

RAILWAY

Traction Group Protection



The protective relay PGTN1 is designed to protect and secure catenary and feeder traction groups located in electric traction sub-stations in the area of MV and HV supply voltage.

The PGTN1 relay is an **advanced** traction protection device. In addition to the standard protection functions, it provides the minimum impedance function.

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.

PGTN1



- Multifunction
- Measures
- Events log
- Disturbance
- Local HMI

Protection functions

- 2 phase thresholds of overcurrent protection [50] [51], with two switchable modes
- 2 thresholds of directional protection [67]
- Under-voltage protection [27]
- Transformer Earth-tank protection [50N]
- Voltage reverse protection
- CB SF6 fault monitoring

Backup for PGTN1

- 3 downstream and 2 upstream zones of minimum of impedance protection [21] (backup)

Our energy at your service

CHARACTERISTICS

Auxiliary supply

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

Analogue inputs

- I_{GT} CT: I_n 1 or 5 A

- Tank CT

- U_{GT} or V_{Ph1} VTs

- Frequency

Logical Inputs

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

Relays Outputs

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

- "Tripping" relays

Overcurrent Protection [50] [51]

- Instantaneous operating time
- Resetting percentage
- Adjustment thresholds 1 A
- Adjustment thresholds 5 A
- Independent time delay
- Timing curves

Undervoltage Protection U_{GT} or U_{Ph1} [27]

- Threshold
- Instantaneous operating time
- Resetting percentage

Directional Protection [67]

- Characteristic
- Instantaneous operating time
- Resetting percentage
- Slow or fast stage, 1 A
- Slow or fast stage, 5 A
- Slow stage time delay
- Fast stage time delay
- Adjustment angle $\frac{1}{2}$ line D1
- Adjustment angle $\frac{1}{2}$ line D2

Earth Tank Protection [50N]

- Instantaneous operating time
- Adjustment threshold
- Resetting percentage

Reverse Protection

- V_{Ph1}/V_{Ph2} threshold φ
- Instantaneous operating time
- Time delay

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

low and high thresholds: measurement from 0.8 to 8 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 32 000 A
measurement from 0.1 to 4 A - burden at $I_n < 0.2 VA$
continuous rating 3 I_n , short duration withstand 80 $I_n/1s$
display of primary currents from 1 to 1 000 A
primary rated value: adjustable from 25 kV to 600 kV
secondary rated value U_{GT} : 100 or 110 V
secondary rated value V_{Ph1} : 100/ $\sqrt{3}$ or 110/ $\sqrt{3}$ 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
45-55 or 55-65 Hz

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

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

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 min
inverse, very inverse, extremely inverse
according to IEC 255-4, accuracy 5%

50 to 90% U_n
from 50ms to 2.00s, in step of 10ms (trip), 60ms (signalling)
101 – 105%

circular with limitation by 2 " $\frac{1}{2}$ lines"
50ms (trip), 60ms (signalling) for $I \geq 2 I_s$
95 – 99%

0.16 to 4.00 A	in step of 0.04 A	accuracy $\pm 2\%$
0.8 to 20.0 A	in step of 0.2 A	accuracy $\pm 2\%$
1 to 10 min	in step of 1 min	accuracy $\pm 2\%$
0.05 to 60s	in step of 0.01s	accuracy $\pm 2\%$
85 to 170°	in step of 1°	accuracy $\pm 1^\circ$
- 10 to - 80°	in step of 1°	accuracy $\pm 1^\circ$

50ms (trip), 60ms (signalling) for $I \geq 2 I_s$
0.1 to 4.0 A in step of 0.1 A accuracy $\pm 2\%$
95 – 99%

between 170° and -15°
50ms (trip), 60ms (signalling) for $I \geq 2 I_s$
0.04 to 2.0s in step of 0.01s accuracy $\pm 2\%$ (20ms min)

CHARACTERISTICS

SF6 Fault Tripping – CB Failure Tripping – External Tripping

- Instantaneous operating time 50ms (trip), 60ms (signalling)

Buchholz Fault Tripping

- Instantaneous operating time 50ms (trip), 60ms (signalling)

Minimum of Impedance Backup Protection [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 $\pm 2\%$ with 20ms min
- Values of adjustment of lines $\pm 3\%$ In 5 A In 1 A
 - 1st stage downstream reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
 - 1st stage upstream reactance 0.1 to 30.0 Ω in step of 0.1 Ω 0.5 to 150.0 Ω in step of 0.5 Ω
 - 1st stage downstream resistance 0.8 to 6.0 Ω in step of 0.1 Ω 4.0 to 30.0 Ω in step of 0.5 Ω
 - 1st stage upstream resistance 0.8 to 12.0 Ω in step of 0.1 Ω 4.0 to 60.0 Ω in step of 0.5 Ω
 - 1st stage downstream switched reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
 - 1st stage upstream switched reactance 0.1 to 30.0 Ω in step of 0.1 Ω 0.5 to 150.0 Ω in step of 0.5 Ω
 - 1st stage downstream switched reactance 0.8 to 6.0 Ω in step of 0.1 Ω 4.0 to 30.0 Ω in step of 0.5 Ω
 - 1st stage upstream switched reactance 0.8 to 12.0 Ω in step of 0.1 Ω 4.0 to 60.0 Ω in step of 0.5 Ω
 - 2nd stage downstream reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
 - 2nd stage downstream switched reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
 - 2nd stage upstream reactance 0.1 to 30.0 Ω in step of 0.1 Ω 0.5 to 150.0 Ω in step of 0.5 Ω
 - 2nd stage upstream switched reactance 0.1 to 30.0 Ω in step of 0.1 Ω 0.5 to 150.0 Ω in step of 0.5 Ω
 - 3rd stage downstream reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
 - 3rd stage downstream reactance 3.0 to 30.0 Ω in step of 0.1 Ω 15.0 to 150.0 Ω in step of 0.5 Ω
- 1st stage time delay T1 0.04 to 1.20s in step of 0.01s accuracy $\pm 2\%$ with 20ms min
- 1st stage angle of the line θ 60 to 85° in step of 1° accuracy 1°
- Magnetizing current limit 0.8 to 6.0 Ω in step of 0.1 Ω 4.0 to 30.0 Ω in step of 0.5 Ω
- Harmonic 2 threshold 10 to 70% in step of 1%
- h2 coefficient 1.2 to 4 in step of 1 1.2 to 4 in step of 1
- 2nd stage time delay T2AV 0.04 to 1.20s in step of 0.01 s accuracy $\pm 2\%$ with 20ms min
- 2nd stage time delay T2AM 0.04 to 1.20s in step of 0.01 s accuracy $\pm 2\%$ with 20ms min
- 3rd stage time delay T3AV 0.04 to 1.20s in step of 0.01 s accuracy $\pm 2\%$ with 20ms min

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 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 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, 12 dedicated outputs
- Logical inputs 12, dedicated
- Signalling LEDs 1 for Watchdog, 2 dedicated multifunction LEDs
- Height, Width, Depth 6U x 1/2 19": 260 x 210 x 320 mm
- Weight 10 kg

FEATURES

- 2 ranges of auxiliary supply voltages
- 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:
 - Transformer current and voltage
 - Resistance, reactance, impedance and angle of the line
 - V_{Ph2}/V_{Ph1} , I_{Tank}
 - Display expressed in primary current and voltage
- Instantaneous alarm thresholds
- 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
- Directional protection with 2 stages
- Catenary undervoltage protection
- As a PDZIN1 backup, protection of feeder and catenary:
 - 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
- Secured tripping circuit with no-level and transmission orders
- Assistance with circuit breaker maintenance: number of operations and break current I^2 per phase counters, alarms
- 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
- Storing of measurements and active settings group
- Local/remote acknowledgement of events
- 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

Functional diagram

