

RETROFITTING

Generator Protection Relay

NPG800R

NPG800R (R3 case) is dedicated to the refurbishment of CEE series 7000 relays providing the protection of generators connected on three-phase networks and driven by any type of prime mover: steam, hydraulic or gas turbine, diesel or gas engines. The various protection functions and measurement possibilities are suitable for hundreds kVA to tens MVA generator groups.

NP800R 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.

Two mountings are available, Flush Rear Connection (**EDPAR**) or Projecting Rear Connection (**SDPAR**).

Setting, reading, measurement and recording are all available locally or remotely.



NPG800R - EDPAR

Minimises retrofitting man-hours

Maximises preservation of existing installation

Simplifies and reduces re-commissioning time

Minimises retrofitting costs

Protection functions

- Minimum of impedance with 2 thresholds [21]
- Overfluxing with 2 thresholds [24]
- Undervoltage with 2 thresholds [27]
- Maximum [32P*] reverse [32RP] and minimum [37P] of active power
- Maximum with 2 thresholds [32Q*] and minimum [37Q] of reactive power
- Field failure with 2 thresholds [40]
- Negative phase sequence overcurrent with 2 thresholds [46]
- Thermal overload with 2 thresholds [49]
- Overcurrent with 3 thresholds [51-1] [51-2] [50]
- With voltage control unit [51-1V] [51-2V] [50V]
- Max of zero sequence voltage with 2 thresholds [59N]
- Overvoltage with 2 thresholds [59]
- Max of zero sequence current with 2 thresholds [64]
- Overfrequency with 2 thresholds [81O]
- Underfrequency with 2 thresholds [81U]
- * operating mode of power, import or export, configurable

Additional functions

- Latching of the output contacts [86]
- Trip circuit supervision of the breaker [74TC]
- Breaker failure [BF]
- Load shedding – Load Restoration, remote control

CHARACTERISTICS NPG800R

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 current inputs

In 1 or 5 A
burden at $I_n < 0.2 \text{ VA}$
continuous rating 3 I_n , short duration withstand 80 I_n / 1s
CT setting: primary value from 1 A to 10 kA
measurement from 0.01 to 18 I_n
display of primary current from 0 to 65 kA
5VA 5P10

- Recommended CTs
- Earth current inputs

I_{n0} 1 or 5 A
burden at $I_{n0} < 0.5 \text{ VA}$
continuous rating 1 I_{n0} , short duration withstand 40 I_{n0} / 1s
measurement from 0.005 to 2.4 I_{n0}
display of primary current from 0 to 6.5 kA
adjustment from 0.1 to 48 A primary
 U_n : 33 to 120 V
input impedance $> 80 \text{ k}\Omega$
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: 45-55 Hz or 55-65 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
 $< 10 \text{ Vdc}$ range 19 to 70 V – $< 33 \text{ Vdc}$ range 85 to 255 V
 $> 20 \text{ Vdc}$ range 19 to 70 V – $> 37 \text{ Vdc}$ range 85 to 255 V
programmable
 $< 15 \text{ mA}$

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

Outputs 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 $L/R = 40 \text{ ms}$: 50W
breaking capacity AC with $\cos \phi = 0.4$: 1250 VA
changeover contact, permanent current 10 A
closing capacity 15 A / 4 s
short circuit current withstand 250 A / 30 ms
breaking capacity DC with $L/R = 40 \text{ ms}$: 50W
breaking capacity AC with $\cos \phi = 0.4$: 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 Under Voltage Release)
- Relays pulse, except WD
- Assignment of name to the output
maximum of 16 characters

Minimum of impedance function [21]

- Trip authorization threshold $I_Z >$
- Operating range $Z < - Z < <$
- Thresholds accuracy
- Reset percentage on the operating level
- Instantaneous operating time
- Definite time delays
- Accuracy of the time delays
- Accuracy of displayed measures

10 to 40 % I_n
10 to 200 % Z_n
 $\pm 5\%$ or 3% of Z_n
105%
60 ms including trip relay
40 ms to 300 s
 $\pm 2\%$ or 20 ms
3% of Z_n

Overfluxing function [24]

- Operating range $(U/F) > - (U/F) > >$
- Measurement range
- Thresholds accuracy
- Reset percentage on the operating level
- Definite time delay
- Accuracy of the time delays
- Operating curves
- Curves accuracy
- Instantaneous operating time
- Accuracy of displayed measures

80 to 200 % U_n/F_n
45-55 Hz or 55-65 Hz
 $\pm 1.5\%$ of U_n/F_n
95%
200 ms to 10 s
 $\pm 2\%$ or 20 ms
IEC 60255-3, ANSI IEEE
class 5 - Time Multiplier Setting : 0.03 to 3 s
60 ms including trip relay
3% of U_n/F_n

CHARACTERISTICS NPG800R

Undervoltage function [27]

- Operating mode
 - Measurement method
 - Undervoltage operating range $U < - U < <$
 - Thresholds accuracy
 - Reset percentage on the operating level
 - Blocking of the thresholds
 - Definite time delay
 - Accuracy of the time delays
 - Operating curves
 - Curves accuracy
 - Instantaneous operating time
 - Accuracy of displayed measures
- function « Or » or « And » programmable
phase-neutral voltages or phase-phase voltages,
according to wiring
20 to 120 % U_n
2% U_n
103%
10% of U_n , programmable: in or out of service
40 ms to 300 s
 $\pm 2\%$ to 20 ms
IEC 60255-3, ANSI IEEE
class 5 - Time Multiplier Setting: 0.03 to 3 s
60 ms including trip relay
3% from 3 to 240 V

Power functions [32P] [32RP] [37P] [32Q] [37Q]

- Measurement method
 - Operation of the [32P] threshold and the two [32Q] thresholds
 - Operating range $RP >$, $P >$ and $P <$
 - Operating range $Q >$, $Q > >$ and $Q <$
 - P-Q thresholds accuracy
 - Reset percentage on the operating level
 - Instantaneous operating time
 - Definite time delay
 - Accuracy of the time delays
 - Operating curves
 - Curves accuracy
 - Accuracy of displayed measures
- 3I-2U or 3I-3V, according to wiring and programming
3 programmable modes for the power-flow :
export / import / export and import
1 to 120 % of S_n
1 to 120 % of S_n
0.5% of S_n , Blocking of the thresholds [37P] and [37Q] 0.5% of S_n
95% for $RP >$, $P >$ and $Q >$, 105% for $P <$ and $Q <$
60 ms including trip relay
40 ms to 300 s
 $\pm 2\%$ or 20 ms
IEC 60255-3, RI, ANSI IEEE
class 5 - Time Multiplier Setting: 0.03 to 3 s – RI: 0.01 to 20 s
1% of S_n

Field failure function [40]

- Setting of the circle offset X_2
 - Setting of the circle diameter X_1
 - Thresholds accuracy
 - Reset percentage on the operating level
 - Blocking threshold
 - Instantaneous operating time
 - Definite time delay
 - Accuracy of the time delays
 - Accuracy of displayed measures
- 8 to 40 % Z_n
50 to 500 % Z_n
 $\pm 5\%$ or 3% of Z_n
95%
 $U < 16\%$ of U_n or $I < 8\%$ of I_n
60 ms including trip relay
40 ms to 300 s
 $\pm 2\%$ or 20 ms
3% of Z_n

Negative phase sequence overcurrent function [46]

- Negative sequence threshold $I_2 >$ - $I_2 > >$
 - Thresholds accuracy
 - Reset percentage on the operating level
 - Inverse time curve
 - Min trip time
 - Curves accuracy
 - Definite time delay
 - Accuracy of the time delays
 - Instantaneous operating time
 - Accuracy of displayed measures
- 3 to 50% I_n
 $\pm 5\%$
95%
4 to 80 s (for $I_{neg} = 100\% I_{neg}/I_n$)
0.1 to 10 s
class 5, type: see application guide
40 ms to 300 s
 $\pm 2\%$ or 20 ms
60 ms including trip relay
3%

Thermal overload function [49]

- Tripping curves
 - Heating-time constant C_{TE}
 - Cooling time constant
 - Negative sequence factor
 - Thermal trip threshold I_b
 - Thermal alarm threshold
 - Thresholds accuracy
- IEC 60255-8
4 to 400 min
1 to 6.0 C_{TE} , in step of 0.1
0 to 9
40 to 130 % I_n
80 to 100 % θ thermal
class 5

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

- 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
 - Operating principle [51V] - [50V]
- 0.3 to 10 I_n
1% between 0.5 and 4 I_n - 3% from 0.3 to 0.5 I_n and from 4 to 10 I_n
95%
60 ms including trip for $I \geq 2 I_s$
40 ms to 300 s: [51-1] $I >$ - [51-2] $I > >$ - [50] $I > > >$
 $\pm 2\%$ or 20 ms
IEC 60255-3, ANSI IEEE
class 5 - Time Multiplier Setting: 0.03 to 3s (type: see last page)
assignment to [50] [51] thresholds of a criterion of voltage
user configurable: in or out of order

CHARACTERISTICS NPG800R

Overvoltage function [59]

- Operating mode
- Measurement method
- Overvoltage operating range $U> - U>>$
- Thresholds accuracy
- Reset percentage on the operating level
- Definite time delay
- Accuracy of the time delays
- Operating curves
- Curves accuracy
- Instantaneous operating time
- Accuracy of displayed measures

function « Or » or « And » programmable
phase-neutral or phase-phase voltages, according to wiring
40 to 150 % U_n
2% U_n
97%
40 ms to 300 s
 $\pm 2\%$ or 20 ms
IEC 60255-3, ANSI IEEE
class 5 - Time Multiplier Setting : 0.03 to 3 s
60 ms including trip relay
3% from 3 to 240 V

Maximum of zero sequence voltage [59N]

- Measurement of V_r (accord. Wiring)
- Operating range $V_o> - V_o>>$
- Thresholds accuracy
- Reset percentage on the operating level
- Instantaneous operating time
- Definite time delay
- Accuracy of the time delays
- Accuracy of displayed measures

calculated or measured (VT in neutral point or broken delta VTs)
2 to 80 % U_n
2% of U_n
97%
60 ms including trip relay
40 ms to 300 s
 $\pm 2\%$ or 20 ms
3% from 3 to 240 V

Maximum of zero sequence current [64]

- Operating range $I_o> - I_o>>$
- Thresholds accuracy
- Reset percentage on the operating level
- Instantaneous operating time
- Definite time delay
- Curves
- Curves accuracy

0.03 to 2.4 I_{n0} / CT – 0.6 to 48 A / ring
1% typical, 2% max from 0.05 to 0.4 I_{n0} / CT
3% typ., 5% max from 0.03 to 0.05 I_{n0} and 0.4 to 2.4 I_{n0} / CT
5% from 0.6 to 48 A / ring
97%
60 ms including trip relay for $I \geq 2 I_s$
40 ms to 300 s
IEC 60255-3, ANSI IEEE
class 5 - Time Multiplier Setting: 0.03 to 3 s

Frequency functions [810] [81U]

- Operating range $F> - F>>$
- Operating range $F< - F<<$
- Thresholds accuracy
- Reset value on the operating level
- Voltage inhibition threshold
- Instantaneous operating time
- Adjustment of time delays
- Accuracy of the time delays
- Accuracy of displayed measures

50.05 – 54.00 Hz / 60.05 – 64.00 Hz
46.00 – 49.95 Hz / 56.00 – 59.95 Hz
 ± 0.1 Hz
0.2 Hz
<10% of U_n
80 ms typical including trip relay, 150 ms maximum
80 ms to 10 s: [810] $F> - F>>$ - [81U] $F< - F<<$
 $\pm 2\%$ or 20 ms
0.1 Hz

Trip circuit supervision and breaker failure [74TC] [BF]

- Trip circuit supervision [74TC]
- Operating time (in faulty condition)
- Fixed operating range [BF]
- Breaker failure time delay

requires one or two digital inputs (see application guide)
500 ms fixed for [74TC] function
>0.5 % of I_n / >0.5% of I_n or >1% of U_n
60 to 1000 ms

Latching of the output contacts [86]

- Manual reset for output relays
- Reset

A, B, C, D, E, F, G (assignment programmable)
digital input, digital communication or local MMI

Digital inputs assignment

- By setting software
- Setting table selection
- Disturbance recording order
- Interlock o/o
- Interlock c/o
- Control mode
- Reset [86] function
- Trip circuit supervision
- CB trip external order
- Blocking of the protection functions
- Blocking of the time delays
- Input-Output Programmable functions

set 1 – set 2

dedicated to remote control, switching device position
dedicated to remote control, switching device position
dedicated to remote control, local / remote
acknowledgment of the selected output(s)
[74TC] function
function [74TC] blocked if external trip order
(except thermal function)
(when time delay cancelled, function acts instantaneously,
except [49] function)

CHARACTERISTICS NPG800R

User programmable functions (digital inputs – digital outputs)

- Status of the function in or out of service, by local MMI or by setting software
- Tripping mode or report report: for time stamping and event recorder
- Operating and release time delays tripping mode: 10 ms to 300 s
- Assignment of name to the function, maximum of 14 characters by setting software
- Assignment of one or more output relays (alarm or trip) by local MMI or by setting software

A, B, C, D, E, F, G

Load shedding – Load Restoration, remote control

- Load shedding level 1 to 6
- Time delay before reclosing 1 to 120 s, $\pm 2\%$
- Reclosing pulse 100 to 500 ms
- Output relays assignment 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

Counters

- Energy E. Active +, E. Active -, E. Reactive +, E. Reactive -
- Cumulative breaking current maximum $64 \cdot 10^6$ kA² (phase 1,2 and 3)
- Operation number circuit breaker 0 to 10 000

Man Machine Interface

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

MODBUS® Communication (option)

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

Disturbance recording

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

Presentation

- Height 4U
- Width case R3
- Brackets 19" rack mounting see drawing 9954 (7000 series rack definition table)

Case (see drawing D40037)

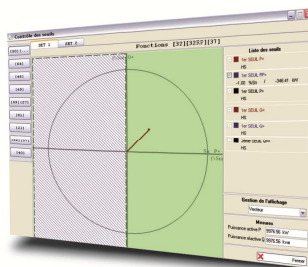
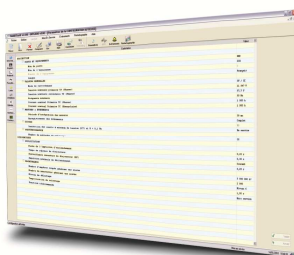
- **EDPAR**
 - H, W, D (case & base) 172 x 125 x 222 mm
 - H, W (front face dimensions) 217 x 140 mm
- **SDPAR**
 - H, W, D (case & base) 172 x 125 x 227 mm
 - H, W (front face dimensions) 172 x 125 mm
- Weight 4.5 kg

Connection - codification

- NPG800R See diagram S39961
- Ring CT See diagram 142941

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 and integrated values of phase currents and S, P, Q powers
 - Values, according to the wiring: phase to phase or phase to neutral voltages - residual voltage - zero sequence current
 - Thermal image value
 - Impedance
 - Frequency
 - Power factor, Cos ϕ
- Instantaneous alarm threshold
- Definite time tripping
- Dependent time tripping according to inverse/very inverse/extremely inverse IEC 60255-3curves
- Tripping according to moderately inverse/very inverse/extremely inverse ANSI /IEEE curves
- 2 setting groups, locally or remotely selectable by a digital input or by the communication channel
- Energy metering : storage of values / hour
- CB Monitoring : interlocks discrepancy, local or remote control of closing / tripping
- 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 10 ms resolution
- Time stamping of digital inputs with 10 ms resolution
- Event recording: 250 locally recorded events, 200 saved in case of loss of auxiliary supply
- Local / remote event acknowledgment
- Disturbance recording according to Comtrade® format: storage of 4 recordings of 52 periods
- Disturbance recording initiated by digital input, setting software or communication network
- 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

Functional diagram

