



POWERFACTORY

PowerFactory 2021

Technical Reference

ABB SACE TMAX PR231

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

F2021

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1 Model information

Manufacturer ABB SACE

Model TMAX PR231

Variants This PowerFactory relay model type simulates the different firmware versions of the ABB SACE TMAX PR231 Low Voltage breakers.

2 General description

The ABB SACE TMAX PR231 is a microprocessor air circuit breakers from 1000A to 1200A which have been designed to increase efficiency. Accordingly to the manufacturer brochures it is the only breaker that protects electrical circuits and also reduces energy consumption based on the user's needs, therefore leading to massive reductions in energy waste.

The ABB SACE TMAX PR231 is a protection assembly containing a phase over current long time element, a short time element and an instantaneous element. A Definite time ground overcurrent element with an activable I2t feature is also available.

The ABB SACE TMAX PR231 Low Voltage Breaker has been modeled using one PowerFactory relay model which includes most of the features available in the Low Voltage Breaker.

The model implementation has been based on the information available in the low voltage breaker documentation provided by the manufacturer and freely available [1].

3 Supported features

3.1 Measurement and acquisition & input signals

It represents the interface between the power system and the Low Voltage Breaker protective elements. The currents flowing in the power system are converted by an element simulating a 3 phase CT; the secondary currents are then measured by three measurement elements which models the digital filter of the relay.

3.1.1 Available Units

- one 3 phase current transformer ("Ct" block).
- one 3 phase measurement element ("Measure" block).
- two input signal ("block" and "block1" input signal).

3.1.2 Functionality

The "Ct" block represents an ideal CT. Using the CT default configuration the current at the primary side are converted to the secondary side using the CT ratio. The CT saturation and/or its magnetizing characteristic are not considered. Please set the "Detailed Model" check box in the "Detailed Data" tab page of the CT dialog and insert the data regarding the CT burden, the CT secondary resistance and the CT excitation parameter if more accurate simulation results are required.

The "Measure" block calculate the RMS value of the current values sampling the input channels at 24 samples/cycle and calculating a rectangular integral.

The input signals can be used to block the "S" element ("block" input signal) and the "I" element ("block1" input signal) to implement *Zone selectivity* logics.

3.1.3 Data input

The ratio of the "Ct" must be 1/1.

The Low Voltage Breaker primary rated current value must be set in the current measurement element ("Measure" block, "Nominal current" parameter). The following values are available:

- 800
- 1000
- 1250
- 1600

3.2 Protective elements

A set of inverse time and a definite time overcurrent elements, four definite time voltage and two definite time frequency elements models the low voltage breaker protective functions.

3.2.1 Available Units

- one 3 phase inverse time overcurrent element ("L" block).
- one 3 phase inverse/definite time overcurrent element ("S" block).
- one 3 phase definite time overcurrent element ("I" block).

3.2.2 Functionality

All the inverse characteristics available in the Low voltage breaker are supported by the inverse time overcurrent element. The following trip characteristics are modeled:

L $I^2t = k$ curve with $t = t_1$ at $I = 6xI_1$

3 Supported features

S $I^2t = k$ curve with $t = t_1$ at $I = 10xI_1$

The following tolerances are used in the ABB SACE TMAX PR231 model:

L Trip Threshold tolerance 105%-120% I_1 , Trip Time tolerance $\pm 10\%$.

S *S-Curve* trip curve: Trip Threshold tolerance $\pm 10\%$ I_1 , Trip Time tolerance $\pm 10\%$.

I Trip Threshold tolerance $\pm 10\%$

3.2.3 Data input

The relationships between the relay settings and the model parameters can be found in the following table:

Address	Relay Setting	Model block	Model Parameter	Note
	L Trip Threshold	L	Current Setting (Ipset)	
	L Trip Time	L	Time Dial (Tpset)	
	S Disabling	S	Out of Service (outserv)	
	S Trip Threshold	S	Current Setting (Ipset)	
	S Trip Time	S	Time Dial (Tpset)	
	I Disabling	I	Out of Service (outserv)	
	I Trip Threshold	I	Current Setting (Ipset)	

3.3 Output logic

It represents the output stage of the low voltage breaker.

3.3.1 Available Units

- one output element ("Output Logic" block).
- one output signal ("yout" signal)

3.3.2 Functionality

The "Output Logic" block collects the trip signals coming from the protective functions; it operates the low voltage breaker power contact using the "yout" trip signal.

3.3.3 Data input

To disable completely the low voltage breaker model ability to open the power circuit disable the "Output Logic" block.

4 References

- [1] ABB SACE S.p.A., Divisione Interruttori B.T., Via Baioni, 35 - 24123 Bergamo - Italy. *Technical catalog Tmax. T Generation Low voltage molded case circuit breakers up to 1200 A UL 489 and CSA C22.2 Standard 1SDC210023D0201 2008 edition.*