

PROCHEM

Stainless Steel Specialists

Product solutions for a world of difference

PIPING PRODUCTS
PIPE AND TUBE



PIPING PRODUCTS



INSTRUMENTATION



VALVES AND ACTUATORS



MANUFACTURING



INDENT SERVICE



HYDRAULIC



Pipe and Tube



SEAMLESS AND WELDED PIPE – Is available throughout Prochem in accordance with material specification ASTM A312 and dimensional specification ANSI/ASME B36.19M and ANSI/ASME B36.10M.

Comprehensive stocks of seamless and welded pipe includes 6 NB (1/8") to 600 NB (16") in SCH 10S and SCH 40S. Seamless pipe is also available ex-stock in heavier schedules such as SCH 80S, SCH 160 and XXS.

Larger sizes of both seamless and welded pipe are readily available through our worldwide network of suppliers. All pipe is fully traceable and available in 6 m lengths.

SEAMLESS TUBE – Prochem leads the field in the supply of high quality instrument tube which is stocked throughout Australia and South East Asia specifically for use with compression fittings. The tube is dual graded, 316/316L and dual specified A269/A213 to not only cover instrumentation applications, but boiler, superheater and heat exchanger applications as well. All tube in sizes 4.76 (3/16") to 25.40 mm (1") OD inclusive are dual specified, contain 2.5% minimum molybdenum to provide maximum corrosion protection and are produced to a maximum hardness of RB 80.

Sizes from 25.4 (1") to 50.8 mm (2") are supplied to ASTM A269 TP316. High quality seamless tube from Prochem is fully certifiable and available in standard 6 m lengths. Tube from 3.2 (1/8") to 12.7 mm (1/2") is available in coiled form with other sizes available on request.

Prochem also holds stock of Monel® 400, Duplex UNS S31803, 904L UNS N08904 and 6Mo UNS S31254 tube for applications where enhanced corrosion resistance is required.

WELDED TUBE – Prochem stock welded tube in a variety of finishes to suit market needs. These include "as welded", "as welded polished", "welded bright annealed", "welded annealed polished", and others on request. Our standard size range covers 12.7 (1/2") to 152.4 mm (6") OD in 1.6 mm WT (16 SWG) and 203.2 mm (8") OD in 2.00 mm WT (14 SWG).

Materials in stock include 304 and 316 stainless steel to ASTM A269, ASTM A554 and AS1528.1 with other grades, standards or sizes available on request.

HEAT EXCHANGER TUBE – Through our extensive network of overseas suppliers, Prochem offers a comprehensive selection of heat exchanger and condenser tubes in a range of stainless and special alloys.

Whether you require finned tube, u-tube or straight tube, please give us a call. We will be pleased to source your requirements.

Monel is a registered trademark.

Pipe and Tube

COMMON PIPE AND TUBE TERMS USED IN THE AUSTRALIAN INDUSTRY

Tube: Tube is usually defined by an outside dimension "OD" and a wall thickness.

Section Tube: Section tubing is initially rolled and welded as round tube and then rolled or drawn to its new non-circular cross section. Typical forms are square, rectangular and oval. Many other forms are available. Section tubing is used extensively in architectural and structural applications.

Pipe: Pipe can be defined by nominal pipe size (NPS) under American standards classifications. Alternatively nominal bore (NB) may be specified under British standards classifications along with a schedule (wall thickness). In Australia these terms are usually mixed, with all stock being available to the American system, although enquiries are usually made under the British system, i.e. 50 NB schedule 40S pipe, rather than 50 NPS Pipe. It should also be noted there are dimensional differences between the American and the British systems. Under the American system size 65 pipe measures 73 mm OD and under the British system it measures 76.2 mm OD. European and Japanese manufacturers may define the pipe by its actual outside diameter and wall thickness, in mm, rather than by nominal size and schedule.

AS WELDED (AW): Tubing produced directly off a continuous tube welding mill.

AS WELDED ANNEALED (AWA): Tubing produced in the same process as for 'As-Welded' but annealed as a final operation.

COLD WORKED (CW) AND COLD WORKED ANNEALED (CWA): Cold worked tubing is produced in the same process as for 'As-Welded' and then the weld area is subjected to a mechanical cold working process for removal of the weld bead to produce a smooth internal surface. An annealing process is then performed to produce cold worked annealed tube.

WELDED DRAWN (WD) AND WELDED DRAWN ANNEALED (WDA): Welded Drawn tube is produced under AWA or CWA conditions and then redrawn through sizing dies and mandrels to achieve close tolerances on outside diameter and wall thickness. An annealing process is then performed to produce welded drawn annealed tube.

ANNEALED: The tube is subjected to heat treatment by either an 'oxygen enriched' furnace or by bright annealing in a 'oxygen deficient' furnace.

POLISHING: Usually for tubing where the quality of the surface finish of the tubing is to be improved. This can be achieved by the use of an abrasive sanding belt or by electropolishing the tube surface. A variety of surface finishes are available e.g. hairline, buff or mirror. Either internal or external surfaces can be polished. External polishing is more common for decorative applications while internal polishing is usually used in analytical applications.

PICKLING: The material is immersed in an acid solution for the purpose of removing the oxide scale which is formed after annealing or heat treatment in an 'oxygen enriched environment furnace'. A mixture of nitric and hydrofluoric acid in water is widely used. Where tenacious oxides are present, sulphuric acid can be used to soften the scale prior to dipping the material in the nitric/hydrofluoric acid bath.

PASSIVATING: The stainless steel is treated by immersion in a dilute solution of acid, which has the effect of eliminating many types of surface contamination which may cause discolouration or superficial corrosive attack in service. A solution of nitric acid in water is widely used. The removal of residues such as particles of steel from cutting tools from the surface permits the material to re-generate its invisible, protective oxide film as a continuous permanent covering.

Information obtained from the Australian Stainless Steel Development Association.

Manufacturing Methods

Pipes and tubes are manufactured by either the seamless or welded process. These processes can be broken down into a number of manufacturing subgroups.

SEAMLESS MANUFACTURING PROCESSES

Hot Finished

Prior to extrusion, a short round billet is pierced or bored to form a hollow billet. The billet is then heated and a mandrel is pushed through. The mandrel is then concentrically positioned to a circular die. Elongation is carried out by squeezing the billet through the annular space formed by the die and the mandrel. Elongation of the material then takes place to attain the required dimensions.

Cold Finished

Stainless steel pipe and tube made by the hot finishing process may have some limitations which might create the need for further cold finishing operations. Cold finishing is desirable to achieve:

- (i) closer tolerances of material,
- (ii) cleaner and smoother surfaces,
- (iii) more readily controlled mechanical properties,
- (iv) a far greater range of sizes, particularly small diameters and thin wall thicknesses,
- (v) an almost limitless range of non-circular shapes.

Cold finishing is obtained by drawing a tube with larger outside diameter and wall thickness than the finished product through an external sizing die. The internal size can be controlled by the use of a plug or mandrel.

Centrifugal Cast

The cast tube or pipe is formed by centrifugal force generated as the metal becomes entrained on the inside of a spinning cylindrical metal mould. This gives a tubular casting with the outside diameter and length determined by the mould size and the inside diameter determined by the amount of metal poured. Centrifugal cast materials come in a range of sizes and these are generally limited to a minimum of 65 mm OD and a maximum of 650 mm OD. Lengths to 5 metres are available although 2-4 metres is more common.

Forged and Bored

An ingot or bloom is forged and brought as nearly as practicable to the finished size and shape by hot working. The material is adequately worked under a tool of sufficient capacity to refine the structure in the wall of the finished pipe. After heat treatment the inside and outside diameters are machined to final size.

WELDED MANUFACTURING PROCESSES

Continuously Longitudinal Welded

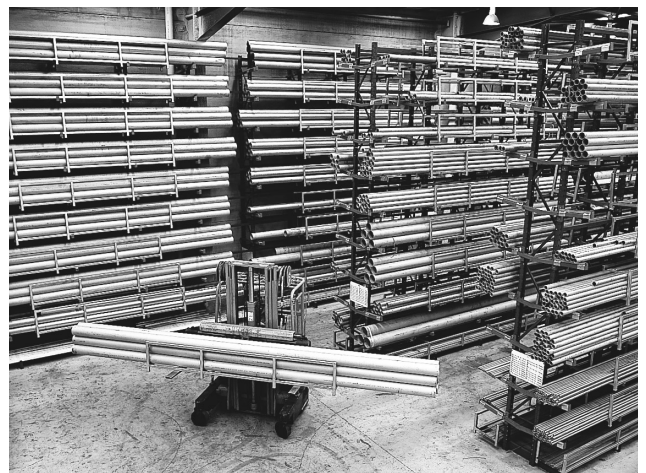
A coil of stainless steel strip is fed into the tube mill. The strip passes through forming rolls which progressively form the material ready for welding. The welding process is then carried out, usually tungsten inert gas (TIG). The product passes under a sanding belt which removes the weld bead on the outside diameter. The product can then be subjected to the proper post-weld treatment to bring it to specification.

Fabricated Welded

This method utilises sheets or plates of the required thickness and developed width, to manufacture the pipe or tube. The plate is pressed into shape with a press brake, which is equipped with the appropriate tooling. Following the forming operation the product is fed through a series of rolls to ensure the correct cross sectional form during the welding operation which follows. After welding, the product can be subjected to the proper post-weld treatment required to bring it to specification.

Spirally Welded

Spirally welded tube is produced by driving coil strip from a de-coiler, through drive rollers, and into a cylindrical former (or shoe), at a pre-determined angle. The edges of the resulting "spring-like" profile are arc welded as they feed past a fixed welding torch. This process is particularly suitable for making large diameter tubes, with relatively thin wall thicknesses, to close tolerances of straightness and ovality.



Information obtained from the Australian Stainless Steel Development Association.

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (MPa) FOR DUAL GRADE 316/316L

NOMINAL WORKING PRESSURES

Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard.

The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 5S ⁽¹⁾						SCHEDULE 10S ⁽¹⁾						SCHEDULE 40S											
	TEMPERATURE DEG C						TEMPERATURE DEG C						TEMPERATURE DEG C											
mm	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400
6									32.49	32.49	32.49	31.31	29.43	28.02	26.84	26.13	47.55	47.55	47.55	45.82	43.07	41.00	39.28	38.24
8									32.51	32.51	32.51	31.33	29.44	28.03	26.85	26.15	46.07	46.07	46.07	44.40	41.73	39.73	38.06	37.06
10									25.45	25.45	25.45	24.52	23.05	21.94	21.02	20.47	36.99	36.99	36.99	35.65	33.51	31.90	30.56	29.75
15	20.06	20.06	20.06	19.34	18.17	17.30	16.57	16.14	26.19	26.19	26.19	25.24	23.72	22.58	21.63	21.06	35.43	35.43	35.43	34.15	32.10	30.55	29.27	28.50
20	15.77	15.77	15.77	15.20	14.29	13.60	13.03	12.69	20.50	20.50	20.50	19.75	18.57	17.67	16.93	16.49	28.65	28.65	28.65	27.61	25.95	24.70	23.67	23.04
25	12.46	12.46	12.46	12.01	11.29	10.75	10.30	10.02	21.59	21.59	21.59	20.81	19.56	18.62	17.83	17.37	26.81	26.81	26.81	25.84	24.28	23.12	22.15	21.56
32	9.77	9.77	9.77	9.42	8.85	8.43	8.07	7.86	16.81	16.81	16.81	16.20	15.23	14.50	13.89	13.52	21.99	21.99	21.99	21.19	19.92	18.96	18.17	17.69
40	8.50	8.50	8.50	8.19	7.70	7.33	7.02	6.84	14.58	14.58	14.58	14.05	13.20	12.57	12.04	11.72	19.71	19.71	19.71	19.00	17.85	17.00	16.28	15.85
50	6.77	6.77	6.77	6.52	6.13	5.83	5.59	5.44	11.55	11.55	11.55	11.13	10.46	9.96	9.54	9.29	16.60	16.60	16.60	15.99	15.03	14.31	13.71	13.35
65	7.16	7.16	7.16	6.90	6.48	6.17	5.91	5.76	10.47	10.47	10.47	10.09	9.48	9.03	8.65	8.42	18.19	18.19	18.19	17.53	16.48	15.69	15.03	14.63
80	5.85	5.85	5.85	5.64	5.30	5.04	4.83	4.70	8.54	8.54	8.54	8.23	7.73	7.36	7.05	6.87	15.76	15.76	15.76	15.19	14.28	13.59	13.02	12.68
90	5.10	5.10	5.10	4.92	4.62	4.40	4.21	4.10	7.44	7.44	7.44	7.17	6.74	6.42	6.15	5.98	14.35	14.35	14.35	13.83	13.00	12.37	11.85	11.54
100	4.53	4.53	4.53	4.36	4.10	3.90	3.74	3.64	6.59	6.59	6.59	6.35	5.97	5.68	5.45	5.30	13.33	13.33	13.33	12.85	12.07	11.49	11.01	10.72
125	4.81	4.81	4.81	4.64	4.36	4.15	3.97	3.87	5.93	5.93	5.93	5.72	5.37	5.11	4.90	4.77	11.66	11.66	11.66	11.24	10.56	10.06	9.63	9.38
150	4.03	4.03	4.03	3.88	3.65	3.47	3.33	3.24	4.96	4.96	4.96	4.78	4.49	4.28	4.10	3.99	10.59	10.59	10.59	10.21	9.59	9.13	8.75	8.52
200	3.08	3.08	3.08	2.97	2.79	2.66	2.55	2.48	4.20	4.20	4.20	4.05	3.81	3.62	3.47	3.38	9.32	9.32	9.32	8.98	8.44	8.03	7.69	7.49
250	3.03	3.03	3.03	2.92	2.75	2.62	2.51	2.44	3.75	3.75	3.75	3.61	3.40	3.23	3.10	3.02	8.44	8.44	8.44	8.14	7.65	7.28	6.97	6.79
300	2.98	2.98	2.98	2.87	2.70	2.57	2.46	2.40	3.44	3.44	3.44	3.32	3.12	2.97	2.84	2.77	7.29	7.29	7.29	7.02	6.60	6.28	6.02	5.86
350	2.71	2.71	2.71	2.61	2.45	2.34	2.24	2.18	3.28	3.28	3.28	3.16	2.97	2.83	2.71	2.64	6.62	6.62	6.62	6.38	6.00	5.71	5.47	5.33
400	2.51	2.51	2.51	2.42	2.27	2.16	2.07	2.02	2.87	2.87	2.87	2.76	2.59	2.47	2.37	2.30	5.78	5.78	5.78	5.57	5.23	4.98	4.77	4.65
450	2.23	2.23	2.23	2.15	2.02	1.92	1.84	1.79	2.54	2.54	2.54	2.45	2.30	2.19	2.10	2.05	5.12	5.12	5.12	4.94	4.64	4.42	4.23	4.12
500	2.29	2.29	2.29	2.20	2.07	1.97	1.89	1.84	2.65	2.65	2.65	2.56	2.40	2.29	2.19	2.13	4.60	4.60	4.60	4.43	4.17	3.97	3.80	3.70
550	2.08	2.08	2.08	2.00	1.88	1.79	1.71	1.67	2.41	2.41	2.41	2.32	2.18	2.08	1.99	1.94								
600	2.21	2.21	2.21	2.13	2.00	1.90	1.82	1.77	2.53	2.53	2.53	2.44	2.29	2.18	2.09	2.04	3.82	3.82	3.82	3.68	3.46	3.29	3.15	3.07
750	2.02	2.02	2.02	1.95	1.83	1.74	1.67	1.63	2.53	2.53	2.53	2.44	2.29	2.18	2.09	2.03								

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004

FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (Mpa) FOR DUAL GRADE 316/316L

NOMINAL WORKING PRESSURES
 Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard. The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 80S TEMPERATURE DEG C										SCHEDULE 160 TEMPERATURE DEG C										SCHEDULE XXS TEMPERATURE DEG C												
	mm	inch	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400							
6	1/8	71.05	71.05	71.05	68.47	64.35	61.27	58.69	57.15									67.43	67.43	67.43	64.99	61.08	58.15	55.70	54.24	122.19	122.19	122.19	117.76	110.68	105.36	100.94	98.28
8	1/4	65.95	65.95	65.95	63.56	59.74	56.87	54.48	53.05									61.49	61.49	61.49	59.26	55.70	53.02	50.80	49.46	95.10	95.10	95.10	91.65	86.14	82.01	78.56	76.49
10	3/8	54.04	54.04	54.04	52.08	48.95	46.60	44.64	43.46									55.07	55.07	55.07	53.08	49.88	47.49	45.49	44.30	86.26	86.26	86.26	83.14	78.14	74.39	71.26	69.39
15	1/2	49.94	49.94	49.94	48.13	45.23	43.06	41.25	40.17									41.84	41.84	41.84	40.33	37.90	36.08	34.57	33.66	69.48	69.48	69.48	66.96	62.94	59.91	57.40	55.89
20	3/4	40.56	40.56	40.56	39.09	36.74	34.97	33.50	32.62									41.00	41.00	41.00	39.51	37.14	35.35	33.87	32.98	62.18	62.18	62.18	59.93	56.32	53.62	51.36	50.01
25	1	37.35	37.35	37.35	35.99	33.83	32.20	30.85	30.04									40.08	40.08	40.08	38.63	36.31	34.56	33.11	32.24	52.81	52.81	52.81	50.90	47.84	45.54	43.63	42.48
32	1-1/4	30.85	30.85	30.85	29.74	27.95	26.60	25.49	24.82									35.59	35.59	35.59	34.30	32.24	30.69	29.40	28.62	55.74	55.74	55.74	53.72	50.49	48.07	46.05	44.84
40	1-1/2	27.97	27.97	27.97	26.96	25.33	24.12	23.10	22.50									33.95	33.95	33.95	32.72	30.75	29.27	28.04	27.31	48.70	48.70	48.70	46.94	44.11	42.00	40.23	39.17
50	2	24.12	24.12	24.12	23.25	21.85	20.80	19.93	19.40									31.78	31.78	31.78	30.63	28.79	27.40	26.25	25.56	41.62	41.62	41.62	40.11	37.70	35.89	34.38	33.48
65	2-1/2	25.31	25.31	25.31	24.40	22.93	21.83	20.91	20.36									30.10	30.10	30.10	29.01	27.26	25.95	24.86	24.21	36.91	36.91	36.91	35.57	33.43	31.83	30.49	29.69
80	3	22.37	22.37	22.37	21.56	20.27	19.29	18.48	18.00									28.95	28.95	28.95	27.90	26.22	24.96	23.91	23.28	35.55	35.55	35.55	34.26	32.20	30.65	29.37	28.59
90	3-1/2	20.64	20.64	20.64	19.89	18.69	17.80	17.05	16.60									27.30	27.30	27.30	26.31	24.72	23.54	22.55	21.95	20.33	20.33	20.33	19.59	18.41	17.53	16.79	16.35
100	4	19.35	19.35	19.35	18.65	17.53	16.68	15.98	15.56									26.58	26.58	26.58	25.62	24.08	22.92	21.96	21.38								
125	5	17.30	17.30	17.30	16.68	15.67	14.92	14.29	13.92									26.35	26.35	26.35	25.40	23.87	22.72	21.77	21.20								
150	6	16.69	16.69	16.69	16.08	15.12	14.39	13.79	13.42									26.17	26.17	26.17	25.22	23.70	22.57	21.62	21.05								
200	8	14.74	14.74	14.74	14.21	13.35	12.71	12.18	11.86									26.01	26.01	26.01	25.07	23.56	22.43	21.49	20.92								
250	10	11.70	11.70	11.70	11.28	10.60	10.09	9.67	9.41									25.47	25.47	25.47	24.54	23.07	21.96	21.04	20.48								
300	12	9.80	9.80	9.80	9.45	8.88	8.45	8.10	7.88									25.77	25.77	25.77	24.83	23.34	22.22	21.29	20.73								
350	14	8.90	8.90	8.90	8.58	8.06	7.67	7.35	7.16																								
400	16	7.75	7.75	7.75	7.47	7.02	6.69	6.40	6.24																								
450	18	6.87	6.87	6.87	6.62	6.23	5.93	5.68	5.53																								
500	20	6.17	6.17	6.17	5.94	5.59	5.32	5.09	4.96																								
550	22	12.92	12.92	12.92	12.45	11.70	11.14	10.67	10.39																								
600	24	5.12	5.12	5.12	4.93	4.63	4.41	4.23	4.11																								
750	30																																

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (MPa) FOR GRADE 316L

NOMINAL WORKING PRESSURES

Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard.

The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 5S (1)						SCHEDULE 10S (1)						SCHEDULE 40S											
	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400
6 1/8									27.08	27.08	27.08	27.08	27.08	27.08	27.08	27.08	39.62	39.62	39.62	39.62	39.62	39.62	39.62	39.62
8 1/4									27.09	27.09	27.09	27.09	27.09	27.09	27.09	27.09	38.39	38.39	38.39	38.39	38.39	38.39	38.39	38.39
10 3/8									21.20	21.20	21.20	21.20	21.20	21.20	21.20	21.20	30.83	30.83	30.83	30.83	30.83	30.83	30.83	30.83
15 1/2	16.72	16.72	16.72	15.70	14.68	13.81	13.23	12.65	21.82	21.82	21.82	21.82	21.82	21.82	21.82	21.82	29.53	29.53	29.53	29.53	29.53	29.53	29.53	29.53
20 3/4	13.14	13.14	13.14	12.34	11.54	10.86	10.40	9.94	17.08	17.08	17.08	17.08	17.08	17.08	17.08	17.08	23.87	23.87	23.87	23.87	23.87	23.87	23.87	23.87
25 1	10.39	10.39	10.39	9.75	9.12	8.58	8.22	7.86	17.99	17.99	17.99	17.99	17.99	17.99	17.99	17.99	22.34	22.34	22.34	22.34	22.34	22.34	22.34	22.34
32 1-1/4	8.14	8.14	8.14	7.65	7.15	6.73	6.44	6.16	14.01	14.01	14.01	14.01	14.01	14.01	14.01	14.01	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33
40 1-1/2	7.08	7.08	7.08	6.65	6.22	5.85	5.60	5.36	12.15	12.15	12.15	12.15	12.15	12.15	12.15	12.15	16.42	16.42	16.42	16.42	16.42	16.42	16.42	16.42
50 2	5.64	5.64	5.64	5.29	4.95	4.66	4.46	4.26	9.63	9.63	9.63	9.63	9.63	9.63	9.63	9.63	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83
65 2-1/2	5.96	5.96	5.96	5.60	5.24	4.92	4.72	4.51	8.72	8.72	8.72	8.72	8.72	8.72	8.72	8.72	15.16	15.16	15.16	15.16	15.16	15.16	15.16	15.16
80 3	4.87	4.87	4.87	4.58	4.28	4.02	3.85	3.69	7.11	7.11	7.11	7.11	7.11	7.11	7.11	7.11	13.13	13.13	13.13	13.13	13.13	13.13	13.13	13.13
90 3-1/2	4.25	4.25	4.25	3.99	3.73	3.51	3.36	3.22	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	11.96	11.96	11.96	11.96	11.96	11.96	11.96	11.96
100 4	3.77	3.77	3.77	3.54	3.31	3.11	2.98	2.85	5.49	5.49	5.49	5.49	5.49	5.49	5.49	5.49	11.11	11.11	11.11	11.11	11.11	11.11	11.11	11.11
125 5	4.01	4.01	4.01	3.76	3.52	3.31	3.17	3.03	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	9.72	9.72	9.72	9.72	9.72	9.72	9.72	9.72
150 6	3.36	3.36	3.36	3.15	2.95	2.77	2.65	2.54	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	8.82	8.82	8.82	8.82	8.82	8.82	8.82	8.82
200 8	2.57	2.57	2.57	2.41	2.25	2.12	2.03	1.94	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	7.76	7.76	7.76	7.76	7.76	7.76	7.76	7.76
250 10	2.53	2.53	2.53	2.37	2.22	2.09	2.00	1.91	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	7.04	7.04	7.04	7.04	7.04	7.04	7.04	7.04
300 12	2.48	2.48	2.48	2.33	2.18	2.05	1.96	1.88	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	6.07	6.07	6.07	6.07	6.07	6.07	6.07	6.07
350 14	2.26	2.26	2.26	2.12	1.98	1.86	1.79	1.71	2.73	2.73	2.73	2.73	2.73	2.73	2.73	2.73	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.52
400 16	2.09	2.09	2.09	1.96	1.83	1.72	1.65	1.58	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81
450 18	1.86	1.86	1.86	1.74	1.63	1.53	1.47	1.40	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	4.27	4.27	4.27	4.27	4.27	4.27	4.27	4.27
500 20	1.90	1.90	1.90	1.79	1.67	1.57	1.51	1.44	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83
550 22	1.73	1.73	1.73	1.62	1.52	1.43	1.37	1.31	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18
600 24	1.84	1.84	1.84	1.73	1.61	1.52	1.45	1.39	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
750 30	1.68	1.68	1.68	1.58	1.48	1.39	1.33	1.27	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (Mpa) FOR GRADE 316L

NOMINAL WORKING PRESSURES
 Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard. The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 80S TEMPERATURE DEG C										SCHEDULE 160 TEMPERATURE DEG C										SCHEDULE XXS TEMPERATURE DEG C									
	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400						
6 1/8	59.21	59.21	59.21	55.60	52.00	48.91	46.85	44.79																						
8	54.96	54.96	54.96	51.61	48.27	45.40	43.49	41.58																						
10	45.03	45.03	45.03	42.29	39.55	37.20	35.63	34.06																						
15	41.61	41.61	41.61	39.08	36.55	34.38	32.93	31.48	56.19	56.19	56.19	52.77	49.35	46.42	44.46	42.51	101.82	101.82	101.82	95.62	89.43	84.11	80.57	77.03						
20	33.80	33.80	33.80	31.74	29.68	27.92	26.74	25.57	51.24	51.24	51.24	48.12	45.00	42.33	40.55	38.76	79.25	79.25	79.25	74.42	69.60	65.47	62.71	59.95						
25	31.12	31.12	31.12	29.23	27.33	25.71	24.63	23.54	45.89	45.89	45.89	43.10	40.30	37.91	36.31	34.72	71.89	71.89	71.89	67.51	63.13	59.38	56.88	54.38						
32	25.71	25.71	25.71	24.15	22.58	21.24	20.34	19.45	34.87	34.87	34.87	32.75	30.62	28.80	27.59	26.38	57.90	57.90	57.90	54.38	50.85	47.83	45.82	43.80						
40	23.31	23.31	23.31	21.89	20.47	19.25	18.44	17.63	34.16	34.16	34.16	32.08	30.00	28.22	27.03	25.85	51.82	51.82	51.82	48.66	45.51	42.80	41.00	39.20						
50	20.10	20.10	20.10	18.88	17.65	16.60	15.90	15.21	33.40	33.40	33.40	31.37	29.33	27.59	26.43	25.27	44.01	44.01	44.01	41.33	38.65	36.36	34.83	33.29						
65	21.09	21.09	21.09	19.81	18.52	17.42	16.69	15.96	29.66	29.66	29.66	27.85	26.05	24.50	23.47	22.43	46.45	46.45	46.45	43.63	40.80	38.37	36.76	35.14						
80	18.64	18.64	18.64	17.51	16.37	15.40	14.75	14.10	28.29	28.29	28.29	26.57	24.85	23.37	22.39	21.40	40.58	40.58	40.58	38.11	35.64	33.52	32.11	30.70						
90	17.20	17.20	17.20	16.15	15.10	14.21	13.61	13.01																						
100	16.12	16.12	16.12	15.14	14.16	13.32	12.76	12.20	26.48	26.48	26.48	24.87	23.26	21.88	20.95	20.03	34.68	34.68	34.68	32.57	30.46	28.65	27.45	26.24						
125	14.42	14.42	14.42	13.54	12.66	11.91	11.41	10.91	25.08	25.08	25.08	23.55	22.03	20.72	19.84	18.97	30.76	30.76	30.76	28.88	27.01	25.41	24.34	23.27						
150	13.91	13.91	13.91	13.06	12.21	11.49	11.00	10.52	24.12	24.12	24.12	22.65	21.18	19.92	19.09	18.25	29.62	29.62	29.62	27.82	26.02	24.47	23.44	22.41						
200	12.28	12.28	12.28	11.54	10.79	10.15	9.72	9.29	23.27	23.27	23.27	21.85	20.44	19.22	18.41	17.60	22.40	22.40	22.40	21.04	19.68	18.51	17.73	16.95						
250	9.75	9.75	9.75	9.16	8.56	8.05	7.71	7.38	23.18	23.18	23.18	21.77	20.36	19.15	18.34	17.53	20.37	20.37	20.37	19.13	17.89	16.83	16.12	15.41						
300	8.17	8.17	8.17	7.67	7.17	6.75	6.46	6.18	22.75	22.75	22.75	21.36	19.98	18.79	18.00	17.21	16.94	16.94	16.94	15.91	14.88	13.99	13.40	12.81						
350	7.41	7.41	7.41	6.96	6.51	6.12	5.87	5.61	22.15	22.15	22.15	20.80	19.45	18.30	17.53	16.76														
400	6.46	6.46	6.46	6.07	5.67	5.34	5.11	4.89	21.96	21.96	21.96	20.62	19.29	18.14	17.38	16.61														
450	5.73	5.73	5.73	5.38	5.03	4.73	4.53	4.33	21.81	21.81	21.81	20.48	19.15	18.01	17.25	16.50														
500	5.14	5.14	5.14	4.83	4.51	4.24	4.07	3.89	21.67	21.67	21.67	20.35	19.04	17.90	17.15	16.40														
550	10.77	10.77	10.77	10.11	9.45	8.89	8.52	8.14	21.22	21.22	21.22	19.93	18.64	17.53	16.79	16.05														
600	4.26	4.26	4.26	4.00	3.74	3.52	3.37	3.22	21.47	21.47	21.47	20.17	18.86	17.74	16.99	16.24														
750																														

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (MPa) FOR DUAL GRADE 304/304L

NOMINAL WORKING PRESSURES

Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard.

The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 5S (1)					SCHEDULE 10S (1)					SCHEDULE 40S												
	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400							
6	1/8								32.49	32.49	32.49	30.61	28.72	27.08	26.13	25.19	47.55	47.55	44.79	42.03	39.62	38.24	36.86
8	1/4								32.51	32.51	32.51	30.62	28.74	27.09	26.15	25.20	46.07	46.07	43.40	40.73	38.39	37.06	35.72
10	3/8								25.45	25.45	25.45	23.97	22.50	21.20	20.47	19.73	36.99	36.99	34.85	32.70	30.83	29.75	28.68
15	1/2	20.06	20.06	20.06	18.90	17.74	16.72	16.14	15.55	15.55	15.55	14.67	13.15	12.82	12.06	11.30	35.43	35.43	33.38	31.33	29.53	28.50	27.47
20	3/4	15.77	15.77	15.77	14.86	13.94	13.14	12.69	12.23	12.23	12.23	11.31	10.12	9.78	9.08	8.32	28.65	28.65	26.99	25.33	23.87	23.04	22.21
25	1	12.46	12.46	12.46	11.74	11.02	10.39	10.02	9.66	9.66	9.66	9.09	8.12	7.79	7.37	6.74	26.81	26.81	25.25	23.70	22.34	21.56	20.79
32	1-1/4	9.77	9.77	9.77	9.21	8.64	8.14	7.86	7.58	7.58	7.58	7.15	6.46	6.14	5.72	5.19	21.99	21.99	20.72	19.44	18.33	17.69	17.05
40	1-1/2	8.50	8.50	8.50	8.01	7.51	7.08	6.84	6.59	6.59	6.59	6.21	5.52	5.20	4.78	4.25	19.71	19.71	18.57	17.42	16.42	15.85	15.28
50	2	6.77	6.77	6.77	6.37	5.98	5.64	5.44	5.24	5.24	5.24	4.96	4.27	3.95	3.53	3.00	16.60	16.60	15.63	14.67	13.83	13.35	12.87
65	2-1/2	7.16	7.16	7.16	6.74	6.33	5.96	5.76	5.55	5.55	5.55	5.27	4.58	4.26	3.84	3.42	15.76	15.76	14.85	13.93	13.13	12.68	14.10
80	3	5.85	5.85	5.85	5.51	5.17	4.87	4.70	4.53	4.53	4.53	4.25	3.56	3.24	2.82	2.40	14.35	14.35	13.52	12.68	11.96	11.54	11.12
90	3-1/2	5.10	5.10	5.10	4.81	4.51	4.25	4.10	3.96	3.96	3.96	3.68	3.00	2.68	2.26	1.84	13.33	13.33	12.56	11.78	11.11	10.72	10.33
100	4	4.53	4.53	4.53	4.26	4.00	3.77	3.64	3.51	3.51	3.51	3.23	2.55	2.23	1.81	1.39	11.66	11.66	10.99	10.31	9.72	9.38	9.04
125	5	4.81	4.81	4.81	4.53	4.25	4.01	3.87	3.73	3.73	3.73	3.45	2.77	2.45	2.03	1.61	10.59	10.59	9.97	9.36	8.82	8.52	8.21
150	6	4.03	4.03	4.03	3.79	3.56	3.36	3.24	3.12	3.12	3.12	2.84	2.16	1.84	1.42	1.00	9.32	9.32	8.78	8.24	7.76	7.49	7.22
200	8	3.08	3.08	3.08	2.90	2.72	2.57	2.48	2.39	2.39	2.39	2.11	1.43	1.11	0.69	0.27	8.44	8.44	7.95	7.46	7.04	6.79	6.55
250	10	3.03	3.03	3.03	2.86	2.68	2.53	2.44	2.35	2.35	2.35	2.07	1.39	1.07	0.65	0.23	7.29	7.29	6.87	6.44	6.07	5.86	5.65
300	12	2.98	2.98	2.98	2.81	2.63	2.48	2.40	2.31	2.31	2.31	2.03	1.35	1.03	0.61	0.19	6.62	6.62	6.24	5.85	5.52	5.33	5.13
350	14	2.71	2.71	2.71	2.55	2.40	2.26	2.18	2.10	2.10	2.10	1.82	1.14	0.82	0.40	0.00	5.78	5.78	5.44	5.11	4.81	4.65	4.48
400	16	2.51	2.51	2.51	2.36	2.22	2.09	2.02	1.94	1.94	1.94	1.66	0.98	0.66	0.24	0.00	5.12	5.12	4.83	4.53	4.27	4.12	3.97
450	18	2.23	2.23	2.23	2.10	1.97	1.86	1.79	1.73	1.73	1.73	1.45	0.77	0.45	0.03	0.00	4.60	4.60	4.33	4.07	3.83	3.70	3.57
500	20	2.29	2.29	2.29	2.15	2.02	1.90	1.84	1.77	1.77	1.77	1.49	0.81	0.49	0.07	0.00	3.82	3.82	3.60	3.38	3.18	3.07	2.96
550	22	2.08	2.08	2.08	1.96	1.83	1.73	1.67	1.61	1.61	1.61	1.33	0.65	0.33	0.00	0.00	3.60	3.60	3.40	3.20	3.00	2.90	2.80
600	24	2.21	2.21	2.21	2.08	1.95	1.84	1.77	1.71	1.71	1.71	1.43	0.75	0.43	0.00	0.00	3.82	3.82	3.60	3.38	3.18	3.07	2.96
750	30	2.02	2.02	2.02	1.90	1.79	1.68	1.63	1.57	1.57	1.57	1.29	0.61	0.29	0.00	0.00	3.82	3.82	3.60	3.38	3.18	3.07	2.96

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (Mpa) FOR DUAL GRADE 304/304L

NOMINAL WORKING PRESSURES
 Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard. The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 80S TEMPERATURE DEG C										SCHEDULE 160 TEMPERATURE DEG C										SCHEDULE XXS TEMPERATURE DEG C									
	mm	inch	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400				
6	1/8	71.05	71.05	71.05	66.93	62.81	59.21	57.15	55.09																					
8	1/4	65.95	65.95	65.95	62.13	58.31	54.96	53.05	51.14																					
10	3/8	54.04	54.04	54.04	50.90	47.77	45.03	43.46	41.90																					
15	1/2	49.94	49.94	49.94	47.04	44.15	41.61	40.17	38.72	67.43	67.43	67.43	63.52	59.61	56.19	54.24	52.28	122.19	122.19	122.19	115.10	108.02	101.82	98.28	94.74					
20	3/4	40.56	40.56	40.56	38.21	35.86	33.80	32.62	31.45	61.49	61.49	61.49	57.92	54.36	51.24	49.46	47.68	95.10	95.10	95.10	89.59	84.07	79.25	76.49	73.74					
25	1	37.35	37.35	37.35	35.18	33.02	31.12	30.04	28.96	55.07	55.07	55.07	51.88	48.69	45.89	44.30	42.70	86.26	86.26	86.26	81.26	76.26	71.89	69.39	66.89					
32	1-1/4	30.85	30.85	30.85	29.06	27.28	25.71	24.82	23.92	41.84	41.84	41.84	39.42	36.99	34.87	33.66	32.44	69.48	69.48	69.48	65.45	61.42	57.90	55.89	53.87					
40	1-1/2	27.97	27.97	27.97	26.35	24.73	23.31	22.50	21.69	41.00	41.00	41.00	38.62	36.24	34.16	32.98	31.79	62.18	62.18	62.18	58.57	54.97	51.82	50.01	48.21					
50	2	24.12	24.12	24.12	22.72	21.32	20.10	19.40	18.70	40.08	40.08	40.08	37.76	35.43	33.40	32.24	31.08	52.81	52.81	52.81	49.75	46.69	44.01	42.48	40.95					
65	2-1/2	25.31	25.31	25.31	23.85	22.38	21.09	20.36	19.63	35.59	35.59	35.59	33.52	31.46	29.66	28.62	27.59	55.74	55.74	55.74	52.51	49.28	46.45	44.84	43.22					
80	3	22.37	22.37	22.37	21.08	19.78	18.64	18.00	17.35	33.95	33.95	33.95	31.98	30.01	28.29	27.31	26.32	48.70	48.70	48.70	45.88	43.05	40.58	39.17	37.76					
90	3-1/2	20.64	20.64	20.64	19.44	18.24	17.20	16.60	16.00																					
100	4	19.35	19.35	19.35	18.23	17.11	16.12	15.56	15.00	31.78	31.78	31.78	29.94	28.09	26.48	25.56	24.64	41.62	41.62	41.62	39.21	36.80	34.68	33.48	32.27					
125	5	17.30	17.30	17.30	16.30	15.30	14.42	13.92	13.42	30.10	30.10	30.10	28.35	26.61	25.08	24.21	23.33	36.91	36.91	36.91	34.77	32.63	30.76	29.69	28.62					
150	6	16.69	16.69	16.69	15.72	14.75	13.91	13.42	12.94	28.95	28.95	28.95	27.27	25.59	24.12	23.28	22.44	35.55	35.55	35.55	33.49	31.43	29.62	28.59	27.56					
200	8	14.74	14.74	14.74	13.89	13.03	12.28	11.86	11.43	27.92	27.92	27.92	26.30	24.69	23.27	22.46	21.65	26.88	26.88	26.88	25.33	23.77	22.40	21.62	20.84					
250	10	11.70	11.70	11.70	11.02	10.34	9.75	9.41	9.07	27.82	27.82	27.82	26.20	24.59	23.18	22.37	21.57	24.45	24.45	24.45	23.03	21.61	20.37	19.66	18.95					
300	12	9.80	9.80	9.80	9.23	8.66	8.17	7.88	7.60	27.30	27.30	27.30	25.71	24.13	22.75	21.95	21.16	20.33	20.33	20.33	19.15	17.97	16.94	16.35	15.76					
350	14	8.90	8.90	8.90	8.38	7.87	7.41	7.16	6.90	26.58	26.58	26.58	25.04	23.50	22.15	21.38	20.61													
400	16	7.75	7.75	7.75	7.30	6.85	6.46	6.24	6.01	26.35	26.35	26.35	24.83	23.30	21.96	21.20	20.43													
450	18	6.87	6.87	6.87	6.47	6.08	5.73	5.53	5.33	26.17	26.17	26.17	24.65	23.13	21.81	21.05	20.29													
500	20	6.17	6.17	6.17	5.81	5.45	5.14	4.96	4.78	26.01	26.01	26.01	24.50	22.99	21.67	20.92	20.17													
550	22	12.92	12.92	12.92	12.17	11.42	10.77	10.39	10.02	25.47	25.47	25.47	23.99	22.51	21.22	20.48	19.75													
600	24	5.12	5.12	5.12	4.82	4.52	4.26	4.11	3.97	25.77	25.77	25.77	24.27	22.78	21.47	20.73	19.98													
750	30																													

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (MPa) FOR GRADE 304L

NOMINAL WORKING PRESSURES

Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard.

The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 5S (1) TEMPERATURE DEG C						SCHEDULE 10S (1) TEMPERATURE DEG C						SCHEDULE 40S TEMPERATURE DEG C											
	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400
6 1/8									27.08	27.08	27.08	27.08	25.66	23.07	22.13	21.66	39.62	39.62	39.62	37.55	35.49	33.76	32.38	31.70
8 1/4									27.09	27.09	27.09	27.09	25.67	23.08	22.14	21.67	38.39	38.39	38.39	36.39	34.39	32.72	31.38	30.71
10 3/8									21.20	21.20	21.20	21.20	20.10	18.07	17.33	16.96	30.83	30.83	30.83	29.22	27.61	26.27	25.20	24.66
15 1/2	16.72	16.72	16.72	15.85	14.97	14.25	13.66	13.37	21.82	21.82	21.82	20.68	19.55	18.60	17.84	17.46	29.53	29.53	29.53	27.99	26.45	25.16	24.13	23.62
20 3/4	13.14	13.14	13.14	12.46	11.77	11.20	10.74	10.51	17.08	17.08	17.08	16.19	15.30	14.55	13.96	13.66	23.87	23.87	23.87	22.63	21.38	20.34	19.51	19.10
25 1	10.39	10.39	10.39	9.84	9.30	8.85	8.49	8.31	17.99	17.99	17.99	17.05	16.11	15.33	14.71	14.39	22.34	22.34	22.34	21.17	20.01	19.04	18.26	17.87
32 1-1/4	8.14	8.14	8.14	7.72	7.29	6.94	6.65	6.51	14.01	14.01	14.01	13.28	12.55	11.94	11.45	11.21	18.33	18.33	18.33	17.37	16.41	15.62	14.98	14.66
40 1-1/2	7.08	7.08	7.08	6.71	6.34	6.03	5.79	5.66	12.15	12.15	12.15	11.51	10.88	10.35	9.93	9.72	16.42	16.42	16.42	15.57	14.71	14.00	13.42	13.14
50 2	5.64	5.64	5.64	5.34	5.05	4.80	4.61	4.51	9.63	9.63	9.63	9.12	8.62	8.20	7.87	7.70	13.83	13.83	13.83	13.11	12.39	11.78	11.30	11.06
65 2-1/2	5.96	5.96	5.96	5.65	5.34	5.08	4.87	4.77	8.72	8.72	8.72	8.27	7.81	7.43	7.13	6.98	15.16	15.16	15.16	14.37	13.58	12.92	12.39	12.13
80 3	4.87	4.87	4.87	4.62	4.36	4.15	3.98	3.90	7.11	7.11	7.11	6.74	6.37	6.06	5.81	5.69	13.13	13.13	13.13	12.45	11.76	11.19	10.73	10.51
90 3-1/2	4.25	4.25	4.25	4.03	3.81	3.62	3.47	3.40	6.20	6.20	6.20	5.88	5.55	5.28	5.07	4.96	11.96	11.96	11.96	11.33	10.71	10.19	9.77	9.56
100 4	3.77	3.77	3.77	3.57	3.38	3.21	3.08	3.02	5.49	5.49	5.49	5.21	4.92	4.68	4.49	4.39	11.11	11.11	11.11	10.53	9.95	9.46	9.08	8.88
125 5	4.01	4.01	4.01	3.80	3.59	3.42	3.28	3.21	4.94	4.94	4.94	4.68	4.43	4.21	4.04	3.95	9.72	9.72	9.72	9.21	8.70	8.28	7.94	7.77
150 6	3.36	3.36	3.36	3.18	3.01	2.86	2.74	2.68	4.13	4.13	4.13	3.92	3.70	3.52	3.38	3.31	8.82	8.82	8.82	8.36	7.90	7.52	7.21	7.06
200 8	2.57	2.57	2.57	2.43	2.30	2.19	2.10	2.05	3.50	3.50	3.50	3.32	3.14	2.98	2.86	2.80	7.76	7.76	7.76	7.36	6.95	6.61	6.34	6.21
250 10	2.53	2.53	2.53	2.40	2.26	2.15	2.07	2.02	3.12	3.12	3.12	2.96	2.80	2.66	2.55	2.50	7.04	7.04	7.04	6.67	6.30	5.99	5.75	5.63
300 12	2.48	2.48	2.48	2.35	2.22	2.11	2.03	1.98	2.87	2.87	2.87	2.72	2.57	2.44	2.34	2.29	6.07	6.07	6.07	5.76	5.44	5.17	4.96	4.86
350 14	2.26	2.26	2.26	2.14	2.02	1.92	1.84	1.81	2.73	2.73	2.73	2.59	2.45	2.33	2.23	2.18	5.52	5.52	5.52	5.23	4.94	4.70	4.51	4.41
400 16	2.09	2.09	2.09	1.98	1.87	1.78	1.71	1.67	2.39	2.39	2.39	2.26	2.14	2.03	1.95	1.91	4.81	4.81	4.81	4.56	4.31	4.10	3.93	3.85
450 18	1.86	1.86	1.86	1.76	1.66	1.58	1.52	1.48	2.12	2.12	2.12	2.01	1.90	1.81	1.73	1.69	4.27	4.27	4.27	4.05	3.82	3.64	3.49	3.41
500 20	1.90	1.90	1.90	1.80	1.71	1.62	1.56	1.52	2.21	2.21	2.21	2.10	1.98	1.88	1.81	1.77	3.83	3.83	3.83	3.63	3.43	3.27	3.13	3.07
550 22	1.73	1.73	1.73	1.64	1.55	1.47	1.41	1.38	2.01	2.01	2.01	1.90	1.80	1.71	1.64	1.60								
600 24	1.84	1.84	1.84	1.74	1.65	1.57	1.50	1.47	2.11	2.11	2.11	2.00	1.89	1.80	1.72	1.69	3.18	3.18	3.18	3.02	2.85	2.71	2.60	2.55
750 30	1.68	1.68	1.68	1.60	1.51	1.43	1.38	1.35	2.11	2.11	2.11	2.00	1.89	1.79	1.72	1.68								

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

NOMINAL WORKING PRESSURES

SEAMLESS PIPE NOMINAL WORKING PRESSURES (Mpa) FOR GRADE 304L

NOMINAL WORKING PRESSURES
 Figures shown in this Table are the nominal working pressures for seamless stainless steel pipe under constant operating conditions; these include a typical factor of safety. Nominal working pressures for welded pipe can be calculated by multiplying the figure in the tables by the weld joint efficiency factor, typically 0.85. The tables have been formulated by using the figures obtained by the Australian Pressure Piping Standard AS 4041. Detailed design calculations should be in accordance with the applicable design standard. The information is provided as a guide, it is recommended that professional engineering advice be sought on all pressure-related design.

NOMINAL BORE SIZE	SCHEDULE 40S TEMPERATURE DEG C										SCHEDULE 160 TEMPERATURE DEG C										SCHEDULE XXS TEMPERATURE DEG C									
	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400	50	100	150	200	250	300	350	400						
6 1/8	59.21	59.21	59.21	56.12	53.03	50.45	48.39	47.36																						
8	54.96	54.96	54.96	52.09	49.22	46.83	44.92	43.97																						
10	45.03	45.03	45.03	42.68	40.33	38.37	36.81	36.02																						
15	41.61	41.61	41.61	39.44	37.27	35.46	34.01	33.29	56.19	56.19	56.19	53.26	50.33	47.89	45.93	44.95	101.82	101.82	101.82	96.51	91.20	86.77	83.23	81.46						
20	33.80	33.80	33.80	32.03	30.27	28.80	27.63	27.04	51.24	51.24	51.24	48.57	45.89	43.67	41.88	40.99	79.25	79.25	79.25	75.11	70.98	67.53	64.78	63.40						
25	31.12	31.12	31.12	29.50	27.87	26.52	25.44	24.90	45.89	45.89	45.89	43.50	41.10	39.11	37.51	36.71	71.89	71.89	71.89	68.14	64.38	61.26	58.76	57.51						
32	25.71	25.71	25.71	24.37	23.03	21.91	21.01	20.57	34.87	34.87	34.87	33.05	31.23	29.71	28.50	27.89	57.90	57.90	57.90	54.88	51.86	49.34	47.33	46.32						
40	23.31	23.31	23.31	22.09	20.87	19.86	19.05	18.64	34.16	34.16	34.16	32.38	30.60	29.11	27.93	27.33	51.82	51.82	51.82	49.11	46.41	44.15	42.35	41.45						
50	20.10	20.10	20.10	19.05	18.00	17.13	16.43	16.08	33.40	33.40	33.40	31.66	29.92	28.46	27.30	26.72	44.01	44.01	44.01	41.71	39.42	37.50	35.97	35.21						
65	21.09	21.09	21.09	19.99	18.89	17.97	17.24	16.87	29.66	29.66	29.66	28.11	26.56	25.27	24.24	23.72	46.45	46.45	46.45	44.03	41.61	39.59	37.97	37.16						
80	18.64	18.64	18.64	17.67	16.70	15.89	15.24	14.91	28.29	28.29	28.29	26.81	25.34	24.11	23.12	22.63	40.58	40.58	40.58	38.47	36.35	34.58	33.17	32.47						
90	17.20	17.20	17.20	16.30	15.40	14.65	14.06	13.76																						
100	16.12	16.12	16.12	15.28	14.44	13.74	13.18	12.90	26.48	26.48	26.48	25.10	23.72	22.57	21.65	21.18	34.68	34.68	34.68	32.87	31.07	29.56	28.35	27.75						
125	14.42	14.42	14.42	13.67	12.91	12.29	11.79	11.53	25.08	25.08	25.08	23.77	22.46	21.37	20.50	20.06	30.76	30.76	30.76	29.15	27.55	26.21	25.14	24.60						
150	13.91	13.91	13.91	13.18	12.45	11.85	11.37	11.12	24.12	24.12	24.12	22.86	21.60	20.55	19.71	19.30	29.62	29.62	29.62	28.08	26.53	25.24	24.21	23.70						
200	12.28	12.28	12.28	11.64	11.00	10.47	10.04	9.83	23.27	23.27	23.27	22.05	20.84	19.83	19.02	18.61	22.40	22.40	22.40	21.23	20.07	19.09	18.31	17.92						
250	9.75	9.75	9.75	9.24	8.73	8.31	7.97	7.80	23.18	23.18	23.18	21.97	20.76	19.75	18.95	18.54	20.37	20.37	20.37	19.31	18.24	17.36	16.65	16.30						
300	8.17	8.17	8.17	7.74	7.31	6.96	6.67	6.53	22.75	22.75	22.75	21.56	20.37	19.38	18.59	18.20	16.94	16.94	16.94	16.06	15.17	14.43	13.85	13.55						
350	7.41	7.41	7.41	7.03	6.64	6.32	6.06	5.93	22.15	22.15	22.15	21.00	19.84	18.88	18.11	17.72														
400	6.46	6.46	6.46	6.12	5.79	5.51	5.28	5.17	21.96	21.96	21.96	20.81	19.67	18.71	17.95	17.57														
450	5.73	5.73	5.73	5.43	5.13	4.88	4.68	4.58	21.81	21.81	21.81	20.67	19.53	18.58	17.82	17.44														
500	5.14	5.14	5.14	4.87	4.60	4.38	4.20	4.11	21.67	21.67	21.67	20.54	19.41	18.47	17.72	17.34														
550	10.77	10.77	10.77	10.20	9.64	9.17	8.80	8.61	21.22	21.22	21.22	20.11	19.01	18.08	17.35	16.98														
600	4.26	4.26	4.26	4.04	3.82	3.63	3.48	3.41	21.47	21.47	21.47	20.35	19.23	18.30	17.55	17.18														
750																														

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ANSI/ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ANSI/ASME B36.10M-2004

(1) Schedule 5S and 10S Wall Thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, ISO 7-1 or ISO 228-1

PIPE DIMENSIONS & WEIGHTS

DIMENSIONS AND WEIGHTS OF SEAMLESS AND WELDED STAINLESS STEEL PIPE IN ACCORDANCE WITH ANSI/ASME B36.19M-2004 AND PIPE SUPPLIED DIMENSIONALLY IN ACCORDANCE WITH ASME B36.10M-2004

Nominal Bore Size	Schedule 5S (1)			Schedule 10S (1)			Schedule 40S			Schedule 80S			Schedule 160			Schedule XXS		
	mm	inch	Outside Diameter	Wall Thickness	Inside Diameter	Theoretical Weight (kg/m)	Wall Thickness	Inside Diameter	Theoretical Weight (kg/m)	Wall Thickness	Inside Diameter	Theoretical Weight (kg/m)	Wall Thickness	Inside Diameter	Theoretical Weight (kg/m)	Wall Thickness	Inside Diameter	Theoretical Weight (kg/m)
6	1/8	10.3		1.24	7.82	0.29	1.73	6.84	0.38	2.41	5.48	0.48						
8	1/4	13.7		1.65	10.40	0.50	2.24	9.22	0.65	3.02	7.66	0.82						
10	3/8	17.1		1.65	13.80	0.65	2.31	12.48	0.86	3.20	10.70	1.12						
15	1/2	21.3	18.00	2.11	17.08	1.02	2.77	15.76	1.30	3.73	13.84	1.65	4.78	11.74	1.99	7.47	6.36	2.60
20	3/4	26.7	23.40	2.11	22.48	1.31	2.87	20.96	1.72	3.91	18.88	2.25	5.56	15.58	2.96	7.82	11.06	3.72
25	1	33.4	30.10	2.77	27.86	2.14	3.38	26.64	2.56	4.55	24.30	3.31	6.35	20.70	4.32	9.09	15.22	5.56
32	1-1/4	42.2	38.90	2.77	36.66	2.75	3.56	35.08	3.46	4.85	32.50	4.56	6.35	29.50	5.73	9.70	22.80	7.93
40	1-1/2	48.3	45.00	2.77	42.76	3.18	3.68	40.94	4.13	5.08	38.14	5.52	7.14	34.02	7.39	10.15	28.00	9.74
50	2	60.3	57.00	2.77	54.76	4.01	3.91	52.48	5.55	5.54	49.22	7.63	8.74	42.82	11.33	11.07	38.16	13.71
65	2-1/2	73.0	68.78	3.05	66.90	5.37	5.16	62.68	8.81	7.01	58.98	11.63	9.53	53.94	15.21	14.02	44.96	20.79
80	3	88.9	84.68	3.05	82.80	6.59	5.49	77.92	11.52	7.62	73.66	15.58	11.13	66.64	21.77	15.24	58.42	28.23
90	3-1/2	101.6	97.38	3.05	95.50	7.56	5.74	90.12	13.84	8.08	85.44	19.00	11.13	77.92	27.66	17.12	68.06	41.83
100	4	114.3	110.08	3.05	108.20	8.54	6.02	102.26	16.39	8.56	97.18	22.76	13.49	87.32	34.19	17.12	80.06	41.83
125	5	141.3	135.76	3.40	134.50	11.79	6.55	128.20	22.19	9.53	122.24	31.58	15.88	109.54	50.08	19.05	103.20	58.55
150	6	168.3	162.76	3.40	161.50	14.10	7.11	154.08	28.82	10.97	146.36	43.39	18.26	131.78	68.88	21.95	124.40	80.76
200	8	219.1	213.56	3.76	211.58	20.36	8.18	202.74	43.38	12.70	193.70	65.90	23.01	173.08	113.44	22.23	174.64	110.03
250	10	273.1	266.30	3.40	264.72	28.33	9.27	254.56	61.49	12.70	247.70	83.14	28.58	215.94	175.69	25.40	222.30	158.18
300	12	323.9	315.98	3.96	314.76	36.69	9.53	304.84	75.32	12.70	298.50	99.36	33.32	257.26	243.41	25.40	273.10	190.61
350	14	355.6	347.68	3.96	346.04	42.16	9.53	336.54	82.92	12.70	330.20	109.49	35.71	284.18	287.19			
400	16	406.4	398.02	4.19	396.84	48.27	9.53	387.34	95.09	12.70	381.00	125.70	40.49	325.42	372.47			
450	18	457.0	448.62	4.19	447.44	54.35	9.53	437.94	107.21	12.70	431.60	141.86	45.24	366.52	468.31			
500	20	508.0	498.44	4.78	498.44	60.48	9.53	488.94	119.43	12.70	482.60	158.14	50.01	407.98	575.81			
550	22	559.0	549.44	4.78	547.92	77.09							28.58	501.84	685.35			
600	24	610.0	598.92	5.54	597.30	96.37	9.53	590.94	143.87	12.70	584.60	190.71	59.54	490.92	823.95			
750	30	762.0	749.30	6.35	746.16	150.15												

ALL DIMENSIONS IN MILLIMETRES

FIGURES PRINTED IN THIS STYLE MEET THE DIMENSIONAL REQUIREMENTS OF BOTH ANSI/ASME B36.19M-2004 & ASME B36.10M-2004
 FIGURES PRINTED IN THIS STYLE & UNDERLINED DO NOT CONFORM DIMENSIONALLY WITH ASME B36.10M-2004

FIGURES PRINTED IN THIS STYLE ONLY MEET THE DIMENSIONAL REQUIREMENTS OF ASME B36.10M-2004.

(1) Schedules 5S and 10S wall thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1, AS ISO 7-1 or ISO 228-1

Mass is given in kilograms per metre and is for 316 Stainless Steel pipe with plain ends. The different grades of Stainless Steel permit considerable variation in mass. Other Austenitic Stainless Steels may be between 1%-2.6% less in mass, and the Ferritic Stainless Steels about 3%-4% less than the mass values as shown in the table. For details of dimensional tolerances, refer to the applicable standards such as ASTM A312/312M. This table is a guide only and should not be used to determine availability of product.

THEORETICAL WORKING PRESSURE FOR SEAMLESS TUBE TP316/316L

316 (Seamless) -253 to 38°C

Size		Wall Thickness							
		Inch	0.028	0.036	0.048	0.064	0.083	0.109	0.128
mm	Inch	mm	0.71	0.91	1.22	1.63	2.11	2.77	3.25
3.18	1/8"	psi	8,579	12,083	19,185				
		kPa	59,110	83,254	132,188				
4.76	3/16"	psi	5,883	7,153	10,389				
		kPa	40,534	49,282	71,581				
6.35	1/4"	psi	4,311	5,682	7,199	10,464	15,363		
		kPa	29,700	39,150	49,603	72,097	105,848		
7.94	5/16"	psi	3,401	4,460	6,129	7,836	11,060		
		kPa	23,436	30,730	42,229	53,990	76,205		
9.53	3/8"	psi		3,671	5,017	6,274	8,679		
		kPa		25,290	34,566	43,230	59,797		
12.7	1/2"	psi		2,711	3,681	5,031	6,726	8,539	
		kPa		18,678	25,362	34,667	46,343	58,834	
15.88	5/8"	psi		2,149	2,907	3,953	5,249	6,474	
		kPa		14,806	20,029	27,233	36,166	44,604	
19.05	3/4"	psi		1,780	2,402	3,255	4,304	5,809	5,887
		kPa		12,264	16,549	22,424	29,654	40,023	40,562
25.4	1"	psi			1,781	2,403	3,161	4,235	4,741
		kPa			12,269	16,555	21,780	29,181	32,665
31.75	1-1/4"	psi				1,906	2,500	3,335	3,726
		kPa				13,131	17,224	22,980	25,673
38.1	1-1/2"	psi				1,574	2,060	2,741	3,058
		kPa				10,844	14,196	18,886	21,072
50.8	2"	psi				1,173	1,532	2,032	2,263
		kPa				8,083	10,556	13,997	15,593

TUBE WORKING PRESSURE NOTES:

Tube working pressures have been calculated in accordance with ASME B31.3

Where Thickness < Diameter/6, the formula 304.1.2 3a has been used. Where Thickness ≥ Diameter/6, the formula K304.1.2 35c has been used.

For TP316

S = 20,000 psi

Y = 0.4

W = 1

E = 1

c0 has been neglected

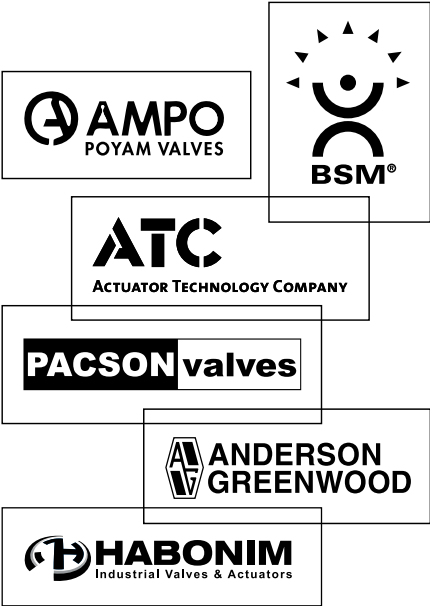
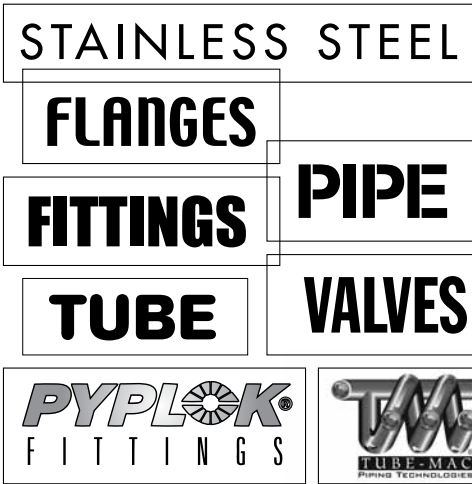
Tube Outside Diameter and Wall Thickness Tolerances have been considered when calculating the working pressures.

Numbers in standard text have been calculated based on ASTM A269/213 tolerances.

Numbers in bold italic text have been calculated based on ASTM A269 tolerances.

The Allowable Working Pressures calculated are a guide only. As there are variables that will alter the Allowable Working Pressure of the tube, it is the ultimate responsibility of the customer to verify that the tube is suitable for the application.

This table does not advise suitability for use with compression fittings. The purchaser must refer to the compression fitting manufacturers' tubing data charts for size and wall thickness suitability.





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