7SG15 MicroTAPP

Automatic Voltage Control

Document Release History

This document is issue 2010/02. The list of revisions up to and including this issue is:
Pre release

2010/02	Document reformat due to rebrand

Software Revision History

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Contents

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1. General

These are preliminary performance specification.

2. Characteristics

2.1 Energising Quantities

Single-phase current (any phase) and 3-phase voltages will be measured at 50 or 60Hz.

	Measured Quantity	Nominal Values	Measured Range
V_n	AC Voltage	110V RMS	227% x V_n
I_n	AC Current	0.5A, 1A, 2A or 5A RMS	285% x I_n

From these quantities the following will be calculated with the specified accuracies.

Calculated Value	Accuracy
RMS Voltage	±0.25% @ 80% x Vn
RMS Current	±5% @ 20% x In
System Frequency	±0.125Hz between 47Hz and 63Hz
System Power Factor	±0.5°

2.2 Measuring Circuit Burden

1A current input	1VA	<0.5Ω
5A current input	1VA	<0.5Ω
110V voltage input	0.1VA	>1MΩ

2.3 Basic Voltage Control

V_t	Target level	85% to 115% step 0.1%
B_w	Bandwidth	0 to ±5% step 0.1%
t_i	Initial Delay	DTL: 2s to 180s step 1s IDMTL: time setting, target voltage and deadband to be defined

The relay will use phase A-B r.m.s. voltage for its basic bandwidth calculations.

2.4 Load Drop Compensation

The value is entered as a percent increase in busbar voltage required at the firm capacity of the substation (taking into account all transformers).

B_s	Bias Level (at firm capacity)	0 to 20% step 0.1%

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Nt	No. of transformers	1 to 16 step 1
pf	Initial Assumed System Power Factor	0.85 to 1.0 step 0.01 leading and lagging

2.5   Coupling

The coupling level is entered as the nameplate impedance of the transformer. If the coupling is set other than zero then the transformers' taps will not drift apart. Over time the transformers will tend to drift together. At the correct setting the transformers will minimise circulating current quickly but will not result in hunting.

Coupling	5 to 50% step 0.1%

2.6   Frequency Load Control

The MicroTAPP will act to prevent frequency reduction by voltage reduction if appropriate by predicting the likely effect. The settings and accuracies are not yet defined.

2.7   Monitoring and Guard Levels

The MicroTAPP will prevent tap-changer runaway and out-of-limit tapping as follows:-

Overcurrent Level	100% to 200% step 1%
Overvoltage Level	95% to 120% step 1%
Undervoltage Level	80% to 105% step 1%
N.P.S. Level	10%

3. Auxiliary energising quantities

3.1   Auxiliary Power Supply
Four versions of power supply will be available.

Nominal	Operating Range
30 V DC	24 to 37.5 V DC
48, 110, V DC	37.5 to 137.5 V DC
220 V DC	175 to 290 V DC
110 V AC	82.5 to 137.5 V AC RMS[1]

3.2   Auxiliary Supply Burden

Quiescent	17W
Maximum	20W

4. Status Inputs

Nominal	Operating Range

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30/34 V AC or DC	18 to 37.5 V
48/54 V AC or DC	37.5 to 60 V
110/125 V AC or DC	87.5 to 137.5 V
220/250 V AC or DC	175 to 280 V

4.1   Electricity Association ESI48-4

The 30/34V and 48/54V inputs meet the requirements of ESI48-4 ESI 1. However, the 110/125V and 220/250V inputs will operate with a DC current of less than 10mA. If 110/125V or 220/250V inputs compliant with ESI48-4 ESI 1 are required, a MicroTAPP with 48/54 V status can be supplied with external dropper resistors as follows:

Nominal Voltage	Resistor Value	Wattage
110, 125 V	2k7 ± 5%	2.5 W
220, 250 V	8k2 ± 5%	6.0 W

4.2   Status Input Performance

Minimum DC current to operate status input	10mA
Reset/Operate voltage ratio	≥90%
Recommended minimum pulse duration	500ms

5. Output Contacts

5.1   Carry continuously   5A a.c. or d.c.

5.2   Make and carry   (limit L/R ≤ 40ms and V ≤ 300V)

For 0.5s	20A a.c. or d.c.
For 0.2s	30A a.c. or d.c.

5.3   Break (limit ≤ 5A and V ≤ 300V)

a.c. resistive	1250VA
a.c. resistive (p.f. ≤ 0.4)	250VA
d.c. resistive	75W
d.c. resistive L/R ≤ 40ms **L/R ≤ 10ms**	30W 50W

Minimum no. of operations (1250VA resistive a.c. load)	250,000
Minimum recommended load	0.5W, limits 10mA or 5V

6. Thermal withstand

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6.1 CT Inputs

3.0 x I_n	continuous
3.5 x I_n	10 min
100A	1 sec
2500A	1 cycle

6.2 VT Inputs

250V	continuous

7. Accuracy

7.1 Accuracy Reference Conditions

Settings	All settings
Auxiliary Supply	Nominal
Frequency	50/60Hz
Ambient temperature	20°C

7.2 Accuracy

Bandwidth accuracy	±1% of absolute level
Load measurement	±5% of total substation load (assuming balance load)
Circulating current measurement	±5% of non-load current
Repeatability	±1%

7.3 Accuracy Influencing Quantities

7.3.1 Temperature

Ambient range	-10°C to +55°C
Variation over range	≤ 5%

7.3.2 Frequency

Range	47Hz to 62Hz
Setting variation	≤ 5%
Operating time variation	≤ 5%

7.3.3 Harmonic Content

Harmonic Content	Frequencies to 350Hz
Setting Variation	≤ 5%
Operating time variation	≤ 5%

7.3.4 Auxiliary Supply (DC)

Allowable superimposed A.C. component	≤ 12% of D.C. level
Allowable breaks/dips in supply (collapse to zero from nominal voltage)	≤ 20ms

8. Environmental withstand

8.1 Temperature - IEC 60068-2-1/2

Operating range	-10°C to +55°C
Storage range	-25°C to +70°C

8.2 Humidity - IEC 60068-2-3

Operational test	56 days at 40°C and 95% r.h.

8.3 Transient Overvoltage - IEC 60255-5

Between all terminals and earth or any 2 terminals without damage or flashover	5kV 1.2/50µs 0.5J

8.4 Insulation – IEC 60255-5

Between any circuit and earth	2.0kV for 1min
Between independent circuits	2.0kV for 1min
Across normally-open contacts	1.0kV for 1min

8.5 High Frequency Disturbance - IEC 60255-22-1 Class III

2.5kV longitudinal mode	variation ≤ 3%
1kV transverse mode	variation ≤ 3%

8.6 Electrostatic Discharge - IEC 60255-22-2 Class III

8kV point discharge	variation ≤ 5%

8.7 Radio Frequency Interference - IEC 60255-2-3 Class III

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20MHz to 1000MHz, 10V/m	variation ≤ 5%

8.8   Fast Transient - IEC 60255-22-4 Class IV

4kV 5/50ns, 2.5kHz repetitive	variation ≤ 3%

8.9   Vibration (Sinusoidal) - IEC 60255-21-1 Class I

Vibration response, 0.5gn	variation ≤ 5%
Vibration endurance, 1.0gn	variation ≤ 5%

8.10 Seismic - IEC 60255-21-3 Class I

Seismic response, 1gn	variation ≤ 5%

8.11 Shock and Bump - IEC 60255-21-2 Class I

Shock response, 5gn, 11ms	variation ≤ 5%
Shock withstand, 15gn, 11ms	variation ≤ 5%
Bump test, 10gn, 16ms	variation ≤ 5%

8.12 Mechanical Classification

Durability	≥ 10^6 operations

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