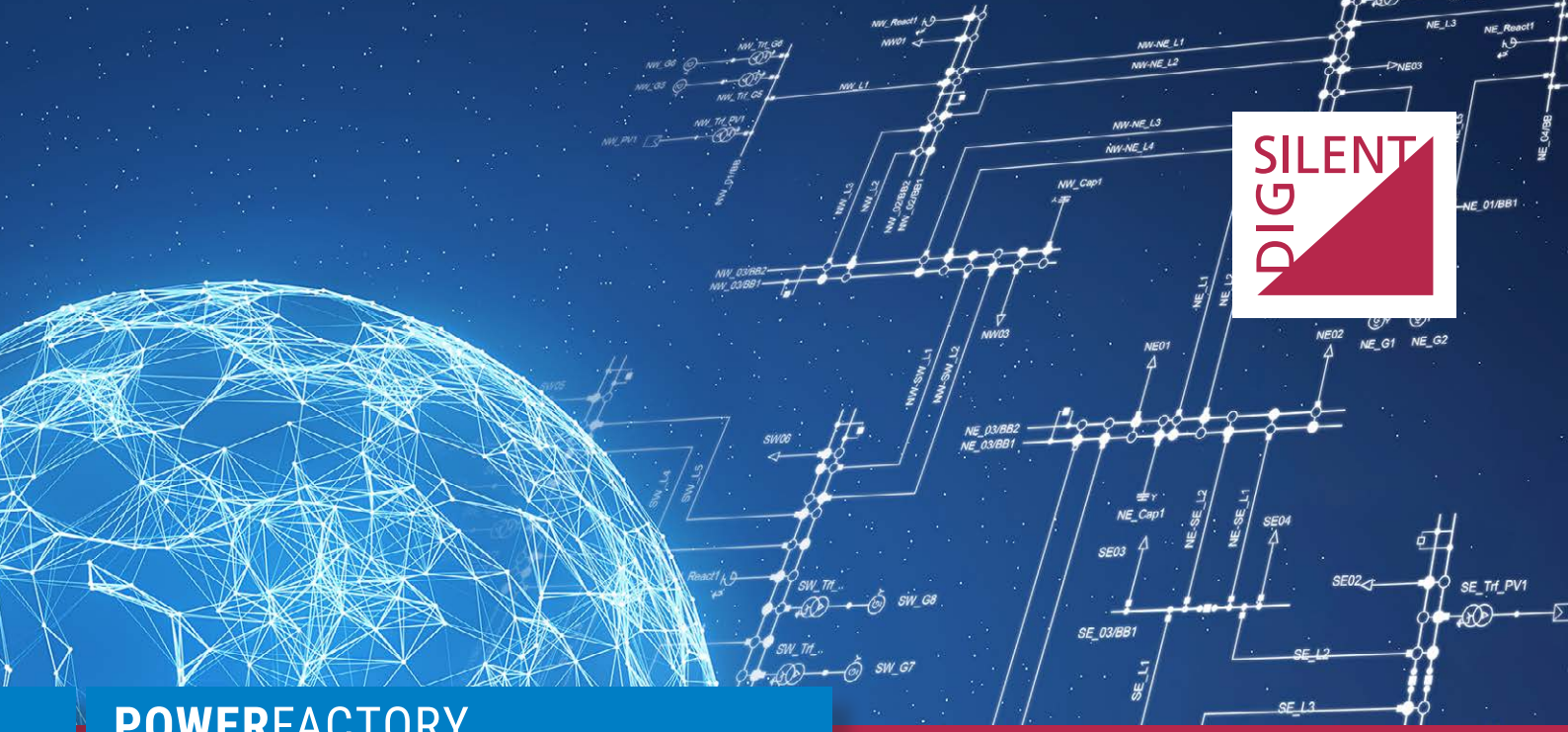

PowerFactory 2021

Technical Reference

Alstom MBCI

PF2021

POWER SYSTEM SOLUTIONS

MADE IN GERMANY

Publisher:
DIgSILENT GmbH
Heinrich-Hertz-Straße 9
72810 Gomaringen / Germany
Tel.: +49 (0) 7072-9168-0
Fax: +49 (0) 7072-9168-88
info@digsilent.de

Please visit our homepage at:
https://www.digsilent.de

May 6, 2019
PowerFactory 2021
Revision 892

Contents

1 Model information

Manufacturer Alstom

Model MBCI

Variants This PowerFactory relay models can be used to simulate the pilot wire differential Alstom MBCI 01 and Alstom MBCI 02 protective relay.

2 General description

The Alstom MBCI protective relay is a pilot wire differential protection derived from the well known Merz-Price circulating current system but which employs phase comparators as the measuring elements. A summation current transformer at each line end produces a single phase current proportional to the summated three phase currents in the protected line. The phase comparator has angular limits of +- 90° giving a circular bias characteristic in the complex plane.

The Alstom MBCI relay has been modeled using one PowerFactory relay model which includes most of the features available in the relay.

The model implementation has been based on the information available in the relay documentation provided by the manufacturer and freely available [1] [2].

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 two elements modeling two 3 phase CTs; two blocks are then summing together each set of 3 phase current values and the two resulting single phase currents are measured by two elements modeling the analog filters of the relay.

3.1.1 Available Units

- Two 3 phase current transformers (”CT1” and ”CT2” block).
- Two summation elements (”Summation transformer local” and ”Summation transformer remote” block).
- Two measurement elements (”Measure 1” and ”Measure 2” block).

3.1.2 Functionality

The ”CT1” and the ”CT2” 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 measurement blocks simulate a second order low pass analog filter with DC component filter; the time constant is 1 ms.

3.1.3 Data input

The CT secondary rated current (1 A or 2 A or 5 A) value must be set in the measurement elements (*"Nominal current"* parameter).

The "K_s" relay setting can be set in the "Logic" tab page of the "Summation transformer local" block. The "K_s" model parameter present in the "Logic" tab page of the "Summation transformer remote" block must be equal to the "K_s" relay setting of the Alstom MBCI relay located at the other end of the line.

3.2 Protective elements

A differential element simulates the relay differential features.

3.2.1 Available Units

- one single phase angle comparator differential element ("Differential" block).

3.2.2 Functionality

The following features are available in the differential element ("Differential" block):

- Phase comparator differential with user configurable delay (available delay values: 0.03 s, 0.05 s, 0.065 s, 0.09 s and 0.3 s).

The differential element calculates the angle between the currents measured by "Measure 1" and by "Measure 2". If the angle is smaller than 90° a trip command is triggered.

3.2.3 Data input

The relationships between the relay settings and the model parameters can be found in the following table (the relay model parameter names are listed between brackets):

Address	Relay Setting	Model block	Model Parameter	Note
	K_t	Differential	Time Setting (Tset)	

Please notice that the K_t relay settings cannot be entered directly but the relay tripping time, as reported in *Figure 15* (see [2]), must be set.

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 element ("Output Logic" block).

3.3.2 Functionality

The "Output Logic" block gets the trip signal coming from the differential element; it operates the relay output contact and the power breaker.

The relay output contact is "yout".

3.3.3 Data input

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

4 Features not supported

The following features are not supported:

- Transformer in rush blocking (Transformer inrush current detector feature).
- Inverse time tripping characteristics (set by the K_t relay setting, *Figure 15* ([2]).

5 References

[1] ALSTOM T&D Protection & Control Ltd, St Leonards works, Stafford ST17 4LX England. *Service Manual Type MBCI (Translay S) Differential Feeder Protection Relay R8011G*, 1999.

[2] ALSTOM T&D Protection & Control Ltd, St Leonards works, Stafford ST17 4LX England. *Type MBCI Relay Translay 'S' Differential Feeder and Transformers Differential Protection R6011V*, 1999.