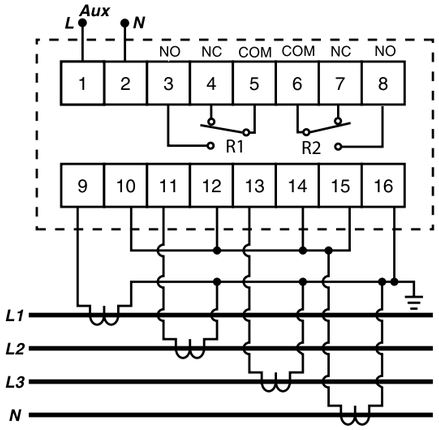
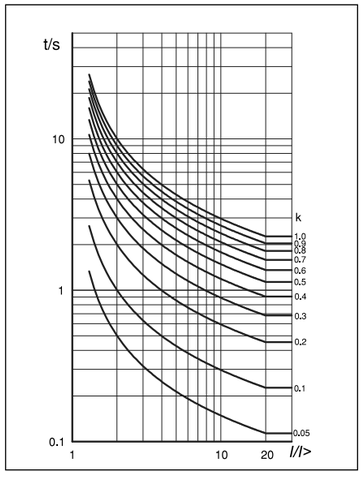
8. Connection Diagram

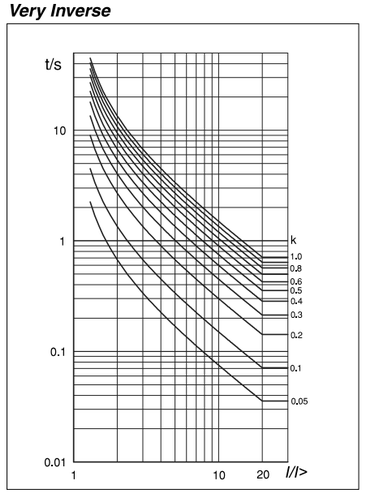


9. Time-current Characteristic

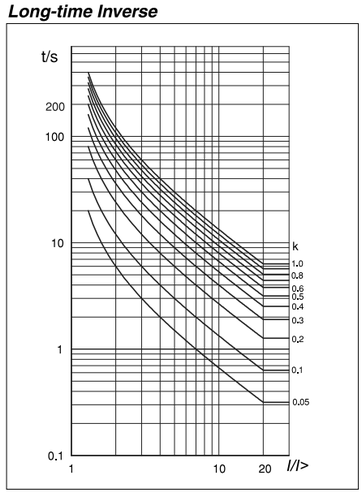
Normal Inverse 3/10



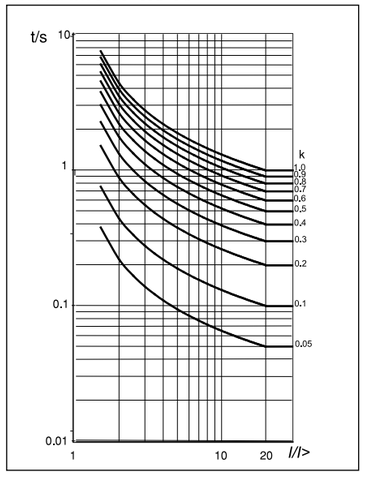
Very Inverse



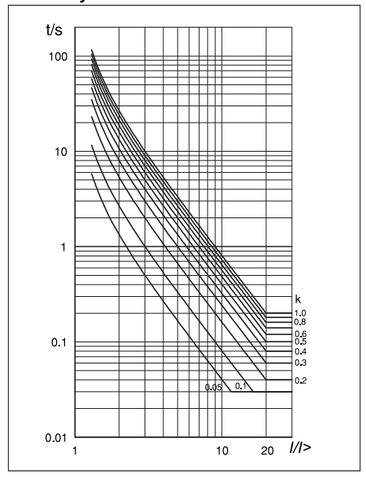
Long-time Inverse



Normal Inverse 1.3/10



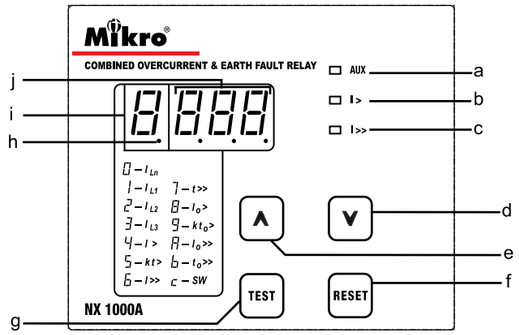
Extremely Inverse



NX1000A Combined Overcurrent & Earth-Fault Relay User's Guide

Rev M0 (04/19)

A BRIEF OVERVIEW



Symbols

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> - Overcurrent low-set
kt> - Overcurrent time multiplier/ time delay
I>> - Overcurrent high-set
t>> - Overcurrent high-set time delay
I_o> - Earth-fault low-set
kt_o> - Earth-fault time multiplier/ time delay
I_o>> - Earth-fault high-set
t_o>> - Earth-fault high-set time delay
sw - Soft switches

1. General Description

The NX 1000A combined overcurrent 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 overcurrent elements and one non-directional earth-fault element. All these elements are connected to the current transformers of the feeder to be protected.

The overcurrent 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 NX 1000A 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 Indicators

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	1	B	Programming mode.

Table 1: System Status
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
t	blink	Last trip elapsed time
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	Overcurrent low-set current setting
5	off	Overcurrent low-set time multiplier/ delay setting
6	off	Overcurrent high-set current setting
7	off	Overcurrent high-set time delay 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 time delay setting
c	off	Soft switch setting

Table 2: Function Codes

Auto Scroll
Under normal operating condition, the 4-digit LED will auto scroll through function 0 to 3 to show current readings. To toggle auto scroll mode, press "UP"+"DOWN" key simultaneously for 2 seconds.

Display off Mode
To toggle display off mode, press "RESET" key for 10 seconds. When display off mode enabled, the display will switch off after 6 minutes if no key is pressed.

3. Push-buttons Operation

a) Trip Test

Press and hold the "TEST" key for 3.5 seconds to stimulate a trip.
Display blinks "T.E.S.T.", indicators I> and I>> after test tripped.

b)Trip Reset

Press the "RESET" key to reset the relay when tripped.

c) View Setting

When the relay is not under tripped condition, pressing the "RESET" key will scroll through the various functions. The sequence of selection is as follow:

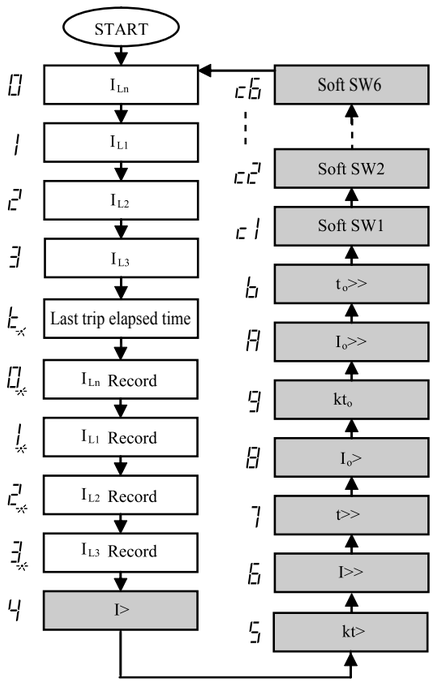


Figure 1: Scroll sequence

Programable items

d) Last Trip Elapsed Time

The function digit shows "t." and time elapsed after last trip in day ("d"), hour ("h") and minute ("n"). If more than 99 days, the display shows "99d" and "oUr"

e) Trip Current Record

By default the most recent ("1") trip current is shown. Press "UP" or "DOWN" key to show the previous ("2") and oldest ("3") trip current.

f) Programming Setting

To program the setting for I>, kt>, I>>, t>>, I_o>, kt_o>, I_o>>, t_o>>, soft SW1 to soft SW6.

Step1: Press "RESET" key until the Function digit shows the required function.

Step2: Press the "UP" and "DOWN" key simultaneously to enter programming mode. The Data digit blinks to indicate the relay is in programming mode.

Step3: Use the "UP" or "DOWN key to select the desired value.

Step4: To save the selected value, press the "UP" and "DOWN" key simultaneously again. It will exit the programming mode with the Data digit displaying the newly set value.

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

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

Procedures	Expected Output	Display
(i) Press "Reset" key until overcurrent low-set setting function. i.e. Function 4.	Function digit shows "4". Data digit shows default setting is "5.00A"	4 5.00
(ii) Press "Up" & "Down" keys simultaneously.	Data digit 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 digit 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	Data digit stops blinking, and shows the new settting, i.e. "6.00".	4 6.00

4. Output Contacts

The NX 1000A has two relay outputs (R1 and R2). The output contacts can be programmed as follow:

- linked to overcurrent trip signal.
- linked to earth-fault trip signal.
- 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.

5. Soft Switches

The NX 1000A incorporates 6 softswitches for system configuration. When the Function digit shows "c", the relay is in "soft switch setting" mode.

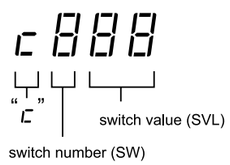


Figure 2: Soft switch indication

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

Procedures	Expected Output	Display
(i) Press "Reset" key until soft switch 1 setting function.	Function digit shows "c". Switch number (SW) shows "1". Switch value (SVL) shows "03"	c 1 0 3
(ii) Press "Up" & "Down" keys simultaneously.	Switch value blinks. Relay is in programming mode.	c 1 0 3
(iii) Press "Up" key to alter the setting until desired value display. i.e."13"	Switch value changed to "13". (refer table 3 for soft switch configuration)	c 1 1 3
(iv) Press "Up" & "Down keys simultaneously to save new value and exit programming mode.	Switch value stops blinking and shows the new setting, i.e."13"	c 1 1 3

Example 3: To change overcurrent 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 digit shows "c". Switch number (SW) shows "4". Switch value (SVL) shows "00"	c 4 0 0
(ii) Press "Up" & "Down" keys simultaneously.	Switch value blinks. Relay is in programming mode.	c 4 0 0
(iii) Press "Up" key to alter the setting until desired value display. i.e. "02"	Switch value changed to "02". (refer table 3 for soft switch configuration)	c 4 0 2
(iv) Press "Up" & "Down keys simultaneously to save new value and exit programming mode.	Switch value stops blinking and shows the new setting, i.e. "02"	c 4 0 2

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
6	50	Network frequency 50 Hz
	60	Network frequency 60 Hz

Table 3: Soft switches setting
E/F = Earth-fault O/C = Overcurrent

7. Case Dimensions

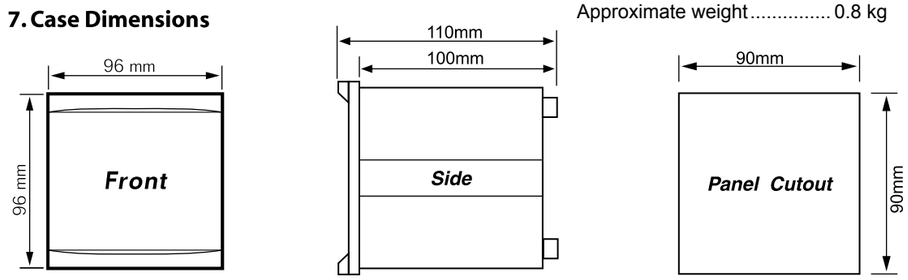


Figure 5: Case dimensions

6. Technical Data

Ratings

Rated current *In* .....5 A
Frequency .....50 or 60 Hz
Burden .....< 0.3 VA at *In*
Thermal withstand.....4 x I_n continuous

Auxiliary Supply

Supply voltage
NX1000A-240A.....198~265 VAC
NX1000A-240AD..... 85 ~ 265 VAC
110 ~ 370 VDC
NX1000A-150D..... 24 ~ 150 VDC
Supply frequency .....50 Hz or 60 Hz
VA rating .....3 VA typical

Accuracy

Protection thresholds.....±5%
Time delay.....±5% with a minimum of 50ms

Setting Ranges

(i) Overcurrent elements

Low-set setting I>.....0.10 - 10.00 A (2%-200%)
Low-set time multiplier kt> .....0.01 - 1.00
Low-set definite time t> .....0.00 - 100 s
High-set setting I>> .....0.50 - 100 A (10%-2000%)
High-set definite time t>>.....0.00 - 100 s

(ii) Earth-fault elements

Low-set setting Io>.....0.10 - 5.00 A (2%-100%)
Low-set time multiplier kto> ....0.01 - 1.00
Low-set definite time to> .....0.00 - 100 s
High-set setting Io>> .....0.10 - 50.0 A (2%-1000%)
High-set definite time to>>.....0.00 - 100 s
(0.00 - 1.00, step 0.01; 1.00-10.0, step 0.10; 10.0-100, step 0.5)

Outputs

Trip Contacts(R1&R2):
Rated voltage .....250 VAC
Continuous carry .....5A (cos φ = 1.0)
Make and carry for 0.2 s 30A
Expected electrical life .....10^5 operations
Expected mechanical life .....5 x10^6 operations

Indicators

Auxiliary supply .....Green LED indicator
Pick up .....Red LED indicator
Trip .....7-segment LED and red LED indicators

Environmental conditions

Temperature ..... -10ºC to 55ºC
Humidity ..... 5% to 95% non-condensing

Mechanical

Mounting..... Panel mounting
Dimension (mm)..... 96(w) x 96(h) x 110(d)
Enclosure protection..... IP54 at the panel
Approximate weight..... 0.8 kg