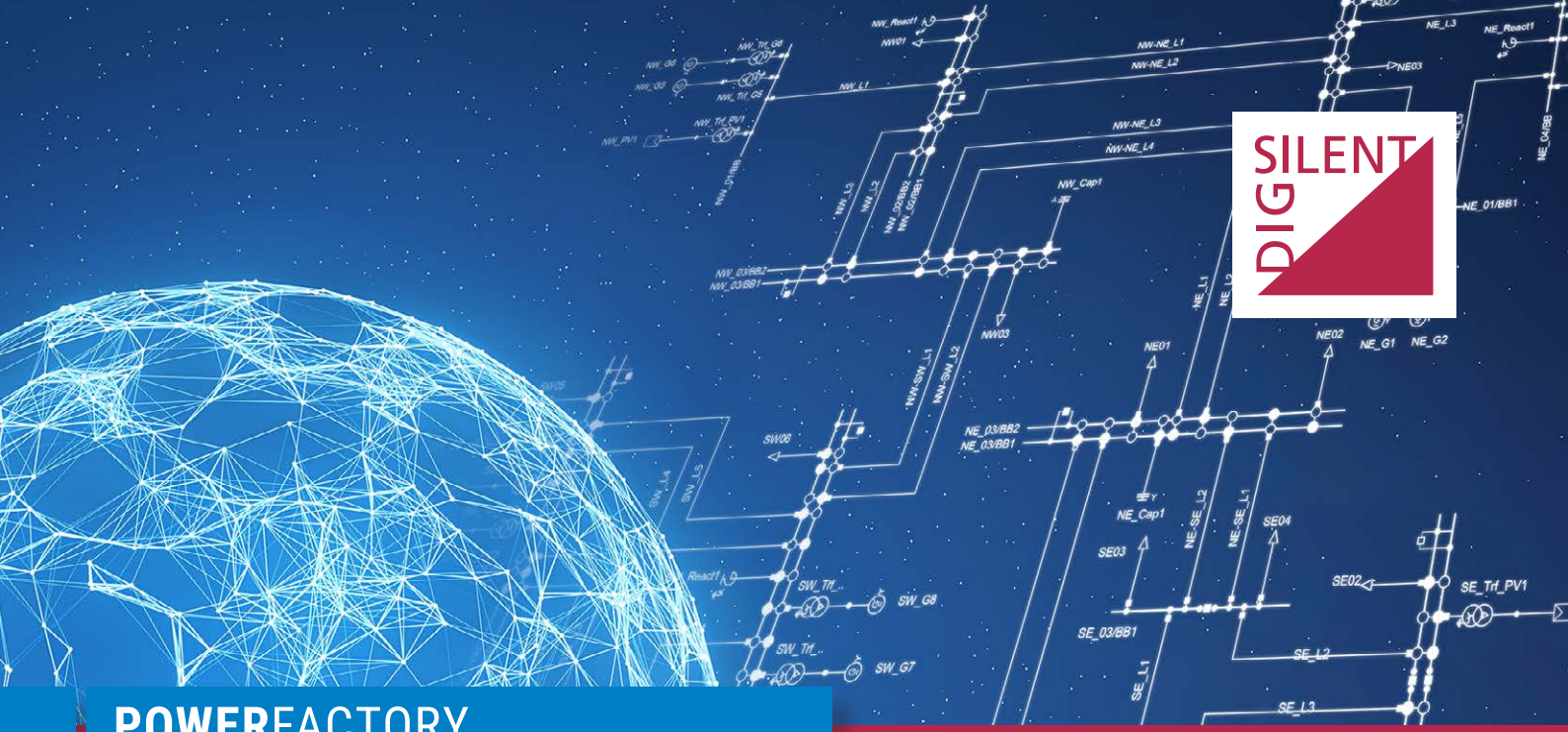

POWERFACTORY

PowerFactory 2021

Technical Reference

Schneider P13x

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 P13x

Variants The Schneider P13x models the overcurrent protection devices P132 and P139 based on the information given in [1] and [2]. The model corresponds with the order number P13xxx904 with CTs and a 4-pole VT.

Modelled Functionality

Functionality	P13x
Definite-Time Overcurrent Protection (DTOC)	X [1]
Inverse-Time Overcurrent Protection (IDMT1 and IDMT2)	X
Short-Circuit Direction Determination (SCDD)	X
Switch on to Fault Protection (SOTF)	-
Protective Signaling (PSIG)	-
Auto Reclosure Control (ARC)	-
Automatic Dynchronism Check (ASC)	-
Motor Protection (MP)	-
Thermal Overload Protection (THERM)	-
Unbalance Protection (I2>)	-
Under- and Overvoltage Protection (V<>)	X
Over-/Underfrequency Protection (f<>)	X [2]
Underfrequency Load Shedding Protection (Pf<)	-
Directional Power Protection (P<>)	-
Voltage Controller Direcitonal Reactive Power Protection (QV)	-
Circuit Breaker Failure Protection (CBF)	-

[1] Excluding voltage dependent overcurrent and sensitive earth fault protection.
[2] Excluding operating mode with mean frequency gradient monitoring.

2 General description

The model consists of a main relay with three sub-functions.

- Main relay : Measurement transformer slots, measurement processing, tripping logic
- Overcurrent : Definite and inverse-definite time overcurrent protection
- Voltage : Under- and overvoltage protection for operating mode delta
- Frequency : Frequency protection

The PowerFactory relay model is delivered with a mapping table in english and german language. The mapping is done for all four parameter subsets (adress: 003.060). Please note, that due to better clarity, only the adresses of parameter subset 1 are described in this document.

3 Main relay

Measurement transformers

The *"CT"* and *"VT"* slots hold the assigned 3-phase measurement transformers. The *"CT T4"* can be assigned to a CT measuring the zero-sequence current. The zero sequence voltage will always be determined by the 3-phase VT.

Measurement units

The *"Measurement"* slots process the transformer inputs and hold the nominal current and voltage values. For determination of zero-sequence values, different nominal current and voltage may be entered in the *"Measure Zero"* slot. The nominal phase values of the relay have to be entered in all other measurement units. Please note, that the minimum operating voltage for the frequency measurement unit is fixed to 0.65 p.u.

Output logic

The *"Trip Logic"* holds an OR functionality for processing the sub-functions output signals and generating the tripping signal.

4 Overcurrent

The *"Overcurrent"* sub-function contains the function groups DTOC, IDMT1, IDMT2 and SCDD for phase, negative-sequence and zero-sequence currents.

DTOC

Four stages of each phase, negative- and zero-sequence overcurrent protection are modelled. Phase direction can be used for all phase stages and the earth direction for the first three earth stages (not IN>>>>).

Address	Relay Setting	Model Unit	Model Parameter	Note
017.000	I>	DTOC I>	Pickup Current	
017.004	tI>	DTOC I>	Time Setting	
017.001	I>>	DTOC I>>	Pickup Current	
017.006	tI>>	DTOC I>>	Time Setting	
017.002	I>>>	DTOC I>>>	Pickup Current	
017.007	tI>>>	DTOC I>>>	Time Setting	
016.149	I>>>>	DTOC I>>>>	Pickup Current	
016.157	tI>>>>	DTOC I>>>>	Time Setting	
072.011	Ineg>	DTOC Ineg>	Pickup Current	
072.023	tIneg>	DTOC Ineg>	Time Setting	
072.012	Ineg>>	DTOC Ineg>>	Pickup Current	
072.024	tIneg>>	DTOC Ineg>>	Time Setting	

Address	Relay Setting	Model Unit	Model Parameter	Note
072.013	Ineg>>>	DTOC Ineg>>>	Pickup Current	
072.025	tIneg>>>	DTOC Ineg>>>	Time Setting	
016.161	Ineg>>>>	DTOC Ineg>>>>	Pickup Current	
016.169	tIneg>>>>	DTOC Ineg>>>>	Time Setting	
017.003	IN>	DTOC IN>	Pickup Current	
017.008	tIN>	DTOC IN>	Time Setting	
017.009	IN>>	DTOC IN>>	Pickup Current	
017.010	tIN>>	DTOC IN>>	Time Setting	
017.018	IN>>>	DTOC IN>>>	Pickup Current	
017.019	tIN>>>	DTOC IN>>>	Time Setting	
072.018	IN>>>>	DTOC IN>>>>	Pickup Current	
072.030	tIN>>>>	DTOC IN>>>>	Time Setting	

IDMT1

For the phase, negative- and zero-sequence current is one stage available. The phase and earth direction can be used for the corresponding stages.

Address	Relay Setting	Model Unit	Model Parameter	Note
013.143	Time Correction	Various	Time Adder	
072.050	Iref,P	IDMT1 P	Current Setting	
007.250	Factor KI,P	IDMT1 KI P	Pickup Current	see 1)
072.056	Characteristic P	IDMT1 P	Characteristic	
072.077	Min. trip time P	IDMT1 P	Min. Response Time	
072.059	Release P	IDMT1 P	Reset Time	
072.051	Iref,neg	IDMT1 neg	Current Setting	
007.254	Factor KI,neg	IDMT1 KI neg	Pickup Current	see 1)
072.057	Character. neg	IDMT1 neg	Characteristic	
072.054	Factor kt,neg	IDMT1 neg	Time dial	
072.078	Min.trip time neg	IDMT1 neg	Min. Response Time	
072.060	Release neg.	IDMT1 neg	Reset Time	
072.052	Iref,N	IDMT1 N	Current Setting	
001.173	Factor KI,N	IDMT1 KI N	Pickup Current	see 1)
072.058	Characteristic N	IDMT1 N	Characteristic	
072.055	Factor kt,N	IDMT1 N	Time Dial	
072.079	Min. trip time N	IDMT1 N	Min. Response Time	
072.061	Release N	IDMT1 N	Reset Time	

Notes:

1) – The factor KI is multiplied by the corresponding reference value and blocks the stage if the current is below the threshold. This setting is only for IDMT1 stages available.

IDMT2

For the phase, negative- and zero-sequence current is one stage available.

Address	Relay Setting	Model Unit	Model Parameter	Note
076.236	Iref,P	IDMT2 P	Current Setting	
071.004	Characteristic P	IDMT2 P	Characteristic	
078.250	Factor kt,P	IDMT2 P	Time dial	
071.044	Min. trip time P	IDMT2 P	Min. Response Time	
071.016	Release P	IDMT2 P	Reset Time	
076.250	Iref,neg	IDMT2 neg	Current Setting	
071.008	Character. neg	IDMT2 neg	Characteristic	
079.250	Factor kt,neg	IDMT2 neg	Time dial	
071.048	Min.trip time neg	IDMT2 neg	Min. Response Time	
071.020	Release neg.	IDMT2 neg	Reset Time	
077.250	Iref,N	IDMT2 N	Current Setting	
071.012	Characteristic N	IDMT2 N	Characteristic	
071.000	Factor kt,N	IDMT2 N	Time Dial	
071.052	Min. trip time N	IDMT2 N	Min. Response Time	
071.024	Release N	IDMT2 N	Reset Time	

SCDD

Direction determination is modelled for phase and earth direction.

Address	Relay Setting	Model Unit	Model Parameter	Note
016.105	Start w. Direct.	Various	Tripping Direction	see 1)
017.071	Direction tI>	DTOC I>	Tripping Direction	
017.072	Direction tI>>	DTOC I>>	Tripping Direction	
007.230	Direction tI>>>	DTOC I>>>	Tripping Direction	
016.177	Direction tI>>>>	DTOC I>>>>	Tripping Direction	
017.073	Direction tIN>	DTOC IN>	Tripping Direction	
017.075	Direction tIN>>	DTOC IN>>	Tripping Direction	
007.235	Direction tIN>>>	DTOC IN>>>	Tripping Direction	
017.066	Direct. tIref,P>	IDMT1 P	Tripping Direction	
017.067	Direct. tIref,N>	IDMT1 N	Tripping Direction	
017.076	Charact. angle G	Directional N	Max. Torque Angle	
017.077	VNG>	Directional N	Polarising Voltage	

Notes:

1) – ”No” : Start not with direction sets the *”Tripping Direction”* of the relevant DTOC stages to ”None”
   – ”Yes” : Start with direction is checked before setting the *”Tripping Direction”* of the relevant DTOC stages

5 Voltage

The *"Voltage"* sub-function models over-/undervoltage related functionality. Six phase, four positive-, two negative- and two zero-sequence stages are available. For the phase and zero-sequence stages only the delta operating mode is supported (address: 076.003).

Address	Relay Setting	Model Unit	Model Parameter	Note
076.001	Operating mode	Various	Out of Service	see 1)
076.003	V>	V>	Pickup Voltage	only Delta mode
076.004	V>>	V>>	Pckup Voltage	only Delta mode
011.075	V>>>	V>>>	Pckup Voltage	only Delta mode
076.005	tV>	V>	Time Delay	
076.006	tV>>	V>>	Time Delay	
011.079	tV>>>	V>>>	Time Delay	
076.027	tV> 3-pole	tV> 3-pole	Time Setting	
011.092	tV>>3-pole	tV>>3-pole	Time Setting	
011.099	tV>>>3-pole	tV>>>3-pole	Time Setting	
076.007	V<	V<	Pickup Voltage	only Delta mode
076.008	V<<	V<<	Pickup Voltage	only Delta mode
011.083	V<<<	V<<<	Pickup Voltage	only Delta mode
076.009	tV<	V<	Time Delay	
076.010	tV<<	V<<	Time Delay	
011.088	tV<<<	V<<<	Time Delay	
076.028	tV< 3-pole	tV< 3-pole	Time Setting	
011.119	tV<< 3-pole	tV<< 3-pole	Time Setting	
011.127	tV<<<3-pole	tV<<<3-pole	Time Setting	
076.015	Vpos>	Vpos>	Voltage Pickup	
076.016	Vpos>>>>	Vpos>>>>	Voltage Pickup	
076.017	tVpos>	Vpos>	Time Delay	
076.018	tVpos>>>>	Vpos>>>>	Time Delay	
076.019	Vpos<	Vpos<	Voltage Pickup	
076.020	Vpos<<	Vpos<<	Voltage Pickup	
076.021	tVpos<	Vpos<	Time Delay	
076.022	tVpos<<	Vpos<<	Time Delay	
076.023	Vneg>	Vneg>	Voltage Pickup	
076.024	Vneg>>	Vneg>>	Voltage Pickup	
076.025	tVneg>	Vneg>	Time Delay	
076.026	tVneg>>	Vneg>>	Time Delay	
076.011	VNG>	VNG>	Voltage Pickup	only Delta mode
076.012	VNG>>	VNG>>	Voltage Pickup	only Delta mode
076.013	tVNG>	VNG>	Time Delay	
076.014	tVNG>>	VNG>>	Time Delay	
001.162	Op. mode V<	Imin	Out of Service	see 2)
001.155	I enable V<	Imin	Pickup Current	

Notes:

1) – *"Delta"* : enables the parameter mapping for phase and zero-sequences stages

- *"Star"* : disables phase and zero-sequence stages

2) – Minimum current monitoring is available for all phase and positive-sequence undervoltage stages.

6 Frequency

The *"Frequency"* sub-function models five stages of the over-/underfrequency related functionality. Only operating modes *"f"* and *"with df"* are supported in this model for all stages.

Address	Relay Setting	Model Unit	Model Parameter	Note
018.120	Oper. mode f1	df1/dt	Out of Service	only modes f and with df
018.100	f1	f1	Frequency	
018.104	tf1	Various	Time Delay	
018.108	df1/dt	df1/dt	Gradient df/dt	
018.144	Oper. mode f2	df2/dt	Out of Service	only modes f and with df
018.124	f2	f2	Frequency	
018.128	tf2	Various	Time Delay	
018.132	df2/dt	df2/dt	Gradient df/dt	
018.168	Oper. mode f3	df3/dt	Out of Service	only modes f and with df
018.148	f3	f3	Frequency	
018.152	tf3	Various	Time Delay	
018.156	df3/dt	df3/dt	Gradient df/dt	
018.192	Oper. mode f4	df4/dt	Out of Service	only modes f and with df
018.172	f4	f4	Frequency	
018.176	tf4	Various	Time Delay	
018.180	df4/dt	df4/dt	Gradient df/dt	
019.171	Oper. mode f5	df5/dt	Out of Service	only modes f and with df
019.151	f5	f5	Frequency	
019.155	tf5	Various	Time Delay	
019.159	df5/dt	df5/dt	Gradient df/dt	

7 Available Mapping Files

Hardware Version	Firmware Version	Language	Multiple Setting Groups	Model
-602	-602	de		P13x
-618	-618	de		P13x
-630	-630	de		P13x
-654	-654	de		P13x
-658	-658	en		P13x
		de		P13x

8 References

[1] Schneider Electric, 35 rue Joseph Monier, 92506 Rueil-Malmaison, FRANCE. *Easergy MiCOM P132 Technical Manual*. P132/EN M/R-93-B.

[2] Schneider Electric, 35 rue Joseph Monier, 92506 Rueil-Malmaison, FRANCE. *Easergy MiCOM P139 Technical Manual*. P139/EN M/R-93-B.