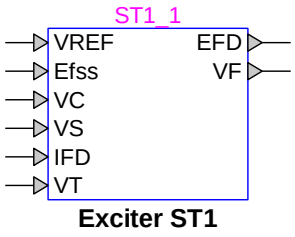
# Exciters and Governors: Exciter ST1



**Exciter ST1**

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## 1 Description

This device is an implementation of the IEEE type ST1 excitation system model. 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 8 pins:

| Pin name | Type | Description | Units |
|---|---|---|---|
| VREF | Input | Reference voltage of the stator terminal voltage | pu |
| Efss | Input | Steady-state field voltage at t = 0, for initialization | pu |
| VC | Input | Terminal voltage of synchronous machine, transducer output | pu |
| VS | Input | Power System Stabilizer signal | pu |
| IFD | Input | Field current | pu |
| VT | Input | Terminal voltage of synchronous machine | pu |
| EFD | Output | The field voltage signal | pu |
| VF | Output | The excitation system stabilizer signal | pu |

## 1.2 Parameters

The default set of parameters can be found in [1].

### 1.2.1 Data tab

The parameters on the Data tab are:

1. **Time constant $T_B$**: lead-lag time constant
2. **Time constant $T_C$**: lead-lag time constant
3. **Gain $K_F$**: excitation control system stabilizer gain

4. **Time constant $T_F$**: excitation control system stabilizer time constant

### 1.2.2 Exciter tab

The exciter tab allows to input:

1. **Gain $K_A$**: voltage regulator gain
2. **Time constant $T_A$**: voltage regulator time constant
3. **Rectifier loading factor $K_C$**: rectifier loading factor
4. **Maximum regulator output $V_{Imax}$**: maximum regulator voltage input
5. **Minimum regulator output $V_{Imin}$**: minimum regulator voltage input
6. **Maximum regulator output $V_{Rmax}$**: maximum regulator voltage output
7. **Minimum regulator output $V_{Rmin}$**: minimum regulator voltage output

## 2 Initial conditions

The reference voltage VREF can be manually or automatically set by connecting or not connecting the input signal VREF, respectively. When VREF is not connected (the signal is zero), the reference voltage is internally found from the steady-state solution. When VREF is connected, its initial value must match the per unit steady-state voltage of the stator terminal voltage, since otherwise the generator voltage will not start at the actual steady-state.

## 3 References

[1] “Excitation System Models For Power System Stability Studies,” IEEE Committee Report. IEEE Transactions on Power Apparatus and Systems, Vol. PAS-100, No. 2 February 1981.