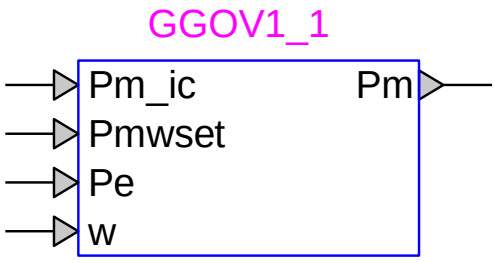
Exciters and Governors: Governor-Turbine GGOV1



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1 Description

This device is an implementation of a general model for turbine and governor GGOV1. 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 5 pins:

Pin name	Type	Description	Units
Pm_ic	Input	Steady-state mechanical power at t = 0, for initialization	pu
Pmwset	Input	Desired MW output of turbine	pu
Pe	Input	Electrical power	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 Data tab

The parameters on the Data tab are:

1. **Droop R**: permanent droop
2. **Time constant T_{Pelec}**: electrical power transducer time constant
3. **Maximum speed error Max_{ERR}**: maximum value for speed error signal
4. **Minimum speed error Min_{ERR}**: minimum value for speed error signal
5. **Gain K_{PGOV}**: governor proportional gain
6. **Gain K_{IGOV}**: governor integral gain
7. **Gain K_{DGOV}**: governor derivative gain
8. **Time constant T_{DGOV}**: governor derivative controller time constant
9. **Maximum valve position V_{MAX}**: maximum valve position limit
10. **Minimum valve position V_{MIN}**: minimum valve position limit
11. **Time constant T_{ACT}**: actuator time constant
12. **Time constant T_{FLOAD}**: load limiter time constant
13. **Gain K_{PLOAD}**: load limiter proportional gain
14. **Gain K_{ILOAD}**: load limiter proportional gain
15. **Load limiter reference L_{DREF}**: load limiter reference value
16. **Damping coefficient D_m**: mechanical damping coefficient
17. **Maximum valve opening rate R_{Open}**: maximum valve opening rate
18. **Maximum valve closing rate R_{Close}**: maximum valve closing rate
19. **Acceleration set point A_{Set}**: acceleration limiter set point
20. **Gain K_A**: acceleration limiter gain
21. **Time constant T_A**: acceleration limiter time constant
22. **Gain K_{IMW}**: power controller gain
23. **Deadband width db_2**: deadband width of speed governor
24. **Time constant T_{SA}**: temperature detection lead time constant
25. **Time constant T_{SB}**: temperature detection lag time constant
26. Feedback signal for governor droop: see explanation below.
27. Switch for fuel source characteristic: see explanation below.

There are four possible selections for the feedback signal option:

1. Isochronous
2. Governor output
3. Fuel valve stroke
4. Electrical power

There are two possible selections for the fuel source characteristic option:

1. Fuel flow proportional of speed
2. Fuel flow independent of speed

1.2.2 Turbine tab

The turbine tab allows to input:

1. **Gain K_{TURB}**: turbine gain
2. **No load fuel flow W_{FNL}**: no load fuel flow
3. **Time constant T_B**: turbine lag time constant
4. **Time constant T_C**: turbine lead time constant
5. **Time constant T_{ENG}**: diesel engine time delay
6. **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] “Dynamic Models for Turbine-Governors in Power System Studies,” Technical report PES-TR1. IEEE Power & Energy Society Jan 2013.