

# POLARIS CABLES & WIRES PVT. LTD.

## (An IS & ISO 9001 :2000 Certified Company)

Plant : Plot 35, Genesis Indl Complex, Kolgaon, PALGHAR, Dist :Thane, Maharashtra.

### MANUFACTURER'S QUALITY ASSURANCE PLAN (Q.A.P for IS-1554 (PT- I))

Component / Process	Characteristics Tests	Method of Check / Test equipment	Sampling plan	Requirement / Doc (if any)	Ref.	Internal acceptances Norms
<b>I. RAW MATERIALS - PVC Wires / Cables</b>						
<b>A. CONDUCTOR</b>	1) Diameter	Vernier / Micrometer	10%	As per IS - 8130		As per IS - 8130
<b>(Cu / Alu)</b>	2) Tensile Test (for Alu)	Tensile Testing M/c	10%	As per IS - 8130		As per IS - 8130
	3) Wrapping Test (for Alu)	Self Device	10%	As per IS - 8130		As per IS - 8130
	4) Surface finish	Visual	10%	The conductor should be smooth.		Confirms to the requirement
	5) Annealing Test (for copper)	Tensile Testing M/c	10%	As per IS - 8130		As per IS - 8130
	6) Conductor Resistance at 20°C	Electrical /Digital micro ohm Meter	10%	As per IS - 8130		As per IS - 8130
	7) Visual check	Visual	10%	Bright Colour, No dents		Confirms to the requirement
	8) Physical & Chemical properties	Review M.T.C	100%	As per IS - 8130		As per IS - 8130
<b>B. PVC COMPOUND</b>	1) Specific Gravity	By Weight on Weighing m/c	One sample Per Lot	As per Manufacturer specification		As per Manufacturer specification
	2) Tensile strength & Elongation	Review M.T.C	100%	As per IS - 5831		As per IS - 5831
	Before and After Ageing					
	3) Loss of mass	Review M.T.C	100%	As per IS - 5831		As per IS - 5831
	4) Thermal Stability	Thermal stability oven	One sample Per Lot	As per IS - 5831		As per IS - 5831
<b>C. ARMOUR</b>						
<b>(G.I.WIRE/STRIP)</b>	1) Physical Dimensions	Vernier / Micrometer	10%	As per IS - 3975		As per IS - 3975
	2) Tensile strength	Tensile Testing M/c	10%	As per IS - 3975		As per IS - 3975
	3) Elongation at Break	Tensile Testing M/c	10%	As per IS - 3975		As per IS - 3975
	4) Winding Test	Self Device	10%	As per IS - 3975		As per IS - 3975
	5) Galvanisation Test ( Mass of Zinc Coating)	Chemical	10%	As per IS - 3975		As per IS - 3975
	6) Resistivity test	Electrical	10%	As per IS - 3975		As per IS - 3975

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	7) Torsion test of armour	Review M.T.C	100%	As per IS - 3975		As per IS - 3975
	8) Visual Check	Visual	10%	As per IS - 3975		As per IS - 3975
<b>II. INPROCESS (SEMI FINISHED CABLES / WIRES) INSPECTION</b>						
<b>A. Bunching / Stranding</b>	1) No of wires/ Strand	Self Device	Measurement at the start of each job	As per IS - 8130		As per IS - 8130
	2) Diameter of Wire/Strand	Vernier calliper / Micrometer	Measurement at the start of each job	As per IS - 8130		As per IS - 8130
	3) Direction of Lay	Visual	Measurement at the start of each job	As per requirement		Confirms to the requirement
	4) Lay length	Meter Scale	Two Samples per Lot	As per requirement		Confirms to the requirement
	5) Overall Dimensions	Vernier calliper / Micrometer	Measurement at the start of each job	As per IS - 8130		As per IS - 8130
	6) Conductor resistance	Electrical /Digital micro ohm Meter	Measurement at the start of each job	As per IS - 8130		As per IS - 8130
<b>B. Core Extrusion</b>	1) Type of Compound	Visual check of grade used	Once when the new bag is opened for use	As per requirement		Confirms to the requirement
	2) Thickness of Insulation	Vernier Calliper	Each setting & twice in a shift	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Core Identification	Visual	Each setting & twice in a shift	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Void Test	Visual	5%	As per Plants Std		No Voids
	5) Spark test ( On Line)	On line sparke tester	100%	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	6) Diameter Check	Vernier Calliper	Each setting & twice in a shift	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	7) Surface finish	Visual	Start and end of each setting & twice during the processing for that setting	Should be smooth & free from porosity		Should be smooth & free from porosity
	8) Continuity of Conductor	Continuity tester	100%	Conductor should show continuity		Conductor should show continuity
<b>C. Tests on cores in Laboratory</b>	1) Thickness of Insulation	Vernier Calliper	Random check for each size & colour	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) Concentricity of PVC	Vernier Calliper	One for each size & colour(if changes)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Tensile strength & Elongation	Tensile testing m/c	- Do -	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Insulation resistance & Volume resistivity	Insulation tester	One for each size & colour(if changes)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
<b>D. Printing / Embossing</b>	Visual Check	Visual	100%	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
<b>E. Laying up</b>	1) Number / Sequence of cores	Visual	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) Identification Of Cores	Visual	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Lay Direction	Visual	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Lay Length	Meter Scale	Each setting	As per requirement		Confirms to the requirement
	5) Continuity of conductors	Continuity tester	100%	Conductor should show continuity		Conductor should show continuity

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<b>F. Inner Sheath</b>	1) Type of PVC	Visual check of grade used	Random	As per requirement		Confirms to the requirement
	2) Thickness of Inner Sheath	vernier calliper / microscope	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Colour of Sheath	visual	Check on each size	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Continuity test	Continuity tester	100%	Conductor should show continuity		Conductor should show continuity
	5) Surface finish	Visual	100%	Smooth surface		Smooth surface
<b>H. Armouring</b>	1) Material	Visual check of Material	Random Check	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) No. of Wires / Flat Strip	Visual	At the start of each drum	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Lay Direction	Visual	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Dimensions of wire / strip	Vernier calliper	At the start of each drum	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	5) Lay Length	Meter scale	Each setting	As per requirement		Confirms to the requirement
	6) High voltage test	High voltage tester	100%	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	7) Continuity test	Continuity tester	100%	Armour should show continuity		Armour should show continuity
<b>I. Outer Sheath Extrusion</b>	1) Type of PVC	Visual check of grade	Random	As per requirement		Confirms to the requirement
	2) Thickness of Outer sheath	Vernier calliper / microscope	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Overall Diameter	Vernier calliper	Each setting	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Colour of sheath	Visual	Check on each Drum	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	5) Embossing / Sequential Marking	Visual	Check on each Drum	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	6) Cable Length	Visual	Check on each Drum	As per requirement		Confirms to the requirement
	7) Surface Quality	Visual	Check on each Drum	Smooth surface		Smooth surface
	8) Continuity test	Continuity tester	100%	Conductor should show continuity		Conductor should show continuity
	9) High Voltage Test	High voltage tester	100%	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
<b>J. DRUMS</b>	1) Marking on Drum	Visual	100%	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) Checking of length	Visual	100%	As per requirement		Confirms to the requirement
<b>III. FINISHED CABLE INSPECTION</b>						
<b>A. Routine Tests</b>	1) Conductor Resistance	Electrical /Digital micro ohm Meter	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) High Voltage Test	High voltage tester	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)



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<b>B. Acceptance Tests</b>	1) Annealing test on Copper	Tensile testing m/c	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) Conductor resistance	Electrical /Digital micro ohm Meter	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Tensile test for Aluminium	Tensile testing m/c	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Wrapping test for Aluminium	Self Device	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	5) Thickness of Insulation / Sheath	measurment	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	6) Tensile strength of PVC insulation / sheath	Tensile testing m/c	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	7) Elongation of PVC insulation / sheath	Tensile testing m/c	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	8) Insulation Resistance Test	I.R. Tester	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	9) High Voltage Test at room temp	High voltage tester	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	10) Flammability Test	Flammability Chamber	As per IS -1554 (PT-1)	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
<b>C. Type Tests</b>	1) Annealing test on Copper	Tensile testing m/c	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	2) Tensile test for Aluminium	Tensile testing m/c	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	3) Wrapping test for Aluminium	Self Device	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	4) Conductor resistance	Electrical /Digital micro ohm Meter	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	5) Thickness of Insul / sheath	measurment	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	6) Tensile strength of PVC insulation / sheath	Tensile testing m/c	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	7) Elongation of PVC insulation / sheath	Tensile testing m/c	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	8) Ageing in air oven	Oven, tensile testing m/c	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	9) Shrinkage test on PVC insulation / sheath	Oven Scales	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	10) Hot deformation test for insulaion / sheath	Oven Scales	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	11) Loss of mass test for insulaion / sheath	oven, weighing	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	12) Heat shock test for insulaion / sheath	Oven Scales	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	13) Thermal Stability Test for insulaion / sheath	Stability oven	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	14) Insul. resistance Test	I.R. Tester	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	15) High Voltage Test at room Temperatue & water Immersion test	Water tank, HV tester	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)

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	16) Test for armour					
	- wire dia / strip size	Vernier/ micrometer	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Tensile test	tensile tester meter	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Elongation test	tensile tester meter	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Resistivity test of armour	resistance meter	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Torsion test of armour	Torsion Apparatus	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Winding test of armour	Self Service	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	- Galvanisation Test ( Mass of zinc coating	Chemical	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
	17) Flammability Test	Flammability Chamber	One Sample Per Lot	As per IS -1554 (PT-1)		As per IS -1554 (PT-1)
<b>D. Special Test</b>	1) Oxygen Index Test	Oxygen Index test set	One Sample Per Lot	ASTM-D-2863		ASTM-D-2863
<b>( For FRLS cable</b>	2) Temperature Index Test	Temperature Index test set	One Sample Per Lot	ASTM-D-2863		ASTM-D-2863
<b>only)</b>	3) Halogen acid gas evolution Test	Halogen acid gas evolution Test set	One Sample Per Lot	IEC-754-1		IEC-754-1
	4) Smoke Density Test	Smoke density test set	One Sample Per Lot	ASTM-D-2843		ASTM-D-2843

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