

# 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. An optional recloser with 3 cycles is available.

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.



#### **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



- Events log
- Disturbance
- Local HMI

#### **Backup for PGTN1**

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





# PGTN1



### **GENERAL 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 <sub>gt</sub> CT: In 1 or 5 A	low and high thresholds: measurement from 0.8 to 8 In - burden at In < 0.2 VA continuous rating 3 In, short duration withstand 80 In/1s display of primary currents up to 32 000 A
<ul> <li>Tank CT</li> <li>U<sub>GT</sub> or U<sub>Ph1</sub> VTs</li> <li>Frequency</li> </ul>	Tank CT measurement from 0.1 to 4 A – burden at In < 0.2 VA continuous rating 3 In, short duration withstand 80 In/1s display of primary currents from 1 to 1,000 A primary rated value: adjustable from 25 kV to 600 kV secondary rated value UGT: 100 or 110 V secondary rated value VPh1: 100/ $\sqrt{3}$ or 110/ $\sqrt{3}$ V burden at Un < 0.2 VA continuous rating 1.5 Un, short duration withstand 1.9 Un/5s display of primary measures 45-55 or 55-65 Hz
Logical inputs • Level 0 / 1 • Burden • Taking into account time	< 20 Vdc / > 34 Vdc between 20 and 40 mA ignored if < 10 ms, taken into account if > 15 ms
<ul> <li>Relays Outputs</li> <li>Breaking capacity DC with L/R = 40ms</li> <li>Breaking capacity AC with cos φ = 0.4</li> <li>"Signalling" relays</li> </ul>	50 W 1,250 VA double contact NO, permanent current 8 A Closing capacity 10 A/4s short circuit current withstand 100 A/30ms
• "Tripping" relaysw	changeover contact, permanent current 16 A closing capacity 25 A/4s short circuit current withstand 250 A/30ms
Overcurrent protection [50] [51] Instantaneous operating time Resetting percentage Adjustment thresholds 1 A Adjustment thresholds 5 A Independent time delay Timing curves	50ms (trip), 60ms (signalling) for $I \ge 2$ Is 95 - 99 % 0.80 to 8.00 A, in step of 0.04 A, accuracy $\pm 2$ % 4.0 to 40.0 A, in step of 0.2 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 %
Undervoltage protection UGT or UPh1 [27] <ul> <li>Threshold</li> <li>Instantaneous operating time</li> <li>Resetting percentage</li> </ul>	50 to 90 % Un from 50ms to 2.00s, in step if 10ms (trip), 60ms (signalling) 101 – 105 %
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 ½ line D1 • Adjustment angle ½ line D2	circular with limitation by 2 «½ lines» 50ms (trip), 60ms (signalling) for $I \ge 2$ Is 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 0.1s accuracy $\pm 2$ % 85 to 170° in step of 1° accuracy $\pm 1°$ -10 to -80° in step of 1° accuracy $\pm 1°$
Earth Tank Protection [50N] <ul> <li>Instantaneous operating time</li> <li>Adjustment threshold</li> <li>Resetting percentage</li> </ul>	50ms (trip), 60ms (signalling) for $I \ge 2$ Is 0.1 to 4.0 A in step of 0.1 A accuracy $\pm 2\%$ 95 – 99%
Reverse Protection         • V <sub>ph1</sub> /V <sub>ph2</sub> threshold φ         • Instantaneous operating time         • Time delay	between 170° and -15° 50ms (trip), 60ms (signalling) for I $\ge$ 2 Is 0.04 to 2.0s in step of 0.01s accuracy $\pm$ 2% (20min)



### **GENERAL CHARACTERISTICS**

<b>SF6 Fault Tripping – CB Failure Tripping – External Tripping</b> • Instantaneous operating time	50ms (trip), 60ms (signalling)
Buchholz Fault Tripping <ul> <li>Instantaneous operating time</li> </ul>	50ms (trip), 60ms (signalling)
<ul> <li>Programming</li> <li>Display</li> <li>Configuration software</li> </ul>	French, English compatible with Windows 95, 98, 2000, NT, XP (French, English)
Minimum of impedance function [21]         • Characteristic         • Instantaneous operating         • Resetting percentage         • Independent time delay         • Values of adjustment of lines ± 3 %         1st stage downstream reactance         1st stage upstream reactance         1st stage downstream resistance         1st stage upstream resistance         1st stage downstream switched reactance         1st stage upstream switched reactance         1st stage downstream switched reactance         2nd stage downstream switched reactance         2nd stage upstream switched reactance         2nd stage upstream switched reactance         2nd stage upstream switched reactance         3rd stage downstream reactance <t< td=""><td>parallelogram with 3 downstream stages and 2 upstream stages time 50ms (trip), 60ms (signalling) 101 – 105 % 0.04 to 0.70s in step of 0.01s accuracy <math>\pm 2</math> % with 20ms min In 5 A In 1 A 3.0 to 30.0 <math>\Omega</math> in step of 0.1 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step of 0.5 $\Omega$ 3.0 to 30.0 $\Omega$ in step of 1.0 $\Omega$ 4.0 to 30.0 $\Omega$ in step of 0.5 $\Omega$ 3.0 to 30.0 $\Omega$ in step
<ul> <li>3<sup>rd</sup> stage time delay T3AV</li> <li>Programming</li> <li>Display</li> </ul>	0.04 to 1.20s in step of 0.01 s accuracy $\pm$ 2 % with 20ms min French, English
Configuration software	compatible with Windows 95, 98, 2000, NT, XP (French, English)
MODBUS <sup>®</sup> communication • Transmission • Interface • Transmission speed Disturbance recording • Number of recordings • Total duration • Pre time	asynchronous series, 2 or 4 wires RS485 300 to 19,200 bauds 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 μs) IEC 255-5 class 3 (2 kV <sub>rms</sub> - 1 min) > 1,000 MΩ 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 <ul> <li>Display</li> <li>Output relay</li> <li>Logical inputs</li> <li>Signalling LEDs</li> <li>Height, Width, Depth</li> <li>Weight</li> </ul>	2 lines of 16 characters 2 trip outputs, 12 dedicated outputs 12, dedicated 1 for Watchdog, 2 dedicated multifunction LEDs 6U x ½ 19": 260 x 210 x 320 mm 10 kg

# PGTN1



## **FUNCTIONALITIES**

- 2 ranges of auxiliary supply voltages
- · Configuration and parameter setting by local HMI or offline 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 autotransformer by shift of measurement curve

#### **Options**

zones 2 and 3

Communication by Modbus<sup>®</sup>, 2 or 4 wires RS485

- 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<sup>2</sup> per phase counters, alarms
- Configuration and operation software compatible with Windows<sup>®</sup> 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 loa
- Self-diagnosis: RAM, ROM, EEPROM, output relays, A/D converters, auxiliary supply, cycles of execution of the software, hardware anomaly



INDUSTRY



GENERATION

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