Turbine Solutions
Hydraulic 2-out-of-3 Trip Block
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The requirements for modern protection systems in power plants demand enhanced efforts in the area of mechanical/hydraulic protection systems as well.

For that purpose ABB has developed a hydraulic SIL3 2-out-of-3 trip block which is used as the central trip component. The main features are:

- very high reliability and availability
- very high shut-off safety in the event of a turbine trip
- compliance with the highest safety requirements in accordance with SIL3 TÜV certification in compliance with IEC 61508

Modern-day state-of-the-art protection systems nowadays are usually performed in a three channel design with 2-out-of-3 selection.

Under the stringent stipulations laid down in IEC 61508, e.g. for a turbine’s overspeed protection, these protection systems have to meet Classification SIL3 in compliance with IEC 61508 after the removal of the mechanical overspeed protection bolts.

Up to this point, this stipulation was met only by manufacturers of electronic overspeed protection systems.

Nevertheless since the best protection system in accordance with IEC 61508 is ineffective without any appropriate trip component in the complete system, it proves to be just as important to assure SIL3 conformity in compliance with IEC 61508 in terms of the mechanical/hydraulic trip component as well.

ABB – as a system supplier of complete control and protection systems for power plants and turbines – has developed a hydraulic 2-out-of-3 trip block whose design combines the following features:

- SIL certified in accordance with IEC 61508
- leading-edge technology with indirect functional principle for low pressure and high pressure hydraulics
- failsafe 2-out-of-3 design
- very high degree of monitoring and availability
- failures within the system can be located by means of integrated analysis functions in every detail
- very compact dimensions
- minimised maintenance requirement

Within this trip block the three electronic Turbotrol® protection channels are hydraulically connected in a 2-out-of-3 circuit and the following safety/control oil circuit is depressurized in the event of a turbine trip. The safety oil circuit is still connected to the existing control and protection actuators.

The trip block is constructed in such a way that a single failure of the system does not result in a trip. Only the release of at least two protection channels causes a safe trip. This means it is possible to avoid unnecessary shutdowns, which lead to additional stress on the material, e.g. the turbine, and therefore assures increased reliability.
It is consequently possible to test each single channel during operation: not only is the hydraulic trip of each channel tested, but also the proper state of the internal components of the TÜV-certified SIL3 trip block by means of intelligent monitoring logic.

The electronic analyzing logic of modern protection systems is completely realized within the Turbotrol® control system.

A parallel realization of hydraulic tripping circuits is not applicable. This means substantially simplified tripping circuits can be realized, which entail only minimised maintenance costs.

The hydraulic 2-out-of-3 trip block is available with the same functional principle for hydraulic low pressure and high pressure systems.

**SIL3 certified 2-out-of-3 Trip Block Type:**

**ABB TB 2005 – L/H**

**Technical Data:**
- **Working Pressure:** 5-150 bar
- **Dimensions (HxWxD):**
  - approx. 360x220x205 (low pressure)
  - approx. 300x190x185 (high pressure)

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