This study investigates AA6061-O and SUS304 dissimilar welding with preheating of stainless steel SUS304 prior to welding process. The welding method used was metal inert gas (MIG) with butt joint type weld. The mechanical strength was investigated using tensile test. Meanwhile, the macrostructure and microstructure of the specimens were analyzed using optical microscope, scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The tensile tests indicate that the preheated specimen with 90 °C have the maximum ultimate tensile strength of 111 MPa. In addition to that, the intermetallic compound (IMC) of the all the specimen was observed to be in the range of 1.59 μm to 10.8 μm. Fracture failures occur at the IMC interfaces on all specimen, where a thicker IMC layer consequently yields a lower tensile value. It can be concluded that the optimum parameters for AA6061-O to SUS304 welding can be achieved at 90 °C with 17.5 V welding voltage and 110 A welding current.