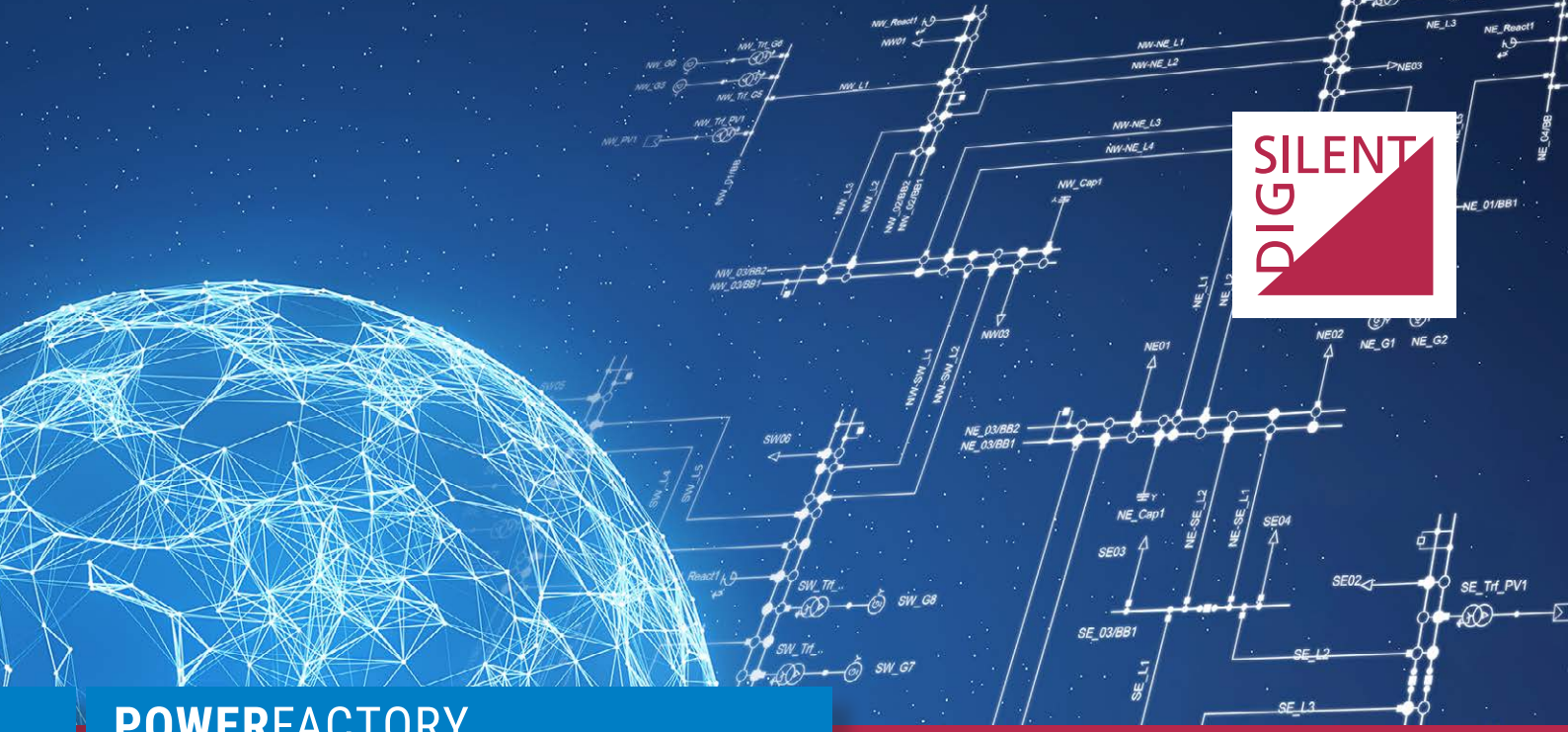

PowerFactory 2021

Technical Reference

ABB REF 610

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POWER SYSTEM SOLUTIONS

MADE IN GERMANY

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Contents

1 Model information

Manufacturer ABB

Model REF 610

Variants This model covers the features present in the ABB REF 610 relay.

2 General description

The feeder protection relay ABB REF 610 is a versatile microprocessor multifunction protection relay mainly designed to protect incoming and outgoing feeders.

The PowerFactory ABB REF 610 relay models simulate most of the protective elements available in the relay.

The model implementation has been based on the information available in the relay manual [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 a block simulating the 3 phase CT and by a block simulating a single phase CT measuring the earth current; the secondary currents are then measured by an element modeling the digital sampling of the relay.

3.1.1 Available Units

- one 3ph current transformer (”Ct-3p” block)
- one single phase current transformer (”Ct-E/N” block)
- two measurement elements (”Measure Ph”, and ”Meas Neutral I” block)

3.1.2 Functionality

The ”Ct-3p” and the ”Ct-E/N” block represent ideal CTs. 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 Ph” and the ”Meas Neutral I” block simulate a DFT (”Discrete Fourier Transform”) using 20 samples per cycle.

3.1.3 Data input

The CT secondary rated current (1 or 5 A) value must be set in the ”Measure Ph” and in the ”Meas Neutral I” block. Different values can be inserted in case of CTs with different secondary rated currents.

If no core CT is available please select the 3 phases CT also in the ”Ct-E/N” slot: the earth current will be calculated assuming that an Holmgreen’s connection of the phases is used.

3.2 Protective elements

A set of inverse time and definite time overcurrent elements is modeling the relay protective functions. All the inverse characteristics available in the relay are available in the inverse time model blocks.

3.2.1 Available Units

- one three-phase non-directional overcurrent protection with definite-time or IDMT characteristic, low-set element (”51P” block)
- one three-phase non-directional overcurrent protection, high-set element (”50P1” block)
- one three-phase non-directional overcurrent protection, instantaneous element (”50P2” block)
- one non-directional ground-fault protection with definite-time or IDMT characteristic, low-set element (”51N” block)
- one non-directional ground-fault protection, high-set element (”50N” block)
- one phase discontinuity protection (”46” block)
- one three-phase thermal overload protection for cables (”49” block)
- one automatic reclosing element(”79” block).

3.2.2 Functionality

The inverse time overcurrent elements support the following trip characteristics:

- Definite time (51)
- IEC Extremely Inverse
- IEC Long time inverse
- IEC Normal Inverse
- IEC Very Inverse
- IEEE extremely inverse
- IEEE inverse
- IEEE very inverse

- RD-Type characteristic
- RI-Type characteristic

The relationship between current and time for ”IEC Normal Inverse,”IEC Very Inverse”,”IEC Extremely Inverse and ”IEC Long Time Inverse” complies with the BS 142.1966 and IEC 60255-3 standards. The ”IEEE extremely inverse”, ”IEEE inverse” and ”IEEE very inverse” characteristic complies with the IEEE C37.112 standards. The ”RI-type” and ”RD-Type” characteristic is a special characteristic used mainly in combination with existing mechanical relays.
The inverse time overcurrent elements include an user configurable reset delay.

Please configure the ”Tab page” of the ”79” block to set the reclosing/lockup logic.

The phase discontinuity protection will be disabled when all phase currents fall below 0.1 x CT. It is possible to block the tripping of the phase discontinuity element by applying a digital input signal to the relay.

The following relay input signals are available to block the protective elements:

- *Block I>* controlling *51P*
- *Block I>>* controlling *50P1*
- *Block I>>>* controlling *50P2*
- *Block Ie>* controlling *51N*
- *Block Ie>>* controlling *50N*
- *Block Ith* controlling *49*
- *Block Idisc* controlling *46*

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 setting	Note
1S1	Start value of stage I>	51P	Current Setting	
1S2	Operate time of stage I>	51P	Time Dial	Active in the relay for the ”Definite Time” characteristic
1S3	Time/current characteristic for stage I>	51P	Characteristic	
1S4	Time multiplier k	51P	Time Dial	Active in the relay for the IEC characteristics
1S5	Time multiplier n	51P	Time Dial	Active in the relay for the IEEE characteristics
1S6	Resetting time of stage I>	51P	Reset Delay	
1S7	Start value of stage I>>	50P1	Pickup Current	
1S8	Operate time of stage I>>	50P1	Time Setting	
1S9	Start value of stage I>>>	50P2	Pickup Current	
1S10	Operate time of stage I>>>	50P2	Time Setting	
1S11	Start value of stage I0>	51N	Current Setting	

Address	Relay Setting	Model block	Model setting	Note
1S12	Operate time of stage I0>	51N	Time Dial	Active in the relay for the ”Definite Time” characteristic
1S13	Time/current characteristic for stage I0>	51N	Characteristic	
1S14	Time multiplier k0	51N	Time Dial	Active in the relay for the IEC characteristics
1S15	Time multiplier n0	51N	Time Dial	Active in the relay for the IEEE characteristics
1S16	Resetting time of stage I0>	51N	Reset Delay	
1S17	Start value of stage I0>>	50N	Pickup Current	
1S18	Operate time of stage I0>>	50N	Time Setting	
1S19	Start value of stage DI>	46	Pickup Current	
1S20	Operate time of stage DI>	46	Time Setting	
1S21	Full load current	49	Current Setting	
1S22	Time constant of stage	49	Time Dial	
1S25	Number of AR shots	79	Operations to Lockout	Set ”Operations to lockout”=”Number of AR shots”+1
V121	CB Closing time	79	Closing Command Duration	
V124	Reclaim Time	79	Reset Time	
V126	Dead time of shot 1	79	Reclosing Interval 1	
V127	Dead time of shot 1	79	Reclosing Interval 1	
V128	Dead time of shot 1	79	Reclosing Interval 1	

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 trip element (”Trip Logic” block)
- one breaker control element (”Closing Logic” block)

3.3.2 Functionality

The ”Trip Logic” block is collecting the trip signals coming from the protective elements and operating the relay output contacts. The output contact is ”yout”.

The ”Closing Logic” block has the responsibility to generate the command to close the breaker during the reclosing sequence. It’s driven by the reclosing logic hosted inside the ”79” block.

3.3.3 Data input

To disable the relay model ability to open the power circuit breaker simply disable the ”Trip Logic” block.

4 Features not supported

The following features are not supported:

- Arc protection
- Circuit breaker failure detection
- Trip circuit supervision
- Alarm level of element 49

5 References

[1] ABB Oy Distribution Automation, P.O.box 699, FI-65101 Vaasa , FINLAND. *Feeder Protection Relay REF610 Technical Reference Manual 1MRS755310 Issued: 05.10.2004 Version: G/20.05.2009*, 2004.