SRI LANKA STANDARD 821 : PART 3 : 1989

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SPECIFICATION FOR

LOW - FREQUENCY CABLES AND WIRES WITH PVC INSULATION AND PVC SHEATH FOR TELECOMMUNICATION

PART 3 - CABLES AND EQUIPMENT WIRES WITH

SOLID OR STRANDED CONDUCTORS, SCREENED, SINGLE

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PART 3 : CABLES AND EQUIPMENT WIRES WITH SOLID OR STRANDED CONDUCTORS, SCREENED, SINGLE

SLS 821 : Part 3 : 1989

Gr. 6

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SRI LANKA STANDARD

SPECIFICATION FOR LOW-FREQUENCY CABLES AND WIRES WITH PVC INSULATION AND PVC SHEATH FOR TELECOMMUNICATION

PART 3 : CABLES AND EQUIPMENT WIRES WITH SOLID OR STRANDED CONDUCTORS, SCREENED, SINGLE

FOREWORD

This Sri Lanka Standard was authorized for adoption and publication by the Council of the Sri Lanka Standards Institution on 89.05.12, after the draft, finalized by the Drafting Committee on Low Frequency Cables and PVC Insulation and PVC sheath for Telecommunication, had been approved by the Electrical Engineering Divisional Committee.

This standard gives specific requirements for screened cables and screened wires with single solid or stranded conductor. It is in line with the publication 189 - 5 of International Electrotechnical Commission and the BS 4808 : Part 3 of British Standards Institution.

References have been made in this standard with regard to general requirements as well as methods of test, to **SLS 821 : Part 1.**

All values given in this specification are in SI units.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or observation shall be rounded off in accordance with **CS 102.** The number of significant figures to be retained in the rounded off value should be the same as that of the specified value in this specification.

The assistance derived from the publications of the International Electro-technilcal Commission and the British Standards Institution, in the preparation of this specification is gratefully acknowledged.

1 SCOPE

This part of the standard gives details of construction, materials, dimensions and requirements for screened cables and screened equipment wires, all with a single solid or stranded conductor and PVC-insulation, used for internal wiring of telephone and telegraph exchanges, electronic and other equipment.

2 REFERENCES

IEC 96 Radio frequency cables
Part 1 General requirements and measuring methods.

IEC 304 Standard colours for insulation for Low frequency cables and wires.

IEC 344 Guide to calculation of resistance of plain and coated copper conductors of Low frequency cables and wires.

CS 102 Presentation of numerical values.

SLS 821 Low frequency cables and wires with PVC sheath for telecommunication
Part 1 General requirements and tests.

3 DEFINITIONS

For the purpose of this standard, definitions given in **SLS 821 : Part 1 : 1988** shall apply.

4 REQUIREMENTS

4.1 Cables and equipment wires covered by this specification shall meet the general requirements of **SLS 821 : Part 1** and when tested in accordance with methods specified therein shall meet the detailed requirements of 4.2 to 4.10 of this specification.

4.2 Colour of insulation
Requirements given in 5.2.3 of **SLS 821 : Part 1 : 1988** shall apply along with the following :

a) The choice of colours or combinations of colours shall be made in the following order of preference :
i) 12 standard colours given in IEC 304
ii) The following 19 easily identifiable combinations of two standard colours :

RED - black	GREEN - black
RED - blue	GREEN - red
ORANGE - green	BLUE - black
ORANGE - blue	GREY - red
ORANGE - violet	GREY - blue
YELLOW - black	WHITE - black
YELLOW - red	WHITE - red
YELLOW - blue	WHITE - green
YELLOW - green	WHITE - blue
YELLOW - violet	

iii) 20 less easily identifiable combinations of two standard colours :

BROWN - black	GREY - black	GREEN - brown
BROWN - blue	GREY - violet	WHITE - brown
ORANGE - black	GREY - brown	WHITE - orange
ORANGE - grey	RED - brown	WHITE - violet
ORANGE - brown	GREEN - grey	WHITE - grey
ORANGE - red	GREEN - violet	WHITE - yellow
VIOLET - black	GREEN - blue	

NOTE

The colour combination YELLOW - green is reserved for protective earth wires exclusively.

b) Except in the case of biocolour extrusion, the colour indicated in capitals shall be known as the 'base colour'; it shall be :

i) the extruded colour ;
ii)the colour having greater area of exposure on the finished wire.

4.3 Binder (wrapping)
The insulated conductors may be wrapped with a protective layer, preferably of non-hygroscopic material. For example a helical or longitudinal lapping of one or more tapes with overlap as specified in 5.5.2 of SLS 821 : Part 1 : 1988 or a thin continuous sheath.

4.4 Screening of wires and cables

4.4.1 *Wires*
The insulated conductor shall be provided with braided screen of the construction as specified in 5.6.1.1
of SLS 821 : Part 1 : 1988 The brading shall consist of tinned copper conductors of not less than 0.1 mm diameter not more than 0.2 mm diameter.

The braid angle as defined in 1.1.2 of IEC 96 - 1 : 1971 shall be not more than 45°.

The filling factor in accordance with the definition given in 5.6.1.1 of SLS 821 : Part 1 : 1988 shall be not less than 0.5.

4.4.2 *Cables*
The insulated conductor shall be provided with a screen, either lapped or braided.

The braided screen shall be as specified in 4.4.1 and the screen may be provided with an outer protective layer, (a longitudinal or helical lapping of one or more tapes with overlap), preferably of non-hygroscopic material.

The lapped screen shall consist of one of the following :

a) A close and continuous lapping of tinned copper conductors of not less than 0.1 mm diameter, not more than 0.2 mm diameter.

b) One copper or aluminium tape of 0.04 mm minimum thickness.

c) One thin tape of the same material, of 0.008 mm minimum thickness laminated to a non-hygroscopic tape, followed by a close and continuous lapping of tinned copper conductors of not less than 0.1 mm diameter nor more than 0.2 mm diameter.

d) One thin tape of copper or aluminium of 0.008 mm minimum thickness laminated to a non-hygroscopic tape and provided with one tinned copper conductor in permanent contact with the metal tape. The conductor shall have minimum diameter of 0.4 mm, or equal flat cross-section.

4.5 Sheath
The cables shall be provided with a sheath as specified in 5.8 of **SLS 821 : Part 1 : 1988** and the thickness shall be not less than the values specified in Table 2 of **SLS 821 : Part 1 : 1988**

4.6 Sealing of ends
The ends of the finished cables shall be adequately sealed to prevent ingress of moisture. Sealing shall be carried out immediately after inspection and acceptance tests.

4.7 Mechanical requirements

4.7.1 *Conductor*

4.7.1.1 Elongation at break of the bare conductor shall be not less than
a) 10 per cent for solid condctor not exceeding 0.4 mm diameter; and
b) 15 per cent for solid conductor over 0.4 mm diameter.

Compliance shall be checked by measuring the elongation at break in accordance with the method specified in 7.4.3 of **SLS 821 : Part 1 : 1988**

4.7.1.2 If the condcutor is tinned, the amount of tin per unit area shall be adequate for soldering the conductor to the terminals without difficulty. Compliance shall be checked by means of the solder test on samples of the conductors in accordance with the method specified in 7.5.7 of **SLS 821 : Part 1 : 1988**

4.7.2 *Insulation*

The insulation shall have adequate mechanical strength and elasticity. These properties shall remain sufficiently constant during normal use. Compliance shall be checked before and after accelerated ageing by measuring the tensile strength and the elongation at break on samples of the insulation in accordance with the method specified in 7.4.3 of SLS 821 : Part 1 : 1988 The accelerated ageing procedure is specified in 7.5.1 of SLS 821 : Part 1 : 1988

The median of the measured values of tensile strength shall be not less than 12.5 N/mm^2.

The median of the measured values of elongation at break shall be not less than 125 per cent for single colour insulation and 100 per cent for extruded bicolour insulation whose minimum thickness is 0.3 mm or less.

However, the difference between the median values for tensile strength and elongation obtained before and after accelerated ageing shall not exceed 20 per cent of the median values before ageing.

NOTES

1. The values specified for tensile strength and for elongation at break are independent and non-concomitant minima. An insulation with one characteristic of near-minimum value should present a value well above the minimum for the other characteristic.

The insulation should be such that the product of tensile strength in N/mm^2 and the elongation percentage at break should be not less than 1750, or 1400 in the case of extruded bicolour insulation whose minimum thickness is 0.3 mm or less.

2. The median value is the middle value if an odd number of values are obtained or the average of the middle values if an even number of values are obtained.
The test results should have been arranged in sequence of increasing values.

4.7.3 *Sheath*

The sheath shall have adequate mechanical strength and elasticity. These properties shall stay sufficiently constant during normal use.

Compliance shall be checked before and after accelerated ageing by measuring the tensile strength and the elongation at break on samples of the sheath in accordance with the method specified in 7.4.3 of SLS 821 : Part 1 : 1988

The median of the measured values of tensile strength shall be not less than 12.5 N/mm^2.

The median of the measured values of elongation at break shall be not less than 125 per cent.

However, the difference between the median values for tensile strength and elongation obtained before and after accelerated ageing shall not exceed 20 per cent of the median values before ageing.

4.8 Thermal stability and climatic requirements

4.8.1 *Insulation*

4.8.1.1 Measurement of insulation shrinkage after overheating of conductor
The insulation shall not shrink unduly when soldering the conductors.

Compliance shall be checked in accordance with the test specified in 7.5.6 of SLS 821 : Part 1 : 1988

4.8.1.2 Cold bend test
The insulation shall remain adequately pliable at the low temperatures to which it may be exposed. Compliance shall be checked in accordance with the test specified in 7.5.4.1 of SLS 821 : Part 1 : 1988

4.8.1.3 Heat shock test
The insulation shall withstand variations of temperature without suffering damage. Compliance shall be checked in accordance with the test specified in 7.5.5.1 or SLS 821 : Part 1.

4.8.2 *Sheath*

4.8.2.1 Pressure test
The sheath shall be sufficiently resistant to external mechanical pressure when exposed to moderately high temperature. Compliance shall be checked in accordance with the test specified in 7.5.2 of SLS 821 : Part 1 : 1988

The thickness at the point of impression shall be not less than 40 per cent of mean value of the thickness at the other two points.

4.8.2.2 Cold bend test
The sheath shall remain adequately pliable at the low temperatures to which it may be exposed. Compliance shall be checked in accordance with the test specified in 7.5.4.2 of SLS 821 : Part 1 : 1988

4.8.2.3 Heat shock test
The sheath shall withstand variations of temperature without suffering damage.Compliance shall be checked in accordance with the test specified in 7.5.5.2 of SLS 821 : Part 1 : 1988

4.9 Electrical requirements

4.9.1 *Electrical resistance of conductors*
Electrical resistance of conductors when measured in accordance with 7.6.1 of SLS 821 : Part 1 : 1988 shall not exceed the value specified in Table 1 or Table 2.

4.9.2 *Dielectric strength*
The insulation shall withstand the application of the voltage specified in Table 1 or 2 , for 1 min without breakdown.

The method for checking dielectirc strength is specified in 7.6.2 of SLS 821 : Part 1 : 1988

4.9.3 *Insulation resistance*
Insulation resistance when measured in accordance with 7.6.3 of SLS 821 : Part 1 : 1988 shall be not less than the value specified in Tables 1 or Table 2.
TABLE 2 - Sizes dimensions and test requirements of conductors as defined in 5.1 of SLS 821 Part 1

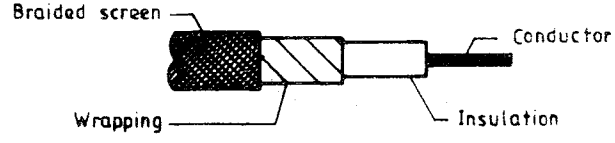
TABLE 1 - Dimensions and test requirements of single-core screened equipment wire

Conductor					Insulation		Test requirements	
Nominal diameter mm	Nominal section mm^2	Number of strands	Maximum diameter of strands mm	Maximum resistance Ω/km	Minimum thickness mm	Maximum diameter over screen mm*	Dielectric strength test voltage V	Minimum insulation resistance MΩ/km
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0.4				148.0		2.10	1000 a.c.	
0.5				95.0	0.25	2.20	or	
	0.22	7	0.21	89.9		2.35	1500 d.c.	
0.6				65.9		2.35		
	0.5	28	0.16	39.5 **		2.90	1500 a.c.	
	0.5	16	0.21	39.5 **		2.90	or	200
0.8				36.7	0.3	2.70	2250 d.c.	
	0.75	42	0.16	26.4 **		3.10		
	0.75	24	0.21	26.4 **		3.10		
	1.5	30	0.26	13.3	0.4	3.80	2000 a.c. or 3000 d.c.	

* *With diameter increase of 0.1 mm for wrapping plus 0.75 mm for braided screen. These values are meant for calculation purposes.*

** *These values are based on strand compositions as follows :*

0.5 mm^2 = 28 strands of 0.15 mm.
0.75 mm^2 = 42 strands of 0.15 mm.



NOTE

Calculation of resistance values of the conductor is based IEC 344

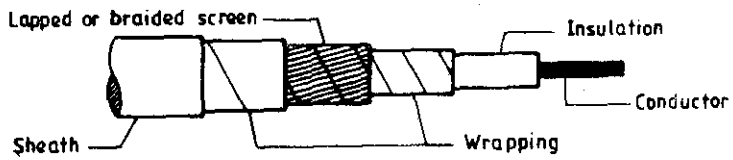
TABLE 2 - Dimensions and test requirements of single-core screened equipment cable

Conductor					Insulation	Sheath		Test requirements	
Nominal diameter mm	Nominal section mm^2	Number of strands	Maximum diameter of strands	Minimum resistance Ω/mm	Minimum thickness mm	Minimum thickness mm	Maximum diameter mm *	Dielectric strength test voltage V	Minimum insulation resistance MΩ/km
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
0.4				148.0			3.5	1000 a.c.	
0.5				95.0	0.25	0.3	3.6	or	
	0.22	7	0.21	89.9			3.7	1500 d.c.	
0.6				65.9			3.7		
	0.5	28	0.16	39.5 **		0.3	4.2	1500 a.c.	
	0.5	16	0.21	39.5 **		0.3	4.2	or	200
0.8				36.7	0.3	0.3	4.1	2250 d.c.	
	0.75	42	0.16	26.4 **		0.45	4.7		
	0.75	24	0.21	26.4 **		0.45	4.7		
	1.5	30	0.26	13.3	0.4	0.45	5.5	2000 a.c. or 3000 d.c.	

* *With diameter increase of 2 x 0.1 mm for wrapping plus 0.75 mm for braided screen. These values are meant for calculation purposes. For engineering calculation purposes.*

** *These values are based on strand compositions as follows :*

0.5 mm^2 = 28 strands of 0.15 mm.
0.75 mm^2 = 42 strands of 0.15 mm.



NOTE

Calculation of resistance values of the conductor is based IEC 344.

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