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A precipitation hardenable semi-austenitic stainless steel AISI 632 grade was austenitized according to industrial specifications and thereafter subjected to isothermal treatment at sub-zero Celsius temperatures. During treatment, austenite transformed to martensite. The isothermal austenite-to-martensite transformation was monitored in situ by magnetometry and data was used to sketch a TTT diagram for transformation. As an alternative treatment, after austenitization the material was immersed in boiling nitrogen and up-quenched to room temperature by immersion in water prior to be subjected to isothermal treatment. Magnetometry showed that the additional thermal step in boiling nitrogen yields a minor increment of the fraction of martensite, but has a noteworthy accelerating effect on the transformation kinetics, which more pronounced when the isothermal holding is performed at a higher temperature. Data is interpreted in terms of instantaneous nucleation of martensite during cooling followed by time dependent growth during isothermal holding.