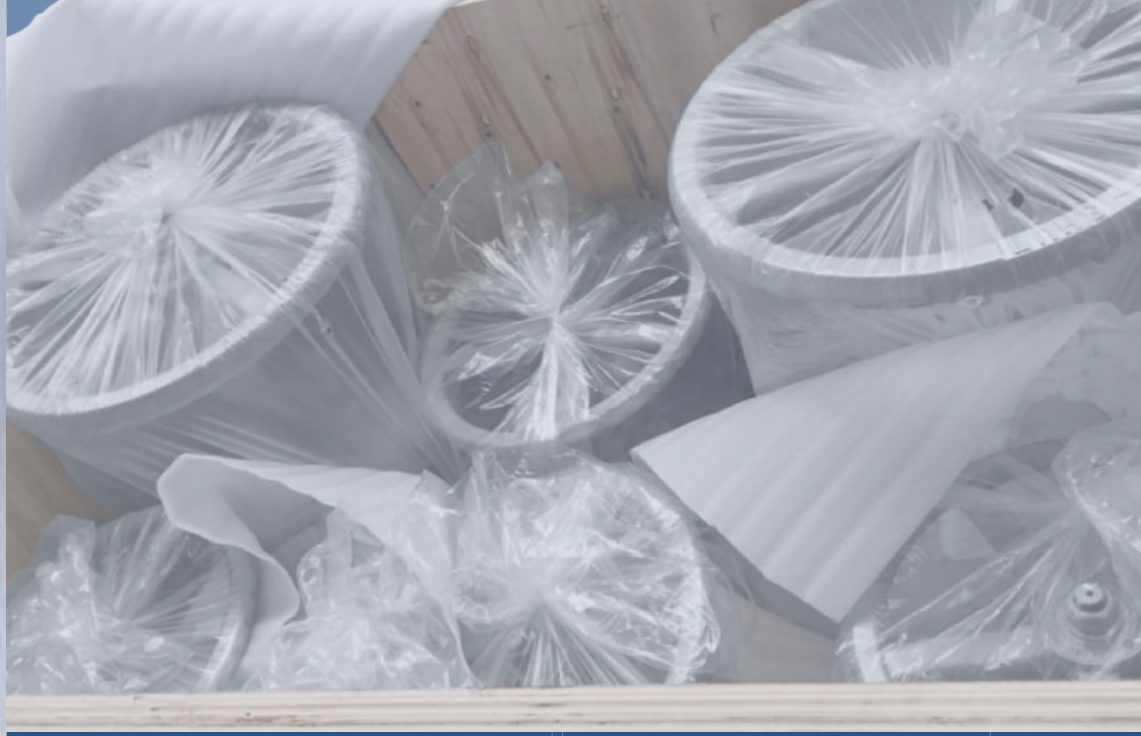


TECHNICAL INFORMATION
Información Técnica

TECHNICAL FEATURES
Características técnicas

FEATURES

SEATS
Asientos

SEATS

RATINGS
Rangos

RATINGS

1. Introduction

Plant fires have become an increasingly serious concern due to the installation of a greater number of soft-seated ball and butterfly valves in place of conventional metal-seated gate and globe valves at many refineries and petrochemical plants. Extremely high temperatures usually result in decomposition or deterioration of resilient or non-metallic sealing components such as gland packing rings, O-rings and gaskets, causing leakage of line fluid which, in turn, increases the magnitude of plant fires.

To minimize the extent of damage in such a mishap, soft-seated valves are expected to have the provision for secondary metal-to-metal sealing functions to minimize external and internal (through-the-bore) leakages as well as the provision for undisturbed valve operation during or after the fire enabling emergency shut-off or release of line fluid.

Soft-seated valves may be manufactured to meet such critical fire safety requirements, if designed adequately, machined and assembled correctly, and equipped with proper sealing components. Valves designed and manufactured in such a way may be called "firesafe valves". Manufacturers' claims of fire safety, however, remain subjective.

To verify the firesafe performance capability, the valve should be subjected to simulated plant fire conditions. API and BSI have developed technical specifications for such destructive tests, which are generally known as fire test standards. Fire tests are destructive and cost a lot to carry out due to high test expenses and bills for a third party's certification, let alone the cost of destroyed samples. Such high costs eventually prohibit repetition of fire tests. To minimize the frequency of fire tests, all existing fire test standards allow a certain range of sizes and pressure classes be qualified and certified without actual test being carried out, given that valves are designed the same and their non-metallic sealing materials are considered same as the actually tested valve.

2. History

BS 6755, Part 2, 1987 (*[1]) was issued to introduce, in a different form of presentation, the technical contents of **API6FA,1985** (*[2]) and **API 607, 1985** (*[3]), with the intention of replacing the requirements of BS 5146, Part 1, 1974, Appendix A.1 (*[4]). Until this new British Standard was issued, technical differences between British Standard and API Standards resulted in high costs to valve manufacturers who desired to certify their products to these standard, and caused confusion amongst contractors and end-users in their evaluation of the products to be purchased.

Even within the United States, valve manufacturers, contractors and end-users used had similar difficulties because of different fire test requirements which existed between API Production Department (which is now responsible for API 6FA) and API Refining Department (which has been responsible for API 607).

Following the virtual unification of fire test requirements by API Production and Refining Departments in their latest 1985 issues, BSI finally launched a major program to adopt American standards as their own, which shall eventually help realize a globally unified fire test standard through ISO.

3. Objetive of Standarization

As high lighted by all of these standards, the fire test standard is prepared to establish test requirements which cover test procedures, performance requirements or evaluation criteria, product qualification and test certification, for the objective of technical evaluation of pressure containing capability of valves exposed to pre-determined, simulated fire conditions.

Here, the performance requirements are intended to establish limits of acceptability of valves regardless of size, nominal pressure or class rating. The burn period, or test duration, is decided on the basis that it represents the maximum time required to extinguish most plant fires. Fires of longer duration than specified in the standards shall be, therefore, considered to be of a major magnitude with consequences, or damage, greater than those anticipated in the fire tests.

For this reason, requirements for more or less stringent testing may be negotiated and established by the valve manufacturer and its customer to meet the customer's specific service applications. In fact, API 607 was subjected to a major revision in its 4th Edition issued in 1993 for more realistic test requirements.

**1 "Testing of valves: Specification for fire type-testing requirements".*
**2 "Specification for fire test for valves". (2nd edition was issued in 1994.)*
**3 "Fire test for soft-seated quarter-turn valves". (4th edition issued in 1993 has nullified the qualification made according to this 3rd edition, as of May 1, 1996.)*
**4 "Inspection and test of valves: Specification for steel valves for the petroleum, petrochemical and allied industries: Fire safe testing of soft seated ball valves".*

4. Evaluation of Test Results

The maximum allowable leakage rates in these standards are determined for the defined test temperature, pressure and duration. Here it is noted that leakages under other test conditions may be substantially different. Fire test standards are prepared for just a prototype test of the valve with a size and class rating selected by the manufacturer under predetermined test conditions assumably representing typical plant fire conditions. This can be translated to mean that test reports certified to any of these fire test standards do not necessarily verify satisfactory performance of the valves that users may purchase from the manufacturer at any given time. As already mentioned, fire test is a kind of destructive test (unlike the pressure test conducted for normal valve shipments), and no one would be willing to purchase such destructively tested valves in a commercial transaction.

It was specifically mentioned in BS 5146, 1974, Appendix A.1 that the "test is intended only as a prototype test and is intended to cover a range of sizes of valves having the same pressure rating, design details and material composition". A test report prepared by BSI for the fire test conducted on KITZ ball valves mentioned that the "report only relates to the actual ball valves which were ested and assessed. The results obtained therefore do not necessarily relate to samples from the production line and in no way imply the performance or quality of the continuing production."

The range of sizes and pressure classes to be automatically qualified by a proto type test of a valve of a certain size and rating is introduced here. Also it should be noted that potential leakage from pipe-to-valve end-connec-tion joint (either flanged, threaded or welded) cannot be evaluated by these standards, and not included in the allow-able external leakages specified. API Production Department issued a stan-dard API Bulletin 6F1 (***5**), for perfor-mance evaluation of such valve end connections exposed to the fire.

Fire Test Valve Qualification (API 607-1993)

Size Qualification		Pressure Rating Qualification	
Size of test valve (NPS)	**Valves sizes qualified (NPS)**	**Rating of test valve (Class)**	**Valve ratings qualified (Class)**
½"	¾ and smaller	150	150, 300
1"	¾, 1, 1 ¼, 1 ½	300	300, 400, 600
2"	1 ½, 2, 2 ½, 3	400	400, 600, 800
4"	3, 4, 6	600	600, 800, 900
8"	6 and larger	800	800, 900, 1500
		1500	1500, 2500

***5** Bulletin on Performance of API and ASME End Connections in a Fire Test According to API Specification 6FA, 2nd Edition, Feb. 15, 1994.

1. Excesive Cavity Pressure

Very important. Look into tables of each Ball Valve type.

2. High-Temperature and High-Pressure Service

The pressure-temperature ratings published by manufacturers are usually considered an appropriate guide to the maximum temperature and pressure that such ball valves may withstand. LOMISA recommends, however, reference to the valve distributor or manufacturer for an assurance of suitability when ball valves are to be subjected to the following conditions:

- **Floating ball valves** are left closed for a long period of time under high temperature or high differential pressure.
- **Floating ball valves** are operated frequently for long periods of time under high temperature or high differential pressure.
- **Floating ball valves** are subjected to frequent change of the line pressure or service temperature.

3. Liquids with High Velocity

When ball valves must be operated frequently on liquids with very high velocity, a check should be made with the valve manufacturer for appropriate advice to minimize the possibility of seat deformation, especially when they are highly pressurized on high-temperature lines.

4. Valve Selection

Be sure to select a valve with design specifications that meet the pressure and temperature conditions required. Take special care to select the valve to be used for fluids containing abrasives, since the high molecular materials employed in the seats could suffer degradation.

5. Valve Installation

Before installing the valve, the pipe bore should be checked to confirm that no weld spatter, scale or rust particles remain inside. For mounting flanged valves, diagonally located flange bolts should be tightened evenly.

6. Degree of Valve Opening

Soft seated ball valves should be considered as ON/OFF valves only and care should be taken to ensure that they are fully closed or open. Opening ball valves partially can result in seat erosion and cause seat leakage. Pipelines that require the use of ball valves for throttling service should be designed in consideration of the amount of the seat leakage which may occur in its fully closed position. Note that ball valves should be stored in a fully open position.

7. Valve Actuation

If a user mounts its own actuators ball valves, however, all users are recommended to contact LOMISA for adequate technical advice, because any improper sizing of actuators may cause serious problems in the field.

It must be noted that the actual value of the operating torque of any given valve may vary, depending on the service conditions listed below:

(1) Fluid.
  a. Kind of fluid
  b. Line pressure
  c. Line temperature
  d. Fluid volume
(2) Ambient temperature.
(3) Opening / closing degree.
(4) Type of actuator.
(5) Frequency and pattern of change of line pressure.
(6) Frequency and pattern of change of line and ambient temperatures.

8. Valve Disassembly

The line fluid should be completely removed from the internal of the valves before they are removed from the pipeline for maintenance.
Even after the line fluid has been discharged through the pipeline, some fluid is always trapped inside the body and body cavity (the room surrounded by the body, ball and two seats).
Be sure to completely discharge the pressure trapped in the body cavity, before valve disassembly.

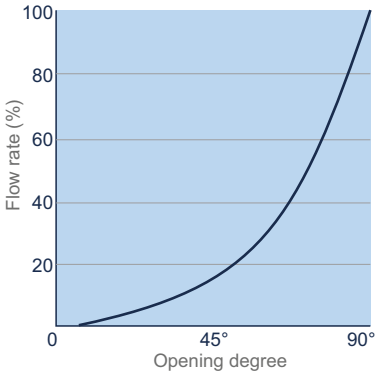
Inspection and Warranty

Each KITZ ball valve is subjected to 100% inhouse inspection designated by API 598 or BS 6755 Part 1. This includes hydrostatic shell tests and pneumatic low-pressure seat test. Manufacturer's material certificates and test reports are available upon request. Each KITZ ball valve is guaranteed for 12 months after placement in service, but not exceeding 18 months after shipment from KITZ factories.

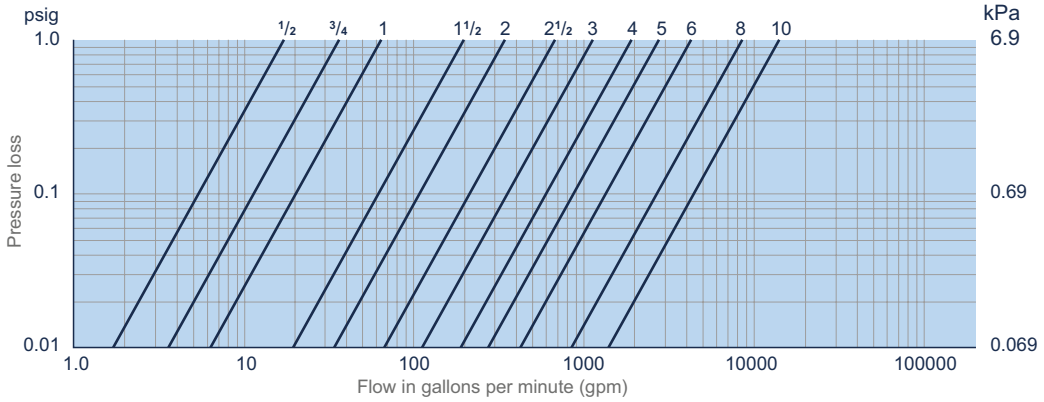
- Flow Characteristics

One of the best advantages of ball valves is that every flow per any given bore size is larger than other types of valves. Fluid is much less disturbed by eddy currents or pulsation. To obtain the figure of flow per valve opening, simply multiply the flow rate (%) given here by the corresponding value given in the table of Pressure Loss vs. Flow Rate.

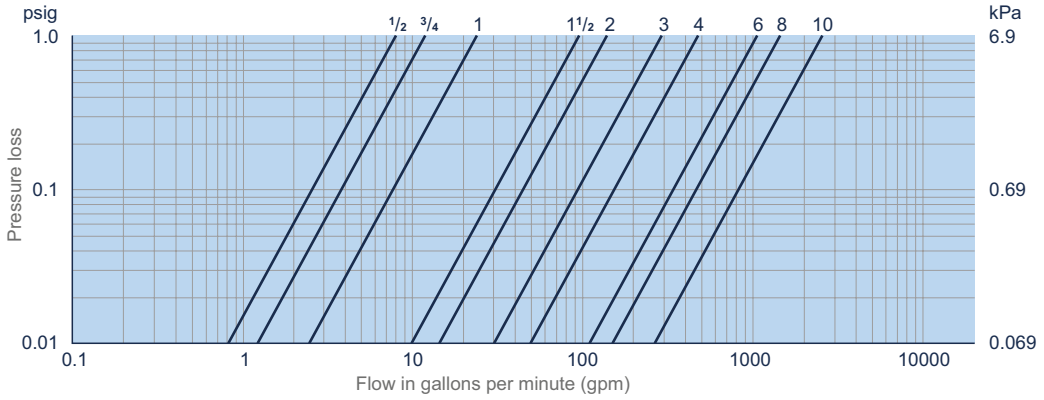
Valve opening vs flow rate



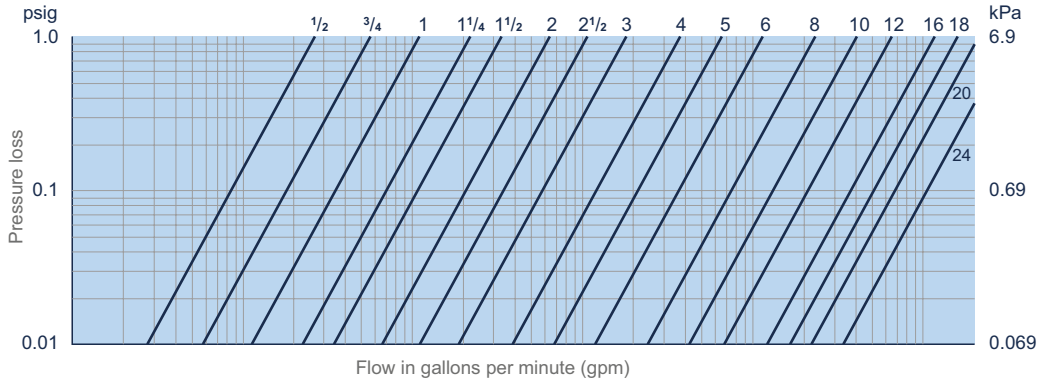
Full port valves

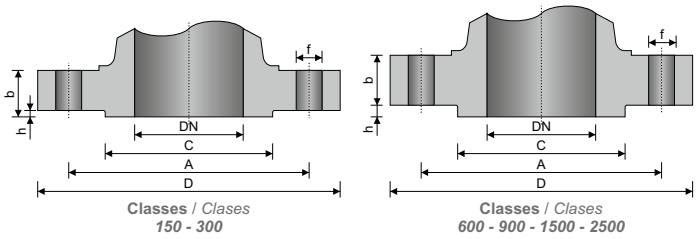


Reduced port valves



Schedule 40 steel pipe (10m)





Classes / *Clases*
150 - 300

Classes / *Clases*
600 - 900 - 1500 - 2500

NOMENCLATURE / *Nomenclatura*

DN = **Nominal pipe size (inches)** / *Diámetro nominal del tubo (pulgadas)*
D = **Outside diameter of flange** / *Diámetro exterior de la brida*
b* = **Thickness of flange min.** / *Espesor mínimo de la brida*
C = **Diameter of hub** / *Diámetro del cubo*
h = **Height of raised face** / *Altura de cara resaltada*
N = **Number of bolt holes** / *Número de orificios para pernos*
f = **Diameter of bolt holes** / *Diámetro de orificios para pernos*
A = **Diameter of bolt circle** / *Diámetro del circulo entre pernos*
RJ = **Groove number** / *Número de ranura*

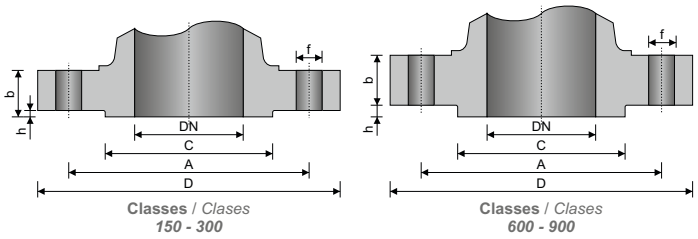
***raised face included for ANSI Class 150 - 300** / *cara resaltada incluida para ANSI Clase 150 - 300*
raised face not included for ANSI Class 600 - 900 - 1500 - 2500 / *cara resaltada no incluida para ANSI Clase 600 - 900 - 1500 - 2500*

FLANGES DIMENSIONS / *Dimensiones bridas* — *ASME B16.5* — CLASS / *Clase* ***150 - 2500***

CLASS	DN (in.)	D	b	C	h	N	f	A	RJ
150	½"	89	11.1	34.9	1.60	4	15	60.3	-
300	½"	95	14.3	34.9	1.60	4	15	66.7	11
600	½"	95	14.3	34.9	6.35	4	15	66.7	11
900	½"	121	22.2	34.9	6.35	4	22	82.5	12
1500	½"	121	22.2	34.9	6.35	4	22	82.5	12
150	¾"	98.4	12.7	42.9	1.60	4	15	69.8	-
300	¾"	118	15.9	42.9	1.60	4	18	82.5	13
600	¾"	118	15.9	42.9	6.35	4	18	82.5	13
900 - 1500	¾"	130	25.4	42.9	6.35	4	22	88.9	14
150	1"	108	14.3	50.8	1.60	4	15	79.4	15
300	1"	124	17.5	50.8	1.60	4	19	88.9	16
600	1"	124	17.5	50.8	6.35	4	19	88.9	16
900 - 1500	1"	149	28.6	50.8	6.35	4	25	102	16
150	1 ¼"	118	15.9	63.5	1.60	4	15	88.9	17
300	1 ¼"	133	19	63.5	1.60	4	18	98.4	18
600	1 ¼"	133	20.6	63.5	6.35	4	18	98.4	18
900 - 1500	1 ¼"	159	28.6	63.5	6.35	4	26	111	18
150	1 ½"	127	17.5	73	1.60	4	15	98.4	19
300	1 ½"	156	20.6	73	1.60	4	22	114	20
600	1 ½"	156	22.2	73	6.35	4	22	114	20
900 -1500	1 ½"	178	31.8	73	6.35	4	30	124	20
150	2"	152	19	92.1	1.60	4	19	121	22
300	2"	165	22.2	92.1	1.60	8	18	127	23
600	2"	165	25.4	92.1	6.35	8	18	127	23
900 - 1500	2"	216	38.1	92.1	6.35	8	26	165	24
2500	2"	235	50.8	92.1	6.35	8	29	171	26
150	2 ½"	178	22.2	105	1.60	8	19	140	25
300	2 ½"	191	25.4	105	1.60	8	22	149	26
600	2 ½"	191	28.6	105	6.35	8	22	149	26
900 - 1500	2 ½"	245	41.3	105	6.35	8	30	191	27
2500	2 ½"	267	57.2	105	6.35	8	32	197	28
150	3"	191	23.8	127	1.60	8	19	152	29
300	3"	210	28.6	127	1.60	8	22	168	31
600	3"	210	31.8	127	6.35	8	22	168	31
900	3"	241	38.1	127	6.35	8	25	191	31
1500	3"	267	47.6	127	6.35	8	32	203	35
2500	3"	305	66.7	127	6.35	8	34.9	229	32
150	4"	229	23.8	157	1.60	8	19	191	36
300	4"	254	31.7	157	1.60	8	22	200	37
600	4"	273	38.1	157	6.35	8	26	216	37
900	4"	292	44.45	157	6.35	8	32	235	37
1500	4"	311	54	157	6.35	8	35	241	39
2500	4"	356	76.2	157	6.35	8	41	273	38
150	5"	254	23.8	186	1.60	8	22	216	40
300	5"	279	34.9	186	1.60	8	22	235	41
600	5"	330	44.4	186	6.35	8	28	267	41
900	5"	349	50.8	186	6.35	8	36	279	41
1500	5"	375	73	186	6.35	8	42	292	44
2500	5"	416	92.1	186	6.35	8	48	324	42

CLASS	DN (in.)	D	b	C	h	N	f	A	RJ
150	6"	279	25.4	216	1.60	8	22	241	43
300	6"	318	36.5	216	1.60	12	22	270	45
600	6"	356	47.6	216	6.35	12	30	292	45
900	6"	381	55.6	216	6.35	12	32	318	45
1500	6"	394	82.6	216	6.35	12	39	318	46
2500	6"	483	108	216	6.35	8	54	368	47
150	8"	343	28.6	270	1.60	8	22	298	48
300	8"	381	41.3	270	1.60	12	26	330	49
600	8"	419	55.6	270	6.35	12	32	349	49
900	8"	470	63.5	270	6.35	12	39	394	49
1500	8"	483	92.1	270	6.35	12	45	394	50
2500	8"	552	127	270	6.35	12	54	438	51
150	10"	406	30.2	324	1.60	12	25	362	52
300	10"	445	47.6	324	1.60	16	28.6	387	53
600	10"	508	63.5	324	6.35	16	36	432	53
900	10"	546	69.8	324	6.35	16	38.1	470	53
1500	10"	584	108	324	6.35	12	52	483	54
2500	10"	673	165	324	6.35	12	67	540	55
150	12"	483	31.7	381	1.60	12	26	432	56
300	12"	521	50.8	381	1.60	16	32	451	57
600	12"	559	66.7	381	6.35	20	36	490	57
900	12"	610	79.4	381	6.35	20	39	533	57
1500	12"	673	124	381	6.35	16	55	572	58
2500	12"	762	184	381	63.5	12	73	619	60
150	14"	533	34.9	413	1.60	12	29	476	59
300	14"	584	54	413	1.60	20	32	514	61
600	14"	603	69.8	413	6.35	20	39	527	61
900	14"	641	85.7	413	6.35	20	42	559	62
1500	14"	749	133	413	6.35	16	60	635	63
150	16"	597	36.5	470	1.60	16	28	540	64
300	16"	648	57.2	470	1.60	20	36	572	65
600	16"	686	76.2	470	6.35	20	42	603	65
900	16"	705	88.9	470	6.35	20	45	616	66
1500	16"	826	146	470	6.35	16	65	705	67
150	18"	635	39.7	533	1.60	16	32	578	68
300	18"	711	60.3	533	1.60	24	36	629	69
600	18"	743	82.6	533	6.35	20	45	654	69
900	18"	787	102	533	6.35	20	52	686	70
1500	18"	914	162	533	6.35	16	75	775	71
150	20"	699	42.9	584	1.60	20	32	635	72
300	20"	775	63.5	584	1.60	24	36	686	73
600	20"	813	88.9	584	6.35	24	45	724	73
900	20"	857	108	584	6.35	20	55	749	74
1500	20"	984	178	584	6.35	16	80	832	75
150	24"	813	47.6	692	1.60	20	36	749	76
300	24"	914	69.8	692	1.60	24	42	813	77
600	24"	940	102	692	6.35	24	52	838	77
900	24"	1041	140	692	6.35	20	65	902	78
1500	24"	1168	203	692	6.35	16	93	991	79

UNITS / *Unidades* ***mm***



NOMENCLATURE / *Nomenclatura*

DN = **Nominal pipe size (inches)** / *Diámetro nominal del tubo (pulgadas)*
D = **Outside diameter of flange** / *Diámetro exterior de la brida*
b* = **Thickness of flange min.** / *Espesor mínimo de la brida*
C = **Diameter of hub** / *Diámetro del cubo*
h = **Height of raised face** / *Altura de cara resaltada*
N = **Number of bolt holes** / *Número de orificios para pernos*
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A = **Diameter of bolt circle** / *Diámetro del circulo entre pernos*
RJ = **Groove number** / *Número de ranura*

***raised face included for ANSI Class 150 - 300** / *cara resaltada incluida para ANSI Clase 150 - 300*
raised face not included for ANSI Class 600 - 900 / *cara resaltada no incluida para ANSI Clase 600 - 900*

FLANGES DIMENSIONS / *Dimensiones bridas* *ASME B16.47 - MSS SP-44* CLASS / *Clase* ***150 - 900***

CLASS	DN (in.)	D	b	C	h	N	f	A	RJ
150	26"	870	68.3	749	1.60	24	35.1	806	-
300	26"	972	79.2	749	1.60	28	44.5	876	93
600	26"	1016	108	749	1.60	28	50.8	914	93
900	26"	1086	139.7	953	1.60	20	73.2	953	100
150	28"	927	71.4	800	1.60	28	35.1	864	-
300	28"	1035	85.9	800	1.60	28	44.5	940	94
600	28"	1073	111.3	800	1.60	28	53.8	965	94
900	28"	1168	142.7	1022	1.60	20	79.2	1022	101
150	30"	984	74.7	857	1.60	28	35.1	914	-
300	30"	1092	91.9	857	1.60	28	47.8	997	95
600	30"	1130	114.3	857	1.60	28	53.8	1022	95
900	30"	1232	149.4	1086	1.60	20	79.2	1086	102
150	32"	1060	81	914	1.60	28	41.1	978	-
300	32"	1149	98.6	914	1.60	28	50.8	1054	96
600	32"	1194	117.3	914	1.60	28	60.5	1080	96
900	32"	1314	158.8	1156	1.60	20	85.9	1156	103
150	34"	1111	82.6	965	1.60	32	41.1	1029	-
300	34"	1207	101.6	965	1.60	28	50.8	1105	97
600	34"	1245	120.7	965	1.60	28	60.5	1130	97
900	34"	1397	165.1	1226	1.60	20	91.9	1226	104
150	36"	1168	90.4	1022	1.60	32	41.1	1086	-
300	36"	1270	104.6	1022	1.60	32	53.8	1168	98
600	36"	1314	124	1022	1.60	28	66.5	1194	98
900	36"	1461	171.5	1289	1.60	20	91.9	1289	105

CLASS	DN (in.)	D	b	C	h	N	f	A	RJ
150	38"	1238	87.4	1073	1.60	32	41.1	1149	-
300	38"	1168	108	1029	1.60	32	41.1	1092	-
600	38"	1270	152.4	1054	1.60	28	60.5	1162	-
900	38"	1461	190.5	1289	1.60	20	91.9	1289	-
150	40"	1289	90.4	1124	1.60	36	41.1	1200	-
300	40"	1238	114.3	1086	1.60	32	44.5	1156	-
600	40"	1321	158.8	1111	1.60	32	60.5	1213	-
900	40"	1511	196.9	1340	1.60	24	91.9	1340	-
150	422	1346	96.8	1194	1.60	36	41.1	1257	-
300	42"	1289	119.1	1137	1.60	32	44.5	1207	-
600	42"	1403	168.1	1168	1.60	28	66.5	1283	-
900	42"	1562	206.2	1391	1.60	24	91.9	1391	-
150	44"	1403	101.6	1245	1.60	40	41.1	1314	-
300	44"	1353	124	1194	1.60	32	47.8	1264	-
600	44"	1454	173	1226	1.60	32	66.5	1334	-
900	44"	1648	214.4	1464	1.60	24	98.6	1464	-
150	46"	1454	103.1	1295	1.60	40	41.1	1365	-
300	46"	1416	128.5	1245	1.60	28	50.8	1321	-
600	46"	1511	179.3	1276	1.60	32	66.5	1391	-
900	46"	1734	225.6	1537	1.60	24	105	1537	-
150	48"	1511	108	1359	1.60	44	41.1	1422	-
300	48"	1467	133.4	1302	1.60	32	50.8	1372	-
600	48"	1594	189	1334	1.60	32	73.2	1461	-
900	48"	1784	233.4	1588	1.60	24	105	1588	-

UNITS / *Unidades* ***mm***

FLANGES FACING FINISH / *Acabado Revestimiento Brida*

NOMINAL ROUGHNESS GRADES (R_a) FOR ROUGHNESS COMPARISON SPECIMENS - ASME B46.1
Grado nominal de rugosidad (R_a) para especificaciones de comparación de rugosidad - ASME B46.1

µm	µin
0.006	0.25
0.0125	0.5
0.025	1
0.05	2
0.1	4
0.2	8
0.4	16
0.8	32
1.6	63
3.2	125
6.3	250
12.5	500
25	1000
50	2000
100	4000
200	8000
400	16000

ASME B16.5

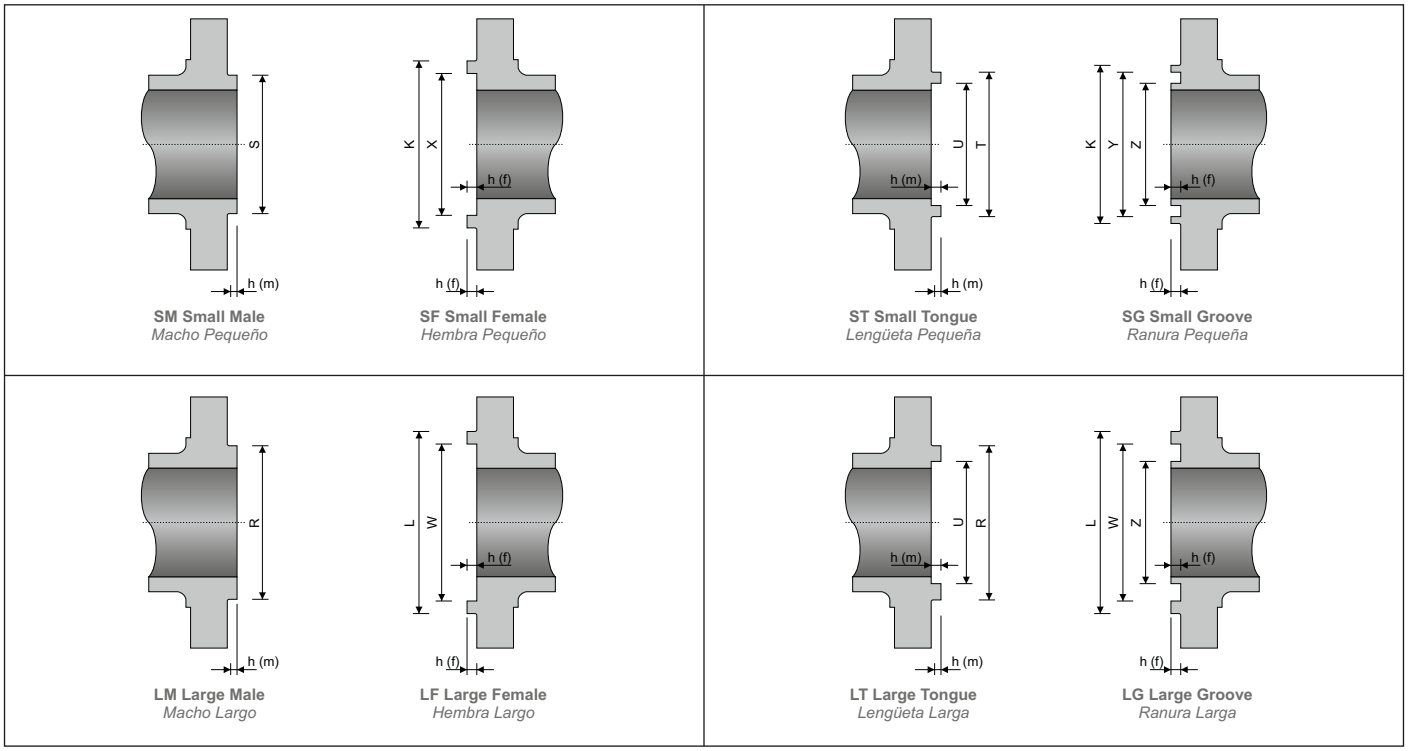
TONGUE AND GROOVE - SMALL MALE & FEMALE / *LENGÜETA Y RANURA - HEMBRA & MACHO PEQUEÑO*
The gasket contact surface shall not exceed 125 microinches (3,2 micrometers) roughness.
La superficie de contacto de la junta no debe exceder la rugosidad de 125 micropulgadas (3,2 micras).
RING JOINT / *JUNTAS*
The side wall surface of gasket groove shall not exceed 63 microinches (1,6 micrometers) roughness.
La superficie de la pared lateral de la ranura de la junta no deberá exceder la rugosidad de 63 micropulgadas (1,6 micras).
OTHER FLANGE FACINGS / *OTROS ACABADOS DE BRIDAS*
Either a serrated concentric or serrated spiral finish having a resultant surface finish from 125 microinches to 250 microinches (3,2 to 6,3 micrometers) average roughness.
Un acabado en espiral dentado concéntrico o dentado con un acabado de superficie resultante de 125 micropulgadas a 250 micropulgadas (3,2 a 6,3 micras) de rugosidad media.

MSS SP-6 - STEEL

FLAT OR 1/6" (1.6mm) RAISED FACE AND 1/4" (6,4mm) RAISED AND LARGE MALE & FEMALE / *PLANA 1/6" (1.6mm) O CARA RESALTADA 1/4" (6,4mm) Y RESALTADA Y LARGA - HEMBRA & MACHO*
Serrated: spiral or concentric, 45 to 55 per inch (18 to 21 per cm).
Dentado: espiral o concéntrico, 45 a 55 por pulgada (18 a 21 por cm).
Surface finish shall have a 125 to 250 microinches (3,2 to 6,3 micrometers) R_a.
El acabado de la superficie debe tener de 125 a 250 micropulgadas (3,2 a 6,3 micras) R_a.
SMALL MALE & FEMALE, LARGE & SMALL TONGUE & GROOVE / *HEMBRA & MACHO PEQUEÑO, LENGÜETA Y RANURA LARGA PEQUEÑA*
Serrated (as above) or non-serrated: 125 microinches (3,2 micrometers) R_a max.
Dentado (como el anterior) o no dentado: 125 micropulgadas (3,2 micras) R_a máx.
RING JOINT / *JUNTAS*
Non-serrated: 63 microinches (1,6 micrometers) R_a max. according to ASME B46.1.
No dentado: 63 micropulgadas (1,6 micras) R_a máx. según ASME B46.1.

Notes / *Notas:*
- **The finish of contact faces of pipe flanges and connecting end flanges of fittings shall be judged by visual comparison with R_a standards.**
  El acabado de las caras de contacto de las bridas de los tubos y de las bridas extremas de conexión de los accesorios se juzgará mediante comparación visual con los estándares Ra.

END FLANGES / *Extremos bridados* — *ASME B16.5*



SM Small Male *Macho Pequeño*
SF Small Female *Hembra Pequeño*
ST Small Tongue *Lengüeta Pequeña*
SG Small Groove *Ranura Pequeña*
LM Large Male *Macho Largo*
LF Large Female *Hembra Largo*
LT Large Tongue *Lengüeta Larga*
LG Large Groove *Ranura Larga*

DIMENSIONS OF FACING / *Dimensiones de cara*

SIZES / *Rango **1 ½" - 24"***

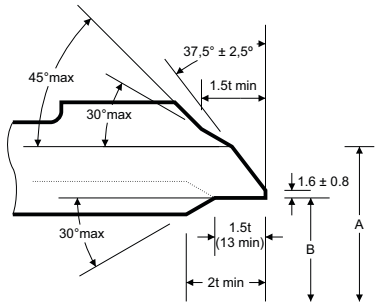
Nominal Pipe Size (inches) *Tamaño nominal del tubo (pulgadas)*	OUTSIDE DIAMETER *Diámetro exterior*			INT. DIAM.	OUTSIDE DIAMETER *Diámetro exterior*			INT. DIAM.	RAISED FACE HEIGHT *Altura Cara resaltada*		Depth of groove or female *Profundidad de ranura o hembra*	OUTSIDE DIAMETER OF RAISED PORTION *Diámetro exterior de la porción aumentada*	
	Raised Face, Lapped, LM & LT *Cara resaltada, solapada, LM y LT*	SM Small Male (*) *Macho pequeño*	ST Small Tongue *Lengüeta pequeña*	LT Large Tongue & SM Small Tongue *Lengüeta larga y pequeña*	LF Large Female & LG Large Groove *Hembra y ranura larga*	SF Small Female *Hembra pequeña*	SG Small Groove *Hembra pequeña*	LG Large Groove & SG Small Groove (*) *Ranura larga y pequeña*	150 & 300 Lbs. Class / *Clase*	LM & SM, LT & ST 400 / 2500 Lbs. *Macho largo y pequeño, y Lengüeta larga y pequeña*		SF & SG (min.) *Hembra y Ranura Pequeña*	LF & LG (min.) *Hembra y Ranura Larga*
	R	S	T	U	W	X	Y	Z	h	h (m)	h (f)	K	L
1 ½"	73.1	44.4	63.5	53.8	74.6	45.9	65.0	52.3	1.6	6.35	4.8	84.1	84.1
2"	91.8	57.1	82.5	73.1	93.7	58.7	84.1	71.4	1.6	6.35	4.8	103.1	103.1
2 ½"	104.6	68.3	95.2	85.8	106.4	69.8	96.8	84.1	1.6	6.35	4.8	115.8	115.8
3"	127.0	84.1	117.3	107.9	128.5	85.8	119.1	106.4	1.6	6.35	4.8	138.2	138.2
4"	157.2	109.5	144.5	131.8	158.7	111.2	146.0	130.0	1.6	6.35	4.8	168.1	168.1
5"	185.7	136.6	173.0	160.3	187.4	138.1	174.7	158.7	1.6	6.35	4.8	196.8	196.8
6"	215.9	162.0	203.2	190.5	217.5	163.5	204.7	188.9	1.6	6.35	4.8	227.0	227.0
8"	269.7	212.8	254.0	238.2	271.5	214.3	255.5	236.5	1.6	6.35	4.8	281.0	281.0
10"	323.8	266.7	304.8	285.7	325.4	268.2	306.3	284.2	1.6	6.35	4.8	335.0	335.0
12"	381.0	317.5	361.9	342.9	382.5	319.0	363.5	341.3	1.6	6.35	4.8	392.1	392.1
14"	412.7	349.2	393.7	374.6	414.3	350.8	395.3	373.1	1.6	6.35	4.8	423.9	423.9
16"	469.9	400.0	447.5	425.4	471.4	401.6	449.3	423.9	1.6	6.35	4.8	481.0	481.0
18"	533.4	450.8	511.0	488.9	535.0	452.4	512.8	487.4	1.6	6.35	4.8	544.5	544.5
20"	584.2	501.6	558.8	533.4	585.7	503.2	560.3	531.8	1.6	6.35	4.8	595.3	595.3
24"	692.1	603.2	666.7	641.3	693.7	604.8	668.8	639.8	1.6	6.35	4.8	703.3	703.3

Notes / *Notas:*

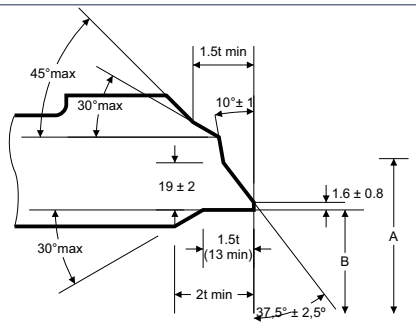
- **(*) Large male and female faces and large tongue and groove are not applicable to Class 150 because of potential dimensional conflict.**
  Las caras macho y hembra largo y lengüeta y ranura larga no son aplicables para la Clase 150 debido a posibles conflictos dimensionales.

UNITS / *Unidades **mm***

BUTT WELDING ENDS / *Extremos soldados a tope* — *ASME B16.25*



Weld bevel for wall thickness not over 22mm
Bisel de soldadura para espesor de pared no superior a 22 mm



Weld bevel for wall thickness over 22mm
Bisel de soldadura para espesor de pared superior a 22 mm

NOMENCLATURE / *Nomenclatura*

t = **pipe thickness** / *espesor de la tubería*

A = **O.D. nominal of component at the welding end** / *Diámetro exterior nominal del componente en el extremo de la soldadura*

B = **I.D. at the welding end (Nom. O.D. of pipe - 2t)** / *Diámetro interior en el extremo de la soldadura (Diámetro exterior nominal de la tuberia - 2t)*

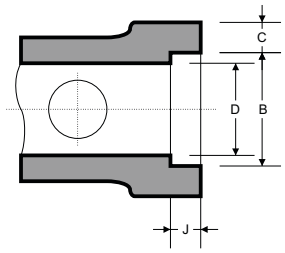
WALL THICKNESS OF PIPE / *Espesor de la pared de la tubería*

DN (inches) *DN (pulgadas)*	Nom. pipe O.D. *Tubería nominal diámetro exterior*	A (1)	WALL THICKNESS OF PIPE / *Espesor de la pared del tubo*											
			sch. 20	sch. 30	sch. Std.	sch. 40	sch. 60	sch. xs	sch. 80	sch. 100	sch. 120	sch. 140	sch. 160	sch. xxs
1 ½"	48.3	n.a.	-	-	3.68	3.68	-	5.08	5.08	-	-	-	7.14	10.16
2"	60.3	n.a.	-	-	3.91	3.91	-	5.54	5.54	-	-	-	8.74	11.07
2 ½"	73.0	75	-	-	5.16	5.16	-	7.01	7.01	-	-	-	9.52	14.02
3"	88.9	91	-	-	5.49	5.49	-	7.62	7.62	-	-	-	11.13	15.24
4"	114.3	117	-	-	6.02	6.02	-	8.56	8.56	-	11.13	-	13.49	17.12
5"	141.3	144	-	-	6.55	6.55	-	9.52	9.52	-	12.70	-	15.88	19.05
6"	168.3	172	-	-	7.11	7.11	-	10.97	10.97	-	14.27	-	18.26	21.95
8"	219.1	223	6.35	7.04	8.18	8.18	10.31	12.70	12.70	15.09	18.26	20.62	23.01	22.22
10"	273.0	278	6.35	7.80	9.27	9.27	12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40
12"	323.8	329	6.35	8.38	9.52	10.31	14.27	12.70	17.48	21.44	25.40	28.57	33.32	-
14"	355.6	362	7.92	9.52	9.52	11.12	15.09	12.70	19.05	23.83	27.76	31.75	35.71	-
16"	406.4	413	7.92	9.52	9.52	12.70	16.66	12.70	21.44	26.19	30.94	36.52	40.46	-
18"	457.2	464	7.92	11.13	9.52	14.27	19.05	12.70	23.83	29.36	34.92	39.67	45.24	-
20"	508.0	516	9.52	12.70	9.52	15.06	20.62	12.70	26.19	32.54	38.10	44.45	49.99	-
24"	609.6	619	9.52	14.27	9.52	17.45	24.59	12.70	30.94	38.89	46.02	52.37	59.51	-

Notes / *Notas:*
- **(1) The diameters listed are not requirements.**
  Los diámetros listados no son requeridos.

UNITS / *Unidades* ***mm***

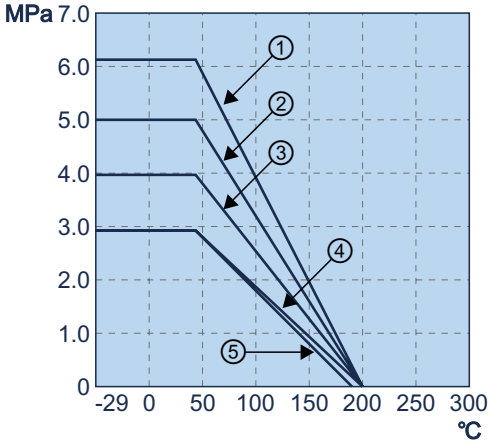
SOCKET WELDING ENDS / *Extremos soldados* — *ASME B16.11*



DN	Nominal pipe size (inches) *Tamaño nominal de la tubería (pulgadas)*	B (min.)	J (min.)	CLASS 3000 Sch. 80		CLASS 6000 Sch. 160		CLASS 9000 WALL DES. XXS	
				C (min.)	D (min.)	C (min.)	D (min.)	C (min.)	D (min.)
6	⅛"	10.8	9.5	3.18	6.1	3.43	3.2	-	-
8	¼"	14.2	9.5	3.30	8.5	4.01	5.6	-	-
10	⅜"	17.6	9.5	3.50	11.8	4.37	8.4	-	-
15	½"	21.8	9.5	4.09	15.0	5.18	11.0	5.94	5.6
20	¾"	27.2	12.5	4.27	20.2	6.04	14.8	6.93	10.3
25	1"	33.9	12.5	4.98	25.9	6.93	19.9	7.95	14.4
32	1 ¼"	42.7	12.5	5.28	34.3	9.93	28.7	7.95	22.0
40	1 ½"	48.8	12.5	5.54	40.1	7.80	33.2	8.91	27.2
50	2"	61.2	16.0	6.04	51.7	9.50	42.1	10.89	37.4
65	2 ½"	73.9	16.0	7.67	61.2	-	-	-	-
80	3"	89.8	16.0	8.30	76.4	-	-	-	-
100	4"	115.2	16.0	9.35	100.7	-	-	-	-

UNITS / *Unidades* ***mm***

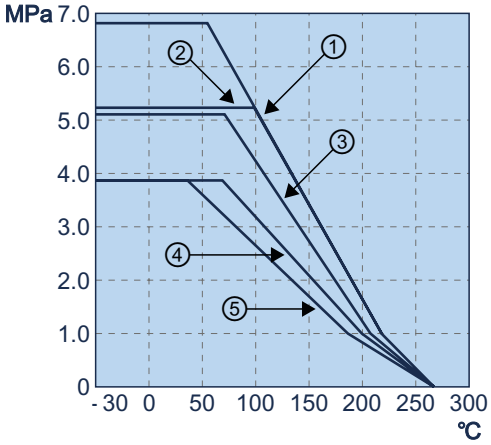
PTFE / *Resina de politetrafluoroetileno*



Pressure-Temperature Ratings	
①	15A·20A
②	25A~65A
③	80A·100A
④	125A·150A
⑤	200A·250A

Maximum Service Temperature: **200ºC**

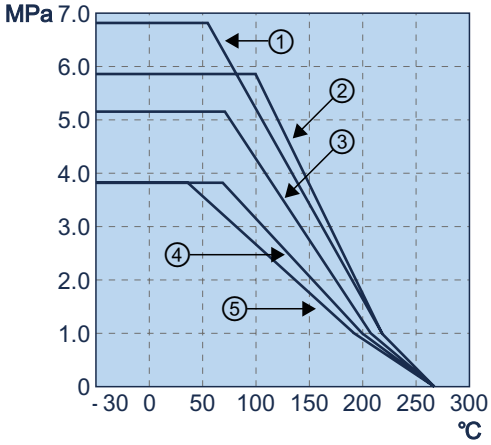
MODIFIED PTFE / *Resina de politetrafluoroetileno modificada*



Pressure-Temperature Ratings	
①	15A·20A
②	25A~65A
③	80A·100A
④	125A·150A
⑤	200A·250A

Maximum Service Temperature: **260ºC**

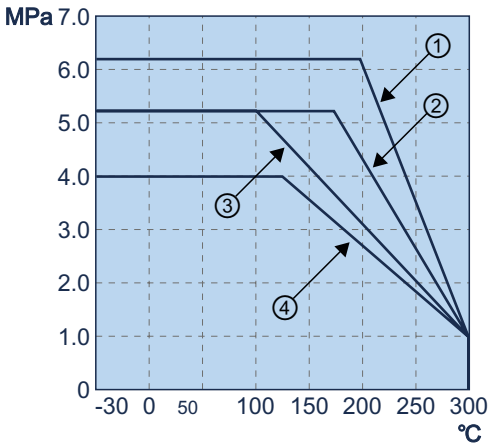
C/F PTFE / *Fibra de carbono rellena de resina de politetrafluoroetileno*



Pressure-Temperature Ratings	
①	15A·20A
②	25A~65A
③	80A·100A
④	125A·150A
⑤	200A·250A

Maximum Service Temperature: **260ºC**

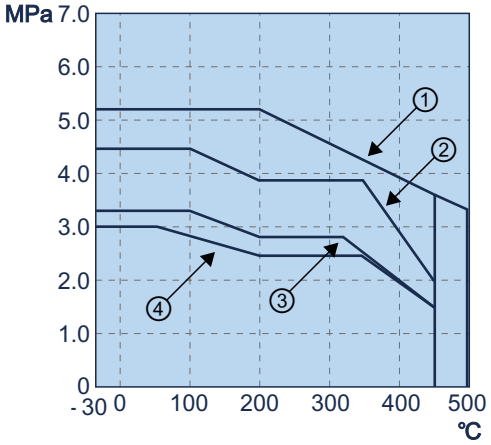
PTFE with carbon based special filler / *Resina de politetrafluoroetileno con carbono a base de relleno especial*



Pressure-Temperature Ratings	
①	15A~32A
②	40A·50A
③	65A~100A
④	125A~200A

Maximum Service Temperature: **300ºC**

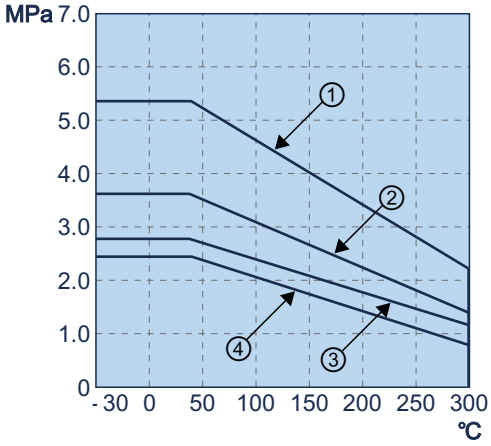
HARD CARBON / *Carbón endurecido*



Pressure-Temperature Ratings	
①	15A~32A
②	40A·50A
③	65A~100A
④	125A~200A

Maximum Service Temperature: **500ºC**

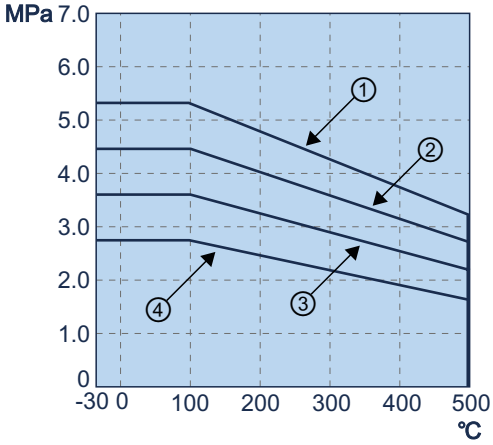
HARD FACED METAL (5H) / *Metal endurecido*



Pressure-Temperature Ratings	
①	15A~32A
②	40A·50A
③	65A~100A
④	125A~200A

Maximum Service Temperature: **300ºC**

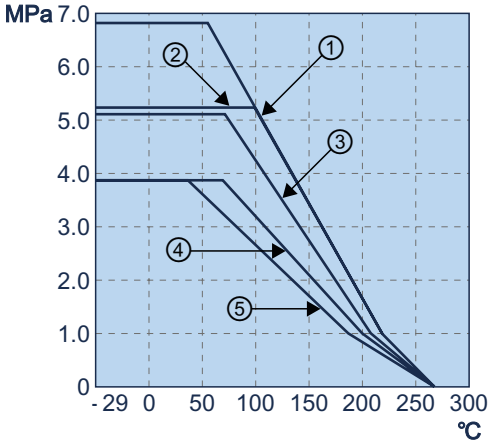
HARD FACED METAL (6H) / *Metal endurecido*



Pressure-Temperature Ratings	
①	15A~32A
②	40A·50A
③	65A~100A
④	125A~200A

Maximum Service Temperature: **500ºC**

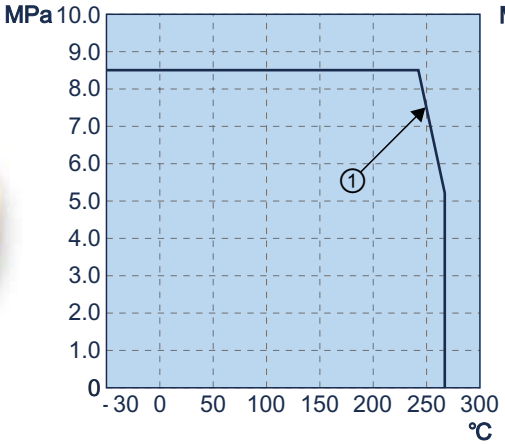
SBR / *Styrene-butadiene rubber*

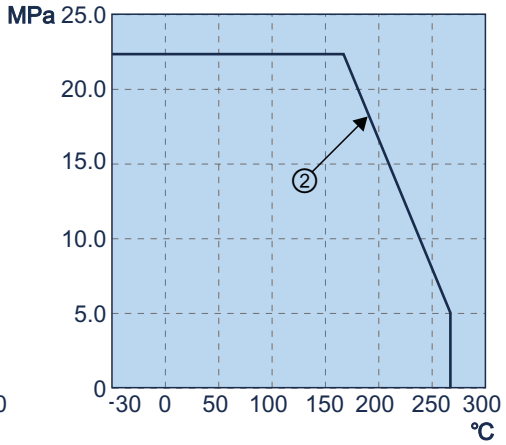


Pressure-Temperature Ratings	
①	15A·20A
②	25A~65A
③	80A·100A
④	125A·150A
⑤	200A·250A

Maximum Service Temperature: **260ºC**

PEEK / *Resina de polieteretercetona*





Pressure-Temperature Ratings	
①	Class 150·300·600
②	Class 900·1500

Maximum Service Temperature: **270ºC**

1. Pressure-Temperature Ratings

The pressure-temperature ratings of ball valves are determined, not only by valve shell materials, but more essentially by sealing materials used for ball seats, gland packing and gaskets. Sealing materials may be high molecule plastics or rubbers, but the choice is limited by the characteristics of the service fluid, working tempera-tures, working pressures, velocity of fluid, and operational frequency of valves.

As it is very difficult to predetermine the exact pressure-temperature rating for all kinds of fluid under all imaginable conditions, we have prepared general rating charts for nonshock fluid service here, based on our past experiences both in the field and in our laboratory.

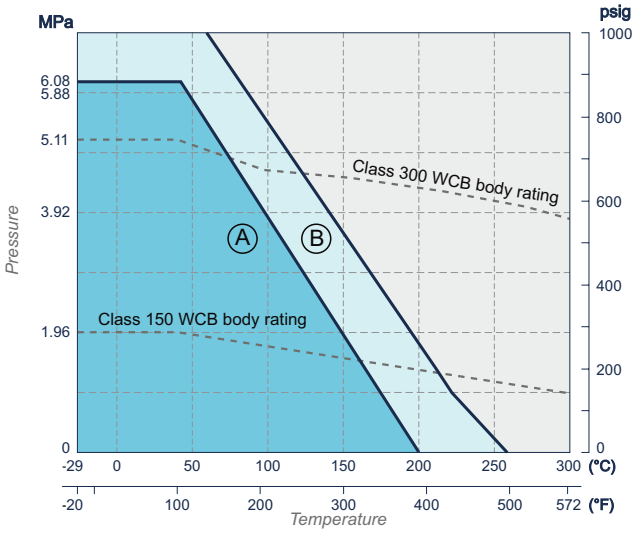
In case of extraordinary service conditions as mentioned below, contact with LOMISA for technical advice:

(1) Valves shall be left fully closed for a long period of time under high temperature or high differential pressure.
(2) Valves shall be frequently operated under high temperature or high differential pressure.
(3) Frequent change of line pressure or temperature.

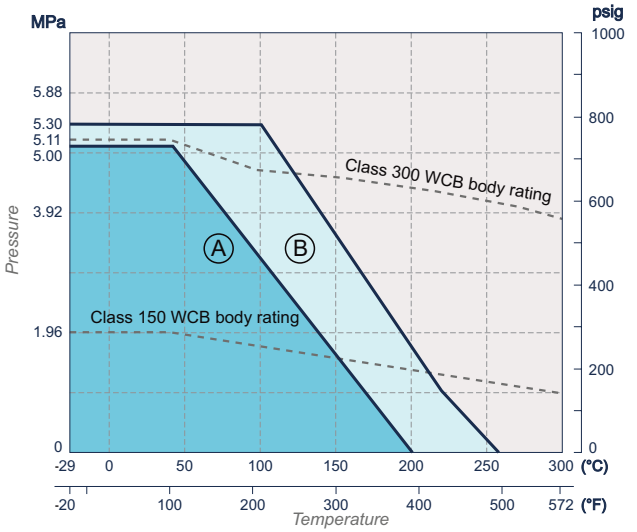
Seat materials ***A:*** *Virgin PTFE .*
B: *Modified PTFE, C/F PTFE or SBR.*

**The body pressure ratings shown here are for ASTM A216 Gr. WCB.*

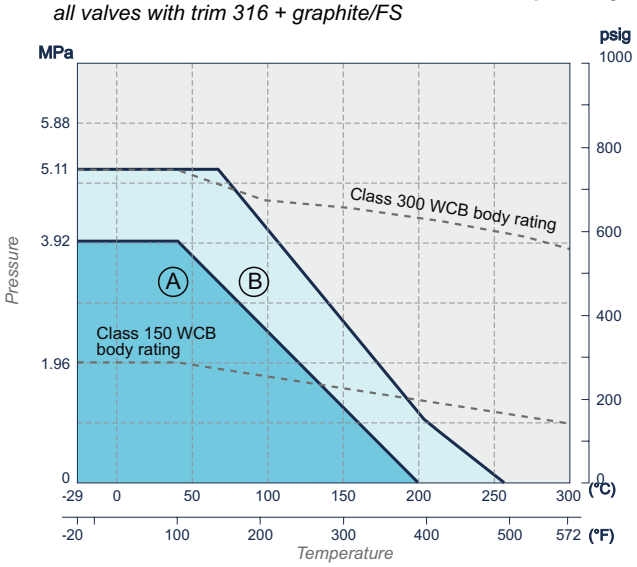
150 / 300 WCB/LCB or LCC; F.B. or split body: ½" and ¾"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body: ½" and ¾"
150 / 300 WCB/LCB or LCC; R.B. or split body: ½" and ¾"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; R.B. or split body: ½" and ¾"
all valves with trim 316 + graphite/FS



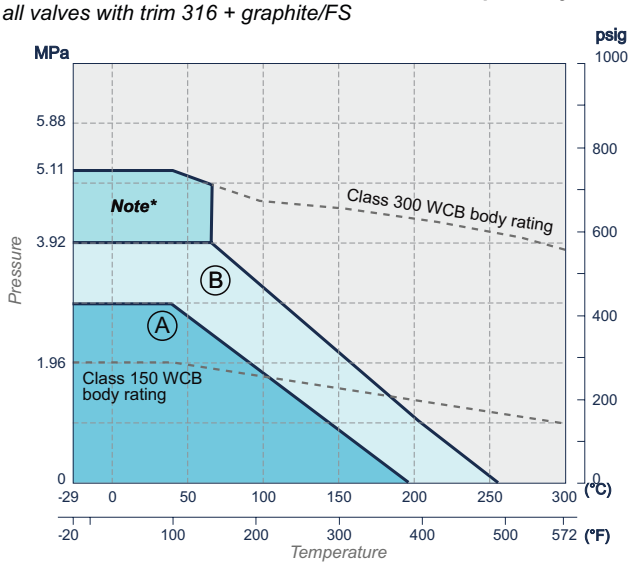
150 / 300 WCB/LCB or LCC; F.B. or split body: 1 to 2 ½"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body: 1 to 2 ½"
150 / 300 WCB/LCB or LCC; R.B. or split body: 1 to 2 ½"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; R.B. or split body: 1 to 2 ½"
all valves with trim 316 + graphite/FS



150 / 300 WCB/LCB or LCC; F.B. or split body: ½" and ¾"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body: ½" and ¾"
150 / 300 WCB/LCB or LCC; R.B. or split body: ½" and ¾"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; R.B. or split body: ½" and ¾"
all valves with trim 316 + graphite/FS

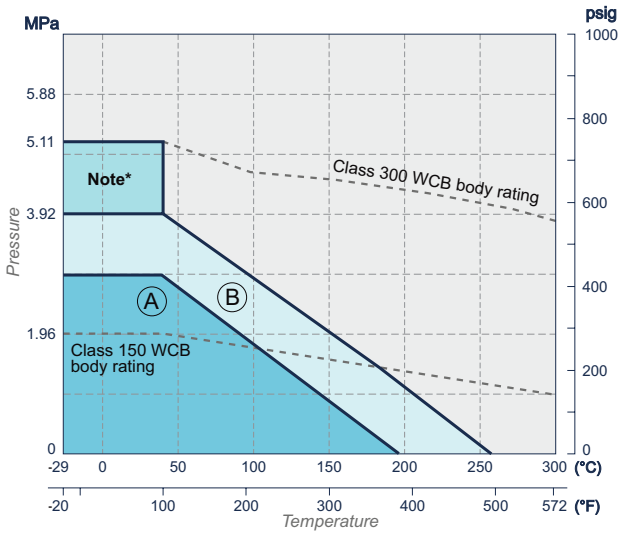


150 / 300 WCB/LCB or LCC; F.B. or split body: 1 to 2 ½"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body: 1 to 2 ½"
150 / 300 WCB/LCB or LCC; R.B. or split body: 1 to 2 ½"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; R.B. or split body: 1 to 2 ½"
all valves with trim 316 + graphite/FS



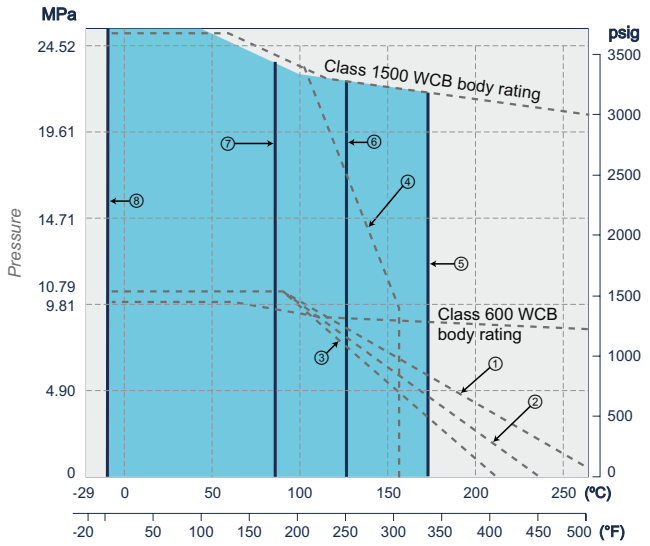
Note* *Continuous pressurization is not recommended in this P-T range.*

150 / 300 WCB/LCB or LCC; F.B. or split body: 8" and 10"
150 / 300 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body: 8" and 10"
all valves with trim 316 + graphite/FS



Note* *Continuous pressurization is not recommended in this P-T range.*

600 / 1500 WCB/LCB or LCC; F.B. or split body.
600 / 1500 CF8M / CF3M / LC1 / LC2 / LC3; F.B. or split body.
all valves with trim 316 + graphite/FS



Ball Seat Materials

① Modified PTFE or C/F PTFE
② Glass-filled PTFE with MoS_2
③ Virgin PTFE
④ Nylon with MoS_2

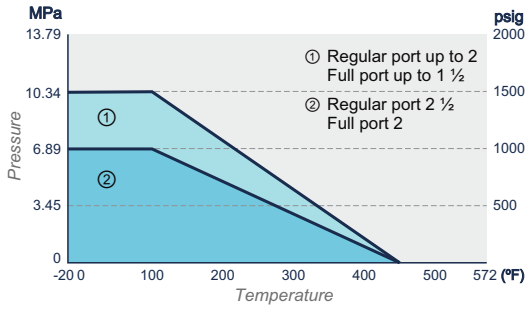
O-ring Upper Limit

⑤ (1) FKM
(2) Low-Temperature FKM
⑥ (1) EPDM
(2) ECO (Epichlorohydrin Copolymer)
⑦ (1) NBR
(2) Low-Temperature NBR

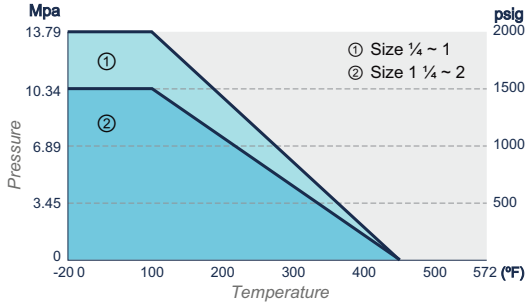
O-ring Lower Limit*

⑧ FKM
*O-rings made of others than FKM can withstand -20ºF (-29ºC).

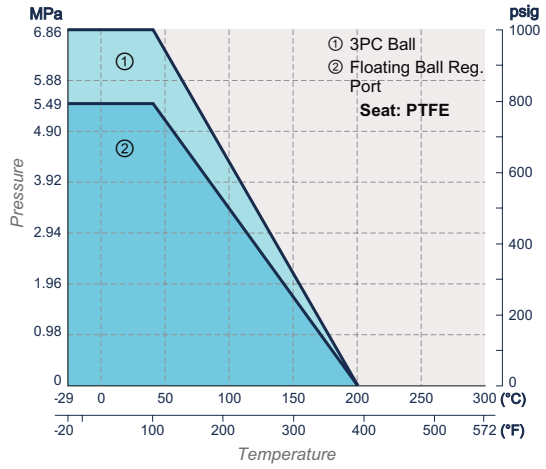
1500 / 1000 Carbon Steel or Stainless; 3PC; Regular; Integral 316SS
1500 / 1000 Carbon Steel or Stainless; 3PC; Full; Integral 316SS



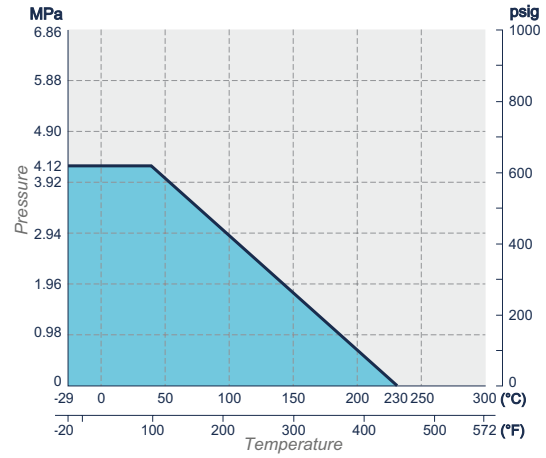
2000 / 1500 Carbon Steel or Stainless; Floating Ball; Reduced port; Integral 316SS.
2000 / 1500 Carbon Steel or Stainless; Floating Ball; Regular port; Integral 316SS.
2000 / 1500 Carbon Steel or Stainless; Floating Ball; Full port; Integral 316SS.



800 Stainless Steel; Floating Ball; Regular Port; 316SS.



600 Stainless Steel; Floating Ball; Reduced Port; 316SS.
600 Carbon Steel; Floating Ball; Reduced Port; 316SS.



NOTES / *Notas*

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