

1 MATHEMATICAL BASICS

- 1.1 PHASOR SYSTEMS
- 1.2 BASIC ELEMENTS AND CURRENT-/ VOLTAGE RELATIONS
- 1.3 CALCULATION DOMAINS
- 1.4 TIME DOMAIN
- 1.5 FREQUENCY DOMAIN
- 1.6 SYMMETRICAL COMPONENTS
- 1.7 SHORT CIRCUIT CALCULATION

2 CURRENT TRANSFORMER

- 2.1 PARAMETERS
- 2.2 MEASURING CORE
- 2.3 PROTECTION CORE
- 2.4 IRON CORED CT - TPS, TPX
- 2.5 CT'S WITH AIR GAPS TPY, TPZ
- 2.6 CLASS X ACCORDING BS 3938
- 2.7 CONNECTION
- 2.8 THEORETICAL CONSIDERATIONS TO THE TRANSMISSION BEHAVIOUR
- 2.9 FUNDAMENTAL EQUATIONS
- 2.10 PRIMARY CURRENT / INDUCTION / SATURATION
- 2.11 STATIONARY TRANSMISSION BEHAVIOUR
- 2.12 TRANSIENT TRANSMISSION BEHAVIOUR
- 2.13 TESTING

3 STARPOINT GROUNDING

- 3.1 THE INFLUENCE OF STARPOINTGROUNDING
- 3.2 CLASSIFICATION OF STARPOINT GROUNDING
- 3.3 APPLICATION, ADVANTAGES AND DISADVANTAGES OF EACH SYSTEM
- 3.4 ISOLATED NETWORK
- 3.5 COMPENSATED NETWORK
- 3.6 SOLIDLY EARTHED NETWORK
- 3.7 EARTHING VIA RESISTOR OR REACTOR

4 EARTH FAULT PROTECTION

- 4.1 APPLICACION AND OPERATIONAL ASPECTS
- 4.2 UNIDIRECTIONAL PROTECTION
- 4.3 WATTMETRIC METHOD
- 4.4 ISOLATED NETWORK
- 4.5 COMPENSATED NETWORK
- 4.6 INCREASED ACTIVE CURRENT METHOD
- 4.7 CT INFLUENCE AND CONNECTION
- 4.8 TRANSIENT METHOD
- 4.9 VOLTAGES AND CURRENTS
- 4.10 ALGORITHMS
- 4.11 HARMONICS
- 4.12 FAULT LOCATOR USING PULS-MODULATION
- 4.13 ADMITTANCE METHOD

5 OVERCURRENT PROTECTION

- 5.1 MAIN PROTECTION
- 5.2 BACK UP PROTECTION
- 5.3 FAULT DETECTION
- 5.4 TIME GRADING
- 5.5 TRIP TIME CHARACTERISTICS
- 5.6 DIRECTIONAL PROTECTION

6 DISTANCE PROTECTION

- 6.1 APPLICATION
- 6.2 TIME GRADING
- 6.3 IMPEDANCE GRADING AT LINES AND TRANSFORMERS
- 6.4 FUNCTIONAL PRINCIPLE
- 6.5 FAULT DETECTION
- 6.6 OVERCURRENT-, V/I- UND $Z <$ STARTERS
- 6.7 IMPEDANCE CALCULATION
- 6.8 TYPES OF FAULTS AND LOOP SELECTION
- 6.9 CHARACTERISTICS
- 6.10 MHO-RELAYS
- 6.11 SETTING
- 6.12 LIMITATION OF THE DISTANCE PROPORTIONAL MEASUREMENT
- 6.13 ARC AND FAULT RESISTANCES
- 6.14 PARALLEL LINES

7 TRANSFORMER PROTECTION

- 7.1 BUCHHOLZ PROTECTION
- 7.2 FUSES
- 7.3 OVERCURRENT PROTECTION
- 7.4 DISTANCE PROTECTION
- 7.5 EARTH FAULT PROTECTION
- 7.6 TRANSFORMER DIFFERENTIAL PROTECTION
- 7.7 FUNCTIONAL PRINCIPLE
- 7.8 STABILISED DIFFERENTIAL PROTECTION
- 7.9 UNSTABILISED DIFFERENTIAL PROTECTION
- 7.10 VECTOR DIAGRAM / TRANSMISSION BEHAVIOUR
- 7.11 KONVENTIONAL DIFFERENTIAL PROTECTION
- 7.12 DIGITAL TRANSFORMER DIFFERENTIAL PROTECTION
- 7.13 MAGNITUDE- AND ANGLE CORRECTION AS WELL AS ZERO SEQUENCE ELIMINATION
- 7.14 CALCULATION OF THE DIFFERENTIAL- AND RESTRAINT CURRENT
- 7.15 STABILISING AGAINST INRUSH
- 7.16 STABILITY TEST
- 7.17 CRITICAL OPERATION
- 7.18 OVERLOAD PROTECTION

8 PRACTICAL TEST / HANDS ON BY USING THE NETMODEL AND DIFFERENT RELAYS

- 8.1 DEVELOPMENT OF THE PROTECTIVE CONCEPT FOR A TYPICAL MV-GRID
- 8.2 SHORT CIRCUIT CALCULATION
- 8.3 CALCULATING THE RELAY SETTINGS
- 8.4 PARAMETERISING
- 8.5 SIMULATION OF SHORT CIRCUITS USING THE NETMODEL AND SECONDARY TEST EQUIPMENT
- 8.6 ANALYSING AND VERIFYING THE ALARMS AND FAULT RECORDS