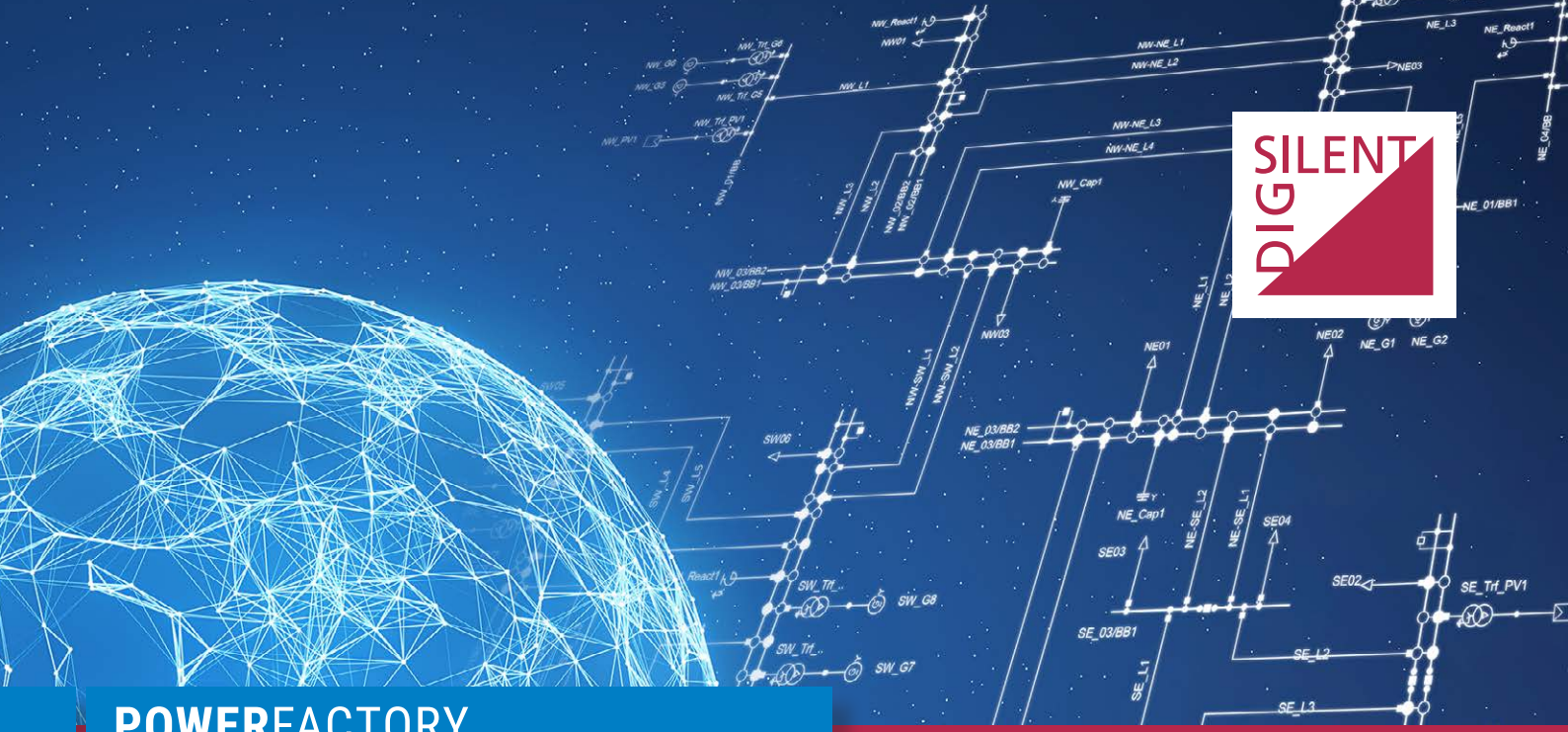

POWERFACTORY

PowerFactory 2021

Technical Reference

Schneider PD532

PF2021

POWER SYSTEM SOLUTIONS

MADE IN GERMANY

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Contents

Disclaimer

DIgSILENT protection device models are developed using publicly accessible information, such as user manuals, and are not validated or tested by the respective manufacturers.

1 Model information

Manufacturer Schneider

Model PD532

Variants The Schneider PD532 consists of two PowerFactory relay models and a third model for establishing communication for protective signalling. Functions and model parameters are derived from information provided in [1].

Modelled Functionality

Functionality	PD532
Overcurrent fault detection logic	X
Undervoltage fault detection logic	X
Underimpedance fault detection logic with load blinding	X
Distance measurement with polygonal or circular tripping characteristics	X
Backup overcurrent-time protection	-
Protective signalling	X
Auto-reclosing control (three-pole)	-
Definite-time overcurrent protection	X
Inverse-time overcurrent protection	X
Time-voltage protection	X
Thermal overload protection	-
Switch on to fault protection	-
Circuit breaker failure protection	-
Ground fault direction determination by steady-state power evaluation	-
Transient ground fault direction determination	-
Ground fault protection signalling	-

2 General description

Both models consists of a main relay with four 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
- Overcurrent : Definite-Time and Inverse-Time overcurrent protection
- Voltage : Over- and Undervoltage protection

Note All parameter addresses are given for *"PS 1"* if the parameter is available in multiple setting groups.

3 Main relay

Measurement transformers

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

Measurement units

The *"Measurement"*, *"Measurement Delta"* and *"Measurement Sequence"* units process the transformer input and hold the nominal current and voltage values. The nominal current is fixed for each model.

Address	Relay Setting	Model Unit	Model Parameter	Note
010 009	MAIN: Vnom V.T. sec.	Measurement Measurement Delta Measurement Sequence	Unom	

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 Polygonal

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

Note Only applies if the parameter *"DIST: Characteristic (Adress 012 040)"* is set to *"Polygon"*. Disable the whole sub-function otherwise.

Starting

Address	Relay Setting	Model Unit	Model Parameter	Note
010 040	MAIN: Transfer for 1p	Starting	Transfer for 1p	
010 048	MAIN: Neutral-point treat	Starting	System Grounding	
010 050	DIST: Xfw PSx	Starting	Forward Reactance	
010 051	DIST: Rfw,PG PSx	Starting	Forward Resistance, Ph-E	
010 052	DIST: Rfw,PP PSx	Starting	Forward Resistance, Ph-Ph	
010 053	DIST: Zbw/Zfw PSx	Starting	Backward/Forward Impedance Ratio	
010 054	DIST: I>> PSx	Starting	I>>	
010 055	DIST: IN>	Starting	IN> sens.range	
010 056	DIST: VN-G>	Starting	VNG>	
010 057	DIST: tIN>	Starting	tIN>	
010 061	DIST: tVN-G>>	Starting	tVNG>>	
010 062	DIST: VN-G>>	Starting	VNG>>	
010 066	DIST: Operat. mode Z< PSx	Starting	Type of Starting: Underimpedance Z Operation Mode	
010 067	DIST: Operat. mode V< PSx	Starting	Type of Starting: Undervoltage V Operation Mode	
010 068	DIST: I> (Imin) PSx	Starting	I> (high range)	
010 069	DIST: V< PSx	Starting	V<	
010 101	DIST: Zfw,PG PSx	Starting	Forward Resistance, Ph-E	
010 105	DIST: Zfw,PP PSx	Starting	Forward Resistance, Ph-Ph	

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
012 036	DIST: Angle kG PSx	Polarisation	Angle	
012 037	DIST: Abs. value kG PSx	Polarisation	k0	

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
012 001	DIST: X1 (polygon) PSx	Z1	+X Reach	
012 002	DIST: X2 (polygon) PSx	Z2	+X Reach	
012 003	DIST: X3 (polygon) PSx	Z3	+X Reach	
012 004	DIST: X4 (polygon) PSx	Z4	+X Reach	
012 005	DIST: R1,PG (polygon) PSx	Z1	+R Resistance (PH-E)	
012 006	DIST: R1,PP (polygon) PSx	Z1	+R Resistance	
012 007	DIST: R2,PG (polygon) PSx	Z2	+R Resistance (PH-E)	
012 008	DIST: R2,PP (polygon) PSx	Z2	+R Resistance	
012 009	DIST: R3,PG (polygon) PSx	Z3	+R Resistance (PH-E)	
012 010	DIST: R3,PP (polygon) PSx	Z3	+R Resistance	
012 011	DIST: R4,PG (polygon) PSx	Z4	+R Resistance (PH-E)	
012 012	DIST: R4,PP (polygon) PSx	Z4	+R Resistance	
012 013	DIST: $\alpha 1$ (polygon) PSx	Z1	Relay Angle	
012 014	DIST: $\alpha 2$ (polygon) PSx	Z2	Relay Angle	
012 015	DIST: $\alpha 3$ (polygon) PSx	Z3	Relay Angle	
012 016	DIST: $\alpha 4$ (polygon) PSx	Z4	Relay Angle	
012 023	DIST: Direction N1 PSx	Z1 Z1E	Tripping Direction	
012 024	DIST: Direction N2 PSx	Z2	Tripping Direction	
012 025	DIST: Direction N3 PSx	Z3	Tripping Direction	
012 026	DIST: Direction N4 PSx	Z4	Tripping Direction	
012 027	DIST: Direction N5 PSx	Directional	Tripping Direction	
012 028	DIST: t1 PSx	T1	Time Setting	
012 029	DIST: t2 PSx	T2	Time Setting	
012 030	DIST: t3 PSx	T3	Time Setting	
012 031	DIST: t4 PSx	T4	Time Setting	
012 032	DIST: t5 PSx	T5	Time Setting	
012 033	DIST: t6 PSx	T6	Time Setting	
012 034	DIST: kze,PG HSR PSx	Z1E	kR	
012 035	DIST: kze,PP HSR PSx		kX	
072 086	DIST: $\sigma 1$ (polygon) PSx	Z1	+X Angle	see 1)
072 087	DIST: $\sigma 2$ (polygon) PSx	Z2	+X Angle	see 1)
072 088	DIST: $\sigma 3$ (polygon) PSx	Z3	+X Angle	see 1)
072 089	DIST: $\sigma 4$ (polygon) PSx	Z4	+X Angle	see 1)

Note

1) Inverted orientation; multiply with -1

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
015 000	PSIG: Operating mode PSx	PSIG Receive PSIG Send	sLogic	see 1)
015 002	PSIG: Release t. send PSx	PSIG T Reset	Time Setting	
015 011	PSIG: Tripping time PSx	PSIG T	Time Setting	
015 014	PSIG: Enable PSx	PSIG Connect	aDipset	see 2)

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.
   - Dir.trans.trip.under : *"DIRECT = TRIP"*
   - PUTT : *"PUTT = TRIP"*
   - Zone extension : *"POTT = TRIP"*
   - Release scheme : *"COMP_RELEASE = TRIP"*
   - Blocking scheme : *"COMP_BLOCK = TRIP"*
   - DC loop operat. mode : *"COMP_PILOT = TRIP"*
   - Reverse interlocking : Currently not implemented
   - Direction comparison : 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 (Adress 012 040)"* 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
012 023	DIST: Direction N1 PSx	Z1 Z1E	Tripping Direction	
012 024	DIST: Direction N2 PSx	Z2	Tripping Direction	
012 025	DIST: Direction N3 PSx	Z3	Tripping Direction	
012 026	DIST: Direction N4 PSx	Z4	Tripping Direction	
012 027	DIST: Direction N5 PSx	Directional	Tripping Direction	
012 028	DIST: t1 PSx	T1	Time Setting	
012 029	DIST: t2 PSx	T2	Time Setting	
012 030	DIST: t3 PSx	T3	Time Setting	
012 031	DIST: t4 PSx	T4	Time Setting	
012 032	DIST: t5 PSx	T5	Time Setting	
012 033	DIST: t6 PSx	T6	Time Setting	
012 034	DIST: kze,PG HSR PSx	Z1E	kZ	
012 035	DIST: kze,PP HSR PSx			
012 038	DIST: Arc comp. (circle)	Z1 Z1E Z2 Z3 Z4	Arc compensation: Enable	
012 042	DIST: Z1 (circle) PSx	Z1	Replica Impedance	
012 043	DIST: Z2 (circle) PSx	Z2	Replica Impedance	
012 044	DIST: Z3 (circle) PSx	Z3	Replica Impedance	
012 045	DIST: Z4 (circle) PSx	Z4	Replica Impedance	
072 090	DIST: $\alpha 1$ (circle) PSx	Z1	Arc compensation: Alpha	
072 095	DIST: $\alpha 2$ (circle) PSx	Z2	Arc compensation: Alpha	
072 096	DIST: $\alpha 3$ (circle) PSx	Z3	Arc compensation: Alpha	
072 099	DIST: $\alpha 4$ (circle) PSx	Z4	Arc compensation: Alpha	

6 Overcurrent

This sub-function models the definite and inverse overcurrent protection.

Note

- The direction for the IDMT units is always determined by the negative sequence

Address	Relay Setting	Model Unit	Model Parameter	Note
072 007	DTOC: I>PSx	I>	Pickup Current	
072 008	DTOC: I>>PSx	I>>	Pickup Current	
072 009	DTOC: I>>>PSx	I>>>	Pickup Current	
072 010	DTOC: I>>>>PSx	I>>>>	Pickup Current	
072 011	DTOC: Ineg>PSx	Ineg>	Pickup Current	
072 012	DTOC: Ineg>>PSx	Ineg>>	Pickup Current	
072 013	DTOC: Ineg>>>PSx	Ineg>>>	Pickup Current	
072 014	DTOC: Ineg>>>>PSx	Ineg>>>>	Pickup Current	
072 015	DTOC: IN>PSx	IN>	Pickup Current	
072 016	DTOC: IN>>PSx	IN>>	Pickup Current	
072 017	DTOC: IN>>>PSx	IN>>>	Pickup Current	
072 018	DTOC: IN>>>>PSx	IN>>>>	Pickup Current	
072 019	DTOC: tI>PSx	I>	Time Setting	
072 020	DTOC: tI>>PSx	I>>	Time Setting	
072 021	DTOC: tI>>>PSx	I>>>	Time Setting	
072 022	DTOC: tI>>>>PSx	I>>>>	Time Setting	
072 023	DTOC: tIneg>PSx	Ineg>	Time Setting	
072 024	DTOC: tIneg>>PSx	Ineg>>	Time Setting	
072 025	DTOC: tIneg>>>PSx	Ineg>>>	Time Setting	
072 026	DTOC: tIneg>>>>PSx	Ineg>>>>	Time Setting	
072 027	DTOC: tIN>PSx	IN>	Time Setting	
072 028	DTOC: tIN>>PSx	IN>>	Time Setting	
072 029	DTOC: tIN>>>PSx	IN>>>	Time Setting	
072 030	DTOC: tIN>>>>PSx	IN>>>>	Time Setting	
072 050	IDMT: Iref,P PSx	IDMT P	Current Setting	
072 051	IDMT: Iref,neg PSx	IDMT neg	Current Setting	
072 052	IDMT: Iref,N PSx	IDMT N	Current Setting	
072 053	IDMT: Ch. factor kt,P PSx	IDMT P	Time Dial	
072 054	IDMT: Factor kt,neg PSx	IDMT neg	Time Dial	
072 055	IDMT: Factor kt,N PSx	IDMT N	Time Dial	
072 056	IDMT: Characterist. P PSx	IDMT P	Characteristic	
072 057	IDMT: Character. neg. PSx	IDMT neg	Characteristic	
072 058	IDMT: Characterist. N PSx	IDMT N	Characteristic	
072 059	IDMT: Reset P PSx	IDMT P	Reset Characteristic	
072 060	IDMT: Reset neg. PSx	IDMT neg	Reset Characteristic	
072 061	IDMT: Reset N PSx	IDMT N	Reset Characteristic	
072 062	IDMT: Direction P PSx	IDMT P	Tripping Direction	
072 063	IDMT: Direction neg. PSx	IDMT neg	Tripping Direction	
072 064	IDMT: Direction N PSx	IDMT N	Tripping Direction	

7 Voltage

This sub-function models over- and undervoltage protection.

Note

- Only *"V<>: Operating mode: Delta (Adress 076 001)"* is modelled
- Only *"V<>: Evaluation VNG: Calculated (Adress 076 002)"* is modelled
- Separate timers for 3-pole over-/undervoltage are not modelled

Address	Relay Setting	Model Unit	Model Parameter	Note
076 003	V<>: V>PSx	V>	Pickup Voltage	
076 004	V<>: V>>PSx	V>>	Pickup Voltage	
076 005	V<>: tV>PSx	V>	Time Delay	
076 006	V<>: tV>>PSx	V>>	Time Delay	
076 007	V<>: V<PSx	V<	Pickup Voltage	
076 008	V<>: V<< PSx	V<<	Pickup Voltage	
076 009	V<>: tV<PSx	V<	Time Delay	
076 010	V<>: tV<< PSx	V<<	Time Delay	
076 011	V<>: VNG>PSx	VNG>	Pickup Voltage	
076 012	V<>: VNG>>PSx	VNG>>	Pickup Voltage	
076 013	V<>: tVNG>PSx	VNG>	Time Delay	
076 014	V<>: tVNG>>PSx	VNG>>	Time Delay	
076 015	V<>: Vpos>PSx	Vpos>	Pickup Voltage	
076 016	V<>: Vpos>>PSx	Vpos>>	Pickup Voltage	
076 017	V<>: tVpos>PSx	Vpos>	Time Delay	
076 018	V<>: tVpos>>PSx	Vpos>>	Time Delay	
076 019	V<>: Vpos<PSx	Vpos<	Pickup Voltage	
076 020	V<>: Vpos<< PSx	Vpos<<	Pickup Voltage	
076 021	V<>: tVpos<PSx	Vpos<	Time Delay	
076 022	V<>: tVpos<< PSx	Vpos<<	Time Delay	
076 023	V<>: Vneg>PSx	Vneg>	Pickup Voltage	
076 024	V<>: Vneg>>PSx	Vneg>>	Pickup Voltage	
076 025	V<>: tVneg>PSx	Vneg>	Time Delay	
076 026	V<>: tVneg>>PSx	Vneg>>	Time Delay	

8 Available Mapping Files

Hardware Version	Firmware Version	Language	Multiple Setting Groups	Model
-606	-606	en		PD532 1A
		de		PD532 1A

9 References

[1] ALSTOM Energietechnik GmbH, Bereich Schutz- und Schaltanlagenleittechnik, Lyoner Straße 44-48, D-60528 Frankfurt. *PD 532 Distance Protection Device*. AFSV.12.05840 EN.