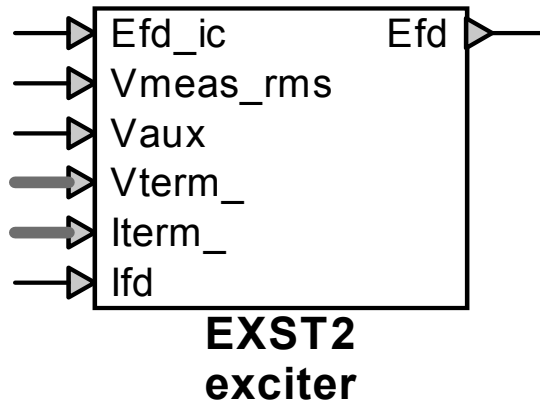


Machine control : exciter EXST2



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1 Description

This device is an implementation of an IEEE Type ST2 excitation system similar to PSS/E's EXST2 exciter model. This version of the exciter interprets all input and output values in physical units. For a version with input and output in per-unit quantities, use the device "exciter EXST2 pu".

1.1 Pins

This device has seven pins:

<i>pin</i>	<i>type</i>	<i>description</i>	<i>units</i>
Efd_ic	input pin	initial field voltage at t=0	V
Vmeas_rms	input pin	measured rms voltage	V
Vaux	input pin	auxiliary voltage order	V
Vterm	2-signal bundle	terminal voltage magnitude	V
		terminal voltage angle	rad
Iterm	2-signal bundle	terminal current magnitude	A
		terminal current angle	rad
Ifd	input pin	field current	A
Efd	output pin	field voltage	V

1.2 Parameters

The value of the following parameters must be defined:

<i>parameter</i>	<i>description</i>	<i>units</i>	
Tr	time constant (lag) of voltage meter	s	
Ta	time constant (lag) of regulator	s	
Te	time constant (lag) of exciter	s	
Tf	time constant (lag) of feedback	s	
Ka	gain of regulator		(includes base conversion)
Ke	gain of exciter		
Kf	gain of feedback		(includes base conversion)
Vrmin	regulator low limit	pu(Efd_base)	
Vrmax	regulator high limit	pu(Efd_base)	
Efd_max	exciter high limit	pu(Efd_base)	
Kp	rectifier gain on terminal voltage		
Ki	rectifier gain on terminal current		
Kc	rectifier gain on field current		

1.3 Input

The input pins may be connected to any control signals. The input phasors may be connected to any phasor bundles.

The following inputs are available:

<i>input</i>	<i>description</i>	<i>units</i>
Efd_ic	initial field voltage at t=0	V
Vmeas_rms	measured rms voltage	V
Vaux	auxiliary voltage order	V
Vterm	terminal voltage magnitude	V
	terminal voltage angle	rad
Iterm	terminal current magnitude	A
	terminal current angle	rad
Ild	field current	A

1.4 Output

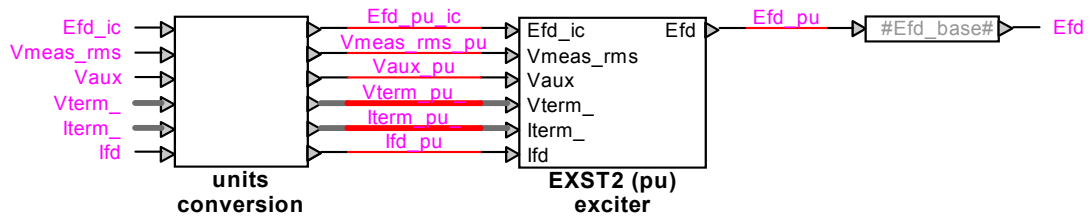
The output value is the calculated field voltage, in per-unit of the base field voltage.

<i>output</i>	<i>description</i>	<i>units</i>
Efd	field voltage	V

1.5 Representation

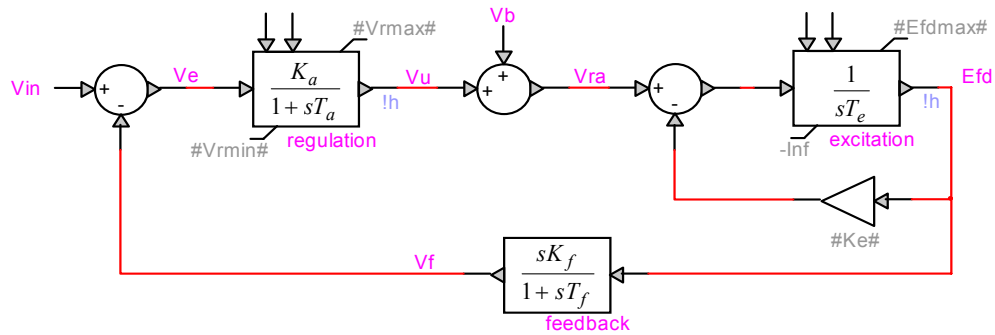
The implementation of the model can be inspected by opening the device's subcircuit.

The model uses a unit-conversion shell surrounding the per-unit version of this exciter.



The model is self-initializing at t=0.

The dynamic representation of the model is the following:



where

$$V_{in} = V_{ref} - V_{meas_rms} + V_{aux} \quad (1)$$

with V_{meas_rms} filtered by $\frac{1}{1 + sT_r}$

and with the value of V_{ref} calculated to produce $E_{fd} = E_{fd_ic}$ at t=0 .

The internal signals are:

signal	description	units
Vin	control input	pu(V_base)
Ve	control error	pu(V_base)
Vu	regulator voltage	pu(Efd_base)
Vb	rectifier correction	pu(Efd_base)
Vra	regulator adjusted voltage	pu(Efd_base)
Vf	feedback	pu(V_base)