Submersible power cable

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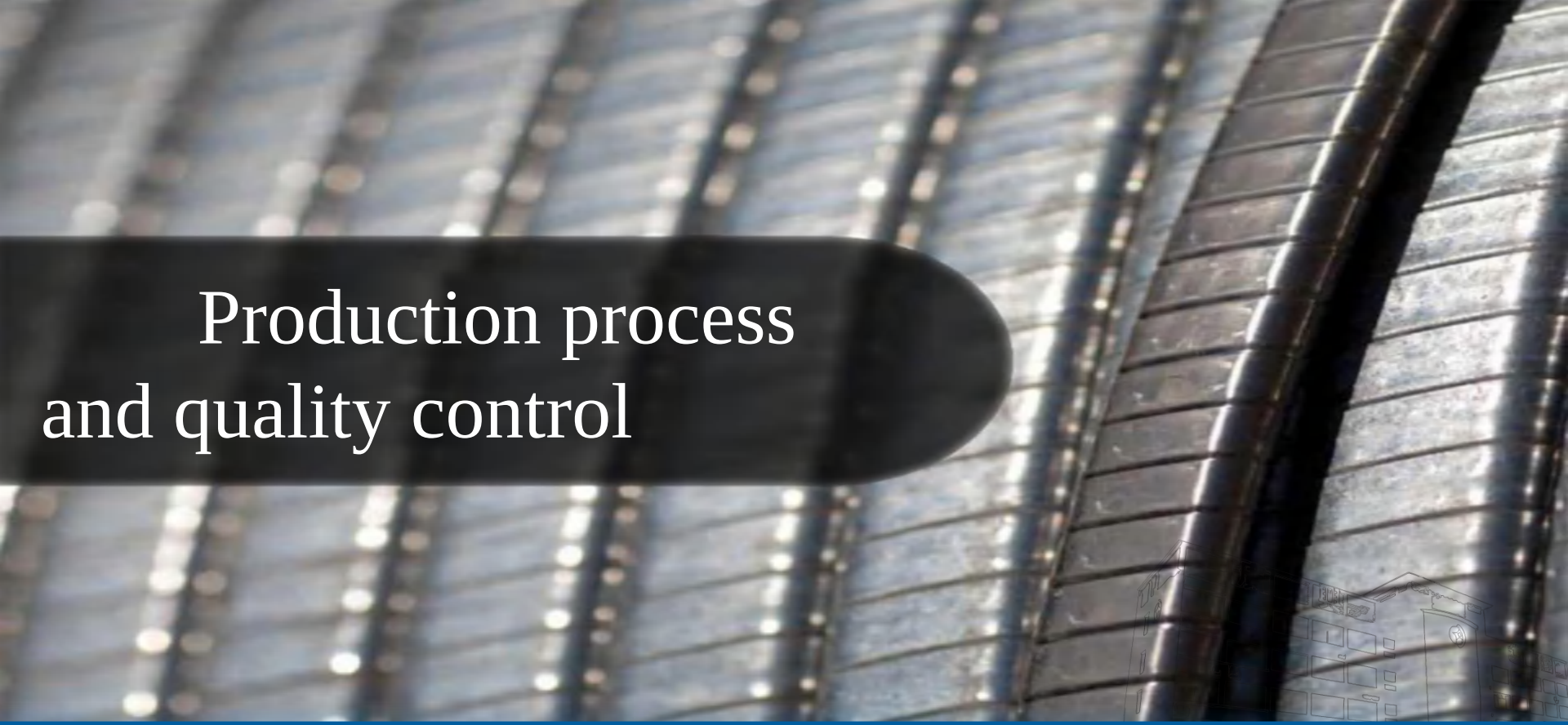
Research & Development

TSINTAO University of Science & Technology

Harbin Institute of Technology

ShanDong University of Technology



Production process and quality control

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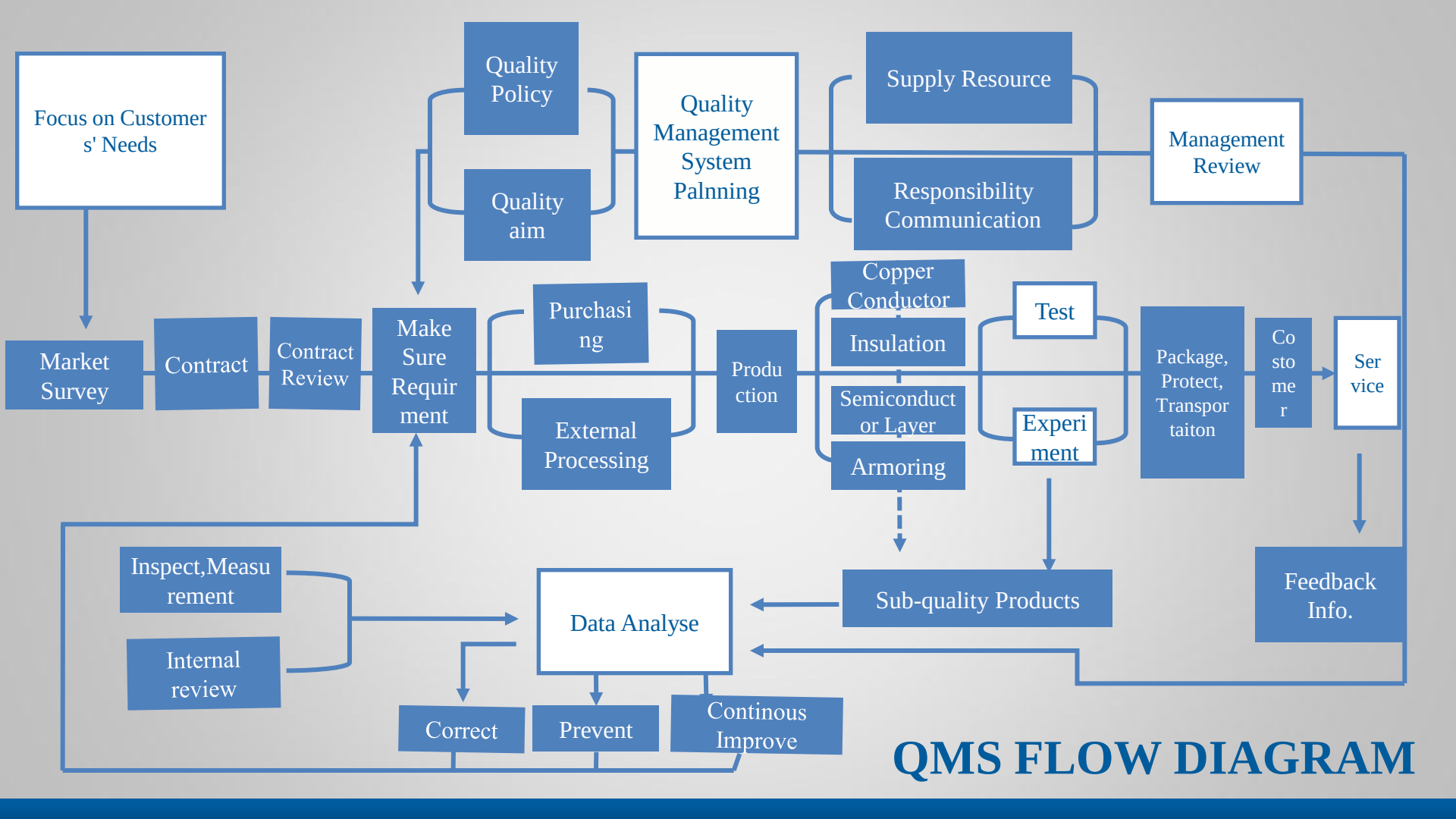
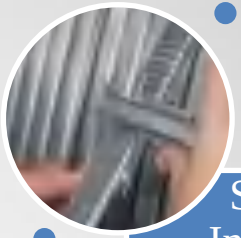
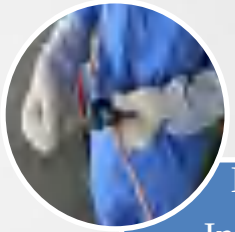

Focus on Customer s' Needs
Quality Policy
Quality aim
Quality Management System Palnning
Supply Resource
Responsibility Communication
Management Review
Market Survey
Contract
Contract Review
Make Sure Requir ment
Purchasi ng
External Processing
Produ ction
Copper Conductor
Insulation
Semiconduct or Layer
Armoring
Test
Experi ment
Package, Protect, Transpor taiton
Co sto me r
Ser vice
Inspect,Measu rement
Internal review
Data Analyse
Correct
Prevent
Continous Improve
Sub-quality Products
Feedback Info.
QMS FLOW DIAGRAM

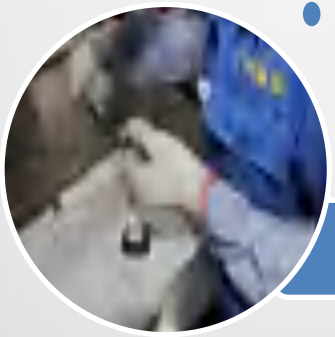
Quality Control on Production



Special Inspection



Mutual Inspection



Tour Inspection

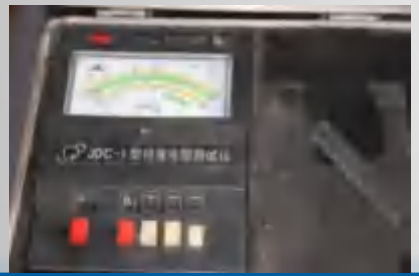
Self-Inspection

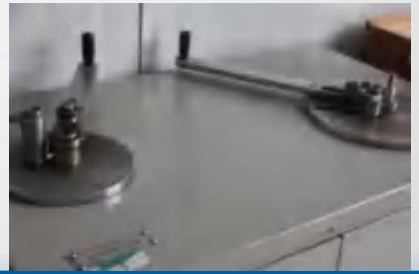








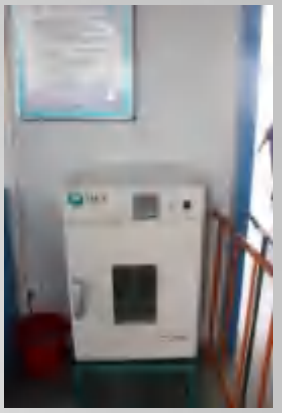





Experiment Machines

ESP Cable Solutions Co.,Limited



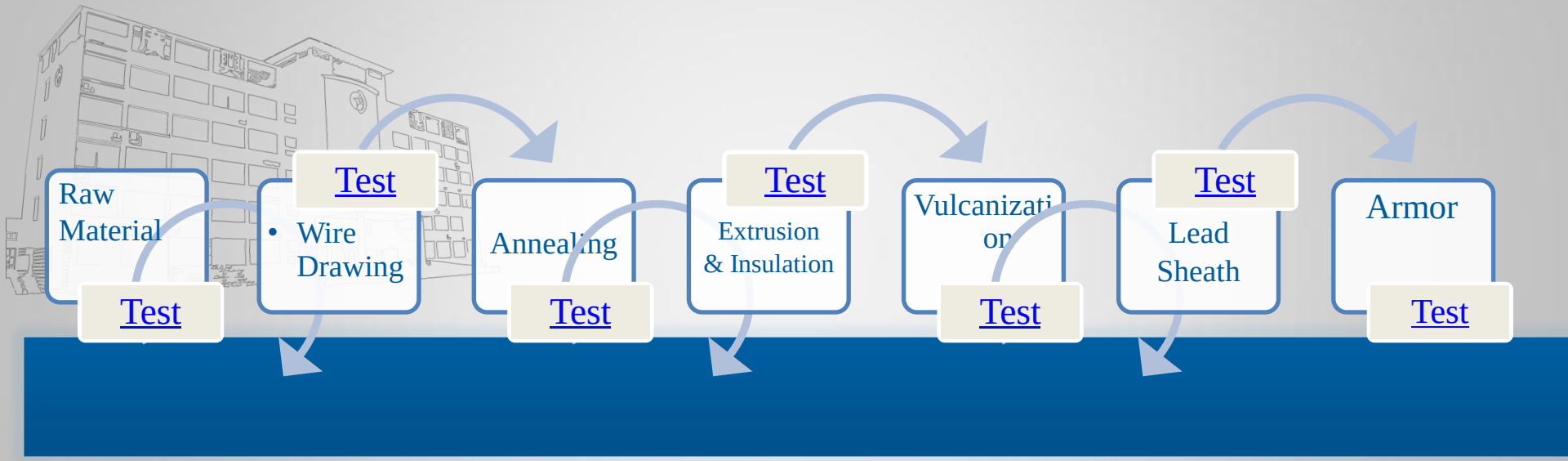




Experiment Machines

ESP Cable Solutions Co.,Limited

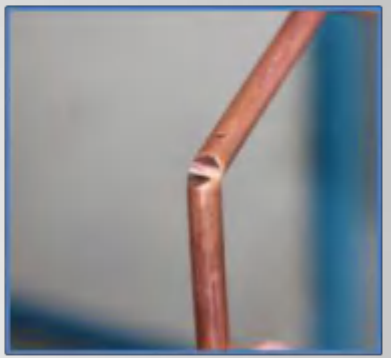
Sketch Map of Quality Control Points



Copper Rod DC Resistance Test

Copper Rod Elongation Rate Test

Raw Material Test



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Wire Drawing Prodution

Self-Inspection & Tour Inspection on Outer Diameter by Using a Micrometer

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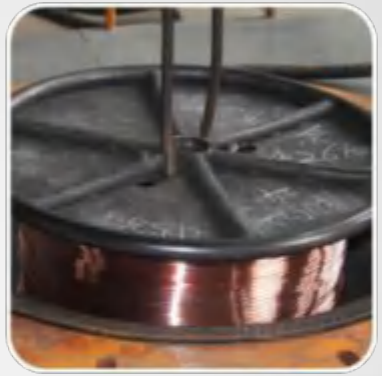
Wire Drawing Test



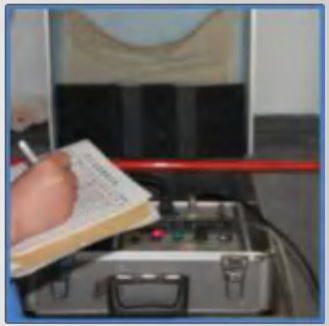
Annealing & Test

Self-Inspection

Inpection Records

Sinnering
&
Water Immersion Test

Water Immersion Test
for Voltage-Resistance



Baking the
Copper Wire

Wire with Polyimide Film Test for Breakdown Performance

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Extrusion

Special Inspection

Check the Insulation Performance by Using High Voltage Electricmagnetic

Spark machine

Test record

Rubber Mixing Machines

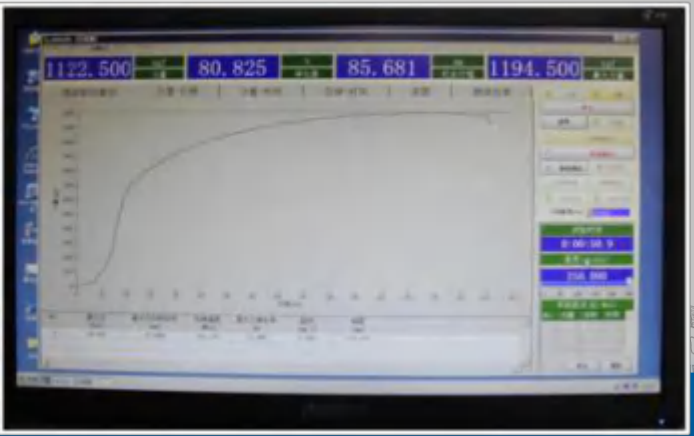
Rubber Aging Test

Vulcanization Test by Using Plate Vulkameter

Test piece

Oven for Aging Test

Tensile Testing Machine



Parameter Chart

Oil Resistance Test Chamber

Tensile Testing Machine

Parameter Chart

Put the Rubber into Oil Resistance Test Chamber for 18 Hours

Produciton Line

Rubber Feed Port

Head

Vulcanization

Vulcanization Thickness

Mutual Inspection

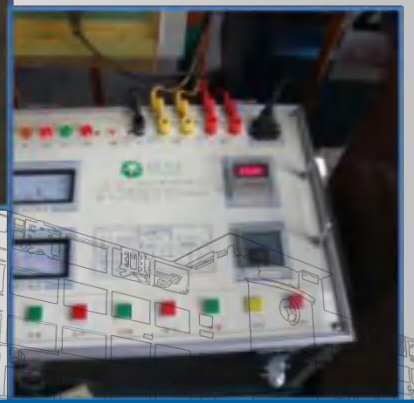
Insulation

Sheath

Records

Check on the Thickness of the Insulation Layer and Sheath to Make Sure if the Conductor is Decentration

Quality Inspection before Voltage-Resistance Test



Water Immersion for 30min, 35KV DC for 5min, it wont Breakdown

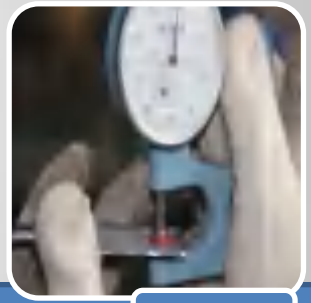
Drying

EPDM has to be Dried for 24hours to Remove the Moisture, to Improve the Insulation Performance

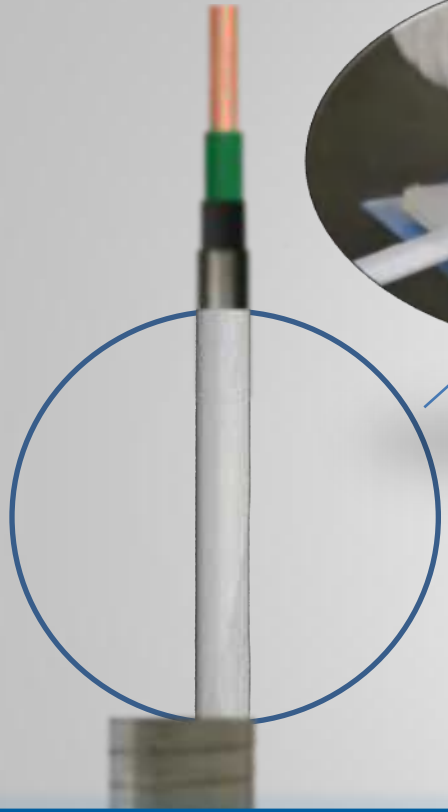
Lead sheath

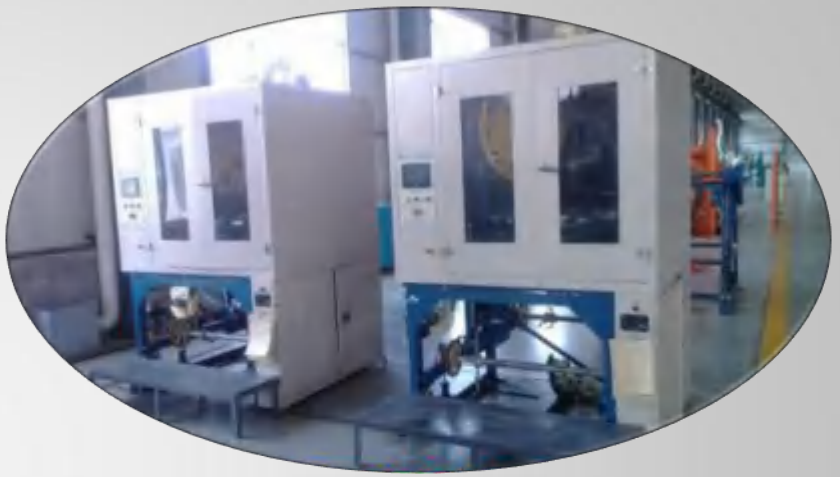
Outer Diameter

Parameter Monitor

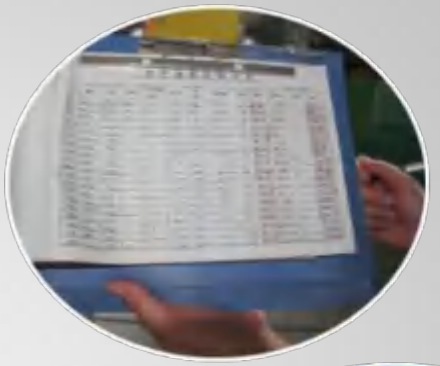


Thickness



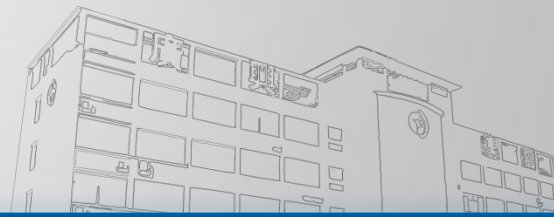


Tape or Braid



Armoring and Tests on Appearance & Size & Overlapping Rate

➢Finished Product Inspection



Finished Product Inspection

Micrometer → Outer Diameter

Vernier Caliper Appearance →

Structure & Size

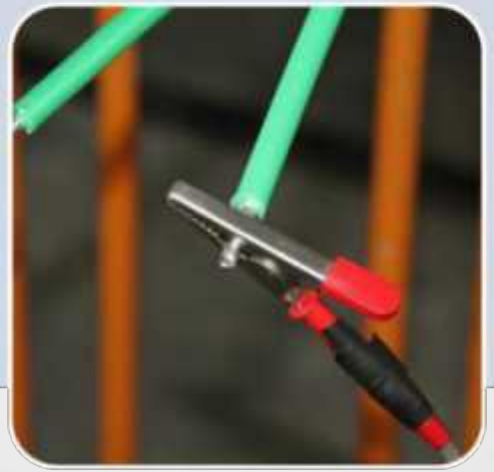
Finished Product Inspection

Test Operation

Resistance Test Instrument

DC Resistance Test

Finished Product Inspection



Insulation Resistance Test

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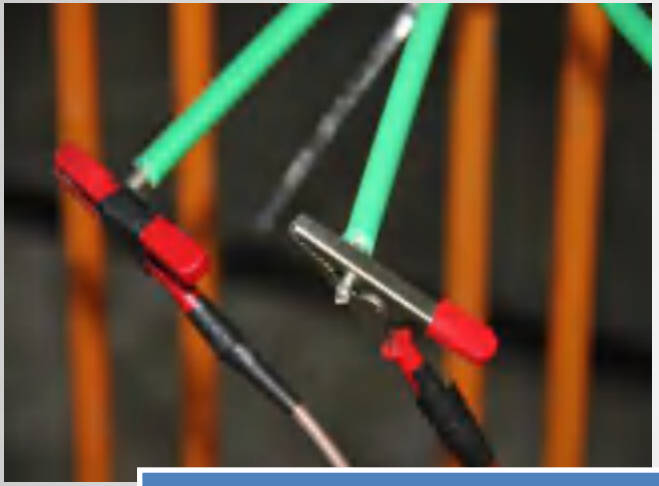
Finished Product Inspection



Operation

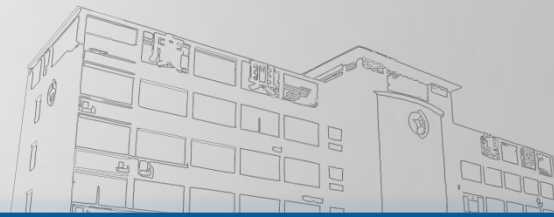
Resistance Test Instrument

Interphase Resistacne Test

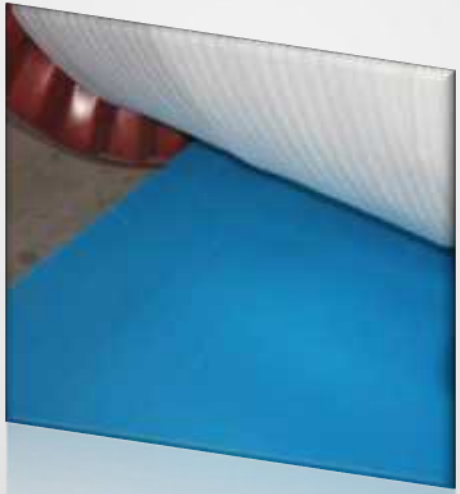
Finished Product Inspection

35KV,5 Minutes Voltage-Resistance Test

➢Package & Transportation



Package：
Four Layers Package



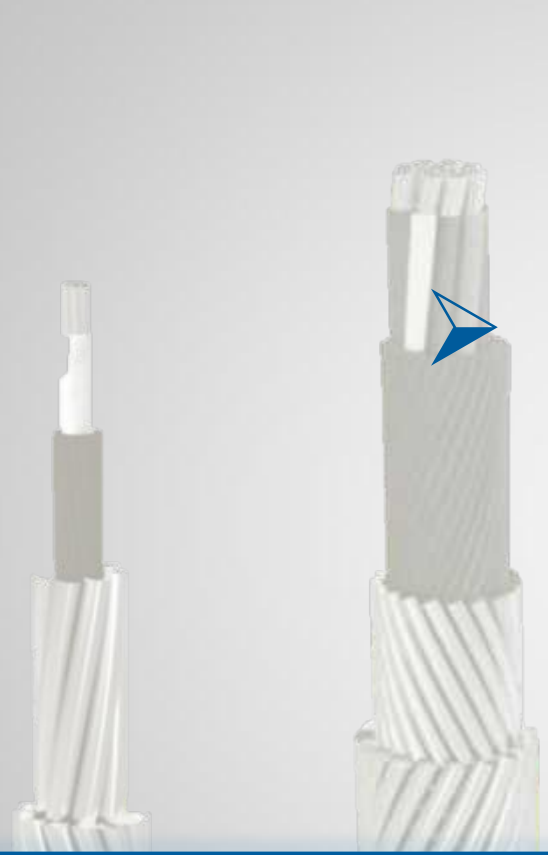
Transportation Base：

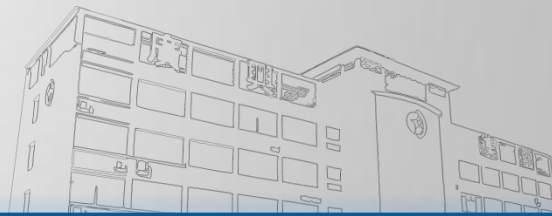
1. Simple Structure,Easy Loading.
2. Large Area,Stable and Safe.

Container

ESP Cable Solutions Co.,Limited

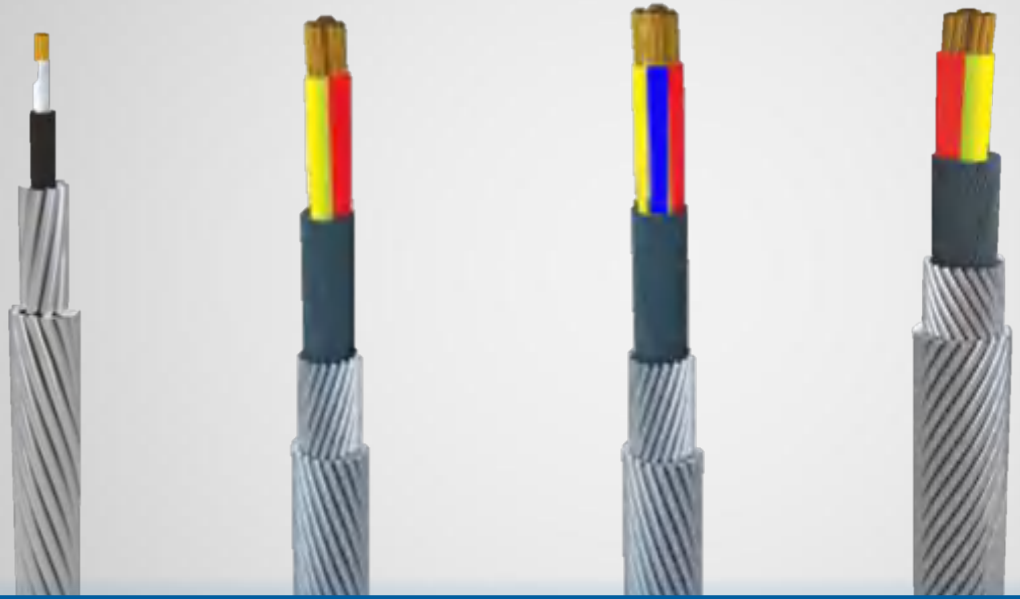
Electro-Mechanical Cable





ESP Cable Solutions Co.,Limited

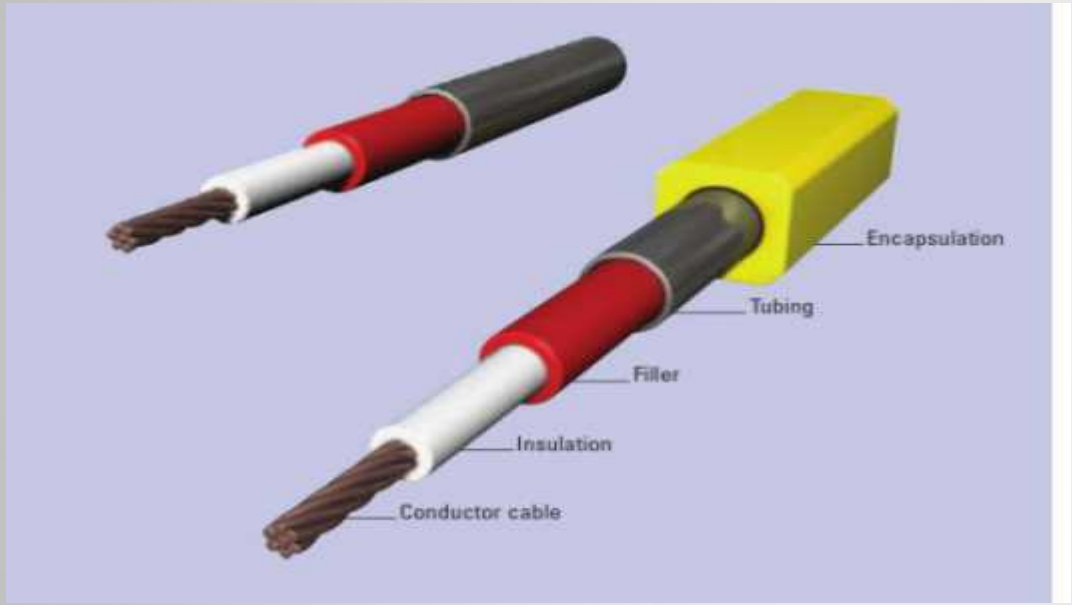
Electro-Mechanical Cable



It is a Kind of Oil Detection Cable that is Used to Withstand Mechanical Load and Measure Electric and Gas.

Mono-conductor 3-Conductors 4-Conductors 7-Conductors

Tubing Encapsulated Cables



Tube material: 316L,Alloy400,Alloy825,Alloy 625
OD of tube: 1/8“,1/4“,1/2“,3/8“,3/4“,5/8“.
Wall thickness: 0.028“,0.035“,0.049“,0.065“,0.083"

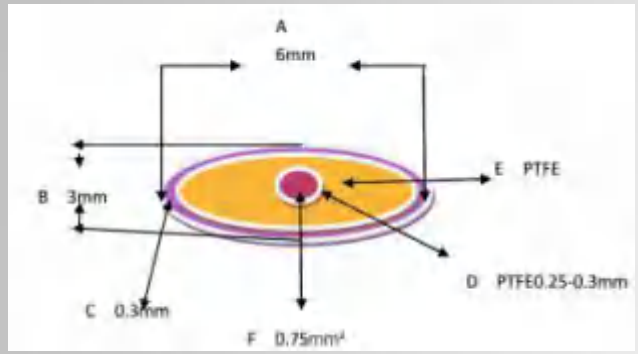
ESP Cable Solutions Co.,Limited

Used in Oil & Gas Industry

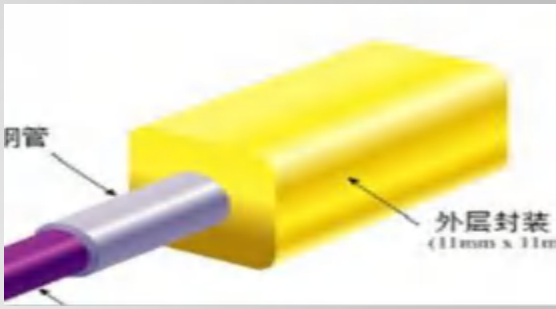
Tubing Encapsulated Cables

Type	Material	Burst pressure(psi)	（0.2%）Expansivity(psi)	（1%）Expansivity(psi)	Recommended Max working pressure(psi)
1/4" * 0.035"	316L	17,370	7,600	9,000	12,160
1/4" * 0.035"	Alloy400	17,370	7,700	8,200	12,160
1/4" * 0.035"	Alloy825	21,150	9,700	10,600	14,720
1/4" * 0.035"	Alloy625	29,790	16,600	17,800	20,800
1/4" * 0.049"	316L	25,200	11,000	13,100	16,000
1/4" * 0.049"	Alloy400	25,200	12,000	11,900	16,000
1/4" * 0.049"	Alloy825	30,600	14,000	15,400	19,440
1/4" * 0.049"	Alloy625	43,200	24,000	25,800	27,440
1/4" * 0.065"	316L	34,560	15,100	17,900	19,840
1/4" * 0.065"	Alloy400	34,560	15,400	16,300	24,800
1/4" * 0.065"	Alloy825	41,940	19,200	21,100	19,840
1/4" * 0.065"	Alloy625	59,220	32,900	35,400	34,000
3/8" * 0.035"	316L	11,340	4,900	5,800	8,480
3/8" * 0.035"	Alloy400	11,340	5,000	5,300	8,480
3/8" * 0.035"	Alloy825	13,680	6,300	6,900	10,320
3/8" * 0.035"	Alloy625	19,350	10,800	11,600	14,560
3/8" * 0.049"	316L	18,100	7,100	8,400	11,520
3/8" * 0.049"	Alloy400	18,100	7,200	7,700	11,520
3/8" * 0.049"	Alloy825	19,710	9,000	9,900	13,920
3/8" * 0.049"	Alloy625	27,900	15,500	16,700	19,680
3/8" * 0.065"	316L	22,230	9,700	11,500	14,640
3/8" * 0.065"	Alloy400	22,230	9,900	10,500	14,640
3/8" * 0.065"	Alloy825	27,000	12,400	13,600	17,760
3/8" * 0.065"	Alloy625	38,160	21,200	22,800	25,040

Flat Pipe Armor Signal Cables



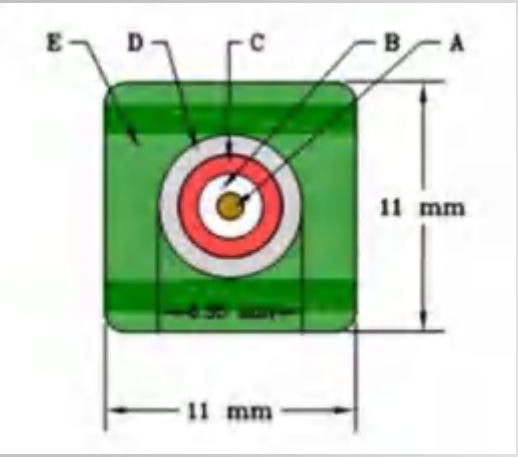
A. Width of the cable：6mm
B. Thickness of the cable：3mm
C. Wall thickness of the pipe：0.3mm
D. PTFE insulation thickness:0.25-0.3mm
E. PTFE jacket,temperature rating is 220℃
F. Copper conductor cross section：0.75 mm ²



Physical Characteristics
Weight：≈60Kg/Km
Tensile resistance：2.458KN
Bending radius：≧0.8M
The material of the pipe：316L
Compression resistance：70Mpa

Electircal Characteristics
Center conductor DC Resistance at 20℃：24Ω/Km
Stainless pipe DC Resistance at 20℃：62Ω/Km
Center conductor to tube insulation resistance at 20℃：3000MΩ/Km
Center conductor to tube capacitance certer at 20℃：90pf/M
Voltage：1000V DC

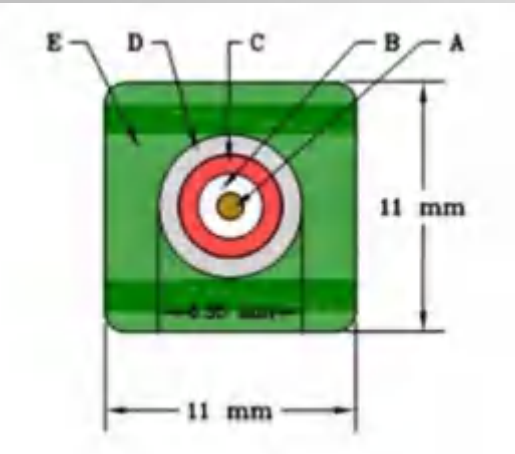
Encapsulated Cable Sample



A. 18#AWG 7/0.39mm Tin Coated Copper: OD 1.16mm (0.046〃) Nominal
B. PFA INSULATION:OD 2.49mm (0.098〃) Nominal
C. PFA JACKET: OD 4.92mm (0.194〃) Nominal
D. 316L STAINLESS STEEL TUBE:WALL THICKNESS:0.71mm(0.028〃),OD 6.35mm(0.250〃) Nominal
E. TPR ENCAPSULATION:MAJOR*MINOR:11mm*11mm

18AWG SINGLE CONDUCTOR STAINLESS STEEL TUBE SQUARE ENCAPSULATION 15,000 PSI SYSTEM
INSULATION: **PFA INSULATION**
JACKET: **PFA MATERIAL**
TUBE: **1/4" x 0.028" A316L STAINLESS STEEL**
ENCAPSULATION: **TPR,11mm Round**

Encapsulated Cable Sample



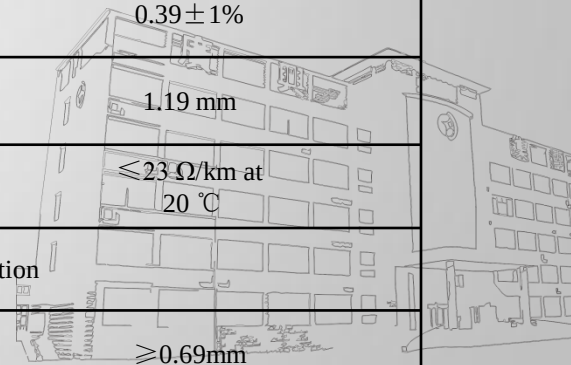
A. 18#AWG 7×0.39mm Copper conductor: OD 1.19mm Nominal
B. ETFE INSULATION:OD 2.60mm Nominal
C. POLYPROPYLENE JACKET: OD 4.92mm Nominal
D. 316L STAINLESS STEEL TUBE:WALL THICKNESS:0.71mm(0.028〃),OD 6.35mm(0.250〃) Nominal
E. POLYPROPYLENE ENCAPSULATION:11mm×11mm COLOR:YELLOW

18AWG MONOCONDUCTOR STAINLESS STEEL TUBE ENCAPSULATION 10,000 PSI SYSTEM
INSULATION: **ETFE INSULATION**
JACKET: **POLYPROPYLENE MATERIAL**
TUBE: **1/4" x 0.028" A316L STAINLESS STEEL TUBE**
ENCAPSULATION: **POLYPROPYLENE MATERIAL**

Test Report Format

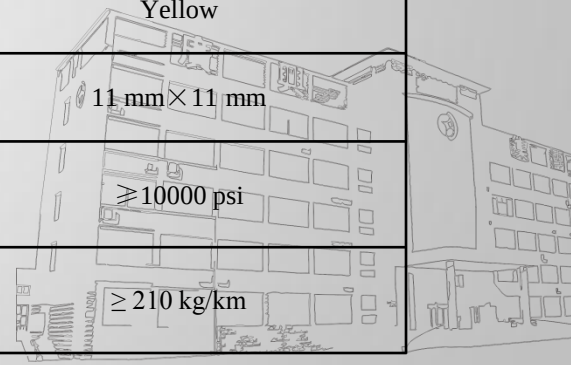
TEST REPORT

Solutions-2015/11/18B				
Description	Type	ENCAPSULATED CABLE 18AWG/150℃/316L SS TUBE		
	Weight	1050 KG	Length	5000 m
	Standard	As Requirement	Shape of cable	Flat
Conductor	Number of cores	7 cores	Type of conductor	Stranded
	Standard diameter of core	0.39±1%	Measured results	0.39±1%
	OD of Conductor	1.19 mm	Measured results	1.19 mm
	Standard conductor resistance	≤23 Ω/km at 20 ℃	Measured results	≤23 Ω/km at 20 ℃
Insulation	Type of insulation	ETFE Insulation		
	Average thickness	0.71 mm	Thickness of the Thinnest Point	≥0.69mm



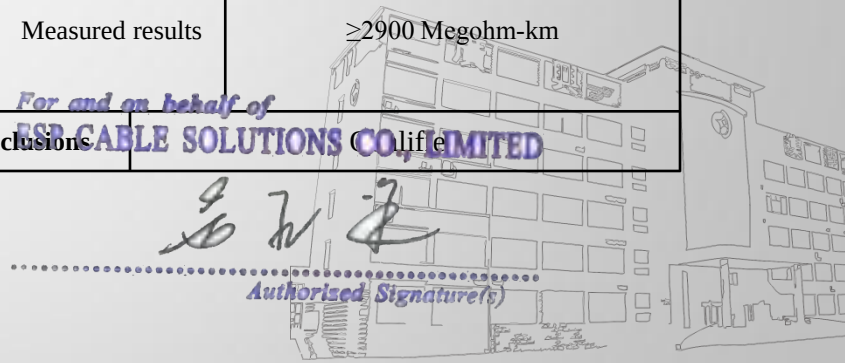
Test Report Format

Jacket	Material	Polypropylene	Average thickness	1.16 mm
			Thickness of the Thinnest Point	⩾1.10 mm
Armor	Material	316L Stainless steel tube	Wall Thickness	0.71 mm
			OD of the tube	6.35 mm
Encapsulation	Material	Polypropylene	Color	Yellow
	Dimension	11 mm×11 mm	Measured results	11 mm×11 mm
Physical Characteristics	External Collapse	⩾10000 psi	Measured results	⩾10000 psi
	Cable Weight	210 kg/km	Measured results	≥ 210 kg/km



Test Report Format

Electrical Characteristics	Stainless Tube DC Resistance at 20℃	⩽62 Ω/km at 20 ℃	Measured results	⩽62 Ω/km at 20 ℃
	Capacitance Center Cond. To Tube	92 pf/m	Measured results	92 pf/m
	Voltage Test	AC 3.5kV,5 minutes	Measured results	No breakdown
	Insulation Resistance at 20 ℃ Center Cond. To Tube	⩾2900 Megohm-km	Measured results	⩾2900 Megohm-km
Appearance	Qualified		**Conclusions**	Qualified



Customer Distribution

BETTER SERVICE
WIN BETTER TOMORROW

THANKS FOR COOPERATION