



Guide to the **Specification** and **Installation** of **Pyro Mi** Wiring Cables

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Preface

This guide has been prepared in response to many requests for a comprehensive aide memoire which would assist the electrical consultant in the preparation of a document which incorporates the specification of Pyro Mi Wiring Cable. We hope you will find it of assistance.

For over 50 years, Pyrotenax have actively encouraged the named specification of our products. We believe that this has been mutually beneficial, providing all parties with the necessary high degree of confidence in a reputable product that will ensure a lifetime of successful installations.

We appreciate that specification of any product places particular responsibilities on the consultant who must be assured that the items featured in the design fully meet the requirements placed on them. Therefore, to ensure that Pyro Mi Cable fully meets our customers' expectations, the Company has sought and obtained all appropriate national and international certification and approvals. Naturally, a cornerstone must be the independent verification of our claims to meet any standard, the most significant of which is LPCB approval to BS EN 60702: Part 1

We at Tyco Thermal Controls are also justly proud to claim that they are approved to ISO 9002 for Quality Systems Management. Quality has always been a keynote within the Company and this new certificate further strengthens the total commitment to this philosophy.

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Guide to the specification and installation of Pyro Mi Wiring Cable

This document is intended to give general guidance on the installation of Pyro Mi Wiring Cables. Relevant paragraphs and clauses may be extracted by specifiers and used to cover specific projects although the information given does not apply specifically to any particular installation.

The installation procedures, materials and components of the installation shall comply with the relevant standards, approvals and specifications.

Typical examples of these standards would be:

- (a) Current edition of the IEE Regulations for Electrical Installations.
- (b) The appropriate British Standard Specifications and Codes of Practice.
- (c) The Electricity Supply Authority Regulations.
- (d) The relevant National or International Standards, Approvals and Codes of Practice issued by the appropriate professional body.

Cable Specification Information

1.0 CABLE

All wiring shall be carried out in one of the following grades of, copper sheathed, copper conductor cables, insulated with compressed mineral insulant supplied and tested in accordance with BS EN 60702: Part 1: by Tyco Thermal Controls.

All cables shall carry LPCB approval and the supplier shall hold ISO 9002 approval.

1.1 LIGHT DUTY GRADE

These cables are rated at 500V and are suitable for use where the voltage between the conductor and sheath and between conductors does not exceed 500V r.m.s. a.c. or 500V d.c.

1.2 HEAVY DUTY GRADE

These cables are rated at 750V and are suitable for use where the voltage between the conductor and sheath and between conductors does not exceed 750V r.m.s. a.c. or 750V d.c.

Outer Covering

2.0 Pyro Mi Wiring Cables can be supplied with an overall LSF plastic covering.

This covering may be specified for one of the following reasons:

- (a) To provide protection of the copper sheath in potentially corrosive environments.
- (b) To provide circuit identification by colour.
- (c) For aesthetic reasons.

When cables are to be buried underground the type having an outer covering should be specified.

When covered cables are used for corrosion protection it is essential that any covering removed to facilitate terminating is replaced by taping over the exposed copper sheath and the backnut of the gland. The tape should be applied 'half lap' and shall overlap the cable outer plastic covering.

Further protection is given by fitting a plastic gland shroud which shall cover the taped area of the sheath and the gland.

When cables are fitted into boxes by means of a clamp instead of using a gland for anchorage the tape shall cover the exposed part of the cable sheath.

Terminating

3.0 All terminations shall be supplied by the cable manufacturer Tyco Thermal Controls and shall comply with the requirements of BS EN 60702: Part 2:. They shall be fitted in accordance with the manufacturer's latest recommended terminating procedures as detailed below:

3.1 SEALS

The following types of seal are available and shall be utilised as appropriate to suit the environment:

Standard 105°C and Fire Resistant Seal Publication CDE-0923 Rev. 0-4/05
 Increased Safety seal for EEXe Hazardous Area installations Publication CDE-0928 Rev. 0-4/05
 250°C High Temperature Glazed Insulator Publication CDE-0924 Rev. 0-4/05
 Radiation Resistant Seal Publication CDE-0932 Rev. 0-4/05

TABLE ONE

Seal Description	Pyro Mi Ref	Recommended Continuous Operating Temperature Range	Application
Standard	RPS RPS1*	-80°C to 105°C	General use between -80°C and 105°C
High Temperature Insulator		50°C to 250°C	Used at temperatures between 150°C and 250°C
Increased Safety (type of protection V)	RPMAA RPMKA*	-20°C to 100°C	Used in hazardous areas with type of protection 'e' apparatus
Fire Resisting and Radiation Resistant		-20°C to 105°C	Smoke Extract and Nuclear Radiation environments

*These seals have an integral earth tail soldered and crimped into the pot and are offered as an alternative to plain seals for conductor sizes up to and including 50mm². They must be utilised to ensure the integrity of the circuit protective conductor in situations where cables are not secured into enclosures by means of Pyro Mi glands.

For the selection of terminations for use in hazardous areas refer to Table 3.

3.2 GLANDS

The standard Pyro Mi externally threaded compression ring gland with 20mm, 25mm, 32mm and 40mm threads shall be used.

All these glands comply with ATEX Directive 94/9/EC and are stamped with the certificate of conformity number 03ATEX0347X and are specifically approved for use with flameproof apparatus (type of protection 'd') zones 1 and 2 groups IIA, IIB, and IIC. They are also suitable for other types of protection.

Jointing

4.0 When the cable run is such that cables require to be jointed, or where cables are damaged, straight through joints can be used. Joints shall only be used with the prior approval of the consultant or specifier and shall be of a type supplied by or approved by the cable manufacture Tyco Thermal Controls. The techniques involved in jointing Pyro Mi Wiring Cables are shown in Publication CDE-0925 Rev. 0-4/05.

NOTE: Refer to manufacturer for specific design requirements for fire rated jointing solutions.

Testing

- 5.0** When required by the consultant or specifier cables may be tested prior to installation using a suitable insulation resistance tester.

NB: It is essential that both ends of the cable are effectively sealed before the insulation resistance test is carried out. In conditions of high humidity it may take up to 24 hours for the insulation resistance reading to attain a satisfactory value.

Cables should only be tested after both ends have been terminated with a permanent seal. In order to prove the integrity of the seals the cable should be subject to a further insulation resistance test 24 hours later, when the insulation resistance should be at least 100M Ω . The test voltage should be selected in accordance with BS 7671 IEE Regulations for Electrical Installation.

Never test a cable which has unsealed ends, because this will result in false readings.

Installation

6.0 BENDING RADII

Bends shall normally be restricted to a minimum radius of six times the bare cable diameter.

Where sharper bends are required, these may be made down to a minimum of 3 times the cable diameter but subsequent re straightening may not be carried out without the permission of the customer or his agent.

6.1 BURIED IN THE GROUND

When cables are buried direct in the ground the trench shall be of sufficient depth to avoid damage occurring to the cables by any disturbance to the ground.

Outer covered cables shall be used as it is possible that corrosive elements will be present in the ground.

No sharp stones or other materials likely to cause damage to the cable shall be left in the bottom of the trench.

The cables shall be laid on a bed of sand or fine soil and initially covered with a similar layer.

The cables shall then be covered with cable covers or suitable marking tape to ensure that anyone disturbing the trench at a future date will be made aware of the presence of the cables.

When single core cable are used they shall be strapped together in trefoil formation at 500mm intervals. (See Table 4).

When multiple runs of cable occupy the same trench the cables may need to be spaced laterally apart in the trench. This shall be agreed with the consultant or specifier prior to installation.

The back filling of the trench shall be carried out in layers with each layer individually compacted.

6.2 UNDERGROUND DUCTS, CONDUITS OR PIPES

When cables are to be drawn into underground ducts the contractor shall inspect the ducts after installation to ensure that they are free of obstructions, smooth and dry.

When the cables are to be installed in concrete ducts the cables shall have an overall outer covering. When the ducts are of a material other than concrete and will remain dry in service then bare copper cables may be used.

6.3 BURIED IN CONCRETE

When cables are to be buried in or covered by concrete there is a risk of the concrete containing elements corrosive to copper. Outer covered Pyro Mi Wiring Cables shall be utilised.

6.4 BURIED IN PLASTER

When cables are installed in a building prior to plastering care shall be taken when carrying out the installation to ensure that cables are run in such a way that they will not be damaged by plastering trowels.

6.4 BURIED IN PLASTER continued

Bare copper cables can be used under plaster.

When cables are terminated into plaster depth boxes using a cable or pot grip device instead of a gland an earth tail seal shall be used to ensure the integrity of the protective conductor.

6.5 SURFACE WIRING

Pyro Mi Wiring Cables shall be fixed to surfaces by means of clips, saddles or fixing strip supplied by the cable manufacturer. Other methods of fixings are available but shall only be used after prior arrangements with the specifier.

The maximum distance between fixings is dependent on the size of cable and shall not be greater than that specified in Table 2.

TABLE TWO

Cable Diameter	Surface	On Cable Tray	Behind Plaster	In Roof Space or Suspended Ceiling
Fixing Distances Vertical				
Less than 9 mm	550mm	800mm	600mm	550mm
9mm up to 20mm	600mm	1000mm	-	800mm
Over 20mm	650mm	1200mm	-	1000mm
Fixing Distances Horizontal				
Less than 9 mm	450mm	800mm	600mm	550mm
9mm up to 20mm	500mm	1000mm	-	800mm
Over 20mm	550mm	1200mm	-	1000mm

Screws used for fixing shall be of a suitable corrosion resistant type.

When the environment is likely to be corrosive to copper plastic covered cables shall be used.

If sections of the cable route pass through areas where mechanical damage to the cables is likely to occur then additional mechanical protection for the cable shall be installed.

This may take the form of short isolated lengths of metal conduits or metal capping.

6.6 ON CABLE TRAY

Cable shall be fixed to the cable tray as described in Section 6.5.

Precautions shall be taken to avoid damage to cables on any sharp edges.

Either bare copper or plastic covered cables may be used dependent on the environmental conditions. In damp conditions electrolytic action can occur between bare copper sheathed cables and galvanised cable tray. This may cause premature deterioration of the tray, but will not adversely affect the cable sheath.

6.7 OUTDOOR OR WET CONDITIONS

When Pyro Mi Wiring Cables are to be terminated into boxes or fittings outdoors or in damp conditions it will be necessary to seal the cable entry hole to prevent moisture ingress.

If the box has a plain hole entry then the gland may be fitted with a suitable sealing washer before fitting it into the box.

If the box has a threaded entry then a suitable thread sealant shall be applied to the gland entry thread before screwing it into the box.

When the outdoor or wet installation is part of a hazardous area then the methods used for sealing shall be in accordance with the British Standard Code of Practice and meet ATEX certification requirements. In these cases the cable manufacturer Tyco Thermal Controls should be consulted.

BS EN 60529 gives an Index of Protection (IP) code for the sealing of equipment and this may be quoted as requirement for a particular installation. For example equipment may be required to be sealed IP 54.

The cable manufacturer shall be consulted for guidance on achieving specific IP ratings.

6.8 POTENTIALLY EXPLOSIVE ATMOSPHERES

When the installation is to be carried out in a potentially explosive atmosphere the type of seal and the type of gland fitted to the cable shall be carefully considered.

Due account must be taken of the type of protection being employed, the area classification and the apparatus gas group.

Table 3 is a guide to the use of Pyro Mi Wiring Cables and accessories in potentially explosive atmospheres.

TABLE THREE

Type of Protection	Zone	Apparatus Grouping	Pyro Mi Gland**	Pyro Mi Seal**
Flameproof Type of Protection 'd'	1,2	IIA, IIB, IIC	RGM	Any standard seal usually RPS,RPSL
Increased Safety Type of Protection 'e'	1,2	II	RGM	Special Seal RPMAA or RPMKA***
Intrinsic Safety Type of Protection 'I'	0,1,2	II	RGM	Any standard seal usually RPS, RPSL

The types of protection shown are the most common in general use. For guidance on the application of Pyro Mi Wiring Cables and accessories to other types of protection consult the manufacturer, Tyco Thermal Controls.

** See Pyrotenax Publication CDE-0923 Rev. 0-4/05 for full description of seals and glands.

*** See Pyrotenax Publication CDE-0928 Rev. 0-4/05.

6.9 HIGH TEMPERATURE ENVIRONMENTS

When the sheath temperature of a Pyro Mi Wiring Cable, taking into account ambient temperature and temperature rise due to current flow, will not exceed 250°C continuously, the choice of bare copper, or plastic outer covering can be made using the following matrix.

Continuous Operating Temperature	Bare Copper	LSF Outer Covering
Up to 80°C	Yes	Yes
Between 80°C and 250°C	Yes	No

At continuous operating temperatures above 250°C the life of the cable will be reduced.

An anticipated cable life can be obtained by referring the details to the cable manufacturer Tyco Thermal Controls

6.10 LOW TEMPERATURE ENVIRONMENTS

Pyro Mi Wiring Cable will operate at temperatures approaching absolute zero with no adverse effects. At extremely low temperatures however, if LSF covered cables have been used some cracking of the plastic covering may occur. This will not affect the inherent performance of the cable. The minimum bending temperature for LSF covered Pyro Mi Wiring Cables is 20°C.

NB: It is important to select the correct termination for an abnormally high or low temperature application by reference to Table 1, or alternatively to POSITION the termination in areas of normal ambient temperature.

Installations Using Large Single Core Cables

7.0 INSTALLING SINGLE CORE CABLES

When single core cables carrying currents in excess of 200 amps are installed care should be taken to minimise the effects of eddy currents and induced sheath circulating currents.

7.1 EDDY CURRENTS

When large single core cables enter a box made from ferrous materials (distribution board, isolator etc.) precautions shall be taken to prevent excessive heating by eddy currents.

In dry conditions and where only one cable per phase is used slots can be cut between the gland holes in the box.

In wet conditions or where more than one cable per phase is used the ferrous gland plate should be replaced by a brass one.

7.2 SHEATH CIRCULATING CURRENTS

When plastic covered single core Pyro Mi Wiring Cables are installed with each end of the cables connected to a metal gland plate a circulating current will flow in the sheath of the cables. These circulating currents will have no adverse effects, providing the cables are run in the configurations shown in the table below.

TABLE FOUR: RECOMMENDED CONFIGURATIONS

Current Rating Reference Method	Single Phase	Three Phase 3 Wire	Three Phase 4 Wire
Single Circuit	All Appropriate		
More than one circuit or more than one cable per phase in parallel	All Appropriate		

NOTES: Current ratings and volt drop values will vary with the configuration of the cables. See Pyrotex Publication CDE-0935 R-1/06 or the Wiring Regulations for relevant values.

D = Cable diameter.

S = Clearance between groups of cables and should be equal to at least 2D to avoid de rating.

In balanced 3 phase, 4 wire systems employing more than one circuit or more than one cable per phase, the neutrals may be located as shown, or alternatively outside the cable groups.

Inductive Components

8.0 When inductive circuit components are switched, high transient voltages may be generated. These voltages are commonly in excess of 2000V and can emanate from such components as 3 phase star connected fractional horse power motors, miniature fluorescent fittings, contactor coils etc.

To ensure that the installation complies with the compatibility clauses of the 16th Edition IEE Regulations (Regulation 331 01, 512 05-01) these inductive components shall be fitted with a suitable surge diverter (voltage dependent resistor), available from Tyco Thermal Controls.

Failure to recognise and suppress inductive components capable of generating damaging voltage surges may result in failure of cables and other equipment in the installation.

Pyrotex Publication CDE-0930 R1-1/06 shall be consulted for further guidance.

Commissioning

9.0 The final testing of the installation shall be carried out in accordance with current Edition IEE Regulations and/or the specification relevant to the installation.

9.1 INSULATION RESISTANCE

The insulation resistance between conductors and between a conductor and sheath of each single isolated length of cable when tested with a 500V d.c. insulation resistance tester shall be in excess of 100 megohms.

This test shall be carried out at least 24 hours after both ends of the cable have been fitted with a suitable Pyro Mi Wiring Cable termination. This delayed testing will ensure that any incorrectly fitted seals will be highlighted by the test results.

9.2 CONDUCTOR IDENTIFICATION

The continuity of each conductor shall be checked and the conductors fitted with identification tapes or markers in accordance with the relevant specification. When there are no specific requirements for marking the identification shall be in accordance with IEE Regulations as shown in Table 5.

TABLE FIVE

Colour identification of cores of non flexible cables and bare conductors for fixed wiring.

Function	Alpha Numeric Marking	Colour Identification
Protective (including earthing) conductor		Green-and-yellow
Phase of a.c. single-phase circuit	L	Brown
Neutral of a.c. single- or three-phase circuit	N	Blue
Phase R of 3-phase a.c. circuit	L1	Brown
Phase Y of 3-phase a.c. circuit	L2	Black
Phase B of 3-phase a.c. circuit	L3	Grey
Positive of d.c. 2-wire circuit	L+	Brown
Negative of d.c. 2-wire circuit	L-	Grey

Standards and Approval

10.0 Cables

Pyro Mi Wiring Cables are manufactured, tested and LPCB approved to BS EN 60702-1.

Pyro Mi Wiring Cables are LPCB approved to BS 8434-2, BS 5839-1 Clause 26.2 (Enhanced) and BS EN 50200 Class PH 120.

BS 8434- Methods of test for assessment of the fire integrity of electric cables Part1: Test for unprotected small cables for use in emergency circuits - BS EN 50200 with the addition of water spray. Part 2: Test for unprotected small cables for use in emergency circuits - BS EN 50200 with a 930°C flame and with water spray.

BS 6387- 1994 Performance Requirements for Cables Required to Maintain Circuit Integrity under Fire Conditions Categories C, W and Z.

IEC 60331- Tests for Electric Cables under fire conditions.

Underwriters Laboratories- UL2196-USA, ULC-S139-Canada. Tests for fire resistant cables.

London Underground- Fire Survival Cable (MICC) EME-SP-14-028-A1.

Pyro Mi Terminations

Pyro Mi Terminations are tested in accordance with BSEN 60702: Part 2: Pyro Mi Terminations are Certified for use in potentially explosive atmospheres.

Glands - BASEEFA 03ATEX0347X. Increased Safety Seals - BASEEFA 02ATEX0194U.

Quality Certification



Assessed to ISO 9001:2001
Certificate No. 063

CE Mark

Pyro Mi cable drums, reels and termination packaging are marked with the CE mark as required by the directive, except for Terminations primarily intended for installation in potentially explosive atmospheres which are not marked, because the low voltage directive does not apply.

Other Standards and Codes of Practice Referring to Pyro Mi Cables:

BS 7671- Requirements for Electrical Installations (IEE Wiring Regulations).

BS 5588- Fire Precautions in the design, construction and use of buildings.

BS 5266- Emergency Lighting.

BS 60079- Code of Practice for the selection, installation and maintenance of electrical apparatus for use in Potentially Explosive Atmospheres.

BS 5454- Storage and exhibition of Archival Documents.

BS 5839- Fire detection and alarm systems in Buildings.

The Institute of Petroleum Guidance for the design, Construction, Modification and Maintenance of Petrol Filling Stations. Electrical Installations.

C.I.O. Lighting and Wiring of Churches.



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