



SIPROTEC Compact Application Note

Constant Drop-Off for Sensitive EFP

SIP Compact-APN-001, Edition 1

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Constant Drop-Off for Sensitive EFP SIPROTEC Compact Application Note

SIPROTEC Compact – Application Note Constant Drop-Off for Sensitive Earth Fault Protection SIP Compact-APN-001, Edition 1

Content

1	Constant Drop-Off for Sensitive Earth Fault Prot.	3
1.1	Introduction	3
1.2	Application Note	3

1 Constant Drop-Off for Sensitive Earth Fault Prot.

1.1 Introduction

Some customers request a constant drop-off of 95% even for the sensitive earth fault element. The 7SJ80 relay manual specifies an operating time tolerance of 7% for the sensitive earth fault protection with user-defined characteristic.

By the following application using the pickup of the sensitive earth fault protection, a timer of the Flexible Functions and some CFC logic, a constant drop-off ratio of 95% can be achieved even for currents below 300 mA.

1.2 Application Note

First you have to enable the function "131 (sensitive) Earth fault" with "User Defined Pickup Curve" in the "Device Configuration" menu in DIGSI as given in the following screen shot

No.	Function	Scope			
0103	Setting Group Change Option	Disabled			
0104	Oscillographic Fault Records	Enabled			
0112	DMT / IDMT Phase	Disabled			
0113	DMT / IDMT Earth	Disabled			
0117	Cold Load Pickup	Disabled			
0122	2nd Harmonic Inrush Restraint	Disabled			
0131	(sensitive) Earth fault	User Defined Pickup Curve			
0140	Unbalance Load (Negative Sequence)	Disabled			
0142	Thermal Overload Protection	Disabled			
0170	Breaker Failure Protection	Disabled			
0172	Circuit Breaker Wear Monitoring	Disabled			
0182	Trip Circuit Supervision	Disabled			
0617	Port B usage	IEC 60870-5-103			
	Flexible Function 1 20	Please select			
Flexible Function 1 20 Please select					
About					

SIPROTEC Compact Application Note

In "Setting Group-A", enable "3101 (Sensitive) Earth Fault" and keep the earth fault pickup setting "3119 IEEp Pickup" and the time delay "3120 T IEEp Time Dial"

(Sensitive)	arth Fault - Settings Group A		X					
General	DMT IDMT IEEp User Def.							
Settings:								
No.	Settings	Value						
3101	(Sensitive) Earth Fault		ON 🔽					
3121A	Dropout Time Delay DMT		0.00 sec					
✓ Displ	✓ Display additional settings							
			About					
ОК	Apply DIGSI -> Device	Cancel	Help					

(Sen:	sitive) I	Earth Fault - Settings Group A	×								
Ge	General DMT IDMT IEEp User Def.										
s	Settings:										
ΙΓ	No.	Settings	Value								
	3119	IEEp Pickup	0.05 A								
	3120	T IEEp Time Dial	1.00 sec								

Group:	А	V	/alue 1	Value 2	Ŀ
oreap.		1.00 Mult	tiple of Pickup	1.00 Time Dial	
Settings:	Multiples of PU Time-Dial	oo Mul	tiple of Pickup	1.00 Time Dial	
Number:	. 3131	oo Mul	tiple of Pickup	1.00 Time Dial	
	0.01	oo Mul	tiple of Pickup	1.00 Time Dial	
		oo Mult	tiple of Pickup	1.00 Time Dial	
		oo Mul	tiple of Pickup	1.00 Time Dial	L
Minimum1:	1.00	oo Mul	tiple of Pickup	1.00 Time Dial	
Maximum 1:	20.00	oo Mult	tiple of Pickup	1.00 Time Dial	
		oo Mult	tiple of Pickup	1.00 Time Dial	
Minimum2:	0.01	oo Mult	tiple of Pickup	1.00 Time Dial	
Maximum2	999.00	oo Mul	tiple of Pickup	1.00 Time Dial	
		oo Mult	tiple of Pickup	1.00 Time Dial	1
		Import	Export	Characteristic	2
				Abo	#

Then also define the 1st pair of user defined curve as shown below.

Note: The operating time tolerance with this user defined curve is 7% or 70msec,

Excerpt from 7SJ80 device manual:

Operating time tolerance in linear range	7 % of reference (calculated) value for $2 \le I/I_{51Ns} \le 20 + 2$ %
	current tolerance, or 70 ms

If this time tolerance is not suitable for your application, you can enable "Flexible Function-01" and make a simple CFC logic to reduce the time tolerance,

→ In this case don't define the values in the user defined curve and keep the setting as oo (infinite)

SIPROTEC Compact Application Note

Group:	A		/alue 1	Value 2	1
		oo Mut	tiple of Pickup	1.00 Time Dial	
Settings:	Multiples of PU Time-Dial	oo Mur	tiple of Pickup	1.00 Time Dial	
Number:	3131	00 Mur	tiple of Pickup	1.00 Time Dial	Ξ
		00 Mur	tiple of Pickup	1.00 Time Dial	
		00 Mur	tiple of Pickup	1.00 Time Dial	
Minimum 1 ·	1.00	00 Mul	tiple of Pickup	1.00 Time Dial	-
Maximum 1	20.00	00 Mut	tiple of Pickup	1.00 Time Dial	
Maximum I.	20.00	oo Mut	tiple of Pickup	1.00 Time Dial	
		oo Mut	tiple of Pickup	1.00 Time Dial	
Minimum2:	0.01	oo Mut	tiple of Pickup	1.00 Time Dial	
Maximum2	999.00	too Mut	tiple of Pickup	1.00 Time Dial	Ŧ
		Import	Export	Characteristic	;

Afterwards enable "Flexible Function 01" under "Device Configuration" menu in DIGSI menu as shown below

No.	Function	Scope	
0103	Setting Group Change Option	Disabled	
0104	Oscillographic Fault Records	Enabled	
0112	DMT / IDMT Phase	Disabled	
0113	DMT / IDMT Earth	Disabled	
0117	Cold Load Pickup	Disabled	
0122	2nd Harmonic Inrush Restraint	Disabled	
0131	(sensitive) Earth fault	User Defined Pickup Curve	
0140	Unbalance Load (Negative Sequence)	Disabled	
0142	Thermal Overload Protection	Disabled	
0170	Breaker Failure Protection	Disabled	
0172	Circuit Breaker Wear Monitoring	Disabled	
0182	Trip Circuit Supervision	Disabled	
0617	Port B usage	IEC 60870-5-103	
	Flexible Function 1 20	Please select	-
		Flexible Function 01	-
		Flexible Function 02	
		Flexible Function 04	
		Flexible Function 05	
		Flexible Function 06	
		Flexible Function 07	-

Under "Additional Function", switch the "Flexible Function 01" on and select the mode as "Without Phase Reference".

SIPROTEC Compact Application Note

Fle	kible Fur	nction 01	×								
0	General Meas. Quantity Meas. Method Settings										
	Settings:										
	No.	Settings	Value								
		Flexible Function	ON								
		Mode of Operation	Without Phase Reference								

Then configure the following parameters:

Fle	exible Fur	action 01	X	ļ	
	General	Meas. Quantity Meas. Method Settings			
Settings:					
	No.	Settings	Value		
		Selection of Measured Quantity	Binray Input		

Fle	Flexible Function 01										
(General Meas. Quantity Meas. Method Settings										
	Settings:										
	No.	Settings	Value								
		Pickup with	Exceeding the Threshold								

After that set the time delay for the earth fault as required by the customer.

Fle	xible Fur	action 01		×
	General	Meas. Quantity Meas. Method Settings		
	Settings:			
	No.	Settings	Value	
		Trip Time Delay		1.00 sec
		Pickup Time Delay		0.00 sec
		Dropout Time Delay		0.00 sec

SIPROTEC Compact Application Note

In the next step open the "IO Matrix" and mask the Sensitive earth fault signal "1227 IEEp Pickup" to "Destination CFC".

	Information				Source					rce Destination																
	Number	Number Display text Long text Typ				BI	F	S	С	BO				LEDs						E	Buffe	r	S	C	СМ	
					1	2 3	1			1	2 3	3 4	5	1	2	3	4	5 6	6 7	8	0	S	T			
Device								×	×												×			×	×	×
P.System Data 1																					×			×		
Osc. Fault Rec.									×												×			×	×	
P.System Data 2											×	×	×	×	×						×		×	×	×	
Measurem.Superv																					×			×		
	01202	>BLOCK IEE>>	>BLOCK IEE>>	SP																	10			X		
	01204	>BLOCK IEEp	>BLOCK IEEp	SP																	10			X		
	01207	>BLK Sens.Earth	>BLOCK Sensitive Earth fault protection	SP																	10			X		
	01211	Sens. Earth OFF	Sensitive Earth fault protection is OFF	OUT													via	sĸ	не	re	10			X		
Sens. E Fault	01212	Sens. Earth ACT	Sensitive Earth fault prot. is ACTIVE	OUT															-		10			X		
	01221	IEE>> Pickup	IEE>> Pickup	OUT																	-		10	X		
	01223	IEE>> TRIP	IEE>> TRIP	OUT								U	U				L							X		_
	01227	IEEp Pickup	IEEp picked up	OUT																			10	X	X.	
	01229	IEEp TRIP	IEEp TRIP	OUT																				XI		
	01230	Sens. E BLOCKED	Sensitive Earth fault detection BLOCKED	OUT																	10		10	X		

Afterwards mask the signal "235.2112.01 Flx01 Dir. TRIP" to "Source CFC" as given in the following screen shot.

		Information				Source						Source Destination												
	Number	Display text	Long text	Туре		31	F	S	С		BO						LED	Ds						
					1	2 3	3			1	2	3	4 5	1	2	3	4	5	6	7	8			
Device								×	×															
P.System Data 1																								
Osc. Fault Rec.									×															
P.System Data 2												×	××	×	×									
Measurem.Superv																								
Sens, E Fault													××				×							
Cntrl Authority																								
Control Device						× ×		×																
Process Data																								
Measurement																								
Set Points(MV)																								
Energy																								
Statistics																								
SetPoint(Stat)																								
ThreshSwitch																								
	235.2110.01	>BLOCK Flx01	>BLOCK Function Flx01	SP										мa	\$K	He	re							
	235.2111.01	>Flx01 instant.	>Function Flx01 instantaneous TRIP	SP																				
	235.2112.01	>Flx01 Dir.TRIP	>Function Flx01 Direct TRIP	SP					(X	М														
	235.2113.01	>FIx01 BLK.TDIy	>Function Fix01 BLUCK TRIP Time Delay	SP						1														
	235.2114.01	>FIx01 BLK.TRIP	>Function Flx01 BLOCK TRIP	SP																	_			
FIG 01	235.2118.01	Fix01 BLOCKED	Function FIx01 is BLOCKED	OUT																				
1.1.4.01	235.2119.01	Fix01 OFF	Function FIx01 is switched OFF	OUT																				
	0.000 04.00 04	FLOW A OTHER	E C ELON : LOTINE	LOUIT													(T							

In the second last step you have to insert a CFC chart. In this CFC chart you have to connect the pickup signal of the SEF function to the Flexible Function 01 by means of a "CONNECT" block as shown in the following screen shot.

<u>Note:</u> Do not forget to bring this logic under "Run Sequence from "Measurement Processing" to "Fast PLC" level.

CFC Logic



Finally you have to mask the signal "235.2126.01 Flx01 TRIP" to one binary output, e.g. BO 1 as "Unlatched". Hence you will have the following options for the tripping of the relay:

Output used for Tripping the relay

Number	Display Text	Long Text	Configuration	Remark
00511	Relay Trip	Relay GENERAL TRIP command	Unlatched	Option 1
235.2126.01	FLx01 TRIP	Function Flx01 TRIP	Unlatched	Option 2

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