

Periodic Maintenance Testing of Motor Circuits.

Introduction: A motor circuit supplied by a circuit breaker/motor starter or drive must be Safe for personnel and assets. The testing is mandatory in the UK & EU.

A high resistance contact or termination in the Phase or Protective Earth has an affect of lengthening the time of a protection device to operate. Limits are set based on the circuit size, with higher current rated assets requiring lower Impedance values.

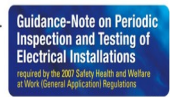
The guidelines for periodic maintenance testing for Industrial Sector is Three years with a visual annually.

Type of Workplace	Suggested Period between Visual Check	Suggested Period between Inspection & Testing
Commercial	1 year	5 years
Educational establishments	1 year	5 years
Healthcare	1 year	5 years
Industrial	1 year	3 years
Residential	1 year	5 years
Offices	1 year	5 years
Shops	1 year	5 years
Laboratories	1 year	5 years
Agricultural / Horticultural	1 year	3 years
Cinemas	1 year	3 year
Leisure complexes(excluding swimming pools)	1 year	3 years
Restaurants / Hotels	1 year	5 years
Theatres	1 year	3 years
Public houses / Bars	1 year	5 years
Marinas	4 months	1 year
Laundrettes	1 year	1 year
Petrol stations	1 year	3 years
Construction sites	3 Months	6 Months

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Chapter 6 - 6.5 - Periodic Inspection and Testing

• HSA Guidance Note for Periodic Inspection and Test give suggested time intervals for periodic inspections in various electrical installations.



• This is noted in 6.5.2: Frequency of periodic verification.

Procedure: 3Phi Reliability recommend conducting Earth Loop Impedance testing of sub boards and following the “Rp+Re” method for final motor circuits.

The Ze Earth loop Impedance test can be achieved using a multifunction tester on a GPO within a cabinet with Visual check of earth conductor.

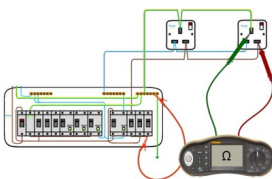
The “Rp+Re” method requires a temporary bond between Phase and PE (Protective Earth) at the motor. The measurement for resistance with MicroOhm meter is made on each phase to earth above the circuit breaker. Note: Earthing at the motor allows for the contactor to be manually pressed to make the measurement. The measurement should taken at the same level as the Ze test. (eg Circuit Breaker of GPO tested).

The “Rp+Re” result is added to the Ze measurement to give the total Zs for the circuit.

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Continuity of Conductors 6.4.3.2 Rp+Re Method

1. Connect phase to earth at distribution board.
2. Null/zero the resistance of the test leads with the test instrument.
3. Take a resistance reading between phase and earth at each outlet
4. Record the highest reading for each circuit.



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Earth Fault Loop Impedance 6.4.3.7.3

Max Loop Impedance for MCBs & RCBOs												
Type	6A	10A	16A	20A	25A	32A	40A	50A	63A	80A	100A	125A
B	7.67Ω	4.6 Ω	2.87Ω	2.3Ω	1.84Ω	1.44Ω	1.15Ω	0.92Ω	0.73Ω	0.57Ω	0.46Ω	0.37Ω
C	3.83Ω	2.3Ω	1.44Ω	1.15Ω	0.92Ω	0.72Ω	0.57Ω	0.46Ω	0.36Ω	0.29Ω	0.23Ω	0.18Ω
D	1.92Ω	1.15Ω	0.72Ω	0.57Ω	0.46Ω	0.36Ω	0.29Ω	0.23Ω	0.18Ω	0.14Ω	0.11Ω	0.09Ω

Note:

“Consideration of the increase of the resistance of the conductors with the increase of temperature due to faults” I.S.10101: 6D.6.4.3.7.2

$$Z_s (m) \leq \frac{2}{3} \times \frac{U_0}{I_a}$$

It is now recommended to keep less than 2/3 the values in the table above.

Results: The regulatory requirement is to take the highest measurement of the three phases and compare this absolute reading with the limits.

3Phi Reliability recommend in addition looking at the percentage imbalance. A reading >3% indicates a problem eg Contactor contact, Circuit Breaker contact, Isolator corrosion, or Termination/crimp. A imbalance >5% is a serious problem that requires fault finding.

A Motor Circuit test is recommended at the Motor for Winding condition.

This is an efficient method of finding high resistance defects that are hidden from view of Thermography.