



# Pars Maghareh Co. (PMC)

The Designer and Manufacturer  
of Toughened Glass Insulators





TYPE TESTS ON SUSPENSION GLASS INSULATORS MANUFACTURED BY PARS  
MAGHAREH CO. IN ACCORDANCE WITH IEC 383-1 1993

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### A brief look at the history of company

Pars Maghareh Co. (P.J.S.C) is established on 2002 by Iran Electrical Equipment Engineering Co. , which herself as a main local manufacturer of electrical equipment for overhead power transmission lines , was founded in 1991.

The complete production line's equipment, machineries and the know-how have been supplied by the most reliable and reputable European companies in the glass insulator production field. Finally in 2006 , installation & commissioning operations carried out with the supervision of the supplier in our site located in Ghazvin-Takestan.

Today, Pars Maghareh Co. is the leading and the sole manufacturer of "toughened glass insulators" in territory and region with annual capacity of 10.000 tons of glass insulators. It is obvious that, this success is due to the valuable experiences and efforts of the company's board in power industries. The range of products include the full spectrum of standard and anti-fog insulators from 40KN to 300KN which their electrical and mechanical characteristics are well beyond the specified values in related standards such as IEC, ANSI and BS.

Pars Maghareh insulators have successfully passed the standard type tests in the most authorized national and international laboratories and the related quality certificates have been collected in this respect.





### Why toughened glass?

Annealed glass insulators are susceptible to micro defects such as micro cracks, voids and inclusions especially on their surface . Under mechanical ( Impact or tension ) , and electrical loads , these defects might cause crack initiation and propagation , leading to complete shattering of insulators .

For overcoming these deficiencies, the SEDIVER company in 1950 evolved the "Toughening" process which improves the mechanical characteristics of molded glass dielectric shells without affecting their already superior electrical properties. Since then, the usage development of the toughened glass insulators on high voltage overhead lines has been increasing for AC up to 800kv and for DC up to 600 kv. PARS MAGHAREH Company is using exactly the same "Toughening" process in its manufacturing line.

### TOUGHENING PROCESS

In this process glass temperature is set to a value in the range of softening point and glass transition ( $T_g$ ) temperatures. Then the heated and homogenized glass is air-quenched by blowing the cold compressed air onto its surface through a precisely designed set of nozzles. Since the outer layers will be cooled more quickly and their shape is set faster than the inner ones, this imparts to the outer layers of glass high compressive stresses and to the inner parts , tensile stresses .

The compressive pre-stresses resulted (250 MPa) on the surface of such glass insulator prohibit the propagation of micro cracks.







## **Manufacturing Process of Toughened Glass Insulators**

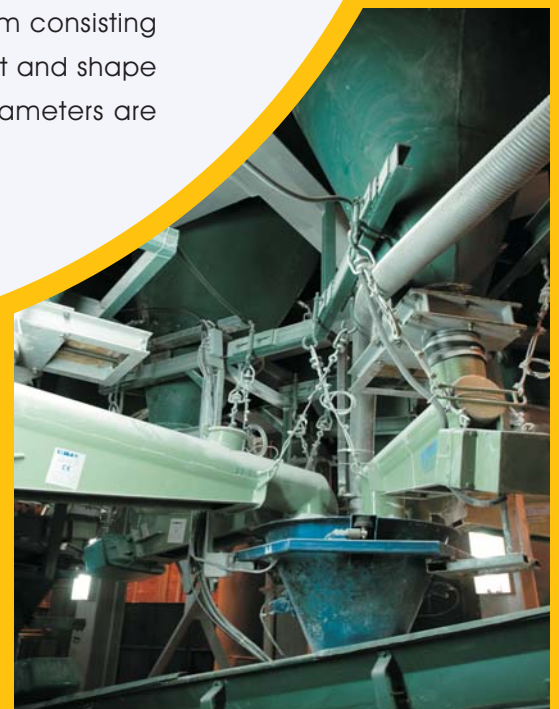
Insulators have dual function (Electrical and Mechanical) in electrical supply networks and make only a few percentage of total cost of the overhead line projects. But they have a great and inevitable role in reliability of the line, economy, safety and daily life of the people. So they should be made with the latest updated manufacturing technology and best quality materials. Manufacturing process of toughened glass insulators in Pars Maghareh Co. consists of the followings:

### **BATCH PLANT**

After quality control of the raw-materials, they are automatically being weighed and completely mixed according to predefined compositions and proportions through a full PLC control process. The weighed and well mixed raw-materials are loaded to furnace by means of some elevators and conveyors.

### **FURNACE**

The glass melting furnace has a capacity of 20 tons/per day. The raw materials after loading to the furnace are melted in about 1500°C. At the end of furnace, the feeder mechanism consisting of tube, plunger, orifice and shear, adjusts the weight and shape of the glass gobs for forming. All of the process parameters are measured and controlled by PLC.





### **PRESS**

The gobs after falling into the moulds are pressed in multiple stations to form the final shape of insulators. Pressing, threading, lubricating and cooling operations automatically are performed in subsequent stations through a fully automated operations.

### **HOMOGENIZER**

After pressing cycle, the formed insulators are transferred to a LEHR or homogenizing furnace for heating them to a predefined temperature homogenously. The glass insulators which exit from LEHR are ready for toughening process.

### **TOUGHENING**

In this stage, compressed air, with pre-specified flow and pressure, is blown to the surface of insulators through properly designed sets of nozzles. Rapid cooling of the outer layers, leads to high residual compressive stresses on the surface and equivalently high residual tensile stresses in the inner layers of glass.







### THERMAL SHOCK TESTING LINE

All the toughened glass insulators should pass through this line as a routine test. The parts are subjected to two different thermal cycles for checking the quality and level of toughening.

### QUALITY CONTROL

Operators of the transmission lines ideally prefer to forget about the insulators for decades after installation. This mainly depends on placing quality at all levels of the company from designing, manufacturing and testing up to supply and after-sales services. We in pars maghareh company believe that, Q.C department is client's agent for ensuring that the overall quality policy is enforced, regarded and respected at all levels of operations .







## RESEARCH AND DEVELOPMENT

This department is responsible for:

- Evolution of insulator product designs with the best possible performance to withstand various electrical, mechanical and environmental stresses applied throughout their expected service life time.
- Defining the manufacturing process control and testing procedures necessary to provide the highest level of assurance that assembled insulators and their component parts will meet the originally intended product performance requirements.
- In fact this department is in charge of all the testing related to the controls of the characteristics of the products and the production process. Such function is accomplished in close collaboration with the production and quality control departments.







### Some Advantages of Glass Insulators

- \* Completely uniform internal structure
- \* High mechanical and electrical endurance
- \* No ageing with time and the elements
- \* Similarity of thermal expansion coefficients of insulator components
- \* High residual strength after glass shell shattering
- \* High puncture voltage
- \* Low growth of aluminous cement
- \* No hidden defects
- \* Easy maintenance
- \* Higher dielectric strength
- \* About 25% lighter than porcelain
- \* More resistance against splitting and impact



Pars Maghareh Co.



### LONG LIFE EXPECTANCY

- \* No mechanical or electrical ageing of the insulating part. Porcelain or polymer electrically puncture and the assembly of mechanical parts may lose their strength due to thermal – mechanical long term stress.
- \* Even in the case of lightning or power arcs the mechanical strength is still guaranteed
- \* Easy and inexpensive inspection for preventive maintenance





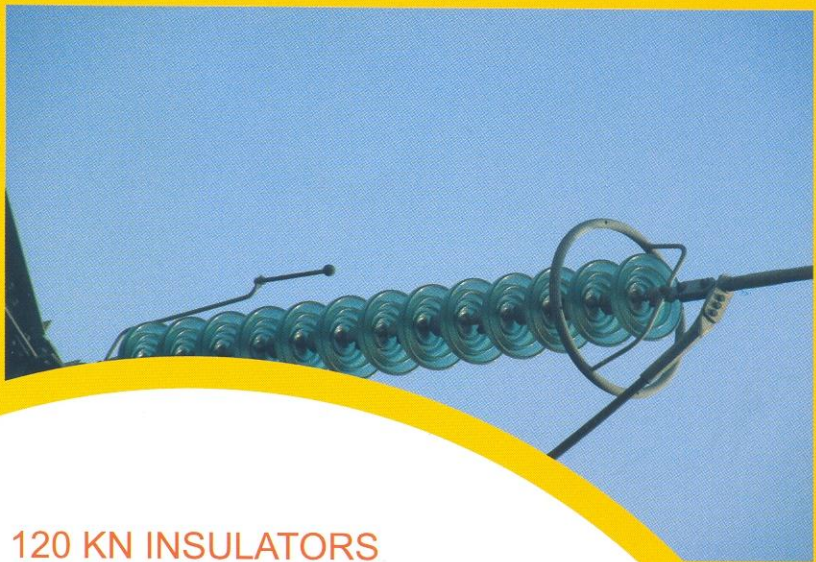


## 70KN INSULATORS

	CHARACTERISTICS	U 70BS	U 70BL
<b>MECHANICAL CHARACTERISTICS</b>	Minimum Mechanical Failing Load ( KN)	70	70
	Impact Strength (NM)	45	45
	Residual Strength (%)	>65	>65
	Mechanical Routine test Load(KN)	35	35
	Thermal-Mechanical Performance(-30~+40 °C) (KN)	42-45.5	42-45.5
<b>DIMENSIONS</b>	Diameter ( mm )	255	255
	Spacing ( mm)	127	146
	Creepage distance ( mm )	320	320
	Metal fitting size	16A	16A
	Galvanized Coating (gr/cm <sup>2</sup> )	0.06 (85μ)	0.06 (85μ)
<b>ELECTRICAL CHARACTERISTICS</b>	Power frequency withstand voltage (KV) -Dry , 1 minute	70	70
	Power frequency withstand voltage (KV) -Wet 1 minute	40	40
	Dry lightning impulse withstand voltage( KV )	115	115
	Puncture withstand voltage ( KV )	130	130
	Max Radio Interference Voltage(20KV,1MHz),(db)	50	50
<b>PACKING AND SHIPPING DATA</b>	Approx. net weight ( kg )	3.7	3.75
	N° of insulators per crate	6	6
	Crate Dimensions (CM)	26×26×85	26×26×85
	Gross weight per crate ( kg )	26.5	26.65
	N° of insulators per pallet	96	96
	Pallet Dimensions W×L×H (CM)	80×120×127	80×120×127
	Gross weight per pallet ( kg )	435	440



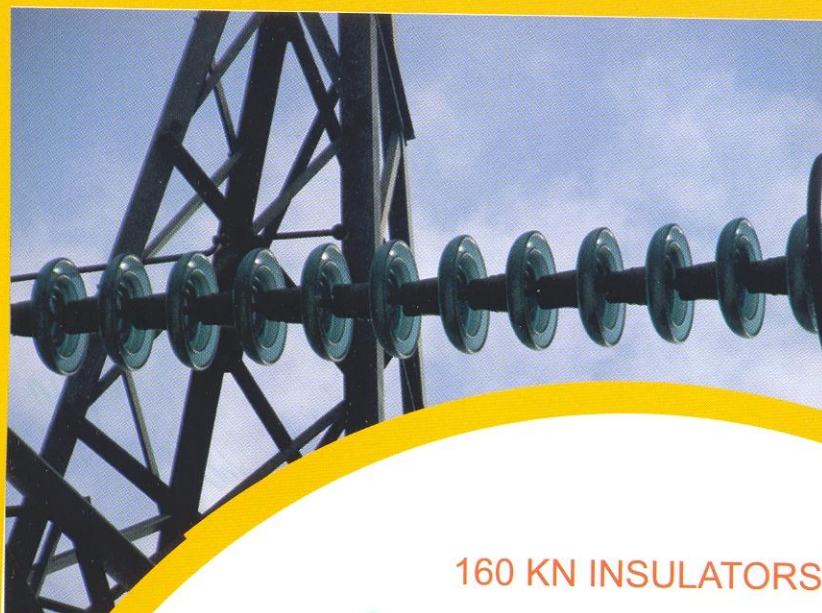




## 120 KN INSULATORS

	CHARACTERISTICS	U 120B	U120BP	U120B-1
MECHANICAL CHARACTERISTICS	Minimum Mechanical Failing Load( KN)	120	120	120
	Impact Strength (NM)	45	45	45
	Residual Strength (%)	>65	>65	>65
	Mechanical Routine test Load (KN)	60	60	60
	Thermal-Mechanical Performance (-30~+40 <sup>°C</sup> ) (KN)	72-78	72-78	72-78
DIMENSIONS	Diameter ( mm )	255	280	280
	Spacing ( mm)	146	146	146
	Creepage distance ( mm )	320	442	370
	Metal fitting size	16A	16A	20A
	Galvanized Coating (gr/cm <sup>2</sup> )	0.06 (85μ)	0.06 (85μ)	0.06 (85μ)
ELECTRICAL CHARACTERISTICS	Power frequency withstand voltage ( KV ) -Dry , 1 minute	70	85	75
	Power frequency withstand voltage (KV) -Wet 1 minute	40	50	45
	Dry lightning impulse withstand voltage ( KV )	115	125	120
	Puncture withstand voltage ( KV )	130	130	130
	Max Radio Interference Voltage(20KV,1MHz),(db)	50	50	50
PACKING AND SHIPPING DATA	Approx. net weight ( kg )	4	5.6	6.14
	N° of insulators per crate	6	6	7
	Crate Dimensions (CM)	26×26×85	29×29×85	29×29×103
	Gross weight per crate ( kg )	28.5	38	47.2
	N° of insulators per pallet	96	72	84
	Pallet Dimensions W×L×H (CM)	80×120×127	100×100×13 6	100×100×136
	Gross weight per pallet ( kg )	470	465	578



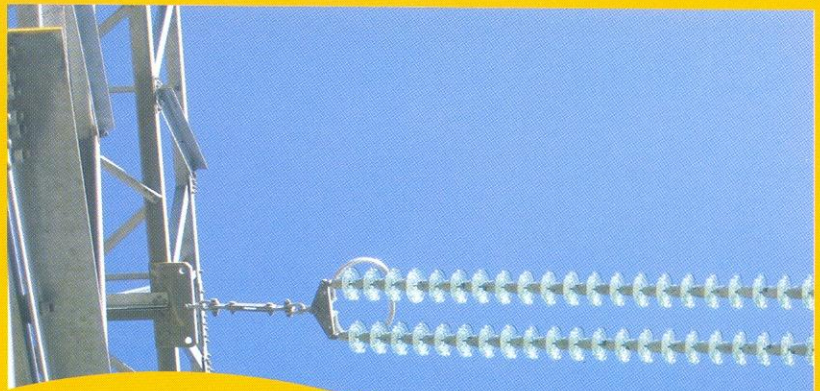


## 160 KN INSULATORS

	CHARACTERISTICS	U 160BS	U 160BL	U160BLP
<b>MECHANICAL CHARACTERISTICS</b>	Minimum Mechanical Failing Load ( KN)	160	160	160
	Impact Strength (NM)	45	45	45
	Residual Strength (%)	>65	>65	>65
	Mechanical Routine test Load(KN)	80	80	80
	Thermal-Mechanical Performance(-30~+40 °C) (KN)	96-104	96-104	96-104
<b>DIMENSIONS</b>	Diameter ( mm )	280	280	325
	Spacing ( mm)	146	170	170
	Creepage distance ( mm )	370	370	545
	Metal fitting size	20A	20A	20A
	Galvanized Coating (gr/cm <sup>2</sup> )	0.06 (85μ)	0.06 (85μ)	0.06 (85μ)
<b>ELECTRICAL CHARACTERISTICS</b>	Power frequency withstand voltage (KV) -Dry , 1 minute	75	75	80
	Power frequency withstand voltage (KV) -Wet 1 minute	45	45	50
	Dry lightning impulse withstand voltage( KV )	120	120	145
	Puncture withstand voltage ( KV )	130	130	130
	Max Radio Interference Voltage(20KV,1MHz),(db)	50	50	50
<b>PACKING AND SHIPPING DATA</b>	Approx. net weight ( kg )	6.14	6.2	8.48
	N° of insulators per crate	7	6	4
	Crate Dimensions (CM)	29×29×103	29×29×98	35×35×66
	Gross weight per crate ( kg )	47.2	41.75	38.15
	N° of insulators per pallet	84	72	36
	Pallet Dimensions W×L×H (CM)	100×100×136	100×100×136	70×105×160
	Gross weight per pallet ( kg )	578	513	353







## 210 KN INSULATORS

	CHARACTERISTICS	U 210B	U 210BP	U210B-1
<b>MECHANICAL CHARACTERISTICS</b>	Minimum Mechanical Failing Load ( KN)	210	210	210
	Impact Strength (NM)	45	45	45
	Residual Strength (%)	>65	>65	>65
	Mechanical Routine test Load(KN)	105	105	105
	Thermal-Mechanical Performance(-30~+40 °C) (KN)	126-136.5	126-136.5	126-136.5
<b>DIMENSIONS</b>	Diameter ( mm )	280	325	280
	Spacing ( mm)	170	170	170
	Creepage distance ( mm )	370	550	370
	Metal fitting size	20A	20A	24A
	Galvanized Coating (gr/cm <sup>2</sup> )	0.06 (85μ)	0.06 (85μ)	0.06(85μ)
<b>ELECTRICAL CHARACTERISTICS</b>	Power frequency withstand voltage (KV) -Dry , 1 minute	75	90	75
	Power frequency withstand voltage (KV) -Wet 1 minute	45	55	45
	Dry lightning impulse withstand voltage( KV )	120	145	120
	Puncture withstand voltage ( KV )	130	130	130
	Max Radio Interference Voltage(20KV,1MHz),(db)	50	50	50
<b>PACKING AND SHIPPING DATA</b>	Approx. net weight ( kg )	6.95	9.34	7.5
	N° of insulators per crate	6	4	6
	Crate Dimensions (CM)	29×29×98	35×35×66	29×29×98
	Gross weight per crate ( kg )	46.25	41.6	45
	N° of insulators per pallet	72	36	72
	Pallet Dimensions W×L×H (CM)	100×100×136	70×105×160	100×100×136
	Gross weight per pallet ( kg )	567	383	605





We are proud to say that, from the commercial, financial and particularly technical point of views, our company potentially is equipped with full skilled and well experienced employees. Naturally with the above-said capabilities the "Quality Control" and the "Quality assurance" departments continuously monitors and supervises the full production line (starting from the raw-material to the assembled glass insulators). A series of well equipped laboratories with trained employees are checking, recording and analyzing the process data for improving quality.

**Pars Maghareh Co.** will offer the glass insulators with superior quality, reliable performance, prompt delivery and also the competitive prices due to raw-material local availability and the fair price of fuel and energy in Iran. Customer satisfaction , not being only a slogan, is a key point in our long term policy of market research and gaining global markets.





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