The design of industrial processing equipment of linear alcohols, an important alternative source of energy, needs accurate VLE measurements of binary mixtures of these compounds with water at high temperatures. A flow apparatus was built to carry out these measurements at temperatures and pressures up to 573 K and 20 MPa, respectively. A flow method was chosen to avoid the thermal degradation of alcohols at high temperatures. The VLE equilibrium is achieved inside a high pressure cell made of 316SS with a sapphire window, sealed with gold O-rings. Inside this cell the temperature is measured using a calibrated Pt100 resistance thermometer with accuracy better than 0.1 K. The pressure was measured with two pressure transducers, operating up to 5 and 20 MPa, with accuracy better than ± 0.2% FS. Furthermore, the equilibrium compositions were determined using a new method for accurately converting vibrating tube periods of oscillation in density values developed by the authors Lampreia and Nieto de Castro (2011) using an Anton Paar vibrating tube densimeter [2], with an accuracy better than 0.1%. VLE measurements for the system water-ethanol were carried out to test the quality of the data obtained with the apparatus, as accurate data are available [3, 4]. Measurements with water + n-propanol mixtures are also presented. The Statistical Associating Fluid Theory for potentials of Variable Range (SAFT-VR) [5, 6] was used to correlate the data. The molecular parameters used were taken from the work of Mac Dowell et al. [7]. The phase equilibria, has proved to be accurately described with this approach, especially considering that the parameters are being applied to a larger region of the phase diagram.