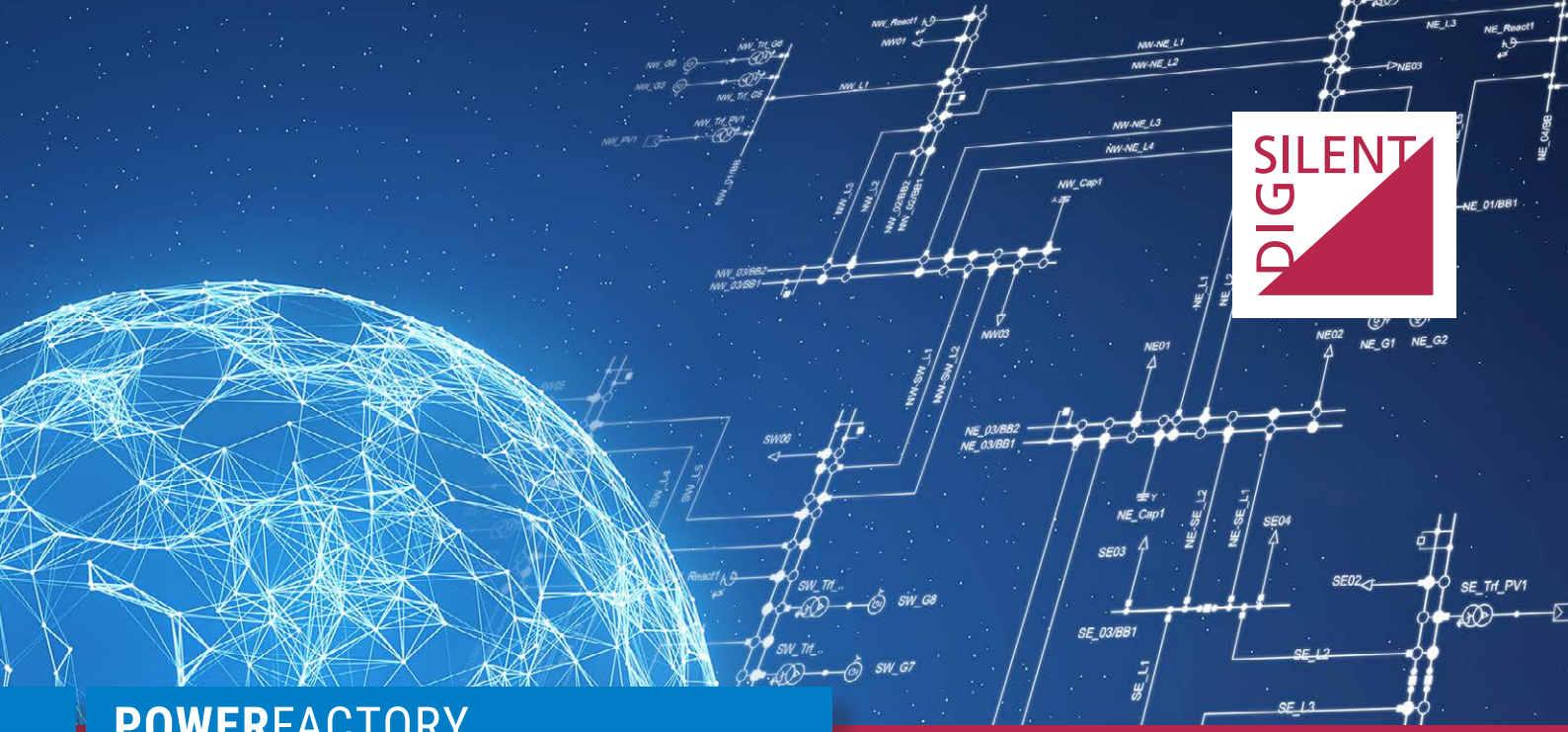

POWERFACTORY

PowerFactory 2021

Technical Reference

VAMP 130

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

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Contents

1 Model information

Manufacturer VAMP

Model 130

Variants This PowerFactory relay model simulates the features present in the VAMP 130 protective relay.

2 General description

The combined overcurrent and earth-fault relay VAMP 130 is a non-directional current measuring protection relay for overcurrent, short-circuit and earth-fault protection. It features the following protection functions:

- Three overcurrent stages.
- Two earth-fault stages.
- One sensitive earth-fault stage.
- Current unbalance stage.
- Thermal overload stage.
- Circuit breaker failure protection.

Further the relay includes a disturbance recorder.

The PowerFactory VAMP 130 relay model is a monolithic model and simulates most of the protective features available in the relay.

The model implementation has been based on the information available in the relay technical brochure and manual [1].

3 Supported features

3.1 Measurement and acquisition

It represents the interface between the power system and the relay protective elements.

The phase currents flowing in the power system are converted by a block which simulates the 3 phase CT and by a block which models a single phase CT detecting the earth current; the secondary currents are then measured in the relay model by four elements which simulate the digital sampling of the relay.

3.1.1 Available elements and input signals

The *Measurement and acquisition* feature consists of the following elements:

- One 3 phase current transformer (”Ct-3P” block).
- One neutral current transformer (”Ct-3I0” block).
- One relay input signal (”iblock” signal).
- One 3 phase measurement element (”MeasPhase” block).
- One 3 phase sequence measurement element (”MeasSeq” block).
- One neutral current measurement element (”MeasEarth” block).
- One 3 phase current 2^{nd} harmonic measurement element (”Meas2nd Harmonic” block).

3.1.2 Functionality

The ”Ct-3P” and the ”Ct-3I0” 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 input current and voltage values are sampled by the ”MeasPh”, ”MeasEarth”, ”Meas2nd Harmonic” and the ”MeasSeq” block at 20 samples/cycle. The values are processed by a DFT filter, operating over a cycle, which then calculates the voltage and current RMS values used by the protective elements extracting the 1^{st} harmonic component. In the ”Meas2nd Harmonic” block the DFT filter is set to calculate the current 2^{nd} harmonic component.

The ”iblock” relay input signal can be used to block all protective elements.

3.1.3 Data input

The CT secondary rated current (1 or 5 A) value must be set in the ”MeasPh”, ”MeasEarth”, ”Meas2nd Harmonic” and the ”MeasSeq” block.

If no core CT is available please select the 3 phases CT also in the ”Ct-3I0” 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 single phase inverse time overcurrent element 50/51("I>" block).
- Two single phase definite time overcurrent elements 50/51("I>>" and "I>>>" block).
- One inverse time ground overcurrent element 50N/51N ("Io>" block).
- Two definite time ground overcurrent elements 50N/51N ("Io>>" and "Io>>>" block).
- One thermal image overload element 49("T>" block).
- One definite time negative sequence protection element ("I2>" block).
- Second harmonic blocking element("If2>" block). .

3.2.2 Functionality

The inverse time overcurrent elements ("I>" and "Io>" block) support the following trip characteristics:

- Definite Time Grnd
- Definite Time Ph
- Extremely Inverse
- Long Time Inverse
- Normal Inverse
- Thermal Overload
- Thermal Overload reset
- Very Inverse

The relationship between current and time values for the "Extremely Inverse", the "Long Time Inverse", the "Normal Inverse", and the "Very Inverse" characteristic complies with the IEC 60255-3 standards.

The phase elements are single phase elements and get the greatest phase current.

The 2^{nd} harmonic blocking logic is implemented inside the "Logic" block in the "Logic" tab page. The logic available by default is blocking the "I>", "I>>", "I>>>", and "T>" element.

3.2.3 Data input

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

Overcurrent :

Address	Relay Setting	Model block	Model setting	Note
	Overcurrent Protection (50/51) I>	I>	Current Setting (Ipset)	
	Overcurrent Protection (50/51) I>>	I>>	Pickup Current (Ipset)	
	Overcurrent Protection (50/51) I>>>	I>>>	Pickup Current (Ipset)	
	Overcurrent Protection (50/51) Curve	I>	Characteristic (pcharac)	
	Overcurrent Protection (50/51) t>	I>	Time Dial (tpset)	Relay setting active when the trip characteristic is DT
	Overcurrent Protection (50/51) t>>	I>>	Time Setting (Tset)	
	Overcurrent Protection (50/51) t>>>	I>>>	Time Setting (Tset)	
	Overcurrent Protection (50/51) K	I>	Time Dial (tpset)	Relay setting active when the trip characteristic is inverse
	Phase unbalance Protection I2> (46) I2>	I2>	Pickup Current (Ipset)	
	Phase unbalance Protection I2> (46) t>	I2>	Time Setting (Tset)	
	Earth Fault Protection (50N/51N) Io>	Io>	Current Setting (Ipset)	
	Earth Fault Protection (50N/51N) Io>>	Io>>	Pickup Current (Ipset)	
	Earth Fault Protection (50N/51N) Io>>>	Io>>>	Pickup Current (Ipset)	
	Earth Fault Protection (50N/51N) Curve	Io>	Characteristic (pcharac)	
	Earth Fault Protection (50N/51N) t>	Io>	Time Dial (tpset)	Relay setting active when the trip characteristic is DT
	Earth Fault Protection (50N/51N) t>>	Io>>	Time Setting (Tset)	
	Earth Fault Protection (50N/51N) t>>>	Io>>>	Time Setting (Tset)	
	Earth Fault Protection (50N/51N) K	Io>	Time Dial (tpset)	Relay setting active when the trip characteristic is inverse
	Overload protection (49) T>	T>	Current Setting (Ipset)	
	Overload protection (49) tau	T>	Time Dial (tpset)	
	Overload protection (49) tau2	T>	Reset Delay (ResetT)	
	Second harmonic stage / inrush (68) If2>	If2>	Pickup Current (Ipset)	
	Second harmonic stage / inrush (68) t_f2	If2>	Time Setting (Tset)	

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 elements and relay output signals

The trip logic is implemented by the "Logic" block.

The following relay output signals are available:

- T1
- T2
- A1
- A2
- A3

The relay trip output signals are "T1" and "T2".

3.3.2 Functionality

The "Logic" block collects the trip signals coming from the overcurrent protective elements and, when any protective element trips, operates the power breaker and the "T1" and "T2" relay output contact.

The *Output relay matrix* and the *Blocking matrix* relay setting can be set in the relay model in the "Logic" tab page of the "Logic" block.
The default trip logic blocks the phase overcurrent and the thermal image element trip ("I>", "I>>", "I>>>", and "T>") when the current 2^{nd} harmonic content exceeds the user configurable threshold set in the "If2>" block. By default the "A1", "A2", and "A3" relay output signals trip when any protective element trips without considering the 2^{nd} harmonic blocking.

3.3.3 Data input

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

4 Features not supported

The following features are not supported:

- Circuit breaker failure protection CBFP(50BF).

5 References

[1] VAMP Ltd., Yrittajankatu 15 P.O.Box 810, FIN 65101 Vaasa, Finland. *VAMP 130 Overcurrent and earth-fault relay Operation and configuration instructions Technical description VM130.EN003*, 2005.