

الشركة العامة لمصفاة حمص
مديرية الصيانات الهندسية
قسم الصيانة العامة

الصمامات

أنواعها – مواصفاتها – صيانتها

-اختيار الصمام

إعداد: م. وديع السبعة

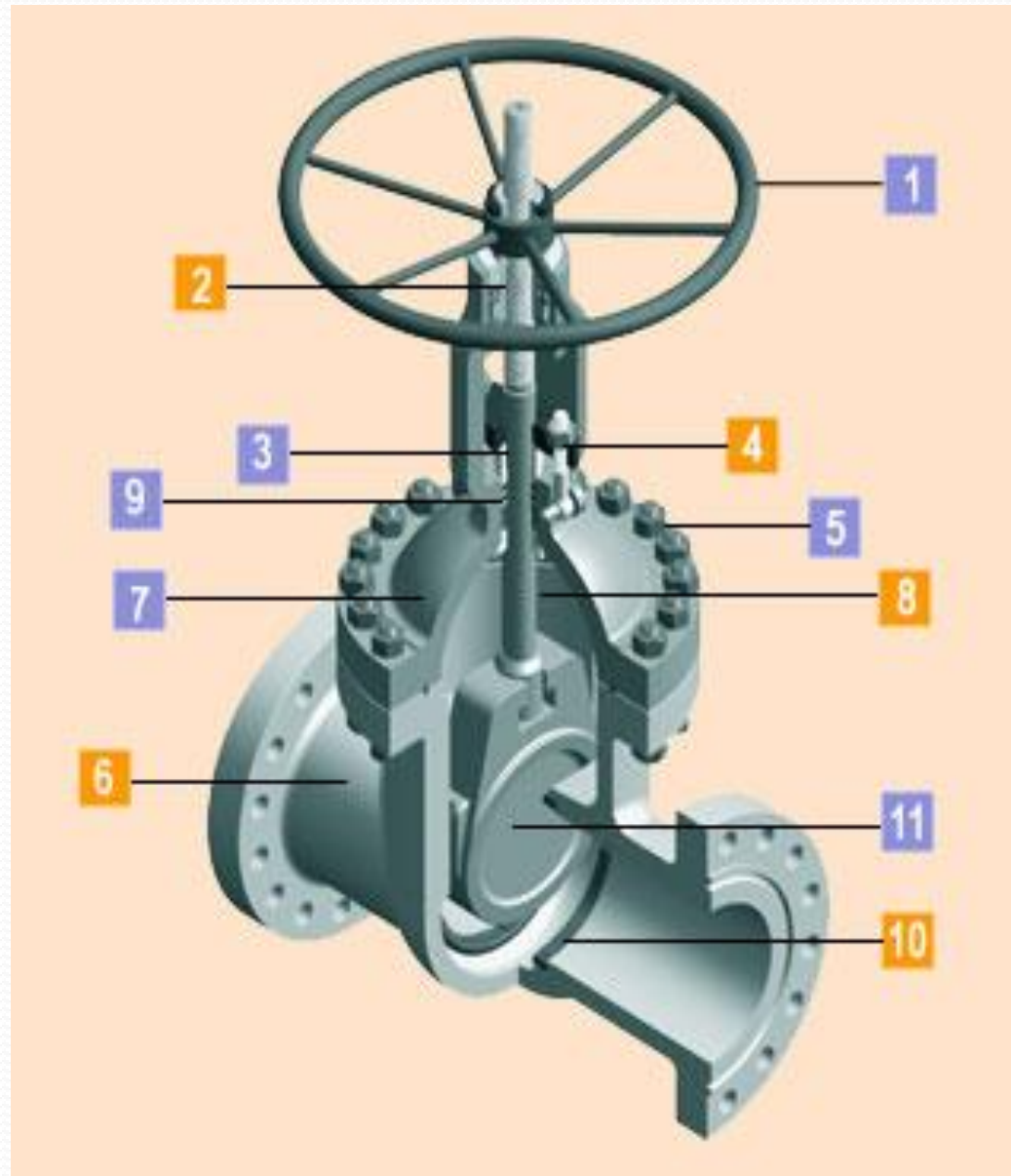
أنواع الصمامات

- ١ - صمامات بوابة Gate valve
- ٢ - صمامات طبش Globe Valve
- ٣ - صمامات كروية Ball valve
- ٤ - صمامات سدة Plug valve
- ٥ - صمامات فراشة Butter fly valve
- ٦ - صمامات عدم الرجوع Check valve
- ٧ - صمامات الأمان Safety Valve

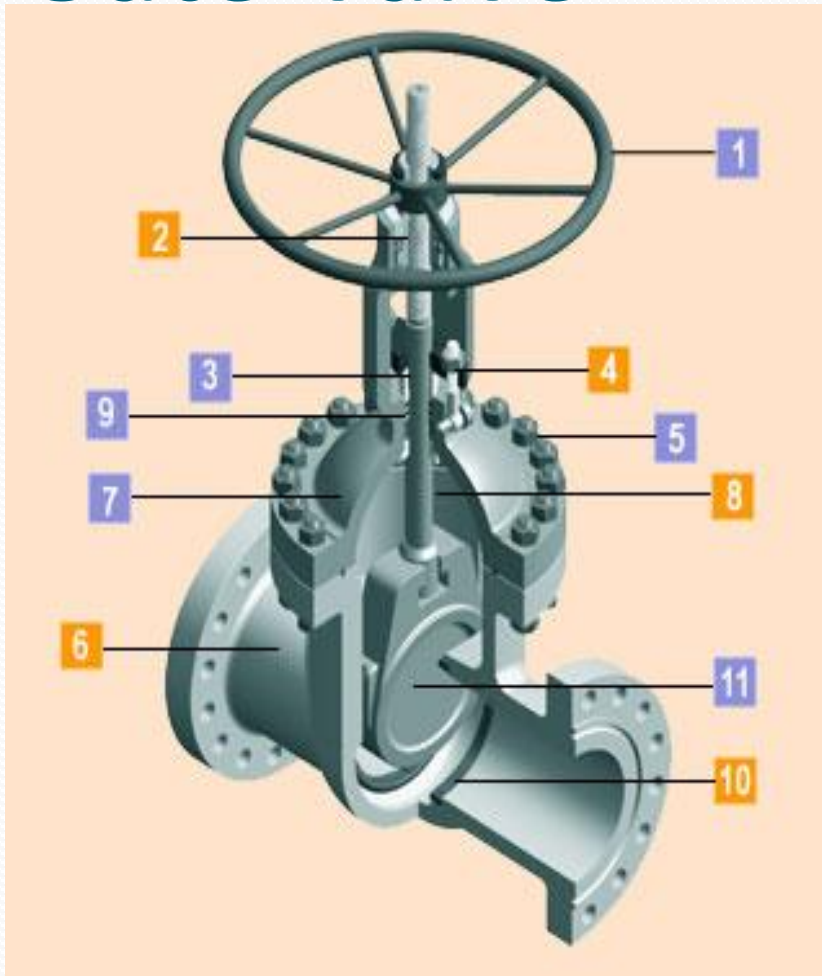
Gate Valve



Gate Valve



Gate Valve



- 1- Handwheel •
- 2- Stem nut
- 3- Gland Flange
- 4- Gland Bolt
- 5- Bonnet Bolts
- 6- Body
- 7- Bonnet
- 8- Stem
- 9- Packing
- 10- Body Seat Ring
- 11- Wedge

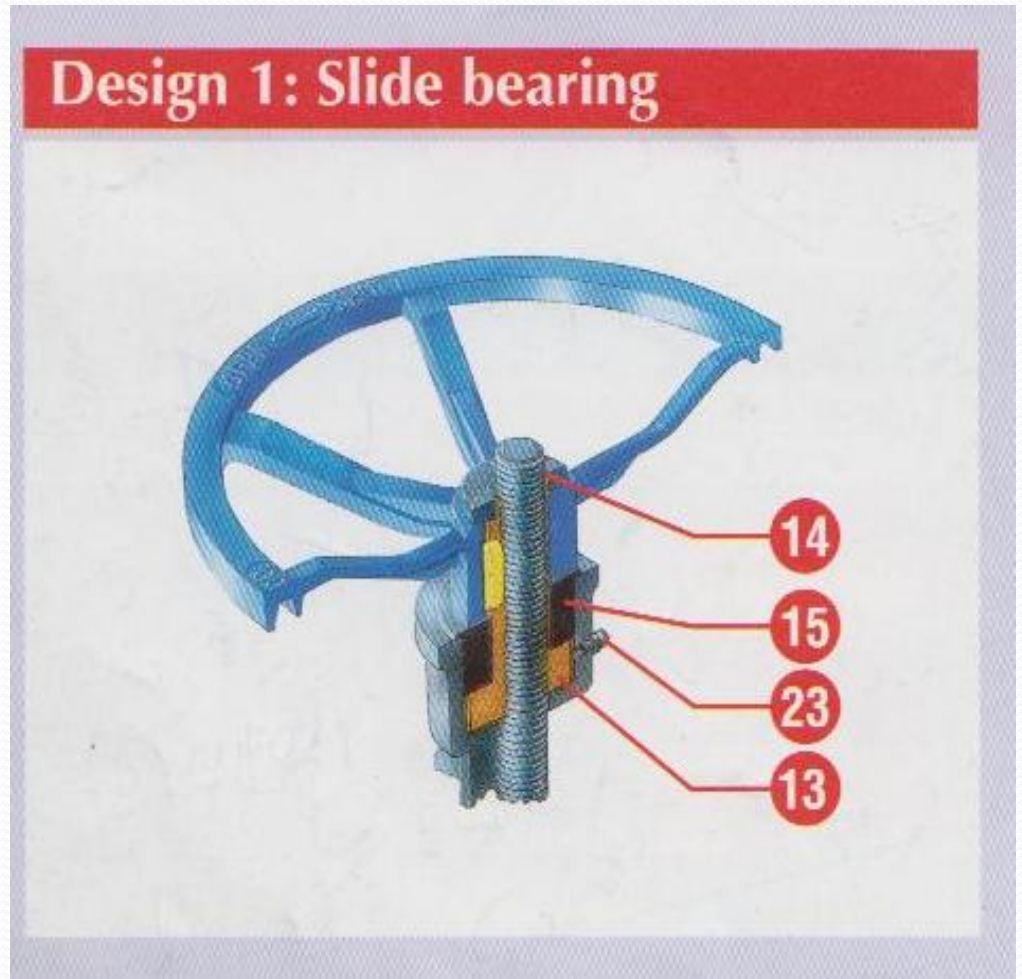
مضجع مترلق

14 – Hand wheel
Nut

15 – Yoke Nut

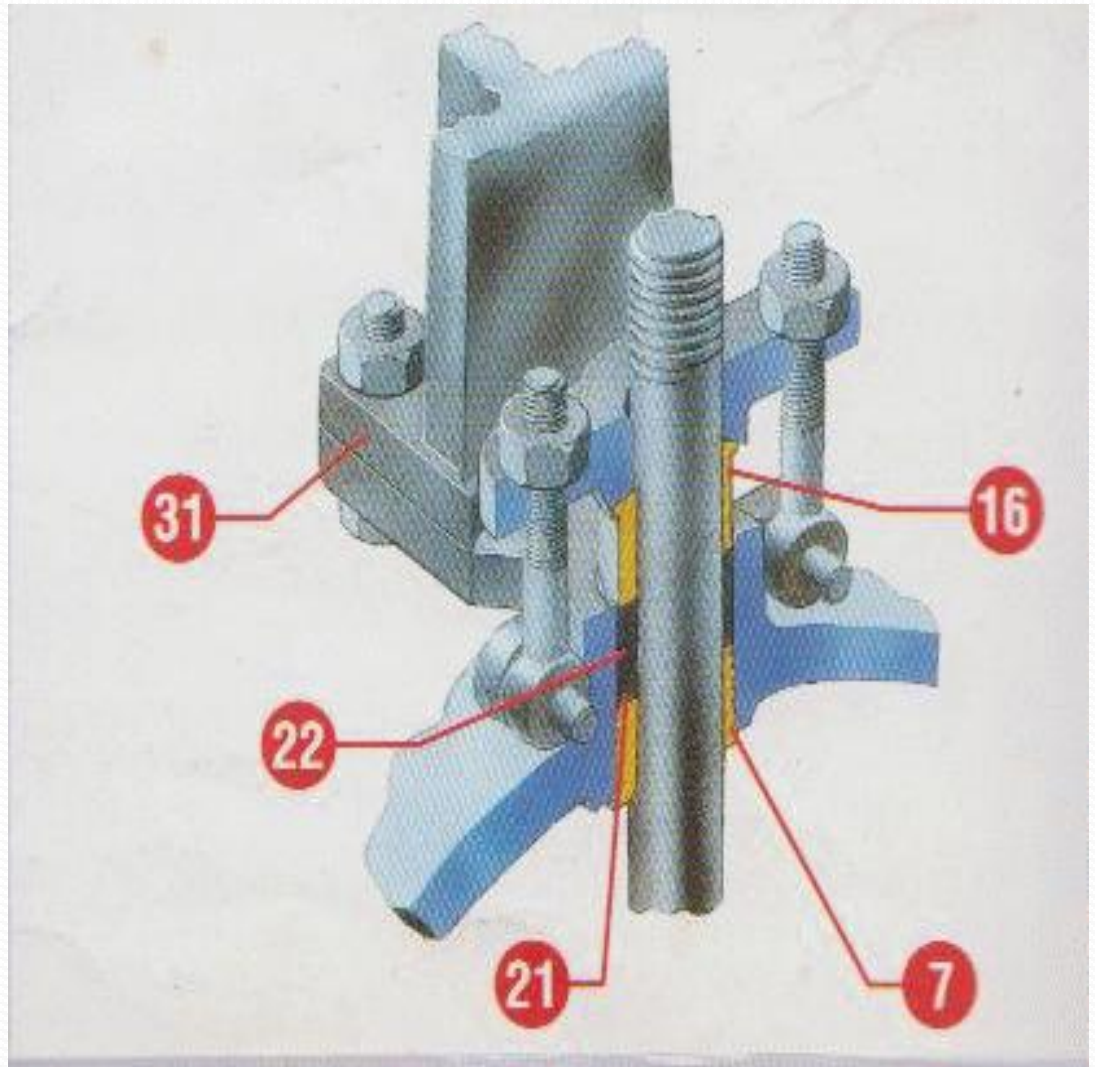
23 – Grease fitting

13 – Stem Nut



Packing

16 – Gland Ring
7- Backseat Bush
21 , 22- Packing
31 - Yoke



مجال استخدام صمام البوابة

- ١ - ماء - بخار - الغازات .
- ٢ - النفط الخام و مشتقاته .
- ٣ - يركب بوضع أفقي و شاقولي .
- ٤ - يستخدم الصمام بوضع فتح كامل أو إغلاق كامل فقط .
- ٥ - لا يستخدم الصمام للتحكم بالتدفق .

By-Pass

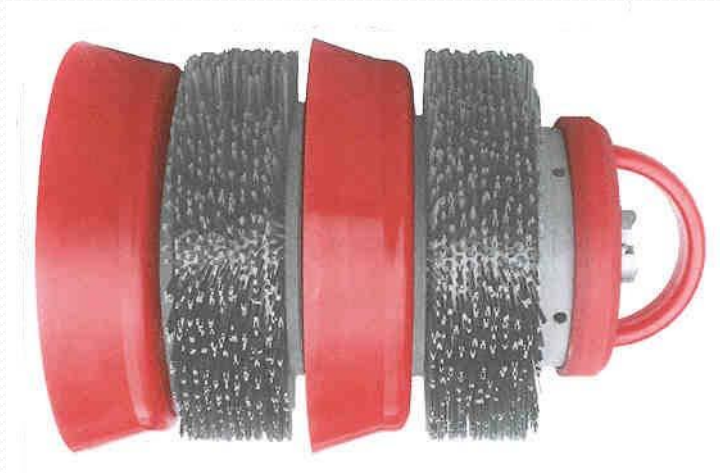


- يستخدم الـ By-Pass في صمامات البوابة لحماية الصمام من التلف والحصول على شروط تشغيل جيد للدائرة أو الآلة.

- يفتح الـ By-Pass قبل فتح الصمام الرئيسي حتى يتم امتلاء الخط قبل و بعد الصمام وتوازن الضغط على طرفي البوابة. ثم يغلق

- يفتح الـ By-Pass قبل إغلاق الصمام الرئيسي للحفاظ على سلامة البوابة عند العودة لمقرها. ثم يغلق

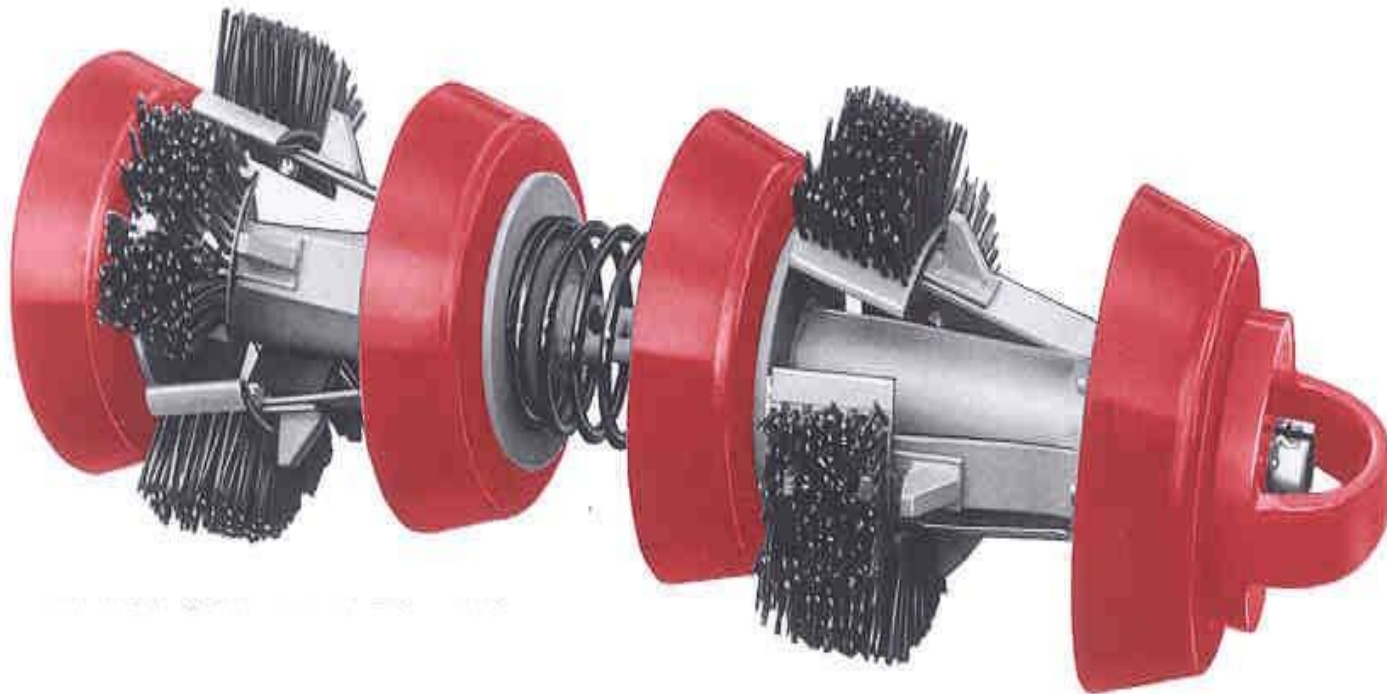
Cleaning Pig



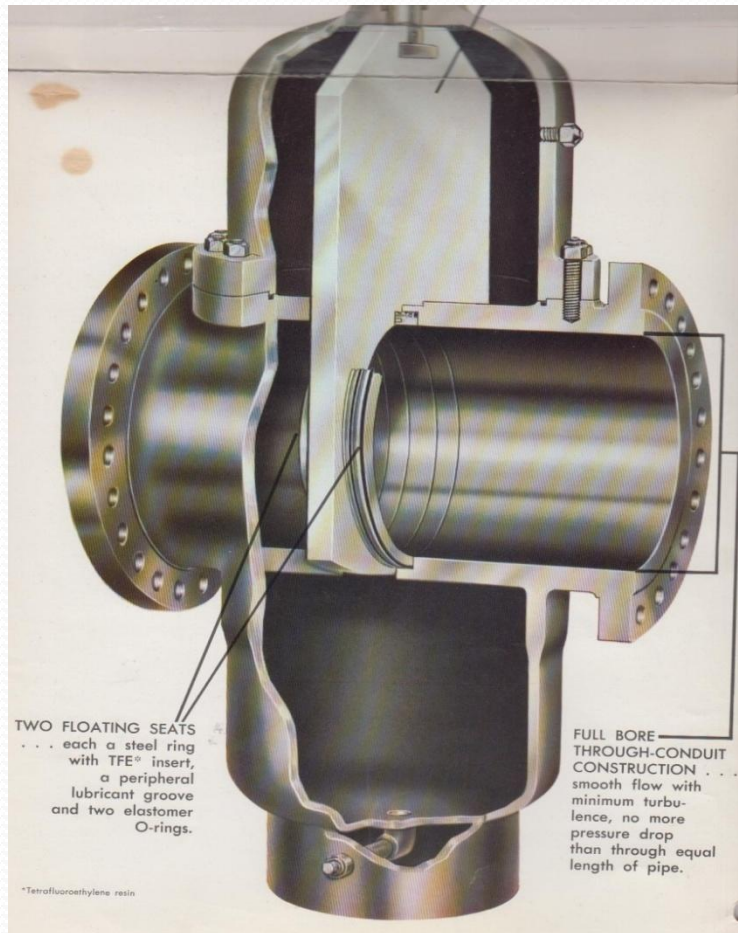
Cleaning Pig



Articulated Cleaning Pig



Through – Conduit Valve

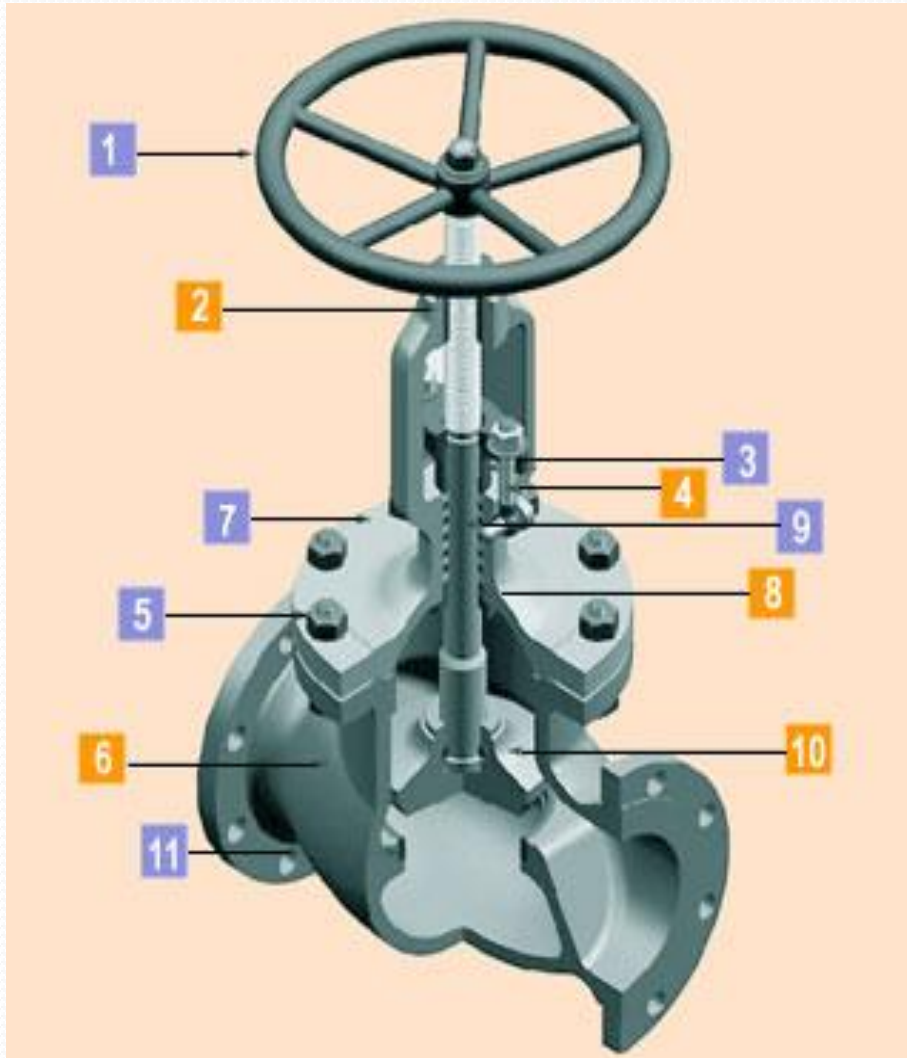


يستخدم على خطوط نقل النفط
كي يسمح للكاشط (Pig)
بالعبور و عدم الاستعصاء

Globe Valve



Globe Valve

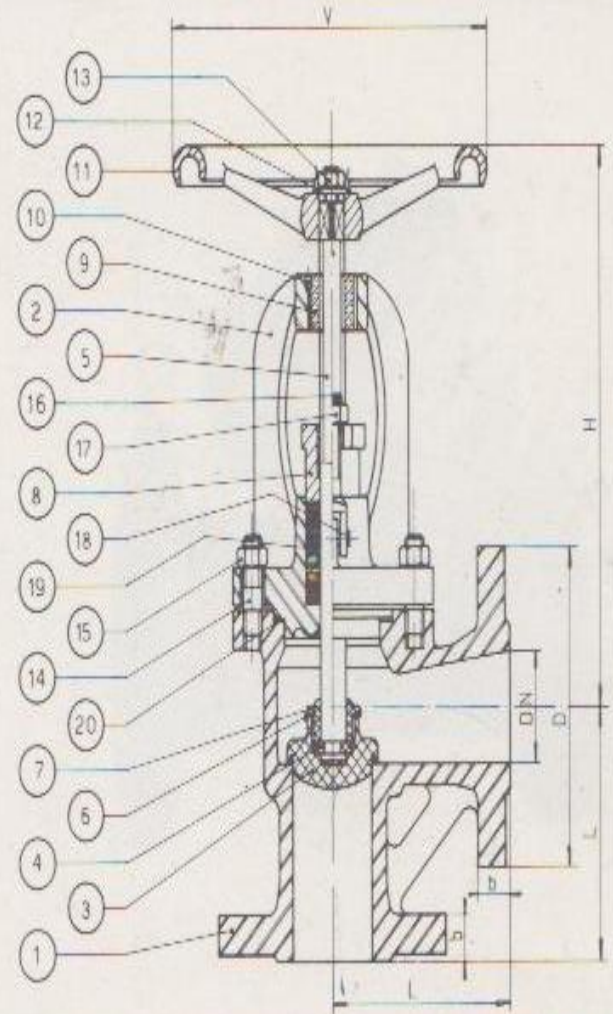


- 1-Handwheel •
- 2- Stem nut
- 3-Gland Flange
- 4- Gland Bolt
- 5- Bonnet Bolts
- 6-Body
- 7- Bonnet
- 8- Stem
- 9- Packing
- 10- Disk
- 11- Body Seat Ring

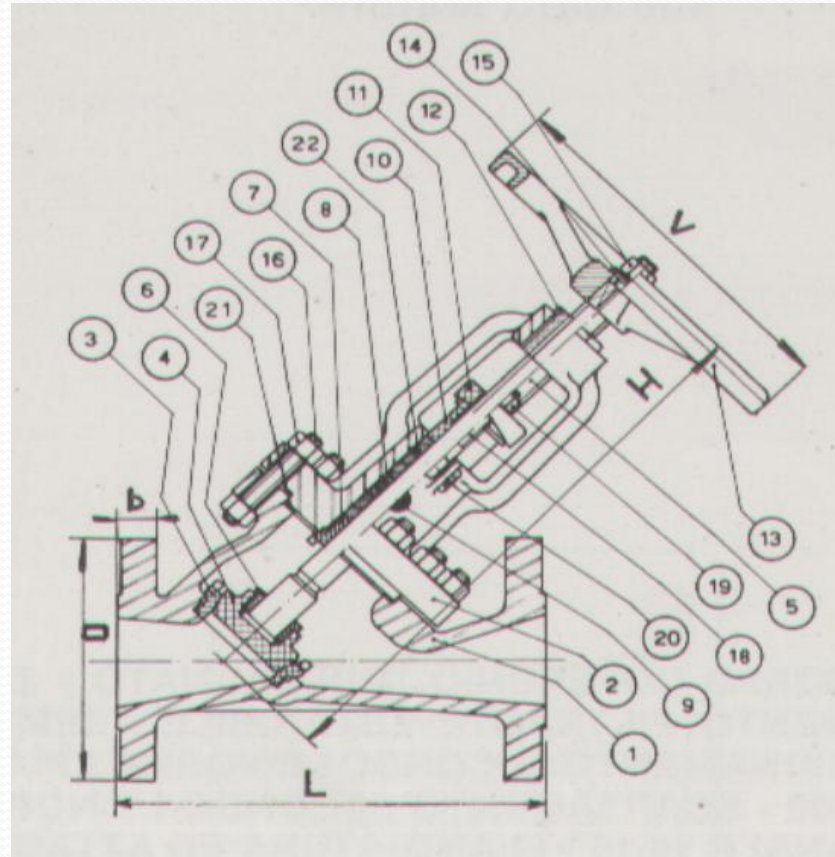
Angle Globe Valve



omologazione A.N.C.C.



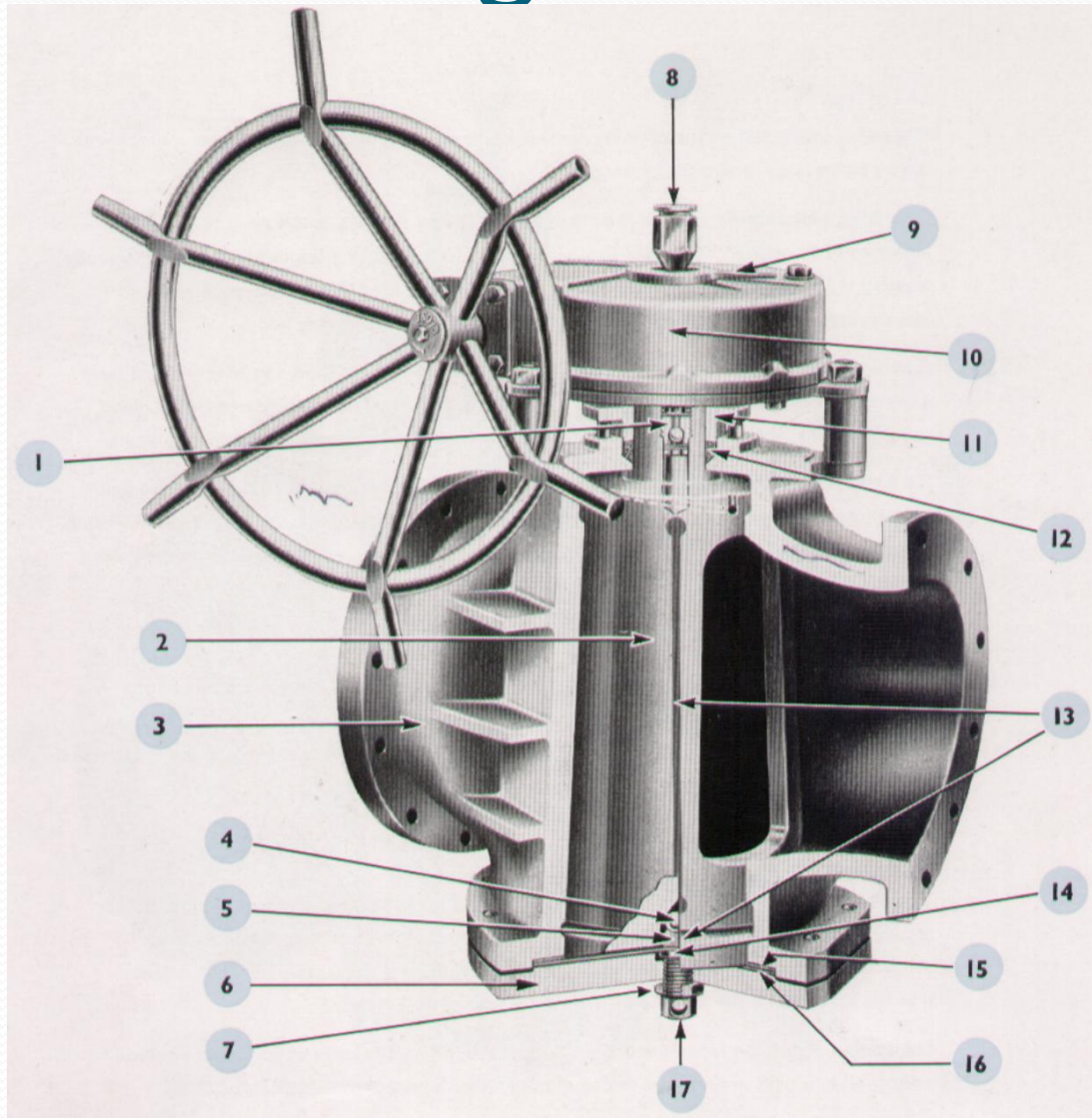
Y Type –Globe Valve



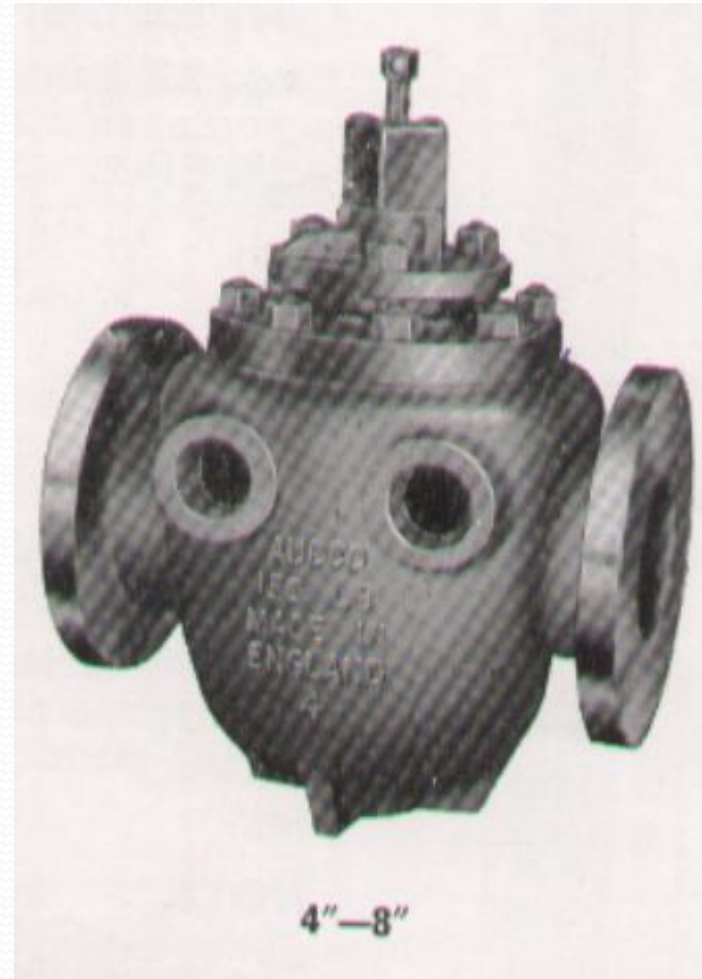
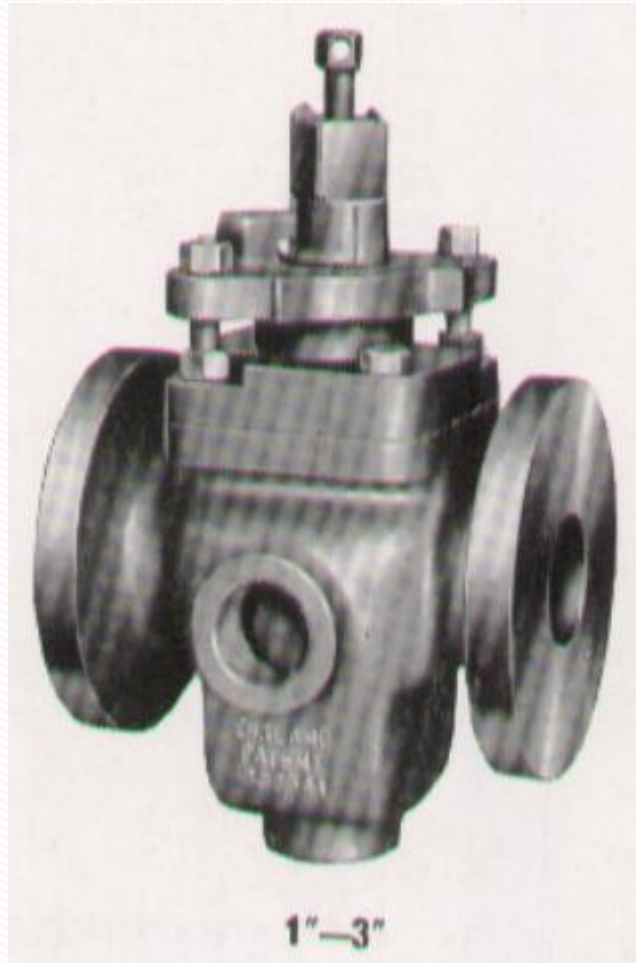
مجال استخدام صمام الطبخ

- ١ - ماء - بخار - الغازات .
- ٢ - النفط الخام و مشتقاته .
- ٣ - يركب بوضع أفقي و شاقولي .
- ٤ - يستخدم الصمام للتحكم بالتدفق و ذلك بفتح جزئي للصمام حسب حاجة المشغل .

Plug Valve



Plug Valve / Steam Jacket



Plug Valve / lined with PTFE



Plug Valve

ميزاته:

- استجابة سريعة للفتح و الإغلاق (ربع دورة)
- إعاقة قليلة للتدفق مما يؤدي لتقليل الضياعات
- حجمه صغير قياسا بالأنواع الأخرى

مساوئه:

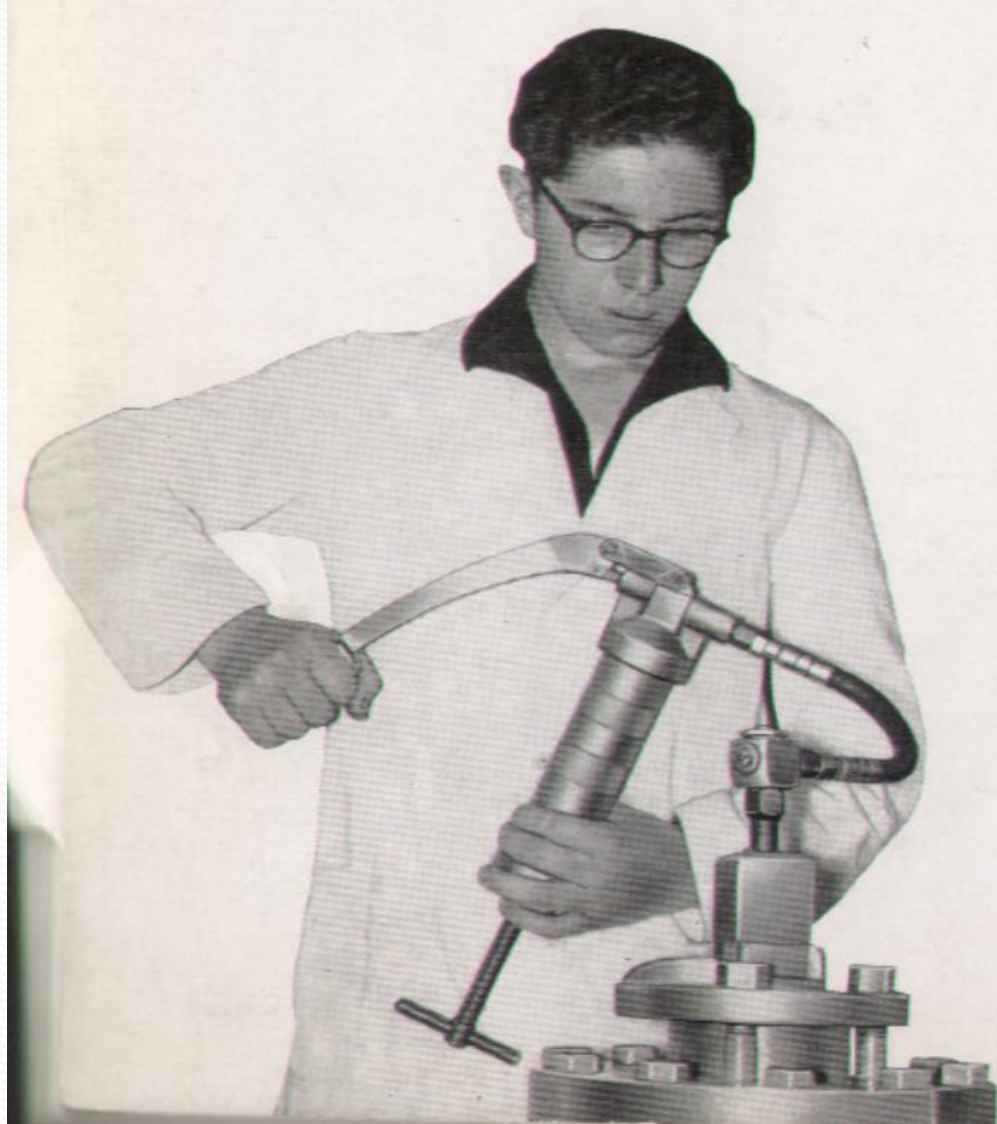
- يحتاج عزم أكبر للدوران بسبب الاحتكاك
- قياس "4 و أكبر يحتاج لعلبة سرعة
- فتحة صغيرة بسبب شكل السدادة

lubrication equipment



LUBRICANT GUN

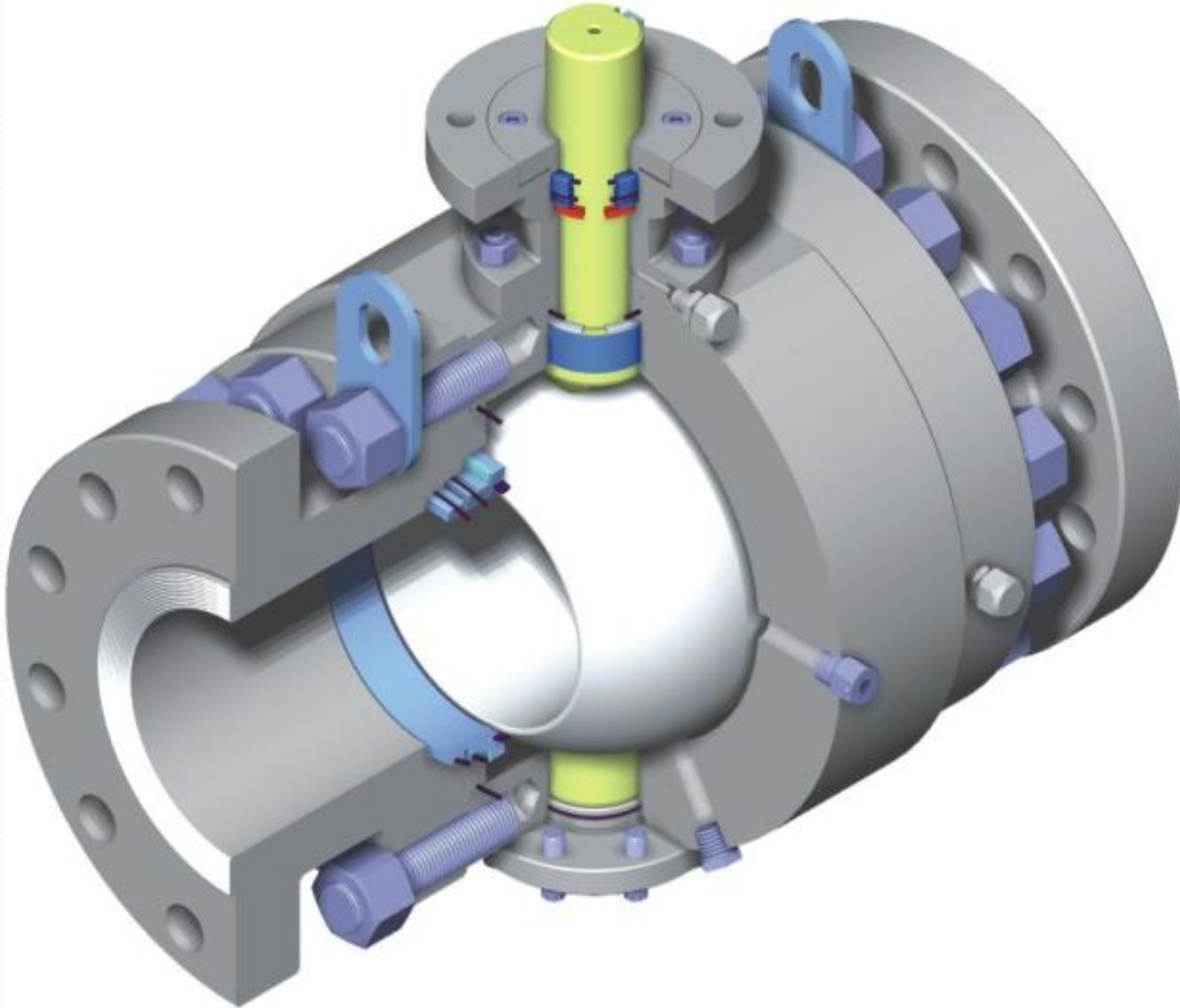
Shown here is the type of gun recommended, Audco Model ALG.4. This is a high pressure unit fitted with a flexible hose giving a push-on or hook-on connection to the giant button head nipple on the valve. This gun is designed to take prepacked cartridges of lubricant which screw into the body of the gun and which can be discarded either when empty or when a change of lubricant is necessary. The gun is recommended for all general purposes on valves operating on line pressures up to 4,000 psi.



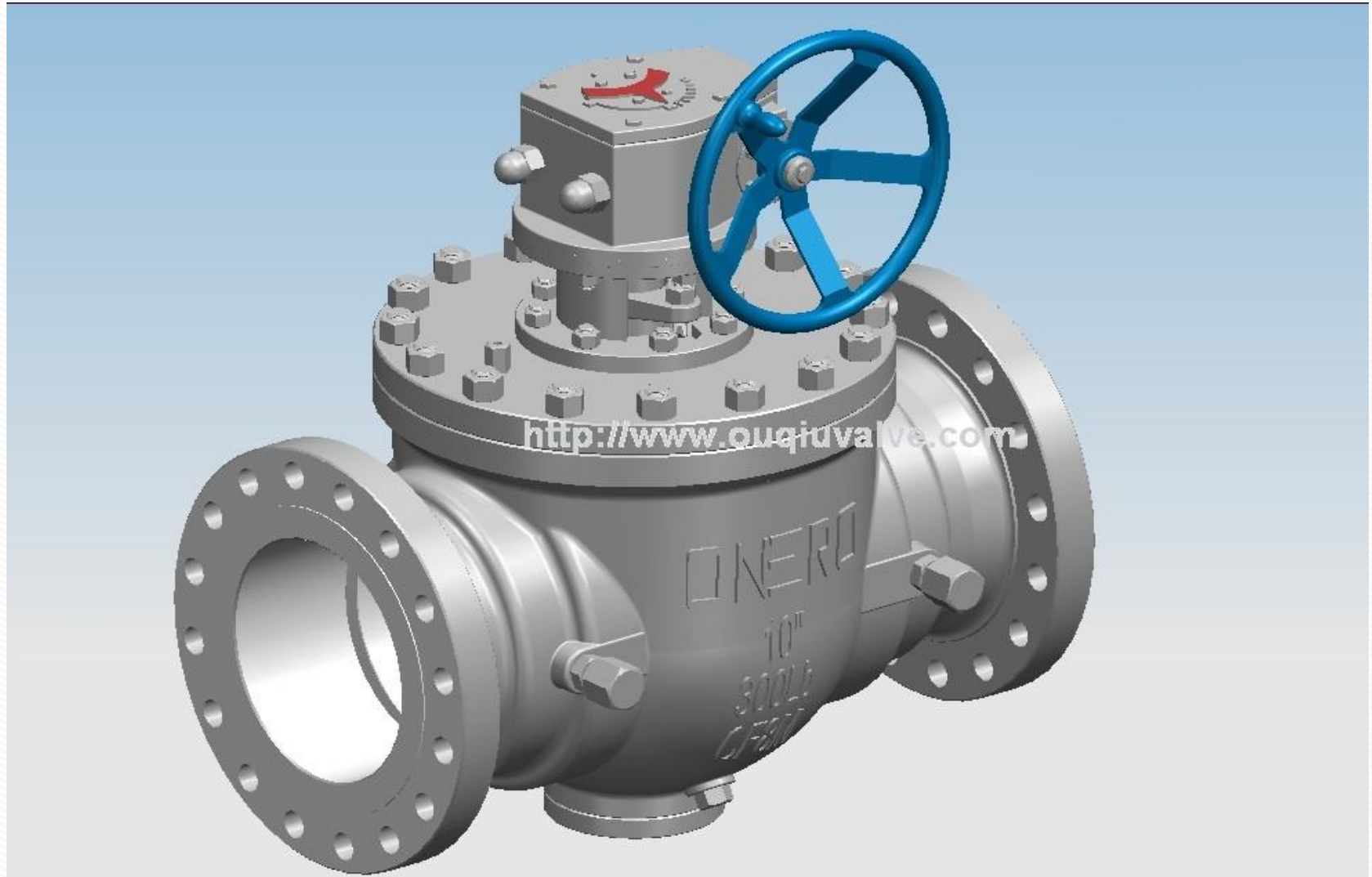
Ball Valve



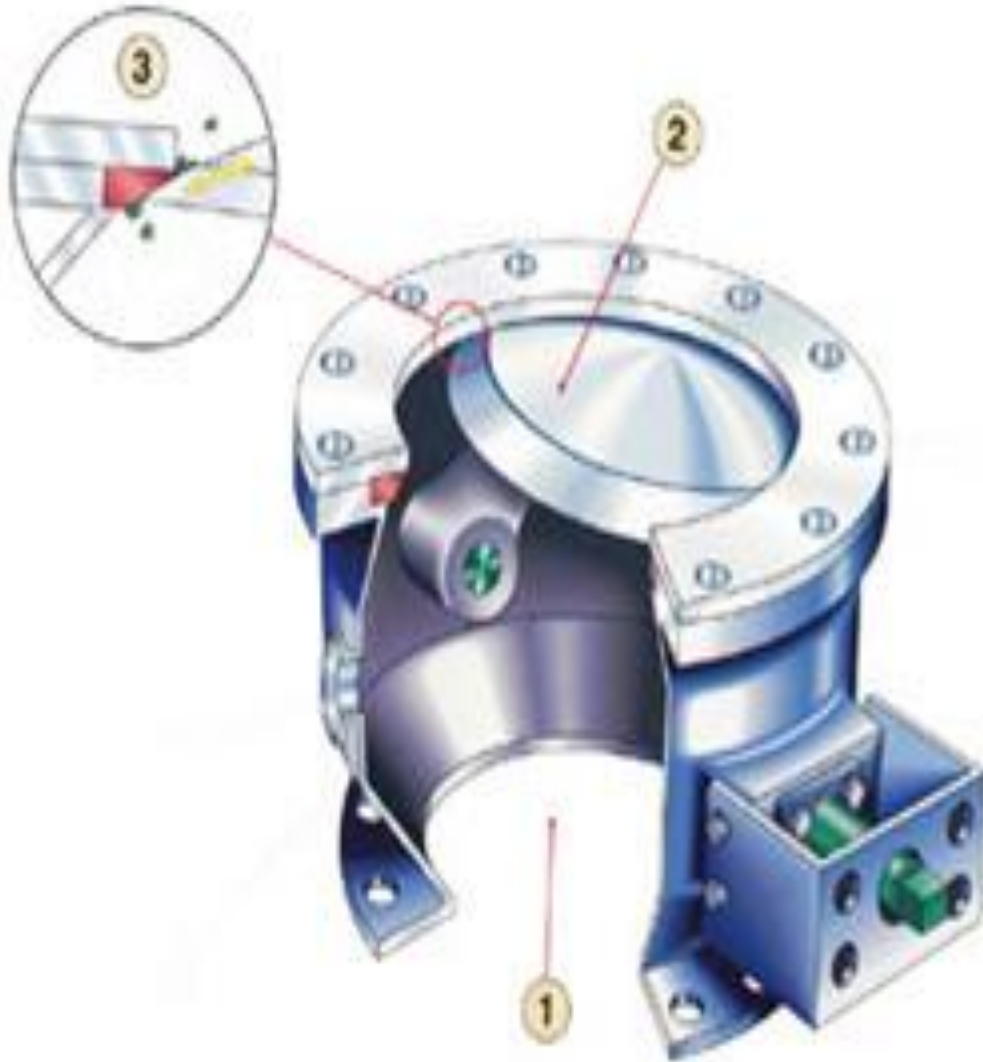
Ball Valve/ 3 pieces



Ball Valve/ Top entry

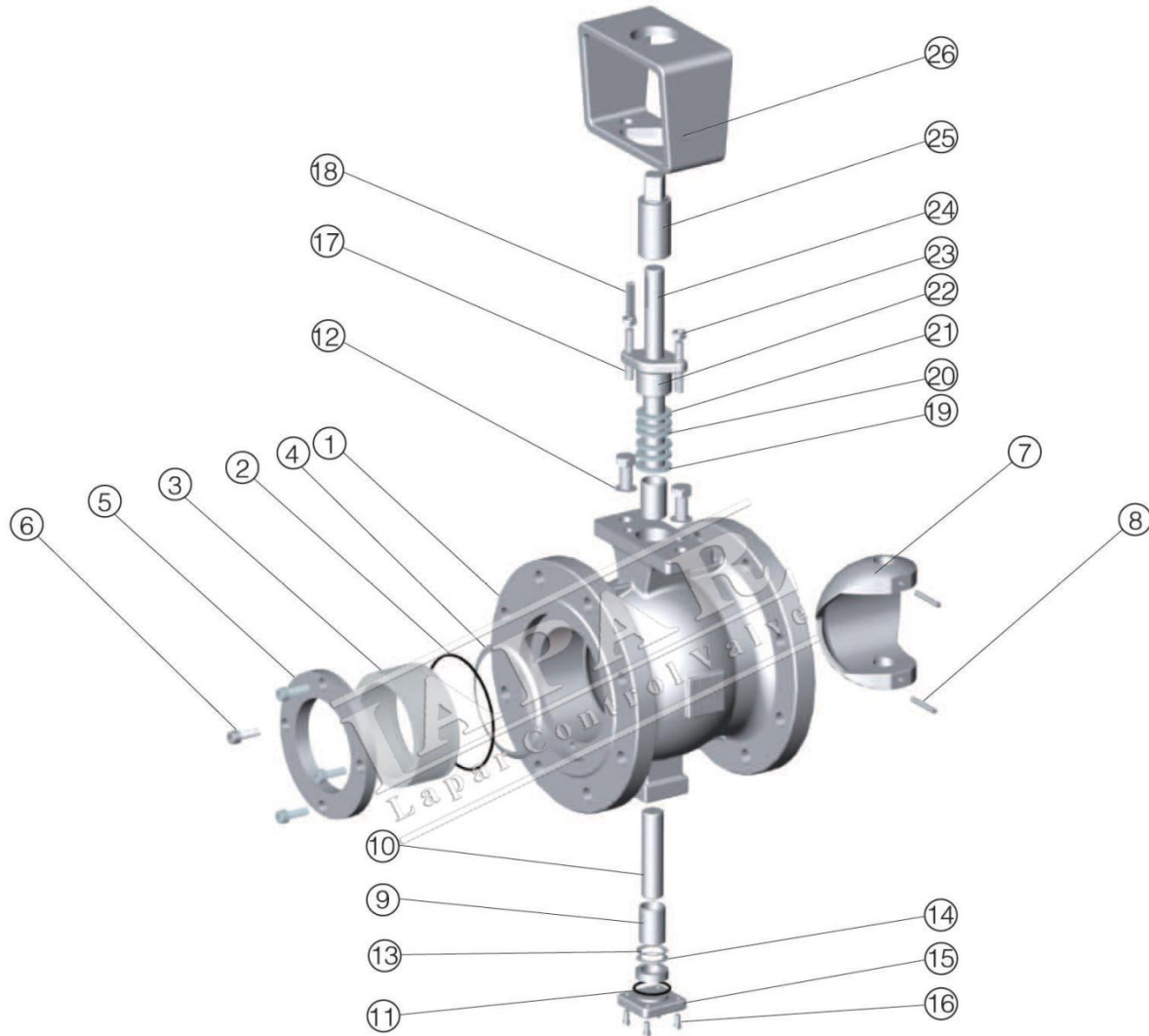


Spherical Disk Valve



1. The spherical disc rotates 90 degrees out of the material flow to allow mass-flow through it's full port.
2. The under-cut disc segment provides clearance that prevents powder jamming between the disc and housing.
3. The spherical disc wipes the material away from the matching radius of the the seat to provide sanitary sealing and longer seat life

V Type Ball Valve



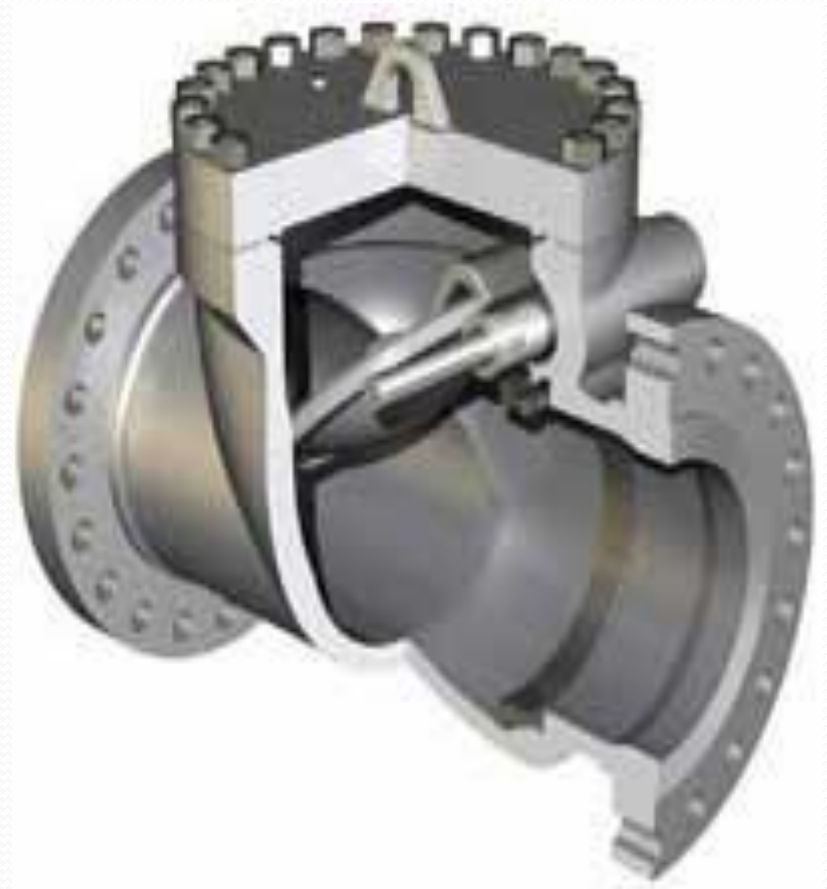
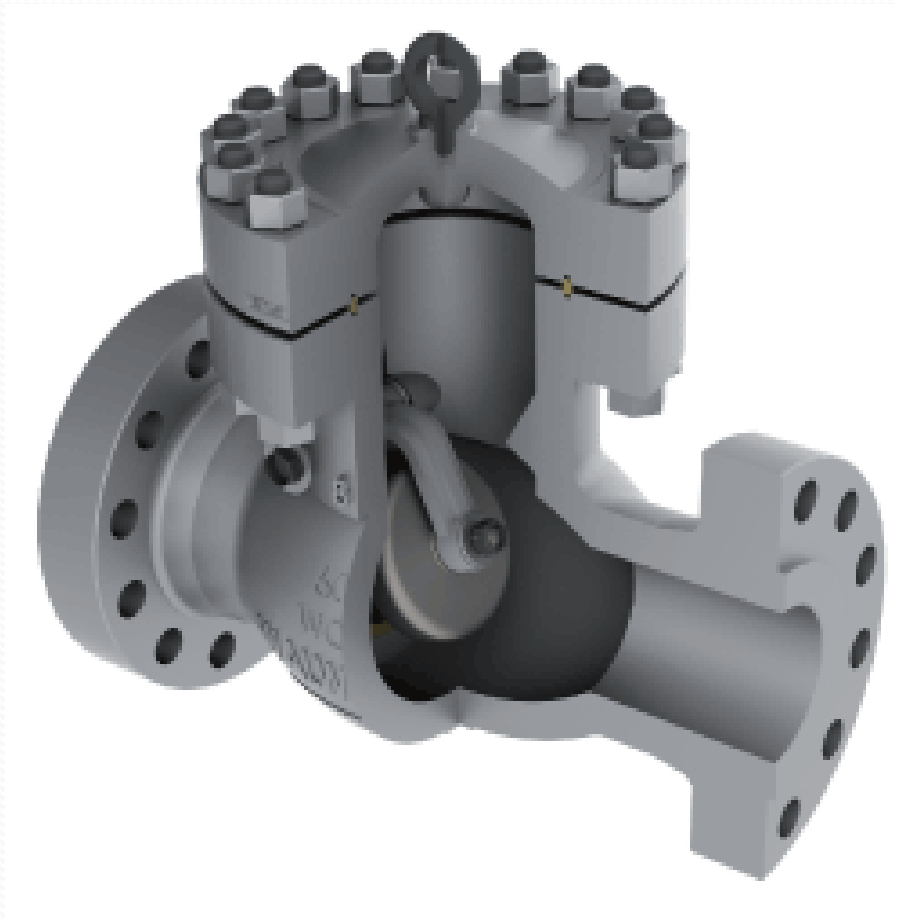
Butterfly Valve



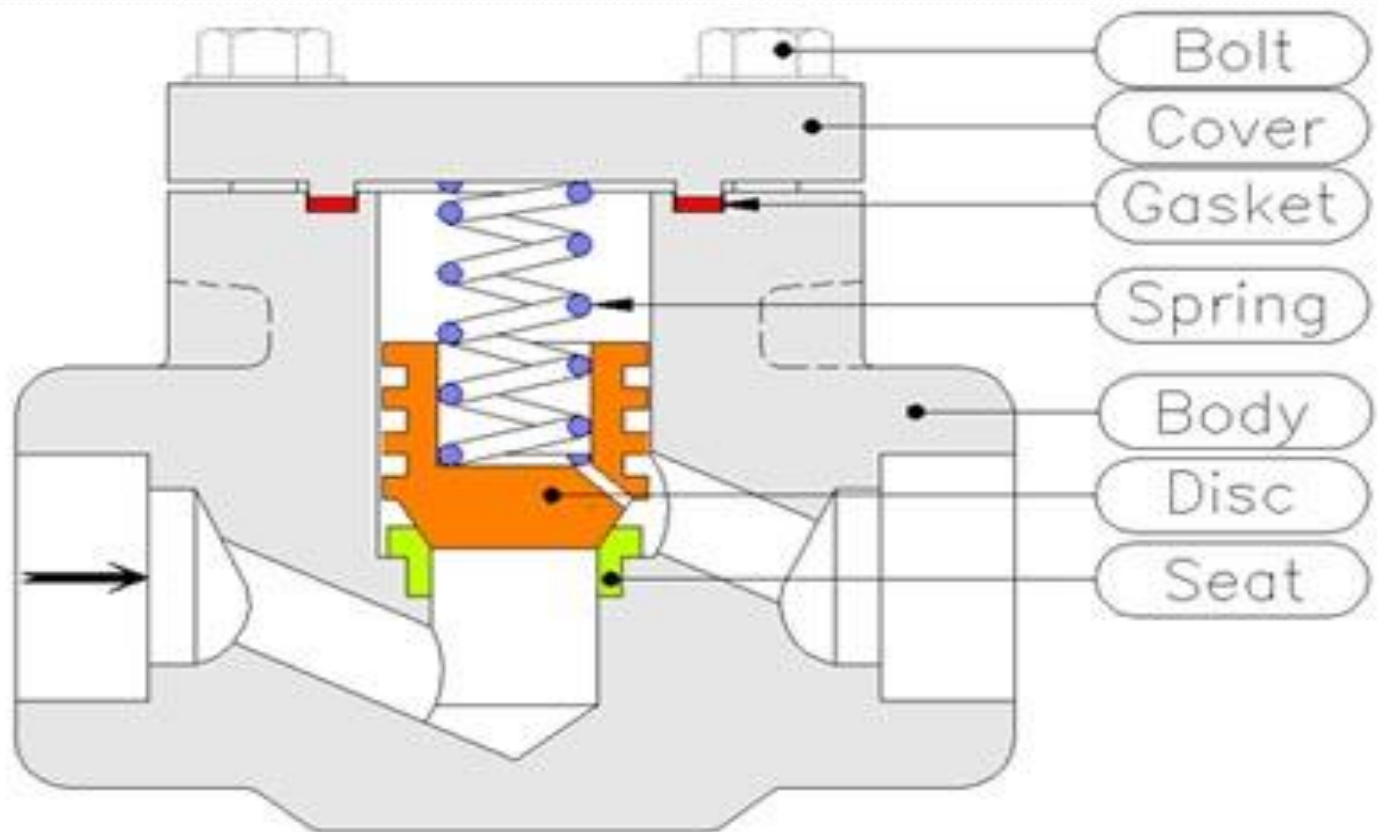
Butterfly Valve



Check Valve/swing type



Check Valve/Lift type



**Forged Steel Lift Check Valve
(Non-Return Valve)**

Check Valve/Piston/lift type



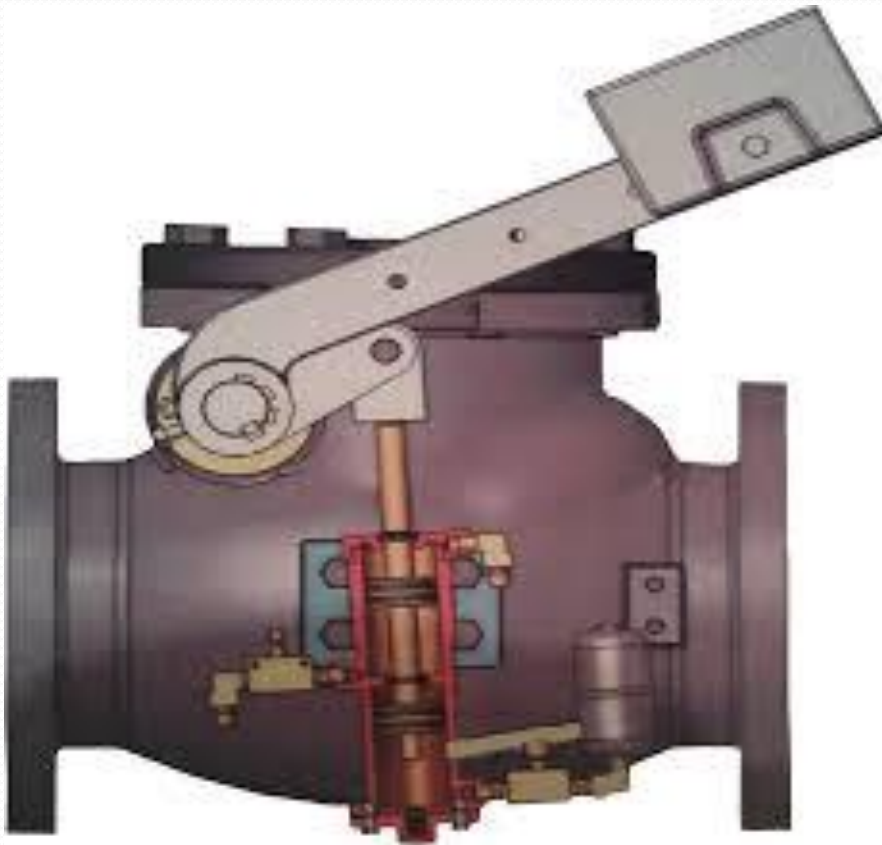
Swing Check Valve/Wafer type



Check Valve/Ball type



Check Valve/swing type – with lever



- لتخفيف صدمة الارتداد يستخدم عادة :

- ذراع موازنة مع ثقل تعديل كما في مضخات الأبراج

- مخمد هيدروليكي كما في التفحيم و درمات الديمي القديمة

Valve Classification

There are two groups to classify the valves:

1 – According to ANSI

ANSI = American National Standards Association

2- According to DIN

DIN = Dutch Industrial Norm

ANSI

S	Class Rate (ASA)		Size Rate
1	75	AWWA	3/8", 1/2" , 3/4"
2	100		1", 1 1/2"
3	125		2"
4	150		3"
5	250		4"
6	300		6"
7	400		8"
8	600		10"
9	800		12"
10	900		14"
11	1500		16"
12	2500		18"

DIN

S	PN Rate (Kg/cm2)	DN Rate (mm)
1	2.5	8 – 10 – 15 – 20 – 25
2	6	40
3	10	50
4	16	80
5	25	100
6	40	150
7	64 – 63	200
8	100	250
9	160	300
10	250	350
11	320	400
12	400	450

ما المقصود بـ ASA

ASA = American Standard Associate

- ASA هي مدلول مجرد من الوحدة يدل على مرتبة الضغط (صمام، فلنجة)
- لمعرفة الضغط الذي يمثله .. ASA 300 , ASA 150 نستعين بالجداول الموجودة في ASIN B16.34

- ولكن بشكل سريع يمكن إجراء الحساب التالي :

- مثال : ما هو ضغط التشغيل لصمام ASA 600

$$- 600 \times 2.4 = 1440 \text{ psi} = 1440 \times 7/100 = 100.8 \text{ Kg/cm}^2$$

- إن الضغط 100.8 kg/cm^2 محسوب عند درجة ٣٨ مئوية و ينقص بارتفاع درجة الحرارة

- هذه المعادلة تطبق فقط من ASA 300 و ما فوق

How do you select the valve ?

You have to Know :

1- Medium : Water , oil , Gas , Vapor...

2- Condition service : Working pressure , Working temperature ,

3 – Size of line

4 – Type of connection : BW ,SW , RF , RTJ , FF , Male & Female ..

5 – What is the target : Open-Close , controlling

Example ?

1- Medium : Crude oil – Carbon steel (WCB)

*2- Service Condition : WP = 22 Kg/cm², WT= 150
C degree , ASA = ?*

3 – Size of line : 6" (6 ")

4 – Type of connection : RF

5 – What is the target : Open-Close= Gate valve

Pressure & Temperature/ANSI B16.34

Materials		WCB ¹	WCC ¹	LCB ⁸ LC2 ⁸ LC3 ⁸	WC1 ^{2,4} LC1	WC4 ⁴ WC5 ⁴	WC6 ⁴	WC9 ⁴	C5 ⁴	C12 ⁴	CF8 CF3 ⁷	CF8 ⁵	CF8M ⁶ CF3M ⁷
Class	Temperature C ³	Working pressures in bars											
150	- 30 TO 38	19.5	19.5	18.3	18.3	19.5	19.5	19.5	19.5	19.5	16.3	16.3	16.3
	100	17.7	17.7	17.2	17.8	17.7	17.7	17.7	17.7	17.7	13.3	14.2	14
	150	17.3	17.3	16.8	17.2	17.3	17.3	17.3	17.3	17.3	11.9	13.3	12.8
	200	16.7	16.7	16.3	16.7	16.7	16.7	16.7	16.7	16.7	10.7	12.6	12.1
	250	15.9	15.9	15.6	15.9	15.9	15.9	15.9	15.9	15.9	10	11.8	11.9
	300	14.8	14.8	14.7	14.8	14.8	14.8	14.8	14.8	14.8	9.5	11.3	11.6
	350	14.1	14.1	14.3	14.1	14.1	14.1	14.1	14.1	14.1	9.2	10.8	11.3
	400	13.2	13.2	12.4	13.2	13.2	13.2	13.2	13.2	13.2	9	10.4	10.9
	450	7.6	7.6	8.4	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
	500	3.3	3.3	4.7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
	550	0.7	0.7	1	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	Shell test	30	30	28	28	30	30	30	30	30	25	25	25
	Seat test	21.5	21.8	20.2	20.2	21.8	21.7	21.8	21.8	21.8	17.9	17.9	17.9
300	- 30 TO 38	51	51.7	47.8	47.8	51.7	51.7	51.7	51.7	51.7	42.5	42.5	42.5
	100	46.3	51.6	45	46.5	48.7	48.7	49	51.6	51.6	34.9	37.2	36.5
	150	45.2	51.3	44	44.9	46.3	46.3	46.6	51.3	51.3	31.1	34.7	33.4
	200	43.8	50.5	42.7	44.1	45.4	45.4	44.8	50.5	50.5	28	32.9	31.6
	250	41.7	49.2	40.6	43	44.4	44.4	44.2	49.2	49.2	26.1	31	31
	300	38.7	48	38.3	42	42.4	42.4	44.1	48	48	24.8	29.5	30.3
	350	36.9	46.7	37.3	40.9	40.2	40.2	43.7	46.7	46.7	24	28.1	29.4
	400	34.4	34.4	32.3	38.2	38.2	36.5	41.3	37.6	41.3	23.5	27.2	28.3
	450	20	20	21.9	34.4	35.6	33.7	37.8	30.8	37.2	23	26.3	27.6
	500	8.7	8.7	12.3	23.4	27	27.7	28.5	20.2	27.4	22.3	25.4	27.5
	550	1.9	1.9	2.7	7.2	8.2	12.7	16.3	11.6	16.9	21.3	24.1	26.1
	600						5.8	7.6	6.5	7.1	16.7	19.8	21.4
	650						2.2	4.5	2.9	3.4	10.5	10.2	14.1
	700										5.9	5.6	9.9
	750										3.6	3	5.9
	800										2	1.9	3.5
	Shell test	77	78	72	72	78	78	78	78	78	64	64	64
	Seat test	56.2	56.9	52.7	52.7	56.9	56.9	56.9	56.9	56.9	46.8	46.8	46.8

+Pressure & Temperature/ANS B16.34

Materials		WCB ¹	WCC ¹	LCB ² LC2 ³ LC3 ³	WC1 ^{2,4} LC1	WC4 ⁴ WC5 ⁴	WC6 ⁴	WC9 ⁴	C5 ⁴	C12 ⁴	CF8 CF3 ⁷	CF8 ⁵	CF8M ⁶ CF3M ⁷
400	- 30 TO 38	68	68.9	63.7	63.8	68.9	68.9	68.9	68.9	68.9	56.7	56.7	56.7
	100	61.8	68.8	60	62.1	64.9	64.9	65.3	68.8	68.8	46.5	49.6	48.6
	150	60.2	68.4	58.6	59.9	61.8	61.8	62.1	68.4	68.4	41.5	46.2	44.6
	200	58.4	67.4	56.9	58.9	60.6	60.6	59.7	67.4	67.4	37.4	43.8	42.2
	250	55.6	65.6	54.1	57.4	59.2	59.2	58.9	65.6	65.6	34.8	41.3	41.4
	300	51.6	64	51.1	56	56.5	56.5	58.8	64	64	33.1	39.3	40.4
	350	49.2	62.2	49.8	54.5	53.6	53.6	58.3	62.2	62.2	32	37.5	39.2
	400	45.9	45.9	43.1	50.9	51	48.7	55	50.2	55	31.3	36.2	37.8
	450	26.7	26.7	29.2	45.9	47.5	45	50.4	41.1	49.6	30.6	35.1	36.8
	500	11.7	11.7	16.4	31.3	36	37	38	27	36.6	29.7	33.9	36.6
	550	2.6	2.6	3.6	9.7	10.9	17	21.8	15.5	22.6	28.4	32.1	34.8
	600						7.8	10.1	8.6	9.5	22.2	26.4	28.6
	650						3	6	3.9	4.5	14	13.7	18.8
	700										7.9	7.4	13.3
	750										4.8	4.1	7.8
	800										2.7	2.5	4.7
	Shell test	103	104	96	96	104	104	104	104	104	86	86	86
	Seat test	74.9	75.8	70.2	70.2	75.8	75.8	75.8	75.8	75.8	62.4	62.4	62.4
600	- 30 TO 38	102.1	103.4	95.5	95.7	103.4	103.4	103.4	103.4	103.4	85	85	85.1
	100	92.7	103.3	90	93.1	97.4	97.4	98	103.3	103.3	69.8	74.4	72.9
	150	90.4	102.6	87.9	89.8	92.7	92.7	93.2	102.6	102.6	62.2	69.4	66.9
	200	87.6	101.1	85.3	88.3	90.9	90.9	89.6	101.1	101.1	56.1	65.8	63.3
	250	83.4	98.4	81.2	86.1	88.9	88.9	88.4	98.4	98.4	52.3	62	62
	300	77.4	96	76.6	84	84.8	84.8	88.2	96	96	49.7	59	60.6
	350	73.8	93.4	74.7	81.8	80.4	80.4	87.5	93.4	93.4	48	56.3	58.8
	400	68.9	68.9	64.7	76.4	76.5	73.1	82.6	75.3	82.6	47	54.4	56.7
	450	40	40	43.8	68.9	71.3	67.5	75.6	61.7	74.5	46	52.7	55.2
	500	17.5	17.5	24.6	46.9	54	55.5	57.1	40.5	54.9	44.6	50.8	54.9
	550	3.9	3.9	5.4	14.5	16.4	25.5	32.7	23.3	33.9	42.7	48.2	52.2
	600						11.7	15.1	13	14.3	33.4	39.6	42.9
	650						4.5	9	5.9	6.8	21	20.5	28.2
	700										11.9	11.2	19.9
	750										7.2	6.1	11.8
	800										4.1	3.8	7
	Shell test	154	156	144	144	156	156	156	156	156	128	128	128
	Seat test	112.3	113.8	105.3	105.3	113.8	113.8	113.8	113.8	113.8	93.6	93.6	93.6

The technical specification is:

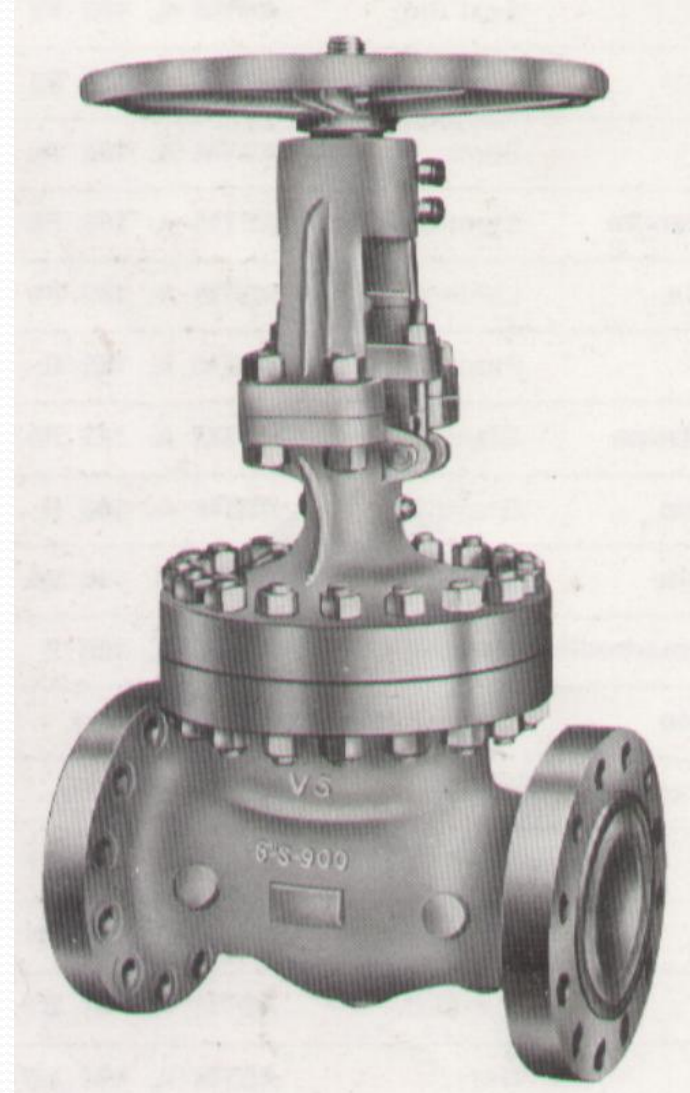
- Cast steel , Gate Valve , Flanged ends , Rising Stem , (OS & Y)

Materials : According to ASTM –
-A216 Gr WCB

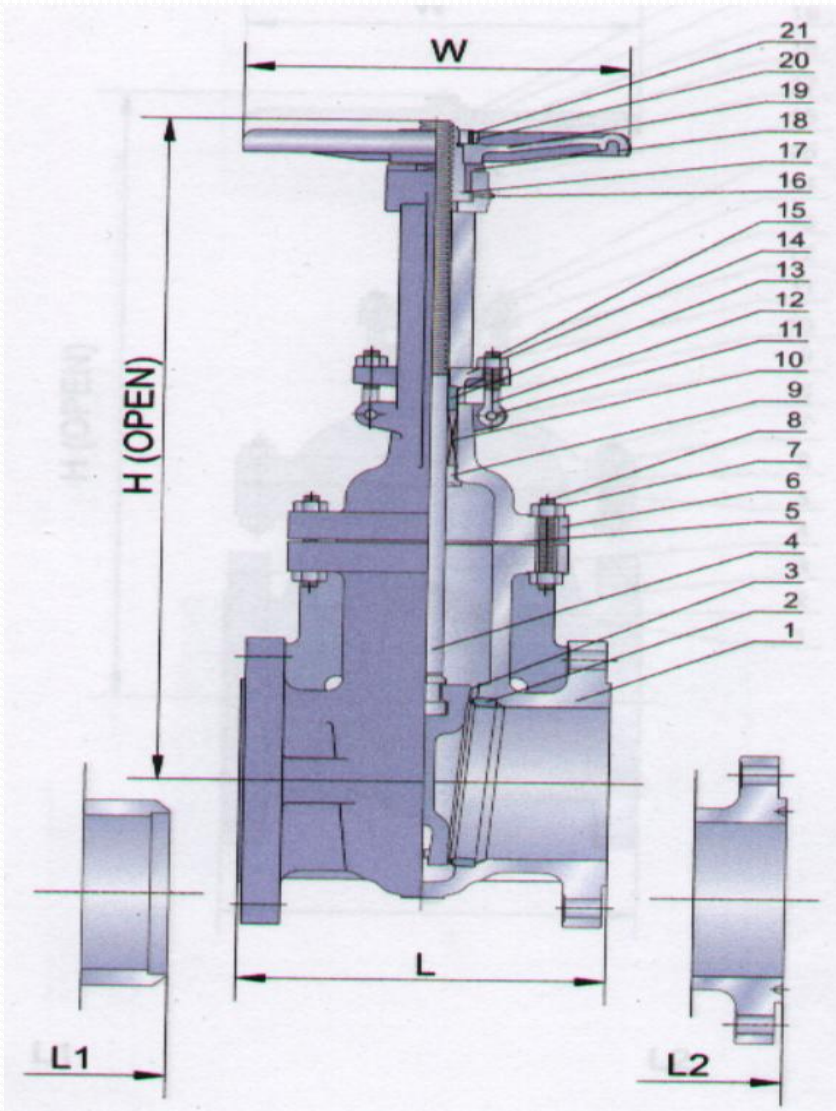
- Trim materials (Stem , gate , seat ring) Cr 13%

- Size 6" , Class 300 , (ASA 300 , 300 Lbs , ANSI 300)

- Manual Operation .



Length of Valve



IDIOMS

Flanged Ends :

Face to Face = F to F

Butt- weld Ends :

End to End = E to E

L,L2=F to F , L1=E to E

Class 150

Dimensions and Weights																		
SIZE	in mm	2" 50	2.5" 65	3" 80	4" 100	6" 150	8" 200	10" 250	12" 300	14" 350	16" 400	18" 450	20" 500	24" 600	28" 700	30" 750	32" 800	36" 900
L	in	7.00	7.50	8.00	9.00	10.50	11.50	13.00	14.00	15.00	16.00	17.00	18.00	20.00	24.00	24.00	28.00	28.00
	mm	178	191	203	229	267	292	330	356	381	406	432	457	508	610	610	711	711
L1	in	8.50	9.50	11.12	12.00	15.88	16.50	18.00	19.75	22.50	24.00	26.00	28.00	32.00	36.00	36.00	38.00	40.00
	mm	216	241	283	305	403	419	457	502	572	610	660	711	813	914	914	965	1016
L2	in	7.50	8.00	8.50	9.50	11.00	12.00	13.50	14.50	15.50	16.50	17.50	18.50	20.50	—	—	—	—
	mm	191	203	216	241	279	305	343	368	394	419	445	470	521	—	—	—	—
H	in	15.31	17.28	19.69	23.43	30.59	38.39	45.67	54.72	61.22	71.30	82.80	90.55	102.72	130.98	141.97	145.98	154.49
	mm	389	439	500	595	777	975	1160	1390	1555	1811	2103	2300	2609	3327	3606	3708	3924
W	in	8	8	10	10	14	14	16	18	22	24	25	27	30	24	24	24	24
	mm	200	200	250	250	350	350	400	450	560	600	640	680	760	610	610	610	610
Weight RF	kg	17	23	29	47	80	129	192	287	410	571	720	1170	1466	1931	2380	2490	3600

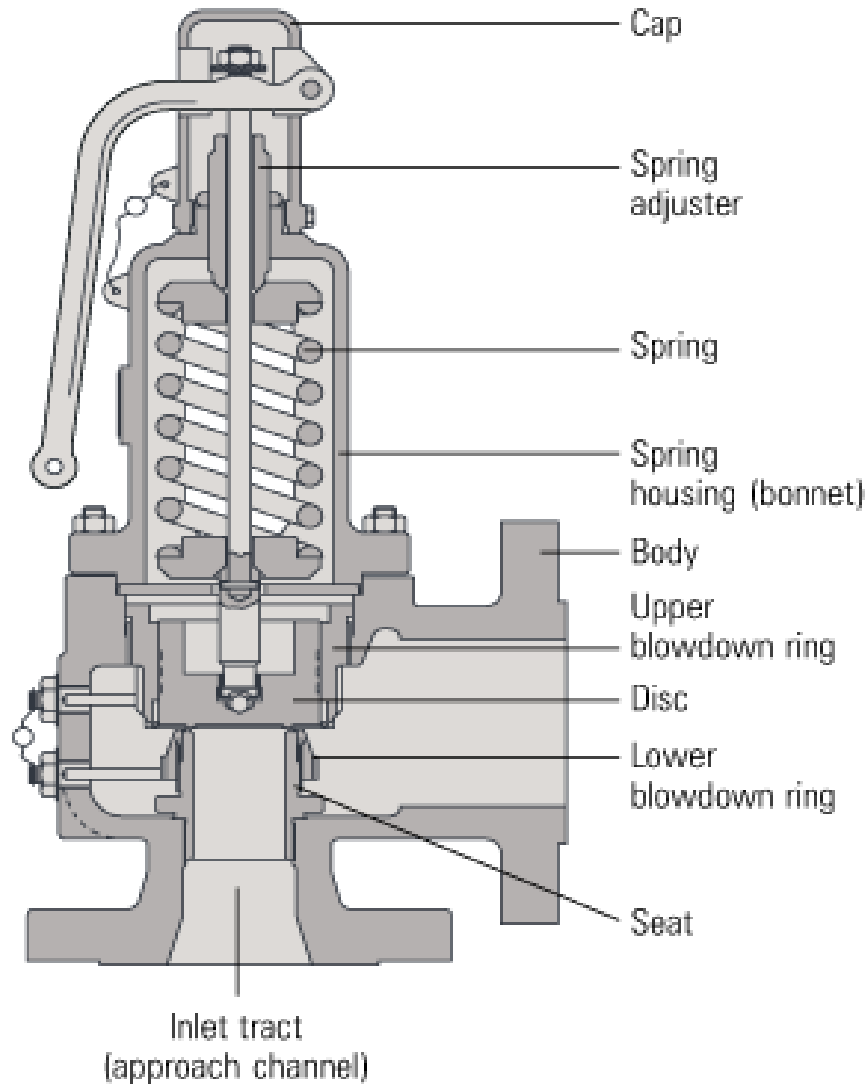
صمامات الأمان Safety Valve

تستخدم للتأمين على الخطوط و الأوعية و الخزانات

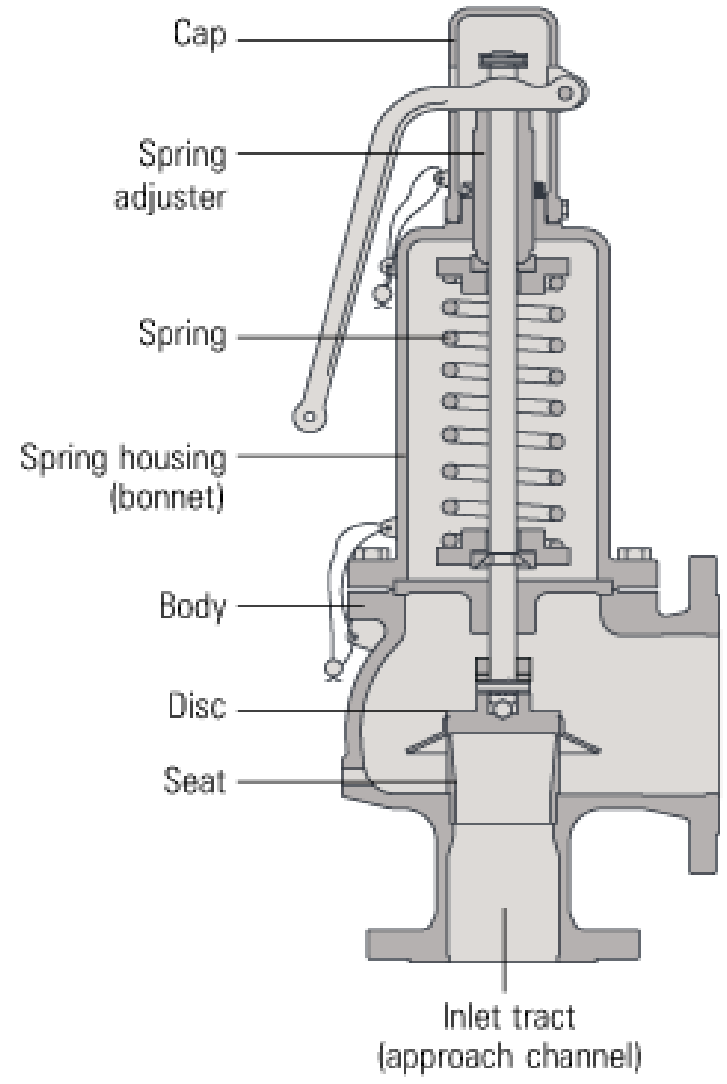
مواصفاته:

- قطر فتحة الخروج أكبر من فتحة الدخول لزيادة التدفق الخارج
- الضغط التصميمي لفتحة الخروج أقل من ضغط فتحة الدخول
- تجهز بذراع لتفريغ الضغط عند التوقفات إذا لزم الأمر
- يوجد صمامات أمان للضغط المرتفع و أخرى الضغط السلبي





Typical ASME valve



Typical DIN valve

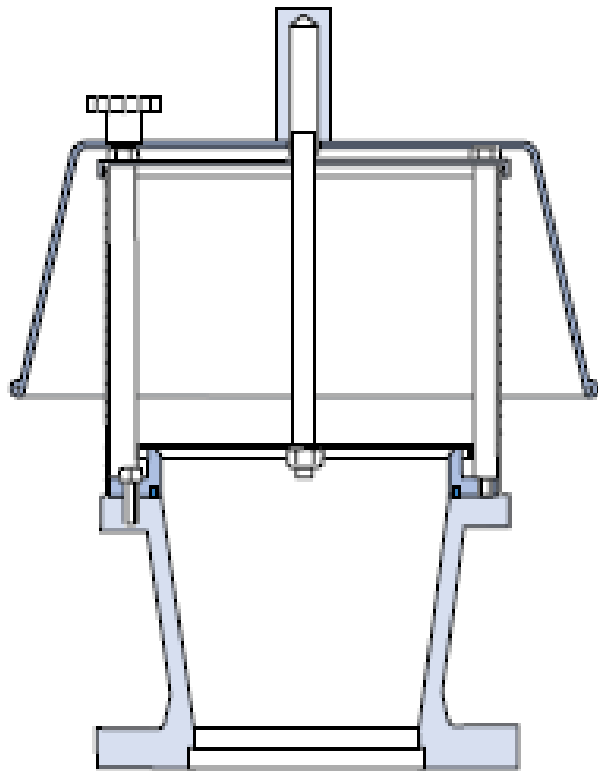
Drums , Vessels / Safety



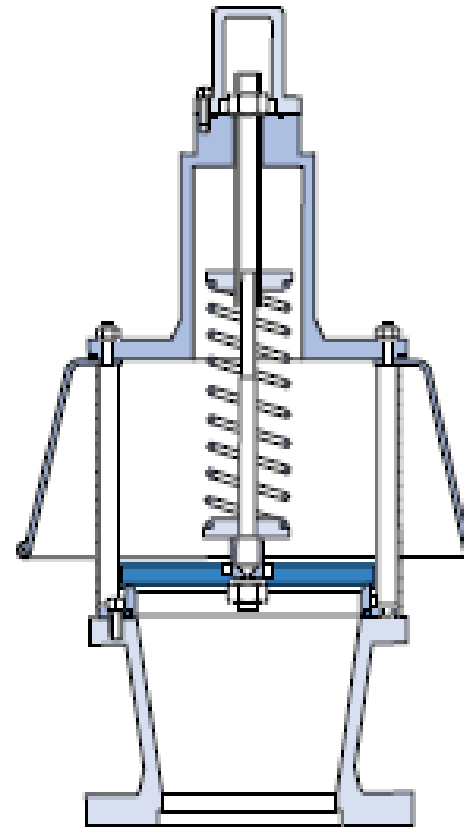
لزيادة الأمان في الدرمات و الأوعية
يستخدم صمام أمان مضاعف

- من ميزات هذا النموذج:
- خفض تكلفة الإنشاء و زيادة متانة
جدار الوعاء بسبب تقليل عدد
الفتحات فيه
- تخفيض عدد الجوانات و
البراغي اللازمة لصمامين
- خفض زمن و أجور الفك و
التركيب

PRESSURE RELIEF ATMOSPHERIC VENT RANGE



Weight loaded



Spring loaded

VACUUM RELIEF

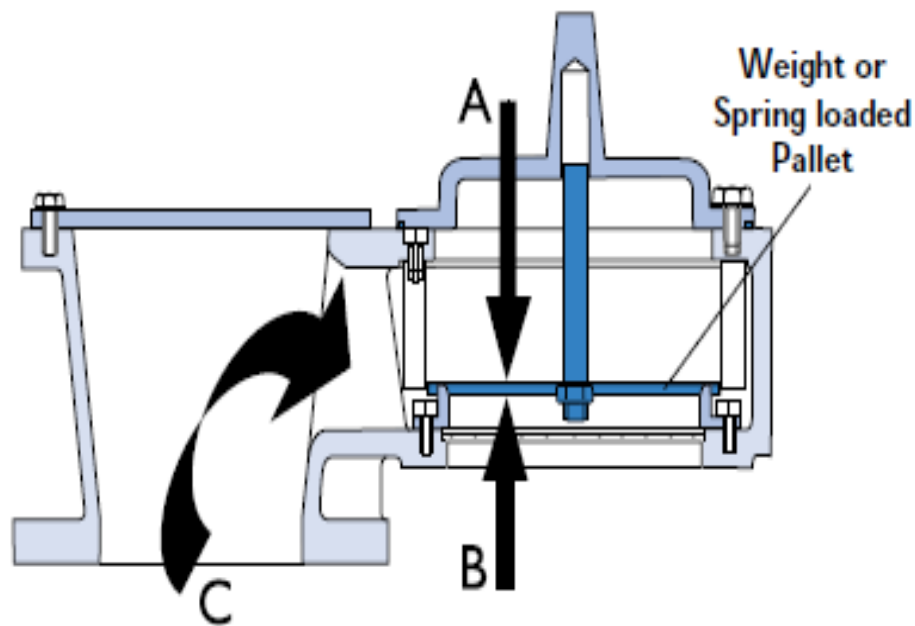


Fig.1 Valve closed.

The downward acting force "A" (generated from either weights or a spring) provides the vacuum set pressure. This force is greater than the atmospheric force "B" acting upward. When the tank is filling, force "C" is generated, which acts with force "A" keeping the valve firmly closed.

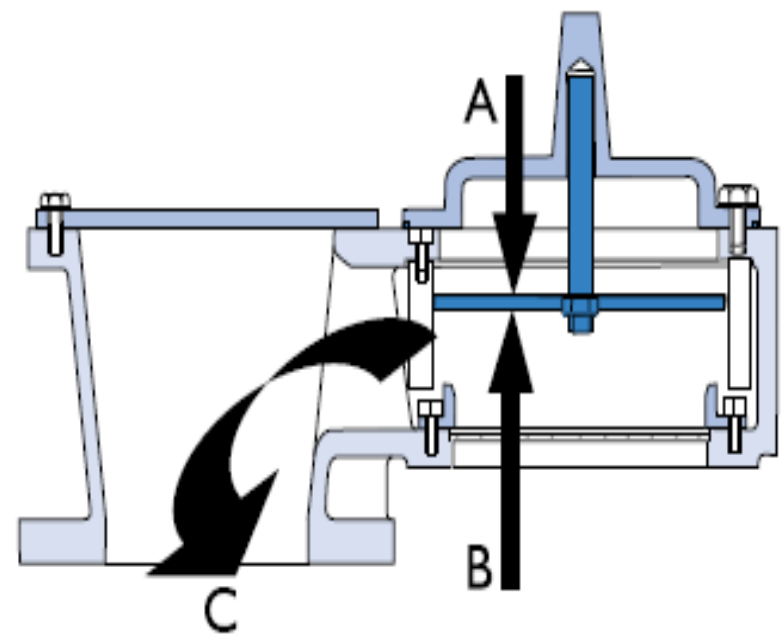


Fig. 2 Valve open.

When the tank is emptying, a vacuum force "C" is generated, which helps to lift the pallet by acting with force "B" and against force "A". This allows the tank to breathe air in.

Vacuum & Relief Valve



Type of Interfacing Raised Face (RF)



Type of Interfacing Flat Face (FF)



Type of Interfacing Ring Type Joint (RTJ)

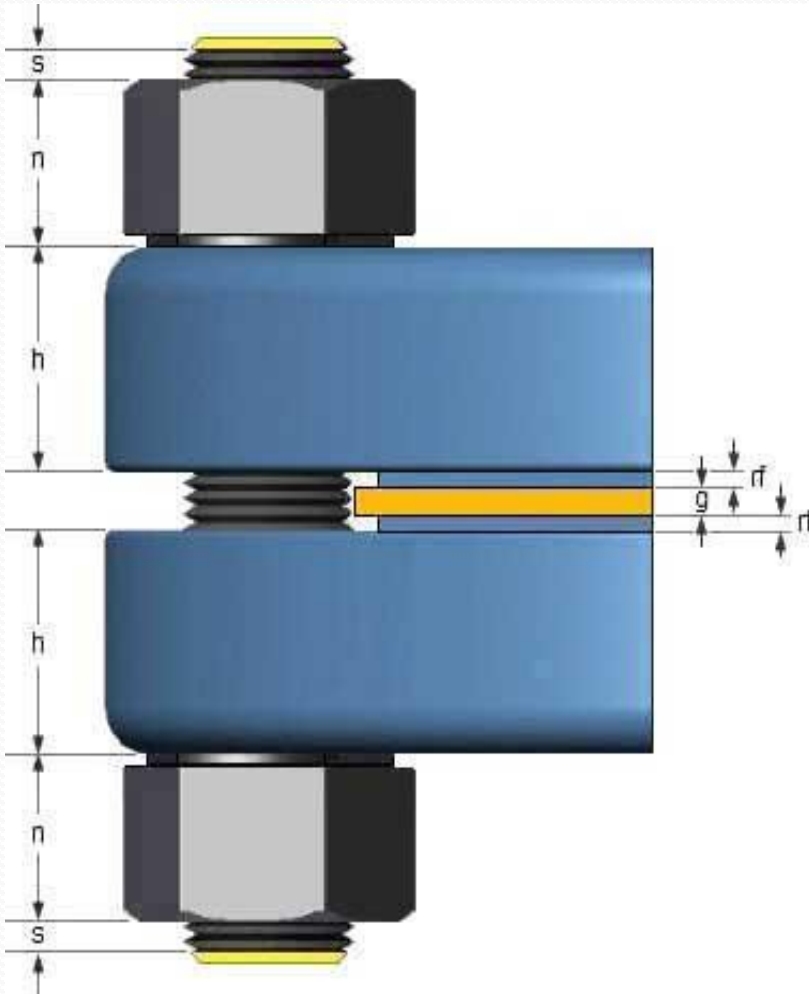


Most common flange types



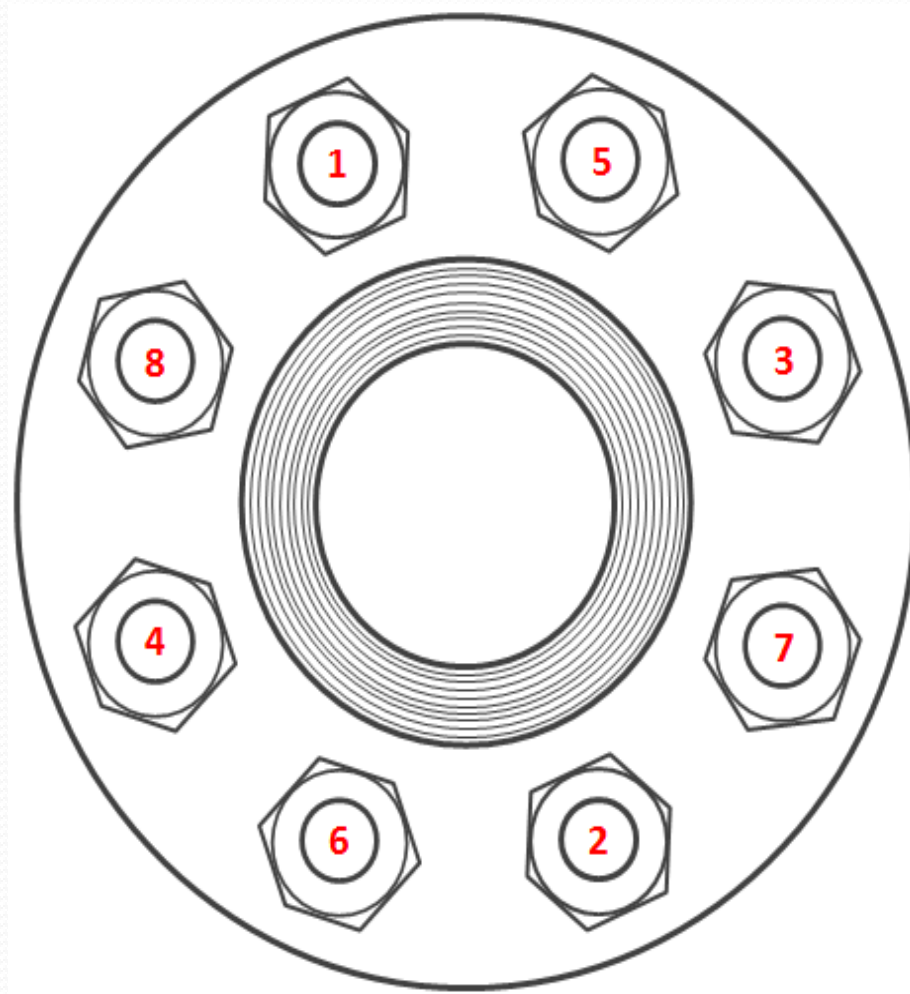


Length of Bolt

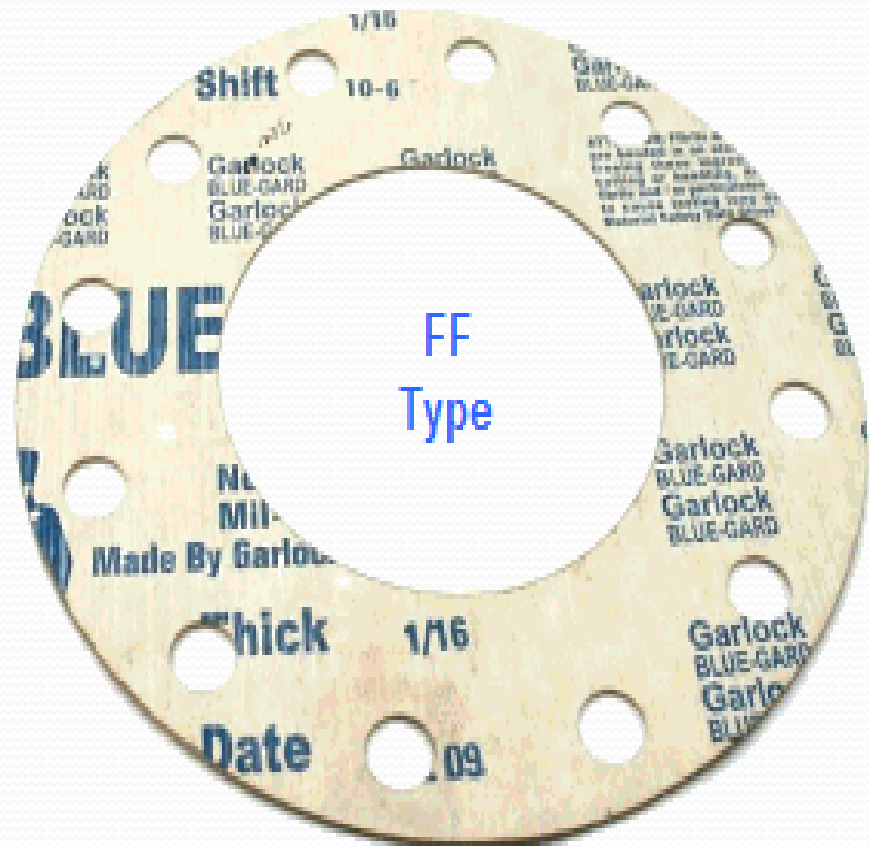


- The Stud Bolt theoretical length can be calculated by means of the formula: $L = 2 (s + n + h + rf) + g$
- s = free threads (equals $1/3$ time bolt diameter)
 - n = nut height (equals nominal bolt diameter)
 - h = flange (plate) thickness
 - rf = height of raised face
 - g = gasket thickness

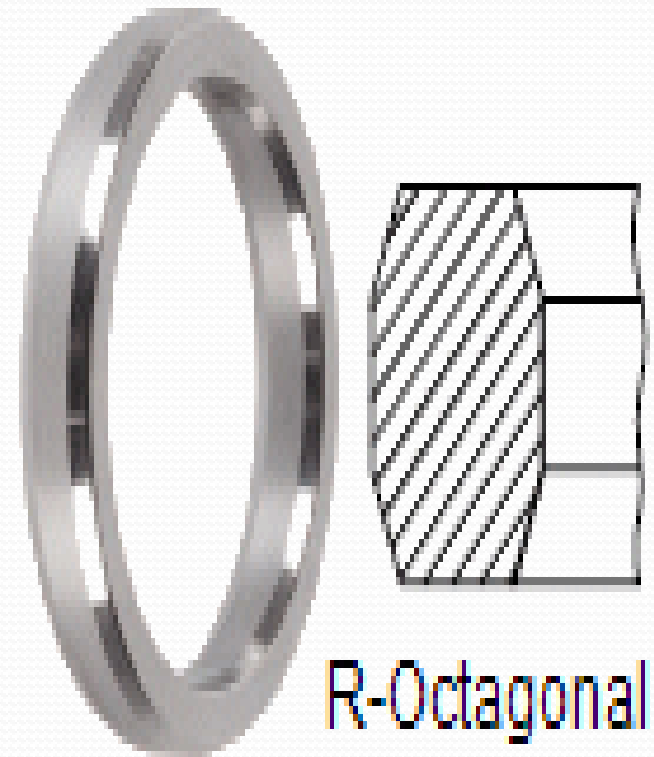
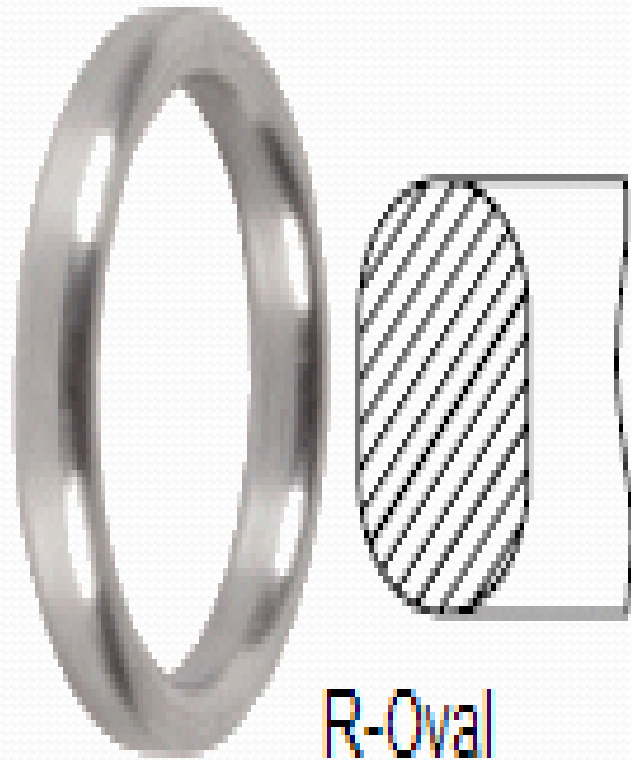
Tightening Sequence



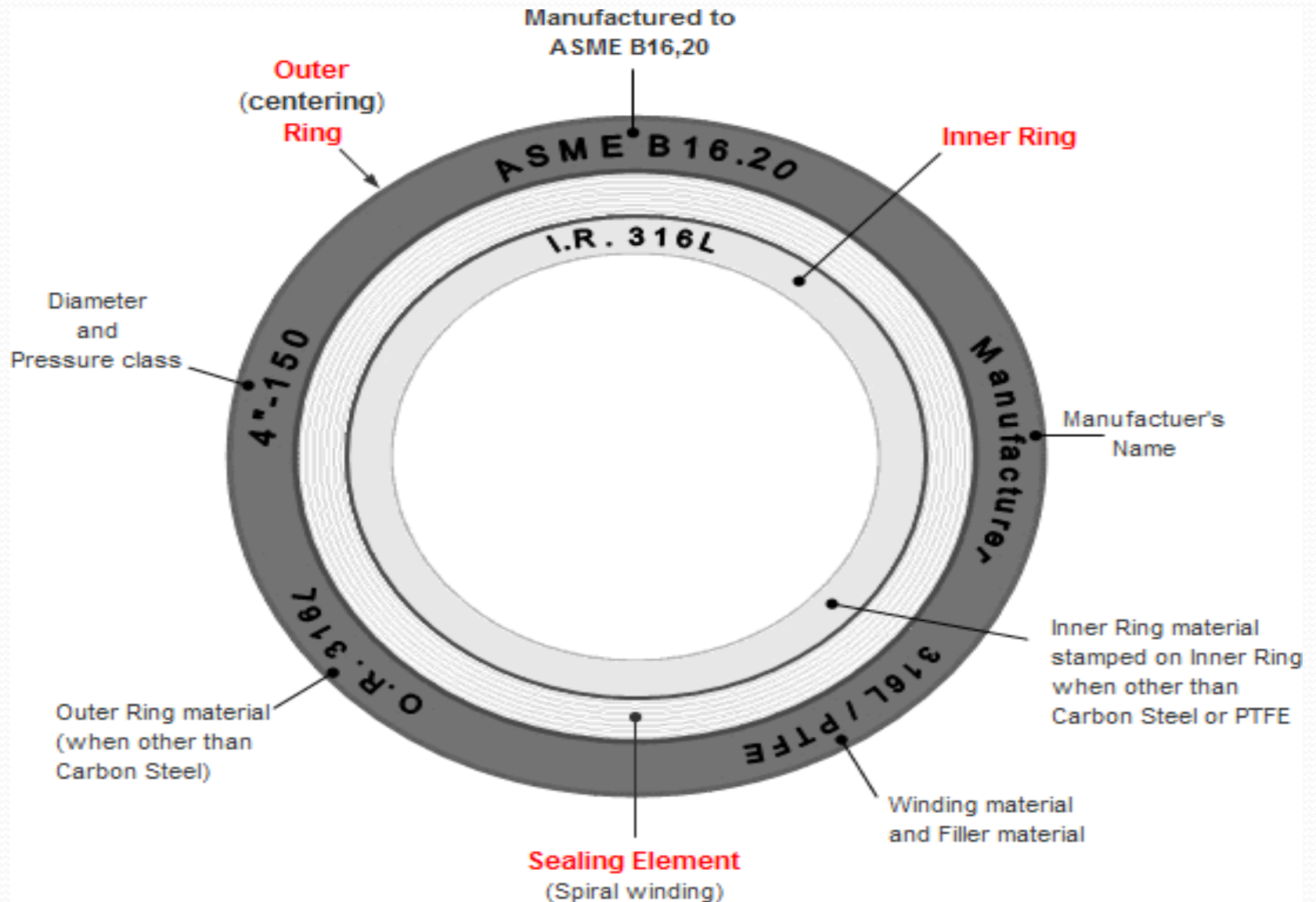
Non-Metallic gaskets types



Types of RTJ gaskets



Spiral wound gaskets



سوا

