ICE

PROTECTION
& CONTROL
COMMAND

NPG800

ICE Group

EE TECHNIREL

GENERATOR PROTECTION RELAY

NPG800 protects synchronous 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 output contacts **[86]**
- Trip circuit supervision of the breaker **[74TC]**
- Breaker failure **[BF]**
- Load shedding – Load Restoration, remote control (communication option)

CHARACTERISTICS NPG800

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

Analogue inputs
- Phase current inputs   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 0.01 to 18 In
  - display of primary current from 0 to 65 kA
- Recommended CTs   5VA 5P10
- Earth current inputs In_0 1 or 5 A
  - burden at In_0 < 0.5 VA
  - Continuous rating 1 In_0, short duration withstand 40 In_0 / 1s
  - measurement from 0.005 to 2.4 In_0
  - display of primary current from 0 to 6.5 kA
- Earth current input from Ring CT 100/1   adjustment from 0.1 to 48 A primary
- Phase voltage inputs   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: 45-55 Hz or 55-65 Hz

Digital inputs (8)
- Polarizing voltage   19 to 70 Vdc for 19 to 70 V auxiliary supply range
  - 37 to 125 Vdc for 85 to 255 V auxiliary supply range
- Level 0   < 10V range 19 to 70 Vdc – < 33V range 85 to 255 Vdc
- Level 1   > 20V range 19 to 70 Vdc – > 37V range 85 to 255 Vdc
- Operating of the input by level 1 or 0   programmable
- Burden   < 15 mA

Outputs Relays (7 + 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 et 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 Release)   breaking capacity DC with L/R = 40 ms : 50W
  - 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

Minimum of impedance function [21]
- Trip authorization threshold IZ>   10 to 40 % In
- Z< - Z<< operating range   10 to 200 % Zn
- Z< - Z<< accuracy of thresholds   ± 5% or 3% of Zn
- Reset percentage on the operating level   105%
- Instantaneous operating time   60 ms including trip relay
- Definite time delay   40 ms to 300 s
- Accuracy of the time delays   ± 2% or 20 ms
- Accuracy of displayed measures   3% of Zn

Overfluxing function [24]
- (U/F)> - (U/F)>> operating range   80 to 200 % Un/Fn
- Measurement range   45-55 Hz or 55-65 Hz
- Accuracy of thresholds   ± 1 .5% of Un/Fn
- Reset percentage on the operating level   95%
- Definite time delay   200 ms to 10 s
- Accuracy of the time delays   ± 2% or 20 ms
- Operating curves   IEC 60255-4, ANSI IEEE and factory configurable (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% of Un/Fn

CHARACTERISTICS NPG800

Undervoltage function [27]

• Operating mode	function « Or » or « And » programmable
• Measurement method	phase-neutral voltages or phase-phase voltages, according to wiring
• Undervoltage operating range U< - U<<	20 to 120 % Un
• Thresholds accuracy	2% Un
• Reset percentage on the operating level	103%
• Blocking of the thresholds	10% of Un, programmable : in or out of service
• Definite time delay	40 ms to 300 s
• Accuracy of the time delays	± 2% to 20 ms
• Operating curves	IEC 60255-4, ANSI IEEE and factory configurable (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

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

• Measurement method	3I-2U or 3I-3V, according to wiring and programming
• Operation of the [32P] threshold and the two [32Q] thresholds	3 programmable modes for the power-flow : export / import / export and import
• RP>, P> and P< operating range	1 to 120 % of Sn
• Q>, Q>> and Q< operating range	1 to 120 % of Sn
• P-Q thresholds accuracy	0.5% of Sn, Blocking of the thresholds [37P] and [37Q] 0.5% of Sn
• Reset percentage on the operating level	95% for RP>, P> and Q>, 105% for P< and Q<
• Instantaneous operating time	60 ms including trip relay
• Definite time delay	40 ms to 300 s
• Accuracy of the time delays	± 2% or 20 ms
• Operating curves	IEC 60255-4, RI, ANSI IEEE and factory configurable (consult us)
• Curves accuracy	class 5 - Time Multiplier Setting : 0.03 to 3 s – RI : 0.01 to 20 s
• Accuracy of displayed measures	1% of Sn

Field failure function [40]

• Setting of the circle offset X2	8 to 40 % Zn
• Setting of the circle diameter X1	50 to 500 % Zn
• Thresholds accuracy	± 5% or 3% of Zn
• Reset percentage on the operating level	95%
• Blocking threshold	U<16% of Un or I< 8% of In
• Instantaneous operating time	60 ms including trip relay
• Definite time delay	40 ms to 300 s
• Accuracy of the time delays	± 2% or 20 ms
• Accuracy of displayed measures	3% of Zn

Negative phase sequence overcurrent function [46]

• Negative sequence threshold I2> - I2>>	3 to 50% In
• Thresholds accuracy	± 5%
• Reset percentage on the operating level	95%
• Inverse time curve	4 to 80 s (for Ineg = 100% Ineg/In)
• Min trip time	0.1 to 10 s
• Curves accuracy	class 5, type: see application guide
• Definite time delay	40 ms to 300 s
• Accuracy of the time delays	± 2% or 20 ms
• Instantaneous operating time	60 ms including trip relay
• Accuracy of displayed measures	3%

Thermal overload function [49]

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

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

• Operating range I> - I>> - I>>>	0.3 to 10 In
• Thresholds accuracy	1% between 0.5 and 4 In - 3% from 0.3 to 0.5 In and from 4 to 10 In
• Reset percentage on the operating level	95%
• Instantaneous operating time	60 ms including trip for I ≥ 2 Is
• Definite time delay	40 ms to 300 s: [51-1] I> - [51-2] I>> - [50] I>>>
• Accuracy of the time delays	± 2% or 20 ms
• Curves [51-1] I> - [51-2] I>>	IEC 60255-4, ANSI IEEE and factory programmable (consult us)
• Curves accuracy and type	class 5 - Time Multiplier Setting: 0.03 to 3s (type: see last page)
• Operating principle [51V] – [50V]	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 % Un
- Thresholds accuracy   2% Un
- Reset percentage on the operating level   97%
- Definite time delay   40 ms to 300 s
- Accuracy of the time delays   ± 2% or 20 ms
- Operating curves   IEC 60255-4, 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 Vr (accord. Wiring)   calculated or measured (VT in neutral point or broken delta VTs)
- Setting of Vo> - Vo>> thresholds   2 to 80 % Un
- Thresholds accuracy   2% of Un
- 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   ± 2% or 20 ms
- Accuracy of displayed measures   3% from 3 to 240 V

Maximum of zero sequence current [64]
- Setting of Io> - Io>> thresholds   0.03 to 2.4 In_0 / CT – 0.6 to 48 A / ring
- Thresholds accuracy   1% between 0.05 and 0.4 In_0 ; 3% of 0.03 to 0.5 In_0 and 0.4 to 2.4 In_0/ CT
  5% from 0.6 to 48 A / ring
- Instantaneous operating time   60 ms including trip relay for I $\geq$ 2 Is
- Definite time delay   40 ms to 300 s
- Curves   IEC 60255-4, ANSI IEEE and factory programmable (consult us)
- Curves accuracy   class 5 - Time Multiplier Setting : 0.03 to 3 s

Frequency functions [81O] [81U]
- Setting of F> - F>> thresholds   50.05 – 54.00 Hz / 60.05 – 64.00 Hz
- Setting of F< - F<< thresholds   46.00 – 49.95 Hz / 56.00 – 59.95 Hz
- Thresholds accuracy   ± 0.1 Hz
- Reset value on the operating level   0.2 Hz
- Blocked for voltage   10% of Un
- Instantaneous operating time   80 ms typical including trip relay, 150 ms maximum
- Adjustment of time delays   80 ms to 10 s : [81O] F> - F>> - [81U] F< - F<<
- Accuracy of the time delays   ± 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 In / >0.5% of In or >1% of Un
- Breaker failure time delay   60 to 1000 ms

Latching output contacts function [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
- Setting table selection   set 1 – set 2
- 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
- Blocking of the protection functions   (except thermal function)
  Blocking of the time delays   (when time delay cancelled, function acts instantaneously, except [49] function)

- Programmable function

CHARACTERISTICS NPG800

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,   by setting software
                                             maximum of 14 characters
- Assignment of one or more output   by local MMI or by setting software
  relays (alarm or trip)   A, B, C, 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% or 20 ms
- Reclosing pulse   100 to 500 ms
- Output relays assignement   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 -

Setting software
- Display   French, English, Spanish, Italian
- Configuration and operating software   Windows® 2000, XP, Vista and 7 compatible
                                             French, English, Spanish, Italian

MODBUS® Communication (option)
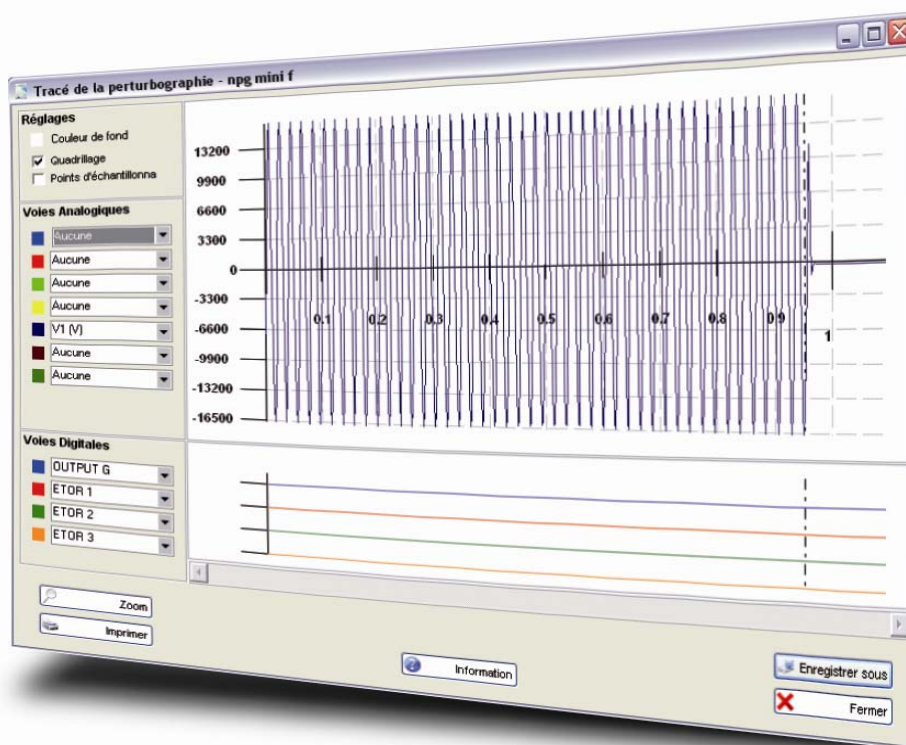- Transmission   asynchronous series, 2 wires
- Interface   RS 485
- Transmission speed   300 to 115 200 bauds

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

CHARACTERISTICS NPG800

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 speed — IEC / EN 60068-2-14: class Nb, -10 °C à +55 °C, 3 °C/min

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 (open contact)
- 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 enclosure (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 transient — 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

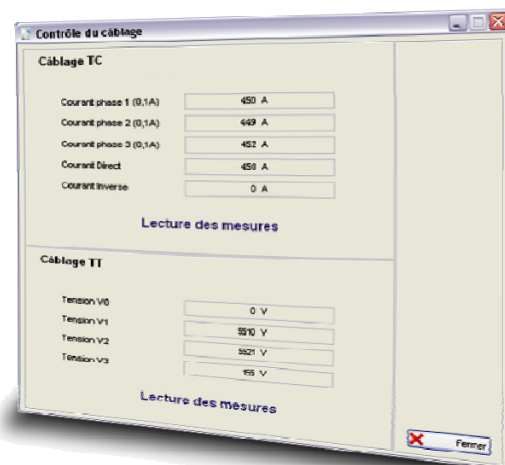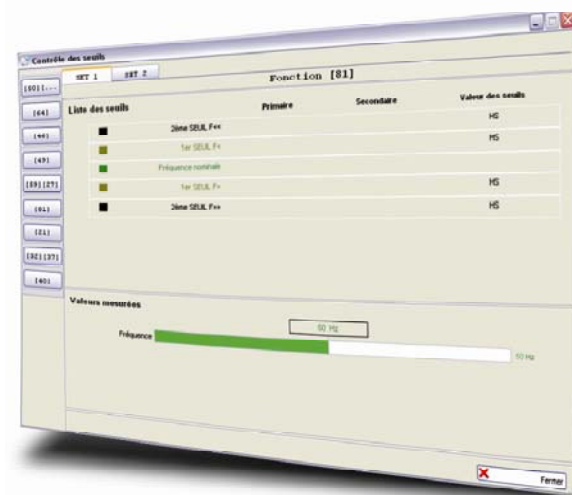## Connection - codification
- See diagram S39494

SMARTsoft

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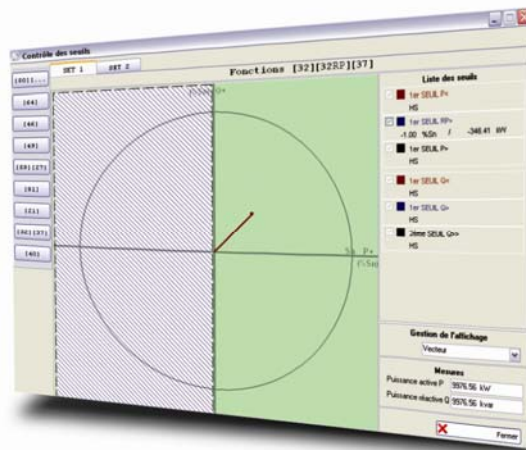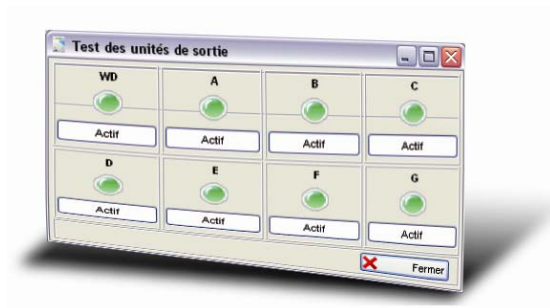
SMARTsoft

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 power
  - 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, Cosφ
- Instantaneous alarm threshold
- Definite time tripping
- Dependent time tripping according to inverse/very inverse/extremely inverse IEC 60255-4 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 internals 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
- 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

(See diagram S39494 for various wirings)

ICE

A497B