

PAKISTAN STANDARD

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V

Part-4: Sheathed cables for fixed wiring



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0. FOREWORD

- 0.1 This Pakistan Standard was adopted by the authority of the Board of Directors of Pakistan Standard and Quality Control Authority after the draft prepared by the Technical Committee for “**Electric Cables**” (TC-7)” had been approved and endorsed by the National Standards Committee on 27 June 2007.
- 0.2 This Pakistan Standard was adopted on the basis of IEC: 60227-4 since IEC Standard have been established in 1992, hence it is deemed necessary to adopt the International standard to keep abreast with the latest technology and as par with IEC standard.
- 0.3 This Pakistan Standard is an adoption of IEC: 60227-4-2007 Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part-4 Sheathed cables for fixed wiring,” and its use hereby acknowledged with thanks.
- 0.4 This standard is subject to periodical review in order to keep pace with the development in industry. Any suggestions for improvement shall be recorded and placed before the revising committee in due course.
- 0.5 This standard is intended chiefly to cover the technical provisions relating to this standard and it does not include all the necessary provisions of a Contract.

POLYVINYL CHLORIDE INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 4: Sheathed cables for fixed wiring

1 General

1.1 Scope

This part of IEC 60227 details the particular specification for light polyvinyl chloride sheathed cables of rated voltage of 300/500 V.

Each cable shall comply with the appropriate requirements given in IEC 60227-1 and the particular requirements of this part.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60227. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60227 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60228:1978, *Conductors of insulated cables*

IEC 60332-1:1979, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60719:1992, *Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V*

IEC 60811-1-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section One: Measuring of thickness and overall dimensions – Tests for determining the mechanical properties*
Amendment 1 (1988). Amendment 2 (1989).

IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*
Amendment 1 (1989).

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking*

IEC 60811-3-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section Two: Loss of mass test – Thermal stability tests.*

2 Light polyvinyl chloride sheathed cable

2.1 Code designation

60227 IEC 10.

2.2 Rated voltage

300/500 V.

2.3 Construction

2.3.1 Conductor

Number of conductors: 2, 3, 4 or 5.

The conductors shall comply with the requirements of IEC 60228:

- class 1 for solid conductors;
- class 2 for stranded conductors.

2.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/C applied around each conductor.

The insulation thickness shall comply with the specified value given in table 1, column 3.

The insulation resistance shall be not less than the value given in table 1, column 8.

2.3.3 Assembly of cores

The cores shall be twisted together.

2.3.4 Inner covering

The twisted cores shall be covered by an extruded inner covering consisting of an unvulcanized rubber or plastic compound.

It shall be possible to separate the cores easily.

2.3.5 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST 4 applied around the inner covering.

It shall fit closely and shall be capable of being removed without damage to the inner covering.

The sheath thickness shall comply with the specified value given in table 1, column 5.

2.3.6 Overall diameter

The mean overall diameter shall be within the limits given in table 1, columns 6 and 7.

2.4 Tests

Compliance with the requirements of 2.3 shall be checked by inspection and by the tests given in table 2.

2.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE - Other guidelines are under consideration.

Table 1 - General data for type 60227 IEC 10

1	2	3	4	5	6	7	8
Number and nominal cross-sectional area of conductors mm ²	Class of conductor IEC 60228	Insulation thickness Specified value mm	Thickness of inner covering Approximate value mm	Thickness of sheath Specified value mm	Mean overall diameter		Minimum insulation resistance at 70 °C MΩ.km
					Lower limit mm	Upper limit mm	
2 x 1,5	1	0,7	0,4	1,2	7,6	10,0	0,011
	2	0,7	0,4	1,2	7,8	10,5	0,010
2 x 2,5	1	0,8	0,4	1,2	8,6	11,5	0,010
	2	0,8	0,4	1,2	9,0	12,0	0,009
2 x 4	1	0,8	0,4	1,2	9,6	12,5	0,0085
	2	0,8	0,4	1,2	10,0	13,0	0,0077
2 x 6	1	0,8	0,4	1,2	10,5	13,5	0,0070
	2	0,8	0,4	1,2	11,0	14,0	0,0065
2 x 10	1	1,0	0,6	1,4	13,0	16,5	0,0070
	2	1,0	0,6	1,4	13,5	17,5	0,0065
2 x 16	2	1,0	0,6	1,4	15,5	20,0	0,0052
2 x 25	2	1,2	0,8	1,4	18,5	24,0	0,0050
2 x 35	2	1,2	1,0	1,6	21,0	27,5	0,0044
3 x 1,5	1	0,7	0,4	1,2	8,0	10,5	0,011
	2	0,7	0,4	1,2	8,2	11,0	0,010
3 x 2,5	1	0,8	0,4	1,2	9,2	12,0	0,010
	2	0,8	0,4	1,2	9,4	12,5	0,009
3 x 4	1	0,8	0,4	1,2	10,0	13,0	0,0085
	2	0,8	0,4	1,2	10,5	13,5	0,0077
3 x 6	1	0,8	0,4	1,4	11,5	14,5	0,0070
	2	0,8	0,4	1,4	12,0	15,5	0,0065
3 x 10	1	1,0	0,6	1,4	14,0	17,5	0,0070
	2	1,0	0,6	1,4	14,5	19,0	0,0065
3 x 16	2	1,0	0,8	1,4	16,5	21,5	0,0052
3 x 25	2	1,2	0,8	1,6	20,5	26,0	0,0050
3 x 35	2	1,2	1,0	1,6	22,0	29,0	0,0044
4 x 1,5	1	0,7	0,4	1,2	8,6	11,5	0,011
	2	0,7	0,4	1,2	9,0	12,0	0,010
4 x 2,5	1	0,8	0,4	1,2	10,0	13,0	0,010
	2	0,8	0,4	1,2	10,0	13,5	0,009
4 x 4	1	0,8	0,4	1,4	11,5	14,5	0,0085
	2	0,8	0,4	1,4	12,0	15,0	0,0077
4 x 6	1	0,8	0,6	1,4	12,5	16,0	0,0070
	2	0,8	0,6	1,4	13,0	17,0	0,0065
4 x 10	1	1,0	0,6	1,4	15,5	19,0	0,0070
	2	1,0	0,6	1,4	16,0	20,5	0,0065
4 x 16	2	1,0	0,8	1,4	18,0	23,5	0,0052
4 x 25	2	1,2	1,0	1,6	22,5	28,5	0,0050
4 x 35	2	1,2	1,0	1,6	24,5	32,0	0,0044
5 x 1,5	1	0,7	0,4	1,2	9,4	12,0	0,011
	2	0,7	0,4	1,2	9,8	12,5	0,010
5 x 2,5	1	0,8	0,4	1,2	11,0	14,0	0,010
	2	0,8	0,4	1,2	11,0	14,5	0,009
5 x 4	1	0,8	0,6	1,4	12,5	16,0	0,0085
	2	0,8	0,6	1,4	13,0	17,0	0,0077
5 x 6	1	0,8	0,6	1,4	13,5	17,5	0,0070
	2	0,8	0,6	1,4	14,5	18,5	0,0065
5 x 10	1	1,0	0,6	1,4	17,0	21,0	0,0070
	2	1,0	0,6	1,4	17,5	22,0	0,0065
5 x 16	2	1,0	0,8	1,6	20,5	26,0	0,0052
5 x 25	2	1,2	1,0	1,6	24,5	31,5	0,0050
5 x 35	2	1,2	1,2	1,6	27,0	35,0	0,0044

NOTE - The lower and upper limits of the mean overall diameter are not calculated in accordance with IEC 60719:1992.

Table 2 - Tests for type 60227 IEC 10

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Publication	Subclause
1.	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	60227-2	2.1
1.2	Voltage test on cores at 2000 V	T	60227-2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	60227-2	2.2
1.4	Insulation resistance at 70 °C	T	60227-2	2.4
2.	<i>Provisions covering constructional and dimensional characteristics</i>		60227-1 and 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	60227-1	Inspection and manual tests
2.2	Measurement of insulation thickness	T, S	60227-2	1.9
2.3	Measurement of sheath thickness	T, S	60227-2	1.10
2.4	Measurement of overall diameter:			
2.4.1	Mean value	T, S	60227-2	1.11
2.4.2	Ovality	T, S	60227-2	1.11
3.	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing	T	60811-1-2	8.1.3
3.3	Loss of mass test	T	60811-3-2	8.1
4	<i>Mechanical properties of sheath</i>			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3
4.3	Loss of mass test	T	60811-3-2	8.2
5.	<i>Test of non-contamination</i>	T	60811-1-2	8.1.4
6.	<i>Pressure test at high temperature</i>			
6.1	Insulation	T	60811-3-1	8.1
6.2	Sheath	T	60811-3-1	8.2
7.	<i>Elasticity and impact strength at low temperature</i>			
7.1	Bending test for insulation at low temperature	T	60811-1-4	8.1
7.2	Bending test for sheath at low temperature	T	60811-1-4	8.2
7.3	Elongation test for sheath at low temperature ¹	T	60811-1-4	8.4
7.4	Impact test on completed cable at low temperature	T	60811-1-4	8.5
8.	<i>Heat shock test</i>			
8.1	Insulation	T	60811-3-1	9.1
8.2	Sheath	T	60811-3-1	9.2
9.	<i>Test of flame retardance</i>	T	60332-1	

¹ Only applicable if the overall diameter of the cable exceeds the limit specified in the test method.