DUCTILE IRON
FLANGED GATE VALVES
for gas distribution
DN40 – DN300

max operating pressure:
MOP 16 bar – PN16
MOP 10 bar – PN10

Ductile Iron Flanged Gate - Valves - Instruction Manual				
Opracował:	T. Włoch	14.02.2022		MANUFACTURED AND DESIGNED BY **METALPOL WĘGIERSKA GÓRKA**
Sprawdził:	M. Dyrlaga	14.02.2022		
Zatwierdził:	J. Karpiński	14.02.2022		

TABLE OF CONTENTS

1. TECHNICAL DESCRIPTION

1.1. Product name and main features

This manual contains information concerning flanged ductile iron gate valve with PN 16 flanges type 21 according to EN 1092-2 and the basic face to face dimensions in '14'and '15' series according to EN 558-1 with the following features:

- Smooth waterway construction with full port diameter waterway.
- Rubber-encapsulated ductile iron wedge
- Not rising stem
- Internal stem thread
- 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

Ductile iron flanged gate valves as described in section 1.1 are designed to

- Closing/opening the flow of gas in natural gas distribution installations at maximum operating pressure MOP 16 bar, and maximum medium temperature from -20°C to +60°C

Ductile iron flanged gate valves as described above can be installed in either vertical or horizontal configuration in underground or surface gas pipelines.

Table 1: Gate valves for gas distribution. Pressure and temperature range.

DN	Size of conenction flanges	Leaktightness test of shell (PEA)	Seat tightness test (1,1xMOP)	Maximum medium temperature (°C)
[mm]	PN (bar)			gas
40 - 300	10	15	11	+60
	16	24	18	

1.3 Construction and principle of operation (Figure 1, Table 2)

The main parts of the gate valve are shown in Fig.1.

Gate valve's outer shell consists of body (1) and valve bonnet (2) that are bolted (7) together. The sealing is provided by a special profile gasket (8).

Valve's body is a tee whose opposite outlets (waterway) are circular and the upper outlet has oval shape. The opposite outlets have flanges, cast together with the body, 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 FTF and connecting flanges are also normalised (Table 2).

The oval outlet consists of a chamber that contains the resilient rubber encapsulated wedge (3) that either opens or closes the valve. The wedge is specially shaped to match the recess in the body. 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 medium.

Valve bonnet is of spherical shape with a tubular gland at the top. There is a metal threaded sleeve (4) in the gland. The sleeve stabilises the stem’s (5) position and minimises operating torque. All mentioned elements are sealed by o-rings (9,10,11). The sleeve also contains a debris collector ring (12) that protects the stem and other valve elements from dust and dirt.

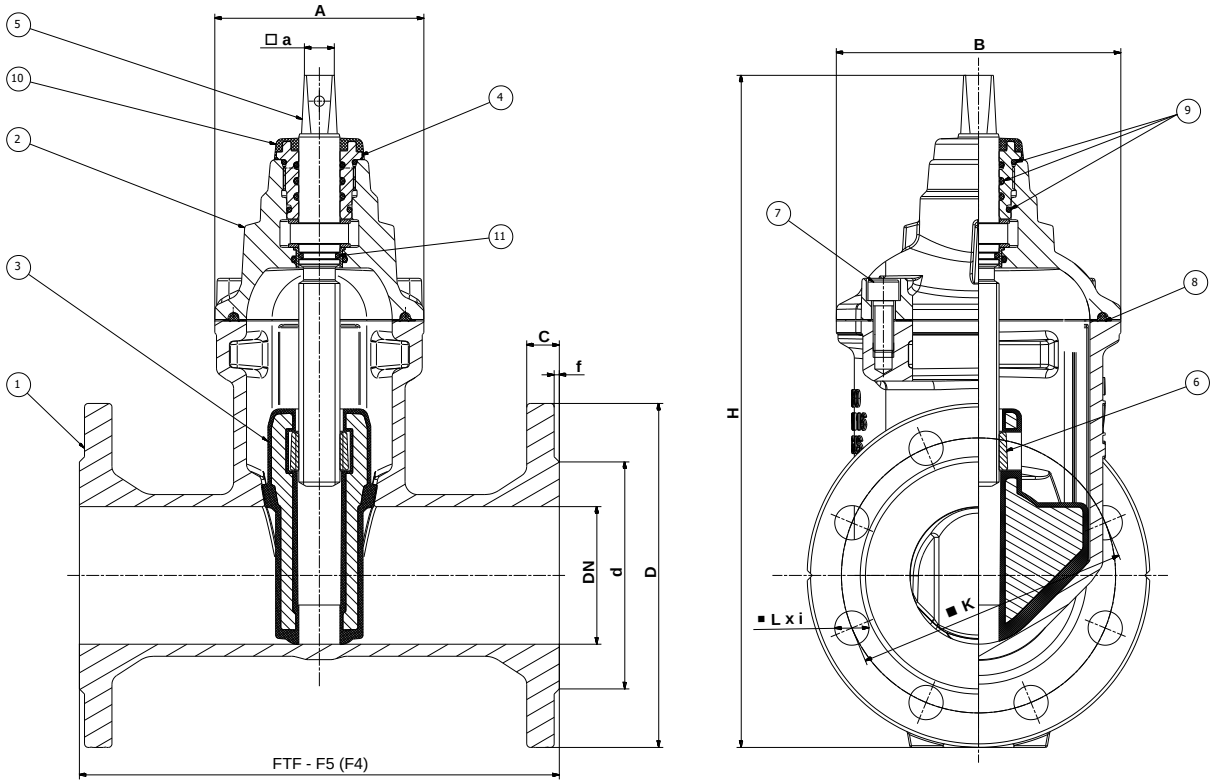


Figure 1: Gate valve cross-sectional drawing

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; weight deviation within limits ± 5%.
** H value is ± 5 mm
*** handwheel diameter (additional gate valve equipment)

Note 1 : Nominal diameters of passage according to EN 1171 point 4.1.3.3.

Note 1: Flange connection diameters according to PN-EN 1092-2 Table 8 and 9

Note 3: Basic face to face dimensions FTF according to PN-EN 558-1 Table 1.

The stem (5) 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 (6) embedded in the rubber encapsulated wedge. Additionally an o-ring sealing is set under the thrust flange, which is a part of the gland sealing system together with the sleeve. Gland's chamber is closed from the bottom with a surface in which a sleeve and an o –ring are set. By this mean the chamber is fully isolated from medium flowing through the gate valve.

Under and above the stem's flange there are brass washers that reduce operating torque between the flange, gland and threaded sleeve and provide backflow sealing allowing replacement of o-rings (9,10,11) under pressure. Section of the stem above valve bonnet is terminated with a square head which can be used for installation a handwheel (for the gate valves in surface pipelines) or a square operating cap (for the gate valves in underground pipelines)

Rotary motion of the handwheel is transferred to the stem and converted by the stem 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.

Table 3: Handwheel diameter Dk and number of turns to open/close the gate valve

DN	D_K	Tr – LH	operating nut	stem thread pitch	№ of turns to open/close valve ± 0,5
[mm]	[mm]	[mm]	[mm]	[mm]	[1/n]
40	200	20 x 4	14	43	11
50	200	20 x 4	14	63	16
65	250	24 x 5	17	74	15
80	250	24 x 5	17	83	17
100	315	26 x 5	19	112	23
125	315	28 x 5	19	129	27
150	315	28 x 5	19	168	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

The gate valves designed for underground operation, closing and opening is done by a special 'T' spanner. In this case the stem is extended to ground surface and protected by housing. The stem's head and valve bonnet are inside a street box.

Stem extension, street box and valve housing are separate parts and can be delivered on customer request.

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

Table 4: Gate valve opening and closing torque

DN	opening and closing torque (Nm) according to EN1074-2 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

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

Pressure values of PFA, PMA and PEA are according to EN 1074-1 Table 1.

1.5 Gate valves category

Gate valves as described herein have been categorised as category 1 devices according to EN 1171 Table 6

Table 5 – gate valves category. Minimum strength torque (Nm).

DN	Category 1
40	80
50	90
65	100
80	150
100	190
125	190
150	190
200	240
250	240
300	300

1.6 Materials

L.p.	Elements of gate valves	material	Reference
1	Valve body, valve bonnet,	EN-GJS 400-15 EN-GJS 500-7	PN-EN 1563
2	Wedge casting	EN-GJS 500-7	PN-EN 1563
3	Handwheel	EN-GJL 200	PN-EN 1561
4	Monolithic stem	X20Cr13	PN-EN 10088-1
5	Stem nut, threaded bush, sliding ring, bush	CuZn39Pb2	PN- EN 12420
6	Wedge rubber, sealing rings, debris collector ring, profile gasket	NBR	PN-EN 682 PN-EN 549
7	Protective coating	Furnace-hardened epoxy powder paint	Acc. to RAL-GZ 662
8	Bolted parts	According to the given standard	PN-EN ISO 4762

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

1.7 Durability

Durability of isolating valves:

- valves with manual drive: 200 "opening / closing" cycles.

1.8 Applicable norms and regulations

- PN-EN 19 - Industrial valves. Marking of metallic valves
- PN-EN 549 - Rubber materials for sealing and membranes used in gas appliances and gas installation accessories
- PN-EN 558-1 - Industrial valves. Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems.
- PN-EN 682 - Elastomeric seals. Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids
- PN-EN 736-2 - Valves. Terminology.
- PN-EN 1074-1 - Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Part 1: General requirements
- PN-EN 1074-2 - Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Part 2: Isolating valves
- PN-EN 1092-2 - Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2: Cast iron flanges
- PN-EN 1171 - Industrial valves. Cast iron gate valves
- PN-EN 1561 - Founding. Grey cast irons
- PN-EN 1563 - Founding. Spheroidal graphite cast irons

- PN-EN 1982 - Copper and copper alloy. Pig sow and castings.
- PN-EN 10088-1- Corrosion resistant steels. Grades
- EN 12266-1 - Industrial valves. Testing of valves. Part 1: Mandatory requirements
- EN 12266-2 - Industrial valves. Testing of valves. Part 2: Supplementary requirements
- PN-EN 13774 - Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar. Performance requirements
- PN-ISO 8062-1 - Castings. System of dimensional tolerances and machining allowances
- PN-EN 12570 - Industrial valves. General requirements and testing
- PN-90/M-73092- Sealings with round profile. Requirements and testings.
- PN-63/M-74085- Industrial valves. Key for gate valves and hydrants
- PN-63/M-74084- Industrial valves. Cast iron covers for gate valves and hydrants
- PN-M-74202 - Industrial valves. Spindle ends for manual control. Dimensions
- PN-M-74203 - Industrial flange valves. Handwheels.

1.9 External laboratory tests. Certificates

Gate valves as described herein have passed positively type tests according to PN-EN 13774 conducted by Oil and Gas Institute, Cracow. Accreditation Certificate no. AB 041 issued by Polish Centre of Accreditation for the use in natural gas installations.
Test report and results are described in the document no. 3CE/GP-1/05

2 DESIGN VARIATIONS

In order to meet the market requirements, 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 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 111.

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

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/G

2.2 Type of valve gate

a) Gate valves with face-to-face dimensions in ‘14’ or ‘15’ series with position indicator – marked by ‘/134-G’ indicator in catalogue number.

Example: Gate valve DN80, catalogue number 111 UG/134-G

Note: CATALOGUE № DESIGNATIONS HAVE THE FOLLOWING MEANING:
UG– gate valve wedge is rubber lined.
GAZ – gate valves designed to natural gas

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.

2.3 Marking of gate valves

2.3.1 Marking of gate valves is done according to the following norms: EN-19,

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

- DN - Inner diameter of main waterway in millimetres
- Material type according to PN-EN 1563
- PN – marking of the connecting flanges size according to EN 1092-2
- Manufacturer’s logo
- Year of production

Gate valves for gas are additionally marked by a yellow label with the word ‘GAZ’ placed on the bonnet.

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 pressure MOP of PN 16 bar, with flange connection PN16, produced in 2018 .

FRONT SIDE	BACK SIDE
DN80 PN16 EN-GJS 400-15	® 2022

3 ASSEMBLY AND OPERATION

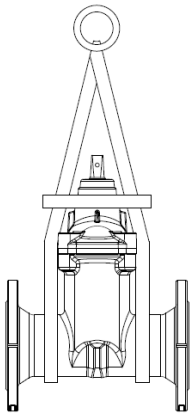
3.1 Transport and storage

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 chemical individuals.

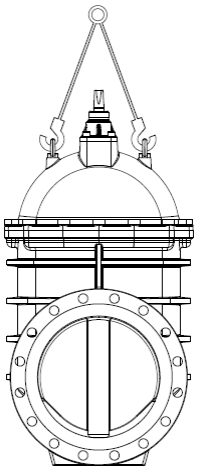
Gate valves must not be stacked as this could lead to damage of protective coating, the handwheel or deformation of the stem, which could, in turn, lead to loss of tightness. For storage of gate valves in horizontal layers, use rigid spacers, strips, cardboard, foam, etc.

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) 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 proper installation configuration.
When installed in an underground pipeline 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 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.

Note: Any debris, dirt or sharp particles on any gate valve parts may cause loss of tightness or irreversible damage to sealing surfaces

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 gas supply **(only if it is allowed by separate regulations on safe use and maintenance of gas pipelines which are not a part of this manual).**

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 and debris collector ring
5. verify the condition of upper surface of the sliding ring and replace, if necessary
6. coat the threaded sleeve with a small amount of the emulsion for threads
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 the 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 gas 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)
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 or by foreign bodies.

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 GATE VALVE (RECYCLING)

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. 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 remove 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 gas 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.

The guarantee period is 24 months from the date of purchase, but not later than 12 months from the date of installation, provided the product has been stored, installed, operated and maintained in accordance with industry standard practices and recommendations contained herein.
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.