

RAILWAY

DC Line Fault Detector

DDL800 performs monitoring of railway and tramway catenaries on DC electrical networks.

DDL800 acts according to rate of rise overcurrent criteria and includes a de-icing monitoring function. A voltage protection is available as well as many operating functions such as a cable thermal image, a recloser with substation management and the check of the correct operation of the high speed circuit breaker.

The optional line test equipment EDL (consult us) confirms the fault elimination before authorizing the closing of the circuit breaker.

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

- Presence and lack of catenary voltage (**P.L.V.**)
- Substation and catenary voltage comparison (**ΔU**)
- Voltage drop monitoring (**ΔU_L**)
- Catenary voltage monitoring [**27DC**] [**59DC**]
- Recloser management on external trip
- Overcurrent protection [**76-1**] [**76-2**]
- Rate-of-rise overcurrent protection (**di/dt**)
- Delta I current step protection (**ΔI**)
- De-icing differential protection [**87**]
- Upstream current detection (monitoring of current flowing to substation)
- Cable thermal image [**49DC**]
- Four shot recloser [**82**]
- High speed circuit breaker failure [**76BF**]
- Sensors monitoring (**S.M.**)
- Latching of the output contacts [**86**]
- Programmable line test before reclosure (with optional EDL interface, see application guide)

CHARACTERISTICS DDL800

Auxiliary Supply

- Auxiliary supply ranges
- Operating range
- Maximum consumption
- Memory backup

48 VDC or 125 VDC
-20% / +10%
< 30 W, with auxiliary supply of 4 sensors
72 hours

Measurements

- DC sensors, current and voltage (contact us for more information)
- Current sensor (I_{catenary} , I_{track})
- Voltage sensor (U_{catenary} , $U_{\text{substation}}$)

voltage supply provided: 48 VDC or +/- 15 VDC (-10%; +10%)

primary value adjustable from 1000 A to 10000 A
secondary value: 5 or 10 V
primary value adjustable from 500 V to 4000 V
rated voltage adjustable from 500 V to 3500 V
secondary value: 5 or 10 V

Analogue Inputs

- Current: 2
- Voltage: 2

I_{catenary} , I_{track} ,
 U_{catenary} , $U_{\text{substation}}$

Digital Inputs (8)

- Polarizing voltage
- Level 0
- Level 1
- Burden

48 VDC or 125 VDC (according to the auxiliary supply range)
< 10 VDC range 48 VDC - < 33 VDC range 125 VDC
> 20 VDC range 48 VDC - > 37 VDC range 125 VDC
< 15 mA

Relay outputs (7 + 1 WD)

- Relay A, B, E, F: (signalling)

- Relay C, D, G and WD: (control, WD: watchdog)

double NO contact, permanent current 8 A
closing capacity 12 A / 4 s
short-circuit current withstand 100 A / 30 ms
breaking capacity CC with L/R = 40 ms: 50 W
breaking capacity CA with $\cos \varphi = 0.4$: 1250 VA
changeover contact, permanent current 16 A
closing capacity 25 A / 4 s
short-circuit current withstand 250 A / 30 ms
breaking capacity CC with L/R = 40 ms : 50 W
breaking capacity CA with $\cos \varphi = 0.4$: 1250 VA

Overcurrent protection [76-1][76-2]

- 2 thresholds (MAXI1 ; MAXI2)
- Operation of MAXI1 and MAXI2
- Time-delay Ti1 (MAXI1)
Time-delay Ti2 (MAXI2)

10 to 10 000 A, step of 10 A
2 programmable mode: non directional / forward only
10 to 250 ms, step of 10 ms
10 ms to 120 s, step of 10 ms

Rate-of-current rise protection (di/dt)

- Enabling (E) and Disabling (D) thresholds
- Fault measuring time TMD

1 to 250A /ms, step of 1 with D<E
1 to 400 ms, step of 1 ms

Delta I current step protection (ΔI)

- Step of current (Delta I)
- Time constant T for Delta I(t)

10 to 10 000 A, step of 10 A
1 to 400 ms, step of 1 ms

De-icing differential protection [87]

- Operating mode
- De-icing threshold (I_{track})
- De-icing monitoring time
- Differential threshold ($I_{\text{diff}} = I_{\text{cat}} - I_{\text{track}}$)
- Differential trip time

use of 2 sensors for measurement of I_{track} and I_{cat}
10 to 10 000 A, step of 10 A
0 to 60 min, step of 1 min
10 to 10 000 A, step of 10 A
10 to 400 ms, step of 10 ms

Operating parameters

- Pulse time of the trip order (Td)
- Pulse time of the close order (Te)
- Reclosing order after external trip
- Blocking time-delay after external trip

0.10 to 10.00 s, step of 0.01 s
0.10 to 2.00 s, step of 0.01 s
programmable: yes / no
0.10 to 10.00 s step of 0.01 s

Sensors monitoring (S.M.)

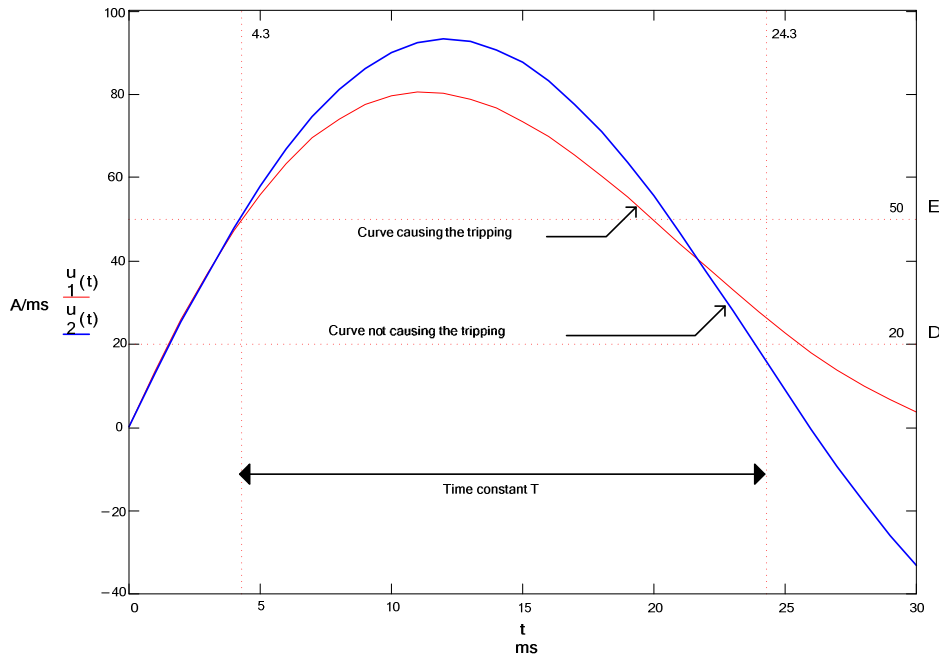
- Monitoring of the current sensors
- Monitoring threshold (f / calibration offset)
- Number of samples filtered
- Time-delay alarm
- Assignment of sensor alarm to WD relay

programmable for sensor 1 and 2: without / with
50 to 90%, step of 10%

1 to 200
10 to 30 min, step of 1 min
programmable: yes / no

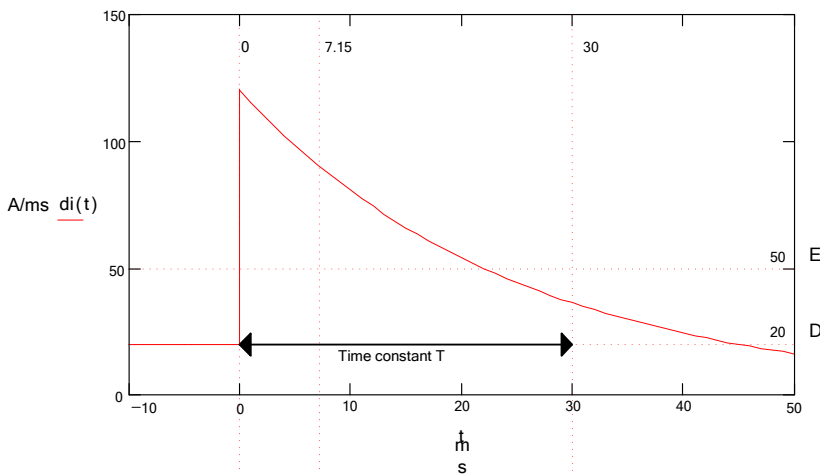
CHARACTERISTICS DDL800

Tripping by Rate-of-current-rise (di/dt)

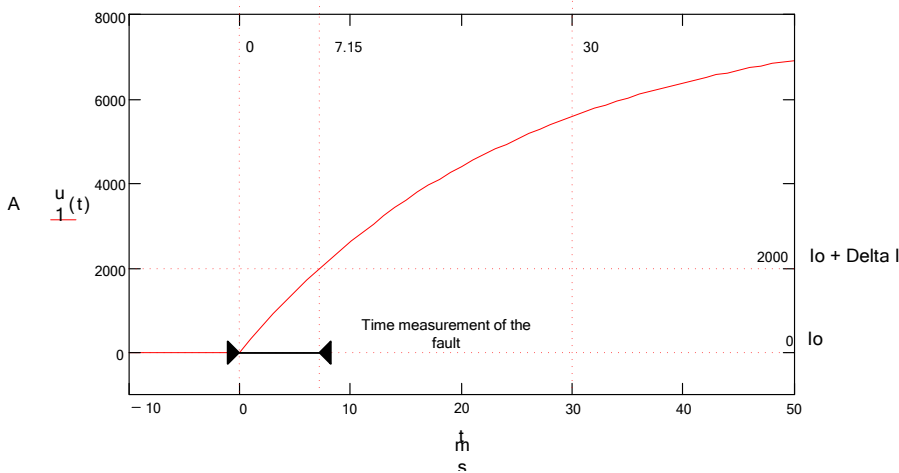


Function starts if $di/dt \geq E$.
Tripping if $di/dt > D$ during TMD.

Tripping by step of current (ΔI)



After reaching threshold E, the DDL records the I_o value. Tripping happens if $i(t) > I_o + \Delta I$ during T.



High speed circuit breaker failure [76BF]

- Breaker failure threshold 10 to 10 000 A step of 10 A
- Breaker failure time delay 0.10 to 10 s step of 0.01 s
- Monitoring of the interlocks position programmable: without - with c/o - with o/o - with c/o and o/o

CHARACTERISTICS DDL800

Presence and lack of catenary voltage (P.L.V.)

- Presence of voltage threshold 60 to 120% Un, step of 5% Un
- Lack of voltage threshold 20 to 80% Un with Lack of voltage < Presence of voltage, step of 5% Un
- Lack of voltage Time-delay 0.0 to 10.0 s, step of 0.1 s
- Trip operation for lack of voltage condition programmable: yes / no

Substation and catenary voltage comparison (ΔU)

- Undervoltage threshold 5 to 100% Un (substation voltage sensor required) step of 5% Un

Voltage drop monitoring (ΔU_L)

- Load resistance adjustment 0.1 to 10.0 Ω , step of 0.1 Ω
- Voltage drop Time-delay 0.10 to 5.00 s, step of 0.01 s

Catenary voltage monitoring [27DC] [59DC]

- Undervoltage alarm threshold 20 to 100 % Un, step of 5% Un
- Undervoltage trip threshold 20 to 100 % Un, step of 5% Un
- Trip operation for undervoltage condition programmable: yes / no
- Overvoltage alarm threshold 100 to 130 % Un, step of 5% Un
- Overvoltage trip threshold 100 to 130 % Un, step of 5% Un
- Trip operation for overvoltage condition programmable: yes / no
- Trip Time-delay 0.0 to 10.0 s, step of 0.1 s

Cable thermal image [49DC]

- Heating time constant 4 to 180 min, by step of 1 min
- Cooling time constant equal to Heating time constant
- Thermal alarm threshold 80 to 100%, step of 1%
- Thermal trip threshold 100 to 10 000 A, step of 10 A

Four shot recloser [82]

- Number of recloser cycles 1 to 4
- Reclose Time-delay (dead time) 4 time-delays of 0.1 to 100.0 s, step of 0.1 s
- Cycles reclaim time (*common to all cycles*) 1 to 100 s, step of 1 s
- Reclaim time after manual closing 0.1 to 100.0 s, step of 0.1 s

Digital Inputs assignment

- User programmable by setting software
- De-icing order none or DI 1
- Request of disturbance recording none or DI 2 (for external order)
- Settings table selection, set 1 – set 2 Fixed: DI 3
- EDL test achieved Fixed: DI 4
- CB manual trip order Fixed: DI 5
- CB manual close order Fixed: DI 6
- Interlock c/o Fixed: DI 7 (switching device position)
- Interlock o/o none or DI 8 (switching device position)
- Blocking of the DDL800 none or DI 1
- Blocking of the EDL800 none or DI 2
- Blocking of the recloser none or DI 8

Digital outputs assignment

- User programmable by setting software
- CB tripping order Fixed: C (adjustable for CB Shunt Opening Release or Under Voltage Release)
none or C (fixed)
- WD tripping order (adjustable) A, B, D, E, F, G
- CB trip signalling A, B, D, E, F, G
- Settings table selected A, B, D, E, F, G
- Sensors calibration in progress A, B, D, E, F, G
- De-icing in progress A, B, D, E, F, G
- De-icing alarm A, B, D, E, F, G
- CB closing order D or G
- CB failure A, B, D, E, F, G
- Voltage presence A, B, D, E, F, G
- Lack of voltage A, B, D, E, F, G
- Test EDL order A, B, D, E, F, G
- Test EDL OK A, B, D, E, F, G
- Test EDL not OK A, B, D, E, F, G
- Thermal overload alarm A, B, D, E, F, G
- Sensor alarm A, B, D, E, F, G and WD
- Blocking of the closing A, B, D, E, F, G
- Undervoltage alarm A, B, D, E, F, G
- Overvoltage alarm A, B, D, E, F, G

CHARACTERISTICS DDL800

Latching of the output contacts [86]

- Manual reset for output relays
- Reset

A, B, E, F (programmable assignment)
digital communication or local MMI

Signalling LEDs assignment

- By setting software

with customisable label

Setting software

- Display
- Configuration and operating software

French, English, Spanish, Italian
Windows® compatible 2000, XP, Vista and 7
French, English, Spanish, Italian

MODBUS® Communication

- Transmission
- Interface
- Transmission speed

asynchronous series, 2 wires
RS 485
300 to 115 200 bauds

Disturbance recording

- Number of recordings
- Pre fault time
- Fault time duration
- Post fault time

12
adjustable from 2 to 5 s
400 ms with sampling rate of 1 ms
adjustable from 0.5 to 1 s

Climatic withstand in operation

- Cold exposure
- Dry heat exposure
- Damp heat exposure
- Temperature variation with specified variation rate

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
- Clearances and creepage distances
- SNCF French railway standard

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
(contact open)
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
EN50123-7-1/2/3, EN50121-1/5 and EN50163

Enclosure safety

- Degree of protection provided by enclosures (IP code)

IEC / EN 60529 : IP50

Immunity – Conducted disturbances

- Immunity to RF conducted disturbances
- Fast transients
- 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

CHARACTERISTICS DDL800

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 falls

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

- Display
- LED indication
- H, W, D (rack 4U – ½ 19" / 1xDDL800)
- H, W, D (rack 4U – 19" / 2xDDL800)
- H, W, D (rack 4U – 19" / 1xDDL800 and 1 blank panel)

2 lines of 16 characters
1 for WD watchdog and 4 user programmable LEDs
177 x 270 x 340 mm - Weight: 6,6 kg
177 x 483 x 340 mm - Weight: 12,6 kg
177 x 483 x 340 mm - Weight: 7 kg



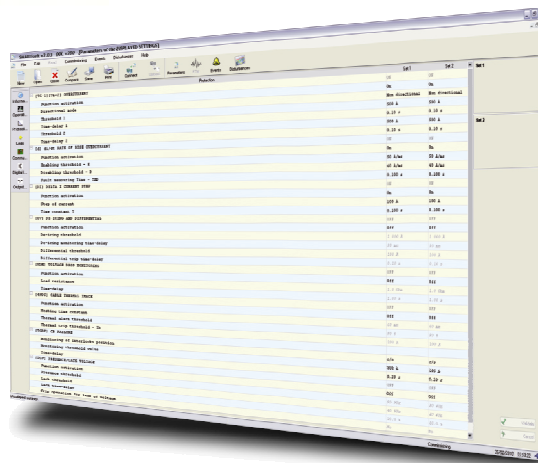
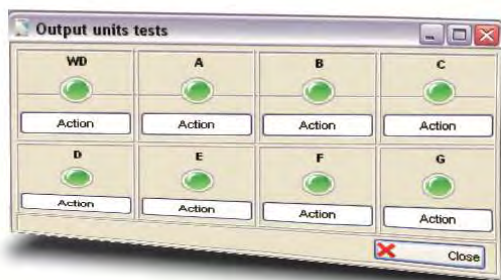
rack 4U – 19" / 2 x DDL800

Connection - Codification

- See diagram S39285
- See ordering information D40679

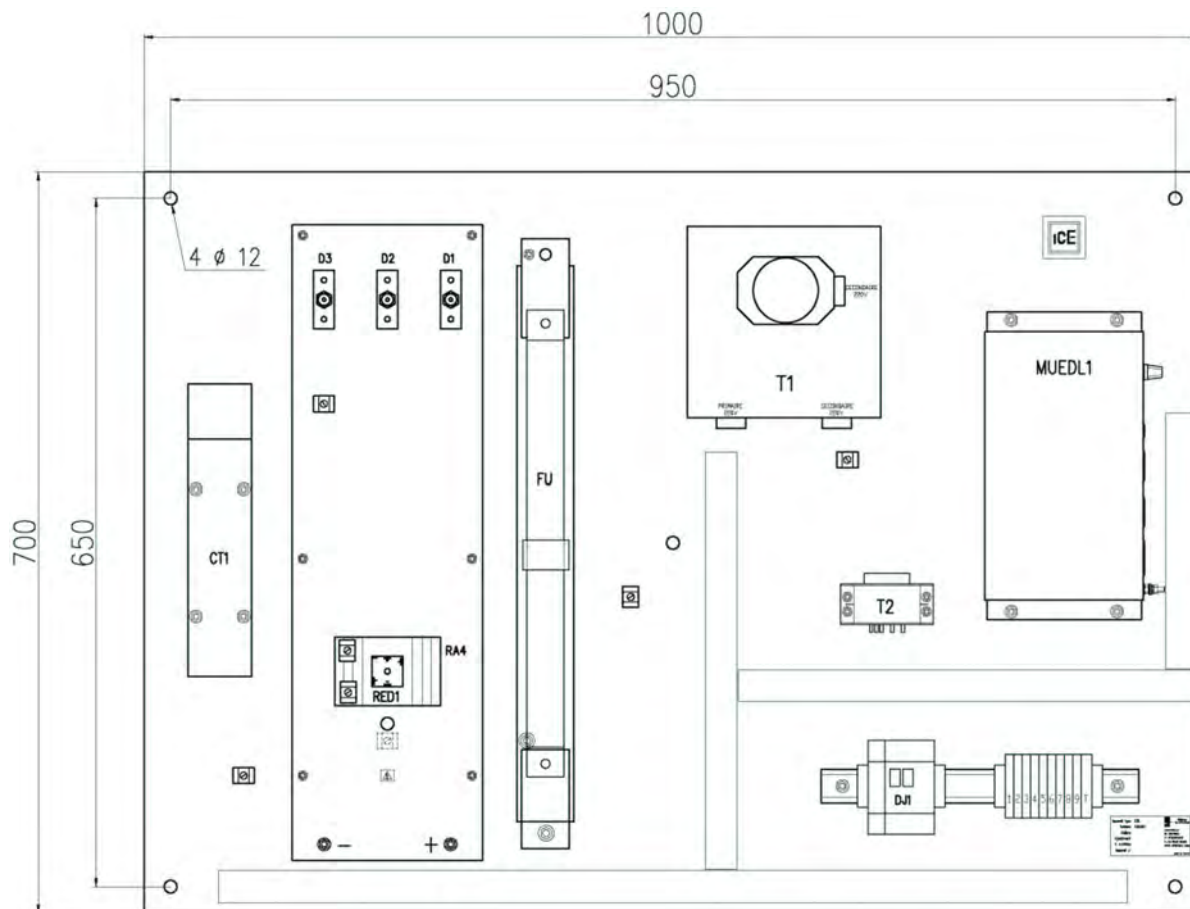
SMARTsoft

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



CHARACTERISTICS DDL800

EDL interface (option)



EDL application*

- Link to the DDL800 the mounting plate EDL carries out the test of the catenary before the closing of the feeder circuit breaker by applying to the catenary an AC voltage of 220Vac (50 or 60HZ) by means of a leakage transformer. The EDL checks the presence of a fault per evaluation of this voltage.

EDL characteristics*

- Weight: 35 kg
- Storage: -40°C et +70°C
- Temperature of operation: -5°C +55°C
- Supply: 220V - 50Hz
- Burden: stand-by position: 0.1A, maximum during the test: 5A

EDL Inputs – Outputs*

- Supply (220V - 50HZ or 60HZ)
- Test EDL order (from DDL800)
- EDL test achieved (to DDL800)
- CB fault (changeover contact)

* for details, see EDL User's guide

Functionalities

- 2 auxiliary supply voltages
- Storage of the lack and the restoration of the auxiliary voltage (events recorded)
- Configuration and parameter setting by local MMI or off-line or on-line PC
- Reading and saving configuration using PC
- Real time measuring of electrical values : display with primary values of voltage, current and differential current
- 2 setting groups, locally or remotely selectable
- Configuration and operation software SMARTsoft compatible with Windows® 2000, XP, Vista and 7
- Time stamping of internal events with 10 ms resolution
- Event recording : 200 / 250 locally recorded events
- Storing of measures and active setting group
- Local/remote acknowledgement of events
- Disturbance recording according to Comtrade format : storage of the last 12 records
- Remote setting and reading of measurements, counters, alarms and parameter settings

- Self-diagnosis : RAM, ROM, EEPROM, output relays, A/D converters, auxiliary supply, cycles of execution of the software, hardware fault
- 4 user programmable LEDs
- Communication by Modbus®

Operating modes

- Calibration mode: adjustment of sensors offset
- Forcing mode: forcing of disturbance recording without tripping
- Manual tripping with memorized event

External Options

- DC sensors, current and voltage can be provided: Icatenary, Itrack, Ucatenary, Usubstation (consult us)
- EDL equipment: provides line test to authorise automatic or manual reclosing function (see application guide)

Functional diagram

