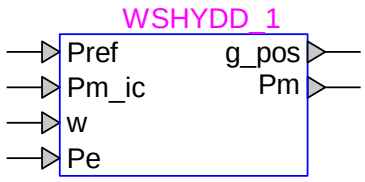
Exciters and Governors: Governor-Turbine WSHYGP



Governor-Turbine WSHYDD

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1 Description

This device is an implementation of a general model for turbine and governor WSHYGP. 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**: intentional deadband of speed governor

4. **Deadband hysteresis E_{RR}**: deadband hysteresis of speed governor
5. **Time constant T_d**: filter time constant
6. **Gain K_p**: proportional gain
7. **Gain K_i**: integral gain
8. **Gain K_d**: derivative gain
9. **Time constant T_f**: derivative time constant
10. **Time constant T_P**: gate servo time constant
11. **Gain K_G**: gate servo gain
12. **Gate opening velocity VEL_{OP}**: maximum gate opening velocity
13. **Gate closing velocity VEL_{CL}**: maximum gate closing velocity
14. **Maximum gate opening P_{MAX}**: maximum gate opening
15. **Minimum gate opening P_{MIN}**: minimum gate opening
16. **Deadband width db_2**: Unintentional deadband of power gate
17. 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_{TURB}**: turbine time constant
2. **Lead time constant multiplier A_{TURB}**: turbine lead time constant multiplier
3. **Lag time constant multiplier B_{TURB}**: turbine lag time constant multiplier
4. **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] “Review of Existing Hydroelectric Turbine-Governor Simulation Models”, Argonne national Laboratory, August 2013