Typical IL’s have been suggested as potentially “green” replacements for conventional organic solvents since they are nonvolatile (negligible vapor pressure), nonflammable, thermal stable, and recyclable. They are salts that are liquid at low temperatures (<100 °C), promising ideal systems for different purposes in chemical catalysis, separation processes and electrochemistry including heat transfer fluids in solar heating, absorption refrigerating systems because of their chemical and physical properties. These applications require high quality of data related to thermophysical and thermodynamic properties of these substances and their mixtures such as density and excess volume properties, gas solubility, surface and interphase tensions, viscosity, diffusion coefficients, thermal and electrical conductivities. In this work, we present: full literature analysis of \((p,\rho,T)\) data of ionic liquids from year 2002 till the present time; our high pressure – high temperature density measurements of various ionic liquids during the last 7 years, including the new measurements \([T=(283.15 to 413.15) K, \rho=(0.101 to 140) MPa]\) using a new, modernized high pressure – high temperature Anton-Paar DMA HPM vibrating tube densimeter with an experimental uncertainty of \(\Delta \rho/\rho = \pm (0.01 to 0.08)\) % in density. The obtained density results compared with available literatures. Densities of IL’s at ambient pressure and at temperatures \(T=(283.15 to 363.15) K\) are also measured using Anton-Paar DMA 5000 vibrating tube densimeter. An equation of state for fitting of the \((p,\rho,T)\) data has been developed as a function of pressure and temperature to calculate the various thermal properties of the IL’s, such as isothermal compressibility, isobaric thermal expansibility, differences in isobaric and isochoic heat capacities, thermal pressure coefficient and internal pressure.