

Pressure Classes of Flanges

Forged steel flanges ASME B16.5 are made in seven primary Pressure Classes:

150

300

400

600

900

1500

2500

The concept of flange ratings likes clearly. A Class 300 flange can handle more pressure than a Class 150 flange, because a Class 300 flange are constructed with more metal and can withstand more pressure. However, there are a number of factors that can impact the pressure capability of a flange.

Pressure Rating Designation

The Pressure Rating for flanges will be given in Classes.

Class, followed by a dimensionless number, is the designation for pressure-temperature ratings as follows: Class 150 300 400 600 900 1500 2500.

Different names are used to indicate a Pressure Class. For example: 150 Lb, 150 Lbs, 150# or Class 150, all are means the same.

But there is only one correct indication, and that is Pressure Class, according to ASME B16.5 the pressure rating is a dimensionless number.

Example of Pressure Rating

Flanges can withstand different pressures at different temperatures. As temperature increases, the pressure rating of the flange decreases. For example, a Class 150 flange is rated to approximately 270 PSIG at ambient conditions, 180 PSIG at approximately 400°F, 150 PSIG at approximately 600°F, and 75 PSIG at approximately 800°F.

In other words, when the pressure goes down, the temperature goes up and vice versa. Additional factors are that flanges can be constructed from different materials, such as stainless steel, cast and ductile iron, carbon steel etc.. Each material have different pressure ratings.

Below an example of a flange **NPS 12** with the several pressure classes. As you can see, inner diameter and diameter of the raised face at all the same; but outside diameter, bolt circle and diameter of bolt holes become larger in each higher pressure class.

The number and diameters (mm) of the bolt holes are:

Class 150: 12 x 25.4

Class 300: 16 x 28.6

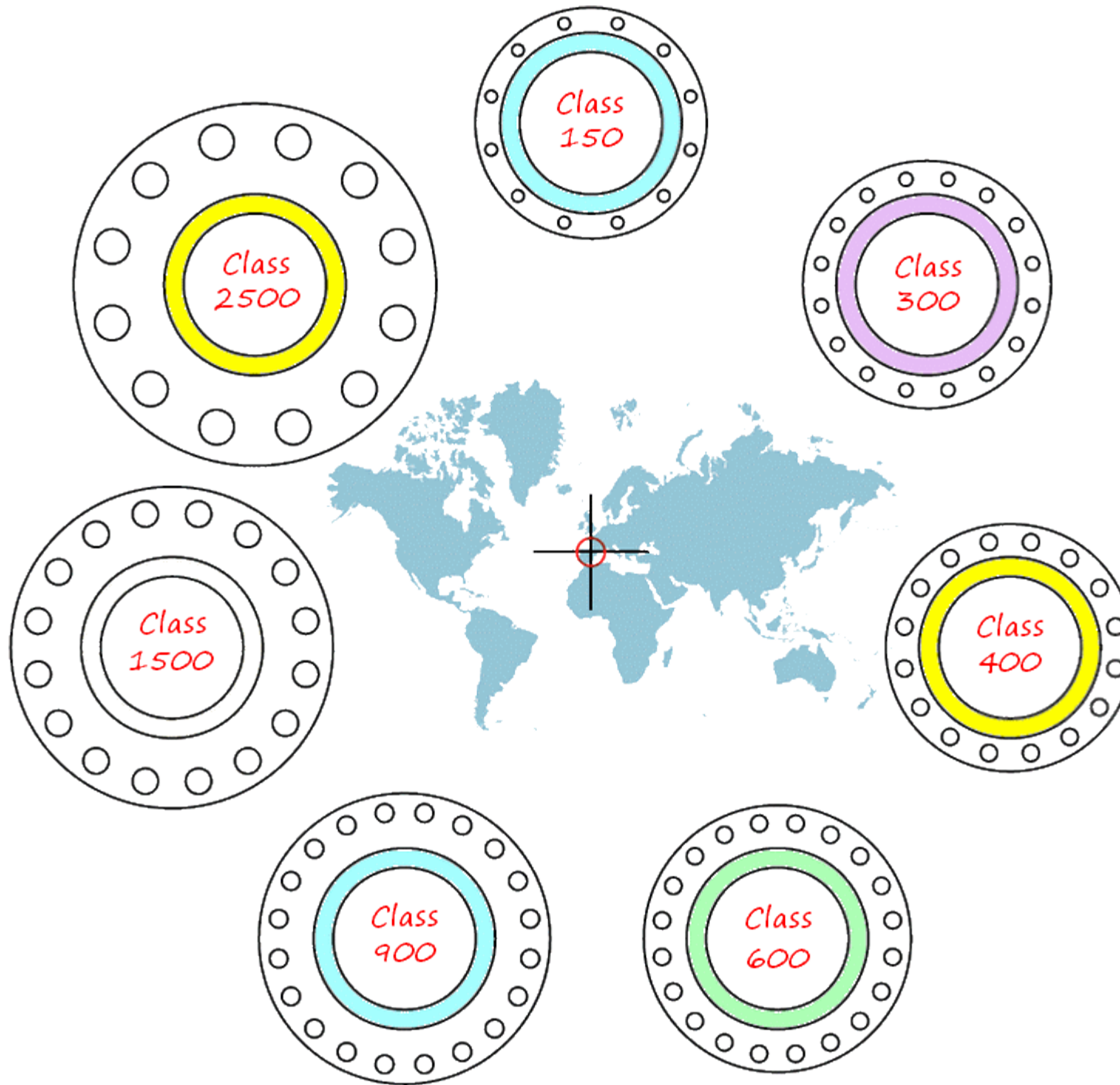
Class 400: 16 x 34.9

Class 600: 20 x 34.9

Class 900: 20 x 38.1

Class 1500: 16 x 54

Class 2500: 12 x 73



Pressure-Temperature Ratings - Example

Pressure-temperature ratings are maximum allowable working gage pressures in bar units at the temperatures in degrees celsius. For intermediate temperatures, linear interpolation is permitted. Interpolation between class designations is not permitted.

Pressure-temperature ratings apply to flanged joints that conform to the limitations on bolting and on gaskets, which are made up in accordance with good practice for alignment and assembly. Use of these ratings for flanged joints not conforming to these limitations is the responsibility of the user.

The temperature shown for a corresponding pressure rating is the temperature of the pressure-containing shell of the component. In general, this temperature is the same as that of the contained fluid. Use of a pressure rating corresponding to a temperature other than that of the contained fluid is the responsibility of the user, subject to the requirements of applicable codes and regulations. For any temperature below -29°C, the rating shall be no greater than the rating shown for -29°C.

As an example, below you will find two tables with material groups ASTM, and two other tables with flange pressure-temperature ratings for those ASTM materials ASME B16.5.

ASTM Group 2-1.1 Materials			
Nominal Designation	Forgings	Castings	Plates
C-Si	A105(1)	A216 Gr.WCB (1)	A515 Gr.70 (1)
C Mn Si	A350 Gr.LF2 (1)		A516 Gr.70 (1), (2)
C Mn Si V	A350 Gr.LF6 Cl 1 (3)		A537 Cl.1 (4)
3½Ni	A350 Gr.LF3		

Notes:

- (1) Upon prolonged exposure to temperatures above 425°C, the carbide phase of steel may be converted to graphite. Permissible but not recommended for prolonged use above 425°C.
- (2) Do not use over 455°C.
- (3) Do not use over 260°C.
- (4) Do not use over 370°C.

ASTM Group 2-2.3 Materials			
Nominal Designation	Forgings	Cast	Plates
16Cr 12Ni 2Mo	A182 Gr.F316L		A240 Gr.316L
18Cr 13Ni 3Mo	A182 Gr.F317L		

18Cr 8Ni	A182 Gr.F304L (1)		A240 Gr.304L (1)

Note:

- (1) Do not use over 425°C.

**Pressure-Temperature Ratings for ASTM Group 2-1.1 Materials
Working pressure by Classes, BAR**

Temp -29 °C	150	300	400	600	900	1500	2500
38	19.6	51.1	68.1	102.1	153.2	255.3	425.5
50	19.2	50.1	66.8	100.2	150.4	250.6	417.7
100	17.7	46.6	62.1	93.2	139.8	233	388.3
150	15.8	45.1	60.1	90.2	135.2	225.4	375.6
200	13.8	43.8	58.4	87.6	131.4	219	365
250	12.1	41.9	55.9	83.9	125.8	209.7	349.5
300	10.2	39.8	53.1	79.6	119.5	199.1	331.8
325	9.3	38.7	51.6	77.4	116.1	193.6	322.6
350	8.4	37.6	50.1	75.1	112.7	187.8	313
375	7.4	36.4	48.5	72.7	109.1	181.8	303.1
400	6.5	34.7	46.3	69.4	104.2	173.6	289.3
425	5.5	28.8	38.4	57.5	86.3	143.8	239.7
450	4.6	23	30.7	46	69	115	191.7
475	3.7	17.4	23.2	34.9	52.3	87.2	145.3
500	2.8	11.8	15.7	23.5	35.3	58.8	97.9
538	1.4	5.9	7.9	11.8	17.7	29.5	49.2
Temp °C	150	300	400	600	900	1500	2500

Pressure-Temperature Ratings for ASTM Group 2-2.3 Materials							
Working pressure by Classes, BAR							
Temp -29 °C	150	300	400	600	900	1500	2500
38	15.9	41.4	55.2	82.7	124.1	206.8	344.7
50	15.3	40	53.4	80	120.1	200.1	333.5
100	13.3	34.8	46.4	69.6	104.4	173.9	289.9
150	12	31.4	41.9	62.8	94.2	157	261.6
200	11.2	29.2	38.9	58.3	87.5	145.8	243
250	10.5	27.5	36.6	54.9	82.4	137.3	228.9
300	10	26.1	34.8	52.1	78.2	130.3	217.2
325	9.3	25.5	34	51	76.4	127.4	212.3
350	8.4	25.1	33.4	50.1	75.2	125.4	208.9
375	7.4	24.8	33	49.5	74.3	123.8	206.3
400	6.5	24.3	32.4	48.6	72.9	121.5	202.5
425	5.5	23.9	31.8	47.7	71.6	119.3	198.8
450	4.6	23.4	31.2	46.8	70.2	117.1	195.1
Temp °C	150	300	400	600	900	1500	2500