve
5 – stem
6 – stem nut
7 – wrench-head bolts
8 – profile gasket body/bonnet
9 – o-rings
10 – protective cap
11 – backflow sealing

Table 2: Dimensions of gate valves

DN	FTF [mm]		D [mm]	K [mm]		d [mm]		C [mm]	f [mm]	L [mm]		i		a [mm]	D_k [mm]	A [mm]	B [mm]	H [mm]	Masa (kg)*	
	F4	F5		PN10	PN16	PN10	PN16			PN10	PN16	PN10	PN16						F4	F5
40	140	240	150	110	110	87	84	19	3	19	19	4	4	14	200	103	122	290	9,3	10
50	150	250	165	125	125	99	99	19	3	19	19	4	4	14	200	104	134	320	12,1	12,7
65	170	270	185	145	145	116	116	19	3	19	19	4	4	17	250	112	146	370	15,3	16,1
80	180	280	200	160	160	132	132	19	3	19	19	8	8	17	250	122	166	390	18	18,7
100	190	300	220	180	180	156	156	19	3	19	19	8	8	19	315	134	186	450	23	25,7
125	200	325	250	210	210	184	184	19	3	19	19	8	8	19	315	152	216	510	31	33,6
150	210	350	285	240	240	211	211	19	3	23	23	8	8	19	315	180	248	575	39	42
200	230	400	340	295	295	266	266	20	3	23	23	8	12	19 lub 24**	315	178	296	582	51	58
250	250	450	405	350	355	319	319	22	3	23	28	12	12	24 lub 27**	400	194	356	778	80,5	92,5
300	270	500	455	400	410	370	370	24,5	4	23	28	12	12	24 lub 27**	400	220	420	878	118	132,7

* weight without handwheel; the deviations from the nominal weight of valves within ± 5%.
** at customer's request

Table3: Handwheel diameter and number of turns to open/close valve

DN	D_K	Tr – LH	operating nut	stem thread pitch	№ of turns to open/close valve
[mm]	[mm]	[mm]	[mm]	[mm]	[1/n]
40	200	20 x 4	14	43	11
50	200	20 x 4	14	53	16
65	250	24 x 5	17	68	15
80	250	24 x 5	17	83	17
100	315	26 x 5	19	103	23
125	315	28 x 5	19	130	27
150	315	28 x 5	19	155	34
200	315	28 x 5	19	205	41
250	400	32 x 6	24	255	43
300	400	32 x 6	24	309	52

Table 4: Gate valve opening and closing torque

DN	Opening and closing torque [Nm] according to EN 1074-2 p.5.2.3	
	nominal torque	maximum torque
40	35	70
50	35	70
65	50	100
80	50	100
100	63	126
125	63	126
150	63	126
200	63	126
250	80	200
300	80	200

1.4. Tightness class

Gate valves as described herein in the pressure range shown in Table 1 and in the conditions of room temperature (20^0C) have been categorised as class A devices according to EN-12266-1 Tab.A5 which means that the gate valves during a leak test cannot develop a visible leakage bigger than 0,01 x DN mm^3/s
Nominal pressure and test pressures are given in Tab.1.

1.5. Materials

- Valve body, bonnet, wedge casting - ductile cast iron
- Hanwheel - grey cast iron
- Stem - stainless steel
- Threaded bush, stem nut, sliding ring, sleeve - brass
- Wedge lining, o-rings, profile gasket - rubber
- Bolted parts - galvanized carbon steel or stainless steel
- Anti-corrosion protection - epoxy paint

Note: Material types and requirements are given in ‘Spare parts list’, which is a constituent of design documentation for each product

1.6. Durability

Durability of isolating valves:

- valves with manual drive: 250 "opening / closing" cycles;
- valves with electric, hydraulic or pneumatic drive: 2500 "opening / closing" cycles

1.7. Technical verification and approval

PZH Hygienic Certificate
Certificate of Conformity INiG – water
Certificate ICIM
Certificate DVGW

1.8. Applicable norms and regulations

	NORM DESIGNATION	DESCRIPTION
1.	PN-EN 19	Industrial valves. Marking of metallic valves
2.	PN-EN 558-1	Industrial valves. Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems.
3.	PN-EN 681-1	Elastomeric seals. Rubber
4.	PN-EN 736-2	Valves. Terminology.
5.	PN-EN 1074-1	Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Part 1: General requirements
6.	PN-EN 1074-2	Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Part 2: Isolating valves
7.	PN-EN 1092-2	Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2: Cast iron flanges
8.	PN-EN 1171	Industrial valves. Cast iron gate valves
9.	PN-EN 1563	Founding. Spheroidal graphite cast irons
10.	EN 12266-1	Industrial valves. Testing of valves. Part 1: Pressure tests, test procedures and acceptance criteria. Mandatory requirements
11.	EN 12266-2	Industrial valves. Testing of valves. Part 2: Tests, test procedures and acceptance criteria. Supplementary requirements
12.	PN-ISO 5210	Industrial valves. Multi-turn valve actuator attachments
13.	PN-ISO 8062-1	Castings. System of dimensional tolerances and machining allowances
14.	PN-EN 12570	Industrial valves. General requirements and testing
15.	PN-EN 12420	Copper and cast copper alloys. Forging.
16.	PN-63/M-74085	Industrial valves. Key for gate valves and hydrants
17.	PN-63/M-74084	Industrial valves. Cast iron covers for gate valves and hydrants
18.	DIN-3202 Part 1	Industrial flange valves. Face-to-face and centre-to-face dimensions of flange valves.

2. DESIGN VARIATIONS

In order to meet the market requirements, the gate valves are manufactured in several variations depending on length, working pressure, type of driving mechanism and additional accessories.
Basic design, materials used in construction, intended use, compliance with requirements remain unchanged for all the variations.

2.1. Face-to-face dimensions

a) Gate valves with face-to-face dimensions in '14' series according to EN 558-1 or in F4 series according to DIN 3202 part 1 denoted by a catalogue number 111UG.

Example: Gate valve DN80, catalogue number 111 UG

b) Gate valves with face-to-face dimensions in '15' series according to EN 558-1 or in F5 series according to DIN 3202 part 1 denoted by a catalogue number 112.

Example: Gate valve DN80, catalogue number 112 UG

2.2 Types of driving mechanism

a) Gate valves with face-to-face dimensions in '14' or '15' series driven by a handwheel for installation in surface (above ground) pipelines or gate valves with face-to-face dimensions in '14' or '15' series driven by a 'T' spanner – without a special indicator in marking.

Example: Gate valve DN80, catalogue number 111 – UG, gate valve DN80, catalogue number 112 – UG

Note: Type of driving mechanism shall be specified in an order

b) Gate valves with face-to-face dimensions in '14' or '15' series adapted to electrical motor according to ISO 5210 – with a '/986' indicator in catalogue number.

Example: Gate valve DN80, catalogue number 111 UG/986

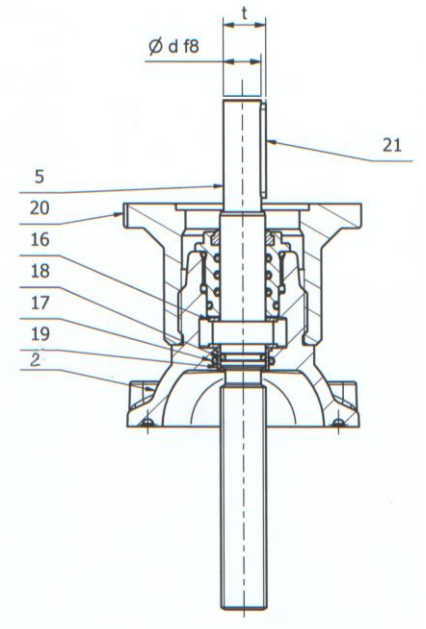


Fig.2 Gate valves adapted to electrical motor according to ISO 5210

2 – valve bonnet
5 – valve stem
16 – thrust washers
17, 18 – O-rings
19 - sleeve
20 – motor base
21 – guide key groove

Table 5: Dimensions of gate valves driven by electrical motor

DN	Flange size	Flange type	Flange outer diameter (mm)	Bolt distance (mm)	Bolt diameter / no of bolts (M x i)	Stem diameter (mm)	Groove b x h x l (mm)
40	F10	B3 ISO 5210 E DIN 3210	125	102	10 x 4	20f8	6 x 6 x 50
50							
65							
80							
100							
125							
150							
200							
250	F14	-„-	175	140	16 x 4	30f8	8 x 7 x 63
300							

2.3 Type of valve gate

a) Gate valves with face-to-face dimensions in ‘14’ or ‘15’ series with opening indicator - with a ‘/134’ indicator in catalogue number.
Example: Gate valve DN80, catalogue number 111 UG/134

Design variations shown above are suitable for operating with connection flanges sizes of PN 10 – 16 bar. The connecting flanges size of a gate valve must be stated in the customer’s order. Catalogue symbols/numbers do not provide any indication of the connecting flanges sizes.

2.4 Marking of gate valves

2.4.1 Marking of gate valves is done according to the following norms: EN-1074-1, PN-EN-19,

2.4.2 All markings are permanently engraved on both sides of gate valve body. Marking shall include the following information:

- DN – nominal diameter,
- Material type according to PN-EN 1563
- Manufacturer’s logo
- Year of production
- PN – marking of the connecting flanges size according to EN 1092-2

Below is an example of marking on a DN 80 gate valve made of ductile iron class EN-GJS 500-7 according to EN 1563 designed for working pressure of PN 16 bar, produced in 2023.

On one side:

DN80
EN-GJS 500-7
PN16

On the opposite side:

2023

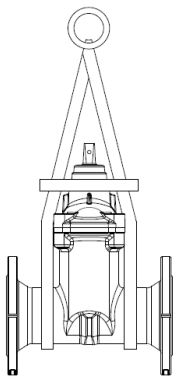
Additionally, the product is marked with a construction sign using a self-adhesive label.

3 ASSEMBLY AND OPERATION

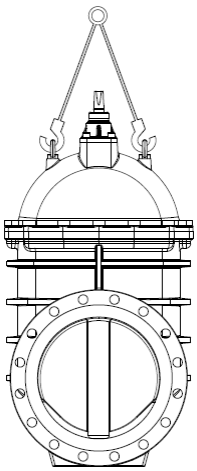
3.1 Transport and storage

Gate valve is delivered in closed position, with all openings fully sealed and the wedge in its lowest position.
Transport and storage should be done in a manner that does not present a risk of permanent damage to external or internal protective coating or soiling of internal parts with dust or any sharp particles. Soiling may lead to damage or loss of tightness. Valve must not be subjected to chemicals that could pollute water passing the waterway.
Gate valves must not be stacked as this could lead to damage of protective coating, the handwheel or deformation of the stem, which could, in turn, lead to loss of tightness. For storage of gate valves in horizontal layers, use rigid spacers, strips, cardboard, foam, etc.
Gate valves must be properly fastened during road transport to prevent displacement and possible damage.
For transportation of the gate valves of large weight (DN 300 and larger) use mounted transport elements – bolts with eye. For a smaller sizes than DN300 use sling belts with protection against the possibility of rotating the gate valve. Never attach a sling to the gate valve's driving elements (handwheel, cap, motor base, stem head) or any flange connection holes or to flange.
The gate valves are recommended to move in the following manner:

DN<300



DN≥300



3.2 Assembly in pipeline

Gate valves described herein can be installed in above ground or underground pipelines (horizontal or vertical). Gate valves DN250-300 are recommended for installation in horizontal pipelines in an upright position only.

Gate valves shall be installed in such a way that they are not subject to shearing forces in the pipeline. Pipeline designer should indicate the proper installation configuration.
When installed in an underground pipeline directly in the ground, it is recommended that gate valve rests on a concrete foundation, this applies especially to gate valves of bigger sizes.

When installed in above ground pipelines, gate valve should rest on a support or concrete foundation.

Prior to installation, it is recommended to wrap valve body with wide insulating tape (or other insulation) to provide better protection against corrosive properties of the surrounding soil.

Prior to installation all the sealing caps must be removed and gate valve must be carefully inspected for any debris or dirt in its parts, and if necessary, rinsed with water.

All the works related to transportation, excavation and installation must comply with health and safety regulations.

Note: Any debris, dirt or sharp particles on any gate valve parts may cause loss of tightness or irreversible damage to sealing surfaces. During priming, the gate valve must be fully open.

3.3 Operation and maintenance

Gate valves described herein do not require any special maintenance.

Worn o-rings in valve gland can be replaced under pressure without the necessity to cut off water supply. In order to replace the o-rings, the following steps must be taken.

1. fully open the gate valve (by a handwheel)
2. remove the handwheel
3. remove the threaded sleeve
4. replace the used o-rings
5. check the condition of the upper surface of the sliding ring and replace it, if necessary
6. coat the sleeve thread with a small amount of the adhesive
7. screw the sleeve in until resistance is felt

Note: During the replacement of o-rings a small leak from the gland may develop. Dimensions of all o-rings for gate valves DN40-300 are given in Tab.6.

If there is loss of tightness around the valve wedge the following steps must be taken:

1. cut off water supply
2. fully open the gate valve
3. undo all bolts fixing valve bonnet to valve body
4. withdraw the internal unit and inspect all sealing surfaces
5. if there is damage to valve wedge it must be replaced
6. if there is damage to wedge recess in valve body, it must be replaced
7. re-assemble the valve (in reverse order, with the principles as during priming)
8. re-apply additional insulation before burying

Note: The manufacturer shall not be liable for damage to gate valves caused by improper transport, handling, installation or operation in violation of recommendations and procedures contained herein

Table 6: O-ring and spanner sizes for use with gate valves

DN	„O - ring”		S type spanner (mm)
	D x d (mm)	pcs.	
40	20,2 x 3 28,2 x 3 35,2 x 3 22,5 x 2 15,3 x 2,4	3 1 1 1 1	36
50	20,2 x 3 28,2 x 3 35,2 x 3 22,5 x 2 15,3 x 2,4	3 1 1 1 1	36
65	24,2 x 3 32,2 x 3 38,2 x 3 27 x 3 18,2 x 3	3 1 1 1 1	41
80	24,2 x 3 32,2 x 3 38,2 x 3 27 x 3 18,2 x 3	3 1 1 1 1	41
100	26,2 x 3 34,2 x 3 41,2 x 3 29 x 3 20,2 x 3	3 1 1 1 1	41
125	28,2 x 3 36,2 x 3 44,2 x 3 31,2 x 3 22,2 x 3	3 1 1 1 1	46
150	28,2 x 3 36,2 x 3 44,2 x 3 31,2 x 3 22,2 x 3	3 1 1 1 1	46
200	28,2 x 3 36,2 x 3 44,2 x 3 31,2 x 3 22,2 x 3	3 1 1 1 1	46
250	32,2 x 3 44,2 x 3 52,2 x 3 35 x 3 26,2 x 3	3 1 1 1 1	55
300	32,2 x 3 44,2 x 3 52,2 x 3 35 x 3 26,2 x 3	3 1 1 1 1	55

4 PROCEEDING DURING REMOVING THE GATE VALVE

Never it was found that any part of gate valve produced by METALPOL WĘGIERSKA GÓRKA Sp. z o.o., has a negative influence for environment, people and animals. This fact is confirmed by Hygienic Certificate issued by PZH in Warsaw. None of the parts of gate valve in chemical analysis holds substances from the list of Substances of Very High Concern (SVHC).

In case of removing the gate valve, each part of gate valve is subjected to recycling and as a raw material it may be using in the other manufacturing process.

Please note that sediment gathered inside the valve or the pipeline may be dangerous to man or to the environment. Therefore adequate safety requirements must be applied. At the end of lifecycle the valve must be disposed in accordance to adequate environmental safety regulations

5 MANUFACTURER'S GUARANTEE

The guarantee covers the products installed and used according to the rules indicated in this Document.

Detailed provisions of manufacturer's guarantee are available in manufacturer's 'Guarantee conditions' constituting attachment to pricelist

Tampering with products (changes, replacement of parts, loosening original connections, etc. without the consent of the Producer) is not permitted and causes the expiration of the guarantee obligations and product liability.