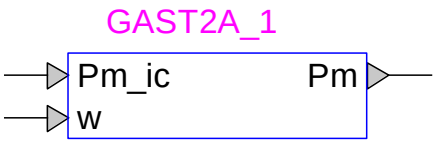
Exciters and Governors: Governor-Turbine GAST2A



Governor-Turbine GAST2A

Tshibain Tshibungu, Jean Mahseredjian, 8/1/2016 2:29 PM

1 Description

This device is an implementation of a general model for steam turbine and governor GAST2A. This device is implemented as described in [1]. Implementation details can be viewed by inspecting the subcircuit of this device.

1.1 Pins

This device has 3 pins:

Pin name	Type	Description	Units
Pm_ic	Input	Steady-state mechanical power at t = 0, for initialization	pu
w	Input	Mechanical speed	pu
Pm	Output	Turbine mechanical power	pu

1.2 Parameters

The default set of parameters are obtained from [1].

1.2.1 Governor tab

The parameters on the Data tab are:

1. **Gain W**: Governor gain on turbine rating
2. **Lag time constant Y**: governor lag time constant
3. **Lead time constant X**: governor lead time constant
4. **Maximum limit MAX**: maximum limit on turbine rating
5. **Minimum limit MIN**: minimum limit on turbine rating
6. Governor mode: see explanation below.

There are two possible selections for the governor mode option:

1. Droop control
2. Isochronous control

1.2.2 Turbine tab

The turbine tab allows to input:

1. **Time constant E_{TD}**: turbine exhaust time constant
2. **Time constant T_{CD}**: turbine dynamic time constant
3. **Time constant T**: fuel control time constant
4. **Fuel control gain K_3**: fuel control gain
5. **Valve positioner A**: valve positioner
6. **Valve positioner B**: valve positioner
7. **Valve positioner C**: valve positioner
8. **Time constant E_{CR}**: combustion reaction time delay
9. **Time constant T_F**: fuel system time constant
10. **Feedback gain K_F**: fuel system feedback gain
11. **Minimum fuel flow K_6**: minimum fuel flow
12. **Time constant T_3**: radiation shield time constant
13. **Radiation shield K_5**: radiation shield
14. **Radiation shield K_4**: radiation shield
15. **Time constant T_4**: thermocouple time constant
16. **Time constant T_T**: temperature control time constant
17. **Time constant T_5**: temperature control time constant
18. **Turbine characteristic A_{F1}**: turbine characteristic
19. **Turbine characteristic B_{F1}**: turbine characteristic
20. **Turbine characteristic A_{F2}**: turbine characteristic
21. **Turbine characteristic B_{F2}**: turbine characteristic
22. **Turbine characteristic C_{F2}**: turbine characteristic
23. **Rate temperature T_R**: rated temperature
24. **Temperature control T_C**: control temperature
25. **Ratio turbine-generator rating T_{RATE}**: ratio turbine-generator rating

2 Initial conditions

The initial output is equal to the generator mechanical power (base for power) at t = 0 s.

3 References

[1] “Simplified mathematical representations of heavy-duty gas turbines,” Rowen, W. I Trans. ASME 1983

[2] P. M. Anderson and A. A. Fouad, “Power system control and stability”, second edition, IEEE Press, Wiley Interscience, 2003.