ELECTRONIC ASSEMBLIES
(Pty) Ltd.

HIGH VOLTAGE SWITCHGEAR

TRICAN

OPERATING AND MAINTENANCE MANUAL

Manufactured Under License For DPM Desta Power Matla

PROUDLY SOUTH AFRICAN

OPERATING AND MAINTENANCE MANUAL

Contents

Introduction

This manual contains instructions regarding correct procedures for installation, operation and maintenance of the TRICON range of Ring Main Units.
TRICON Ring Main Units have been designed and tested in line with the latest IEC Specifications and will, if the correct procedures are followed, have a long and trouble free life.
The TRICON is suitable for free-standing applicators, indoors or outdoors, and is particularly suited for compact mini-substation application.
The basic TRICON type 2RF comprises two ring switches and a fused transformer switch. All switches are hand operated. Spring assisted mechanisms ensure that switching action is independent of the speed of the handle operation.
Operation is logical and simple. Visible interlocks are easy to operate and are mechanically sound.

The operating locations for the ring switches and the transformer switch are on the front of the unit. The cable testing facilities are located on the sides of the unit. (Fig. 1 and 2).
Cable boxes suitable for oil or compound filling and "XLPE" type terminations are available.
Alternatively, the unit can be supplied with a pedestal suitable for "XPLE" terminations.
The advanced double contact break design gives very short arcing times, thereby extending contact life, while the reduced carbon contamination of the oil extends the period between routine maintenance services.
Modular construction of the TRICON allows for quick and easy change of complete mechanisms.

Installation and Commissioning

CAUTION: *MECHANISMS CAN BE DAMAGED IF THE UNIT IS OPERATED WITHOUT THE TANK BEING FILLED WITH OIL AND / OR WITHOUT FUSE LINKS BEING FITTED.*

Inspection of equipment on site

On arrival at site the equipment should be examined and any damage caused in transit and any shortage of accessories should be reported to the supplier immediately.

Installation (Fig. 3)

The unit should be bolted to a solid level plinth with 12mm rag bolts.
Use a spirit level to ensure the all important unit levelling. (See Fig. 3 for floor plan dimensions).

WARNING: *If the unit has been stored for a period, suitable precautions must be taken to dry out the unit prior to commissioning.*

Oil Filling

All units are shipped without oil. Insulating oil to SABS Specification No. 555 must be used and the unit can be filled after the top cover is removed. The oil level is indicated inside the switching chamber and by an external glass oil level indicator

Note: *The level indicated on the label adjacent to the oil level indicator indicates the level of the oil with fuse links fitted (either long or short) and the switch closed. Prior to filling the unit, the oil should be tested in accordance with BS 148: 1972.*

Cabling (Fig. 3)

Cable boxes are fitted with removable cover plates and gland plates for easy access. After connection, ensure that the inside of the box and bushings are clean and dry before replacing the cover plate.

Cover plates and gland plates are sealed with a flat section of “Neocork” and these should be examined for damage before fitting.

Torque cover nuts in a cross pattern to 15nm. To prevent corrosion, cover the studs with anti-rust paint after assembly.

Filling of compound cable box

To fill the compound insulated box, remove the cover of the filling spout and after pre-heating the box, fill with hot compound to the top of the filling spout. Allow the compound to cool and top up with more compound.

Generally, the compound should be heated to between 160ºC and 180ºC for pouring and 140ºC for topping up, but compound manufacturer’s instructions should always be followed.

Filling of oil cable box

To fill the oil cable box the filler spout cover must be removed. After filling, replace filler spout cover, taking care not to damage the “Neocork” gasket.

Dry type cable boxes

The TRICON cable bushings are not spaced for air insulation. Dry type cable terminations have to be insulated by means of high voltage heat shrink insulation or high voltage insulation tape. In both instances the manufacturer’s instructions should be followed.

Cable testing (Fig. 1 and 2)

Cable testing prods are built into the unit and mounted on the sides, immediately above the associated cable terminations. They fold flat against the unit and are protected by a cover which is interlocked with the ring switch operating mechanism.
The cable testing cover can only be opened when the ring switch is in the “CABLE EARTHED POSITION”. With the test cover open, the switch can be operated to the “OFF” position for testing purposes, but a strong interlock prevents the operation of the switch into the “SERVICE” position.

To test the cable:

1. Operate ring switch to “CABLE EARTHED” position.
2. Remove padlock from side cover interlock and open cover.
3. Unclip and rotate test prods until they are fully extended.
4. Press prods downwards. This will engage the prods on the bushing contacts.
5. Apply the necessary test connections to the prods.
6. Operate the switch from “CABLE EARTHED” to “OFF” position. Tests can now be performed.
7. After tests are completed, operate the switch from “OFF” to “CABLE EARTHED” position to discharge cable.
8. Remove test connections.
9. Withdraw test prods and fold against the tank, close test access cover and padlock interlock arm with cover.
10. Ring switch is now operational in all positions.

Operating Instructions

WARNING: *MECHANISMS CAN BE DAMAGED IF THE UNIT IS OPERATED WITHOUT THE TANK BEING FILLED WITH OIL AND/OR WITHOUT FUSES.*

Ring Switches (Fig. 1)

The operating bosses for the Ring Switches are located on the front right and left hand sides of the unit.

A spring loaded selector bar blocks the cable earth position thus ensuring that any movement to “CABLE EARTHED” position is clearly premeditated to prevent accidental switching to earth.

The selector bar is also used to padlock the switch in any position. The selector bar will also prevent the switching through from service to earth position and vice versa.

WARNING: - If the unit is switched with out the front cover fitted, this interlock is defeated and it is possible to switch through from service to earth and vice versa.

Ring Switches (Fig. 1)

To operate switches from "OFF" to "SERVICE" position:

Without moving the selector bar, insert the handle into the operating boss and rotate in an anti clockwise direction for the left hand ring switch or in a clockwise direction for the right hand ring switch.

To operate switches from "SERVICE" to "OFF" position:

Reverse the direction of rotation explained above.

To operate switches from "OFF" to "CABLE EARTHED" position:

1. Move selector bar against the spring pressure and insert the handle into operating boss.
2. Rotate the handle in a clockwise direction for the left hand ring switch or anticlockwise for the right hand switch.

To operate switches from "CABLE EARTHED" to "OFF" position:

1. Move selector bar against the spring pressure and insert the handle into operating boss.
2. Reverse the direction of rotation explained above.

Transformer Fuse Switch (Fig. 1)

The operating crank is situated in the front top right hand side of the unit. The switch position indicator is located to the right of the operating crank. The fuse switch mechanism is of the type where the fuse carrier is a moving component. It carries the fuse from the "ISOLATED" position, through the "OPEN" position and on to the "CLOSED" position in one movement, the latter part of the stroke being by means of an independent spring operated mechanism.

Access to the fuses is only possible once they have been isolated and earthed (Earthing of the fuse links is automatic in the isolated position).

The interlocked hinged cover is opened on the front face of the unit. The fuse clip can only be released when the cover is open and the fuses are easily removed for replacement. The strikers are visible immediately the cover is opened. Any attempt to re-close without replacing the expended fuse is prevented by early operation of the trip-all-phases device.

To operate switch from "ISOLATED" to "CLOSED" position:

1. Ensure fuse links are fitted.
2. Move interlock bar to the left to free the operating crank and trap the fuse access cover.
3. Insert handle in operating crank, move downwards until spring resistance is felt and indicator shows "OPEN" position.
4. Continue the downward movement compressing the spring until the mechanism fires.
5. The switch is now closed and the indicator should show "CLOSED" position.

Transformer Fuse Switch (Fig. 1)

To operate the switch from "CLOSED" to "OPEN" to "ISOLATED" (Manual Trip)

1. Insert handle in operating crank and move upwards – the switch will trip after a small amount of travel. The position indicator will show OPEN position.
2. Continue the upwards movement of the handle until the ISOLATED position is reached.

Fitting / Replacing fuse links (Fig. 4)

1. Ensure that the transformer switch is in the isolated position.
2. Slide interlock bar to the right to free fuse access cover and earth the transformer bushings (see below).
3. Open fuse cover.
4. Unclip front fuse spring clip
5. Push fuse link and simultaneously lift fuse link up, release pressure on fuse and remove
6. Place new fuse into the fuse carriage (***ensuring that striker pin is towards the front of the unit***) locating the link with the rear fuse holder and push backwards and down to locate the fuse behind the front fuse contact lip.
7. Re-engage the fuse spring clip.

Note: *If fuse spring clip is not engaged correctly, the switch will not latch into the CLOSED position. Repetitive attempts to close the switch in this condition can damage the mechanism.*

Changing fuse sizes (Fig. 5)

The fuse carrier is designed to accommodate either 256mm or 361mm length fuses without the need for extra parts.

The following procedures can be followed to change the fuse carrier configuration:

1. Isolate and earth the incoming supply.
2. Ensure the transformer switch is in the isolated position and the transformer bushings are earthed.
3. Remove the top cover.
4. Remove the four M8 bolts securing the fuse carrier.
5. Remove the fuse carrier.
6. Refer to figure No. 5 to change position of the rear fuse holder.
7. Replace fuse carrier and top cover.

Note: Care should be taken not to distort or damage the fuse carrier bottom contacts.

Transformer Earth Switch

To operate the switch from “OFF” to “ON”:

1. Manual or reverse trip the fuse switch as above.
2. Move interlock bar to the right to trap the operating crank.
3. Insert handle in earth switch operating crank, move downwards, continue the downward movement compressing the spring until the mechanism fires.

To operate the switch from “ON” to “OFF”:

1. Insert handle in earth switch operating crank, move upwards, until you are able to slide the interlock bar to the right and trap the operating crank.
2. You are now able to operate the Transformer fuse switch as directed above

Maintenance

Before carrying out any of the maintenance procedures mentioned below, ensure that the unit is disconnected from the supply and earthed. Additionally any other standard procedures necessary to render the equipment safe must be carried out.

Mechanisms

TRICON mechanisms are designed to perform a minimum of 1000 service-free operations and only an annual inspection for corrosion is necessary. To inspect, remove top and front covers, check for corrosion spots and cover springs with fine grease. Examine the sides of the unit for any signs of oil leaks.

Contacts / Oil

Contacts are designed to withstand the rated through fault current without damage, therefore, no inspection is required in cases of fault current passing through the switch. The switch is capable of two full fault makes in the service position and two full fault makes in the earth position before any inspection of the contacts becomes necessary. Due to the very short arcing times little damage is caused to the contacts during load operations, however, oil testing after 100 operations is recommended. (BS 148 1972).

Paint

Any damage to the protective coat of paint should be repaired at the first opportunity to prevent corrosion from setting in.

The units should be stored in a warm, dry and well ventilated place.

Outdoor storage is not recommended, but if unavoidable, units should be protected from rainfall and direct sunlight. Also, precautions against condensation should be taken.

Fuse link operation

After fuse link operation, the fuse carrier will be in the OPEN position and the operating crank has to then be re-set to the isolated position to gain access to the fuse links.

Note: When one or more of the fuse links are operated, the fuse mechanism will not latch on the CLOSED position before the affected fuse links are replaced. Repetitive attempts to close the switch with a blown fuse link may cause damage to the mechanism.
It is recommended that all three fuse links are replaced with "Busman" fuse links only and that special attention is paid to ensure that the front fuse retaining clip is replaced correctly (Fig 5)

IMPORTANT NOTE:

Instructions contained herein cover the whole range of standard variations and therefore will not necessarily apply completely to every unit. Please read carefully and understand them before attempting any operation or adjustment.

Instructions given are for the information and guidance of the user but the company cannot accept responsibility for the manner in which they are observed, nor for any consequences thereof.

Designs are constantly being improved and consequently there may be small differences in detail of the equipment supplied and that described in this manual.

SHOULD YOU HAVE ANY QUERIES OR WOULD LIKE FURTHER INFORMATION OR CLARIFICATION PLEASE CONTACT YOUR SUPPLIER

Ratings	Ring Switch	Earth Switch	Fuse Switch	Integral Earthing
Maximum rated voltage	12kV		12kV	
Impulse withstand voltage	95kV		95kV	
Switch through current	630A		100A	
Unit fault rating	400MVA	400MVA	400MVA **o**	
Unit short term current (3s)	20kA	20kA		2.1kA Δ
Peak making capacity	50kA	50kA		5.25kA Δ
Breaking capacity	630A		560A **ж**	
o When fitted with fuse links to BS 2696 or IEC 282				
ж Fitted with solid links				
Δ Optional				

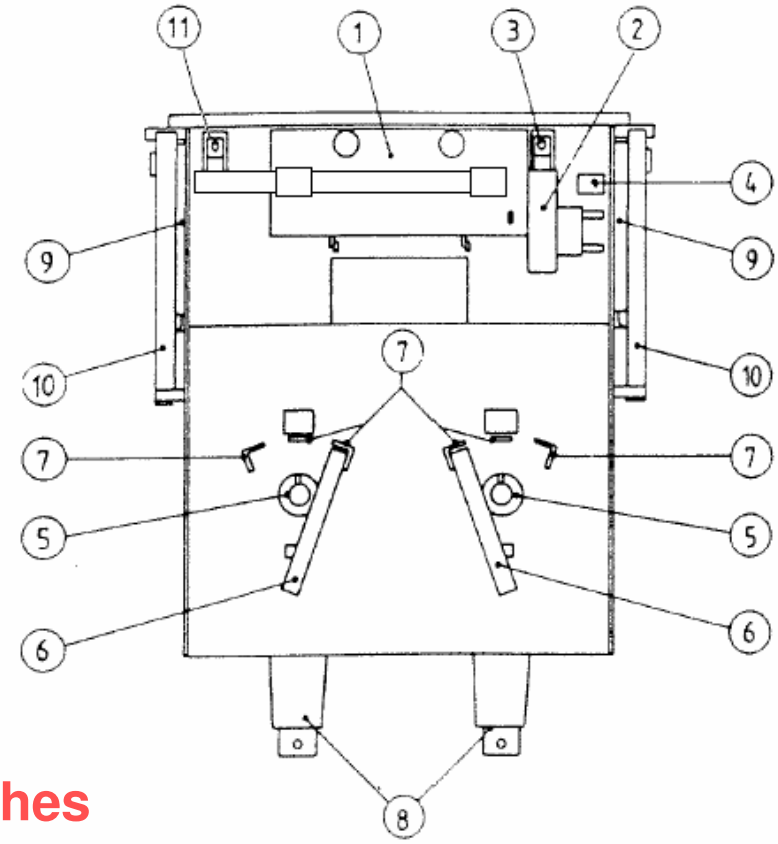


FIGURE 1

1) Fuse access cover
2) Interlock bar
3) Operating crank
4) Position indicator
5) Operating crank
6) Selector bar
7) Padlock lugs
8) Ring bushings
9) Cable test access cover
10) Cable test cover interlock
11) Earth switch

For Ring & Fuse Switches & Cable Testing

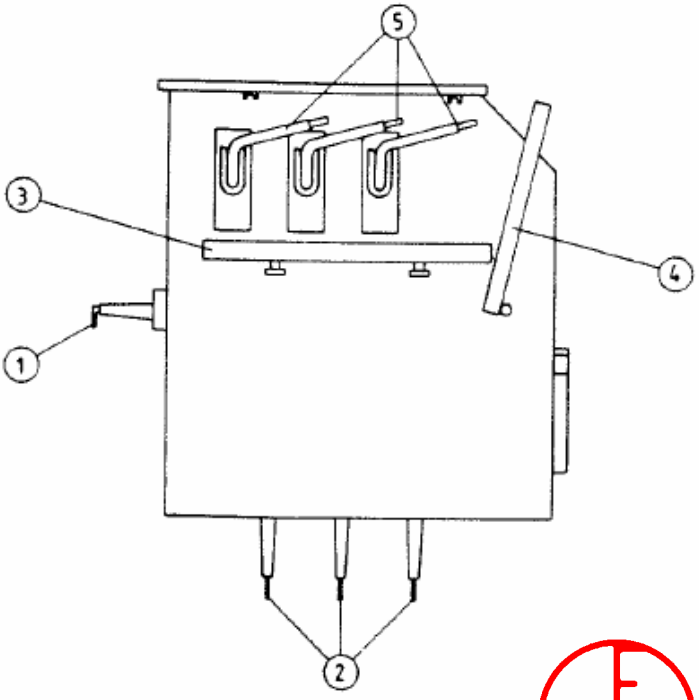
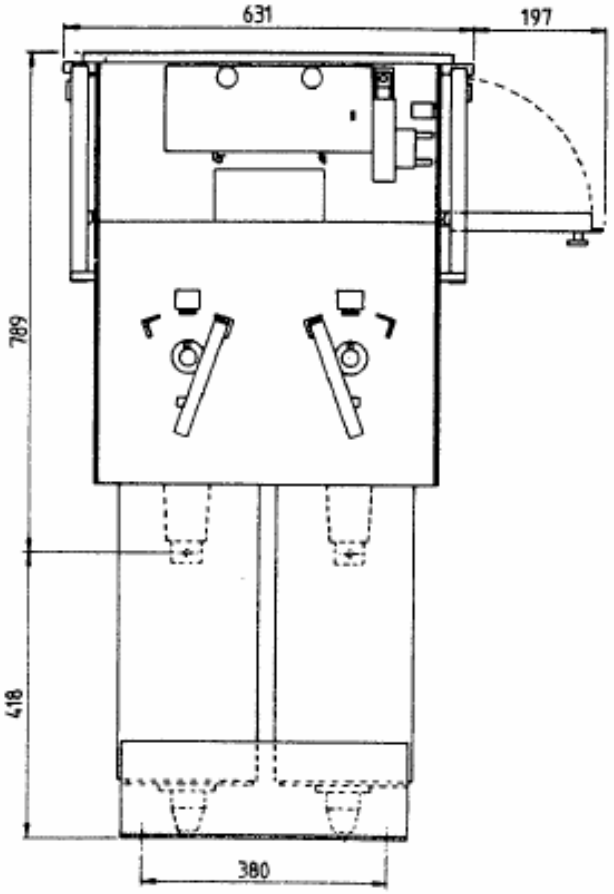


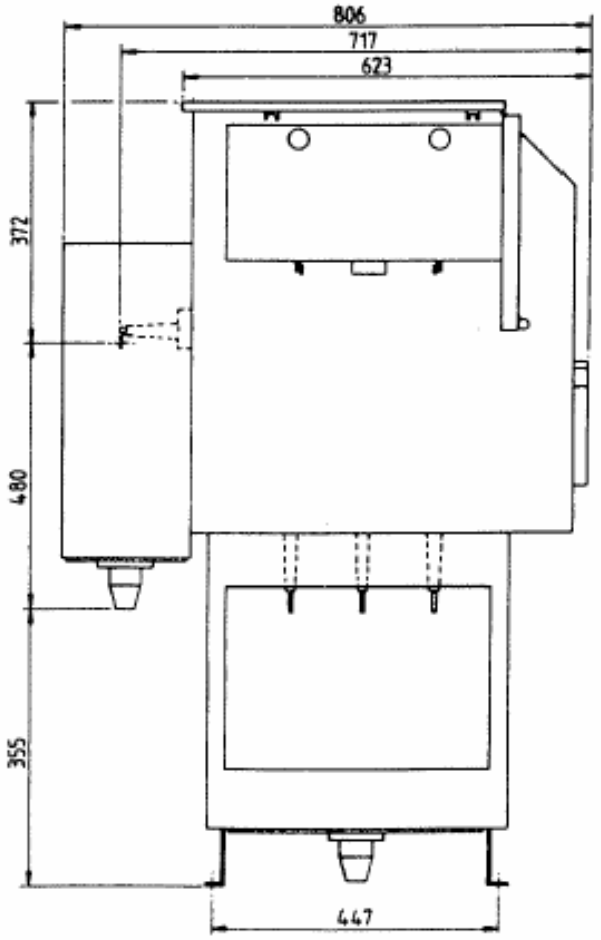
FIGURE 2

1) Transformer switch bushing
2) Ring switch bushing
3) Cable test access cover (OPEN)
4) Cable test cover interlock
5) Test prods

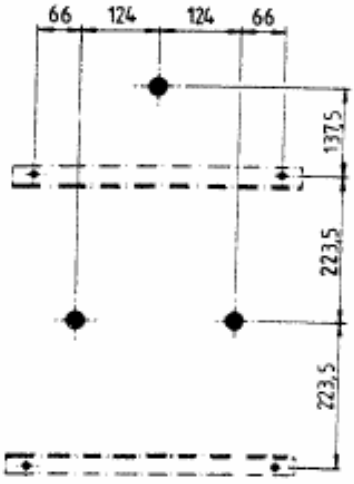
For Cable Testing



FRONT VIEW



SIDE VIEW



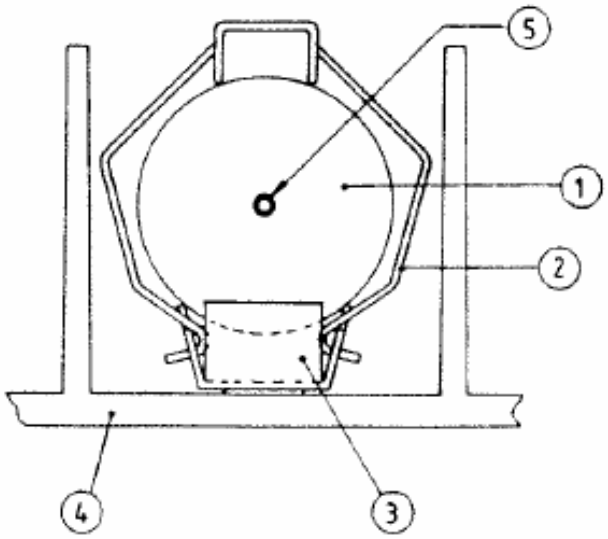
FLOOR PLAN

FIGURE 3

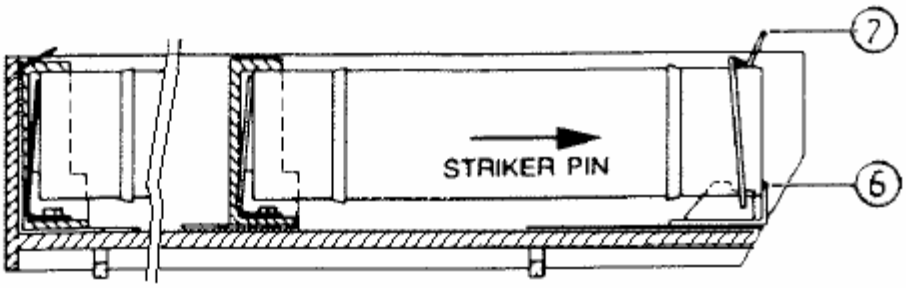
For Installation & Cabling

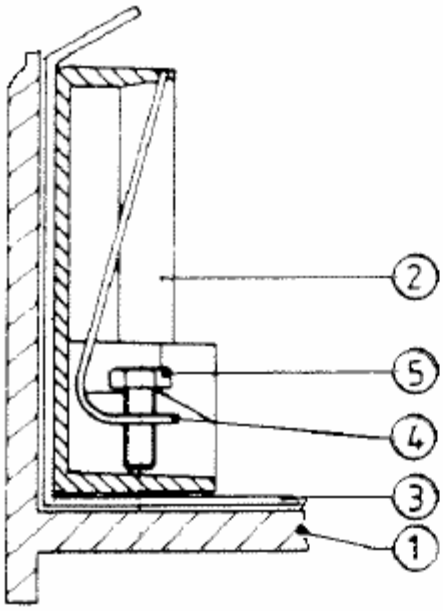
FIGURE 4.

1) Fuse
2) Spring clip
3) Fuse contact lip
4) Fuse carrier
5) Striker pin

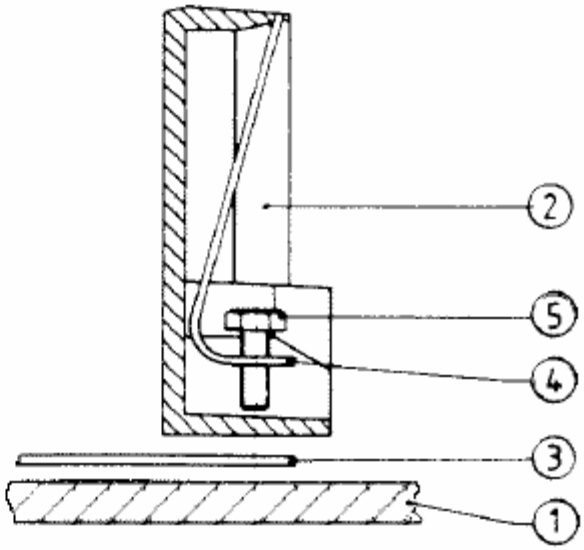


For Fitting / Replacing Fuse Links





359 mm Fuse Assembly



254 mm Fuse Assembly

FIGURE 5

1) Fuse carrier
2) Rear fuse holder
3) Link bar
4) Rear fuse contact
5) M6 x 16 HEX head bolt
6) Front fuse holder
7) Spring Clip

For Changing Fuse Sizes

ELECTRONIC ASSEMBLIES (Pty) Ltd.

Reg. No. 69/04603/07

2 Brown Street
Ezakheni
Ladysmith
KZN

PO Box 2400
Ladysmith
3370

Tel: +2736 634 1970
Fax: +2736 634 1979

DPM
Desta Power Matla

PROUDLY SOUTH AFRICAN

Reg. No. 1987/006551/07

1 Buitekant Street
Pretoria West
Pretoria
Gauteng

PO Box 8627
Pretoria
0001

Tel: +2712 318 9911
Fax: +2712 327 1245