

GENERATION & NETWORK

Generator Protection

NPG800

NPG800 protects generators connected to three phase network and driven by any type of prime mover: steam, hydraulic or gas turbine and also diesel or gas engine.

The various functions and connection possibilities are suitable for hundreds kVA to tens MVA generators.

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

- 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 (communication option)



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CHARACTERISTICS NPG800

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 $I_n < 0.2$ VA
continuous rating 3 I_n , short duration withstand 100 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 $I_{n0} < 0.5$ VA
continuous rating 1 I_{n0} , short duration withstand 40 I_{n0} / 1s
measurement from 0.005 to 2.4 I_{n0}

- Earth current input from Ring CT 100/1
- Phase voltage inputs

display of primary current from 0 to 6.5 kA
adjustment from 0.1 to 48 A primary

- Frequency (50Hz or 60Hz)

U_n : 33 to 120 V

input impedance > 80 k Ω

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

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 Vdc range 19 to 70 V – < 33 Vdc range 85 to 255 V
 > 20 Vdc range 19 to 70 V – > 37 Vdc range 85 to 255 V
programmable
 < 15 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 $L/R = 40$ ms: 50W
breaking capacity AC with $\cos \phi = 0.4$: 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 $\cos \phi = 0.4$: 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 and factory configurable (consult us)
class 5 - Time Multiplier Setting : 0.03 to 3 s
60 ms including trip relay
3% of U_n/F_n

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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 and factory configurable (consult us)
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 and factory configurable (consult us)
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 X2
 - Setting of the circle diameter X1
 - 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 $I2> - I2>>$
 - 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 and factory programmable (consult us)
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 NPG800

Overvoltage function [59]

- Operating mode function « Or » or « And » programmable
- Measurement method phase-neutral or phase-phase voltages, according to wiring
- Overvoltage operating range $U> - U>>$ 40 to 150 % U_n
- Thresholds accuracy 2% U_n
- Reset percentage on the operating level 97%
- Definite time delay 40 ms to 300 s
- Accuracy of the time delays $\pm 2\%$ 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

Maximum of zero sequence voltage [59N]

- Measurement of V_r (accord. Wiring) calculated or measured (VT in neutral point or broken delta VTs)
- Operating range $V_{o>} - V_{o>>}$ 2 to 80 % U_n
- Thresholds accuracy 2% of U_n
- Reset percentage on the operating level 97%
- Instantaneous operating time 60 ms including trip relay
- Definite time delay 40 ms to 300 s
- Accuracy of the time delays $\pm 2\%$ or 20 ms
- Accuracy of displayed measures 3% from 3 to 240 V

Maximum of zero sequence current [64]

- Operating range $I_{o>} - I_{o>>}$ 0.03 to 2.4 $I_{n0} / CT - 0.6$ to 48 A / ring
- Thresholds accuracy 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
- Reset percentage on the operating level 97%
- Instantaneous operating time 60 ms including trip relay for $I \geq 2 I_s$
- Definite time delay 40 ms to 300 s
- Curves IEC 60255-3, ANSI IEEE and factory programmable (consult us)
- Curves accuracy class 5 - Time Multiplier Setting: 0.03 to 3 s

Frequency functions [810] [81U]

- Operating range $F> - F>>$ 50.05 – 54.00 Hz / 60.05 – 64.00 Hz
- Operating range $F< - F<<$ 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 U_n
- Instantaneous operating time 80 ms typical including trip relay, 150 ms maximum
- Adjustment of time delays 80 ms to 10 s: [810] $F> - F>>$ - [81U] $F< - F<<$
- Accuracy of the time delays $\pm 2\%$ or 20 ms
- Accuracy of displayed measures 0.1 Hz

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

- Trip circuit supervision [74TC] requires one or two digital inputs (see application guide)
- Operating time (in faulty condition) 500 ms fixed for [74TC] function
- Fixed operating range [BF] $>0.5\%$ of $I_n / >0.5\%$ of I_n or $>1\%$ of U_n
- Breaker failure time delay 60 to 1000 ms

Latching of the output contacts [86]

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

Digital inputs assignment

- By setting software set 1 – set 2
- Setting table selection
- Disturbance recording order
- Interlock o/o dedicated to remote control, switching device position
- Interlock c/o dedicated to remote control, switching device position
- 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 (except thermal function)
- Blocking of the protection functions (when time delay cancelled, function acts instantaneously, except [49] function)
- Blocking of the time delays
- Input-Output Programmable functions

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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 setting software
report: for time stamping and event recorder
tripping mode: 10 ms to 300 s
by setting software

by local MMI or by setting software
A, B, C, D, E, F, G

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

- Load shedding level
- Time delay before reclosing
- Reclosing pulse
- Output relays assignment

1 to 6
1 to 120 s, $\pm 2\%$
100 to 500 ms

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
- Cumulative breaking current
- Operation number circuit breaker

E. Active +, E. Active -, E. Reactive +, E. Reactive -
maximum $64 \cdot 10^6$ kA² (phase 1,2 and 3)
0 to 10 000

Man Machine Interface

- Relay display Language
- Configuration and operating software Language

2 lines of 16 characters
French, English, Spanish, Italian
Windows® 2000, XP, Vista and 7 compatible
French, English, Spanish, Italian

MODBUS® Communication (option)

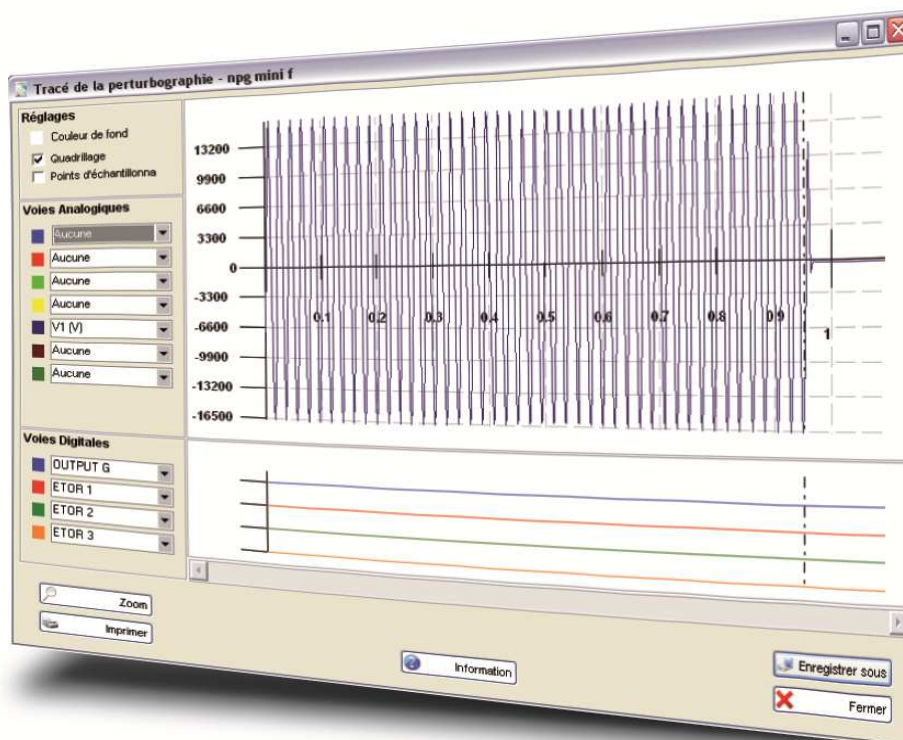
- Transmission Interface
- Transmission speed

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



CHARACTERISTICS NPG800

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 to +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

Electrical safety

- Ground bond test current
- Impulse voltage withstand

- Dielectric withstand (50Hz or 60Hz)

- Insulation resistance
- Clearance and creepage distances

IEC / EN 61010-1: 30 A
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
IEC / EN 60255-5: common mode 2 kV_{rms} - 1 min differential mode for Digital Output 1 kV_{rms} - 1 min (open contact)
IEC / EN 60255-5: 500 Vdc - 1 s : > 100 MΩ
IEC / EN 60255-5: rated insulation voltage: 250 V
pollution degree: 2
overvoltage category: III

Enclosure safety

- Degree of protection provided by enclosure (IP code)

IEC / EN 60529 : IP51, with front face

Immunity – Conducted disturbances

- Immunity to RF conducted disturbances
- Fast transient
- Oscillatory waves disturbance

- Surge immunity
- Supply interruptions

IEC / EN 61000-4-6: class III, 10 V
IEC / EN 60255-22-4 / IEC / EN 61000-4-4: class IV
IEC / EN 60255-22-1: class III, 2.5 kV CM, 1 kV DM except RS485, class II, 1 kV CM
IEC / EN 61000-4-5: class III
IEC / EN 60255-11: 100% 20 ms

Immunity – Radiated disturbances

- Immunity to RF radiated fields

- Electrostatic discharges

- Power frequency magnetic field immunity test

IEC / EN 60255-22-3 /
IEC / EN 61000-4-3 : class III, 10 V/m
IEC / EN 60255-22-2 /
IEC / EN 61000-4-2: class III, 8 kV air / 6 kV contact
IEC / EN 61000-4-8: class IV, 30 A/m continuous, 300 A/m 1 to 3 s

Mechanical robustness - energised

- Vibrations
- Shocks

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

Mechanical robustness - not energised

- Vibrations
- Shocks
- Bumps
- Free fall

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

Electromagnetic compatibility (EMC)

- Radiated field emissivity
- Conducted disturbance emissivity

EN 55022: class A
EN 55022: class A

Presentation

- Height
- Width
- Brackets 19" rack mounting

4U
¼ 19"
option (see drawing D37739)

Case

- H, W, D without short-circuiting device
- H, W, D with short-circuiting devices
- Weight

173 x 106.3 x 250 mm (see drawing D37739)
173 x 106.3 x 305 mm (see drawing D37739)
3.6 kg

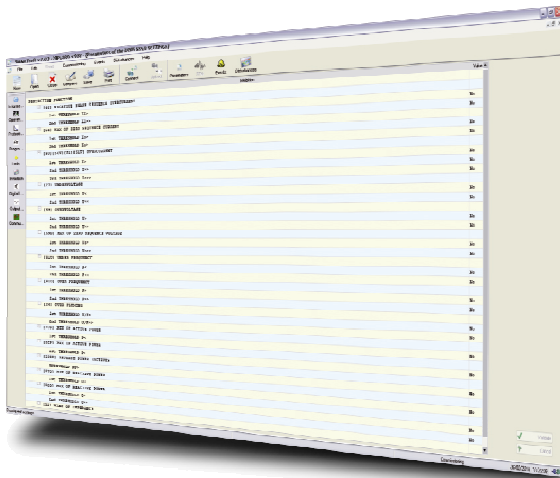
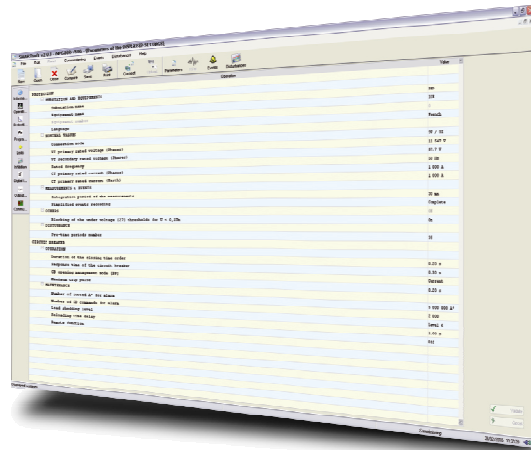
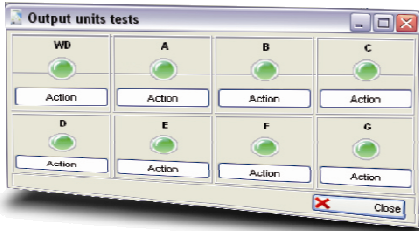
Connection - codification

- See diagram S39494
- Ring CT

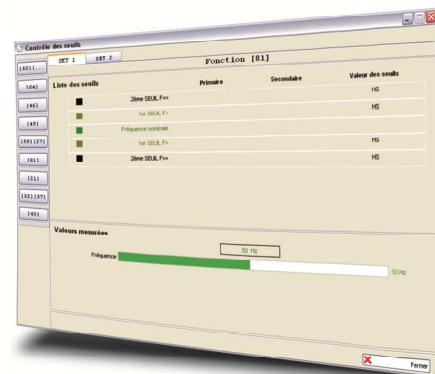
See diagram 142941

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



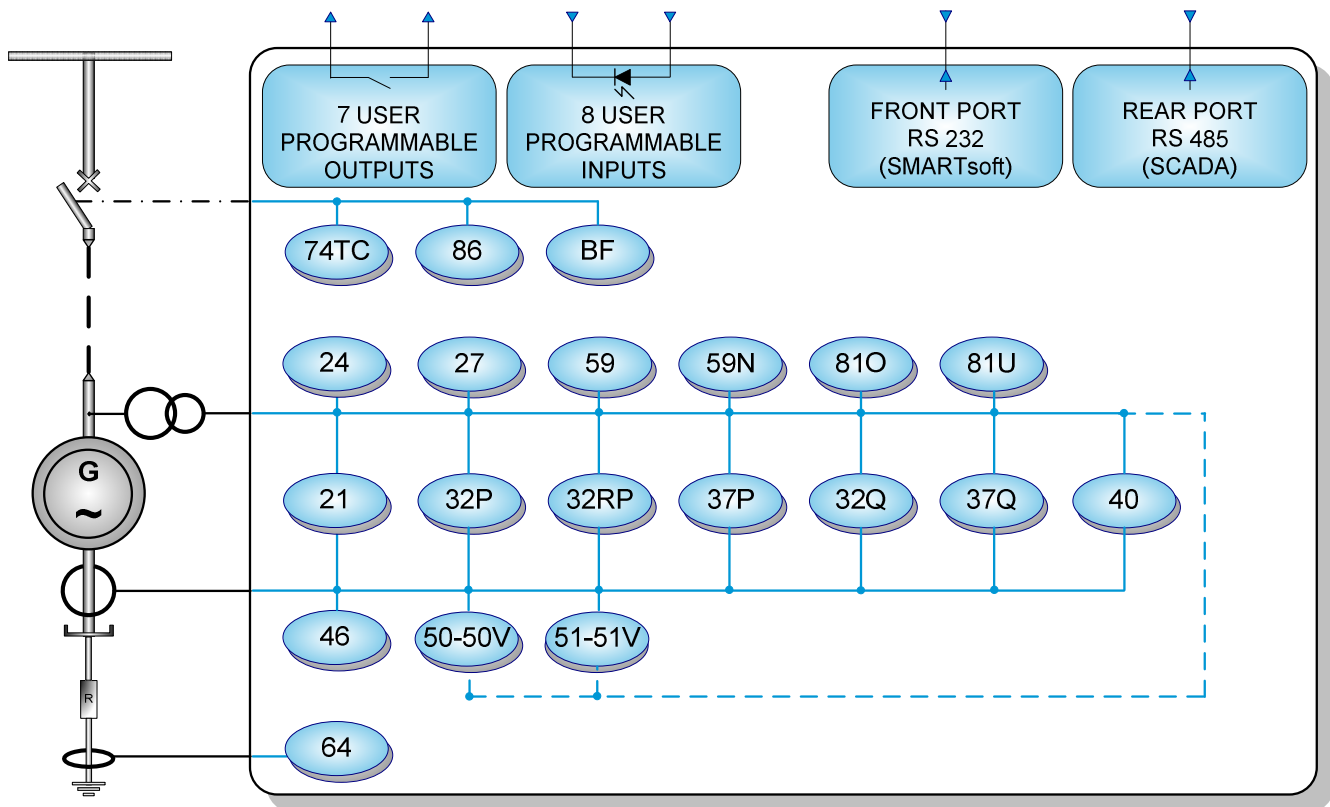
Functionalities

- 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 60255-3 curves
- 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

Options

- Communication by Modbus® RS 485
- Communication by Modbus® RS 485 with redundancy
- 2 dependent time, configurable and downloadable curves, consult us

Functional diagram



The specifications and drawings given are subject to change and are not binding unless confirmed by our specialists.



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