

# LONDON UNDERGROUND EDITION



# LCS

RAILWAY

RELIABLE, LOW MAINTENANCE SWITCHGEAR AND CONTROL PANELS



ESTABLISHED 1999



Front Cover Pictures:

Overhead Switchable Trolleys at London Underground Depot  
Changeover Manual Track Isolating Switch on London Underground

Inset:

Tunnel Switch on London Underground  
3 position Switchable Pedestal

## Directions for L.C. Switchgear from the M25

Junction 7- to Gatwick Airport M23  
 M23 becomes the A23, follow the signs for Brighton  
 Junction - A27 to Worthing,  
 see below

**A27 from the WEST**  
 Junction - to Hove A2038  
 Roundabout - Turn right and cross the A27  
 Roundabout - Fourth exit A2038

**A27 from the EAST**  
 Junction – to Hove A2038  
 Roundabout - take the third exit A2038

A2038 take the second road on the left as you climb the next hill  
 A2023 past Hove Greyhound Stadium  
 Mini roundabout - Straight on.  
 Traffic lights - Turn Right on to the Old Shoreham Road A270 (See Map Below)  
 Traffic lights - Turn Left, this is St Joseph’s Close  
 Hove Technology Centre - Turn Left  
 LCS - Unit 16 L.C. Switchgear Ltd (See Below) - Parking is alongside and in front of this building

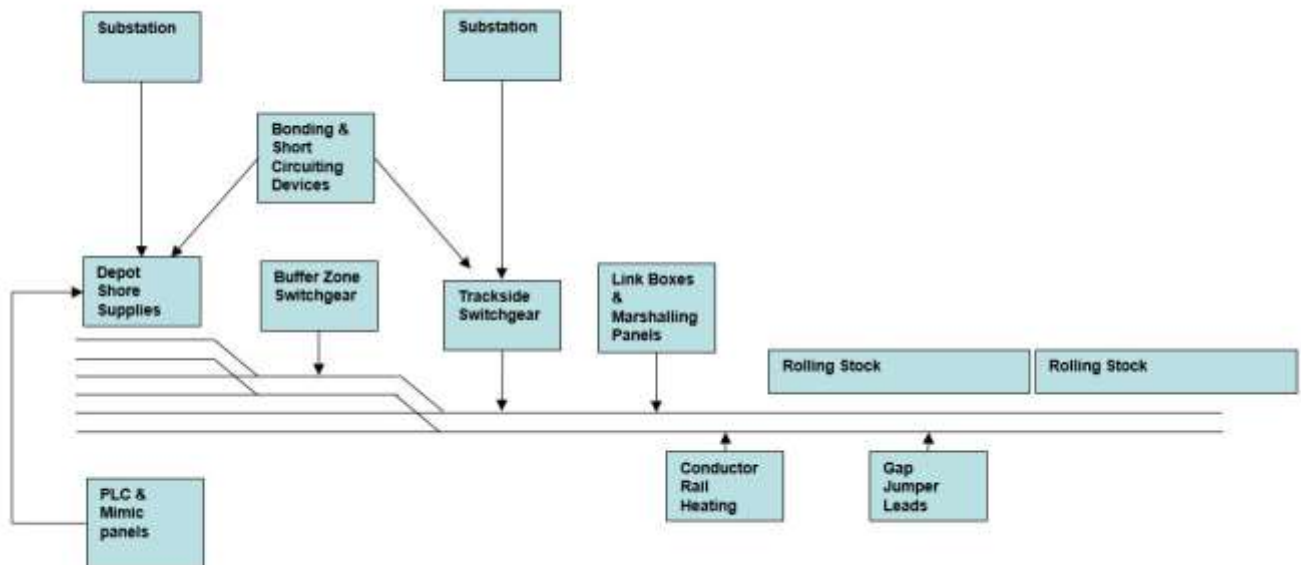


## Section Product Title Colours

1	Switchgear News - Railway Applications - Product Ranges - NR / LU Approvals
2	Railway Switchgear – SUBSTATION
3	Railway Switchgear – DEPOT SHORE SUPPLIES
4	Railway Switchgear – TRACKSIDE
5	Railway Switchgear – LINK BOXES & MARSHALLING BOXES
6	Railway Gap Jumper Leads, Earth Fault Test Box & Touch Potential Monitoring
7	Railway Switchgear - MIMIC PANELS
8	Railway Disconnectors
9	Railway Fuses
10	Railway AC & DC Contactors
11	LVAC Control & Distribution Panels, Current On Line Relays, DNO Panels, & Indicators
12	LVAC Cable Management Panels
13	Servicing
14	Training & Consultancy & Repair Service
15	Installation
16	Accessories
17	Adhesives, Lubricants, Cleaning Materials and Toolkits
18	Email Enquiry Form – Notes - Project History

## Railway Products 'A New Order'

Products now are sorted to provide logical step from Substation supply through the Depot supplies eventually to trackside equipment and rolling stock switches



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The policy of L.C. Switchgear Ltd. is one of continuous improvement and innovation and for this reason the Company reserves the right to carry out modifications to the specification of the models described in this publication.  
Every care has been taken in the compilation of the information in this publication but the publishers cannot be held responsible for any inaccuracies that may occur.

## 1 Switchgear News - Railway Applications - Product Ranges - NR / LU Approvals

### Case Studies



### New Products



## 1.1 Whole Life Solutions from LCS

**Dave Tanner**, Principal Engineer at L. C. Switchgear Ltd (LCS)

Analysis of LCS product life cycle costs and the savings that can be made by the railway companies

CTS Controlled Track Switches (see above) supplied in the mid 1990's currently in service. This type requires very little maintenance or servicing throughout its designed service life of 30 years

Cheaper components with a shorter design life import considerable extra cost during their life cycle. The graphical example which follows gives an illustration how the costs can escalate and the cheaper product can work out as the more expensive product when the whole life cycle is considered.

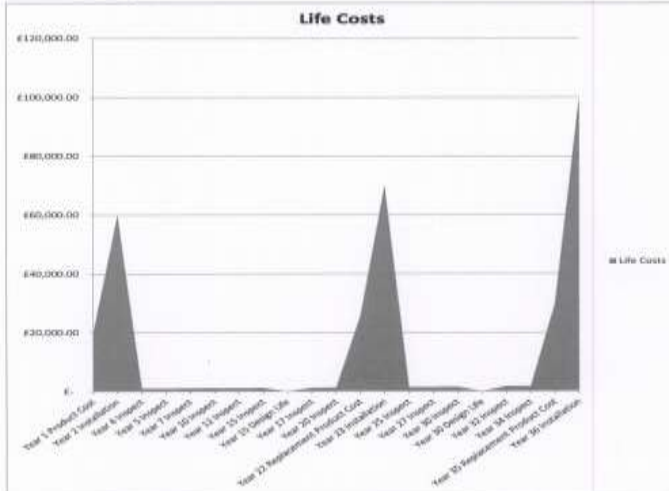
It is important to note that in the case of a cheaper product the following costs can also become a major factor:

- Spare Parts
- Maintenance
- Repairs



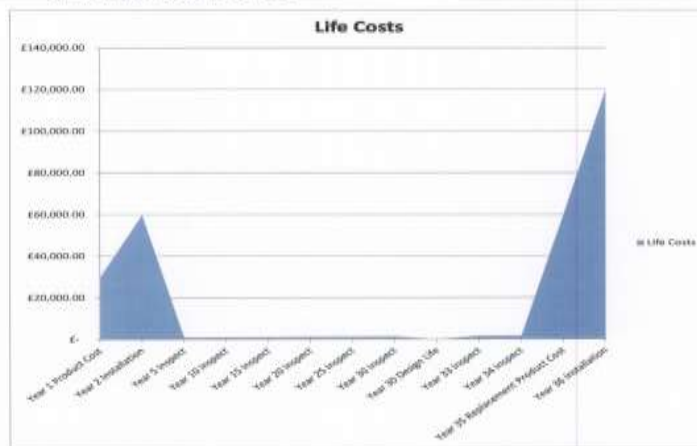
15 Year Design Life Costs

Time	Life Costs
Year 1 Product Cost	£ 20,000.00
Year 2 Installation	£ 80,000.00
Year 4 Inspect	£ 1,000.00
Year 5 Inspect	£ 1,000.00
Year 7 Inspect	£ 1,100.00
Year 10 Inspect	£ 1,100.00
Year 12 Inspect	£ 1,100.00
Year 15 Inspect	£ 1,200.00
Year 15 Design Life	£ 1.00
Year 17 Inspect	£ 1,200.00
Year 20 Inspect	£ 1,300.00
Year 22 Replacement Product Cost	£ 20,000.00
Year 23 Installation	£ 70,000.00
Year 25 Inspect	£ 1,400.00
Year 27 Inspect	£ 1,400.00
Year 30 Inspect	£ 1,500.00
Year 30 Design Life	£ 1.00
Year 32 Inspect	£ 1,700.00
Year 34 Inspect	£ 1,700.00
Year 36 Replacement Product Cost	£ 30,000.00
Year 36 Installation	£ 100,000.00
<b>Whole Life Cost</b>	<b>£ 322,703.00</b>



30 Year Design Life Costs

Time	Life Costs
Year 1 Product Cost	£ 30,000.00
Year 2 Installation	£ 80,000.00
Year 5 Inspect	£ 1,000.00
Year 10 Inspect	£ 1,100.00
Year 15 Inspect	£ 1,200.00
Year 20 Inspect	£ 1,300.00
Year 25 Inspect	£ 1,400.00
Year 30 Inspect	£ 1,500.00
Year 30 Design Life	£ 1.00
Year 33 Inspect	£ 1,700.00
Year 34 Inspect	£ 1,700.00
Year 36 Replacement Pr	£ 80,000.00
Year 36 Installation	£ 120,000.00
<b>Whole Life Cost</b>	<b>£ 280,901.00</b>



## 1.2 LCS approach to Whole-of-Life Cost

LCS have always taken into account the requirement of the railways need for reliable cost effective long life equipment in line with the Customer Specifications.

The following factors are considered in determining the whole of life cost of LCS products.

### Initial purchase price

Every attempt is made to ensure that cost can be kept to a minimum as long as quality and endurance are not compromised.

### Cost of manuals

The cost of manuals is included in the product price. Replacement manuals readily available but a charge is generally only levied if excessive copies are required.

### Cost of maintenance

LCS staff can maintain the products at very competitively prices and are flexible with respect to customer programme dates.

### Cost of replacement parts and inventory spares

Spare components and replacement parts are competitively priced.



**Environmental costs and Decommissioning and Disposal**

Hazardous materials are not used on LCS products and most of the product can be recycled

**Electrical Losses**

Electrical losses are minimised within LCS products by the selection of suitable copper bus bars for the current rating and traction rated switchgear. Stringent torque settings and Cropico  $\mu\Omega$  testing ensure that all electrical bus bar joints and the switchgear component do not import an electrical loss to the rail network.

**Cost of installation**

LCS do not carry out installation of the switchgear. Every effort is made to provide the best solutions for installation of the switchgear and discussions frequently take place with installers to evaluate quicker methods of installation.

**Reliability and cost of failures**

L.C. Switchgear has the reputation for high quality reliable products which enable railways to operate more efficiently and safely. The low maintenance requirements provide life cost savings, throughout the long service life of the products.

**Lifetime of equipment**

The equipment is always designed to comply with the requirements of the specification. LCS products typically will exceed the specified requirement as long as they are maintained. Typically a product designed for 20 year use will last well beyond by the nature of the equipment and materials that are required to meet the 20 year minimum.

**Discount Rate**

Quotation for discount rates relating to quantity are always available from LCS.

**Cost of staff training**

LCS staff training courses are very competitively priced and flexible with respect to numbers of participants and the venue for the training.

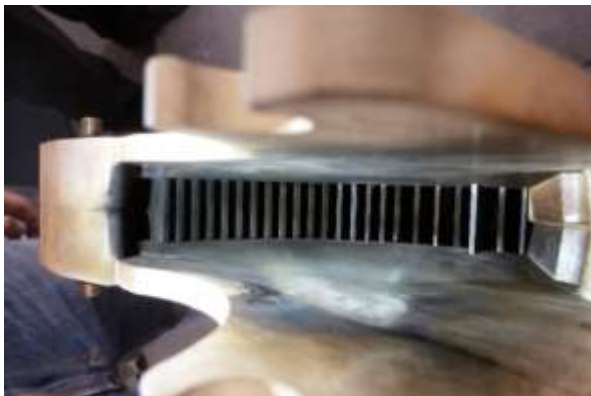
**Cost of special tools**

Where possible LCS avoid special tools unless specifically requested by the customer

**Examples of LCS equipment after 10 years in service**



2 pole Track Disconnectors on London Underground



Contactor panels components after 10 years on load use in a London Underground Depot



Conductor rail pick shoes on a depot trolley



Two examples of remote control panels.

## 1.3 Case Studies

### Acton TMU Train Maintenance Unit – CLIP Central Line Improvement Project

Stabling roads in the Train Maintenance unit are being upgraded to allow trains to be split to allow the improvement of the old stock, within the sheds behind the sidings via a turntable.

This project keeps the works local within LU, negating the need to transport the trains via road networks to maintenance facilities in central England.

New products such as the 3 Position switchable pedestal, hard wired mimic and bespoke earth fault monitoring have been developed for this project.



### Tube Lines Tranche 2 TIS Replacement Programme (London Underground)

LCS are More Manual and Motorised Track Isolating Switches & Motorised Changeover Switches of the standard frame mounted panels. In addition a number of tunnel switches are to be supplied to the project with further requirements in 2014/5.



### London Underground upgrades Ealing Common and Upminster Depots

Work on Ealing Common is already underway and is first for completion in 2013, with the Upminster depot revamp expected to be completed by 2015.

LCS is providing the complete shore supply system from the Isolating and Changeover Supply Isolators, through the Road Contactor Suites, to Overhead Switchable Trolleys & Pedestals to the train. DDM Mimic Panels & Overhead Status Indicators provide feed-back to the DDM, operators and maintainers. This employs the LU approved products previously supplied to Stonebridge Park, Hainault, Northumberland Park, Ruislip, London Road, Waterloo & City, Neasden & Hammersmith.



### London Underground Tube Lines P400 Power Supply Upgrade

LCS is just starting to supply manual off load / fault make Depot Switches and motorised and manual Tunnel Switches for the Jubilee, Northern and Piccadilly Lines. The products are based on the experience of the Tunnel Switches supplied for the Victoria Line Upgrade, Metropolitan Line Upgrade and the Jubilee Line Upgrade in the mid 90's. The first deliveries will be for High Barnet, Edgware followed by Cockfosters



### Tube Lines (London Underground)

Manual and Motorised Track Isolating Switches & Motorised Changeover Switches specifically designed for Screw Pile Mounting have been jointly developed by LCS & Tube Lines. The pile mounting solution greatly reduces the installation cost which is the major share of the overall cost of a switch to the railway.



### London Underground SSL Metropolitan Line Upgrade

LCS is currently supplying manual off load / fault Make **Depot Switches** and motorised and manual **Tunnel Switches** for the Metropolitan Line. The products are based on the experience of the Tunnel Switches supplied for the Victoria Line Upgrade and the Jubilee Line Upgrade in the mid 90's. These tunnel switches are off load / fault make switches of compact design, constructed to meet the stringent London Underground Low Smoke Zero Halogen requirements and to fit into the narrow tunnels of the Metropolitan Line



### London Underground Victoria Line Upgrade VLU

LCS has recently completed an order to supply motorised and manual **Tunnel Switches** for the VLU. The products are an updated derivative of the Tunnel Switches supplied for the Jubilee Line in the mid 90's. These are off load / fault make switches of an extremely compact design to fit into the narrow tunnels of the Victoria Line. These also meet the very stringent Low Smoke Zero Halogen requirements of London Underground. Also included in the project are a number of on load **Depot Switches** and **Changeover Switches**.



### 1.4 ISO 9001:2015

L.C. Switchgear is ISO 9001: 2015 accredited so you can be assured of their quality, reliability and service. This accreditation is supported by the extensive product history of L.C. Switchgear Ltd.



### 1.5 Link-Up

L.C. Switchgear is a member of Link-Up and therefore a registered supplier to the Railway Industry. An increasing number of customers from all industries are now finding that L.C. Switchgear hold the solutions to their power switching and protection requirements.



### 1.6 CIRAS

LCS employ the Confidential Reporting for Safety systems within the company to ensure employee safety is paramount in the factory and on site.



### 1.7 Rail Alliance



LCS are now members of the Rail Alliance. The Rail Alliance is the rail sector's largest dedicated B2B networking organisation. The Rail Alliance is all about bringing customers, suppliers and supply chain opportunities together. It is a membership organisation that sits at the very heart of the rail supply chain. LCS are proud to add their skills to the alliance.

## 1.8 Product History

Switchgear Enclosures		5863
Including	CTS Controlled Track Switches for Network Rail	262
	LCS2 Track Isolating Switches for Network Rail and Depot applications	1973
	NSCD Negative Short-Circuiting Devices	729
	Conductor Rail Heating Panels	298
	Track and Tunnel Switches for London Underground	519
	Depot Road Supply panels (Contactor panels & Disconnecter Panels) for London Underground	239
	Overhead Switchable Trolleys & Power Pedestals for London Underground	405
Switch Automation's & Customised Switches		1169
Fuse Assemblies and Enclosures		1322
Including	Rail Mounted Fuses	1015
Indicator Assemblies		428
Including	COSI Cleaning road ON / OFF Indicators	70
	OSI Overhead Indicators	281
Resistor Assemblies		989
Including	Spark Gap & Non Linear Resistors	70
LVAC Control Panels		609

For a list of satisfied customers, refer to the product history section at the back of this catalogue on page 102.

## 1.9 Product Ranges

The following section details the major groups of products available from L.C. Switchgear Ltd.

If you require a product that is not listed do not hesitate to contact us and our experienced engineers will be pleased to assist you.

## 1.10 Railway Enclosures

A wide range of high quality switchgear enclosures providing combinations of features:

- Quick and efficient track sectioning
- Removal of power in emergencies
- Bonding of tracks for safety when carrying out maintenance
- Greater flexibility i.e. by-passing a substation in the event of substation failure or maintenance

**MLU - Main Line Underground**

On and Off Load switchgear enclosures for Main Line Underground Traction systems.

These range from **2000A - 4400A** typically but can go higher on request.

These vary from the ML range because of the **Low smoke and Zero halogen** requirements.

The functions available are as **ML** and vary as above: -

**Disconnecter types**

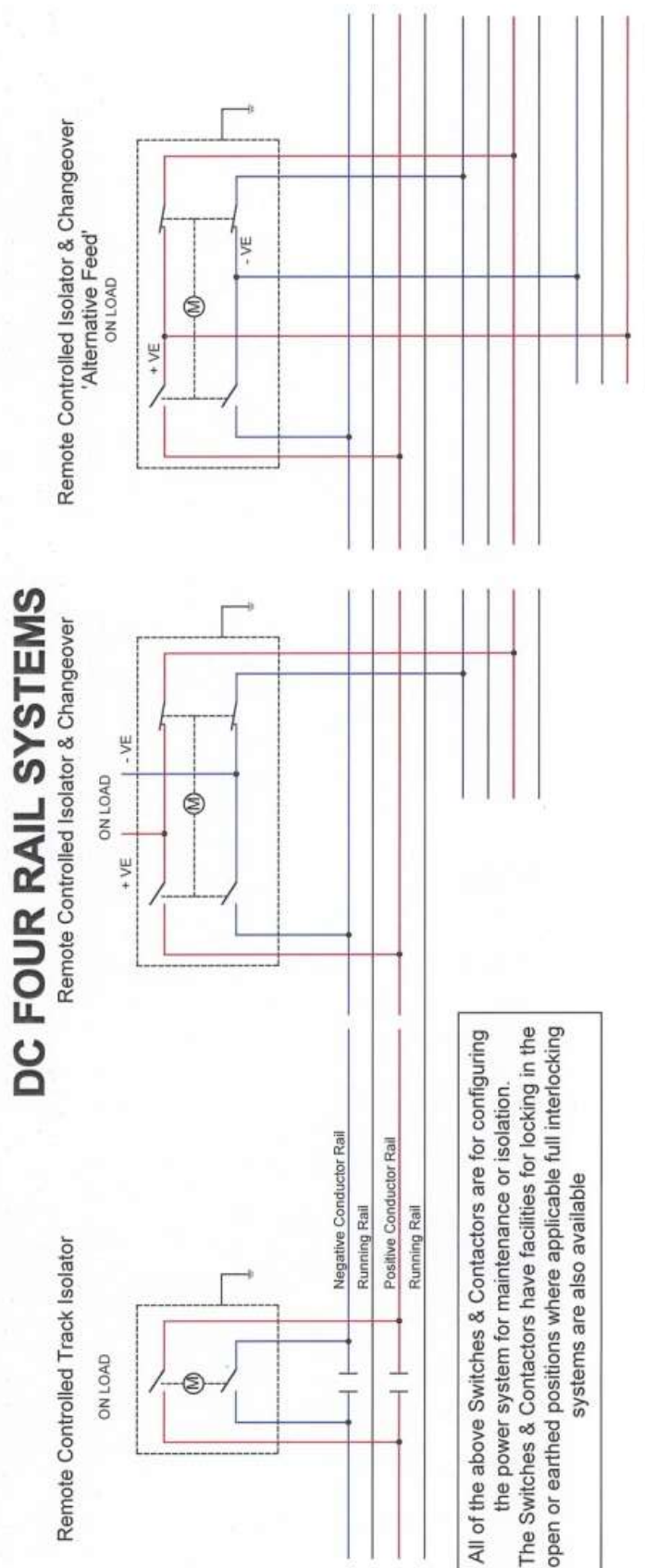
- Off load
- Off load, fault make
- On load fault make

**Voltage Systems**

- 500V DC
- 630V DC
- 750V DC
- 1500V DC

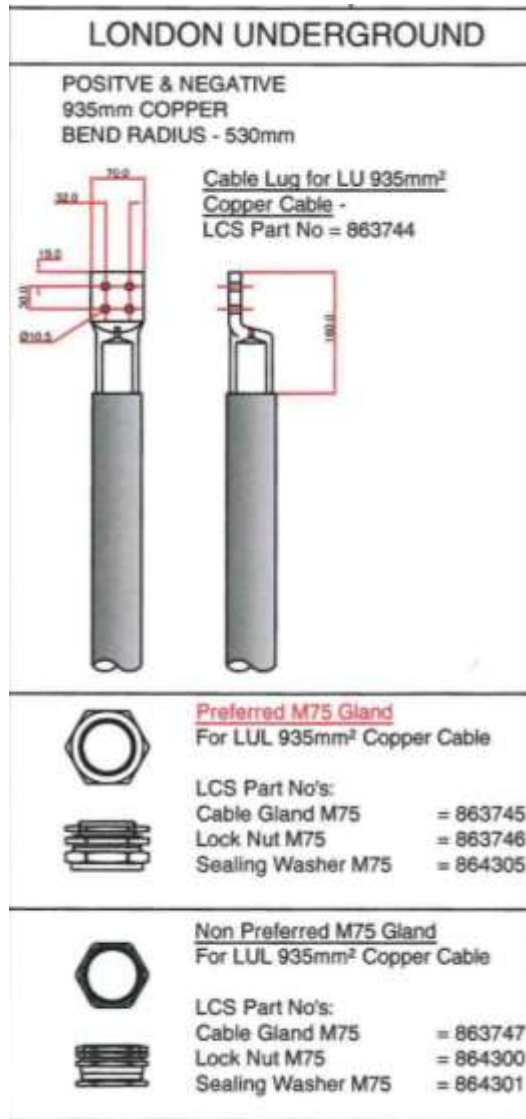
Manual pneumatic or electrically driven - Traction grade enclosures up to IP67- Steel or GRP indoor and outdoor enclosures

## 1.11 Some Typical Railway Applications



## 1.12 Standard Traction Cables, Lugs & Glands

LCS can supply Traction grade cable lugs and glands, some of these are listed in the Accessories section (Page 85) of this catalogue (Ref Only – Always consult the latest Network Rail, London Underground Standards etc.)



## 1.13 LUL Approved Products

LCS has developed specific products to meet the stringent Low Smoke Zero Halogen requirements of LUL.

The following is a list of approved products currently used on the London Underground System.

The products in **yellow** are LU Framework Products.

Product			Description	Used On	Ref to Page
<b>8800471</b>	<b>MLU</b>	<b>RCCTIS</b>	<b>RCTIS Changeover Isolating Switch 4kA 2 Pole</b>	<b>Metronet Rail SSL</b>	<b>37</b>
8800445	MLU	MDS	Track Isolating Manual Disconnecter Switch 4kA 2 Pole (Top entry Cables)	Metronet Rail SSL	33
8800442		COLR	725 Type Current On Line Relay	Various LU Projects	73
8800435	MLU	MCOD	Manual Changeover Off load Disconnecter 4kA 2 Pole	Metronet Rail SSL	
8800414	MLU	MTTIS	Manual Tunnel Track Isolating Switch 4kA 2 Pole (Tunnel)	Metronet Rail SSL	43
8800411	MLU	RCTIS	RCTIS Remote Controlled Track Isolating Disconnecter Switch 4kA 2 Pole	Metronet Rail SSL	
8800410	MLU	MDS	MDS Track Isolating Manual Disconnecter Switch 4kA 2 Pole (Slim line)	Metronet Rail SSL	
8800409	MLU	CP	2 Pole Contactor Panel with Remote Control	Acton Depot	38
<b>8800397</b>	<b>MLU</b>	<b>MDS</b>	<b>Track Isolating MDS Manual Disconnecter Switch 4kA 2 Pole</b>	<b>Metronet Rail SSL</b>	<b>33</b>
<b>8800364</b>	<b>MLU</b>	<b>RCTIS</b>	<b>Remote Controlled Track Isolating Switch 4kA 2 Pole (Tunnel)</b>	<b>Metronet Rail BCV</b>	<b>43</b>
<b>8800363</b>	<b>MLU</b>	<b>MCOIS</b>	<b>Manual Changeover Isolating Switch 4kA 2 Pole</b>	<b>Metronet Rail BCV</b>	<b>36</b>
<b>8800361</b>	<b>MLU</b>	<b>MTTIS</b>	<b>Manual Track Isolating Switch 4kA 2 Pole (Tunnel)</b>	<b>Metronet Rail BCV</b>	<b>43</b>
<b>8800360</b>	<b>MLU</b>	<b>MTIS</b>	<b>Manual Track Isolating Switch 4kA 2 Pole</b>	<b>Metronet Rail BCV</b>	<b>32</b>
8800352	MLU	RCTIS	4 kA RCTIS 2 Pole Motorised Switch -	Stanmore 3rd Platform	31
8800327	MLU	TTSS	Motorised Track Isolating Switch RCTIS 2 Pole (Tunnel) & Remote	Baker St	43
8800318	MLU	RCTIS	3kA RCTIS 2 Pole Motorised Switch - SCADA	Heathrow T5	31
8800317	MLU	RCTIS	3kA RCTIS 2 Pole Motorised Switch -	Wembley Park Sidings	31
8800314	MLU	COSI	Cleaning Road Overhead Status Indicator (with alarm and beacon)	Upminster Depot	
8800307	MLU	MDDS	Motor Driven Disconnecter Switch (London Rd)	BCV DEISIP Project	34
8800306	MLU	MDDS	Motor Driven Disconnecter Switch LH (Queens Park)	BCV DEISIP Project	34
8800305	MLU	MDDS	Motor Driven Disconnecter Switch RH(Queens Park)	BCV DEISIP Project	34
8800303		MP	Mimic Panel Waterloo and City	BCV DEISIP Project	54
8800302		MP	Mimic Panel Queens Park	BCV DEISIP Project	54
8800301		MP	Mimic Panel Hainault	BCV DEISIP Project	54
8800299		MP	Mimic Panel London Road	BCV DEISIP Project	54
8800298		MP	Mimic Panel Ruislip	BCV DEISIP Project	54
8800297		MP	Mimic Panel Northumberland Park	BCV DEISIP Project	54
8800296		MP	Mimic Panel Stonebridge Park	BCV DEISIP Project	54
8800295	MLU		Contactor Panel 200A (Waterloo and City)	BCV DEISIP Project	
8800293	MLU	OSI	Overhead Conductor Rail Status Indicator (less than 60V)	BCV DEISIP Project	26
8800292	MLU	COSI	Cleaning Road Overhead Status Indicator (with alarm and beacon)	BCV DEISIP Project	28
8800291	MLU	PP	Power Pedestal (200A)	BCV DEISIP Project	27
8800290	MLU	OST	Overhead Switchable Trolley 150A	BCV DEISIP Project	26
8800289	MLU	CRCP	Cleaning Road Contactor Panel	BCV DEISIP Project	28
8800288	MLU	CP	Contactor Panel	BCV DEISIP Project	25
8800287	MLU	SBI	Shed Board Isolator	BCV DEISIP Project	28
8800286	MLU	MDS	Manual Disconnecter Switch	BCV DEISIP Project	32
8800284	MLU	CWRC	Remote Controlled Wash Road Contactor	Upminster Depot	37
8800283	CP	RCTIS	2 Switch Remote Control Panel Lathe Road	Upminster Depot	
8800268	MLU	MTIS	3kA MTIS II Depot	Various LUL Projects	
8800219	FU		Rail Mounted Fuse Enclosure	Various LUL Projects	64
8800219A	FU		Rail Mounted Fuse Enclosure (Tunnel lighting Fuse 5A)	Various LUL Projects	64
8800219B	FU		Rail Mounted Fuse Enclosure (With special label TED Fuse 0.8A)	Various LUL Projects	64
8800209	MLU	RCTIS	3kA RCTIS Depot Train Cleaning Road Isolator	Northfields Depot	31
8800203	MLU	RCTIS	3kA RCTIS Depot Under Wheel Lathe Isolator & Remote Control	Various LUL Projects	31
8800115	MLU	TSSN	4kA Surface Switch	Jubilee Line Extension	
8800098	MLU	TTSM	Tunnel switch IP67	Lounsdale Electrical	44
8800076	MLU	TTSS	4kA Tunnel Switch	Jubilee Line Extension	43
8800075	MLU	TCOS	4kA Changeover Switch	Jubilee Line Extension	
8800074	MLU	TSS	4kA Surface Switch	Jubilee Line Extension	44
8800073	MLU	TCOS	2kA Changeover Switch	Jubilee Line Extension	35
8800072	MLU	RCTIS	2 kA RCTIS 2 Pole Remote Controlled Track Isolating Switch	Jubilee Line Extension	35



#### 1.14 Switches

AC & DC switches for **on load, off load** and **off load – fault make** applications.

These can be manually operated or automated by Electric drive or Pneumatic drive.

Switches of multi pole construction are available typically up to 6 poles for off load switches.

The configurations can be typically:

- Disconnectors (1-0)
- Changeover (1-2)
- Changeover Disconnectors (1-0-2)

Many options are available including;

- Interlocking
- Multiple Auxiliary indication
- Padlock facilities

#### 1.15 Fuses

A full range is available, complete with their accessories, from the smallest electronic fuse to large medium voltage fuses. DC and semi-conductor fuses to North American and European Standards.

International brand names: -AMP-TRAP-TRI-ONIC-Protistor-Ultrasafe-Linder-Linocur-Limitor-Nortroll

Stock of obsolete specialist fuses now available including many DC fuses suitable for a variety of arduous requirements.

#### 1.16 Fuse Assemblies

Specialist fuse assemblies can be designed and manufactured by L.C. Switchgear Ltd.

The experience gained on railway fuse assemblies can be applied to any industrial requirement.

#### 1.17 Contactors & Contactor Panels

L.C. Switchgear Ltd. supply high power contactors and contactor panels for use throughout industry.

AC & DC contactors for heavy duty industrial and traction applications are a speciality with contactors up to 5000A DC 1000V, typically required for main line traction systems,

#### 1.18 Switch Refurbishment, Service & Repair

Service and repair of your existing switches can be carried out at competitive rates.

Our expertise allows us to refurbish or repair switches supplied by others, at very competitive prices.

#### 1.19 Operator & Maintenance Training

Training can be given at LCS in Hove, or at your site.

Many managers, operators and maintainers have attended our courses.

Please consult technical sales with your requirements.



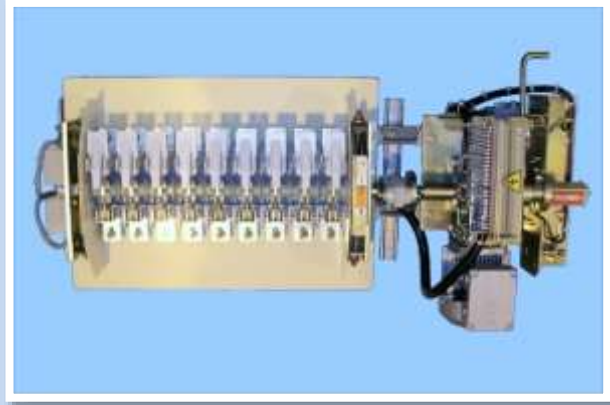
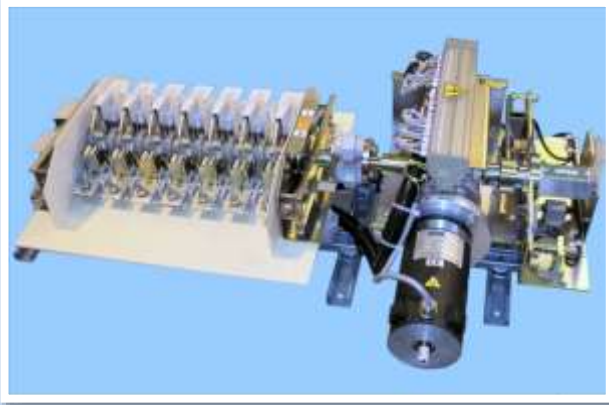
## 2 Railway Switchgear – SUBSTATION

Power Isolation & Maintenance Switchgear Enclosures for:

Tramway & Light Railway



Main Line



**DC Switchgear Enclosures for the following applications:**  
 Substation feeds to Tracks or Overhead Lines with Bonding facilities  
 Substation feeds to Tracks or Overhead Lines with Bypass facilities  
 Substation feeds to Tracks or Overhead Lines with automatic Bonding / Negative bonding  
 Disconnectors for the output from Rectifiers

## 2.1 LVAC Hex Spider Panel

### London Underground

#### APPLICATION

Current monitoring of the interface between the LU and Network Rail earth systems on the Heathrow Express Line.

#### Features

- ❑ IP66 & NEMA 4X,12, 13
- ❑ 2.5mm galvanised steel mounting plate

#### Cubicle Construction

Material 1.4mm 304 S15 pre grained stainless steel plate  
 Finish Internal Painted - White Anti-Condensation paint  
 Finish External Painted BS381C-- L309 Canary Yellow Semi -Gloss  
 Baseplate Orange Paint Gloss Finish RAL 2004

#### Installation

Wall mounted, cable entry from below via insulating gland plates

#### Cabling

35mm<sup>2</sup> and 50mm<sup>2</sup> PVC/PVC cables for the LU bonds  
 50mm<sup>2</sup> and 75mm<sup>2</sup> PVC cables for the Network Rail bonds

#### Electrical Characteristics & Dimensions



	8800458-V01	8800458-V02	8800458-V03	
Length	600 mm			
Height	600 mm			
Depth	210 mm			
Weight	27kg			

## 2.2 2 Pole DC Changeover Switch Enclosure

### London Underground

#### Switch Technical Data

Category - DC21  
 Voltage - 250V AC/DC  
 Current - 40A

#### Box Technical Data

Material - 1.5mm Steel Plate  
 Body - Folded & seam Welded  
 Door - Hinged Left  
 Lock - Sash Lock with 3mm Toe  
 Gland Plates - Top Only  
 (Side Gland plates upon request)  
 Finish - Powder Structure Paint Grey RAL 7035  
 Protection - IP55 & NEMA12  
 Mounting Plate - 2.5mm Mounting Plate Zinc Coated



	8800389
Supply	50 or 100V dc
Current	40A
Length	300 mm
Height	300 mm
Depth	225 mm
Weight	9kg

## 3 Railway Switchgear – DEPOT SHORE SUPPLIES

Power Isolation & Maintenance Switchgear Enclosures for:

Underground



DC Switchgear enclosures for the following applications:

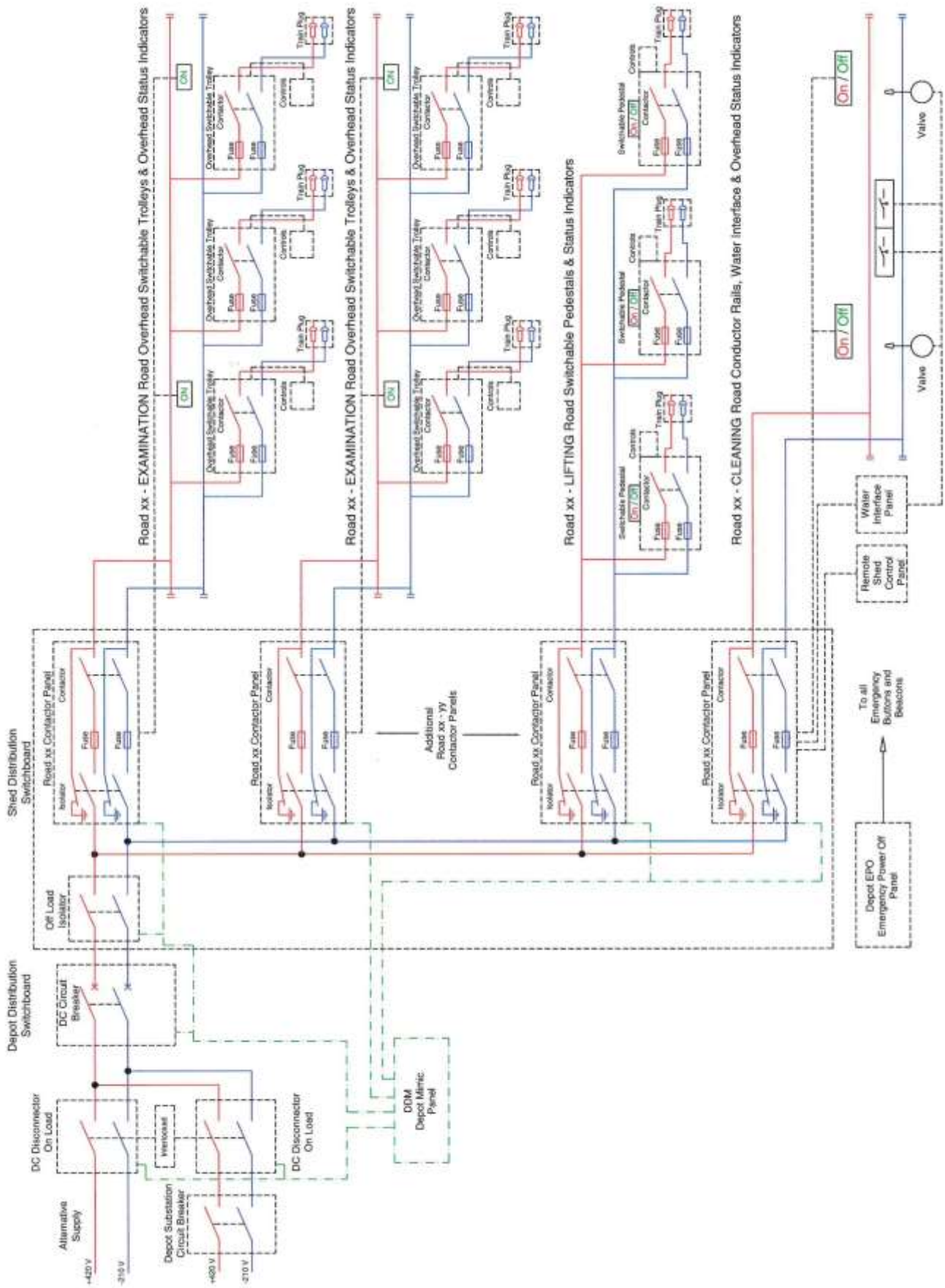
Track to depot road feeds where ground level conductor rails are present.

Isolation & Bonding of depot roads, Depot road feeds to overhead lines with automatic negative bonding

Overhead Switchable Trolley's & Pedestals for connections to the trains, Changeover switching of depot roads

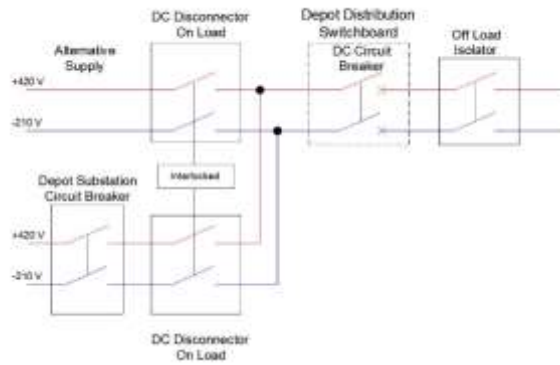
Emergency Power off Control Panels

## 3.1 Depot Shore Supply Systems 2 Pole (Typically for London Underground)

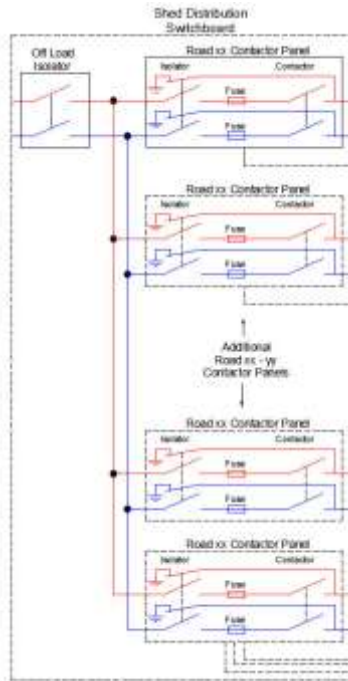


The complete system is isolated OR alternatively supplied via **On Load DC Disconnectors**.

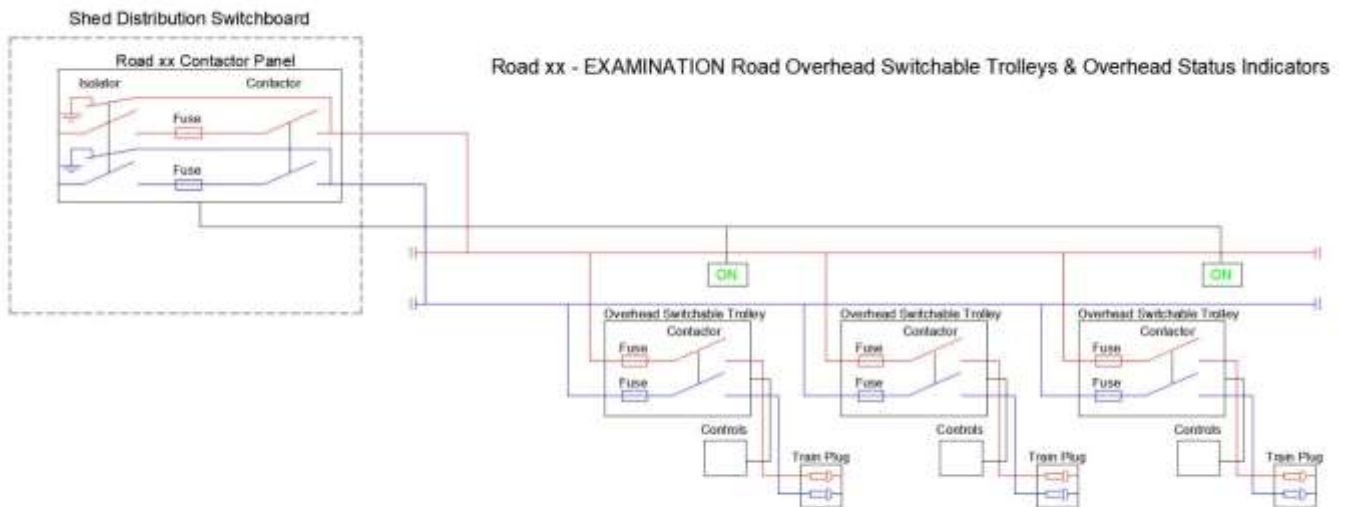
The depot is then protected by Depot Distribution Circuit Breakers. The Breakers feed suites of Depot Road Contactors, typically for a particular shed or section of a shed. Each Suite has its own Incoming Off Load Isolator for contactor suite maintenance.



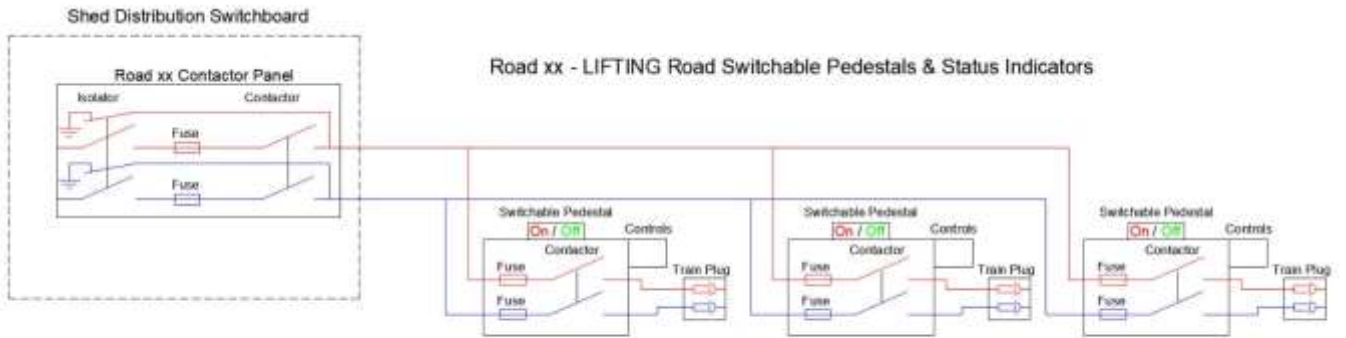
The makeup of this Contactor Suite can contain Examination or Lifting Road Contactors OR Cleaning Road Contactors.



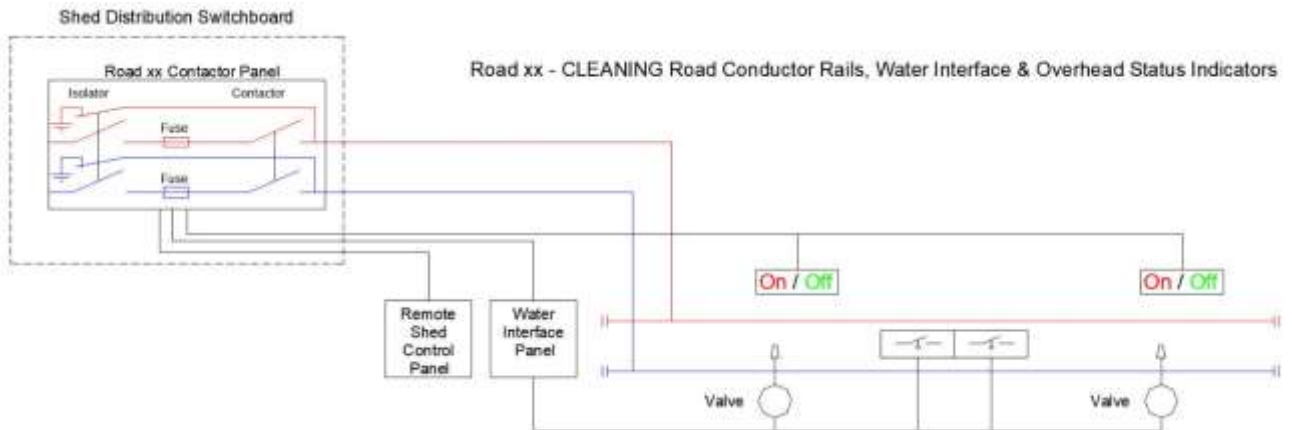
Examination Road Contactors feed Overhead bus bars which in turn feed Overhead Switchable Trolleys.



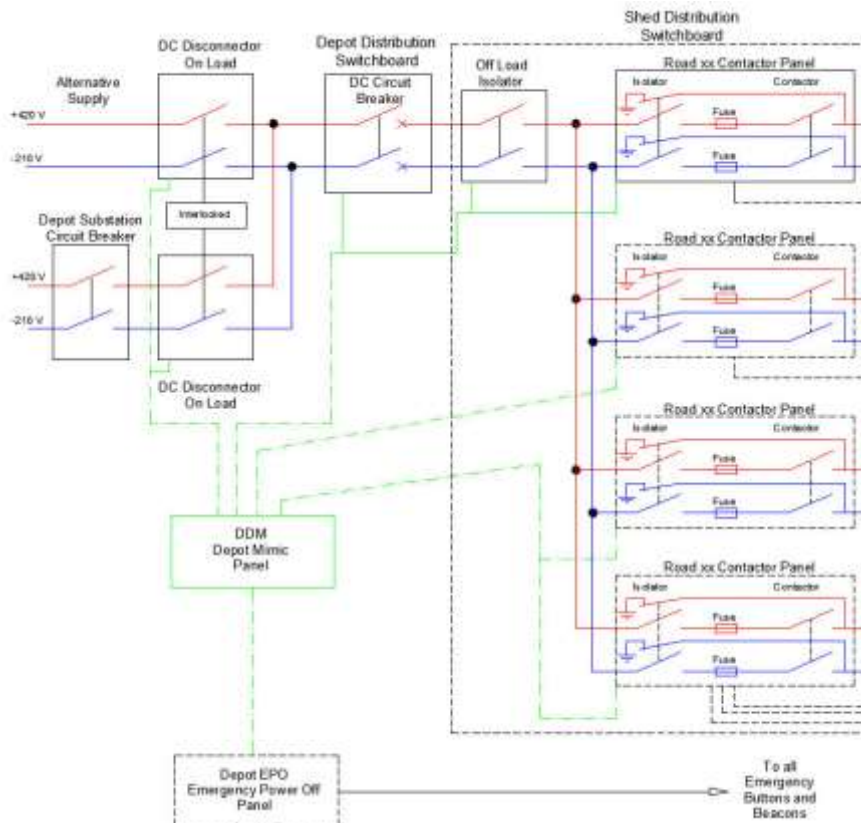
Lifting Shed Contactors feed Switchable Pedestals.



Cleaning Road Contactors contain more monitoring equipment because they feed the Conductor Rails of the Cleaning Road. This panel is interfaced with the Water supplies and controls Overhead Status Indicators for the Conductor Rail Status.



A Mimic Panel in the DDM office monitors the status of each piece of equipment in the depot power system. An EPO Emergency Power Off Panel comprises approved Safety Relays which monitor groups of Emergency Power Off pushbuttons which are distributed throughout the depot.





## ALL DEPOT CONTACTORS ARE AVAILABLE FROM 500A UPWARDS

### 3.2 MLU CP – 2 Pole Exam Road Depot Contactor Panel - 500A or 630A 630V DC

#### London Underground

#### APPLICATION – ON LOAD

The 630V DC is then fed directly from the Contactor to the Road Shore Supply for the Overhead Switchable Trolleys (8800290) OR to the Lifting Shed Power Pedestals (8800291).

The 630V DC is fed to the 2 pole contactor via:

4 pole Isolating & Bonding Disconnecter, which has interlocks for Maintenance and Secure Isolations. These prevent contactor operation and the 630V DC supply when maintenance is being performed.

The Contactor provides signals to the Overhead Status Indicators OSI and the Mimic Panel in the DDM Office.

When the Disconnecter is moved to the Earthed position the outgoing supplies to the Examination or Lifting Sheds are earthed and can be locked, making them safe for maintenance.

#### Contactor

Traction grade bar type 500A or 630A 2 Pole Contactor

#### Fuse

Positive and negative traction grade fuses

#### Switch

One (1-0-E) 4 pole Manual Off Load, switch

Pad lockable handle

Interlock facility for the bonded position & open positions.

#### Features

- IP54
- Protected for internal use
- 60mm Electrical Clearance
- Anti-Condensation paint

#### Installation

Plinth mounted, 630V DC supply is derived from the bus bar chamber at the bottom.

#### Cabling

2 x 250mm<sup>2</sup> Incoming Traction Positive cables

2 x 250mm<sup>2</sup> Outgoing Traction Positive cables



	8800288	8800391
<b>Voltage</b>	630 Volts DC (900V DC Max.)	630 Volts DC (900V DC Max.)
<b>Current</b>	500A	630A
<b>No of Poles</b>	2	2
<b>Length</b>	1300 mm	1300 mm
<b>Height</b>	2100 mm	2100 mm
<b>Depth</b>	600 mm	600 mm
<b>Weight</b>	420kg	450kg

#### Shed Board Isolator

##### Application – Off Load

The 630V DC is fed from a Shed Board Isolator (8800287) via bus bars which connect into the suite of Contactor Panels. This is interlocked with the contactors so that all of the contactors will de-energise if the isolator is operated ensuring off load operation.

##### Cabling

1 x 935mm<sup>2</sup> Incoming Traction Positive cable

1 x 935mm<sup>2</sup> Incoming Traction Negative cable

	8800287
<b>Voltage</b>	630 Volts DC (900V DC Max.)
<b>Current</b>	2000A
<b>No of Poles</b>	2
<b>Length</b>	800 mm
<b>Height</b>	1800 mm
<b>Depth</b>	600 mm
<b>Weight</b>	325kg



### 3.3 OST 2 Pole Overhead Switchable Trolley

## London Underground

#### APPLICATION – ON LOAD

The Overhead Switchable Trolley mounts on a 4 inch wide overhead 'I' beam. The Road 630V DC is then fed directly from the Contactor to the 630V DC Traction Power supply overhead supply bars. The Trolley Brush collectors pick up the supply from the supply bars. Two 110V AC control supply collectors pick up the supply from two control bars fitted along the length of each road.

The Shore Supply Plug is fitted with a Plug Engaged sensor which inhibits the application of Traction Power to the train unless a magnet in the train receptacle is detected.

The Trolley supplies Traction Power to trains in the depot area via a Shore Supply Plug. The Shore Supply Plug is stowed in the area underneath the Local Operator Station and hangs from the Trolley.

There is a high level frangible link that disconnects under strain thus preventing damage to the trolley should the train be moved out of the depot with the plug remaining in the train receptacle.

#### Contactor

Traction grade bar type 2 Pole Contactor

#### Fuse

Positive and negative traction grade fuses.

#### Features

- IP32
- Protected for internal use
- 60mm Electrical Clearance
- Self-compensating shock absorber
- Stainless steel carriage & wheels
- EMC Tested
- Tested to an inductive time constant of 150ms

The enclosure is segregated into three areas:

- The left hand section houses the two traction fuses.
- The centre section houses the contactor, the voltage monitor & fuses, and isolation relay.
- The right hand section houses the earth leakage detector and control equipment

#### Installation

The carriage mounts on a 4 inch wide overhead 'I' beam

#### Cabling

1 x 50mm<sup>2</sup> Outgoing Traction Positive cable

1 x 50mm<sup>2</sup> Outgoing Traction Negative cable



	8800290	8800304
<b>Voltage</b>	630 Volts DC (900V DC Max.)	630 Volts DC (900V DC Max.)
<b>Current</b>	150A	200A
<b>Length</b>	1013 mm	1085 mm
<b>Height</b>	526 mm	744 mm
<b>Depth</b>	426 mm	520 mm
<b>Weight</b>	105kg	150kg

#### Overhead Status Indicator 8800293

The OSI indicates when a voltage less than 60V detected (fail safe) on the overhead bars that feed the 630V DC to the trolley. More than one unit is required for each road and typically 3 are deployed on each road.



## 3.4 PP 2 Pole Power Pedestal 150A or 200A with Optional Boom

### London Underground

#### APPLICATION – ON LOAD

The Road 630V DC is then fed directly from the Contactor to the Power Pedestal.

Two 110V AC control supply is also derived from the respective Contactor panel.

The Shore Supply Plug is fitted with a Plug Engaged sensor which inhibits the application of Traction Power to the train unless a magnet in the train receptacle is detected.

The Pedestal supplies Traction Power to trains in depot lifting sheds via a Shore Supply Plug. The Shore Supply Plug is stowed in the area underneath the Local Operator Station and the cable is coiled either on the end of a middle road enclosure or on the boom or wall bracket for outer road enclosures.

There is a frangible link that disconnects under strain thus preventing damage to the pedestal should the train be moved out of the depot with the plug remaining in the train receptacle.

Shore supply status beacons are positioned on top of the Power Pedestal enclosure

#### Contactor

Traction grade bar type 2 Pole Contactor

#### Fuse

Positive and negative traction grade fuses

#### Features

- IP54
- Protected for internal use
- 60mm Electrical Clearance
- Doors that give access for maintenance are interlocked with the road contactor panel isolator

The enclosure is segregated into three areas:

- The lower left hand section houses the two traction fuses and the supply connection lugs
- The top section houses the contactor, the voltage monitor & fuses, isolation relay and earth leakage CT
- The lower right hand section houses the earth leakage detector and the control equipment

#### Installation

Floor mounted

#### Cabling

8800291	8800452
1 x 50mm <sup>2</sup> Outgoing Traction Positive cable	1 x 75mm <sup>2</sup> Outgoing Traction Positive cable
1 x 50mm <sup>2</sup> Outgoing Traction Negative cable	1 x 75mm <sup>2</sup> Outgoing Traction Negative cable

	8800291	8800452
<b>Voltage</b>	630 Volts DC (900V DC Max.)	630 Volts DC (900V DC Max.)
<b>Current</b>	150A	200A (For S- Stock)
<b>Length</b>	1013 mm	1050 mm
<b>Height</b>	526 mm	1500 mm
<b>Depth</b>	426 mm	600 mm
<b>Weight</b>	105kg	275kg



#### Optional Overhead Boom

The overhead boom ensures that a clear walkway is maintained through the lifting shed. The trip hazard is limited to beyond the yellow passage markings. The local control station is situated on the other end of the boom along with the cable stowage.



Parked Overhead Boom



Overhead Boom in use

## 3.5 MLU CRCP – 2 Pole Depot Cleaning Road Contactor Panel - 500A or 630A 750V DC

### London Underground

#### APPLICATION – ON LOAD

These 630V DC bus bars are connected into a suite of Contactor Panels and the incoming supply to these bus bars is fed by a Shed Board Isolator (8800287). The 630V DC is then fed directly from the Contactor to the Cleaning Road conductor rails. The 630V DC is fed to the 2 pole contactor via: 4 pole Isolating & Bonding Disconnecter, which has interlocks for Maintenance and Secure Isolations. These prevent contactor operation and the 630V DC supply when maintenance is being performed. The Contactor provides signals to the Cleaning Road Overhead Status Indicators COSI and the Mimic Panel in the DDM Office.

When the Disconnecter is moved to the earthed position the outgoing supplies to the Cleaning Road Conductor Rails earthed and can be locked, making them safe for maintenance.

Control of the contactor supply can be done at a remote control panel at the end of the road or at local control buttons at the contactor in the Switch room.

The contactor panel is interlocked with the Depot Fire Alarm, Sump Pumps and Flood Sensors

#### Contactor

Traction grade bar type 500A or 630A 2 Pole Contactor

#### Fuse

Positive and negative traction grade fuses.

#### Switch

One (1-0-E) 4 pole Manual Off Load, switch.

Pad lockable handle

Interlock facility for the bonded position & open positions.

#### Features

- IP54
- Protected for internal use
- 60mm Electrical Clearance
- Anti-Condensation paint

#### Installation

Plinth mounted, 630V DC supply is derived from the bus bar chamber at the bottom.

#### Cabling

1 x 935mm<sup>2</sup> Outgoing Traction Positive cable

1 x 935mm<sup>2</sup> Outgoing Traction Negative cable

	8800289	8800392
<b>Voltage</b>	630 Volts DC (900V DC Max.)	630 Volts DC (900V DC Max.)
<b>Current</b>	500A	630A
<b>Length</b>	1300 mm	1300 mm
<b>Height</b>	2100 mm	2100 mm
<b>Depth</b>	600 mm	600 mm
<b>Weight</b>	450kg	450kg

#### Shed Board Isolator

##### Application – Off Load

The 630V DC is fed from a Shed Board Isolator (8800287) via bus bars which connect into the suite of Cleaning Road Contactor Panels. This is interlocked with the contactors so that all of the contactors will de-energise if the isolator is operated ensuring off load operation.

##### Cabling

1 x 935mm<sup>2</sup> Incoming Traction Positive cable

1 x 935mm<sup>2</sup> Incoming Traction Negative cable

	8800287
<b>Voltage</b>	630 Volts DC (900V DC Max.)
<b>Current</b>	2000A
<b>Length</b>	800 mm
<b>Height</b>	1800 mm
<b>Depth</b>	600 mm
<b>Weight</b>	325kg

#### Cleaning Road Overhead Status Indicator COSI 8800292

The overhead status indication of the conductor rail 630V DC power (for more details refer to 11.5).



Remote Control Panel



## London Underground

### 3.6 EPO Emergency Power Off Interface Panel

The Emergency Power Off Panel comprises approved **Safety Relays** which monitor groups of Emergency Power Off pushbuttons which are distributed throughout the depot.

**Features**

- Degree of Ingress Protection IP54
- Material 2mm Sheet Steel
- Finish RAL 7032 Grey

**Supply Voltage**

110V AC ±10% 50Hz

**Internal Control Voltages**

110V AC ±10% 50Hz

48V DC ±10%

The EPO Panel should be permanently connected to a 110VAC 50Hz power supply. This should be a 'secure power supply', supported by a UPS.

	8800444-V01	8800444-V02	8800444-V03
<b>EPO Beacon Supply</b>	20A	5A	5A
<b>Length</b>	800 mm	400 mm	600 mm
<b>Height</b>	1500 mm	1000 mm	1000 mm
<b>Depth</b>	215 mm	215 mm	215 mm
<b>Weight</b>	112kg	36kg	45kg



### 3.7 Water Interface Panel

The Cleaning Road Water Interface Panel ensures that the Road 630V DC supply and the Cleaning Road Water supplies cannot be 'on' at the same time.

Initiation of 630V DC power supply to the road at the Contactor Panel Remote Control causes the water systems to be isolated and upon receipt of confirmation that they are isolated the Contactor will close.

Switching off the 630V DC at the Road Contactor Remote panels will reinstate the Cleaning Water supply.

**Features**

- Degree of Ingress Protection IP55 & NEMA12
- Material 1.5mm Sheet Steel
- Finish RAL 7035 Grey

	8800443-V01
<b>UPS supported Secure Supply</b>	110V ac
<b>Rated Service Current I</b>	2A
<b>Length</b>	800 mm
<b>Height</b>	1000 mm
<b>Depth</b>	300 mm
<b>Weight</b>	67kg



### 3.8 Battery Charger Changeover Panel

The Battery Charger Changeover Panel has been design for the purpose of interfacing the 110V DC battery chargers used to supply the DC traction switchgear in Neasden depot E1 switch room.

The panel enables two battery chargers to be used in a redundant configuration, allowing either to be isolated for maintenance without interrupting the supply from the other one. In normal use both battery chargers are used to supply 110V DC in parallel.

Diode blocking prevents a fault on one charger from affecting the supply from the other.

The panel also allows the mains supply for either charger to be manually switched over from the usual 230V LVAC supply to the UPS fed 110V AC supply in the case of a supply fault, to further increase availability.

	8800460
<b>Battery Supply</b>	110V dc
<b>Length</b>	400 mm
<b>Height</b>	500 mm
<b>Depth</b>	210 mm
<b>Weight</b>	18kg



## London Underground

### 3.9 Siding Outlet Plunger Box

These drivers' plunger switches are intended for train driver to inform the signalman he is ready to move

The door needs is hinged at the top and a non-locking latch at the bottom which can be lifted up to access the plunger which prevents unintentional operation and the rain getting at the switch. They are 100v AC (5amp) single push to make closed contacts and spring return to an open contacts when not pushed.

They mount on a concrete posts which are 150mm wide.

#### Construction

- 3.0mm Stainless Steel Sheet 1.4003
- Stainless steel concealed hinges
- Colour BS381C - Light Admiralty Grey No.697 Semi -Gloss Finish

	<b>8800457</b>
Supply	100V ac
Length	150 mm
Height	300 mm
Depth	150 mm
Weight	6kg



### 3.10 EPO/Emergency Shower Interface Panel

Monitors a proximity sensor for the emergency shower.

Beacon activated when the sensor is operated.

The system can be reset via a padlockable reset switch when the conditions are back to normal.

	<b>8800455</b>
Supply	100V ac
Current	0.25A
Length	300 mm
Height	300 mm
Depth	225 mm
Weight	9kg



### 3.11 4kA 2 Pole Off-Load Disconnecter in GRP Enclosure

## London Underground

#### APPLICATION - OFF LOAD

Manual road isolation for Depots

#### Switches

One (1-0) 2 pole off load manual disconnecter

#### Construction

- IP55
- GRP insulating enclosure
- Protected for external use

#### Features

- 60mm electrical clearance
- Mechanical interlocking

#### Installation

Insulating plinth mounted, cable entry from below via aluminium gland plates.

#### Cabling

Traction Positive 2 x 935mm<sup>2</sup> cable

Traction Negative 2 x 935mm<sup>2</sup> cable

#### Electrical Characteristics & Dimensions

	<b>8800438</b>
Voltage	630V DC
Current	4000 A
Length	1070 mm
Height	1875 mm
Depth	750 mm
Weight	178kg



### 3.12 MLU CRI – 2 Pole Cleaning Road Isolator - 3150A 630V DC

#### London Underground

#### APPLICATION - ON LOAD

Motorised cleaning road isolation with a remote control panel for **Depots**

#### Switches

Two (1-0) 1 pole on load 110V AC motorised switch

#### Construction

- IP55
- 3mm sheet steel
- Protected for external use

#### Features

- 60mm electrical clearance
- Mechanical interlocking

#### Installation

Plinth mounted, cable entry from below via aluminium gland plates.

#### Cabling

Traction Positive 2 x 935mm<sup>2</sup> cable

Traction Negative 2 x 935mm<sup>2</sup> cable

#### Electrical Characteristics & Dimensions

	<b>8800209</b>
<b>Voltage</b>	630V DC
<b>Current</b>	3150 A
<b>Length</b>	2380 mm
<b>Height</b>	1850 mm
<b>Depth</b>	750 mm
<b>Weight</b>	775kg



### 3.13 MLU RCTIS – 2 Pole Remote Controlled Track Isolator – 3150A or 4000A 630V DC

#### London Underground

#### APPLICATION - ON LOAD

Road Isolation for various applications with a remote control panel for **Depots**.

#### Switches

Two (1-0) 1 pole 230V AC motorised switch

#### Construction

- IP55
- 3mm sheet steel
- Protected for external use

#### Features

- 60mm electrical clearance
- Mechanical interlocking

#### Installation

Plinth mounted, cable entry from below via aluminium gland plates.

#### Cabling

Traction Positive 1 or 2 x 935mm<sup>2</sup> cable in and out

Traction Negative 1 or 2 x 935mm<sup>2</sup> cable in and out

#### Electrical Characteristics & Dimensions

	<b>8800203</b>	<b>8800317</b>	<b>8800318</b>	<b>8800352</b>
<b>Voltage</b>	630V DC	630V DC	630V DC	630V DC
<b>Current</b>	3150A	3150A	3150A	4000A
<b>Length</b>	2380 mm	2380 mm	2380 mm	2380 mm
<b>Height</b>	1850 mm	1850 mm	1850 mm	1850 mm
<b>Depth</b>	750 mm	750 mm	750 mm	750 mm
<b>Weight</b>	775kg	775kg	775kg	805kg



Remote Control Units configured to the different applications:



## 3.14 MLU MTIS – 2 Pole Manual Track Isolating Switch - 3150A or 4000A 630V DC

### London Underground

#### APPLICATION - ON LOAD

Depot Shed Switchroom Isolation, Depot Road Isolation and main line sectioning.

Supplied to London Underground on the **BCV DEISIP Project, VLU Victoria Line Upgrade & SSR Metropolitan Line Upgrade**

#### Switches

Two (1-0) 1 pole on load switches

#### Construction

- IP55
- 3mm sheet steel
- Protected for External use

#### Features

- 60mm electrical clearance
- Mechanical interlocking

#### Installation

Plinth mounted, cable entry from below via aluminium gland plates.

The 4000A MTIS has rear mounting straps (not visible in the picture) for alternative mounting. Pile mounting version is also available.

#### Cabling

Traction Positive Incoming 2 x 935mm<sup>2</sup> cables

Traction Negative Incoming 2 x 935mm<sup>2</sup> cables





Traction Positive Outgoing 2 x 935mm<sup>2</sup> cables

Traction Negative Outgoing 2 x 935mm<sup>2</sup> cables




#### Electrical Characteristics & Dimensions

Voltage	630V DC
Current	4000A
Length	2380 mm
Height	1850 mm
Depth	750 mm
Weight	762kg



8800360-V01	Manual Track Isolating Switch 4kA 2 Pole – Standard	
8800360-V02	Manual Track Isolating Switch 4kA 2 Pole – Rear Mounting Straps	
8800360-V03	Motorised Locally Controlled Track Isolating Switch 4kA 2 Pole	
8800360-V04	Manual Track Isolating Switch 4kA 2 Pole – Pile Mounting	
8800360-V05	Manual Track Isolating Switch 4kA 2 Pole – Without Torque Limiter	



8800360-V06	Manual Track Isolating Switch 4kA 2 Pole - Base Increased by 355mm in height	
8800360-V07	Manual Track Isolating Switch 4kA 2 Pole – Slimline	
8800360-V08	2 Pole 4kA MTIS with 4 × 935 mm <sup>2</sup> Cable Connections	
8800360-V09	2 Pole 4kA MTIS with KNICK Transducers	
8800286	Manual Track Isolating Switch 3.15kA 2 Pole	

### 3.15 MLU MDS – 2 Pole Manual Disconnecter Switch - 3150A 630V DC London Underground

Application, Electrical Characteristics & Dimensions  
As per page 32.

8800397 MDS – 2 Pole Manual Disconnecter Switch - 4000A



8800445 MDS – 2 Pole Manual Disconnecter Switch - 4000A With Top Entry



### 3.16 MLU MDDS – 2 Pole Motor Driven Track Isolator - 3150A or 4000A 630V DC

#### London Underground

##### APPLICATION - ON LOAD

Depot Shed Switchroom or Road isolation

##### Switches

Two (1-0) 1 pole

##### Construction

- IP55
- 3mm sheet steel
- Protected for external use

##### Features

- 60mm electrical clearance
- Mechanical interlocking
- Local external open / closed indication

##### Installation

Plinth mounted, cable entry from below via aluminium gland plates

##### Electrical Characteristics, Cabling & Dimensions

	<b>8800307</b>
<b>Voltage</b>	630V DC
<b>Current</b>	3150A
<b>Length</b>	2380 mm
<b>Height</b>	1850 mm
<b>Depth</b>	750 mm
<b>Weight</b>	722kg
<b>Traction Positive</b>	Up to 2 x 935mm <sup>2</sup> cable
<b>Traction Negative</b>	Up to 2 x 935mm <sup>2</sup> cable



### 3.17 MLU MDDS – 2 Pole Motor Driven Track Isolator LH & RH - 2000A 630V DC

#### London Underground

##### APPLICATION - ON LOAD

Depot Shed Switchroom or Road isolation

##### Switches

Two (1-0) 1 pole

##### Construction

- Lightweight two part cubicle
- Left Hand & Right Hand configurations
- IP55
- 3mm sheet steel
- Protected for External use

##### Features

- 60mm electrical clearance
- Mechanical interlocking

##### Installation

Plinth mounted, cable entry from below via aluminium gland plates.

##### Cabling

Traction Positive 1 x 935mm<sup>2</sup> cable

Traction Negative 1 x 935mm<sup>2</sup> cable

##### Electrical Characteristics & Dimensions

	<b>8800305</b>	<b>8800306</b>
	Left Hand	Right Hand
<b>Voltage</b>	630V DC	630V DC
<b>Current</b>	2000A	2000A
<b>Length</b>	1650 mm	1650 mm
<b>Height</b>	1650 mm	1650 mm
<b>Depth</b>	615 mm	615 mm
<b>Weight</b>	250kg	250kg



### 3.18 MLU DTS – 2 Pole Depot Track Switch - 2000A 630V DC

#### London Underground

#### APPLICATION - ON LOAD

Depot road isolation for **LUL Depots**

#### Switches

One (1-0) 2 pole 230V AC motorised switch

#### Construction

- IP55
- 3mm sheet steel
- Protected for external use

#### Features

- 60mm electrical clearance
- Mechanical interlocking

#### Installation

Plinth mounted, cable entry from below via aluminium gland plates

#### Cabling

Traction Positive 1 x 935mm<sup>2</sup> cable

Traction Negative 1 x 935mm<sup>2</sup> cable

#### Electrical Characteristics & Dimensions

	<b>8800072</b>
<b>Voltage</b>	630V DC
<b>Current</b>	2000A
<b>Length</b>	1790 mm
<b>Height</b>	1505 mm
<b>Depth</b>	600 mm
<b>Weight</b>	307kg



### 3.19 MLU TCOS – 2 Pole Track Changeover Switch - 2000A 630V DC

#### London Underground

#### APPLICATION - ON LOAD

2 pole changeover switching of depot roads on **LUL Depots**

#### Switches

Two (1-0) 2 pole chain driven 230V AC motorised switches

#### Construction

- IP55
- Protected for external use
- Low Smoke Paint Finish

#### Features

- 60mm Electrical Clearance
- Padlocking facility

#### Cabling

4 x 935mm<sup>2</sup> cables in and out

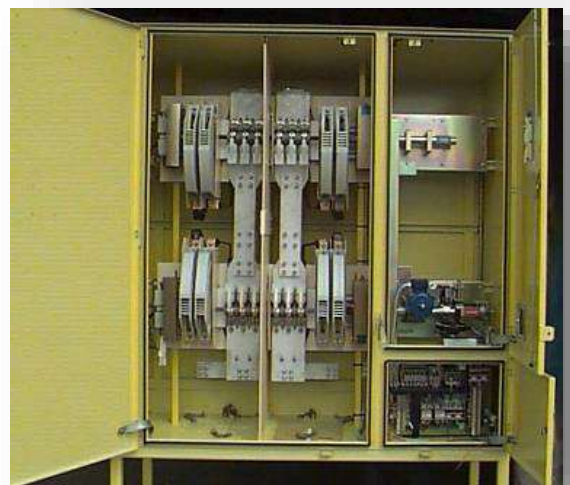
#### Installation

Plinth mounted, cable entry from below via aluminium gland plates

#### Electrical Characteristics & Dimensions

Nominal Current	2000 A
Peak let through Current I <sub>c</sub>	10 000 A
Rated Short Term Withstand Current 1 min	6 000 A
Rated Short Circuit Peak value	75 000 A
Nominal Voltage	1000V

	<b>8800073</b>
<b>Voltage</b>	630V DC
<b>Length</b>	1800 mm
<b>Height</b>	2200 mm
<b>Depth</b>	750 mm
<b>Weight</b>	520kg



### 3.20 MLU MCOD - 2 Pole Manual Changeover Off load Disconnecter 4000A 630V DC

#### London Underground

#### APPLICATION – OFF LOAD

Isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Typically used by **London Underground** for depot track road changeover switching.

**Disconnecter**

Manually operated off load, fault make Disconnector

**Features**

- IP56
- Protected for external use
- Anti-Graffiti Paint Finish
- 60mm Electrical Clearance
- Interlocking between supplies 1# & 2# to ensure only one can be on at a time
- Interlocking for full isolation of both supplies

**Installation**

Plinth mounted, cable entry un-drilled Aluminium gland plates.

**Cabling**

Traction Positive Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable

**Electrical Characteristics & Dimensions**

	<b>8800435</b>
<b>Voltage</b>	630V DC
<b>Current</b>	4000A
<b>Weight</b>	780kg
<b>Length</b>	2050 mm
<b>Height</b>	2040 mm
<b>Depth</b>	743 mm



**3.21 MLU MCOIS – 2 Pole Manual Changeover Isolator Switch - 4000A 630V DC**

**London Underground**

**APPLICATION – ON LOAD**

Isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Typically used by **London Underground** for depot track road changeover switching.

**Disconnecter**

Manually operated on load, fault make / load break Disconnector

**Features**

- IP56
- Protected for external use
- Anti-Graffiti Paint Finish
- 60mm Electrical Clearance
- Interlocking between supplies 1# & 2# to ensure only one can be on at a time
- Interlocking for full isolation of both supplies

**Installation**

Plinth mounted or wall mounted from rear straps (not visible in the picture), cable entry un-drilled Aluminium gland plates.

**Cabling**

Traction Positive Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable

**Electrical Characteristics & Dimensions**

	<b>8800363</b>
<b>Voltage</b>	630V DC
<b>Current</b>	4000A
<b>Weight</b>	1180kg
<b>Length</b>	2450 mm
<b>Height</b>	2392 mm
<b>Depth</b>	1171 mm



## 3.22 MLU RCTIS – 2 Pole Motor Driven Changeover Isolator Switch with Remote Panel - 4000A 630V DC

### APPLICATION – ON LOAD

Isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required. Typically used by **London Underground** for depot track road changeover switching.

### Disconnecter

Motor Driven on load, fault make / load break Disconnecter

### Features

- IP56
- Protected for external use
- Anti-Graffiti Paint Finish
- 60mm Electrical Clearance
- Interlocking between supplies 1# & 2# to ensure only one can be on at a time
- Interlocking for full isolation of both supplies

### Installation

Plinth mounted or Pile mounted, cable entry un-drilled Aluminium gland plates.

### Cabling



Traction Positive Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Incoming	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 1#	3 x 935mm <sup>2</sup> Copper Cable
Traction Positive Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable
Traction Negative Outgoing 2#	3 x 935mm <sup>2</sup> Copper Cable



### Electrical Characteristics & Dimensions

	<b>8800471-V01</b>
<b>Voltage</b>	630V DC
<b>Current</b>	4000A
<b>Weight</b>	1202kg
<b>Length</b>	2450 mm
<b>Height</b>	1980 mm
<b>Depth</b>	1172mm



Pile Mounting

	<b>8800471-V02</b>
<b>Voltage</b>	630V DC
<b>Current</b>	4000A
<b>Weight</b>	1180kg
<b>Length</b>	2450 mm
<b>Height</b>	2280 mm
<b>Depth</b>	943 mm



Plinth Mounting

### 3.23 MLU CWRS – 2 Pole Remote Controlled Wash Road Contactor - 3200A 630V DC

#### London Underground

##### APPLICATION – ON LOAD

Isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required. Typically used by **London Underground** for depot track wash road switching.

##### Contactactor

Motor driven On Load, fault make / load break contactor

##### Features

- IP56
- Protected for external use
- Anti-Graffiti Paint Finish
- 60mm Electrical Clearance
- Earth Fault Current Detection
- High Speed under voltage release

##### Installation

Plinth mounted cable entry un-drilled Aluminium gland plates

##### Cabling

##### Electrical Characteristics & Dimensions

	<b>8800284</b>
<b>Voltage</b>	630V DC
<b>Current</b>	3200A
<b>Weight</b>	909kg
<b>Length</b>	1995 mm
<b>Height</b>	2540 mm
<b>Depth</b>	1100 mm



### 3.24 MLU CWRS – 2 Pole Remote Controlled Wash Road Contactor

#### London Underground

##### APPLICATION – ON LOAD

Isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required. Typically used by **London Underground** for depot track wash road switching. Local or Remote Control via a purpose built stainless steel remote panel.

##### Contactactor

2 pole On Load, fault make / load break contactor

##### Disconnecter

2 x Off Load / fault make 2000A 1kV switches

##### Traction Grade Fuses

2 x Match pair 1000A 1500V DC Fuses (2000A rating)

##### Features

- IP56
- Protected for external use
- Anti-Graffiti Paint Finish
- 60mm Electrical Clearance
- High Speed under voltage release
- Emergency pushbutton interface

##### Installation

Plinth mounted, cable entry un-drilled Aluminium gland plates.

##### Cabling

<b>Traction Positive Incoming &amp; Outgoing</b>	1 x 935mm <sup>2</sup> Copper Cable
<b>Traction Negative Incoming &amp; Outgoing</b>	1 x 935mm <sup>2</sup> Copper Cable

##### Electrical Characteristics & Dimensions

	<b>8800409</b>
<b>Voltage</b>	630V DC
<b>Current</b>	2000A
<b>Weight</b>	962kg (75kg Remote Control)
<b>Length</b>	2120 mm
<b>Height</b>	2300 mm
<b>Depth</b>	1030 mm

##### Remote Control Panel

- IP56
- Stainless Steel construction
- Controls on a secondary internal door



## 3.25 WLCP / GRPH Wheel Lathe Road Contactor Panel 630A 1000V DC 8800518-V01

**Specification**

Based on the General specification for a 630A 900V DC Contactor Panel for Examination Roads and incorporating features of the 630A 900V DC Contactor Panel for Cleaning Roads in London Underground maintenance depots.

To comply with LUL Document: **SUP-PSEB1071-SSL-SPC-00001 Issue A1**  
*[Based on a hybrid combination of Examination Road Contactor Panel 630A – 8800391 & Cleaning Road Contactor Panel – 8800392]*

**Brief Description**

The Wheel Lathe Road Contactor Panel supplies the 630V DC Shore Supply from the Manual Disconnecter Switch (formerly motorised) to the wheel Lathe Conductor Rail to enable safe train movements and isolation of the road whilst the lathe is in use.

The Contactor Panel consists of a 2 pole 630A 1000V DC Contactor with associated control equipment, 600A traction grade fuses, and a 4 pole 1250A 1000V DC Disconnecter for maintenance. Local controls are fitted on the front of the Panel for maintenance but the contactor is operated from a Remote Control panel.

The Contactor Panel has provision for signals to the Overhead Status Indicators and to the Mimic Panel.

**Supply Panel Rating**

System Voltage	630V DC (900V DC Maximum)
System Current	630A
Auxiliary Voltage AC	110V AC 50Hz

**Contactor Cubicle Construction**

Material	2mm Sheet Steel
External Finish	BS831C Shade 697 Light Admiralty Grey
Internal Finish	J124 White Anti-Condensation paint
Degree of Ingress Protection	IP52
Height	2100
Length	1300mm
Depth	600mm
Approx. Weight	550kg

**Disconnecter Specification**

Type	Max-E-Switch Disconnecter
Number of Poles	4
Voltage	1500V DC
Current	1250A

**Contactor Specification**

Type	CBC 75
Number of Poles	2
Voltage	1000V DC
Current	630A
Coil Voltage	110V AC

## GRP Enclosure Construction

Material	GRP/Plywood/GRP
External Finish	Gloss finish gel coat - colour: 18-B-25 Dark admiral grey
Internal Finish	White GRP
Degree of Ingress Protection	IP55
Height	2500mm
Length	2500mm
Depth	1000mm
Approx. Weight	414kg
Access	Maximum height double door fitted with <ul style="list-style-type: none"> <li>• Stainless steel hinges</li> <li>• Automatic hold open stays</li> <li>• Night latch lock</li> </ul>
Ventilation	Louvered vents complete with internal meshed back closers
Fire resistance	Constructed using fire retardant resin to provide self-extinguishing laminates to BS476 part 7 class 2 In compliance with BS476 part 22, half hour fire resistance
U value	2.2 W/M2/°C
Fixing down	The Enclosure has an open base with all around 100mm internal GRP fixing flange, for fixing down with anchor bolts on to prepared concrete base, (concrete base by others). It is recommended that the concrete base has a rebate formed into the perimeter to prevent water ingress.

## Remote Control Cubicle Construction

Material	1.2mm Sheet Steel
External Finish	BS831C Shade 307 Canary Yellow
Internal Finish	BS831C Shade 307 Canary Yellow
Degree of Ingress Protection	IP66
Height	500mm
Length	500mm
Depth	210mm
Approx. Weight	14kg





## 4 Railway Switchgear – TRACKSIDE

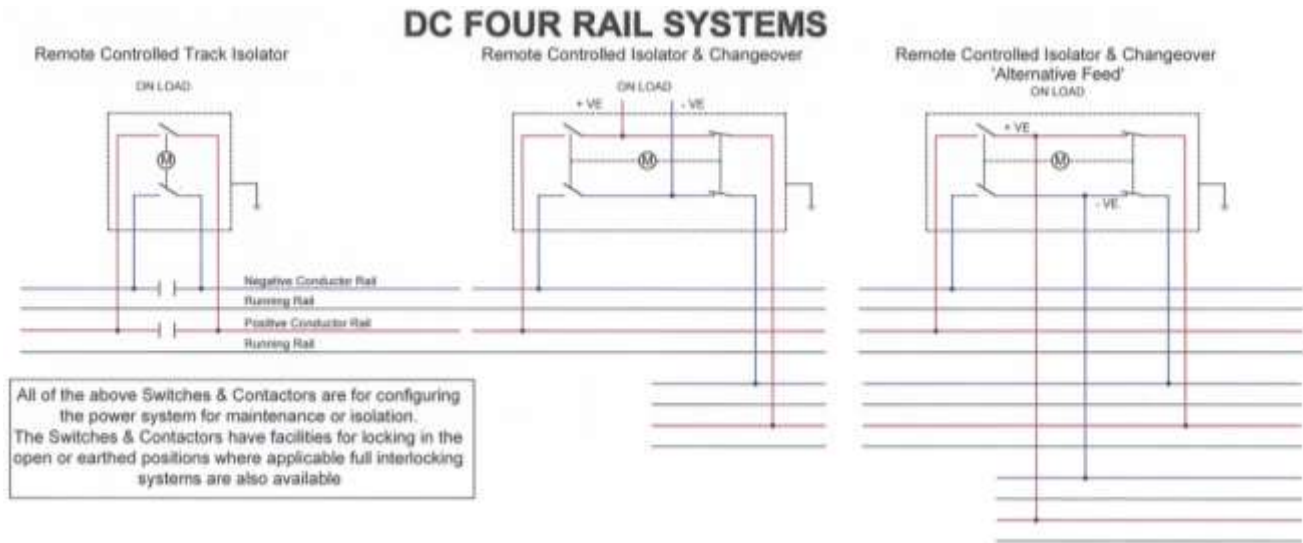
Power Isolation & Maintenance Switchgear Enclosures for:

Underground



DC Switchgear enclosures for the following applications:  
 Track isolation  
 Controlled Track Switching

## 4.1 MLU - 2 Pole DC Railway – (Typically London Underground)



## 4.2 MLU RCTIS – 2 Pole Remote Controlled Track Isolating Switch – 4000A 630V DC

### London Underground

#### APPLICATION – ON LOAD, FAULT MAKE

2 pole isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Used by **London Underground** for track sectioning.

#### Switches

(1-0) Motor driven On Load, fault make switch

#### Features

- IP56
- Low Smoke Zero Halogen Components
- Protected for external use
- Low Smoke Paint Finish (**To LUL Section 12 Specification**)
- 60mm Electrical Clearance
- 110V Control Supply

#### Installation

Refer to table below.

#### Cabling

Traction Positive Incoming 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Positive Outgoing 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Incoming 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Outgoing 2 x 935mm<sup>2</sup> Copper Cable



#### Electrical Characteristics & Dimensions

	8800433-V03	8800433-V04	8800433-V05	8800433-V06
<b>Mounting</b>	Pile Mounting	Slim line Post	Frame	Slimline wall / post
<b>Voltage</b>	630V	630V	630V	630V
<b>Current</b>	4kA	4kA	4kA	4kA
<b>Length</b>	2380 mm	2600 mm	2380 mm	2600 mm
<b>Height</b>	1250 mm + 600 pile	1070 mm	1850 mm	1070 mm
<b>Depth</b>	770 mm	510 mm	750 mm	510 mm
<b>Weight</b>	690kg	520kg	710kg	520kg

## 4.3 MLU TTSS – 2 Pole Tunnel Track Section Switch – 4000A 630V DC

### London Underground

#### APPLICATION – OFF LOAD, FAULT MAKE

2 pole isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Used by **LUL Jubilee & Victoria Lines** for track sectioning.

#### Switches

(1-0) Motor driven Off Load, fault make switch

#### Features

- IP56
- Low Smoke Zero Halogen Components
- Protected for external use
- Low Smoke Paint Finish (To LUL Section 12 Specification)
- 60mm Electrical Clearance
- 110V Control Supply

#### Installation

Wall mounted, external cabling with heatshrink-sleeving

#### Cabling

Positive and negative cables feed through their respective poles but incoming and outgoing are connected to opposing ends of the enclosure.

The cable connections are external to the enclosure and must be covered by heatshrink-sleeving of a suitable material to ensure that accidental contact cannot be made with live connections.

Traction Positive Incoming 2 x 935mm<sup>2</sup> Copper Cable

Traction Positive Outgoing 2 x 935mm<sup>2</sup> Copper Cable

Traction Negative Incoming 2 x 935mm<sup>2</sup> Copper Cable

Traction Negative Outgoing 2 x 935mm<sup>2</sup> Copper Cable

#### Electrical Characteristics & Dimensions

	8800076	8800361	8800364	8800414
System	Jubilee Line	Victoria Line	Victoria Line	Metropolitan Line
Variant	Electrical	Manual	Electrical + Remote Control Panel	Manual
Voltage	630V	630V	630V	630V
Current	4kA	4kA	4kA	4kA
Length	2375 mm	2335 mm	2335 mm	2335 mm
Height	670 mm	670 mm	670 mm	670 mm
Depth	325 mm	319 mm	319 mm	319 mm
Weight	450kg	414kg	427kg	335kg

#### Special frame mounted variant with Remote Control Box

2 pole isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Used at **Baker Street** for track sectioning.

100mm high frame for mounting to ensure train clearance from the front of the switch.

	8800327
Voltage	630V
Current	4kA
No of poles	2
Length	2375 mm
Height	670 mm
Depth	320 mm
Weight	550kg



## 4.4 MLU STSS – 2 Pole Surface Track Section Switch – 4000A 630V DC

### London Underground

#### APPLICATION – ON LOAD

2 pole isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Used by **LUL Jubilee Line** for track sectioning.

#### Switches

(1-0) Motor driven On Load, fault make load break switch.

#### Features

- IP56
- Protected for external use
- Low Smoke Paint Finish (**To LUL Section 12 Specification**)
- 60mm Electrical Clearance
- 110V AC Control Supply

#### Installation

Wall mounted, external cabling with heat shrink covers

#### Cabling

Traction Positive Incoming 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Positive Outgoing 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Incoming 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Outgoing 3 x 935mm<sup>2</sup> Copper Cable

#### Electrical Characteristics & Dimensions

	<b>8800074</b>
<b>Voltage</b>	630V
<b>Current</b>	4kA
<b>Length</b>	2990 mm
<b>Height</b>	1070 mm
<b>Depth</b>	510 mm
<b>Weight</b>	502kg



## 4.5 MLU TTSM – 2 Pole Tunnel Track Section Switch Manual IP67 – 4000A 630V DC

### London Underground

#### APPLICATION – ON LOAD

2 pole isolation and/or switching of high power circuits, where a high short circuit withstand and high voltage isolation is required.

Used by **LUL Northern Line** for track sectioning.

#### Switches

(1-0) Manual On Load, fault make/ fault break switch.

#### Features

- IP67 (Type test available)
- Protected for external use
- Low Smoke Paint Finish (**To LUL Section 12 Specification**)
- 60mm Electrical Clearance

#### Installation

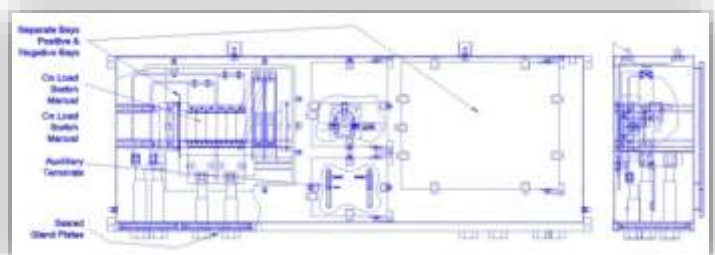
Wall / Post mounted, cable entry from below via Aluminium gland plates.

#### Cabling

Traction Positive Incoming 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Positive Outgoing 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Incoming 2 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Outgoing 2 x 935mm<sup>2</sup> Copper Cable

#### Electrical Characteristics & Dimensions

	<b>8800098</b>
<b>Voltage</b>	630V
<b>Current</b>	4kA
<b>Length</b>	2375 mm
<b>Height</b>	670 mm
<b>Depth</b>	320 mm
<b>Weight</b>	550kg



## 4.6 Depot Switches that are also suitable for Trackside Applications

### London Underground

Depot switches can be used in many Trackside applications where space is not a constraint.

The details for all of the following products can be found in the Depot section of this catalogue.



Product			Description	Ref to Page
8800445	MLU	MDS	Track Isolating Manual Disconnecter Switch 4kA 2 Pole (Top entry Cables)	33
8800435	MLU	MCOD	Manual Changeover Off load Disconnecter 4kA 2 Pole ( Slimline)	
8800411	MLU	RCTIS	RCTIS Remote Controlled Track Isolating Disconnecter Switch 4kA 2 Pole	
8800410	MLU	MDS	MDS Track Isolating Manual Disconnecter Switch 4kA 2 Pole (Slimline)	
8800397	MLU	MDS	Track Isolating MDS Manual Disconnecter Switch 4kA 2 Pole	33
8800363	MLU	MCOIS	Manual Changeover On Load Isolating Switch 4kA 2 Pole	36
8800360	MLU	MTIS	Manual Track Isolating Switch 4kA 2 Pole	32
8800352	MLU	RCTIS	4 kA RCTIS 2 Pole Motorised Switch -	31
8800318	MLU	RCTIS	3kA RCTIS 2 Pole Motorised Switch - SCADA	31
8800317	MLU	RCTIS	3kA RCTIS 2 Pole Motorised Switch -	31
8800307	MLU	MDDS	Motor Driven Disconnecter Switch (London Rd)	34
8800306	MLU	MDDS	Motor Driven Disconnecter Switch LH (Queens Park)	34
8800305	MLU	MDDS	Motor Driven Disconnecter Switch RH(Queens Park)	34
8800286	MLU	MDS	Manual Disconnecter Switch	32
8800268	MLU	MTIS	3kA MTIS II Depot	

## 4.7 4kA Disconnection Panel (Cable Marshalling Box)

### London Underground

#### APPLICATION – ON LOAD

The disconnection panel is used to a reduction of the cabling from 2 x 935mm<sup>2</sup> down to 1 x 935mm<sup>2</sup> or 3 x 935mm<sup>2</sup> down to 2 x 935mm<sup>2</sup> this can save long runs of expensive cable and installation cost where there is not a sufficient current demand for this cable.

#### Features

- IP54
- Low Smoke Zero Halogen Composite construction
- Protected for external use
- Low Smoke Paint Finish (**To LUL Section 12 Specification**)
- 60mm Electrical Clearance

#### Installation

Plinth mounted, cable entry from below via insulating gland plates.

#### Cabling

Traction Positive Incoming 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Positive Outgoing 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Incoming 3 x 935mm<sup>2</sup> Copper Cable  
 Traction Negative Outgoing 3 x 935mm<sup>2</sup> Copper Cable

#### Electrical Characteristics & Dimensions

	8800448
Voltage	630V
Current	4kA
Length	1030 mm
Height	1480 mm
Depth	480 mm
Weight	120kg





**5 Railway Switchgear – LINK BOXES & MARSHALLING BOXES**

**Traction grade Link Boxes**  
**Vibration and Shock Resistant to suit the arduous trackside requirements**



**DC & AC Link enclosures for the following applications:**  
**Supply Isolation**  
**Negative Isolation**

## London Underground

## 5.1 2 Pole 4kA Disconnection Panel (Cable Marshalling Box)

2 Pole, 4kA Marshalling Panel for 4 x 935mm<sup>2</sup> Copper Cables in and 4 x 935mm<sup>2</sup> Copper Cables out , housed in a steel enclosure.

Segregated Positive & Negative Poles.

**Enclosure Construction**

Material 3mm sheet steel hot zinc sprayed

Finish Canary Yellow BS381C-L309 Semi-Gloss

Degree of Ingress Protection IP54

**Electrical System**

System Voltage 630V DC

System Current 4kA

	<b>8800477</b>
<b>Voltage</b>	630V DC
<b>Current</b>	4000A
<b>Length</b>	1800 mm
<b>Height</b>	1600 mm
<b>Depth</b>	600 mm
<b>Weight</b>	350kg





## 6 Railway GAP JUMPER LEADS, EARTH FAULT TESTING & TOUCH POTENTIAL MONITOR

Traction grade Conductor Rail Gap Jumpers  
Designed to suit the arduous trackside requirements



Earth Fault Test Boxes



Touch Potential Monitors



## 6.1 TL GJL Conductor Rail Gap Jumper Leads (Pair)

### London Underground

#### APPLICATION OFF LOAD

The Gap Jumper Lead is used to connect a supply to a stranded (Gapped) Train.

This is where a train current collector shoe (pick up shoe) is no longer in connection with the power supply conductor rails.

#### Cubicle Construction

Material Micam EM42

To assist with correct positioning the Gap Jumper Leads are colour coded Red for positive and Blue for negative.

(This is an LUL colour requirement which could be tailored to suit other rail networks)

#### Features

The LCS Gap Jumper Lead design incorporates the following features:

A shoe assembly that houses the conduction plate with integral magnets to suit various conductor rails, the cable connection point, cable restraint gland and conductor rail location guides.

The conduction plate is made from plated Brass which is plated to provide good corrosion resistance.

Connection force and stability assisted by the use of magnets.

(Previously only the weight of the shoe with support of the cables by the operator)

Magnets are located within the conduction plate to enable the magnetic field to interact with the conductor rail/s

An insulated lifting handle is positioned towards the top of the connection shoe to allow easy positioning on the conductor rails.

The supply cable enters the shoe assembly horizontally (previously the cable entered via the top of the shoe assembly, hence the need for support by the operator)

The design allows the re-use of existing cables.

The lift handle allows the removal of the shoe by tilting the assembly to disconnect the magnetic forces. Lift of force 16kgf.

The rail guides also serve to provide a barrier by distance to the magnetic field.

The Gap Jumper shoe fits all 4 of the Conductor Rail profiles used by London Underground including the composite Stainless Steel / Aluminium rail.

#### Cabling

The cable connection is made directly to the top of the conduction plate.

Positive Shoe 1 x 50mm<sup>2</sup> Copper Cable

Negative Shoe 1 x 50mm<sup>2</sup> Copper Cable

#### Electrical Characteristics & Dimensions

	<b>8800464-V01</b>
<b>Voltage</b>	630V
<b>Current</b>	700A for 20 sec
<b>Length</b>	230 mm
<b>Height</b>	185 mm
<b>Depth</b>	132 mm
<b>Lift of force</b>	16kgf



## 6.2 TL EFTB Earth Fault Test Box

## London Underground

**Application**

The Earth Fault Relay Test Set is designed to provide two independently adjustable 0-500Vdc supplies, one Positive and one Negative about a common point. Voltages are displayed on digital panel meters. It is intended primarily for testing the London Underground Traction Earth Detection (TED) equipment.

The two supplies are in separate robust portable cases for ease of movement. In normal use the two supplies are linked together to provide the required functionality. However, the Positive unit may be used on its own as a single variable dc supply.

**Basic Specification**

Input: 230Vac 50Hz

Nominal positive output voltage:

High range - +490Vdc

Low range - +285Vdc

Nominal negative output voltage:

High range - -490Vdc

Low range - -285Vdc

Current rating: 0.5A

**Preparation for Use**

Place the two power supply cases adjacent to each other on a flat surface, with the Positive (Main) supply on the left and the Negative (Auxiliary) supply on the right, and open the lids.

On each power supply, ensure that the Mains Isolator is turned to its 'Off' (anticlockwise) position, the Mains Input and DC Fault circuit breakers are in the 'Off' (down) position, the Output Range switch is in the 'Off' (central) position and the 'Output Control' knob is turned to the 0% (fully anticlockwise) position.

**Power Supply Interconnections**

Two colour coded output coupling leads are provided with the Test Set. These are terminated in 4mm plugs with fixed shrouds.

A mains interconnection cable is also provided. This is terminated with 10A IEC60320 C13/C14 connectors.

- Link the yellow 4mm sockets on the two power supplies using the yellow coupling lead.
- This establishes the common point of the Positive and Negative supplies.
- Link the white 4mm sockets on the two power supplies using the white coupling lead.
- This provides the positive connection to the Total DC Output panel meter in the Negative supply.
- Link the mains IEC receptacles using the mains interconnection cable.
- This provides the mains supply to the Negative (Auxiliary) supply.



## 6.3 TL – TVP Touch Voltage Panels

### Dockland Light Railway

The Touch Voltage Relay Panel (8800528-V01) monitors the voltage between the running rails and earth, with regard to a series of voltage levels and their associated permitted durations advised by Docklands Light Railway and referenced to their curve representing the body voltage criteria in BS EN 50122-1:2011+A1:2011.

The voltage levels are split into two groups, viz. the lower voltage 'Warning' range, and the higher voltage 'Alarm' range.

In the event that a particular voltage has been present for a duration exceeding that permitted, then the normally energised Warning Relay or Alarm Relay, as appropriate to the group, is de-energised, providing a signal to SCADA.

A lamp on the front panel illuminates to indicate whenever the lowest warning voltage level of 60V is exceeded. In addition, a panel meter displays the current Touch Voltage.

#### Panel Rating

	8800528
Supply Voltage	110VDC
Supply Current	1A
Supply Inrush	<15A, I2t <0.6A2s
Control Panel Voltage	110VDC & 24VDC

#### Enclosure Construction

Material	1.4mm Sheet Steel
Finish	RAL 7035 Light Grey
Degree of Ingress Protection	IP54
Height	400mm
Length	600mm
Depth	210mm
Weight	22kg



**7 Railway Switchgear - MIMIC PANELS**

**Mimic Panels**



**Mimic panels for the following applications:  
Automatic Control & Monitoring of Plant and Equipment  
Remote monitoring of equipment (up to 10km)**

## 7.1 CP- WMM – Wall Mounted Mimic Panel System

### London Underground

#### APPLICATION

Mimic for a depot supply system with indication of the power supply configuration and status.

The Mimic Panel System consists of three cabinets:

- i. Mimic Panel Display Cabinet (located within the DDM office)
- ii. Status Monitor Cabinet 1 (located within Switchroom)
- iii. Status Monitor Cabinet 2 (located within Switchroom)

The cabinets are interconnected by a two-wire communications link (data-bus) for data exchange.

The cabinet has an engraved front-panel that shows a simple geographic plan of the depot.

Status Indicators on the panel will be illuminated to indicate the status of all monitored equipment.

- Incomers / Circuit Breakers (CB)
- Uninterruptible Power Supply (UPS) Systems
- Emergency Power Off (EPO) Systems
- Shed Isolators
- Road Power Supplies
- Overhead Status Indicators (OSIs)

The Mimic Panel Status Indicators (LEDs) are connected to the Output Modules located inside the Mimic Panel Display Cabinet.

The depot equipment Status Signals are connected to the Input Modules located inside the Status Monitor Cabinet(s).

The PLC executes a software program that is specifically written for each depot.

This program is stored on the memory cartridge installed into the PLC. The PLC communicates with the Input / Output Modules via the Master Module and data-bus.

All depot Status Signals are repeatedly scanned and analysed every 136mS.

If any Changes of Status or Fault conditions are identified the audible alarm will be sounded and the appropriate Status Indicator(s) are flashed.

As used on the BCV Metronet DEISIP Project

#### Features

- Engraved & Filled Aluminium
- Welded sheet steel enclosure
- IP 52
- Painted Grey. RAL 7032
- Clear interlocking procedures for maintenance
- LED Indication for a long life
- 110V AC ±10%, 50Hz, single phase

#### Installation

Wall mounted in DDM control rooms

#### Cabling

Control cabling via un-drilled steel gland plates

#### Dimensions

	8800296	8800297	8800298	8800299	8800301	8800302	8800303
Length	1000mm	1000mm	1000mm	1000mm	1000mm	1000mm	1000mm
Height	600mm	600mm	600mm	600mm	600mm	600mm	600mm
Depth	260mm	260mm	260mm	260mm	260mm	260mm	260mm
Weight	50 kg	50 kg	50 kg	50 kg	50 kg	50 kg	50 kg



## 7.2 CP- WMM – Wall Mounted Hardwired Mimic Panel System

General specification for Mimic Panel for use in London Underground Train Maintenance Unit.

To generally comply with LUL Document:

V119/BCV/SPEC/C/090/0 Draft and BVL0006/E – Addendum, and relevant TQs to this product.

Purpose of the Mimic Panel

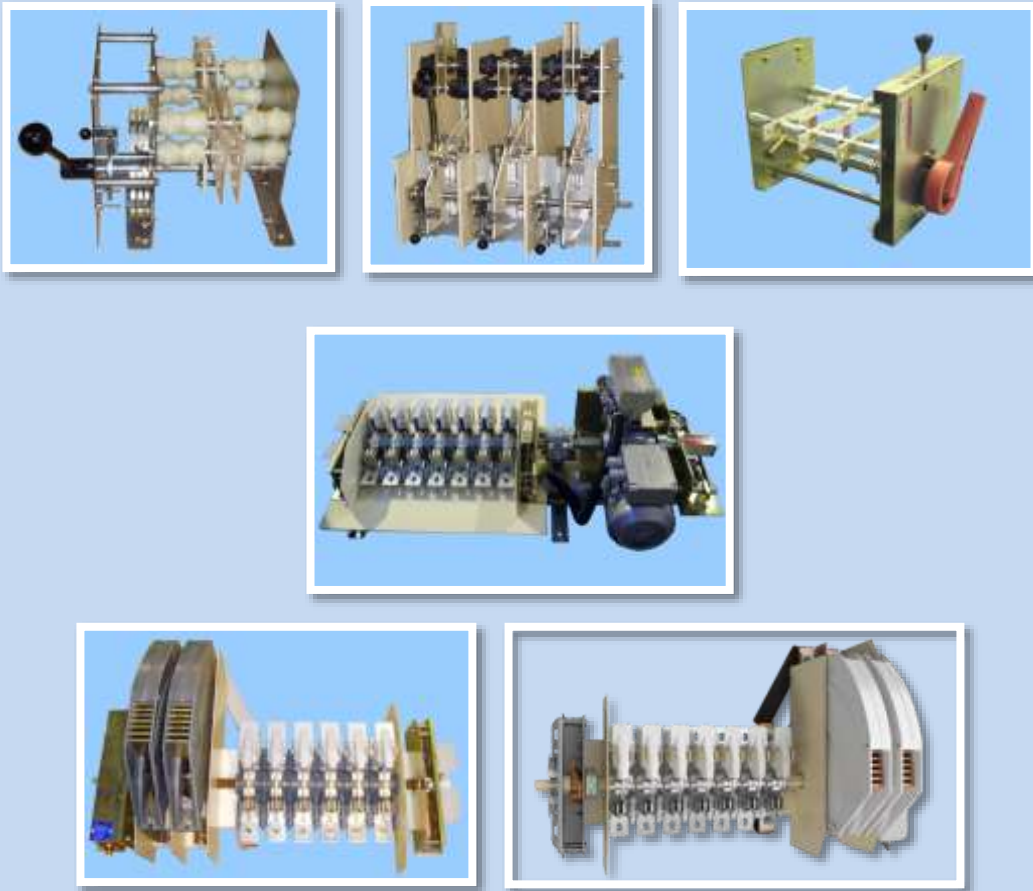
- A system to monitor and display the operational status of the Depot Shore Supply Equipment.
- To notify personnel of an EPO (Emergency Power Off) being pressed by sounding an audible alarm and illuminating the relevant status indicator.

	8800439
Height	550 mm
Length	900 mm
Depth	260 mm
Weight	40 kg



## 8 Railway Disconnectors

### Traction Power Isolation & Bonding



### 8.1 Switch Finder

Range	Switch Type	ON LOAD or OFF LOAD	Number of Poles	A.C.					D.C.			
				Current Range		Voltage Range		Freq. Hz	Current Range		Voltage Range	
				A	kA	kV	kV		kA	kA	kV	kV
<b>Max-E-Switch</b>	Disconnectors & Changeover	<b>OFF LOAD</b>	1 to 6	1250	4.00	1.50		175	1.25	4.00	1.50	
<b>FA</b>	Disconnectors & Changeover		1 to 6	500	6.30	3.00		175	0.5	6.30	3.00	
<b>F</b>	Disconnectors & Changeover		1 to 6	500	6.30	7.20	12.00	175	0.5	6.30	7.20	12.00
<b>ODxL**</b>	Heavy duty off load disconnector	<b>ON LOAD (Fault Make)</b>	1	200	7.50	1.00	1.50	50/60	0.200	7.50	1.00	1.50
<b>SF *</b>	Heavy duty off load disconnector		1 to 2	200	7.50	1.00	1.50	50/60	0.200	7.50	1.00	1.50
<b>OSxL</b>	DC Load break disconnector	<b>ON LOAD</b>	1	-	-	-		-	0.8	6.30	1.00	1.50
<b>IF</b>	DC Load break disconnector		1 to 2	-	-	-		-	0.8	6.30	1.00	1.50

If you have other, switchgear requirements please consult Technical Sales

\* SF disconnectors are capable of fault make, which makes them ideal for Earthing / Bonding applications.

\*\*\* Refer to Technical Sales for details.

## 8.2 Max-E-Switch – Railway AC / DC Disconnectors to BS EN 50123

TECHOV Range 1250 – 4000A 1500V AC / DC



### Construction

Off load isolator and changeover disconnectors specifically designed and tested to comply to:

### BS EN 50123 & BS EN 50124 Railway Standards

#### Features

- Stainless steel parts
- 1 to 6 poles
- Clear isolation distance between contacts
- Switch design produces stable temperature rise characteristics
- High short circuit current withstand
- Flexible foot mounting Unistrut compatible

#### Design

- Self-cleaning silver plated contacts
- Insulating parts made from highly durable materials
- Spring tensioned twin blade contacts provide excellent electrical contact



#### Applications

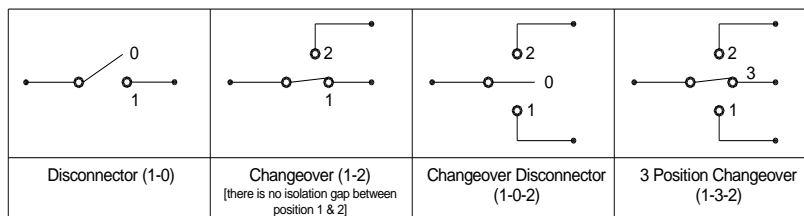
Isolation of railway installations where a high voltage withstand is required

#### Electrical Characteristics AC & DC

Rated thermal current in accordance with **BS EN 50123** i.e. maximum temperature rise of 70°C

AC Rated Thermal current A 50/60 Hz		1250	2000	2500	4000
DC Rated Thermal current $I_{Ne}$		1250	2000	2500	4000
Nominal voltage $U_n$ :	kV	1.5	1.5	1.5	1.5
Rated voltage $U_{Ne}$	kV	1.8	1.8	1.8	1.8
Rated insulation voltage $U_{Nm}$	kV	2.3	2.3	2.3	2.3
Overvoltage category		OV4	OV4	OV4	OV4
Pollution degree:		PD4	PD4	PD4	PD4
Dielectric Voltage Withstand @ 50Hz for 1 min.	kV	20	20	20	20
Dielectric Voltage Withstand / Aux contacts @ 50Hz for 1 min.	kV	2	2	2	2
Rated impulse voltage $U_{Ni}$	kV	20	20	20	20
Rated Peak Current $I_{NSS}$	kA	81	92		142
Rated short circuit capacity $I_{NCW}$ for 250ms.	kA	65	65		100
Rated short circuit capacity $I_{NCW}$ for 300ms.	kA	57	57		
Maximum operating temperature	°C	140	140	140	140
Mechanical endurance in cycles		5,000	5,000	10,000	10,000

#### Switch Configuration



#### Options

- Auxiliary Microswitches
- Interlocking cam
- Interlocks
- Padlocking facilities

#### De-rating

For **higher frequencies** or **high ambient temperatures**, please consult technical sales



## 8.3 FA – Disconnectors & Changeover AC / DC Disconnectors

Standard Range 500 – 8000A 3000V AC / DC up to 175Hz

Rated Insulation V	Rated Thermal Current I
3.0 kV - AC/DC	500 – 6300 A - AC
7.2 kV - AC/DC	500 – 8000 A - DC

### Construction

The FA off load switch conforms to: - IEC 129, IEC 694 & IEC 77

### Features

- 1 to 6 poles
- Visible breaking with a large isolation distance between contacts
- The contacts are specifically designed to produce stable temperature rise characteristics
- High short circuit current withstand

### Design

- Self-cleaning contacts
- Insulating parts made from glass reinforced polyester (VO level to UL94)
- Silver plated contacts
- Knife blade contacts provide good electrical contact, because the knife blades provide two contact surfaces (one each side of the blade) unlike a contact point in a pressure system. Therefore the temperature rise is reduced.

### Applications

Isolation of electrical installations where a high short circuit withstand is required.

#### Hoists and Handling

Isolation of industrial cranes using DC electric motors

#### Inverters and Rectifiers

DC supply isolation of excitation circuits of generators.

Isolation of rectifiers and inverters, it is possible to isolate the DC and AC simultaneously with one operation.

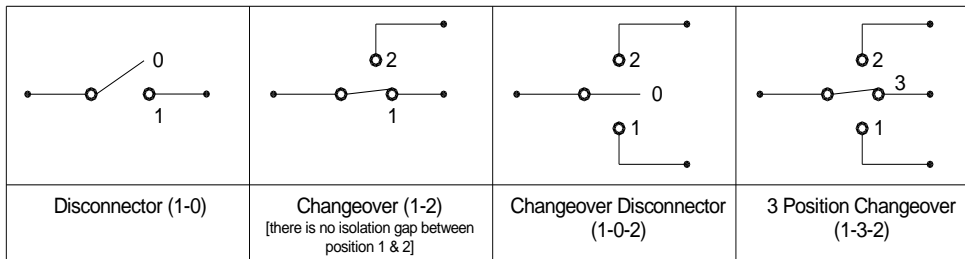
#### Electric Traction

Subways, tramways, trolleybuses, and railways

Fixed equipment: distribution of power from substations and track sectioning.

Rolling equipment: - general isolation of traction power or Earthing of shoe gear.

### Switch Configuration



### Electrical Characteristics AC & DC

Rated thermal current in accordance with IEC 408 i.e. maximum temperature rise of 70°C

Rated Thermal current A 50/60 Hz AC	500	1250	2000	2500	3200	4000	6300
Rated Thermal current A DC	500	1250	2000	2500	4000	5000	8000
No of Poles Available	1-6	1-6	1-6	1-6	1-5	1-4	1-3
Dielectric Voltage Withstand @ 50Hz for 1 min. kV	20	20	20	20	20	20	20
Dielectric Voltage Withstand / Aux contacts @ 50Hz for 1 min kV	2	2	2	2	2	2	2
Impulse Voltage Withstand (IEC 694) 1.2/50µs kV	20	20	20	20	20	20	20
Rated short circuit capacity kA 1 <sup>st</sup> wave peak value	75	90	90	150	150	150	150
Rated short circuit capacity kA I r.m.s. for 1 sec.	15	35	35	70	70	70	70
Maximum operating temperature °C	140	140	140	140	140	140	140
Mechanical endurance in cycles	5,000	5,000	5,000	10,000	10,000	10,000	10,000

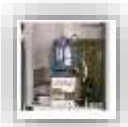
### De-rating

If the frequency is between 60 & 175 Hz a 5% de-rating factor should be applied.

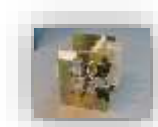
For ambient temperatures over 40°C the de-rating percentage is =  $\frac{1}{\sqrt{[(110 - \theta) / 70]}}$   $\theta$  = Ambient Temperature of the environment

Please consult Technical Sales: - Rated Insulation voltage = 7.2kV, 12kV & 24kV -For greater mechanical endurance.

### Available options



Electric motor or actuator drive



Pneumatic drive



Special interlocking requirements



## 8.4 Otter DC Switch - OS1L - OS7R

The latest range of Otter switches and disconnectors is designed for high current DC applications including but not limited to; rail, trams, renewable energy, electric vehicle charging, DC distribution networks and industrial processes e.g. aluminium smelting, arc furnaces.

The modular design adapts to various functions including isolation, fault making and load breaking. Designed and manufactured to high quality standards and comprehensively tested, ensuring high reliability and minimal maintenance. The switch can be offered as a standalone product, with or without a motor drive, or as part of a full switchgear assembly.



### SPECIFICATIONS

#### Load Break/Make Switch capable of Making on Fault

Type tested to BS EN 50123-1 & 3 / IEC 62497-1 / IEC 61992-1

Fast acting over-centre spring mechanism Manual or motor driven options

High performance double break contacts

Separate current carrying and current breaking contacts

800A to 4400A Normal current rating depending upon number of modules installed Position indication by micro switch or auxiliary switch in addition to visual indication. Ultra-low smoke insulation material (LU approved)

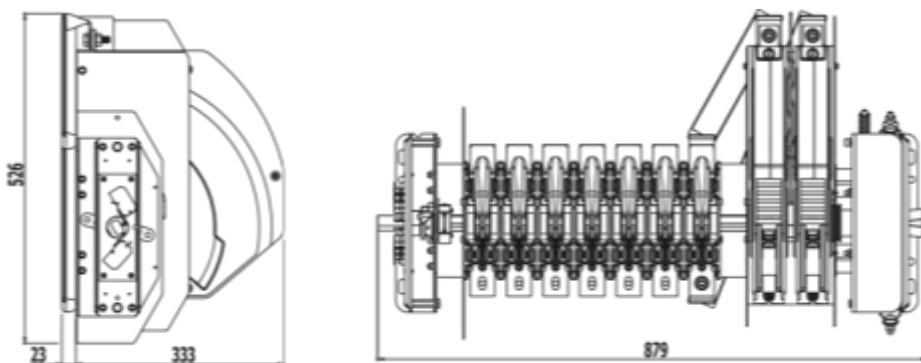
Left hand, right hand and double pole options

Rated Voltage	1800VDC
Rated Insulation Voltage	2.3kV
Overtoltage Level (BSEN 50123-1)	OV3
Rated impulse withstand voltage	12.0/14.4kVp
Power frequency withstand voltage	5.5/6.6kV
Categories (BSEN 50123-3)	VI
Normal Current	800 - 4400A
Making Current	Up to 65kA
Breaking Current	Up to 13.2kA
Withstand Current	Up to 70kA / 100kAp 250ms
Mechanical Endurance	M2: 10000 Operations

### VARIANTS / NOMENCLATURE

O	Otter - Switch Series
S	S = Switch (Arcing contacts)
1-7	Number of current carrying modules (1 to 7)
L/R	Left or right hand configuration

OS7L



OSxL - Switch

Rated Thermal current A	800	1600	2000	2500	3150	4000	4400
Number of current carrying modules	1	2	3	4	5	6	7
Number of breaking modules	2	2	2	2	2	2	2
Approx. length mm	400	460	520	580	635	695	750
Approx. height mm	500	500	500	500	500	500	500
Approx. depth mm	390	390	390	390	390	390	390
Weight kg	30	32	34	35	37	38	40

## 8.5 Otter DC Disconnecter - OD1L - OD7R

The latest range of Otter switches and disconnectors is designed for high current DC applications including but not limited to; rail, trams, renewable energy, electric vehicle charging, DC distribution networks and industrial processes e.g. aluminium smelting, arc furnaces.

The modular design adapts to various functions including isolation, fault making and load breaking. Designed and manufactured to high quality standards and comprehensively tested, ensuring high reliability and minimal maintenance. The switch can be offered as a standalone product, with or without a motor drive, or as part of a full switchgear assembly.



### SPECIFICATIONS

#### Disconnecter Off Load, capable of Making on Fault

Type tested to BS EN 50123-1 & 3 / IEC 62497-1 / IEC 61992-1

Fast acting over-centre spring mechanism Manual or motor driven options

High performance double break contacts

800A to 4400A Normal current rating depending upon number of modules installed Position indication by micro switch or auxiliary switch in addition to visual indication. Ultra-low smoke insulation material (LU approved)

Left hand, right hand and double pole options

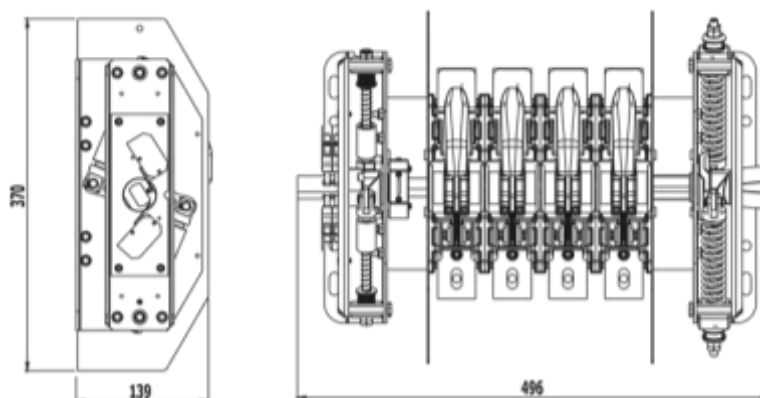
Rated Voltage	1800VDC
Rated Insulation Voltage	2.3kV
Overtoltage Level (BSEN 50123-1)	OV3
Rated impulse withstand voltage	12.0/14.4kVp
Power frequency withstand voltage	5.5/6.6kV
Categories (BSEN 50123-3)	V
Normal Current	800 - 4400A
Making Current	Up to 65kA
Withstand Current	Up to 70kA / 100kAp 250ms
Mechanical Endurance	M2: 10000 Operations

### VARIANTS / NOMENCLATURE

O	Otter - Switch Series
D	D = Disconnecter (No arcing contacts)
1-7	Number of current carrying modules (1 to 7)
L/R	Left or right hand configuration

### DIMENSIONS

OD4L



ODxL - Disconnecter

Rated Thermal current A	800	1600	2000	2500	3150	4000	4400
Number of current carrying modules	1	2	3	4	5	6	7
Approx. length mm	400	460	520	580	635	695	750
Approx. height mm	500	500	500	500	500	500	500
Approx. depth mm	390	390	390	390	390	390	390
Weight kg	-	-	-	15	-	-	-

## 8.6 SF – Off Load, Fault Make AC / DC Disconnectors

Standard Range 800 – 7500A 1000 or 1500V AC / DC

### Construction

The SF off load / fault make switch consists of:

The disconnector unit which carries the rated current of the switch via an assembly of knife blades and jaws mounted in parallel

### Features

- ❑ Visible breaking with a large isolation distance due to the opening angle of 90°
- ❑ The contacts are specifically designed to produce stable temperature rise characteristics

### Design

- ❑ Insulating parts made from glass reinforced polyester.
- ❑ Stainless steel springs, mechanism and clamps.
- ❑ Silver-plated thermal contacts.
- ❑ Thermal contacts with knife blades and jaws, providing:
  - a) Better electrical contact, the knife blades - jaws system provides two contact surfaces (one each side of the blade) unlike a contact point in a pressure system. This minimises the switch temperature rise.
  - b) Better short circuit withstand current is obtained using the dynamic electric-force that results from the shape of the blades.

### Applications

#### Hoists and Handling

Isolation of industrial cranes using DC electric motors

#### Inverters and Rectifiers

DC supply isolation of excitation circuits of generators.

Breaking and isolation of either the rectifier or the inverter (isolation for repairing one unit without interruption of the others)

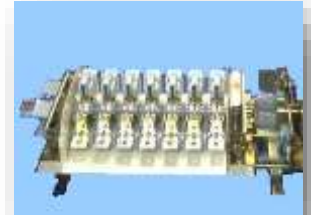
For the above applications, it is possible to isolate the DC and AC simultaneously with one operation.

### Electric Traction

Subways, tramways, trolley busses, and railways

Fixed equipment: - distribution of power from substations and track sectioning.

Rolling equipment: - general isolation of traction power.



### Electrical Characteristics AC & DC, Configuration & Weight

Rated Thermal current A	200	800	1600	2000	2500	3150	3800
Rated Insulation Voltage V	1000	1000	1000	1000	1000	1000	1000
Number of current carrying poles	1	1	2	3	4	5	6
Approx. length mm	75	115	175	235	380	435	495
Approx. height mm	190	300	300	370	370	370	370
Approx. depth mm	106	145	145	145	145	145	145
Weight kg	15	27	29	31	32	34	35
Mechanical Endurance Cycles	10 000	10 000	10 000	10 000	10 000	10 000	10 000
Dielectric Voltage Withstand @ 50Hz for 1 min. V	7500	7500	7500	7500	7500	7500	7500
Rated short circuit making capacity kA	50	50	63	66	66	66	66
Rated Thermal current A	4400	5000	5700	6300	7000	7500	
Rated Insulation Voltage V	1000	1000	1000	1000	1000	1000	
Number of current carrying poles	7	8	9	10	11	12	
Approx. length mm	550	615	675	735	786	850	
Approx. height mm	370	370	370	370	370	370	
Approx. depth mm	145	145	145	145	145	145	
Weight kg	37	39	41	43	45	47	
Mechanical Endurance Cycles	10 000	10 000	10 000	10 000	10 000	10 000	
Dielectric Voltage Withstand @ 50Hz for 1 min. V	7500	7500	7500	7500	7500	7500	
Rated short circuit making capacity kA	100	100	100	100	100	100	

Please consult Technical Sales for switch characteristics: -

Rated Insulation voltage = 1500V & 1800V

800 - 2500A versions are available in 2 pole versions and other multi-pole combinations are available for AC applications.

## 8.7 IF – Load Break DC Disconnectors

Standard Range - 800 to 6300A - 1000V or 1500V DC

### Construction

The IF load break switch consists of two separate switch units assembled along the same shaft and connected to the same drive mechanism:

The disconnecter unit which is an assembly of knife blades and jaws, mounted in parallel. These carry the rated current of the switch.

The load break unit provides the final load interruption through arc quenching chambers.

### Features

- ❑ Visible breaking with a large isolation distance because of the opening angle of 90°.
- ❑ Total separation of the current carrying and breaking functions. This allows the contacts to be specifically designed for these different requirements, resulting in stable temperature rise characteristics and high current breaking characteristics.

### Design

- ❑ Insulating parts made from glass reinforced polyester.
- ❑ Stainless steel springs, mechanism and clamps.
- ❑ Silver plated thermal contacts and breaking contacts on silver discs
- ❑ Thermal contacts with knife blades and jaws, providing:
  - a) Better electrical contact, the knife blades - jaws system provides two contact surfaces (one each side of the blade) unlike a contact point in a pressure system; therefore the temperature rise is reduced.
  - b) Better short circuit withstand current is obtained using the dynamic electric-force that results from the shape of the blades.

### Applications

#### Electric Traction

Subways, tramways, trolleybuses, and railways

Fixed equipment: distribution of power from substations and track sectioning

Rolling equipment: general breaking and disconnection of traction power

#### Hoists and Handling

Isolation of industrial cranes using DC electric motors

#### Inverters and Rectifiers

DC supply isolation of excitation circuits of generators.

Breaking and isolation, of either the rectifier or the inverter (isolation for repairing one unit without interruption of the others).

For the above applications, it is possible to isolate the DC and AC simultaneously with one operation.

### Electrical Characteristics DC, Configuration & Weight



Rated Thermal current A	800	1600	2000	2500	3150	4000	4400	5000	5700	6300
Rated Insulation Voltage V	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Number of current carrying poles	1	2	3	4	5	6	7	8	9	10
Number of breaking poles	2	2	2	2	2	2	2	2	2	2
Approx length mm	400	460	520	580	635	695	750	810	870	930
Approx height mm	500	500	500	500	500	500	500	500	500	500
Approx depth mm	390	390	390	390	390	390	390	390	390	390
Weight kg	30	32	34	35	37	38	40	41	42	43
<b>Rated Breaking Capacity</b>										
Recovery Voltage (Ur) V *	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Peak let Through Current (Ic) A	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000
Time Constant ms	5	5	5	5	5	5	5	5	5	5
Electric Endurance Cycles (1000V = 5000A - L/R 20ms) **	100	100	100	100	100	100	100	100	100	100
Mechanical Endurance Cycles	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000
Rated Short Term Withstand Current 1 min. A	2700	4800	6000	7500	9500	11500	13200	15000	17100	19000
Rated Short Term Withstand Current 2 hr. A							6000			
Rated conditional short circuit current (Peak value) kA **	50	75	75	75	75	75	75	75	75	75
Rated short circuit making capacity kA **	50	63	66	66	66	66	66	66	66	66

\* The recovery voltage is 10% higher than the working voltage; it is the voltage, which appears across the terminals of a pole during breaking capacity tests, after the breaking of current.

\*\* These values are minimum values since the switch was not been tested to a greater numbers of cycles.

Please consult Technical Sales for:

Rated Insulation voltage = 1500V or 1800V

L/R = 20ms

800 - 2500A versions are available 2 pole

They have twice as many current carrying poles and breaking poles.



9 Railway Fuses

Conductor Rail Fuses



## 9.1 Conductor Rail Mounted Fuse Assembly

The rail mounted fuse box is a custom designed and machined composite assembly, to meet the customer specification. The fuse box houses, **20 x 127 fuses** of differing current ratings depending upon the application.

### Installation

The box must be fixed using the mounting facilities provided on a level surface, squarely to eliminate mechanical distortion and secured with the fixings provided.

### Orientation

The box must be mounted horizontally.

### Ingress protection

The installation company must ensure that the cable entry provisions to the box maintain the specified level of ingress protection.

### Power Cables

The 1 x 4mm<sup>2</sup> triple insulated cable enters via the gland at the end of the box.

Connection is made using the screw connection to the fuse lug provided.

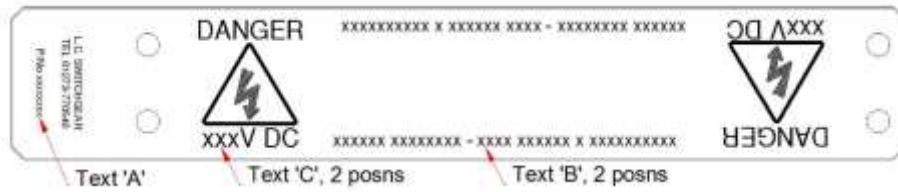
### Electrical Characteristics

System Voltage	630 or 750 VDC
Nominal Voltage Rating	1000 VDC
Test Voltage	5kVAC (5000 VAC)

### Box Construction

Material	Composite
Degree of ingress protection	IP 65
Approximate weight	1.5 kg
Approximate Height	66 mm
Approximate Width	362 mm
Approximate Depth	62 mm

### Variants & Part Numbers



Label Variation for Versions 8800219-V02 - V09

Adaptor kit

	LCS Part No	Text 'A'	Text 'B'	Text 'C'
Adaptor Kit *	8800219-V00			
Standard	8800219-V01			630
TED Fuse Rating 800mA (Formerly 8800219A)	8800219-V02	8800219-V02	TED – FUSE RATING 0.8 AMP	630
Tunnel Lighting – Fuse Rating 6 Amp (Formerly 8800219B)	8800219-V03	8800219-V03	TUNNEL LIGHTING – FUSE RATING 5 AMP	630
Current On Line relay – Fuse Rating 1A	8800219-V04	8800219-V04	CURRENT ONLINE RELAY – FUSED 1A	750
Bleed Resistor – Fuse Rating 2A	8800219-V05	8800219-V05	BLEED RESISTOR – FUSED 2A	750
Tunnel Lighting – Fuse Rating 1 Amp	8800219-V06	8800219-V06	TUNNEL LIGHTING – FUSE RATING 1 AMP	750
Tunnel Lighting – Fuse Rating 5 Amp	8800219-V07	8800219-V07	TUNNEL LIGHTING – FUSE RATING 5 AMP	750
Standard	8800219-V08	8800219-V08		750
TED Fuse Rating 800mA	8800219-V09	8800219-V09	TED – FUSE RATING 0.8 AMP	750

\* Adaptor kit is required for use with composite conductor rail

### Adaptor kit

Composite conductor rail requires an adaptor kit to allow the fuse box to fit the profile of the rail. This kit is Part No 8800219-V00 and is shown in the picture.





### Fuses

**No Fuses** are supplied with the Rail Mounted Fuse Assembly. These need to be purchased separately to suit the circuit requirements. Refer to table below for fuse sizes available.



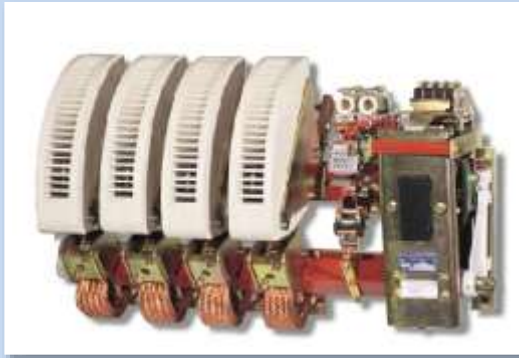
Spare 20 x 127 Fuses

Fuse Assy Part No	Suffix	Suffix	Rating of Fuse (A)	Part No With Indicator	Part No W/O Indicator
8800219	V02	V09	0.8	851397	856167
8800219	V04	V06	1.0	854825	856168
			1.5		856169
8800219	V05		2.0	856105	856080
			3.15	860911	856170
			4.0		856171
8800219	V03	V07	5.0	860912	856172
			6.0	855269	856173
			8.0		856174
			10.0		856175



## 10 Railway AC & DC Contactors

### DC Contactors



### 2 Pole Contactors



## 10.1 CBFC 75

### Standard versions

1 to 4 single pin main poles with silver pad contacts.

Closing electromagnet mounted on the right side of the poles, and laminated magnetic circuit.

Control circuit supplied from an AC source:

- ❑ For currents 400 (1 to 4 poles), 500 and 630 (1 to 2 poles), without economy resistor.
- ❑ Over, rectified and power-saved current via a rectifier mounted on the contactor.
- ❑ Control circuit supplied from a DC source: power-saved circuit with economy resistor.

Mechanical locking: vertical type.

### Auxiliary contacts

- ❑ 2 NO + 2 NC available on D blocks on the whole range (2 extra D blocks can be mounted on request).
- ❑ Control circuit supplied from an AC source: one M block, form F2.01Y, on calibres 500 and 630, from 3 to 4 poles and on calibres 800 and 1000; from 1 pole as control circuit is rectified and coil power -saved via 1 NC overlap contact, 1 NO + 1 NC free auxiliary contacts.

Control circuit supplied from a DC source: on the whole range, one block type F2.01Y with one NC overlap contact for inserting the economy resistor and 1 NO + 1 NC free auxiliary contacts.

Control circuit supplied from a DC source: on the whole range, one block type F2.01Y with one NC overlap contact for inserting the economy resistor and 1 NO + 1 NC free auxiliary contacts.

### Options

- ❑ NO or NC delayed block, TP 86 type (this one also includes 4 free instant contacts, i.e. 3 NO + 1NF).
- ❑ Addition of D type and M type auxiliary contact blocks according to different versions.
- ❑ Device to hold the contactor closed in case of untimely micro-cuts for contactors that are not equipped with a mechanical latching.
- ❑ Mechanical latching with single or double electrical release.
- ❑ Self-protective device for the release coil(s).
- ❑ Metallic support for 'Ronis type' lock (lock not supplied).
- ❑ Horizontal or back-to-back mechanical locking.
- ❑ Poles of different currents and supplied with different currents.

### CB 75 400 to 1000 A Technical features CBFC 75 400 to 1000 A

#### DC contactors Ue up to 2000 V<sub>DC</sub>



Standards: IEC 947-4-1

Direct current	CBFC Type 75									
	400	500	630	800	1000					
<b>Thermal nominal current<sup>(1)</sup> DC 1</b>	A 500/500	500/500	630/630	800/800	1000/1000					
<b>Nominal insulating voltage</b>	V 1000	1000	1000	1000	1000					
<b>connecting section</b>	mm <sup>2</sup> 240	300	400	500	600					
<b>Nominal operating voltage</b>	V 500	1000 <sup>(2)</sup>	500	1000 <sup>(2)</sup>	500	1000 <sup>(2)</sup>	500	1000 <sup>(2)</sup>	500	1000 <sup>(2)</sup>
<b>Maximum controlled powers</b>										
voltage	V 220/250	440/500	220/250	440/500	220/250	440/500	220/250	440/500	220/250	440/500
DC 2-DC 4 duty cycle	kW 90	180	110	220	110	220	175	350	175	350
<b>Short-time current, t ≤ 40°C</b>										
1 s	kA 10	12	14	24	26					
5 s	kA 4.5	5.75	6.5	11	12.5					
10 s	kA 3.25	4	4.5	7.8	8.5					
15 s	kA 2.7	3.4	3.8	6.5	7					
30 s	kA 1.9	2.4	2.7	4.6	5					
1 min	kA 1.4	1.78	2	3.3	3.65					
3 min	kA 0.88	1.1	1.3	2	2.3					
10 min	kA 0.62	0.79	0.92	1.38	1.6					
<b>Allowable overcurrent / time</b>	kA 2.5	3.25	3.75	6.5	7.25					
<b>Current switch-off rating L/R = 15 ms</b>										
voltage applied	V 500	700	1000	500	700	1000	500	700	1000	500
single-pole <sup>(3)</sup>	kA 6	8	8	19	19					
two-pole <sup>(3)</sup>	kA 16	5	10	7	10	7	17	10	17	10
voltage applied	V 1500	1800	2000	1500	1800	2000	1500	1800	2000	1500
three-pole <sup>(3)</sup>	kA 5	12	1.5	7	2.5	2.5	10	8	6	10
four-pole <sup>(3)</sup>	kA 5	5	7	7	10	10	8	8	10	10
<b>Current switch-on rating L/R = 15 ms</b>	kA 6.500 V	10.5/500 V	10.5/500 V	19/500 V	19/500 V					
<b>Mechanical endurance</b>	millions of operations	3	3	3	3	3	3	3	3	3
<b>Control circuit</b>										
<b>Nominal voltage</b>	AC 50 Hz	V 24 - 48 - 110 - 127 - 220 - 380 - 500								
	DC	V 24 - 48 - 115 - 220 - 440 - 500								
<b>Maximum consumptions</b>										
AC <sup>(2)</sup>	1P	VA 2000/175	2000/175	2000/175	500/30	500/30				
	2P	VA 2000/175	2000/225	2500/225	500/30	500/30				
	3P	VA 2000/175	525/30	525/30	750/66	750/66				
	4P	VA 2000/175	525/30	525/30	750/66	750/66				
DC	1P	W 400/26	400/26	400/26	500/30	500/30				
	2P	W 400/26	525/30	525/30	500/30	500/30				
	3P	W 400/26	525/30	525/30	750/66	750/66				
	4P	W 525/30	525/30	525/30	750/66	750/66				
<b>Average time of operation at nominal voltage<sup>(4)</sup></b>										
<b>Constant L/R rate of electromagnet open/closed</b>										
<b>Closing time at Un</b>	AC	ms 40	40	40						
	DC	ms 90	90	90	120	120				
<b>Opening time at Un between command and separation of contacts</b>	AC	ms 20	20	20						
	DC	ms 25	25	25	38	38				

(1) in open air.  
 (2) bold type ratings: rectified and power-saved control circuit voltage.  
 (3) diodes are warranted up to a network overload of 3 Un affiant.  
 (4) closing time is measured from the time of supply of the closing coil until the time of contact of the main poles. Opening time is measured from the time of supply of the tripping coil until the time of separation of the main poles.  
 (5) dielectric testing voltage according to insulation voltage can reach 8 kV for specific applications.  
 (6) for applications with Ue > 500 V, please consult our technical department to select the contactor (specific dimensions and insulation).  
 \*Temperature factor to be applied to the poles or the current controlled according to the ambient temperature (around the contactor):

1.04	40 < t < 45°C
1.08	45 < t ≤ 50°C
1.12	50 < t ≤ 55°C
1.19	55 < t ≤ 60°C

\*factor to be applied to the contactor for poles connected in parallel, this factor already includes a safety margin:

	2 poles in parallel	3 poles in parallel
DC	1.1 in 1 pole x 2 x 0.8	1.1 in 1 pole x 3 x 0.75

- The current switch-off rating of poles connected in parallel remains the same as for a single pole.  
 - Maximum consumptions:  
 Bold type ratings:  
 - AC: control circuit is supplied with rectified and power-saved current via a rectifier mounted on the contactor.  
 - DC: control circuit is power-saved.  
 For technical features of opening poles, see p. 70.

## 10.2 CBC 71

### Standard versions

1 to 4 single pin main poles with copper contacts for calibre 1250 A (silver pad contact on request) and silver contacts for calibres 1600 and 2000 A.

Arc-blowout coil operates only during opening.

Closing electromagnet mounted on the right side of the poles, solid iron magnetic circuit with 2 coils.

- control circuit supplied from an AC source via a rectifier and power-saved coils (device mounted and cabled on the contactor).
- control circuit supplied from a DC source with power-saved coils (device mounted and cabled on the contactor).

### Auxiliary contacts

- ❑ two M type contact blocks with 3 contacts 3 NO + 3 NC, instant contacts or form to be specified when you order.
- ❑ number of M type contact blocks can be increased to 6 blocks.

Mechanical locking - vertical type.

### Options

- ❑ Silver pad contact pins for current 1250 A.
- ❑ NO or NC delayed block TP 86 type (this one also includes 4 free instant contacts, i.e. 3 NO + 1 NF).
- ❑ More than 6 M type contact blocks can be mounted on the contactor by mounting them below the contactor to reduce its total dimensions.
- ❑ Device to hold the contactor closed in case of untimely micro-cuts for contactors that are not equipped with a mechanical latching.
- ❑ Mechanical latching with single or double electrical release (does not change the total dimensions of the contactor).
- ❑ Self-protective device for the release coil(s).
- ❑ Metallic support for «Ronis type» lock (lock not supplied).
- ❑ Horizontal or back-to-back mechanical locking.
- ❑ Poles of different calibres and supplied with different currents.
- ❑ Poles without magnetic blowout.
- ❑ Reinforced insulation.
- ❑ Double insulation for specific applications.
- ❑ Tropical treatment n° 2.

### CS 71 1250 to 2000 A Technical features CBC 71 1250 to 2000 A

#### DC contactors Ue: 600 and up to 2000 V<sub>DC</sub>

Current	1250				1600				2000																			
<b>Thermal nominal current<sup>(1)</sup> DC 1</b>	1250				1600				2000																			
<b>connecting section</b>	mm <sup>2</sup> -9000				14000				18000																			
<b>Nominal insulating voltage<sup>(2)</sup></b>	1500				1000				1000																			
<b>Nominal operating voltage<sup>(2)</sup></b>	V 600				700 <sup>(3)</sup> 1000 <sup>(4)</sup>				600 700 <sup>(3)</sup> 1000 <sup>(4)</sup>																			
<b>Maximum operating current</b>																												
permanent duty	A 1250				1600				2000																			
8 hour duty	A 2250				1600				2000																			
temporary duty without opening on load	A 2000				2400				3500																			
30 minutes	A 1400				1700				2500																			
60 minutes	A 1250				1600				2000																			
temporary duty with opening on load	A 7000				2400				3500																			
30 minutes	A 7000				1700				2500																			
60 minutes	A 1500				1600				2000																			
continuous duty	A 1250				1600				2000																			
<b>Short-time current I<sub>t</sub> &lt; 40 °C</b>																												
1 s	kA 31				36				46																			
5 s	kA 25				19				24																			
10 s	kA 23,5				19,9				21																			
15 s	kA 21,8				18,7				17,9																			
30 s	kA 21,9				18				18																			
1 min	kA 21,5				18,5				18,5																			
5 min	kA 21				18				18																			
10 min	kA 21				18				18																			
<b>Allowable overcurrent / time</b>	kA 3,250				36,18				36,7																			
<b>Current switch-off rating</b>																												
voltage	V 500				700				1000																			
one-pole	kA 23				18				20																			
Up to 4 poles	kA 13				19				19																			
voltage	V 1000				2000				2000																			
Up to 2 poles	kA 18				8				8																			
Up to 4 poles	kA 19				19				19																			
<b>Current switch-on rating</b>	L/R = 15 mV				kA 25550 V				35550 V																			
<b>Poles inductance</b>	mH 2,34				2,34				2,34																			
<b>Poles resistance</b>	mΩ 12,5				12,5				12,5																			
hot	mΩ 12,5				12,5				12,5																			
<b>Number of openings on load at nominal current</b>	50000				100000				200000																			
for I = 1250 A	50000				150000				150000																			
for I = 1600 A	20000				100000				100000																			
for I = 2000 A	30000				30000				30000																			
<b>Mechanical endurance</b>	millions of operations				1				1																			
<b>Control circuit</b>																												
<b>Nominal voltage</b>	AC 50/60 Hz				V 24				48				110				220				380				500			
	DC				V 24				48				110				220				440				500			
<b>Maximum consumption</b>																												
AC																												
1P	VA 18014				18014				18014				18014				18014											
2P	VA 36024				36024				36024				36024				36024											
3P	VA 54036				54036				54036				54036				54036											
4P	VA 72048				72048				72048				72048				72048											
DC																												
1P	W 16517,5				16517,5				16517,5				16517,5				16517,5											
2P	W 33035				33035				33035				33035				33035											
3P	W 49552,5				49552,5				49552,5				49552,5				49552,5											
4P	W 66067,5				66067,5				66067,5				66067,5				66067,5											
<b>Constant L/R rate of electromagnet (operating)</b>	mV 11641				11641				11641				11641				11641											
<b>Closing time<sup>(5)</sup></b>																												
at U <sub>c</sub>	ms 180				180				180				180				180											
at 0,85 U <sub>c</sub>	ms 215				215				215				215				215											
<b>Opening time<sup>(6)</sup></b>																												
between command and separation of contacts	ms 60				60				60				60				60											
total opening of electromagnet	ms 95				95				95				95				95											
complete opening	ms 300				300				300				300				300											



(1) In open air.  
 (2) For applications under voltage > 1000 V<sub>DC</sub>, please consult our technical department.  
 (3) Values are corrected up to an ambient air (Ta) of 40 °C.  
 (4) For other voltage classes contact us.  
 (5) At nominal operating voltage = 1000 V, please consult us.  
 (6) Closing time is measured from the supply of the energy and the contact of main poles. Opening time is measured from the supply of the tripping energy until the separation of main poles.  
 (7) Ambient failure voltage must be a good insulation voltage on earth.  
 \* for specific applications.  
 † normal value.  
 ‡ especially concerned with abnormal current arc-extinction and prevention.  
 § The current switch-off rating of poles connected to parallelism is the same as for a single pole.  
 ¶ Specifications listed for its applied to the poles of the current controlled according to the ambient temperature around the contactor.  
 \*\* refer to be applied to the contactor for poles connected to parallelism. Factor already includes a safety margin.  
 †† 2 poles in parallel, ††† 3 poles in parallel.  
 For technical features of opening poles, see p. 76.



## 11 LVAC Control & Distribution Panels, Current On Line Relays, DNO Panels, & Indicators

### Standard and Custom Built Control Panels & Indicator Units



Switchgear enclosures for the following applications:  
 Circuit Protection & Isolation  
 Circuit Isolation & Bonding  
 Supply Changeover  
 Tunnel Lighting Distribution & Current On Line Relays  
 Trackside Indicators

## 11.1 LVAC Switchboard 250A

### London Underground

#### APPLICATION

Three phase AC Switchboard with a single four pole isolator and four Switch Fuse supplies.

#### Switch Disconnecter Specification

Number of Poles	4 pole (3P+N)
Number of Positions	2
Voltage	1000V AC 50Hz
Current	250A

#### Switch Fuses Specification

Number of Poles	4 pole (3P+N)
Number of Positions	2
Voltage	1000V AC 50Hz
Current	160A

#### Features

- 2mm Aluzinc
- Colour Grey RAL 7032
- IP54

#### Installation

Floor standing in control rooms

#### Cabling

Cabling via un-drilled aluminium gland plates

#### Dimensions

	<b>8800365</b>
<b>Voltage</b>	415V (3P+N) 50Hz
<b>Current</b>	250A
<b>Length</b>	630mm
<b>Height</b>	1800mm
<b>Depth</b>	630mm
<b>Weight</b>	190kg



## 11.2 LVAC Tunnel Lighting Switchboard 50A

### London Underground

#### APPLICATION

Single phase AC Switchboard with an automatic changeover from the LU supply to a DNO supply when the LU supply is lost.

The switchboard feeds four tunnel lighting circuits which are automatically invoked when their associated traction supply is switched off.

The switchboard can be divided into three sections to enable installation into limited access switch rooms.

#### 2 x Incoming Changeover Supply Switch/Fuse Disconnecter Specification

Number of Poles	2 pole (P+N)
Voltage	1000V AC 50Hz
Current	50A

#### 4 x Lighting Circuit Switch/Fuse Disconnecter Specification

Number of Poles	2 pole (P+N)
Voltage	1000V AC 50Hz
Current	25A

#### Features

- 2mm Electro Zinc Plated Mild Steel
- Colour Light Admiralty Grey BS 381C 697 semi-gloss
- IP54

#### Installation

Floor standing in control rooms

#### Cabling

Cabling via un-drilled Electro Zinc Plated Mild Steel gland plates

#### Dimensions

	<b>8800437</b>
<b>Voltage</b>	230V (P+N) 50Hz
<b>Current</b>	50A
<b>Length</b>	1800mm (Splits into 3 x 600mm sections)
<b>Height</b>	2000mm
<b>Depth</b>	325mm
<b>Weight</b>	420kg





## 11.3 COLR - 725 Type Current On Line Relay (Tunnel Lighting)

### London Underground

#### APPLICATION - ON LOAD

The 725 Type Current On-Line Relay consists of a Bar and Shaft Type Contactor mounted in a stainless steel enclosure. This automatically switches on the tunnel lighting when the traction power supply is switched off or is lost due to a fault.

#### Bar and Shaft Type Contactor 3 Pole

Coil voltage 500 to 900V DC  
 Contact voltage 80 to 110V AC 50Hz  
 Contact Load <200mA (Resistive Load)

#### Cubicle Construction

- External protection to IP54
- 1.5mm Stainless Steel Sheet 316
- External Surfaces natural Stainless Steel

#### Electrical Characteristics & Dimensions

	<b>8800442</b>
Voltage	630V DC
Current	200mA
Length	360 mm
Height	450 mm
Depth	220 mm
Weight	25kg



## 11.4 LVAC SER Signalling Equipment Room LVAC Panel 40A

### London Underground

#### APPLICATION - ON LOAD

Twin circuit breaker distribution low voltage A.C. distribution

#### 2 x Distribution MCCB, Tmax T1, 40A 4 poles, 25kA

Number of Poles 3 pole (+N)  
 Voltage 690V AC 50Hz  
 Current 40A

#### Cubicle Construction

- External protection to IP54
- 1.5mm Stainless Steel Sheet 304
- Internal Surfaces White Anti Condensation Paint
- External Surfaces Colour BS381C - L309 Canary Yellow

#### Electrical Characteristics & Dimensions

	<b>8800451</b>
Voltage	415V AC
Current	40A
Length	600 mm
Height	640 mm
Depth	270 mm
Weight	30kg



Variant	Features	Length	Height	Depth
8800451-V01	Leyton	600	600	270
8800451-V02	SER LVAC Panel 40A - South Woodford	600	600	270
8800451-V03	2 x 100A MCCB	600	600	270
8800451-V04	1 x 100A MCCB	600	600	270
8800451-V05	2 x 100A MCCB	800	800	270
8800451-V06	3 x 100A MCCB	800	800	270
8800451-V07	2 x 100A MCCB - see dims	600	800	270
8800451-V08	IDP Trunking Switch Panel 3 x 100A Isolators	800	800	270

## 11.5 COSI Cleaning Road Overhead Status Indicator

### London Underground

#### APPLICATION

The Cleaning Road Overhead Status Indicator is a roof mounted unit that displays the electrical status of the roads fitted with ground mounted conductor rails.

It is controlled by the associated Cleaning Road Contactor.

The control circuit is easily accessible at the end of the unit.

The unit is controlled by a high integrity circuit that is built into the Cleaning Road Contactor Panel.

An Audible Alarm and Flashing Beacon are activated as a warning prior to traction current being switched on.

They sound and flash for approximately 8 seconds.

#### Features

- Alpha display of either ON or OFF
- Two sets of LEDs face in opposite directions
- Cowls to shield the display area sunlight
- High Intensity LEDs
- Supply 'OFF' is illuminated with green LEDs.
- Supply 'ON' is illuminated with red LEDs.
- Audible alarm and flashing beacon
- IP 65
- Black semi – gloss with anti-condensation paint inside

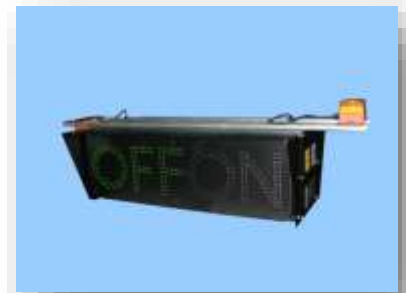
#### Installation

Hangs from the roof on Unistrut™ or an equivalent framework.

#### Dimensions

	<b>8800292</b>
<b>Voltage</b>	110V
<b>Length</b>	1080mm
<b>Height</b>	500mm
<b>Depth</b>	750mm
<b>Weight</b>	62kg

Also available in other colours and configurations:



#### Overhead Indicator Control Circuit Requirements

The Voltage Monitor circuit gives a secure indication of the status of the outgoing 750V DC and this is used to operate the Overhead Track Status Indicators, the indicators on the front of the Track Indicator Control Panel cubicle.

Dual Voltage Monitors VM1 and VM2 (Track Alive Relays) are both connected to the outgoing side of Contactor KI and will therefore be energised when 630V DC is present on the output connection.

These two voltage monitor output contacts are cross checked for parity via DCON and DCOF relays.

These DCON and DCOF then provide cross checked signals to the:

Track Alive – TA Relay

Track Not Alive – TNA Relay

These in turn then switch the overhead Status Indicators for the road.

Track Alive –	RED	750V DC ON
Track Not Alive –	WHITE	750V DC OFF & Bonded

If there is a disparity between the Voltage monitors, a fuse blown in the VM circuit, or a connection problem in the VM circuit this will force both Track Alive and Track Not Alive to de-energise producing a fault condition i.e. there will be no White or Red indicators displayed.

#### WARNING

If BOTH of the Road Track Status Indicators are NOT illuminated, this is an Indicator Fault condition and it MUST be assumed that the Road Supply is LIVE

Action must be taken to rectify this fault.

This system is extensively employed throughout London Underground Depots and is the standard method employed for their indications.

## 12 LVAC Cable Management Panels

Power & Control Cable Marshalling, Termination and Interface Enclosures



Railway and Industrial

## 12.1 Cable Marshalling Panels

Various Cable Marshalling Panels to suit a variety of cabling applications



8800478-V01	Disconnection Box - 19 Ways (Stainless steel)	LUL Nominee BCV Ltd	St Steel			
8800478-V02	Marshalling Panel - 60 Ways - (Stainless steel)	VolkerFitzpatrick Ltd	St Steel			
8800478-V03	Marshalling Panel - Manchester Metro - Victoria Station Redevelopment	Morgan Sindall				
8800478-V04	Marshalling Panel - 60 Ways - (GRP)		GRP			
8800478-V05	Marshalling Panel - 22 Ways - (GRP)	VolkerFitzpatrick Ltd	GRP			
8800478-V06	Marshalling Panel - 20 Ways - (Mild Steel)	Antagrade Electrical	Steel	300	300	225
8800478-V07	Marshalling Panel - 618 Ways - (Mild Steel)	Siemens	Steel	2100	800	620
8800478-V08	Marshalling Panel - 101 Ways - (Mild Steel)	HVMS	Steel	800	600	400
8800478-V09	Marshalling Panel - 101 Ways - (Mild Steel)	HVMS	Steel	800	600	210
8800478-V10	Marshalling Panel - 165 Ways - (Mild Steel)	HVMS	Steel	1000	600	210
8800478-V11	Marshalling Panel - Bescot - (Mild Steel)	Siemens	Steel	1000	800	300
8800478-V12	Marshalling Panel - Brereton - (Mild Steel)	Siemens	Steel	1000	800	300
8800478-V13	Marshalling Panel - Hednesford - (Mild Steel)	Siemens	Steel	1000	800	300
8800478-V14	Marshalling Panel - Grid Interface - (Mild Steel)	Siemens	Steel	600	380	210
8800478-V15	Marshalling Panel - IS1M - (Mild Steel)	UKPNS	Steel	1200	800	400
8800478-V16	Marshalling Panel - IS2M - (Mild Steel)	UKPNS	Steel	1200	800	400
8800478-V17	Marshalling Panel - CES Switchroom A - (Mild Steel)	UKPNS	Steel	2100	800	620
8800478-V18	Marshalling Panel - CES Switchroom B - (Mild Steel)	UKPNS	Steel	2100	800	620
8800478-V19	Marshalling Panel - Grove Hill	Siemens	Steel	2000	800	400
8800478-V20	Marshalling Panel - High Brooms	Siemens	Steel	2000	800	400
8800478-V21	Marshalling Panel - Grid Interface - (Mild Steel)	Siemens	Steel	600	380	210

## 12.2 ML TLB Translay Send & Receive Boxes

### APPLICATION

The Translay system is made up of two cubicles, each containing Translay 'S' Differential Feeder and Transformer Feeder Protection units and associated equipment.  
Manufactured to the Power Supply Upgrade Specification A437-00-DC-32 511

### Cubicle Construction

Cubicle Material	2mm electro zinc coated mild steel
Cubicle Finish	Grey RAL7032
Baseplate Material	3mm electro zinc coated mild steel
Baseplate Finish	Orange RAL2004
Degree of Ingress Protection	IP41

### Equipment

MMLG 01	Test block
MVAA 11	Single element relay with self-reset contacts
MCBI 01	Pilot wire differential protection relay
M RTP 01	AC pilot supervision relay with injection filter
M RTP 02	AC pilot supervision injection filter

### Electrical Characteristics

DC Auxiliary Supply	60V DC
AC Auxiliary Supply	220V AC

### Dimensions

	<b>8800384</b>
<b>Weight</b>	62kg
<b>Length</b>	600 mm
<b>Height</b>	800 mm
<b>Depth</b>	400 mm



## 12.3 ML PB Pilot Box

Pilot Boxes of various sizes and different numbers of ways can be provided to Network rail specifications.  
These incorporate the spring loaded screw clamp style of terminals as specified.

8800383	20 Pair Cable Terminal Box - Indoor
8800383-V02	30 Pair Cable Terminal Box - Indoor-
8800383-V03	30 Pair Cable Terminal Box - Indoor-
8800383-V04	20 Pair Cable Terminal Box - Indoor-
8800383-V05	20 Pair Cable Terminal Box - Indoor-
8800383-V06	20 Pair Cable Terminal Box - Outdoor-
8800383-V07	20 Pair Cable Terminal Box - Indoor -
8800383-V08	20 Pair Cable Terminal Box - Indoor-
8800383-V09	40 Pair Cable Terminal Box - Indoor-



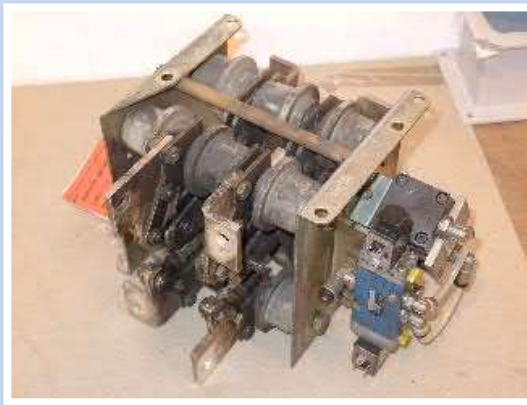


## 13 Servicing

### On Site Service and Commissioning



### In house Switch Refurbishment



**Maintaining or servicing your equipment could save £££ over the years**

## 13.1 Repair, Refurbishment, Maintenance & Service

Whilst our product range consists of equipment which requires little maintenance, regular servicing will extend the life of your products. An LCS service package could save you significant costs over the life of your system. We pride ourselves on a quick efficient service and endeavour to return products as quickly as we can.



### 8800033 - Pneumatic Rolling Stock Switch Refurbishment

Rolling Stock Switch showing the condition as it was received at L.C. Switchgear.



After extensive work the switch can be seen after testing ready for packing and dispatch. All items returned for overhaul are fully tested prior to despatch.

### Old Railway 2 Panel Switchboard Refurbishment

The old 2 panel switchboard in the adjacent picture was completely cleaned and rewired to the current standards giving it a new lease of life. The switchboard was thoroughly tested prior to installation.



#### Maintenance

- 4hr response times available
- 24/7 on-call available
- LU and NR trained staff

#### Servicing & Refurbishment

- Ensure product performance and longevity
- Renew existing products

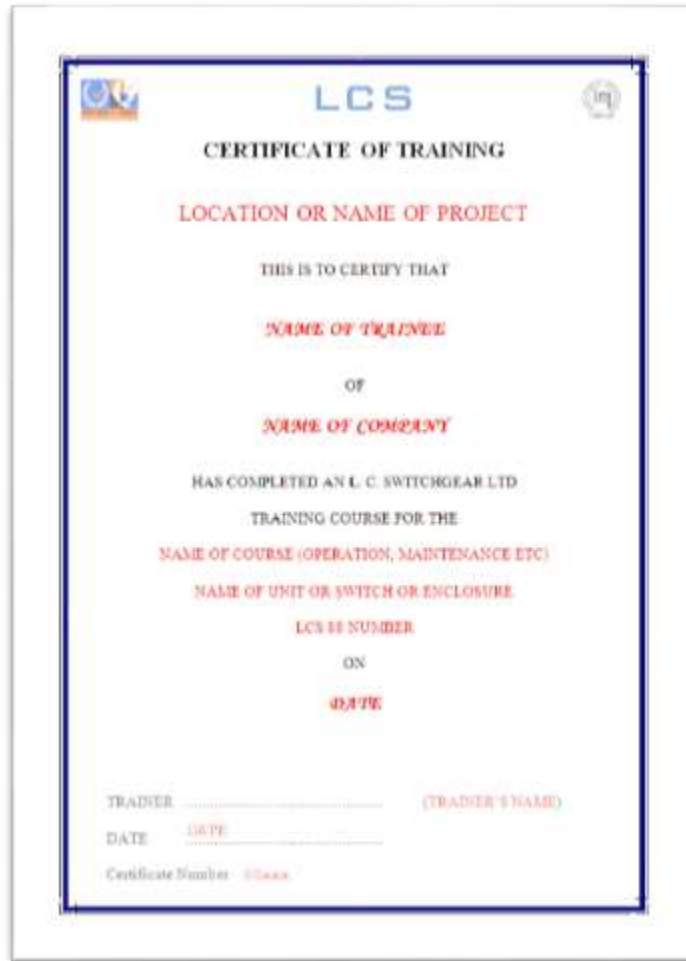
Contact us and plan your Support Package  
+ 44 (0) 1273 770540



## 14 Training & Consultancy & Repair Service

### 14.1 Training

Detailed training courses can be provided for Maintenance or Operation.  
 Training can be given at LCS in Hove or at your site.  
 Many Operators and Maintenance Technicians have attended our courses.  
 Please consult technical sales with your training requirements.



### 14.2 Consultancy

Experience with a wide variety of DC traction systems makes L.C. Switchgear able to give advice on different solutions, depending upon budget or technical requirements.

Impartial advice on the best solution is not clouded by OEM product driven decisions.

L.C. Switchgear is not tied to specific OEM products and therefore is able to recommend the best products on the market that meet your needs.





## 15 Installation

### 15.1 London Bridge Signal Box

Three & Two panel Changeover Switchboards feeding Multi Circuit Switchboards for the power supplies at London Bridge Signal Box were designed & supplied by L.C. Switchgear.

The whole installation was also undertaken including the integration of:

- UPS's,
- Transformers
- PLC Alarms
- Battery systems

The automatic Changeover of power supplies has already proven its worth on a number of occasions during unexpected interruption of the supplies to London Bridge.

Fully compliant with the latest Network Rail standards

The multi circuit distribution board is fitted with fuse blown indication to reduce downtime in the event of a failure.

Fuse location and change times have been reduced from 10-15 minutes to 2-3 minutes, which offers considerable savings in the event of failure due to circuit overload.

Supervisory cover for changing from the old to new systems was provided during night time possessions.



### 15.2 Rye Signal Box

UPS Switchgear and battery enclosure assembly

A modular design, to suit the requirements of a small signal box switch room.

Permits continued use of the signalling equipment in the event of an external supply failure.

The current rating and time constant can be accommodated to suit the requirement at site installation.

The unit was remotely positioned and was supplied with a signal box warning panel to alert the signal staff to the failure mode.





## 16 Accessories

### 16.1 Cable Glands for 935mm<sup>2</sup> Copper Traction Cable (LU Standard)

These are the glands for London Underground Standard 935mm<sup>2</sup> Copper cables used for the Positive and Negative supplies. For indoor/outdoor use

- Seals on the cable sheath, to IP68.
- Specially formulated elastomeric seals.
- Wide sealing range
- Precision manufactured from high quality brass

There are two types that are offered by LCS.

#### Nickel plated gland

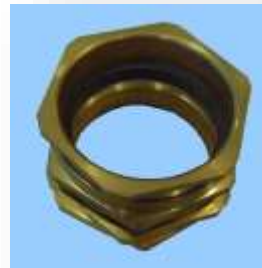
The more commonly used type is the larger Nickel plated gland shown in the pictures this requires a greater pitch between cables due to the large dimension A/C across corners.

#### Un-plated brass

Less commonly used is the un-plated brass indoor & outdoor cable gland for use with all types of un-armoured cable, providing mechanical cable retention and an environmental seal on the cable outer sheath.



Plated



Un-plated

Part No.	Type	Height	Across Flats	Across Corners
863745	M75 Gland – Nickel Plated	66mm	96mm	110mm
863747	M 75 Gland - Un-plated Natural Brass	51mm	85mm	95mm
863746	M75 Nickel Plated Brass Locknut <i>(Required for either of the above)</i>	7.5mm	96mm	110mm
864305	M75 Sealing Washer <i>(Required for either of the above)</i>			

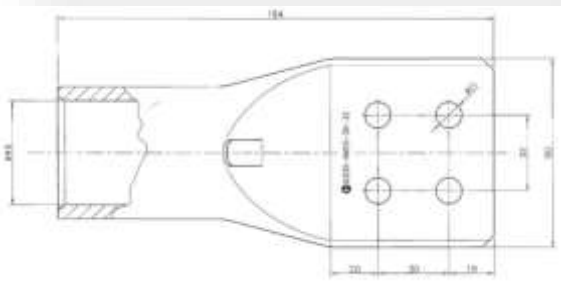
### 16.2 Cable Lugs for 935mm<sup>2</sup> Copper Cable (LU Standard)

These are the lugs for London Underground Standard 935mm<sup>2</sup> Copper cables used for the Positive and Negative supplies.

Copper tube lugs

- High purity electrolytic copper tube annealed and tin plated
- Four hole stud fixing
- Hydraulic Crimp tool fitting

LCS does not supply the cold shrink shown below.



Part No.	Ref.	Fixing Size	Length	Palm	Horizontal Pitch	Vertical Pitch
863744	A200	M10	184 mm	80mm	32mm	30mm

## 16.3 Insulators Low Smoke Zero Halogen

### Approvals & Specification

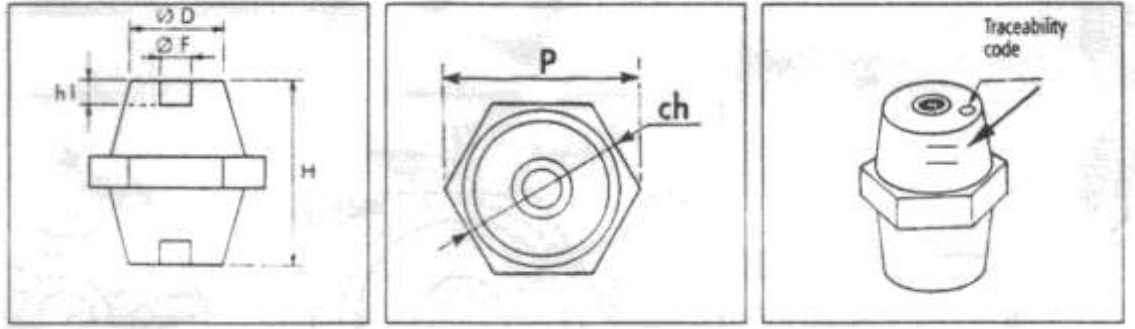
NFF 16-101 F2, UL recognised

Self-extinguishing: UL 94 HB

Material: Polyamide material reinforced with glass fibre, halogen free.

Insert Materials: Bi-chromate zinc plated steel inserts, threaded according to ISO standard.

Working temperature: -40°C + 130°C



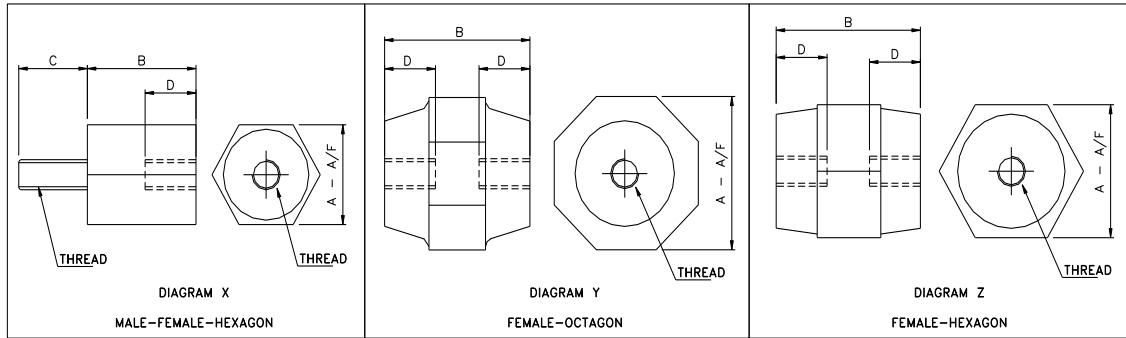
L.C.S. Part No	Description	H mm	Ch mm	F mm	h1 mm	D Dia. mm	P mm	Nominal Voltage V dc	Nominal Voltage V ac	Tensile Strength ↓ daN	Bending Strength ← daN	Weight kg
855709	ISO 50M6	50	50	M6	9	41	57	1000	1500	2000	1000	0,152
853404	ISO 30M8	30	30	M8	8	26	34	750	900	600	300	0,046
855831	ISO 35M8	35	41	M8	8	34	46	750	900	1100	800	0,074
855830	ISO 40M8	40	46	M8	8	40	53	1000	1200	1100	800	0,104
855829	ISO 45M8	45	41	M8	15	34	47	1000	1200	1100	650	0,136
855828	ISO 45M8L	45	50	M8	15	41	57	1000	1200	1800	1000	0,132
854468	ISO 50M8	50	50	M8	15	41	57	1000	1500	2000	1000	0,148
856887	ISO 60M8	60	55	M8	15	44	63	1000	1500	2200	1000	0,192
855027	ISO 35M10	35	41	M10	10	34	46	750	900	1100	800	0,092
856321	ISO 40M10	40	46	M10	10	40	53	1000	1200	1100	800	0,102
855719	ISO 45M10	45	50	M10	10	41	57	1000	1200	1800	1000	0,116
853405	ISO 50M10	50	50	M10	10	41	57	1000	1500	2000	1000	0,196
855225	ISO 60M10	60	55	M10	10	44	63	1000	1500	2200	1000	0,380
862182	ISO 70M12	75	65	M12	14	52	75	1000	1500	2500	1600	0,470
862183	ISO100M12	100	65	M12	14	46	75	1000	1500	3000	1500	0,476

Please note these are **not suitable** for use in London Underground 'Tunnel' Applications

## 16.4 Insulators Low Smoke

**Approvals: NFF101/102 10/F1 & UL94 – VO**

Material	DMC (Developed Polyester Molding Compound), low smoke emissions with high fire retardancy
Limiting Oxygen index	> 70% to ISO4589
Insert Material;	Female – Brass Male – Mild steel zinc & yellow passivate
Working temperature	+ 160 degrees
Nominal Insulation Voltage	690V ac
Nominal Working Voltage	440V ac
Flexural Strength	80 Mpa
Tensile Strength	30 Mpa

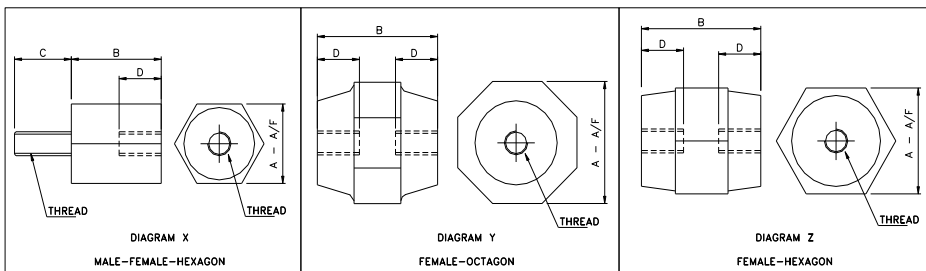


L.C.S. Part No.	Ref.	Diagram Type	Thread M	A mm	B mm	C mm	D mm	Tightening Torque Nm	Creepage mm
850470	LSH835H28	X	M8	35	25	28	10	14	35
851162	L3850	Y	M8	51	51		10	17	57
850465	L31050	Y	M10	51	51		16	33	57
7850137	L31250	Y	M12	51	51		16	40	57
855119	L31060	Z	M10	55	60		16	33	63
852828	L3870	Z	M8	55	70		10	17	73
851842	L31070	Z	M10	55	70		16	33	73
850421	L31270	Z	M12	55	70		16	57	73

Test voltage for L31050 & L31070 is 32.5Kv

## 16.5 Insulators Ultra Low Smoke – Suitable for London Underground Tunnels

**Approvals; - LU – NF F-16-101 – NFT 51-071 – NFC 20-455 – UL94 VO**



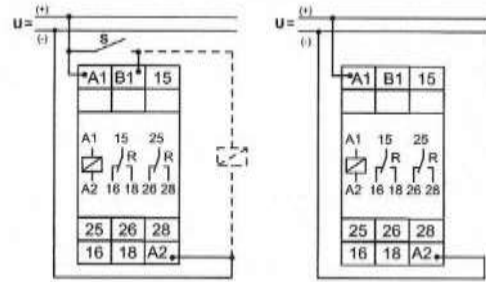
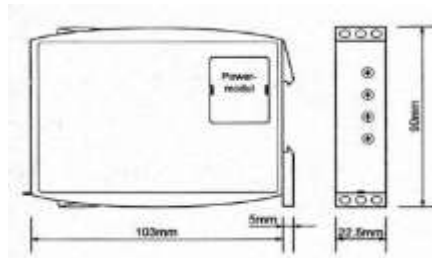
Insert Material;- Female – Brass / Male - Mild steel zinc & yellow passivate

**Ultra Low Smoke Insulators – for use in tunnels – LUL Approved**

L.C.S. Part No.	Diagram Type	Thread	Dimensions – mm				Tightening Torque	Creepage	Ref. No.
			A	B	C	D			
860751	Y	M10	51	51	-	16	33	57	U31050
860752	Z	M10	55	60	-	16	33	63	U31060
860753	Z	M10	55	70	-	16	33	73	U31070

## 16.6 Timer Relays

### Gamma Series



Time Relay G2Z

Tele Automation - Multifunctional Timer Relay – Gamma series - TS 35 Rail mounted

L.C.S. Part No.	Voltage	Controls	Tele Automation Ref. No.
860014	12 – 240V AC / DC	2 – Time function	G2Z120

## Functions

The function has to be set before connecting the relay to the supply voltage.

### Asymmetric flasher pause first (Ip)

When the supply voltage U is applied, the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired, the output relay switches into off-position (yellow LED not illuminated).

The output relay is triggered at the ratio of t1:t2 until the supply voltage is interrupted.



### Asymmetric flasher pulse first (Ii)

When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired, the output relay switches into off-position (yellow LED not illuminated) and the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired, the output relay switches into on-position (yellow LED illuminated). The output relay is triggered at the ratio of t1:t2 until the supply voltage is interrupted.

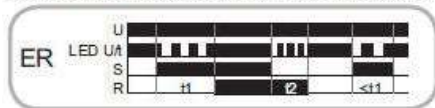


### ON delay and OFF delay with control input (ER)

The supply voltage U must be constantly applied to the device (green LED U/t illuminated).

When the control contact S is closed, the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired (green LED U/t illuminated), the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated).

If the control contact is closed during timing of t2 the expired interval is erased, and the off delay restart next time the control contact is opened.

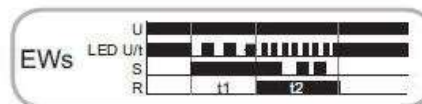


### ON delay and single shot leading edge with control input (EWS)

The supply voltage U must be constantly applied to the device (green LED U/t illuminated).

When the control contact S is closed, the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired (green LED U/t illuminated), the output relay R switches into on-position (yellow LED illuminated) and the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times.

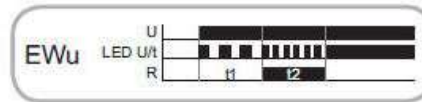
A further cycle can only be started when the cycle run has been completed.



### ON delay and single shot leading edge voltage controlled (EWu)

When the supply voltage U is applied, the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired the output relay R switches into on-position (yellow LED illuminated) and the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated).

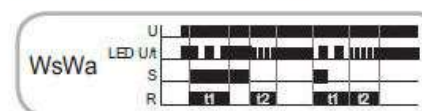
If the supply voltage is interrupted before the interval t1+t2 has expired, the interval already expired is erased and is restarted when the supply voltage is next applied.



### Single shot leading and single shot trailing edge with control contact (WsWa)

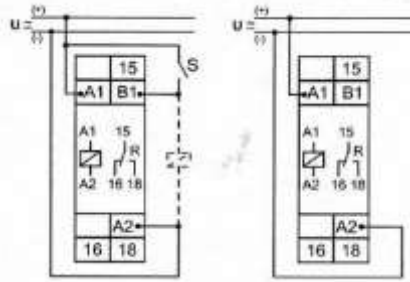
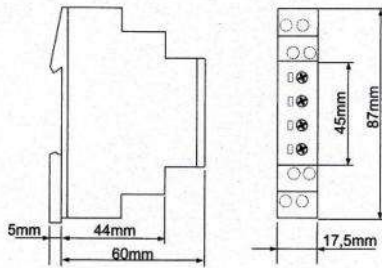
The supply voltage U must be constantly applied to the device (green LED U/t illuminated).

When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated) and the set interval t1 begins (green LED U/t flashes slowly). After the interval t1 has expired, the output relay R switches into off-position (yellow LED not illuminated). If the control contact is opened, the output relay again switches into on-position (yellow LED illuminated) and the set interval t2 begins (green LED U/t flashes fast). After the interval t2 has expired the output relay switches into off-position (yellow LED not illuminated). If the control contact opens before the interval t1 has expired, t1 continuous according to the adjusted period and the single shot trailing edge impulse (t2) follows directly after t1. During the interval, the control contact can be operated any number of times.





## Enya Series multifunction timer relay



Time relay E1ZM  
T35 Rail mounted

Part No.	Voltage	Controls	Tele Automation Ref.
859957	12-240V AC / DC	Time - Function	E1ZM10

## Functions

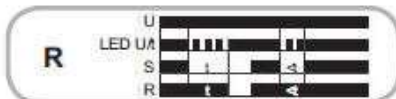
### ON delay (E)

When the supply voltage U is applied, the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the expiry of the interval t, the interval already expired is erased and is restarted when the supply voltage is next applied.



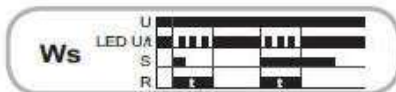
### OFF delay (R)

The supply voltage U must be constantly applied to the device (green LED U/t illuminated). When the control contact S is closed, the output relay R switches into on-position (yellow LED illuminated). If the control contact is opened, the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). If the control contact is closed again before the interval t has expired, the interval already expired is erased and is restarted.



### Single shot leading edge with control input (Ws)

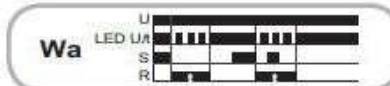
The supply voltage U must be constantly applied to the device (green LED U/t illuminated). When the control contact S is closed, the output relay R switches into on-position (green LED U/t illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.



### Single shot trailing edge with control input (Wa)

The supply voltage U must be constantly applied to the device (green LED U/t illuminated).

Closing the control contact S has no influence on the condition of the output R. When the control contact is opened, the output relay switches into on-position (yellow LED illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated), the output relay switches into off-position (yellow LED not illuminated). During the interval, the control contact can be operated any number of times. A further cycle can only be started when the cycle run has been completed.

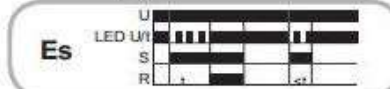


### ON delay with control input (Es)

The supply voltage U must be constantly applied to the device (green LED U/t illuminated).

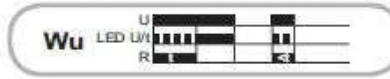
When the control contact S is closed, the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay R switches into on-position (yellow LED illuminated). This status remains until the control contact is opened again.

If the control contact is opened before the interval t has expired, the interval already expired is erased and is restarted with the next cycle.



### Single shot leading edge voltage controlled (Wu)

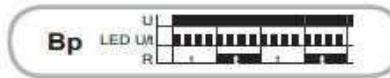
When the supply voltage U is applied, the output relay R switches into on-position (yellow LED illuminated) and the set interval t begins (green LED U/t flashes). After the interval t has expired (green LED U/t illuminated) the output relay switches into off-position (yellow LED not illuminated). This status remains until the supply voltage is interrupted. If the supply voltage is interrupted before the interval t has expired, the output relay switches into off-position. The interval already is erased and is restarted when the supply voltage is next applied.



### Flasher pause first (Bp)

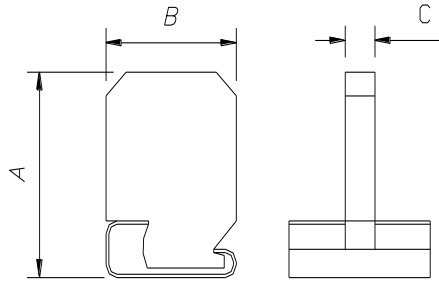
When the supply voltage U is applied, the set interval t begins (green LED U/t flashes). After the interval t has expired, the output relay R switches into on-position (yellow LED illuminated) and the set interval t begins again. After the interval t has expired, the output relay switches into off-position (yellow LED not illuminated).

The output relay is triggered at a ratio of 1:1 until the supply voltage is interrupted.

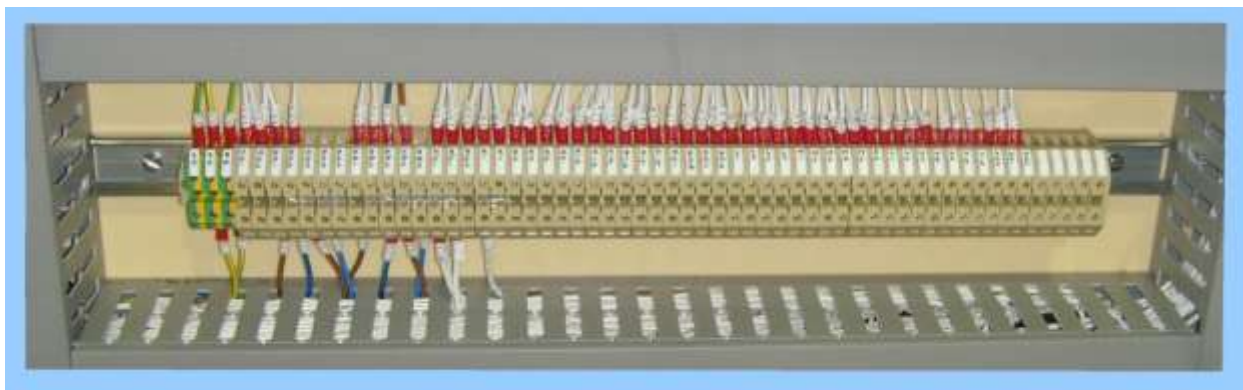


## 16.7 Terminals & Accessories – RSF Spring Clamp & Screw Type – TS32 ‘G’ Rail

This Range of Terminals are often Specified for **Railway Applications** – Consult Specifications



Type	mm	RSF3	RSF1
L.C.S. Part No		850681	850682
Voltage (V)		500	600
Current (A)		36	50
Height (mm)	A	60	60
Depth (mm)	B	50	50
Thickness (mm)	C	8	11
<b>Accessories</b>			
Rail TS32 ('G' Rail)		851256	851256
Rail TS32 (6mm Slots)		7850188	7850188
End Bracket EWK1	(8.5)	850685	850685
End Bracket EWK2	(15)		
End Plate AP	(3)	850683	
End Plate AP	(3)		850684
Partition TW	(2)	850697	850697
Cross Connector QL4		852785	
Cross Connector QL10		850688	
Sleeve VH13.5		850686	
Screw BS M3x20		850690	
Cross Connector QL10			850689
Sleeve VH17.5			850687
Screw BS M3x25			850691
Test Plug		852121	
Cable Range mm <sup>2</sup>		0.5 - 4.0	0.5 - 10.0
<i>Thickness in brackets (in mm)</i>			



## 16.8 Terminals WDU TYPE Spring Loaded Cable Clamps

TS 35 'Top Hat Rail' OR TS32 'G Rail' Dual Mounting Terminals

This Range of Terminals are often Specified for **Railway Applications** – Consult Specifications



Type WDU 4



Type WDU 10

TS35 & TS32 Rail mounting

TYPE	WDU 4 SL/EN	WDU 10 SL/EN
L.C.S. Part No.	862800	865748
Ordering Code	9537450000	9537490000
Rated Voltage	500V	500V
Rated Current	32A	57A
Rated Cross Section	4mm <sup>2</sup>	10mm <sup>2</sup>
Height (mm)	47	47
Length (mm)	60	56.6
Thickness (mm)	6.1	9.9
Material	Wemid	Wemid
Colour	Dark beige	Dark beige
Accessories		
Screw-in cross-connection WQV4/2 2 pole 41A Order No. 1051960000	863393	863393
Screw-in cross-connection WQV 4/3 3 pole 41A Order No. 1054560000	863394	863394
Screw-in cross-connection WQV 4/4 4 pole 41A Order No. 1054660000	863395	863395
Screw-in cross-connection WQV 4/10 10 pole 41A	862862	862862
End plate WAP 2.5-10 Order No. 1050000000	861809	861809
Partition WAP 16+35 WTW 2.5-10 Order No. 1050100000	863351	863351
End bracket – WEW 35/2 Order No. 1061200000 H 47mm, L 56mm, W 8mm	855567	855567
Marking tags – WS 12/6	863588	863588

### 16.8.1 W Type Terminal Cross Connector assembly instructions



Assembly instructions

Type WQV 4 shown above is a 2 Pole version, Part No. 863393

Extending number of Poles, Pre-fitted cross connections can be set one after the other to produce any required number of poles.

Example in ref. b above is a 3 Pole version (Part No. 863394) first, remove the fixing screw and screwdriver guide (insulated part) at one of the outer contact points of one the cross connection.

Insert the 3 Pole connector without fixing screw and insulating part. At the same time, insert (for example) another unmodified 3 pole connection in parallel so as to produce an overlap at the connection. The connection is screwed tight using the fixing screw of the unmodified connection.

When used together with W series terminals, WQV insulated cross-connection units guarantee absolute safety for finger and back-hand in accordance with the accident prevention regulations 'Electrical systems and equipment' (VGB4).

However, if a cross connector (e.g. 10 Pole Pt. No. 862862) is cut down to a shorter number of segments it is recommended to place a Partition (WTW ) or End Plate (WAP) adjacent to the exposed cut end of the cross connector.

## 16.9 LED Enclosure Lighting



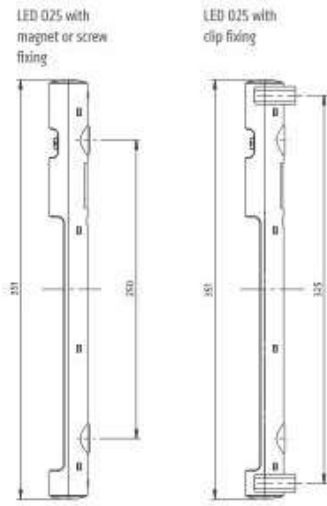
- > Wide voltage range
- > Integrated power unit
- > Long-lived and maintenance-free by LED technology
- > Daisy chain
- > On/off switch or movement sensor
- > Magnet, screw or clip fixing

The lamp series LED 025 is suitable for all types of panels and enclosures, especially where space is at a premium. The lamps have a very long service life thanks to the use of LED technology. Three different fixing options provide more flexibility for installation. The power output allows up to 10 lamps to be connected to each other (12VDC versions up to 5 lamps). Both the power input and output connectors snap lock into their sockets. With the integrated power unit and the plugs the lamp can quickly be connected.



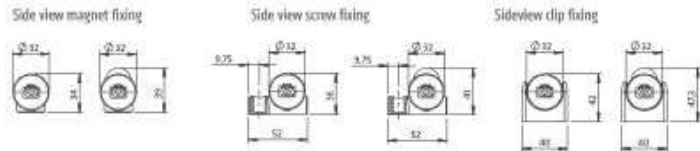
### TECHNICAL DATA

Power consumption	max. 5W
Luminosity	2900lm at 120° (8700lm at 360°) or equivalent 75W light bulb
Lamp type	LED, angle of radiation 120° light color: daylight, color temperature: 6,500K
Service life	60,000h at +20°C (+68°F)
Connection	2-pole connector with snap lock AC: max. 2.5A / 240VAC, color: white DC: max. 2.5A / 60VDC, color: blue
Mounting	magnet fixing or screw fixing (M5), clip fixing (M6), torque 2Nm max.
Casing	plastic, transparent
Dimensions	see drawings
Weight	0.2kg
Operating/Storage temperature	-30 to +60°C (-22 to +140°F) / -40 to +85°C (-40 to +185°F)
Operating/Storage humidity	max. 90% RH (non-condensing)
Protection type/Protection class	IP20 / II (double insulated), 12VDC: IP20 / III (extra-low voltage)



**Mounting options:** The lamps are available with magnet fixing for easy positioning in any steel cabinet or enclosure. A classic is the LED 025 with screw fixing. And the specifically designed clip holders for clip fixing of the LED 025 can also be positioned anywhere in the cabinet. The clip holders are screwed to the cabinet wall, the lamp is simply snapped into the clip holders and can be turned as needed for a perfect illumination.

**Note:** The lamp must not be used for household lighting.



867935	LED 025 Panel Lamp 24 - 48V DC Ref 02540.1-01 (Standard Version - On/Off Switch)
867165	LED 025 Panel Lamp 100 - 240VAC Ref 02540-0-01 (Standard Version - On/Off Switch)
866096	LED 025 Panel Lamp 100 - 240VAC Ref 02541-0-01 with PIR
866097	AC Connection Cable + connector for LED 025 Lamp 244356
867937	DC Extension Cable, 1m Long, for interconnecting LED025 lamp. Ref: 244362
867936	DC Connection Cable, 2m Long, with Female connector for LED 025 Lamp. Ref: 244360
863294	Din Rail Mounting Bracket (STEGOFIX) ref: 282-1001. - Self Adhesive

## 16.10 Heaters – Anti-Condensation

### Touch-Safe Heater CSF 060 Series (semiconductor)

50W to 150W



- Low surface temperature
- Integrated thermostat
- Quick mounting due to clip fixing
- Double insulated (plastic)
- Wide voltage range
- Small size

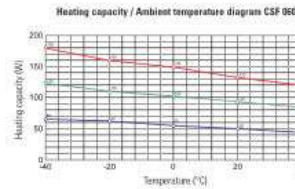
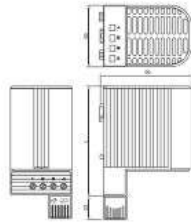
Touch-safe heater for the use in enclosures with electrical/electronic components. The design of the heater supports the natural convection which results in a high air current of warm air. The surface temperatures on the accessible side surfaces of the housing are kept down as a result of the heater design. This model with plug-in thermostat does not require additional wiring. The heaters are designed for permanent operation. This heater is also available in a version without thermostat (CS 063).



#### Technical Data

Operating voltage	120-240VAC* (min. 110V, max. 265V)
Heating capacity	see table
Heating element	PTC resistor - temperature limiting
Surface temperature	< 80°C (176°F), except upper protective grille
Connection	4-pole terminal 2.5mm <sup>2</sup> , torque 0.8Nm max.
Casing	plastic according to UL94 V-0, black
Mounting	clip fix 35mm DIN rail, EN 50022
Fitting position	vertical
Operating / Storage temperature	-20 to +70°C (-4 to +158°F) / -45 to +70°C (-49 to +158°F)
Protection type / Protection class	IP20 / II (double insulated)
Approvals	VDE + UL File No. E150057 (according to UL488 in combination with UL508A)
Note	other voltages on request

\*Operating with voltages below 140VAC reduces heating performance by approx. 10%.



L.C.S. Part No.	Type
866522	Heater 20W 110V- 240V without thermostat type 06030.0-00
862522	Heater PTC 30W 120V- 240V DIN Rail Mount. Type HG040 ref.
863287	Heater 50W 110V- 240V with thermostat type 06001.0-00 15 Degrees
863809	Heater 100W 110V- 240V without thermostat. type 06010.0-00
862371	Heater 100W 110V- 240V with thermostat 15 Degrees type 06011.0-00
866027	Heater 150W 110V- 240V with thermostat 15 Degrees type 06021.0-00
863810	Thermostat N/C. DIN rail mount. On 5°C, Off 15°C type 01160.0-00

## 16.11 Thermostats - Cooling / Heating

Anti-Condensation Heaters– Bi-metal Thermostat – Adjustment Range –0 to 60°C

Mounting; clip mounting on 35mm DIN rail – 250V a.c.-6A – IP30

L.C.S. Part No.	Thermostat Type	Contacts	Colour	Dimensions mm		
				H	B	D
855586	Cooling	N/O	Blue	60	33	35
855462	Heating	N/C	Yellow	60	33	35



## 16.12 Thermostats – Bi-Metallic

N/C Types OPEN on Temperature Rise - N/O Types CLOSE on Temperature Rise

Height (Incl. Terminals) 21.4mm x Width 30mm x Dia. 16mm - Fixing centers 23.8 x 6BA

Contact Rating 250V AC 10A - Contact Resistance <50 mΩ - Dielectric strength 2000V AC

L.C.S. Part No.	Type	Opening Temp.	Re-closing Temp.
852796	N/C	20°C +3°C	10°C +4°C



## 16.13 Ventilator

The Ventilator is surface mounted and provides an ingenious system of features to avoid ingress:

- Deflector plates
- Angled ventilation holes
- Rubber seal
- Drain holes



L.C.S.	Type
Part No.	
85	Single Grey

## 16.14 Trackside Equipment Transformer

Enclosed Transformer Assembly

Features

- 5kV Single Phase Isolating Transformer 230V Primary / 230V Secondary Earth Free
- 20A SP Fusing
- Steel Enclosure IP44 Hot Dip Galvanised



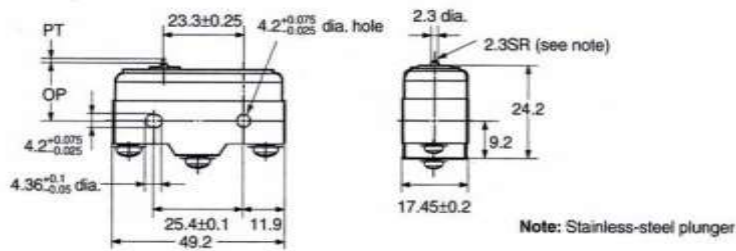
L.C.S.	Type
Part No.	
861232	20A

## 16.15 Door Microswitches

SPDT Contacts – Rating: 15A @ 250VAC Omron



Type Z-15



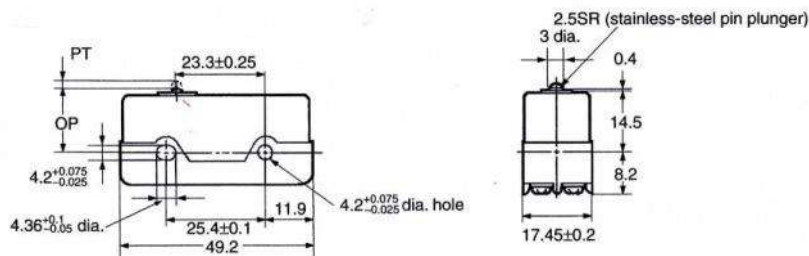
Stainless Steel Plunger — Screw Terminals

L.C.S.	Operating	Pre-Travel	Over-Travel	Operating	Omron
Drawing No.	Force - N	mm	mm	Position - mm	Ref. No.
860987	2.45 to 3.43	0.4 max.	0.13 min.	15.9 +/- 0.4	Z-15G-B

DPTP Contacts – Rating: 10A @ 250VAC Omron



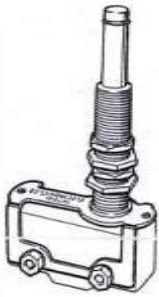
Type DZ-10



Stainless Steel Plunger — Screw Terminals

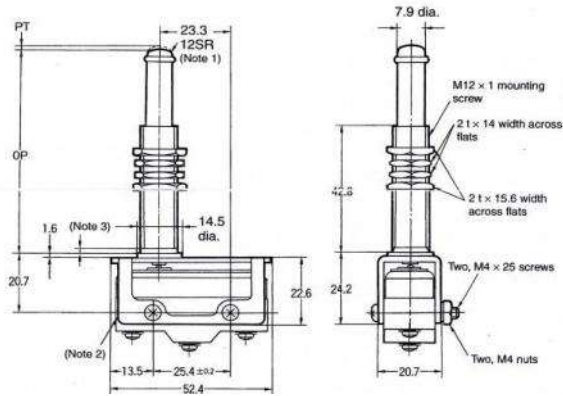
L.C.S.	Operating	Pre-Travel	Over-Travel	Operating	Omron
Drawing No.	Force - N	mm	mm	Position - mm	Ref. No.
860988	5.6 max.	1.7 max.	0.13 min.	15.9 +/- 0.4	DZ-10G-1B

## Long Travel Panel Mount Microswitch Plunger Omron



Type ZAQ

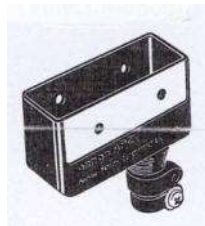
Bronze Frame – Stainless Steel Pin Plunger



L.C.S.	Over-Travel	Operating	Omron
Drawing No.	mm	Position - mm	Ref. No.
860989	20.5 min	69.1 +/- 1.5	ZAQ-1

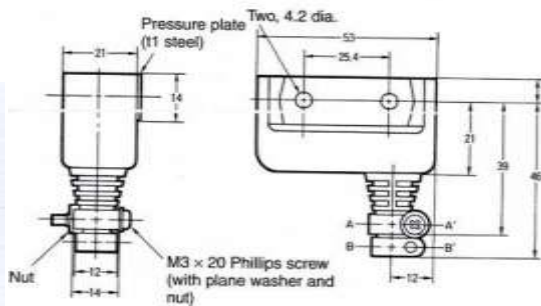
Note; Operating Force and Pre-Travel dimension is dependent on type of microswitch being used. Refer to drawing for individual values.

## Microswitch Dust Covers – Omron



Type AP-

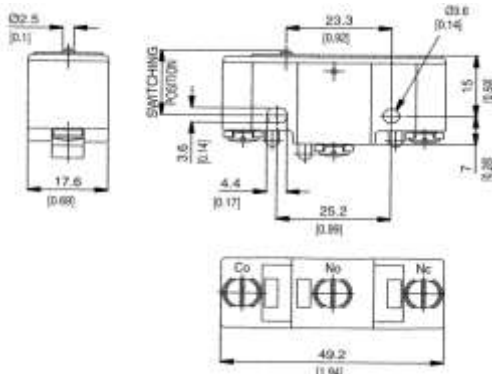
For use with microswitches ZAQ-1 Types - ref. 5.1.3.1 and 5.1.3.2 above



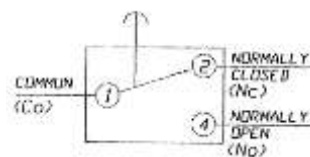
L.C.S.	Omron
Part No.	Ref. No.
860990	AP-Z

## Microswitches – Saia-Burgess – Snap-action – PN4 Type

Up to 250V AC 15A – Temperature range -10°C to + 85°C – IP 40



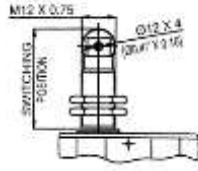
Type PN4 dimensions



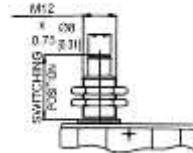
Circuit diagram



PN4GK26 type



PN4G type



PN41 type

Side / Panel mounting - Screw/washer Terminals – Silver Contacts

L.C.S. Part No.	Type of Actuator	Actuator Material	Lever Material	Saia-Burgess Ref. No.
850864	Roller	Stainless steel	Zinc plated mild steel	PN4GK26
855335	Spring plunger In line Roller	Stainless steel	-	PN4G
860439	Long over travel plunger	-	-	PN41
855334	Accessory	for above	Terminal Cover	PN4

16.16 Limit Switches Metal Enclosed



Type XCMD includes; ZCE02 Type

Type ZCMD + ZCY Type + ZCE01 Type

Ordering examples

Types ZCMD + ZCY + ZCE will be supplied as individual items and will require assembling.

Type XCMD and ZCE02 above should be supplied assembled, but may be supplied as three items, will need assembling the above shown plus the lead.

When delivered to stores, these will be bag the items with the L.C.S. Part No. attached.

1 N/C & 1 N/O contacts – with Flying Leads – 240V 1.5A at AC15 to IEC947-1-1 – IP67

L.C.S. Part No.	Actuator Type	Lead Length m	Telemecanique Ref. No.
850695	Roller Plunger Head	5	XCMD2102L5
850628	Roller Plunger Head	1	XCMD2102L1
850696	Roller Lever	5	ZCMD21L5 + ZCY15 + ZCE01



## 17 Adhesives, Lubricants, Cleaning Materials and Toolkits

### 17.1 Thread lock Type 222

Threadlocking Adhesive - low strength. Easy disassembly. Suitable for all metal threaded assemblies. LOCTITE 222 is a low-strength threadlocker that allows the adjustment of screws including countersunk head screws and set screws. Good on low-strength metals which could fracture during disassembly, e.g. aluminium or brass. The product works on all metals, including passive substrates such as stainless steel, aluminium and plated surfaces. It is proven to be tolerant of minor contamination due to industrial oils, e.g. engine oils, corrosion prevention oils and cutting fluids.

Ideal for low-strength threadlocking of adjusting screws, countersunk head screws and set screws  
Prevents loosening on vibrating assemblies, e.g. pumps, gear boxes or presses  
Permits disassembly with hand tools  
Especially suited to small thread sizes  
P1 NSF Reg. No.: 123002



#### Technical Data

Colour: Purple  
Max. thread size: Up to M36  
Service temperature range: -55 to +150°C  
Breakaway torque: 6 Nm  
Approvals: P1 NSF Reg. No.: 123002  
Fixture time steel: 15 min.  
Fixture time brass: 8 min.  
Fixture time stainless steel: 360 min.

L.C.S. No	Description	Ref. No.
T00186	Type 222 lower strength	222

### 17.2 Thread Lock Type 270

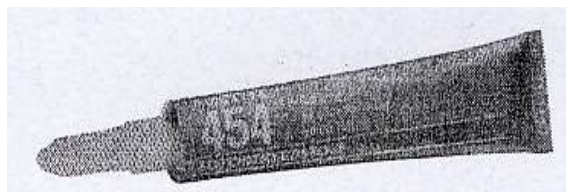
LOCTITE HYSOL GR 2710 has been formulated to provide the best possible mouldability and as wide a moulding latitude as possible. Although moulding and curing conditions will vary from situation to situation, recommended starting ranges are shown above. High Strength for locking and sealing of threaded fasteners and close-fitting parts after assembly

Technology Epoxy  
Appearance Gold  
Cure Heat cure  
Product Benefits Green product  
Low stress  
High Tg  
High flexural strength  
Mould at low temperatures  
Fast cycle time  
Filler Weight, % 81.7  
Flammability 94 V-0



L.C.S. No	Description	Ref. No.
T00076	Type 2701 High strength	2701

### 17.3 Adhesive Type 454



General Purpose, gel-type instant adhesive.  
Bonds rapidly I.E. leather, fabrics, paper, wood & ceramics

L.C.S. No.	Description	Ref. No.
T00072	Type 454 general purpose	454

## 17.4 Loctite 511 Thread Sealant x 50ml

General purpose, low strength thread sealant for metal threaded pipes and fittings. The product cures rapidly when confined in the absence of air between close fitting metal surfaces. Maximum pipe size: 3" Disassembly strength: Low Service temperature range: -50°C - +150°C Breakaway torque: 6 Nm

For use on Air fittings thread sealing

L.C.S. No	Description	Ref. No
T00071	Type 511 pipe sealant	511



## 17.5 Acetoxy Silicone Sealant, fast cure tack free in one hour



L.C.S. No.	Description
T00397	Colour – Clear

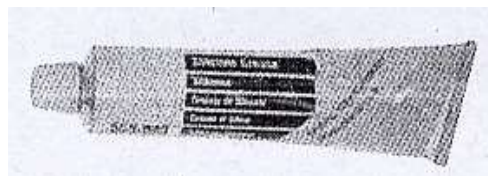
## 17.6 Freezer aerosol



Freezer aerosol, powerful non-corrosive refrigerant for use as a rapid and safe method of cooling small components, particularly electrical and electronic equipment

L.C.S. No.	Description
T00329	Freezer aerosol 400ml

## 17.7 Multipurpose grease



Type 556

Maintains low contact resistance on all types of wiping, sliding and non-arcng electrical contacts, including low power make-and break switches

L.C.S. No.	Description
T00077	Multipurpose grease 50ml tube

## 17.8 SGB 2GX Contact Treatment Grease (up to 2,500A)

The switch contacts should be re-greased using Electrolube 2GX (SGB) contact treatment grease. Do not use any other oil or grease, including special products for electrical contacts



20ml syringe - 35ml syringe - 1Kg - 5Kg -  
 Product code: SGB20S - SGB35SL - SGB01K - SGB05K - SGB12.5K

SGB (2X Grease) was developed as an extension of the No 2 Range (SFA, SGA and SOA) with increased plastics compatibility. This product development was necessary due to the use of thermoplastics in the electronics and automotive industries. SGB will significantly increase contact performance and lifetime. Separate data sheets are available for the diluted oil (EML), oil (SOB), the red standard grease (SGBR) and the low penetration grease (SGBH).

**Key Properties:**  
 High quality, non-melting contact grease  
 Hard consistency version SGBH) and oil version (SOB)  
 Reduces contact wear and arcing  
 Good plastics compatibility

L.C.S. No.	Description	Ref. No.
T00425	Contact Treatment Grease	SGB35SL

## 17.9 Copaslip Grease (500g tin) High Current

Copaslip is a High and low temperature assembly compound that protects against seizure, fusion and corrosion in extreme conditions. Reduces wear and torque in areas of high friction. Prevents galling and pitting. Use to ensure easy dismantling and re-assembly of metal fittings. Can be used on all joints including nuts, bolts, battery terminals and spark plug threads. Copaslip offers protection from -40°C to over 1100°C.



L.C.S. No.	Description	
853978	Copa Slip Grease (500g tin)	

## 17.10 Section Switch Tool Kit



### L.C. SWITCHGEAR LTD.

#### SECTION SWITCH TOOL KIT.

**8800170**

This tool kit is primarily for the replacement of the main arc chute contacts and removal of the spring actuating assembly for use on IF/SF switches.

ITEM	DRG	PART NO	QTY	DESCRIPTION	DCN
1		853906	1	10MM COMBINATION SPANNER	
2		853907	1	13MM COMBINATION SPANNER	
3		853908	1	17MM COMBINATION SPANNER	
4		853909	1	1/2" RATCHET HANDLE	
5		853910	1	M10 X 1/2" SOCKET	
6		853911	1	1/2" DRIVE EXTENSION (250MM)	
7		853912	1	5MM LONG SERIES ALLEN KEY	
8		853913	1	8MM TAPERED SCREWDRIVER	
9		853914	1	TOOLCASE	
10					



				<b>L.C. SWITCHGEAR LTD.</b> UNIT 1, HIVE TECHNOLOGY CENTRE ST JOSEPH'S CLOSE, HOVE, E. SUSSEX BN3 7ES Telephone: 01273 770540 Fax: 01273 770547		TITLE Section Switch Tool Kit DRAWING NUMBER <b>853905</b>
A	1043	FIRST ISSUE	EU	MAR 00		
REV	DCN	DESCRIPTION OF CHANGE	ENG	DATE		

## 18 Email Enquiry Form – Notes - Project History

Print fill in and email to [sales@lcswitchgear.com](mailto:sales@lcswitchgear.com)

★ L.C. Switchgear to complete

Company		Quote No ★	
Contact Name		Customer Order No ★	
Title		LCS Order No ★	
Company Address			
Tel.			
E-mail			
Inquiry Date		Catalogue Required	Yes / No

Application	On load <input type="checkbox"/>	Off Load <input type="checkbox"/>
Description of the project requirements	Please attach sketch of the circuit.	
Quantity		
Delivery required		

Poles	1	2	3	4	5	6	Other: -
-------	---	---	---	---	---	---	----------

System	DC		AC	
Voltage		V		V
Frequency				Hz
Current				A
Clearance *				mm
Creepage *				mm

System Faults	DC		AC	
Voltage		V		V
Frequency				Hz
Current				A
Time Const.				ms

\* If specified.

Operation						
Manual	Lever					
	Hand wheel					
Automatic	Motor		V	DC/AC	Hz	PH
	Actuator		V	DC/AC	Hz	PH
	Pneumatic		Bar	Solenoids	V	DC/AC Hz

Auxiliary Indication	Type	No per position	Positions required	Cabling Requirements	
	N/O - N/C			Cables Per Pole	
	N/O + N/C			Type	
	Pneumatic			Cable CSA	mm <sup>2</sup>
				Max. OD	mm
				Min Bend Radius	mm
Locking	Type	No per position	Positions required	Space Available	
	Padlock			Height	mm
	Key lock			Width	mm
				Depth	mm

Environment	Ingress Protection Degree	Max. Humidity	Typ. Max. Ambient Temperature	Typ. Min. Ambient Temperature
	IP	% @ °C	°C	°C
EMC	State Requirements -			
Materials	Normal	Low Smoke	Zero Halogen	Low smoke / zero halogen
Documents	Manuals **	Tests**	Labelling Language**	Special Packing **

\*\* Please state: -

Rev ★		Date ★		Authority ★	
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## 18.1 Project History

The extensive product history includes:

Customer Title	Major Projects	Year
South Western	Fratton Depot Switchgear	2021
Network Rail	Primrose Hill ICTS's	2021
RJ Power	Beckton Depot Switches	2021
NEXUS	Gosforth Depot Switchgear	2021
Blackpool Tramway	Fleetwood Tramway Extension	2021
London Underground Ltd	Neasden Depot	2021
NEXUS	Howdon Depot Switchgear	2020
LUL Nominee SSL Ltd	Farringdon Switchgear	2019
Balfour Beatty Rail	Northern Line Extension Tunnel Lighting	2019
Network Rail	CP5 additional works	2019
London Underground Ltd	Ealing & Upminster Depot Enabling Works	2019
Emico	Acton Depot CLIP Project	2019
Network Rail	CP5 Trackside Switchgear	2018
Lowery Ltd	Rotherhithe Panelboards	2018
McNicholas	Trackside Switchgear	2018
BCM Construction	Trackside Switchgear	2017
HVMS Power Engineering	LCS2 Supply Disconnectors & Frames	2015
LUL Nominee SSL Ltd	Modular MCOIS Switch and Hammersmith Depot work	2015
Network Rail	NSCD Status Indication & Training	2015
Network Rail	TFS Track Feeder Switches - Merseyrail	2015
EFACEC Sistemas Electronica	Substation Panels Dublin	2015
Network Rail	LCS2 Supply Disconnectors & Frames	2015
Govia Thameslink Railway	Maintenance and Service Support Contract	2015
Colas Rail	LCS2's & Frames	2015
Cairn Cross Civil Engineering Ltd	Wheel Lathe Road Contactor	2015
London Underground Limited	Gap Jumper Leads	2015
LUL Nominee SSL Ltd	Power Pedestal Components	2015
Transformers and Rectifiers	4.5kA Disconnectors Manual & Motorised	2014
Unipart Rail	LCS2's	2014
Siemens Plc	LVAC Panels	2014
EFACEC Sistemas Electronica	Substation Panels Dublin	2014
Tube Lines Ltd	Tranch 2 TIS Replacement	2014
Brecknell Willis & Co	Track Isolators and Contactor Panels - Beckton Ext	2014
Volker Fitzpatrick	LCS2's & Marshalling Boxes - Three Bridges	2014
Balfour Beatty Rail Infrastructure Services	4kA CTS's & LCS2's	2014
Tube Lines Ltd	MTIS Switches & RCTIS Changeover Switches	2014
Network Rail	2.5kA NSCD with LCP	2014
Network Rail	4kA CTS	2014
Network Rail	2.5kA NSCD with LCP	2014
London Underground Ltd	COLR Current Online Relays & Fuses	2014
UK Power Network Services	2.5kA NSCD with LCP	2014
Tube Lines Ltd	Track Isolating Switches	2014
LUL Nominee SSL Ltd	Upminster Depot	2014
LUL Nominee SSL Ltd	Ealing Common Depot	2014
Network Rail	Conductor Rail Heating Supply & Control Panels	2013
Tube Lines Ltd	Track Isolating Switches	2013
Brecknell Willis & Co	Midland Metro Substation Panels	2013
LUL Nominee SSL Ltd	Track Isolating & Changeover Switches	2013
LUL Nominee SSL Ltd	Current Online Relays & Fuses	2013
Network Rail	4kA CTS's	2013
Network Rail	4kA CTS's	2013
UK Power Network Services	4 kA CTS's	2013
Network Rail	4 kA CTS's	2013
Southern Railway Ltd	Selhurst Wheel Lathe	2012

Network Rail	LCS2 Supply Disconnectors & Frames	2012
Unipart Rail (Eurostar International Ltd)	Replacement Switches for Eurostar	2012
LUL Nominee SSL Ltd	Manual Track Isolating Switches	2012
Network Rail	Fuse Retrofits	2011
Eurostar (UK) Ltd	Coils Pistons & Cylinders	2012
LUL Nominee SSL Ltd	Track Isolating Switches	2011
HVMS Power Engineering	Dockland Track Isolators & Mimic Lime House Sub	2011
LUL Nominee SSL Ltd	Track Isolating Switches -Upminster	2011
Network Rail	Conductor Rail Heating Supply & Control Panels	2011
LUL Nominee SSL Ltd	Neasden Depot- Phase 2	2011
LUL Nominee SSL Ltd	Hammersmith Depot	2011
Network Rail	Conductor Rail Heating Supply Panels	2011
LUL Nominee SSL Ltd	Track Isolating Switches	2011
Network Rail	Conductor Rail Heating Supply Panels	2010
Lowery Ltd	LCS2 Supply Disconnectors & Frames	2010
BAM Nuttall Ltd	Neasden Depot - Phase 1	2010
LUL Nominee BCV Ltd	Current on line relays and Rail mounted Fuses	2010
LUL Nominee SSL Ltd	Track Isolating Switches	2010
Tube Lines Ltd	Track Isolating Switches	2010
BAM Nuttall	Neasden Depot	2010
EFACEC Sistemas Electronica	Dublin Light Rail A1 Extension	2010
Nexus	Tyne & Wear Metro Traction Isolating Switches	2010
Network Rail	Conductor Rail Heating Supply Panels	2010
LUL Nominee SSL Ltd	SSL Track Isolating Switches	2010
Brecknell Willis & Co	Docklands Extension (Stratford P6)	2009
Antagrade Electrical Ltd	Manchester Metro	2009
Carillion Rail	North London Line	2009
BBCJV (Balfour Beatty Carillion Joint Venture)	East London Line - New Cross Depot	2009
LUL Nominee BCV Ltd	Rail Mounted Fuses	2009
Metronet BCV	Acton Contactor Panel	2008
Brecknell Willis & Co	Dublin Light Rail C1 Extension	2008
Network Rail	Thameslink Contactors Ludgate Cellars	2008
Antagrade	Docklands Track Isolators & Indicators	2008
Metronet Rail SSL	SSL Track Isolating Switches	2008
Ultra-Electronics (PMES)	East London Line	2008
EMICO-Rail	New Cross Depot Contactor Panels	2008
Network Rail	Thameslink Contactors Farringdon	2008
Eurostar	TMSTG Hafner Valve Retrofit	2008
EFACEC Sistemas Electronica	Dublin Light Rail B1 & Sandyford Depot Extension	2008
Metronet	DEISIP Phase II	2008
Metronet	Victoria Line Upgrade VLU	2008
Eurostar	Switch pneumatic kits	2007
Tube Lines	RCTIS's for Stanmore	2007
Fitzpatrick Contractors	Ashford Depot Buffer Zone	2007
Brecknell Willis & Co.	Dockland Light Railway - Woolwich Arsenal Extension	2007
UKAEA	Contactor Switch panel	2007
Birse Process	Spark Gap 25kv/11kv CTRL Channel Tunnel Rail Link	2007
Ultra-Electronics	Bonding devices LCS2s Ramsgate Depot	2007
Alstom (Brazil)	Traction Equipment	2007
Bam Rail bv	Dublin Light Rail LUAS Red Cow Depot Extension	2007
CCLRC (Rutherford Appleton Lab)	Bonding Switch assemblies	2007
Ultra-Electronics	Bonding devices Ashford Depot	2007
AMEC Capital Projects	Bonding devices All Southern Depots	2007
Ultra-Electronics	Bonding devices Ashford Depots	2006
Metronet SSL	Tunnel Switch	2006
Mowlem Ltd	Dockland Light Rail Beckton Depot	2006
Balfour Beatty Rail	Temple Mills 25kv Switchgear	2006
Network Rail	Spark Gap & Non Linear Resistors North London Line	2006

Tube Lines	RCTIS's for Heathrow	2006
Tube Lines	RCTIS's for Wembley Park	2006
Network Rail	LCS2's for the Power Upgrade	2006
Network Rail	LCS2's for the Power Upgrade	2005
Network Rail	Conductor Rail Heating	2005
ACT Joint Venture	Spark Gap & Non Linear Resistors CTRL Channel Tunnel Rail Link	2005
Bailey Rail	DEISIP Infraco BCV Depot Improvement	2005
Bailey Rail	DEISIP Infraco JNP Depot Improvement	2005
Network Rail	LCS2's for the Wessex Power Upgrade	2004
Bailey Rail	Upminster Wheel Lathe Project	2004
AMEC Capital Projects	LCS2's for the GoVia Depot Upgrade	2004
Brecknell Willis & Co.	Dockland Light Rail City Airport Extension	2004
AMEC SPIE	Spark Gap & Non Linear Resistors CTRL Channel Tunnel Rail Link	2003
Blackpool Transport	Depot Isolator	2003
Railtrack	2 Panel Switchboard for Greenwich Substation	2003
AMEC Capital Projects	GoVia Depot Contactor panels	2003
AMEC Capital Projects	Depot Controlled track Switch CTS Mk 3's and LCS2's	2003
Network Rail	LCS2's for the Power Supply Upgrade	2003
Bombardier	Electrostar Shoe gear Isolation Switches	2002
Balfour Beatty Rail	Supply Disconnectors	2002
Infraco BCV	Depot Isolator	2002
Infraco JNP	Depot Isolator	2002
Mowlem Railways	Controlled Track Switch	2002
NEXUS	OHL Section Isolators	2002
Railtrack	Multi panel Distribution Switchboard London Bridge Signal Box	2002
Railtrack	Complete Installation for London Bridge Signal Box	2002
Railtrack	2 Panel Switchboard for London Bridge Signal Box	2002
Railtrack	Depot Isolator/bonding switch	2002
Brecknell Willis & Co.	Dublin Light Rail LUAS Electrification	2002
ABB	Link Box West Coast Main Line	2001
Railtrack	3 Panel Switchboard for London Bridge Signal Box	2001
Semple Cochrane	Supply Disconnectors	2001
Ultra-Electronics	DCDS for CTRL	2001
URENCO	Test Bed Switches	2001
Roche Products Ltd	MV Medium voltage switches, twin motor isolators	1999
Ultra-Electronics	Hays Chemical Plant - Chlorine Cell Rectifier supply.	1999
Railtrack	Conductor Rail heating	1999
Adtranz/Bombardier	Electrostar Shoe gear Bonding Switches	1999
CEGELEC Beautiel	Medium voltage switches for Oil Rigs	1998
Elequip Projects Ltd	MV Control panel	1998
UKAEA	Nuclear Research Equipment Isolators	1998
AMEY McAlpine	Croydon Tramway	1998
Brecknell Willis & Co.	Dockland Light Railway Extension	1998
London Electricity	Automation of existing manual Ringmaster Circuit Breakers	1998
Balfour Beatty	ML-CTS Units	1997
Brecknell Willis & Co.	Midland Metro	1997
Lounsdale Electrical	MLU- TTSM IP67 tunnel switches for LUL	1997
Railtrack	ML-CTS Units for Railtrack	1997
GEC Alsthom	Inchon & Pusan Line 2 Fuse Assembly	1997
Gatwick Airport	Gatwick Airport Terminal Transit System	1996
Hunslett Barclay	Mining traction Equipment	1996
JET	Joint Taurus project	1996
CEGELEC Projects Ltd	London Underground Jubilee Line Extension	1996
Deeside Electrical Ltd	Wirral Tramway	1995
Dockland Light Railway	Dockland Light Railway	1995
LUL	MLU - TIS double pole isolating switches	1995
T & R	Automated transformer tap changer switches	1995
Hill Graham	Power Generation and traction applications	1995



Brush Traction	SF800 Bonding Switch Class 92	1994
CEGELEC Projects Ltd	Ankara Rapid Transit System	1994
GEC Alsthom	Ankara Train Switch	1994
GEC Manchester & Preston	Test Bed Switches	1994
N.E. Water	Automated FA Switches	1994
Railtrack	ML-CTS Units on Waterloo to Channel Tunnel.	1994
Brentford Electric	British Rail DCDS DC Disconnecter switch project	1993
GEC Alsthom TMST	Battery Isolator	1993
Thorn Automation	British Rail DCDS Switches	1993
Whipp & Bourne	British Rail - Waterloo 10kA Substation Switches	1993
GEC Alsthom TMST	Converter Changeover Switches on Channel Tunnel TMST	1993
GEC Alsthom TMST	SF 800 Shoe gear Bonding switches	1992

## 18.2 LCS 2021 Christmas Card – 2154 'William Siemens' in August 1926

# Merry Christmas from LCS



*2154 'William Siemens' in August 1926*

### LCS PRODUCTS:

- 8800146- 2kA Isolator & Bonding Switch (LH Side)
- 8800523 Integrated CTS at Strawberry Hill
- 8800488 – NSCD's (Background of Strawberry Hill)
- 8800514 – NSCD Interlocking Panel (in front of Strawberry Hill)
- 8800411 – 4kA Tunnel Switch – Northern Line Extension (on bridge) with – Long Range Stainless Steel Remote Control (front Left Hand Side)
- 8800534 – Earth Negative Changeover Panel – Kirkdale Depot (front and centre)
- 8800496 OSI's (on Bridge)
- 8800261 – Depot Contactors Outdoor – Fratton Depot (on Bridge)
- 8800185 – LCS2's (behind the train)

If you would like to receive the 2022 LCS Xmas Card, please contact [mail@lcswitchgear.com](mailto:mail@lcswitchgear.com) with your full postal address details.

## Notes
