KLIPNO-PRSTENASTI VENTILI

7

PISTON-RING VALVES

PRIMENA

Ime klipno-prstenastih ventila izvedeno je iz konstruktivne karakteristike samih ventila. Klipno-prstenasti ventili uglavnom se koriste u sistemima gde se javljaju velilke razlike pritisaka i veliki protoci. Svoju primenu našli su u sistemima vodosnabdevanja, energetskim postrojenjima, industrijskoj i procesnoj tehnici i drugim granama privredne delatnosti. Shodno velikom broju varijanti konstruktivnog izvođenja, klipno-prstenasti ventili imaju višestruku ulogu u cevnim sistemima i koriste se kao: zaporni organi, merni uređaji, regulatori pritiska i protoka, sigurnosni uređaji, sigurnosni uređaji sa funkcijom povratnog ventila, ventili sa ispustima za pražnjenje i ispiranje.

Kao **zaporni organi**, klipno-prstenasti ventili se koriste u sistemima sa velikom brzinom strujanaja, do 7 (m/s), i velikim diferencijalnim pritiskom.

Kao **merni uređaji** koriste se kada se na ulazu u klipno-prstenasti ventil ugradi Venturijeva cev koja omogućava tačno merenje protoka kod svih stepeni otvorenosti ventila. Primena Venturijeve cevi u većini slučajeva omogućava da se izabere manji nazivni prečnik ventila nego što je prečnik cevovoda.

Kao **regulatori protoka** klipno-prstenasti ventili koriste se u vodovodnim i rashladnim sistemima i procesnom inženjeringu, kao **regulatori pritiska** između različitih visinskih zona vodosnabdevanja, kao **regulatori protoka i pritiska** u pumpnim stanicama, kao **regulatori dotoka** u gravitacionim sistemima vodosnabdevanja, a kao **regulatori nivoa** u rezervoarima i prekidnim komorama.

APPLICATION

The name itself - piston ring valve - comes from a structural characteristic of the valves themselves. These are mainly used in the systems where there are great pressure differences and huge flows. They are widely applied in the water supply systems, power plants, industrial and process techniques and other industrial fields. In accordance with a large number of design variants, the piston ring valves have multiple role in the piping systems, being used as: shutoff bodies, measuring units (gauges), pressure and flow regulators, safety devices, safety devices having a function of a return valve, valves with outlets for discharge and washout.

As **shutoff bodies**, the piston-ring valves are used in the systems with a high flow rate, up to 7 (m/s) and high differential pressure.

As **measuring units**, they are used when a Ventury tube, enabling precision flow measuring in all valve opening degrees, is fitted at the inlet of the piston ring valve. In most cases, the application of Ventury tube enables a smaller nominal diameter of the valve to be chosen than the pipeline diameter.

As **flow regulators**, the piston-ring valves are used in waterworks and cooling systems and process engineering, as **pressure regulators**, between various water supply elevation zones, as pressure and flow regulators - in pump stations, as inflow regulators in waterworks gravitational systems, and as **level regulators** - in tanks and fluctuating chambers.

Sigurnosni uređaji sa funkcijom povratnog ventila klipno-prstenasti ventili postaju kada se postave na potisni cevovod pumpnih stanica.

Hidraulični udar se javlja kao posledica nagle promene protoka usled nekontrolisanog otvaranja ili zatvaranja ventila, ispadanja pumpnih agregata ili pucanja cevovoda. Klipno-prstenasti ventili, kao **sigurnosni uređaji** sa automatskim otvaranjem i zatvaranjem, koriste se u cilju smanjivanja oscilacija pritisaka u cevnoj instalaciji i za sprečavanje nekontrolisanog izlivanja za slučaj pucanja cevovodne instalacije.

IZVOĐENJE

Protočni poprečni presek klipno-prstenastih ventila je u obliku prstena, a pokretni deo preko koga se ostvaruje regulacija je u obliku klipa. Spoljašnje kućište je tako formirano da se poprečni protočni presek od ulaza ka prstenastom sedištu kontinualno smanjuje. Klip ventila u unutrašnjosti kućišta ima dve prstenaste vođice i može da se pomera u aksijalnom pravcu preko krivajnog mehanizma. Potpuno zatvaranje ventila ostvaruje se naleganjem zaptivnog prstena klipa na prstenasto sedište ventila. Prstenasto sedište je razdvojivo od kućišta i promena tipa prstenastog sedišta omogućava promenu hidrauličkih karakteristika klipno-prstenastog ventila bez izmena cevnog voda.

U zavisnosti od funkcije i uslova u kojima će da se koriste klipno-prstenasti ventili primenjuju se različiti tipovi prstenastih sedišta.

Priključne mere su prema JUS M.B6.011 i DIN 2501, nazivni pritisci 10, 16, 25 i 40 (bar), a nazivni prečnici od DN 150 do DN 1200 (mm).

Piston-ring valves become **safety units having the function of a return valve** when located in the pump stations discharge pipeline.

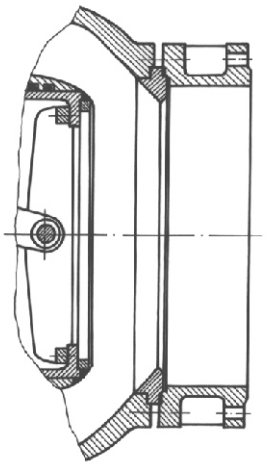
Water hammer occurs as an effect of abrupt flow change due to uncontrolled valve closing and opening, pump generators dropping out or pipeline splitting. Piston-ring valve, **as safety units** with automatic opening and closing are used in order to decrease the pressure fluctuations in piping installation and to prevent non-controlled discharge in case the piping installation is split.

FABRICATION

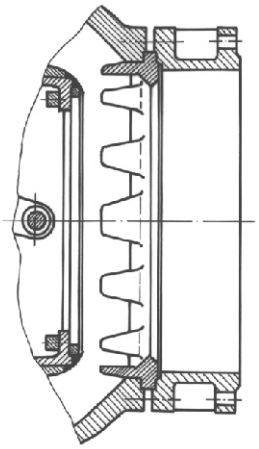
Piston ring valves flow cross section is in a ring form, and the mobile part through which the regulation is accomplished is in the form of a piston. The outside housing is such formed that the flow cross section from the inlet to the ring-shaped seat is continually reduced. The valve piston in the housing internal part has got two ring-shaped guides and it can be moved axially via beam and crank mechanism. Complete closing of a valve is accomplished by adhering of a piston sealing ring onto the valve ring-shaped seat. The ring-shaped seat can be split from the housing, the change of the ring shaped seat type influencing the change of the piston-ring valve hydraulic characteristics, without the change of the pipeline.

Depending on the function and the conditions in which we use the piston ring valves, various types of ring-shaped seats are being applied.

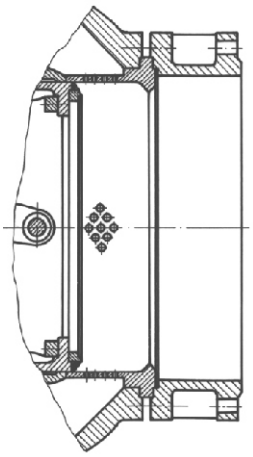
The in-built measures are according to JUS M.B6.011 and DIN 2501, nominal pressures NP 10, 16, 25 i 40 (bar), and nominal diameters from DN 150 to DN 1200 (mm).



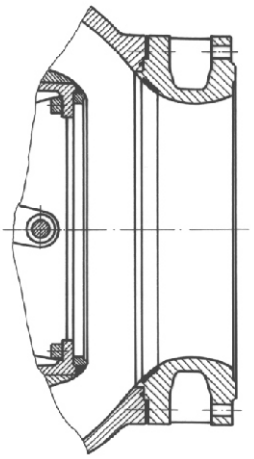
PSE



PSS



PSL



PSF

Tip sedišta Type of the seat	Opis - Description	Ugradnja - Fitting
PSE	Prstenasto sedište sa oborenom ivicom i naglim proširenjem Ring shaped seat with a chamfer and abrupt enlargement	- prvenstveno kao prigušni organ - pri velikim razlikama pritiska i dovoljnim kontra-pritiskom - primarily as a throttling body - when large pressure differences and sufficient counter-pressure exist
PSF	Prstenasto sedište u izlaznoj cevi u obliku kratkog difuzora Ring shaped seat in outlet tube in the form of a short diffuser	- prvenstveno kao zaporni organ za uslove otvoreno/zatvoreno - sa malim padom pritiska pri potpunoj otvorenosti - primarily as a shutoff body for open/closed condition - with low pressure drop when fully opened
PSS	Prstenasto sedište sa vencem lopatica Ring shaped seat with blades rim	- prvenstveno kao regulacioni organ - pri velikim razlikama pritiska i dovoljnim kontra-pritiskom - moguće podešavanje regulacionih karakteristika u skladu sa zahtevima - primarily as a regulation body - when large pressure differences and sufficient counter-pressure exist - possible adjustment of control characteristics according to requirements
PSL	Prstenasto sedište sa perforiranim cilindrom Ring shaped seat with a perforated cylinder	- prvenstveno kao regulacioni organ - pri velikim razlikama pritiska i dovoljnim kontra-pritiskom - moguće podešavanje regulacionih karakteristika u skladu sa zahtevima - primarily as a regulation body - when large pressure differences and small counter-pressure exist - possible adjustment of control characteristics according to requirements

Klipno-prstenaste ventile isporučujemo sa ručnim ili elektro-mehaničkim pogonom, a na zahtev kupca i sa drugim vrstama pogona.

We supply piston ring valves with manual or electro-mechanical drive, and other drive types if requested by the Customer.

IZBOR

Pri izboru dimenzije i tipa regulacionog klipno-prstenastog ventila mora da se zadovolji sledeće:

1. Dimenzija ventila mora da bude tako usvojena da se može obezbediti zahtevani protok pri najmanjoj vrednosti pada pritiska na ventilu.

2. Dijagram zavisnosti protoka od procentualne otvorenosti ventila, tj. karakteristična kriva protoka mora biti takva da se može obezbediti stabilna regulacija.

3. U celoj radnoj oblasti ventil mora da radi u bezkavitacionim uslovima, tj. kavitacioni broj sistema σs mora da bude veći od kavitacionog broja ventila σv. Preporučljivo je da se kavitacioni broj ventila predstavljen na dijagramu poveća za 25%.

Kavitacioni broj sistema u kome je ugrađen klipno-prstenasti ventil izračunava se po sledećem obrascu:

$$\sigma_S = \frac{H_2 + H_B - H_D}{H_1 - H_2 + v^2/2g}$$

pri čemu je:

σs - kavitacioni broj sistema
H_1-(mVS) pritisak ispred ventila (uzvodno)
H_2-(mVS) pritisak iza ventila (nizvodno)
H_D-(mVS) pritisak isparavanja vode
H_B-(mVS) barometarski pritisak
v - (m/s) srednja brzina protoka kroz nazivnu dimenziju ventila
g=9.81 (m/s^2) - ubrzanje zemljine teže

Izbor tipa i dimenzija regulacionog klipno-prstenastog ventila vrši se na sledeći način:

1. U zavisnosti od konfiguracije sistema za različite tipove prstenastih sedišta (PSE, PSS, PSL) klipno-prstenastih ventila, vrši se izbor dimenzija ventila koji obezbeđuje zahtevani protok pri najmanjoj vrednosti pada pritiska na ventilu.

2. Za usvojene dimenzije i tipove ventila vrši se proračun propusne moći ventila (karakteristične krive protoka) i kavitacijske rezerve sistema u funkciji procentualne otvorenosti ventila.

3. Usvaja se minimalna dimenzija ventila koja obezbeđuje zahtevane protoke pri bezkavitacionom radu i ima krivu zavisnosti protoka od procentualne otvorenosti (karakterističnu krivu) koja obezbeđuje stabilnu regulaciju.

CHOICE

When choosing the size and the type of piston ring valve, the following must be satisfied:

1. The size of the valve must be adopted in such a way that the required flow can be provided at the presure drop lowest value in the valve.

2.The chart representing the flow dependance on the percentual opening of the valve, i.e., the characteristic curve of the flow must be such as to provide for stable regulation.

3. Within the whole operating area, th valve must work in cavitation free conditions, i.e., the cavitation number of the system s must be higher than the cavitation number of the valve v. It is advisible that the cavitation number of the valve, represented on the chart, be increased for 25%.

The cavitation number of the system with a piston-ring valve fitted, is calculated according to the following expression:

$$\sigma_S = \frac{H_2 + H_B - H_D}{H_1 - H_2 + v^2/2g}$$

where:
σ - system cavitation number
H_1 - (mVS) pressure in front of the valve (upstream)
H_2 - (mVS) pressure behind the valve (downstream)
H_D - (mVS) pressure of water evaporation
H_B - (mVS) barometer pressure
v - (m/s) medium flow rate through the valve nominal size
g = 9.81(m/s^2) - gravity acceleration

The choice of the size and the type of piston ring valve is made in the following way:

1. Depending on the system configuration for different types of ring-shaped seats (PSE, PSS, PSL) of the piston-ring valves, the valve size is chosen, that provides for the required flow at the lowest value of the pressure drop in the valve.

2. For adopted dimensions and types of valves, the calculation of the valve throughput (flow characteristic curve), and cavitational reserve of the system is made in the function of percentual opening degree of the valve.

3. Minimum valve size, providing for the required flows in operation without cavitation is adopted and it has the flow curve depending on the percentual opening degree of the valve (characteristic curve) that ensures the stable regulation.

Na dijagramima su za pretpostavljenu konfiguraciju instalacije prikazani rezultati proračuna propusne moći i kavitacijske rezerve sistema. Iz priloženih dijagrama vidi se da se u konkretnom slučaju za opseg regulacije protoka od Qmin=100 (l/s) mora koristiti klipno-prstenasti ventil DN 600 (mm) sa prstenastim sedištem PSL 15.

Korišćenjem sopstvenog programskog paketa unosimo osnovne parametre o konfiguraciji sistema, vršimo proračun karakteristične krive protoka i kavitacijske rezerve sistema koju zatim sprežemo sa kavitacijskom rezervom ventila, odakle se konstantuje da li pretpostavljeni klipno-prstenasti ventil u datom sistemu može da radi kao regulator protoka.

MATERIJAL

Kućište, klip i krivajni mehanizam klipno-prstenastih ventila izrađujemo od konstrukcionih čelika zavarivanjem, s tim da su naležuće zaptivne površine od odgovarajućih nerđajućih čelika, a zaptivna guma je od EPDM-a.

Vratilo klipno-prstenastih ventila izrađujemo od nerđajućih čelika, a klizne ležajeve od specijalnog sivog liva.

NARUČIVANJE

Naručivanje klipno-prstenastih ventila vrši se opisno kao što je naznačeno u opštim napomenama uz obavezno dostavljanje dodatnih podataka o sledećem:

- protok radnog fluida na ulazu ventila
- uzvodni pritisak
- nizvodni pritisak
- maksimalni dozvoljeni pad pritiska pri maksimalnom protoku
- primena ventila (zaporni organ, regulator protoka i pritiska, funkcija nepovratnog ventila, sigurnosni uređaj od pojave hidroudara, ispusni organ, uređaj za pražnjenje cevovoda, uređaj za kontrolu nivoa u rezervoaru, merni uređaj, ostalo)
- da li postoji mogućnost upuštanja vazduha
- na kom rastojanju uzvodno od ventila postoji armatura
- na kom rastojanju nizvodno od ventila postoji armatura.

The charts show the results of the system throughput and cavitation reserves calculation for the supposed installation configuration. It can be seen from the charts that in the particular case, for the range of the flow regulation from Q_{min} = 100 (l/s) the piston-ring valve DN 600 (mm) with a ring shaped seat PSL 15, must be used .

By using our own programme packet, we enter the basic parameters on the system configuration, we calculate the flow characteristic curve and cavitational reserves of the system that we adjoin later to the valve cavitational reserve, and find out if the supposed piston-ring valve can operate as a flow regulator within a given system .

MATERIAL

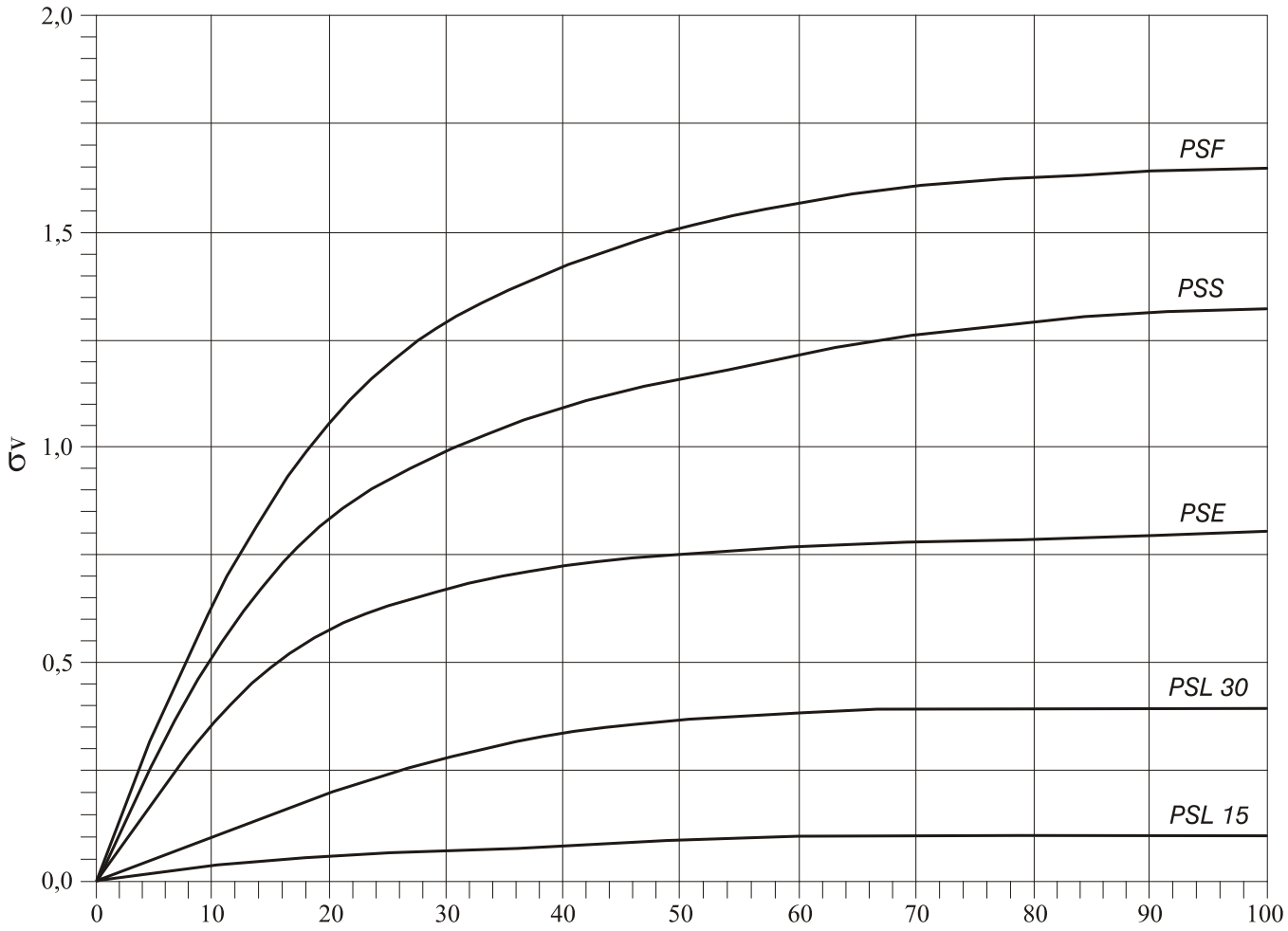
The housing, piston and the beam and crank mechanism of the piston-ring valves are made of the structural steels by welding. The adhering sealing surfaces are made of corresponding stainless steels, and sealing rubber is of EPDM.

The piston-ring valve shaft is made of stainless steel and the slide bearings are made of a special grey cast iron.

HOW TO ORDER

You can order the piston-ring valves by describing the goods you need, as in dedicated in general notes with obligatory submission of additional data on the following:

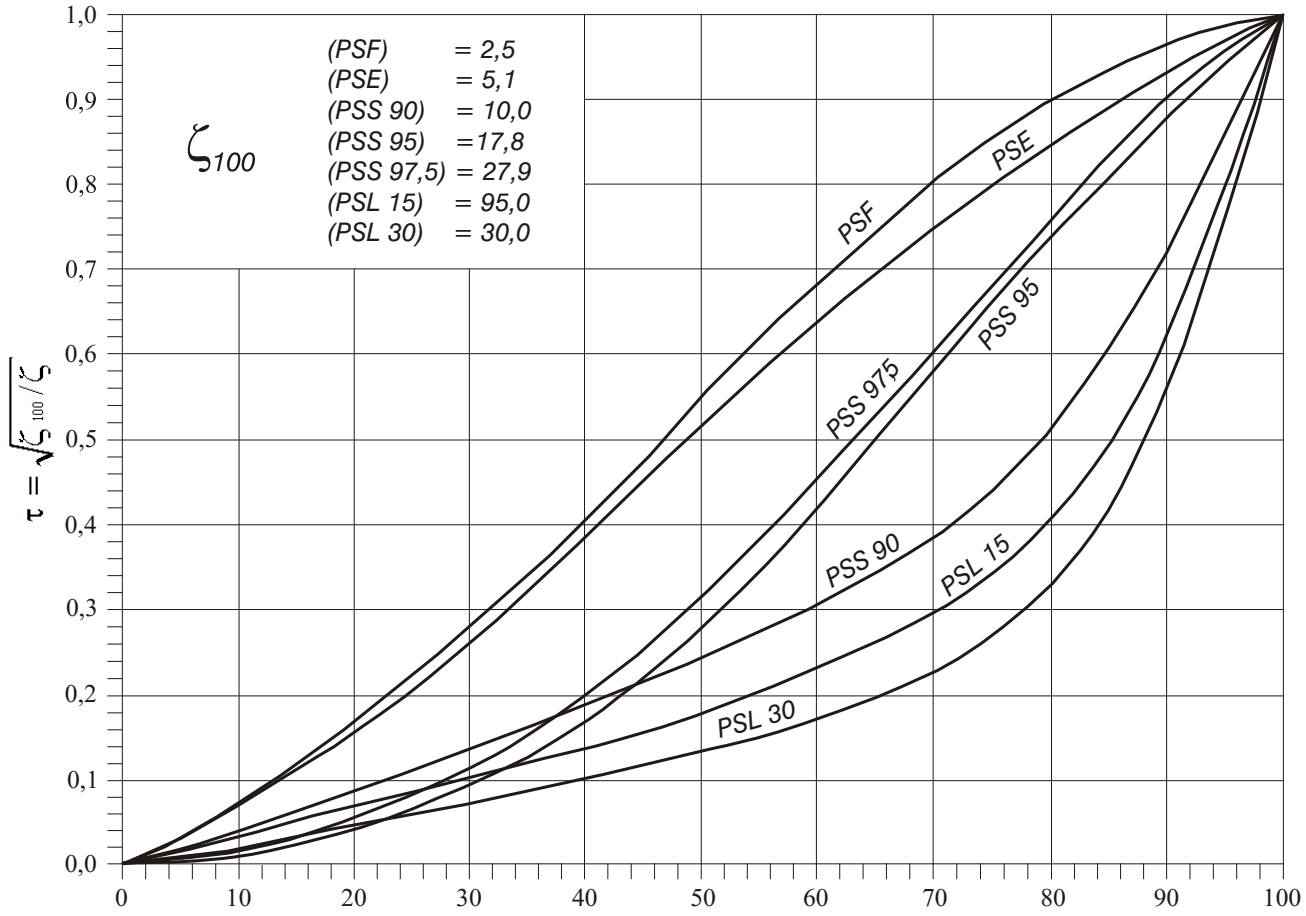
- operating fluid flow at the valve inlet
- upstream pressure
- downstream pressure
- maximum allowable pressure drop at maximum flow
- valve application (shutoff body, flow and pressure regulator, non-return valve function, safety unit from the occurrence of water hammer, discharge body, pipeline discharge unit, tank level control unit, measuring unit etc.)
- if there is a possibility of air admission
- what is the distance to the armature, upstream of the valve
- what is the distance to the armature, downstream of the valve.



α [%] – *PROCENTUALNI OTVOR VENTILA*
α [%] – *PERCENTAGE OPENING OF THE VALVE*

σ_v (-)

α	PSF	PSS	PSE	PSL30	PSL15
0	0,000	0,000	0,000	0,000	0,000
10	0,635	0,524	0,365	0,101	0,027
20	1,071	0,829	0,582	0,196	0,047
30	1,290	0,992	0,673	0,283	0,064
40	1,417	1,092	0,719	0,340	0,078
50	1,506	1,162	0,748	0,366	0,090
60	1,565	1,218	0,766	0,378	0,100
70	1,604	1,260	0,778	0,386	0,101
80	1,626	1,289	0,787	0,392	0,102
90	1,639	1,307	0,794	0,396	0,103
100	1,650	1,320	0,800	0,400	0,104



α [%] – *PROCENTUALNI OTVOR VENTILA*

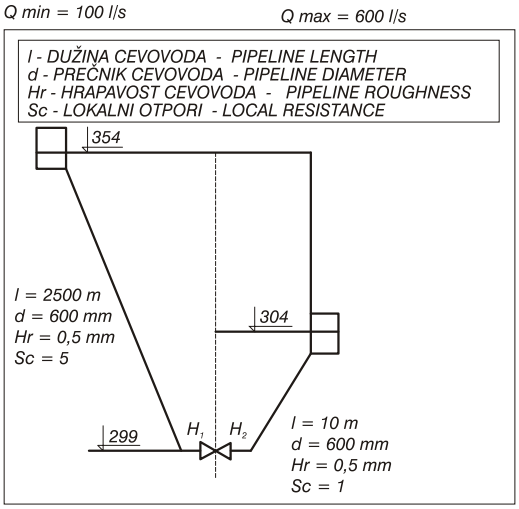
α [%] – *PERCENTAGE OPENING OF THE VALVE*

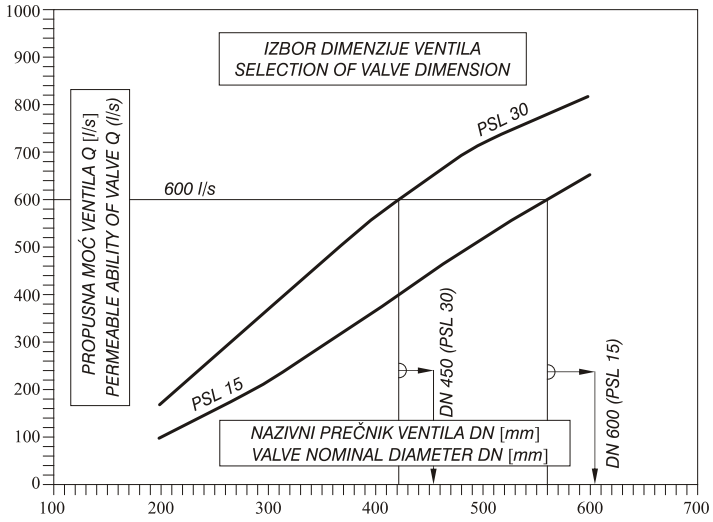
$$\tau = \sqrt{\zeta_{100} / \zeta}$$

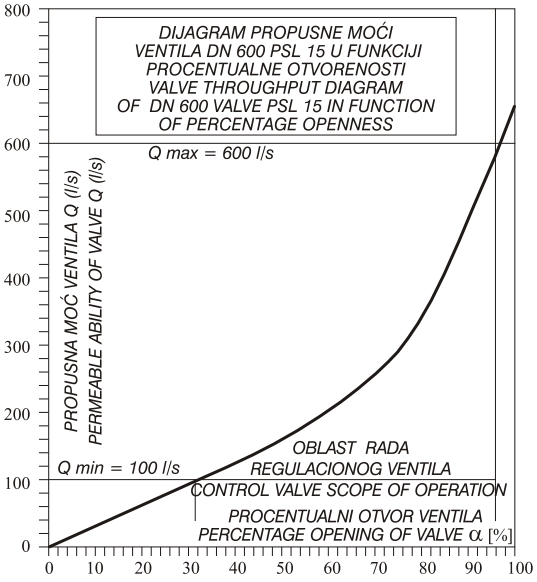
α	PSF	PSE	PSS90	PSS95	PSS97,5	PSL15	PSL30
0	0,000	0,000	0,000	0,000	0,000	0,000	0,000
10	0,081	0,079	0,041	0,020	0,020	0,037	0,021
20	0,172	0,164	0,087	0,046	0,057	0,075	0,049
30	0,286	0,265	0,139	0,097	0,116	0,107	0,079
40	0,410	0,388	0,192	0,174	0,206	0,141	0,108
50	0,543	0,514	0,250	0,282	0,319	0,182	0,136
60	0,683	0,638	0,312	0,421	0,463	0,234	0,176
70	0,800	0,749	0,390	0,582	0,609	0,300	0,236
80	0,894	0,843	0,511	0,725	0,751	0,412	0,326
90	0,959	0,931	0,720	0,882	0,903	0,463	0,568
100	1,000	1,000	1,000	1,000	1,000	1,000	1,000

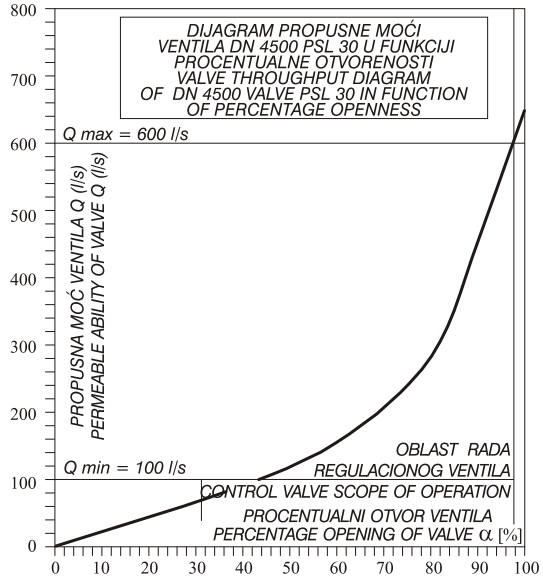
KLIPNO-PRSTENASTI VENTILI
PISTON-RING TYPE VALVES

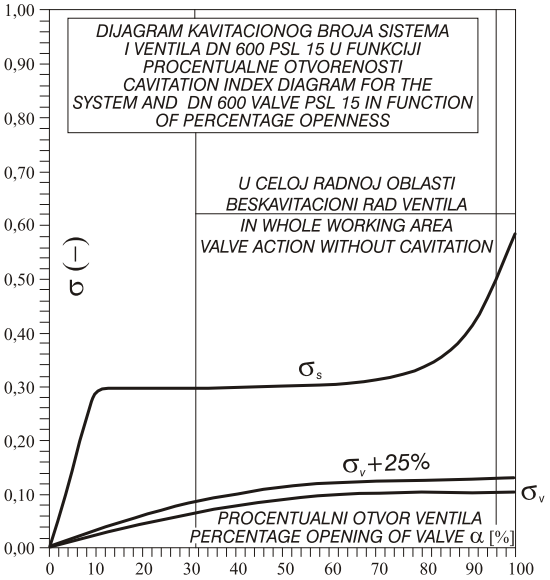
KPV

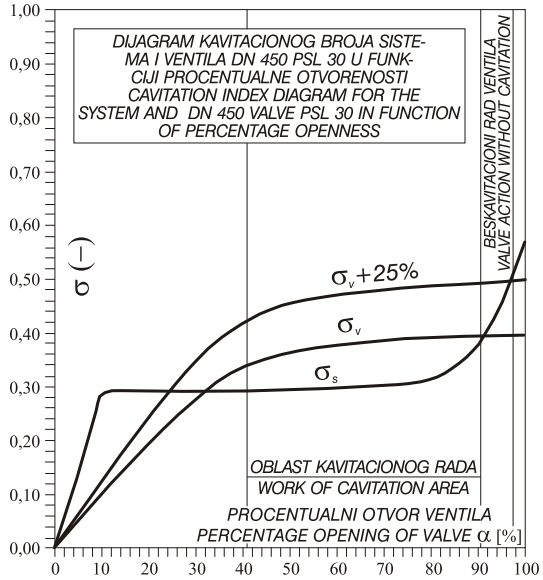








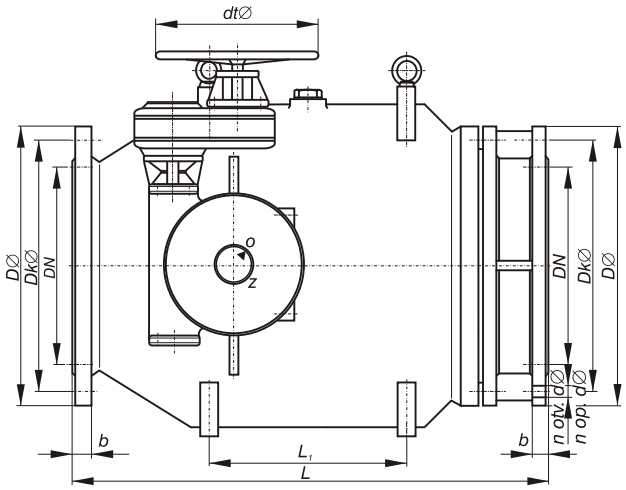


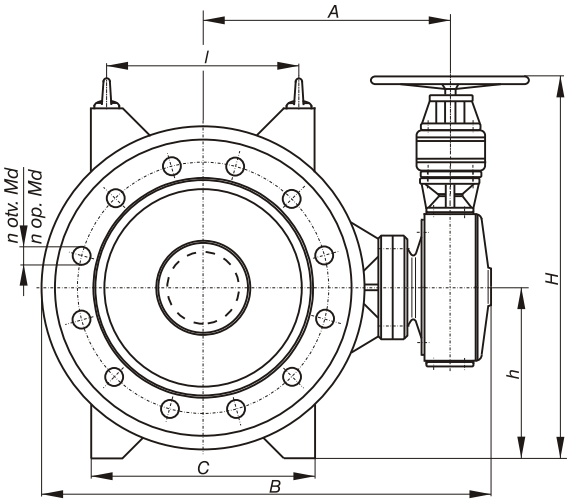


KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 10 DN 150 - 1200

KPVR

RUČNI POGON - MANUAL DRIVE



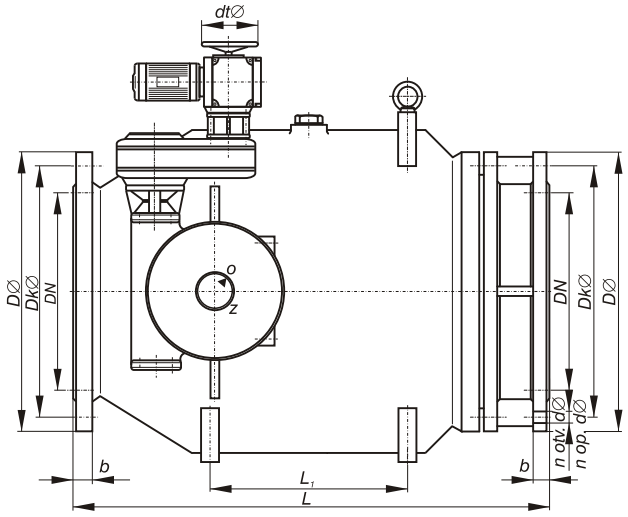


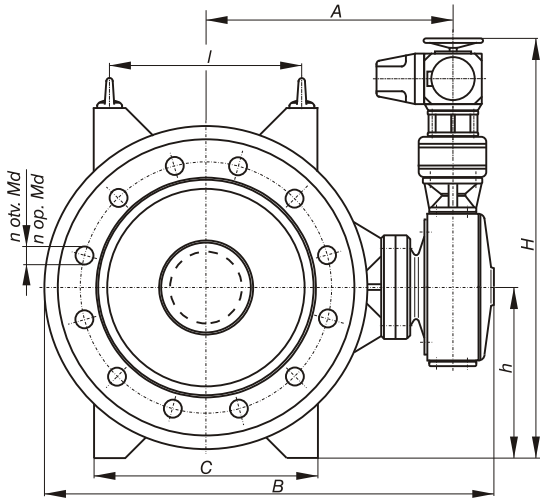
DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	400	285	240	8	22	M20	130	130	295	520	170	375	175	22	250	138
200	400	340	295	8	22	M20	120	130	295	520	170	350	150	26	250	150
250	500	395	350	12	22	M20	160	170	340	590	210	440	190	28	250	234
300	600	445	400	12	22	M20	220	230	375	700	270	520	220	28	250	336
350	700	505	460	16	22	M20	250	260	425	790	290	600	260	30	250	483
400	800	565	515	16	26	M24	300	310	460	890	340	680	300	32	315	621
450	900	615	565	20	26	M24	360	370	510	970	410	760	340	32	315	862
500	1000	670	620	20	26	M24	400	410	550	915	460	840	380	34	400	1104
600	1100	780	725	20	30	M27	440	460	580	980	510	920	420	36	400	1392
700	1300	895	840	24	30	M27	520	530	660	1135	580	1060	490	40	400	2081
800	1500	1015	950	24	33	M30	600	630	740	1290	680	1200	560	44	400	2882
900	1700	1115	1050	28	33	M30	680	740	860	1490	790	1390	650	46	500	3993
1000	1900	1230	1160	28	36	M33	760	810	980	1680	860	1530	720	50	630	5061
1200	2100	1455	1380	32	39	M36	840	860	1055	1820	910	1650	780	56	630	8688

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 10 DN 150 - 1200

KPVE

ELEKTRO-MEHANIČKI POGON - ELECTRO-MECHANICAL DRIVE



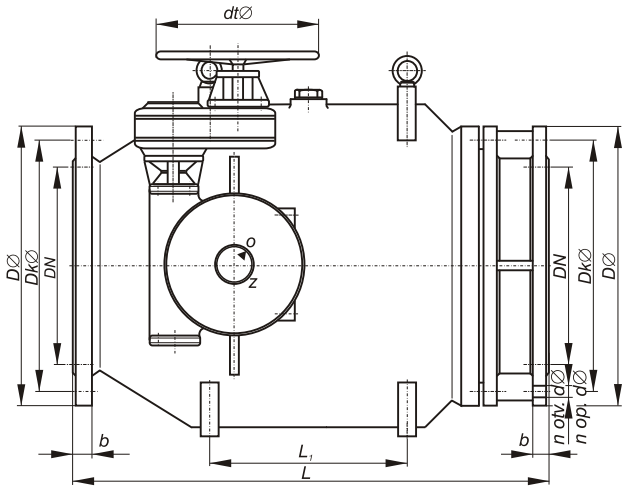


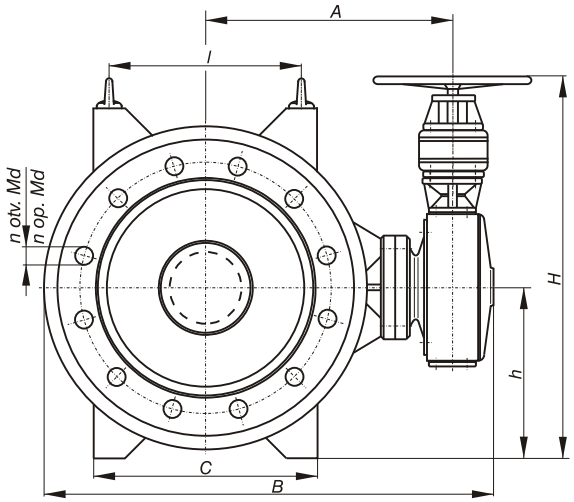
DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	400	285	240	8	22	M20	130	130	295	520	170	634	175	22	180	148
200	400	340	295	8	22	M20	120	130	295	520	170	609	150	26	180	160
250	500	395	350	12	22	M20	160	170	340	590	210	709	190	28	180	244
300	600	445	400	12	22	M20	220	230	375	700	270	757	220	28	180	351
350	700	505	460	16	22	M20	250	260	425	790	290	797	260	30	220	498
400	800	565	515	16	26	M24	300	310	460	890	340	897	300	32	220	636
450	900	615	565	20	26	M24	360	370	510	970	410	937	340	32	220	882
500	1000	670	620	20	26	M24	400	410	550	915	460	977	380	34	220	1124
600	1100	780	725	20	30	M27	440	460	580	980	510	1019	420	36	280	1412
700	1300	895	840	24	30	M27	520	530	660	1135	580	1163	490	40	280	2106
800	1500	1015	950	24	33	M30	600	630	740	1290	680	1233	560	44	280	2907
900	1700	1115	1050	28	33	M30	680	740	860	1490	790	1409	650	46	400	4018
1000	1900	1230	1160	28	36	M33	760	810	980	1680	860	1569	720	50	400	5091
1200	2100	1455	1380	32	39	M36	840	860	1055	1820	910	1665	780	56	400	8718

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 16 DN 150 - 1200

KPVR

RUČNI POGON - MANUAL DRIVE

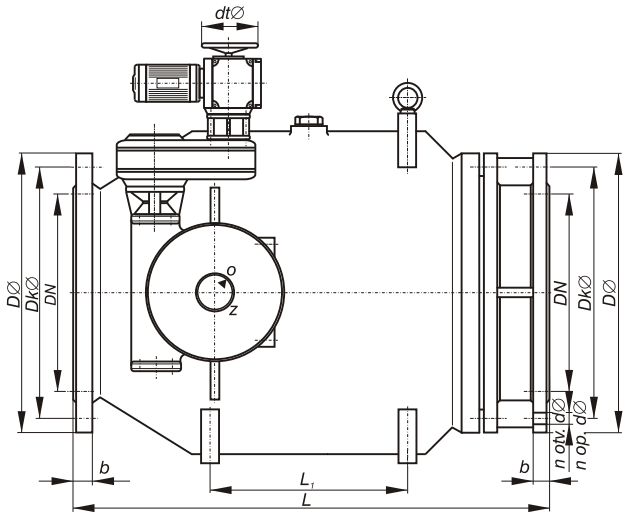


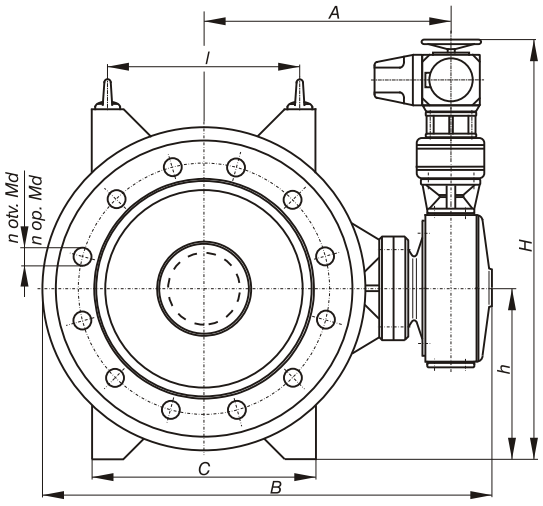


DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	400	285	240	8	22	M20	130	130	295	520	170	375	175	24	250	138
200	400	340	295	12	22	M20	120	130	295	520	170	350	150	26	250	150
250	500	410	355	12	26	M24	160	170	340	590	210	440	190	32	250	246
300	600	470	410	12	26	M24	220	230	375	700	270	520	220	32	250	348
350	700	525	460	16	26	M24	250	260	425	790	290	600	260	36	250	495
400	800	580	525	16	30	M27	300	310	460	890	340	680	300	38	315	656
450	900	640	585	20	30	M27	360	370	510	970	410	760	340	40	315	897
500	1000	715	650	20	33	M30	400	410	550	915	460	840	380	42	400	1150
600	1100	840	770	20	36	M33	440	460	580	980	510	920	420	48	400	1472
700	1300	910	840	24	36	M33	520	530	660	1135	580	1010	490	54	400	2173
800	1500	1025	950	24	39	M36	600	630	740	1290	680	1150	560	58	400	2992
900	1700	1125	1050	28	39	M36	680	740	860	1490	790	1400	650	62	500	4070
1000	1900	1255	1170	28	42	M39	760	810	980	1680	860	1530	720	66	630	5248
1200	2100	1485	1390	32	48	M45	840	860	1055	1820	910	1580	780	76	630	8913

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 16 DN 150 - 1200

ELEKTRO-MEHANIČKI POGON - ELECTRO-MECHANICAL DRIVE



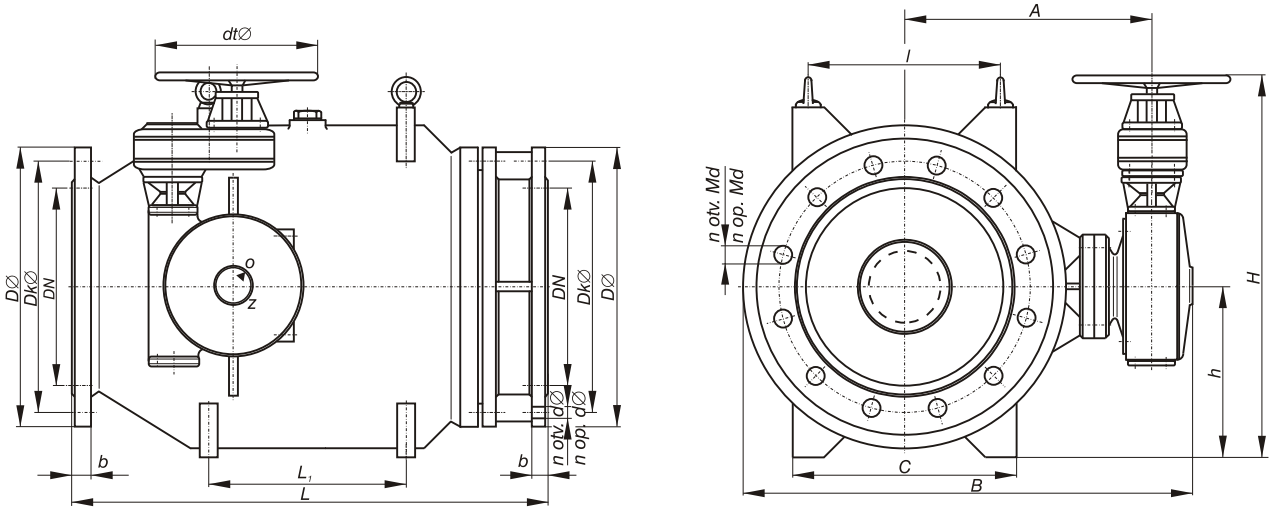


DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	400	285	240	8	22	M20	130	130	295	520	170	634	175	24	180	148
200	400	340	295	12	22	M20	120	130	295	520	170	608	150	26	180	160
250	500	405	355	12	26	M24	160	170	340	590	210	709	190	32	180	256
300	600	460	410	12	26	M24	220	230	375	700	270	757	220	32	180	363
350	700	520	470	16	26	M24	250	260	425	790	290	797	260	36	220	510
400	800	580	525	16	30	M27	300	310	460	890	340	897	300	38	220	671
450	900	640	585	20	30	M27	360	370	510	970	410	937	340	40	220	917
500	1000	715	650	20	33	M30	400	410	550	915	460	977	380	42	220	1170
600	1100	840	770	20	36	M33	440	460	580	980	510	1019	420	48	280	1492
700	1300	910	840	24	36	M33	520	530	660	1135	580	1163	490	54	280	2198
800	1500	1025	950	24	39	M36	600	630	740	1290	680	1233	560	58	280	3017
900	1700	1125	1050	28	39	M36	680	740	860	1490	790	1409	650	62	400	4095
1000	1900	1255	1170	28	42	M39	760	810	980	1680	860	1569	720	66	400	5278
1200	2100	1485	1390	32	48	M45	840	860	1055	1820	910	1665	780	76	400	8943

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 25 DN 150 - 1200

KPVR

RUČNI POGON - MANUAL DRIVE

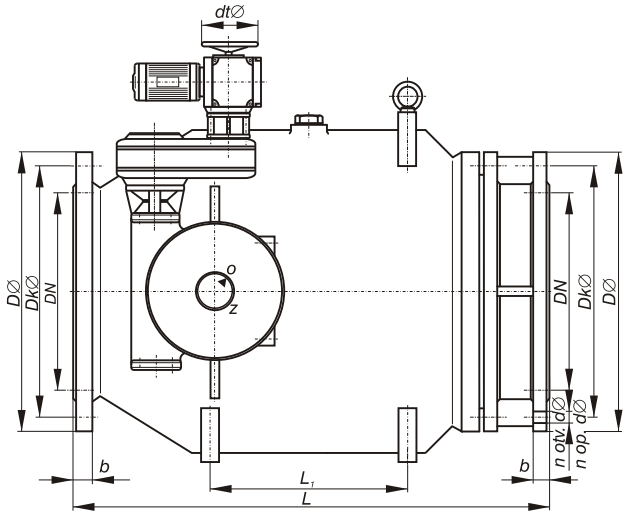


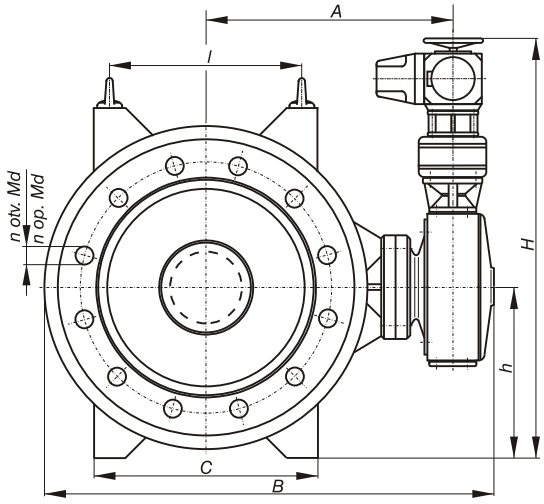
DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	450	300	250	8	26	M24	130	130	305	520	170	350	150	30	250	144
200	450	360	310	12	26	M24	120	130	305	520	170	350	150	32	250	156
250	550	425	370	12	30	M27	160	170	350	590	210	390	190	36	250	252
300	650	485	430	16	30	M27	220	230	375	700	270	490	220	38	250	366
350	750	555	490	16	33	M30	250	260	450	790	290	530	260	42	315	541
400	850	620	550	16	36	M33	300	310	460	890	340	630	300	44	315	685
450	950	670	600	20	36	M33	360	370	510	970	410	670	340	46	400	966
500	1050	730	660	20	36	M33	420	410	550	915	460	710	380	50	400	1208
600	1150	845	770	20	39	M36	460	460	620	1020	510	750	420	54	500	1612
700	1350	960	875	24	42	M39	540	530	700	1180	580	820	490	60	500	2346
800	1550	1085	990	24	48	M45	620	630	835	1390	680	890	560	64	630	3333
900	1750	1185	1090	28	48	M45	700	740	910	1550	790	1040	650	72	800	4521
1000	1950	1320	1210	28	56	M52	780	810	980	1680	860	1200	720	76	800	5725
1200	2150	1530	1420	32	56	M52	860	860	1050	1820	910	1260	780	80	800	9523

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 25 DN 150 - 1200

KPVE

ELEKTRO-MEHANIČKI POGON - ELECTRO-MECHANICAL DRIVE



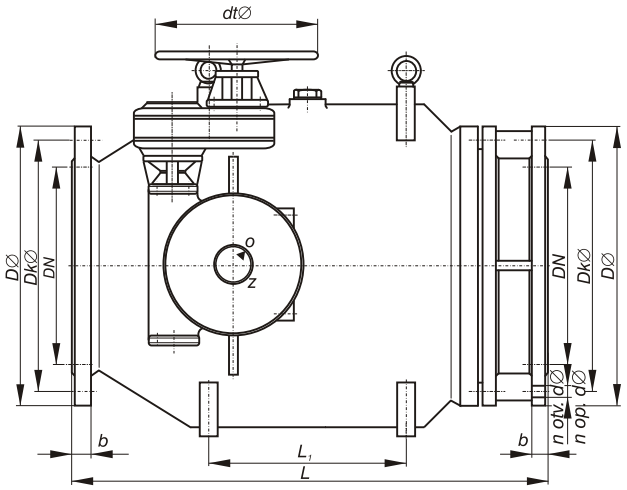


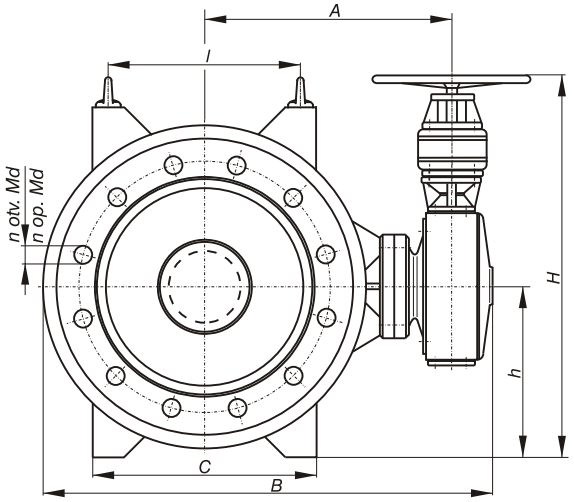
DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	450	300	250	8	26	M24	130	130	305	520	170	609	150	30	180	154
200	450	360	310	12	26	M24	120	130	305	520	170	609	150	32	180	166
250	550	425	370	12	30	M27	160	170	350	590	210	709	190	36	180	262
300	650	485	430	16	30	M27	220	230	375	700	270	757	220	38	180	381
350	750	555	490	16	33	M30	250	260	450	790	290	797	260	42	220	556
400	850	620	550	16	36	M33	300	310	460	890	340	897	300	44	220	700
450	950	670	600	20	36	M33	360	370	510	970	410	937	340	46	220	986
500	1050	730	660	20	36	M33	420	410	550	915	460	977	380	50	220	1228
600	1150	845	770	20	39	M36	460	460	620	1020	510	1019	420	54	280	1642
700	1350	960	875	24	42	M39	540	530	700	1180	580	1163	490	60	280	2371
800	1550	1085	990	24	48	M45	620	630	835	1390	680	1233	560	64	280	3358
900	1750	1185	1090	28	48	M45	700	740	910	1550	790	1409	650	72	400	4546
1000	1950	1320	1210	28	56	M52	780	810	980	1680	860	1569	720	76	400	5755
1200	2150	1530	1420	32	56	M52	860	860	1050	1820	910	1665	780	80	400	9553

KLIPNO-PRSTENASTI VENTILI
PISTON-RING VALVES
NP 40 DN 150 - 1200

KPVR

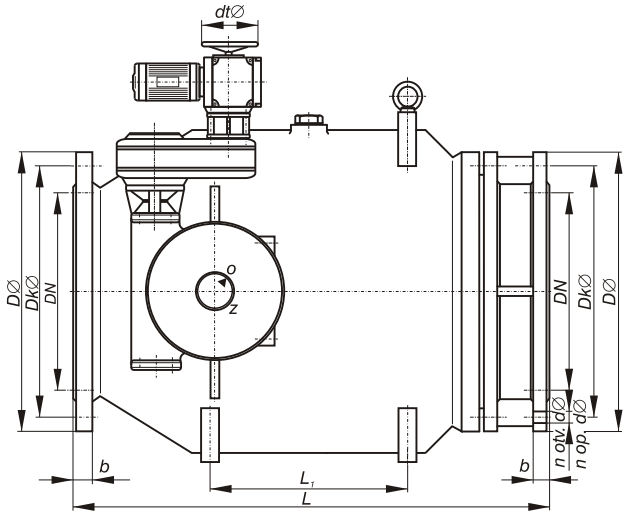
RUČNI POGON - MANUAL DRIVE

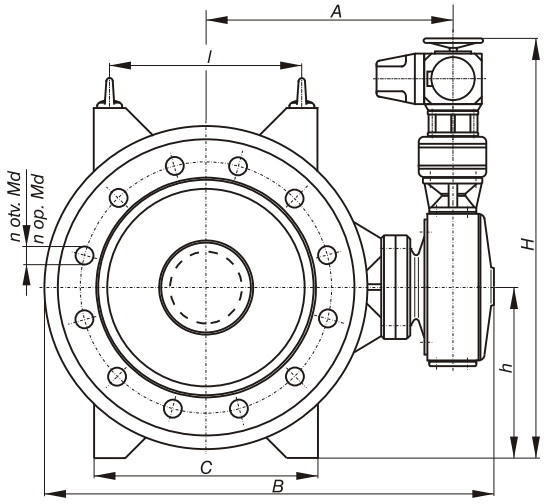




DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	450	300	250	8	26	M24	130	130	305	520	170	350	150	34	250	150
200	450	360	320	12	30	M27	120	130	305	520	170	350	150	36	250	162
250	550	450	385	12	33	M30	160	170	350	590	210	440	190	38	250	282
300	650	515	450	16	33	M30	220	230	375	700	270	520	220	42	250	408
350	750	580	510	16	36	M33	250	260	450	790	290	600	260	44	315	570
400	850	660	585	16	39	M36	300	310	460	890	340	680	300	46	400	748
450	950	685	610	20	39	M36	360	370	510	970	410	760	340	50	400	1035
500	1050	755	670	20	42	M39	420	410	590	960	460	790	380	54	500	1277
600	1150	890	795	20	48	M45	460	460	620	1020	510	870	420	60	500	1772
700	1350	995	900	24	48	M45	540	530	755	1180	580	920	490	64	630	2519
800	1550	1140	1030	24	56	M52	620	630	835	1390	680	1060	560	72	630	3559
900	1750	1250	1140	28	56	M52	700	740	910	1550	790	1330	650	76	800	4972
1000	1950	1360	1250	28	56	M52	780	810	980	1680	860	1460	720	80	800	6202
1200	2150	1575	1460	32	62	M56	860	860	1050	1820	910	1580	780	88	800	10133

ELEKTRO-MEHANIČKI POGON - ELECTRO-MECHANICAL DRIVE





DN	L	D∅	Dk∅	n	d∅	Md	L_1	l	A	B	C	H	h	b	dt∅	m(kg)
150	450	300	250	8	26	M24	130	130	305	520	170	609	150	34	180	160
200	450	360	320	12	30	M27	120	130	305	520	170	609	150	36	180	172
250	550	450	385	12	33	M30	160	170	350	590	210	709	190	38	180	292
300	650	515	450	16	33	M30	220	230	375	700	270	757	220	42	180	423
350	750	580	510	16	36	M33	250	260	450	790	290	797	260	44	220	585
400	850	660	585	16	39	M36	300	310	460	890	340	897	300	46	220	763
450	950	685	610	20	39	M36	360	370	510	970	410	937	340	50	220	1055
500	1050	755	670	20	42	M39	420	410	590	960	460	977	380	54	220	1297
600	1150	890	795	20	48	M45	460	460	620	1020	510	1019	420	60	280	1792
700	1350	995	900	24	48	M45	540	530	755	1180	580	1163	490	64	280	2544
800	1550	1140	1030	24	56	M52	620	630	835	1390	680	1233	560	72	280	3584
900	1750	1250	1140	28	56	M52	700	740	910	1550	790	1409	650	76	400	4997
1000	1950	1360	1250	28	56	M52	780	810	980	1680	860	1569	720	80	400	6232
1200	2150	1575	1460	32	62	M56	860	860	1050	1820	910	1665	780	88	400	10163