

# RAILWAY

## Protection for Catenaries



The protective relay for catenary feeder PDZIN1 protects the fixed installations of electric traction, in charge of feeding catenaries with 25 kV or 2 x 25 kV, 50 or 60 Hz voltages.

To help network operation, the PDZIN1 relay also features the following functions: fault locator, assistance to the maintenance of the circuit breakers, disturbance recording, monitoring, measurement and recording of the electrical quantities of the network.

An optional recloser with 3 cycles is available.

Parameter setting can be set locally, using either the keypad or the RS232 port, or remotely using the RS485 port.

The calculation of electrical values is achieved by Fast Fourier Transforms.

The setting, reading, measuring and recording are all available locally or remotely.

PDZIN1



- Help to network operation
- Monitoring and assistance to maintenance of CB
- Inrush insensitive
- Safe operation with secured tripping circuit

### Protection functions

- 3 downstream and 2 upstream zones of minimum of impedance protection [21]
- 2 phase thresholds of overcurrent protection [50] [51], with two switchable modes
- 2 thresholds of directional protection [32]
- De-icing function by differential current protection [87]
- 1 threshold under-voltage protection [27]
- Circuit breaker failure protection [50BF]
- Fault locator [21FL]-[50FL]-[87FL]

### Additional functions

- 3 cycles recloser [79]
- 2 setting groups
- Customisable automatic functions

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## CHARACTERISTICS

### Auxiliary supply

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

48 – 110 to 125 Vdc, -20 % +10 %  
 8 W (in survey), 12 W (operating)  
 30ms  
 32 hours

### Analogue inputs

- $I_{cat}$ ,  $I_{feed}$ ,  $I_{deg}$  CTs:  $I_n$  1 or 5 A
- $U_{cat}$  and  $U_{feed}$  VTs
- Frequency

measurement from 0.4 to 4  $I_n$  – burden at  $I_n < 0.2$  VA  
 continuous rating 3  $I_n$ , short duration withstand 80  $I_n/1s$   
 display of primary currents up to 5,000 A  
 primary rated value: adjustable from 25 kV to 55 kV  
 secondary rated value: 100 or 110 V  
 burden at  $U_n < 0.2$  VA  
 continuous rating 1.5  $U_n$ , short duration withstand 1.9  $U_n/5s$   
 display of primary measures  
 47-53 or 57-63 Hz

### Logical inputs

- Level 0 / 1
- Burden
- Taking into account time

< 20 Vdc / > 34 Vdc  
 between 20 and 40 mA  
 ignored if < 10ms, taken into account if > 15ms

### Outputs relays

- Breaking capacity DC with  $L/R = 40ms$
- Breaking capacity AC with  $\cos \varphi = 0.4$
- "Signalling" relays
- "Tripping" relays

50 W  
 1,250 VA  
 double contact NO, permanent current 8 A  
 closing capacity 10 A/4s  
 short-circuit current withstand 100 A/30ms  
 changeover contact, permanent current 16 A  
 closing capacity 25 A/4s  
 short-circuit current withstand 250 A/30ms

### Minimum of impedance function [21]

- Characteristic
- Instantaneous operating time
- Resetting percentage
- Independent time delay
- Values of adjustment of lines  $\pm 3$  %
- 1<sup>st</sup> stage downstream reactance
- 1<sup>st</sup> stage upstream reactance
- 1<sup>st</sup> stage downstream resistance
- 1<sup>st</sup> stage upstream resistance
- 1<sup>st</sup> stage downstream switched reactance
- 2<sup>nd</sup> stage downstream reactance
- 2<sup>nd</sup> stage upstream reactance
- 3<sup>rd</sup> stage downstream reactance
- 1<sup>st</sup> stage time delay T1
- 1<sup>st</sup> stage angle of the line  $\theta 1$
- Magnetising current limit
- 2<sup>nd</sup> Harmonic threshold
- 2<sup>nd</sup> Harmonic coefficient
- H2 time-delay detection after A.T. closure
- 2<sup>nd</sup> stage time delay T2AV
- 2<sup>nd</sup> stage time delay T2AM
- 3<sup>rd</sup> stage time delay T3AV

parallelogram with 3 downstream stages and 2 upstream stages  
 50ms (trip), 60ms (signalling)  
 101 – 105 %  

0.04 to 0.70s	in step of 0.01s	accuracy $\pm 2$ % with 20ms min
$I_n$ 5 A		$I_n$ 1 A
0.2 to 150.0 $\Omega$	in step of 0.1 $\Omega$	1.0 to 750.0 $\Omega$ in step of 0.5 $\Omega$
0.2 to 150.0 $\Omega$	in step of 0.1 $\Omega$	1.0 to 750.0 $\Omega$ in step of 0.5 $\Omega$
1.6 to 30.0 $\Omega$	in step of 0.1 $\Omega$	8.0 to 150.0 $\Omega$ in step of 0.5 $\Omega$
1.6 to 60.0 $\Omega$	in step of 0.1 $\Omega$	8.0 to 300.0 $\Omega$ in step of 0.5 $\Omega$
0.2 to 150.0 $\Omega$	in step of 0.1 $\Omega$	1.0 to 750.0 $\Omega$ in step of 0.5 $\Omega$
0.2 to 150.0 $\Omega$	in step of 0.1 $\Omega$	1.0 to 750.0 $\Omega$ in step of 0.5 $\Omega$
0.2 to 150.0 $\Omega$	in step of 0.1 $\Omega$	30.0 to 600.0 $\Omega$ in step of 0.5 $\Omega$
0.04 to 0.70s	in step of 0.01s	accuracy $\pm 2$ % with 20ms mini
60 to 85°	in step of 1°	accuracy 1°
1.6 to 60.0 $\Omega$	in step of 0.1 $\Omega$	8.0 to 300.0 $\Omega$ in step of 0.5 $\Omega$
10 to 70 %	in step of 1 %	
1 to 4	in step of 0.1	
0 to 2s	in step of 0.01s	
0.04 to 2.55s	in step of 0.01s	accuracy $\pm 2$ % with 20ms mini
0.04 to 2.55s	in step of 0.01s	accuracy $\pm 2$ % with 20ms mini
0.04 to 2.55s	in step of 0.01s	accuracy $\pm 2$ % with 20ms mini

## CHARACTERISTICS

### Overcurrent protection [50] [51]

- Status in or out of service
- Instantaneous operating time
- Resetting percentage
- Adjustment thresholds 1 A
- Adjustment thresholds 5 A
- Independent time delay
- Timing curves

50ms (trip), 60ms (signalling) for  $I \geq 2 I_s$   
 95 – 99 %  
 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 3.00s in step of 0.01s accuracy  $\pm 2 \%$  with 20ms mini  
 inverse, very inverse, extremely inverse according to IEC 255-4,  
 accuracy 5 %

### Undervoltage protection [27]

- Threshold
- Instantaneous operating time
- Resetting percentage

50 to 90 %  $U_n$   
 50ms (trip), 60ms (signalling)  
 101 – 105 %

### Directional protection [32]

- Status in or out of service
- Characteristic
- Instantaneous operating time
- Resetting percentage
- Slow stage 1 A
- Slow stage 5 A
- Slow stage time delay
- Fast stage 1 A
- Fast stage 5 A
- Fast stage time delay
- Adjustment angle  $\frac{1}{2}$  line D1
- Adjustment angle  $\frac{1}{2}$  line D2

circular with limitation by 2 " $\frac{1}{2}$  lines"  
 measure of  $U_{cat}$  and angle Z by protection  
 adjustment of the threshold by  $I_{cat}$   
 50ms (trip), 60ms (signalling) for  $I \geq 2 I_s$   
 95 – 99 %  
 0.08 to 0.80 A in step of 0.02 A accuracy  $\pm 2 \%$   
 0.4 to 4.0 A in step of 0.1 A accuracy  $\pm 2 \%$   
 1 to 10 min in step of 1 min accuracy  $\pm 2 \%$   
 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  $\pm 2 \%$   
 0.5 to 60s in step of 0.5s accuracy  $\pm 2 \%$   
 85 to 170° in step of 1° accuracy  $\pm 1^\circ$   
 -10 to -80° in step of 1° accuracy  $\pm 1^\circ$

### De-icing protection [87]

- Status in or out of service
- Resetting percentage
- 1 A threshold
- 5 A threshold
- 1 A differential current threshold
- 5 A differential current threshold
- Time delay

95 – 99 %  
 0.10 to 4.0 A in step of 0.02 A accuracy  $\pm 2 \%$   
 0.5 to 20.0 A in step of 0.1 A accuracy  $\pm 2 \%$   
 0.04 to 0.40 A in step of 0.02 A accuracy  $\pm 5 \%$   
 0.2 to 2.0 A in step of 0.1 A accuracy  $\pm 5 \%$   
 0.04 to 0.50s in step of 0.01s accuracy 20ms

### C.B. failure [50BF]

- Alarm for the number of  $kA^2$  cut-off
- Operation number

1,000 to  $(2^{32}/2)-1 kA^2$   
 1,000 to 20,000

### C.B. monitoring [50BF]

- Time-delay
- C.B. management mode

0.10 to 1.00s in step of 0.01s  
 Cut-off current

### Recloser [79] (option)

- Status
- Number of cycles
- Dead time cycle 1
- Dead time cycle 2
- Dead time cycle 3
- Reclaim time for each cycle
- Number of cycles per minute (alarm)
- Reclaim time for manually closing
- Reclosing pulse duration

in or out of service  
 0 to 3  
 0.3 to 650s in step of 0.1s accuracy  $\pm 2 \%$   
 0.3 to 650s in step of 0.1s accuracy  $\pm 2 \%$   
 0.3 to 650s in step of 0.1s accuracy  $\pm 2 \%$   
 1 to 650s in step of 1s accuracy  $\pm 2 \%$   
 1 to 999 in step of 1  
 1 to 650s in step of 1s accuracy  $\pm 2 \%$   
 0.1 to 5s in step of 0.1s accuracy  $\pm 2 \%$

## CHARACTERISTICS

### Fault locator [21FL]-[50FL]-[87FL]

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

0.100 to 0.999  $\Omega$ / km      in step of 0.001  $\Omega$ / km  
2 downloadable characteristics,  
each one 1,000 points in txt format  
0.00 to 100.0 km      in step of 100 m      accuracy  $\pm$  2 %

### Programming

- Display
- Configuration software

French, English  
compatible with Windows 95, 98, 2000, NT, XP (French, English)

### MODBUS® communication

- Transmission
- Interface
- Transmission speed

asynchronous series, 2 or 4 wires  
RS485  
300 to 19,200 bauds

### Disturbance recording

- Number of recordings
- Total duration
- Pre time

8  
52 periods per recording  
adjustable from 0 to 52 periods

### Environment

- Transient impulses 5ns
- Shock
- Dielectric withstand
- Insulation resistance
- EMC emissivity
- EMC susceptibility
- Operating temperature
- Vibrations
- Mechanical shocks
- E.U. low voltage directive
- Water and dust projection

IEC 801.4 class 4 (equivalent IEC 255-22-4 class 4)  
IEC 255-4 class 3 (5 kV – 1.2/50  $\mu$ s)  
IEC 255-5 class 3 (2 kVrms – 1 min)  
> 1,000 M $\Omega$  according to IEC 255-5  
EN 55011 and EN 55022 class A  
IEC 255-22 (1/2/4)  
-5 to +55°C – IEC 870-2-1/B4  
IEC 255.21.1 class 1  
IEC 255.21.2 class 1  
89/336/CEE dated 03.05.1989  
IP50

### Presentation and dimensions

- Display
- Output relay
- Logical inputs
- Signalling LEDs
- Height, Width, Depth
- Weight

2 lines of 16 characters  
2 trip outputs, 22 dedicated outputs  
12, dedicated  
1 for Watchdog, 2 dedicated multifunction LEDs  
6U x ½ 19": 260 x 210 x 320 mm  
10 kg

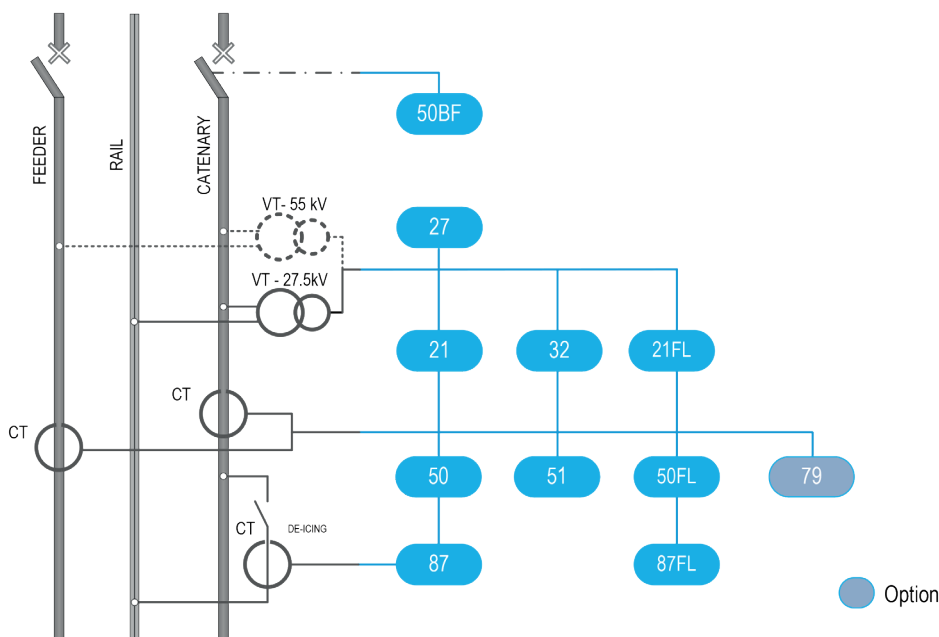
## FUNCTIONALITIES

- 2 ranges of auxiliary supply
- Configuration and parameter setting by local HMI or off-line or on-line PC
- Reading and saving relay configuration using PC
- Measurement of electrical quantities:
  - Catenary, feeder and de-icing currents
  - Catenary voltage
  - Resistance, reactance, impedance and angle of the line
  - Harmonic ratio H2 and H3
  - Display expressed in primary current
- Instantaneous alarm thresholds
- Minimum of impedance protection, type parallelogram, with 3 downstream zones and 2 upstream zones:
  - Inhibition of detection of fault when reclosing on auto-transformer by shift of measurement curve
  - Inhibition of detection of fault due to harmonic H2
- 2 phase thresholds of overcurrent protection, with two switchable modes (external input or communication network):
  - Independent time tripping
  - Dependent time tripping according to inverse / very inverse / extremely inverse IEC 255-4 curves
  - Function  $\Delta I$  of desensitising to harmonic 3 on high threshold
- Directional protection with 2 current set thresholds ( $U_{cat}$  and Z angle measured)
- De-icing protection:
  - Desensitising to de-icing current
  - Threshold of de-icing current
- Catenary undervoltage protection
- Secured tripping circuit with no-level and transmission orders
- 2\*25 kV operation mode forced to 1\*25 kV (external input or communication network)
- Assistance with circuit breaker maintenance: number of operations and break current  $I^2$ , counters, alarms
- Breaker failure monitoring by checking disappearance of the catenary and feeder currents when opening the circuit breaker
- Configuration and operation software compatible with Windows® 95, 98, NT, 2000, XP
- User interface with access to all functions
- Time stamping of internal events with 1ms resolution
- Event recording: 100 locally recorded events, retained in the event of loss of auxiliary supply
- Local/remote acknowledgement of events
- Storing of measurements and active settings group
- Disturbance recording according to Comtrade format: storage of eight 52 periods recordings
- Remote setting, remote reading of measurements, counters, alarms, and parameter settings
- Remote reading of disturbance recording and event log
- Self-diagnosis: RAM, ROM, EEPROM, output relays, A/D converters, auxiliary supply, cycles of execution of the software, hardware anomaly

### Options

- Communication by Modbus®, 2 or 4 wires RS485 remote measures, remote signalling, distance to the fault, setting in or out of service of the minimum of impedance zones 2 and 3
- 3 recloser cycles
- Fault locator
- Automatism functions (factory set, consult us)

### Functional diagram



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