

# GENERATION & NETWORK

## PHASE and EARTH OVERCURRENT RELAY with or without DIRECTIONAL criteria

NPID800  
NPIDR800

NPID800 provides the three-phase and earth fault overcurrent protection for medium and high voltage electrical networks. This multi-function and directional relay supervises phase to phase and phase to earth faults, negative sequence current, thermal state of the protected device and the good operating of the circuit breaker and its trip circuits.

As well as the usual protection functions, NP800 relays provide monitoring, measurement and recording of the electrical quantities of the network. The relays can be set locally, using either the keypad and display or the RS232 port, or remotely using the RS485 port. Setting, reading, measurement and recording are all available locally or remotely.



Multifunction  
Measurement  
Recording / event log  
Disturbance recording  
Local MMI

### Protection functions

- Overcurrent with 3 thresholds [51-1] [51-2] [50]
- Phase directional [67]
- Earth fault with 2 thresholds [51N] [50N]
- Earth directional [67N]
- Thermal overload for cable and transformer [49]
- Negative phase sequence overcurrent [46]
- Broken conductor with 2 thresholds [46BC]
- Load reclosing function
- Logical selectivity

### Additional functions

- Latching of the output contacts [86]
- Trip circuit supervision of the breaker [74TC]
- Breaker failure [50BF] [50N\_BF]
- Load shedding – Load Restoration, remote control (with communication option)

### Additional function NPIDR800

- Recloser 1 fast cycle and 3 slow cycles [79]



CEE Relays Ltd

# CHARACTERISTICS NPID800 – NPIDR800

## Auxiliary Supply

- Auxiliary supply ranges
- Typical burden
- Memory backup

19 to 70 – 85 to 255 / Vdc or Vac 50 or 60 Hz  
6 W (DC), 6 VA (AC)  
72 hours

## Analogue inputs

- Phase CT

In 1 or 5 A  
burden at In < 0.2 VA  
Continuous rating 3 In, short duration withstand 100 In / 1s  
CT setting: primary value from 1 A to 10 kA  
measurement from 0.05 to 24 In  
display of primary current from 0 to 65 kA  
5VA 5P20

- Recommended CTs
- Earth current CT

In<sub>0</sub> 1 or 5 A  
burden at In<sub>0</sub> < 0.5 VA  
Continuous rating 1 In<sub>0</sub>, short duration withstand 40 In<sub>0</sub> / 1s  
measurement from 0.005 to 2.4 In<sub>0</sub>  
display of primary current from 0 to 6.5 kA  
measurement from 0.1 to 48 A primary

- Earth current from Ring CT 100/1 or Ring CT 1500/1 and BA800
- VT nominal value

Un: 33 to 120 V  
input impedance > 80 kΩ  
Continuous rating 240 V, short duration withstand 275V - 1 min  
measurement from 1 to 240 V  
VT setting: primary value from 220 V to 250 kV  
measurement: 45 to 55 Hz or 55 to 65 Hz

- Frequency (50Hz or 60Hz)

## Digital inputs (8)

- Polarizing voltage

20 to 70 Vdc for 19 to 70 V auxiliary supply range  
37 to 140 Vdc for 85 to 255 V auxiliary supply range  
< 10Vdc range 19 to 70 V – < 33Vdc range 85 to 255 V  
> 20Vdc range 19 to 70 V – > 37Vdc range 85 to 255 V  
programmable  
< 15 mA

- Level 0
- Level 1
- Operating of the input by level 1 or 0
- Burden

## Output Relays (7 + 1 WD)

- Relays A, B, E, F:  
(signalling, Shunt Opening Release)

double contact NO, permanent current 8 A  
closing capacity 12 A / 4 s  
short circuit current withstand 100 A / 30 ms  
breaking capacity DC with L/R = 40 ms: 50W  
breaking capacity AC with cos φ = 0.4: 1250 VA  
changeover contact, permanent current 16 A  
closing capacity 25 A / 4 s  
short circuit current withstand 250 A / 30 ms  
breaking capacity DC with L/R = 40 ms: 50W  
breaking capacity AC with cos φ = 0.4: 1250 VA  
adjustable from 100 to 500 ms  
by the setting software  
capital letters or digits

- Relays C, D, G et WD:  
(control, WD: Watchdog)  
(C, D, G: programmable for CB Shunt  
Opening Release or Undervoltage Release)
- Relays pulse, except WD
- Assignment of name to the output  
maximum of 16 characters

## Overcurrent function [51-1] [51-2] [50]

- Operating range I> - I>> - I>>>
- Thresholds accuracy
- Reset percentage on the operating level
- Instantaneous operating time
- Definite time delay
- Accuracy of the time delays
- Curves [51-1] I> - [51-2] I>>
- Curves accuracy and type

0.3 to 24 In  
1% typical, 2% max from 0.5 to 4 In  
3% typical, 5% max from 0.3 to 0.5 In and from 4 to 24 In  
95%  
60 ms including trip for I ≥ 2 Is  
40 ms to 300 s: [51-1] I> - [51-2] I>> - [50] I>>>  
± 2% or 20 ms  
IEC 60255-3, ANSI IEEE and factory programmable (consult us)  
class 5 - Time Multiplier Setting: 0.03 to 3 s, type: see  
functionalities

## Earth fault function [51N] [50N]

- Operating range Io> - Io>>
- Thresholds accuracy
- Reset percentage on the operating level
- Instantaneous operating time
- Definite time delay
- Accuracy of time delay
- Curves [51N] Io>
- Curves accuracy and type

0.03 to 2.4 In<sub>0</sub> / CT - 0.6 to 48 A / ring CT  
1% typical, 2% max from 0.05 to 0.4 In<sub>0</sub> / CT  
3% typ., 5% max from 0.03 to 0.05 In<sub>0</sub> and 0.4 to 2.4 In<sub>0</sub> / CT  
5% from 0.6 to 48 A / ring CT  
95%  
60 ms including trip for I ≥ 2 Is  
40 ms to 300 s: [51N] Io> [50N] Io>>  
± 2% or 20 ms  
IEC 60255-3, ANSI IEEE and factory programmable (consult us)  
class 5 - Time Multiplier Setting: 0.03 to 3 s, type: see  
functionalities

# CHARACTERISTICS NPID800 – NPIDR800

## Operating characteristics [67] [67N]

- Operating principle [67] assignment of a directional criteria to the functions [50] [51-1] [51-2]
- Operating principle [67N] assignment of a directional criteria to the functions [50N] [51N]
- Measurement of residual voltage  $V_r$  [67N] measured
- Polarization threshold [67] 3%  $U_n$ , accuracy  $\pm 1\%$
- Polarization threshold [67N] 3% to 20%  $U_n$ , step of 1 %, accuracy  $\pm 5\%$  or 1 V
- Operating mode according to the polarization voltage programmable: blocking or permission, common choice for [67] and [67N] (tripping by functions [50] [51] and [50N] [51N])
- Angle measurements  $V_p/I_1$  et  $V_p/I_3$  [67]  $-180^\circ$  à  $+180^\circ$ , accuracy  $\pm 5^\circ$
- Angle measurement  $V_p/I_0$  [67N]  $-180^\circ$  à  $+180^\circ$ , step of  $1^\circ$ , accuracy  $\pm 5^\circ$
- Setting of characteristic angle  $\alpha$  programmable: yes or no ; by digital input or by the communication
- Inhibition of function [67N]

## Transformer thermal overload function [49]

- Tripping curves IEC 60255-8
- Heating-time constant  $C_{TE}$  4 to 180 min, class 5
- Cooling time constant 1 to 6.0  $C_{TE}$ , in step of 0.1
- Negative sequence factor 0 to 9
- Closing factor  $F_D$  50 to 100%  $C_{TE}$
- Thermal trip threshold  $I_b$  40 to 130 %  $I_n$ , class 5
- Thermal alarm threshold 80 to 100 %  $\theta$  thermal, class 5
- Reclosing thermal threshold inhibition 40 to 100 %  $\theta$  thermal, class 5

## Cable thermal overload function [49]

- Tripping curves IEC 60255-8
- Heating-time constant  $C_{TE}$  4 to 180 min, class 5
- Thermal alarm threshold 80 to 100 %  $\theta$  thermal, class 5
- Thermal trip threshold  $I_b$  40 to 130 %  $I_n$ , class 5

## Negative phase sequence overcurrent function [46]

- Threshold  $I_{neg}$ :  $I_2 >$  0.1 to 2.4  $I_n$ , accuracy 5% for  $I_{ph} > 0.3 I_n$
- Instantaneous operating time 60 ms including trip relay for  $I \geq 2 I_s$
- Definite time delay 40 ms to 300 s
- Accuracy of the time delay  $\pm 2\%$  or 20 ms
- Curves IEC 60255-3, ANSI IEEE and factory programmable (consult us)
- Curves accuracy and type class 5 - Time Multiplier Setting: 0.03 to 3 s, type: see functionalities

## Broken conductor function [46BC]

- Thresholds  $I_{neg}/I_{pos}$ :  $I_2/I_1 >$  -  $I_2/I_1 >>$  10 to 250%
- Accuracy  $\pm 5\%$
- Definite time delay 40 ms to 300s
- Accuracy of the time delays  $\pm 2\%$  or 20 ms

## Recloser [79] (NPIDR800 only)

- Dead time delay (1<sup>st</sup> cycle) 0.1 to 360 s
- Reclaim time delay (1<sup>st</sup> cycle) 9 to 360 s
- Dead time delay (2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> cycle) 15 to 360 s
- Reclaim time delay (2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> cycle) 1 to 360 s
- Width of reclosing pulse 100 to 500 ms
- Reclaim time for manual reclosing 1 to 360 s
- Accuracy of time delays  $\pm 2\%$  or 20 ms
- N cycles alarm / T min N: 4 to 30 and T: 1 to 30 min

## Trip circuit supervision and breaker failure [74TC] [50BF] [50N\_BF]

- Trip circuit supervision [74TC] requires four digital inputs (see application guide)
- Operating time (in faulty condition) 500 ms fixed for [74TC] function
- Failure threshold [50BF] 5% to 30 %  $I_n$ , step of 1  $I_n$
- Failure threshold [50N\_BF] 0.5% to 3%  $I_{n0}$ , step of 0.1  $I_{n0}$
- Breaker failure time delay 60 to 1000 ms, step of 10 ms

## Latching of the output contacts [86]

- Latching of output relays A, B, C, D, E, F, G (programmable assignment)
- Reset digital input, digital communication or local MMI

## Load reclosing function

- Application threshold adjustment [50] [51] [50N] [51N] [46] [46BC]
- Operating principle function activation by digital input
- Ratio « K » of reclosing time 50 à 200%
- Accuracy  $\pm 5\%$
- Reclosing time 40 ms to 300s,  $\pm 2\%$  or 20 ms

# CHARACTERISTICS NPID800 – NPIDR800

## Logical selectivity

- Application on radial network
  - Operating principle
  - Additional time delay [51] [51N]
  - Additional time delay [50] [50N]
  - Operating mode of digital inputs
- number of relays too important to allow the use of time co-ordination  
additional time added to the functions [50] [51] [50N] [51N]  
60 ms to 120s, ± 2% or 20 ms  
60 ms to 3s, ± 2% or 20 ms  
negative or positive true-data mode

## Digital inputs assignment

- By setting software
  - Setting table selection
  - Disturbance recording order
  - Logical selectivity
  - Interlock o/o
  - Interlock c/o
  - Control mode
  - Closing mode
  - Reset [86] function
  - Trip circuit supervision
  - CB trip external order
  - Circuit breaker ready
  - Inhibition 1
  - Inhibition 2
  - RSE A
  - RSE B
  - Input – output programmable functions
- set 1 – set 2
- dedicated to remote control, local / remote
- acknowledgment of the selected output(s)  
[74TC] function  
function [74TC] blocked if external trip order  
NPIDR800 only  
NPIDR800 only  
NPIDR800 only  
NPIDR800 only

## User programmable functions (digital inputs – digital outputs)

- Status of the function
  - Tripping mode or report
  - Operating and release time delays
  - Assignment of name to the function, maximum of 14 characters
  - Assignment of one or more output relays (alarm or trip)
- in or out of service, by local MMI or by the setting software  
report: for time stamping and event recorder  
tripping mode: 40 ms to 300 s  
by the setting software
- by local MMI or by the setting software  
A, B, C, D, E, F, G

## Counters

- Cumulative breaking current
  - Operation number circuit breaker
- maximum  $64.10^6$  kA<sup>2</sup> (phase 1,2 and 3)  
0 to 10 000

## Load shedding – Load Restoration, remote control (communication option)

- Load shedding level
  - Time delay before reclosing
  - Reclosing pulse
  - Output relays assigned
- 1 to 6  
1 to 120 s, ± 2%  
100 to 500 ms (remote control)  
programmable by local MMI or by setting software  
A, B, C, D, E, F, G

## Digital outputs assignment

- By local MMI or by setting software

## Signalling LEDs assignment

- By setting software

## Man Machine Interface

- Relay display
  - Configuration and operating software
- Language  
Language
- 2 lines of 16 characters  
French, English, Spanish, Italian  
Windows® 2000, XP, Vista and 7 compatible  
French, English, Spanish, Italian

## MODBUS® Communication (option)

- Transmission
  - Interface
  - Transmission speed
- asynchronous series, 2 wires  
RS 485  
300 to 115 200 bauds

## Disturbance recording

- Number of recordings
  - Total duration
  - Pre fault time
- 4  
52 periods per recording  
adjustable from 0 to 52 cycles

## Climatic withstand in operation

- Cold exposure
  - Dry heat exposure
  - Damp heat exposure
  - Temperature variation with specified speed
- IEC / EN 60068-2-1: class Ad, -10 °C  
IEC / EN 60068-2-2: class Bd, +55 °C  
IEC / EN 60068-2-3: class Ca, 93 % HR, 40 °C, 56 days  
IEC / EN 60068-2-14: class Nb, -10 °C à +55 °C, 3 °C/min

## Storage

- Cold exposure
  - Dry heat exposure
- IEC / EN 60068-2-1: class Ad, -25 °C  
IEC / EN 60068-2-2: class Bd, +70 °C

# CHARACTERISTICS NPID800 – NPIDR800

## Electrical safety

- Ground bond test current IEC / EN 61010-1: 30 A
- Impulse voltage withstand IEC / EN 60255-5: 5 kV MC, 5 kV MD (waveform: 1.2/50 $\mu$ s) except Digital Output, 1 kV differential mode except RS485, 3 kV common mode
- Dielectric withstand (50Hz or 60Hz) IEC / EN 60255-5: common mode 2 kV<sub>rms</sub> – 1 min differential mode for Digital Output 1 kV<sub>rms</sub> – 1 min (contact open)
- Insulation resistance IEC / EN 60255-5: 500 Vdc - 1 s: > 100 M $\Omega$
- Clearance and creepage distances IEC / EN 60255-5: rated insulation voltage: 250 V pollution degree: 2 overvoltage category: III

## Enclosure safety

- Degree of protection provided by enclosures (IP code) IEC / EN 60529: IP51, with front face

## Immunity – Conducted disturbances

- Immunity to RF conducted disturbances IEC / EN 61000-4-6: class III, 10 V
- Fast transients IEC / EN 60255-22-4 / IEC / EN 61000-4-4: class IV
- Oscillatory waves disturbance IEC / EN 60255-22-1: class III, 2.5 kV CM, 1 kV DM except RS485, class II, 1 kV CM
- Surge immunity IEC / EN 61000-4-5: class III
- Supply interruptions IEC / EN 60255-11: 100% 20 ms

## Immunity – Radiated disturbances

- Immunity to RF radiated fields IEC / EN 60255-22-3 / IEC / EN 61000-4-3: class III, 10 V/m
- Electrostatic discharges IEC / EN 60255-22-2 / IEC / EN 61000-4-2: class III, 8 kV air / 6 kV contact
- Power frequency magnetic field immunity test IEC / EN 61000-4-8: class IV, 30 A/m continuous, 300 A/m 1 to 3 s

## Mechanical robustness - energised

- Vibrations IEC / EN 60255-21-1: class 1 - 0.5g
- Shocks IEC / EN 60255-21-2: class 1 - 5g / 11 ms

## Mechanical robustness - not energised

- Vibrations IEC / EN 60255-21-1: class 1 - 1g
- Shocks IEC / EN 60255-21-2: class 1 - 15g / 11 ms
- Bumps IEC / EN 60255-21-2: class 1 - 10g / 16 ms
- Free fall IEC / EN 60068-2-32: class 1 - 250 mm

## Electromagnetic compatibility (EMC)

- Radiated field emissivity EN 55022: class A
- Conducted disturbance emissivity EN 55022: class A

## Presentation

- Height 4U
- Width ¼ 19"
- Brackets 19" rack mounting option (see drawing D37739)
- Display 2 lines of 16 characters

## Case

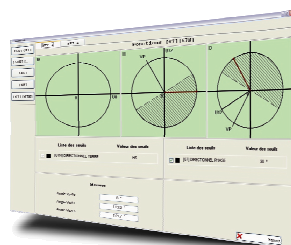
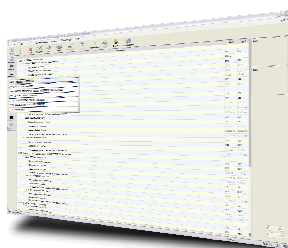
- H, W, D without short-circuiting device 173 x 106.3 x 250 mm (see drawing D37739)
- H, W, D with short-circuiting devices 173 x 106.3 x 305 mm (see drawing D37739)
- Weight 3.6 kg

## Connection - codification

- NPID800 See diagram S38019
- NPIDR800 See diagram S38020
- Ring CT See diagram 142941
- BA800 See diagram 38766

## SMARTsoft

SMARTsoft, integrated software for the Industry, Railway and Transmission ranges, helps the User get the best from NP800 series relays.



SMARTsoft

User friendly  
Diagnosis  
Fault analysis  
Maintenance tools

## Functionalities

- 2 ranges of auxiliary supply
- Storage of the lack and the restoration of the auxiliary voltage (time stamped events)
- Configuration and parameter setting by local MMI or off-line / on-line PC
- Measurement of electrical quantities:  
Display expressed in primary values  
Instantaneous, integrated and maximum values of phase and earth currents  
Phase voltage and residual voltage values  
Frequency  
Instantaneous, integrated and maximum values of active and reactive powers  
Thermal image value  
Cos  $\phi$
- Instantaneous alarm threshold
- Definite time tripping
- Dependent time tripping according to inverse/very inverse/extremely inverse IEC 60255-3 curves
- Tripping according to RI curve (electromechanical)
- Tripping according to moderately inverse/very inverse/extremely inverse ANSI /IEEE curves
- Logical selectivity on the three phase thresholds and the two earth thresholds
- Thermal image according to IEC 60255-8:
- Cable (by phase) and transformer (3 phase)
- 2 setting groups, locally or remotely selectable
- Energy counters: stored values / 12 hours  
Measurement active and reactive power
- CB Monitoring: interlocks discrepancy, local or remote control of closing / tripping
- Circuit breaker maintenance:  
counters of operation number and  $I^2$  cut-off per phase, alarm and threshold
- Monitoring of breaker failure by checking the disappearance of current after opening
- Remote control by communication channel: tripping or closing, load shedding with priority levels and load restoration
- Setting software compatible with Windows® 2000, XP, Vista and 7
- User interface with access to all protection functions
- Time stamping of internal events with 10ms resolution
- Time stamping of digital inputs with 10ms resolution
- Event recording: 250 locally recorded events, 200 saved in case of loss of auxiliary supply
- Recording of measurements and current setting group
- Local / remote events acknowledgment
- Disturbance recording according to Comtrade® format: storage of 4 recordings of 52 periods
- Disturbance recording forced by digital input, setting software or communication channel
- Closing function: adjustment of phase, earth, negative sequence current thresholds by external input
- Remote setting, remote reading of measurements, counters, alarms and parameters settings
- Remote reading of disturbance recording and event log
- Self-diagnosis: Memories, output relays, A/D converters, auxiliary supply, cycles of execution of software, hardware failure
- Test of wiring, phase rotation and direction of the currents

## Options

- Communication by Modbus® - (IEC 60870-5-103 protocol: consult us)
- 2 inverse time curves, programmable (in factory, consult us) and downloadable

## Related equipment

- BA800 for ring CT 1500/1

## Functional diagram

