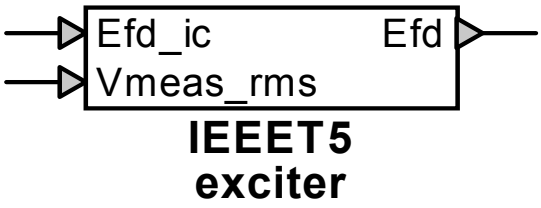
Machine control : exciter IEEET5



1 Description

This device is an implementation of an IEEE Type 5 exciter similar to PSS/E's IEEET5 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 IEEET5 pu".

1.1 Pins

This device has three pins:

pin	*type*	*description*	*units*
Efd_ic	input pin	initial field voltage at t=0	V
Vmeas_rms	input pin	measured rms voltage	V
Efd	output pin	field voltage	V

1.2 Parameters

The value of the following parameters must be defined:

parameter	*description*	*units*	
Trh	1/gain of regulator	s	(includes base conversion)
Te	time constant of exciter	s	
Ke	gain of exciter		
Kv	regulator zone	pu(V_base)	
Vrmin	regulator low limit	pu(Efd_base)	
Vrmax	regulator high limit	pu(Efd_base)	
E1	E value of point 1 of saturation curve	pu(Efd_base)	
S1	S value of point 1 of saturation curve	pu(Efd_base)	
E2	E value of point 2 of saturation curve	pu(Efd_base)	

S2	S value of point 2 of saturation curve	pu(Efd_base)
V_base	terminal voltage base	V
Efd_base	field voltage base	V

1.3 Input

The input pins may be connected to any control signals.

The following inputs are available:

input	*description*	*units*
Efd_ic	initial field voltage at t=0	V
Vmeas_rms	measured rms voltage	V

1.4 Output

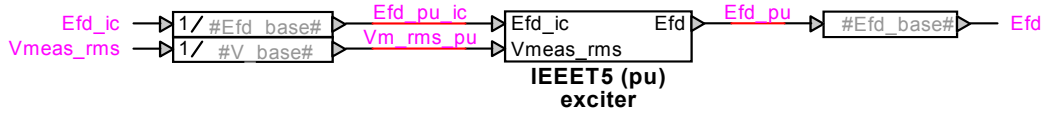
The output value is the calculated field voltage, in physical units.

output	*description*	*units*
Efd	field voltage	V

1.5 Representation

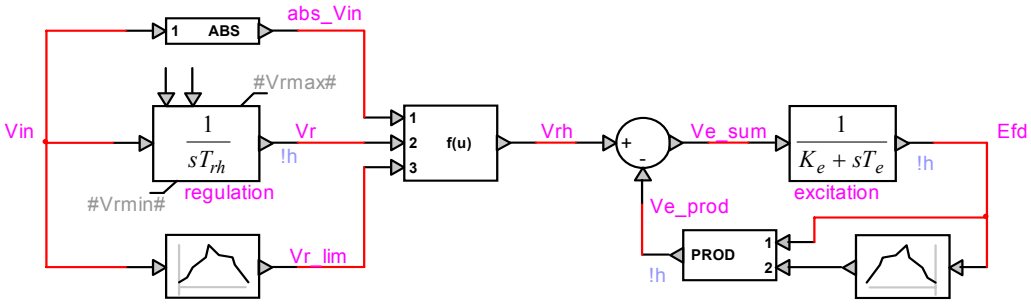
The implementation of the model can be inspected by opening the device's subcircuit.

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

$$V_{in} = V_{ref} - V_{meas\_rms} \qquad (1)$$

$$
\begin{aligned}
V_{r\_lim} &= V_{r\_min} \quad \text{when } V_{in} < -K_v \\
&= V_{r\_max} \quad \text{when } V_{in} > K_v \\
&= 0 \quad \text{when } -K_v \le V_{in} \le K_v
\end{aligned} \tag{2}
$$

$$
\begin{aligned}
V_{rh} &= V_r \quad \text{when } |V_{in}| \le K_v \\
&= V_{r\_lim} \quad \text{when } |V_{in}| > K_v
\end{aligned} \tag{3}
$$

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)
Vr	regulator voltage	pu(Efd_base)
Vr_lim	regulator limit	pu(Efd_base)
Vrh	actual regulator voltage	pu(Efd_base)