TESTING AND MEASURING EQUIPMENT/ALLOWED SUBCONTRACTING
IEC 60245-1:2003+A1:2007
Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 1: General requirements

“R”	Required
“S”	May be subcontracted, see OD 2012
“SP”	Specialized Facility, see IECEE 02-2
“W”	Witness testing in the categories “MED” and “MEAS”
“3PPS”	Three Phase Power Supply required

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
3	Marking	Piece of cotton wool or cloth and water; Ruler.	R
4	Core identification	Piece of cotton wool or cloth and water; Suitable device for measuring the color distribution; Ruler.	R
5	General requirements for the construction of cables		R
5.1	Conductors	Dial micrometer; Measuring bridge or equivalent electronical equipment; Thermometer or temperature compensation to 20°C; Ruler.	R
5.2	Insulation		R
	Insulation thickness	Profile projector or measuring microscope ofat least 10 x magnification.	R

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Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
Table 1 Reference No.1.1,1.2 (IEC 60811-401 and 501)	Tensile strength and elongation at break (Properties in the state as delivered and Properties after ageing in air oven)	Tensile machine; Equipment for punching dumb-bell test pieces andequipment for cutting or grinding the insulation or/and sheath to obtain 2 parallelsurfaces; Optical measuring device / dial gauge; Air oven with natural air flow (airflow rate: 8-20 complete airchanges per hour).	PULL-2000KG
Table 1 Reference No.1.4 (IEC 60811-412)	Properties after ageing in an air bomb	Tensile machine; Equipment for punching dumb-bell test pieces andequipment for cutting or grinding the insulation or/and sheath to obtain 2 parallelsurfaces; Optical measuring device / dial gauge; Air bomb which can be filled with air, which shall be free from oil and moisture, to a pressure of (0,55 ±0,02) MPa.	LS-B48
Table 1 Reference No.2 (IEC 60811-507)	Hot set test	An oven capable of maintaining the temperature and tolerance specified; Grips shall be provided, such that each test piece can be suspended from an upper grip in the oven and weights attached to a lower grip attached to the test piece.	GW-500
Table 1 Reference No.3 (IEC 60811-508)	Pressure test at high temperature	Indentation device with a rectangular blade with an edge (0,70 ± 0,01)mm wide; loads (weights);Support; Air oven; Microscope or profile projector with two decimalplaces.	GNGPL-3610-2PA
Table 1 Reference No.4 (IEC 60811-403)	Ozone resistance	A device for generating a controlled amount of ozone; A means for circulating ozonized air under controlled conditions of humidity and temperature through a chamber containing the test pieces to be tested; A means for determination of ozone concentration; A suitable device for the clamping and elongation of test pieces; Cylindrical mandrels consisting of wood or metal; A desiccator filled with silica gel or equivalent material; An accurate laboratory balance reading to 0,1 mg.	OTC-150A
5.3	Filler		
5.4	Textile braid		
5.5	Sheath		

Clause	Measurement/testing	Testing / measuring equipment / material needed	Equipment Classification
	Sheath thickness	Profile projector or measuring microscope ofat least 10 x magnification.	
Table 2 Reference No.1.1, 1.2 (IEC 60811-401 and 501)	Tensile strength and elongation at break (Properties in the state as delivered and Properties after ageing in air oven)	Tensile machine; Equipment for punching dumb-bell test pieces andequipment for cutting or grinding the insulation or/and sheath to obtain 2 parallelsurfaces; Optical measuring device / dial gauge; Air oven with natural air flow (airflow rate: 8-20 complete airchanges per hour).	PULL-2000KG
Table 2 Reference No. 1.3 (IEC 60811-404)	Mechanical properties after immersion in mineral oil	Tensile machine; Equipment for punching dumb-bell test pieces andequipment for cutting or grinding the insulation or/and sheath to obtain 2 parallelsurfaces; Optical measuring device / dial gauge; Air oven with natural air flow (airflow rate: 8-20 complete airchanges per hour); Unless otherwise agreed, the mineral oil to be used shall be oil no. 2 (IRM 902) as described in ISO 1817.	
Table 2 Reference No.2 (IEC 60811-507)	Hot set test	An oven capable of maintaining the temperature and tolerance specified; Grips shall be provided, such that each test piece can be suspended from an upper grip in the oven and weights attached to a lower grip attached to the test piece.	GW-500
Table 2 Reference No.3 (IEC 60811-504)	Bending test at low temperature	Cold bend test apparatus consisting essentially of a revolvingmandrel and guiding devices for the test pieces; Refrigerator/Low temperature chamber; Mandrels with different diameters.	
Table 2 Reference No.4 (IEC 60811-505)	Elongation test at low temperature	Tensile machine with a cooling device or elongation machine installedin a cooling chamber.	LS-B40
5.6	Tests on completed cables		R
5.6.1	Electrical properties		R

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Table 3 Reference No.1 (IEC 60245-2,Cl.2.1)	Measurement of the resistance of conductors	Measuring bridge or equivalent electrical equipment; Thermometer or temperature compensation to 20°C; Ruler.	
Table 3 Reference No.2 (IEC 60245-2,Cl.2.2)	Voltage test on completed cables	AC voltage source (AC 0-2500 V); Water bath.	
Table 3 Reference No.3 (IEC 60245-2,Cl.2.3)	Voltage test on cores	AC voltage source (AC 0-2500 V); Water bath.	
Table 3 Reference No.4 (IEC 60245-2,Cl.2.4)	Measurement of insulation resistance at temperatures above 90℃	Insulation resistance tester with DC source between 80 V and 500 V; Heated water bath; Thermometer; Ruler; An oven capable of maintaining the temperature and tolerance specified.	WB2681A
5.6.2	Overall dimensions	Profile projector; Dial micrometer; Verniercaliper; Diameter measuring tape.	
5.6.3	Mechanical strength of flexible cables		

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5.6.3.1 (IEC 60245-2,Cl.3.1)	Flexing test for flexible cables	Flexing apparatus; Pulleys made of metal with different diameters; Weights; For current load a low voltage or a voltage about 230/400V to be used; For voltage load between conductors, about 230 V ac (two-core) and/or about 400 V ac (more cores); Fault detection facilities: Current interruption; Short circuit between conductors and short circuit between test sample and pulleys; Carrier speed: 0,33 m/s; Water tank; timer; AC voltage power supply (AC 2000V).	WDT-B42
5.6.3.2 (IEC 60245-2,Cl.3.2)	Static flexibility test	Static flexibility test apparatus; Clamps; Ruler	WDT-3
5.6.3.3 (IEC 60245-2,Cl.3.3)	Wear resistance test	Wear resistance test apparatus; Fixed reel having a diameter of 40mm at the bottom of the groove; Weight having a mass of 500g.	WDT-B49
5.6.3.4 (IEC 60245-2,Cl.3.4)	Tensile strength of central heart of lift cables	Tensile force corresponding to the mass of 300m of cable; A freely hanging weight or a suitable mechanical strength testing machine capable of applying a constant force.	PULL-2000KG
5.6.3.5 (IEC 60245-2,Cl.5)	Flame retardance test for lift cables	A voltage of about 220V in series with a lamp of about 100W/220V; An indicator lamp of above 10W/220V; Three sided metal screen.	ZRS-3H
5.6.3.6 (IEC 60245-2,Cl.6)	Test for the resistance to heat of textile braids	Electrically heated cabinet with natural air flow; A block made of aluminium with smooth flat surfaces (roughness class Ra 50, mass of 1000g±50g); Steel base plate and upright with guide rods; Timer.	

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