LDN2

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

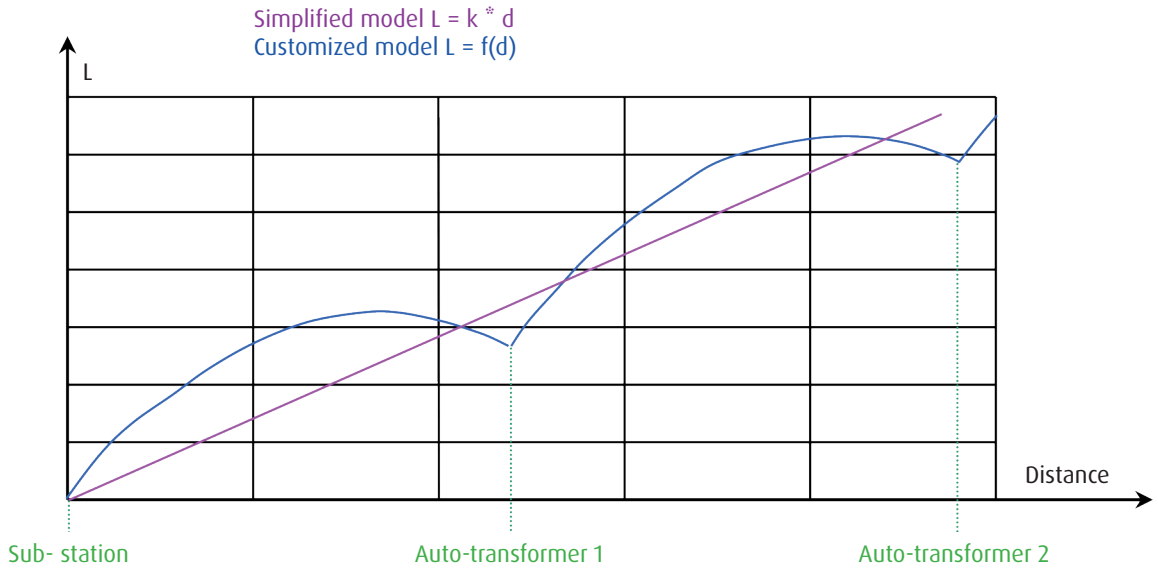
- Distance based fault location **[21FL]**
- Location starts by minimum of impedance criterion
- Location starts by overcurrent criterion
- Location starts by directional criterion
- Alarm undervoltage **[27/74]**
- Circuit-Breaker Failure detection
- Fault location announced in kilometres or four zones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

Option

- Modbus® communication

GENERAL CHARACTERISTICS

Auxiliary supply	
• Auxiliary supply ranges	19 to 70 – 85 to 255 / DC or AC 50 or 60 Hz
• Typical burden	6 W (DC), 6 VA (AC)
• Power off withstand	20ms
• Memory backup	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
• Recommended CTs	30VA 5P5
• Phase voltage inputs	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
• Frequency (50Hz or 60Hz)	measurement: 44,5-55,5 Hz or 54,5-65,5 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
• Level 0	< 10 Vdc range 19 to 70 V – < 33 Vdc range 85 to 255 V
• Level 1	> 20 Vdc range 19 to 70 V – > 37 Vdc range 85 to 255 V
• Burden	< 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 φ = 0.4: 1,250 VA
• Relays C, D, G & WD: control, WD : Watchdog	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 φ = 0.4: 1,250 VA
Fault Locator [21FL]	
• Standard linear reactance	0.100 to 0.999 Ω / km in step of 0.001
• Calculated linear reactance (option)	2 downloadable characteristics, each one 1,000 points in TXT format
• Distance to fault	0.0 to 100.0 km in step of 100 m, accuracy ± 2 % or +/- 100 m



GENERAL CHARACTERISTICS

Minimum of impedance threshold	
• Characteristic	parallelogram with 1 downstream stage and 1 upstream stage
• Definite time delay	0.04 to 0.70 s in step of 0.01 s accuracy ± 2 % with 20 ms
• Adjustment values of lines ± 3 %	In 5A / In 1A
• 1st stage downstream reactance (D11)	0.2 to 150.0 Ω in step of 0.1 Ω / 1.0 to 750.0 Ω in step of 0.5 Ω
• 1st stage upstream reactance (D12)	0.2 to 120.0 Ω in step of 0.1 Ω / 1.0 to 600.0 Ω in step of 0.5 Ω
• 1st stage downstream resistance (D13)	1.6 to 24.0 Ω in step of 0.1 Ω / 8.0 to 120.0 Ω in step of 0.5 Ω
• 1st stage upstream resistance (D14)	1.6 to 48.0 Ω in step of 0.1 Ω / 8.0 to 480.0 Ω in step of 0.5 Ω
• Angle of the line ϕ	60 to 85° in step of 1° / accuracy 1°
Overcurrent thresholds	
• Status	in or out of service
• Adjustment threshold In: 1A	0.40 to 4.00 A in step of 0.02 A accuracy ± 2 %
• Adjustment threshold In: 5A	2.0 to 20.0 A in step of 0.1 A accuracy ± 2 %
• Definite time delay	0.04 to 3.00 s in step of 0.01 s accuracy ± 2 % / 20 ms
Directional threshold	
• Status	in or out of service
• Characteristic	circular with limitation by two "half-line" measure of Ucat and ϕ angle by the relay
• In: 1A	0.24 to 1.60 A in step of 0.02 A accuracy ± 2 %
• In: 5A	1.2 to 8.0 A in step of 0.1 A accuracy ± 2 %
• Definite time delay	0.50 to 60.00 sec in step of 0.01 sec accuracy ± 2 %
• Adjustment of angle ½ line D1	85 to 170° in step of 1° accuracy ± 1°
• Adjustment of angle ½ line D2	- 80 to - 10° in step of 1° accuracy ± 1°
Catenary Undervoltage alarm [27/74]	
• Catenary Undervoltage threshold	50% to 90% Un in step of 1%
Circuit breaker failure detection	
• Time delay	0.10 to 1.00 sec in step of 0.01
• C.B. management mode	Current cut off
Setting software	
• Display	French, English
• Configuration and operating software	Windows® 2000, XP, Vista and 7
MODBUS® Communication (option)	
• Transmission	asynchronous series, 2 wires
• Interface	RS485
• Transmission speed	300 to 115,000 bauds
Disturbance Recording	
• Number of recordings	4
• Total duration	52 periods per recording
• Pre fault time	adjustable from 0 to 52 periods
Digital inputs	
• Input 1	Enabling of setting group 2
• Input 2	External location request
• Input 3	Request of disturbance recording
• Input 4	Enabling of overcurrent function
• Input 5	Enabling of directional function
• Input 6	Location LCD display reset
• Input 7	Kilometric Point reset
• Input 8	Spare
Digital output relays	
• Relay A	Fault location signal
• Relay B	SET 2 enabled
• Relay C	Section 1 signal
• Relay D	Section 2 signal
• Relay E	Section 3 signal
• Relay F	Section 4 signal
• Relay G	Catenary undervoltage
Signalling LEDs	
• LED 1	RS485 activity
• LED 2	RS232 PC connected
• LED 3	Set 2 enabled
• LED 4	Events not acknowledged available on RS232 communication port

GENERAL CHARACTERISTICS

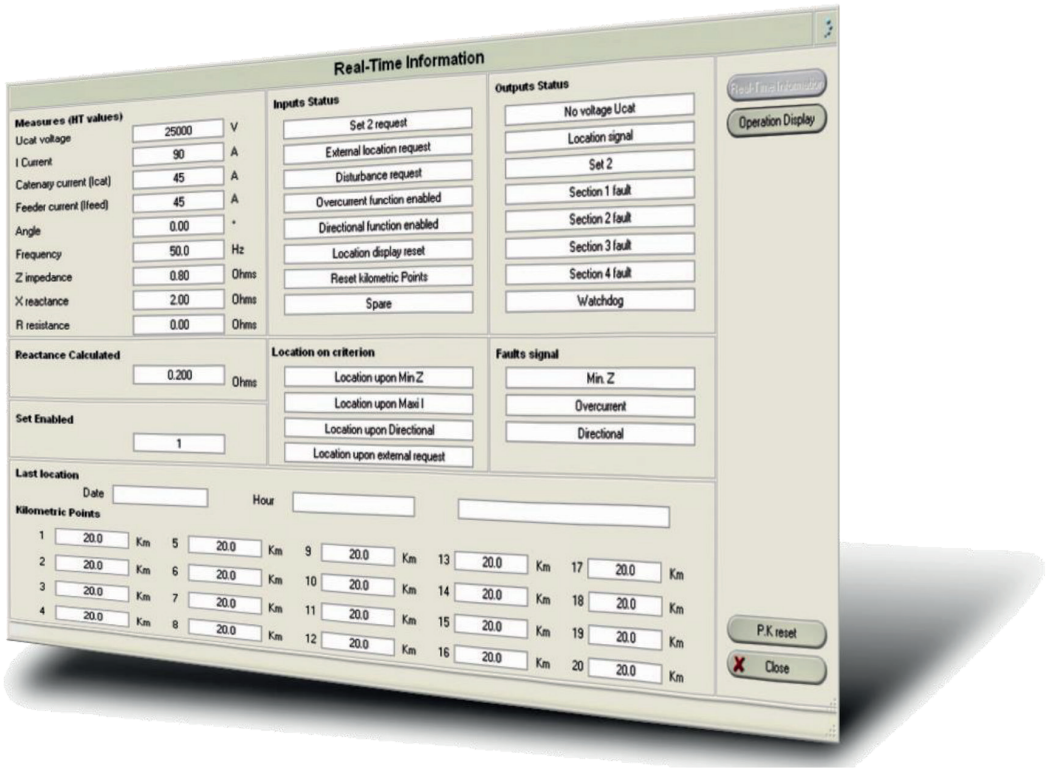
Climatic withstand in operation	
• Cold exposure	IEC / EN 60068-2-1: class Ad, -10 °C
• Dry heat exposure	IEC / EN 60068-2-2: class Bd, +55 °C
• Damp heat exposure	IEC / EN 60068-2-3: class Ca, 93 % HR, 40 °C, 56 days
• Temperature variation with specified variation rate	IEC / EN 60068-2-14: class Nb, -10 °C to +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 Outputs, 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
• Clearances 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 enclosures (IP code)	IEC / EN 60529 : IP51, with front cover
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 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

GENERAL CHARACTERISTICS

Electromagnetic compatibility (EMC) • Radiated field emissivity • Conducted disturbance emissivity	 EN 55022: class A EN 55022: class A
Presentation • Height • Width • Brackets 19" rack mounting • Display	 4U ¼ 19» option (see drawing D37739) 2 lines of 16 characters
Case • H, W, D without short-circuiting devices • Weight	 173 x 106.3 x 250 mm (see drawing D37739) 3.6 kg
Connection - codification • See diagram S38361	

SMARTTSOFT

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



- User friendly
- Diagnosis
- Fault analysis
- Maintenance tools

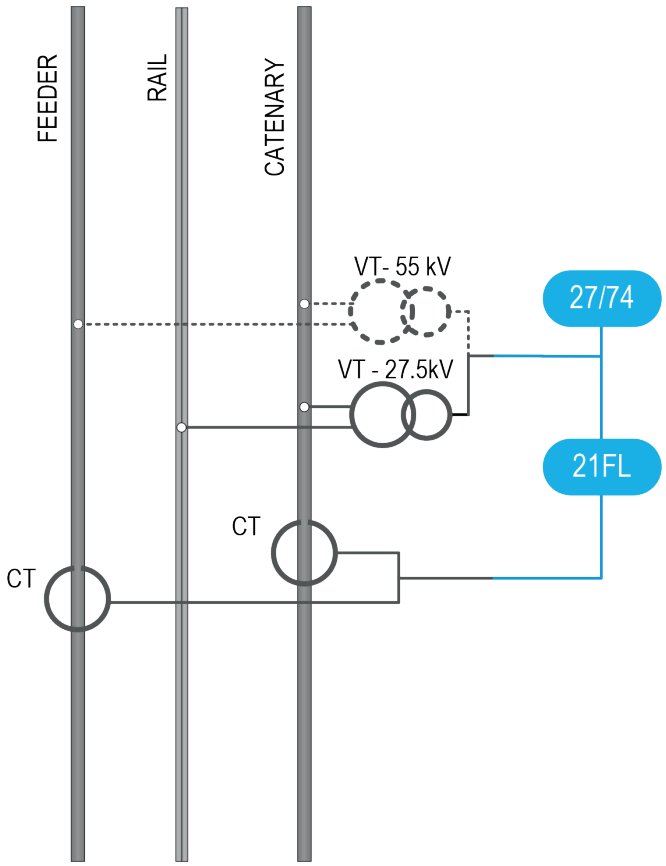
FUNCTIONALITIES

- 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



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