Powerlock Termination Guide

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1. OVERVIEW

Due to the wide range of cables used in the market, to ensure that a satisfactory result is obtained when Powerlock connectors are terminated onto the end of the cables, the type and method used needs to be evaluated.
This guide is intended to provide details of how to successfully terminate cables into Powerlock connectors, either by crimping, set screws or threaded post methods.
This document provides guidelines on;

- how to perform a crimped termination.
- what type of crimp tools and dies to use with recommendations.
- how to perform a set screw termination.
- terminating a threaded post panel type connector.
- typical test results obtained when terminating connectors onto a range of cables.

2. TERMINATION METHODS

Powerlock connectors can be terminated to cables by using one of the following methods;

- Crimp termination.
- Set screw termination.
- Threaded post termination.

These recommended assembly methods are detailed below. If in doubt, consult ITT. A separate test report (Report No. 1392) shows details of the test data currently available.

2.1 CRIMP TERMINATION

It is essential to use the recommended crimp tool and die to ensure a satisfactory crimp.
It is important that you are satisfied that the crimped joint meets your requirements.
Consult ITT for details on pull off loads and mV drop values expected.

2.1.1 Crimp Connector Components

Shown below in figures 1 and 2 are the components supplied for both line drain and line source connectors. Both connector types include the following;

- Cable Gland
- Contact
- Insulator
- Cotter Pin

Figure 1. Line Drain Crimped Connector

Figure 2. Line Source Crimped Connector

2.1.2 Crimp Die

The crimp die type and size are one of the most important aspects of the crimping operation to achieve a satisfactory crimped joint.
They vary depending on the actual cable / contact combination to be crimped.
A hexagon type crimp is recommended by ITT.
The main variables are the across flats dimension and the die width.

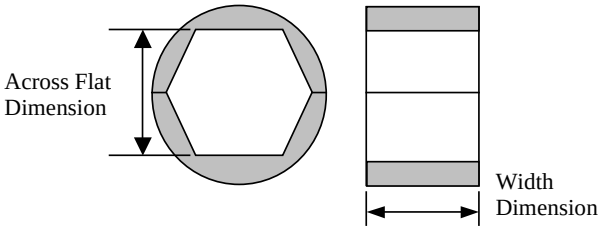

Figure 3. Crimp Die Dimensions

2.1.3 Crimp Tool

Depending on the application, various crimp tool and die set combinations can be used.
Listed in Table 1 below is the crimping die and tool data currently available for use by ITT.

Supplier	Crimp Tool Type	Crimp Die Type	Description	Crimp Die Details	
				Die Across Flat Dimension (mm)	Die Width Dimension (mm)
ITT	C130	30220	C25	7.6	9.0
		30221	C35	9.0	12.0
		30222	C50	10.0	12.0
		30223	C70	12.0	12.0
		30224	C95	14.0	12.0
		30235	C120	16.0	12.0
		30236	C150	17.3	12.0
		30237	C185	19.0	12.0
		30227	C240	23.57	12.0
		30228	C240	21.5	12.0
		30229	C300	23.0	12.0
Kompress	KHH	13C-300	C240	24.3mm	15.0

Table 1. Crimping Die And Tool Data

2.1.4 Crimp Assembly Tools

The tools listed below are recommended:
Cable Stripper
Soft hammer/Press
Strap Wrench
Crimping Tool - ITT or Kompress (See end of document for tool suppliers)

Figure 4. Example Of A Typical Hydraulic Crimp Tool With Dies

2.1.5 Double Crimp Arrangement

The default recommended method is to double crimp although single crimps may be suitable for crimping smaller cables. See the test data attached for information.
Each crimp should be at 90° to each other and positioned centrally within the contact crimp area, as shown in Figure 4 below.
If a single crimp is used, the crimp should be positioned centrally within the 35mm area shown in figure 4 below.
Crimp in the order shown to ensure a satisfactory crimp. Consult the factory if any additional information or advice is required.

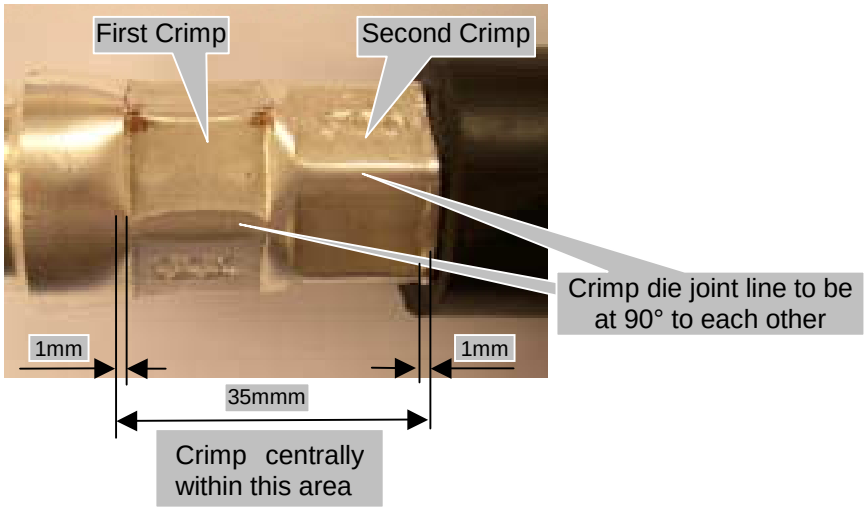

Figure 5. Recommended Double Crimp Arrangement

2.1.6 Recommended Assembly Procedure

1. Remove the Cable Gland from the Insulator and remove the contact.
2. Slide the Cable Gland onto the cable being terminated.
3. Carefully strip back the cable insulation by 42mm taking care not to damage any of the conductor stranding.

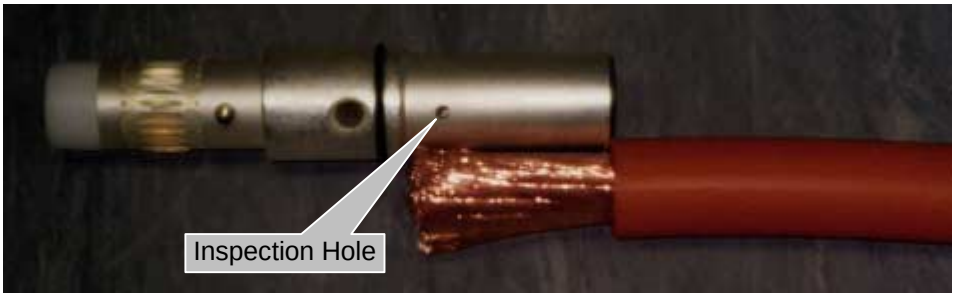

Figure 6. Inspection Hole In Contact

4. Insert the conductor stranding into the crimp bucket at the rear of the contact. Ensure that the cable is straight within a distance of 1 metre of the crimping location. This ensures that the individual cable wire strands are not distorted or displaced to each other caused by bending the cable.
With the crimping tool, crimp the contact twice (as shown in figure 4) making sure that the cable is being forced into the contact and ensuring that the cable conductor is visible through the inspection hole.
5. Examine the crimped joint to ensure that the crimp is satisfactory. Ensure that all of the conductor strands are contained within the crimped area.
6. Following the crimping operation, any contact material deformed between the crimp dies which prevents the contact assembly from being fitted into the Insulator assembly should be removed, in line with normal working practices.

Figure 7. Example Of Crimp Operation

7. Fit the crimped contact into the insulator and visually align the cotter pin holes.
8. Fit the cotter pin, tapered end first into the insulator/contact using either a press or a soft hammer.
Note that the cotter pin should only be used once. Re-using the cotter pin will invalidate the IP67 rating.
9. Ensure that the cotter pin is visible from both sides of the assembly after fitting and is flush/sub flush with the insulator.
9. Screw the cable gland into the insulator, tightening to a torque of 7.9Nm minimum.
10. Finally inspect overall assembly.

2.2 SET SCREW TERMINATION

It is essential to use the recommended assembly method, reduction sleeves and set screw tightening torques to ensure a satisfactory termination.

2.2.1 Set Screw Connector Components

Show below in figures 7 and 8 are the components supplied for both line drain and line source connectors. Both connector types include the following;

- Cable Gland
- Contact
- Insulator
- Cotter Pin
- Reduction Sleeves

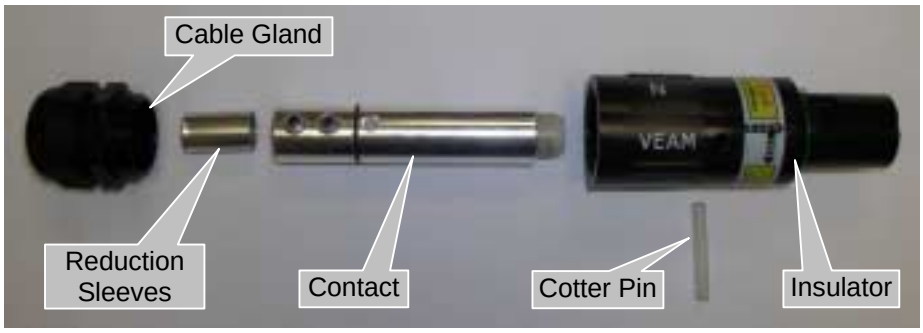

Figure 8. Line Drain Set Screw Connector

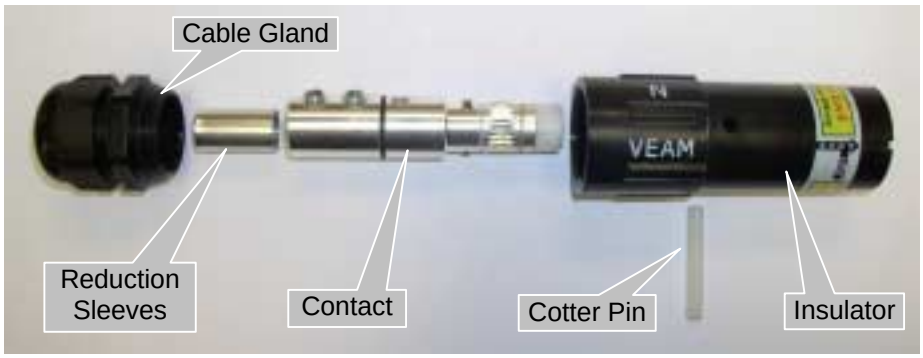

Figure 9. Line Source Set Screw Connector

2.2.2 Recommended Assembly Procedure

1. Remove the Cable Gland from the insulator and take out the contact.
2. Slide the Cable Gland onto the cable being terminated.
3. Carefully strip back the cable insulation by ~33mm taking care not to damage any of the conductor stranding.

Figure 10. Showing Cable Stripped Alongside Reduction Sleeve

4. Select the appropriate reduction sleeves (see table 2 below) and slide on in sequence over the exposed conductor stranding.
All sleeves down to the size recommended for the cable in use should be used.
i.e. for the 35mm^2 cable, the R120, R95, R70, R50 and R35 sleeves should all be used.
The sleeves fit inside each other to give a gradual reduction in diameter.
The flared end of the sleeves should be against the cable insulation.

Figure 11. Showing Reduction Sleeve Fitted

5. Slide the cable and reduction sleeves into the rear of the contact ensuring that they are fully seated inside of the contact.
Using a 5mm A/F Allen key tighten the set screws to the appropriate torque setting (see table 2 below).

Figure 12. Showing Contact With Set Screws Fitted Over Cable And Reduction Sleeves

Cable Size (mm^2)	Reduction Sleeve Required	Set Screw Torque Minimum (Nm)	Cable Jacket Strip Length (mm)
25mm^2	R120…R25	10.5	33
35mm^2	R120…R35	10.5	33
50mm^2	R120…R50	10.5	33
70mm^2	R120…R70	10.5	33
95mm^2	R120 + R95	10.5	33
120mm^2	R120	10.5	33

Table 2. Set Screw Assembly Data

6. Fit the contact into the front insulator and visually align the cotter pin holes.
7. Fit the cotter pin, tapered end first into the insulator/contact using either a press or a soft hammer.

Note that the cotter pin should only be used once. Re-using the cotter pin can invalidate the IP67 rating.

8. Ensure that the cotter pin is visible from both sides of the assembly after fitting and is flush/sub flush with the insulator.
9. Screw the cable gland into the insulator, tightening to a torque of 7.9Nm minimum.
10. Finally inspect overall assembly.

Note for users of fine stranded cables

When using fine stranded power cables it is advisable to use the maximum number of sleeves and increase the torque setting.

This will protect the individual cable strands from mechanical damage and allow greater compression of the conductor.

2.3 PANEL MOUNT TERMINATION

Panel receptacles are supplied fully assembled with contacts (See Figure 12 below.)

An M12 nut and a spring washer are also supplied loosely fitted onto the contact.

Termination to the panel connector is made by fitting the cable lug or other accessory using the nut and washer.

2.3.1 Panel Mount Connector Components

Shown below in figure 13 are the components supplied for both line drain and line source panel connectors. Both connector types include the following;

- Insulator Assembly (incorporating a fully fitted contact assembly).
- M12 Nut.
- M12 Washer.

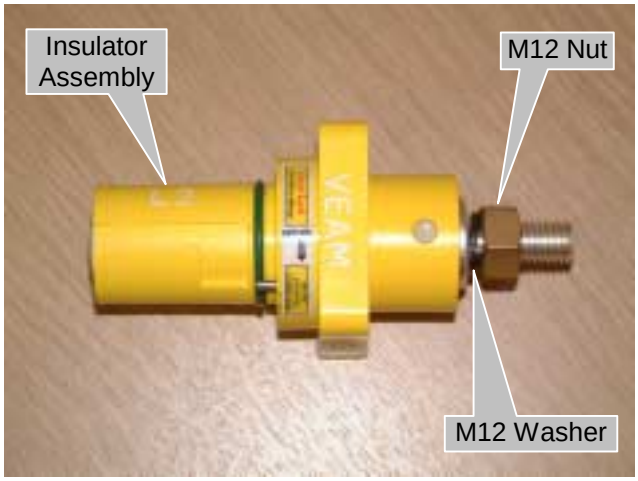

Figure 13. Panel Type Connector

2.3.2 Recommended Assembly Procedure

1. Remove the M12 nut and washer from the threaded post.
2. Fit terminal or accessory over the threaded post.
3. Refit the M12 washer and nut onto the threaded post and tighten to a maximum value of 12Nm.

3. TERMINATION TEST DATA

This data is shown in a separate test report (Report No. 1392) and shows details of the test data currently available. It is continually updated as new cables are tested. It shows the test results obtained for specific combinations of contact, cable, crimp tool and die.

Results for the following termination methods are shown;

- Crimp termination.
- Set screw termination.

4. HYDRAULIC CRIMP TOOL SUPPLIERS

Listed below are details of known suppliers of suitable crimp tools and dies. Other tools and dies may be suitable but if the customer is unsure that the crimped joint obtained meets their requirements, ITT should be contacted for advice.

ITT
Crimping Tool (Type Dubuis C130) - Part No. 000V74174
Crimping Tool and Die Set - Part No. 000V71400
Contact details shown below.

Kompress
Crimping Tool - Part No. KHH13C
Die Set - Part No. 13C

Contact details are as follows;
Kompress Holdings Ltd
Little Tennis Street
Nottingham NG2 4EL
United Kingdom
Tel: +44 (0) 115 958 1029
Fax: +44 (0) 115 958 4180

5. DISCLOSURE STATEMENT

As there are many cables made to the same specification but with different measurements, it is advisable to contact your local sales office so they can advise the best possible crimping solution. There are also many crimping tools and crimping die combinations available and as such ITT Industries cannot be held responsible for defective crimps unless a sample of cable is submitted for confirmation testing.

6. CONTACT DETAILS

If any further assistance is required, please contact;

UK	44.1256.311200
Germany	49.7151.699.0
Italy	39.2.93532.1
USA	1.860.274.9681

To enhance the level of information made available for this product range, this document along with all relevant information on the Powerlock range can be viewed on the ITT Industries website: http://www.ittcannon.com/