

ModieLoad

Static capacitive load unit

9.8A 240vac single phase

- No heat dissipation.
- No air movement initiated.
- No inrush current issues.
- No sparking or arcing.
- Immediately usable for Re-connection. (no waiting time)



ACMA
N15191



CAUTION:
Ensure only Phase to
Neutral connection

CAT IV 300V



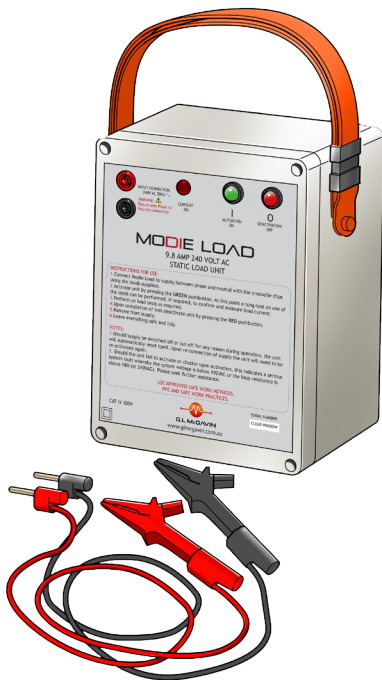
Safety information



Safety Information

To ensure safe operation and service of the ModieLoad, please follow these instructions. Failure to observe warnings can result in severe injury or death.

- Ensure that user is competent, qualified and authorised to carry out the required work.
- Avoid working alone.
- Use appropriate PPE.
- Do not use the ModieLoad in wet conditions, or around explosive gas or vapour.
- Use the ModieLoad only as specified in this manual.
- When using leads, keep your fingers behind the finger guards.
- Only use leads supplied with the unit.
- Use extreme caution when working around bare conductors or busbars. Contact with conductors can result in both electric shock and electrocution.
- Use caution with voltages above 30VAC RMS. This voltage poses a shock hazard.
- Comply with local and national safety requirements when working in locations.
- Use only the replacement fuse specified or the protection may be impaired.



THE MANUFACTURER DISCLAIMS ALL LIABILITY FOR LOSS OR DAMAGE SUFFERED AS A RESULT OF:
(A) USE OF THIS UNIT BY UNTRAINED PERSONNEL.
(B) UNAUTHORISED ALTERATION OF THIS UNIT.
(C) USE OF THIS UNIT OTHER THAN SPECIFIED IN DOCUMENTATION.

Description

The ModieLoad is a static capacitive load which draws 9.8A from a single phase nominal 240VAC supply.

Intended Use

Its intended use is as an appropriate electrical load which can be used for general installation testing and facilitate neutral integrity testing according to the methods set out in AS4741:2010. It is NOT intended to be used to test electricity kilowatt hour [kWh] meters and will not work as such.

Features:

- No heat dissipation and no moving parts.
- No moving air generated which might cause friable asbestos or allergenic dust hazards.
- No duty cycle required. Can operate indefinitely with no minimum Off time.
- No thermal cut-outs required as little heat is generated.
- Employs soft start circuitry at switch On (~20ms) and automatic rapid discharge ($t < 0.25s$) at switch Off.
- Latching switching action assures immediate switch Off if supply is disconnected or supply failure occurs during operation.
- Shoulder strap for convenient carrying and magnets attached for easy mounting on metallic surfaces.
- Superior performance to a resistive load (see Appendix 1).

Technical Specification:

Rated supply voltage: 240VAC ($\pm 10\%$) @ 50Hz

Current at nominal rated supply voltage: 9.8A (9.4A@230VAC)

Apparent power: 2.35kVA@240VAC

Insulation rating: 22KV/mm IEC 60243-1

Designed to (environmental conditions): AS61010 -1 2003 (Awaiting Approval)

Conforms to AS61010: CAT IV 300V

Part identification

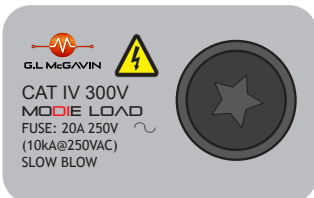
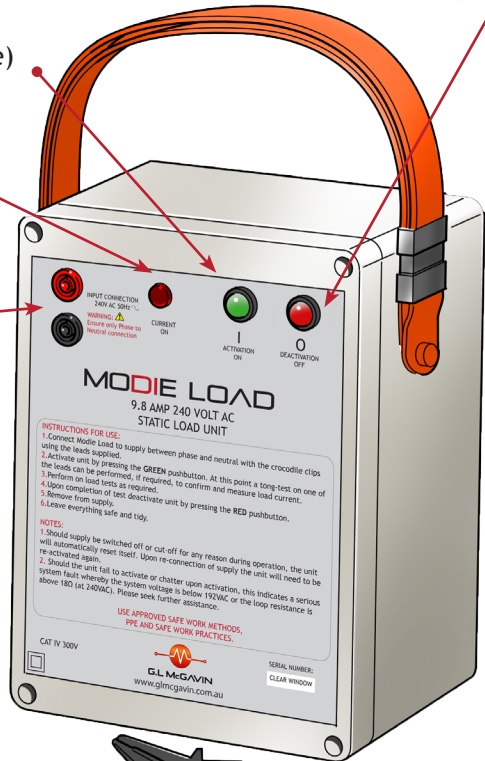
Unit Activation
(Push once to activate)

Unit Activation
Indicator

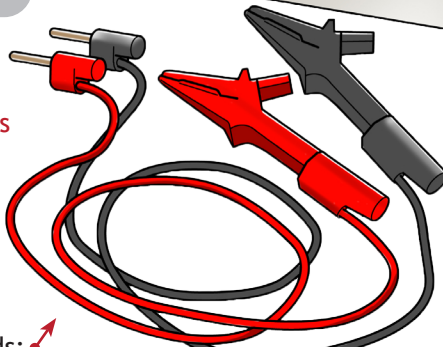
Input Connection
Phase to Neutral
only

Unit Deactivation
(Push to deactivate)

Unit Fuse:
Fuse :20 Amps 250VAC
Slow Blow Ceramic fuse
(10kA@250VAC)
SCHURTER 8020.0605



Warning : ⚡
Do not open Fuse Cap
with power on and leads
connected. Deactivate
Unit as per procedure
before removing cap.

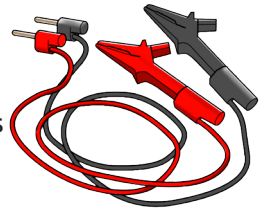


Supplied Test Leads: ⚡
Only use Approved CAT IV 300v
double insulated leads.
Ensure Leads are not damaged in
any way before each use.

Warning: ⚡
Ensure only Phase to Neutral
connection

Connection to supply

Connection to supply is by way of the two leads provided. The leads have 4mm banana plugs at one end and crocodile clips at the other end. The banana plugs are inserted into the 4mm sockets on the load unit, whilst the crocodile clips are connected to the supply connecting points (between Phase and Neutral ONLY).



Warning: Do not connect between two phases.

Operating instructions

General operating instructions

1. Appropriate PPE must be worn and safe work methods employed when using the ModieLoad.
2. Connect ModieLoad to supply between Phase and Neutral conductors with the crocodile clips using the leads provided.
3. Activate unit by pressing the **GREEN** push button. **Red** indicator lamp will light up to indicate current is flowing. Perform testing as required.

IMPORTANT: *If unit chatters or does not switch on, this indicates insufficient drive voltage as a result of a serious low voltage system fault (less than 180VAC under a 10A load). Remove the load immediately and notify the system fault to the appropriate authority.*

4. Upon completion of test, press **RED** push button to deactivate unit.
5. Leave work area tidy and safe.

Specific Operating Instructions

Pertaining to AS4741

1. Appropriate PPE must be worn and safe work methods employed when using the ModieLoad.
2. Connect the ModieLoad to the supply between Phase and Neutral conductors with the crocodile clips, using the leads provided.
3. MEN Link:
 - a. If performing Neutral Voltage measurement according to AS4741 Appendix B: B2 Voltage Method OR Appendix B: B3 Loop Impedance Method, remove the customer MEN link.
 - b. If performing Neutral integrity to AS4741 Appendix B: B4 Current Method, leave the MEN link in place.
4. Activate unit by pressing the **GREEN** push button. **Red** indicator lamp will light

to indicate current is flowing.

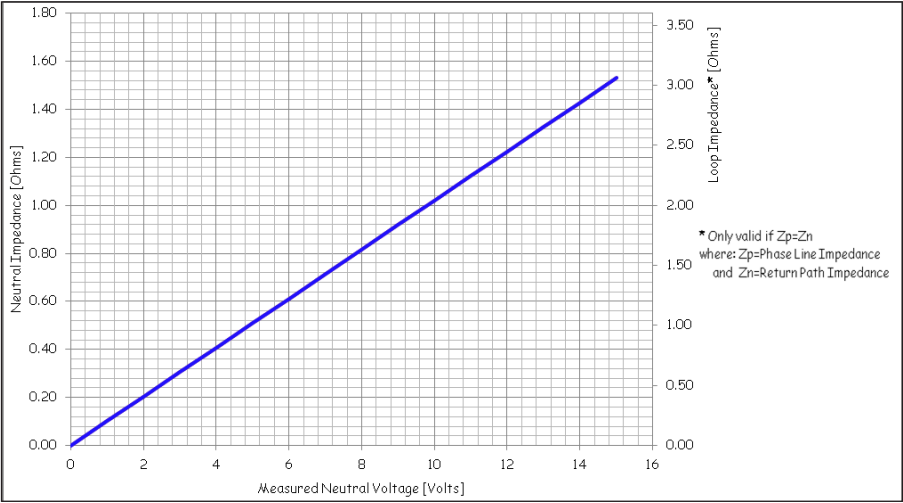
IMPORTANT: *If unit chatters or does not switch on, this indicates insufficient drive voltage as a result of a serious low voltage system fault (less than 180VAC under a 10A load). Remove the load immediately and notify the system fault to the appropriate authority.*

5. At this point, tong-test the incoming phase lead, if required, to confirm and measure load current. Note this value.
6. Deactivate the ModieLoad by pressing the **RED** push button.
7.
 - a. For AS4741 Neutral Integrity Voltage Method (B2) continue to Step (8).
 - b. For AS4741 Neutral Integrity Loop Impedance Method (B3) continue to Step (8).
 - c. For AS4741 Neutral Integrity Current Method (B4) method proceed to Step (11).
8. Establish an independent Earth connection with a suitable stake driven into the ground, or similar, with a long enough lead to reach the test area. The lead should have a crocodile clip or similar to allow for convenient connection for measurement.
9. **Neutral-Earth Voltage measurement:** Activate the ModieLoad and measure the Neutral Voltage with respect to the independent Earth conductor, as required. Note this value.
 - a. If using Voltage Method B2: Assess measured Neutral Voltage value with respect to the voltage level criteria given in AS4741 Sect:4.2. Proceed to step (12).
 - b. If using Loop Impedance Method B3: Use Chart 1 or Table 1 to give Neutral and Loop Impedance values. Compare impedance value with company acceptability criteria. Proceed to step (12).
 - c. If Phase-Neutral Voltage is also required then continue to Step (10).
10. **Phase-Neutral Voltage measurement:** If a Phase-Neutral Voltage value is required that would correspond to a resistive load at the rated test current (or measured test current):
 - a. Measure the Phase Voltage with respect to the independent Earth Voltage.
 - b. Subtract the Neutral Voltage recorded in Step (9). The nomogram on the back of the load unit can be used to facilitate this.
 - c. The result is the Phase-Neutral Voltage value required. Note result.
 - d. Go to Step (12).
11.
 - a. Activate the ModieLoad
 - b. Measure the current in the Neutral Conductor with a Tong Ammeter.
 - c. Calculate this value of Neutral Current as a percentage of Phase Current (already noted in Step (5), or check again):
$$I_{\text{Neutral}} \% = (I_{\text{Neutral}} / I_{\text{Phase}}) \times 100\%$$

- d. Assess compliance with supply authority's acceptance criterion.
- 12. Upon completion of test, press **RED** push button to deactivate unit.
- 13. Disconnect from supply.
- 14. Leave work area tidy and safe.

Chart 1: Neutral and Loop Impedance Values

Instructions: Find value of measured Neutral-Earth Voltage on horizontal scale of chart. Find the Neutral Impedance Z_n on the left vertical axis. The Loop Impedance can be found on the right vertical axis under the conditions stated.



Vn [Volts]	Zn [Ohms]	Zloop*[Ohms]
0	0.00	0.00
1	0.10	0.20
2	0.20	0.41
3	0.31	0.61
4	0.41	0.82
5	0.51	1.02
6	0.61	1.22
7	0.71	1.43
8	0.82	1.63
9	0.92	1.84
10	1.02	2.04
11	1.12	2.24
12	1.22	2.45
13	1.33	2.65
14	1.43	2.86
15	1.53	3.06

Table 1
 * Only valid if $Z_p=Z_n$
 where:
 Z_p =Phase Line Impedance
 and
 Z_n =Return Path Impedance

Appendix 1

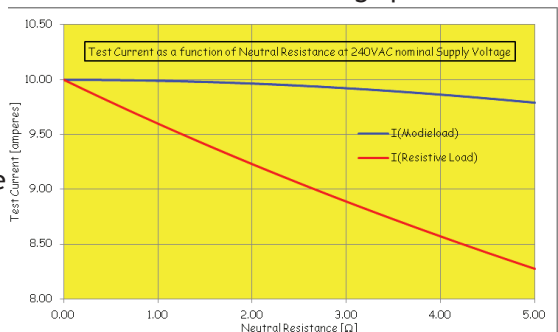
A technical note on comparing a Capacitive load with a resistive load:

The ModieLoad capacitive load has numerous advantages over a resistive load, and the user should have no doubts as to the correctness of using this method of applying load for the purposes of the AS4741 Neutral Integrity Tests and Neutral Voltage Measurements.

In addition to the clear benefits of negligible power dissipation (no heat, no moving parts, no thermal cutouts required, no duty cycle), the capacitive load exhibits another notable advantage.

As the resistance of a high resistance neutral conductor increases, so does its voltage drop under load. As a result of this voltage drop, the supply voltage available at the consumer terminals will drop and thus the test current will drop proportionally. Due to the orthogonal nature of the voltage on the ModieLoad capacitive load with respect to the neutral voltage drop, the drop in supply voltage at the consumer terminals is negligible in comparison with the corresponding drop that would occur with a resistive load. For example, with a neutral voltage of 32VAC (the maximum acceptable neutral voltage compliant with AS4741), the voltage at the consumers terminal falls by less than 1% with the ModieLoad at a nominal 10A load current (as compared with 11% using an equivalent resistive load). Thus, the rated test current will be maintained over a much greater range than with an equivalent resistive load, as shown in the figure (1) below.

To measure Line Neutral voltage available for a high power factor load (where $PF > 0.8$) with the ModieLoad, simply subtract the Neutral-Earth voltage from the Line-Earth voltage measured and determination of Phase-Neutral Voltage under load (with the MEN link removed) that would be available for high power factor (mainly resistive where $PF > 0.8$) equipment at the installation. Usually this would never be an issue as there would be ample high PF equipment loading the distributor that would compensate for the capacitive effect of the ModieLoad. Accurate Phase-Neutral Voltage determination can be easily obtained just by subtracting the Neutral-Earth



Voltage from the Phase-Earth Voltage measured across the ModieLoad as outlined in Step (10) of the AS4741 Testing Operating Instructions.

It is also possible to obtain accurate Neutral Line Impedance and Loop Impedance by using a simple chart. There is also a simple nomogram on the back of the unit which performs this calculation for the user.

Appendix 2

Earth Fault Loop Impedance testing for Neutral Integrity testing (AS4741 - Method B: B3):

Earth Fault Loop Impedance testers are designed to measure impedance around the total fault loop. They do this to ascertain sufficient prospective short circuit current will flow to assure effective fault clearance by the appropriate over-current protective device. They are not designed to test Neutral Integrity. In order to use this method for Neutral Integrity testing, an assumption has to be made that the loop impedance is equally distributed between the Line and Neutral conductors. There is no guarantee that this is the case without having detailed knowledge of the conductors installed around the loop. This major disadvantage is clearly stated in AS4741-Appendix B, B3, item (d). This could be a dangerous assumption to make.

By way of example, should a 1Ω loop impedance be measured using such a meter, one might assume a 50/50 impedance split, resulting in 0.5Ω in the Neutral conductor and 0.5Ω in the Line conductor, which, with a 10 ampere current flowing would result in a 5VAC Neutral Voltage, which is under the acceptable limit. However, it could be the case that only 0.1Ω was manifest in the Line conductor with the remaining 0.9Ω on the Neutral conductor. Were a current of 10 amperes to flow in the Neutral conductor this would result in a voltage of 9VAC on the Neutral conductor at the installation, which is above the 6VAC limit, resulting in further testing being required. The advantage of using the ModieLoad over regular Fault Loop Impedance Testers is that the ModieLoad will reveal the true Neutral conductor impedance (Z_n) without any questionable assumptions needing to be made.

If required, for ascertaining effective over-current protection, an earth fault impedance Z_{ef} can be derived by doubling this Z_n value using the assumption outlined above, but that is NOT the requirement of AS4741: Neutral Integrity testing.

In addition, due to return path conductors invariably having a higher impedance than phase conductors, using the ModieLoad method, the error would be towards

the side of safety. The derivation of return path impedance Z_n using a regular loop impedance tester will err on the side of danger.

Another major advantage of using the Modie system to determine Neutral conductor integrity is that the ModieLoad subjects the loop being tested to 10 amperes (nominal) current over an unlimited time period. This will enable poor joints, which may fail under load, to warm sufficiently to expose their faults (if they exist). Regular Fault Loop Impedance Testers do not sample more than 1 or 2 cycles at 50Hz (40mS) which might not test a bad joint or connection sufficiently.

Recommended practice for using Regular Fault Loop Impedance Testers involves multiple tests and to then take an average to obtain an accurate value. This may not happen under field conditions and the value obtained might be unrepresentative of the true value existing in the Neutral conductor. With the ModieLoad this will not happen, as the user can see the variability, if any, for as long as they want to do the test, and thus rapidly and accurately estimate a reasonable average value. There is a nomogram on the back.

Summary:

For the correct and accurate measurement of Neutral Voltage as required by all three methods as recommended in AS4741 for Neutral Integrity testing B2 (Neutral Voltage method), B3 (Loop Impedance Method, or to provide a test load for the AS4741 Neutral Integrity testing B4 (Current method), the ModieLoad:

- a. Will allow a higher test current to flow for any significant Neutral resistance, than an equivalent resistive load, and as a result,
- b. Enable the measuring instrument (voltmeter or ammeter, depending on the test method (B2 or B4) employed) to provide a correct and more accurate value of measurement, due to the higher test current being maintained .(see Figure 1)
- c. Is the only simple measuring instrument capable of providing an accurate Neutral conductor impedance value by removing the guesswork inherent with the Loop Impedance (B3) method of Neutral integrity testing as outlined in the standard (B3 item d).

Equipment maintenance

GL McGAVIN PTY. LTD.

ABN 73 383 170 955

MANUFACTURERS OF ELECTRICAL TESTING
AND MEASUREMENT

This product has been manufactured in Australia by:

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Please contact the manufacturers for all repairs, spare parts and technical advice.

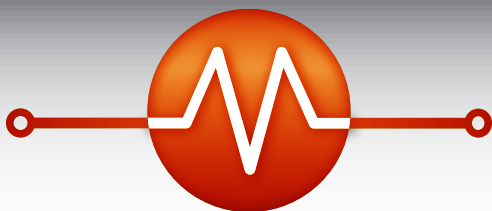
Do not replace with incorrect fuse type. Consult manufacturers if in doubt.

Fuse type(user replaceable):

SCHURTER 8020.0605, 6.3x32mm Slow Blow , 20A or similar.

CAUTION :

Do not open Fuse Cap with power on and leads connected. Deactivate unit, as shown, prior to removing cap.



G.L McGAVIN

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