GENERATION & NETWORK
Voltage and Frequency Relay

NPU800 provides the voltage and frequency monitoring of electrical networks. This multi-function relay supervises phase to phase and phase to earth faults, positive, negative and zero sequence voltage and the good operating of the circuit breaker and its trip circuit. With its numerous under and over voltage and frequency thresholds, NPU800 is intended for network supervision, load management and load-shedding.

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.

NPU800

- Multifonction
- Measurement
- Recording / event log
- Disturbance recording
- Local MMI

Protection functions
- Undervoltage with 4 thresholds **[27]**
- Positive sequence voltage drops with 3 thresholds **[27P]**
- Max of negative sequence voltage with 2 thresholds **[47]**
- Overvoltage with 2 thresholds **[59]**
- Max of zero sequence voltage with 2 thresholds **[59N]**
- Overfrequency with 4 thresholds **[81O]**
- Underfrequency with 4 thresholds **[81U]**

Additional functions
- Latching of the output contacts **[86]**
- Trip circuit supervision of the breaker **[74TC]**

CHARACTERISTICS NPU800

Auxiliary Supply
- Auxiliary supply ranges   19 to 70 – 85 to 255 / Vdc or Vac 50 or 60 Hz
- Typical burden   6 W (DC), 6 VA (AC)
- Memory backup   72 hours

Connection modes
- 1, 2 or 3 phase to neutral voltages
- 1, 2 or 3 phase to phase voltages
- Zero sequence voltage measured if connection mode 1 or 2 voltage(s)

Analogue inputs
- 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
- Frequency (50Hz or 60Hz)   measurement: 45 to 55 Hz or 55 to 65 Hz

Digital inputs 4 or 8 according option
- 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
- Level 0   < 10Vdc range 19 to 70 V – < 33Vdc range 85 to 255 V
- Level 1   > 20Vdc range 19 to 70 V – > 37Vdc range 85 to 255 V
- Operating of the input by level 1 or 0   programmable
- Burden   < 15 mA

Output Relays 3* or 7 according option + 1 WD
- Relays A*, B*, E, F: double contact NO, permanent current 8 A
  (signalling, Shunt Opening Release)   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
- Relays C*, D, G & WD: changeover contact, permanent current 16 A
  (control, WD: Watchdog)   closing capacity 25 A / 4 s
  (C, D, G: programmable for CB Shunt   short circuit current withstand 250 A / 30 ms
  Opening Release or Under Voltage   breaking capacity DC with L/R = 40 ms: 50W
  Release)   breaking capacity AC with cos φ = 0.4: 1250 VA
- Relays pulse, except WD   adjustable from 100 to 500 ms
- Assignment of name to the output   by the setting software
- maximum of 16 characters   capital letters or digits

Undervoltage [27]
- Operating mode   function « Or » or « And » programmable
- Measurement method   phase to neutral or phase to phase, according to wiring
- Setting of thresholds   5 à 120 % Un
  U< - U<< - U<<< - U<<<<
- Reset percentage on the operating level   103%
- Thresholds accuracy   2%
- Definite time delays   40 ms to 300 s
- Tripping curves   CEI 60255-4, ANSI IEEE
- Accuracy and type of curves   class 5 - Time Multiplier Setting: 0,03 à 3 s, type see
                                              Functionalities
- Instantaneous operating time   60 ms including trip relay
- Blocking of the thresholds   10% Un, programmable: in or out of service (If the blocking is
                                              activated, the minimum setting of the thresholds is 20% Un)
- Display accuracy   5% from 3 to 240 V
  Note: the functions [27] and [27P] cannot be used simultaneously

Positive sequence voltage drops [27P]
- Measurement method   positive voltage calculated with 3 phase connection mode
- Setting of thresholds   5 to 120 % Un
  Ud<- Ud<< - Ud<<<
- Reset percentage on the operating level   103%
- Definite time delay   40 ms to 300 s
- Time delays accuracy   ± 2% or 20 ms
- Instantaneous operating time   60 ms including trip relay
- Blocking of the thresholds   10% Un, programmable: in or out of service (If the blocking is
                                              activated, the minimum setting of the thresholds is 20% Un)
- Display accuracy   5% from 3 to 240 V
  Note: the functions [27] and [27P] cannot be used simultaneously

CHARACTERISTICS NPU800

Max of negative sequence voltage [47]
- Measurement method   negative voltage calculated with 3 phase connection mode
- Setting of thresholds $U_{neg}>$ - $U_{neg}>>$ 3 to 30 % Un
- Thresholds accuracy   5% Un
- Reset percentage on the operating level   94%
- Definite time delays   40 ms to 300 s
- Time delays accuracy   ± 2% or 20 ms
- Instantaneous operating time   60 ms including trip for U ≥ 2 Us
- Accuracy of displayed measures   3% from 3 to 240 V

Overvoltage function [59]
- Operating mode   function « Or » or « And » programmable
- Measurement method   phase-neutral voltages or phase-phase voltages, according to wiring
- Setting of thresholds U> - U>>   40 to 200 % Un
- Reset percentage on the operating level   97%
- Thresholds accuracy   2% from 40% to 150% Un – 3% above 150% Un
- Definite time delays   40 ms to 300 s
- Accuracy of the time delays   ± 2% or 20 ms
- Operating curves   IEC 60255-3, ANSI IEEE and factory programmable (consult us)
- Curves accuracy   class 5 - Time Multiplier Setting: 0.03 to 3 s
- Instantaneous operating time   60 ms including trip relay
- Accuracy of displayed measures   3% from 3 to 240 V

Max of zero sequence voltage [59N]
- Measurement method (according wiring)   calculated: 3 phase and neutral connection
  measured: with 1 neutral point VT or 3 VT with broken delta (<u>with V1 or U12 connected</u>)
- Setting of thresholds Vo> - Vo>>   2 to 80 % Un
- Thresholds accuracy   2% of Un
- Reset percentage on the operating level   97%
- Instantaneous operating time   60 ms including trip relay Vo ≥ 2 Vs
- Definite time delays   40 ms to 300 s
- Accuracy of the time delays   ± 2% or 20 ms
- Accuracy of displayed measures   3% from 3 to 240 V

Frequency functions [81O] [81U]
- Setting of the 4 thresholds F> ... F>>>>   50.05 – 54.00 Hz / 60.05 – 64.00 Hz
- Setting of the 4 thresholds F> ... F>>>>   46.00 – 49.95 Hz / 56.00 – 59.95 Hz
- Thresholds accuracy   ± 0.1 Hz
- Reset value on the operating level   0.2 Hz
- Voltage inhibition threshold   10% of Un
- Instantaneous operating time   80 ms typical including trip relay, 150 ms maximum
- Adjustment of time delays   80 ms to 10 s
- Accuracy of the time delays   ± 2% or 20 ms
- Accuracy of displayed measures   0.1 Hz

Trip circuit supervision of the breaker [74TC]
- Trip circuit supervision   requires four digital inputs (see application guide)
- Operating time (in faulty condition)   500 ms fixed

Latching of the output contacts [86]
- Latching of output relays   A, B, C and with option: D, E, F, G (programmable assignment)
- Reset   digital input, digital communication or local MMI

Digital inputs assignment
- By setting software
- Setting table selection   set 1 – set 2
- Disturbance recording order
- Interlock o/o
- Interlock c/o
- Control mode   dedicated to remote control, local / remote
- Reset [86] function   acknowledgment of the selected output(s)
- Trip circuit supervision   [74TC] function
- CB trip external order   function [74TC] blocked if external trip order
- Input – output programmable functions

CHARACTERISTICS NPU800

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

Load shedding – Load Restoration, remote control (communication option)
- Load shedding level   1 to 6
- Time delay before reclosing   1 to 120 s, ± 2%
- Reclosing pulse   100 to 500 ms (remote control)
- Output relays assigned   programmable by local MMI or by setting software
       A, B, C and with option: 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   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

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

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

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: 1.2/50µs)
       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_{rms} – 1 min
       differential mode for Digital Output 1 kV_{rms} – 1 min
       (contact open)
- Insulation resistance   IEC / EN 60255-5: 500 Vdc - 1 s: > 100 MΩ
- 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   IEC / EN 60529: IP51, with front face
  enclosures (IP code)

CHARACTERISTICS NPU800

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   IEC / EN 61000-4-8: class IV, 30 A/m continuous, 300 A/m
  immunity test   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)
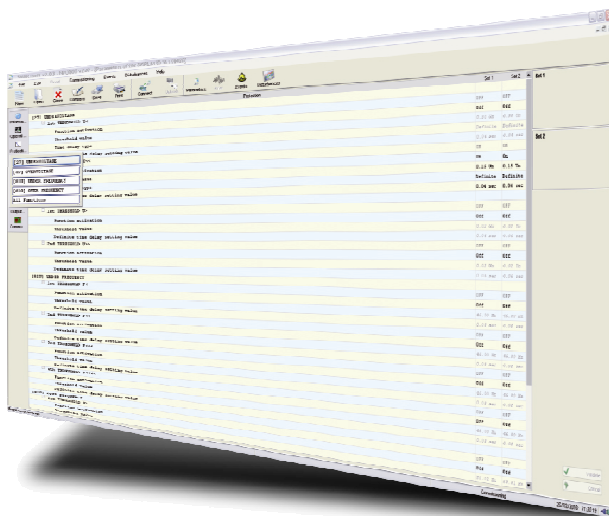
Case
- H, W, D without connector   173 x 106,3 x 250 mm (see drawing D37739)
- Weight   3.6 kg

Connection - codification
- See diagram S38025

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 to neutral voltages V or phase to phase voltages U
  Positive and negative sequence voltage (according wiring)
  Frequency
  Residual voltage and maximum value
- Instantaneous voltage alarm threshold
- Instantaneous frequency alarm threshold
- Definite time tripping for undervoltage and overvoltage thresholds
- Definite time tripping for undervoltage and overvoltage thresholds inverse/very inverse/extremely inverse time according to IEC inverse/very inverse/extremely inverse time according to ANSI /IEEE
- Definite time tripping for positive sequence voltage drop thresholds
- Tripping on frequency thresholds: programmable definite time
- 2 setting groups, locally or remotely selectable
- CB Monitoring: interlocks discrepancy, local or remote control of reclosing / 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 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 logical states of digital I/O, of measures, of faulty phase (phase to neutral voltages only), of 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
- 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 order

Options

- Communication by Modbus® - (IEC 60870-5-103 protocol: consult us)
- Additional card with 4 assignable output relays and 4 assignable digital inputs

Functional diagram