

“Connections to Energise Your Ideas”

MODULAR WIRING SYSTEMS INSTALLATION GUIDE



SECTION 1: SYSTEM OVERVIEW

- 1.1: Introduction
- 1.2: General Product Compliance
- 1.3: Services Covered
- 1.4: Power Systems (HL Mechanical Supply Application)
- 1.5: Lighting Systems (Light Control Module Application)

SECTION 2: PRODUCT OVERVIEW

- 2.1: System Components
- 2.2: Product Description
 - 2.2.1: Master Distribution Box (MDB) c/w Home Run
 - 2.2.2: Extender Cables
 - 2.2.3: Tee's
 - 2.2.4: Fuse Spur Tee
 - 2.2.5: Whip-Ends
 - 2.2.6: Distribution Cable
 - 2.2.7: Data Distribution Cable

SECTION 3: INSTALLATION

- 3.1: General
- 3.2: Installation Sequence
- 3.3: Connections
- 3.4: Terminations
- 3.5: Stripping Armour
- 3.6: Installation Conditions

SECTION 4: TESTING & INSPECTION

- 4.1: General
 - 4.1.1: Routine Factory Tests
 - 4.1.2: Site Tests
- 4.2: On Site Requirements
 - 4.2.1: MDB/Home Run Cable
 - 4.2.2: Distribution Cables
 - 4.2.3: Extender Cables
 - 4.2.4: Tee's or Ports

SECTION 5: MAINTENANCE

- 5.1: General

SECTION 6: COMPLIANCE

- 6.1: General
- 6.2: Product Traceability & QS
- 6.3: Product Specification & Materials

SECTION 7: QUALITY ASSURANCE

- 7.1: Definition
- 7.2: Our Quality Policy
- 7.3: Purchasing
- 7.4: Manufacturing
- 7.5: Testing & Inspection



SECTION 1: SYSTEM OVERVIEW

1.1: Introduction

This application guide outlines the various components and methods used to complete a high level 'Modular Wiring System'.

1.2: General Product Compliance

Modular Wiring Systems armoured components are factory sealed units complying with BSEN 61535:2009 – 'Installation couplers intended for permanent connection in fixed installation' specification'.

1.3: Services Covered

The Modular Wiring System provides mains power to the following services:

- a. Power systems: Both high and low level systems, in both ring and radial configuration.
- b. Lighting systems: Both light control via a data bus and traditional switching systems.

NB: In addition to the mains power, the Modular Wiring System, can integrate a signal BUS cable of both the shielded (STP), or unshielded (UTP) type bus cable. This bus cable may be applied to both lighting or power systems.

1.4: Power Systems (HL Mechanical Supply Application)

This comprises power distribution to High Level Mechanical Supplies namely 'fan coil units' (FCU).

From the MDB, 'Extender Cables' connect to fuse spur Tee's which in turn connect to FCU's via the associated cable drop.

As with the lighting system, the power system may also be supplied with integral BUS cable, enabling BMS integration with the mechanical supplies and control.



1.5: Lighting Systems (Light Control Module Application)

This comprises power distribution to Light Control Modules (LCM) with an integral signal BUS cable throughout.

From the Master Distribution Box (MDB), 'Extender Cables' with integral BUS cable, connect to Tee's which in turn connect to LCM's via a cable 'Whip-End'.

A separate BUS cable runs back from the MDB to the lighting area controller.



SECTION 2: PRODUCT OVERVIEW

2.1: System Components

The armoured and unarmoured Modular Wiring System providing power to the high level mechanical power installations and lighting system comprises the following components:

- a. Master Distribution Box (MDB) c/w Home-Run Cable.
- b. Extender Cables.
- c. Tee's or Fused Spur Tee's
- d. Whip-ends.
- e. Distribution Cables.
- f. Data Distribution Cable.

2.2: Product Description

This following will describe the various components used to complete a high level 'Modular Wiring System'.

2.2.1: Master Distribution Box (MDB) c/w Home Run

The MDB takes power and lighting circuits from a distribution board and extends them out onto the ceiling space. The MDB generally comprises 6 or 9 SPN circuits and may include a data BUS input. In this configuration, only one multi core 'Home Run' cable is run back to the distribution board.

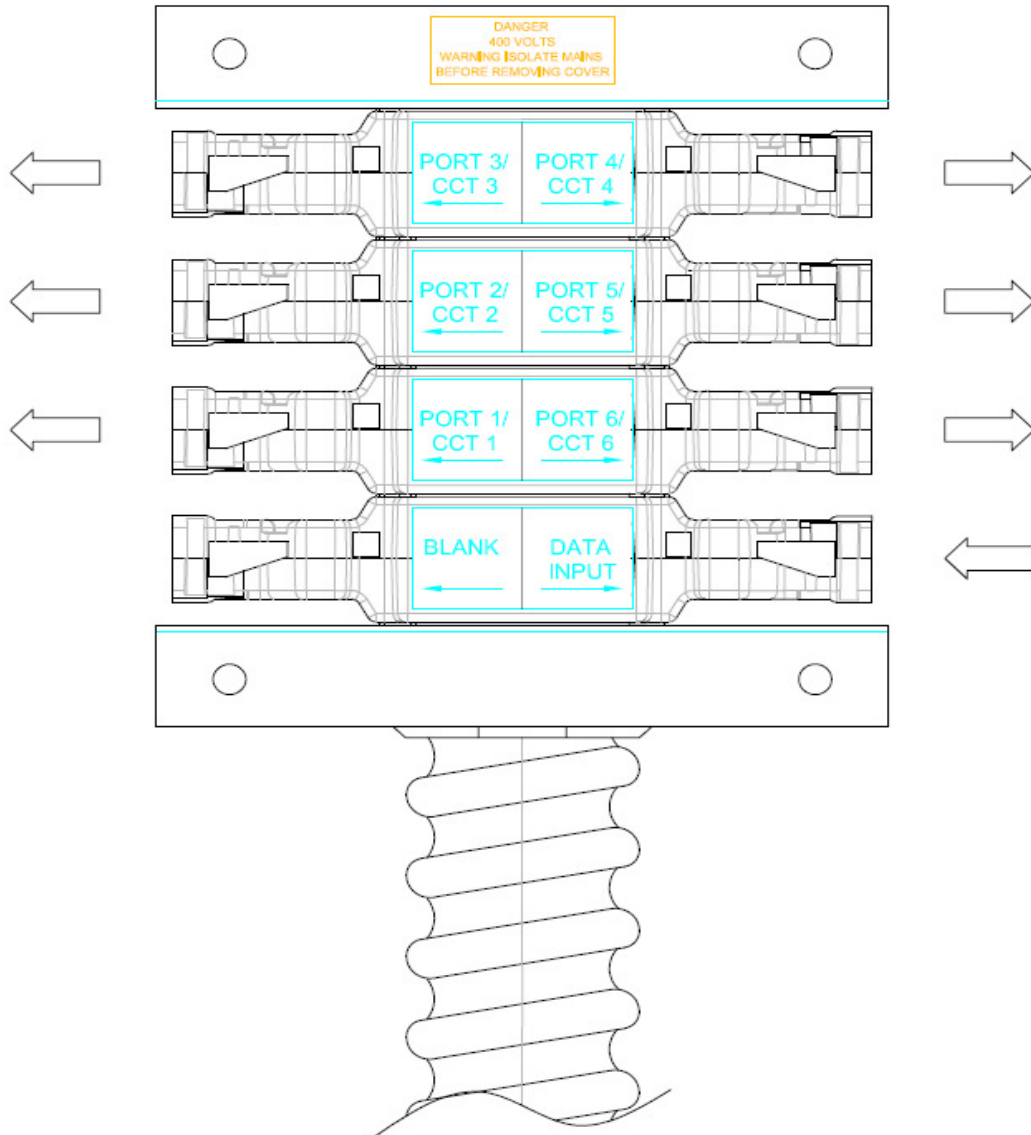


Fig: 2.0 ~ 9-Port SPN Master Distribution Box

As can be seen in figure 2.0, the MDB is fashioned from a stack arrangement of polycarbonate mouldings housing female connectors (and a male connector in the case of a data port). The stack is then sandwiched between two metal brackets which allow the home run armouring to be properly anchored to by means of an appropriate grand. These formed metal plates also provide a mount fixing points for the MDB which can be fixed direct to the wall, ceiling, cable tray/basket or alternatively suspended via threaded rods.

The Home Run cable comprises multiple conductors of BASEC approved, EI5 insulation, contained within a Mylor® wrap to prevent snagging within the Home Run outer sheath (see fig 2.1). Each individual conductor is marked continuously throughout the length of the Home Run assembly at 150mm spacing with the corresponding port number it is wired to and



facilitates identification. The number of cores in a home run is: 18 core in the case of a 6 port MDB; 27 core in the case of a 9 port MDB. (The option of ring circuits, and/or a mix of ring/radial circuits are also readily available). Refere to tables 3.4 and 3.6 for various cable CSA's.

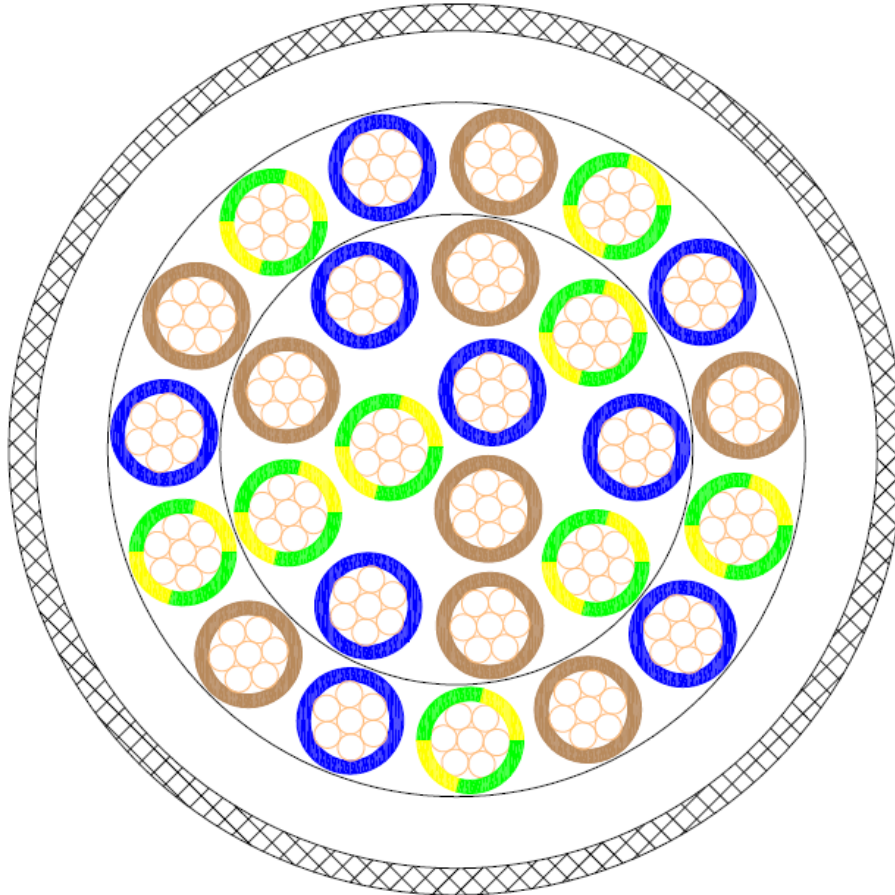


Fig: 2.1 ~ 27-Core Home-Run Cable

A label on the side of the MDB indicates 'port' configuration, distribution board and circuit references. In addition, each MDB is provided with a unique manufacturing code for identification and record purposes (See fig 2.0)

MDB's are factory-assembled units to BSEN61535:2009 (see Section 1.2) and as such, should not be altered in any way.

2.2.2: Extender Cables

The extenders plug into the MDB and take power to individual devices in circuit.



Extender cables have a male plug and female socket on either end, and plug into each other to provide a cable run of the desired length, to the desired location. These in turn plug into Tee's that feed the various devices in circuit.

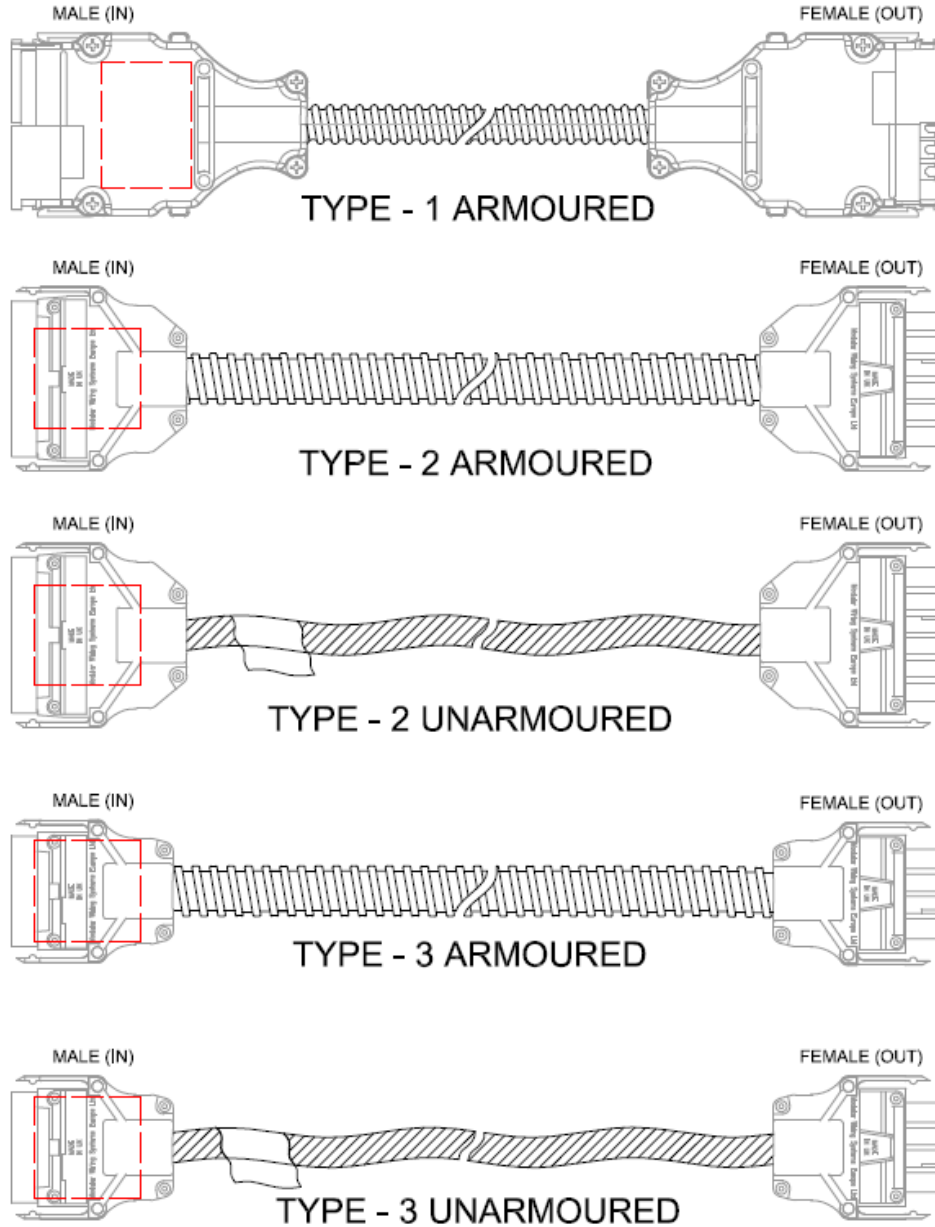


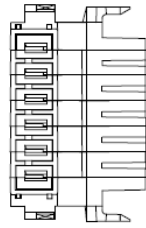
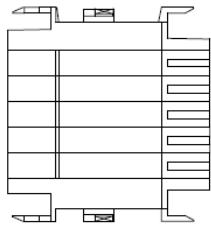
Fig: 2.2 ~ Extender Cable Range.

2.2.3: Tee's

Tee's provide a form of tap-off from the main run, formed by the extender cables, to various in circuit devices such as LCM's, luminaries, FCU's, floor boxes, socket outlets etc...

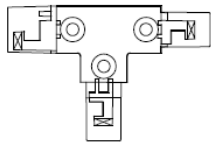


MALE (IN) FEMALE (OUT)



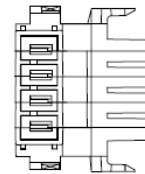
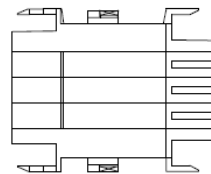
FEMALE (OUT)

MALE (IN) FEMALE (OUT)



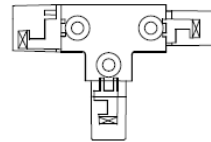
FEMALE (OUT)

MALE (IN) FEMALE (OUT)



FEMALE (OUT)

MALE (IN) FEMALE (OUT)



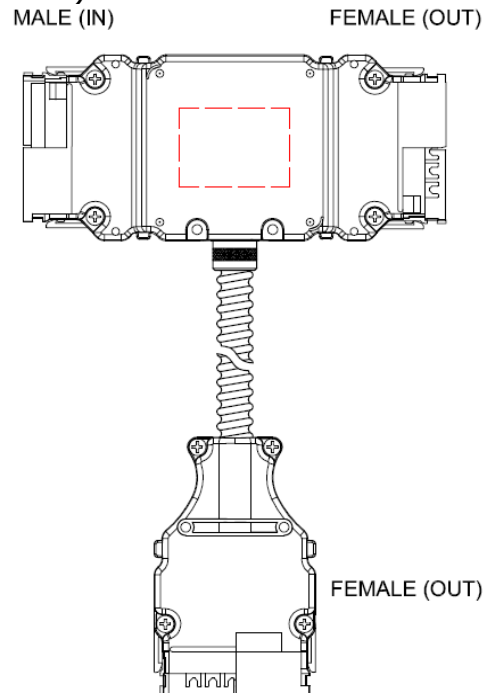
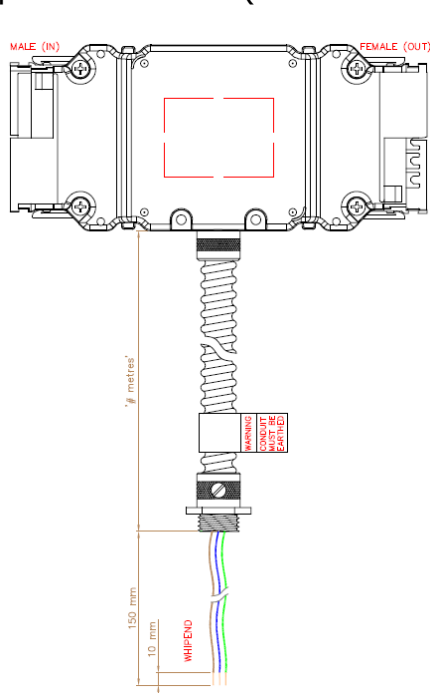
FEMALE (OUT)

6 POLE Tee (LIGHTING)

4 POLE Tee (LIGHTING)

Fig: 2.3 ~ Lighting Tee Range.

In general, devices fed off a basic Tee do not need to be isolated while in circuit, either because the device would have a built isolating switch (like in the case of an LCM or any other active device) or because it would be a passive device (like in the case of a socket outlet).



6 POLE Tee's (POWER)

Fig: 2.4 ~ Power Tee Range.



2.2.4: Fuse Spur Tee

Like the basic Tee, Fuse Spur Tee's also provide a tap-off from the main run of extender cables, to the various field devices.

In general, devices fed by a Fuse Spur Tee would require being individually isolated i.e. without interrupting all the devices on the same circuit. This would be necessary for maintenance or replacement purposes as in the case of fan coil units.

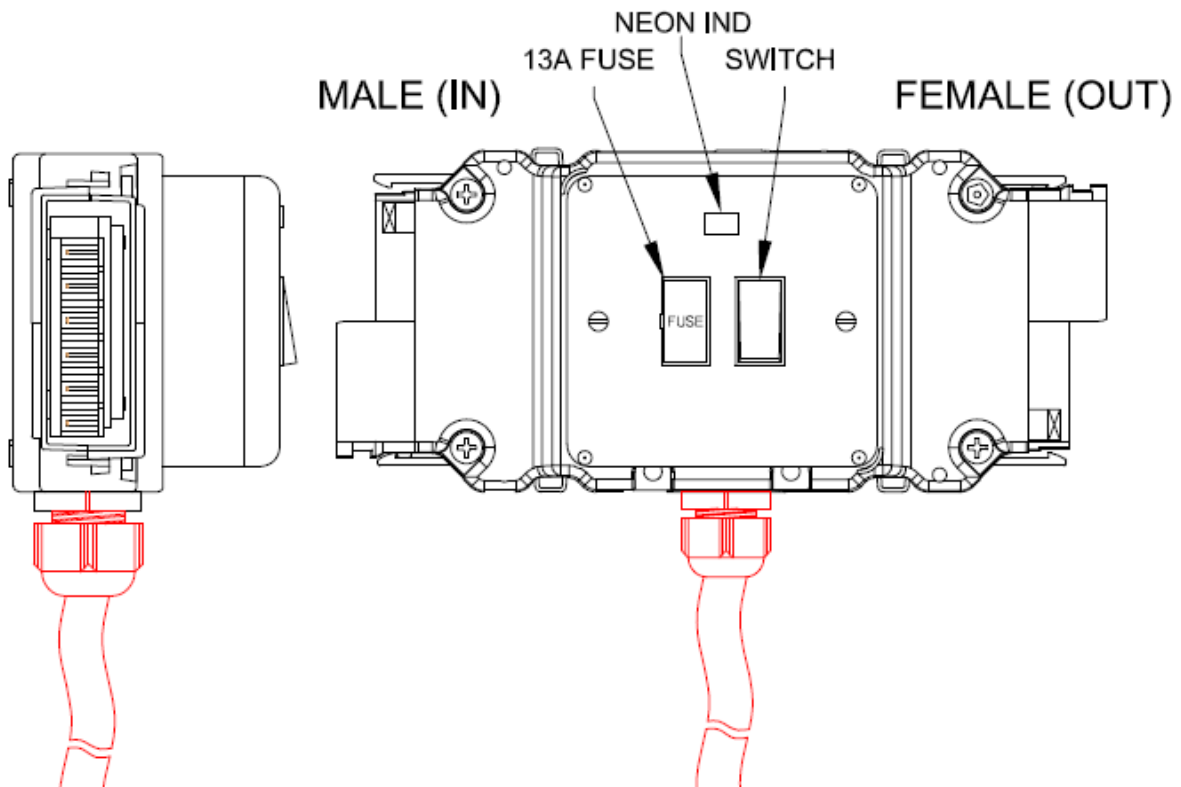


Fig: 2.5 ~ Power Fuse Spur Tee.

2.2.5: Whip-Ends

Whip-end cables provide a final power connection to individual devices in circuit, (e.g. LCM's, luminaries, floor boxes etc.).

Whip-end cables have a male plug that allows them to plug into Tee's that tap into the main circuit.

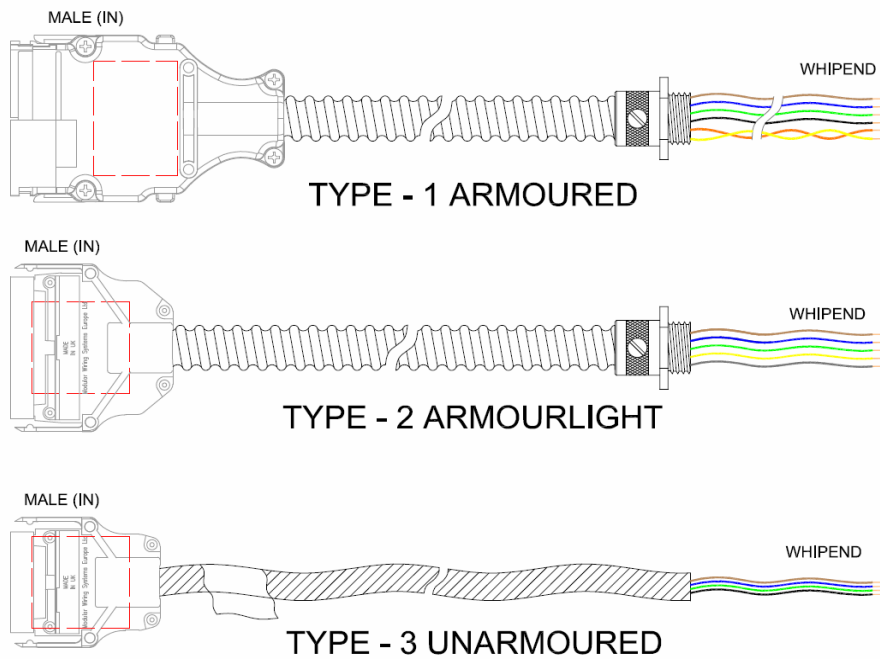


Fig: 2.6 ~ Whip-End Cable Range.

2.2.6: Distribution Cable

Distribution cables provide a single power connection to an individual circuit in an installation.

Distribution cables have a free end for termination (into a panel board or other source of supply) and female plug that provides an appropriate IP index to protect the installer from electric shock prior to plugging into the Tee or whip-end feeding the device in circuit.

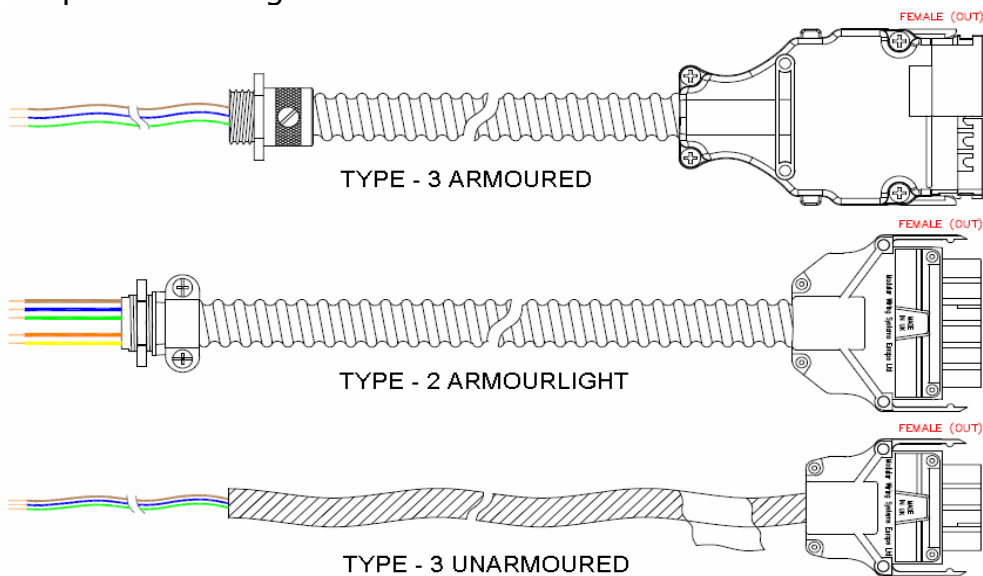


Fig: 2.7 ~ Distribution Cable Range.



2.2.7: Data Distribution Cable

Data Distribution cable, is a bus signal cable that provides a connection between the 'building management system' (BMS - in the case of power) or 'lighting area controller (LAC - in the case of lighting) and the MDB.

The BUS cable from that point is integral to the various extenders, Tee's and Whip-ends that make up the installed system.

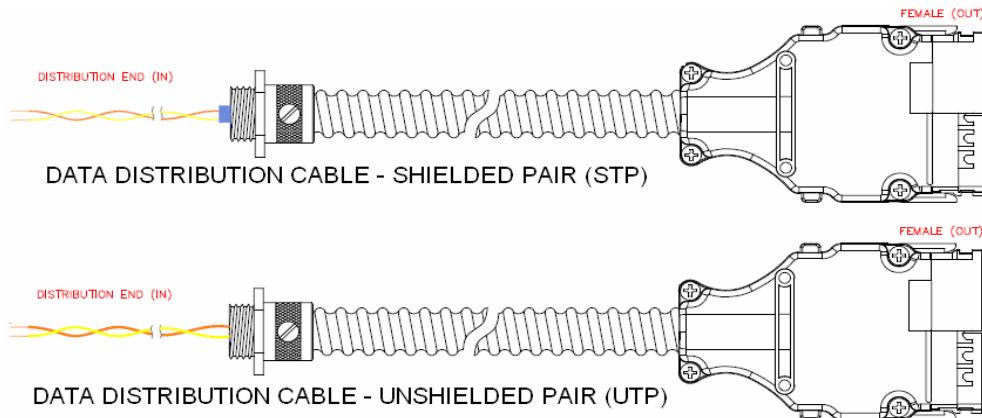


Fig: 2.8 ~ Data Distribution Cable Range.

Data distribution cables can have both shielded or unshielded twisted data pair bus cable, depending on the data protocol the bus is required to carry through to the field devices.

In most cases the Data Distribution cable is run separate to the MDB home run but on request, the data cable can be integral to the MDB home run.



SECTION 3: INSTALLATION

3.1: General

All Modular Wiring should be installed in accordance with:

- BS7671:2008 (With especial emphases on clause 522.8)
- BS8488:2009+A1:2010
- The project drawings provided by Modular Wiring Systems Limited (M.W.S. Ltd).

Component locations codes are shown on the drawings in a 'graphical representation'. The installer needs only to follow the sequence of connection of the components as shown on the installation drawings.

Under NO circumstances should components be modified by site-operatives. Any defective components MUST be reported to M.W.S. Ltd. within 3 working days of delivery.

All queries regarding installation and connection must be relayed to our Technical Services Department.

Each delivery comprises cartons packed with the necessary components to affect a particular floor/zone/area of the installation. The deliveries will be effected in accordance to the installation program.

Modular Wiring is a 'fast track' installation and once delivered to site, components are not intended to be kept in storage. Upon delivery to site, each carton should be located in the relevant floor/zone/area and installation commenced immediately. Components from particular cartons should not be randomly mixed or substituted with those from other cartons.

3.2: Installation Sequence

The installation should commence with the MDB's. These are unique to the area defined on the installation drawings and are not suitable for use elsewhere.

This first fix operation is due to the fact that the home run cable attached to the MDB cannot be modified in any way. The MDB is delivered to site on a suitable cable drum with the stack bolted to one side. The Home Run should be unravelled and then the stack should be unbolted from the drum and lifted into position. The Home Run cable will generally lay on



cable ladder/basket/tray or be fixed to the building ceiling using suitable cable fixing/support devices.

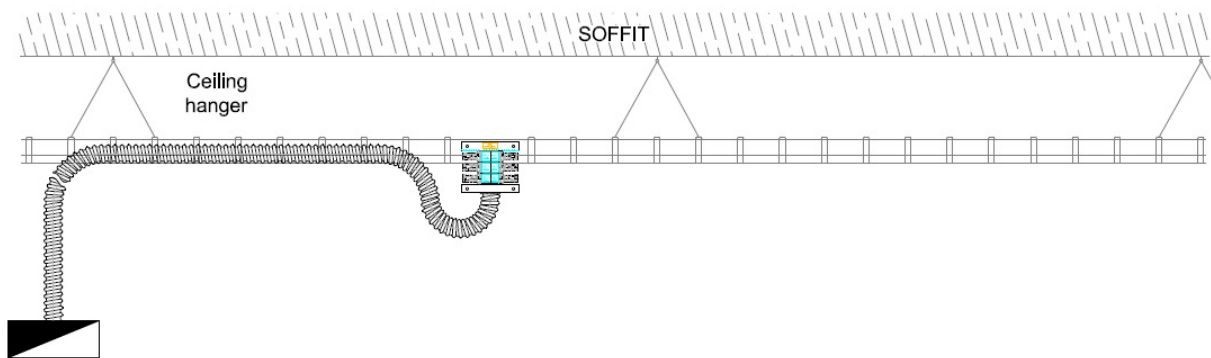


Fig: 3.1 ~ Typical MDB Arrangement

It is vital to make sure that enough length of the Home Run is left in the riser to terminate in the distribution board. Only at this point should the Home Run be secured and the stack is permanently fixed onto the containment.

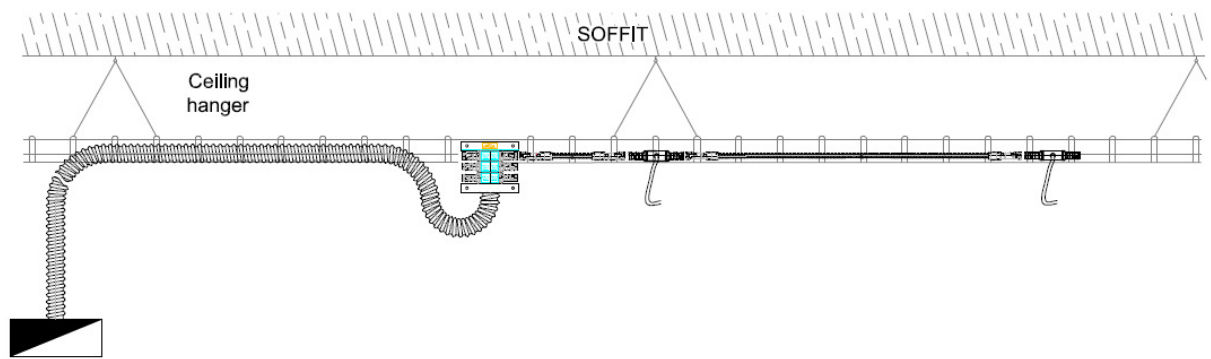


Fig: 3.2 ~ Typical MDB & Extender Arrangement

Only after the MDB is in place, can the extender cables and 'T's and other modular components can be installed. Extender cables will also either lay on cable basket or fixed to the building ceiling.

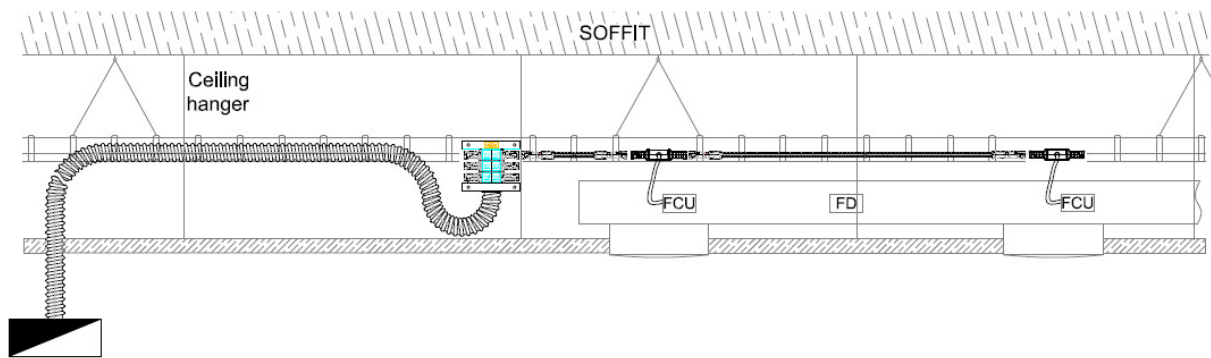


Fig: 3.3 ~ Typical Power Installation



Fuse spur Tee's may be free issued to the FCU manufacturer enabling off site fitting.

Product Description – Power	Cable Conductor CSA mm ²
MDB	10.0 – 6.0 – 4.0
Extender (Type 1)	6.0 – 4.0 – 2.5
Fuse Spur Tee cable drops	4.0 - 2.5 – 1.5

Fig: 3.4 ~ Power Cable Conductor CSA

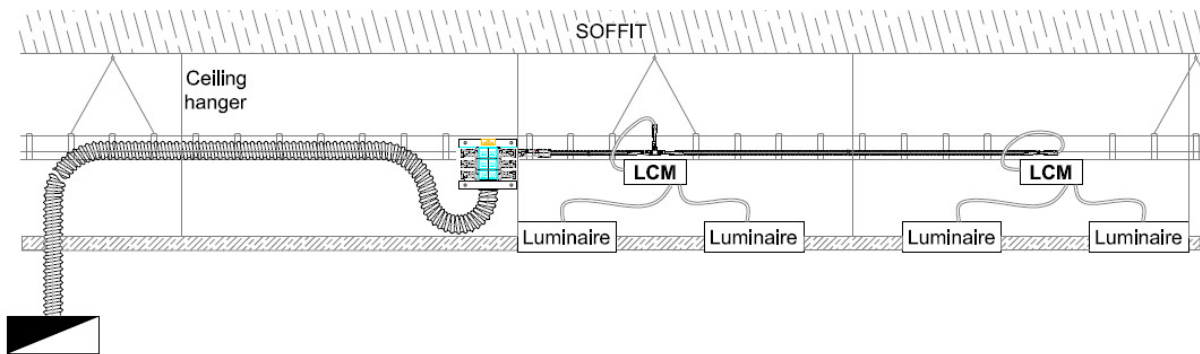


Fig: 3.5 ~ Typical Lighting Installation

Whip-Ends may be free issued to the LCM manufacturer enabling off site fitting directly to the LCM's.

Product Description – Lighting	Cable Conductor CSA mm ²
MDB	10.0 – 6.0 – 4.0 – 2.5
Extender (Type 2 & 3)	4.0 – 2.5 – 1.5
Whip-end	2.5 – 1.5 – 1.0

Fig: 3.6 ~ Lighting Cable Conductor CSA

3.3: Connections

Pushing together male & female plugs effects connection of Extender cables, T's and whip-end's etc. ('Power In' & 'Power Out').

It is of vital importance to make sure that, while pushing the connectors together, the catches on the side of the connectors actually interlock properly. This will guarantee that the connectors have been pushed far enough to fit properly together.

This also indicates male & female pin configuration. Where applicable, a male plug ('Power In') is always fitted to the start on an extender cable,



and likewise, a female socket ('Power Out') is always fitted at the end (see Fig. 3.7).

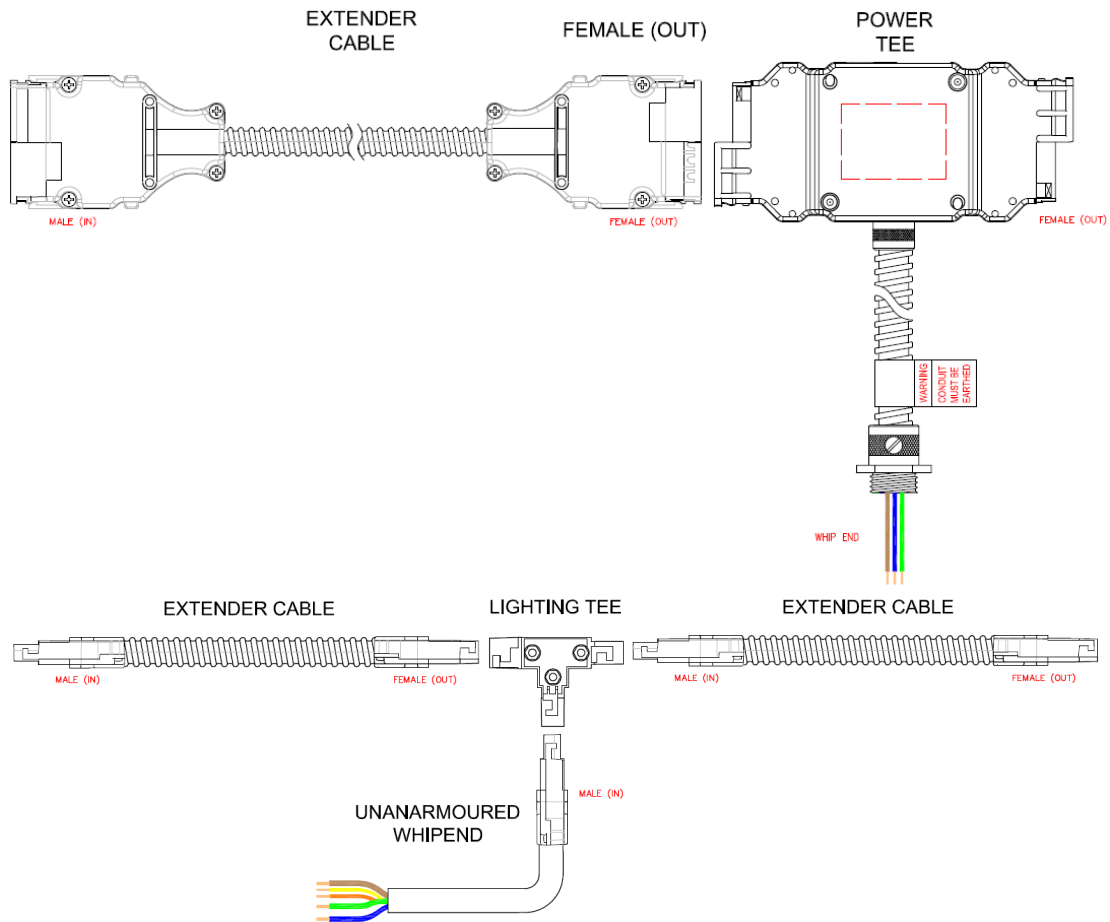


Fig: 3.7 ~ Connection Arrangement

3.4: Terminations

The termination of the Home Run of the MDB is the only termination that differs from a standard installation methodology. For this example, we shall assume that a 6 port MDB is to be installed.

After stripping back the required length of the Home Run armour (ref. to section 3.5) you will notice that there are 6 groups of 3 core cable (brown_blue_green/yellow). Each of the three cables in the group will be marked with a number 1, the next three with the number 2 etc... until the number 6. These numbers coincide with the port number on the stack i.e. cables marked with the number 1 run back to port number 1 and so on.

At this point the installer needs only to make a note of which core number he chooses to connect to the various circuit numbers (Power or Lighting)



to be fed out into the installation. Example cores marked 1 are servicing power circuit 1L1 while cores marked 5 are feeding lighting circuit 3L2.

Termination of whip-ends, fuse spur Tee's and distribution cables will be treated in the same manner as a traditional installation.

3.5: Stripping Armour

Measure cable and mark where the armour is to be cut.

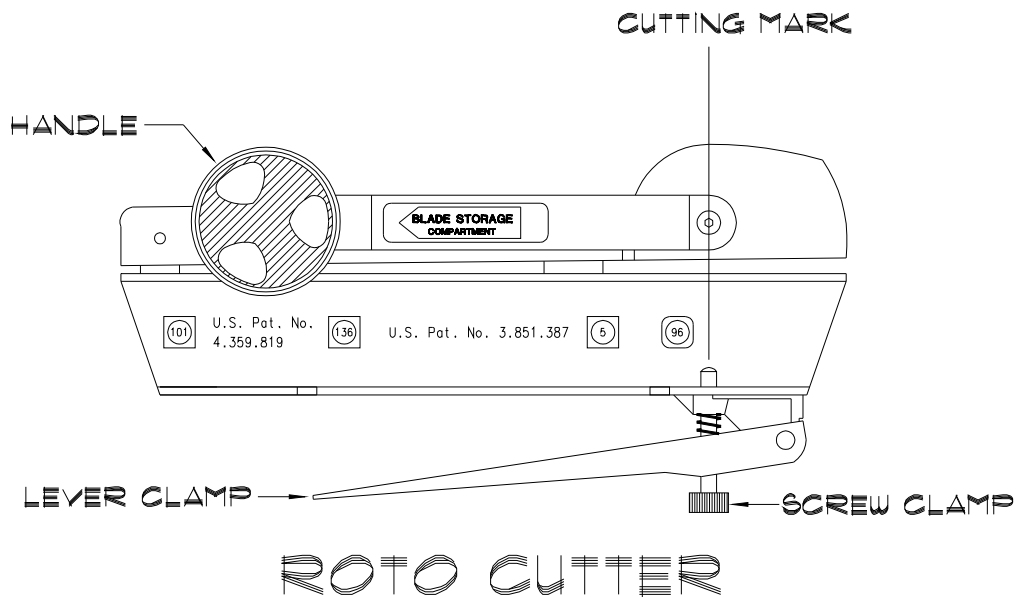


Fig: 3.8 ~ Roto Cutter

Using the Roto Cutter; line up the mark on the armour with the screw clamp. (See Fig. 3.9). A couple of turns of the handle will allow the tool to produce a controlled cut into the armour. Slide off the access armour to expose the cable.

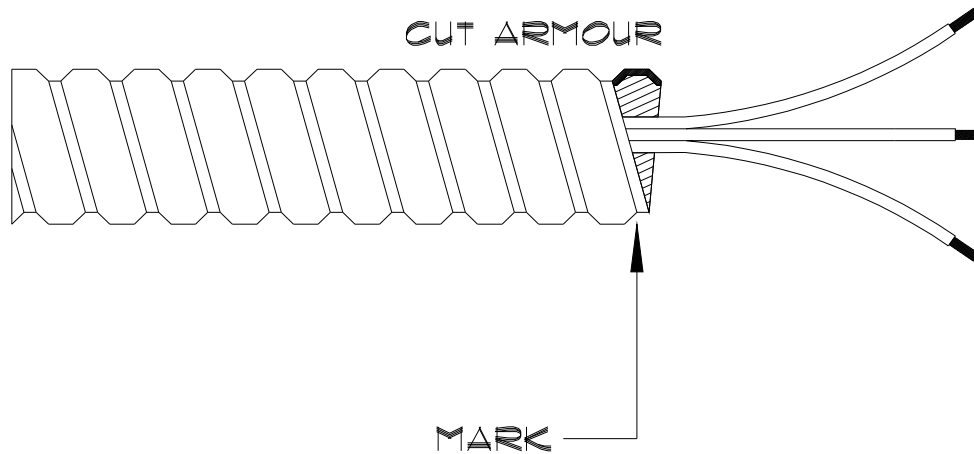


Fig: 3.9 ~ Cutting Armour

Secure the gland and anti short bush to the end of the cut. The cable can now be secured to the distribution board, header trunking, conduit box or device enclosure etc.

3.6: Installation Conditions

Modular Wiring should not be installed in damp or severely cold conditions.

Armoured and Un-Armoured components should only be installed where ambient temperatures are above 0°C.



SECTION 4: TESTING & INSPECTION

4.1: General

The following testing procedures refer only to 'Modular Wiring' and do not negate any considerations required by BS7671: 2008.

Modular Wiring must be installed in accordance with the instructions laid down in Section 3 of this manual. Visual verification is required to ensure that all plug-in connections are sound and secure. This must be verified by site-operatives as the Modular Wiring is installed.

4.1.1: Routine Factory Tests

All Modular Wiring components are tested prior to leaving the factory. MDB's, Extenders, whip-ends, Tee's etc. are tested for the following way:

- a. Visual Inspection.
- b. Earth Bond.
- c. Impulse Voltage (Flash Test).
- d. Insulation Resistance.
- e. Function Test.

4.1.2: Site Tests

Where conductors are terminated on-site, the following tests are required:

- a. Visual Inspection.
- b. Continuity of CPC's
- c. Insulation Resistance
- d. Polarity
- e. Phase-Earth Loop Impedance

Testing should generally be carried out in the usual manner. Reference to BS7671: 1992 Part 7 and the Guidance Notes 3 should be made.



4.2: On Site Requirements

The following tests are required upon completion of the installation, prior to energising circuits.

Where appliances containing electronic components are installed, reference should be made to Regulation 612.33 of BS7671:2008.

4.2.1: MDB/Home Run Cable

These generally require Testing as 4.1.2 and Inspection on every installation, as the start of the Home Run cable is terminated at a distribution board by site operatives.

4.2.2: Distribution Cables

These generally require testing as 4.1.2 and Inspection on every installation, as the start of the cable is terminated at a distribution board by site operatives.

4.2.3: Extender Cables

These generally only require testing as 4.1.2 'a', 'b' & 'd', but may be subjected to full testing by default where installed with other items to which this requirement applies (e.g. Distribution Cable(s)).

4.2.4: Tee's or Ports

These generally only require testing as 4.1.2 'a', 'b' & 'd' when fitted and terminated by OEM's, but may be subjected to full testing by default where installed with other items to which this requirement applies (e.g. Distribution Cables, floor boxes etc...). Where site operatives terminate cable connections, full Testing & Inspection is required.



SECTION 5: MAINTENANCE

5.1: General

Materials and components supplied by Modular Wiring Systems Limited are in general non-mechanical and have no serviceable moving parts i.e connections are mostly of the crimp type and not screw contacts.

No maintenance or testing is required, other than periodic test & inspection as required by BS7671: 1992.



SECTION 6: COMPLIANCE

6.1: General

Where indicated, Armoured system components supplied by Modular Wiring Systems Limited are assembled and tested in accordance with BSEN 61535:2009.

6.2: Product Traceability & QS

All components are tested prior to shipment. Tests (as indicated in 4.1.1) are carried out using a MWSL proprietary test gig, which gig will only produce a product label if the product on test passes all test criteria.

The label is the product is the product test certificate which shows product code, test data results and a unique serial number. This number is held in a database allowing full tractability of the products. In addition to this a second label fixed to the component indicates the initial of the person responsible for the assembly of the finished product.

6.3: Product Specification & Materials

Modular Wiring Systems Ltd. reserves the right to the alter specification of materials without prior notice.



SECTION 7: QUALITY ASSURANCE

7.1: Definition

Quality is defined as the supply of the finished product, fit for the purpose as stated in the original purchase order and any subsequent amendments or variations, delivered to the customer on the due date.

7.2: Our Quality Policy

It is our objective to develop and supply innovative products that meet or exceed the specification and performance requirements of our customers. These expectations include quality, reliability, safety, and efficiency. We view quality as extending beyond the manufactured product to include a complete service.

7.3: Purchasing

The Modular Wiring Systems Ltd. principal supplier operates a quality system which has been assessed as being in accordance with BSEN ISO 9001: 2008.

All purchased items are inspected upon receipt to ensure compliance with specified requirements. Non-complying items are quarantined prior to return to supplier. Non-compliance is monitored to identify trends with certain components or suppliers in order that corrective action can be taken at source.

7.4: Manufacturing

Manufacturing and assembly is carried out according to issued work instructions and materiel assembly drawings and, in the case of specials, a drawing and/or photograph of an approved sample.

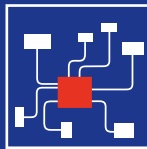
7.5: Testing & Inspection

All completed products undergo a thorough visual inspection to ensure compliance to specification prior to undergoing testing procedure.

All complying products are marked with a label indicating that the product has been passed and indicating the date of inspection and the initials of the responsible person undertaking the inspection.

For further details of tests, refer to section 4.1.1 of this specification.

"Connections to Energise Your Ideas"



MODULAR WIRING SYSTEMS LTD

UNIT 1, BAY 5, BANBURY AVENUE,
SLOUGH, BERKSHIRE SL1 4LH
TELEPHONE: +44 (0)1753 566700
FAX: +44 (0)1753 566701
INFO@MODWIRE.COM
WWW.MODULARWIRING.COM