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National Grid

National Grid Technical Specification

NGTS 3.24.35
Issue 1
May 2000

Non-Unit Feeder Protection

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(National Grid Legal Services. November 1999)

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Registered in
England and Wales
No. 2366977

Published by:

National Grid
Kelvin Avenue
Leatherhead
Surrey KT22 7ST

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NON-UNIT FEEDER PROTECTION

FOREWORD

This Specification is a functional specification within the Substation Control and Protection suite.

1 SCOPE

This Specification details the functional and performance requirements for non-unit protection for feeder circuits on the National Grid 400 kV, 275 kV and 132 kV systems. It covers the requirements for non-unit feeder main and back-up protection based on distance protection.

2 REFERENCES

This Specification makes reference to the following documents:

NGTS 1	Overview – National Grid System
NGTS 3.2.4	Current Transformers for Protection and General Use on the 132 kV, 275 kV and 400 kV Systems
NGTS 3.2.5	Voltage Transformers for Use on the 132 kV, 275 kV and 400 kV Systems
NGTS 3.24.4	Hardware Platform
NGTS 3.24.7	Feeder Bay Function
NGTS 3.24.36	Teleprotection
IEC 255-16	Electrical Relays - Impedance Measuring Relays

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3 FUNCTIONAL REQUIREMENTS

General

- 3.1 The functionality shall be implemented in accordance with the Hardware Platform Specification NGTS 3.24.4.

Non-Unit Feeder Protection

Informative: A non-unit feeder protection can be defined as a protection whose operation and section selectivity are solely dependent on the measurement of electrical quantities at one end of the protected line. It is assumed that the non-unit feeder protection provided is based on distance protection.

Informative: If a non-unit feeder protection based on a different operating principle is offered, it shall have equivalent functionality and performance.

- 3.2 Non-unit feeder protection shall be provided with the following functions:

- (i) Distance protection function
- (ii) Switch-onto-fault function
- (iii) Distance schemes
- (iv) Zone 2 time delay override function
- (v) Voltage transformer supervision function
- (vi) Power swing blocking function

- 3.3 The input and output logic of a non-unit feeder protection shall be in accordance with Figures 1, 2 and 3.

Distance Protection Function

- 3.4 The distance protection shall employ an impedance measuring algorithm with inputs derived from voltage transformers and current transformers. The protection shall meet the requirements of IEC 255-16.
- 3.5 As a plain scheme, the distance protection shall be provided with three independent zones of protection, normally termed Zone 1, Zone 2 and Zone 3 as specified in Table 1.

Table 1

Protection Zone	Main/Back-up	Direction of Measurement	Zone Timer
Zone 1	Main zone	Forward	Not Required
Zone 2	Back-up zone	Forward	Zone 2 Timer (Z2t)
Zone 3	Back-up zone	Forward + Reverse	Zone 3 Timer (Z3t)

Informative: Zone 3 protection can be provided by two independent protection zones (Zone 3 Forward and Zone 3 Reverse).

- 3.6 The input and output logic of a plain scheme shall be in accordance with Figure 1.
- 3.7 Each protection zone shall be responsive to all types of short circuit fault located within its reach settings. Algorithms shall be employed to detect each type of phase-to-phase faults and each type of phase-to-earth faults simultaneously.
- 3.8 The protection shall be able to detect evolving faults, simultaneous faults and inter-circuit faults.

Operating Characteristics

- 3.9 The Manufacturer shall declare the operating characteristics of the protection in graphical form (ie. in R/X diagram) and by mathematical formulae. The operating characteristics shall be referred to the reach setting in accordance with Clause 4.1 of IEC 255-16.