



POWERFACTORY

PowerFactory 2021

Technical Reference

Schneider P43x

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

F2021

Publisher:

DlgSILENT 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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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 P43x

Variants The Schneider P43x consists of six PowerFactory relay models and an additional model for establishing communication for protective signalling. The models are grouped according to different variants of the device, where the P43x versions are intended to be used for P433, P435 and P439. Functions and model parameters are derived from information provided in [1], [2], [3], [4] and [5].

Modelled Functionality

Functionality	P430C	P43x	P437
Distance Protection	X	X	X
Power swing blocking and out-of-step tripping	-	-	-
Backup overcurrent protection	-	-	-
Switch on to fault protection	-	-	-
Protective signaling	X	X	X
Auto-reclosing control	-	-	-
Ground fault short circuit protection	-	-	-
Ground fault short circuit protection signaling	-	-	-
Definite-time overcurrent protection, four stages	X	X	X
Inverse-time overcurrent protection, single-stage	X	X	X
Short-circuit direction determination	X	X	X
Thermal overload protection	-	-	-
Over- /Undervoltage Protection	X	X	X
Over- /Underfrequency protection	X	X	X
Directional power protection	-	-	-
Delta-I protection	-	-	-
Circuit breaker failure protection	-	-	-

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
- Frequency : Over- and Underfrequency 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 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 Measurement Frequency	Unom	
010 028	MAIN: VNG,nom V.T. sec.	Measurement Neutral	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 Polygon

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 PSx	Starting	Transfer for 1p	
010 048	MAIN: Neutral-point treat PSx	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	
012 172	DIST: Meas. start. 1pG PSx	Starting	Meas. start. 1pG	see 1)
012 176	DIST: Meas. start. 2pG PSx	Starting	Meas. start. 2pG	see 1)
012 180	DIST: Meas. start. 3pG PSx	Starting	Meas. start. 3pG	see 1)

Note

- 1) Setting is only available in P437; leave at default for other variants

Polarisation

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

Note Currently only the complex compensation factor is supported.

4 Distance Polygonal

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	
012 049	DIST: kG,par angle PSx	Polarisation	Mutual Earth Factor: Angle	see 1)
012 048	DIST: kG,par abs.value PSx	Polarisation	Mutual Earth Factor: k0m	see 1)
012 184	DIST: IN,par> PSx	Polarisation	Mutual Earth Factor: Earth Current Ratio	see 1)

Note

1) Only available in P437

Zones

The units "Z1" - "Z6" (P430C) or "Z1" - "Z8" (P43x and P437) and their respective timers model the tripping characteristics of the distance protection. Additionally the timers "T7" and "T8" (P430C) or "T9" and "T10" (P43x and P437) 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
- Zones always consider Xn,PP to be equal to Xn,PG

Address	Relay Setting	Model Unit	Model Parameter	Note
002 076	DIST: X1,PP (polygon) PSx	Z1	+X Reach	
002 080	DIST: X2,PP (polygon) PSx	Z2	+X Reach	
002 084	DIST: X3,PP (polygon) PSx	Z3	+X Reach	
002 089	DIST: X4,PP (polygon) PSx	Z4	+X Reach	
002 093	DIST: X5,PP (polygon) PSx	Z5	+X Reach	
002 097	DIST: X6,PP (polygon) PSx	Z6	+X Reach	
021 088	DIST: X7,PP (polygon) PSx	Z7	+X Reach	
021 092	DIST: X8,PP (polygon) PSx	Z8	+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	
012 108	DIST: R5,PG (polygon) PSx	Z5	+R Resistance (PH-E)	
012 112	DIST: R5,PP (polygon) PSx	Z5	+R Resistance	
012 116	DIST: R6,PG (polygon) PSx	Z6	+R Resistance (PH-E)	
012 120	DIST: R6,PP (polygon) PSx	Z6	+R Resistance	
021 096	DIST: R7,PG (polygon) PSx	Z7	+R Resistance (PH-E)	
021 104	DIST: R7,PP (polygon) PSx	Z7	+R Resistance	

4 Distance Polygonal

Address	Relay Setting	Model Unit	Model Parameter	Note
021 100	DIST: R8,PG (polygon) PSx	Z8	+R Resistance (PH-E)	
021 118	DIST: R8,PP (polygon) PSx	Z8	+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	
012 124	DIST: $\alpha 5$ (polygon) PSx	Z5	Relay Angle	
012 128	DIST: $\alpha 6$ (polygon) PSx	Z6	Relay Angle	
021 155	DIST: $\alpha 7$ (polygon) PSx	Z7	Relay Angle	
021 159	DIST: $\alpha 8$ (polygon) PSx	Z8	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	Z5	Tripping Direction	
012 132	DIST: Direction N6 PSx	Z6	Tripping Direction	
021 147	DIST: Direction N7 PSx	Z7	Tripping Direction	
021 151	DIST: Direction N8 PSx	Z8	Tripping Direction	
012 136	DIST: Direction N9 PSx	Directional	Tripping Direction	see 2)
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	
021 139	DIST: t7 PSx	T7	Time Setting	
021 143	DIST: t8 PSx	T8	Time Setting	
012 140	DIST: t9 PSx	T9 (T7)	Time Setting	see 3)
012 144	DIST: t10 PSx	T10 (T8)	Time Setting	see 4)
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)
012 156	DIST: $\sigma 5$ (polygon) PSx	Z5	+X Angle	see 1)
012 160	DIST: $\sigma 6$ (polygon) PSx	Z6	+X Angle	see 1)
021 163	DIST: $\sigma 7$ (polygon) PSx	Z7	+X Angle	see 1)
021 168	DIST: $\sigma 8$ (polygon) PSx	Z8	+X Angle	see 1)

Note

- 1) Inverted orientation; multiply with -1
- 2) For P430C this corresponds to "DIST: Direction N7 PSx"
- 3) For P430C this corresponds to "DIST: t7 PSx"
- 4) For P430C this corresponds to "DIST: t8 PSx"

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" - "Z6"* (P430C) or *"Z1" - "Z8"* (P43x and P437) and their respective timers model the tripping characteristics of the distance protection. Additionally the timers *"T7"* and *"T8"* (P430C) or *"T9"* and *"T10"* (P43x and P437) 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	Tripping Direction	see 1)
		Z1E		
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	Z5	Tripping Direction	
012 132	DIST: Direction N6 PSx	Z6	Tripping Direction	
021 147	DIST: Direction N7 PSx	Z7	Tripping Direction	
021 151	DIST: Direction N8 PSx	Z8	Tripping Direction	
012 136	DIST: Direction N9 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	
021 139	DIST: t7 PSx	T7	Time Setting	see 2)
021 143	DIST: t8 PSx	T8	Time Setting	
012 140	DIST: t9 PSx	T9 (T7)	Time Setting	
012 144	DIST: t10 PSx	T10 (T8)	Time Setting	
012 034	DIST: kze,PG HSR PSx	Z1E	kZ	see 3)
012 035	DIST: kze,PP HSR PSx			

Address	Relay Setting	Model Unit	Model Parameter	Note
012 038	DIST: Arc comp. (circle)	Z1 Z1E Z2 Z3 Z4 Z5 Z6 Z7 Z8	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	
012 148	DIST: Z5 (circle) PSx	Z5	Replica Impedance	
012 152	DIST: Z6 (circle) PSx	Z6	Replica Impedance	
021 172	DIST: Z7 (circle) PSx	Z7	Replica Impedance	
021 183	DIST: Z8 (circle) PSx	Z8	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	
012 164	DIST: $\alpha 5$ (circle) PSx	Z5	Arc compensation: Alpha	
012 168	DIST: $\alpha 6$ (circle) PSx	Z6	Arc compensation: Alpha	
021 176	DIST: $\alpha 7$ (circle) PSx	Z7	Arc compensation: Alpha	
021 187	DIST: $\alpha 8$ (circle) PSx	Z8	Arc compensation: Alpha	

Note

- 1) For P430C this corresponds to "DIST: Direction N7 PSx"
- 2) For P430C this corresponds to "DIST: t7 PSx"
- 3) For P430C this corresponds to "DIST: t8 PSx"

6 Overcurrent

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

Note

- The direction for the phase and negative sequence 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: tl> PSx	I>	Time Setting	
072 020	DTOC: tl>> PSx	I>>	Time Setting	
072 021	DTOC: tl>>> PSx	I>>>	Time Setting	
072 022	DTOC: tl>>>> PSx	I>>>>	Time Setting	
017 071	DTOC: Direction tl> PSx	I>	Tripping Direction	see 1)
017 072	DTOC: Direction tl>> PSx	I>>	Tripping Direction	see 1)
007 230	DTOC: Direction tl>>> PSx	I>>>	Tripping Direction	see 1)
013 115	DTOC: Direction tl>>>> PSx	I>>>>	Tripping Direction	see 1)
072 023	DTOC: tlneg> PSx	Ineg>	Time Setting	
072 024	DTOC: tlneg>> PSx	Ineg>>	Time Setting	
072 025	DTOC: tlneg>>> PSx	Ineg>>>	Time Setting	
072 026	DTOC: tlneg>>>> 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	
072 032	DTOC: Direction tIN> PSx	I>	Tripping Direction	see 1)
072 033	DTOC: Direction tIN>> PSx	I>>	Tripping Direction	see 1)
072 034	DTOC: Direction tIN>>> PSx	I>>>	Tripping Direction	see 1)
072 035	DTOC: Direction tIN>>>> PSx	I>>>>	Tripping Direction	see 1)
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	

Address	Relay Setting	Model Unit	Model Parameter	Note
072 058	IDMT: Characterist. N PSx	IDMT N	Characteristic	see 2)
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	

Note

- 1) Only available in P43x and P437
- 2) Only available in P430C

7 Voltage

This sub-function models over- and undervoltage protection.

Note

- "V<>: Operating mode (Address 076 001)" is modelled by providing separate units for line-earth (LE) and line-line (LL) voltages; deactivate the unused set of tripping units
- "V<>: Evaluation VNG: Calculated (Address 076 002)" can be modelled by omitting the "VT VNG" selection
- Separate timers for 3-pole over-/undervoltage are not modelled

Address	Relay Setting	Model Unit	Model Parameter	Note
076 003	V<>: V> PSx	V> LE V> LL	Pickup Voltage	see 1)
076 004	V<>: V>> PSx	V>> LE V>> LL	Pickup Voltage	
011 075	V<>: V>>> PSx	V>>> LE V>>> LL	Pickup Voltage	
076 005	V<>: tV> PSx	V> LE V> LL	Time Delay	
076 006	V<>: tV>> PSx	V>> LE V>> LL	Time Delay	see 1)
011 079	V<>: tV>>> PSx	V>>> LE V>>> LL	Time Delay	
076 007	V<>: V< PSx	V< LE V< LL	Pickup Voltage	
076 008	V<>: V<< PSx	V<< LE V<< LL	Pickup Voltage	
011 083	V<>: V<<< PSx	V<<< LE V<<< LL	Pickup Voltage	see 1)
076 009	V<>: tV< PSx	V< LE V< LL	Time Delay	
076 010	V<>: tV<< PSx	V<< LE V<< LL	Time Delay	
011 088	V<>: tV<<< PSx	V<<< LE V<<< LL	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	

Note

- 1) Only available in P43x and P437

8 Available Mapping Files

Hardware Version	Firmware Version	Language	Multiple Setting Groups	Model
-661	-661	en		P437 1A P437 5A P43x 1A P43x 5A
		de		P437 1A P437 5A P43x 1A P43x 5A
-651	-651	de		P43x 1A P43x 5A
-631	-631	de		P43x 1A P43x 5A
-605	-605	en		P430C 1A P430C 5A
		de		P430C 1A P430C 5A P43x 1A P43x 5A

9 References

- [1] Schneider Electric, 35 rue Joseph Monier, FR-92506 Rueil-Malmaison. *Easergy MiCOM P433 Distance Protection and Control Unit Technical Manual*. Publication: P433/EN M/R-b5-A Volume 1+ 2.
- [2] Schneider Electric, 35 rue Joseph Monier, FR-92506 Rueil-Malmaison. *Easergy MiCOM P435 Distance Protection and Control Unit Technical Manual*. Publication: P435/EN M/R-b5-A Volume 1+ 2.
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