

RAILWAY

Protection for Catenaries

The digital protection for catenary feeder PDZI_N 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.

The PDZIN1 also features functions that help network operation: fault locator, assistance to the maintenance of the circuit breakers, disturbance recording.

An optional recloser with 3 cycles is available.

As well as the usual functions of protection, PDZIN1 relay provides monitoring, measurement and recording of the electrical quantities of the network.

The relays 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
(V.8)



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
- Customizable automatic functions



CEE Relays Ltd

CHARACTERISTICS PDZIN1

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)
30 ms
32 hours

Analogue inputs

- I_{cat} , I_{feed} , I_{deg} CTs: In 1 or 5 A

measurement from 0.4 to 4 In – burden at In < 0.2 VA
continuous rating 3 In, short duration withstand 80 In/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 Un < 0.2 VA
continuous rating 1.5 Un, short duration withstand 1.9Un/5s
display of primary measures
47-53 or 57-63 Hz

- U_{cat} and U_{feed} VTs

- Frequency

Logical inputs

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

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

Outputs Relays

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

50W
1250 VA
double contact NO, permanent current 8A
closing capacity 10A/4s
short-circuit current withstand 100A/30ms
changeover contact, permanent current 16A
closing capacity 25A/4s
short-circuit current withstand 250A/30ms

- « Tripping » relays

Minimum of impedance function [21]

- Characteristic
- Instantaneous operating time
- Resetting percentage
- Independent time delay
- Values of adjustment of lines $\pm 3\%$
- 1st stage downstream reactance
- 1st stage upstream reactance
- 1st stage downstream resistance
- 1st stage upstream resistance
- 1st stage downstream switched reactance
- 2nd stage downstream reactance
- 2nd stage upstream reactance
- 3rd stage downstream reactance
- 1st stage time delay T1
- 1st stage angle of the line θ_1
- Magnetizing current limit
- 2nd Harmonic threshold
- 2nd Harmonic coefficient
- H2 time-delay detection after A.T. closure
- 2nd stage time delay T2AV
- 2nd stage time delay T2AM
- 3rd stage time delay T3AV

parallelogram with 3 downstream stages and 2 upstream stages
50 ms (trip), 60 ms (signalling)
101 – 105 %
0.04 to 0.70 s in step of 0.01 s accuracy $\pm 2\%$ with 20 ms min
In 5A In 1A
0,2 à 150,0 Ω in step of 0.1 Ω 1,0 à 750,0 Ω in step of 0.5 Ω
0.2 to 150.0 Ω in step of 0.1 Ω 1,0 à 750,0 Ω in step of 0.5 Ω
1.6 to 30.0 Ω in step of 0.1 Ω 8.0 to 150.0 Ω in step of 0.5 Ω
1.6 to 60.0 Ω in step of 0.1 Ω 8.0 to 300.0 Ω in step of 0.5 Ω
0,2 à 150,0 Ω in step of 0.1 Ω 1,0 à 750,0 Ω in step of 0.5 Ω
0,2 à 150,0 Ω in step of 0.1 Ω 1,0 à 750,0 Ω in step of 0.5 Ω
0,2 à 150,0 Ω in step of 0.1 Ω 1,0 à 750,0 Ω in step of 0.5 Ω
0,2 à 150,0 Ω in step of 0.1 Ω 30.0 to 600.0 Ω in step of 0.5 Ω
0.04 to 0.70 s in step of 0.01 s accuracy $\pm 2\%$ with 20 ms mini
60 to 85° in step of 1° accuracy 1°
1,6 à 60,0 Ω in step of 0.1 Ω 8,0 à 300,0 Ω in step of 0.5 Ω
10 to 70 % in step of 1%
1 to 4 in step of 0,1
0 to 2 s in step of 0,01 s
0.04 to 2.55 s in step of 0.01 s accuracy $\pm 2\%$ with 20 ms mini
0.04 to 2.55 s in step of 0.01 s accuracy $\pm 2\%$ with 20 ms mini
0.04 to 2.55 s in step of 0.01 s accuracy $\pm 2\%$ with 20 ms mini

Overcurrent protection [50] [51]

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

50 ms (trip), 60 ms (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 3.00 s, in step of 0.01 s,
accuracy $\pm 2\%$ with 20 ms minimum
inverse, very inverse, extremely inverse
according to IEC 255-4, accuracy 5%

- Timing curves

Undervoltage protection [27]

- Threshold
- Instantaneous operating time
- Resetting percentage

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

Directional protection [67]

- Status in or out of service
- Characteristic

circular with limitation by 2 "½ lines"
measure of U_{cat} and angle Z by protection
adjustment of the threshold by I_{cat}

CHARACTERISTICS PDZIN1

Directional protection [67] (following)

- Instantaneous operating time
- Resetting percentage
- Slow stage 1A
- Slow stage 5A
- Slow stage time delay
- Fast stage 1A
- Fast stage 5A
- Fast stage time delay
- Adjustment angle ½ line D1
- Adjustment angle ½ line D2

50 ms (trip), 60 ms (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 60 sec in step of 0.5 sec

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
- Independent operating time
- Resetting percentage
- 1A threshold
- 5A threshold
- 1A differential current threshold
- 5A differential current threshold

from 50 ms, for $I \geq 2 I_s$, to 500 ms (order)

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 $\pm 5 \%$

C.B. failure [50BF]

- Alarm for the number of kA^2 cut-off
- Operation number
- Time-delay
- C.B. management mode

1000 to $(2^{32}/2)-1 kA^2$

1 000 to 20 000

0,10 to 1,00 sec in step of 0,01 sec

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 650 sec

pas de 0,1 sec

précision $\pm 2 \%$

0,3 to 650 sec

pas de 0,1 sec

précision $\pm 2 \%$

0,3 to 650 sec

pas de 0,1 sec

précision $\pm 2 \%$

1 to 650 sec

pas de 1 sec

précision $\pm 2 \%$

1 to 999

pas de 1

1 to 650 sec

pas de 1 sec

précision $\pm 2 \%$

0,1 to 5 sec

pas de 0,1 sec

précision $\pm 2 \%$

Fault locator [21FL]-[51FL]-[87FL]

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

0.100 to 0.999 Ω / km in step of 0.001 Ω / km

2 downloadable characteristics,
each one 1000 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

Communication MODBUS®

- Transmission
- Interface
- transmission Speed

asynchronous series, 2 or 4 wires

RS 485

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 5 ns
- 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 μ s)

IEC 255-5 class 3 (2 kVrms – 1 min)

> 1 000 M Ω 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 ΔI of desensitizing to harmonic 3 on high threshold
- Directional protection with 2 current set thresholds (Ucat and Z angle measured)
- De-icing protection:
Desensitizing 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 1 ms 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 RS 485 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

