In this work phase transformations in metastable β (primarily Ti-15Mo) alloys were studied utilizing electrical resistance, dilatometry, transmission electron microscopy and X-ray and neutron diffraction. The materials Ti-15Mo, Ti-6.8Mo-4.5Fe-1.5Al (LCB), Ti-5Al-5V-5Mo-3Cr (Ti-5553), Ti-29Nb-1Fe-0.5Si (TNFS), Ti-15Mo-3Nb-3Al-0.2Si (Timetal 21S) and Ti-13Cr-1Fe-3Al (TCFA) (in wt. %) - were subjected to a solution treatment at a temperature above β transus and quenched into water. In this condition, the microstructure of the investigated materials consists of β matrix and ω particles. Samples quenched from important temperatures determined from in-situ electrical resistance and dilatometry measurements were studied by post-mortem TEM. In-situ X-ray and neutron diffraction provided direct observations of microstructure of Ti-15Mo alloy during linear heating and confirmed statements based on results of indirect methods, such as: the decrease of volume fraction of ω phase during heating at low temperatures (up to 250 ◦ C), complete dissolution of ω phase at 560 ◦ C and precipitation of α phase without ω particles serving as its direct precursors. X-ray diffraction experiment allowed to determine relative evolution of the size of ω particles while phase fraction evolution was derived from neutron diffraction. The volume fraction of β phase at room temperature is about 60 %. The volume fraction of ω phase during heating with the heating rate of 5 ◦ C/min reaches its maximum value of 45 % at about 400 ◦ C. The maximum amount of the volume fraction of α phase during the same experiment was 11 % at about 650 ◦ C.