

RAILWAY

Catenaries Fault Locator

LDN2 calculates the location of a fault detected by any protection relay, on AC railway catenaries feeders on conventional network or with autotransformers. Its algorithm is similar to the PDZI800 distance protection.

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

Functionalities

- Distance based fault location **[21FL]**
- Location starts by minimum of impedance criterion
- Location starts by overcurrent criterion
- Location starts by directional criterion
- Alarm undervoltage [27/74]
- Circuit-Breaker Failure detection
- Fault location announced in kilometres or four zones
- Linear or customized modelling of line
- 2 setting groups for two line configurations

Option

- Modbus® communication



CEE Relays Ltd

CHARACTERISTICS LDN2

Auxiliary Supply

- Auxiliary supply ranges
- Typical burden
- Power off withstand
- Memory backup

19 to 70 – 85 to 255 / DC or AC 50 or 60 Hz
6 W (DC), 6 VA (AC)
20 ms
72 hours

Analogue Inputs

- Phase current inputs

In: 1 or 5A
burden at In < 0.2 VA
continuous rating 3 In, short duration withstand 100 In/1 s
CT setting: primary value from 100 A to 5 000 A
measurement from 0.3 to 24 In
30VA 5P5
Un: 100 or 110 V
input impedance > 80 kΩ
continuous rating 240 V, short duration withstand 275V - 1 min
measurement: 200 or 220 V
VT setting: primary value from 1*25 kV, 2*25 kV
measurement: 44,5-55,5 Hz or 54,5-65,5 Hz

- Recommended CTs
- Phase voltage inputs

- Frequency (50Hz or 60Hz)

Digital Inputs (8)

- Polarizing voltage

- Level 0
- Level 1
- Burden

20 to 70 Vdc for: 19 to 70 V auxiliary supply range
37 to 140 Vdc for: 85 to 255 V auxiliary supply range
< 10Vdc range 19 to 70 V – < 33Vdc range 85 to 255 V
> 20Vdc range 19 to 70 V – > 37Vdc range 85 to 255 V
< 15 mA

Output Relays (7 + 1WD)

- Relays A, B, E, F:
signalling

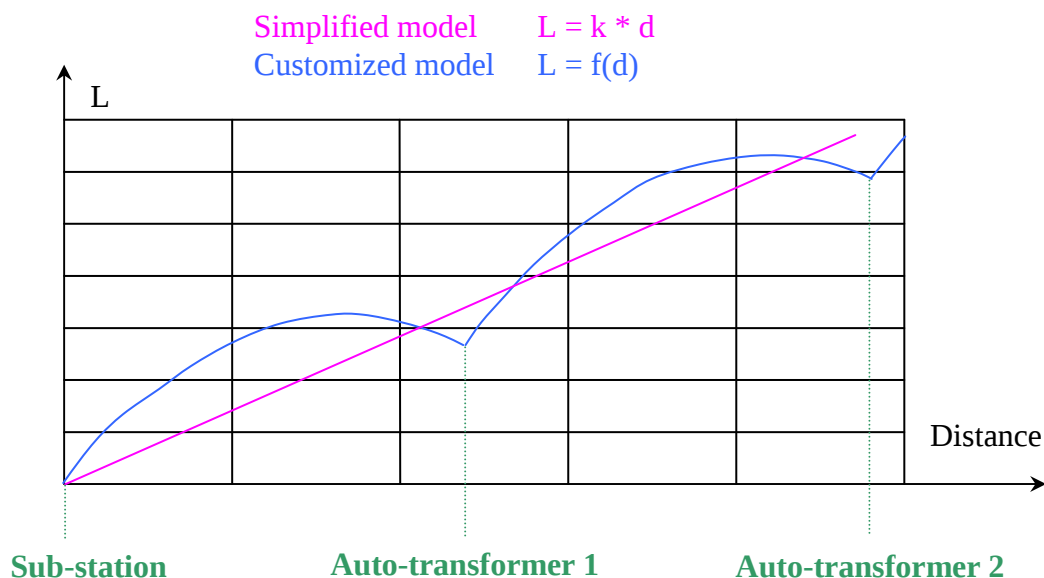
double contact NO, permanent current 8 A
closing capacity 12 A / 4 s
short-circuit current withstand 100 A / 30 ms
breaking capacity DC with L/R = 40 ms: 50W
breaking capacity AC with $\cos \varphi = 0.4$: 1250 VA
changeover contact, permanent current 16 A
closing capacity 25 A / 4 s
short-circuit current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

- Relays C, D, G et WD:
control, WD : Watchdog

Fault Locator [21FL]

- Standard linear reactance
- Calculated linear reactance (option)
- Distance to fault

0.100 to 0.999 Ω/ km in step of 0.001
2 downloadable characteristics, each one 1000 points in TXT
format
0.0 to 100.0 km in step of 100 m, accuracy $\pm 2\%$ or ± 100 m



CHARACTERISTICS LDN2

Minimum of impedance threshold

- Characteristic
- Definite time delay
- Adjustment values of lines $\pm 3\%$
- 1st stage downstream reactance (D11)
- 1st stage upstream reactance (D12)
- 1st stage downstream resistance (D13)
- 1st stage upstream resistance (D14)
- Angle of the line θ

parallelogram with 1 downstream stage and 1 upstream stage
 0.04 to 0.70 s in step of 0,01 s accuracy $\pm 2\%$ with 20 ms
 In 5A In 1A
 0.2 to 150.0 Ω in step of 0.1 Ω 1.0 to 750.0 Ω in step of 0.5 Ω
 0.2 to 120.0 Ω in step of 0.1 Ω 1.0 to 600.0 Ω in step of 0.5 Ω
 1.6 to 24.0 Ω in step of 0.1 Ω 8.0 to 120.0 Ω in step of 0.5 Ω
 1.6 to 48.0 Ω in step of 0.1 Ω 8.0 to 480.0 Ω in step of 0.5 Ω
 60 to 85° in step of 1° accuracy 1°

Overcurrent thresholds

- Status
- Adjustment threshold In : 1A
- Adjustment threshold In : 5A
- Definite time delay

in or out of service
 0.40 to 4.00 A in step of 0,02 A accuracy $\pm 2\%$
 2.0 to 20.0 A in step of 0.1 A accuracy $\pm 2\%$
 0.04 to 3.00 s in step of 0.01 s accuracy $\pm 2\%$ / 20 ms

Directional threshold

- Status
- Characteristic
- In: 1A
- In: 5A
- Definite time delay
- Adjustment of angle $\frac{1}{2}$ line D1
- Adjustment of angle $\frac{1}{2}$ line D2

in or out of service
 circular with limitation by two "half-line"
 measure of Ucat and θ angle by the relay
 0.24 to 1.60 A in step of 0.02 A accuracy $\pm 2\%$
 1.2 to 8.0 A in step of 0.1 A accuracy $\pm 2\%$
 0.50 to 60.00 sec in step of 0.01 sec accuracy $\pm 2\%$
 85 to 170° in step of 1° accuracy $\pm 1^\circ$
 - 80 to - 10° in step of 1° accuracy $\pm 1^\circ$

Catenary Undervoltage alarm [27/74]

- Catenary Undervoltage threshold

50% to 90% Un in step of 1%

Circuit breaker failure detection

- Time delay
- C.B. management mode

0.10 to 1.00 sec in step of 0.01
 Current cut off

Setting software

- Display
- Configuration and operating software

French, English
 Windows® 2000, XP, Vista and 7

MODBUS® Communication (option)

- Transmission
- Interface
- Transmission speed

asynchronous series, 2 wires
 RS 485
 300 to 115 000 bauds

Disturbance Recording

- Number of recordings
- Total duration
- Pre fault time

4
 52 periods per recording
 adjustable from 0 to 52 periods

Digital inputs

- Input 1
- Input 2
- Input 3
- Input 4
- Input 5
- Input 6
- Input 7
- Input 8

Enabling of setting group 2
 External location request
 Request of disturbance recording
 Enabling of overcurrent function
 Enabling of directional function
 Location LCD display reset
 Kilometric Point reset
 Spare

Digital output relays

- Relay A
- Relay B
- Relay C
- Relay D
- Relay E
- Relay F
- Relay G

Fault location signal
 SET 2 enabled
 Section 1 signal
 Section 2 signal
 Section 3 signal
 Section 4 signal
 Catenary undervoltage

Signalling LEDs

- LED 1
- LED 2
- LED 3
- LED 4

RS485 activity
 RS232 PC connected
 Set 2 enabled
 Events not acknowledged available on RS232 communication port

CHARACTERISTICS LDN2

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

IEC / EN 61010-1: 30 A
IEC / EN 60255-5: 5 kV MC, 5 kV MD (waveform: 1.2/50µs)
except Digital Outputs, 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 enclosures (IP code)

IEC / EN 60529 : IP51, with front cover

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

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

CHARACTERISTICS LDN2

Electromagnetic compatibility (EMC)

- Radiated field emissivity EN 55022: class A
- Conducted disturbance emissivity EN 55022: class A

Presentation

- Height 4U
- Width 1/4 19"
- Brackets 19" rack mounting option (see drawing D37739)
- Display 2 lines of 16 characters

Case

- H, W, D without short-circuiting devices 173 x 106.3 x 250 mm (see drawing D37739)
- Weight 3.6 kg

Connection - codification

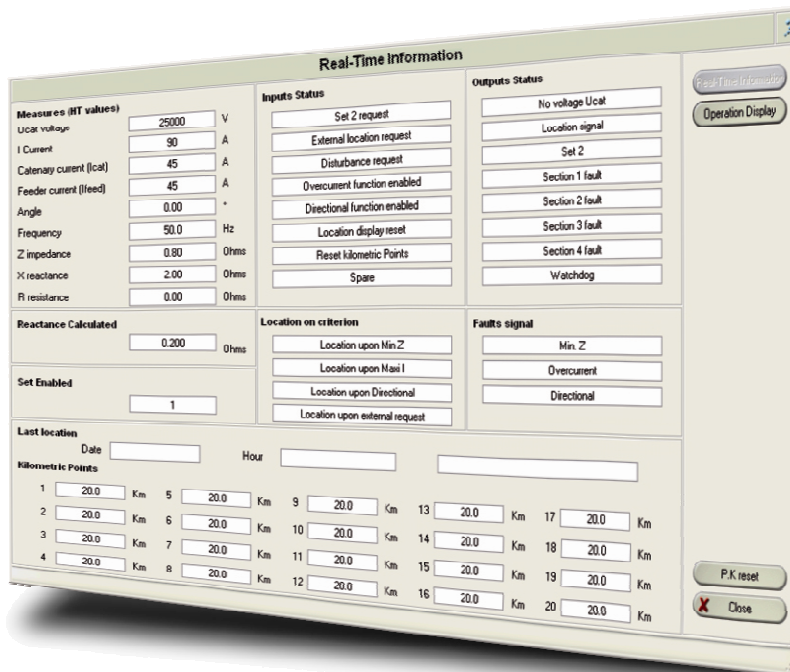
- See diagram S38361

LDN2 – Settings Software

LDN2 settings software helps the User get the best from Fault Locator relay.

LDN2 – Settings Software

User friendly
Diagnosis
Fault analysis
Maintenance tools



Functionalities

- 2 ranges of auxiliary supply voltages
- Configuration and parameter setting by local MMI or off-line or on-line PC
- Reading and saving relay configuration using PC
- Location of faults in distance with linear locator or user configurable advanced locator
- Measurement of electrical quantities:
Display expressed in primary values
Instantaneous values of phase currents and voltage
Impedance Z , Resistance R , Reactance X , Angle θ of the line
Display expressed in relative or absolute distance
- Configuration and operation software compatible with Windows® 2000, XP, Vista and 7
- User interface with access to all functions

- Setting software compatible with Windows® 2000, XP, Vista and 7
- Time stamping of internal events with 10 ms resolution
- Event recording: 100 locally recorded events, retained in the event of loss of auxiliary supply
- Storing of measurements and active settings group
- Local/remote acknowledgement of events
- Disturbance recording according to Comtrade® standard: storage of four recordings of 52 periods
- Remote reading of disturbance recording and event log
- Self-diagnosis: Memories, output relays, A/D converters, auxiliary supply, cycles of execution of the software, hardware anomaly
- Test of wiring by output relays activation

Options

- Communication by Modbus® : remote signalling, distance to the fault

Functional diagram

