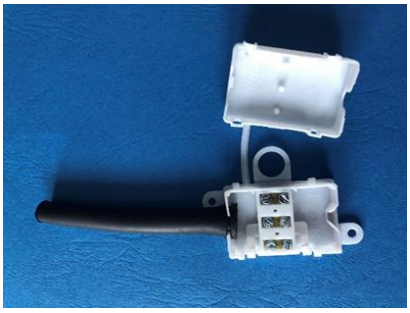
TECHNICAL STATEMENT

Luminaire terminal blocks - FAQ

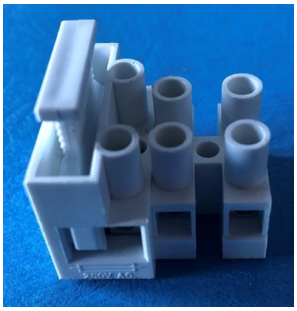
Typical Terminal Block types

"Choc block" strip connector

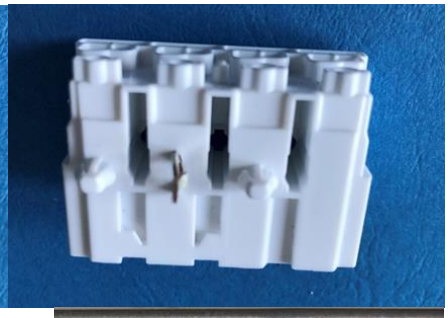


Fully enclosed terminal block

Fully enclosed terminal block in its own enclosure



Terminal block with integral fuse carrier



Terminal block with screwless earth connection – the earth connection is made by clipping the terminal block into a pre punched hole in a metal

The Lighting Industry Association Limited
7 Stafford Park, Telford, Shropshire, TF3 3BQ 01952 290905 | info@thelia.org.uk | thelia.org.uk

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Question 1
Do I need to supply a terminal block with a luminaire?

There is no need to supply a terminal block with a luminaire. This is covered in BS EN 60598-1, but the following requirements shall be met:

> **3.3.24** Where the terminal block is not supplied with the luminaire, the packaging shall contain the following wording:
>
> "Terminal block not included. Installation must be performed by a qualified person." A1

> **4.6 Terminal blocks**
>
> If luminaires are provided with connecting leads (tails) requiring a separate terminal block for the connection to the fixed wiring, adequate space for this terminal block shall be provided within the luminaire, or within a box delivered with the luminaire, or specified by the manufacturer.
>
> This requirement applies to terminal blocks for connecting leads (tails) with conductor nominal cross-sectional areas not exceeding 2,5 mm^2.

Question 2
What do I need to do if I don't supply a terminal block with my product?(leads, tails etc)

If a product is supplied without a terminal block, the manufacturer will need to ensure all relevant information is provided and assessments have been undertaken
If a terminal block is not provided with the luminaire, the product packaging shall contain the following wording as per clause 3.3.24 of EN 60598-1.

> **3.3.24** Where the terminal block is not supplied with the luminaire, the packaging shall contain the following wording:
>
> "Terminal block not included. Installation must be performed by a qualified person." A1

Clause 5.2.1 of EN 60598-1 states the following information shall be provided to ensure the installer uses a correct terminal block. This can be a specific terminal block or general specification.

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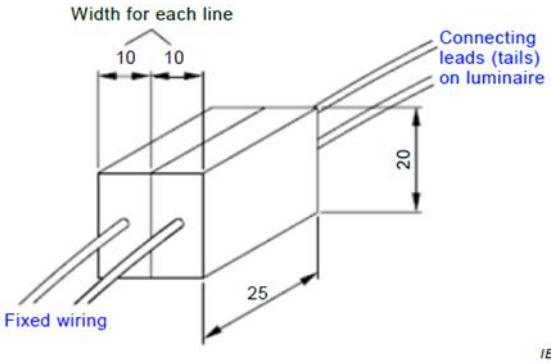
Where the luminaire is delivered with connecting leads (tails) and without a means of connection to the supply, the manufacturer of the luminaire shall specify which terminal block may be used which shall conform to IEC 60998-2-1 or IEC 60998-2-2; either the terminal block to be used shall be specified or the following shall be defined:

- the type of terminal (screw/screwless);
- number of terminals;
- rated voltage;
- rated connecting capacity;
- any necessary preparation of the ends of conductors
- any fixing method.

In addition, the luminaire manufacturer will need to establish if a terminal block will fit inside the product or if a separate terminal block enclosure will be needed.
If the luminaire manufacturer has not stated a specific terminal block to be used, then EN 60598-1 figure 2 provides the spacing requirements inside the luminaire for a terminal block to fit in per conductor pairs (i.e. 10 mm x 20 mm x 25 mm).



Compliance is checked by measurement and by an installation test, using one terminal block for each two conductors to be connected together, as shown in Figure 2, and fixed wiring having a length of approximately 80 mm. The dimensions of the terminal blocks are those specified by the manufacturer or, in the absence of such a specification, 10 mm × 20 mm × 25 mm.

Where the terminal block will not fit inside the luminaire body due to a lack of adequate space, the manufacturer will need to supply or specify a suitable terminal enclosure.

4.6 Terminal blocks

If luminaires are provided with connecting leads (tails) requiring a separate terminal block for the connection to the fixed wiring, adequate space for this terminal block shall be provided within the luminaire, or within a box delivered with the luminaire, or specified by the manufacturer.

This requirement applies to terminal blocks for connecting leads (tails) with conductor nominal cross-sectional areas not exceeding 2,5 mm^2.

It should be remembered that the building fabric can only be used to house a terminal block if it meets fire retardancy requirements set out in current wiring regulations. This in effect precludes the use of terminal blocks which are not fully enclosed outside of the luminaire as the building fabric will generally not be known.
The only materials in the building fabric which can be considered as non-combustible are metal and plasterboard.

Section 526.5 of BS7671 (IEE wiring regulations) states:

Every termination and joint in a live conductor or a PEN conductor shall be made within one of the following or a combination thereof:
(i) A suitable accessory complying with the appropriate product standard
(ii) An equipment enclosure complying with the appropriate product standard
(iii) An enclosure partially formed or completed with building material which is non-combustible when tested to BS 476-4

A suitable metal or plastic ceiling cup, wall cup or similar attached to a plasterboard surface is considered to form a fire-retardant enclosure.

Question 3
Can I use a “choc block” type terminal block in my product?

Choc block type terminals are acceptable in luminaires as long the terminal block fits wholly inside the luminaire and there are no issues with creepage and clearance distances. The product will need to pass the 8mm strand test when the terminal block is placed in all possible positions in the luminaire.

When considering creepage and clearance distance for the supply terminals, note should be made of the diagram in figure 24 of EN 60598-1, in particular the position of the incoming mains supply wiring from the installer.

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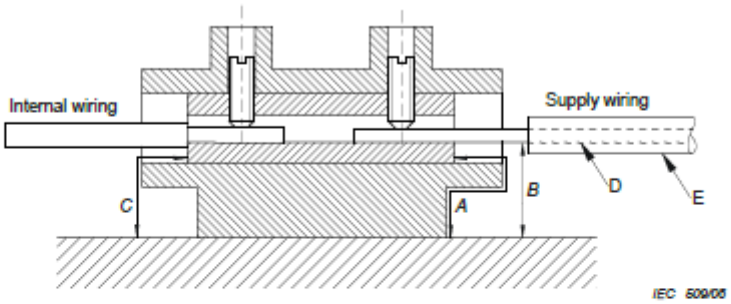
Terminal block fits wholly in the ceiling cup but as it not secured, creepage and clearance distances may not be met, and the terminal block is likely to fail the 8mm strand



Key
A creepage distance
B clearance (supply wiring)
C clearance (internal wiring)
D conductor
E insulation

Figure 24 – Illustration of creepage and clearance measurements at a supply terminal

Choc block style connectors are unlikely to pass the 8mm strand test when used in a metal enclosure without additional means of insulation provided, generally in the form of an insulating pad attached to the base of the terminal block and often fixed in position. The test is described in clause 4.7.2 of EN 60598-1.

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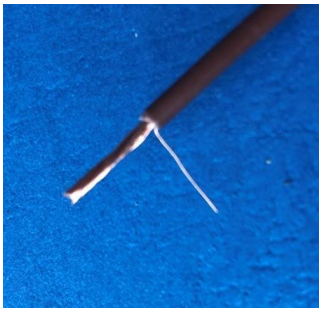
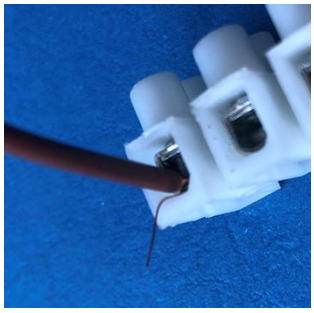
4.7.2 Supply terminals shall be located or shielded in such a way that, if a wire of a stranded conductor escapes from a terminal when the conductors are fitted, there is no risk of contact between live parts and metal parts which can be touched with the standard test finger when the luminaire is fully assembled for use or open for the replacement of replaceable light sources or starters.

Compliance is checked by inspection and by the following test.

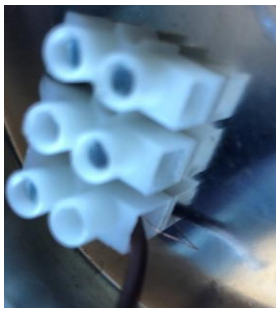
An 8 mm length of insulation is removed from the end of a flexible conductor having the largest cross-sectional area specified in Section 5. One wire of the stranded conductor is left free and the remainder are fully inserted and clamped in the terminal. The free wire is bent, without tearing the insulation back, in every possible direction, but without making sharp bends around barriers.

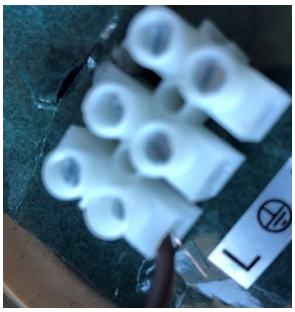
The free wire of a conductor connected to a live terminal shall not touch any metal part which is accessible or connected to an accessible metal part, and the free wire of a conductor connected to an earthing terminal shall not touch any live part.





Stranded wire with an 8mm strand exposed and protruding from a terminal.



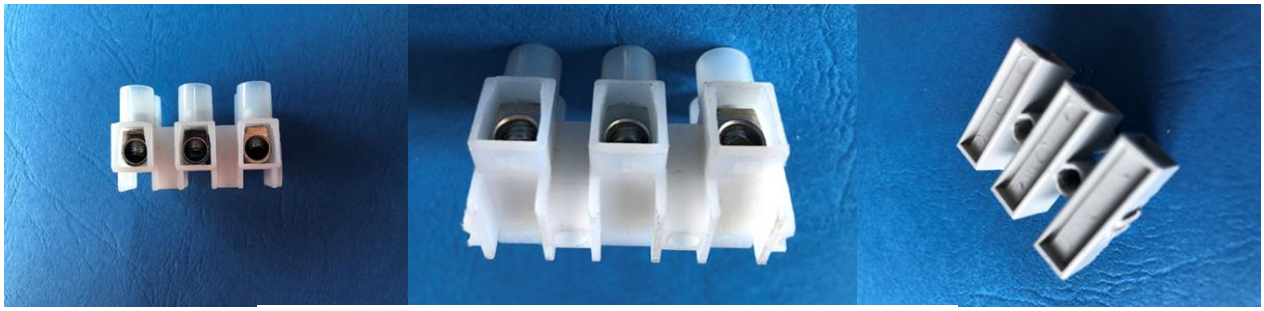


Without additional insulation, the loose strand can touch accessible metal.
Terminal block with insulating material below to ensure compliance with creepage and clearance and 8mm strand test requirements.

Where choc block type terminals are used, these need to pass the above requirements without the need for the installer to have to apply any additional insulation.

Typical insulation material applied below a terminal block. Needs to be factory assembled and ideally the terminal block is secured in the product.

An alternative method to aid in ensuring a terminal block meet both the 8mm strand test and creepage and clearance distances, is to use a terminal block with an extended base moulding, this spaces the terminal away from the mounting surface.



Terminal blocks with extended base mouldings

Question 4
Does the terminal block in my product need to be secured?

Unsecured terminal blocks are acceptable to be used in luminaires as long as they meet the requirements stated in Question 3. Due to the uncertainty of the installed position, it is advised that unsecured “choc block” type terminals are not used.
If the terminal block is fully enclosed type, then these meet both creepage and clearance, and the 8mm strand test requirements without any additional insulation needed.

Fully enclosed terminal block ensures creepage and clearance distances and the 8mm strand test requirements are met.

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Question 5
Does the terminal block have to fit inside the luminaire?

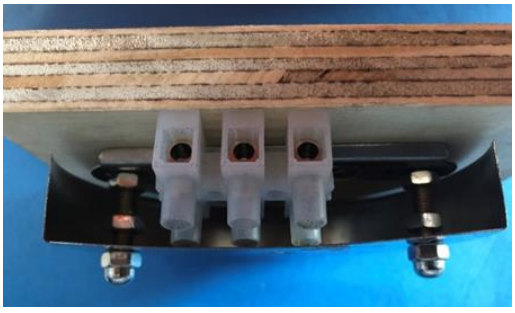
If a terminal block will not fit in the luminaire, a separate terminal enclosure will need to be provided or specified as stated in clause 4.6 of EN 60598-1.

> **4.6 Terminal blocks**
>
> If luminaires are provided with connecting leads (tails) requiring a separate terminal block for the connection to the fixed wiring, adequate space for this terminal block shall be provided within the luminaire, or within a box delivered with the luminaire, or specified by the manufacturer.
>
> This requirement applies to terminal blocks for connecting leads (tails) with conductor nominal cross-sectional areas not exceeding 2,5 mm^2.

It should be remembered that the building fabric can only be used to house a terminal block if it meets fire retardancy requirements set out in current wiring regulations (see question 2). This in effect precludes the use of terminal blocks which are not fully enclosed where they do not fit in the luminaire as the building fabric in which the luminaire will be installed will generally not be known.

The only materials in the building fabric which can be considered fire retardant are metal and plasterboard.

A metal ceiling cup, wall cup or similar attached to a plasterboard surface is considered to form a fire-retardant enclosure.



Insufficient space in the ceiling cup to allow the terminal block to be housed so a separate terminal enclosure will be required.

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Question 6
What do I do if there is not enough room in my product for a terminal block?

If a terminal block will not fit in the luminaire, a separate terminal enclosure will need to be provided or specified as stated in clause 4.6 of EN 60598-1

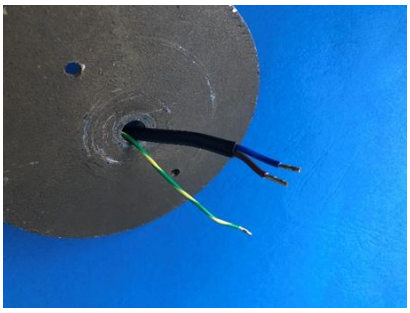
> **4.6 Terminal blocks**
>
> If luminaires are provided with connecting leads (tails) requiring a separate terminal block for the connection to the fixed wiring, adequate space for this terminal block shall be provided within the luminaire, or within a box delivered with the luminaire, or specified by the manufacturer.
>
> This requirement applies to terminal blocks for connecting leads (tails) with conductor nominal cross-sectional areas not exceeding 2,5 mm^2.

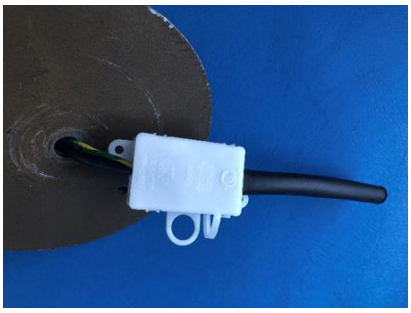
It should be remembered that the building fabric can only be used to house a terminal block if it meets fire retardancy requirements set out in current wiring regulations (see question 2). This in effect precludes the use of terminal blocks which are not fully enclosed where they do not fit in the luminaire as the building fabric in which the luminaire will be installed will generally not be known.

The only materials in the building fabric which can be considered fire retardant are metal and plasterboard.

Where a luminaire does not have room for a terminal block, a suitable wiring accessory can be stated to be used. It must be remembered that the 8 mm strand test and creepage and clearance distances still apply so a fully enclosed terminal block may be more appropriate.

An alternative method to ensure safe installation, is to supply the product with an approved fully enclosed terminal block where there is not room in the product for a terminal block



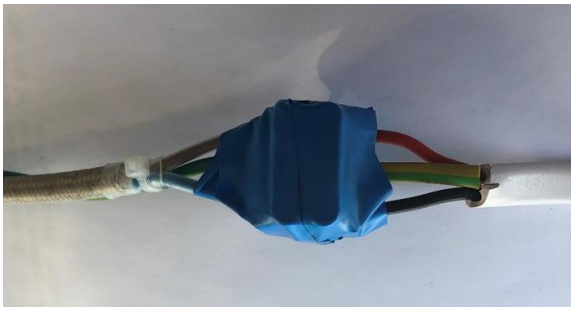


Product with a flush mounted wall plate with no space for a terminal block supplied with a fully enclosed terminal block.

Question 7
Can I tell the installer to wrap the terminal block in insulating tape?

No. Historically, this was an acceptable solution but does not provide the degrees of protection needed by current luminaire standards or wiring regulations. As the luminaire manufacturer has no control over how the tape will be applied by the installer, or the quality of the tape used, this cannot be classed as suitable insulation.

Insulation tape will not provide a satisfactory fire-retardant enclosure to satisfy current wiring regulation requirements.



Wrapping terminals in insulation tape is NOT allowed.

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Question 8
Is a 2 pole terminal block suitable for a class 2 product?

Whilst in principle, a 2 pole terminal block is suitable to be provided with a class 2 luminaire, it should be considered that most installation wiring will be a 3 core cable. In domestic and some commercial environments this cable is generally of the “twin and earth” type, where the earth core is uninsulated.

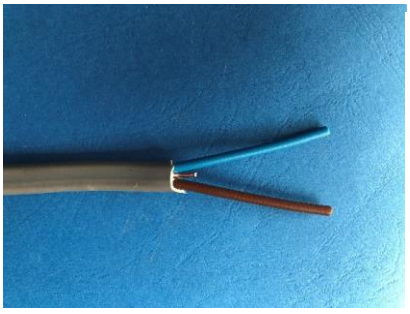
In a class 2 product, any earth wire must be insulated from live parts or accessible metal parts by double or reinforced insulation as per clause 7.2.10 of EN 60598-1.

> **7.2.10** If a fixed class II luminaire is provided with internal terminal(s) for maintaining the electrical continuity e.g. for looping in or through wiring of an earthing conductor, this(these) terminal(s) shall be insulated from accessible metal parts by double insulation or reinforced insulation.
>
> If a fixed connected class II luminaire has an earth connection for functional purposes, e.g. for looping in, to assist the starting of a lamp or to avoid radio interference, the functional earth circuit shall be separated from live parts or accessible metal parts by double or reinforced insulation.

As both the luminaire safety standard and safety legislation (LVD) states that all necessary information must be provided for safe installation, this also includes the termination of supply wiring to the luminaire.

If a 2-pole terminal block is provided in a class 2 product, the installation instructions will need to specify how to suitably terminate and insulate any earth core(s) present.

The use of a 3-pole terminal block in a class 2 product assists the installer in safe installation. It is not permissible to inform the installer to cut off or tape back any earth cores. As well as not ensuring suitable insulation from other parts, if an earth wire is cut off, in future, alternative products could be installed in place of the existing class 2 product which may be class 1 and an earth connection would not be available, or other products on the same circuit may lose earth connection.



Earth cores must be properly insulated on class 2 products. Taping back or cutting off is not allowed.

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Question 9
Does my terminal block need to be marked with L, N and Earth?

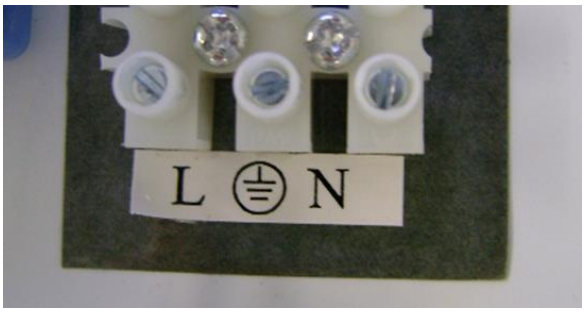
Information needs to be supplied to ensure the installer can identify the terminations. Clause 3.2.12 states that terminations shall be marked to identify Live, Neutral and Earth to ensure safe and satisfactory operation. The correct symbols shall be used for this identification, in particular the correct earth symbol. The markings may be on the terminal block itself, an adjacent label or on individual cable cores.

Protective Earth Symbol (IEC 60417)

If an earth terminal is used in a class 2 luminaire for functional purposes (such as EMC purposes or other functional aspects) the correct functional earth symbol shall be used (See also Question 8)

Functional Earth Symbol (IEC 60417)

If terminations are provided in a class 2 luminaire for the continuity or termination of an earth conductor, the terminal shall be marked with the letter E not the earth symbol. (See also Question 8)



Terminal block marked with L, N, and earth symbol

Individual cable cores marked with L, N, and earth symbol

Terminal block marked with L, N and E indicating the "E" terminal is provided for the termination of the supply conductor but not connected to the luminaire e.g. class 2 product.

Question 10
Are all supply terminals suitable for looping in connections?

1.2.48
looping-in
system of mains supply connection to two or more luminaires where each supply conductor is taken into and out of the same terminal

Terminal blocks designed for single conductors only are not suitable for looping in. If the luminaire is designed to have looping in and out to other luminaires, then the terminal block provided shall be suitable for multi conductors. Pillar terminal blocks are normally suitable for single conductors while terminal blocks with compression plates are suitable for multi conductors.

Terminals on the right have compression plates which allow the safe use of multiple conductors.

Terminals where more than one connection point for each wire (eg 2 X Live, 2 X Neutral and 2 X Earth) are provided, are suitable for looping in.
In each case, the maximum permissible current or number of luminaires which can be connected must be supplied ref EN 60598-1 Clause 3.2.17

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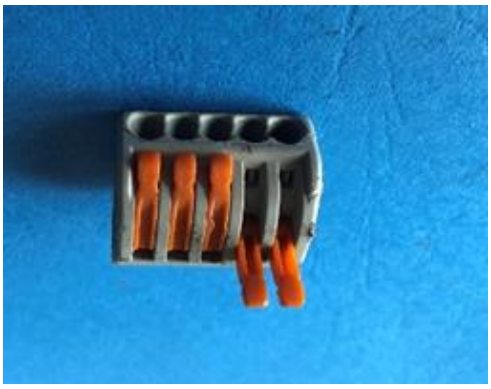
3.2.17 The maximum number of luminaires that may be interconnected or the maximum total current that may be drawn by means of couplers provided for looping-in connection to the mains supply. For fixed luminaires, this information may alternatively be provided within the installation instructions.



Multi-way terminals such as this are designed such that several conductors can be connected to each pole effectively (looping in). The looping in current rating is dependent on the terminal block rating.

Question 11
Can I supply a product which needs a terminal block with an integral screwless earth connection but is not included?

No, any product which requires a terminal block that uses an integral screwless earth must be provided installed in the product.

To ensure good earth continuity checks must be made to ensure the terminal block and its mounting are satisfactory during manufacture.

Question 12
Does the terminal block need to be attached to the luminaire or can it be supplied loose?

Terminal blocks can be provided loose with the product if desired as long as it has been established suitable for all parameters. Any special cable preparation must be stated in the user instructions. (see also questions above for additional information)

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Question 13
Do I need to make any special preparations to wires going into terminal blocks?

When fitting or supplying a terminal block with a product, care must be taken to ensure any necessary preparation of the wire ends is either factory made, or the correct information is provided to the installer. This should also include where multiple wires are intended to be used in one terminal.

Pillar terminal blocks are normally suitable for single conductors while terminal blocks with compression plates are suitable for multi conductors.

Terminals on the right have compression plates which allow the safe use of multiple conductors.

Typical wire end preparations for stranded cable are twisting strands together, applying ferrules or applying solder to the strands.

Solder must only be applied where the wire is in terminals that do not rely on a screw for security.

> **5.2.13** The ends of flexible stranded conductors may be tinned, but shall not have additional solder applied, unless a means is provided of ensuring that clamped connections cannot work loose owing to cold flow of the solder (see Figure 28).
>
> EXAMPLE This requirement is met when spring terminals are used. Securing the clamping screws is not an adequate means of preventing the connection of soldered strands from working loose owing to cold flow of the solder.

When selecting terminals for a luminaire, it should also consider what type of wiring the installer will use to supply the product. Typically, fixed domestic products will use a solid core twin and earth type cable whereas commercial and industrial products may have a either flexible or armoured cables. Products for outdoors that are supplied without cable are generally going to be supplied by a rubber insulated flexible cable.

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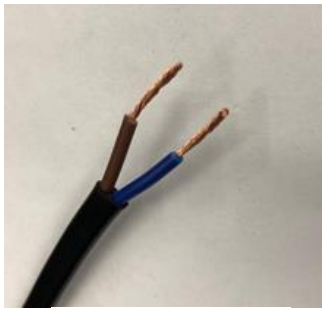
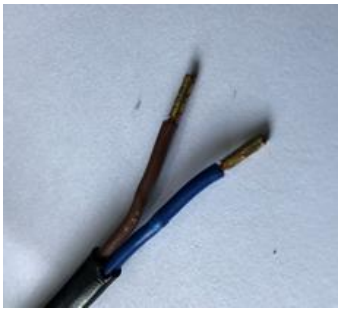
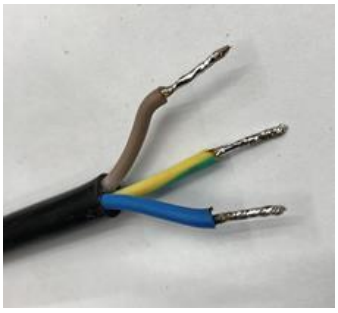


Stranded cable

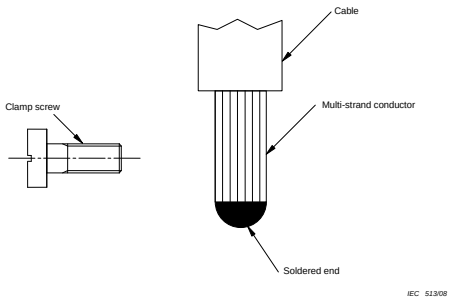


Ferrules fitted



Soldered ends (Screwless terminals)

Solid core cable



Soldered ends (Screw terminals) Fig. 28 of BS EN 60598-1.

Additional Information

Terminals General

When using terminals, as well as suitability shown above, the terminal must also meet other requirements in EN 60598. Typical aspects will be the temperature at which they are operating (temperature limits should be available from the terminal manufacturer) and the mechanical strength requirements for terminals, (particularly enclosed types).

The conformity of a terminal to its own safety standard should always be validated prior to selections (or alternatively the tests of EN 60598-1 Clauses 14 and 15 can be applied).

Cord Restraints

It must be remembered that where required, cord restraints must operate independently of any wires in terminals. Consideration should also be given to supply cords which the installer will need to supply / fit. The cord restraint must be effective and suitable for the expected cable to be used. Details of cord restraint requirements can be found in EN 60598-1.

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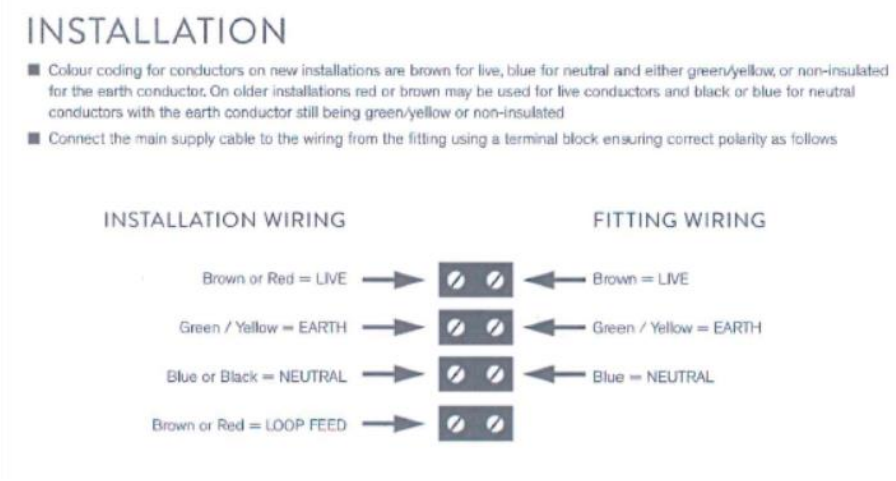
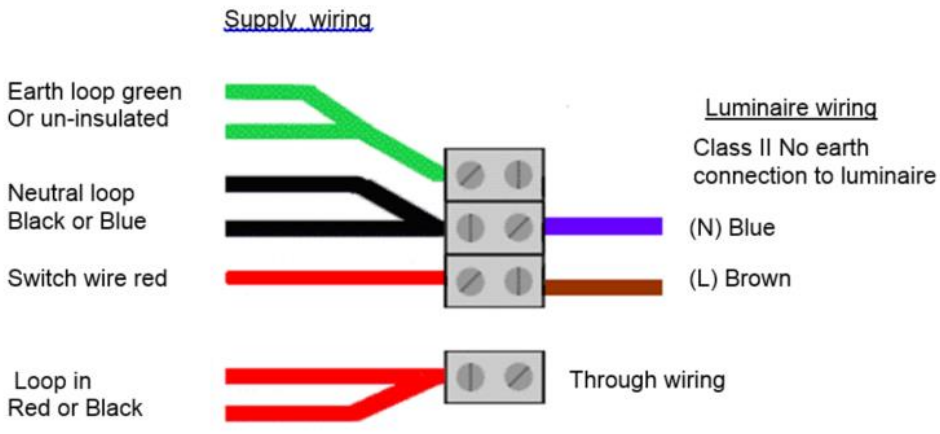
Supply Cords
Whilst it is not always necessary to provide a product with a supply cord, special note must be taken of both EN 60598-1 and also the relevant EN 60598-2-X for the particular product type in question. Some products such as portable luminaires (both indoor and outdoor) must be provided with a supply cord fitted.

User Instructions
In support of all terminal block types used / supplied, the manufacturer should ensure all necessary information for safe installation shall be provided. This may take the form of written or diagrammatic instruction accompanying the product (pictorial information is multi language and can be useful for products sold in many regions).

Examples of wiring instructions for terminal blocks:





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Examples of wiring instructions for terminal blocks: