

Material overview for sheets

Grønlandsvej 197 +45 7642 8200
 DK-7100, Vejle - Denmark ei@elektro-isola.dk
 VAT no.: DK20429488 www.elektro-isola.com

Test method: IEC/EN 60893-2

Norm

Thickness of sample

Conditioning: IEC 60212

Closest relevant standards

| Material designation | IEC 60893-3-1 | NEMA | Reinforcement | Resin | Colour* |
|----------------------|---------------|--------|-------------------------|-----------------|---------|
| Etronit I | PF CP 202 | XX | Paper | Phenol | ● |
| Etronit II | PF CP 203 | XX | Paper | Phenol | ● |
| Etronit IIQ | PF CP 203 | XX | Paper | Phenol | ● |
| Etronit IIQ S | PF CP 203 | XX | Paper | Phenol | ● |
| Etronit IIQ S AL | PF CP 203 | XX | Paper | Phenol | ● |
| Etronit IIQR | PF CP 203 | XX | Paper | Phenol | ● |
| Etronit IS | PF CP 202 | XXX | Paper | Phenol | ● |
| Etronit MBM | | - | Paper | Phenol/Melamine | ● |
| Etronax MF | PF CC 201 | C | Cotton fabric | Phenol | ● |
| Etronax MMF | PF CC 203 | L | Cotton fabric | Phenol | ● |
| Etronax MMMF | PF CC 305 | - | Cotton fabric | Phenol | ● |
| Etronax MF G | | - | Cotton fabric | Phenol | ● |
| Etronax MFP G | | - | Cotton/synthetic fabric | Phenol | ● |
| Etronax P EP | EP PC 301 | - | Polyester fabric | Epoxy | ● |
| G-Etronax B | PF GC 201 | G-3 | Glass fabric | Phenol | ● |
| G-Etronax EP 10 | EP GC 201 | G-10 | Glass fabric | Epoxy | ● |
| G-Etronax EP 11 | EP GC 308 | G-11 | Glass fabric | Epoxy | ● |
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| G-Etronax EP 311 HC | EP GC 311 | FR-5 | Glass fabric | Epoxy | ● |
| G-Etronax EP FR4 | EP GC 204 | FR 4&5 | Glass fabric | Epoxy | ● |
| G-Etronax PI | PI GC 301 | - | Glass fabric | Polyimide | ● |
| G-Etronax PM 953 | UP GM 203 | GPO 3 | Glass mat | Polyester | ● |
| G-Etronax PM GPO 3 | UP GM 203 | GPO 3 | Glass mat | Polyester | ● |
| G-Etronax PM GPO 3 | UP GM 203 | GPO 3 | Glass mat | Polyester | ● |
| G-Etronax PM H | UP GM 204 | GPO 1 | Glass mat | Polyester | ● |
| G-Etronax SI | SI GC 202 | G-7 | Glass fabric | Silicone | ● |

Conditioning

- 1: 24h/23°C/50%RH
- 2: 24h/23°C/50%RH + 1h/ in oil at 90°C
- 3: 96h/105°C + 1h/23°C/20%RH
- 4: 24h/50°C/<20% RH + 24h in water at 23°C
- 5: 96h/105°C + 1h/ in oil at 90°C

Notes

- A: 1h/130°C / measured at 130°C
- B: 1h/150°C / measured at 150°C
- C: Halogen free
- D: 1h/180°C / measured at 180°C
- E: 1h/200°C / measured at 200°C

Mechanical properties

| Bending strength | | Modulus of elasticity | Compressive strength | Izod impact strength, parallel with layers | Shearing strength, parallel | Tensile strength |
|------------------|----------------------|-----------------------|----------------------|--|-----------------------------|------------------|
| Room temperature | Elevated temperature | | | | | |
| 6.1 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 | 6.6 |
| ISO 178 | ISO 178 | ISO 178 | ISO 604 | ISO180/2A | IEC 60893-2 | ISO 527-4 |
| ≥ 1,5 mm | ≥ 1,5 mm | ≥ 1,5 mm | ≥ 5 mm | ≥ 5 mm | ≥ 5 mm | ≥ 1,5 mm |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| MPa | MPa | MPa | MPa | kJ/m² | MPa | MPa |
| 150 | - | 8000 | 300 | 3.5 | 35 | 110 |
| 160 | - | 8000 | 300 | 3.3 | 35 | 110 |
| 170 | - | 8000 | 320 | 3.5 | 35 | 140 |
| 170 | - | 8000 | 320 | 3.5 | 35 | 140 |
| 170 | - | 8000 | 320 | 3.5 | 35 | 140 |
| 160 | - | 8000 | 300 | 3.3 | 35 | 110 |
| 140 | - | 8000 | 300 | 3.5 | 35 | 110 |
| 120 | - | 10000 | 300 | 3.3 | 35 | 90 |
| 115 | - | 7000 | 320 | 10 | 40 | 80 |
| 130 | - | 7000 | 280 | 10 | 50 | 100 |
| 140 | - | 8000 | 280 | 6 | 50 | 90 |
| 135 | - | 7000 | 330 | 10 | 50 | 80 |
| 140 | - | 5000 | 320 | 10 | 50 | 85 |
| 150 | - | 4500 | 450 | 50 | 35 | 135 |
| 350 | - | 19000 | 500 | 55 | 50 | 250 |
| 450 | 250 ^(A) | 22000 | 550 | 65 | 50 | 320 |
| 450 | 300 ^(B) | 22000 | 550 | 65 | 55 | 320 |
| 450 | 280 ^(B) | 22000 | 550 | 65 | 50 | 320 |
| 430 | 300 ^(B) | 22000 | 550 | 60 | 55 | 320 |
| 375 | 280 ^(B) | 20000 | 500 | 60 | 45 | 300 |
| 450 | 170 ^(B) | 22000 | 550 | 65 | 55 | 320 |
| 450 | 360 ^(E) | 25000 | 650 | 55 | 55 | 300 |
| 160 | 100 ^(A) | 11000 | 300 | 50 | 20 | 100 |
| 160 | 70 ^(A) | 10000 | 240 | 50 | 20 | 100 |
| 160 | 70 ^(A) | 10000 | 240 | 50 | 20 | 100 |
| 250 | 100 ^(A) | 11000 | 350 | 60 | 35 | 150 |
| 135 | - | 13000 | 330 | 45 | 15 | 160 |

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| G-Etronax EP 311 HC | EP GC 311 | FR-5 | Glass fabric | Epoxy | ● |
| G-Etronax EP FR4 | EP GC 204 | FR 4&5 | Glass fabric | Epoxy | ● |
| G-Etronax PI | PI GC 301 | - | Glass fabric | Polyimide | ● |
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Electrical properties

| Electrical strength in 90°C oil | | Permittivity | | Dissipation factor | | Insulation resistance after submersion in water | Comparative tracking index [CTI] |
|---------------------------------|-------------------|---------------|--------|--------------------|--------|---|----------------------------------|
| Perpendicular | Parallel | 50HZ | 1MHz | 50HZ | 1MHz | 7.3 | 7.4 |
| 7.1.3.2 | 7.1.3.3 | 7.2 | | 7.2 | | 7.3 | 7.4 |
| IEC 60243-1 | | IEC 62631-2-1 | | IEC 62631-2-1 | | IEC 62631-3-3 | IEC 60112 |
| 3 mm | ≥ 3 mm | ≤ 3 mm | ≤ 3 mm | ≤ 3 mm | ≤ 3 mm | All | ≥ 3 mm |
| 2 kV/mm | 2 kV/25 mm | 3 | 3 | 3 | 3 | 4 MΩ | 1 V |
| 13.3 | 60 | 5 | - | 0.03 | - | 50 | 100 |
| 10 | 30 | 5 | - | 0.04 | - | 50 | 100 |
| 5 | 20 | 5 | - | 0.05 | - | 50 | 100 |
| 4 | 15 | 5 | - | 0.05 | - | 100 | 100 |
| 4 | 15 | 5 | - | 0.05 | - | 100 | 100 |
| 7 | 25 | 5 | - | 0.04 | - | 50 | 100 |
| 14 ⁽⁵⁾ | 80 ⁽⁵⁾ | 5 | - | 0.02 | - | 50 | 100 |
| 5 | 15 | 6 | - | 0.04 | - | 100 | 500 |
| 1 | 5 | - | - | - | - | 1 | 100 |
| 2 | 12 | - | - | - | - | 1 | 100 |
| 2 | 12 | - | - | - | - | 1 | 100 |
| - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - |
| 20 | 70 | 4 | - | 0.01 | - | 100000 | 200 |
| 10 | 30 | 5 | - | 0.03 | - | 1000 | 100 |
| 16 | 60 | 4.5 | 4.5 | 0.008 | 0.01 | 500000 | 200 |
| 18 | 70 | 5 | 5 | 0.008 | 0.01 | 500000 | 200 |
| 16 | 60 | 4.5 | 4.5 | 0.008 | 0.01 | 500000 | 200 |
| 18 | 70 | 5 | 5 | 0.008 | 0.01 | 500000 | 200 |
| 15 | 70 | 4.5 | 4.5 | 0.005 | 0.008 | 500000 | 600 |
| 15 | 70 | 4.5 | 4.5 | 0.005 | 0.008 | 500000 | 200 |
| 20 | 60 | 4 | - | 0.01 | - | 500000 | 250 |
| 11.5 | 60 | 4 | 4 | 0.04 | 0.04 | 1000 | 600 |
| 12 | 60 | 4 | 4 | 0.04 | 0.04 | 1000 | 600 |
| 12 | 60 | 4 | 4 | 0.04 | 0.04 | 1000 | 600 |
| 10 | 60 | 4 | 4 | 0.01 | 0.01 | 1000 | 600 |
| 7 | 50 | 4 | 4 | 0.003 | 0.003 | 100000 | 400 |

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Physical and thermal properties

| Temperature index 20,000 h (T.I.) | Fire class | Density | Water absorption | Smoke emission & toxicity | Oxygen Index (OI) | Smoke density (Ds max.) | Smoke density (Ds max.) | Toxicity (CIT _{NLP}) |
|-----------------------------------|---------------------------|-------------------|------------------|---------------------------------|-------------------|-------------------------|-------------------------|--------------------------------|
| 8.1 | 8.2 | 9.1 | 9.2 | - | - | - | - | - |
| ISO 60216 | IEC 60695-11-10 | ISO 1183-A | ISO 62-1 | EN 45545-2; R22, R23 & R24 | EN ISO 4589-2 | EN ISO 5659-2 | EN ISO 5659-2 | NF X 70-100-1/-2 |
| ≥ 3 mm | - | All | 50x50x3 mm | - | 3 mm | - | - | - |
| - | - | 1 | 4 | - | - | - | - | - |
| °C | Thickness in mm /Category | g/cm ³ | mg | Thickness in mm /Classification | % | Thickness in mm /Value | Thickness in mm /Value | - |
| 120 | | 1.35 | 120 | | | | | |
| 120 | | 1.35 | 110 | | | | | |
| 120 | | 1.35 | 200 | | | | | |
| 120 | | 1.35 | 200 | | | | | |
| 120 | | 1.35 | 200 | | | | | |
| 120 | | 1.35 | 110 | | | | | |
| 120 | | 1.35 | 100 | | | | | |
| 120 | ≥ 8 / V-0 | 1.4 | 100 | | | | | |
| 100 | | 1.35 | 120 | | | | | |
| 100 | | 1.35 | 100 | | | | | |
| 100 | | 1.4 | 60 | | | | | |
| 100 | | 1.35 | 120 | | | | | |
| 100 | | 1.35 | 450 | | | | | |
| 130 | | 1.35 | 20 | | | | | |
| 155 | ≥ 3 / V-0 | 1.95 | 40 | | | | | |
| 140 | | 1.85 | 15 | | | | | |
| 180 | | 1.85 | 15 | | | | | |
| 160 | | 1.85 | 15 | | | | | |
| 180 | | 1.85 | 15 | | | | | |
| 180 | ≥ 3 / V-0 ^c | 1.9 | 20 | ≥ 3 / HL3 | ≥ 32 | 25 / 1 | 1 / 106 | 0.06 |
| 145 | ≥ 0.2 / V-0 | 1.9 | 10 | | | | | |
| 190 | ≥ 4 / V-0 | 1.95 | 25 | | | | | |
| 155 | ≥ 3 / V-0 | 1.9 | 30 | | | | | |
| 155 | ≥ 3 / V-0 | 1.85 | 30 | | | | | |
| 155 | ≥ 3 / V-0 | 1.85 | 30 | | | | | |
| 180 | | 1.6 | 25 | | | | | |
| 220 | ≥ 3 / V-0 | 1.9 | 12 | | | | | |

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