PDZIN1

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.

- 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

GENERAL CHARACTERISTICS

Auxiliary supply	
• Auxiliary supply ranges	48 – 110 to 125 Vdc, -20 % +10 %
• Typical burden	8 W (in survey), 12 W (operating)
• Power off withstand	30ms
• 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
• U_{cat} and U_{feed} VTs	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 1.9 Un/5s display of primary measures
• Frequency	47-53 or 57-63 Hz
Logical inputs	
• Level 0 / 1	< 20 Vdc / > 34 Vdc
• Burden	between 20 and 40 mA
• Taking into account time	ignored if < 10ms, taken into account if > 15ms
Outputs relays	
• Breaking capacity DC with L/R = 40ms	50 W
• Breaking capacity AC with cos φ = 0.4	1,250 VA
• "Signalling" relays	double contact NO, permanent current 8 A closing capacity 10 A/4s short-circuit current withstand 100 A/30ms
• "Tripping" relays	changeover contact, permanent current 16 A closing capacity 25 A/4s short-circuit current withstand 250 A/30ms

Minimum of impedance function [21]				
• Characteristic	parallelogram with 3 downstream stages and 2 upstream stages			
• Instantaneous operating	time 50ms (trip), 60ms (signalling)			
• Resetting percentage	101 – 105 %			
• Independent time delay	0.04 to 0.70s	in step of 0.01s	accuracy ± 2 % with 20ms min	
• Values of adjustment of lines ± 3 %	In 5 A		In 1 A	
• 1st stage downstream reactance	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	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 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 to 150.0 Ω	in step of 0.1 Ω	1.0 to 750.0 Ω	in step of 0.5 Ω
• 2nd stage downstream reactance	0.2 to 150.0 Ω	in step of 0.1 Ω	1.0 to 750.0 Ω	in step of 0.5 Ω
• 2nd stage upstream reactance	0.2 to 150.0 Ω	in step of 0.1 Ω	1.0 to 750.0 Ω	in step of 0.5 Ω
• 3rd stage downstream reactance	0.2 to 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 0.70s	in step of 0.01s	accuracy ± 2 % with 20ms mini	
• 1st stage angle of the line 0 1	60 to 85°	in step of 1°	accuracy 1°	
• Magnetising current limit	1.6 to 60.0 Ω	in step of 0.1 Ω	8.0 to 300.0 Ω	in step of 0.5 Ω
• 2nd Harmonic threshold	10 to 70 %	in step of 1 %		
• 2nd Harmonic coefficient	1 to 4	in step of 0.1		
• H2 time-delay detection after A.T. closure	0 to 2s	in step of 0.01s		
• 2nd stage time delay T2AV	0.04 to 2.55s	in step of 0.01s	accuracy ± 2 % with 20ms mini	
• 2nd stage time delay T2AM	0.04 to 2.55s	in step of 0.01s	accuracy ± 2 % with 20ms mini	
• 3rd stage time delay T3AV	0.04 to 2.55s	in step of 0.01s	accuracy ± 2 % with 20ms mini	

GENERAL CHARACTERISTICS

Overcurrent protection [50] [51]			
• Status in or out of service			
• Instantaneous operating time	50ms (trip), 60ms (signalling) for I ≥ 2 Is		
• Resetting percentage	95 – 99 %		
• Adjustment thresholds	1 A 0.40 to 4.00 A	in step of 0.02 A	accuracy ± 2 %
• Adjustment thresholds	5 A 2.0 to 20.0 A	in step of 0.1 A	accuracy ± 2 %
• Independent time delay	0.04 to 3.00s	in step of 0.01s	accuracy ± 2 % with 20ms mini
• Timing curves	inverse, very inverse, extremely inverse according to IEC 255-4, accuracy 5 %		
Undervoltage protection [27]			
• Threshold	50 to 90 % Un		
• Instantaneous operating time	50ms (trip), 60ms (signalling)		
• Resetting percentage	101 – 105 %		
Directional protection [32]			
• 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}		
• Instantaneous operating time	50ms (trip), 60ms (signalling) for I ≥ 2 Is		
• Resetting percentage	95 – 99 %		
• Slow stage 1 A	0.08 to 0.80 A	in step of 0.02 A	accuracy ± 2 %
• • Slow stage 5 A	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 1 A	0.24 to 1.60 A	in step of 0.02 A	accuracy ± 2 %
• Fast stage 5 A	1.2 to 8.0 A	in step of 0.1 A	accuracy ± 2 %
• Fast stage time delay	0.5 to 60s	in step of 0.5s	accuracy ± 2 %
• Adjustment angle ½ line D1	85 to 170°	in step of 1°	accuracy ± 1°
• Adjustment angle ½ line D2	-10 to -80°	in step of 1°	accuracy ± 1°
De-icing protection [87]			
• Status in or out of service			
• Resetting percentage	95 – 99 %		
• 1 A threshold	0.10 to 4.0 A	in step of 0.02 A	accuracy ± 2 %
• 5 A threshold	0.5 to 20.0 A	in step of 0.1 A	accuracy ± 2 %
• 1 A differential current threshold5 A differential current	0.04 to 0.40 A	in step of 0.02 A	accuracy ± 5 %
• Time delay	0.04 à 0.50s	in step of 0.01s	accuracy 20ms
C.B. failure [50BF]			
• Alarm for the number of kA^2 cut-off	1,000 to $(2^{32}/2)$-1 kA^2		
• Operation number	1,000 to 20,000		
C.B. monitoring [50BF]			
• Time-delay	0.10 to 1.00s	in step of 0.01s	
• C.B. management mode	Cut-off current		
Recloser [79] (option)			
• Status	in or out of service		
• Nomber of cycles	0 to 3		
• Dead time cycle 1	0.3 to 650s	in step of 0.1s	accuracy ± 2 %
• Dead time cycle 2	0.3 to 650s	in step of 0.1s	accuracy ± 2 %
• Dead time cycle 3	0.3 to 650s	in step of 0.1s	accuracy ± 2 %
• Reclaim time for each cycle	1 to 650s	in step of 1s	accuracy ± 2 %
• Number of cycles per minute (alarm)	1 to 999	in step of 1	
• Reclaim time for manually closing	1 to 650s	in step of 1s	accuracy ± 2 %
• Reclosing pulse duration	0.1 to 5s	in step of 0.1s	accuracy ± 2 %

GENERAL CHARACTERISTICS

Fault locator [21FL]-[50FL]-[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 1,000 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)
MODBUS® communication	
• Transmission	asynchronous series, 2 or 4 wires
• Interface	RS485
• 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 5ns	IEC 801.4 class 4 (equivalent IEC 255-22-4 class 4)
• Shock	IEC 255-4 class 3 (5 kV – 1.2/50 µs)
• Dielectric withstand	IEC 255-5 class 3 (2 kV_{rms} – 1 min)
• Insulation resistance	> 1,000 MΩ 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 ½ 19": 260 x 210 x 320 mm
• Weight	10 kg

FUNCTIONALITIES

- 2 ranges of auxiliary supply
- Configuration and parameter setting by local HMI or offline 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 autotransformer 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 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 transmision orders
- 2*25 kV operation mode forced to 1*25 kV (external input or communication network)

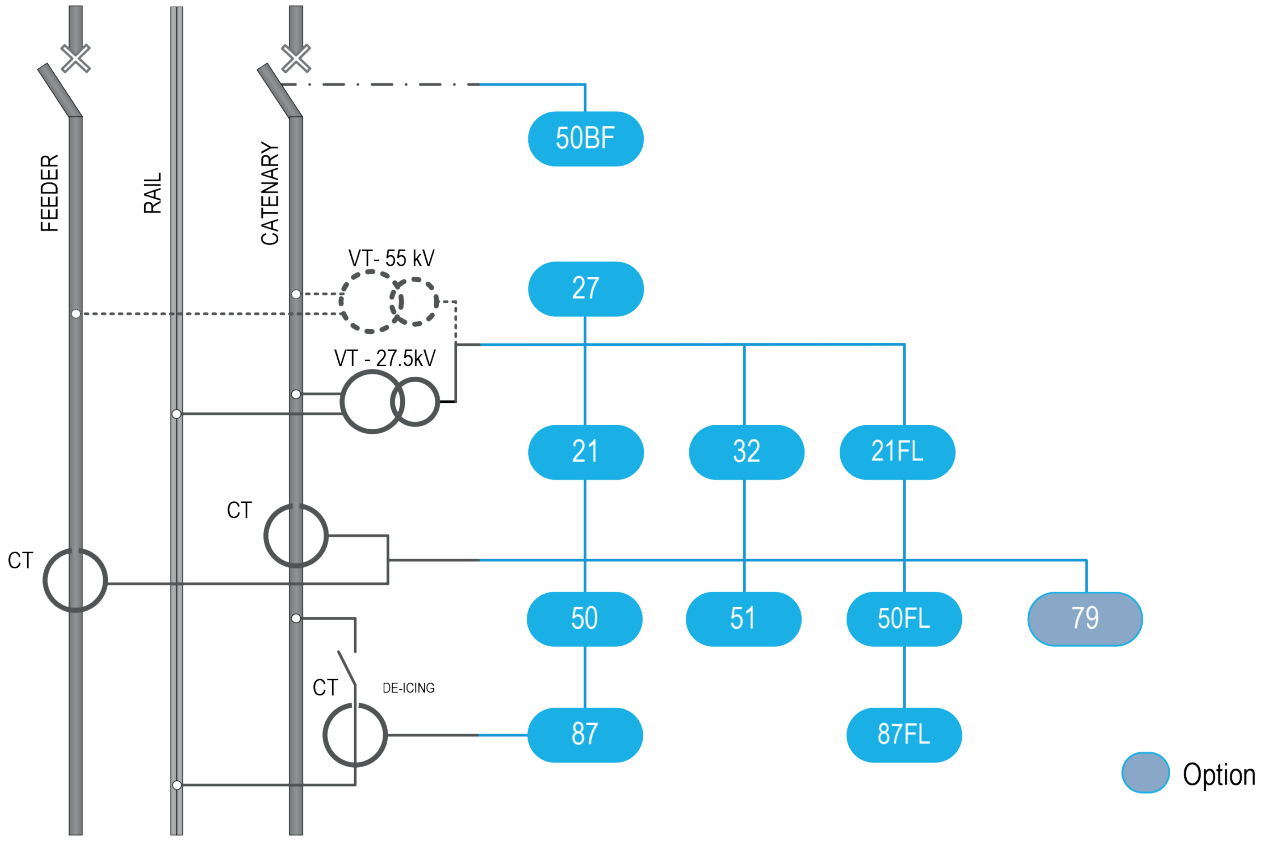
PDZIN1

- 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
- Automatisms functions (factory set, consult us)

FUNCTIONAL DIAGRAM



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