



POWERFACTORY

PowerFactory 2021

Technical Reference

ABB/Westinghouse IMPRS

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

F2021

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1 Model information

Manufacturer ABB/Westinghouse

Model IMPRS

Variants This family of PowerFactory relay model types simulates the IMPRS overcurrent relays originally manufactured by Westinghouse and then by ABB;

2 General description

The ABB/Westinghouse IMPRS protective relays are phase and ground current microprocessor non directional inverse time overcurrent devices. The ABB/Westinghouse IMPRS family of PowerFactory relay model types consists of models using an unique connection scheme.

The PowerFactory relay library tries to cover most of the ABB/Westinghouse IMPRS subtypes.

The PowerFactory ABB/Westinghouse IMPRS relay model type names have the following structure: "IMPRS" + "_470" + <available range ID> + "x0x"

The following PowerFactory relay model types can be found at \Library\Relays\Relays\Overcurrent Relays\ABB\Westinghouse\IMPRS:

- IMPRS_470A0x0x (phase range 1.0-15 A, ground range 1.0-15 A)
- IMPRS_470A1x0x (phase range 1.0-15 A, ground range 0.2-3 A)
- IMPRS_470A2x0x (phase range 0.2-3 A, ground range 0.2-3 A)

The unique difference between these models is the setting range definition.

The model implementation has been based on the information available in the relay documentation [2] [1].

3 Supported features

3.1 Measurement and acquisition

It represents the interface between the power system and the relay protective elements. The currents flowing in the power system are converted by an element simulating a 3 phase CT or a single phase CT.

3.1.1 Available Units

- one 3ph current transformer measuring three phase currents and the zero sequence current ("Ct" block)

- one 3ph measurement block calculating both the phase currents and the earth current ("Measure" block)

3.1.2 Functionality

The "Ct" block represent 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 measurement block simulates a second order low pass analog filter with DC component filter; its time constant is 1 ms.

3.1.3 Data input

The relay secondary rated current (1 or 5 A) must be set in the measurement block.

3.2 Protective elements

A set of inverse time characteristic and definite time overcurrent elements is modeling the relay protective functions.

3.2.1 Available Units

- one three phase inverse time overcurrent element ("TC(51)" block) with external input blocking signal ("block51" relay signal)
- one three phase definite time overcurrent element ("I(50)" block) with external input blocking signal ("block50" relay signal)
- one zero sequence inverse time overcurrent element ("TC(51N)" block) with external input blocking signal ("block51N" relay signal)
- one zero sequence definite time overcurrent element ("I(50N)" block) with external input blocking signal ("block50N" relay signal)

3.2.2 Functionality

The PowerFactory ABB/Westinghouse IMPRS relay model types simulates exactly all the protective elements available in the relays.

The following tripping characteristics are available in the PowerFactory relay model types:

- DefiniteTime
- ExtremelyInverse
- Inverse
- LT-ExtremelyInverse

- LT-Inverse
- LT-VeryInverse
- ShortTimeInverse
- VeryInverse

The following external input blocking signals are available:

- *"block 51"* blocking the "TC51" element
- *"block 50"* blocking the "I(50)" element
- *"block 51N"* blocking the "TC51N" element
- *"block 50N"* blocking the "I(50N)" element

3.2.3 Data input

The relationships between the relay settings and the model parameters can be found in the following tables.

Address	Relay Setting	Model block	Model setting	Note
	Time Current(51)Curve	TC(51)	Characteristic	
	Time Current(51)Curve Pickup	TC(51)	Current Setting	
	Time Current(51)Curve Time Dial	TC(51)	Time Dial	
	Instantaneous(50)Multiple	I(50)	Pickup Current	
	Instantaneous(50)Time Delay	I(50)	Time Setting	
	Time Current(51N)Curve	TC(51N)	Characteristic	
	Time Current(51N)Curve Pickup	TC(51N)	Current Setting	
	Time Current(51N)Curve Time Dial	TC(51N)	Time Dial	
	Instantaneous(50N)Multiple	I(50N)	Pickup Current	
	Instantaneous(50N)Time Delay	I(50N)	Time Setting	

3.3 Output logic

It represents the output stage of the relay; it's the interface between the relay and the power breaker.

3.3.1 Available Units

- one output logic element ("Logic" block)

3.3.2 Functionality

The "Logic" block is collecting the trip signals coming from the protective elements and is operating the relay output contacts. Two output contacts are available in the models:

- "yout1112" operated by the inverse time characteristic elements ("TC(51)" and "TC(51N)" block)
- "yout1314" operated by the definite time elements ("I(51)" and "I(51N)" block)

The "Logic" block is getting the following trip signals:

- TC51 (three phase inverse time overcurrent element trip signal)
- I50 (three phase definite time overcurrent element trip signal)
- TC51N (zero sequence inverse time overcurrent element trip signal)
- I50N (zero sequence definite time overcurrent element trip signal)

3.3.3 Data input

No user input is required. To disable the relay model ability to open the power circuit breaker simply disable the "Logic" block.

The output contact operating the breaker can be set using the *"Tripping signals"* parameter in the "Logic" block. By default both output contacts are operating the power breaker.

The logic connecting the relay output contacts can be modified in the "Logic" tab page of the "Logic" block.

4 Features not supported

The following features are not supported:

- Instantaneous element("I(50)" and "I(50N)" block) tripping characteristic selection
- Delayed reset characteristic
- Cold Load Pickup

5 References

- [1] ABB Power T&D Company Inc Relay Division, Coral Springs, FL 33065 USA. *IMPRS Overcurrent Relay Descriptive Bulletin 41-121M July 1991*, 1991.
- [2] ABB Power T&D Company IncPower Automation and Protection Division, 7036 Snowdrift Road, Allentown PA 18106 USA. *IMPRS Protective Relay System Catalog Series 470A IB-7.12.1.7-1 Issue E*, 1997.