



POWERFACTORY

PowerFactory 2021

Technical Reference

Schneider PD521

PF2021

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

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1 Model information

Manufacturer Schneider

Model PD521

Variants The Schneider PD521 consists of two PowerFactory relay models and a third model for establishing communication for protective signalling. Due to lack of current documentation, functions and model parameters are derived from aggregating information in [1] and [2].

Modelled Functionality

Functionality	PD521
Overcurrent fault detection logic with optional undervoltage fault detection logic	X
Underimpedance fault detection logic with load blinding	-
Distance measurement with selection of polygonal or circular characteristic	X
Circuit breaker failure protection	-
Switch on to fault protection	-
Backup overcurrent time protection	-
Protective signaling	X
Ground fault direction determination using steady-state values	-

2 General description

Both models consists of a main relay with two sub-functions.

- Main relay : Measurement transformer slots, measurement processing, signal logic, breaker logic
- Distance Polygonal : Distance protection with polygonal characteristic
- Distance Circular : Distance protection with circular characteristic

3 Main relay

Measurement transformers

The *"CT"* and *"VT"* slots hold the assigned 3-phase measurement transformers.

Measurement units

The *"Measurement"* and *"Measurement Delta"* slots process the transformer input and hold the nominal current and voltage values. Nominal current and voltage are fixed for each model.

Signal logic

The *"Signal Connected"* and *"Signal Logic"* are auxiliary units used by the protective signalling.

Breaker logic

The *"Trip Logic"* holds the breakers which are to be tripped.

4 Distance Polygon

This sub-function models the distance protection with polygonal characteristics.

Note Only applies if the parameter *"DIST: Characteristic (Adress 12 40)"* is set to *"Polygon"*. Disable the whole sub-function otherwise.

Starting

Address	Relay Setting	Model Unit	Model Parameter	Note
10 40	MAIN: Transfer for 1p	Starting	Transfer for 1p	
10 48	MAIN: Neutral-point treat	Starting	System Grounding	
10 54	START: I>>	Starting	I>>	
10 55	START: IN>	Starting	IN> sens.range	
10 56	START: VN-G>	Starting	VNG>	
10 57	START: tIN>	Starting	tIN>	
10 61	START: tVN-G>>	Starting	tVNG>>	
10 62	START: VN-G>>	Starting	VNG>>	
10 67	START: Operating mode	Starting	Type of Starting: Undervoltage V Operation Mode	
10 68	START: I> (Imin)	Starting	I> (high range)	
10 69	START: V<	Starting	V<	

Polarisation

The *"Polarisation"* unit models the impedance calculation and voltage memory for the distance protection.

Note Currently only the complex compensation factor is supported.

Address	Relay Setting	Model Unit	Model Parameter	Note
12 36	DIST: kG angle	Polarisation	k0	
12 37	DIST: kG abs. value	Polarisation	Angle	

Zones

The units *"Z1"* - *"Z4"* and their respective timers model the tripping characteristics of the distance protection. Additionally the timers *"T5"* and *"T6"* are provided for the directional and non-directional backup.

Note

- The zone *"Z4"* always operates in *"Normal"* mode

- The zone extension factors are considered to be always equal

Address	Relay Setting	Model Unit	Model Parameter	Note
12 01	DIST: X1 (polygon)	Z1	+X Reach	
12 02	DIST: X2 (polygon)	Z2	+X Reach	
12 03	DIST: X3 (polygon)	Z3	+X Reach	
12 04	DIST: X4 (polygon)	Z4	+X Reach	
12 05	DIST: R1 P-G (polygon)	Z1	+R Resistance (PH-E)	
12 06	DIST: R1 P-P (polygon)	Z1	+R Resistance	
12 07	DIST: R2 P-G (polygon)	Z2	+R Resistance (PH-E)	
12 08	DIST: R2 P-P (polygon)	Z2	+R Resistance	
12 09	DIST: R3 P-G (polygon)	Z3	+R Resistance (PH-E)	
12 10	DIST: R3 P-P (polygon)	Z3	+R Resistance	
12 11	DIST: R4 P-G (polygon)	Z4	+R Resistance (PH-E)	
12 12	DIST: R5 P-P (polygon)	Z4	+R Resistance	
12 13	DIST: α (polygon)	Z1 Z1E Z2 Z3 Z4	Relay Angle	
12 23	DIST: Direction N1	Z1 Z1E	Tripping Direction	
12 24	DIST: Direction N2	Z2	Tripping Direction	
12 25	DIST: Direction N3	Z3	Tripping Direction	
12 26	DIST: Direction N4	Z4	Tripping Direction	
12 27	DIST: Direction N5	Directional	Tripping Direction	
12 28	DIST: t1	T1	Time Setting	
12 29	DIST: t2	T2	Time Setting	
12 30	DIST: t3	T3	Time Setting	
12 31	DIST: t4	T4	Time Setting	
12 32	DIST: t5	T5	Time Setting	
12 33	DIST: t6	T6	Time Setting	
12 34	DIST: kze P-G HSR	Z1E	kR	
12 35	DIST: kze P-P HSR		kX	

Protective Signalling

The "Protective Signalling" is integrated into the sub-function and controlled via several logics (see below).

Note The "Echo" functionality is not modelled.

Address	Relay Setting	Model Unit	Model Parameter	Note
15 00	PSIG: Operating mode	PSIG Receive PSIG Send	sLogic	see 1)
15 02	PSIG: Reset time send	PSIG T Reset	Time Setting	see 2)
15 04	PSIG: Enabled USER	PSIG Connect	aDipset	
15 11	PSIG: Tripping time	PSIG T	Time Setting	

Note

- 1) The operation modes are enabled by adding the corresponding lines to the *"Logic"* field. At most one operation mode should be enabled at any given moment, otherwise the behaviour is undefined.
 - Direct trans.trip underr. : *"DIRECT = TRIP"*
 - PUTT : *"PUTT = TRIP"*
 - Zone extension : *"POTT = TRIP"*
 - Signal comp.releas.scheme : *"COMP_RELEASE = TRIP"*
 - Signal comp. block.scheme: *"COMP_BLOCK = TRIP"*
 - Signal comp. pilot wire : *"COMP_PILOT = TRIP"*
 - Reverse interlocking : Currently not implemented
- 2) To enable the *"Protective Signalling"*, set the DIP Setting for *"wConnect"* to *"On"*. To disable it, set the DIP Setting to *"Off"* and clear the *"Logic"* fields of *"PSIG Receive"* and *"PSIG Send"*

5 Distance Circular

This sub-function models the distance protection with circular characteristics.

Note

- Only applies if the parameter *"DIST: Characteristic (Address 12 40)"* is set to *"Circle"*. Disable the whole sub-function otherwise.
- Only the zones are described here. For the configuration of *"Starting"*, *"Polarising"* and *"Protective Signalling"* please see section 4

Zones

The units *"Z1"* - *"Z4"* and their respective timers model the tripping characteristics of the distance protection. Additionally the timers *"T5"* and *"T6"* are provided for the directional and non-directional backup.

Note

- The zone *"Z4"* always operates in *"Normal"* mode
- The zone extension factors are considered to be always equal

Address	Relay Setting	Model Unit	Model Parameter	Note
12 23	DIST: Direction N1	Z1	Tripping Direction	
		Z1E		
12 24	DIST: Direction N2	Z2	Tripping Direction	
12 25	DIST: Direction N3	Z3	Tripping Direction	
12 26	DIST: Direction N4	Z4	Tripping Direction	
12 27	DIST: Direction N5	Directional	Tripping Direction	
12 28	DIST: t1	T1	Time Setting	
12 29	DIST: t2	T2	Time Setting	
12 30	DIST: t3	T3	Time Setting	
12 31	DIST: t4	T4	Time Setting	
12 32	DIST: t5	T5	Time Setting	
12 33	DIST: t6	T6	Time Setting	
12 34	DIST: kze P-G HSR	Z1E	kZ	
12 35	DIST: kze P-P HSR			
12 38	DIST: Arc comp. (circle)	Z1	Arc compensation: Enable	
		Z1E		
		Z2		
		Z3		
		Z4		
12 41	DIST: α (circle)	Z1	Arc compensation: Alpha	
		Z1E		
		Z2		
		Z3		
		Z4		

Address	Relay Setting	Model Unit	Model Parameter	Note
12 42	DIST: Z1 (circle)	Z1	Replica Impedance	
12 43	DIST: Z2 (circle)	Z2	Replica Impedance	
12 44	DIST: Z3 (circle)	Z3	Replica Impedance	
12 45	DIST: Z4 (circle)	Z4	Replica Impedance	

6 Available Mapping Files

Hardware Version	Firmware Version	Language	Multiple Setting Groups	Model
-101	-101	de		PD521 1A PD521 5A

7 References

- [1] AEG Energietechnik GmbH, Bereich Schutz- und Schaltanlagenleittechnik, Lyoner Straße 44-48, D-60528 Frankfurt. *PD 521 Distance Protection Device*. SLTS.06.05350PDF/0597 EN.
- [2] ALSTOM Energietechnik GmbH, Bereich Schutz- und Schaltanlagenleittechnik, Lyoner Straße 44-48, D-60528 Frankfurt. *PD 521 Distance Protection Device*. AFSV.12.06470/0500EN.