

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

CHARACTERISTICS PDZIN1

Auxiliary supply

- Auxiliary supply ranges 48 – 110 to 125 Vdc, -20% +10 %
- Typical burden 8 W (in survey), 12 W (operating)
- Power off withstand 30 ms
- Memory backup 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 < 20Vdc / > 34Vdc
- Burden between 20 and 40 mA
- Taking into account time ignored if < 10ms, taken into account if > 15 ms

Outputs Relays

- Breaking capacity DC with L/R = 40 ms 50W
- Breaking capacity AC with cos φ = 0.4 1250 VA
- « Signalling » relays 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 parallelogram with 3 downstream stages and 2 upstream stages
- Instantaneous operating time 50 ms (trip), 60 ms (signalling)
- Resetting percentage 101 – 105 %
- Independent time delay 0.04 to 0.70 s in step of 0,01 s accuracy ± 2 % with 20 ms min
- Values of adjustment of lines ± 3 %

	In 5A	In 1A
• 1st stage downstream reactance	0,2 à 150,0 Ω in step of 0.1 Ω	1,0 à 750,0 Ω in step of 0.5 Ω
• 1st stage upstream reactance	0.2 to 150.0 Ω in step of 0.1 Ω	1,0 à 750,0 Ω in step of 0.5 Ω
• 1st stage downstream resistance	1.6 to 30.0 Ω in step of 0.1 Ω	8.0 to 150.0 Ω in step of 0.5 Ω
• 1st stage upstream resistance	1.6 to 60.0 Ω in step of 0.1 Ω	8.0 to 300.0 Ω in step of 0.5 Ω
• 1st stage downstream switched reactance	0,2 à 150,0 Ω in step of 0.1 Ω	1,0 à 750,0 Ω in step of 0.5 Ω
• 2nd stage downstream reactance	0,2 à 150,0 Ω in step of 0.1 Ω	1,0 à 750,0 Ω in step of 0.5 Ω
• 2nd stage upstream reactance	0,2 à 150,0 Ω in step of 0.1 Ω	1,0 à 750,0 Ω in step of 0.5 Ω
• 3rd stage downstream reactance	0,2 à 150,0 Ω in step of 0.1 Ω	30.0 to 600.0 Ω in step of 0.5 Ω
• 1st stage time delay T1	0.04 to 0.70 s in step of 0.01 s accuracy ± 2 % with 20 ms mini	
• 1st stage angle of the line $\theta 1$	60 to 85° in step of 1° accuracy 1°	
• Magnetizing current limit	1,6 à 60,0 Ω in step of 0.1 Ω	8,0 à 300,0 Ω in step of 0.5 Ω
• 2 nd Harmonic threshold	10 to 70 % in step of 1%	
• 2 nd Harmonic coefficient	1 to 4 in step of 0,1	
• H2 time-delay detection after A.T. closure	0 to 2 s in step of 0,01 s	
• 2 nd stage time delay T2AV	0.04 to 2.55 s in step of 0.01 s accuracy ± 2 % with 20 ms mini	
• 2 nd stage time delay T2AM	0.04 to 2.55 s in step of 0.01 s accuracy ± 2 % with 20 ms mini	
• 3 rd stage time delay T3AV	0.04 to 2.55 s in step of 0.01 s accuracy ± 2 % with 20 ms mini	

Overcurrent protection [50] [51]

- Status in or out of service
- Instantaneous operating time 50 ms (trip), 60 ms (signalling) for $I \geq 2 I_s$
- Resetting percentage 95 – 99 %
- Adjustment thresholds 1A 0.40 to 4.00 A, in step of 0,02 A, accuracy ± 2 %
- Adjustment thresholds 5A 2.0 to 20.0 A, in step of 0.1 A, accuracy ± 2 %
- Independent time delay 0.04 to 3.00 s, in step of 0.01 s, accuracy ± 2 % with 20 ms minimum
inverse, very inverse, extremely inverse
according to IEC 255-4, accuracy 5%
- Timing curves

Undervoltage protection [27]

- Threshold 50 to 90 % Un
- Instantaneous operating time 50 ms (trip), 60 ms (signalling)
- Resetting percentage 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	50 ms (trip), 60 ms (signalling) for $I \geq 2 I_s$		
• Resetting percentage	95 – 99 %		
• Slow stage 1A	0.08 to 0.80 A	in step of 0.02 A	accuracy ± 2 %
• Slow stage 5A	0.4 to 4.0 A	in step of 0.1 A	accuracy ± 2 %
• Slow stage time delay	1 to 10 min	in step of 1 min	accuracy ± 2 %
• Fast stage 1A	0.24 to 1.60 A	in step of 0.02 A	accuracy ± 2 %
• Fast stage 5A	1.2 to 8.0 A	in step of 0.1 A	accuracy ± 2 %
• Fast stage time delay	0.5 to 60 sec	in step of 0.5 sec	accuracy ± 2 %
• Adjustment angle $\frac{1}{2}$ line D1	85 to 170°	in step of 1°	accuracy ± 1 °
• Adjustment angle $\frac{1}{2}$ line D2	- 10 to - 80°	in step of 1°	accuracy ± 1 °

De-icing protection [87]

• Status in or out of service	from 50 ms, for $I \geq 2 I_s$, to 500 ms (order)		
• Independent operating time	60 ms (signalling)		
• Resetting percentage	95 – 99 %		
• 1A threshold	0.10 to 4.0 A	in step of 0.02 A	accuracy ± 2 %
• 5A threshold	0.5 to 20.0 A	in step of 0.1 A	accuracy ± 2 %
• 1A differential current threshold	0.04 to 0.40 A	in step of 0.02 A	accuracy ± 5 %
• 5A differential current threshold	0.2 to 2.0 A	in step of 0.1 A	accuracy ± 5 %

C.B. failure [50BF]

• Alarm for the number of kA^2 cut-off	1000 to $(2^{32}/2)-1 kA^2$		
• Operation number	1 000 to 20 000		
• Time-delay	0,10 to 1,00 sec	in step of 0,01 sec	
• C.B. management mode	Cut-off current		

Recloser [79] (option)

• Status	in or out of service		
• Number of cycles	0 to 3		
• Dead time cycle 1	0,3 to 650 sec	pas de 0,1 sec	précision ± 2 %
• Dead time cycle 2	0,3 to 650 sec	pas de 0,1 sec	précision ± 2 %
• Dead time cycle 3	0,3 to 650 sec	pas de 0,1 sec	précision ± 2 %
• Reclaim time for each cycle	1 to 650 sec	pas de 1 sec	précision ± 2 %
• Number of cycles per minute (alarm)	1 to 999	pas de 1	
• Reclaim time for manually closing	1 to 650 sec	pas de 1 sec	précision ± 2 %
• Reclosing pulse duration	0,1 to 5 sec	pas de 0,1 sec	précision ± 2 %

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

• Standard linear reactance	0.100 to 0.999 Ω / km	in step of 0.001 Ω / km	
• Calculated linear reactance (option)	2 downloadable characteristics, each one 1000 points in txt format		
• Distance to fault	0.00 to 100.0 km	in step of 100 m	accuracy ± 2 %

Programming

• Display	French, English		
• Configuration software	compatible with Windows 95, 98, 2000, NT, XP		
	French, English		

Communication MODBUS®

• Transmission	asynchronous series, 2 or 4 wires		
• Interface	RS 485		
• transmission Speed	300 to 19 200 bauds		

Disturbance recording

• Number of recordings	8		
• Total duration	52 periods per recording		
• Pre time	adjustable from 0 to 52 periods		

Environment

• Transient impulses 5 ns	IEC 801.4 class 4 (equivalent IEC 255-22-4 class 4)		
• Shock	IEC 255-4 class 3 (5 kV – 1,2/50 μ s)		
• Dielectric withstand	IEC 255-5 class 3 (2 kVrms – 1 min)		
• Insulation resistance	> 1 000 M Ω according to IEC 255-5		
• EMC emissivity	EN 55011 and EN 55022 class A		
• EMC susceptibility	IEC 255-22 (1/2/4)		
• Operating temperature	-5 to + 55 °C – IEC 870-2-1/B4		
• Vibrations	IEC 255.21.1 class 1		
• Mechanical shocks	IEC 255.21.2 class 1		
• E.U. low voltage directive	89/336/CEE dated 03.05.1989		
• Water and dust projection	IP50		

Presentation and dimensions

• Display	2 lines of 16 characters		
• Output relay	2 trip outputs, 22 dedicated outputs		
• Logical inputs	12, dedicated		
• signalling LEDs	1 for Watchdog, 2 dedicated multifunction LEDs		
• Height, Width, Depth	6U x $\frac{1}{2}$ 19" : 260 x 210 x 320 mm		
• Weight	10 kg		

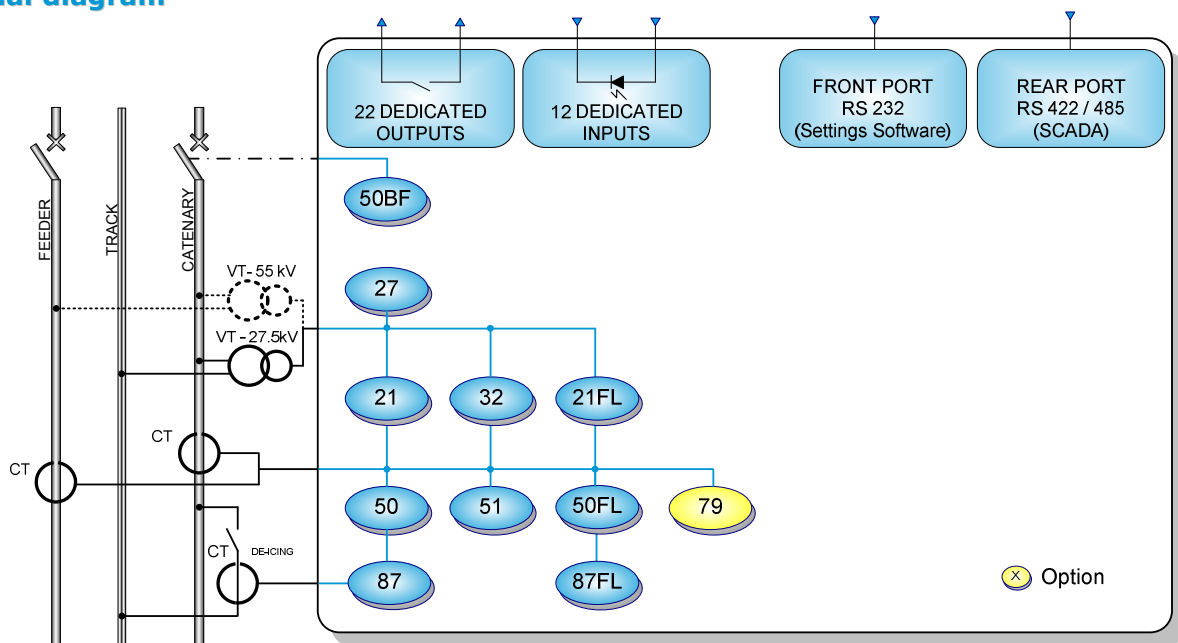
Functionalities

- 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



Only documents supplied with our acknowledgment are to be considered as binding.