



شركة مجموعة أرابكو الدولية

**ARABCO INTERNATIONAL**

للتجارة العامة والمقاولات ذ.م.م. Gen. Trad. & Cont. Company W.L.L.



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Pipe is a hollow tube with round cross section for the conveyance of products. The products include fluids, gas, pellets, powders and more. The word pipe is used as distinguished from tube to apply to tubular products of dimensions commonly used for pipeline and piping systems.

In the world of piping, the terms pipe and tube will be used. Pipe is customarily identified by "Nominal Pipe Size" (NPS), with wall thickness defined by "Schedule number" (SCH).

Tube is customarily specified by its outside diameter (O.D.) and wall thickness (WT), expressed either in Birmingham wire gage (BWG) or in thousandths of an inch.

Pipe: NPS 1/2-SCH 40 is even to outside diameter 21,3 mm with a wall thickness of 2,77 mm.

Tube: 1/2" x 1,5 is even to outside diameter 12,7 mm with a wall thickness of 1,5 mm.

The principal uses for tube are in Heat Exchangers, instrument lines and small interconnections on equipment such as compressors, boilers etc..

## Types Of Pipes



Seamless Pipes



Lsaw Pipes



Spiral Weld Pipes



GI Threaded Pipes



Drilling Pipes



3 Layer PP/PE  
Coated Pipes

## Grades Of Pipes

- ASTM SA106 GRB ➤ ASTM SA333 GR 6 ➤ API 5L X42 TO X70 ➤ SA312 TP 304L/316L
- UNS S31803 (Duplex) ➤ UNS S32760 (Super Duplex)



NIPPON STEEL &  
SUMITOMO METAL  
CORPORATION



Tenaris







A flange is a method of connecting pipes, valves, pumps and other equipment to form a piping system. It also provides easy access for cleaning, inspection or modification. Flanges are usually welded or screwed. Flanged joints are made by bolting together two flanges with a gasket between them to provide a seal.

## Types Of Flanges:



Welding Neck Flange



Orifice Flange



Slip On Flange



Socket Weld Flange



Threaded Flange



Blind Flange



Lap Joint Flange



Spectacle Blind



Reducing Flange



Long Welding Neck Flanges



Weldoflange / Nipoflange

## Standards:

➔ ASME ➔ BS ➔ DIN ➔ AWWA ➔ TAYLOR ➔ JIS ➔ AS PER CUSTOMER DIAGRAM

## Grades Of Flanges:

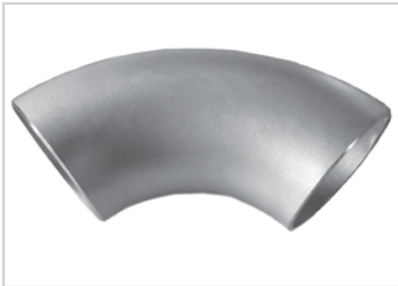
➔ SA105N ➔ SA182F(304L/316L) ➔ DUPLEX (UNS 31803)  
➔ SUPER DUPLEX (UNS 32760) ➔ INCONNEL UNS6625/8825

# Buttwelded Fittings



A pipe fitting is defined as a part used in a piping system, for changing direction, branching or for change of pipe diameter, and which is mechanically joined to the system. There are many different types of fittings and they are the same in all sizes and schedules as the pipe

## Types Of Fittings:



Elbow 90° long radius/  
short radius



Elbow 45°



Elbow 180° long radius/  
short radius



Tee straight



Tee reducing



Reducer concentric



Reducer eccentric



End cap



Lap joint Stub End

**Standards:** ➔ ASME ➔ DIN ➔ EU

## Grades Of Fittings:

➔ ASTM A/SA234 WPB ➔ ASTM A/SA234 WP1 - WP91 ➔ ASTM A/SA420 WPL6  
➔ ASTM A/SA403 304L/316L ➔ ASTM A/SA815 UNS S31803 ➔ ASTM A/SA815 UNS S32205  
➔ ASTM SB336 UNS 6625 ➔ ASTM SB336 UNS 8825



A Forged Fitting is defined as hot formed sections with different types for high pressure fittings. These forgings generally go through forging by multiple product die presses. These fittings normally attached to pipes to the end of pipes, fittings, valves, or other objects to facilitate the assembly and disassembly of piping systems with different methods of joining that is by

- ➔ Socket Weld (SW) fittings Class 3000, 6000, 9000
- ➔ Threaded (THD), screwed fittings Class 2000, 3000, 6000

## Types Of Forged Fittings



Elbows 90/45 degrees



Tees



Crosses



Hex Nipple



End or Pipe Caps



Swedge Nipple



Street Elbow



O lets

## Grades Of Fittings:

- ➔ SA105N ➔ SA182F (304L/316L) ➔ DUPLEX (UNS 31803)
- ➔ SUPER DUPLEX (UNS 32760) ➔ INCONNEL UNS6625/8825





Valves are mechanical devices that controls the flow and pressure within a system or process. They are essential components of a piping system that conveys liquids, gases, vapors, slurries etc..

Different types of valves are available: gate, globe, plug, ball, butterfly, check, diaphragm, pinch, pressure relief, control valves etc. Each of these types has a number of models, each with different features and functional capabilities. Some valves are self-operated while others manually or with an actuator or pneumatic or hydraulic is operated.

## Types Of Valves



Gate



Globe



Ball



Swing Check



Butterfly



Plug



Safety



Relief

## Class Ratings:

Pressure-temperature ratings of valves are designated by class numbers. ASME B16.34, Valves- Flanged, Threaded, and Welding End is one of the most widely used valve standards. It defines three types of classes: standard, special, and limited. ASME B16.34 covers Class 150, 300, 400, 600, 900, 1500, 2500, and 4500 valves.



In Petro and chemical industry for flange connections Stud Bolts and Hex Bolts are used. The Stud Bolt is a threaded rod with 2 heavy hexagon nuts, while the Hex Bolt has a head with one nut. Nuts and head are both six sided.

## Types Of Stud Bolts



BLACK



GALVANISED



CADMIUM



HOT DIP GALVANISED



PTFE COATED

## Grades Of Stud Bolts:

- ASTM A 193 B7/2H ➤ B7M/2HM ➤ B8/ GR8
- B8M/GR 8M ➤ B16 / GR 4 ➤ A320L7/GR4-GR7



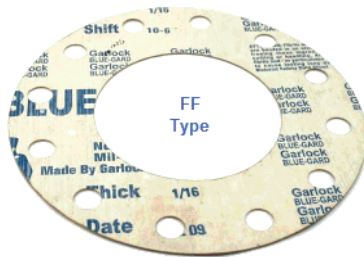
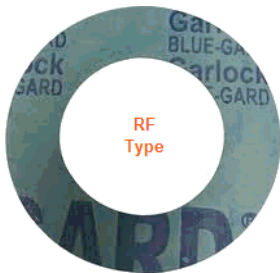
Flange gaskets are used to create a static seal between two flanges faces, at various operating conditions, with varied pressure and temperature ratings. A gasket fills the microscopic spaces and irregularities of the flange faces, and then it forms a seal that is designed to keep liquids and gases. Correct installation of damage-free gaskets and demerger-free flange faces is a requirement for a leak-free flange connection.

If it would be technically possible, in order to manufacture flanges perfectly flat and smooth, and perfectly compatible with one another under all operating conditions, a gasket would not be necessary. But in normal practice it is not possible, because flange connections under ANY circumstances should be made. Small impurities and a small bit of dirt, is in practice not be avoided and therefore it is necessary to use a gasket.

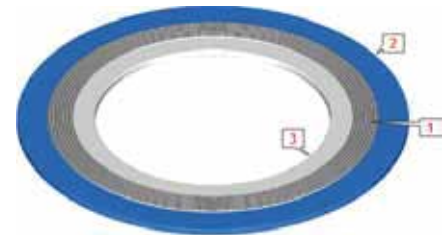
## Types Of Gaskets

Materials for gaskets can be divided into three main categories:

### Non-Metallic types

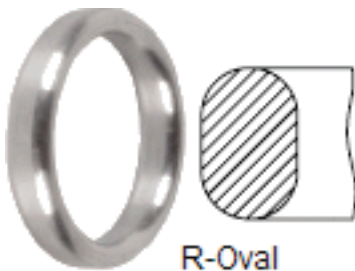


### Semi-Metallic types

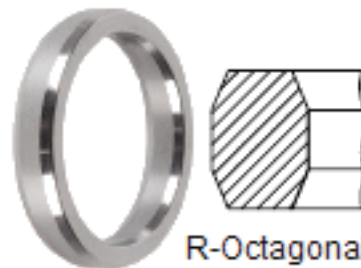


1. Sealing Element 2. Outer Ring 3. Inner Ring

### Metallic types



R-Oval



R-Octagonal



## ANSI PIPE SCHEDULE SI – units (metric)

Wall thickness = mm Weight –kg/m (Plain end mass)

Pipe Size (Inches)	Pipe OD (mm)	5S	10S	10	20	30	STD	40S	40	XS	80S	80	XXS
3/8	17.10		1.65 <b>0.64</b>			W.Thick → 2.31 Weight → <b>0.84</b>	2.31	2.31	2.31	3.20	3.20	3.20	
1/2	21.30	1.65 <b>0.82</b>	2.11 <b>1.01</b>				2.77 <b>1.27</b>	2.77 <b>1.30</b>	2.77 <b>1.27</b>	3.73 <b>1.62</b>	3.73 <b>1.65</b>	3.73 <b>1.62</b>	7.47 <b>1.95</b>
3/4	26.70	1.65 <b>1.04</b>	2.11 <b>1.31</b>				2.87 <b>1.69</b>	2.87 <b>1.71</b>	2.87 <b>1.69</b>	3.91 <b>2.20</b>	3.91 <b>2.24</b>	3.91 <b>2.20</b>	7.82 <b>3.64</b>
1	33.40	1.65 <b>1.33</b>	2.77 <b>2.13</b>				3.38 <b>2.50</b>	3.38 <b>2.55</b>	3.38 <b>2.50</b>	4.55 <b>3.24</b>	4.55 <b>3.29</b>	4.55 <b>3.24</b>	9.09 <b>5.45</b>
1 1/4	42.20	1.65 <b>1.68</b>	2.77 <b>2.76</b>				3.56 <b>3.39</b>	3.56 <b>3.46</b>	3.56 <b>3.39</b>	4.85 <b>4.47</b>	4.85 <b>4.56</b>	4.85 <b>4.47</b>	9.70 <b>7.77</b>
1 1/2	48.30	1.65 <b>1.95</b>	2.77 <b>3.17</b>				3.68 <b>4.05</b>	3.68 <b>4.13</b>	3.68 <b>4.05</b>	5.08 <b>5.41</b>	5.08 <b>5.51</b>	5.08 <b>5.41</b>	10.15 <b>9.56</b>
2	60.30	1.65 <b>2.44</b>	2.77 <b>4.01</b>				3.91 <b>5.44</b>	3.91 <b>5.54</b>	3.91 <b>5.44</b>	5.54 <b>7.48</b>	5.54 <b>7.63</b>	5.54 <b>7.48</b>	11.07 <b>13.44</b>
2 1/2	73.00	2.11 <b>3.77</b>	3.05 <b>5.36</b>				5.16 <b>8.63</b>	5.16 <b>8.81</b>	5.16 <b>8.63</b>	7.01 <b>11.41</b>	7.01 <b>11.64</b>	7.01 <b>11.41</b>	14.02 <b>20.39</b>
3	88.90	2.11 <b>4.60</b>	3.05 <b>5.59</b>				5.49 <b>11.29</b>	5.49 <b>11.52</b>	5.49 <b>11.29</b>	7.62 <b>15.27</b>	7.62 <b>15.59</b>	7.62 <b>15.27</b>	15.24 <b>27.68</b>
3 1/2	101.6	2.11 <b>5.29</b>	3.05 <b>7.99</b>				5.74 <b>13.57</b>	5.74 <b>13.84</b>	5.74 <b>13.57</b>	8.08 <b>18.63</b>	8.08 <b>19.01</b>	8.08 <b>18.63</b>	
4	114.3	2.11 <b>5.96</b>	3.05 <b>8.52</b>				6.02 <b>16.07</b>	6.02 <b>16.40</b>	6.02 <b>16.07</b>	8.56 <b>22.32</b>	8.56 <b>22.77</b>	8.56 <b>22.32</b>	17.12 <b>41.03</b>
5	141.3	2.77 <b>9.67</b>	3.40 <b>11.82</b>				6.55 <b>21.77</b>	6.55 <b>22.20</b>	6.55 <b>21.77</b>	9.53 <b>30.97</b>	9.53 <b>31.59</b>	9.53 <b>30.97</b>	19.05 <b>57.43</b>
6	168.3	2.77 <b>11.55</b>	3.40 <b>14.13</b>				7.11 <b>28.26</b>	7.11 <b>28.83</b>	7.11 <b>28.26</b>	10.97 <b>42.56</b>	10.97 <b>43.42</b>	10.97 <b>42.56</b>	21.95 <b>79.22</b>
8	219.1	2.77 <b>15.09</b>	3.76 <b>20.37</b>		6.35 <b>33.31</b>	7.04 <b>36.81</b>	8.18 <b>42.55</b>	8.18 <b>43.39</b>	8.18 <b>42.55</b>	12.70 <b>64.64</b>	12.70 <b>65.95</b>	12.70 <b>64.64</b>	22.23 <b>107.92</b>
10	273.1	3.40 <b>23.08</b>	4.19 <b>28.34</b>		6.35 <b>41.77</b>	7.80 <b>51.03</b>	9.27 <b>60.31</b>	9.27 <b>61.52</b>	9.27 <b>60.31</b>	12.70 <b>81.55</b>	12.70 <b>83.19</b>	15.90 <b>96.01</b>	25.40 <b>155.15</b>
12	323.9	3.96 <b>31.89</b>	4.57 <b>36.73</b>		6.35 <b>49.73</b>	8.35 <b>65.20</b>	9.53 <b>73.88</b>	9.27 <b>75.32</b>	10.31 <b>79.73</b>	12.70 <b>97.46</b>	12.70 <b>99.43</b>	17.48 <b>132.08</b>	25.40 <b>186.97</b>
14	355.6	3.96 <b>35.06</b>	4.78 <b>42.14</b>	6.35 <b>54.69</b>	7.92 <b>67.90</b>	9.53 <b>81.33</b>	9.53 <b>93.27</b>	11.13 <b>94.55</b>	12.70 <b>107.39</b>	12.70 <b>107.39</b>	19.05 <b>158.10</b>		
16	406.4	4.19 <b>42.41</b>	4.78 <b>48.26</b>	6.35 <b>62.64</b>	7.92 <b>77.83</b>	9.53 <b>93.27</b>	9.53 <b>81.33</b>	12.70 <b>123.30</b>	12.70 <b>123.30</b>	12.70 <b>123.30</b>	21.44 <b>203.53</b>		
18	457.0	4.19 <b>47.77</b>	4.78 <b>54.36</b>	6.35 <b>70.57</b>	7.92 <b>87.71</b>	11.13 <b>122.38</b>	9.53 <b>105.16</b>	14.27 <b>155.80</b>	12.70 <b>139.15</b>	12.70 <b>139.15</b>	23.38 <b>254.55</b>		
20	508.0	4.78 <b>60.46</b>	5.54 <b>70.00</b>	6.35 <b>78.55</b>	9.35 <b>117.15</b>	12.70 <b>155.12</b>	9.53 <b>117.15</b>	15.09 <b>183.42</b>	12.70 <b>155.12</b>	12.70 <b>155.12</b>	25.19 <b>311.17</b>		
22	559.0	4.78 <b>66.57</b>	5.54 <b>77.06</b>	6.35 <b>86.54</b>	9.35 <b>129.13</b>	12.70 <b>171.09</b>	9.53 <b>129.13</b>		12.70 <b>171.09</b>	12.70 <b>171.09</b>	28.58 <b>373.83</b>		
24	610.0	5.54 <b>84.16</b>	6.35 <b>96.37</b>	6.35 <b>94.53</b>	9.35 <b>141.12</b>	14.27 <b>209.64</b>	9.53 <b>141.12</b>	17.48 <b>255.41</b>	12.70 <b>187.06</b>	12.70 <b>187.06</b>	30.96 <b>442.08</b>		

## COMPATIBILITY CHART FOR PIPE, VALVES AND FITTINGS

PIPE	BUTT WELD FITTINGS	SCREWED & SOCKET FITTINGS	FLANGES	VALVES
A106B	A234 WPB	A105 GR.N	A105 GR.N	A105 A216 WCB
A312TP304	A403 WP304	A182 F-304	A182 F-304	A182 F-304 CF8
A312TP316	A403 WP316	A182 F-316	A182 F-316	A182 F-316 CF8M
A333 GR.6	A420 WPL6	A350 LF-2	A350 LF-2	A350 LF-2 A352 LCB
A333 GR.3	A420 WPL3	A350 LF-3	A350 LF-3	A350 LF-3 A352 LC3

## INTERNATIONAL COMPARISON FOR MATERIAL STANDARDS

ASTM STANDARD	DIN STANDARD	EN STANDARD	JIS STANDARD	BS STANDARD
A126 CL.B	GG-25	GJL-250	FC 250	GRADE 260
A536	GGG 40.3	GJS-400-18	FCD 450	370/17
A216 WCB	GS-C25N	GP240GH+N	SCPH 2	504-161 GR.B
A217 WC6	GS-17 CrMo55	G17CrMo5-5	SCPH 21	B2
A105	C 22.8	C 22.8	SF 490A	050A20
A351 CF-8	G-X 6CrNi189 (1.4308)	—	SCS 13	304 C 15
A351 CF-8M	GX 6CrNiMo1810 (1.4408)	GX5CrNiMo 19-11-12	SCS 14	316 C 16

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