

7SR242 Duobias

Multi-Function 2-Winding Transformer Protection Relay

Document Release History

This document is issue **2010/02**. The list of revisions up to and including this issue is:

2010/02	Document reformat due to rebrand

Software Revision History

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Example Test Sheet

7SR24

CUSTOMER
CUSTOMER CONTRACT NUMBER
SIEMENS CONTRACT NUMBER

SITE
CIRCUIT
PANEL
DIAGRAM NUMBER

RELAY TYPE
RELAY SERIAL NUMBER
RELAY ARTICLE NUMBER

DATE

Signatures:
Test Engineer

Customers Representative

.....

.....

1 Inspection

Check relay article number and voltage rating.

Remove any packing material and inspect relay for transit damage

Check relay corresponds to relevant general arrangement.

Check the case earthing connection is used to connect the relay to the panel earth.

Check connections against schematic/wiring diagrams

CONFIRM.....

2 Applying Settings

The relay technical manual lists all settings available within the relay. Relevant settings should be applied before any secondary testing is carried out. Where relevant settings are not available then the relay default settings can be used for pre-commissioning tests.

Settings can be applied using the keypad on the relay fascia, or can be downloaded from Reydisp Evolution software where a PC and suitable data comms connections are available.

CONFIRM.....

It is recommended that the relay time and date are set before testing commences.

CONFIRM.....

Relays have eight alternative settings groups. For applications where more than one group is used testing should be carried out for each configuration.

3 LEDs & LCD

1. Press **CANCEL** a number of times to so that the relay displays the default screen. Now press **TEST/RESET** so that an LED test is initiated. All of the LED's should operate momentarily and the LCD will display 'LED TEST – FLAGS RESET'. The 'Trip' led should be red, the 'Pick-up' led and all 8 or 16 programmable leds should be amber.
2. View the LCD from a point directly in front of the relay. If the LCD is too faint or too dark then adjust the contrast by adjusting the small adjustment screw at the top of the relay fascia.

CONFIRM.....

4 Energising Quantities

	Applied Current								Applied Voltage
	W1-I _A	W1-I _B	W1-I _C	I _{G1}	W2-I _A	W2-I _B	W2-I _C	I _{G2}	V ₁ (V _X)
Secondary									
Primary									

Apply 3P balanced Current and Voltage at nominal levels and ensure that the measured ZPS and NPS quantities are approximately zero.

	ZPS	NPS
Current		

5 Binary Inputs

BI	Tested	DO Delay	Measured	PU Delay	Measured	Notes (method of initiation)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						

6 Binary Output Contacts

BO	Checked	Notes (method of test)
1NC		
2NO		
2NC		
3NO		
3NC		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

Note : If Protection Healthy output is used to test the output relays, after testing the output relays is complete make sure that the 'Prot Healthy' is re-assigned to the correct output relay given in the settings file and that all other relays have been de-selected from this option.

7 Case Shorting Contacts

CT Shorting contacts checked	
Relay Withdrawn Alarm Checked (C25-C26)	

8 Protection Functions

8.1 Biased Differential 87BD/87HS

8.1.1 Results for testing 87BD with a Variac

87BD INITIAL SETTING	87BD 1 ST BIAS SLOPE SETTING	RESTRAIN CURRENT MEASURED ON AMMETER A1 (xIn)				
		0.00	1.00	1.50	2.00	2.50
		Operate Current Measured on Ammeter A2 (xIn)				
Selected Settings		Test Results				
		0.00	1.00	1.50	2.00	2.50
Phase A Pickup						
Phase B Pickup						
Phase C Pickup						

8.1.2 Results for testing 87BD with 2 current sources

87BD INITIAL SETTING	87BD 1 ST BIAS SLOPE SETTING	W1 CURRENT (xIn)				
		0.00	1.00	1.50	2.00	2.50
		W2 Current(xIn)				
Selected Settings		Test Results				
		0.00	1.00	1.50	2.00	2.50
Phase A Pickup						
Phase B Pickup						
Phase C Pickup						

8.1.3 Differential Highset 87HS

Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
I _A					
I _B					
I _C					

8.2 Phase Overcurrent

8.2.1 Inverse Time Overcurrent 51

8.2.1.1 51-1

P.U. D.O. & TIMING	Phase	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
	A									
	B									

TESTS	C									
--------------	----------	--	--	--	--	--	--	--	--	--

8.2.1.2 51-2

P.U. D.O. & TIMING TESTS	Phase	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
	A									
	B									
	C									

8.2.2 Definite Time overcurrent 50

8.2.2.1 50-1

Phase	W1/ W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
A						
B						
C						

8.2.2.2 50-2

Phase	W1/ W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
A						
B						
C						

8.2.3 Element Blocking

Element	BI Inhibits	Inrush Detector
51-1		
51-2		
50-1		
50-2		

8.2.4 ANSI Reset

Operate time (expected)	Reset time (calculated)	Operate time (measured)	50% Reset Time (calculated)	50% operate time (calculated)	50% operate time (measured)
		First test (c)			Second Test (c)

8.3 Derived Earth Fault

8.3.1 51N-1

P.U. D.O. & TIMING TESTS	Ph.	W1/ W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.3.2 51N-2

P.U. D.O. & TIMING TESTS	Ph.	W1/ W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.3.3 50N-1

Phase	W1/ W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
E						

8.3.4 50N-2

Phase	W1/ W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
E						

8.3.5 Element Blocking

Element	BI Inhibits	Inrush Detector
51N-1		
51N-2		
50N-1		
50N-2		

8.3.6 ANSI Reset

Operate time (expected)	Reset time (calculated)	Operate time (measured)	50% Reset Time (calculated)	50% operate time (calculated)	50% operate time (measured)
		First test (c)			Second Test (c)

8.4 Measured Earth Fault

8.4.1 51G-1

P.U. D.O. & TIMING TESTS	Ph.	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.4.2 51G-2

P.U. D.O. & TIMING TESTS	Ph.	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.4.3 51G-3

P.U. D.O. & TIMING TESTS	Ph.	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.4.4 51G-4

P.U. D.O. & TIMING TESTS	Ph.	W1/W2	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
						P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
E										

8.4.5 50G-1

Phase	W1/W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
E						

8.4.6 50G-2

Phase	W1/W2	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
E						

8.4.7 Element Blocking

Element	BI Inhibits	Inrush Detector
51G-1		
51G-2		
51G-3		
51G-4		
50G-1		

50G-2		
50G-3		
50G-4		

8.4.8 ANSI Reset

Operate time (expected)	Reset time (calculated)	Operate time (measured)	50% Reset Time (calculated)	50% operate time (calculated)	50% operate time (measured)
		First test (c)			Second Test (c)

8.5 REF

Element/Input	Settings Data: Series Stabilising Resistor Value	Measured
64H-1/I _{G1}		
64H-2/I _{G2}		

Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
64H-1/I _{G1}					
64H-2/I _{G2}					

Element/Input	Settings Data: Voltage Setting	Measured
64H-1/I _{G1}		
64H-2/I _{G2}		

8.5.1 Element Blocking

Element	BI Inhibits
64H-1	
64H-2	

8.6 46BC Open Circuit

46BC Setting	3P balanced current (A)	1P unbalance current (A)	Measured Unbalance current
46BC-1			
46BC-2			

46BC Delay setting	Measured
46BC-1	
46BC-2	

8.6.1 46BC Element Blocking

Element	BI Inhibits	U/I Guard	NOTES
46BC-1			
46BC-2			

8.7 Negative Phase Sequence Overcurrent

8.7.1 46IT-1

W1/W2	Ph.	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
					P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
	NPS								

8.7.2 46IT-2

W1/W2	Ph.	Char. (NI EI VI LTI, DTL)	Is (A)	T.M.	Operate Current		Operate Time		NOTES
					P.U. (Amps)	D.O. (Amps)	2 x Is (sec)	5 x Is (sec)	
	NPS								

8.7.3 46DT-1

W1/W2	Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
	NPS					

8.7.4 46DT-2

W1/W2	Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 2 x Is	NOTES
	NPS					

8.7.5 ANSI Reset

Element	Operate time (expected)	Reset time (calculated)	Operate time (measured)	50% Reset Time (calculated)	50% operate time (calculated)	50% operate time (measured)
46IT-1			First test (c)			Second Test (c)
46IT-2			First test (c)			Second Test (c)

8.7.6 Element Blocking

Element	BI Inhibits
46IT-1	
46IT-2	
46DT-1	
46DT-2	

8.8 Undercurrent (37, 37G)

8.8.1 37

Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 0.5 x Is	NOTES
Wn-I _{L1} (I _A)					
Wn-I _{L2} (I _B)					
Wn-I _{L3} (I _C)					
Wn-I _{L1} (I _A)					
Wn-I _{L2} (I _B)					
Wn-I _{L3} (I _C)					

8.8.2 37 Element Blocking

Element	BI Inhibits	U/I Guard	NOTES
37-1			
37-2			

8.8.3 37G

Phase	Is (Amps)	DTL (sec)	P.U. Current Amps	Operate Time 0.5 x Is	NOTES
I _G					
I _G					

8.8.4 37G Element Blocking

Element	BI Inhibits	U/I Guard	NOTES
37G-1			
37G-2			

8.9 Thermal Overload (49)

W1/W2	Calculated Operate Time (s)	Measured Operate Time (s)

Capacity Alarm Setting	Measured

8.9.1 Element Blocking

Element	BI Inhibits
49	

8.10 Phase Under/Over Voltage (27/59)

8.10.1 Operation

Phase	27/59 setting (Volts)	U/O	DTL (sec)	Hyst.	D.O. (calculated)	P.U. Volts	D.O Volts	Op. Time 2x Vs (OV) 0.5x Vs (UV)	UV Guard	NOTES
27/59-1										
27/59-2										
27/59-3										
27/59-4										

8.10.2 Element Blocking

Element	BI Inhibits
27/59-1	
27/59-2	
27/59-3	

27/59-4

8.11 UV Guard

Phase	Vs (Volts)	V element Used for test	Blocked Volts	NOTES
UVG				

8.12 Neutral Overvoltage

8.12.1 Definite Time 59NDT

Phase	Vs (Volts)	DTL (sec)	P.U. Current Volts	Operate Time 2 x Vs	NOTES
E					

8.12.2 Inverse Time 59NIT

P.U. D.O. & TIMING TESTS	Ph.	Vs (V)	TM	Operate Voltage		Operate Time		NOTES
				P.U. (Volts)	D.O. (Volts)	2 x Vs (sec)	x Vs (sec)	
	E							

8.12.3 Element Blocking

Element	BI Inhibits
59NIT	
59NDT	

8.13 U/O Frequency

8.13.1 81-1

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.2 81-2

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.3 81-3

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.4 81-4

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.5 81-5

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.6 81-6

F (Hertz)	U/O	DTL (sec)	D.O. (calculated)	P.U. Freq Hertz	D.O. Freq. Hertz	Operate Time +/- 0.5Hz	UV Guard	NOTES

8.13.7 Undervoltage Guard

UVG	UVG Setting (Volts)	Freq element Used for test	Blocked Volts (D.O.)	Unblocked Volts (P.U.)	NOTES
U/O Freq					

8.13.8 Element Blocking

Element	BI Inhibits
81-1	
81-2	
81-3	
81-4	
81-5	
81-6	

9 Supervision Functions

9.1 CB Fail

Setting (xIn)	Test Current	50BF-1 Delay.....	50BF-2 Delay.....
50BF-1	(110%).....		
	(90%).....	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>
	50BF CB Faulty	Operation No Delay <input type="checkbox"/>	Operation No Delay <input type="checkbox"/>
50BF-1-I4	(110%).....		
	(90%).....	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>
	50BF CB Faulty	Operation No Delay <input type="checkbox"/>	Operation No Delay <input type="checkbox"/>
50BF-2	(110%).....		
	(90%).....	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>
	50BF CB Faulty	Operation No Delay <input type="checkbox"/>	Operation No Delay <input type="checkbox"/>
50BF-2-I4	(110%).....		
	(90%).....	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>
	50BF CB Faulty	Operation No Delay <input type="checkbox"/>	Operation No Delay <input type="checkbox"/>

Mech Trip		50BF-1 Delay.....	50BF-2 Delay.....
50BF-1	CB Closed		
	CB Open	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>
50BF-2	CB Closed		
	CB Open	No Operation <input type="checkbox"/>	No Operation <input type="checkbox"/>

9.1.1 Element Blocking

Element	BI Inhibits
50BF-1	
50BF-2	

9.2 Trip/Close Circuit Supervision

Element	TCS-n Delay setting	Measured
TCS-1		
TCS-2		
TCS-3		
TCS-4		
TCS-5		
TCS-6		

Element	TCS-n Delay setting	Measured
CCS-1		
CCS-2		
CCS-3		
CCS-4		
CCS-5		
CCS-6		

9.3 Inrush Detector

Operation tested	
% level.....%	

9.4 Overfluxing Detector

Operation tested	
% level.....%	

10 Control & Logic

Operation tested	
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