## Technical data sheet of industrial laminated rods

1. The statments are requirements to Norm 61212-3-3; IEC 61212-3-3:2006 (German version EN 61212-3-3:2006)

2. A dash "! " signifies that there is no requirement.

3. All statements are not binding. No liability is accepted for any injury, loss, damage arising from the use of this information.

4. The following abbreviations are used at this pages.

| Resin | |
|---|---|
| EP | Epoxy |
| PF | Phenol |
| SI | Silicone |

| Reinforcement | |
|---|---|
| CC | Woven cotton cloth |
| CP | Cellulosic paper |
| GC | Woven glass cloth |

5. Similar norms

| | EP CC 41 | EP GC 41 | EP GC42 | EP GC 43 | PF CC 41 | PF CC 42 | PF CC 43 | PF CP 41 | PF CP 42 | PF CP 43 | SI GC 41 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DIN 7735 | | | | | Hgw 2089 | Hgw 2088 | | | | | |
| Nema | | | | | L | C | | | | | |

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## Technical data sheet of industrial laminated rods (page 2 of. 5)

| Table1; Type of rod; Norm 61212-3-3; IEC:61212-3-3:2006; (German version EN 61212-3-3:2006) | | | |
|---|---|---|---|
| Type | | | Applications and distinguishing characteristics (note 1) |
| Resin | Reinforcement | serial number | |
| EP | CC | 41 | Mechanical and electrical applications. Good resistance to electrical tracking. Fine weave(2). |
| | GC | 41 | Mechanical and electrical applications. Good mechanical stability at middle temperatures. Good stability of electric properties in high humidity. |
| | | 42 | Similar EP GC 41, but with better mechanical properties by higher temperatures. |
| | | 43 | Similar EP GC 41, but with better flammibility |
| PF | CC | 41 | Mechanical and electrical applications. Fine weave(2) |
| | | 42 | Mechanical and electrical applications. Coarse weave(2) |
| | | 43 | Mechanical and electrical applications. Very coarse weave (2) |
| | CP | 41 | Mechanical and electrical applications. Good stability of electriacl properties in high humidity. |
| | | 42 | Similar Typ PF CP 41, but with poorer mechanical and electrical properties. |
| | | 43 | Mechanical and electrical applications at low voltage. |
| SI | GC | 41 | Mechanical and electrical applications. Good stability of the electrical properties at higher temperatures. |

Note 1: It should not be inferred from the contens of Table 1 that laminates of any particular type are necessarily unsuitable for applications other than those listed for them, or that specific laminates will be suitable for all applications within in the wide description given.

Note 2: Fabric weaves of type PC and CC reinforcements: These values are only for information. They are not to be considered as specification values. In general, the finer weave materials have better machining characteristics.

| | Basis weight g/m! | yarns $cm^{-1}$ |
|---|---|---|
| Very coarse weave | > 200 | < 18 |
| Coarse weave | > 130 | 18-29 |
| Fine weave | " 130 | # 30 |

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| Table 2 a; Tolerances of nominal diameter as fabricated; Norm 61212-3-3; IEC:61212-3-3:2006; (German version EN 61212-3-3:2006) | | |
|---|---|---|
| Nominal diameter D<br>mm | Tolerance (all types) +- mm | |
| | PF CP<br>EP CC | All other<br>types |
| ≤10 | 0,30 | 0,40 |
| 10<D≤20 | 0,30 | 0,40 |
| 20<D≤30 | 0,40 | 0,50 |
| 30<D≤50 | 0,40 | 0,50 |
| 50<D≤75 | 0,40 | 0,70 |
| 75<D≤100 | 0,50 | 1,00 |
| 100<D≤150 | 0,60 | 1,50 |
| 150<D≤200 | 0,70 | 1,70 |
| 200<D≤300 | 0,75 | 2,00 |
| 300<D≤500 | 0,80 | 2,20 |
| >500 | 1,00 | 2,50 |

| Table 2 b; Tolerances of nominal diameter with sanded surface; Norm 61212-3-3; IEC:61212-3-3:2006; (German version EN 61212-3-3:2006) | |
|---|---|
| Nominal diamter D<br>mm | tolerances +- mm<br>all types |
| ≤25 | 0,15 |
| 25<D≤50 | 0,25 |
| 50<D≤75 | 0,30 |
| 75<D≤100 | 0,35 |
| 100<D≤125 | 0,45 |
| >125 | 0,50 |

Buyer and supplier can agree that the tolerance is only + or - tolerance. Then the tolerances shall apply not more as the double tolerance.

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| Table 3; Straightness; Norm 61212-3-3; IEC:61212-3-3:2006; (German version EN 61212-3-3:2006) | |
|---|---|
| | |
| All types (1) | 3,5 $L^2$ mm |

Note 1: Test 4.4 according IEC 61212-2 straightness deviation does not exceed 3,5 mm on the length of 1 meter for all diamters.

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## Technical data sheet of industrial laminated rods (page 5 of 5)

| Table 4; Property requirement; Norm 61212-3-3; IEC:61212-3-3:2006; (German version EN 61212-3-3:2006) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | IEC 61212-2 Abschnitt | unit | Min. oder Max. | Types | | | | | | | | | | |
| | | | | EP CC 41 | EP GC 41 | EP GC 42 | EP GC 43 | PF CC 41 | PF CC 42 | PF CC 43 | PF CP 41 | PF CP 42 | PF CP 43 | SI GC 41 |
| Flexural strenght perpendicular to lamination (1) | 5.1 | Mpa | Min. | 125 | 220 | 220 (1) | 220 | 125 | 90 | 90 | 120 | 110 | 100 | 180 |
| Compressive strenght, axial | 5.2 | Mpa | Min. | 80 | 175 | 175 | 175 | 90 | 80 | 80 | 80 | 80 | 80 | 40 |
| Breakdown voltage at 90 °C in oil ‖ to lamination | 6.1 | kV | Min. | 30 | 40 | 40 | 40 | 5 | 5 | 1 | 13 | 10 | 10 | 30 |
| Isolation resistance after immersion in water | 6.2 | M Ω | Min. | 50 | 1000 | 150 | 1000 | 5 | 1 | 0,1 | 75 | 30 | 0,1 | 150 |
| Thermical long term behaviour | 7.1 | TI | Min | "(130)" | "(130)" | "(155)" | "(130)" | "(120)" | "(120)" | "(120)" | "(120)" | "(120)" | "(120)" | "(180)" |
| Water absorption | 7.2 | mg/cm$^2$ | Max. | 2 | 3 | 5 | 3 | 5 | 8 | 8 | 3 | 5 | 8 | 2 |
| Density | 7.3 | g/cm$^3$ | Bereich | "(1,2-1,4)" | "(1,7-1,9)" | "(1,7-1,9)" | "(1,7-1,9)" | "(1,2-1,4)" | "(1,2-1,4)" | "(1,2-1,4)" | "(1,2-1,4)" | "(1,2-1,4)" | "(1,2-1,4)" | "(1,6-1,8)" |
| Flammibility | 7.4 | Klasse | | "-" | "-" | "-" | V0 | "-" | "-" | "-" | "-" | "-" | "-" | V0 |

Note 1: The flexural strenght at 150 $^0$ C +-3 K after 1 h 150 $^0$ C +-3 K, not less as 50 % of the value.

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