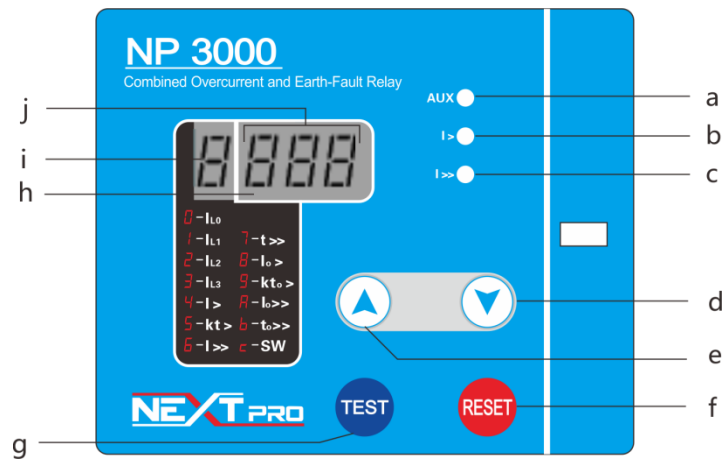


NP3000 Combined Over-current & Earth-Fault Relay (IDMT) User Manual

A BRIEF OVERVIEW



a - Auxiliary power supply indicator

b - Low-set start/trip status indicator

c - High-set start/trip status indicator

d - Down key

e - Up key

f - Reset key

g - Test Key

h - DP LED indicator

i - FUNCTION LED indicator

j - DATA LED indicator

IL n - Earth-fault current

IL 1 - L1 current

IL 2 - L2 current

IL 3 -L3 current

I> - Over-current low-set

kt> - Over-current time multiplier/ time delay

I>> - Over-current high-set

t>> - Over-current high-set delay time

IL0> - Earth-fault low-set

kto> - Earth-fault time multiplier/ time delay

IL0>> - Earth-fault high-set

to>> - Earth-fault high-set delay time

sw - Soft switches

1. General Description

The NP3000 combined over-current and earth-fault relay is a microprocessor based numerical relay. It uses fundamental frequency current measurement for excellent harmonic current rejection. The relay provides three independent phase over-current elements and one non-directional earth-fault element. All these elements are connected to the current transformers of the feeder to be protected.

The over-current and the earth-fault elements consist of independent low-set units and high-set units. The time current characteristic of the low-set units are selectable between inverse definite minimum time (IDMT) normal inverse curve 3/10, normal inverse curve 1.3/10, long time inverse curve, very inverse curve, extremely inverse curve and definite time. The high-set units are the definite time type, instantaneous tripping is made possible by setting the time to minimum.

The NP3000 incorporates a 4-digit LED indicator which allows direct numerical readout of set values, actual measured value, recorded value and system indication. All current measurements and current settings are based on 5A current transformer (CT).

2. Light indication

The indicators display the status of the system as follow;

LED Indicator					Status
Aux	I>	I>>	FUNCTION	DATA	
0	0	0	0	0	No Auxiliary power supply

1	0	0	X	X	Normal condition, no tripping.
1	1	0	X	X	Low-set triggered,time delay countdown started.
1	0	1	X	X	High-set triggered,time delay countdown started.
1	B	0	B	B	Low-set tripped, Function LED indicates tripping source, Data LED shows tripped value.
1	0	B	B	B	High-set tripped,Function LED indicates tripping source Data LED shows tripped value.
1	x	X	B	1	Programming mode

Table1: System state 1= ON 0 = OFF X= don' t care, not blinking B = blinking

Indicator		
FUNCTION	DP	DATA
0	off	Earth-fault current.
1	off	L1 load current.
2	off	L2 load current.
3	off	L3 load current.
0	blink	Previous earth-fault tripped current.
1	blink	Previous L1 tripped current.
2	blink	Previous L2 tripped current.
3	blink	Previous L3 tripped current.
4	off	Over-current low-set current setting.
5	off	Over-current time multiplier/ delay setting.

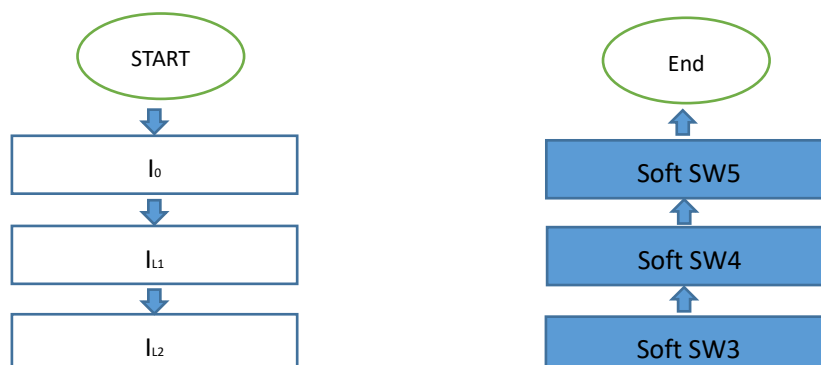
6	off	Over-current high-set current setting.
7	off	Over-current high-set delay time setting.
8	off	Earth-fault low-set current setting.
9	off	Earth-fault time multiplier/ delay setting.
A	off	Earth-fault high-set current setting.
b	off	Earth-fault high-set delay time setting.
c	off	Soft switch setting.

Table 2: Function Codes

Note: Under normal operating condition, The 4-digit display is off. When the RESET key is pressed, the 4-digit display will light up. The display will switch off automatically after 6 minutes if no further key is pressed.

3. Push-buttons Operation

- (1) Trip Test: Press the "TEST" button to simulate a trip condition.
- (2) Trip Reset: Press the "RESET" button to reset the relay when tripped
- (3) View Setting: When the relay is not under tripped condition, pressing the "RESET" button will scroll through the various functions. The sequence of selection is as follow:



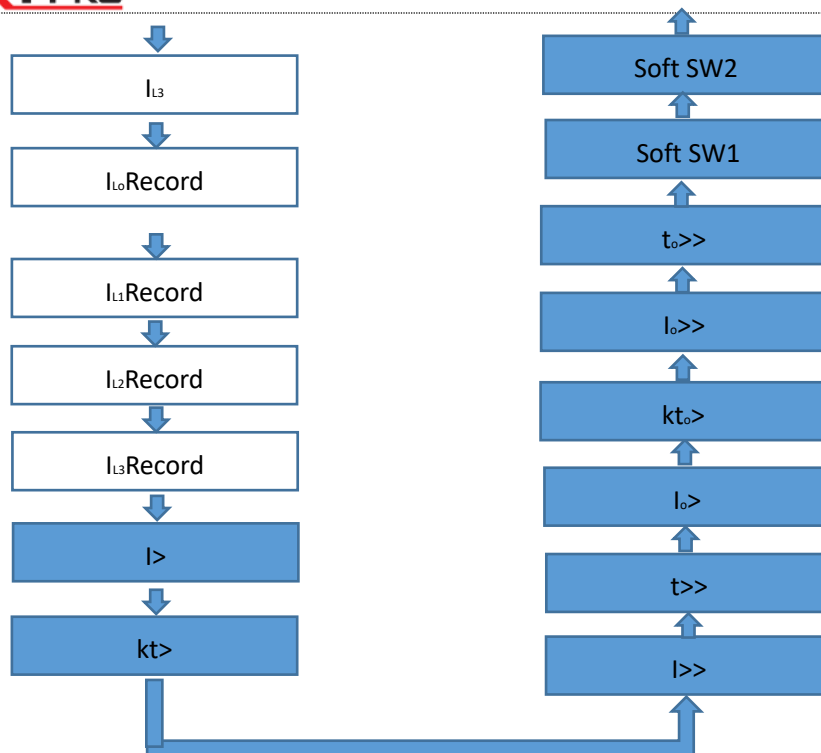


Figure 1: Scroll sequence

(4) Programming Setting: To program the setting for $I_{L>}$, $kt>$, $I_{L>>}$, $t>>$, $I_{L0>}$, $kt0>$, $I_{L0>>}$, $t0>>$, soft SW1, soft SW2, soft SW3, soft SW4, soft SW5.

Step 1: Press "RESET" key until the Function LED shows the required function.

Step 2: Press the "UP" and "DOWN" key simultaneously to enter programming mode. The Function LED blinks to indicates the relay is in programming mode.

Step 3: Use the "UP" or "DOWN" key to select the desired value.

Step 4: To save the selected value, press the "UP" and "DOWN" key simultaneously again.

It will exit the programming mode with the Data LED displaying the newly set value.

To exit programming mode without saving the selected setting, press the "RESET" key once.

Example 1: To set over-current low-set setting from 5A(100%) to 6A(120%)

Procedures	Expected Output	Display
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(i) Press "Reset" key until over-current low-set setting function. i.e. Function 4.	Function LED shows "4". Data LED shows default setting is 5.00A	45.00
(ii) Press "Up" & "Down" keys simultaneously.	Function LED blinks. Relay is in programming mode.	4:5.00
(iii) Press "Up" key to alter the setting until desired value display. i.e. 6.00	Data LED shows set value increasing until it shows "6.00"	4:6.00
(iv) Press "Up" & "Down" keys simultaneously to save new value and exit programming mode.	Function LED stop blinking, DATA LED displays the new setting. i.e. 6.00	46.00

Output Contacts

The NP3000 has two relay outputs (R1 and R2). The output contacts can be programmed as follow:

Soft-switches. When the function LED displays "C", it means that the relay is in the soft-switch setting mode

- i) Linked to Over-Current Trip Signal.
- ii) linked to earth-fault trip signal.
- iii) manual reset or auto reset type.

For auto reset type, the contact remains activated until the fault current is removed.

For manual reset type, the contact remains activated even with the removal of fault current.

This contact can only be reset by pressing the "RESET" key.

4. Soft Switches

The NP3000 incorporates 5 soft switches for system configuration. When the Function LED

shows "c" , the relay is in "soft switch setting" mode.

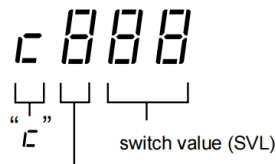


Figure 2: Soft switch indication

Example 2: To change contact R1(linked to over-current & earth-fault) from auto reset to manual reset.

Procedures	Expected Output	Display
(i) Press "Reset" key until soft switch 1 setting function.	Function LED shows "c". Switch number (SW) shows "1" Switch value (SVL) shows "03"	c 103
(ii) Press "Up" & "Down" keys simultaneously.	Function LED blinks. Relay is in programming mode.	:c: 103
(iii) Press "Up" key to alter the setting until desired value display.	Switch value (SVL) changed to "13". (refer table 3 for soft switch configuration)	:c: 113
(iv) Press "Up" & "Down" keys simultaneously to save new value and exit programming mode.	Function LED stop blinking, Switch value(SVL) shows the new setting. i.e. "13"	c 113

Example 3: To change over-current low-set IDMT characteristic from normal inverse 3/10 curve to long time inverse curve.

Procedures	Expected Output	Display
(i) Press "Reset" key until soft switch 4 setting function.	Function LED shows "c". Switch number (SW) shows "4" Switch value (SVL) shows "00"	c 400
(ii) Press "Up" & "Down" keys simultaneously.	Function LED blinks. Relay is in programming mode.	:c: 400
(iii) Press "Up" key to alter the setting until desired value display.	Switch value (SVL) changed to "02". (refer table 3 for soft switch configuration)	:c: 402
(iv) Press "Up" & "Down" keys simultaneously to save new value and exit programming mode.	Function LED stop blinking, Switch value(SVL) shows the new setting. i.e. "02"	c 402

SW	SVL	System configuration
1	01	R1 auto reset type, linked to O/C.
	02	R1 auto reset type, linked to E/F.
	03	R1 auto reset type, linked to O/C & E/F.
	11	R1 manual reset type, linked to O/C.
	12	R1 manual reset type, linked to E/F.
	13	R1 manual reset type, linked to O/C & E/F.
2	01	R2 auto reset type, linked to O/C.
	02	R2 auto reset type, linked to E/F.
	03	R2 auto reset type, linked to O/C & E/F.
	11	R2 manual reset type, linked to O/C.
	12	R2 manual reset type, linked to E/F.
	13	R2 manual reset type, linked to O/C & E/F.
3	00	E/F high-set disabled; O/C high-set disabled.
	01	E/F high-set disabled; O/C high-set enabled.
	10	E/F high-set enabled; O/C high-set disabled.
	11	E/F high-set enabled; O/C high-set enabled.
4	00	O/C Normal Inverse curve 3/10.
	01	O/C Normal Inverse curve 1.3/10.
	02	O/C Long time Inverse curve.

	03	O/C Very Inverse curve.
	04	O/C Extremely Inverse curve.
	05	O/C Definite time.
5	00	E/F Normal Inverse curve 3/10.
	01	E/F Normal Inverse curve 1.3/10.
	02	E/F Long time inverse curve.
	03	E/F Very inverse curve.
	04	E/F Extremely inverse curve.
	05	E/F Definite time.

Table 3: Soft switches setting E/F = Earth-fault; O/C = Over-current; R1 = Relay DO1; R2 = Relay DO2

5. Technical Data

Ratings

Rated current 1n.....5 A

Frequency.....50 Hz

Burden..... < 0.3 VA at 1 n

Auxiliary Supply

Supply voltage.....220~240 VAC

Supply frequency.....50 Hz

VA rating.....3 VA typical

Setting Ranges

(i) Over-current elements

Low-set setting $I_{>}$ 0.10 - 10.0 A (2%-200%)

Low-set time multiplier $k_{t>}$ 0.01 - 1.0

Low-set definite time $t_{>}$ 0.05 - 20 s

High-set setting $I_{>>}$ 0.50 - 100 A (10% - 2000%)

High-set definite time $t_{>>}$ 0.05 - 20 s

(ii) Earth-fault elements

Low-set setting $I_{o>}$ 0.10 - 5.00 A (2% - 100%)

Low-set time multiplier $k_{to>}$ 0.01 - 1.00

Low-set definite time $t_{o>}$ 0.05 - 20 s

High-set setting $I_{o>>}$ 0.10-50.0A(2%~1000%)

High-set definite time $t_{o>>}$ 0.05 - 20 s

Outputs

Trip Contacts(R1&R2):

Rated voltage.....250 VAC

Continuous carry.....5A ($\cos\phi = 1.0$)

Make and carry for 0.2 s.....30A

Expected electrical life..... 10^5 operations

Expected mechanical life..... 5×10^6 operations

Indicators

Auxiliary supply.....Red LED indicator

Pick up.....Red LED indicator

Trip.....Red LED indicator

Mechanical

Mounting.....Panel mounting

Front panel.....Standard DIN 96x96

Approximate weight.....0.46 kg

6. Case Dimension

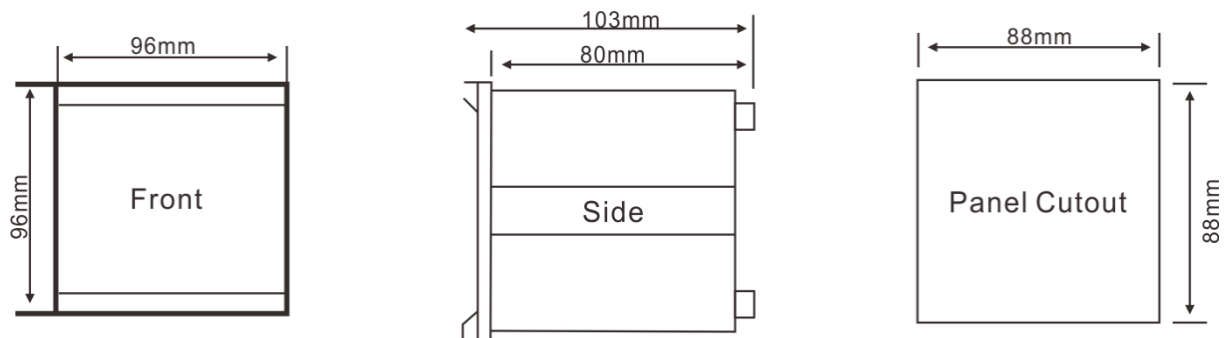


Figure3: Case Dimension

7. Connection Diagram

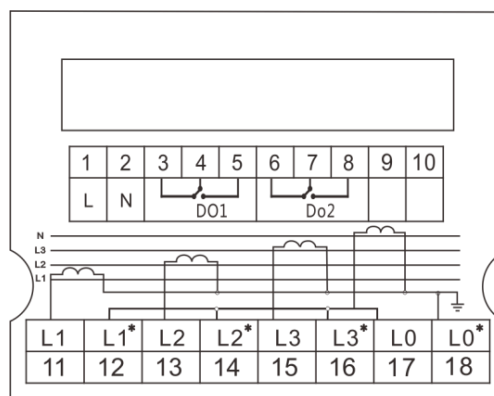
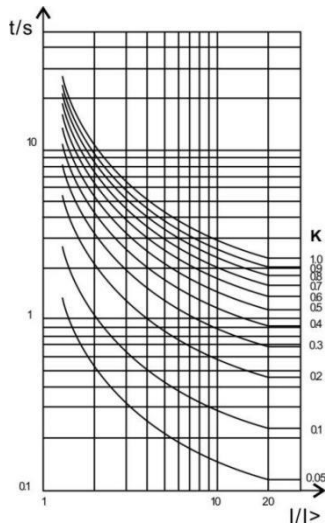


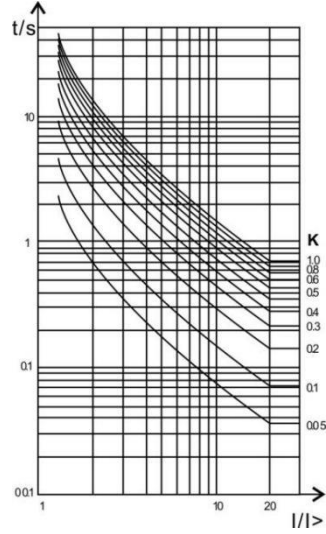
Figure4: Connection Diagram

8. Time-current Characteristic

IDMT Normal Inverse

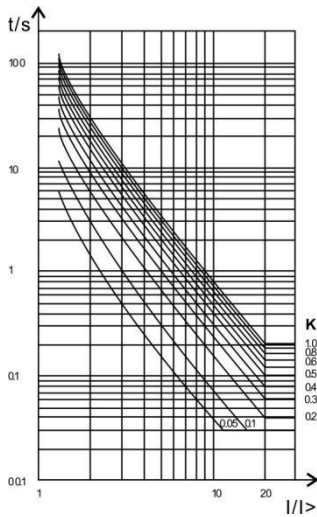


IDMT Very Inverse

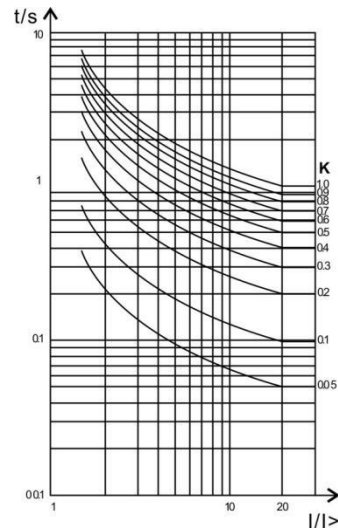


IDMT Extremely

IDMT Inverse 1.3/10



Inverse



IDMT Long Time Inverse

