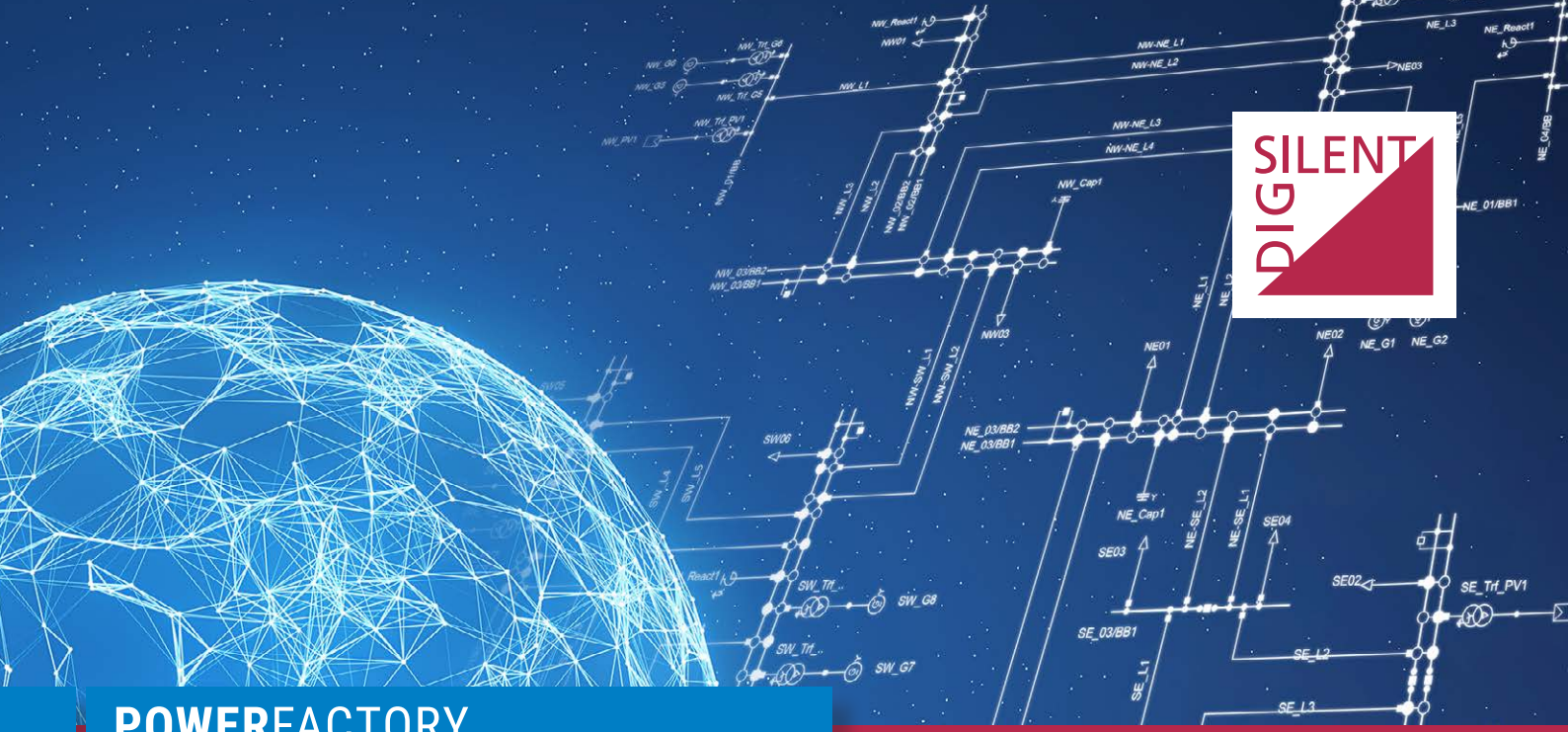

POWERFACTORY

PowerFactory 2021

Technical Reference

ABB REF 630

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 ABB

Model REF 630

Variants The ABB REF 630 models consist of two models, one for each of the two pre-configurations A and B and support the connection of both 1A and 5A current transformers. Model parameters and pre-configurations were taken from [1] and [2].

Modelled Functionality

Functionality	REF 630 A	REF 630 B
Three-phase non-directional overcurrent protection, low stage	X	X
Three-phase non-directional overcurrent protection, high stage	X	X
Three-phase non-directional overcurrent, instantaneous stage	-	-
Three-phase directional overcurrent protection, low stage	X	-
Three-phase directional overcurrent protection, high stage	X	-
Autoreclosing	-	-
Non-directional earth-fault protection, low stage	-	X
Non-directional earth-fault protection, high stage	X	X
Non-directional earth-fault protection, instantaneous stage	-	-
Directional earth-fault protection, low stage	X	X
Directional earth-fault protection, high stage	X	-
Transient/intermittent earth-fault protection	-	-
Phase discontinuity protection	-	-
Negative-sequence overcurrent protection	X	X
Three-phase thermal overload protection for feeder	-	-
Three-phase current inrush detection	-	-
Circuit breaker failure protection	-	-

Per-Unit System

The per-unit system used in the models is the device per-unit system. If the reference system(s) specified in the device differ, recalculation of settings is necessary.

2 General description

The model consists of a main relay with several sub-functions:

- Main relay : Measurement transformer slots, measurement processing, breaker logics
- Overcurrent : Three-phase non-directional and directional overcurrent protection
- Earth-fault : Non-directional and directional earth-fault protection for feeders
- Unbalance : Negative-sequence overcurrent protection

3 Main relay

Measurement transformers

The *"CT"* and *"VT"* slots hold the assigned 3-phase measurement transformers. The *"Ct-N"* slot contains a designated 1-phase current transformer connected to the neutral current. The *"Vt-NG"* can be assigned to VT with an open triangle winding to enter the measured zero-sequence voltage.

Measurement units

The *"Measurement"* slots process the transformer input and hold the nominal current and voltage values. Please note that phase current and neutral current may have different rated values. The rated voltage *"VT-NG"* and rated current *"CT-N"* of the relay must be entered only in unit *"Measurement Zero Seq"*. The rated voltage *"VT"* and rated current *"CT"* of the relay entered into other measurement units.

Address	Relay Setting	Model Unit	Model Parameter	Note
CTsec1	Rated CT secondary current	Measurement Measurement Delta	Nominal Current	see 1)
CTsec5	Rated CT secondary current	Measurement Zero Seq	Nominal Current	
VTsec7	Rated VT secondary voltage	Measurement Measurement Delta	Nominal Voltage	see 2)
VTsec10	Rated VT secondary voltage	Measurement Zero Seq	Nominal Voltage	

Notes:

1) Unit *"Measurement Delta"* is used only in model *"Pre-Configuration A"*

2) Setting *"VTsec7"* is used only in *"Pre-Configuration A"*

Breaker logics

The *"Out Logic"* hold the breaker and signal assignments for relay trips.

4 Overcurrent

The *"Overcurrent"* sub-function models three-phase non-directional and directional overcurrent protection against single-phase, two-phase or three-phase short circuits. The response time characteristics of the protection can be selected equal to a definite time (DT) or inverse definite minimum time (IDMT). Only the *"Cross pol"* polarizing method used to determine fault direction.

Three-phase non-directional overcurrent protection

Address	Relay Setting	Model Unit	Model Parameter	Note
PHLPTOC: 1	Operation	PHLPTOC1	Out of Service	
PHLPTOC: 1	Start value	PHLPTOC1	Current Setting	
PHLPTOC: 1	Time multiplier	PHLPTOC1	Time Dial	see 1)
PHLPTOC: 1	Operating curve type	PHLPTOC1	Characteristic	see 2)
PHLPTOC: 1	Operate delay time	PHLPTOC1	Time Dial	see 3)
PHLPTOC: 1	Reset delay time	PHLPTOC1	Reset Delay	see 3)
PHLPTOC: 1	Minimum operate time	PHLPTOC1	Min. Time	see 1), 4)
PHHPTOC: 1	Operation	PHHPTOC1	Out of Service	
PHHPTOC: 1	Start value	PHHPTOC1	Current Setting	
PHHPTOC: 1	Time multiplier	PHHPTOC1	Time Dial	see 1)
PHHPTOC: 1	Operating curve type	PHHPTOC1	Characteristic	see 2)
PHHPTOC: 1	Operate delay time	PHHPTOC1	Time Dial	see 3)
PHHPTOC: 1	Reset delay time	PHHPTOC1	Reset Delay	see 3)
PHHPTOC: 1	Minimum operate time	PHHPTOC1	Min. Time	see 1), 4)
PHHPTOC: 2	Operation	PHHPTOC2	Out of Service	
PHHPTOC: 2	Start value	PHHPTOC2	Current Setting	
PHHPTOC: 2	Time multiplier	PHHPTOC2	Time Dial	see 1)
PHHPTOC: 2	Operating curve type	PHHPTOC2	Characteristic	see 2)
PHHPTOC: 2	Operate delay time	PHHPTOC2	Time Dial	see 3)
PHHPTOC: 2	Reset delay time	PHHPTOC2	Reset Delay	see 3)
PHHPTOC: 2	Minimum operate time	PHHPTOC2	Min. Time	see 1), 4)

Notes:

1) Used only in IDMT mode
2) The model does not support the type of characteristic *"Programmable"*
3) Used only in DT mode
4) Lower bound of the range might be smaller than permitted in the device

Three-phase directional overcurrent protection

Address	Relay Setting	Model Unit	Model Parameter	Note
DPHLPTOC: 1	Operation	DPHLPTOC1	Out of Service	
DPHLPTOC: 1	Directional mode	DPHLPTOC1	Tripping Direction	

Address	Relay Setting	Model Unit	Model Parameter	Note
DPHLPTOC: 1	Start value	DPHLPTOC1	Current Setting	
DPHLPTOC: 1	Characteristic angle	Dir DPHLPDOC1	Max. Torque Angle	
DPHLPTOC: 1	Time multiplier	DPHLPTOC1	Time Dial	see 1)
DPHLPTOC: 1	Operating curve type	DPHLPTOC1	Characteristic	see 2)
DPHLPTOC: 1	Operate delay time	DPHLPTOC1	Time Dial	see 3)
DPHLPTOC: 1	Min operate current	Dir DPHLPDOC1	Operating Current	
DPHLPTOC: 1	Min operate voltage	Dir DPHLPDOC1	Polarising Voltage	
DPHLPTOC: 1	Reset delay time	DPHLPTOC1	Reset Delay	see 3)
DPHLPTOC: 1	Minimum operate time	DPHLPTOC1	Min. Time	see 1), 4)
DPHLPTOC: 2	Operation	DPHLPTOC2	Out of Service	
DPHLPTOC: 2	Directional mode	DPHLPTOC2	Tripping Direction	
DPHLPTOC: 2	Start value	DPHLPTOC2	Current Setting	
DPHLPTOC: 2	Characteristic angle	Dir DPHLPDOC2	Max. Torque Angle	
DPHLPTOC: 2	Time multiplier	DPHLPTOC2	Time Dial	see 1)
DPHLPTOC: 2	Operating curve type	DPHLPTOC2	Characteristic	see 2)
DPHLPTOC: 2	Operate delay time	DPHLPTOC2	Time Dial	see 3)
DPHLPTOC: 2	Min operate current	Dir DPHLPDOC2	Operating Current	
DPHLPTOC: 2	Min operate voltage	Dir DPHLPDOC2	Polarising Voltage	
DPHLPTOC: 2	Reset delay time	DPHLPTOC2	Reset Delay	see 3)
DPHLPTOC: 2	Minimum operate time	DPHLPTOC2	Min. Time	see 1), 4)
DPHHPTOC: 1	Operation	DPHHPTOC1	Out of Service	
DPHHPTOC: 1	Directional mode	DPHHPTOC1	Tripping Direction	
DPHHPTOC: 1	Start value	DPHHPTOC1	Current Setting	
DPHHPTOC: 1	Characteristic angle	Dir DPHHPDOC1	Max. Torque Angle	
DPHHPTOC: 1	Time multiplier	DPHHPTOC1	Time Dial	see 1)
DPHHPTOC: 1	Operating curve type	DPHHPTOC1	Characteristic	see 2)
DPHHPTOC: 1	Operate delay time	DPHHPTOC1	Time Dial	see 3)
DPHHPTOC: 1	Min operate current	Dir DPHHPDOC1	Operating Current	
DPHHPTOC: 1	Min operate voltage	Dir DPHHPDOC1	Polarising Voltage	
DPHHPTOC: 1	Reset delay time	DPHHPTOC1	Reset Delay	see 3)
DPHHPTOC: 1	Minimum operate time	DPHHPTOC1	Min. Time	see 1), 4)

Notes:

1) Used only in IDMT mode
2) The model does not support the type of characteristic *"Programmable"*
3) Used only in DT mode
4) Lower bound of the range might be smaller than permitted in the device

5 Earth-fault

The *"Eart-fault"* sub-function models non-directional and directional earth-fault protection. The response time characteristics of the protection can be selected equal to a definite time (DT) or inverse definite minimum time (IDMT). Only the *"Phase angle"* operation method and *"Zero seq. volt."* polarizing quantity used to determine fault direction.

Non-directional earth-fault protection

Address	Relay Setting	Model Unit	Model Parameter	Note
EFLPTOC: 1	Operation	EFLPTOC1	Out of Service	
EFLPTOC: 1	Start value	EFLPTOC1	Current Setting	
EFLPTOC: 1	Time multiplier	EFLPTOC1	Time Dial	see 1)
EFLPTOC: 1	Operating curve type	EFLPTOC1	Characteristic	see 2)
EFLPTOC: 1	Operate delay time	EFLPTOC1	Time Dial	see 3)
EFLPTOC: 1	Reset delay time	EFLPTOC1	Reset Delay	see 3)
EFLPTOC: 1	Minimum operate time	EFLPTOC1	Min. Time	see 1), 4)
EFHPTOC: 1	Operation	EFHPTOC1	Out of Service	
EFHPTOC: 1	Start value	EFHPTOC1	Current Setting	
EFHPTOC: 1	Time multiplier	EFHPTOC1	Time Dial	see 1)
EFHPTOC: 1	Operating curve type	EFHPTOC1	Characteristic	see 2)
EFHPTOC: 1	Operate delay time	EFHPTOC1	Time Dial	see 3)
EFHPTOC: 1	Reset delay time	EFHPTOC1	Reset Delay	see 3)
EFHPTOC: 1	Minimum operate time	EFHPTOC1	Min. Time	see 1), 4)

Notes:

1) Used only in IDMT mode
2) The model does not support the type of characteristic *"Programmable"*
3) Used only in DT mode
4) Lower bound of the range might be smaller than permitted in the device

Directional earth-fault protection

Address	Relay Setting	Model Unit	Model Parameter	Note
DEFLPDEF: 1	Operation	DEFLPDEF1	Out of Service	
DEFLPDEF: 1	Enable voltage limit	V_lim DEFLPDEF1	Out of Service	
DEFLPDEF: 1	Directional mode	DEFLPDEF1	Tripping Direction	
DEFLPDEF: 1	Start value	DEFLPDEF1	Current Setting	
DEFLPDEF: 1	Voltage start value	V_lim DEFLPDEF1	Pickup Voltage	
DEFLPDEF: 1	Characteristic angle	Dir DEFLPDEF1	Max. Torque Angle	
DEFLPDEF: 1	Time multiplier	DEFLPDEF1	Time Dial	see 1)
DEFLPDEF: 1	Operating curve type	DEFLPDEF1	Characteristic	see 2)
DEFLPDEF: 1	Operate delay time	DEFLPDEF1	Time Dial	see 3)

Address	Relay Setting	Model Unit	Model Parameter	Note
DEFLPDEF: 1	Min operate current	Dir DEFLPDEF1	Operating Current	
DEFLPDEF: 1	Min operate voltage	Dir DEFLPDEF1	Polarising Voltage	
DEFLPDEF: 1	Reset delay time	DEFLPDEF1	Reset Delay	see 3)
DEFLPDEF: 1	Minimum operate time	DEFLPDEF1	Min. Time	see 1), 4)
DEFLPDEF: 2	Operation	DEFLPDEF2	Out of Service	
DEFLPDEF: 2	Enable voltage limit	V_lim DEFLPDEF2	Out of Service	
DEFLPDEF: 2	Directional mode	DEFLPDEF2	Tripping Direction	
DEFLPDEF: 2	Start value	DEFLPDEF2	Current Setting	
DEFLPDEF: 2	Voltage start value	V_lim DEFLPDEF2	Pickup Voltage	
DEFLPDEF: 2	Characteristic angle	Dir DEFLPDEF2	Max. Torque Angle	
DEFLPDEF: 2	Time multiplier	DEFLPDEF2	Time Dial	see 1)
DEFLPDEF: 2	Operating curve type	DEFLPDEF2	Characteristic	see 2)
DEFLPDEF: 2	Operate delay time	DEFLPDEF2	Time Dial	see 3)
DEFLPDEF: 2	Min operate current	Dir DEFLPDEF2	Operating Current	
DEFLPDEF: 2	Min operate voltage	Dir DEFLPDEF2	Polarising Voltage	
DEFLPDEF: 2	Reset delay time	DEFLPDEF2	Reset Delay	see 3)
DEFLPDEF: 2	Minimum operate time	DEFLPDEF2	Min. Time	see 1), 4)
DEFHPDEF: 1	Operation	DEFHPDEF1	Out of Service	
DEFHPDEF: 1	Enable voltage limit	V_lim DEFHPDEF1	Out of Service	
DEFHPDEF: 1	Directional mode	DEFHPDEF1	Tripping Direction	
DEFHPDEF: 1	Start value	DEFHPDEF1	Current Setting	
DEFHPDEF: 1	Voltage start value	V_lim DEFHPDEF1	Pickup Voltage	
DEFHPDEF: 1	Characteristic angle	Dir DEFHPDEF1	Max. Torque Angle	
DEFHPDEF: 1	Time multiplier	DEFHPDEF1	Time Dial	see 1)
DEFHPDEF: 1	Operating curve type	DEFHPDEF1	Characteristic	see 2)
DEFHPDEF: 1	Operate delay time	DEFHPDEF1	Time Dial	see 3)
DEFHPDEF: 1	Min operate current	Dir DPHHPDOC1	Operating Current	
DEFHPDEF: 1	Min operate voltage	Dir DPHHPDOC1	Polarising Voltage	
DEFHPDEF: 1	Reset delay time	DPHHPTOC1	Reset Delay	see 3)
DEFHPDEF: 1	Minimum operate time	DPHHPTOC1	Min. Time	see 1), 4)

Notes:

1) Used only in IDMT mode
2) The model does not support the type of characteristic *"Programmable"*
3) Used only in DT mode
4) Lower bound of the range might be smaller than permitted in the device

6 Unbalance

The *"Unbalance"* sub-function models negative-sequence overcurrent protection used to increase sensitivity for detecting single-phase and interphase faults or unbalanced loads. The response time characteristics of the protection can be selected equal to a definite time (DT) or inverse definite minimum time (IDMT).

Address	Relay Setting	Model Unit	Model Parameter	Note
NSPTOC: 1	Operation	NSPTOC1	Out of Service	
NSPTOC: 1	Start value	NSPTOC1	Current Setting	
NSPTOC: 1	Time multiplier	NSPTOC1	Time Dial	see 1)
NSPTOC: 1	Operating curve type	NSPTOC1	Characteristic	see 2)
NSPTOC: 1	Operate delay time	NSPTOC1	Time Dial	see 3)
NSPTOC: 1	Minimum operate time	NSPTOC1	Min. Time	see 1), 4)
NSPTOC: 1	Reset delay time	NSPTOC1	Reset Delay	see 3)
NSPTOC: 2	Operation	NSPTOC2	Out of Service	
NSPTOC: 2	Start value	NSPTOC2	Current Setting	
NSPTOC: 2	Time multiplier	NSPTOC2	Time Dial	see 1)
NSPTOC: 2	Operating curve type	NSPTOC2	Characteristic	see 2)
NSPTOC: 2	Operate delay time	NSPTOC2	Time Dial	see 3)
NSPTOC: 2	Minimum operate time	NSPTOC2	Min. Time	see 1), 4)
NSPTOC: 2	Reset delay time	NSPTOC2	Reset Delay	see 3)

Notes:

1) Used only in IDMT mode
2) The model does not support the type of characteristic *"Programmable"*
3) Used only in DT mode
4) Lower bound of the range might be smaller than permitted in the device

7 Available Mapping Files

Hardware Version	Firmware Version	Language	Multiple Setting Groups	Model
1.3	1.3	en		REF 630 Pre-Configuration A
				REF 630 Pre-Configuration B

8 References

[1] ABB Distribution Solutions Distribution Automation, P.O. Box 699 FI-65101 VAASA. *630 series Technical Manual*. 1MRS756508 F.

[2] ABB Distribution Solutions Distribution Automation, P.O. Box 699 FI-65101 VAASA. *Feeder Protection and Control REF630 Product Guide*. 1MRS756976 H.