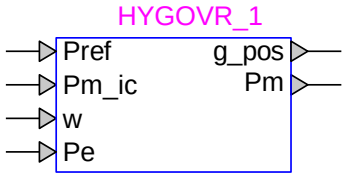
Exciters and Governors: Governor-Turbine HYGOVR



Governor-Turbine HYGOVR

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1 Description

This device is an implementation of a general model for turbine and governor HYGOVR. 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 6 pins:

Pin name	Type	Description	Units
Pref	Input	Power reference from load controller LCBF1	pu
Pm_ic	Input	Steady-state mechanical power at t = 0, for initialization	pu
w	Input	Mechanical speed	pu
Pe	Input	Electrical power	pu
g_pos	Output	Gate position	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 Governor tab are:

1. **Permanent droop R**: permanent droop
2. **Time constant T_t**: power feedback time constant
3. **Deadband width db_1**: deadband width of speed governor

4. **Deadband hysteresis E_{RR}**: deadband hysteresis of speed governor
5. **Time constant T_d**: filter time constant
6. **Time constant T_1**: time constant
7. **Time constant T_2**: time constant
8. **Time constant T_3**: time constant
9. **Time constant T_4**: time constant
10. **Time constant T_5**: time constant
11. **Time constant T_6**: time constant
12. **Time constant T_7**: time constant
13. **Time constant T_8**: time constant
14. **Gain K_i**: integral gain
15. **Maximum governor output G_{MAX}**: maximum governor output
16. **Minimum governor output G_{MIN}**: minimum governor output
17. **Time constant T_P**: gate servo time constant
18. **Gain K_G**: gate servo gain
19. **Maximum opening velocity V_{ELop}**: maximum gate opening velocity
20. **Maximum closing velocity V_{ELclo}**: maximum gate closing velocity
21. **Maximum gate opening P_{MAX}**: maximum gate opening
22. **Minimum gate opening P_{MIN}**: minimum gate opening
23. **Deadband width db_2**: deadband width of power gate
24. Feedback switch control: see explanation below.

There are two possible selections for the feedback mode option:

1. Electrical power feedback
2. Gate position feedback

1.2.2 Turbine tab

The turbine tab allows to input:

1. **Time constant T_W**: water inertia time constant
2. **Damping factor D_T**: turbine damping factor
3. **Gain A_T**: turbine gain
4. **No-load flow Q_{NL}**: no-load flow at nominal head

2 Initial conditions

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

3 References

[1] "Review of Existing Hydroelectric Turbine-Governor Simulation Models", Argonne national Laboratory, August 2013