

**UNIVERSIDADE FEDERAL DE VIÇOSA**  
**DEPARTAMENTO DE ENGENHARIA ELÉTRICA**  
**CURSO DE ENGENHARIA ELÉTRICA**

**ELT 448 - Qualidade de Energia**

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**Aula Prática 3**

O objetivo desta prática é classificar os distúrbios referentes a tensão, para faltas aplicadas a um sistema de distribuição, modelado conforme os parâmetros descritos abaixo.

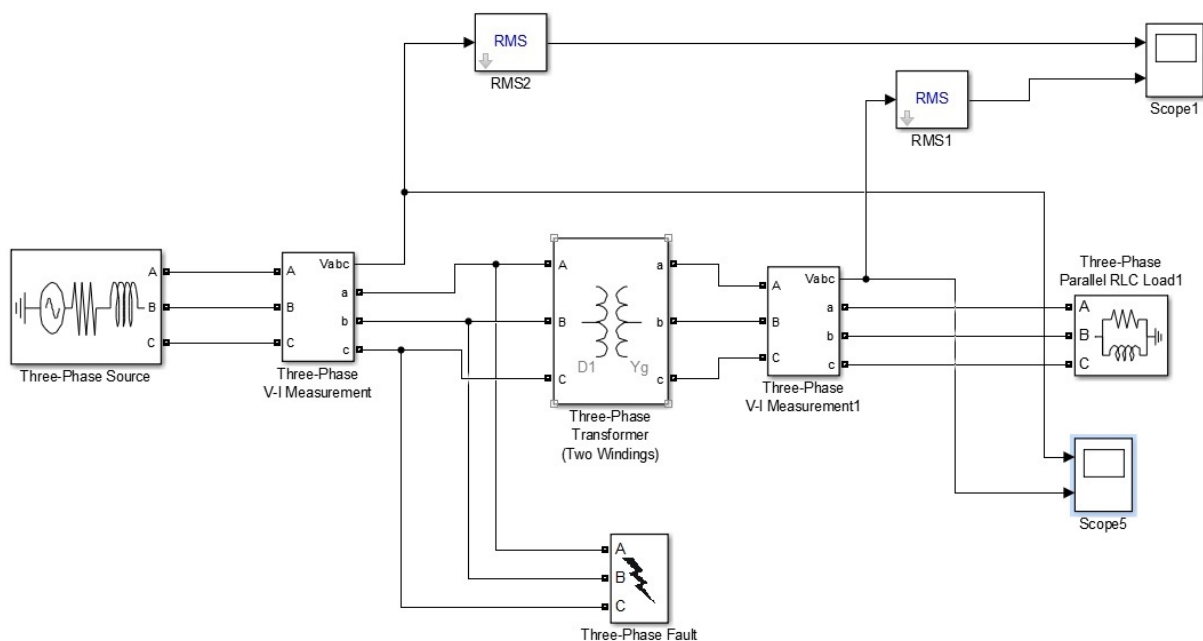


Fig. 1: Diagrama esquemático - Sistema de distribuição.

**Experimento:**

Aplique falta monofásica (fase A), fase bifásica (fase A e B) e falta trifásica, todas para terra, inicialmente com  $R_g=0\ \Omega$  e posteriormente com  $R_g=1000\ \Omega$ . Para cada caso simulado, identifique se houve problema de variação de tensão no lado da carga e classifique-o.

Block Parameters: Three-Phase Source

Three-Phase Source (mask) (link)

Three-phase voltage source in series with RL branch.

Parameters Load Flow

Configuration: Yg

Source

☐ Specify internal voltages for each phase

Phase-to-phase voltage (Vrms):

11e3

Phase angle of phase A (degrees):

0

Frequency (Hz):

50

Impedance

☒ Internal ☒ Specify short-circuit level parameters

3-phase short-circuit level at base voltage(VA):

30e6

Base voltage (Vrms ph-ph):

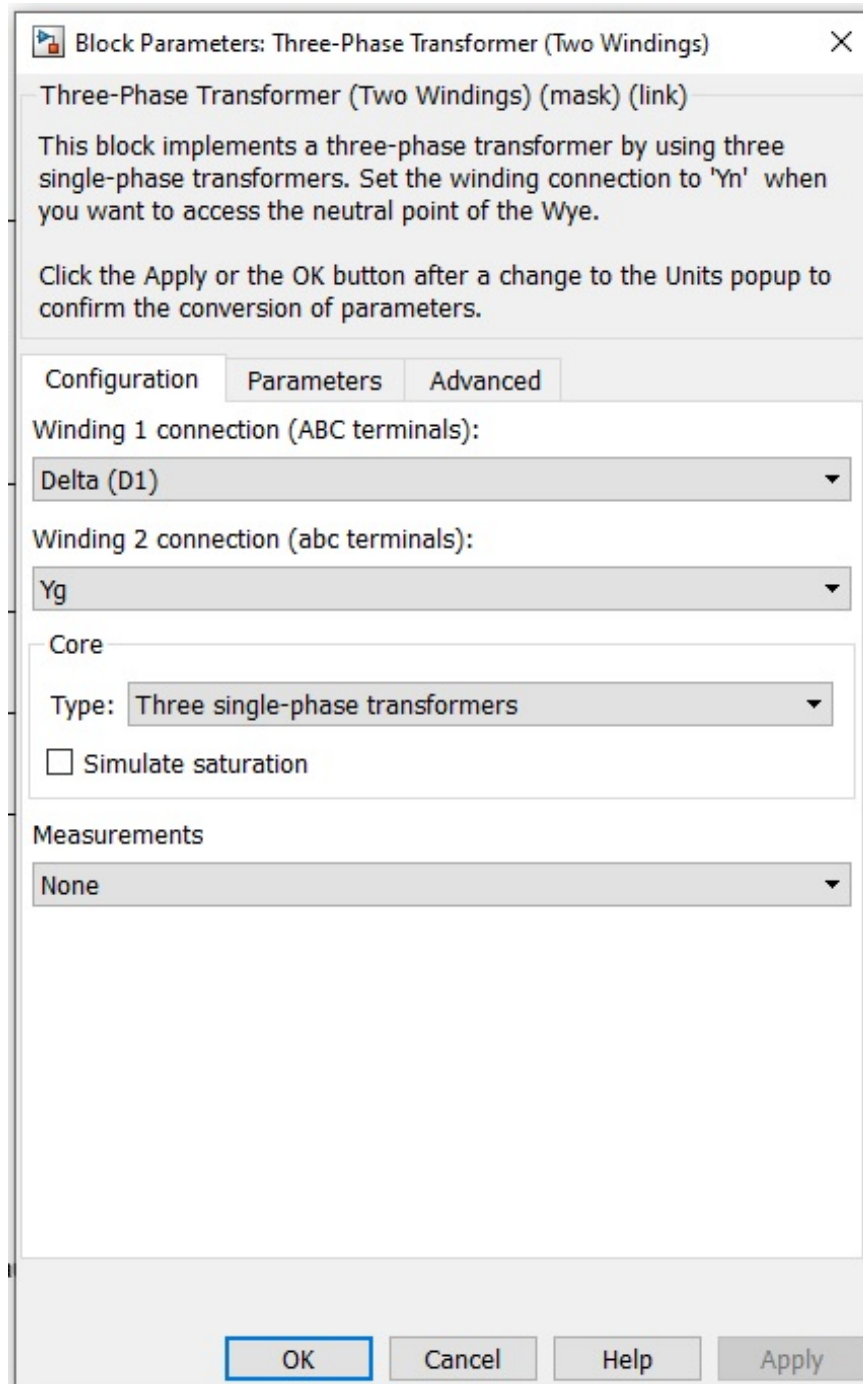
11e3

X/R ratio:

7

OK Cancel Help Apply

Fig. 2: Fonte de tensão.



Block Parameters: Three-Phase Transformer (Two Windings) [X]

Three-Phase Transformer (Two Windings) (mask) (link)

This block implements a three-phase transformer by using three single-phase transformers. Set the winding connection to 'Yn' when you want to access the neutral point of the Wye.

Click the Apply or the OK button after a change to the Units popup to confirm the conversion of parameters.

Configuration Parameters Advanced

Winding 1 connection (ABC terminals):  
Delta (D1)


Winding 2 connection (abc terminals):  
Yg

Core  
Type: Three single-phase transformers  
☐ Simulate saturation

Measurements  
None

OK Cancel Help Apply

Fig. 3: Transformador - Configuration.


Block Parameters: Three-Phase Transformer (Two Windings)
✕

Three-Phase Transformer (Two Windings) (mask) (link)

This block implements a three-phase transformer by using three single-phase transformers. Set the winding connection to 'Yn' when you want to access the neutral point of the Wye.

Click the Apply or the OK button after a change to the Units popup to confirm the conversion of parameters.

ConfigurationParametersAdvanced

Units

pu

Nominal power and frequency [ Pn(VA) , fn(Hz) ]

[ 1e6 , 50 ]

Winding 1 parameters [ V1 Ph-Ph(Vrms) , R1(pu) , L1(pu) ]

[ 11e3 , 0.002 , 0.08 ]

Winding 2 parameters [ V2 Ph-Ph(Vrms) , R2(pu) , L2(pu) ]

[ 0.4e3 , 0.002 , 0.08 ]

Magnetization resistance Rm (pu)

500

Magnetization inductance Lm (pu)

500

Saturation characteristic [ i1 , phi1 ; i2 , phi2 ; ... ] (pu)

[ 0,0 ; 0.0024,1.2 ; 1.0,1.52 ]

Initial fluxes [ phi0A , phi0B , phi0C ] (pu):

[ 0.8 , -0.8 , 0.7 ]

OK

Cancel

Help

Apply

Fig. 4: Transformador - Parameters.

Block Parameters: Three-Phase Parallel RLC Load1

Three-Phase Parallel RLC Load (mask) (link)  
Implements a three-phase parallel RLC load.

Parameters Load Flow

Configuration Y (grounded)

Nominal phase-to-phase voltage  $V_n$  (Vrms)  
400

Nominal frequency  $f_n$  (Hz):  
50

☐ Specify PQ powers for each phase

Active power  $P$  (W):  
10e3

Inductive reactive Power  $Q_L$  (positive var):  
100

Capacitive reactive power  $Q_c$  (negative var):  
0

Measurements None

OK Cancel Help Apply

Fig. 5: Carga.

Block Parameters: Three-Phase Fault

Three-Phase Fault (mask) (link)

Implements a fault (short-circuit) between any phase and the ground. When the external switching time mode is selected, a Simulink logical signal is used to control the fault operation.

Parameters

Initial status: 0

Fault between:

☒ Phase A   ☒ Phase B   ☐ Phase C   ☒ Ground

Switching times (s): [0.1 0.168]   ☐ External

Fault resistance  $R_{on}$  (Ohm):

8

Ground resistance  $R_g$  (Ohm):

0.01

Snubber resistance  $R_s$  (Ohm):

1e6

Snubber capacitance  $C_s$  (F):

inf

Measurements: None

OK   Cancel   Help   Apply

Fig. 6: Bloco de falta.