

Conder Solutions Ltd – Electrical Composites

The Company

Based in the North East of England, Conder has been manufacturing electrical composites for over 28 years. Conder is one of the UK's market leading designers and manufacturers of engineered products in Glass Reinforced Plastic (GRP) which serve to contain and protect the water environment.

Conder is also recognized worldwide as a global leader in the field of electronic composites, with a reputation for quality assured products, first class customer service and technical excellence. Conder manufactures electrical insulation cylinders, resin coated papers and rollers for the printing industry for clients worldwide and was the first in the electrical composites industry to achieve BE EN ISO 9001 accreditation.

Conder provides its customers with a complete service from initial enquiry through to final delivery. Conder's technical expertise also extends to product development, in conjunction with our customers' technical team, together with on-site and after-sales technical support. Conder's team have extensive experience in supporting customers world-wide and are able to schedule deliveries anywhere in the world.

Conder Solutions Ltd is a part of the EPS Group of Companies and was acquired in October 2008. Backed by a group with a turnover over 70m Euro, Conder has just over 120 employees and offers a comprehensive product portfolio, unrivalled manufacturing capability and proven expertise in all electrical composites markets.

Customers / Market Sectors

Manufacturers of Power Transformers (oil to air, oil to oil)
Manufacturers of Step-up Transformers
Manufacturers of AC generators
Manufacturers of Capacitance Bushings
Manufacturers of Generator Bushings
Manufacturers of Transformer Bushings (oil to air, oil to oil)
Paper Printers
Paper Print Cylinder Manufacturers
Manufacturers of Fabric Bearings, Machine Parts

Products

Phenolic Resin Coated Paper
Epoxy Resin Coated Paper
Phenolic Tubes and Phenolic Cylinders
Epoxy Tubes and Epoxy Cylinders
SRBP Tubes and S.R.B.P. Cylinders
Fabric Tubes and Fabric Cylinders

Products

1. Resin Coated Paper

Conder manufacture and supply a wide range of resin coated papers, ideal for tubes, cylinders and bushings – including those used in oil filled transformers where end products must remain absorbent.

Our pre-impregnated varnished paper is produced from high quality cellulose paper. Coated with phenolic or epoxy resin, it is then dried to a B-stage to ensure flexibility and easy handling. After wrapping or heat forming into the final shape, the material is fully cured to produce a rigid structure with specific electrical, thermal and mechanical properties.

Uniquely, all types of Conder resin coated paper can be supplied up to 3.4m in width or custom cut to a specified width. Product is supplied wound on paper tubes – inside diameter 90mm – outside diameter as required – and protected in sealed bags. Product should be stored in its original packing in a cool, dry place; in such conditions at 20°C storage life is one year.

Applications

60/113 impregnated	<i>Tubes</i>
60/84C coated one side	<i>Condenser bushings manufacture</i>
60/110 coated one side	<i>Tubes and cylinders for use in HV oil-insulated transformers</i>
70/92 coated one side	<i>Bushing Manufacture for High Current set-up transformers</i>
70/125 coated one side	<i>Tubes and cylinders for use in HV Transformers and end collars</i>

Paper Types and Specifications

	60/113 impregnated	60/84C coated one side	60/110 coated one side	70/92 coated one side	70/125 coated one side
Paper Weight: (g/m ²)	60 +/- 3	60 +/- 3	60 +/- 3	70 +/- 3	70 +/- 3
Resin Weight: (g/m ²)	53	24	50	22	55
Total coated paper weight: (g/m ²)	113 +/- 5	84 +/- 5	110 +/- 5	92 +/- 5	125 +/- 5
Average % of resin . - ref to total weight	47%	28.50%	45%	24%	45%
. - ref to paper weight	88%	40%	83%	31.5%	83%
Paper thickness: (mm)	0.09	0.09	0.09	0.10	0.10
Thickness of Coated Paper: (mm)	0.14	0.11	0.13	0.12	0.15
Tensile strength of paper (lengthwise): (N/cm)	50	50	50	90	90
Melting point of resin (Kofler Test): (degrees C)	70 - 100	70-100	70-100	70-90	70-90

2. Electrical Insulation Cylinders (including Winding Own Material Service)

Conder offers a comprehensive range of electrical insulation cylinders to BS EN ISO 9001. Using a range of base papers and laminating resins, a variety of cylinder grades can be manufactured to meet any requirement – such as winding cylinders, support tubes, coil formers, helical end collars and stress ring formers – or any other application requiring lightweight, high strength electrical insulating cylinders.

Cylinders produced from phenolic bonded paper are available in sizes from 50mm to 1880mm diameter and in un-jointed lengths up to 3.1m. Glass and cotton cylinders are also manufactured on Conder's extensive range of mandrels, but with lower axial lengths.

We can also offer a winding service for your own materials (epoxy glass, fabric, mica) using our vast range of large mandrels. Click on link here to view mandrel listing.

Grades & Applications (*in italics*)

Grade E – Temperature/Class A/E

Relatively absorbent phenolic paper laminate, ideal for high voltage work in oil immersed applications due to its good absorbency.

Winding Cylinders HV (in oil), Barrier Cylinders HV / LV (in oil).

Grade EM Temperature/Class A/E

Phenolic paper laminate that is mechanically stronger than Grade E, but still capable of oil impregnation. The most popular grade for winding cylinders; can be cut, drilled and shaped so is ideal for helical or straight transformers end insulation. Suitable for vapour phase drying treatment.

Winding Cylinders HV (in oil). Winding Cylinders LV (in oil or air). End insulators. Support tubes. Oil flow tubes. Lead supports.

Grade M Temperature/Class A/E

Full resin impregnated phenolic paper laminate with very low absorption, but excellent mechanical strength and machinability. Suitable for vapour phase drying treatment.

Winding Cylinders HV (in air). Winding Cylinders LV (in oil or air). Stress ring formers. Tank bodies. Capacitor housings. Insulated handles. Magnet formers. MRI Cylinders.

Grade FRC 28 Temperature/Class A/E

Medium grade cotton phenolic laminate with good machinability.

Low voltage insulation applications.

Grade FRC 32 Temperature/Class A/E

A fine grade cotton phenolic laminate with good mechanical properties and excellent machinability.

Machine parts. Marine bearings.

Grade FRG 46 Temperature/Class F

Woven glass epoxy resin laminate for class F use (155°C) – axial length limit 1.5m.

Magnet formers. MRI cylinders. Class F high temp cylinders and collars.

See mandrel list for standard sizes and tolerances. No British Standard covers this cylinder size range. Materials offered are similar to those set out in IEC 1212 and the corresponding DIN and NEMA grades.

3. Paper & Print Converting Rollers

Conder has an excellent track record within the paper and paper converting industries, and considerable expertise in the supply of custom made and standard rollers.

Rollers are manufactured as a phenolic or epoxy bonded laminate, in diameters up to 1.8m and with face widths up to 3m (subject to a 10:1 length to diameter ratio). Conder supply both completely made up rollers to customer designs, and raw material for self assembly / machining by clients. In some cases, product can be applied to existing rollers as a size modification or protective coating.

Key Product Features and Properties

- Light weight
- Low inertia
- High strength to weight ratio
- Corrosion resistance to mild acids, alkalis and steam

Tensile Strength:	65 MPa
Compressive strength – axially	198 MPa
Compressive strength – radially	150 MPa
Young's Modulus	$10^3 \times 12\text{N/mm}^2$
Specific Gravity	1.3
Coefficient of thermal expansion	0.000025/°C

Cylinder Mandrel Listing

Conder are able to produce cylinders with a minimum thickness of 2mm, and to an extensive standard range of diameter as follows. Special diameter potentially available on request:

Dia in mm	Max Length (m)	Dia in mm	Max Length (m)	Dia in mm	Max Length (m)	Dia in mm	Max Length (m)	Dia in mm	Max Length (m)
50.8	2.74	115.0	2.74	210.0	2.74	381.0	2.54	705.0	2.90
52.4	2.74	120.0	2.74	213.5	2.74	403.0	2.54	711.2	2.90
53.6	2.74	125.0	2.74	220.0	2.74	419.0	2.54	724.0	2.90
55.9	2.74	127.0	2.74	228.6	2.74	422.0	2.54	736.6	2.90
57.1	2.74	130.0	2.74	230.0	2.74	425.0	2.54	749.4	2.90
60.0	2.74	133.2	2.74	235.0	2.74	427.0	2.54	774.7	2.90
60.5	2.74	135.0	2.74	239.0	2.74	428.8	2.54	787.4	2.90
32.3	2.74	136.5	2.64	241.3	2.74	432.0	2.54	800.1	2.90
63.5	2.74	139.7	2.74	244.0	2.74	434.0	2.54	812.8	2.90
64.3	2.74	140.0	2.74	244.5	2.74	438.0	2.54	825.5	2.90
66.7	2.74	142.9	2.74	248.0	2.74	445.0	2.54	838.4	2.90
69.8	2.74	145.0	2.74	248.5	2.74	450.7	2.54	850.5	2.90
70.2	2.74	150.0	2.74	250.0	2.74	470.0	2.54	860.5	2.90
76.2	2.74	152.4	2.74	255.0	2.74	482.6	2.54	884.0	2.90
77.0	2.74	155.0	2.74	260.0	2.74	498.0	2.54	901.7	2.90
79.4	2.74	159.0	2.74	265.0	2.74	501.5	2.54	914.6	2.90
80.0	2.74	160.0	2.74	272.0	2.74	520.7	2.54	940.0	2.90
82.5	2.74	164.0	2.74	275.0	2.74	533.5	2.54	966.0	2.90
85.0	2.74	165.0	2.74	277.0	2.64	540.0	2.54	990.8	2.90
88.9	2.74	169.0	2.74	284.0	2.74	546.0	2.54	1028.7	2.90
89.0	2.74	170.0	2.74	289.0	2.74	552.5	2.54	1041.4	2.90
90.0	2.74	171.5	2.74	295.0	2.74	555.4	2.54	1066.8	2.90
95.0	2.74	174.6	2.74	305.0	2.74	571.5	2.54	1085.8	2.90
95.2	2.74	178.0	2.74	309.0	2.74	578.0	2.70	1098.0	2.90
98.0	2.74	180.0	2.74	320.0	2.74	584.2	2.50	1167.0	2.90
100.0	2.74	183.0	2.74	334.0	2.54	589.0	2.50	1194.0	2.90
101.6	2.74	189.0	2.74	335.0	2.54	597.0	2.70	1206.0	2.90
108.0	2.74	190.4	2.74	349.0	2.54	628.8	2.55	1241.4	2.90
110.0	2.74	197.0	2.74	355.0	2.54	647.7	2.90	1343.0	3.22
110.3	2.74	199.5	2.74	364.0	2.54	654.0	2.90	1787.5	2.54
114.0	2.74	200.0	2.74	372.0	2.54	685.8	2.90		

Dimensional Tolerances

Internal Diameter		Wall Thickness	Length
<150mm	± 0.35mm	± 10%	± 1.5mm
152 - 305mm	± 0.75mm		
309 - 597mm	± 1.00mm		
629 - 915mm	± 1.25mm		
940 - 1206mm	± 1.50mm		
1241 - 1788mm	± 2.00mm		

For intermediate diameters between standard mandrels add 50% to the above diameter and wall thickness tolerances