

## DOUBLE ECCENTRIC DOUBLE FLANGED BUTTERFLY VALVES

VALVES DEDICATED TO THE WATER DISTRIBUTION NETWORK  
AND HYDROPOWER SECTOR

WE DO NOT SELL JUST VALVES, WE SELL A SOLUTION  
FOR THE EFFICIENCY OF THE WATER NETWORK

TIS SERVICE

TIS POLSKA

TIS ASIA

TIS EUROPE

TIS GROUP



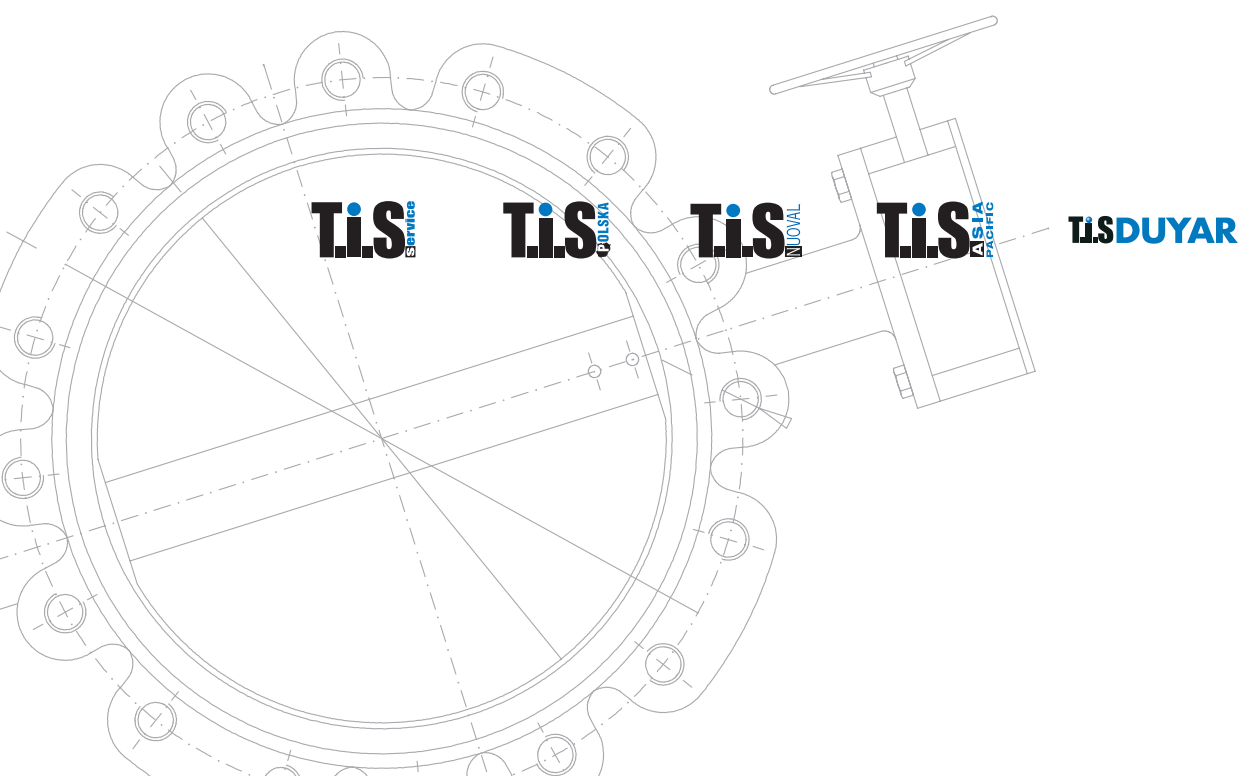
T.I.S. SERVICE S.p.A., is a leading international company specializing in the production and sale of equipment for water networks services and for hydroelectric power plants. One of its core products are safety valves.

Thanks to its partners, the company is able to produce a wide range of high technology valves and fittings, both in cast iron and plastic; butterfly valves, gate valves, air release valves, automatic control valves, plunger flow control valves and dismantling joints. These products can be controlled by electric motors or pneumatic actuators.

The T.i.S. system guarantees a complete solution package: from individual equipment supplies to engineering consultations on the more complex problems of water systems. The company's main activities are: supply of hydraulic equipment, automation, hydraulic network modelling and model calibration, leak detection, controlled pressure management, energy efficiency, white certificate management.

T.i.S. Service offers customers a personalized service, from the equipment selection stage right through to after-sales support.

All T.i.S. companies are certified ISO 9001. The company has held the prestigious Group certification since 2011.



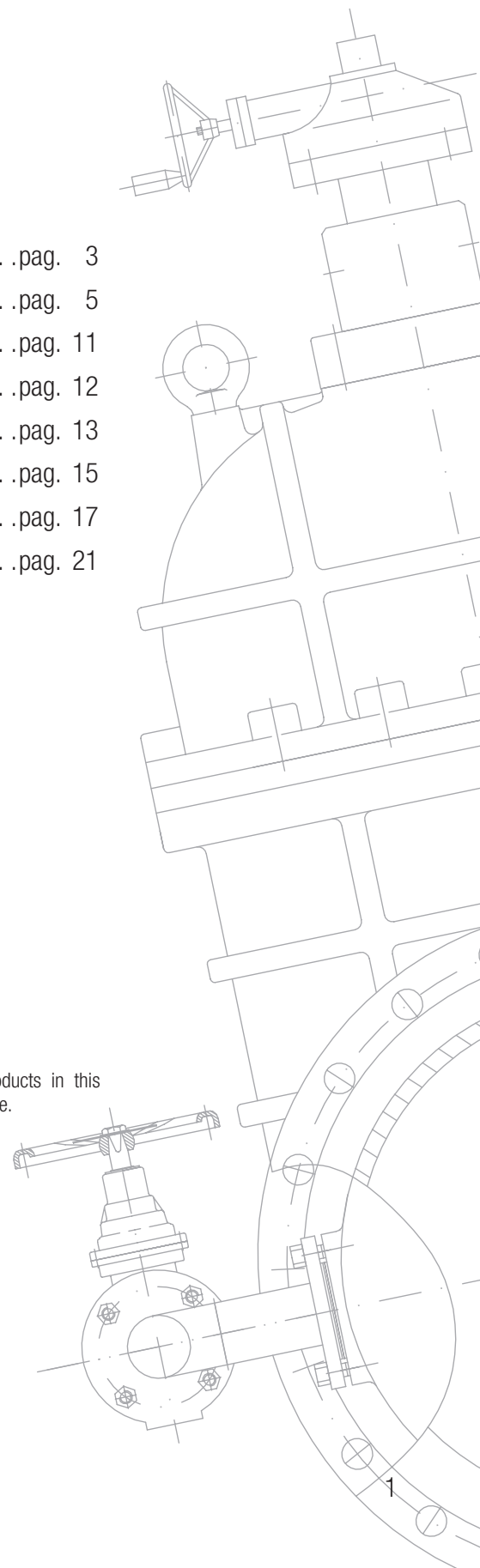


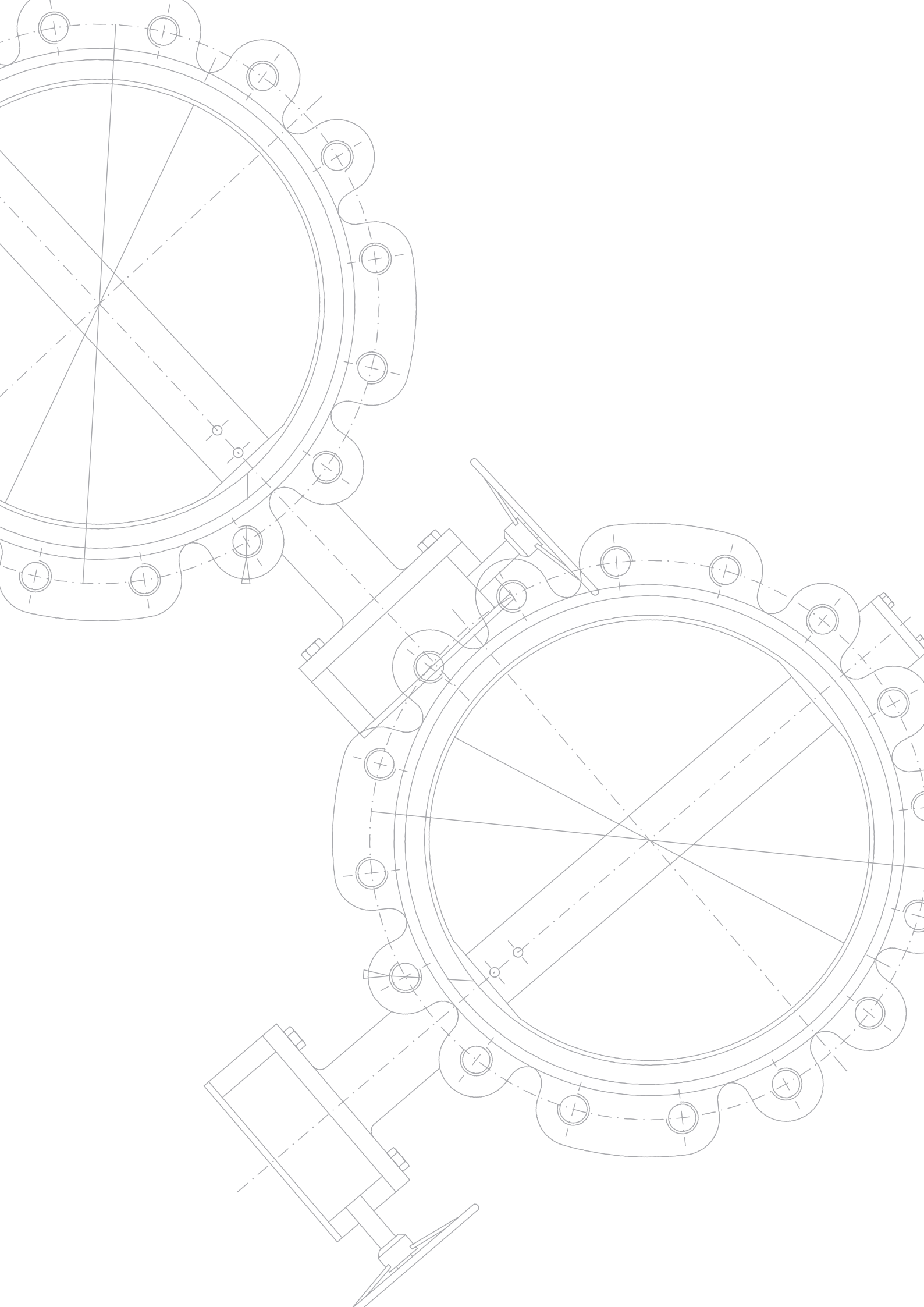
# BUTTERFLY VALVES

## INDEX

Introduction . . . . .	pag. 3
Technical specifications . . . . .	pag. 5
Hydraulic specifications . . . . .	pag. 11
- Pressure drop . . . . .	pag. 12
- Cavitation . . . . .	pag. 13
Main operating devices . . . . .	pag. 15
Special applications . . . . .	pag. 17
Main applications . . . . .	pag. 21

Data, photographs, illustrations and drawings concerning the products in this catalogue are merely indicative and could be varied without any notice.



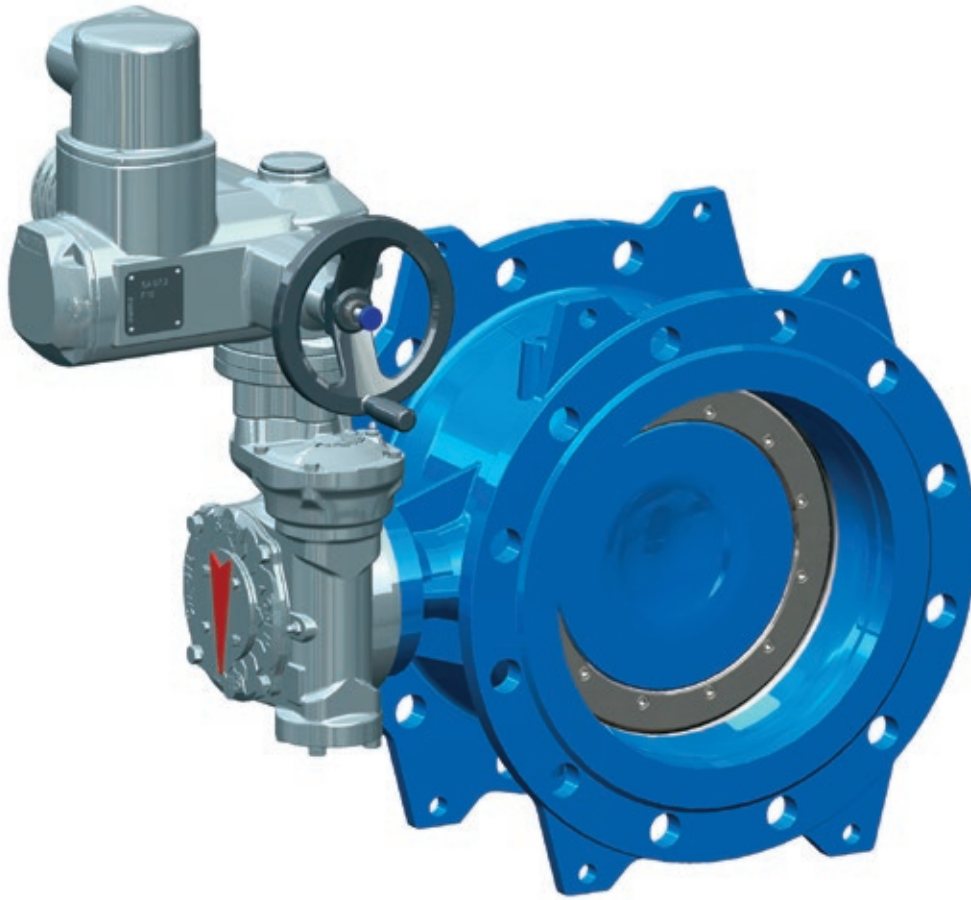






# INTRODUCTION

# INTRODUCTION



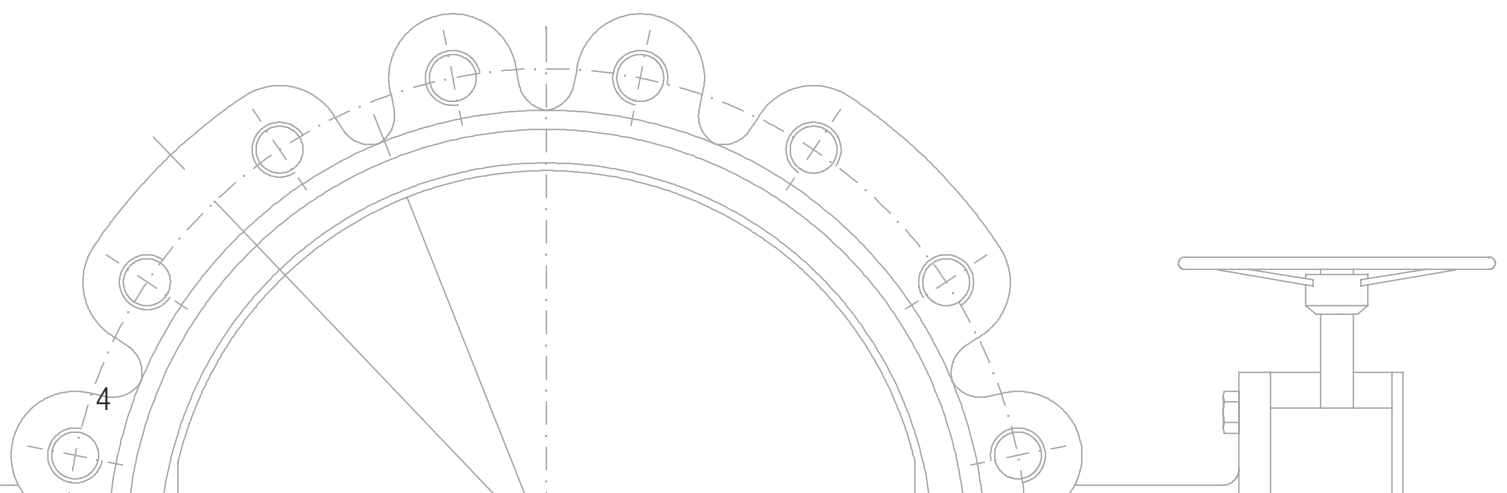
Double eccentric double flanged butterfly valve is a shut-off bi-directional valve designed for installation in pipelines that could be also used as a control valve only within certain limits.

The design of the valve is that of an eccentric valve with a double offset of the disc. Due to the double offset of the disc, the profile seal ring is completely unstressed when the valve is in open position. During opening / closing phase, the disc sealing ring does not exert any friction on the body seat reducing the

operating forces and increasing the life of the seal.

In closed position, the disc is perpendicular to the direction of flow. To close or open the valve, the disc must be turned by  $90^\circ$ .

The tightness is guaranteed by a special profile seal ring which in the standard version is fixed by stainless steel retaining ring. In closed position, the elastic profile sealing ring is pressed to the conical seat surface inside the body and safely seals in both flow directions.







# TECHNICAL SPECIFICATIONS

# TECHNICAL SPECIFICATIONS

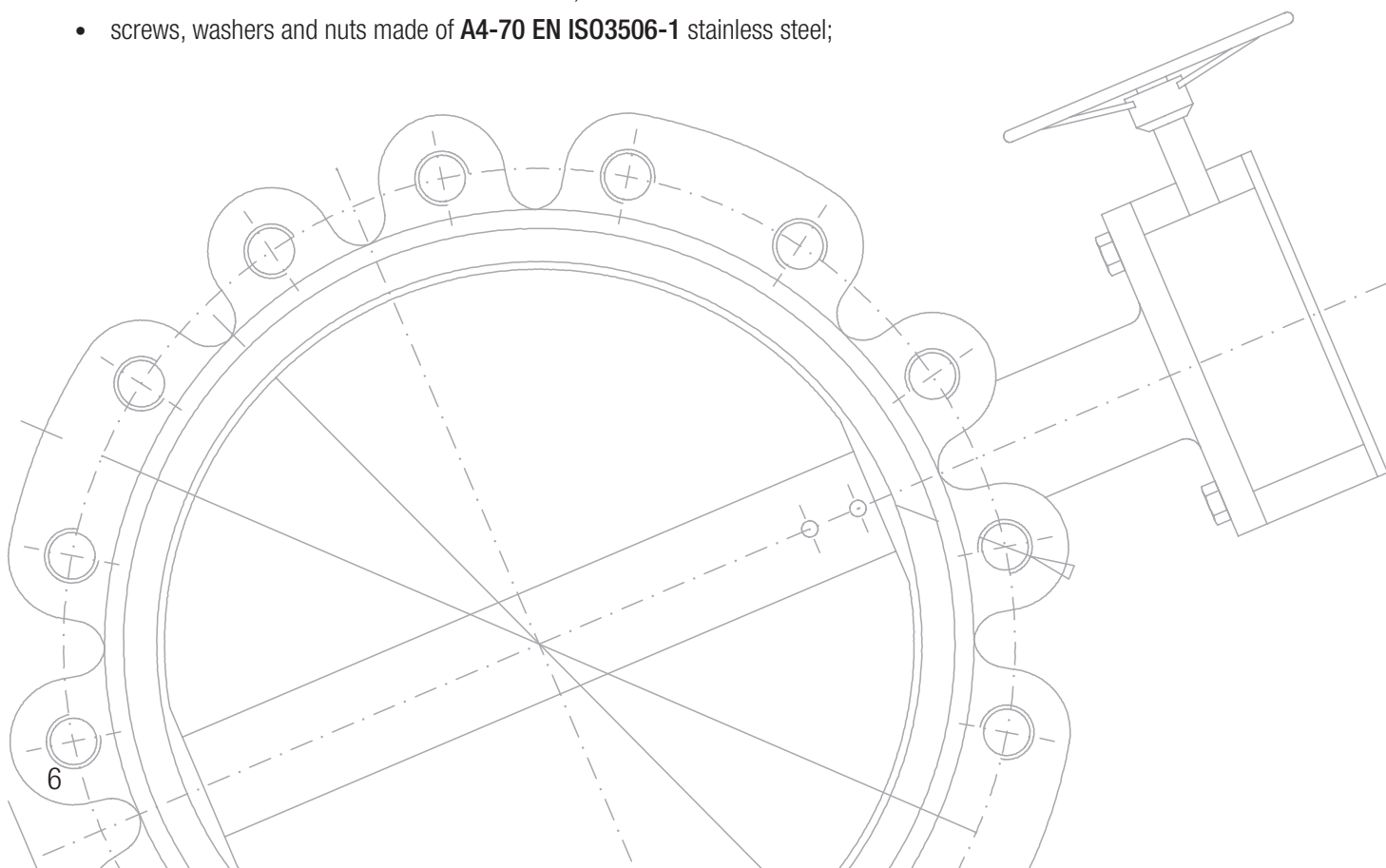
## CONSTRUCTION CHARACTERISTICS:

- Conform to EN 593 Resilient seated;
- The parts in contact with water are conform to DM 174 of 06/04/2004;
- One-piece body made of ductile cast iron EN GJS 400-15 according to EN 1563;
- Flange dimensions according to EN 1092-2;
- All screws, washers and pins are made of stainless steel A2-70 EN ISO3506-1;
- Body sealing ring welded on the body made of stainless steel EN 1.4301 EN10088-3 (AISI304);
- Disc sealing ring made of EPDM according to EN 681-1;
- Shaft and disc with polygon connection according to DIN32711-1-2
- Shaft are supported by solid and maintenance-free bronze bearings;
- The gearbox is suitable for the coupling with an electrical actuator according to ISO 5211 top flange;
- FBE internal and external surface protection obtained with epoxy resin powder of blue colour RAL 5015 and thickness of 250µm;
- Hydraulic test according to EN 12266-1;
- Tight in both flow directions according to EN1074-2;
- With self-locking worm gear including mechanical position indicator.

## AVAILABLE HIGH CORROSION-RESISTANT MATERIALS

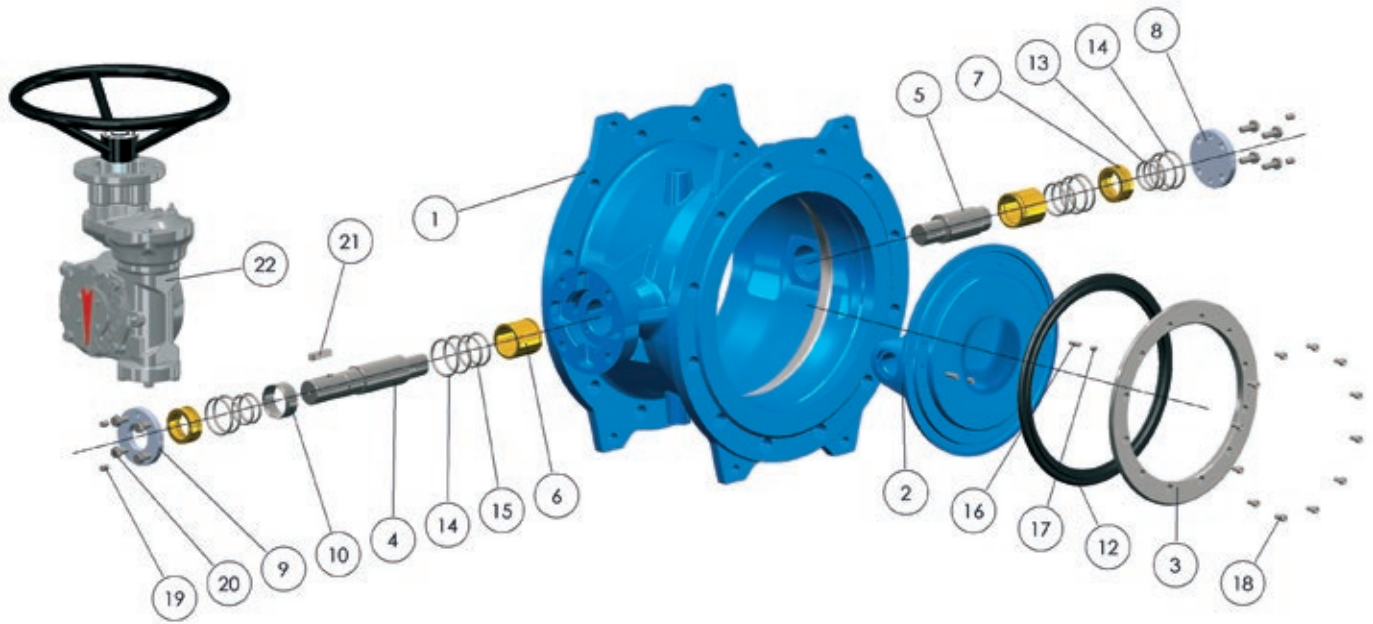
Upon request, some parts can be produced by high corrosion-resistant materials:

- disc made of **1.4301 EN10088-3 (AISI304)** or **1.4404 EN10088-3 (AISI316L)**;
- retaining ring made of **1.4404 EN10088-3 (AISI316L)**;
- shafts made of **1.4301 EN10088-3 (AISI304)** or **1.4401 EN10088-3 (AISI316L)** or **1.4462 EN10088-3 DUPLEX** stainless steel;
- screws, washers and nuts made of **A4-70 EN ISO3506-1** stainless steel;



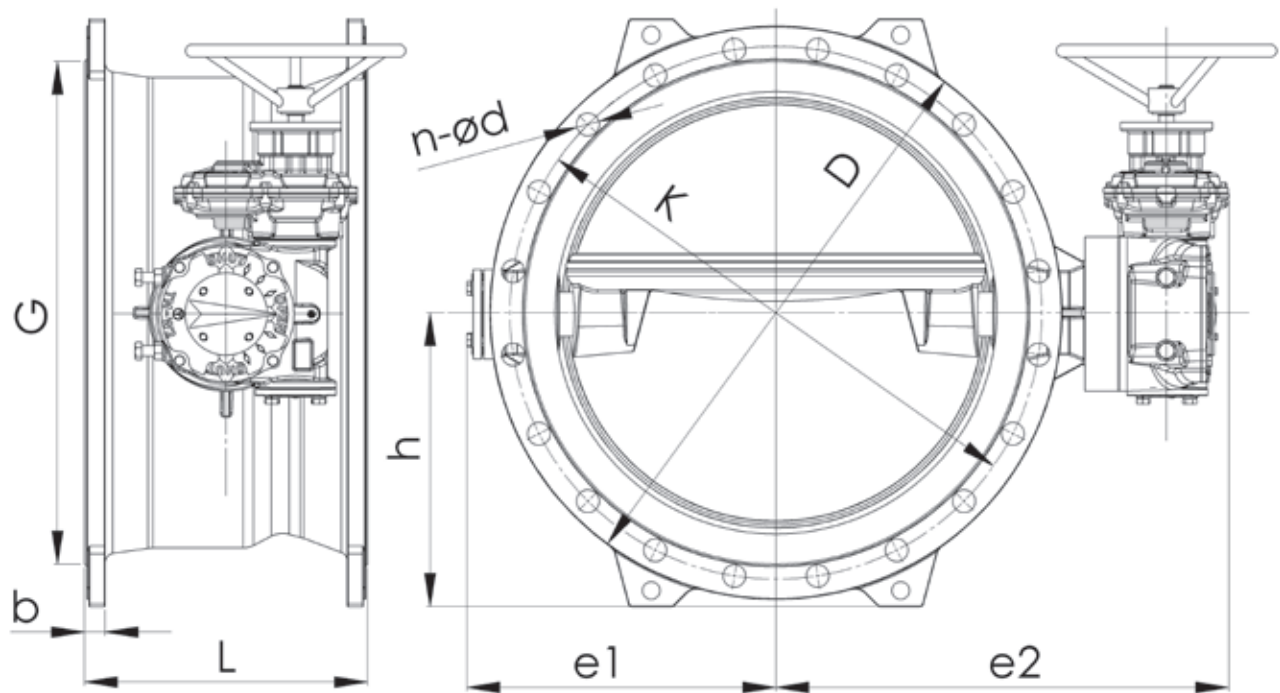


# STANDARD VALVE MATERIALS



ITEM	DESCRIPTION	MATERIAL	NOTE
1	BODY	DUCTILE IRON EN-GJS 400-15	FBE COATED
2	DISC	DUCTILE IRON EN-GJS 400-15	FBE COATED
3	RETAINING RING	STAINLESS STEEL AISI304 (EN1.4301)	
4	DRIVEN SHAFT	STAINLESS STEEL AISI420 (EN1.4028)	
5	SHAFT (Free end)	STAINLESS STEEL AISI420 (EN1.4028)	
6	BEARING BUSH	ALUMINUM-BRONZE	
7	SEALING BUSH	ALUMINUM-BRONZE	
8	SEALING BUSH COVER	STAINLESS STEEL	
9	SEALING BUSH FLANGE	STAINLESS STEEL	
10	SPACER BUSH	STAINLESS STEEL	
12	PROFILE SEAL	EPDM RUBBER	
13	O-RING	NBR RUBBER	
14	O-RING	NBR RUBBER	
15	O-RING	NBR RUBBER	
16	PIN	STAINLESS STEEL A2-70	
17	GRUB SCREW	STAINLESS STEEL A2-70	
18	RETAINING RING SCREW	STAINLESS STEEL A2-70	
19	GRUB SCREW	STAINLESS STEEL A2-70	
20	COVER SCREW AND WASHER	STAINLESS STEEL A2-70	
21	PARALLEL KEY	STEEL	
22	GEAR BOX	ACCORDING TO SUPPLIER SPECIFICATION	
	EYE BOLTS	AVAILABLE ON REQUEST	

# DIMENSIONS AND WEIGHT



## PN10

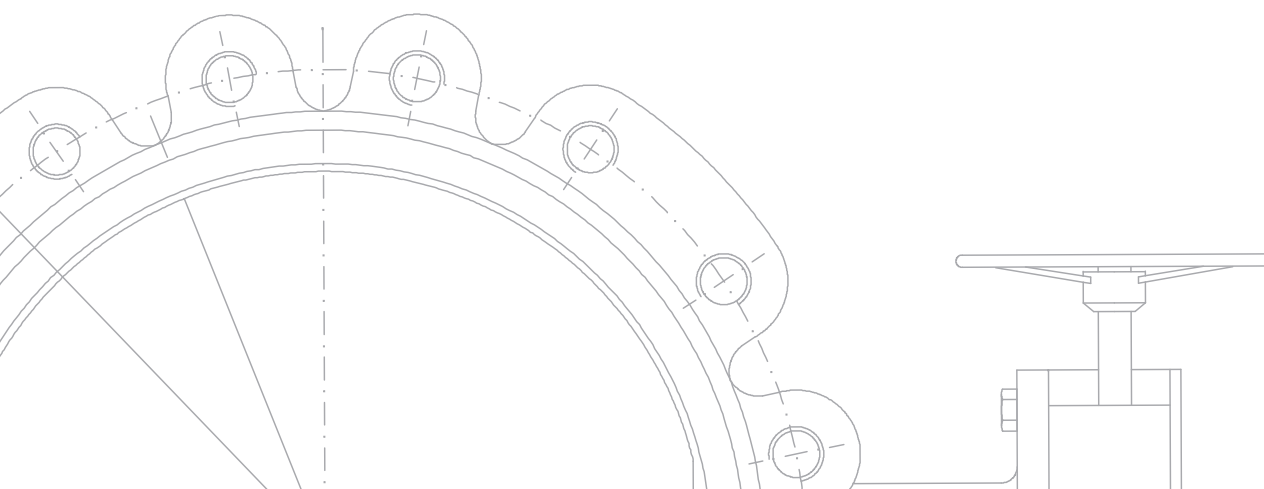
DN	G	K	D	n-ød	b	L	e1	e2	h	w (kg)
200	266	295	340	8-23	20	230	185	308	179	54
250	319	350	395	12-23	22	250	209	332	209	68
300	370	400	445	12-23	24.5	270	240	278	234	103
350	429	460	505	16-23	24.5	290	263	401	262	125
400	480	515	565	16-28	24.5	310	297,5	460	287	178
450	530	565	615	20-28	25.5	330	324,5	522	311	219
500	582	620	670	20-28	26.5	350	348	545	341	263
600	682	725	780	20-31	30	390	422	615	399	373
700	794	840	895	24-31	32.5	430	482	720	458	502
800	901	950	1015	24-34	35	470	541	817	518	729
900	1001	1050	1115	28-34	37.5	510	613	873	568	924
1000	1112	1160	1230	28-37	40	550	675	921	623	1493
1200	1328	1380	1455	32-41	45	630	800	1133	736	2224
1400	1530	1590	1675	36-44	46	710	985	1302	845	2935
1600	1750	1820	1915	40-50	49	790	1115	1427	970	3785
1800	1950	2020	2115	44-50	52	870	1245.5	1714	1070	5356
2000	2150	2230	2325	48-50	55	950	1494.5	1819	1182.5	7168

## PN16

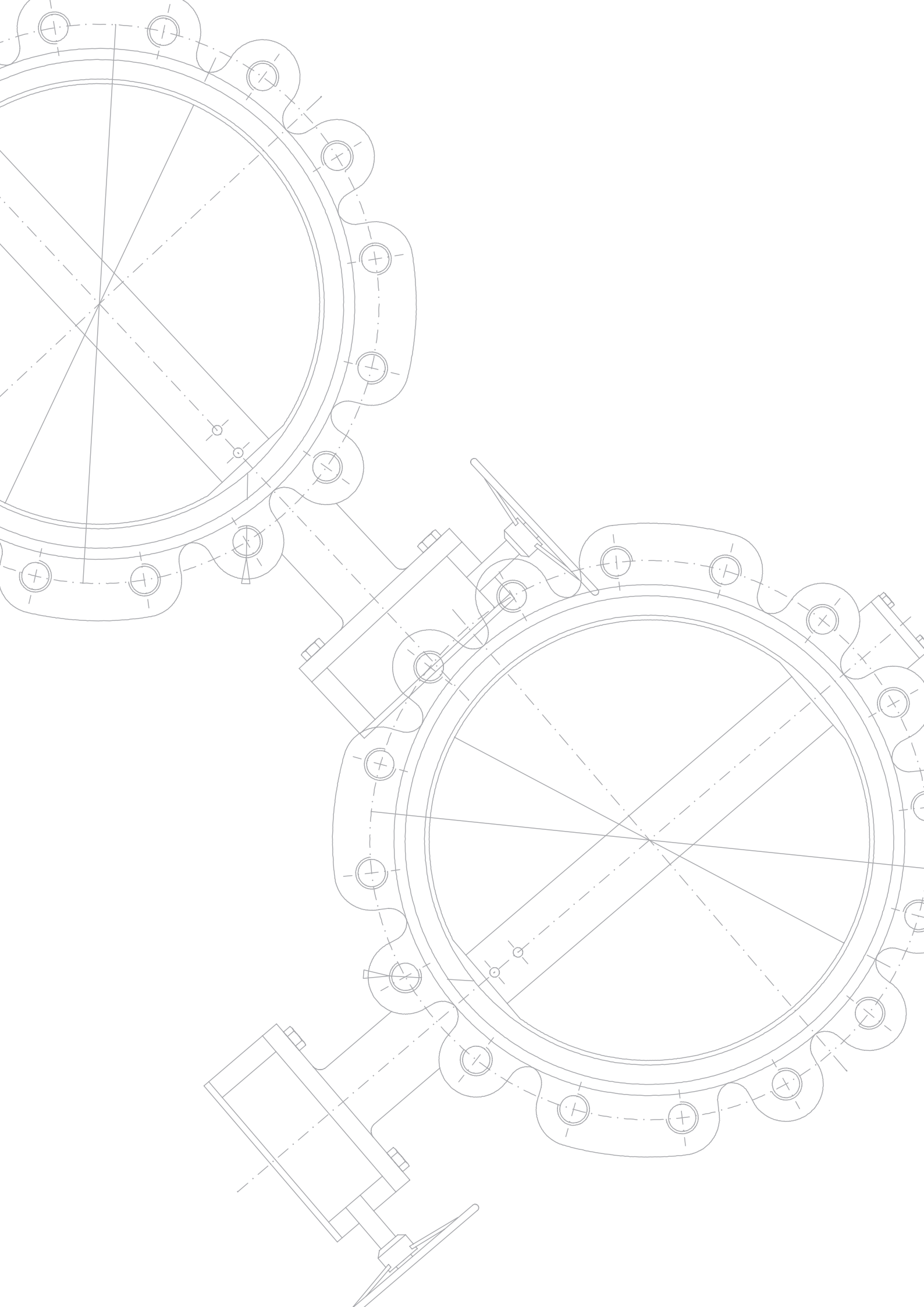
DN	G	K	D	n-ød	b	L	e1	e2	h	w (kg)
200	266	295	340	12-23	20	230	185	308	179	54
250	319	355	405	12-28	22	250	209	332	209	91
300	370	410	460	12-28	24.5	270	240	378	240	111
350	429	470	520	16-28	26.5	290	275	427	267	168
400	480	525	580	16-31	28	310	297,5	485	294	216
450	548	585	640	20-31	30	330	345	544	338	270
500	609	650	715	20-34	31.5	350	372	569	369	349
600	720	770	840	20-37	36	390	430	682	430	486
700	794	840	910	24-37	39.5	430	497	772	469	674
800	901	950	1025	24-41	43	470	580,5	826	523	904
900	1001	1050	1125	28-41	46.5	510	643,5	951	571	1243
1000	1112	1170	1255	28-44	50	550	700,5	1035	636	1580
1200	1328	1390	1485	32-50	57	630	849	1151	751	2569
1400	1530	1590	1985	36-50	60	710	992	-	858	3335
1600	1750	1820	1930	40-57	65	790	1136	1582	980	4905

## PN25

DN	G	K	D	n-ød	b	L	e1	e2	h	w (kg)
200	274	310	360	12-28	22	230	206	221	185	82
250	330	370	425	12-31	24.5	250	248	254	222.5	120
300	389	430	485	16-31	27.5	270	295	298	248	180
400	503	550	620	16-37	32	310	345	370	315	330
500	609	660	730	20-37	36.5	350	415	453	375	533
600	720	770	845	20-41	42	390	535	495	427.5	687
800	928	990	1085	24-50	51	470	643	646	550	1325
900	1028	1090	1185	28-50	55.5	510	708	695	605	1985
1000	1140	1210	1320	24-57	60	550	791	779	665	2440











# HYDRAULIC SPECIFICATIONS



# HYDRAULIC SPECIFICATIONS

## PRESSURE DROPS

Pressure drops of butterfly valves can be evaluated using below equation:

$$\Delta P = (Q / Kv)^2 \quad [\text{bar}]$$

Where:

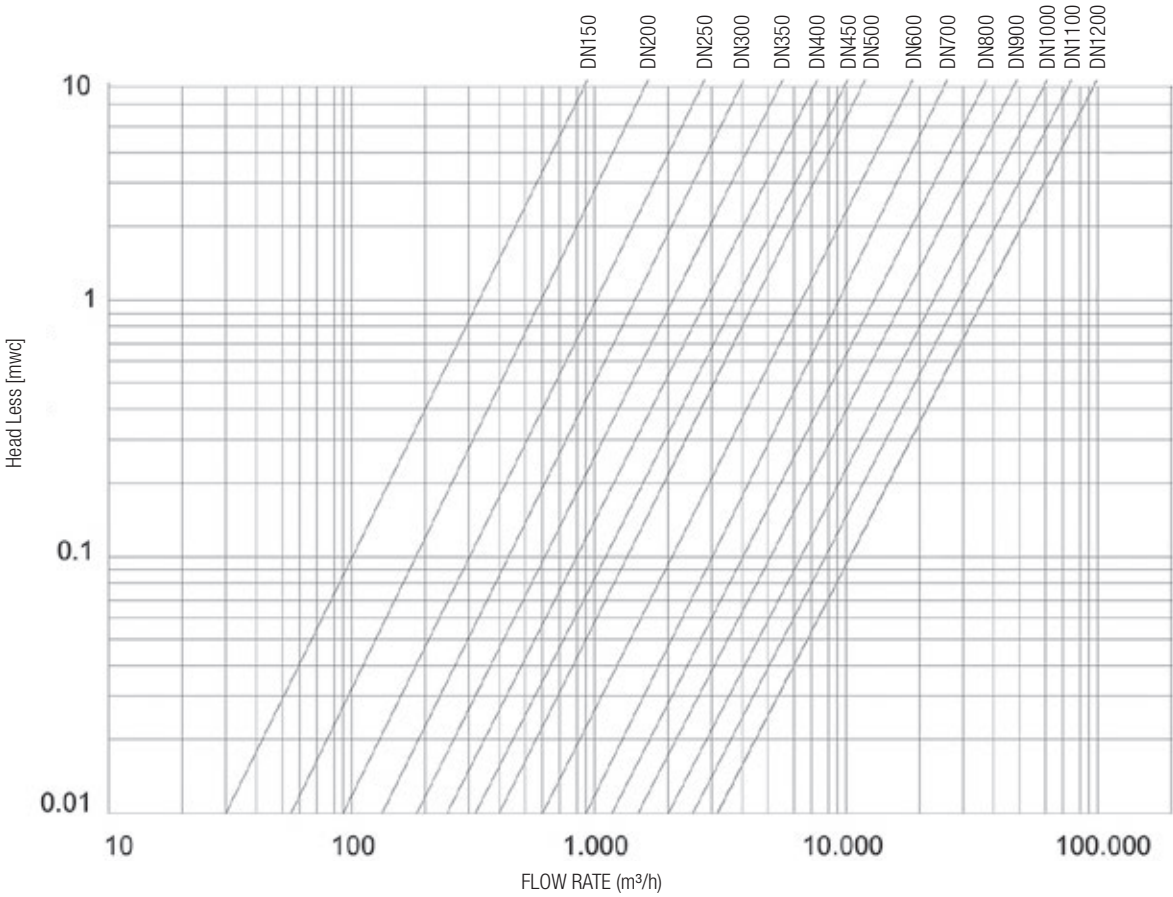
- $\Delta P$  = pressure drop [bar]
- $v$  = fluid speed referred to valve's DN [m/s]
- $g = 9.81 \text{ [m/s}^2\text{]}$
- $Q$  = flow rate [m³/h]
- $Kv$  = flow coefficient [m³/h] see table below:

## FLOW COEFFICIENT

DN	150	200	250	300	350	400	450	500	600	700	800	900	1000	1200	1400	1600	1800	2000
Kv [m³/h]	935	1861	2132	3521	6765	8901	10891	14208	21060	30088	39063	51363	66643	92319	132353	173309	222794	268699

Pressure drops in butterfly valves can be also evaluated by using below diagram:

## PRESSURE DROP DIAGRAM





## CAVITATION

Butterfly valves are mainly used to shut off the flow. If a butterfly valve is used to control the flow, the operational limits of the maximum flow velocity as well as the cavitation must be observed.

Cavitation number could be evaluated within below equation:

$$\sigma = P_{out} / (\Delta P + v^2/2g)$$

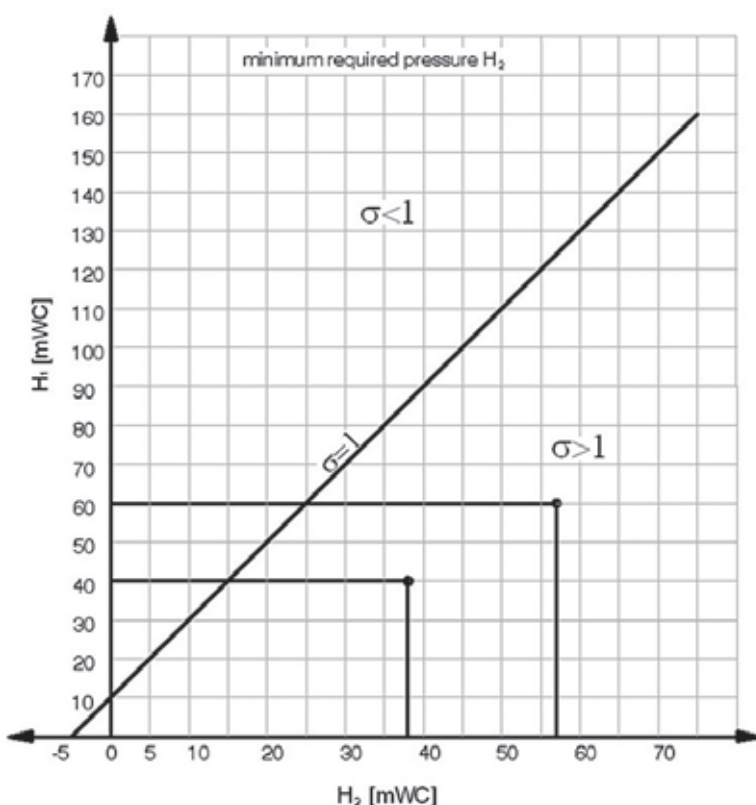
Where:

- $\Delta P$  = pressure drop [mhw]
- $P_{out}$  = valve outlet pressure
- $v$  = fluid velocity referred to valve's DN [m/s]
- $g = 9.81 \text{ m/s}^2$

## CAVITATION RISK IN BUTTERFLY VALVES CAN BE APPROXIMATELY EVALUATED:

$\sigma \geq 1$  there is risk of cavitation;

$\sigma < 1$  there is no risk of cavitation.



## CAVITATION LIMITS:

$H_1$  - inlet pressure

$H_2$  - outlet pressure

If  $\sigma$  value lies above the limit curves of  $\sigma = 1$ , cavitation will occur. As possible solution we recommend changing the back pressure or choosing a different place of installation.

If cracking, noises or vibrations occur while the valve is being put into operation; the actual operation conditions should be checked.

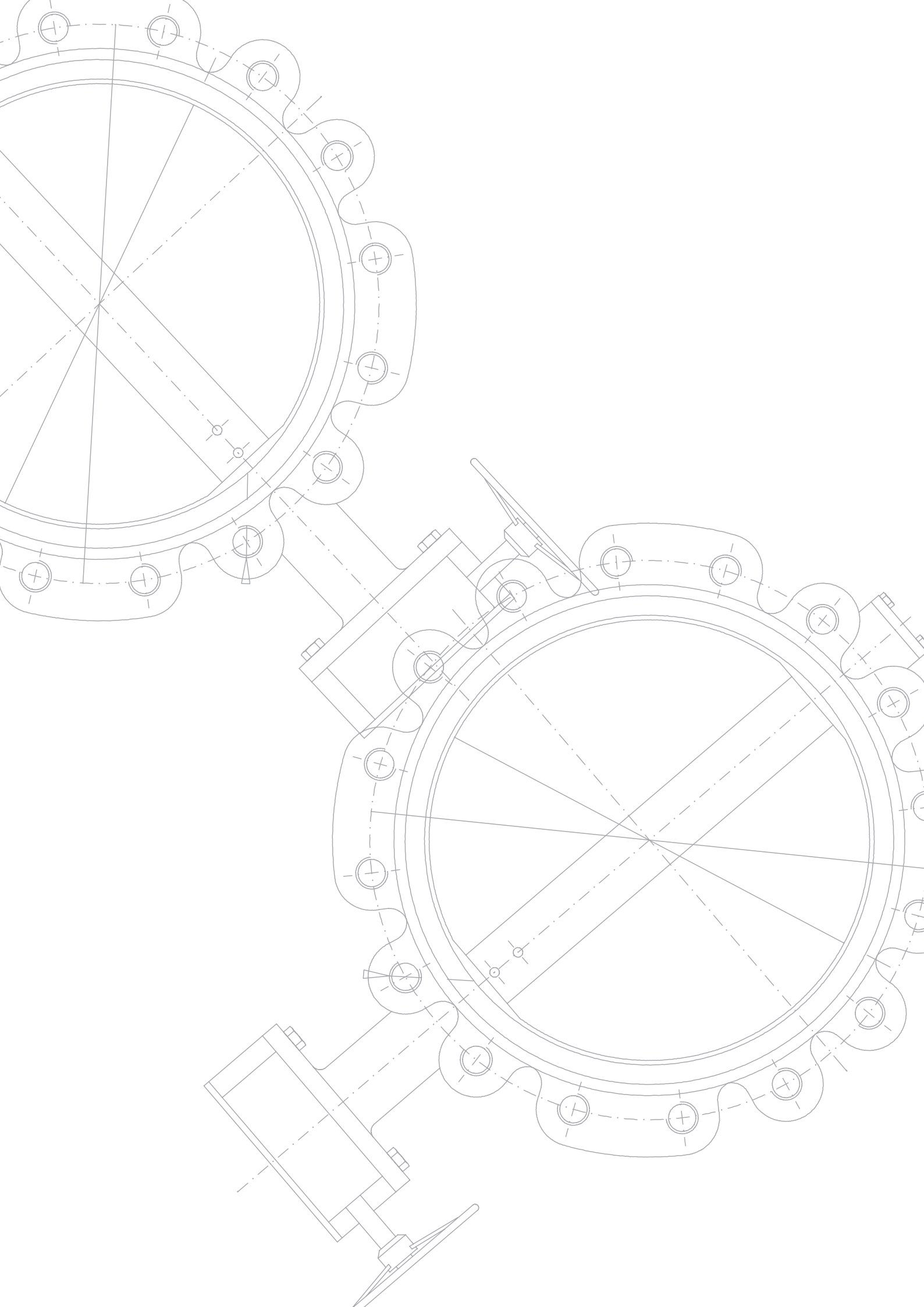
## IMPORTANT:

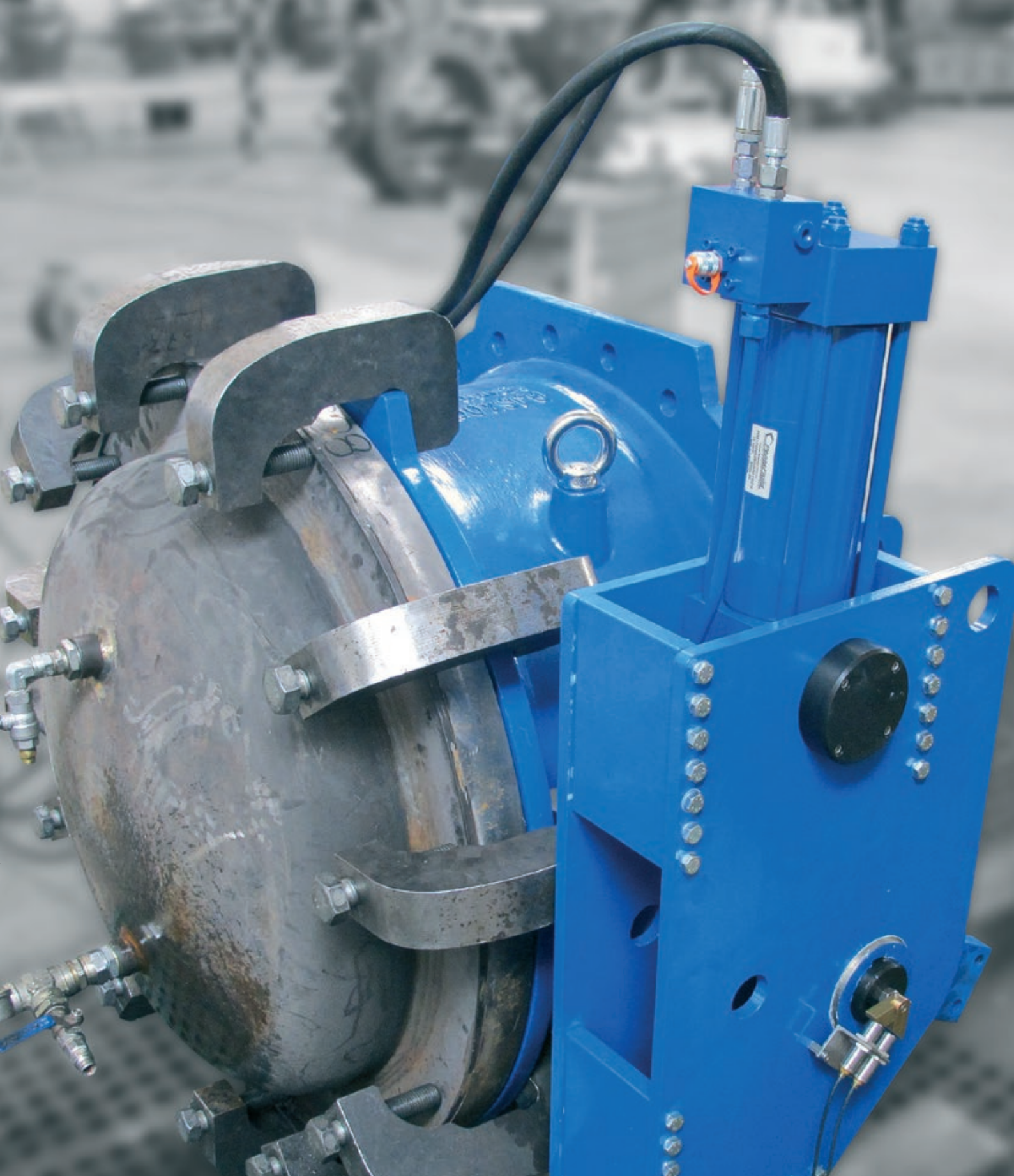
Between 10-100% opening degree (which is recommended), no reasonable control can be guaranteed.

## MAXIMUM PERMISSIBLE FLOW VELOCITY.

According to EN 593 Table 3, butterfly valves are designed for the specific velocities in liquid media as for:

- Recommended flow velocity for PN10  $v_{max} = 3 \text{ m/s}$ ;
- Recommended flow velocity for PN16  $v_{max} = 4 \text{ m/s}$ ;
- Recommended flow velocity for PN25  $v_{max} = 5 \text{ m/s}$ .

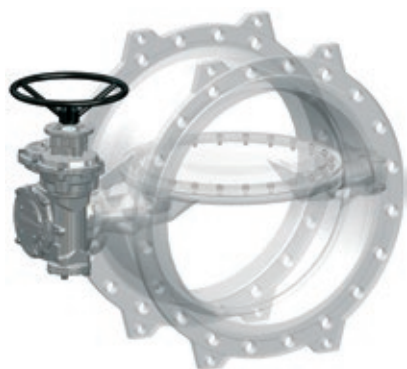




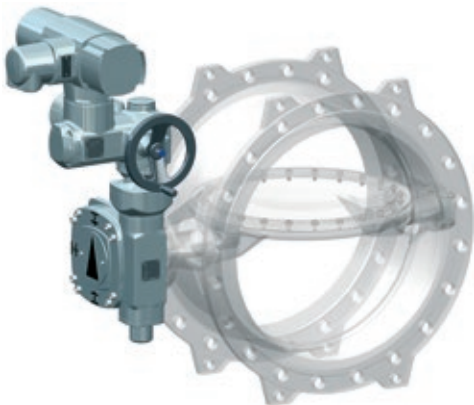
**MAIN OPERATING DEVICES**



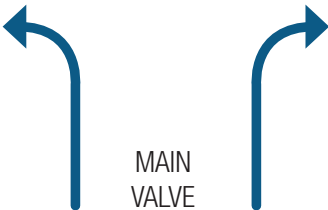
# MAIN OPERATING DEVICES



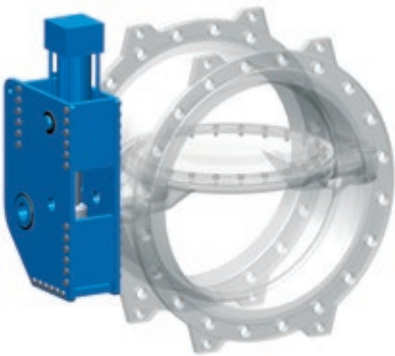
WORM GEAR BOXES  
AND HAND WHEEL



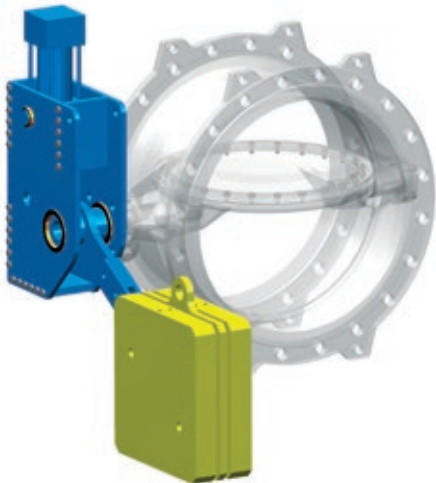
ELECTRIC ACTUATOR



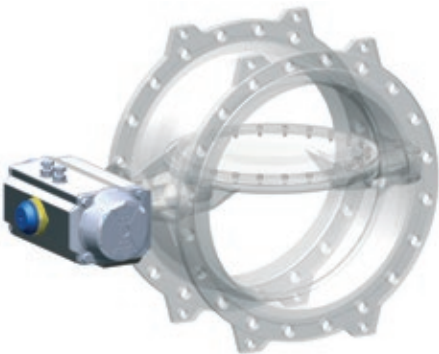
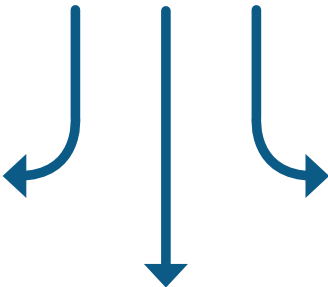
MAIN  
VALVE



HYDRAULIC CYLINDER WITH  
DOUBLE ACTING



HYDRAULIC CYLINDER  
AND COUNTERWEIGHT



PNEUMATIC ACTUATOR



**SPECIAL APPLICATIONS**

# SPECIAL APPLICATIONS

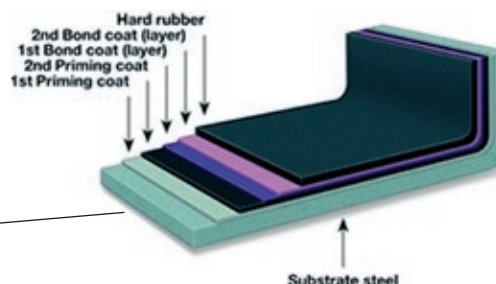
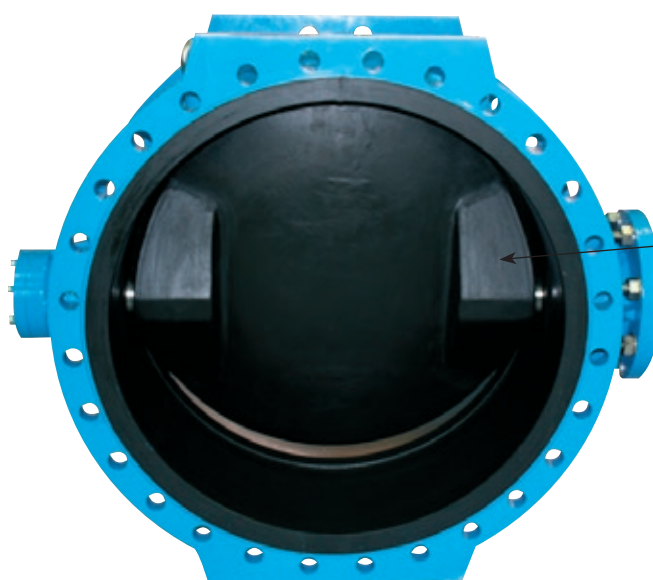
## VULCANIZED HARD RUBBER LINED VALVE

Valves for saline media (seawater or well-desalination) or corrosive media have to resist against chemical attack of chloride ions. Due to the fluid aggressivity, standard epoxy coated valve surfaces will be rapidly abraded. The best possible solution, in order to guarantee valves longevity and safe operation of the plants, is to entirely protect the valve surface by means of a 3 mm HARD RUBBER LINING which will be able to ensure no metal parts in contact with aggressive fluids. To apply the lining, the work piece is heated up to about 135°-145°C and rubber

sheets are vulcanized on the surface at a pressure of about 4.5 bar.

Other parts of the valve in contact with water (shaft, link, piston rod, bracket-fork) are made of duplex stainless steel, with high resistance to corrosion in the presence of ions dissolved in water.

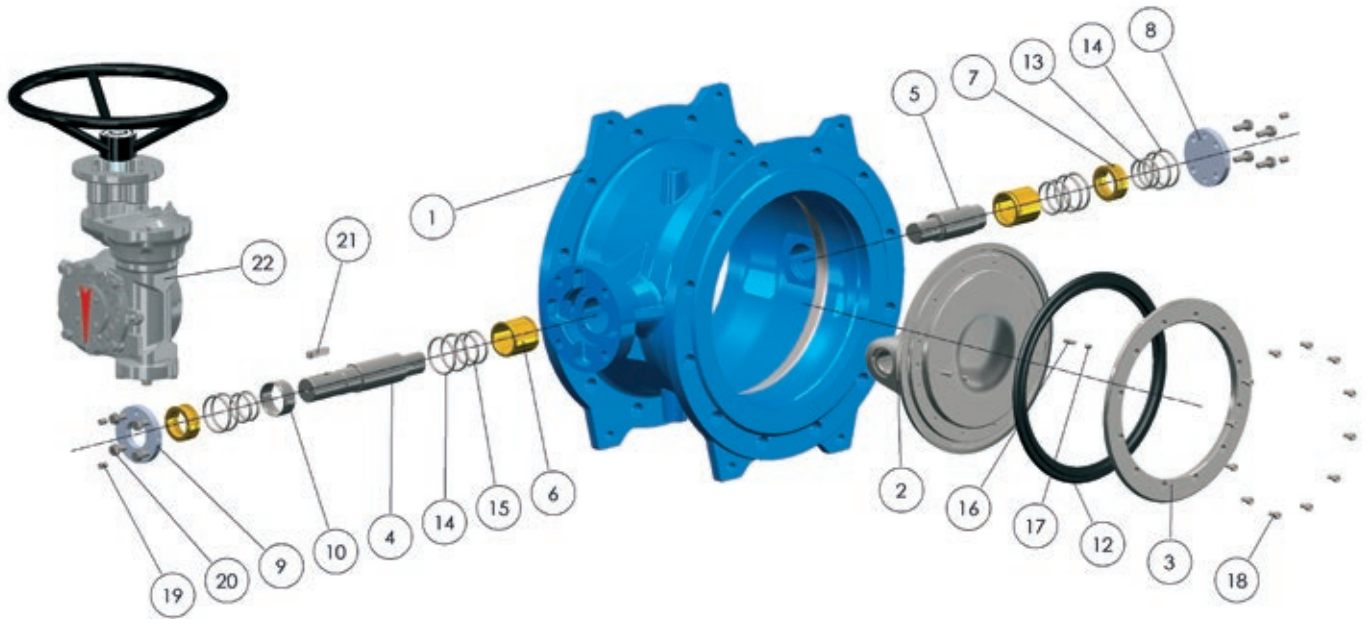
Typical applications of these valves are: water treatment plants, desalination plants, mines, industrial water, treatment plants in minerals.



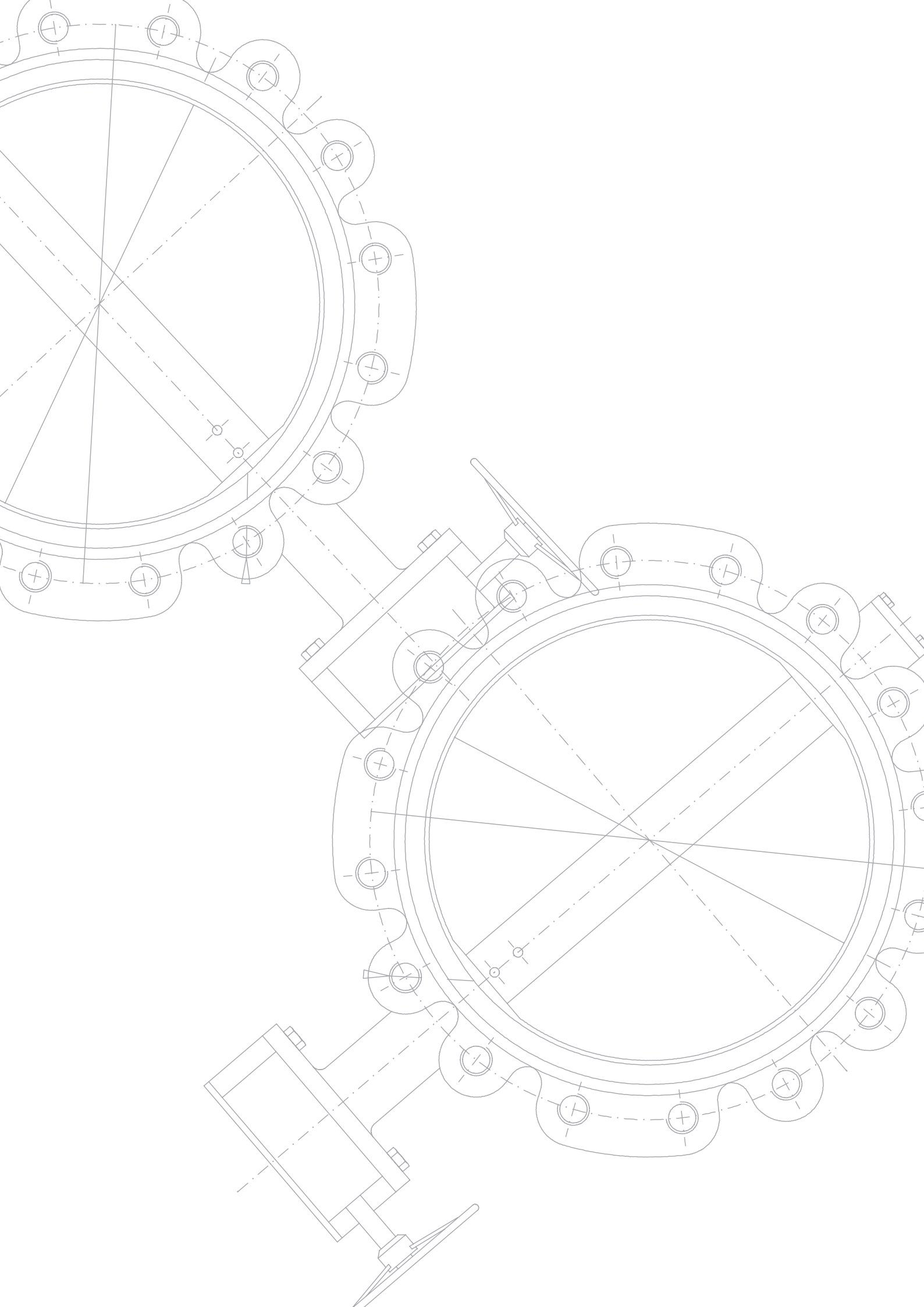
The body/disc surface, in contact with the fluid, is completely lined with a rubber layer which allows additional protection to the corrosion due to brackish waters and significantly increases lifespan of the valve.



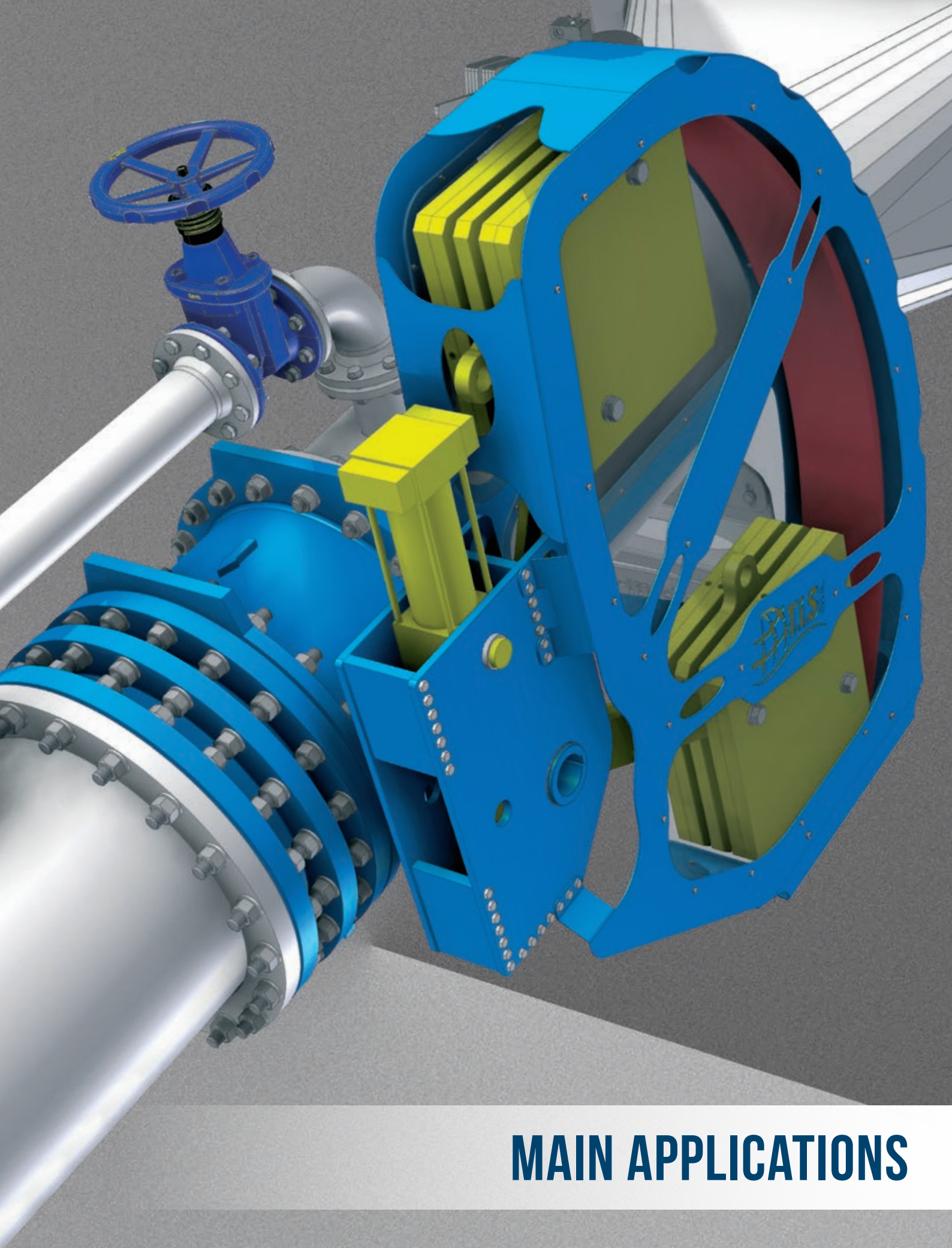
# HEAVY CORROSION APPLICATION



ITEM	DESCRIPTION	MATERIAL DESIGNATION	NOTE
1	BODY	DUCTILE IRON EN-GJS 400-15	FBE COATED
2	DISC	STAINLESS STEEL AISI316L (EN1.4404)	
3	RETAINING RING	STAINLESS STEEL AISI316L (EN1.4404)	
4	DRIVEN SHAFT	DUPLEX STAINLESS STEEL (EN1.4462)	
5	SHAFT (Free end)	DUPLEX STAINLESS STEEL (EN1.4462)	
6	BEARING BUSH	ALUMINUM-BRONZE	
7	SEALING BUSH	ALUMINUM-BRONZE	
8	SEALING BUSH COVER	STAINLESS STEEL	
9	SEALING BUSH FLANGE	STAINLESS STEEL	
10	SPACER BUSH	STAINLESS STEEL	
12	PROFILE SEAL	EPDM RUBBER	
13	O-RING	NBR RUBBER	
14	O-RING	NBR RUBBER	
15	O-RING	NBR RUBBER	
16	PIN	STAINLESS STEEL A4-70	
17	GRUB SCREW	STAINLESS STEEL A4-70	
18	RETAINING RING SCREW	STAINLESS STEEL A4-70	
19	GRUB SCREW	STAINLESS STEEL A4-70	
20	COVER SCREW AND WASHER	STAINLESS STEEL A4-70	
21	PARALLEL KEY	STEEL	
22	GEAR BOX	ACCORDING TO SUPPLIER SPECIFICATION	
	EYE BOLTS	AVAILABLE ON REQUEST	





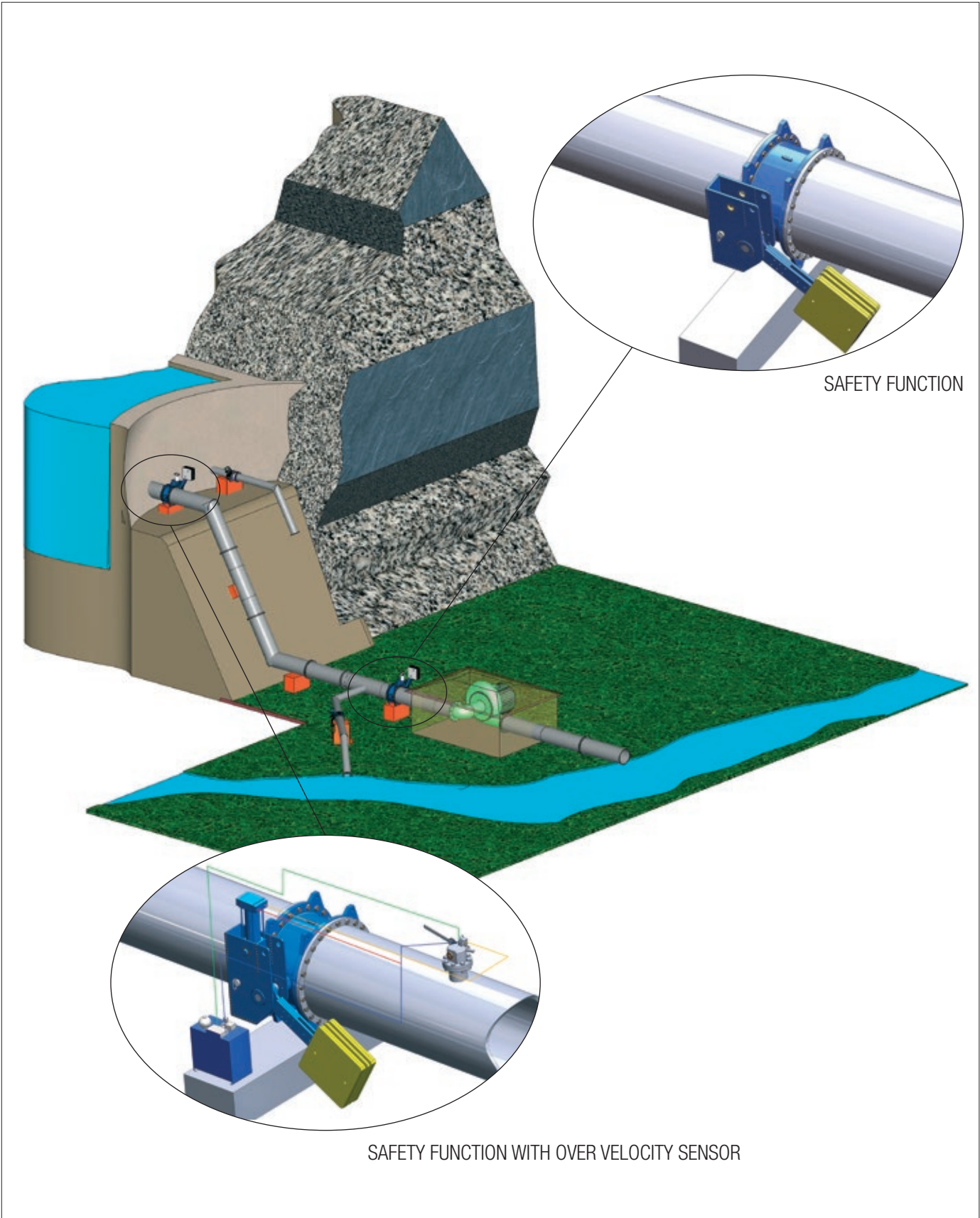


**MAIN APPLICATIONS**



# MAIN APPLICATIONS

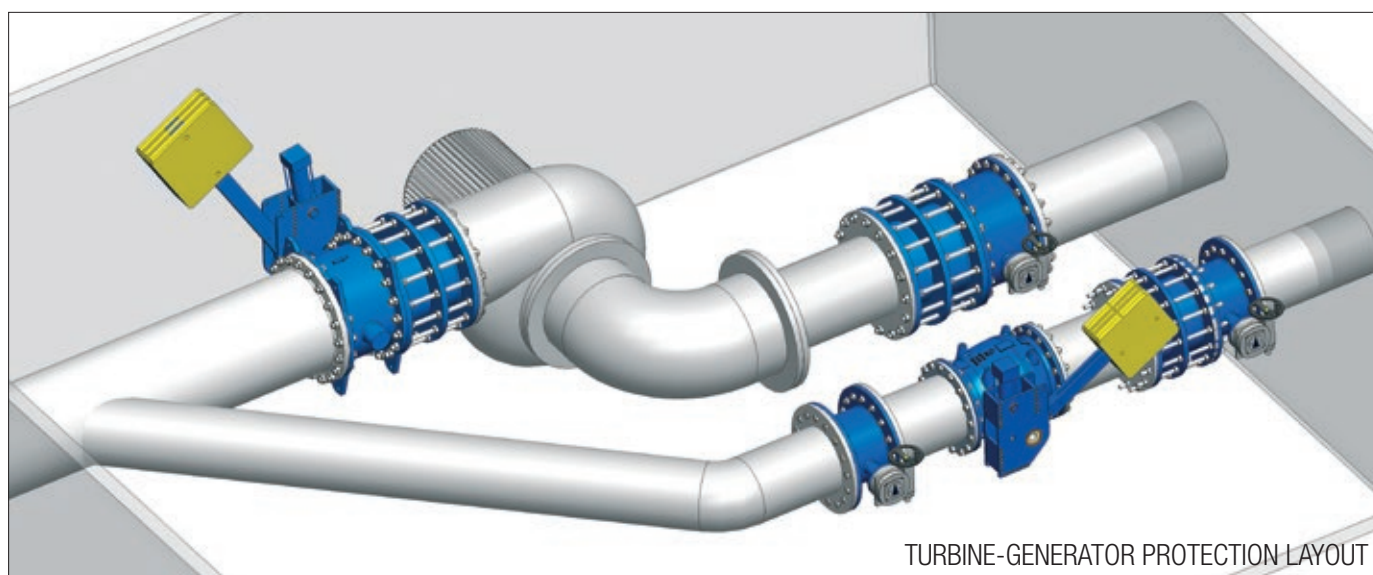
## HYDRO POWER PLANTS APPLICATION



## SAFETY FUNCTION

Safety lever and counterweight butterfly valves are generally used in hydroelectric plants (see image below), water supply, irrigation; in particular:

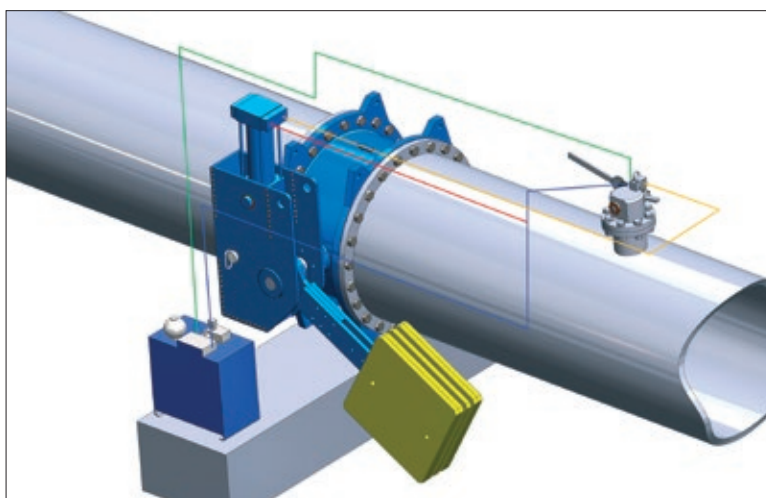
- turbine-generator protection;
- to prevent damage caused by pipeline rupture;
- to shut off the duct in case of power failure;
- as a check valve in case of duct backflow.



## SAFETY FUNCTION WITH OVER VELOCITY SENSOR.

For applications such as protection of turbine-generator or in order to prevent possible leakage of fluid due to breakage of the pipeline, to the butterfly valve with lever and counterweight is associated a mechanical device for fluid speed detection.

The over velocity sensor detects fluid speed in the duct. If limit/pre-set speed will be exceeded, the over velocity sensor will trigger, by a circuit, the hydraulic cylinder which will operate the valve (open or closed depending on the function).

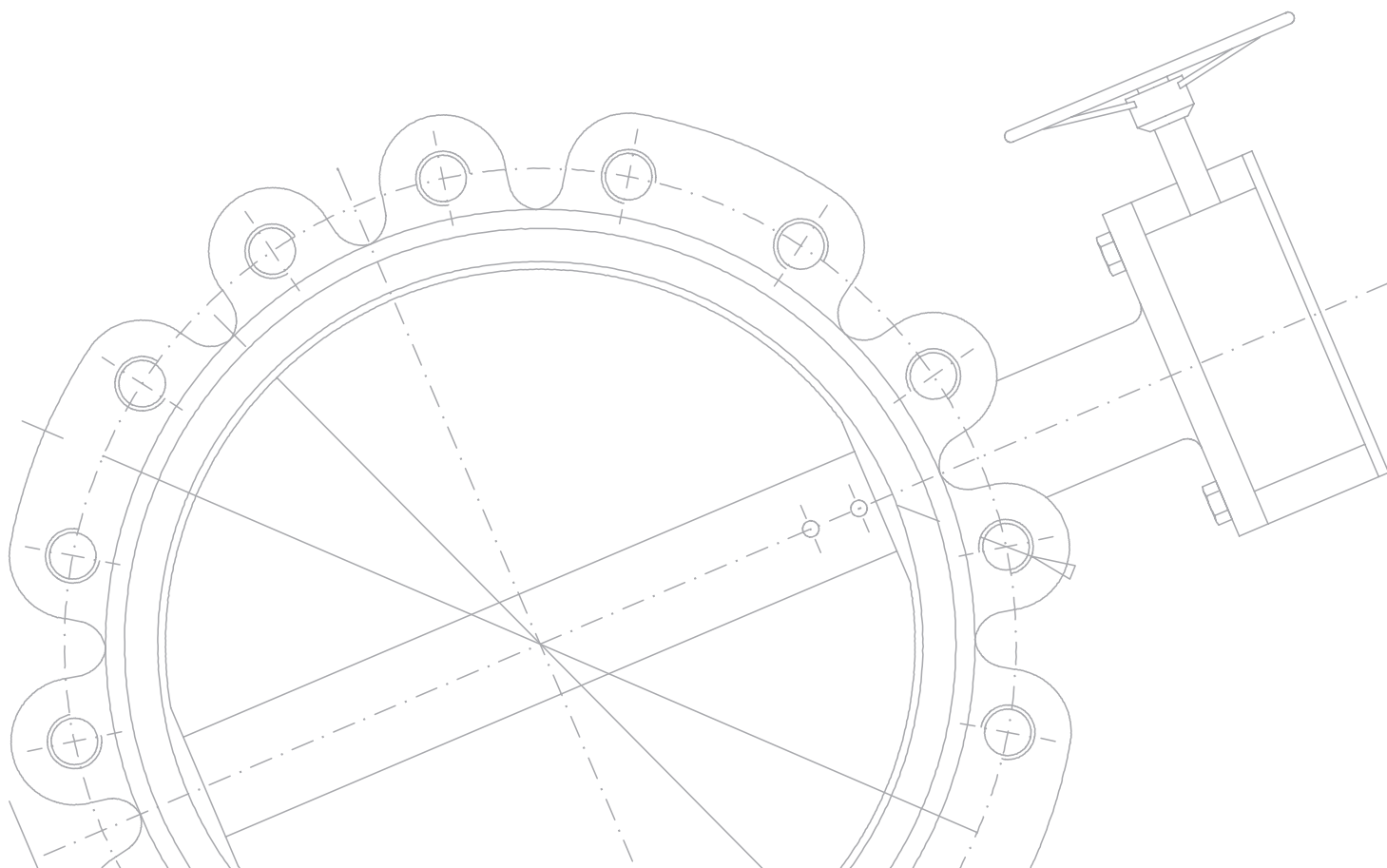
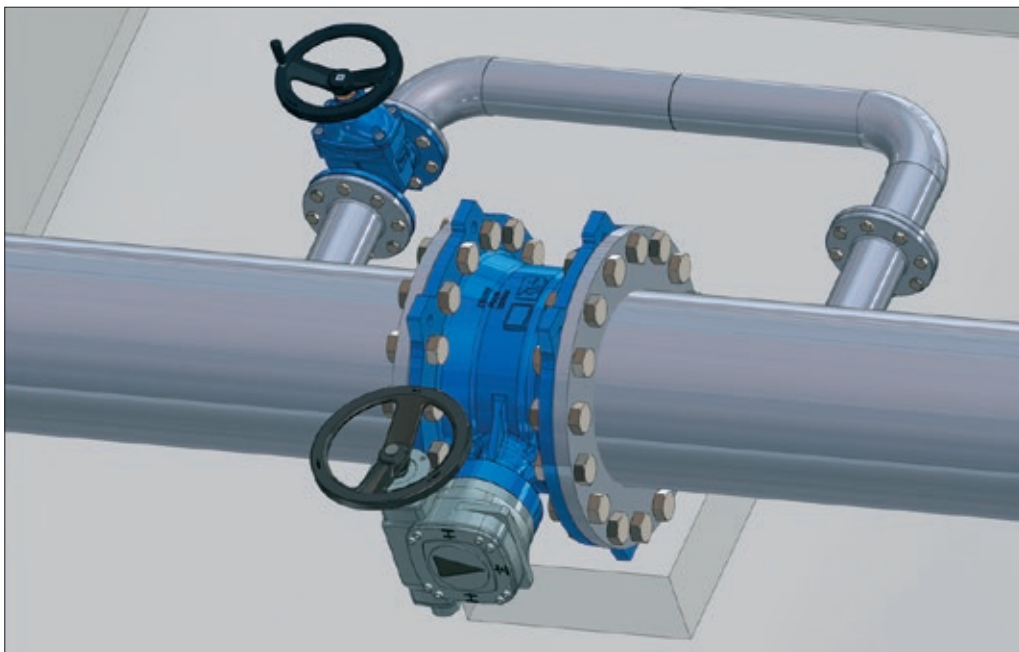


A typical application of lever and the counterweight butterfly valve with speed detector vane and hydraulic unit.

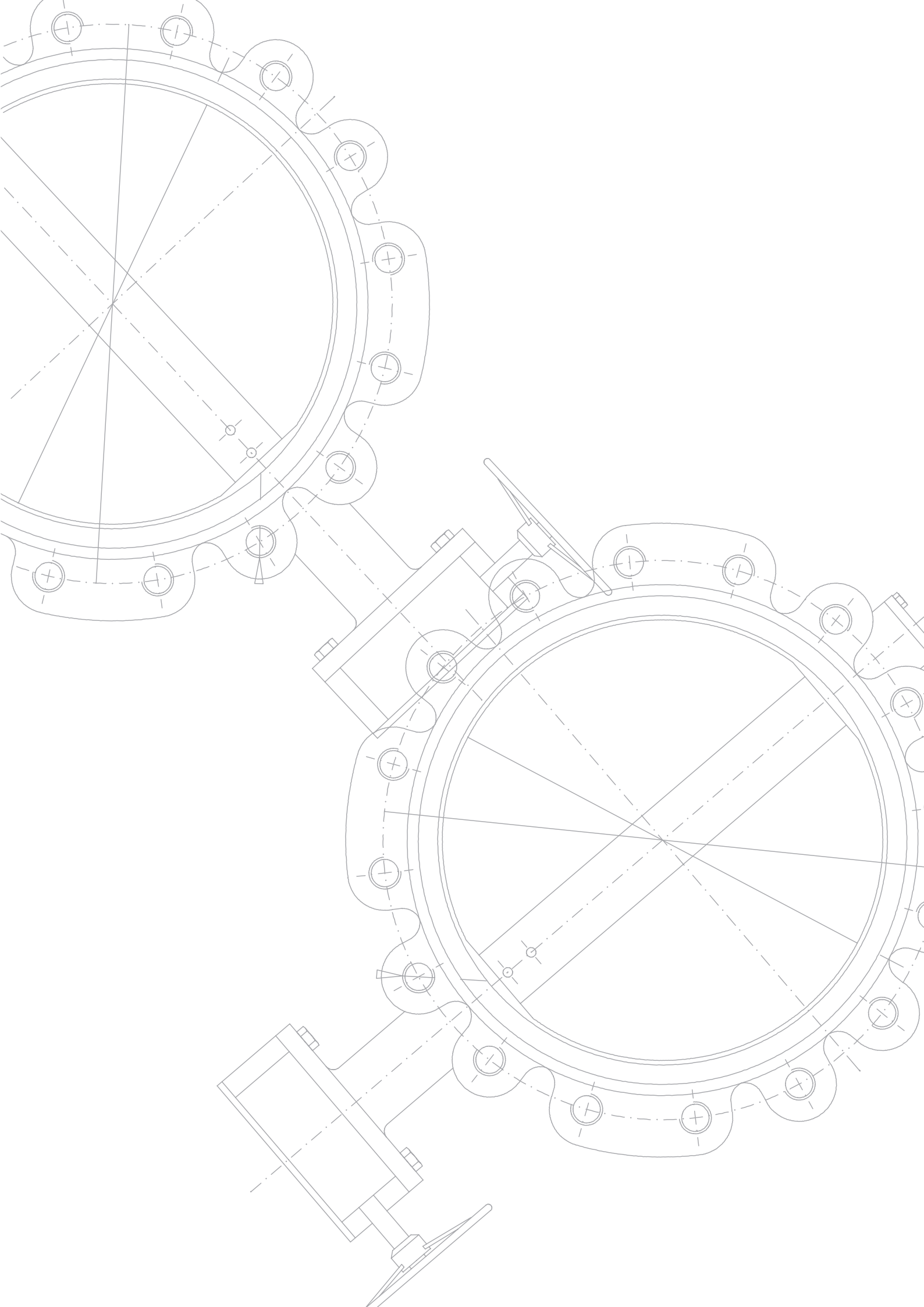
The over velocity sensor, at speed limit exceeded, trigger the hydraulic cylinder which will open or close the valve according to the application.

## ON - OFF FUNCTION

Double eccentric double flanged butterfly valves are generally used in the pipelines to intercept fluids. This may be controlled manually, or by means of electric actuator pneumatic or hydraulic.







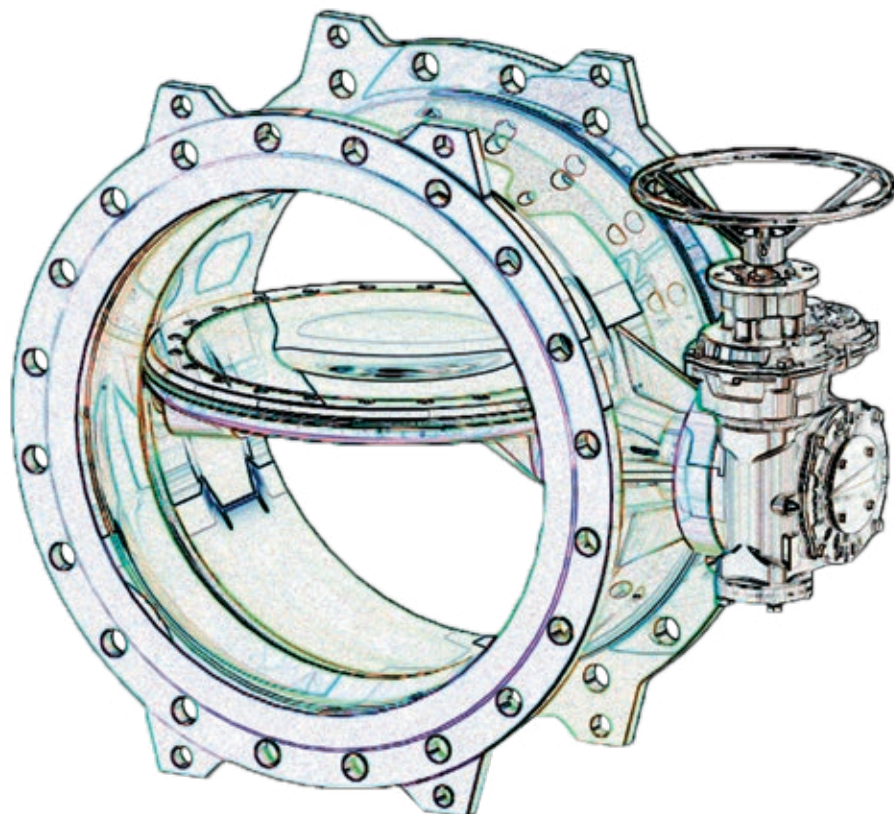
ASSOCIATED



Associazione Italiana  
costruttori valvole e rubinetteria



Federazione delle Associazioni Nazionali  
dell'Industria Meccanica Varia ed Affine



UNI EN ISO 9001:2008

**T.i.S.** SERVICE

BERGAMO ITALY

**T.i.S.** POLSKA

WARSAW POLAND

**T.i.S.** NUOVAL

TRENTO ITALY

**T.i.S.** ASIA PACIFIC

SHANGHAI CHINA

**T.i.S.** DUYAR

ISTANBUL TURKEY

**T.I.S. SERVICE S.P.A.**

VIA LAGO D'ISEO 4,6 - 24060 BOLGARE (BG) - ITALY  
TEL. +39/035/83.54.811 - FAX +39/035/83.54.888  
WWW.TISGROUP.IT - INFO@TISGROUP.IT

**T.I.S. POLSKA SP. Z O.O.**

UL. OŻAROWSKA 30D 05-850 OŻARÓW MAZOWIECKI - DUCHNICE - POLAND  
TEL. +48/22/483.56.00 - FAX +48/22/483.56.03  
WWW.TISPOLSKA.PL - INFO@TISPOLSKA.PL