

**TUBERÍA Y CARACTERÍSTICAS  
DEL ACERO INOXIDABLE**  
***PIPE AND STAINLESS STEEL  
PROPERTIES***



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## ***PIPE AND STAINLESS STEEL PROPERTIES***

|                                                                            | <u>PÁG.:</u> |
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# PROPIEDADES DE LOS ACEROS INOXIDABLES MAS UTILIZADOS



| AISI                       | Werkstoff No. | C Max | COMPOSICIÓN QUÍMICA % |                                  |            |                 |                                |         |                  |        |        |        |        |         | Varios                     | Otros             |
|----------------------------|---------------|-------|-----------------------|----------------------------------|------------|-----------------|--------------------------------|---------|------------------|--------|--------|--------|--------|---------|----------------------------|-------------------|
|                            |               |       | Ni                    | Cr                               | Fe         | Ti              | Mo                             | Cu      | Co               | Al     | Si     | Mn     | S Max  | P Max   |                            |                   |
| AISI 304                   | 1.4301        | 0,08  | 8-11                  | 18-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 304 L                 | 1.4306        | 0,03  | 8-11                  | 18-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316                   | 1.4401        | 0,08  | 11-14                 | 16-18                            | Resto      |                 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316 L                 | 1.4404        | 0,03  | 11-14                 | 16-18                            | Resto      |                 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316 TI                | 1.4571        | 0,08  | 11-14                 | 16-18                            | Resto      | >=5xC<br><=0,60 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 321                   | 1.4541        | 0,08  | 9-13                  | 17-20                            | Resto      | >=5xC<br><=0,60 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 347                   | 1.4550        | 0,15  | 9-13                  | 17-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    | Nb + Ta<br>e 10xC<br>d 1,0 |                   |
| AISI 309                   | 1.4828        | 0,15  | 9-13                  | 22-24                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 310                   | 1.4841        | 0,15  | 19-22                 | 24-26                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| Alloy 904 L                | 1.4539        | 0.020 | 23-28                 | 20-21                            |            |                 | 4-5                            | 1-2     |                  |        | 1,00   | 2,00   | 0,035  | 0,045   |                            | N:0,05<br>0,10    |
| Manel 400                  | 2.436/61      | 0,30  | >=63                  |                                  | <=2,5      |                 |                                | 28-34   |                  | <=0,50 | <=0,50 | <=2,00 | 0,02   |         |                            |                   |
| Incoloy 825                | 2.4858        | 0,05  | 38-46                 | 19 <sup>5</sup> -23 <sup>5</sup> | Resto      | 0,16-1,2        | 2 <sup>5</sup> -3 <sup>5</sup> | 1,5-3,0 |                  |        | <=0,50 | <=1,0  |        |         |                            |                   |
| Hastelloy C                | 2.4818        | 0,08  | Resto                 | 14 <sup>5</sup> -16 <sup>5</sup> | 4-7        |                 | 15-17                          |         | <=2 <sup>5</sup> |        | <=1,0  | <=1,0  | 0,03   | 0,04    | W0=34                      |                   |
| Incoloy 800                | 1.4876        | 0,1   | 30-34                 | 19-22                            | Resto      |                 |                                | <=0,5   |                  |        | <=1,0  | <=1,5  | 0,03   |         |                            |                   |
| Inconel 625                | 2.4856        | 0,1   | Resto                 | 20-23                            | Max<br>5,0 | <=0,40          | 8-10                           |         | <=1,0            | <=0,40 | <=0,5  | <=0,5  | <=0,15 |         | Nb<br>+Ta 3,15<br>4,15     |                   |
| UNS S32750<br>Super Duplex | 1.4410        | 0,03  | 6-8                   | 24-26                            |            |                 | 3-5                            | <=0,5   |                  |        | <=0,8  | <=1,2  | <=0,02 | <=0,035 |                            |                   |
| UNS S32760<br>Super Duplex | 1.4501        | 0,05  | 6-8                   | 24-26                            |            |                 | 3-4                            | 0,5-1   |                  |        | <=1,0  | <=1,0  | <=0,01 | <=0,03  |                            | W 0,5-1<br>40 min |
| UNS S31803<br>Duplex       | 1.4462        | 0,03  | 4,5 - 6,5             | 21-23                            |            |                 | 2,5 - 3,5                      |         |                  |        | <=1,0  | <=2,0  | <=0,02 | <=0,03  |                            |                   |



| CARACTERÍSTICAS MECÁNICAS   |                               |                  |                     |                                                                                                                                                                                                                                                                       |
|-----------------------------|-------------------------------|------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carga de Rotura<br>Mpa-min. | Límite<br>Elástico<br>Mpa-min | Alarga<br>% Min. | Dureza<br>(HB) Max. | Los grados 304H, 316H, 321H y 347H son, en cuanto a su composición química, idénticos a los 304, 316, 321 y 347, con la excepción de que el contenido de carbono está entre 0,04 y 0,10%.<br>(A) A.S.T.M A312                                                         |
| 515                         | 205                           | 35               | 183                 | Resistencia satisfactoria en las aguas dulces y en la atmósfera. Muy buen comportamiento mecánico a muy bajas temperaturas.                                                                                                                                           |
| 485                         | 170                           | 35               | 183                 | Excelente resistencia a la corrosión de los ácidos nítricos 36 B, y de las mezclas Sulfonítricas hasta 70 C. Resistencia a la corrosión intercrisalina. Su bajo contenido en carbono evita los tratamientos térmicos después de la soldadura.                         |
| 515                         | 205                           | 35               | 217                 | Resiste a los ácidos nítricos 36 B, y los fosfóricos por debajo de 70 C.                                                                                                                                                                                              |
| 485                         | 170                           | 35               | 217                 | Resistencia a la corrosión netamente superior a la del AISI-316, en particular en medios susceptibles de atacar por picado (cloruro), resistente a la corrosión intercrisalina. Su muy bajo contenido en carbono evita tratamientos térmicos después de la soldadura. |
| 515                         | 205                           | 35               | 217                 | Resiste los ácidos nítricos 30 B, y los fosfóricos por debajo de 70 C. Estabilizado con Titanio, lo que evita tratamientos térmicos después de la soldadura.                                                                                                          |
| 515                         | 205                           | 35               | 183                 | Resiste bastante bien a la oxidación y a la corrosión. En determinadas circunstancias, puede actuar como acero refractario.                                                                                                                                           |
| 515                         | 205                           | 35               | 201                 | Mismas características que el AISI-321, pero estabilizado con niobio.                                                                                                                                                                                                 |
| 515                         | 205                           | 35               | 217                 | Ofrece mejor resistencia a la corrosión que le 304 debido a us mayores porcentajes en Cromo y Níquel. Esta aleación es usada para piezas de hornos, contenedores de alta temperatura, cordones de soldadura.                                                          |
| 515                         | 205                           | 35               | 217                 | Cromo-Níquel acero con un excelente resistencia a la oxidación en ambientes carburados y reducidos. El Inoxidable 310 tiene una excelente resistencia a las sales templadas, neutrales, cianhídricas y sales de alta velocidad.                                       |
| 490                         | 200                           | 35               | 293                 | Gran resistencia a la oxidación, a la corrosión por tensión y a la corrosión por cristalización. Excelente resistencia a los ácidos reductores moderadamente agresivos.                                                                                               |
| 482                         | 192                           | 35               | 270                 | Este material destaca por su dureza sobre una gran variedad de temperaturas y su excelente resistencia en muchos ambientes corrosivos. El Monel 400 sólo se puede endurecer en frío.                                                                                  |
| 586                         | 240                           | 40               | 270                 | Gran resistencia en diferentes ambientes corrosivos, así como a picarse, corrosión de grieta, corrosión intergranular y a agrietarse por corrosión de tensión. Buenas características mecánicas para temperaturas moderadas y altas.                                  |
| 689                         | 315                           | 20               | 270                 | Muy buena resistencia a la corrosión al ácido clorhídrico hirviendo y al gas clorhídrico húmedo.                                                                                                                                                                      |
| 515                         | 205                           | 30               | 220                 | Buena dureza y excelente resistencia a la oxidación y a la carburación. Su estructura se mantiene estable durante la exposición a altas temperaturas.                                                                                                                 |
| 827                         | 415                           | 30               | 190                 | Alta resistencia y dureza en el rango de temperaturas criogénicas d 2000° F (1093°C) que se deriva en gran parte por los efectos de la solución sólida de los metales refractarios, molibdeno y en una matriz de cromo-níquel.                                        |
| 800                         | 550                           | 15               | 310                 | Alta resistencia a la corrosión por picaduras y grietas.                                                                                                                                                                                                              |
| 750-895                     | 550                           | 25               | 270                 | Alta resistencia al agrietamiento corrosivo por exposición a cloruros.                                                                                                                                                                                                |
| 620                         | 450                           | 25               | 290                 | Combina la resistencia de base de los demás comunes aceros inoxidables austeníticos con la mayor resistencia a la corrosión.                                                                                                                                          |

# PROPERTIES OF MOST COMMON STAINLESS STEELS



| AISI                       | Werkstoff No. | C Max | COMPOSICIÓN QUÍMICA % |                                  |            |                 |                                |         |                  |        |        |        |        |         | Varios                     | Otros             |
|----------------------------|---------------|-------|-----------------------|----------------------------------|------------|-----------------|--------------------------------|---------|------------------|--------|--------|--------|--------|---------|----------------------------|-------------------|
|                            |               |       | Ni                    | Cr                               | Fe         | Ti              | Mo                             | Cu      | Co               | Al     | Si     | Mn     | S Max  | P Max   |                            |                   |
| AISI 304                   | 1.4301        | 0,08  | 8-11                  | 18-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 304 L                 | 1.4306        | 0,03  | 8-11                  | 18-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316                   | 1.4401        | 0,08  | 11-14                 | 16-18                            | Resto      |                 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316 L                 | 1.4404        | 0,03  | 11-14                 | 16-18                            | Resto      |                 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 316 TI                | 1.4571        | 0,08  | 11-14                 | 16-18                            | Resto      | >=5xC<br><=0,60 | 2-3                            |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 321                   | 1.4541        | 0,08  | 9-13                  | 17-20                            | Resto      | >=5xC<br><=0,60 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 347                   | 1.4550        | 0,15  | 9-13                  | 17-20                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    | Nb + Ta<br>e 10xC<br>d 1,0 |                   |
| AISI 309                   | 1.4828        | 0,15  | 9-13                  | 22-24                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| AISI 310                   | 1.4841        | 0,15  | 19-22                 | 24-26                            | Resto      |                 |                                |         |                  |        | <=0,75 | <=2,00 | 0,03   | 0,04    |                            |                   |
| Alloy 904 L                | 1.4539        | 0.020 | 23-28                 | 20-21                            |            |                 | 4-5                            | 1-2     |                  |        | 1,00   | 2,00   | 0,035  | 0,045   |                            | N:0,05<br>0,10    |
| Manel 400                  | 2.436/61      | 0,30  | >=63                  |                                  | <=2,5      |                 |                                | 28-34   |                  | <=0,50 | <=0,50 | <=2,00 | 0,02   |         |                            |                   |
| Incoloy 825                | 2.4858        | 0,05  | 38-46                 | 19 <sup>5</sup> -23 <sup>5</sup> | Resto      | 0,16-1,2        | 2 <sup>5</sup> -3 <sup>5</sup> | 1,5-3,0 |                  |        | <=0,50 | <=1,0  |        |         |                            |                   |
| Hastelloy C                | 2.4818        | 0,08  | Resto                 | 14 <sup>5</sup> -16 <sup>5</sup> | 4-7        |                 | 15-17                          |         | <=2 <sup>5</sup> |        | <=1,0  | <=1,0  | 0,03   | 0,04    | W0=34                      |                   |
| Incoloy 800                | 1.4876        | 0,1   | 30-34                 | 19-22                            | Resto      |                 |                                | <=0,5   |                  |        | <=1,0  | <=1,5  | 0,03   |         |                            |                   |
| Inconel 625                | 2.4856        | 0,1   | Resto                 | 20-23                            | Max<br>5,0 | <=0,40          | 8-10                           |         | <=1,0            | <=0,40 | <=0,5  | <=0,5  | <=0,15 |         | Nb<br>+Ta 3,15<br>4,15     |                   |
| UNS S32750<br>Super Duplex | 1.4410        | 0,03  | 6-8                   | 24-26                            |            |                 | 3-5                            | <=0,5   |                  |        | <=0,8  | <=1,2  | <=0,02 | <=0,035 |                            |                   |
| UNS S32760<br>Super Duplex | 1.4501        | 0,05  | 6-8                   | 24-26                            |            |                 | 3-4                            | 0,5-1   |                  |        | <=1,0  | <=1,0  | <=0,01 | <=0,03  |                            | W 0,5-1<br>40 min |
| UNS S31803<br>Duplex       | 1.4462        | 0,03  | 4,5 - 6,5             | 21-23                            |            |                 | 2,5 - 3,5                      |         |                  |        | <=1,0  | <=2,0  | <=0,02 | <=0,03  |                            |                   |



| MECHANICS PROPERTIES         |                            |                      |                       |                                                                                                                                                                                                                                  |
|------------------------------|----------------------------|----------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tensile Strength<br>Mpa-min. | Yield Strength<br>Mpa-min. | Elongation<br>% Min. | Hardness<br>(HB) Max. | 304H, 316H, 321H and 347H grades, are about their chemist composition equals to 304, 316, 321 and 347, with the exception that the Carbon content it's around 0,04 and 0,10% (A) A.S.T.M. A312                                   |
| 515                          | 205                        | 35                   | 183                   | Satisfactory resistance in fresh waters and Atmosphere. Very good mecanical work in too very low temperatures                                                                                                                    |
| 485                          | 170                        | 35                   | 183                   | Excelent resistance to corrosion of nitrics acids 36 B and sulfonitrics mixtures up to 70 C. His low Carbon content avoid heat treatments after welding.                                                                         |
| 515                          | 205                        | 35                   | 217                   | Resist 36 B nitrics acids and phoshoporics acids below 70 C.                                                                                                                                                                     |
| 485                          | 170                        | 35                   | 217                   | Resistance to corrosion it's higher than AISI + 316. His low Carbon content avoid heat treatments after welding.                                                                                                                 |
| 515                          | 205                        | 35                   | 217                   | Resists 30 B nitrics acids and phosphorics acids below 70 C. Stabilized with Titanium wich avoids heat tratments after welding.                                                                                                  |
| 515                          | 205                        | 35                   | 183                   | Resists too enough the oxidation and corrosion. In certain circumstances it could work like refractory steel.                                                                                                                    |
| 515                          | 205                        | 35                   | 201                   | Same properties than AISI - 321 but stabilized with Niobio.                                                                                                                                                                      |
| 515                          | 205                        | 35                   | 217                   | Stainless 309 offers a better corrosion resistance than the type 304 because of higher percentages of nicked and chromium. This alloy has been used for furnace parts, high temperature containers, weld wire, and box sheets    |
| 515                          | 205                        | 35                   | 217                   | Chromium-nicked steel with excellent oxidation resistance to carburizing and reducing environments. Stainless 310 has excellent resitance to drawing and tempering salts, cyaniding salts, and high-speed salts.                 |
| 490                          | 200                        | 35                   | 293                   | High resistance to pitting, stress=corrosion cracking and intercrystalline corrosion. Excellent resistance to moderately aggressive reducing acids.                                                                              |
| 482                          | 192                        | 35                   | 270                   | This material is noted for its toughness over a considerable range of temperatures, and has excellent resistance to many corrosive environments. Monel 400 can be hardened only by cold-working.                                 |
| 586                          | 240                        | 40                   | 270                   | Great resistance to many corrosive environments, such as pitting, crevice corrosion, intergranular corrosion, and stress-corrosion cracking. Has good mechanical properties from moderately to high temperatures.                |
| 689                          | 315                        | 20                   | 270                   | Very good resistance to corrosion in boiled clorhidric acids and wet clorhidric gas.                                                                                                                                             |
| 515                          | 205                        | 30                   | 220                   | Good strength and excellent resistance to oxidation and carburization. The alloy maintains stable structure during exposure to high temperature                                                                                  |
| 827                          | 415                        | 30                   | 190                   | It has high strength and toughness in the temperature range cryogenic to 2000°F (1093°C) which is derived largery from the solid solution effects of the refractory metals, columbium and molydenum, in a nicked-chromium matrix |
| 800                          | 550                        | 15                   | 310                   | High resistance to pitting and crevice corrosion.                                                                                                                                                                                |
| 750-895                      | 550                        | 25                   | 270                   | High resistance to corrosion cracking by exposure to chlorides.                                                                                                                                                                  |
| 620                          | 450                        | 25                   | 290                   | Combines the base resistance of the other common austenitic stainless steels with higher corrosion resistance                                                                                                                    |

| Temperatura<br>Temperature<br>C° | (B)<br>Variedades<br>Type<br>AISI | (A)<br>Limite Max. trabajo<br>Max. Work. Limit<br>h/bar | 1/2" |     | 3/4" |     | 1"   |     | 1 1/4" |     | 1 1/2" |     | 2"   |     | 2 1/2" |     |
|----------------------------------|-----------------------------------|---------------------------------------------------------|------|-----|------|-----|------|-----|--------|-----|--------|-----|------|-----|--------|-----|
|                                  |                                   |                                                         | Sch. |     | Sch. |     | Sch. |     | Sch.   |     | Sch.   |     | Sch. |     | Sch.   |     |
|                                  |                                   |                                                         | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S     | 10S | 5S     | 10S | 5S   | 10S | 5S     | 10S |
| -29° a + 38°                     | 304                               | 10,840                                                  | 155  | 202 | 122  | 158 | 97   | 167 | 76     | 130 | 66     | 113 | 53   | 90  | 56     | 81  |
|                                  | 321-347                           | 10,840                                                  | 155  | 202 | 122  | 158 | 97   | 167 | 76     | 130 | 66     | 113 | 53   | 90  | 56     | 81  |
| -29° to +38°                     | 316 (2)                           | 10,840                                                  | 155  | 202 | 122  | 158 | 97   | 167 | 76     | 130 | 66     | 113 | 53   | 90  | 56     | 81  |
| 93°                              | 304                               | 9,590                                                   | 137  | 178 | 108  | 140 | 85   | 147 | 67     | 115 | 58     | 100 | 46   | 79  | 49     | 72  |
|                                  | 321-347                           | 10,840                                                  | 155  | 202 | 122  | 158 | 97   | 167 | 76     | 130 | 66     | 113 | 53   | 90  | 56     | 81  |
|                                  | 316 (2)                           | 10,840                                                  | 155  | 202 | 122  | 158 | 97   | 167 | 76     | 130 | 66     | 113 | 53   | 90  | 56     | 81  |
| 149°                             | 304                               | 8,640                                                   | 124  | 161 | 97   | 126 | 77   | 133 | 60     | 104 | 53     | 90  | 42   | 71  | 44     | 65  |
|                                  | 321-347                           | 9,790                                                   | 140  | 182 | 110  | 143 | 87   | 150 | 68     | 117 | 60     | 102 | 47   | 81  | 50     | 73  |
|                                  | 316 (2)                           | 10,300                                                  | 147  | 191 | 116  | 150 | 92   | 158 | 72     | 124 | 63     | 107 | 50   | 85  | 53     | 77  |
| 204°                             | 304                               | 7,860                                                   | 112  | 164 | 88   | 115 | 70   | 121 | 55     | 94  | 48     | 82  | 38   | 65  | 40     | 59  |
|                                  | 321-347                           | 9,080                                                   | 130  | 169 | 102  | 133 | 81   | 140 | 63     | 109 | 55     | 94  | 44   | 75  | 46     | 68  |
|                                  | 316 (2)                           | 10,100                                                  | 144  | 188 | 114  | 147 | 90   | 155 | 71     | 121 | 61     | 105 | 49   | 83  | 52     | 76  |
| 260°                             | 304                               | 7,180                                                   | 103  | 133 | 81   | 105 | 64   | 110 | 50     | 86  | 44     | 75  | 35   | 59  | 37     | 54  |
|                                  | 321-347                           | 8,740                                                   | 125  | 162 | 98   | 128 | 78   | 134 | 61     | 105 | 53     | 91  | 42   | 72  | 45     | 65  |
|                                  | 316 (2)                           | 9,890                                                   | 141  | 184 | 111  | 144 | 88   | 152 | 69     | 119 | 60     | 103 | 48   | 82  | 51     | 74  |
| 316°                             | 304                               | 6,670                                                   | 95   | 124 | 75   | 97  | 59   | 102 | 47     | 80  | 40     | 69  | 32   | 55  | 34     | 50  |
|                                  | 321-347                           | 8,605                                                   | 123  | 160 | 97   | 126 | 77   | 132 | 60     | 103 | 52     | 90  | 42   | 71  | 44     | 64  |
|                                  | 316 (2)                           | 9,860                                                   | 141  | 183 | 111  | 144 | 88   | 152 | 69     | 118 | 60     | 103 | 48   | 81  | 51     | 74  |
| 343°                             | 304                               | 6,440                                                   | 92   | 120 | 72   | 94  | 57   | 99  | 45     | 77  | 39     | 67  | 31   | 53  | 33     | 48  |
|                                  | 321-347                           | 8,570                                                   | 123  | 159 | 96   | 125 | 76   | 132 | 60     | 103 | 52     | 89  | 41   | 71  | 44     | 64  |
|                                  | 316 (2)                           | 9,825                                                   | 141  | 183 | 111  | 143 | 88   | 151 | 69     | 118 | 60     | 102 | 48   | 81  | 50     | 74  |
| 371°                             | 304                               | 6,230                                                   | 89   | 116 | 70   | 91  | 55   | 96  | 43     | 75  | 38     | 65  | 30   | 51  | 32     | 47  |
|                                  | 321-347                           | 8,540                                                   | 122  | 159 | 69   | 125 | 76   | 131 | 60     | 102 | 52     | 89  | 41   | 71  | 44     | 64  |
|                                  | 316 (2)                           | 9,790                                                   | 140  | 182 | 110  | 143 | 87   | 150 | 68     | 117 | 60     | 102 | 47   | 81  | 50     | 73  |
| 399°                             | 304                               | 5,995                                                   | 86   | 111 | 67   | 87  | 53   | 92  | 42     | 72  | 36     | 62  | 29   | 49  | 31     | 45  |
|                                  | 321-347                           | 8,470                                                   | 121  | 157 | 95   | 124 | 75   | 130 | 59     | 102 | 51     | 88  | 41   | 70  | 43     | 63  |
|                                  | 316 (2)                           | 9,725                                                   | 139  | 181 | 110  | 143 | 87   | 149 | 68     | 117 | 59     | 101 | 47   | 80  | 50     | 73  |
| 427°                             | 304                               | 5,760                                                   | 82   | 107 | 65   | 84  | 51   | 88  | 40     | 69  | 35     | 60  | 28   | 47  | 29     | 43  |
|                                  | 321-347                           | 8,370                                                   | 119  | 156 | 94   | 122 | 75   | 129 | 58     | 100 | 51     | 87  | 40   | 69  | 43     | 63  |
|                                  | 316 (2)                           | 9,655                                                   | 138  | 179 | 109  | 141 | 86   | 148 | 68     | 116 | 59     | 101 | 47   | 80  | 49     | 72  |
| 454°                             | 304                               | 5,590                                                   | 137  | 104 | 63   | 81  | 50   | 86  | 39     | 67  | 34     | 58  | 27   | 46  | 28     | 42  |
|                                  | 321-347                           | 8,230                                                   | 118  | 153 | 93   | 120 | 73   | 126 | 57     | 99  | 50     | 86  | 40   | 68  | 42     | 62  |
|                                  | 316 (2)                           | 9,485                                                   | 136  | 176 | 107  | 138 | 85   | 146 | 66     | 114 | 58     | 99  | 46   | 76  | 49     | 71  |
| 482°                             | 304                               | 5,420                                                   | 77   | 101 | 61   | 79  | 48   | 83  | 38     | 65  | 33     | 56  | 26   | 45  | 28     | 40  |
|                                  | 321-347                           | 8,130                                                   | 116  | 151 | 91   | 119 | 72   | 125 | 57     | 97  | 49     | 85  | 39   | 67  | 42     | 61  |
|                                  | 316 (2)                           | 9,215                                                   | 131  | 171 | 104  | 135 | 82   | 142 | 64     | 111 | 56     | 96  | 45   | 76  | 47     | 69  |
| 510°                             | 304                               | 5,250                                                   | 75   | 97  | 59   | 76  | 47   | 80  | 37     | 63  | 32     | 54  | 25   | 43  | 27     | 39  |
|                                  | 321-347                           | 7,895                                                   | 114  | 150 | 90   | 117 | 71   | 123 | 56     | 96  | 49     | 83  | 39   | 66  | 41     | 60  |
|                                  | 316 (2)                           | 8,675                                                   | 134  | 161 | 98   | 127 | 77   | 133 | 61     | 104 | 53     | 90  | 42   | 72  | 44     | 65  |
| 538°                             | 304                               | 5,080                                                   | 72   | 94  | 57   | 74  | 45   | 78  | 35     | 61  | 31     | 53  | 24   | 42  | 26     | 38  |
|                                  | 321-347                           | 7,790                                                   | 111  | 145 | 88   | 114 | 69   | 120 | 54     | 93  | 47     | 81  | 38   | 64  | 40     | 58  |
|                                  | 316 (2)                           | 8,065                                                   | 115  | 150 | 91   | 118 | 72   | 124 | 56     | 97  | 49     | 84  | 39   | 67  | 41     | 60  |
| 566°                             | 304                               | 4,880                                                   | 70   | 91  | 55   | 71  | 43   | 75  | 34     | 58  | 29     | 51  | 23   | 40  | 25     | 36  |
|                                  | 321-347                           | 7,520                                                   | 107  | 140 | 85   | 110 | 67   | 115 | 53     | 90  | 46     | 78  | 36   | 62  | 38     | 56  |
|                                  | 316 (2)                           | 7,050                                                   | 101  | 131 | 79   | 103 | 63   | 108 | 49     | 84  | 43     | 73  | 34   | 58  | 36     | 53  |
| 593°                             | 304                               | 4,335                                                   | 68   | 91  | 49   | 64  | 39   | 67  | 30     | 52  | 26     | 45  | 21   | 36  | 21     | 32  |
|                                  | 321-347                           | 7,180                                                   | 112  | 150 | 82   | 106 | 64   | 112 | 50     | 87  | 44     | 75  | 35   | 60  | 35     | 54  |
|                                  | 316 (2)                           | 5,995                                                   | 94   | 125 | 68   | 89  | 54   | 93  | 42     | 73  | 37     | 63  | 29   | 50  | 29     | 45  |
| 621°                             | 304                               | 3,320                                                   | 55   | 76  | 38   | 50  | 30   | 53  | 23     | 41  | 20     | 35  | 16   | 28  | 15     | 25  |
|                                  | 321-347                           | 4,605                                                   | 77   | 105 | 53   | 70  | 42   | 74  | 33     | 57  | 28     | 49  | 22   | 39  | 21     | 35  |
|                                  | 316 (2)                           | 4,880                                                   | 81   | 111 | 57   | 74  | 45   | 78  | 35     | 61  | 30     | 52  | 24   | 41  | 23     | 37  |
| 649°(C)                          | 304                               | 2,575                                                   | 43   | 59  | 30   | 39  | 23   | 41  | 18     | 32  | 16     | 27  | 12   | 22  | 12     | 19  |
|                                  | 321-347                           | 2,880                                                   | 48   | 66  | 33   | 44  | 26   | 46  | 20     | 36  | 18     | 31  | 14   | 24  | 13     | 22  |
|                                  | 316 (2)                           | 3,930                                                   | 65   | 90  | 46   | 60  | 36   | 63  | 28     | 49  | 24     | 42  | 19   | 33  | 18     | 30  |
| 677°(C)                          | 304                               | 1,865                                                   | 31   | 42  | 21   | 28  | 17   | 30  | 13     | 23  | 11     | 20  | 9    | 15  | 8      | 14  |
|                                  | 321-347                           | 2,065                                                   | 34   | 47  | 24   | 31  | 19   | 33  | 14     | 25  | 12     | 22  | 10   | 17  | 9      | 16  |
|                                  | 316 (2)                           | 3,050                                                   | 51   | 69  | 35   | 46  | 28   | 49  | 22     | 38  | 19     | 33  | 15   | 26  | 14     | 23  |
| 704°(C)                          | 304                               | 1,420                                                   | 23   | 32  | 16   | 21  | 13   | 23  | 10     | 17  | 8      | 15  | 7    | 12  | 6      | 11  |
|                                  | 321-347                           | 1,560                                                   | 26   | 35  | 18   | 23  | 14   | 25  | 11     | 19  | 9      | 16  | 7    | 13  | 7      | 12  |
|                                  | 316 (2)                           | 2,305                                                   | 38   | 52  | 27   | 35  | 21   | 37  | 16     | 28  | 14     | 24  | 11   | 19  | 10     | 17  |
| 732°(C)                          | 304                               | 1,050                                                   | 17   | 24  | 12   | 16  | 9    | 17  | 7      | 13  | 6      | 11  | 5    | 9   | 5      | 8   |
|                                  | 321-347                           | 1,150                                                   | 19   | 26  | 13   | 17  | 10   | 18  | 8      | 14  | 7      | 12  | 5    | 9   | 5      | 8   |
|                                  | 316 (2)                           | 1,725                                                   | 29   | 39  | 20   | 26  | 15   | 27  | 12     | 21  | 10     | 18  | 8    | 14  | 8      | 13  |
| 760°(C)                          | 304                               | 0,815                                                   | 13   | 18  | 9    | 12  | 7    | 13  | 5      | 10  | 5      | 8   | 4    | 7   | 3      | 6   |
|                                  | 321-347                           | 0,880                                                   | 14   | 20  | 10   | 13  | 8    | 14  | 6      | 11  | 5      | 9   | 4    | 7   | 4      | 6   |
|                                  | 316 (2)                           | 1,355                                                   | 22   | 31  | 15   | 20  | 12   | 21  | 9      | 17  | 8      | 14  | 6    | 11  | 6      | 10  |
| 788°(C)                          | 304                               | 0,575                                                   | 9    | 13  | 6    | 8   | 5    | 9   | 4      | 7   | 3      | 6   | 2    | 4   | 2      | 4   |
|                                  | 321-347                           | 0,675                                                   | 11   | 15  | 7    | 10  | 6    | 11  | 4      | 8   | 4      | 7   | 3    | 5   | 3      | 5   |
|                                  | 316 (2)                           | 1,050                                                   | 17   | 24  | 12   | 16  | 9    | 17  | 7      | 13  | 6      | 11  | 5    | 9   | 5      | 8   |
| 816°(C)                          | 304                               | 0,440                                                   | 7    | 10  | 5    | 6   | 4    | 7   | 3      | 5   | 2      | 4   | 2    | 3   | 2      | 3   |
|                                  | 321-347                           | 0,575                                                   | 9    | 13  | 6    | 8   | 5    | 9   | 4      | 7   | 3      | 6   | 2    | 4   | 2      | 4   |
|                                  | 316 (2)                           | 0,880                                                   | 14   | 20  | 10   | 13  | 8    | 14  | 6      | 11  | 5      | 9   | 4    | 9   | 4      | 6   |

PRESION DE SERVICIO MAXIMO ADMISIBLE SEGUN LOS DIAMETROS NOMINALES EN BAR (1)  
MAXIMUM ADMISSIBLE PRESSURE SERVICE ACCORDING TO THE NOMINAL DIAMETERS IN BAR (1)

| 3"   |     | 3 1/2" |     | 4"   |     | 5"   |     | 6"   |     | 8"   |     | 10"  |     | 12"  |     | 14"  |     | 16"  |     | 18"  |     | 20"  |     | 24"  |     |
|------|-----|--------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| Sch. |     | Sch.   |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     |
| 5S   | 10S | 5S     | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S | 5S   | 10S |
| 45   | 66  | 40     | 58  | 35   | 51  | 37   | 46  | 31   | 38  | 24   | 33  | 23   | 29  | 23   | 27  | 21   | 25  | 19   | 22  | 17   | 20  | 18   | 20  | 17   | 20  |
| 45   | 66  | 40     | 58  | 35   | 51  | 37   | 46  | 31   | 38  | 24   | 33  | 23   | 29  | 23   | 27  | 21   | 25  | 19   | 22  | 17   | 20  | 18   | 20  | 17   | 20  |
| 45   | 66  | 40     | 58  | 35   | 51  | 37   | 46  | 31   | 38  | 24   | 33  | 23   | 29  | 23   | 27  | 21   | 25  | 19   | 22  | 17   | 20  | 18   | 20  | 17   | 20  |
| 40   | 59  | 35     | 51  | 31   | 45  | 33   | 41  | 28   | 34  | 21   | 29  | 21   | 26  | 20   | 24  | 18   | 22  | 17   | 19  | 15   | 17  | 15   | 18  | 15   | 17  |
| 45   | 66  | 40     | 58  | 35   | 51  | 37   | 46  | 31   | 38  | 24   | 33  | 23   | 29  | 23   | 27  | 21   | 25  | 19   | 22  | 17   | 20  | 18   | 20  | 17   | 20  |
| 45   | 66  | 40     | 58  | 35   | 51  | 37   | 46  | 31   | 38  | 24   | 33  | 23   | 29  | 23   | 27  | 21   | 25  | 19   | 22  | 17   | 20  | 18   | 20  | 17   | 20  |
| 36   | 53  | 31     | 46  | 28   | 41  | 30   | 37  | 25   | 31  | 19   | 26  | 19   | 23  | 18   | 21  | 17   | 20  | 15   | 17  | 15   | 15  | 14   | 16  | 13   | 15  |
| 41   | 60  | 36     | 52  | 32   | 46  | 34   | 42  | 28   | 35  | 21   | 29  | 21   | 26  | 21   | 24  | 19   | 22  | 17   | 20  | 15   | 18  | 16   | 18  | 15   | 18  |
| 43   | 63  | 38     | 55  | 33   | 49  | 35   | 44  | 30   | 37  | 23   | 31  | 22   | 28  | 22   | 25  | 20   | 24  | 18   | 21  | 16   | 19  | 17   | 19  | 16   | 19  |
| 33   | 48  | 29     | 42  | 25   | 37  | 27   | 33  | 23   | 28  | 17   | 23  | 17   | 21  | 17   | 19  | 15   | 18  | 14   | 16  | 12   | 14  | 13   | 15  | 12   | 14  |
| 38   | 55  | 33     | 48  | 29   | 43  | 31   | 38  | 26   | 32  | 20   | 27  | 20   | 24  | 19   | 22  | 17   | 21  | 16   | 18  | 14   | 16  | 15   | 17  | 14   | 16  |
| 42   | 62  | 37     | 54  | 33   | 48  | 35   | 43  | 29   | 36  | 22   | 30  | 22   | 27  | 21   | 25  | 19   | 23  | 18   | 21  | 16   | 18  | 16   | 19  | 16   | 18  |
| 30   | 44  | 26     | 38  | 23   | 34  | 25   | 30  | 20   | 25  | 16   | 21  | 15   | 19  | 15   | 18  | 14   | 16  | 13   | 14  | 11   | 13  | 11   | 13  | 11   | 13  |
| 37   | 53  | 32     | 47  | 28   | 41  | 30   | 37  | 25   | 31  | 19   | 26  | 19   | 23  | 18   | 21  | 17   | 20  | 15   | 18  | 14   | 16  | 14   | 16  | 14   | 16  |
| 41   | 60  | 36     | 53  | 32   | 47  | 34   | 42  | 28   | 35  | 22   | 30  | 21   | 26  | 21   | 24  | 19   | 23  | 18   | 20  | 16   | 18  | 16   | 19  | 15   | 18  |
| 28   | 41  | 24     | 35  | 21   | 31  | 23   | 28  | 19   | 24  | 14   | 20  | 14   | 18  | 14   | 16  | 13   | 15  | 12   | 13  | 10   | 12  | 11   | 12  | 10   | 12  |
| 36   | 53  | 31     | 46  | 28   | 41  | 30   | 36  | 25   | 30  | 19   | 26  | 20   | 23  | 18   | 21  | 17   | 20  | 15   | 17  | 13   | 15  | 14   | 16  | 13   | 15  |
| 41   | 60  | 36     | 53  | 32   | 47  | 34   | 42  | 28   | 35  | 22   | 30  | 21   | 26  | 21   | 24  | 19   | 23  | 17   | 20  | 15   | 18  | 16   | 19  | 15   | 18  |
| 27   | 39  | 23     | 34  | 21   | 30  | 22   | 27  | 18   | 23  | 14   | 19  | 14   | 17  | 13   | 16  | 12   | 15  | 11   | 13  | 10   | 11  | 10   | 12  | 10   | 11  |
| 36   | 52  | 31     | 46  | 28   | 40  | 29   | 36  | 25   | 30  | 19   | 26  | 18   | 23  | 18   | 21  | 16   | 20  | 15   | 17  | 13   | 15  | 14   | 16  | 13   | 15  |
| 41   | 60  | 36     | 52  | 32   | 46  | 34   | 42  | 28   | 35  | 22   | 29  | 21   | 26  | 21   | 24  | 19   | 22  | 17   | 20  | 15   | 18  | 16   | 18  | 15   | 18  |
| 26   | 38  | 23     | 33  | 20   | 29  | 21   | 26  | 18   | 22  | 14   | 19  | 13   | 17  | 13   | 15  | 12   | 14  | 11   | 13  | 10   | 11  | 10   | 11  | 10   | 11  |
| 36   | 52  | 31     | 45  | 28   | 40  | 29   | 36  | 24   | 30  | 19   | 26  | 18   | 23  | 18   | 21  | 16   | 19  | 15   | 17  | 13   | 15  | 14   | 16  | 13   | 15  |
| 41   | 60  | 36     | 52  | 32   | 46  | 34   | 42  | 28   | 35  | 21   | 29  | 21   | 26  | 21   | 24  | 19   | 22  | 17   | 20  | 15   | 18  | 16   | 18  | 15   | 18  |
| 25   | 36  | 22     | 32  | 19   | 28  | 20   | 25  | 17   | 21  | 13   | 18  | 13   | 16  | 12   | 14  | 11   | 14  | 10   | 12  | 9    | 11  | 10   | 11  | 9    | 11  |
| 35   | 52  | 31     | 47  | 27   | 40  | 29   | 36  | 24   | 30  | 19   | 25  | 18   | 23  | 18   | 21  | 16   | 19  | 15   | 17  | 13   | 15  | 14   | 16  | 13   | 15  |
| 41   | 59  | 35     | 52  | 31   | 46  | 33   | 41  | 28   | 34  | 21   | 29  | 21   | 26  | 21   | 24  | 19   | 22  | 17   | 20  | 15   | 17  | 16   | 18  | 15   | 17  |
| 24   | 35  | 21     | 31  | 18   | 27  | 20   | 24  | 16   | 20  | 12   | 17  | 12   | 15  | 12   | 14  | 11   | 13  | 10   | 12  | 9    | 10  | 9    | 11  | 9    | 10  |
| 35   | 51  | 30     | 45  | 27   | 39  | 29   | 35  | 24   | 30  | 18   | 25  | 18   | 22  | 18   | 20  | 16   | 19  | 15   | 17  | 13   | 15  | 13   | 16  | 13   | 15  |
| 40   | 59  | 35     | 51  | 31   | 46  | 33   | 41  | 28   | 34  | 21   | 29  | 21   | 26  | 20   | 24  | 19   | 22  | 17   | 20  | 15   | 17  | 16   | 18  | 15   | 17  |
| 23   | 34  | 20     | 30  | 18   | 26  | 19   | 24  | 16   | 20  | 12   | 17  | 12   | 15  | 12   | 14  | 11   | 13  | 10   | 11  | 9    | 10  | 9    | 10  | 9    | 10  |
| 34   | 50  | 30     | 44  | 27   | 39  | 28   | 35  | 24   | 29  | 18   | 25  | 18   | 22  | 17   | 20  | 16   | 19  | 15   | 17  | 13   | 15  | 13   | 15  | 13   | 15  |
| 40   | 58  | 36     | 50  | 31   | 45  | 33   | 40  | 27   | 34  | 21   | 28  | 20   | 25  | 20   | 23  | 18   | 22  | 17   | 19  | 15   | 17  | 15   | 18  | 15   | 17  |
| 22   | 33  | 20     | 29  | 17   | 25  | 18   | 23  | 17   | 19  | 12   | 16  | 11   | 14  | 11   | 13  | 10   | 12  | 9    | 11  | 8    | 10  | 8    | 10  | 8    | 10  |
| 34   | 50  | 30     | 43  | 26   | 38  | 28   | 34  | 23   | 29  | 18   | 24  | 17   | 22  | 17   | 20  | 16   | 19  | 14   | 16  | 13   | 15  | 13   | 15  | 13   | 15  |
| 39   | 56  | 34     | 49  | 30   | 43  | 32   | 39  | 26   | 33  | 20   | 28  | 20   | 25  | 19   | 23  | 18   | 21  | 16   | 19  | 14   | 17  | 15   | 17  | 14   | 17  |
| 22   | 32  | 19     | 28  | 17   | 25  | 18   | 22  | 15   | 18  | 11   | 16  | 11   | 14  | 11   | 13  | 10   | 12  | 9    | 10  | 8    | 9   | 8    | 10  | 8    | 9   |
| 33   | 49  | 29     | 43  | 26   | 38  | 27   | 34  | 23   | 28  | 17   | 24  | 17   | 21  | 17   | 20  | 15   | 18  | 14   | 16  | 12   | 14  | 13   | 15  | 12   | 14  |
| 36   | 53  | 32     | 46  | 28   | 41  | 30   | 37  | 25   | 31  | 19   | 26  | 19   | 23  | 18   | 21  | 17   | 20  | 15   | 18  | 14   | 16  | 14   | 16  | 13   | 16  |
| 21   | 31  | 18     | 27  | 16   | 24  | 17   | 21  | 14   | 18  | 11   | 15  | 11   | 13  | 10   | 12  | 10   | 11  | 9    | 10  | 8    | 9   | 8    | 9   | 8    | 9   |
| 33   | 48  | 28     | 41  | 25   | 37  | 27   | 33  | 22   | 28  | 17   | 23  | 17   | 21  | 16   | 19  | 15   | 18  | 14   | 16  | 12   | 14  | 12   | 15  | 12   | 14  |
| 34   | 49  | 29     | 43  | 26   | 38  | 28   | 34  | 23   | 29  | 18   | 24  | 17   | 21  | 17   | 20  | 15   | 18  | 14   | 16  | 13   | 14  | 13   | 15  | 13   | 14  |
| 20   | 30  | 18     | 26  | 16   | 23  | 17   | 21  | 14   | 17  | 10   | 14  | 10   | 13  | 10   | 12  | 9    | 11  | 8    | 10  | 7    | 9   | 8    | 9   | 7    | 9   |
| 31   | 46  | 27     | 40  | 24   | 35  | 26   | 32  | 22   | 27  | 16   | 22  | 16   | 20  | 16   | 18  | 14   | 17  | 13   | 15  | 12   | 13  | 12   | 14  | 12   | 13  |
| 29   | 43  | 26     | 37  | 23   | 33  | 24   | 30  | 20   | 25  | 15   | 21  | 15   | 19  | 15   | 17  | 13   | 16  | 12   | 14  | 11   | 13  | 11   | 13  | 11   | 13  |
| 18   | 26  | 16     | 23  | 14   | 20  | 15   | 18  | 12   | 15  | 9    | 13  | 9    | 11  | 9    | 10  | 8    | 10  | 7    | 9   | 7    | 8   | 7    | 8   | 7    | 8   |
| 30   | 44  | 26     | 38  | 23   | 34  | 25   | 30  | 21   | 25  | 16   | 21  | 15   | 19  | 15   | 18  | 14   | 17  | 13   | 15  | 11   | 13  | 11   | 13  | 11   | 13  |
| 25   | 37  | 22     | 32  | 19   | 28  | 21   | 25  | 17   | 21  | 13   | 18  | 13   | 16  | 13   | 15  | 11   | 14  | 10   | 12  | 9    | 11  | 10   | 11  | 9    | 11  |
| 14   | 20  | 12     | 18  | 11   | 16  | 11   | 14  | 9    | 12  | 7    | 10  | 7    | 9   | 7    | 8   | 6    | 8   | 6    | 7   | 5    | 6   | 5    | 6   | 5    | 6   |
| 19   | 28  | 17     | 25  | 15   | 22  | 16   | 20  | 13   | 16  | 10   | 14  | 10   | 12  | 10   | 11  | 9    | 11  | 8    | 9   | 7    | 8   | 7    | 9   | 7    | 8   |
| 21   | 30  | 18     | 26  | 16   | 23  | 17   | 21  | 14   | 17  | 11   | 14  | 10   | 13  | 10   | 12  | 9    | 11  | 9    | 10  | 8    | 9   | 8    | 9   | 7    | 9   |
| 11   | 16  | 9      | 14  | 8    | 12  | 9    | 11  | 7    | 9   | 5    | 7   | 5    | 7   | 5    | 6   | 5    | 6   | 4    | 5   | 4    | 4   | 4    | 5   | 4    | 4   |
| 12   | 18  | 10     | 15  | 9    | 14  | 10   | 12  | 8    | 10  | 6    | 8   | 6    | 8   |      |     |      |     |      |     |      |     |      |     |      |     |

| Temperatura<br>Temperature<br>C° | (B)<br>Variedades<br>Type<br>AISI | (A)<br>Limite Max. trabajo<br>Max. Work. Limit<br>h/bar | 1/2"              |                   | 3/4"              |                   | 1"                |                   | 1 1/4"            |                   | 1 1/2"            |                   | 2"                |                   | 2 1/2"            |                   |
|----------------------------------|-----------------------------------|---------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                  |                                   |                                                         | Sch.              |                   | Sch.              |                   | Sch.              |                   | Sch.              |                   | Sch.              |                   | Sch.              |                   | Sch.              |                   |
|                                  |                                   |                                                         | 40S               | 80S               | 40S               | 80S               | 40S               | 80S               | 40S               | 80S               | 40S               | 80S               | 40S               | 80S               | 40S               | 80S               |
| -29° a + 38°<br>-29° to +38°     | 304<br>321-347<br>316 (2)         | 12,705<br>12,705<br>12,705                              | 318<br>318<br>318 | 443<br>443<br>443 | 259<br>259<br>259 | 362<br>362<br>362 | 242<br>242<br>242 | 334<br>334<br>334 | 200<br>200<br>200 | 277<br>277<br>277 | 179<br>179<br>179 | 252<br>252<br>252 | 151<br>151<br>151 | 218<br>218<br>218 | 165<br>165<br>165 | 228<br>228<br>228 |
| 93°                              | 304<br>321-347<br>316 (2)         | 11,280<br>12,705<br>12,705                              | 282<br>318<br>318 | 394<br>443<br>443 | 230<br>259<br>259 | 322<br>362<br>362 | 215<br>242<br>242 | 297<br>334<br>334 | 177<br>200<br>200 | 246<br>277<br>277 | 158<br>179<br>179 | 224<br>252<br>252 | 134<br>151<br>151 | 193<br>218<br>218 | 146<br>165<br>165 | 203<br>228<br>228 |
| 149°                             | 304<br>321-347<br>316 (2)         | 10,165<br>11,520<br>12,130                              | 254<br>288<br>303 | 355<br>402<br>423 | 207<br>235<br>247 | 290<br>329<br>346 | 193<br>219<br>231 | 267<br>303<br>319 | 159<br>180<br>190 | 222<br>252<br>265 | 143<br>162<br>170 | 202<br>228<br>241 | 120<br>137<br>144 | 174<br>198<br>208 | 132<br>150<br>157 | 203<br>207<br>218 |
| 204°                             | 304<br>321-347<br>316 (2)         | 9,250<br>10,705<br>11,860                               | 231<br>268<br>297 | 323<br>373<br>414 | 188<br>218<br>242 | 264<br>305<br>338 | 176<br>204<br>226 | 243<br>282<br>312 | 145<br>168<br>186 | 202<br>234<br>259 | 130<br>150<br>167 | 183<br>212<br>235 | 110<br>127<br>141 | 159<br>184<br>203 | 120<br>139<br>154 | 166<br>192<br>213 |
| 260°                             | 304<br>321-347<br>316 (2)         | 8,470<br>10,300<br>11,655                               | 212<br>257<br>291 | 295<br>359<br>407 | 173<br>210<br>238 | 241<br>294<br>332 | 161<br>196<br>222 | 223<br>271<br>307 | 132<br>161<br>182 | 185<br>225<br>225 | 119<br>145<br>164 | 168<br>204<br>231 | 100<br>122<br>138 | 145<br>177<br>200 | 110<br>134<br>151 | 152<br>185<br>210 |
| 316°                             | 304<br>321-347<br>316 (2)         | 7,860<br>10,095<br>11,585                               | 196<br>252<br>290 | 274<br>352<br>404 | 160<br>206<br>236 | 224<br>288<br>330 | 149<br>192<br>220 | 207<br>266<br>305 | 123<br>150<br>181 | 172<br>220<br>253 | 110<br>142<br>163 | 156<br>200<br>230 | 93<br>120<br>127  | 135<br>173<br>199 | 102<br>131<br>150 | 141<br>181<br>208 |
| 343°                             | 304<br>321-347<br>316 (2)         | 7,590<br>10,060<br>11,555                               | 190<br>251<br>289 | 265<br>351<br>403 | 155<br>205<br>236 | 216<br>287<br>330 | 144<br>191<br>220 | 200<br>265<br>304 | 119<br>157<br>181 | 166<br>220<br>252 | 107<br>141<br>162 | 150<br>199<br>229 | 90<br>119<br>137  | 130<br>172<br>198 | 98<br>131<br>150  | 136<br>181<br>208 |
| 371°                             | 304<br>321-347<br>316 (2)         | 7,320<br>10,030<br>11,520                               | 183<br>251<br>288 | 255<br>350<br>402 | 149<br>204<br>235 | 209<br>286<br>329 | 139<br>191<br>219 | 193<br>264<br>303 | 114<br>157<br>180 | 160<br>219<br>252 | 99<br>140<br>161  | 145<br>199<br>228 | 87<br>119<br>137  | 125<br>172<br>198 | 95<br>130<br>150  | 131<br>180<br>207 |
| 399°                             | 304<br>321-347<br>316 (2)         | 7,050<br>9,960<br>11,450                                | 176<br>249<br>286 | 246<br>347<br>400 | 144<br>203<br>233 | 201<br>284<br>327 | 134<br>189<br>218 | 185<br>262<br>301 | 110<br>156<br>179 | 154<br>217<br>250 | 95<br>138<br>159  | 140<br>197<br>227 | 83<br>118<br>136  | 121<br>171<br>196 | 91<br>129<br>149  | 127<br>179<br>206 |
| 427°                             | 304<br>321-347<br>316 (2)         | 6,775<br>9,860<br>11,350                                | 169<br>246<br>284 | 236<br>344<br>396 | 138<br>201<br>231 | 193<br>281<br>324 | 129<br>188<br>216 | 178<br>259<br>299 | 106<br>154<br>178 | 148<br>215<br>248 | 92<br>136<br>157  | 134<br>196<br>225 | 80<br>117<br>135  | 116<br>169<br>195 | 88<br>128<br>157  | 122<br>177<br>204 |
| 454°                             | 304<br>321-347<br>316 (2)         | 6,570<br>9,690<br>11,180                                | 164<br>242<br>280 | 229<br>338<br>390 | 134<br>197<br>228 | 187<br>276<br>319 | 125<br>184<br>213 | 173<br>255<br>294 | 103<br>152<br>175 | 143<br>212<br>244 | 89<br>134<br>152  | 130<br>192<br>222 | 78<br>115<br>132  | 112<br>166<br>192 | 85<br>126<br>145  | 118<br>174<br>201 |
| 482°                             | 304<br>321-347<br>316 (2)         | 6,370<br>9,555<br>10,840                                | 159<br>239<br>271 | 222<br>333<br>378 | 130<br>195<br>221 | 181<br>272<br>309 | 121<br>182<br>206 | 167<br>251<br>285 | 100<br>150<br>170 | 139<br>209<br>237 | 86<br>132<br>144  | 126<br>189<br>215 | 75<br>113<br>128  | 109<br>164<br>186 | 82<br>124<br>141  | 114<br>172<br>195 |
| 510°                             | 304<br>321-347<br>316 (2)         | 9,165<br>9,385<br>10,230                                | 154<br>235<br>256 | 215<br>327<br>357 | 125<br>191<br>208 | 176<br>268<br>292 | 117<br>178<br>195 | 162<br>247<br>269 | 96<br>147<br>170  | 134<br>205<br>223 | 84<br>128<br>133  | 122<br>186<br>203 | 73<br>111<br>121  | 106<br>161<br>175 | 80<br>122<br>133  | 111<br>169<br>184 |
| 538°                             | 304<br>321-347<br>316 (2)         | 5,960<br>9,150<br>9,485                                 | 149<br>229<br>237 | 208<br>319<br>331 | 121<br>186<br>193 | 170<br>261<br>270 | 113<br>174<br>180 | 157<br>241<br>250 | 93<br>143<br>148  | 130<br>200<br>207 | 81<br>125<br>116  | 118<br>181<br>188 | 70<br>108<br>112  | 102<br>157<br>163 | 77<br>119<br>123  | 107<br>164<br>170 |
| 566°                             | 304<br>321-347<br>316 (2)         | 5,760<br>8,875<br>8,265                                 | 144<br>222<br>207 | 201<br>310<br>288 | 117<br>181<br>168 | 164<br>253<br>236 | 109<br>169<br>157 | 151<br>233<br>217 | 90<br>139<br>129  | 126<br>194<br>180 | 72<br>121<br>100  | 114<br>176<br>164 | 68<br>105<br>98   | 99<br>152<br>142  | 75<br>115<br>107  | 103<br>159<br>149 |
| 593°                             | 304<br>321-347<br>316 (2)         | 5,080<br>8,470<br>7,050                                 | 130<br>217<br>181 | 183<br>306<br>255 | 105<br>176<br>147 | 149<br>249<br>207 | 98<br>164<br>137  | 137<br>229<br>190 | 81<br>135<br>112  | 113<br>189<br>157 | 57<br>79<br>84    | 103<br>171<br>143 | 61<br>101<br>84   | 88<br>148<br>123  | 67<br>111<br>93   | 93<br>155<br>129  |
| 621°                             | 304<br>321-347<br>316 (2)         | 3,850<br>5,420<br>5,760                                 | 105<br>146<br>156 | 152<br>211<br>224 | 84<br>117<br>125  | 121<br>169<br>179 | 78<br>109<br>116  | 111<br>155<br>164 | 64<br>89<br>94    | 91<br>126<br>134  | 49<br>114<br>67   | 82<br>114<br>121  | 48<br>66<br>71    | 70<br>78<br>104   | 52<br>73<br>78    | 74<br>103<br>109  |
| 649°(C)                          | 304<br>321-347<br>316 (2)         | 3,050<br>3,390<br>4,610                                 | 82<br>91<br>124   | 119<br>132<br>179 | 66<br>73<br>100   | 95<br>105<br>144  | 61<br>68<br>93    | 87<br>97<br>132   | 50<br>55<br>76    | 71<br>79<br>107   | 32<br>35<br>52    | 64<br>71<br>97    | 37<br>41<br>56    | 55<br>61<br>83    | 41<br>46<br>62    | 58<br>64<br>87    |
| 677°(C)                          | 304<br>321-347<br>316 (2)         | 2,200<br>2,440<br>3,590                                 | 59<br>66<br>97    | 85<br>95<br>140   | 47<br>53<br>78    | 68<br>76<br>112   | 44<br>49<br>72    | 63<br>69<br>102   | 36<br>40<br>59    | 51<br>57<br>84    | 24<br>27<br>39    | 46<br>51<br>75    | 27<br>30<br>44    | 39<br>44<br>65    | 29<br>33<br>49    | 41<br>46<br>68    |
| 704°(C)                          | 304<br>321-347<br>316 (2)         | 1,660<br>1,830<br>2,710                                 | 45<br>49<br>73    | 64<br>71<br>105   | 36<br>39<br>59    | 51<br>57<br>84    | 33<br>37<br>54    | 47<br>52<br>77    | 27<br>30<br>44    | 38<br>42<br>63    | 18<br>20<br>29    | 35<br>38<br>57    | 20<br>22<br>33    | 30<br>33<br>49    | 22<br>24<br>36    | 31<br>34<br>51    |
| 732°(C)                          | 304<br>321-347<br>316 (2)         | 1,220<br>1,355<br>2,030                                 | 33<br>36<br>55    | 47<br>52<br>79    | 26<br>29<br>44    | 38<br>42<br>63    | 24<br>27<br>41    | 35<br>38<br>58    | 20<br>22<br>33    | 28<br>31<br>47    | 14<br>15<br>23    | 25<br>28<br>42    | 15<br>16<br>25    | 22<br>24<br>36    | 16<br>18<br>27    | 23<br>25<br>38    |
| 760°(C)                          | 304<br>321-347<br>316 (2)         | 0,950<br>1,050<br>1,590                                 | 25<br>28<br>43    | 37<br>41<br>62    | 20<br>22<br>34    | 29<br>32<br>49    | 19<br>21<br>32    | 27<br>30<br>45    | 15<br>17<br>26    | 22<br>24<br>37    | 14<br>15<br>23    | 20<br>22<br>33    | 11<br>13<br>19    | 17<br>19<br>28    | 12<br>14<br>21    | 18<br>20<br>30    |
| 788°(C)                          | 304<br>321-347<br>316 (2)         | 0,675<br>0,815<br>1,255                                 | 18<br>22<br>34    | 26<br>31<br>49    | 14<br>17<br>27    | 21<br>25<br>39    | 13<br>16<br>25    | 19<br>23<br>36    | 11<br>13<br>20    | 15<br>19<br>29    | 10<br>12<br>18    | 14<br>17<br>26    | 8<br>10<br>15     | 12<br>14<br>22    | 9<br>11<br>17     | 12<br>15<br>24    |
| 816°(C)                          | 304<br>321-347<br>316 (2)         | 0,510<br>0,675<br>1,010                                 | 13<br>18<br>27    | 19<br>26<br>39    | 11<br>14<br>22    | 16<br>21<br>31    | 10<br>13<br>20    | 14<br>19<br>29    | 8<br>11<br>16     | 12<br>15<br>23    | 7<br>10<br>14     | 10<br>14<br>21    | 6<br>8<br>12      | 9<br>12<br>18     | 7<br>9<br>13      | 9<br>12<br>19     |

PRESION DE SERVICIO MAXIMO ADMISIBLE SEGUN LOS DIAMETROS NOMINALES EN BAR (1)  
MAXIMUM ADMISSIBLE PRESSURE SERVICE ACCORDING TO THE NOMINAL DIAMETERS IN BAR (1)

| 3"   |     | 3 1/2" |     | 4"   |     | 5"   |     | 6"   |     | 8"   |     | 10"  |     | 12"  |     | 14"  |     | 16"  |     | 18"  |     | 20"  |     | 24"  |     |
|------|-----|--------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| Sch. |     | Sch.   |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     |
| 40S  | 80S | 40S    | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S | 40S  | 80S |
| 143  | 202 | 130    | 187 | 121  | 175 | 106  | 157 | 96   | 151 | 85   | 134 | 77   | 107 | 66   | 89  | 60   | 81  | 53   | 71  | 47   | 63  | 42   | 56  | 35   | 47  |
| 143  | 202 | 130    | 187 | 121  | 175 | 106  | 157 | 96   | 151 | 85   | 134 | 77   | 107 | 66   | 89  | 60   | 81  | 53   | 71  | 47   | 63  | 42   | 56  | 35   | 47  |
| 143  | 202 | 130    | 187 | 121  | 175 | 106  | 157 | 96   | 151 | 85   | 134 | 77   | 107 | 66   | 89  | 60   | 81  | 53   | 71  | 47   | 63  | 42   | 56  | 35   | 47  |
| 127  | 180 | 116    | 166 | 108  | 156 | 94   | 139 | 86   | 134 | 75   | 119 | 67   | 95  | 59   | 79  | 54   | 72  | 47   | 63  | 41   | 56  | 37   | 50  | 31   | 41  |
| 143  | 202 | 130    | 187 | 121  | 175 | 106  | 157 | 96   | 151 | 85   | 134 | 77   | 107 | 66   | 89  | 60   | 81  | 53   | 71  | 47   | 63  | 42   | 56  | 35   | 47  |
| 143  | 202 | 130    | 187 | 121  | 175 | 106  | 157 | 96   | 151 | 85   | 134 | 77   | 107 | 66   | 89  | 60   | 81  | 53   | 71  | 47   | 63  | 42   | 56  | 35   | 47  |
| 114  | 162 | 104    | 149 | 97   | 140 | 85   | 126 | 77   | 121 | 68   | 107 | 61   | 85  | 53   | 71  | 48   | 65  | 42   | 56  | 37   | 50  | 33   | 45  | 28   | 37  |
| 130  | 183 | 118    | 169 | 110  | 159 | 96   | 142 | 87   | 137 | 77   | 121 | 70   | 97  | 60   | 81  | 55   | 73  | 48   | 64  | 42   | 57  | 38   | 51  | 31   | 42  |
| 137  | 193 | 124    | 178 | 116  | 167 | 101  | 150 | 92   | 145 | 81   | 128 | 73   | 102 | 63   | 85  | 58   | 77  | 50   | 67  | 40   | 60  | 40   | 54  | 33   | 44  |
| 104  | 147 | 95     | 136 | 88   | 128 | 77   | 114 | 70   | 110 | 62   | 97  | 56   | 77  | 48   | 65  | 44   | 59  | 38   | 51  | 34   | 45  | 30   | 41  | 25   | 34  |
| 121  | 170 | 110    | 157 | 102  | 148 | 89   | 132 | 81   | 128 | 71   | 113 | 65   | 90  | 56   | 75  | 51   | 68  | 44   | 59  | 39   | 53  | 35   | 47  | 29   | 39  |
| 134  | 189 | 122    | 174 | 113  | 164 | 99   | 147 | 90   | 141 | 79   | 125 | 75   | 99  | 62   | 83  | 56   | 76  | 49   | 66  | 43   | 58  | 39   | 52  | 32   | 43  |
| 95   | 135 | 87     | 124 | 81   | 117 | 71   | 105 | 64   | 101 | 56   | 89  | 51   | 71  | 44   | 59  | 40   | 54  | 35   | 47  | 31   | 42  | 28   | 37  | 23   | 31  |
| 116  | 164 | 106    | 151 | 98   | 142 | 86   | 127 | 78   | 123 | 69   | 108 | 62   | 86  | 54   | 72  | 49   | 66  | 43   | 57  | 38   | 51  | 34   | 45  | 28   | 38  |
| 131  | 186 | 119    | 171 | 111  | 161 | 97   | 144 | 88   | 139 | 78   | 123 | 71   | 98  | 61   | 82  | 55   | 74  | 48   | 65  | 43   | 57  | 38   | 51  | 32   | 43  |
| 88   | 125 | 81     | 115 | 75   | 108 | 66   | 97  | 59   | 94  | 52   | 83  | 47   | 66  | 41   | 55  | 37   | 50  | 32   | 44  | 29   | 39  | 26   | 35  | 21   | 29  |
| 114  | 161 | 104    | 148 | 96   | 139 | 84   | 125 | 77   | 120 | 67   | 106 | 61   | 85  | 53   | 71  | 48   | 64  | 42   | 56  | 37   | 50  | 33   | 45  | 28   | 37  |
| 130  | 184 | 119    | 170 | 110  | 160 | 97   | 143 | 88   | 138 | 77   | 122 | 70   | 97  | 61   | 81  | 55   | 74  | 48   | 64  | 42   | 57  | 38   | 51  | 32   | 42  |
| 85   | 121 | 78     | 111 | 72   | 105 | 63   | 94  | 57   | 90  | 51   | 80  | 46   | 63  | 40   | 53  | 36   | 48  | 31   | 42  | 28   | 37  | 25   | 33  | 21   | 28  |
| 113  | 160 | 103    | 148 | 96   | 139 | 84   | 124 | 76   | 120 | 67   | 106 | 61   | 84  | 52   | 71  | 48   | 64  | 42   | 56  | 37   | 49  | 33   | 44  | 27   | 37  |
| 130  | 184 | 119    | 170 | 110  | 159 | 96   | 143 | 88   | 138 | 77   | 122 | 70   | 97  | 60   | 81  | 55   | 74  | 48   | 64  | 42   | 57  | 38   | 51  | 32   | 42  |
| 82   | 116 | 75     | 107 | 70   | 101 | 61   | 90  | 55   | 87  | 49   | 77  | 44   | 61  | 38   | 51  | 35   | 47  | 30   | 41  | 27   | 36  | 24   | 32  | 20   | 27  |
| 113  | 160 | 103    | 147 | 96   | 138 | 84   | 124 | 76   | 119 | 67   | 106 | 61   | 84  | 52   | 70  | 48   | 64  | 41   | 56  | 37   | 49  | 33   | 44  | 27   | 37  |
| 130  | 183 | 118    | 169 | 110  | 159 | 96   | 142 | 87   | 137 | 77   | 121 | 70   | 97  | 60   | 81  | 55   | 73  | 48   | 64  | 42   | 57  | 38   | 51  | 31   | 42  |
| 79   | 112 | 72     | 104 | 67   | 97  | 59   | 87  | 56   | 84  | 47   | 74  | 43   | 59  | 37   | 49  | 33   | 45  | 29   | 39  | 26   | 35  | 23   | 31  | 19   | 26  |
| 112  | 159 | 102    | 146 | 95   | 137 | 83   | 123 | 75   | 119 | 66   | 105 | 60   | 83  | 52   | 70  | 47   | 63  | 41   | 55  | 36   | 49  | 33   | 44  | 27   | 36  |
| 129  | 182 | 117    | 168 | 109  | 158 | 96   | 141 | 87   | 136 | 76   | 121 | 69   | 96  | 60   | 80  | 54   | 73  | 47   | 64  | 42   | 56  | 38   | 51  | 31   | 42  |
| 76   | 108 | 69     | 99  | 64   | 93  | 56   | 84  | 51   | 81  | 45   | 71  | 41   | 57  | 35   | 47  | 32   | 43  | 28   | 37  | 25   | 33  | 22   | 30  | 18   | 25  |
| 111  | 157 | 101    | 145 | 94   | 136 | 82   | 122 | 75   | 117 | 66   | 104 | 60   | 83  | 51   | 69  | 47   | 63  | 41   | 55  | 36   | 48  | 32   | 44  | 27   | 36  |
| 128  | 181 | 116    | 167 | 108  | 157 | 95   | 140 | 86   | 135 | 76   | 120 | 69   | 95  | 59   | 80  | 54   | 72  | 47   | 63  | 42   | 56  | 37   | 50  | 31   | 42  |
| 74   | 104 | 67     | 96  | 62   | 90  | 55   | 81  | 50   | 78  | 44   | 69  | 40   | 55  | 34   | 46  | 31   | 42  | 27   | 36  | 24   | 32  | 21   | 29  | 18   | 24  |
| 109  | 154 | 99     | 142 | 92   | 134 | 81   | 120 | 73   | 115 | 65   | 102 | 59   | 81  | 51   | 68  | 46   | 62  | 40   | 54  | 35   | 48  | 32   | 43  | 26   | 35  |
| 126  | 178 | 115    | 164 | 106  | 154 | 93   | 138 | 85   | 133 | 75   | 118 | 68   | 94  | 58   | 78  | 53   | 71  | 46   | 62  | 41   | 55  | 37   | 49  | 31   | 41  |
| 72   | 101 | 65     | 93  | 61   | 88  | 53   | 79  | 48   | 76  | 42   | 67  | 38   | 53  | 33   | 45  | 30   | 40  | 26   | 35  | 23   | 31  | 21   | 28  | 17   | 23  |
| 108  | 152 | 98     | 140 | 91   | 132 | 80   | 118 | 72   | 114 | 64   | 101 | 58   | 80  | 50   | 67  | 45   | 61  | 39   | 53  | 35   | 47  | 31   | 42  | 26   | 35  |
| 122  | 173 | 111    | 159 | 103  | 150 | 90   | 134 | 82   | 129 | 72   | 114 | 66   | 91  | 57   | 76  | 51   | 69  | 45   | 60  | 40   | 53  | 36   | 48  | 30   | 40  |
| 69   | 98  | 63     | 90  | 59   | 85  | 51   | 76  | 47   | 73  | 41   | 65  | 37   | 51  | 32   | 43  | 29   | 39  | 25   | 34  | 22   | 30  | 20   | 27  | 17   | 22  |
| 106  | 149 | 96     | 138 | 89   | 129 | 78   | 116 | 71   | 112 | 63   | 99  | 57   | 79  | 49   | 66  | 44   | 60  | 39   | 52  | 3    | 46  | 31   | 41  | 26   | 34  |
| 115  | 163 | 105    | 150 | 97   | 141 | 85   | 126 | 78   | 122 | 68   | 108 | 62   | 86  | 53   | 72  | 48   | 65  | 42   | 57  | 37   | 50  | 34   | 45  | 28   | 37  |
| 67   | 95  | 61     | 87  | 57   | 82  | 50   | 73  | 45   | 71  | 40   | 63  | 36   | 50  | 31   | 42  | 28   | 38  | 24   | 33  | 22   | 29  | 19   | 26  | 16   | 22  |
| 103  | 146 | 94     | 134 | 87   | 126 | 76   | 113 | 69   | 109 | 61   | 96  | 55   | 77  | 48   | 64  | 43   | 58  | 38   | 51  | 33   | 45  | 30   | 40  | 25   | 33  |
| 107  | 151 | 97     | 139 | 90   | 131 | 79   | 117 | 72   | 113 | 63   | 100 | 57   | 79  | 49   | 67  | 45   | 60  | 39   | 53  | 35   | 47  | 31   | 42  | 26   | 35  |
| 65   | 92  | 59     | 84  | 55   | 79  | 48   | 71  | 43   | 68  | 38   | 60  | 35   | 48  | 30   | 40  | 27   | 37  | 24   | 32  | 21   | 28  | 19   | 25  | 16   | 21  |
| 100  | 141 | 91     | 130 | 85   | 122 | 74   | 110 | 67   | 106 | 59   | 93  | 54   | 74  | 46   | 62  | 42   | 56  | 37   | 49  | 32   | 44  | 29   | 39  | 24   | 32  |
| 93   | 131 | 85     | 121 | 79   | 114 | 69   | 102 | 63   | 98  | 55   | 87  | 50   | 69  | 43   | 58  | 39   | 53  | 34   | 46  | 30   | 41  | 27   | 36  | 22   | 30  |
| 58   | 82  | 52     | 76  | 49   | 71  | 43   | 63  | 39   | 61  | 34   | 54  | 31   | 43  | 26   | 36  | 24   | 32  | 21   | 28  | 19   | 25  | 17   | 22  | 14   | 18  |
| 96   | 137 | 88     | 126 | 81   | 118 | 71   | 106 | 65   | 102 | 57   | 90  | 51   | 71  | 44   | 60  | 40   | 54  | 35   | 47  | 31   | 42  | 28   | 37  | 23   | 31  |
| 80   | 114 | 73     | 105 | 68   | 98  | 59   | 88  | 54   | 85  | 47   | 75  | 43   | 59  | 37   | 50  | 33   | 45  | 29   | 39  | 26   | 35  | 23   | 31  | 19   | 26  |
| 45   | 65  | 41     | 60  | 38   | 56  | 33   | 50  | 30   | 48  | 26   | 42  | 24   | 33  | 20   | 28  | 18   | 25  | 16   | 22  | 14   | 19  | 13   | 17  | 10   | 14  |
| 63   | 90  | 57     | 83  | 53   | 78  | 46   | 69  | 42   | 67  | 37   | 59  | 33   | 46  | 29   | 39  | 26   | 35  | 22   | 30  | 20   | 27  | 18   |     |      |     |

| Temperatura<br>Temperature | (B)<br>Variedades<br>Type | (A)<br>Limite Max. trabajo<br>Max. Work. Limit | 1/2" |      | 3/4" |     | 1"   |     | 1 1/4" |     | 1 1/2" |     | 2"   |     |
|----------------------------|---------------------------|------------------------------------------------|------|------|------|-----|------|-----|--------|-----|--------|-----|------|-----|
|                            |                           |                                                | Sch. |      | Sch. |     | Sch. |     | Sch.   |     | Sch.   |     | Sch. |     |
|                            |                           |                                                | 160  | XXS  | 160  | XXS | 160  | XXS | 160    | XXS | 160    | XXS | 160  | XXS |
| C°                         | AISI                      | h/bar                                          | 160  | XXS  | 160  | XXS | 160  | XXS | 160    | XXS | 160    | XXS | 160  | XXS |
| -29° a +38°                | 304                       | 12,705                                         | 587  | 1033 | 539  | 819 | 487  | 748 | 374    | 609 | 366    | 551 | 356  | 469 |
|                            | 321-347                   | 12,705                                         | 587  | 1033 | 539  | 819 | 487  | 748 | 374    | 609 | 366    | 551 | 356  | 469 |
| -29° to +38°               | 316 (2)                   | 12,705                                         | 587  | 1033 | 539  | 819 | 487  | 748 | 374    | 609 | 366    | 551 | 356  | 469 |
|                            | 304                       | 11,280                                         | 521  | 917  | 479  | 727 | 433  | 664 | 332    | 540 | 325    | 489 | 316  | 417 |
| 93°                        | 321-347                   | 12,705                                         | 587  | 1033 | 539  | 819 | 487  | 748 | 374    | 609 | 366    | 551 | 356  | 469 |
|                            | 316 (2)                   | 12,705                                         | 587  | 1033 | 539  | 819 | 487  | 748 | 374    | 609 | 366    | 551 | 356  | 469 |
|                            | 304                       | 10,165                                         | 470  | 826  | 431  | 655 | 390  | 598 | 299    | 487 | 293    | 440 | 285  | 375 |
| 149°                       | 321-347                   | 11,520                                         | 532  | 937  | 489  | 742 | 442  | 678 | 339    | 552 | 332    | 499 | 323  | 426 |
|                            | 316 (2)                   | 12,130                                         | 561  | 986  | 515  | 782 | 465  | 714 | 357    | 581 | 350    | 526 | 340  | 448 |
|                            | 304                       | 9,250                                          | 427  | 752  | 393  | 596 | 355  | 545 | 272    | 443 | 267    | 401 | 259  | 342 |
| 204°                       | 321-347                   | 10,705                                         | 495  | 870  | 454  | 690 | 410  | 630 | 315    | 513 | 308    | 464 | 300  | 395 |
|                            | 316 (2)                   | 11,860                                         | 548  | 964  | 503  | 764 | 455  | 698 | 349    | 568 | 342    | 514 | 333  | 438 |
|                            | 304                       | 8,470                                          | 391  | 689  | 359  | 546 | 325  | 499 | 249    | 406 | 244    | 367 | 237  | 313 |
| 260°                       | 321-347                   | 10,300                                         | 476  | 837  | 437  | 664 | 395  | 606 | 303    | 493 | 297    | 446 | 289  | 380 |
|                            | 316 (2)                   | 11,655                                         | 539  | 948  | 495  | 751 | 447  | 686 | 343    | 558 | 336    | 505 | 327  | 431 |
|                            | 304                       | 7,860                                          | 363  | 639  | 334  | 506 | 301  | 463 | 231    | 376 | 226    | 340 | 220  | 290 |
| 316°                       | 321-347                   | 10,095                                         | 466  | 821  | 428  | 650 | 387  | 594 | 297    | 484 | 291    | 437 | 283  | 373 |
|                            | 316 (2)                   | 11,585                                         | 535  | 942  | 492  | 747 | 444  | 682 | 341    | 555 | 334    | 502 | 325  | 428 |
|                            | 304                       | 7,590                                          | 351  | 617  | 322  | 489 | 291  | 447 | 223    | 363 | 219    | 329 | 213  | 280 |
| 343°                       | 321-347                   | 10,060                                         | 465  | 818  | 427  | 648 | 386  | 592 | 296    | 482 | 290    | 436 | 282  | 372 |
|                            | 316 (2)                   | 11,555                                         | 534  | 940  | 490  | 745 | 443  | 680 | 340    | 554 | 333    | 501 | 324  | 427 |
|                            | 304                       | 7,320                                          | 338  | 595  | 311  | 472 | 281  | 431 | 215    | 351 | 211    | 317 | 205  | 270 |
| 371°                       | 321-347                   | 10,030                                         | 463  | 815  | 426  | 646 | 385  | 591 | 295    | 480 | 289    | 435 | 281  | 370 |
|                            | 316 (2)                   | 11,520                                         | 532  | 937  | 489  | 742 | 442  | 678 | 339    | 552 | 332    | 499 | 323  | 426 |
|                            | 304                       | 7,050                                          | 326  | 573  | 299  | 454 | 270  | 415 | 207    | 338 | 203    | 305 | 198  | 260 |
| 399°                       | 321-347                   | 9,960                                          | 460  | 810  | 423  | 642 | 382  | 586 | 293    | 477 | 287    | 432 | 279  | 368 |
|                            | 316 (2)                   | 11,450                                         | 529  | 931  | 486  | 738 | 439  | 674 | 337    | 548 | 330    | 496 | 321  | 423 |
|                            | 304                       | 6,775                                          | 313  | 551  | 287  | 436 | 260  | 399 | 199    | 324 | 195    | 293 | 190  | 250 |
| 427°                       | 321-347                   | 9,860                                          | 456  | 802  | 418  | 635 | 378  | 581 | 290    | 472 | 284    | 427 | 277  | 364 |
|                            | 316 (2)                   | 11,350                                         | 524  | 923  | 482  | 731 | 435  | 668 | 334    | 544 | 327    | 492 | 318  | 419 |
|                            | 304                       | 6,570                                          | 303  | 534  | 279  | 423 | 252  | 387 | 193    | 315 | 189    | 285 | 184  | 243 |
| 454°                       | 321-347                   | 9,690                                          | 448  | 788  | 411  | 624 | 371  | 570 | 285    | 464 | 279    | 420 | 272  | 358 |
|                            | 316 (2)                   | 11,180                                         | 517  | 909  | 475  | 720 | 429  | 658 | 329    | 536 | 322    | 484 | 314  | 413 |
|                            | 304                       | 6,370                                          | 294  | 518  | 270  | 410 | 244  | 375 | 187    | 305 | 183    | 276 | 179  | 235 |
| 482°                       | 321-347                   | 9,555                                          | 441  | 777  | 406  | 616 | 366  | 563 | 281    | 458 | 275    | 414 | 268  | 353 |
|                            | 316 (2)                   | 10,840                                         | 501  | 881  | 460  | 698 | 416  | 638 | 319    | 519 | 312    | 470 | 304  | 400 |
|                            | 304                       | 6,165                                          | 285  | 501  | 261  | 397 | 236  | 363 | 181    | 295 | 177    | 267 | 173  | 227 |
| 510°                       | 321-347                   | 9,385                                          | 434  | 763  | 398  | 605 | 360  | 553 | 276    | 450 | 270    | 407 | 263  | 347 |
|                            | 316 (2)                   | 10,230                                         | 473  | 832  | 434  | 659 | 392  | 602 | 301    | 490 | 295    | 443 | 287  | 378 |
|                            | 304                       | 5,960                                          | 275  | 484  | 253  | 384 | 228  | 351 | 175    | 285 | 172    | 258 | 167  | 220 |
| 538°                       | 321-347                   | 9,150                                          | 423  | 744  | 388  | 590 | 351  | 539 | 269    | 438 | 264    | 396 | 257  | 338 |
|                            | 316 (2)                   | 9,485                                          | 438  | 771  | 403  | 611 | 364  | 558 | 279    | 454 | 273    | 411 | 266  | 350 |
|                            | 304                       | 5,760                                          | 266  | 468  | 244  | 371 | 221  | 339 | 169    | 276 | 166    | 249 | 161  | 213 |
| 566°                       | 321-347                   | 8,875                                          | 410  | 721  | 377  | 572 | 340  | 522 | 261    | 425 | 256    | 384 | 249  | 328 |
|                            | 316 (2)                   | 8,265                                          | 382  | 672  | 351  | 532 | 317  | 487 | 243    | 396 | 238    | 358 | 232  | 305 |
|                            | 304                       | 5,080                                          | 246  | 449  | 225  | 350 | 202  | 318 | 154    | 255 | 151    | 230 | 146  | 195 |
| 593°                       | 321-347                   | 8,470                                          | 410  | 750  | 375  | 583 | 338  | 530 | 256    | 426 | 251    | 384 | 244  | 325 |
|                            | 316 (2)                   | 7,050                                          | 341  | 624  | 312  | 485 | 281  | 441 | 213    | 355 | 209    | 319 | 203  | 270 |
|                            | 304                       | 3,895                                          | 209  | 419  | 189  | 311 | 169  | 278 | 125    | 218 | 123    | 194 | 119  | 162 |
| 621°                       | 321-347                   | 5,420                                          | 291  | 583  | 263  | 433 | 235  | 387 | 175    | 303 | 171    | 270 | 166  | 225 |
|                            | 316 (2)                   | 5,760                                          | 309  | 619  | 280  | 460 | 249  | 412 | 186    | 322 | 182    | 287 | 176  | 239 |
|                            | 304                       | 3,050                                          | 163  | 328  | 148  | 243 | 132  | 218 | 98     | 170 | 96     | 152 | 93   | 126 |
| 649° (C)                   | 321-347                   | 3,390                                          | 182  | 364  | 165  | 271 | 147  | 242 | 109    | 189 | 107    | 169 | 104  | 141 |
|                            | 316 (2)                   | 4,610                                          | 247  | 496  | 224  | 368 | 200  | 330 | 148    | 258 | 145    | 229 | 141  | 191 |
|                            | 304                       | 2,200                                          | 118  | 236  | 107  | 175 | 95   | 157 | 71     | 123 | 69     | 109 | 67   | 91  |
| 677° (C)                   | 321-347                   | 2,440                                          | 131  | 262  | 118  | 195 | 105  | 174 | 78     | 136 | 77     | 121 | 74   | 101 |
|                            | 316 (2)                   | 3,590                                          | 192  | 386  | 174  | 287 | 155  | 257 | 115    | 201 | 113    | 179 | 110  | 149 |
|                            | 304                       | 1,660                                          | 89   | 178  | 80   | 132 | 72   | 118 | 53     | 93  | 52     | 82  | 51   | 69  |
| 704° (C)                   | 321-347                   | 1,830                                          | 98   | 197  | 89   | 146 | 79   | 131 | 59     | 102 | 57     | 91  | 56   | 76  |
|                            | 316 (2)                   | 2,710                                          | 145  | 291  | 132  | 216 | 117  | 194 | 87     | 151 | 85     | 135 | 83   | 112 |
|                            | 304                       | 1,220                                          | 65   | 131  | 59   | 97  | 53   | 87  | 39     | 68  | 38     | 60  | 37   | 50  |
| 732° (C)                   | 321-347                   | 1,355                                          | 72   | 145  | 66   | 108 | 58   | 97  | 43     | 75  | 42     | 67  | 41   | 56  |
|                            | 316 (2)                   | 2,030                                          | 109  | 218  | 98   | 162 | 88   | 145 | 65     | 113 | 64     | 101 | 62   | 84  |
|                            | 304                       | 0,950                                          | 51   | 102  | 46   | 76  | 41   | 68  | 30     | 53  | 30     | 47  | 29   | 39  |
| 760° (C)                   | 321-347                   | 1,050                                          | 56   | 113  | 51   | 84  | 45   | 75  | 33     | 58  | 33     | 52  | 32   | 43  |
|                            | 316 (2)                   | 1,590                                          | 85   | 171  | 77   | 127 | 69   | 113 | 51     | 89  | 50     | 79  | 48   | 66  |
|                            | 304                       | 0,675                                          | 36   | 72   | 32   | 54  | 29   | 48  | 21     | 37  | 21     | 33  | 20   | 28  |
| 788° (C)                   | 321-347                   | 0,815                                          | 43   | 87   | 39   | 65  | 35   | 58  | 26     | 45  | 25     | 40  | 25   | 33  |
|                            | 316 (2)                   | 1,255                                          | 67   | 135  | 61   | 100 | 54   | 89  | 40     | 70  | 39     | 62  | 38   | 52  |
|                            | 304                       | 0,510                                          | 27   | 54   | 24   | 40  | 22   | 36  | 16     | 28  | 16     | 25  | 15   | 21  |
| 816° (C)                   | 321-347                   | 0,675                                          | 36   | 72   | 32   | 54  | 29   | 48  | 21     | 37  | 21     | 33  | 21   | 28  |
|                            | 316 (2)                   | 1,010                                          | 54   | 108  | 49   | 80  | 43   | 72  | 32     | 56  | 31     | 50  | 31   | 42  |

PRESION DE SERVICIO MAXIMO ADMISIBLE SEGUN LOS DIAMETROS NOMINALES EN BAR (1)  
 MAXIMUM ADMISSIBLE PRESSURE SERVICE ACCORDING TO THE NOMINAL DIAMETERS IN BAR (1)

| 2 1/2" |     | 3"   |     | 3 1/2" |     | 4"   |     | 5"   |     | 6"   |     | 8"   |     | 10"  |     | 12"  |     |
|--------|-----|------|-----|--------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| Sch.   |     | Sch. |     | Sch.   |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     | Sch. |     |
| 160    | XXS | 160  | XXS | 160    | XXS | 160  | XXS | 160  | XXS | 160  | XXS | 160  | XXS | 160  | XXS | 160  | XXS |
| 319    | 492 | 304  | 431 |        | 396 | 286  | 371 | 271  | 331 | 260  | 318 | 252  | 242 | 251  |     | 246  |     |
| 319    | 492 | 304  | 431 |        | 396 | 286  | 371 | 271  | 331 | 260  | 318 | 252  | 242 | 251  |     | 246  |     |
| 319    | 492 | 304  | 431 |        | 396 | 286  | 371 | 271  | 331 | 260  | 318 | 252  | 242 | 251  |     | 246  |     |
| 283    | 437 | 270  | 383 |        | 351 | 254  | 329 | 240  | 293 | 231  | 282 | 223  | 215 | 223  |     | 218  |     |
| 319    | 492 | 304  | 431 |        | 396 | 286  | 371 | 271  | 331 | 260  | 318 | 252  | 242 | 251  |     | 246  |     |
| 319    | 492 | 304  | 431 |        | 396 | 286  | 371 | 271  | 331 | 260  | 318 | 252  | 242 | 251  |     | 246  |     |
| 255    | 394 | 243  | 345 |        | 317 | 229  | 297 | 217  | 264 | 208  | 254 | 201  | 194 | 201  |     | 197  |     |
| 289    | 446 | 275  | 391 |        | 359 | 259  | 336 | 246  | 300 | 235  | 288 | 228  | 219 | 228  |     | 223  |     |
| 304    | 470 | 290  | 412 |        | 378 | 273  | 354 | 259  | 316 | 248  | 304 | 240  | 231 | 240  |     | 235  |     |
| 232    | 358 | 221  | 314 |        | 288 | 208  | 270 | 197  | 241 | 189  | 231 | 183  | 176 | 183  |     | 179  |     |
| 268    | 415 | 256  | 36  |        | 334 | 241  | 313 | 228  | 278 | 219  | 268 | 212  | 204 | 211  |     | 207  |     |
| 297    | 459 | 284  | 403 |        | 370 | 267  | 346 | 253  | 309 | 242  | 297 | 235  | 226 | 234  |     | 229  |     |
| 212    | 328 | 202  | 287 |        | 264 | 190  | 247 | 180  | 220 | 173  | 212 | 168  | 161 | 167  |     | 164  |     |
| 258    | 399 | 246  | 350 |        | 321 | 232  | 301 | 219  | 268 | 210  | 258 | 204  | 196 | 203  |     | 199  |     |
| 292    | 451 | 279  | 396 |        | 363 | 262  | 340 | 248  | 303 | 238  | 292 | 231  | 222 | 230  |     | 226  |     |
| 197    | 304 | 188  | 267 |        | 245 | 177  | 229 | 167  | 204 | 161  | 197 | 155  | 150 | 155  |     | 152  |     |
| 253    | 391 | 241  | 343 |        | 314 | 227  | 295 | 215  | 263 | 206  | 253 | 200  | 192 | 199  |     | 195  |     |
| 291    | 449 | 277  | 393 |        | 361 | 261  | 338 | 247  | 301 | 237  | 290 | 229  | 221 | 229  |     | 224  |     |
| 190    | 294 | 181  | 257 |        | 236 | 171  | 222 | 162  | 197 | 155  | 190 | 150  | 144 | 150  |     | 147  |     |
| 252    | 390 | 240  | 342 |        | 313 | 226  | 294 | 214  | 262 | 206  | 252 | 199  | 192 | 199  |     | 195  |     |
| 290    | 448 | 276  | 392 |        | 360 | 260  | 338 | 246  | 301 | 236  | 289 | 229  | 220 | 228  |     | 224  |     |
| 183    | 283 | 175  | 248 |        | 228 | 165  | 214 | 156  | 190 | 149  | 183 | 145  | 139 | 144  |     | 142  |     |
| 251    | 388 | 240  | 341 |        | 312 | 226  | 293 | 214  | 261 | 205  | 251 | 198  | 191 | 198  |     | 194  |     |
| 289    | 446 | 275  | 391 |        | 359 | 259  | 336 | 246  | 300 | 235  | 288 | 228  | 219 | 228  |     | 223  |     |
| 177    | 273 | 168  | 239 |        | 219 | 158  | 206 | 150  | 183 | 144  | 176 | 139  | 134 | 139  |     | 136  |     |
| 250    | 386 | 238  | 338 |        | 310 | 224  | 291 | 212  | 259 | 204  | 249 | 197  | 190 | 197  |     | 193  |     |
| 287    | 443 | 274  | 389 |        | 357 | 258  | 334 | 244  | 298 | 234  | 286 | 227  | 218 | 226  |     | 222  |     |
| 170    | 262 | 162  | 230 |        | 211 | 152  | 198 | 144  | 176 | 138  | 169 | 134  | 129 | 134  |     | 131  |     |
| 247    | 382 | 236  | 335 |        | 307 | 22   | 288 | 210  | 256 | 201  | 247 | 195  | 188 | 197  |     | 191  |     |
| 285    | 440 | 271  | 385 |        | 354 | 255  | 332 | 242  | 295 | 232  | 284 | 225  | 216 | 224  |     | 222  |     |
| 165    | 254 | 157  | 223 |        | 205 | 148  | 192 | 140  | 171 | 134  | 164 | 130  | 125 | 130  |     | 127  |     |
| 243    | 375 | 232  | 329 |        | 302 | 218  | 283 | 206  | 252 | 198  | 242 | 192  | 185 | 191  |     | 187  |     |
| 280    | 433 | 267  | 380 |        | 348 | 252  | 327 | 238  | 291 | 229  | 280 | 221  | 213 | 221  |     | 216  |     |
| 160    | 247 | 152  | 216 |        | 198 | 143  | 186 | 136  | 166 | 130  | 159 | 126  | 121 | 126  |     | 123  |     |
| 240    | 370 | 228  | 324 |        | 298 | 215  | 279 | 204  | 249 | 195  | 239 | 189  | 182 | 189  |     | 185  |     |
| 272    | 420 | 259  | 368 |        | 338 | 244  | 317 | 231  | 282 | 222  | 271 | 215  | 206 | 214  |     | 210  |     |
| 154    | 239 | 147  | 209 |        | 192 | 139  | 180 | 131  | 160 | 126  | 154 | 122  | 117 | 122  |     | 119  |     |
| 235    | 363 | 224  | 319 |        | 292 | 211  | 274 | 200  | 244 | 192  | 235 | 186  | 179 | 185  |     | 182  |     |
| 257    | 396 | 245  | 347 |        | 319 | 230  | 299 | 218  | 266 | 209  | 256 | 202  | 195 | 202  |     | 198  |     |
| 149    | 231 | 142  | 202 |        | 185 | 134  | 174 | 127  | 155 | 122  | 149 | 118  | 113 | 118  |     | 115  |     |
| 229    | 354 | 219  | 311 |        | 285 | 206  | 267 | 195  | 238 | 187  | 229 | 181  | 174 | 181  |     | 177  |     |
| 238    | 367 | 227  | 322 |        | 295 | 213  | 277 | 202  | 247 | 194  | 237 | 188  | 181 | 187  |     | 183  |     |
| 144    | 223 | 138  | 195 |        | 179 | 129  | 168 | 123  | 150 | 118  | 144 | 114  | 110 | 114  |     | 111  |     |
| 222    | 344 | 212  | 301 |        | 276 | 200  | 259 | 189  | 231 | 181  | 222 | 176  | 169 | 175  |     | 172  |     |
| 207    | 320 | 197  | 281 |        | 257 | 186  | 241 | 176  | 215 | 169  | 207 | 163  | 157 | 163  |     | 160  |     |
| 130    | 204 | 124  | 178 |        | 163 | 117  | 153 | 110  | 135 | 106  | 130 | 102  | 98  | 102  |     | 100  |     |
| 218    | 341 | 207  | 298 |        | 272 | 195  | 255 | 184  | 226 | 177  | 217 | 171  | 164 | 171  |     | 167  |     |
| 181    | 284 | 173  | 248 |        | 227 | 162  | 212 | 153  | 188 | 147  | 181 | 142  | 137 | 142  |     | 139  |     |
| 105    | 170 | 100  | 137 |        | 134 | 94   | 124 | 88   | 104 | 85   | 105 | 82   | 78  | 82   |     | 77   |     |
| 147    | 237 | 139  | 190 |        | 186 | 131  | 173 | 123  | 145 | 118  | 146 | 114  | 109 | 114  |     | 107  |     |
| 156    | 252 | 148  | 202 |        | 198 | 139  | 184 | 131  | 154 | 125  | 156 | 121  | 116 | 121  |     | 113  |     |
| 82     | 133 | 78   | 107 |        | 105 | 73   | 97  | 69   | 81  | 66   | 82  | 64   | 61  | 64   |     | 60   |     |
| 92     | 148 | 87   | 119 |        | 116 | 82   | 108 | 77   | 90  | 74   | 91  | 71   | 68  | 71   |     | 67   |     |
| 125    | 202 | 119  | 162 |        | 158 | 111  | 147 | 105  | 123 | 100  | 124 | 97   | 93  | 97   |     | 91   |     |
| 59     | 96  | 56   | 77  |        | 75  | 53   | 70  | 50   | 58  | 48   | 59  | 46   | 44  | 46   |     | 43   |     |
| 66     | 107 | 63   | 85  |        | 84  | 59   | 78  | 55   | 65  | 53   | 66  | 51   | 49  | 51   |     | 48   |     |
| 97     | 157 | 92   | 126 |        | 123 | 86   | 115 | 81   | 96  | 78   | 97  | 75   | 72  | 75   |     | 71   |     |
| 45     | 72  | 42   | 58  |        | 57  | 40   | 53  | 37   | 44  | 36   | 45  | 35   | 33  | 35   |     | 32   |     |
| 49     | 80  | 47   | 64  |        | 63  | 44   | 58  | 41   | 49  | 40   | 49  | 38   | 37  | 38   |     | 36   |     |
| 33     | 118 | 70   | 95  |        | 93  | 65   | 86  | 61   | 72  | 59   | 73  | 57   | 54  | 57   |     | 53   |     |
| 33     | 53  | 31   | 43  |        | 42  | 29   | 39  | 27   | 32  | 26   | 33  | 25   | 24  | 25   |     | 24   |     |
| 36     | 59  | 35   | 47  |        | 46  | 32   | 43  | 31   | 36  | 29   | 36  | 28   | 27  | 28   |     | 26   |     |
| 55     | 89  | 52   | 71  |        | 69  | 49   | 65  | 46   | 54  | 44   | 55  | 42   | 41  | 42   |     | 40   |     |
| 25     | 41  | 24   | 33  |        | 32  | 23   | 30  | 21   | 25  | 20   | 25  | 20   | 19  | 20   |     | 18   |     |
| 28     | 46  | 27   | 37  |        | 36  | 25   | 33  | 24   | 28  | 23   | 28  | 22   | 21  | 22   |     | 20   |     |
| 43     | 69  | 41   | 56  |        | 54  | 38   | 51  | 36   | 42  | 34   | 43  | 33   | 32  | 33   |     | 31   |     |
| 18     | 29  | 17   | 23  |        | 23  | 16   | 21  | 15   | 18  | 14   | 18  | 14   | 13  | 14   |     | 13   |     |
| 22     | 35  | 21   | 28  |        | 28  | 19   | 26  | 18   | 21  | 17   | 22  | 17   | 16  | 17   |     | 16   |     |
| 34     | 55  | 32   | 44  |        | 43  | 30   | 40  | 28   | 33  | 27   | 34  | 26   | 25  | 26   |     | 24   |     |
| 13     | 22  | 13   | 18  |        | 17  | 12   | 16  | 11   | 13  | 11   | 13  | 10   | 10  | 10   |     | 10   |     |
| 18     | 29  | 17   | 23  |        | 23  | 16   | 21  | 15   | 18  | 14   | 18  | 14   | 13  | 14   |     | 13   |     |
| 27     | 44  | 26   | 35  |        | 34  | 24   | 32  | 23   | 27  | 22   | 27  | 21   | 20  | 21   |     | 20   |     |

# **DIMENSIONES Y PESOS DE LOS TUBOS**

## **SEGUN NORMAS ASME**

### **B36.10 y B36.19**

## **PIPES DIMENSIONS AND WEIGHT**

### **ACORDING TO ASME**

### **B36.10 AND B36.19**



| NPS    | OD mm. | 5S             | 10S            | 10             | 20              | 30              | Std. 40S       | 40              | 60              | XS 80S          | 80              | 100             | 120             | 140             | 160             | XXS             |
|--------|--------|----------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1/8"   | 10,29  |                | 1,24<br>0,28   |                |                 |                 | 1,73<br>0,37   | 1,73<br>0,37    |                 | 2,41<br>0,47    | 2,41<br>0,47    |                 |                 |                 |                 |                 |
| 1/4"   | 13,72  |                | 1,65<br>0,49   |                |                 |                 | 2,24<br>0,64   | 2,24<br>0,64    |                 | 3,02<br>0,82    | 3,02<br>0,82    |                 |                 |                 |                 |                 |
| 3/8"   | 17,15  |                | 1,65<br>0,63   |                |                 |                 | 2,31<br>0,87   | 2,31<br>0,87    |                 | 3,20<br>1,12    | 3,20<br>1,12    |                 |                 |                 |                 |                 |
| 1/2"   | 21,3   | 1,65<br>0,81   | 2,11<br>1,02   | 2,11<br>1,02   |                 |                 | 2,77<br>1,29   | 2,77<br>1,29    |                 | 3,73<br>1,64    | 3,73<br>1,64    |                 |                 |                 | 4,75<br>1,97    | 7,47<br>2,59    |
| 3/4"   | 26,7   | 1,65<br>1,03   | 2,11<br>1,30   | 2,11<br>1,30   |                 |                 | 2,87<br>1,71   | 2,87<br>1,71    |                 | 3,91<br>2,23    | 3,91<br>2,23    |                 |                 |                 | 5,54<br>2,93    | 7,82<br>3,69    |
| 1"     | 33,4   | 1,65<br>1,31   | 2,77<br>2,13   | 2,77<br>2,13   |                 |                 | 3,38<br>2,54   | 3,38<br>2,54    |                 | 4,55<br>3,29    | 4,55<br>3,29    |                 |                 |                 | 6,35<br>4,30    | 9,09<br>5,53    |
| 1 1/4" | 42,2   | 1,65<br>1,67   | 2,77<br>2,73   | 2,77<br>2,73   |                 |                 | 3,56<br>3,44   | 3,56<br>3,44    |                 | 4,85<br>4,53    | 4,85<br>4,53    |                 |                 |                 | 6,35<br>5,69    | 9,70<br>7,88    |
| 1 1/2" | 48,3   | 1,65<br>1,93   | 2,77<br>3,16   | 2,77<br>3,16   |                 |                 | 3,68<br>4,11   | 3,68<br>4,11    |                 | 5,08<br>5,49    | 5,08<br>5,49    |                 |                 |                 | 7,14<br>7,35    | 10,16<br>9,69   |
| 2"     | 60,3   | 1,65<br>2,42   | 2,77<br>3,99   | 2,77<br>3,99   |                 |                 | 3,91<br>5,52   | 3,91<br>5,52    |                 | 5,54<br>7,60    | 5,54<br>7,60    |                 |                 |                 | 8,71<br>11,26   | 11,07<br>13,65  |
| 2 1/2" | 73,0   | 2,11<br>3,75   | 3,05<br>5,34   | 3,05<br>5,34   |                 |                 | 5,16<br>8,77   | 5,16<br>8,77    |                 | 7,01<br>11,59   | 7,01<br>11,59   |                 |                 |                 | 9,53<br>15,15   | 14,02<br>20,72  |
| 3"     | 88,9   | 2,11<br>4,59   | 3,05<br>6,56   | 3,05<br>6,56   |                 |                 | 5,49<br>11,47  | 5,49<br>11,47   |                 | 7,62<br>15,51   | 7,62<br>15,51   |                 |                 |                 | 11,13<br>21,67  | 15,24<br>28,11  |
| 3 1/2" | 101,6  | 2,11<br>5,25   | 3,05<br>7,53   | 3,05<br>7,53   |                 |                 | 5,74<br>13,78  | 5,74<br>13,78   |                 | 8,08<br>18,92   | 8,08<br>18,92   |                 |                 |                 |                 | 16,15<br>34,56  |
| 4"     | 114,3  | 2,11<br>5,93   | 3,05<br>8,50   | 3,05<br>8,50   |                 |                 | 6,02<br>16,32  | 6,02<br>16,32   |                 | 8,56<br>22,66   | 8,56<br>22,66   |                 | 11,13<br>28,75  |                 | 13,49<br>34,05  | 17,12<br>41,66  |
| 5"     | 141,3  | 2,77<br>9,61   | 3,40<br>11,74  | 3,40<br>11,74  |                 |                 | 6,55<br>22,10  | 6,55<br>22,10   |                 | 9,53<br>31,44   | 9,53<br>31,44   |                 | 12,70<br>40,90  |                 | 15,88<br>49,87  | 19,05<br>58,31  |
| 6"     | 168,3  | 2,77<br>11,47  | 3,40<br>14,04  | 3,40<br>14,04  |                 |                 | 7,11<br>28,69  | 7,11<br>28,69   |                 | 10,91<br>43,21  | 10,91<br>43,21  |                 | 14,27<br>55,03  |                 | 18,24<br>68,53  | 21,95<br>80,43  |
| 8"     | 219,1  | 2,77<br>15,00  | 3,76<br>20,27  | 3,76<br>20,27  | 6,35<br>33,82   | 7,04<br>37,38   | 8,18<br>43,20  | 8,18<br>43,20   | 10,31<br>53,90  | 12,70<br>65,63  | 12,70<br>65,63  | 15,06<br>76,93  | 18,24<br>91,73  | 20,62<br>102,47 | 23,01<br>112,97 | 22,23<br>109,57 |
| 10"    | 273,1  | 3,40<br>22,95  | 4,19<br>28,20  | 4,19<br>28,20  | 6,35<br>42,41   | 7,80<br>51,81   | 9,27<br>61,22  | 9,27<br>61,22   | 12,70<br>82,80  | 12,70<br>82,80  | 15,06<br>97,27  | 18,24<br>116,38 | 21,41<br>134,90 | 25,40<br>157,51 | 28,58<br>174,95 | 25,40<br>157,51 |
| 12"    | 323,9  | 3,96<br>31,72  | 4,57<br>36,54  | 4,57<br>36,54  | 6,35<br>50,48   | 8,38<br>66,20   | 9,53<br>75,01  | 10,31<br>80,94  | 14,27<br>110,62 | 12,70<br>98,95  | 17,45<br>133,88 | 21,41<br>162,14 | 25,40<br>189,82 | 28,58<br>211,31 | 33,32<br>242,40 | 25,40<br>189,82 |
| 14"    | 355,6  | 3,96<br>34,86  | 4,78<br>41,99  | 6,35<br>55,53  | 7,92<br>68,95   | 9,53<br>82,58   | 9,53<br>82,58  | 11,13<br>96,00  | 15,06<br>128,42 | 12,70<br>109,04 | 19,05<br>160,54 | 23,80<br>197,74 | 27,76<br>227,88 | 31,75<br>257,47 | 35,71<br>286,04 |                 |
| 16"    | 406,4  | 4,19<br>42,20  | 4,78<br>48,07  | 6,35<br>63,61  | 7,92<br>79,03   | 9,53<br>94,70   | 9,53<br>94,70  | 12,70<br>125,20 | 16,66<br>162,59 | 12,70<br>125,20 | 21,41<br>206,40 | 26,19<br>249,34 | 30,94<br>290,88 | 36,53<br>338,32 | 40,46<br>370,74 |                 |
| 18"    | 457,2  | 4,19<br>47,46  | 4,78<br>54,15  | 6,35<br>71,69  | 7,92<br>89,10   | 11,13<br>124,32 | 9,53<br>106,83 | 14,27<br>158,27 | 19,05<br>209,00 | 12,70<br>141,35 | 23,80<br>258,29 | 29,36<br>314,54 | 34,93<br>369,34 | 39,67<br>414,75 | 45,24<br>466,67 |                 |
| 20"    | 508,0  | 4,78<br>60,23  | 5,54<br>69,70  | 6,35<br>79,76  | 9,53<br>118,95  | 12,70<br>157,51 | 9,53<br>118,95 | 15,06<br>185,89 | 20,62<br>251,65 | 12,70<br>157,51 | 26,19<br>315,97 | 32,54<br>387,41 | 38,10<br>448,30 | 44,45<br>515,94 | 49,99<br>573,31 |                 |
| 24"    | 609,6  | 5,54<br>83,80  | 6,35<br>95,92  | 6,35<br>95,92  | 9,53<br>143,20  | 14,27<br>212,72 | 9,53<br>143,20 | 17,45<br>258,74 | 24,59<br>360,21 | 12,70<br>189,20 | 30,94<br>448,30 | 38,89<br>555,76 | 46,02<br>649,44 | 52,37<br>730,72 | 59,51<br>819,70 |                 |
| 26"    | 660,4  |                |                | 7,92<br>129,40 | 12,70<br>205,97 |                 | 9,53<br>155,32 |                 |                 | 12,70<br>205,97 |                 |                 |                 |                 |                 |                 |
| 28"    | 711,2  |                |                | 7,92<br>139,47 | 12,70<br>222,13 | 15,88<br>276,48 | 9,53<br>167,44 |                 |                 | 12,70<br>222,13 |                 |                 |                 |                 |                 |                 |
| 30"    | 762,0  | 6,35<br>120,15 | 7,92<br>149,55 | 7,92<br>149,55 | 12,70<br>238,28 | 15,88<br>296,68 | 9,53<br>179,56 |                 |                 | 12,70<br>238,28 |                 |                 |                 |                 |                 |                 |
| 32"    | 812,8  |                |                | 7,92<br>159,62 | 12,70<br>254,44 | 15,88<br>316,88 | 9,53<br>191,69 | 17,48<br>348,11 |                 | 12,70<br>255,44 |                 |                 |                 |                 |                 |                 |
| 34"    | 863,6  |                |                | 7,92<br>169,64 | 12,70<br>270,50 | 15,88<br>336,96 | 9,53<br>203,74 | 17,48<br>370,22 |                 | 12,70<br>270,50 |                 |                 |                 |                 |                 |                 |
| 36"    | 914,4  |                |                | 7,92<br>179,77 | 12,70<br>286,75 | 15,88<br>357,28 | 9,53<br>215,93 | 19,05<br>427,09 |                 | 12,70<br>286,75 |                 |                 |                 |                 |                 |                 |

Los números en negro indican espesores / Black numbers indicates wall thickness  
 Los números en rojo indican el peso Kg/m / Red numbers indicates weight in Kg/m

# DIMENSIONES Y PESOS DE LOS TUBOS SEGUN NORMA DIN-2463 / PIPE DIMENSIONS AND WEIGHT ACCORDING TO DIN-2463

Peso / Weight : Kg/m

**DIN-2463** Tubos soldados de acero inoxidable, de acuerdo con DIN 17440 / Welded stainless steel pipes according DIN 17440

| DN     | 6    | 8    | 10   | 15   | 20   | 25   | 30   | 31,8 | 33,7 | 38   | 42,4 | 44,5 | 48,3 | 51   | 54   | 57   | 60,3 | 63,5 | 65   | 80   | 90   | 100  |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Exp. Ø | 10,2 | 13,5 | 16   | 17,2 | 21,3 | 25   | 26,9 | 30   | 31,8 | 33,7 | 38   | 42,4 | 44,5 | 48,3 | 51   | 54   | 57   | 60,3 | 63,5 | 70   | 76,1 | 88,9 |
| 1,0    | 0,23 | 0,31 | 0,37 | 0,40 | 0,51 | 0,60 | 0,65 | 0,73 | 0,77 | 0,82 | 0,93 | 1,03 | 1,09 | 1,18 | 1,25 |      |      |      |      |      |      |      |
| 1,2    | 0,27 | 0,37 | 0,44 | 0,48 | 0,61 | 0,71 | 0,77 | 0,87 | 0,92 | 0,97 | 1,10 | 1,24 | 1,30 | 1,42 | 1,49 | 1,59 | 1,68 | 1,77 | 1,87 |      |      |      |
| 1,6    | 0,35 | 0,48 | 0,57 | 0,62 | 0,79 | 0,93 | 1,01 | 1,14 | 1,21 | 1,28 | 1,46 | 1,64 | 1,71 | 1,87 | 1,97 | 2,09 | 2,22 | 2,35 | 2,48 | 2,74 | 2,98 | 3,49 |
| 2,0    | 0,41 | 0,57 | 0,70 | 0,76 | 0,97 | 1,14 | 1,25 | 1,41 | 1,49 | 1,59 | 1,80 | 2,02 | 2,12 | 2,32 | 2,45 | 2,60 | 2,76 | 2,91 | 3,07 | 3,40 | 3,71 | 4,34 |
| 2,3    |      | 0,65 | 0,78 | 0,86 | 1,10 | 1,30 | 1,42 | 1,60 | 1,69 | 1,80 | 2,05 | 2,30 | 2,43 | 2,65 | 2,80 | 2,97 | 3,15 | 3,33 | 3,52 | 3,89 | 4,24 | 4,98 |
| 2,6    |      |      |      | 0,94 | 1,22 | 1,45 | 1,58 | 1,78 | 1,89 | 2,02 | 2,30 | 2,59 | 2,72 | 2,97 | 3,14 | 3,34 | 3,54 | 3,75 | 3,96 | 4,37 | 4,78 | 5,61 |
| 2,9    |      |      |      |      |      | 1,59 | 1,73 | 1,96 | 2,09 | 2,22 | 2,55 | 2,86 | 3,01 | 3,29 | 3,48 | 3,70 | 3,93 | 4,16 | 4,39 | 4,86 | 5,31 | 6,23 |
| 3,2    |      |      |      |      |      |      |      | 2,13 | 2,28 | 2,43 | 2,77 | 3,12 | 3,35 | 3,61 | 3,82 | 4,06 | 4,31 | 4,57 | 4,82 | 5,33 | 5,84 | 6,85 |
| 3,6    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 5,07 | 5,35 | 5,94 | 6,48 | 7,64 | 8,90 |
| 4,0    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 8,45 | 9,72 |
| 4,5    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 9,45 | 10,9 |
| 5,0    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 10,4 | 12,0 |
| 5,6    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 11,6 | 13,4 |
| 6,3    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 13,0 | 14,9 |
| 8,0    |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 16,1 | 18,6 |
| 10,0   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 12,5   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

| TOLERANCIA PARA TUBO RECTO<br>STRAIGHT PIPE TOLERANCE                                         |
|-----------------------------------------------------------------------------------------------|
| Diferencia admisible para diámetros exteriores<br>Permissible deviation for external diameter |
| D0                                                                                            |
| D1                                                                                            |
| D2                                                                                            |
| D3                                                                                            |
| D4                                                                                            |

| DN     | 100   | 125  | 150   | 200  | 250   | 300   | 350   | 400   | 450  | 500  | 600   | 700   | 800  | 900   | 1000  |
|--------|-------|------|-------|------|-------|-------|-------|-------|------|------|-------|-------|------|-------|-------|
| Exp. Ø | 114,3 | 133  | 139,7 | 159  | 168,3 | 193,7 | 219,1 | 244,5 | 267  | 273  | 323,9 | 355,6 | 368  | 406,4 | 419,0 |
| 1,0    |       |      |       |      |       |       |       |       |      |      |       |       |      |       |       |
| 1,2    |       |      |       |      |       |       |       |       |      |      |       |       |      |       |       |
| 1,6    |       |      |       |      |       |       |       |       |      |      |       |       |      |       |       |
| 2,0    | 5,61  | 6,56 | 6,88  | 7,84 | 8,32  | 9,59  | 10,8  | 12,1  | 13,3 | 13,6 | 16,1  | 17,6  | 18,2 |       |       |
| 2,3    | 6,44  | 7,52 | 7,90  | 9,00 | 9,55  | 11,0  | 12,5  | 13,9  | 15,2 | 15,6 | 18,5  | 20,3  | 20,9 | 23,1  | 23,9  |
| 2,6    | 7,26  | 8,49 | 8,91  | 10,1 | 10,8  | 12,4  | 14,1  | 15,8  | 17,2 | 17,6 | 20,9  | 22,6  | 23,6 | 26,1  | 26,9  |
| 2,9    | 8,08  | 9,45 | 9,91  | 11,3 | 12,0  | 13,9  | 15,7  | 17,6  | 19,1 | 19,6 | 23,3  | 25,6  | 26,5 | 29,2  | 30,0  |
| 3,2    | 8,88  | 10,4 | 10,9  | 12,5 | 13,2  | 15,3  | 17,3  | 19,3  | 21,1 | 21,6 | 25,7  | 28,2  | 29,2 | 32,2  | 33,1  |
| 3,6    | 9,91  | 11,7 | 12,3  | 14,0 | 14,8  | 17,2  | 19,4  | 21,7  | 23,7 | 24,3 | 28,9  | 31,7  | 32,8 | 36,3  | 37,4  |
| 4,0    | 11,0  | 12,8 | 13,5  | 15,4 | 16,5  | 18,9  | 21,5  | 24,1  | 26,3 | 26,9 | 32,0  | 35,2  | 36,4 | 40,3  | 41,5  |
| 4,5    | 12,3  | 14,4 | 15,1  | 17,3 | 18,2  | 21,0  | 23,9  | 26,7  | 29,1 | 29,8 | 35,5  | 39,1  | 40,4 | 44,7  | 46,1  |
| 5,0    | 13,6  | 15,9 | 16,8  | 19,2 | 20,2  | 23,4  | 26,6  | 29,7  | 32,5 | 33,2 | 39,6  | 43,5  | 45,0 | 49,8  | 51,4  |
| 5,6    | 15,2  | 17,8 | 18,7  | 21,4 | 22,5  | 26,1  | 29,5  | 33,0  | 36,2 | 37,0 | 44,0  | 48,5  | 50,2 | 55,4  | 57,2  |
| 6,3    | 16,9  | 19,9 | 20,8  | 23,9 | 25,4  | 29,4  | 33,4  | 37,4  | 40,8 | 41,8 | 49,9  | 54,8  | 56,8 | 62,8  | 64,7  |
| 8,0    | 21,2  | 24,9 | 26,2  | 30,1 | 31,7  | 36,7  | 41,7  | 46,8  | 51,2 | 52,3 | 62,5  | 68,7  | 71,2 | 78,7  | 81,3  |
| 10,0   |       | 30,6 | 32,3  | 37,1 | 39,3  | 45,6  | 51,8  | 58,2  | 63,7 | 65,2 | 77,9  | 85,7  | 88,8 | 98,3  | 101   |
| 12,5   |       |      |       |      |       | 48,7  | 55,6  | 64,5  | 72,5 | 75,5 | 81,4  | 107   | 111  | 123   | 127   |

| TOLERANCIA PARA TUBO RECTO<br>STRAIGHT PIPE TOLERANCE                                    |
|------------------------------------------------------------------------------------------|
| Diferencia admisible para espesores de pared<br>Permissible deviation for wall thickness |
| T0                                                                                       |
| T1                                                                                       |
| T2                                                                                       |
| T3                                                                                       |
| T4                                                                                       |

**DIN-2463** Tubos de precision soldados de acero inoxidable austeniticos / Welded precision pipes of austenitic stainless steel

| Exp. Ø                               | 6    | 8    | 10   | 12   | 14   | 16   | 18   | 20   | 22   | 25   | 28   | 30   | 32   | 35   | 38   | 40   |
|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| TOLERANCIA ISO D4 / ISO TOLERANCE D4 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| TOLERANCIA ISO D2 / ISO TOLERANCE D2 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 1,0                                  | 0,13 | 0,18 | 0,23 | 0,28 | 0,33 | 0,38 | 0,43 | 0,48 | 0,53 | 0,60 | 0,68 | 0,73 | 0,78 | 0,85 | 0,93 | 0,98 |
| 1,2                                  |      |      | 0,26 | 0,33 | 0,38 | 0,45 | 0,51 | 0,57 | 0,63 | 0,72 | 0,81 | 0,87 | 0,93 | 1,02 | 1,11 | 1,17 |
| 1,5                                  |      |      | 0,32 | 0,39 | 0,47 | 0,54 | 0,62 | 0,70 | 0,77 | 0,88 | 1,00 | 1,07 | 1,15 | 1,26 | 1,37 | 1,45 |
| 1,8                                  |      |      | 0,46 | 0,55 | 0,64 | 0,73 | 0,82 | 0,91 | 1,05 | 1,18 | 1,28 | 1,36 | 1,50 | 1,64 | 1,72 |      |
| 2,0                                  |      |      | 0,50 | 0,60 | 0,70 | 0,80 | 0,90 | 1,00 | 1,15 | 1,30 | 1,42 | 1,50 | 1,65 | 1,82 | 1,90 |      |
| 2,2                                  |      |      | 0,54 | 0,65 | 0,76 | 0,87 | 0,98 | 1,09 | 1,26 | 1,42 | 1,53 | 1,64 | 1,81 | 1,97 | 2,08 |      |
| 2,5                                  |      |      |      |      |      |      |      | 1,22 | 1,41 | 1,60 | 1,72 | 1,85 | 2,03 | 2,22 | 2,35 |      |

Peso / Weight : Kg/m

ISO-1127 Tubos soldados de acero inoxidable, de acuerdo con ISO 1127 / Welded stainless steel pipes according ISO 1127

| Esp  | Ø    | 10,2 | 13,5 | 17,2 | 21,3 | 26,9 | 31,8 | 33,7 | 42,4 | 48,3 | 60,3 | 76,1 | 88,9 | 101,6 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| 1,0  | 0,23 | 0,31 | 0,40 | 0,51 | 0,65 | 0,77 | 0,82 | 0,82 | 1,03 | 1,18 |      |      |      |       |
| 1,2  | 0,27 | 0,37 | 0,48 | 0,61 | 0,77 | 0,92 | 0,97 | 0,97 | 1,24 | 1,42 | 1,77 |      |      |       |
| 1,6  | 0,35 | 0,48 | 0,62 | 0,79 | 1,01 | 1,21 | 1,28 | 1,28 | 1,64 | 1,87 | 2,35 | 2,98 | 3,49 |       |
| 2,0  | 0,41 | 0,57 | 0,76 | 0,97 | 1,25 | 1,49 | 1,59 | 1,59 | 2,02 | 2,32 | 2,91 | 3,71 | 4,34 | 4,98  |
| 2,3  |      | 0,65 | 0,86 | 1,10 | 1,42 | 1,69 | 1,80 | 1,80 | 2,30 | 2,65 | 3,33 | 4,24 | 4,98 | 5,71  |
| 2,6  |      |      | 0,94 | 1,22 | 1,58 | 1,89 | 2,02 | 2,02 | 2,59 | 2,97 | 3,75 | 4,78 | 5,61 | 6,43  |
| 2,9  |      |      |      |      | 1,73 | 2,09 | 2,22 | 2,22 | 2,86 | 3,29 | 4,16 | 5,31 | 6,23 | 7,16  |
| 3,2  |      |      |      |      |      | 2,28 | 2,43 | 2,43 | 3,12 | 3,61 | 4,57 | 5,84 | 6,85 | 7,87  |
| 3,6  |      |      |      |      |      |      |      |      |      |      | 5,07 | 6,48 | 7,64 | 8,78  |
| 4,0  |      |      |      |      |      |      |      |      |      |      |      |      | 8,45 | 9,72  |
| 4,5  |      |      |      |      |      |      |      |      |      |      |      |      | 9,45 | 10,9  |
| 5,0  |      |      |      |      |      |      |      |      |      |      |      |      | 10,4 | 12,0  |
| 5,6  |      |      |      |      |      |      |      |      |      |      |      |      | 11,6 | 13,4  |
| 6,3  |      |      |      |      |      |      |      |      |      |      |      |      | 13,0 | 14,9  |
| 8,0  |      |      |      |      |      |      |      |      |      |      |      |      | 16,1 | 18,6  |
| 10,0 |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| 12,5 |      |      |      |      |      |      |      |      |      |      |      |      |      |       |

| TOLERANCIA PARA TUBO RECTO<br>STRAIGHT PIPE TOLERANCE |                                     |
|-------------------------------------------------------|-------------------------------------|
| Diferencia admisible para diámetros exteriores        |                                     |
| Permissible deviation for external diameter           |                                     |
| D0                                                    | + 0,02                              |
| D1                                                    | + - 1,5% Mínimo / Minimum + - 0,75  |
| D2                                                    | + - 1% Mínimo / Minimum + - 0,50    |
| D3                                                    | + - 0,75% Mínimo / Minimum + - 0,30 |
| D4                                                    | + - 0,5% Mínimo / Minimum + - 0,10  |

| Esp  | Ø    | 114,3 | 139,7 | 168,3 | 219,1 | 273  | 323,9 | 355,6 | 406,4 | 457,2 | 508,0 | 609,6 | 711,2 | 812,8 |
|------|------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1,0  |      |       |       |       |       |      |       |       |       |       |       |       |       |       |
| 1,2  |      |       |       |       |       |      |       |       |       |       |       |       |       |       |
| 1,6  |      |       |       |       |       |      |       |       |       |       |       |       |       |       |
| 2,0  | 5,61 | 6,88  | 8,32  | 10,8  | 13,6  | 16,1 | 17,6  | 17,6  | 23,1  | 26,0  |       |       |       |       |
| 2,3  | 6,44 | 7,90  | 9,55  | 12,5  | 15,6  | 18,5 | 20,3  | 20,3  | 26,1  | 29,4  | 32,7  |       |       |       |
| 2,6  | 7,26 | 8,91  | 10,8  | 14,1  | 17,6  | 20,9 | 22,9  | 22,9  | 29,2  | 32,8  | 36,5  | 43,8  |       |       |
| 2,9  | 8,08 | 9,91  | 12,0  | 15,7  | 19,6  | 23,3 | 25,6  | 25,6  | 32,2  | 36,2  | 40,2  | 48,3  | 56,4  | 64,5  |
| 3,2  | 8,88 | 10,9  | 13,2  | 17,3  | 21,6  | 25,7 | 28,2  | 28,2  | 36,3  | 40,8  | 45,4  | 54,3  | 63,4  | 72,5  |
| 3,6  | 9,91 | 12,3  | 14,8  | 19,4  | 24,3  | 28,9 | 31,7  | 31,7  | 40,3  | 45,3  | 50,4  | 60,6  | 70,7  | 80,9  |
| 4,0  | 11,0 | 13,5  | 16,5  | 21,5  | 26,9  | 32,0 | 35,2  | 35,2  | 44,7  | 50,4  | 56,0  | 67,3  | 78,6  | 89,9  |
| 4,5  | 12,3 | 15,1  | 18,2  | 23,9  | 29,8  | 35,5 | 39,1  | 39,1  | 49,8  | 56,1  | 62,5  | 75,0  | 87,6  | 100   |
| 5,0  | 13,6 | 16,8  | 20,2  | 26,6  | 33,2  | 39,6 | 43,5  | 43,5  | 55,4  | 62,5  | 69,5  | 83,6  | 92,9  | 112   |
| 5,6  | 15,2 | 18,7  | 22,5  | 29,5  | 37,0  | 44,0 | 48,5  | 48,5  | 62,8  | 70,8  | 78,7  | 94,7  | 111   | 127   |
| 6,3  | 16,9 | 20,8  | 25,4  | 33,4  | 41,8  | 49,9 | 54,8  | 54,8  | 78,7  | 88,8  | 98,8  | 119   | 139   | 159   |
| 8,0  | 21,2 | 26,2  | 31,7  | 41,7  | 52,3  | 62,5 | 68,7  | 68,7  | 98,3  | 111   | 124   | 159   | 174   | 199   |
| 10,0 |      | 32,3  | 39,3  | 51,8  | 65,2  | 77,9 | 85,7  | 85,7  | 123   | 139   | 155   | 186   | 218   | 250   |
| 12,5 |      |       |       | 55,6  | 19,5  | 81,4 | 107   | 107   |       |       |       |       |       |       |

| TOLERANCIA PARA TUBO RECTO<br>STRAIGHT PIPE TOLERANCE |          |
|-------------------------------------------------------|----------|
| Diferencia admisible para espesores de pared          |          |
| Permissible deviation for wall thickness              |          |
| T0                                                    | + - 0,20 |
| T1                                                    | + - 0,15 |
| T2                                                    | + - 0,13 |
| T3                                                    | + - 0,10 |
| T4                                                    | + - 0,08 |

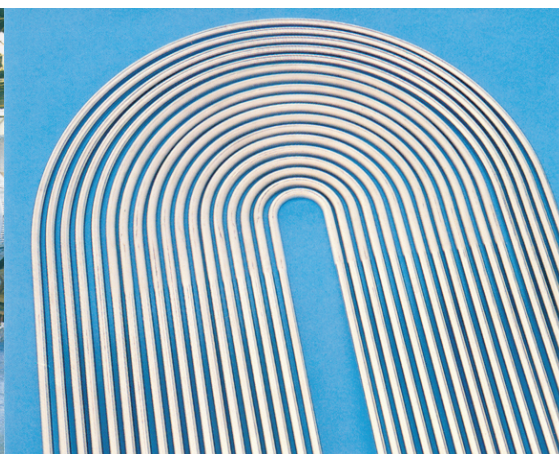
| Esp. | Ø | 6    | 8    | 10   | 12   | 13   | 14   | 15   | 16   | 18   | 19   | 20   | 22   | 23   | 25   | 28   | 30   | 32   | 33   | 35   | 38   | 40   | 43   | 44,5 | 51   |
|------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1,0  |   | 0,13 | 0,18 | 0,23 | 0,28 | 0,30 | 0,33 | 0,35 | 0,38 | 0,43 | 0,45 | 0,48 | 0,53 | 0,55 | 0,60 | 0,68 | 0,73 | 0,78 | 0,81 | 0,86 | 0,93 | 0,98 | 1,06 | 1,10 | 1,26 |
| 1,2  |   |      |      |      |      | 0,36 | 0,39 | 0,42 | 0,45 | 0,51 | 0,54 | 0,57 | 0,63 | 0,66 | 0,72 | 0,81 | 0,87 | 0,93 | 0,96 | 1,02 | 1,11 | 1,17 | 1,26 | 1,31 | 1,51 |
| 1,5  |   |      |      |      |      | 0,43 | 0,47 | 0,51 | 0,55 | 0,62 | 0,66 | 0,70 | 0,77 | 0,81 | 0,89 | 1,00 | 1,08 | 1,15 | 1,19 | 1,27 | 1,38 | 1,45 | 1,57 | 1,62 | 1,87 |
| 2,0  |   |      |      |      |      |      |      |      |      | 0,81 | 0,86 | 0,91 | 1,01 | 1,06 | 1,16 | 1,31 | 1,41 | 1,51 | 1,56 | 1,66 | 1,81 | 1,91 | 2,07 | 2,14 | 2,47 |
| 2,5  |   |      |      |      |      |      |      |      |      |      |      |      | 1,23 | 1,29 | 1,42 | 1,61 | 1,73 | 1,86 | 1,92 | 2,05 | 2,24 | 2,36 | 2,55 | 2,64 | 3,05 |
| 3,0  |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 2,27 | 2,42 | 2,65 | 2,80 | 3,02 | 3,14 | 3,63 |
| 4,0  |   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |

| Esp. | Ø | 53   | 54   | 57   | 63,5 | 69   | 70   | 73   | 76   | 83   | 84   | 103  | 104  | 129   | 131   | 153   | 154   | 204   | 254   | 255   | 304   | 306   | 354   | 355   |
|------|---|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1,0  |   |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |
| 1,2  |   |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |
| 1,5  |   | 1,95 | 1,98 | 2,10 | 2,34 | 2,55 | 2,59 | 2,70 | 2,82 | 3,08 | 3,12 | 3,84 |      |       |       |       |       |       |       |       |       |       |       |       |
| 2,0  |   | 2,57 | 2,62 | 2,77 | 3,10 | 3,38 | 3,43 | 3,58 | 3,73 | 4,01 | 4,13 | 5,09 | 5,14 | 6,40  | 6,50  | 7,61  | 7,66  | 10,18 | 12,70 | 12,75 | 15,22 | 15,32 | 17,74 | 17,79 |
| 2,5  |   | 3,18 | 3,24 | 3,43 | 3,84 | 4,19 | 4,25 | 4,44 | 4,63 | 5,07 | 5,13 | 6,33 | 6,39 | 7,97  | 8,09  | 9,48  | 9,54  | 12,69 | 15,84 | 15,90 | 18,99 | 19,12 | 22,14 | 22,20 |
| 3,0  |   | 3,78 | 3,85 | 4,08 | 4,57 | 4,99 | 5,06 | 5,29 | 5,52 | 6,05 | 6,12 | 7,56 | 7,63 | 9,52  | 9,67  | 11,34 | 11,41 | 15,19 | 18,97 | 19,05 | 22,75 | 22,90 | 26,53 | 26,61 |
| 4,0  |   |      |      |      |      |      |      |      |      |      |      |      |      | 12,60 | 12,80 | 15,02 | 15,12 | 20,16 | 25,19 | 25,30 | 30,23 | 30,44 | 35,27 | 37,37 |

# TUBO PARA INTERCAMBIADORES DE CALOR

## HEAT EXCHANGER PIPE

| Medidas<br>Sizes |     |    | Diametro<br>Exterior<br>External<br>Diameter<br>(mm) | x | Espesor<br>Minimo<br>Minimus<br>Wall Th. | Peso teórico<br>Theoric weight |        |
|------------------|-----|----|------------------------------------------------------|---|------------------------------------------|--------------------------------|--------|
|                  |     |    |                                                      |   |                                          | Min.                           | Max.   |
|                  |     |    |                                                      |   |                                          | (Kg/m)                         | (Kg/m) |
| 1/2"             | BWG | 18 | 12,70                                                | x | 1,24                                     | 0,353                          | 0,391  |
|                  |     | 16 |                                                      | x | 1,65                                     | 0,453                          | 0,502  |
|                  |     | 14 |                                                      | x | 2,11                                     | 0,550                          | 0,610  |
| 5/8"             | BWG | 16 | 15,87                                                | x | 1,25                                     | 0,460                          | 0,511  |
|                  |     | 14 |                                                      | x | 1,65                                     | 0,590                          | 0,655  |
|                  |     | 12 |                                                      | x | 2,11                                     | 0,727                          | 0,807  |
|                  |     | 12 |                                                      | x | 2,77                                     | 0,909                          | 1,009  |
| 3/4"             | BWG | 18 | 19,05                                                | x | 1,25                                     | 0,557                          | 0,618  |
|                  |     | 16 |                                                      | x | 1,65                                     | 0,719                          | 0,798  |
|                  |     | 14 |                                                      | x | 2,11                                     | 0,895                          | 0,993  |
|                  |     | 12 |                                                      | x | 2,77                                     | 1,120                          | 1,243  |
| 1"               | BWG | 18 | 25,40                                                | x | 1,25                                     | 0,750                          | 0,832  |
|                  |     | 16 |                                                      | x | 1,65                                     | 0,981                          | 1,089  |
|                  |     | 14 |                                                      | x | 2,11                                     | 1,231                          | 1,366  |
|                  |     | 12 |                                                      | x | 2,77                                     | 1,570                          | 1,742  |
| 1 1/4"           | BWG | 16 | 31,75                                                | x | 1,65                                     | 1,244                          | 1,380  |
|                  |     | 14 |                                                      | x | 2,11                                     | 1,566                          | 1,738  |
|                  |     | 12 |                                                      | x | 2,77                                     | 2,010                          | 2,231  |
| 1 1/2"           | BWG | 14 | 38,01                                                | x | 2,11                                     | 1,897                          | 2,105  |
|                  |     | 12 |                                                      | x | 2,77                                     | 2,444                          | 2,713  |
| 2"               | BWG | 12 | 50,08                                                | x | 2,77                                     | 3,281                          | 3,642  |



## INFORMACIONES TECNICAS

## TECHNICAL INFORMATION

La presión máxima admisible en la tubería viene dada por la fórmula siguiente de USAS B31.3-1966:

$$P = \frac{2 S (t - C)}{D - 2 Y (t - C)}$$

Y el grosor de la pared "t" necesaria para resistir una presión de servicio P, por la formula:

$$t = \frac{P \times D}{2 S + 2 y P} + C$$

por las que:

P= presión de servicio máximo en bar

S= límite de trabajo máximo admisible en bar

D= diámetro exterior del tubo en cm

t= grosor de la pared en cm (No olvidar la tolerancia de la pared que es en el máximo el 87,5% del espesor nominal)

C= el sobre espesor previsible por la corrosión en cm

y= coeficiente teniendo los valores siguientes para los aceros austeníticos:

0,4 para las temperaturas hasta 566° C inclusive

0,5 para 593° C

0,7 para las temperaturas iguales o superiores a 621° C

- A) El límite de trabajo máximo admisible indicado en esta tabla está igualmente dado en la tabla 302-3-1A, apéndice A de las USAS B31.3-1966 para los tubos sin soldadura (ASTM A312).
- B) Esta tabla indica la presión admisible de una parte solamente de los metales de los que se fabrican.
- C) Mas allá de 650° C, una fragilización por formación de fase Sigma puede aparecer en los aceros austeníticos. Es aconsejable en este caso utilizar aleaciones resistentes a esta fragilización tales como las aleaciones Incoloy 800, Incoloy 825, Inconel 600 e Inconel 625. Consultarnos para la elección de la mejor aleación.

- 1) Esta presión no tiene en cuenta ni los choques ni la corrosión.
- 2) Ver "Características mecánicas comparadas a alta temperatura de los aceros inoxidables austeníticos tipo 316 y 316L".

Maximum working pressure is obtained by USAS B31.3 1966 formula as follows:

$$P = \frac{2 S (t - C)}{D - 2 Y (t - C)}$$

And thickness of "t" wall required to resist a P working pressure is obtained by following formula:

$$t = \frac{P \times D}{2 S + 2 y P} + C$$

P= Maximum working pressure in bar

S= Maximum admissible working limit in bar

D= External diameter of the pipe in cm.

T= Wall thickness in cm. ( Do not forget the wall tolerance, that is maximum 87,5% of nominal thickness )

C= Foreseeable over-thickness by corrosion in cm.

Y= Coefficient, having following values for austenitic steels:

0,4 for temperatures till 566° C

0,5 for 593° C

0,7 for temperature of 621° C and above.

- A) Maximum admissible working limit indicated in this chart is also given in chart 302 3 -1A, appendix A of USAS B31.3-1966 for seamless pipes.
- B) This chart shows maximum working pressure of only a part of steels of which fittings are made.
- C) Over 650° C , austenitic steels can become fragile due to formation of Sigma phase. In this case, it is recommendable to use alloys that can resist this phenomenon as Incoloy 800, Incoloy 825, Inconel 600 and Inconel 625. Please contact us to decide the best alloy.
- 1) This pressure do not consider shocks and neither corrosion.
- 2) See " Compared mechanical characteristics at high temperature of austenitic stainless steels type 316 and 316L