



Excel Technology Co Pty Ltd

Specification Loop 'Winding' and Feeder Cable

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LOOP FEEDER CABLE

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Cables for traffic signal installations

Part 2: Feeder cable for vehicle detectors

1 SCOPE This Standard specifies requirements for screened, twisted balanced-twin feeder cable, intended for use in traffic signal installations for the interconnection of vehicle detector equipment and inductive type vehicle detector loops.

The cable is intended to operate in extra-low voltage (ELV) circuits in traffic signal installations, to have a nominal characteristic impedance (Z_c) of 90Ω at 50 kHz and to exhibit minimum change in its characteristics under adverse service environmental conditions.

NOTE: Purchasing guidelines are given in Appendix A.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

1049 Telecommunication cables—Insulation, sheath and jacket

1125 Conductors in insulated electric cables and flexible cords

AS/NZS

1660 Test methods for electric cables, cords and conductors (all Parts)

3808 Insulating and sheathing materials for electric cables

3 DEFINITIONS For the purpose of this Standard, the definitions given in the referenced Standards and those below apply.

3.1 Core—conductor with its insulation but not including any screen or protective covering.

3.2 Core conductor—conductor that has the specific function of conveying signal-loop current.

3.3 Drain conductor—conductor that has the specific function of ensuring electrical continuity of a metallic tape screen throughout the length of the cable.

3.4 Lay-up—the assembling of cores.

3.5 Length of lay—axial distance between each successive turns of the helix formed by a core of a two-core cable.

3.6 Routine tests—tests made by the manufacturer on all completed cable to demonstrate the integrity of the cable.

3.7 Sample tests—tests made by the manufacturer on samples of completed cable, or components taken from the completed cable, adequate to verify that the finished product meets the design specifications.

3.8 Type tests—tests required to be made by the manufacturer before supplying on a general commercial basis a type of cable covered by this Standard in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are of such a nature that, after they have been made, they need not be repeated, unless changes are made in the cable materials or design that might change the performance characteristics.

4 VOLTAGE DESIGNATION The cables are intended for operation at extra-low voltage (ELV).

NOTE: In order to meet the requirements of the relevant national regulations, the dielectric strength and thickness of the outer sheath provides adequate insulation to allow feeder cable to be installed with low voltage cables in a common duct or conduit.

5 OPERATING TEMPERATURE The cable shall be suitable for continuous operation within the temperature range -10°C to $+70^{\circ}\text{C}$.

6 CONSTRUCTION The construction shall be in accordance with the details given in Figure 1.

7 CONDUCTORS

7.1 Core conductors Core conductors shall—

- (a) be of plain or tinned annealed copper. If tinned, any wire taken from the conductor need not meet the tinning test in AS 1125.
- (b) comprise seven wires and have a nominal cross-sectional area of 1.5 mm^2 ; and
- (c) comply with the appropriate requirements of AS 1125 for stranded circular conductors.

7.2 Drain conductors Drain conductors shall—

- (a) be of tinned annealed copper;
- (b) comprise seven wires and have a nominal cross-sectional area of 0.35 mm^2 ; and
- (c) comply with the appropriate requirements of AS 1125 for stranded circular conductors.

The drain conductor shall be located on the metallic side of the tape screen and shall be in electrical contact with the screen throughout the length of the cable.

8 INSULATION

8.1 Material Insulation shall be low density polyethylene, Type 1 Category 5, and shall meet the requirements for solid insulation in accordance with AS 1049 for cables jointed outdoors, except that there shall be no spark test failures.

8.2 Thickness The average thickness of insulation when determined in accordance with the relevant part of AS/NZS 1660 shall be not less than 0.4 mm and the thickness at any point shall be not less than 0.30 mm .

9 CORE COLOUR The colour of cores shall be the same and black, unless otherwise specified (see Appendix A).

10 LAY-UP The lay-up of the cores in the complete cable shall be of helical configuration. The length of lay shall not exceed 50 mm .

NOTE: The specified lay-up was selected to impart a degree of flexibility and to reduce the probability of pick-up of electrical interference.

11 WATER BLOCK MATERIALS Fillers and filling compounds (if used) shall be of a material which is compatible with the other materials of the cable with which they are in contact.

NOTE: Water blocking may be required to reduce the change in mutual capacitance resulting from the accumulation of bulk water in the voids.

12 BINDING TAPES Binding tapes (if used) shall be of a material which is compatible with the other materials of the cable with which they are in contact.

NOTE: Binding tapes may be used to prevent the adherence of the inner sheath to the cores.

13 INNER SHEATH

13.1 Material Inner sheath material shall be low density polyethylene as specified in Clause 8.

13.2 Application The inner sheath shall not adhere to the underlying cores.

13.3 Thickness The average thickness of the inner sheath when determined in accordance with the relevant part of AS/NZS 1660 shall be not less than 0.5 mm and the thickness at any point shall be not less than 0.30 mm.

14 METALLIC SCREEN A screen shall be applied over the inner sheath. The screen material shall consist of copper or aluminium tape having a nominal thickness of 0.075 mm, or aluminium/polyester laminated tape having a nominal aluminium thickness of 0.025 mm.

Where an aluminium or aluminium/polyester tape is incorporated in the cable, a drain conductor in accordance with Clause 7.2 shall be included and it shall be in contact with the aluminium surface of the tape. It may be applied longitudinally. It shall be continuous throughout the length of the cable.

If laminated tape is used, the metallic side shall face inwards (see Figure 1).

15 OUTER SHEATH

15.1 Materials The sheath shall be of 4V-75 PVC complying with the requirements of AS/NZS 3808.

NOTE: For protection against termite attack an outer jacket of polyamide may be used.

15.2 Thickness The average thickness of sheath when determined in accordance with the relevant part of AS/NZS 1660 shall be not less than 0.8 mm and the thickness at any point shall be not less than 0.62 mm.

15.3 Overall diameter The overall diameter over the PVC sheath shall not exceed 9.5 mm.

15.4 Colour The colour of the sheath shall be black.

16 POLYAMIDE JACKET Where a polyamide jacket is required, the material shall be black polyamide Type 11 or 12, heat and light stabilized. It should be recognized that it may become ineffective as a protection from termite damage if scuffed, cracked or crazed due to mechanical abrasion, or if the surface is rippled or contains discontinuities. The jacket shall be applied over the PVC sheath.

The average thickness of the polyamide jacket when determined in accordance with the relevant part of AS/NZS 1660 shall be not less than 0.4 mm and the thickness at any point shall be not less than 0.20 mm. The overall diameter shall not exceed 10.5 mm.

17 MARKING The cable shall comply with the following marking requirements:

- (a) *Manufacturer's identification* The manufacturer shall be identified by either—
- (i) the manufacturer's name or mark legibly and durably marked on the outer surface; or
 - (ii) by means of a tape in the cable.
- (b) *Height of characters* The height of the characters shall be not less than 1.5 mm.

NOTE: By agreement between the purchaser and manufacturer, an indication of the length of cable remaining on the reel or drum may be marked on the outer surface at intervals of 1 m. See Appendix A.

18 PACKAGING Packaging requirements shall be as follows:

- (a) *Marking* The reels (or drums) shall be marked with the following information:
- (i) The name or registered trade name or mark of the manufacturer.
 - (ii) The words and letters 'FEEDER CABLE FOR VEHICLE DETECTORS ELV'.
 - (iii) Length of cable, in metres.
 - (iv) The words 'POLYAMIDE JACKET' (if appropriate).
- (b) *Packaging length* Unless otherwise specified by the purchaser, the reel shall contain 1000 m of cable.
- (c) *End sealing* Both ends of each length of cable shall be sealed to prevent the ingress of water.
- (d) *Barrel diameter* The barrel diameter shall be not less than 170 mm for PVC sheathed cable and 300 mm for PVC sheathed/polyamide jacketed cable.

NOTE: Manufacturers making a statement of compliance with this Australian/New Zealand Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

19 TESTS Cables shall comply with the requirements of Table 1.

TABLE 1 (continued)

1	2	3	4	5
Test No.	Test	Criteria	Category of test	Reference for test method.
13	Water penetration between cores and between cores and metallic screen	Water penetration to be assessed by measurement of variation of C_{50} between cores following water penetration test. Maximum variation 3 percent	Sample	Appendix E
14	Spark test (a) Spark test on core 4 kV a.c. r.m.s. 50 Hz or 6 kV d.c. (b) Spark test on finished cable 6 kV a.c. r.m.s. 50 Hz or 9 kV d.c.	No breakdown of the insulation No breakdown of the sheath	Routine Routine	AS/NZS 1660 AS/NZS 1660

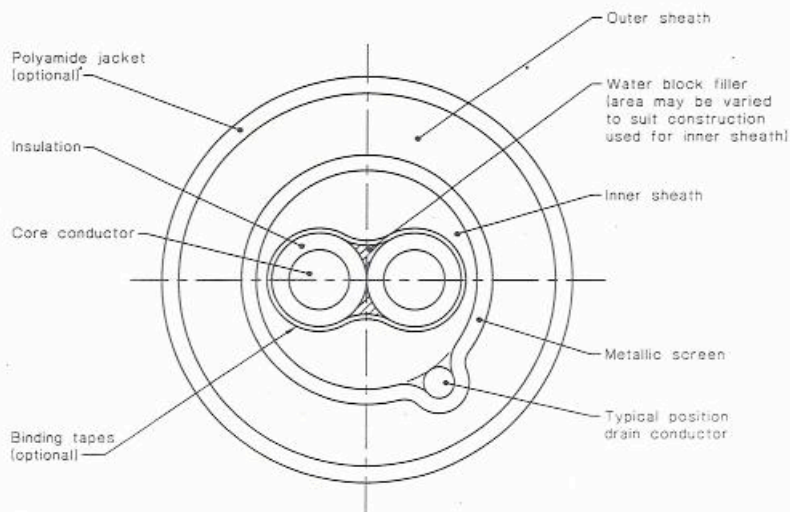


FIGURE 1 SCHEMATIC DIAGRAM—CONSTRUCTION OF FEEDER CABLE

LOOP 'WINDING' WIRE

STANDARDS AUSTRALIA

Australian Standard

Cables for traffic signal installations

Part 3: Loop cable for vehicle detectors

1 SCOPE This Standard specifies requirements for single-core cable intended for the construction of inductive vehicle-detector loops for traffic signal installations operating in the frequency range 20 kHz to 200 kHz, and suitable for installation in slots cut into road surface, the slots being subsequently filled with a suitable sealant.

The cable is intended for operation in extra-low voltage (ELV) installations.

2 REFERENCED DOCUMENTS The following Standards are referred to in this Standard:

- AS
1049 Telecommunication cables—Insulation and sheath—Polyethylene
1125 Conductors in insulated electric cables and flexible cords
1660 Methods of test for electric cables and flexible cords
3198 Approval and test specification—Electric cables—XLPE insulated—For working voltages up to and including 0.6/1 kV.

3 DEFINITIONS For the purpose of this Standard, the relevant definitions given in the referenced Standards and those below apply.

3.1 Routine tests—tests made by the manufacturer on all completed cable to demonstrate the integrity of the cable.

3.2 Special tests—tests made by the manufacturer on samples of completed cable, or components taken from the completed cable, so as to verify that the finished product meets the design specifications.

3.3 Type tests—tests required to be made by the manufacturer before supplying on a general commercial basis a type of cable covered by this Standard to demonstrate satisfactory performance characteristics. These tests are of such a nature that after they have been made, they need not be repeated unless changes are made in the cable materials or design which might change the performance characteristics.

4 VOLTAGE DESIGNATION The cable is intended for use at extra-low voltage.

5 OPERATING TEMPERATURE The cable shall be suitable for operating continuously within the temperature range -10°C to $+80^{\circ}\text{C}$.

6 CONDUCTOR The conductor shall be stranded and have a nominal cross-sectional area of 1.5 mm^2 and comprise plain or tinned annealed copper wire complying with the requirements of AS 1125. Where tinned conductors are used, they need not pass the tinning test in AS 1125.

7 INSULATION

7.1 Material

- (a) *Polypropylene* The insulation material shall be electric cable grade polypropylene, stabilized against heat and ultraviolet light and containing a metal deactivator.
(b) *XLPE* The material shall be X-90, in accordance with AS 3198, and shall contain not less than 2% by weight of carbon black.

7.1.1 Dielectric constant (type test) The dielectric constant shall not exceed 2.5 for XLPE and 2.3 for polypropylene, when measured on laboratory prepared samples, in accordance with AS 1049 for a frequency range 20 kHz to 200 kHz.

7.2 Application The insulation shall be homogeneous. It shall be applied with a close fit but shall not adhere to the conductor.

7.3 Thickness The average thickness of insulation, determined in accordance with AS 1660, shall be not less than 1.0 mm for polypropylene or 1.2 mm for XLPE, and the minimum thickness at any point shall be not less than 0.80 mm for polypropylene or 1.00 mm for XLPE.

The overall diameter of the completed cable shall not exceed 4.0 mm for polypropylene or 4.5 mm for XLPE.

NOTE: The different insulation thicknesses specified are due to the different dielectric constants of the insulation materials.

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7.4 **Colour** The colour of the insulation shall be black.

8 **CABLE LENGTH** Unless otherwise specified (see Appendix A) by the purchaser, the reel shall contain a nominal length of 500 m.

9 **TESTS** Cables shall comply with the requirements of Table 1.

TABLE 1
TESTS AND PERFORMANCE REQUIREMENTS

1	2	3	4	5
Test No.	Test	Criteria	Category of test	Reference for test method
1	All appropriate tests, on conductors taken from the cable	As specified in AS 1125 for the appropriate conductor		
2.1	Tests on polypropylene insulation taken from the cable: (a) Mechanical tests without ageing (i) Tensile strength, minimum (MPa) (ii) Elongation at rupture, minimum (percent) (b) Mechanical tests after ageing in oven* (i) Duration and temperature of ageing (ii) Tensile strength, percent minimum of value for unaged specimens (iii) Elongation at rupture, percent minimum of value for unaged specimens	28 400 96 h at 121 ± 2°C 80 70	Type	AS 1660 Rate of separation 50 ± 5 mm minimum
2.2	Tests on XLPE insulation	As specified in AS 3198 for X-90 insulation		
3	Measurement of cable dimensions: Insulation thickness (a) Minimum average, (b) Minimum at any point Maximum overall diameter of completed cable	XLPE Polypropylene 1.2 mm 1.0 mm 1.00 mm 0.80 mm 4.5 mm 4.0 mm	Routine	AS 1660
4.1	Insulation resistance constant (k) for polypropylene insulation: (a) At 20°C minimum (b) At 80 ± 3°C minimum	10 000 GΩ.m 1 GΩ.m	Type	AS 1660
5	Spark test 6.0 kV a.c. r.m.s., 50 Hz or 9.0 kV d.c.	The insulation shall not break down	Routine	AS 1660
6	Maximum dielectric constant at 100 kHz	XLPE Polypropylene 2.5 2.3	Type	AS 1049

* The test procedure for thermal ageing of elastomers in AS 1660 shall be followed.

10 **MARKING** Marking is only required on reels.

10.1 **Reel marking** Every reel of cable shall have the following information marked by means of an attached tag or label or by marking directly on the reel.

- The name or registered trade name or mark of the manufacturer or other distinguishing mark.
- Insulating material (polypropylene or XLPE).
- Length of cable, in metres.
- Manufacturer's type number and the words 'loop cable for vehicle detectors ELV'.

NOTE: Manufacturers making a statement of compliance with this Australian Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.