

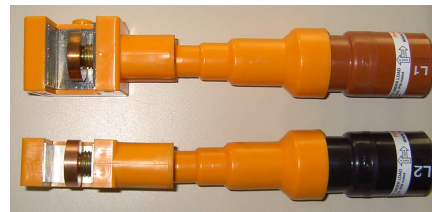
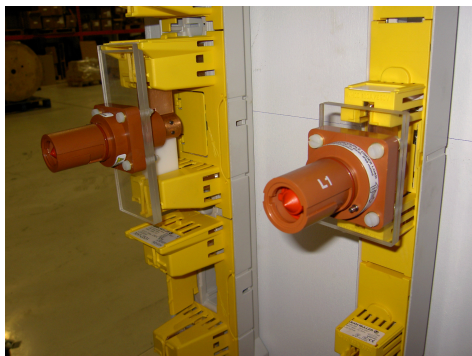
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Rev 5: March 2009

## Powerline Connectors, Cables and Devices



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## POWERLINE CONNECTORS

### INTRODUCTION



#### BACKGROUND

Keyed “L” slot single pole connectors have become widely adopted in a diverse range of applications and industries.

One of the main features of early designs was the mechanical keying of the connectors to prevent possible connection errors.

i.e. A Phase Line cannot be connected into Earth Line etc.

it was evident that several enhancements to existing designs were possible to further improve the product but at the same time remaining intermateable.

#### TYPICAL APPLICATIONS

- Power Distribution
- Utilities
- Electric Vehicles
- Railway Equipment
- Military Field Power
- Mobile Generators
- Loadbanks
- Back-up Power Systems

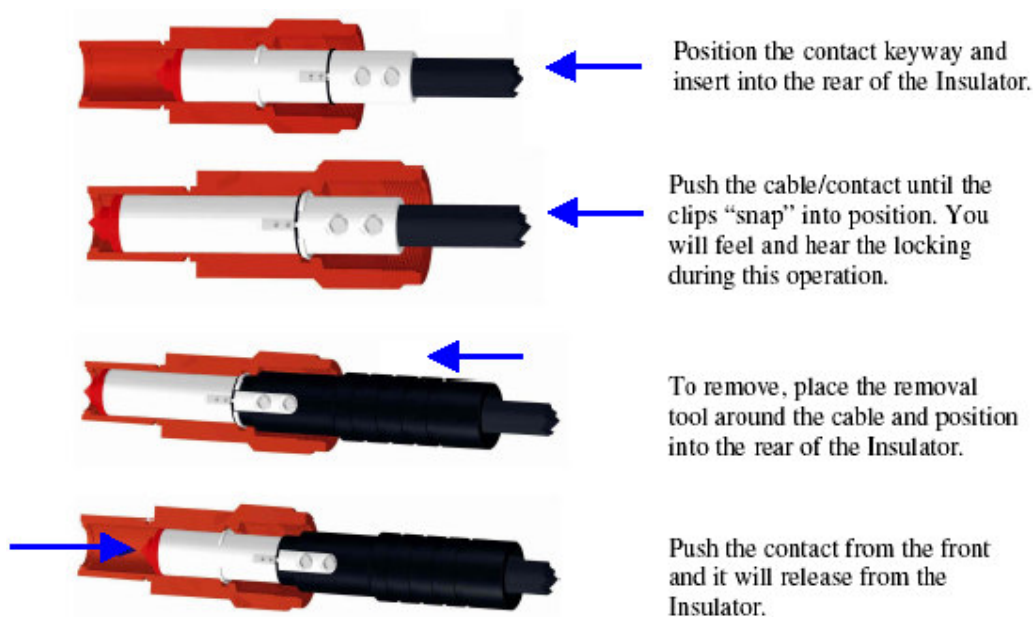
#### POWERLINE FEATURES

- 500 Mating Cycles minimum.
- Intermateable with other versions.
- IP2X Finger Protected contacts.
- IP68 sealed when mated.
- Remote tool required to release mated connectors.
- For use with Electrical Power Cables.
- Heavy Duty Hand Grips.
- Clip retained contacts.
- No Dowel / Cotter pin required.
- Cable sizes from 25mm<sup>2</sup> to 300mm<sup>2</sup>
- Facilitate cables up to 37mm Ø.
- High Impact Insulators.
- Harmonised Colour Coding.
- CE Compliant.
- EN/ESI compliant Creepage and Clearance distances.
- Multi-louver contact system.
- Mechanically keyed to prevent connection errors.
- Permanent Marking
- Set Screw and Crimp contact versions.
- UL94 VO Flame Retardant.
- Field Assembly & Repair.
- No special tools required.
- Daisy Chain hook up system.

## POWERLINE CONNECTORS

### CLIP CONTACT RETENTION SYSTEM

- Some versions of this connector format have relied upon the Electrical Contact being retained within the Insulator by means of a Plastic dowel/cotter pin.
  - These pins are forced through a mating hole in the insulator and contact and any re-use of the same pin may adversely affect the IP sealing of the connectors.
  - Ten 47 “Powerline” contacts are retained by means of a spring clip design that can retain the equivalent weight of 100metres of 240mm<sup>2</sup> cable.
  - The contacts are inserted from the rear and “snap” into position within the Insulator with no requirement for any Cotter/Dowel pin or assembly tools.
  - A simple removal tool is supplied to release the contact from the insulator.
  - As our clip design does not require any holes through the Insulator, it provides several advantages over the “cotter/dowel pin” design;
- On-Centre contact alignment ensures low connector mating forces.
  - Improved mechanical Insulator strength and Environmental Sealing to IP68.
  - Improved electrical integrity of the Insulator.
  - Reduced assembly times.
  - The contacts can be removed and replaced with no detrimental affect to the Insulator.
  - No replacement parts (cotter/dowel pins) are required.



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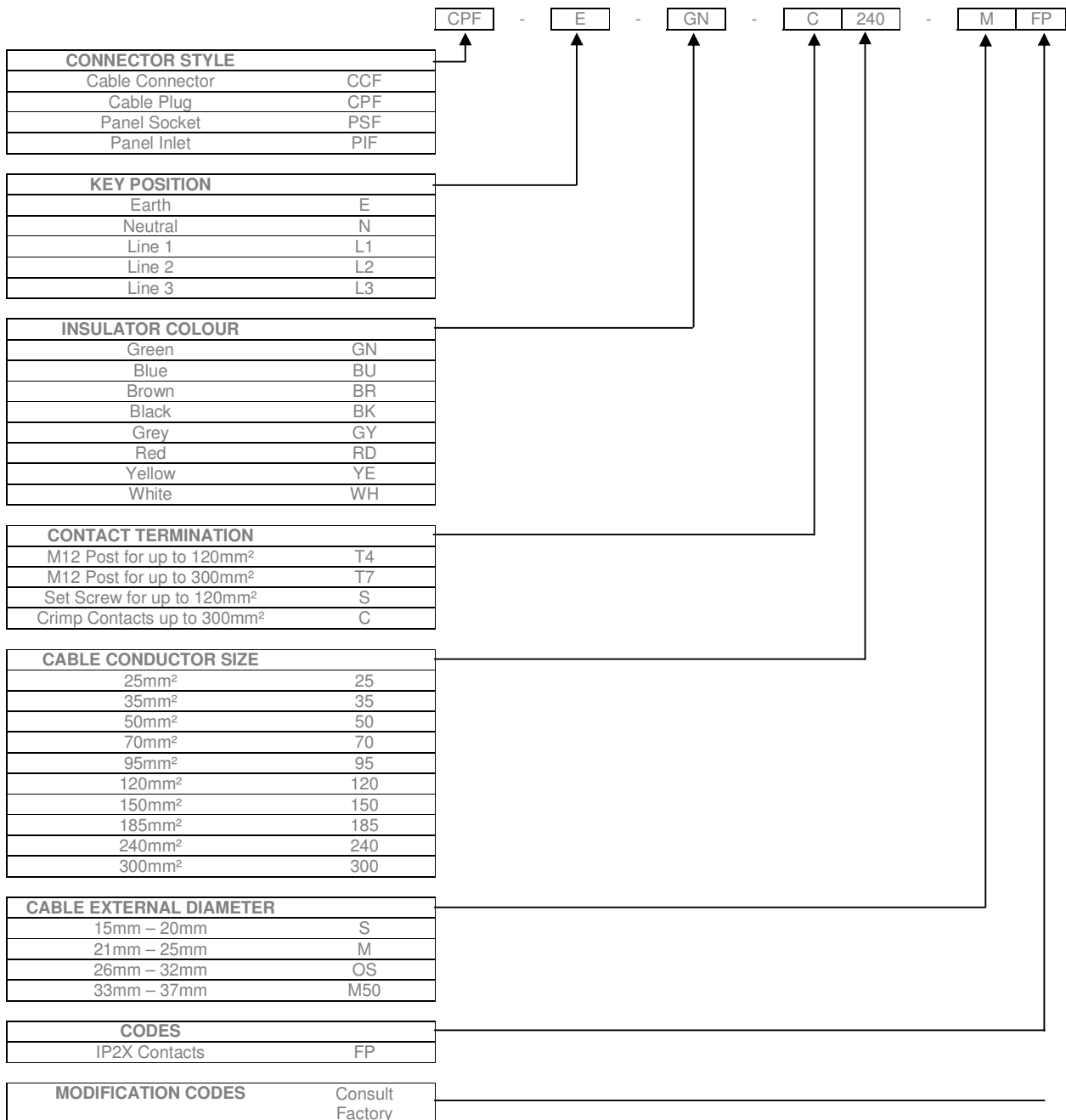
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## POWERLINE CONNECTORS

### PART NUMBER CONFIGURATION



	Earth	Neutral	Line 1	Line 2	Line 3
UK & Europe	Green	Blue	Brown	Black	Grey
UK (Old)	Green	Black	Red	Yellow	Blue
USA	Green	White	Black	Red	Blue
Australia	Green	Black	Red	White	Blue

## POWERLINE CONNECTORS

### CABLE CONNECTOR (Line Source) Style “CCF”

Cable Connectors are typically used as the Live or Supply side of the circuit and utilise a Solid Insulated contact tip to provide IP2X Finger Protection when unmated. “CCF” Connectors incorporate a slot that engages with the Locking Pin on both the mating Panel Inlet and Cable Plug connectors.



### CABLE PLUG (Line Drain) Style “CPF”

“CPF” Connectors utilise a spring-mounted contact with a Double Insulated Sleeve that provides IP2X Finger Protection when unmated. The “CCF” contact depresses the spring and sleeves to obtain Electrical connection. When unmated, they return automatically to the IP2X position. A Locking Pin engages with the slot on both the Panel Socket and Cable Connectors when mated.



### PANEL SOCKET (Panel Source) Style “PSF”

Panel Socket Connectors are typically used as the Live or Supply side of the circuit and utilise a Solid Insulated contact tip to provide IP2X Finger Protection when unmated. “PSF” Connectors incorporate a slot that engages with the Locking Pin on both the mating Panel Inlet and Cable Plug connectors.



### PANEL INLET (Panel Drain) Style “PIF”

“PIF” Connectors utilise a spring-mounted contact with a Double Insulated Sleeve that provides IP2X Finger Protection when unmated. The “CCF” contact depresses the spring and sleeves to obtain Electrical connection. When unmated, they return automatically to the IP2X position. A Locking Pin engages with the slot on both the Panel Socket and Cable Connectors when mated.



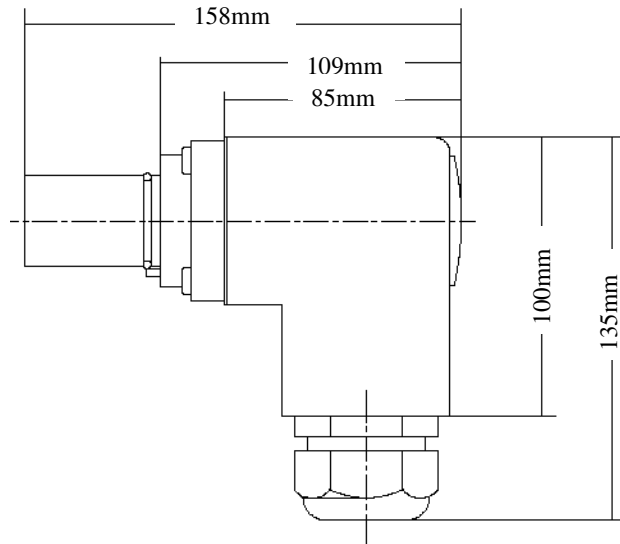
- All connectors are IP2X Protected.
- In Line Connectors are supplied as standard with Metric Cable Glands.
- Connectors seal to IP68 when mated.
- Once mated, the connectors are separated by using a remote unlocking key.
- Panel connectors can be Front or Rear mounted on equipment.
- All connectors are mechanically keyed and individually colour coded to help prevent any possible cross connection errors.
- (see page 5 for key positions and colours)
- Plastic Push / Pull or Environmental Locking caps are available for all connectors.





## POWERLINE CONNECTORS

### Right Angled Connectors and Cable Assemblies



For applications where space is restricted, for example within Cabinets that require the door to be closed and locked while Generator Connectors are attached.

The right angle connectors can be supplied as either “CPF” Plug or “CCF” Connectors and cable assemblies supplied to suit individual requirements.

A standard assembly consists of 2 metres of 150mm<sup>2</sup> cable with a connector configuration as shown above.

The 90° Connectors can be supplied separately for self-assembly as shown in the following table.  
 All connectors are IP2X Protected when un-mated and provide IP68 Protection when mated.

Item	Part Number
90° Cable Assembly	FER***-**m-*
*** = Cable Size mm <sup>2</sup>	95, 120, 150, 185, 240, 300
** = Cable Length	As required in metres
* = Phase.	E, N, 1, 2 or 3

Example	FER300-2m-N
---------	-------------

Item	Part Number
90° Plug Connector	CPRF-*_-**_-***_-****_-FP
* = Phase	E, N, 1, 2 or 3
** = Colour	GN, BU, BR, BK, GY, RD, YE or WH.
*** = Cable Size	95, 120, 150, 185, 240, 300
**** = Gland Size	M = 19mm / 28mm cable Ø OS = 22mm / 32mm cable Ø M50 = 30mm / 37mm cable Ø
Assembly Tool	TBS-13
Example	CPRF-E-GN-240-M50-FP

Item	Part Number
90° Cable Connector	CCRF-*_-**_-***_-****_-FP
* = Phase	E, N, 1, 2 or 3
** = Colour	GN, BU, BR, BK, GY, RD, YE or WH
*** = Cable Size	95, 120, 150, 185, 240, 300
**** = Gland Size	M = 19mm / 28mm cable Ø OS = 22mm / 32mm cable Ø M50 = 30mm / 37mm cable Ø
Assembly Tool	TBS-13
Example	CCRF-3-GY-120-M-FP

## POWERLINE CONNECTORS

### Cable Lug to Powerline Conversion

This device enables the conversion of pre-terminated cables with M10 Lug Terminals to in-line Powerline cable connectors.

Cable Lugs can be either Copper or Bi-Metallic (Aluminium Barrels with Copper Palms)

Lugs from 35mm<sup>2</sup> to 300mm<sup>2</sup> with a maximum Palm Width of 37mm and Cable Diameters from 15mm to 37mm can be terminated.

Bolt the Lugged cable onto the Powerline Contact, align within the Insulator and push the cable home until it locks into the Clipped Contact retention system.

A simple tool can be supplied to remove the contact and lug from the Insulator.

The product can be supplied for either Cable Connector (CCF) or Cable Plug (CPF) contacts, both of which provide IP2X protection.

4 sizes of Cable Gland are available to accommodate a wide range of cable and lug dimensions and provide IP68 Sealing.

#### LUG to CCF CONVERSION

Part No: L2CCF-\*\_\*\_\*\_\*\_\*  
example: L2CCF-E-GN-M

#### LUG to CPF CONVERSION

Part No: L2CPF-\*\_\*\_\*\_\*\_\*  
example: L2CPF-N-BU-M50

Please add codes as shown to complete the part numbers



#### Part Number Codes

- \* = E, N, L1, L2 or L3.
- \*\* = GN (Green). BU (Blue). BR (Brown). BK (Black). GY (Grey). WH (White). RD (Red) or YL (Yellow).
- \*\*\* = S = 15mm/23mm cable Ø and 23mm maximum lug palm width.  
M = 19mm/28mm. cable Ø and 28mm maximum lug palm width.  
OS = 22mm/32mm cable Ø and 32mm maximum lug palm width.  
M50 = 30mm/37mm cable Ø and 37mm maximum lug palm width.



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## POWERLINE DEVICES and ACCESSORIES

### INTRODUCTION

To compliment our Powerline connectors, we have manufactured several accessories and devices to allow for various connection requirements onto LV Busbars and Circuits.

Short, Long and 90° G-Clamps, Rotary Clamps, Overhead Line Clamps and JSU / JPU Fuse Carriers with a built in Powerline Generator Connection.

Where appropriate, the devices have been independently tested and approved in accordance with: "Testing of Insulated Tools and Assemblies for Live Working and use up to 1000V A.C. and 1500V D.C. to BS EN 60900:2004"

Also available are Replacement Kits for damaged Insulators that require Dowel Pins or to change from Old to New Harmonised colours without changing the electrical contact.

We are currently manufacturing other Powerline devices and we welcome the opportunity to discuss any individual requirements you may have.

1 of 12

**ERA**  
TECHNOLOGY

**ELECTRICAL TESTING**

**Testing Of Insulated Tools And Assemblies For Live Working And Use Up To 1000V A.C. And 1500V D.C. To BS EN 60900:2004**

S R Heady

ERA Report 2005-0483  
ERA Project: TE2050007  
Final Report

Client : Ten 47 Ltd

Client Reference : P06644

ERA Report Checked by: *David Triggs*  
David Triggs  
Head of Electrical Testing

Approved by: *Simon Brown*  
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July 03

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Company registered in England No 4544559  
Approved to BS EN ISO 9001:2008  
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## FUSE CARRIER with GENERATOR CONNECTION

Fuse Carriers with Powerline Generator Input to connect into distribution boards.  
 This allows for a generator cable to be connected to either the LV busbar or feeder circuit.  
 Available with Neutral, Line 1, Line 2 or Line 3 Powerline connectors for either JPU 82mm or JSU 92mm pitch.



Item	Part Number
JPU 82mm Neutral	FC82-N-BU
JPU 82mm Line 1	FC82-1-BR
JPU 82mm Line 2	FC82-2-BK
JPU 82mm Line 3	FC82-3-GY
JPU 82mm Dummy Fuse	PDF-82

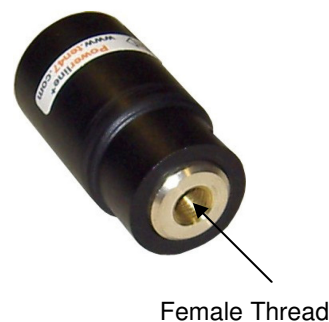
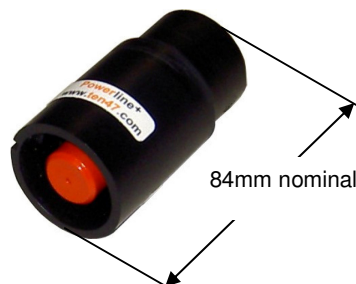
JSU 92mm Neutral	FC92-N-BU
JSU 92mm Line 1	FC92-1-BR
JSU 92mm Line 2	FC92-2-BK
JSU 92mm Line 3	FC92-3-GY
JSU 92mm Dummy Fuse	PDF-92

## POWERLINE Screw on Connectors

Where a customer requires a connection onto an existing threaded post, we can supply our 400Amp Powerline connectors with various threads to suit many applications.  
 By using these designs, all mechanical key positions to prevent connection errors are maintained, the unmated connector provides IP2X Finger Proof protection and sealed to IP68 when mated to our standard Cable Plugs.

Item	Female Thread	Part Number
Earth Connector	M12	PSF-E-GN-T4-NF-M12FT
Neutral Connector	M12	PSF-N-BU-T4-NF-M12FT
Line 1 Connector	M12	PSF-1-BR-T4-NF-M12FT
Line 2 Connector	M12	PSF-2-BK-T4-NF-M12FT
Line 3 Connector	M12	PSF-3-GY-T4-NF-M12FT

Earth Connector	M8	PSF-E-GN-T4-NF-M8FT
Neutral Connector	M8	PSF-N-BU-T4-NF-M8FT
Line 1 Connector	M8	PSF-1-BR-T4-NF-M8FT
Line 2 Connector	M8	PSF-2-BK-T4-NF-M8FT
Line 3 Connector	M8	PSF-3-GY-T4-NF-M8FT



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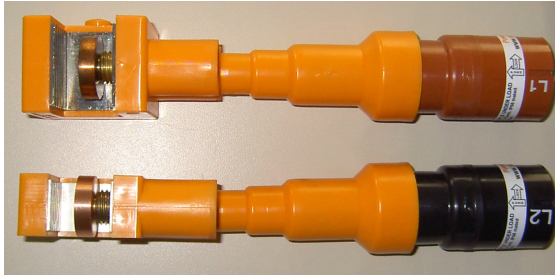
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## INSULATED G-CLAMPS

Insulated clamps, tool and either 28mm wide 400Amp or 45mm wide 750Amp G-Clamp heads and Powerline Generator connector for connection to LV busbars.  
 Available with “CCF” or “CPF” style cable connectors and Short Arm, Extended Arm and 90° versions with Earth, Neutral, Line 1, Line 2 or Line 3 positions.



GCS750-1-BR

NGCS400-2-BK



GCH750

### “CCF” 400Amp Cable Connector

Item	Part Number
Short Arm Earth	NGCS400-E-GN
Short Arm Neutral	NGCS400-N-BU
Short Arm Line 1	NGCS400-1-BR
Short Arm Line 2	NGCS400-2-BK
Short Arm Line 3	NGCS400-3-GY
Insulated T-Bar	GCH750

Item	Part Number
Long Arm Earth	NGCL400-E-GN
Long Arm Neutral	NGCL400-N-BU
Long Arm Line 1	NGCL400-1-BR
Long Arm Line 2	NGCL400-2-BK
Long Arm Line 3	NGCL400-3-GY

Item	Part Number
90° Earth	NGCR400-E-GN
90° Neutral	NGCR400-N-BU
90° Line 1	NGCR400-1-BR
90° Line 2	NGCR400-2-BK
90° Line 3	NGCR400-3-GY

### “CPF” 400Amp Cable Plug

Item	Part Number
Short Arm Earth	NGCSP400-E-GN
Short Arm Neutral	NGCSP400-N-BU
Short Arm Line 1	NGCSP400-1-BR
Short Arm Line 2	NGCSP400-2-BK
Short Arm Line 3	NGCSP400-3-GY
Insulated T-Bar	GCH750

Item	Part Number
Long Arm Earth	NGCLP400-E-GN
Long Arm Neutral	NGCLP400-N-BU
Long Arm Line 1	NGCLP400-1-BR
Long Arm Line 2	NGCLP400-2-BK
Long Arm Line 3	NGCLP400-3-GY

Item	Part Number
90° Earth	NGCRP400-E-GN
90° Neutral	NGCRP400-N-BU
90° Line 1	NGCRP400-1-BR
90° Line 2	NGCRP400-2-BK
90° Line 3	NGCRP400-3-GY

### CCF” 750Amp Cable Connector

Item	Part Number
Short Arm Earth	GCS750-E-GN
Short Arm Neutral	GCS750-N-BU
Short Arm Line 1	GCS750-1-BR
Short Arm Line 2	GCS750-2-BK
Short Arm Line 3	GCS750-3-GY
Insulated T-Bar	GCH750

Item	Part Number
Long Arm Earth	GCL750-E-GN
Long Arm Neutral	GCL750-N-BU
Long Arm Line 1	GCL750-1-BR
Long Arm Line 2	GCL750-2-BK
Long Arm Line 3	GCL750-3-GY

Item	Part Number
90° Earth	GCR750-E-GN
90° Neutral	GCR750-N-BU
90° Line 1	GCR750-1-BR
90° Line 2	GCR750-2-BK
90° Line 3	GCR750-3-GY

### “CPF” 750Amp Cable Plug

Item	Part Number
Short Arm Earth	GCSP750-E-GN
Short Arm Neutral	GCSP750-N-BU
Short Arm Line 1	GCSP750-1-BR
Short Arm Line 2	GCSP750-2-BK
Short Arm Line 3	GCSP750-3-GY
Insulated T-Bar	GCH750

Item	Part Number
Long Arm Earth	GCLP750-E-GN
Long Arm Neutral	GCLP750-N-BU
Long Arm Line 1	GCLP750-1-BR
Long Arm Line 2	GCLP750-2-BK
Long Arm Line 3	GCLP750-3-GY

Item	Part Number
90° Earth	GCRP750-E-GN
90° Neutral	GCRP750-N-BU
90° Line 1	GCRP750-1-BR
90° Line 2	GCRP750-2-BK
90° Line 3	GCRP750-3-GY

## INSULATED G-CLAMP CABLE ASSEMBLY

For connection to busbars where space is restricted. Assembly comprises of our Insulated G-Clamp Head, 400Amp Powerline “CCF” or “CPF” connector and 2 metres of 120mm<sup>2</sup> single core cable. The cable size and length can be changed to suit individual requirements.

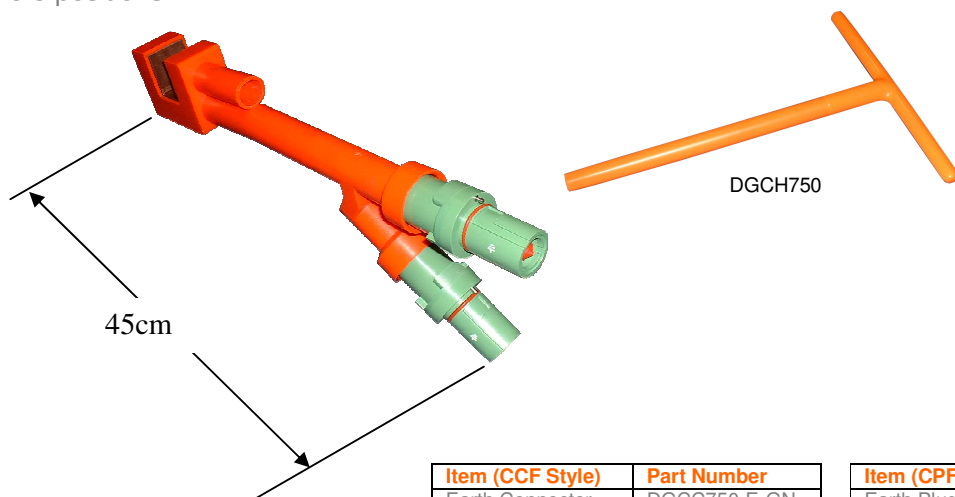
Item	Part Number
Earth Cable Connector Assembly	GCC120-2-E-GN
Neutral Cable Connector Assembly	GCC120-2-N-BU
Line 1 Cable Connector Assembly	GCC120-2-1-BR
Line 2 Cable Connector Assembly	GCC120-2-2-BK
Line 3 Cable Connector Assembly	GCC120-2-3-GY
Insulated T-Bar	GCH750

Item	Part Number
Earth Cable Plug Assembly	GCP120-2-E-GN
Neutral Cable Plug Assembly	GCP120-2-N-BU
Line 1 Cable Plug Assembly	GCP120-2-1-BR
Line 2 Cable Plug Assembly	GCP120-2-2-BK
Line 3 Cable Plug Assembly	GCP120-2-3-GY
Insulated T-Bar	GCH750



## INSULATED G-CLAMP with Double Cable Connection

1200Amp Insulated G-Clamp, Arm, 2 x Powerline “IP2X” connectors and extended T-Bar for connection to live LV busbars. Available with Powerline “CCF” or “CPF” style cable connections and Earth, Neutral, Line 1, Line 2 & Line 3 positions.



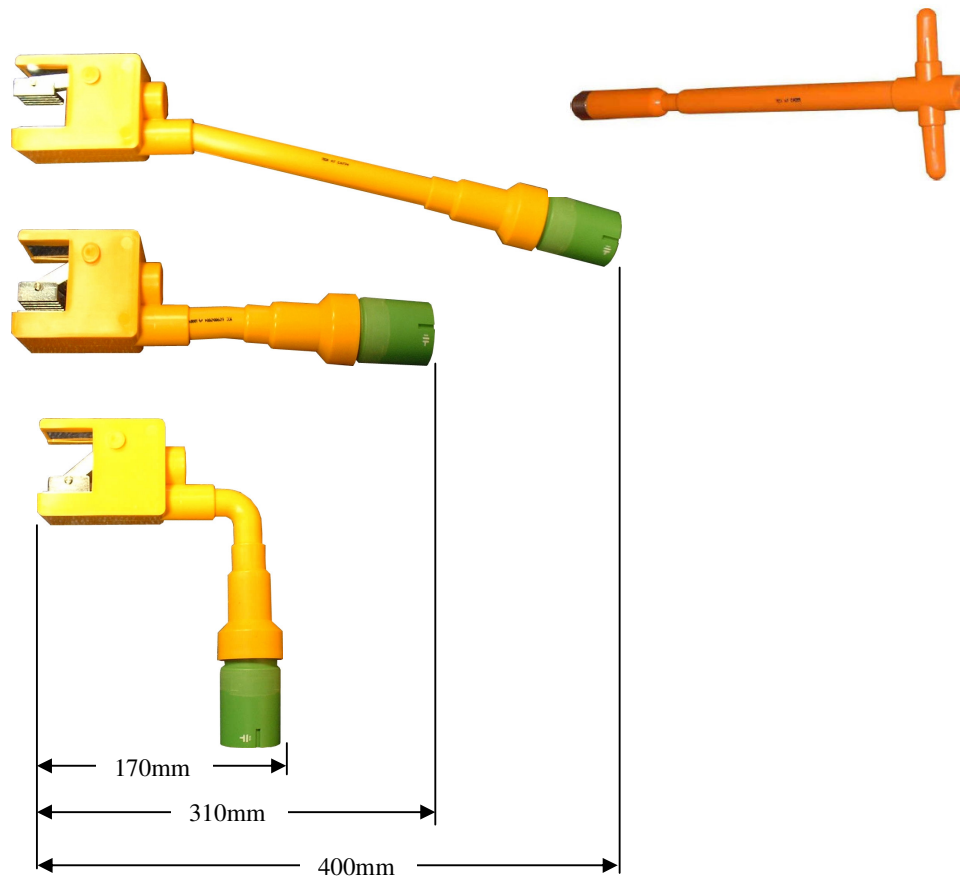
Item (CCF Style)	Part Number
Earth Connector	DGCC750-E-GN
Neutral Connector	DGCC750-N-BU
Line 1 Connector	DGCC750-1-BR
Line 2 Connector	DGCC750-2-BK
Line 3 Connector	DGCC750-3-GY
Insulated T-Bar	DGCH750

Item (CPF Style)	Part Number
Earth Plug	DGCP750-E-GN
Neutral Plug	DGCP750-N-BU
Line 1 Plug	DGCP750-1-BR
Line 2 Plug	DGCP750-2-BK
Line 3 Plug	DGCP750-3-GY

## INSULATED HORIZONTAL CLAMPS

Insulated clamp, tool and 750Amp Powerline Generator connector for connection to LV busbars.

Available with Powerline "CCF" or "CPF" style cable connections with Short, Extended and 90° Arms with Earth, Neutral, Line 1, Line 2 or Line 3 Powerline connectors.



Item (CCF Style)	Part Number
Short Arm Earth	HCS750-E-GN
Short Arm Neutral	HCS750-N-BU
Short Arm Line 1	HCS750-1-BR
Short Arm Line 2	HCS750-2-BK
Short Arm Line 3	HCS750-3-GY
Insulated T-Bar	GCH750

Item (CCF style)	Part Number
Long Arm Earth	HCL750-E-GN
Long Arm Neutral	HCL750-N-BU
Long Arm Line 1	HCL750-1-BR
Long Arm Line 2	HCL750-2-BK
Long Arm Line 3	HCL750-3-GY

Item (CCF Style)	Part Number
90° Earth	HCR750-E-GN
90° Neutral	HCR750-N-BU
90° Line 1	HCR750-1-BR
90° Line 2	HCR750-2-BK
90° Line 3	HCR750-3-GY

Item (CPF Style)	Part Number
Short Arm Earth	HCSP750-E-GN
Short Arm Neutral	HCSP750-N-BU
Short Arm Line 1	HCSP750-1-BR
Short Arm Line 2	HCSP750-2-BK
Short Arm Line 3	HCSP750-3-GY
Insulated T-Bar	GCH750

Item (CPF Style)	Part Number
Long Arm Earth	HCLP750-E-GN
Long Arm Neutral	HCLP750-N-BU
Long Arm Line 1	HCLP750-1-BR
Long Arm Line 2	HCLP750-2-BK
Long Arm Line 3	HCL750P-3-GY

Item (CPF Style)	Part Number
90° Earth	HCRP750-E-GN
90° Neutral	HCRP750-N-BU
90° Line 1	HCRP750-1-BR
90° Line 2	HCRP750-2-BK
90° Line 3	HCR750-3-GY

## INSULATED ROTARY CLAMP

Insulated clamp, tool and 750Amp Powerline Generator connector for connection to slotted LV busbars.

Available with Earth, Neutral, Line 1, Line 2 or Line 3 Powerline connectors.

Item	Part Number
Rotary Clamp Earth	RC750-E-GN
Rotary Clamp Neutral	RC750-N-BU
Rotary Clamp Line 1	RC750-1-BR
Rotary Clamp Line 2	RC750-2-BK
Rotary Clamp Line 3	RC750-3-GY
Insulated Handle	RCH750



## INSULATED OVERHEAD LINE CLAMP

Insulated clamp, 750Amp Powerline Generator connector and 3metres of 50mm<sup>2</sup> flexible single core cable for connection to LV Overhead Lines.

Available with Earth, Neutral, Line 1, Line 2 or Line 3 Powerline connectors.

Other cable lengths and cable sizes are available if required.

Item	Part Number
Overhead Line Clamp Earth	OH3-E-GN
Overhead Line Clamp Neutral	OH3-N-BU
Overhead Line Clamp Line 1	OH3-1-BR
Overhead Line Clamp Line 2	OH3-2-BK
Overhead Line Clamp Line 3	OH3-3-GY





## INSULATED UNDERGROUND CABLE CONNECTOR

Insulated unit for connecting Generators to Solid or Stranded Underground Alloy Cables up to 185mm<sup>2</sup>.

Incorporating a 750Amp Powerline Generator connector with cable termination via 2 set screws tightened with the Insulated Ratchet tool.

Item	Part Number
Underground Cable Connector Neutral	UCC750-N-BU
Underground Cable Connector Line 1	UCC750-1-BR
Underground Cable Connector Line 2	UCC750-2-BK
Underground Cable Connector Line 3	UCC750-3-GY
Insulated Ratchet Tool	UCH750



## TRANSFORMER POLE MOUNTED FUSE

By removing the existing screw in fuse and replacing with the Powerline Fuse Unit, it allows for connection of a Generator cable to the Overhead Line.

As the unit incorporates a Dummy Fuse, connection can only be made to the outgoing circuit.

Item	Part Number
Pole Mounted Fuse Unit Neutral	PMF200-N-BU
Pole Mounted Fuse Unit Line 1	PMF200-1-BR
Pole Mounted Fuse Unit Line 2	PMF200-2-BK
Pole Mounted Fuse Unit Line 3	PMF200-3-GY



## PANEL MOUNTED UNITS

Ten 47 can supply pre-mounted Powerline Sockets or Inlets in standard 19" format. The units and connectors provide finger protection to IP2X when unmated.

Each connector offers distinct mechanical keyways to ensure the correct mating of Lines / Phase. ie. The Earth Cable will only mate with the Earth Panel, Neutral to Neutral, L1 to L1, L2 to L2 and L3 to L3.

Incorporating our standard Powerline Panel connectors with M12 Stud terminations, these units are designed for use and operation by "electrically trained and competent" personnel.

There are 2 sizes of unit available to fit different Panel cut out dimensions.

Design 1: Height = 80mm.      Width = 483mm.  
Design 2: Height = 176mm.      Width = 483mm.

**PSP/1**



**PIP/2**



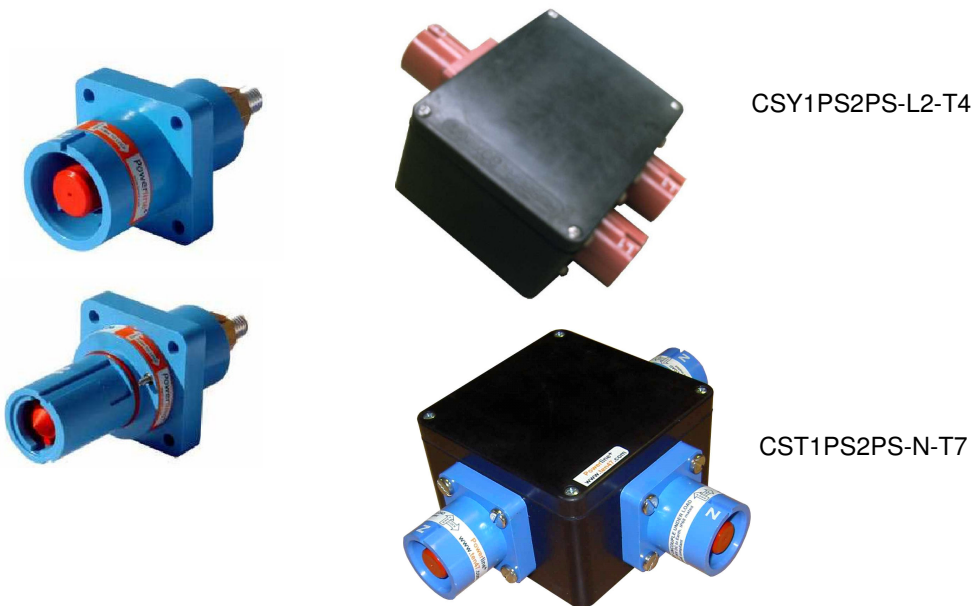
Design 1	Part Number
5 x PSF-T4	PSP4/1
5 x PIF-T4	PIP4/1
5 x PSFT7	PSP7/1
5 x PIFT7	PIP7/1

Design 2	Part Number
5 x PSF-T4	PSP4/2
5 x PIF-T4	PIP4/2
5 x PSFT7	PSP7/2
5 x PIFT7	PIP7/2

## CABLE SPLITTERS

Incorporating our Powerline Panel connectors and housed in a tough Rubber enclosure, these units can be configured for several inlet / outlet options utilising either our T4 or T7 Panel connectors.

All Cable and Panel connectors are IP2X rated, once assembled and coupled, the Cable Splitter is sealed to IP65.



T-Piece Description	Inlet A	Outlet B	Outlet C	Part Number
1 Inlet, 2 Outlet	1 x PS	1 x PS	1 x PS	CST1PS2PS-*-*
	1 x PS	1 x PI	1 x PI	CS1PS2PI-*-*

Y-Piece Description	Inlet A	Outlet B	Outlet C	Part Number
1 Inlet, 2 Outlet	1 x PS	1 x PS	1 x PS	CSY1PS2PS-*-*
	1 x PS	1 x PI	1 x PI	CSY1PS2PI-*-*

- Please add E (Earth), N (Neutral), 1 (Line 1), 2 (Line 2) or 3 (Line 3) as required.
- Other Inlet/Outlet configurations are possible. Please consult our factory to discuss any requirements.

## PHASE CONVERTER CONNECTORS

When confronted with requirements to change Phases (L1 to L2, L2 to L3 etc etc) these Double ended connectors allow conversion from existing Male or Female contacts.

The converters are supplied with 1 x “CCF” style 750Amp contact and 1 x “CPF” style 750Amp contact.

All connectors are IP2X when unmated and sealed to IP68 when mated.

Available with “CCF” and “CPF” style cable connections and L1, L2 & L3 positions.

Item	Part Number
L1 to L2 Phase Converter	PHC-L1-L2-T7
L1 to L3 Phase Converter	PHC-L1-L3-T7
L2 to L1 Phase Converter	PHC-L2-L1-T7
L2 to L3 Phase Converter	PHC-L2-L3-T7
L3 to L1 Phase Converter	PHC-L3-L1-T7
L3 to L2 Phase Converter	PHC-L3-L2-T7



PHC-L1-L2-T7

## GENDER CONVERTER CONNECTORS

When confronted with unexpected or incorrect hook-up situations, these Double ended connectors allow conversion from Male to Female or Female to Male Powerline connections on existing Chassis or Cable mounts.

The “GEC-MF” unit is supplied with 2 x “CCF” style 750Amp connectors to convert from an existing Male Insulator to the required Female.

The “GEC-FM” unit is supplied with 2 x “CPF” style 750Amp connectors to convert from an existing Female Insulator to the required Male.

All connectors are IP2X when unmated and sealed to IP68 when mated.

Available in positions Earth, Neutral, Line 1, Line 2 & Line 3.

Item	Part Number
Male to Female Earth Converter	GEC-MF-E-*-T7
Male to Female Neutral Converter	GEC-MF-N-*-T7
Male to Female L1 Converter	GEC-MF-L1-*-T7
Male to Female L2 Converter	GEC-MF-L2-*-T7
Male to Female L3 Converter	GEC-MF-L3-*-T7

Female to Male Earth Converter	GEC-FM-E-*-T7
Female to Male Neutral Converter	GEC-FM-N-*-T7
Female to Male L1 Converter	GEC-FM-L1-*-T7
Female to Male L2 Converter	GEC-FM-L2-*-T7
Female to Male L3 Converter	GEC-FM-L3-*-T7

**\* Add the following codes to identify connector colour:**

- GN = Green
- BU = Blue
- BR = Brown
- BK = Black
- GY = Grey
- WH = White
- RD = Red
- YL = Yellow

GEC-MF style



GEC-FM style



## REPLACEMENT COMPONENT PARTS

Ten 47 can supply individual component parts as:

- Insulators for our CCF and CPF connectors with clipped contacts..
- Insulators for Line Source and Drain connectors utilising a Dowel (cotter) pin.
- “Old” and “New Harmonised” coloured Insulators.
- Connectors for G-Clamp, Horizontal Clamp, Rotary Clamp, Overhead Line and Fuse Carrier connectors.
- Cable Glands.
- Other components, please contact our factory.



Item	Part Number
Cable Connector (CCF) Insulator Kit	CCF-***-INS
Cable Plug (CPF) Insulator Kit	CPF-***-INS
Line Source Insulator Kit (with Dowel pin)	LS-***-KIT
Line Drain Insulator Kit (with Dowel pin)	LD-***-KIT
Source Insulators and Dowel pin for G-Clamp, Horizontal Clamp, Rotary Clamp and Underground connectors.	PS-***-NF-KIT

Item	Part Number
Cable Gland 15mm – 23mm	M40-S
Cable Gland 19mm – 28mm	M40-M
Cable Gland 22mm – 32mm	M40-OS
Cable Gland 30mm – 37mm	M50

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## POWERLINE DEVICES & PROTECTIVE CASES

As well as supplying individual Protective Cases and Powerline Devices, we supply both products as complete kits ready for immediate use, storage and reuse.

**Some of our more common kit part numbers are shown below. Please contact us for any special requirements**



Description	Part Number
G-Clamp Short Arm, 3 Phase, Neutral & Tool	GCS-3PNT-PC
G-Clamp 90° Arm, 3 Phase, Neutral & Tool	GCR-3PNT-PC
G-Clamp Long Arm, 3 Phase, Neutral & Tool	GCL-3PNT-PC
Horizontal Clamp Short Arm, 3 Phase, Neutral & Tool	HCS-3PNT-PC
Horizontal Clamp 90° Arm, 3 Phase, Neutral & Tool	HCR-3PNT-PC
Horizontal Clamp Long Arm, 3 Phase, Neutral & Tool	HCL-3PNT-PC
Rotary Clamp, 3 Phase, Neutral, Earth & Tool	RC-3PNET-PC
Rotary Clamp, 3 Phase, Neutral & Tool	RC-3PNT-PC
Rotary Clamp, 3 Phase & Tool	RC-3PT-PC
Overhead Line Assembly (3m x 50mm <sup>2</sup> cable), 3 Phase & Neutral	OH3-3PN-PC
Underground Cable Connector, 3 Phase, Neutral & Tool	UCC-3PNT-PC
JSU 3 Phase, Neutral & Dummy Fuses	JSU-3PN-DF-PC
JPU 3 Phase, Neutral & Dummy Fuses	JPU-3PN-DF-PC
JSU / JPU 3 Phase	JSU / JPU-3P-PC
JSU / JPU 3 Phase & Neutral	JSU / JPU-3PN-PC



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## PROTECTIVE CASES



- Waterproof
- Dustproof
- Crushproof
- Buoyant
- Corrosion Proof
- NATA Codified
- Foam sets available to cut/shape individual requirements.
- 4 digit combination locks available
- Automatic Pressure Release Valve
- Easy Open latches
- Rubberised Handles for comfort and grip



Part Number	Weight with foam Kg	Internal Length mm	Internal Width mm	Internal Depth Lid mm	Internal Depth Base Mm	Black	Yellow	Orange	Grey	Green
PC1120	0.62	187	124	12	65	#	#	#	#	
PC1150	0.82	212	149	19	74	#	#	#	#	
PC1200	1.26	238	184	30	74	#	#	#	#	
PC1300	1.60	238	184	30	125	#	#	#	#	
PC1400	2.04	305	230	30	101	#	#	#	#	#
PC1430	2.95	358	158	40	245	#				
PC1450	3.02	376	263	45	107	#	#	#	#	#
PC1470	2.26	400	268	35	60	#				
PC1490	2.82	454	292	38	67	#				
PC1500	3.68	432	290	46	109	#	#	#	#	#
PC1510*	5.95	514	289	46	147	#				
PC1520	4.00	454	324	46	125	#	#	#	#	#
PC1550	5.08	481	367	46	151	#	#	#	#	#
PC1560*	8.00	510	387	52	180	#				
PC1600	6.14	552	427	46	154	#	#	#	#	#
PC1610*	10.2	563	435	52	217	#				
PC1620*	10.66	560	432	52	268	#				
PC1650*	15.26	736	454	47	220	#				
PC1660*	19.58	740	525	89	359	#				
PC1700*	7.46	910	351	44	89	#				
PC1720*	9.04	1067	343	44	89	#				
PC1750*	10.06	1283	341	44	89	#				
PC0340*	11.84	455	455	90	315	#				
PC0350*	14.24	508	508	120	350	#				
PC0370*	18.9	610	610	118	452	#				

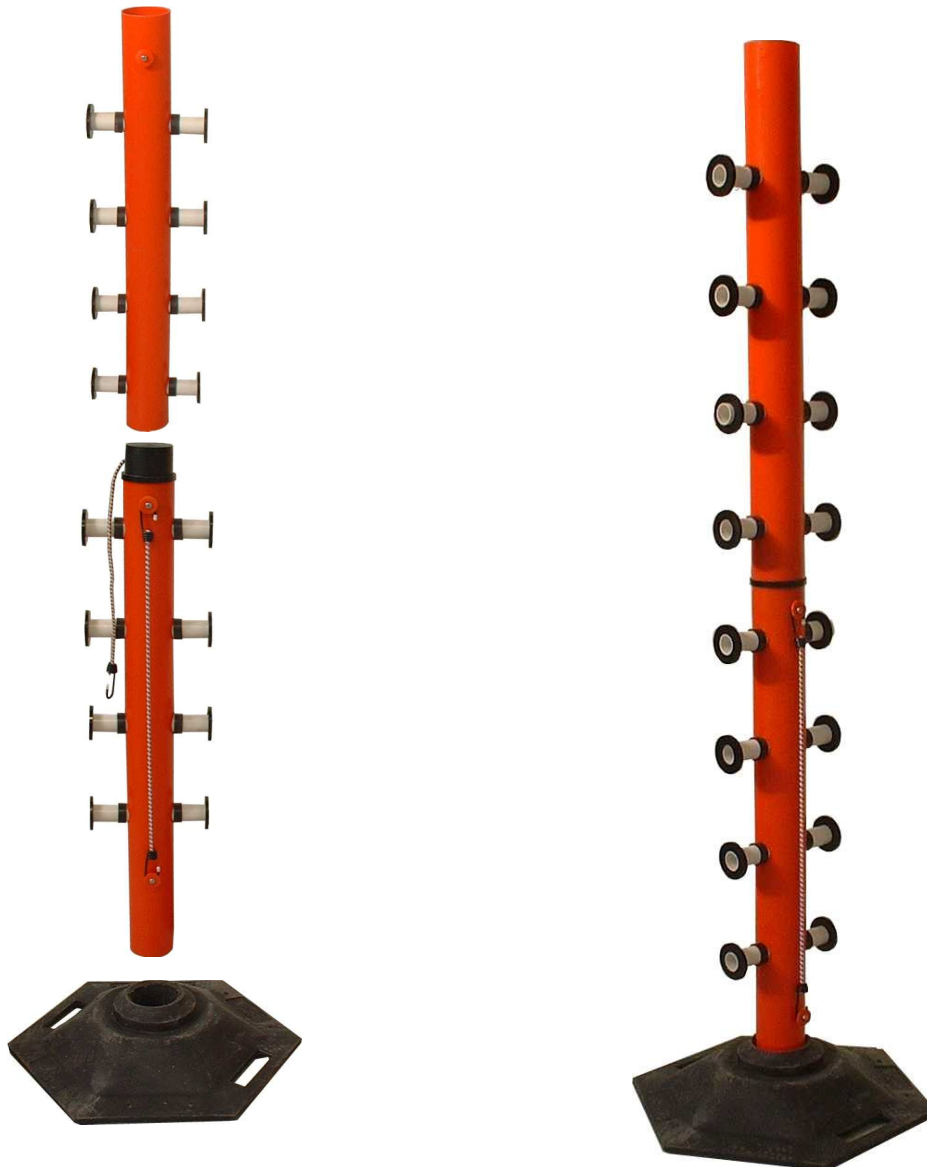
\* Transportable Case with wheels (optional extra on 0350 & 0370)

## POWER CABLE SUPPORT STAND

The design of this cable support stand helps to reduce stresses that occur on electrical connectors due to the weight of the power cables being connected.

The unit can be assembled without any tools and is portable to allow for connection of cables to various applications including Low Voltage Pillars, Switchgear equipment, Substations etc.

The 8 supporting arms are positioned to give support at various connection heights and there are 2 cable tie ropes to secure the cables in place.  
Once assembled, from ground to top measures approximately 2.0 metres and weighs 9.5kg.



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## 600/1000V POWER CABLE

### SINGLE CORE Flexible Cable



Nominal Voltage:	600/1000V
Maximum Conductor Temperature:	+90°C
Minimum Operating Temperature:	-15°C
Minimum Bend Radius:	9 x Cable Ø
Flammability:	IEC 60332-1
Conductor:	Flexible Class 6 Plain Annealed Copper.
Insulation:	6mm <sup>2</sup> - 70mm <sup>2</sup> = TPE. >95mm <sup>2</sup> = XLPE.
Outer Sheath:	Orange TPE.
Applications:	Flexible cable for distribution of Electric power.

\* Current carrying capacities based upon installation in air, spaced if in parallel.

\* Current ratings are recommended based upon actual testing.

Conductor Size mm <sup>2</sup>	Nom OD mm	Nom Weight Kg/km	Current Capacity Amps*
10	8.0	125	75
16	9.5	185	100
25	11.0	290	154
35	13.0	390	192
50	15.0	540	235
70	17.0	750	303
95	19.0	1000	370
120	21.5	1300	431
150	24.0	1590	499
185	26.0	1830	573
240	29.0	2400	679
300	33.0	3250	786

Temperature variation Rating Factors					
Ambient temp: (°C)	25	30	35	40	45
Rating Factor	1.04	1.00	0.96	0.91	0.87

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## XTREME H07RN-F

### SINGLE CORE Flexible Cable

Nominal Voltage:	450/750V (Up to 1000V is acceptable in Fixed Protected assemblies).
Nominal Service Temperature:	-25°C
Maximum Conductor Temperature:	+90°C
Maximum Short-Circuit Temperature:	250°C (maximum 5secs)
Minimum Bend Radius:	3 x Cable Ø
Flammability:	EN50265 / IEC 332-1.
Conductor:	Flexible Class 5 to IEC 60228.
Insulation:	Thermosetting Rubber, type E17 according to HD 22.
Outer Sheath:	Thermosetting Rubber, type EM2 according to HD 22.
Colour:	Black.
Applications:	Flexible cable for mobile service. Suitable for installations where the cable must withstand medium mechanical stresses and oil resistance.

Current carrying capacities are calculated according to HD 516 for Mobile service and HD 384 for Fixed installations.

Mobile service: Open air. One cable with adequate ventilation and ambient temperature of 30°C.

Fixed Installation: Open air. One cable with adequate ventilation and ambient temperature of 30°C, supported or on perforated trays (reference method F)

Conductor Size mm <sup>2</sup>	Nominal OD mm	Nominal Weight Kg/km	Current Capacity Amps		Voltage Drop (V/A-km)
			FIXED	MOBILE	
10	10.1	182	74	53	3.84
16	11.4	250	101	71	2.43
25	13.4	361	135	94	1.57
35	14.7	469	169	117	1.11
50	17.5	671	207	148	0.776
70	19.6	892	268	185	0.546
95	22.0	1140	328	222	0.414
120	24.2	1420	383	260	0.323
150	26.6	1760	444	300	0.259
185	28.8	2090	510	341	0.213
240	32.2	2710	607	407	0.161
300	34.9	3310	703	468	0.129
400	39.3	4270	823	553	0.0976
500	43.1	5390	946	634	0.0772

Correction Factors for air temperature other than 30°C					
T. air (°C)	30	35	40	45	50
Mobile Service	1	0.91	0.82	0.71	0.58
Fixed Installation	1	0.96	0.91	0.87	0.82

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## CABLE ASSEMBLIES



Ten 47 can supply cable, plugs, sockets, cam-loks, lugs or complete cable assemblies to customer requirements.

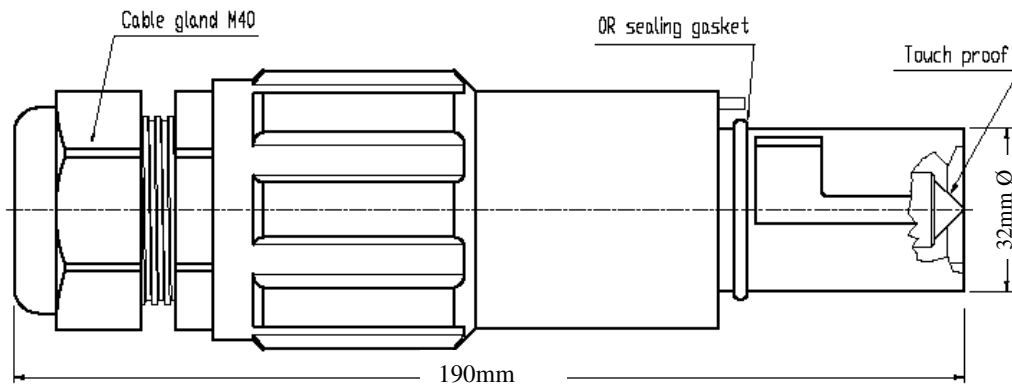
The following table shows ordering information for some of the most common cable assemblies using our single core 600/1000V cable, however please contact us to discuss any particular requirements you have.

EXAMPLE		PLA	—	E	—	120	—	10	—	M12	—	XXX
<b>ASSEMBLY CONFIGURATION</b>												
Cable Connector to Cable Connector	CCA											
Cable Connector to Cable Plug	CPA											
Cable Connector to LUG	CLA											
Cable Plug to Cable Plug	PPA											
Cable Plug to LUG	PLA											
LUG to LUG	LLA											
<b>KEY POSITION</b>												
Earth	E											
Neutral	N											
Line 1	L1											
Line 2	L2											
Line 3	L3											
<b>CABLE SIZE</b>		as required in mm <sup>2</sup>										
<b>ASSEMBLY LENGTH</b>		as required in metres										
<b>LUG Bolt Size (if applicable)</b>												
	M6											
	M8											
	M10											
	M12											
	M16											
<b>Modification Code</b>		Consult Factory										

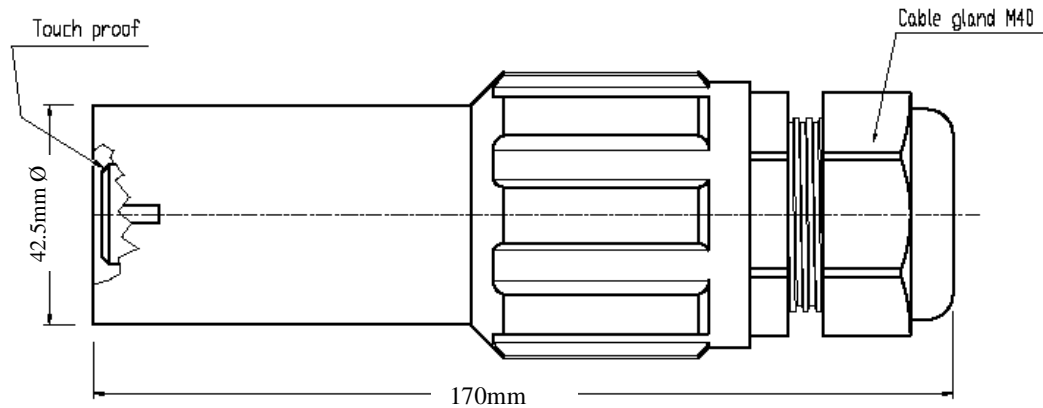
## POWERLINE CONNECTORS

### CONNECTOR DIMENSIONS

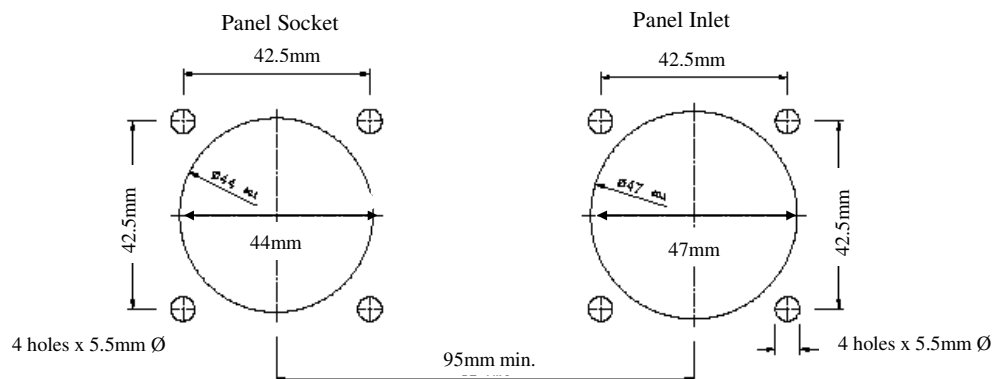
#### Cable Plug



#### Cable Connector



#### Cut Out Dimensions

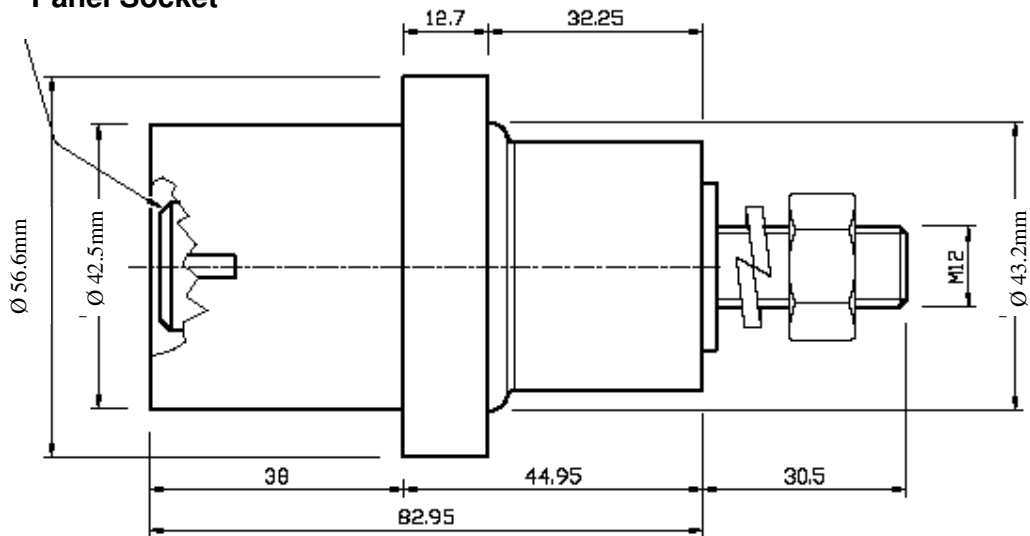




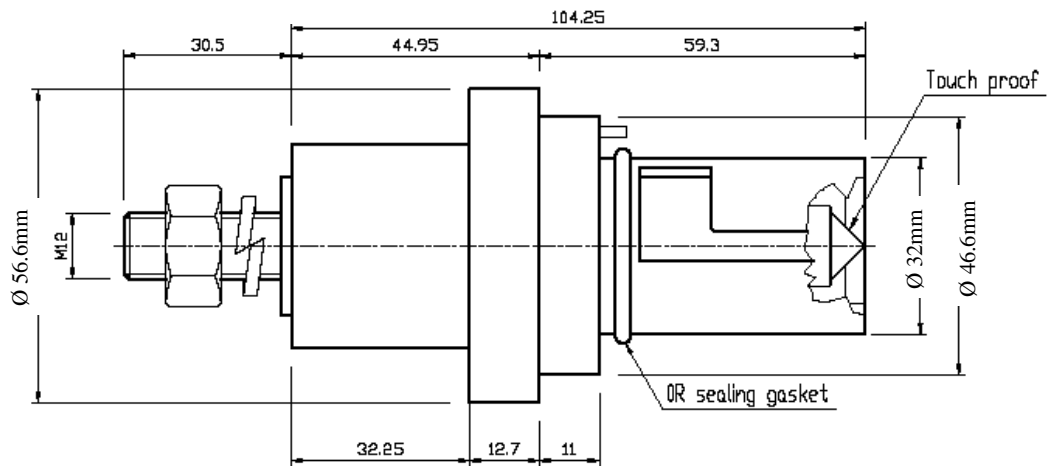
## POWERLINE CONNECTORS

### CONNECTOR DIMENSIONS

#### Panel Socket



#### Panel Inlet



## POWERLINE CONNECTORS

### DEFINITIONS / TERMINOLOGY

#### RATED CURRENT

The current rating of the connector is determined by the conductor size and type utilised.  
 Values are taken from IEE wiring regulations BS7671 Table 4F1A Reference method 12 (cables in Free Air).  
 The quoted values relate to non-armoured Single core, copper stranded cable with Rubber insulation and an operating temperature of 85°C.  
 The de-rated values for ambient temperature are taken from Table 4H2A.

#### RATED VOLTAGE

The determined voltage of a connector from which the related operating characteristics are defined.

#### CONTACT RESISTANCE

The resistance occurring at the point of two contact areas.  
 Its value is calculated with the measured voltage drop and the rated current.

#### TEST VOLTAGE

The voltage the connector will withstand without breakdown or flashover under test conditions.

#### SURGE CURRENT

The current the connector will withstand during a short time surge or current spike. Duration 10msecs.

#### INGRESS PROTECTION

Level of resistance to dust and water ingress according to EN60529.  
 When mated, POWERLINE connectors meet the requirements of IP68, submersible in water and closed to entry of foreign objects.

#### CREEPAGE

The shortest distance along the surface of the Insulating material between two conductive parts. This is also a function of the properties of the Insulating material.

#### CLEARANCE

The shortest distance in air for arcing potential between two conductive parts.

#### CE CABLE GLANDS

In December 1999, European standard EN50262 (metric glands) replaced the withdrawn standard DIN46320 (PG glands).  
 The transition period for granting certification marks for PG glands ended on 1<sup>st</sup> March 2001.  
 In order to comply with CE Certification requirements, POWERLINE utilises metric glands compliant with current legislation and specifications.

#### MATING CYCLES

The minimum number of continuous mating operations the connectors will withstand without damage to their operation or safety.  
 The values assume normal usage.

#### SET SCREW TERMINATION

Two threaded set screws at the cable entry point into the contact.  
 The screws are tightened to compress a copper sleeve(s) fitted around the strands of the cable conductor.  
 The standard contact is supplied with a sleeve suitable for 120mm<sup>2</sup> csa.  
 When used with smaller cable sizes, additional sleeves are required to suit the cable size.  
 The contacts are Silver Plated Copper Alloy

#### CRIMP TERMINATION

Compression termination.  
 The contacts are Silver Plated Oxygen Free high conductivity Copper.

#### FIXED LOCKING

Once mated, the connectors are locked together via a metal pin.  
 A tool is required to release this locking mechanism to allow disconnection.  
 This version provides additional safety where unsupervised or public access to live equipment may be possible.

#### HARMONISED COLOUR CODING

On 31<sup>st</sup> March 2004, the IEE published Amendment No. 2 to BS7671: 2001 (IEE Wiring Regulations).  
 This amendment specifies new cable core colours for Electrical installations in the UK.

These "Harmonised" colours bring the UK more closely in line with practice in mainland Europe.

Electrical installation work commencing after 31<sup>st</sup> March 2004 may use harmonised colours or the pre-existing colours, but not both.

Work commencing after 31<sup>st</sup> March 2006 will be required to comply with harmonised colours and must not use old colours.

#### POWERLINE SERIES

New Harmonised Colour Codes & Marking for Single and Three-Phase applications.

Function	Alphanumeric Colour	
Phase of single phase circuit	L	Brown
Neutral of single or three-phase circuit	N	Blue
Phase 1 of three-phase a.c. circuit	L1	Brown
Phase 2 of three-phase a.c. circuit	L2	Black
Phase 3 of three-phase a.c. circuit	L3	Grey

## POWERLINE CONNECTORS

### CONNECTOR PARAMETERS

TECHNICAL PARAMETER	VALUE
CCF-*-**-S120-S-FP weight	0.53kg
CCF-*-**-S120-M-FP weight	0.51kg
CCF-*-**-S120-OS-FP weight	0.54kg
CPF-*-**-S120-S-FP weight	0.50kg
CPF-*-**-S120-M-FP weight	0.48kg
CPF-*-**-S120-OS-FP weight	0.51kg
CCF-*-**-C240-OS-FP weight	0.63kg
CPF-*-**-C240-OS-FP weight	0.60kg
PSF-*-**-T4-FP weight	0.37kg
PIF-*-**-T4-FP weight	0.34kg
PSF-*-**-T7-FP weight	0.39kg
PIF-*-**-T7-FP weight	0.35kg
Set Screw Contact Tightening Torque	12Nm
Panel Contact Tightening Torque	30Nm max.
Cable Gland Tightening Torque	13Nm
Minimum Mating Cycles	500
Contact Retention in Insulator	2.5kN Axial Load
Flammability	UL94 V0
Environmental Sealing (when mated)	IP68
Rated Voltage to Earth	2000V AC
Minimum Flashover (EN60309-1)	6.8kV AC – 1 minute
Minimum Insulation Resistance	5Gohms @ 500V
Operating Voltage	1000V AC or DC
Test Voltage (Mated Condition)	5kV – 1 minute @ 50Hz
Contact Resistance	<5mohms
Short Circuit Current – 1 second	16kA
Short Circuit Current – 3 seconds	12kA
Surge Current (DIN VDE 0102/1.90)	62kA – 10mseconds
Creepage Distance	>25mm
Clearance Distance	>25mm
Temperature Range	-30°C / +125°C

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## POWERLINE CONNECTORS

### CONNECTOR RATED CURRENT

Connector Style	Part Number	Current	Minimum Cable c.s.a. for Rated Current (in free air)	Contact Termination
Panel Socket	PSF-*-**-T4	431A	120mm <sup>2</sup>	M12 Thread
Panel Inlet	PIF-*-**-T4	431A	120mm <sup>2</sup>	M12 Thread
Panel Socket	PSF-*-**-T7	750A	300mm <sup>2</sup>	M12 Thread
Panel Inlet	PIF-*-**-T7	750A	300mm <sup>2</sup>	M12 Thread
Cable Connector	CCF-*-**-S25-S	154A	25mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-S35-S	192A	35mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-S50-S	235A	50mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-S70-S	303A	70mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-S95-S	370A	95mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-S120-S	431A	120mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S25-S	154A	25mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S35-S	192A	35mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S50-S	235A	50mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S70-S	303A	70mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S95-S	370A	95mm <sup>2</sup>	Set Screw
Cable Plug	CPF-*-**-S120-S	431A	120mm <sup>2</sup>	Set Screw
Cable Connector	CCF-*-**-C185-M	573A	185mm <sup>2</sup>	Crimp
Cable Connector	CCF-*-**-C240-OS	679A	240mm <sup>2</sup>	Crimp
Cable Connector	CCF-*-**-C300-M50	750A	300mm <sup>2</sup>	Crimp
Cable Plug	CPF-*-**-C185-M	573A	185mm <sup>2</sup>	Crimp
Cable Plug	CPF-*-**-C240-OS	679A	240mm <sup>2</sup>	Crimp
Cable Plug	CPF-*-**-C300-M50	750A	300mm <sup>2</sup>	Crimp

\* = Key Position (Earth, Neutral, Line 1, Line 2, Line 3)

\*\* = Colour (Green, Blue, Brown, Black, Grey)

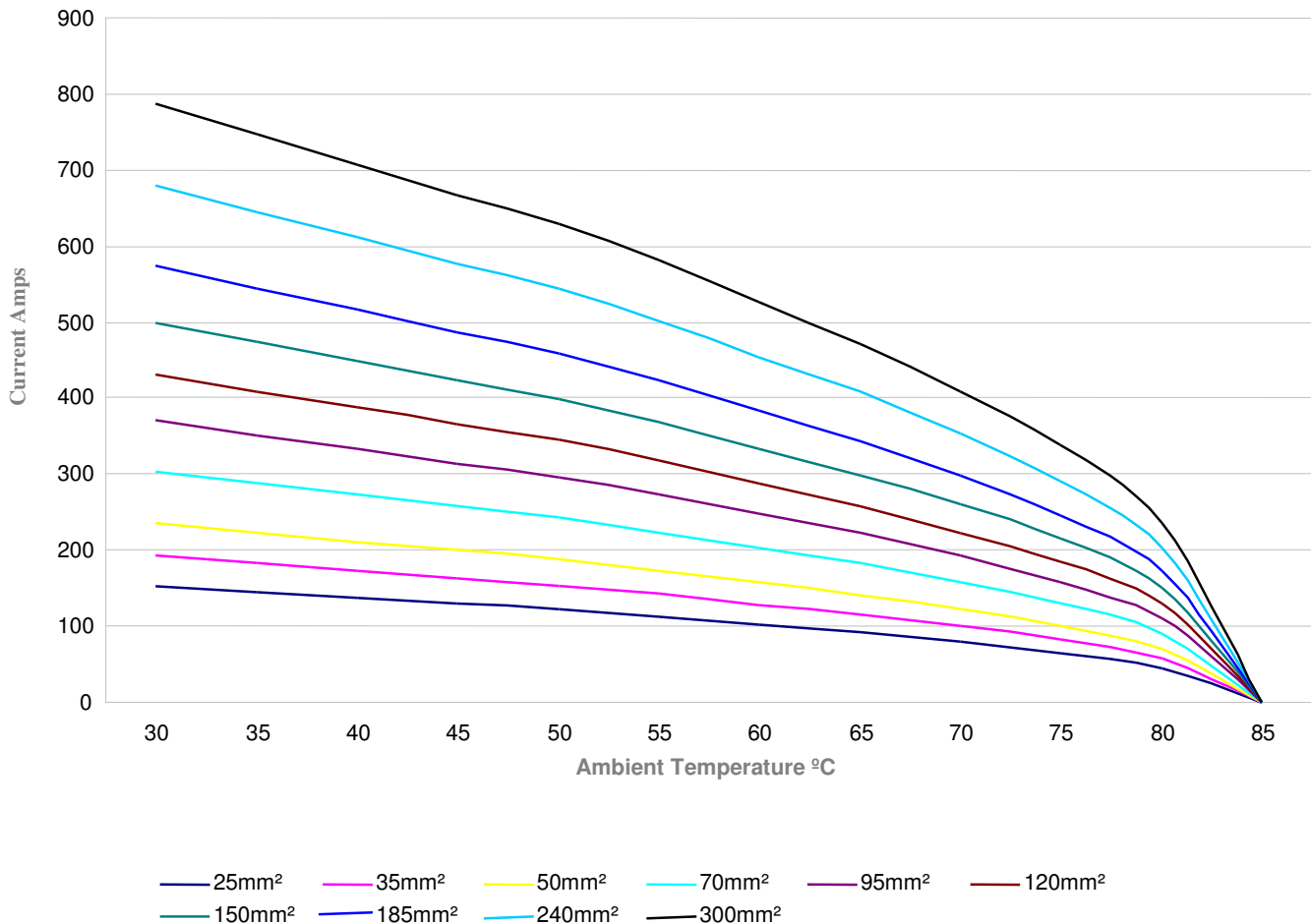
## POWERLINE CONNECTORS

### REFERENCE DATA FOR CABLE SELECTION

The Current Rating of the connector is determined by the conductor size and type utilised. For this publication, values are taken from IEE wiring regulations BS7671 Table 4F1A Reference Method 12 (Free Air).

The quoted values relate to non-armoured Single Core, Copper stranded cables with Rubber Insulation and an operating temperature of 85°C.

Derating Data for 85°C Rubber Insulated Cables

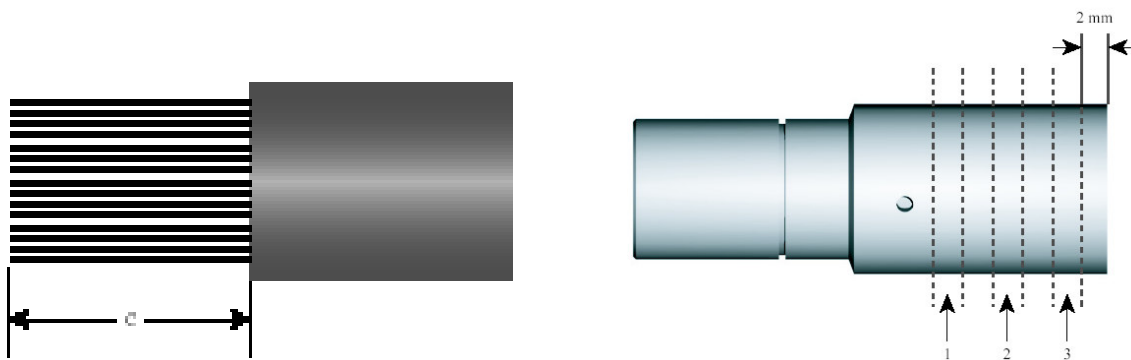


Powerline contacts are suitable for termination onto Aluminium conductors for short term applications. However, we would recommend that bi-metallic contacts or cable lugs are used to provide optimum electrical and mechanical performance over time and repeated use. Please contact us to discuss further.

## POWERLINE CONNECTORS

### TOOLS AND DATA

Cable Size	Up to 120mm <sup>2</sup>	185mm <sup>2</sup> Class 2	240mm <sup>2</sup> Class 2	300mm <sup>2</sup> Class 2	185mm <sup>2</sup> Class 5	240mm <sup>2</sup> Class 5	300mm <sup>2</sup> Class 5
Insulation Strip (dim C)	33mm	40mm	40mm	40mm	40mm	40mm	40mm
Recommended Number of Crimps	N/A (set screw)	2	3	3	2	3	3
Hand Operated Crimp Tool	N/A	HT131-C	HT131-C	HT131-C	HT131-C	HT131-C	HT131-C
Cordless Hydraulic Crimp Tool	N/A	B131-C	B131-C	B131-C	B131-C	B131-C	B131-C
Crimp Die Set	N/A	T185-C	T240-C	T300-C	T185-CF	T240-CF	T300-CF
Contact Removal Tool	REM-185P	REM-240P	REM-240P	REM-300M50P	REM-240P	REM-240P	REM-300M50P



- It is recommended to apply multiple crimp compressions in accordance with the above table to obtain optimum mechanical and electrical performance.
- The correct sequence of compressions is as shown above.
- When correctly terminated, the Electrical and Mechanical performance of the Crimp will be in accordance with IEC61238-1.
- 185mm<sup>2</sup> Crimp: Tensile Strength = 11,100N min.
- 240mm<sup>2</sup> Crimp: Tensile Strength = 14,400N min.
- 300mm<sup>2</sup> Crimp: Tensile Strength = 18,000N min.
- Due to the numerous cable types available, it is recommended to contact Ten 47 to confirm cable & crimp suitability.

### Connector Release Key: REM-FL

To release a mated pair of connectors, we recommend the use of our REM-FL key. It is designed to push the secondary locking pin away from the locked position without any damage occurring to the Insulator.





## CRIMPING TOOLS



**Crimping Tool HT131-C**

- This tool features a double speed action; a fast advancing speed for rapid approach of the dies to the contact and a slower, more powerful speed for crimping.
- The tool will accept all semi-circular slotted dies common to most 130kN tools.
- The built in safety valve will by-pass the oil supply when maximum pressure is reached.
- A pressure release system can easily be operated at any stage of the compression.



**Crimping Tool B131-C**

- 14.4v cordless hydraulic crimping tool, lightweight and balanced for single hand operation.
- This tool features a double speed action; a fast advancing speed for rapid approach of the dies to the contact and a slower, more powerful speed for crimping.
- The tool will accept all semi-circular slotted dies common to most 130kN tools.
- For ease of operation and operator comfort, the tool head can be fully rotated through 180°.
- A microprocessor controls the tool operation and automatically cuts out the motor on completion of the crimping operation. This saves energy and extends the battery life.
- The residual battery capacity is automatically displayed after every cycle.
- Fitted with an integral socket for connection to a 12v DC external power supply.



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