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We will present results of a combined experimental and theoretical study of magnesium silicate Mg_2SiO_4 across diverse thermodynamic regimes spanning pressures up to 1000 GPa and temperatures up to 50000 K. We highlight several quantities of interest for planetary science applications and high pressure science including the principal Hugoniot states, principal isentrope, and principle isotherm. The results constitute a new, highly accurate and fully self-consistent multi-phase equation of state for an important planetary material in thermodynamic regimes most important for planetary interior models.