MACHINE PROTECTION SYSTEM ON THE COMPASS TOKAMAK

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The machine protection system on COMPASS [1] secures a safe operation of the tokamak and its subsystems with respect to potential risk of damages on the machine and/or its individual systems. The operation parameters are divided into two groups: a) time uncritical and b) time critical tasks.

The first group of parameters, time uncritical, is checked in a cycle of 100 miliseconds and it covers namely the conditions necessary to launch the plasma shot: radial hydraulic pre-load system; electrical connection of the power supply circuits (vacuum vessel baking / experiment); operation of cooling system. The output of this protection circuit allows the operation of power supplies that feed the tokamak windings during the shot.

The second group, the time critical parameters, is monitored in a cycle of 100 microseconds. This cycle controls the operation of potentially dangerous systems, typically during the shot, i.e. during the operation of the tokamak power supplies. The monitored parameters are: vertical hydraulic pre-load system; toroidal field coils protection system; microwave interferometer; and personnel protection system [2]. Based on the status of the inputs, a permission for operation is granted to the controlled systems (vertical hydraulic pre-load, the tokamak power supplies, and the neutral beam heating).

The design of the machine protection system includes Programmable Logical Controller (PLC) TECO Foxtrot CP1014 as a core element with corresponding input/output modules for the time uncritical section. The time critical section is managed by an ARM based socket board with necessary digital and analog inputs and RS485 serial ports for the time critical communication. The non-critical communication is run over the ethernet.

This contribution will give a detailed description of the design, implementation, and function of the machine protection system on COMPASS.

[1] R. Pánek et al., Czech J. Phys. 56 (Suppl. B) (2006) B125-B137
[2] M. Hron, et al., Interlock system for the COMPASS tokamak, Fus. Eng. Des. (2010), doi:10.1016/j.fusengdes.2010.03.054