

AD-DRIVE-01: Train traction drive

Keywords: PMSM motor, 3-level inverter, 12-pulse thyristor rectifier

The train traction drive demo is composed of a grid-connected, 12-pulse, thyristor rectifier connected to a 3-level, GTO (gate turn-off thyristor) inverter feeding a 1 MW permanent magnet motor.

To achieve hard-real-time simulation of the AC-side rectifier, the inverter was modeled with Time-Stamped Bridges and ARTEMIS. To artificially decouple the 2 secondary windings of the transformer, a special transformer model was designed. Thus, ARTEMIS solvers can make a full precomputation of the two 6-pulse thyristor modes. Without this, the algorithm would have to precompute 4096 (2^{12}) different system equations for the AC-side only.

To decouple the secondary windings, a short transmission line having the same line inductance modeled the secondary leakage inductance. This approximation has the effect of introducing some line capacitances that are not present in the actual circuit. However, as long as the sample time is small, the spurious capacitances are also small and the error is minimal.

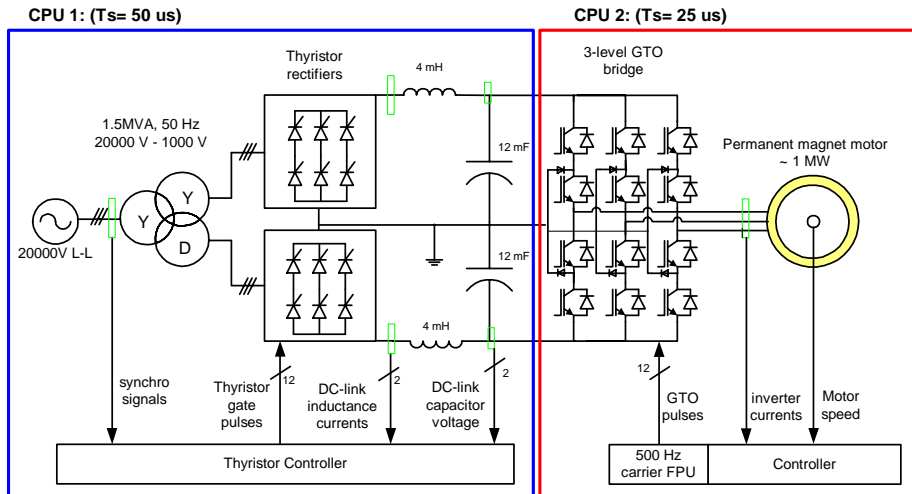


Figure 1. Train traction drive circuit

System configuration	
Hardware enclosure	HILBox
Software modules	Time-stamped bridge, ARTEMIS
Additional models	Advanced models (DT)
Package	D21Q-1