

Numerical three phase overcurrent & earth-fault relay

Type NI 40/41



ABB

ABB – a global technology leader

ABB is a global leader in Power and Automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group operates in around 100 countries and employs over 1,08,000 people.

In India, ABB serves customers with a complete range of power and automation technologies. The company has a vast installed base, an extensive manufacturing facilities and a countrywide marketing and service presence.

As a part of its Power Technologies offering, ABB serves electric, gas and water utilities as well as industrial and commercial customers with a wide range of products, systems and services for power generation, transmission and distribution. ABB's system solutions include Electrical Balance of Plant (EBOP) automation, controls and instrumentation, for power plants, bulk power transmission systems, turnkey substations, automation controls and instrumentation, utility automation and power distribution.

The product offering includes a wide spectrum of technologies across the entire voltage range including indoor and outdoor circuit breakers, air and gas insulated switchgear, disconnectors, capacitor banks, reactive power compensators, power transformers, distribution transformers, instrument transformers, Compact Secondary substations (CSS) and Ring Main Units (RMU).

Advantage ABB

- ✓ 120 years of technology and innovation
- ✓ Unparalleled domain competence
- ✓ Global experience
- ✓ Complete solution capabilities
- ✓ Large installed base
- ✓ Environment-friendly technologies



Numerical three phase over current and earth fault Relay Type NI 40/41

Features

Protection functions ANSI Code

- | | |
|--|-----|
| ■ Three-phase over current protection low-set stage (IDMT or DT) | 51 |
| ■ Three-phase over current protection, high -set stage (DT) | 50 |
| ■ Earth fault protection, low-set stage (IDMT or DT) | 51N |
| ■ Earth fault protection, high-set stage (DT) | 50N |
- Facility of site selection of IDMT curves for low set stage
 - Four standard IDMT curves (NI, VI, EI, LI) as per IEC standard.
 - Wide and accurate numerical settings with perfect long time stability.

Measurement, Monitoring and Recording Function

- Measuring of 3 Phase current in primary or secondary terms
- Measurement of Neutral current in primary or secondary terms.
- Latest Five fault data recording
- Extensive relay internal self supervision monitoring relay hardware and software.
- Trip lockout function

Display and Indications

- 2 x 16 Digit backlit LCD display
- Control supply on, Fault alarm / trip, Relay internal failure indication LED's
- Display of fault cause indication

Inputs and Outputs

- Four accurate current inputs
- Normally open heavy duty output contacts
- Two change over signaling output contacts
- Freely configurable output contacts
- Dedicated output contact for relay internal self supervision
- Low burden on current transformer

Relay Design

- Relay case with a degree of protection according to IP54
- Design confirming to requirements of IEC 60255
- Design immune to any kind of electromagnetic interference
- Dimensions: 196 (H) x 166 (W). Depth behind panel only 158 mm.

Application

The NI 40 / 41 Feeder Protection Relay is ABB's new and advanced solution for cost-efficient feeder protection relay. It provides medium and low voltage networks with an optimized composition of protection functions within one relay.

This composite relay facilitates combined three phase over current and neutral current relay functions for use with selective short-circuit and time-over current protection of distribution feeders. It can also be applied to feeder earth fault protection in solidly earthed, resistance earthed and isolated neutral networks.

As multi-function solutions, these relays can be flexibly adapted to different kind of incoming and outgoing feeders in varying substation environments. The NI 40/41 series of relays can be used for protection of feeders of utility and industrial applications.

With its compact size and unique technical features, NI 40/41 is an ideal relay for retrofit, small switchgear and switchgear with limited space. A small mounting depth makes it possible to install the relay in places where space is money and every millimeter counts.

NI 40/41 provides feeder protection applications with the best performance usability in its class and are based on ABB's in-depth knowledge of protection and numerical technology, backed by years of service performance across applications. ABB has delivered numerical relays worldwide.

Design & Principle

NI 40/41 series relays are based on numerical microprocessor based technology. They incorporate an extensive self-supervision system that continuously monitors the internal hardware and software of the relay. It manages run time fault situation and alerts the user of any relay internal fault. With its non-volatile memory NI 40/41 records & retains fault data indications even after an auxiliary power failure.

The relay is inherently reliable and features excellent immunity to external interference. IP 54 class degree of protection ensures water and dust proof protection for relay, which allows the relay to be used in any kind of substation environment.

In addition to its comprehensive protection functions, the relay provides additional features such as measurement data in primary value, RMS value in terms of I_n , fault data recording, fault indications etc. LCD display and three front LEDs enable fast fault indication. The fault recorded data helps user for quick fault diagnostics and analysis. The relay also has freely configurable output relays for tripping and signaling. These value-added features make NI 40 / 41 a product beyond compare.

The combined over current and earth-fault relay is a secondary relay to be connected to the current transformers of the protected object. The three-phase over current unit and the earth-fault unit continuously measure the phase currents and the neutral current of the protected object. On detection of a fault, the relay trips the circuit breaker, provides alarm, records fault data etc. in accordance with the application and the configured relay functions.

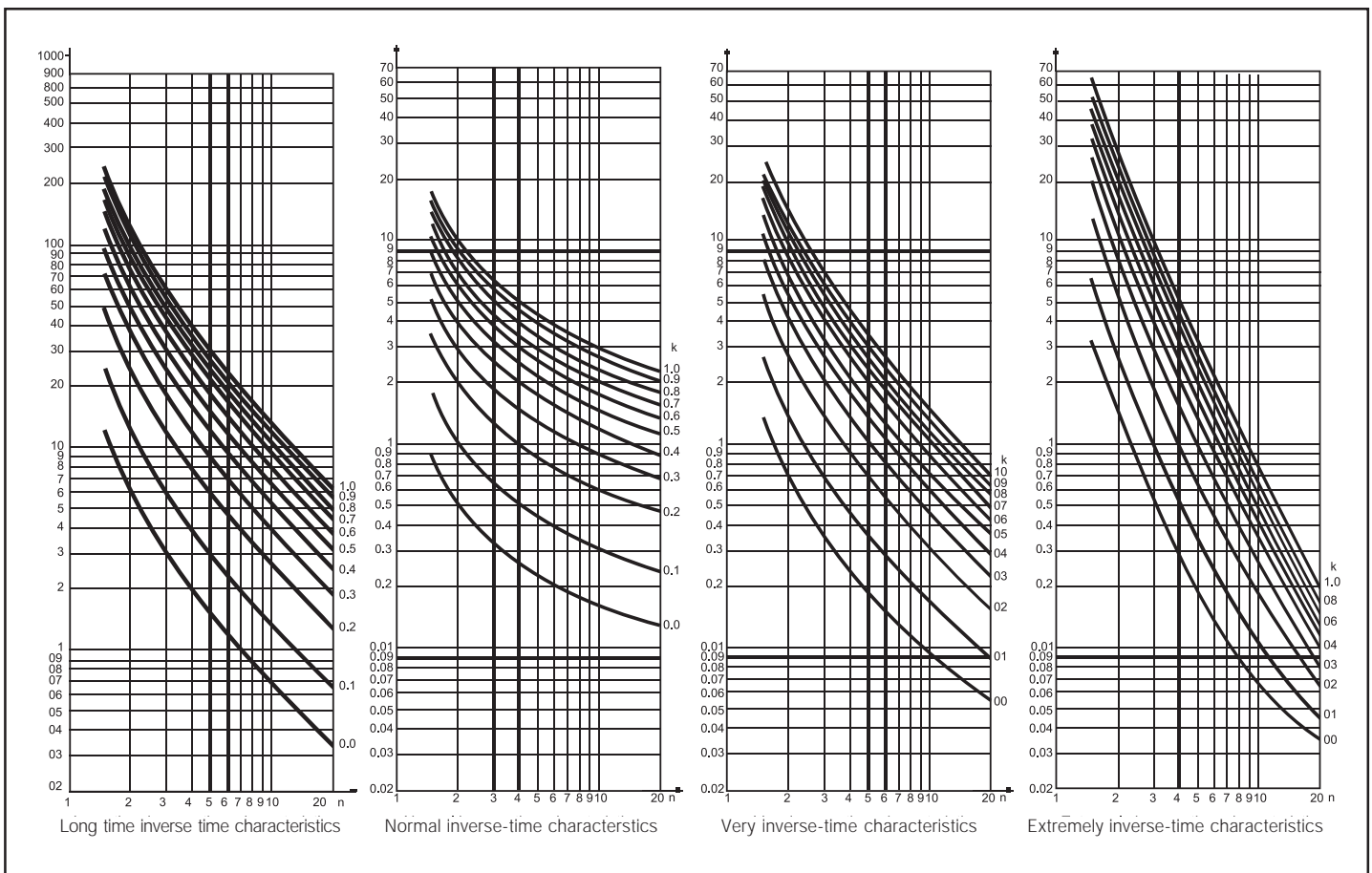
When the phase current exceeds the set start current of the low-set stage $I_{>}$, and when the set operate time at definite time operated or the calculated operate time at inverse time operation elapses, the over current unit operates.

In the same way, the high-set stage $I_{>>}$ of the over current unit (for NI 41) operation and delivers a trip signal when the set start current exceeds and the set operate time elapses.

When the earth-fault current exceeds the set start current of the low-set stage $I_{>}$, and the set operate time at definite time operation or the calculated operate time at inverse time operation elapses, the earth-fault unit operates. In the same way the high-set stage $I_{>>}$ of the earth fault unit (for NI 41) operates and delivers a trip signal when the set start current exceeds and the set operate time elapses.

The low-set stage of the over current unit and the low-set stage of the earth-fault unit may be given definite time or inverse definite minimum time (IDMT) characteristic. When the IDMT characteristic is chosen, four time / current curves are available that comply with BS 142:1962 and IEC 255 standards and are named "Normal inverse", "Very inverse", "Extremely inverse" and "Long-time inverse".

By appropriate configuration of the output relay matrix, the trip signals of the over current and earth fault units are obtained as contact functions.



Technical Data

Energizing quantities, rated values & limits		
Type designation	NI 40/41	
Energizing inputs		
Rated Current In	1 A	5 A
Thermal Withstand		
a) Continuous	4 A	20 A
b) For 1 Second	100A	500A
Dynamic current withstand	250A	1250A
Input impedance	<100mΩ	<20mΩ
Auxiliary power supply		
Rated auxiliary supply	18 - 80 V DC or 80 - 265 V AC/DC	
Rated Frequency	50 Hz	
Power Consumption		
a) Under quiescent condition	~ 4 W	
b) Under Operating condition	~ 6 W	
Indications		
Relay supply healthy	Green LED	
Protection start	Yellow LED	
Protection trip	Red LED	
Relay internal failure	Red LED	
Relay display	2 x 16 Digit backlit LCD	

Over current and earth fault relay settings		
Over Current Protection		
Low Set (I>) Stage		
a) Current Range	50-200% of In in steps of 1%	
b) Operate time at DMT mode	0.05 - 64 Sec	
c) Item/current characteristics at IDMT mode (site selectable)	Normal Inverse Very Inverse Extreme Inverse Long time Inverse	
d) Time Multiplier "k"	0.05 to 1.0	
High Set (I>>) Stage		
a) Current Range	50-2000% of In in steps of 1%	
b) Operate time at Inst. mode	50 mSec	
c) Operate time at DMT mode	0.05 - 64 Sec	

Technical Data

Over current and earth fault relay settings

Earth Fault Protection

Low Set (I_{o>}) Stage

a) Current Range	10 - 80% of I _n in steps of 1%
b) Operate time at DMT mode	0.05 - 64 Sec
c) Item/current characteristics at IDMT mode (site selectable)	Normal Inverse
	Very Inverse
	Extreme Inverse
	Long time Inverse
d) Time Multiplier "k"	0.05 to 1.0

High Set (I_{o>>}) Stage

a) Current Range	10 - 1000% of I _n in steps of 1%
b) Operate time at Inst. mode	50 mSec
c) Operate time at DMT mode	0.05 - 64 Sec

Output contact ratings

Tripping Contact

Terminals	11,12 (NO)
Rated voltage	250V AC/DC
Continuous Carrying capacity	5 A
Make and Carry 3.0 Sec	15 A
Make and carry 0.5 Sec	30 A
Breaking capacity for DC when control circuit time constant L/R ≤ 40 ms and at voltage	
a) 220V DC	1 A
b) 110V DC	3 A
c) 48V DC	5A

Signaling & IRF Contact

Terminals	21,22,23 (C/O) & 24,25,26 (C/O) & 27,28,29 (C/O)
Rated voltage	250V AC/DC
Continuous Carrying capacity	5 A
Make and Carry 3.0 Sec	8 A
Make and carry 0.5 Sec	10 A
Breaking capacity for DC when control circuit time constant L/R < 40 ms and at voltage	
a) 220V DC	0.15 A
b) 110V DC	0.25 A
c) 48V DC	1A

Electrical Tests

Insulation Requirement

Dielectric test voltage (IEC 60255-5)	2.0 kV, 50Hz, 1 min
Impulse test voltage (IEC 60255-5)	5.0 kV, 1.2/50 ms, 0.5J
Insulation resistance (IEC 60255-5)	>100 m Ω , 500 V dc

Interference Test

High Frequency (1 MHz) disturbance test (IEC 60255-22-1), common mode	2.5 kV
High Frequency (1 MHz) disturbance test (IEC 60255-22-1), differential mode	1.0 kV
Fast transients (IEC 60255-22-4, class III and IEC 801-4, level 4), power supply port	4 kV, 2.5kHz, 50 Ω
Fast transients (IEC 60255-22-4, class III and IEC 801-4, level 4), other ports	2 kV, 2.5kHz, 50 Ω
Electrostatic discharge (IEC 60255-22-2 and IEC 801-2, class III), air discharge	8 kV
Electrostatic discharge (IEC 60255-22-2 and IEC 801-2, class III), contact discharge	6 kV
RF electromagnetic field test (IEC 61000-4-3 and ENV 50140)	10 V/m, f = 80...1000 MHz
Conducted RF disturbance test (IEC 61000-4-6 and ENV 50141)	10 V/m, f=150 kHz.....1000 MHz
Surge immunity test (IEC 60255-22-5 and IEC 61000-4-5), common mode	2 kV, 1.2/50 μ s, 12 Ω
Surge immunity test (IEC 60255-22-5 and IEC 61000-4-5), differential mode	1 kV, 1.2/50 μ s, 2 Ω
Conducted and radiated RF emission test (IEC 60255-25, EN55011-CISPR11), conducted emission (main)	Class A
Conducted and radiated RF emission test (IEC 60255-25, EN55011-CISPR11), radiated emission (main)	Class A
Power frequency magnetic field immunity test (IEC 61000-4-8), continuous	100 A/m
Power frequency magnetic field immunity test (IEC 61000-4-8), Short duration	300 A/m

Power Supply Test (IEC 60255 - 11, IEC 61000-4-11)

Variation voltage	68...265 V
Interruption 80 V - 50%	0...200 ms
Interruption 80 V - 100%	0...30 ms
Interruption 255 V - 100%	0...160 ms
Ripple in DC voltage	Max. 12% of DC value

Electrical Tests

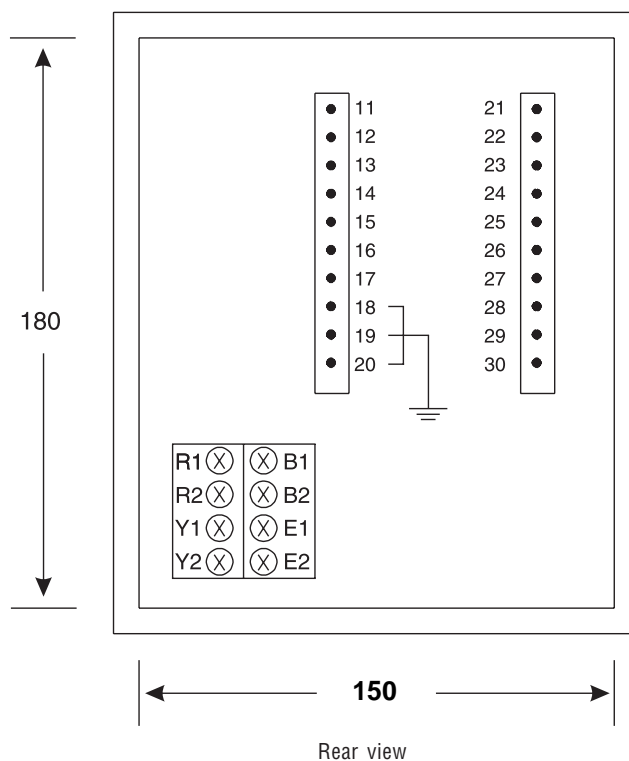
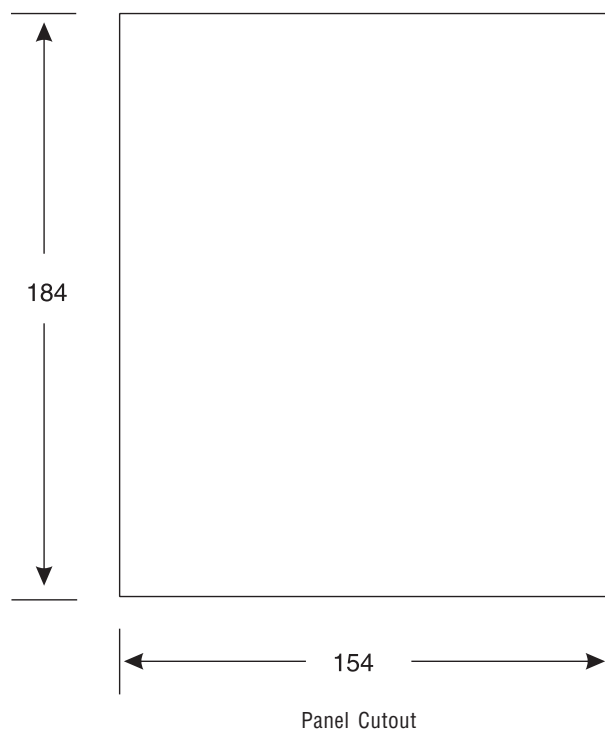
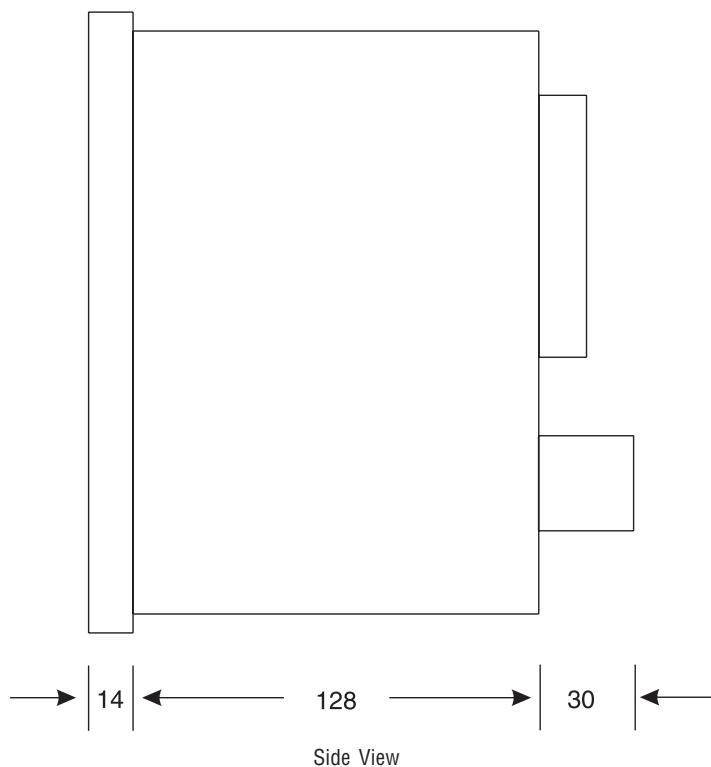
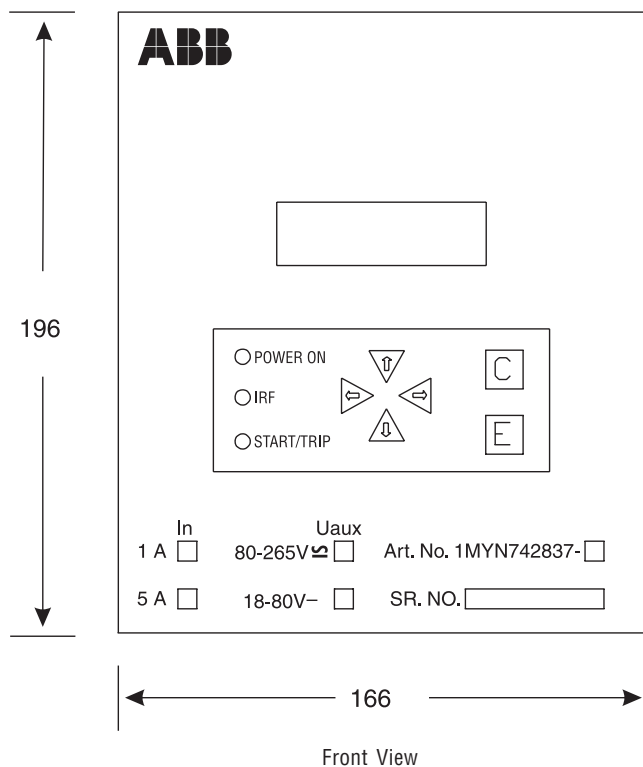
Mechanical test

Seismic test (ANSI/IEEE C37.98-1987), operating basis earthquake test	0.5...5.25 g
Seismic test (ANSI/IEEE C37.98-1987), safe shut down earthquake test	0.5...7.5 g
Vibration response and endurance test (IEC 60255-2-1)	2...13.2 Hz, \pm 1.0 mm 13.2...100 Hz, \pm 0.7 g
Shock response and endurance test (IEC 60255-21-2)	Class 1, 11ms
Bump test (IEC 60255-21-2)	20 g, 1000 bumps/direction

Environmental test

Service temperature range	-10 °C+55 °C
Transport and storage temperature range (IEC 60068-2-48)	-40 °C+70 °C
Dry heat test, (IEC 60068-22-2)	+55 oC+70 °C
Cyclic (12+12 hour cycle) damp heat test , (IEC 60068-2-30)	<95%, +40°C, 96% Rh
Cold heat test, (IEC 60068-22-1)	-10 oC -20 °C
Corrosion test	Battelle test
Degree of protection by enclosure, IP test (IEC 60529)	IP 54

Mounting Details



Ordering Details

Relay Type	Current Input	Aux Supply	Article No.
NI 40	1A	80-265 V AC/DC	1MYN742837-A
NI 40	5A	80-265 V AC/DC	1MYN742837-B
NI 40	1A	18-80 V DC	1MYN742837-C
NI 40	5A	18-80 V DC	1MYN742837-D
NI 41	1A	80-265 V AC/DC	1MYN742838-A
NI 41	5A	80-265 V AC/DC	1MYN742838-B
NI 41	1A	18-80 V DC	1MYN742838-C
NI 41	5A	18-80 V DC	1MYN742838-D



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