CHUAN KOK
CREATING OPPORTUNITIES

STAINLESS STEEL TUBES

Literature

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Chuan Kok Hardware maintains a large stock of stainless steel tube to be needed in high performance hydraulic line application. Seamless cold drawn tubes are being constantly offered to clients due to its quality and cleanliness. Seamless cold drawn tubes are precision in dimension and free of scale.

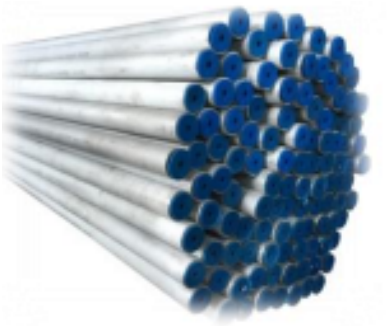


Figure 1 Stainless Steel Tube Bundle Photo

Introduction:

Chuan Kok keeps an ex-stock of stainless steel tubes in dual grade which is SS316/316L with seamless quality. The stainless steel tubes are in accordance with ASTM A269/A213.

ASTM A269 is the standard specification for seamless and welded austenitic stainless steel tubing for general service. While for ASTM A213, it is a standard specification for seamless ferritic and austenitic alloy-steel boiler, super heater and heat-exchanger tubes.

Stainless Steel Tube Attributes:

The minimum yield strength for stainless steel tube is 515 N/mm² and with maximum 90 HRB of hardness. Maximum 80 HRB is commonly specified so that compression fittings can work well with the tubes. Stainless steel tubes contain at least 10.5% of chromium and it will react with the oxygen to form an invisible chrome-oxide layer. The layer is strong enough to prevent further oxygen from rusting the surface.

SS316/316L is molybdenum-bearing austenitic stainless steel with molybdenum content ranging from 2.0 to 3.0%. The high nickel and molybdenum content provides resistance in highly corrosive surroundings such as salt water or chloride environments. In addition, SS316/316L also provides excellent elevated temperature tensile, outstanding formability and weld-ability.

Figure 2 Annealed & Pickled, Polished 320 Grit Tube

The means of "L" designation after the grade number is the carbon content is restricted to a maximum of 0.03% where the normal level of carbon content of stainless steel is maximum of 0.08%. The lower level of carbon content stainless steel tubes are used where welding will be performed. This lower level carbon content prevents the chromium from being depleted and thus it can still form the chrome-oxide layer on the tube surface.

Stainless Steel Tube Finishing:

Tubes are supplied in 3 types of finishing as Annealed and Pickled, Polished 320 Grit, and Bright Annealed.

Usually stainless steel tubes are supplied in anneal and pickle condition. Anneal is a heat treatment that will alter the physical and chemical properties of the material. It increases the ductility and reduces the hardness of the stainless steel tube. Pickling is a metal surface treatment that contains strong acid to remove the impurities on the tube surface.

Figure 3 Stainless Steel Tube Bundle Photo

Polished 320 Grit are produced for applications where a smoother finishing is required for aesthetic application. Bright Annealed is produced by heat treating (annealing) steel with a controlled atmosphere. After the heat treatment, the steel has a reflective, mirror-like appearance.

Stainless Steel Tubes are also suitable for flaring and cold bending. For cold bending, a bend radius of 3x the external tube diameter is recommended with tube benders or by hand. Tubes made of SS316/316L are suitable for arc welding according to usual techniques. The welding filler should be selected in accordance with DIN EN 1600 and DIN EN 12072 part 1 taking into account the type of application and the welding technique.

Outer Diameter and Tube Thickness Specifications:

The tube's outer diameter (OD) is according to ASTM A269/A213. However, for hydraulic applications, a tighter tolerance is usually specified to work well with compression fittings. Tolerance specifications are as per below:

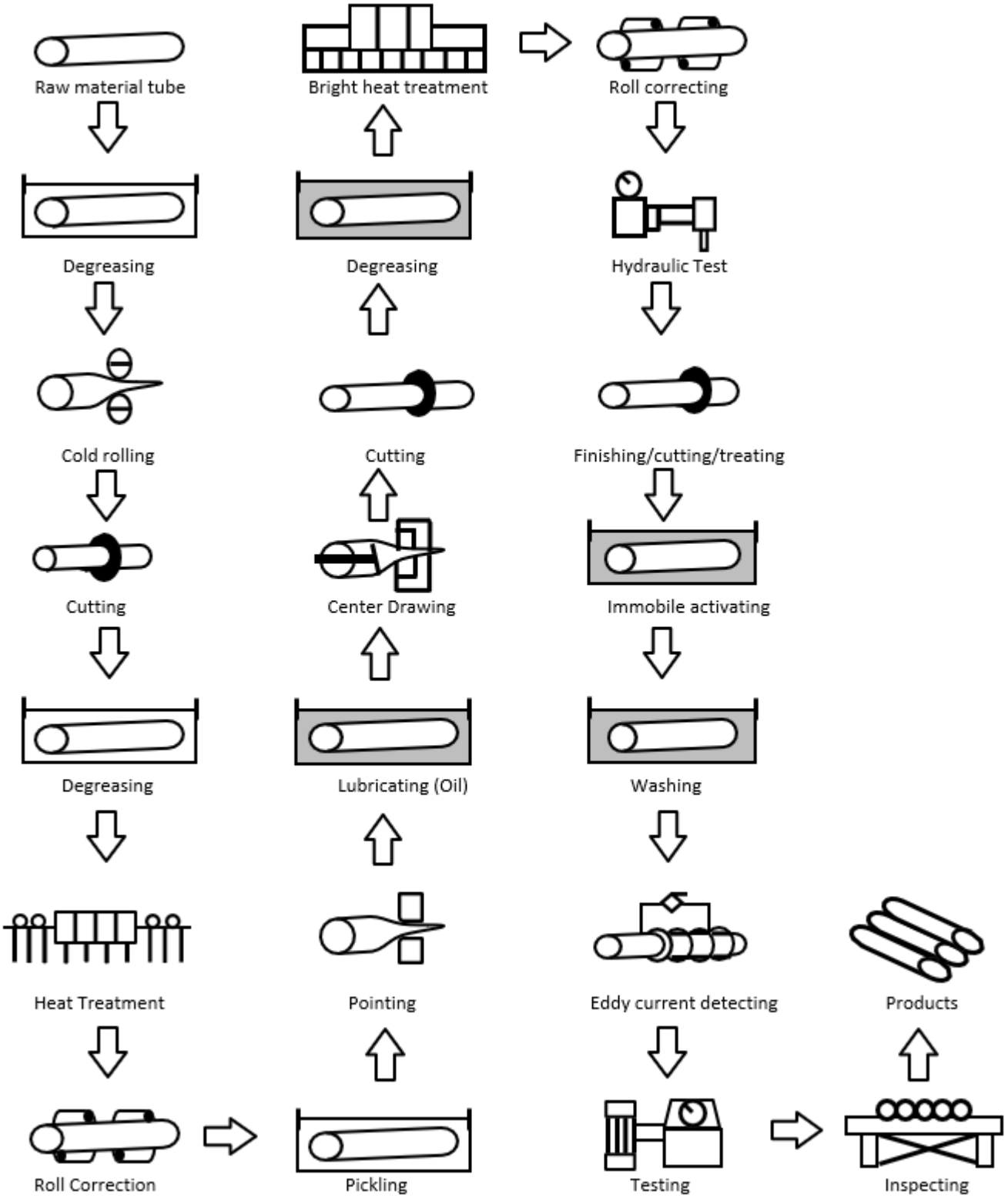
TUBE OD	TOLERANCE
4MM to 35MM	+/- 0.08MM
35MM to 38MM	+/- 0.15MM
38MM to 60MM	+/- 0.20MM
60MM and ABOVE	+/- 0.25MM

For tube thickness, A269 and A213 have 2 different types of wall thickness tolerance. For ASTM A269, the permissible variations in wall thickness is +/− 10%. However for ASTM A213, there are 2 options for the wall thickness tolerance. The 1st option is minimum wall thickness which is + 20%, − 0% of wall thickness. The 2nd option is average wall thickness which is +/− 10% of wall thickness.

Our usual option for tubing products wall thickness is +/− 10% and it will comply with both A269 and A213 standards.

Stainless steel tubes manufacturing process will be illustrated in the next page.

Manufacturing Process:



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