

## What is Hgw 2372.4 (EP GC 203)

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Hgw 2372.4 acc. to DIN 7735 / EP GC 203 acc. to EN 60893 – glass-fabric laminate with epoxy resin, elevated temperature limit (155 °C)

Hgw 2372.4 (EP GC 203) is a glass-fabric reinforced epoxy resin laminate with an elevated temperature limit of 155 °C compared with the standard grade (EP GC 202 / Hgw 2372.1, "FR-4"). It combines very high mechanical strength, low water absorption and very good electrical insulation properties with an extended continuous-use temperature limit.

### CLASSIFICATION AND BASIC CHARACTER

Hgw 2372.4 (EP GC 203) belongs to the family of glass-fabric laminates: layers of glass fabric are impregnated with epoxy resin and pressed under heat and pressure into sheets, rods or tubes. Compared with cotton-fabric laminates, this gives significantly higher strength, lower water absorption and better electrical insulation. The colour is characteristically green.

Within the glass-fabric/epoxy family to DIN 7735 / EN 60893, Hgw 2372.4 (EP GC 203) marks an upgraded temperature class: while the standard grade EP GC 202 (Hgw 2372.1, "FR-4") is rated for around 130 °C, Hgw 2372.4 (EP GC 203) reaches 155 °C (thermal class F) through an adapted resin formulation, combined with higher mechanical values.

### HOW HGW 2372.4 (EP GC 203) IS MADE AND MACHINED

Hgw 2372.4 (EP GC 203) is produced by pressing epoxy-impregnated glass fabric layers into sheets, rods or tubes. We machine precision parts from these semi-finished products – sawing, milling, drilling and turning are carried out with sharp, carbide-tipped or diamond-coated tools, with increased tool wear from the glass fabric to be expected. Adequate dust extraction must be ensured during machining.

### MECHANICAL, ELECTRICAL AND THERMAL PROPERTIES

Hgw 2372.4 (EP GC 203) achieves typical values of around 530 MPa flexural strength, 320 MPa tensile strength and 320 MPa compressive strength, with a modulus of elasticity of around 28,000 MPa and a density of 1.7-1.9 g/cm<sup>3</sup> (typically 1.85 g/cm<sup>3</sup>). Electrically, the material offers a comparative tracking index of CTI 200-210 and an electric strength of 80 kV (||) resp. 70 kV (⊥). The temperature limit for continuous use is 155 °C (thermal class F).

### WHEN HGW 2372.4 (EP GC 203) IS THE RIGHT CHOICE

Hgw 2372.4 (EP GC 203) is worthwhile whenever high mechanical strength, good electrical insulation and an elevated continuous thermal load capacity are required together – for example:

- High-strength insulating parts requiring an elevated continuous-use temperature (up to 155 °C)
- Medium-voltage switchgear and transformer construction
- Components located near heat sources in mechanical engineering
- Applications where the standard grade (130 °C class) is thermally insufficient

### WHEN HGW 2372.4 (EP GC 203) IS NOT THE RIGHT CHOICE

Equally important are the limits of the material:

- Direct food contact – Hgw 2372.4 (EP GC 203) is not declared for this
- Pure cost optimisation without an elevated temperature requirement – the standard grade EP GC 202 (Hgw 2372.1) is sufficient here
- Continuous use well above 155 °C – the 180 °C special grades are more suitable here
- Forming or welding – not possible as a thermoset (machining only)

## COSTS AND MACHINING AT LIEDTKE

Due to the adapted resin formulation for the elevated temperature limit, Hgw 2372.4 (EP GC 203) is priced above the standard grade EP GC 202. The component price is determined mainly by sheet thickness, dimensions, material utilisation, machining effort and batch size – we are glad to provide binding prices on request based on your drawing. During machining we ensure adequate dust extraction and allow for the increased tool wear caused by the glass fabric, reliably manufacturing high-strength, temperature-resistant insulating parts from single items to series production.

## ADVANTAGES AND DISADVANTAGES AT A GLANCE

An honest assessment – and how the disadvantages can be mitigated in practice:

### Advantages

- Very high mechanical strength
- Elevated temperature limit (155 °C)
- Very good electrical insulation properties

### Disadvantages

- Not declared for direct food contact
- Higher tool wear during machining (glass fabric)
- Higher price than the standard grade EP GC 202

Practical tip: Hgw 2372.4 (EP GC 203) is the right choice when high strength, low water absorption and an elevated continuous-use temperature up to 155 °C are required. If 130 °C is sufficient, the standard grade EP GC 202 (Hgw 2372.1) is the more economical choice; for requirements up to 180 °C, the corresponding high-temperature special grades of the series are more suitable.

### Typical Properties

- Very high mechanical strength
- Elevated temperature limit (155 °C)
- Low water absorption
- Very good electrical insulation properties
- Thermoset laminate (dimensionally stable)
- Colour green

### Product Examples

- High-strength insulating and partition parts
- Transformer and apparatus components
- Components requiring a 155 °C temperature limit
- Mechanically highly loaded insulating parts
- Precision and test engineering components

### Typical Industries

- Electrical engineering and switchgear construction (medium voltage)
- Transformer and apparatus manufacturing
- Mechanical and plant engineering (high-strength insulating parts)
- Jig, fixture and tool making
- Test and measurement engineering
- Drive technology

|                                           | Test Method | Unit                | Value               |
|-------------------------------------------|-------------|---------------------|---------------------|
| <b>Mechanical Properties</b>              |             |                     |                     |
| Flexural strength                         | DIN 53452   | MPa                 | 530 (DIN 7735: 350) |
| Flexural strength at elevated temperature | DIN 53452   | MPa                 | 295 (DIN 7735: 175) |
| Tensile strength                          | DIN 53455   | MPa                 | 320 (DIN 7735: 220) |
| Compressive strength                      | DIN 53454   | MPa                 | 320 (DIN 7735: 150) |
| Impact strength                           | DIN 53453   | kJ / m <sup>2</sup> | 145 (DIN 7735: 100) |

|                                        | Test Method | Unit                 | Value                                                  |
|----------------------------------------|-------------|----------------------|--------------------------------------------------------|
| Notched impact strength                | DIN 53453   | kJ / m <sup>2</sup>  | 60 (DIN 7735: 50)                                      |
| Bond strength (splitting force)        | DIN 53463   | N                    | 4200 (DIN 7735: 3000)                                  |
| Modulus of elasticity                  | DIN 53452   | MPa                  | 28 · 10 <sup>3</sup> (DIN 7735: 18 · 10 <sup>3</sup> ) |
| <b>Electrical Properties</b>           |             |                      |                                                        |
| Surface resistivity                    | DIN 53482   | Ω                    | 10 <sup>12</sup> (DIN 7735: 5 · 10 <sup>10</sup> )     |
| Electric strength    / ⊥               | DIN 53481   | kV                   | 80 / 70 (DIN 7735: 40 / 40)                            |
| Dielectric dissipation factor (1 MHz)  | DIN 53483   |                      | 0.03 (DIN 7735: 0.05)                                  |
| Dielectric constant                    | DIN 53483   |                      | 5                                                      |
| Comparative tracking index CTI         | IEC 60112   |                      | 210 (DIN 7735: 200)                                    |
| Electrolytic corrosion (tracking)      | DIN 53489   |                      | AN 1.2 (DIN 7735: AN 1.4)                              |
| <b>Thermal Properties</b>              |             |                      |                                                        |
| Temperature limit                      | VDE 0304    | °C                   | 155                                                    |
| Thermal conductivity    / ⊥            | DIN 52612   | W / (m·K)            | 0.3 / 0.25                                             |
| Coefficient of linear expansion    / ⊥ | VDE 0304    | 10 <sup>-6</sup> / K | 10-20 / 15                                             |
| Thermal class                          | VDE 0534    |                      | F                                                      |
| <b>General Properties</b>              |             |                      |                                                        |
| Density                                | DIN 53479   | g / cm <sup>3</sup>  | 1.7-1.9 (typical 1.85)                                 |
| Water absorption (5 mm thickness)      | DIN 53495   | mg                   | 15 (DIN 7735: 30)                                      |
| Glow resistance                        | DIN 53459   |                      | 2a                                                     |
| Colour                                 |             |                      | green                                                  |

Hgw 2372.4 (EP GC 203) (acc. to DIN 7735 / EN 60893) is a glass-fabric epoxy resin laminate with an elevated temperature limit. The values stated are typical figures, researched from market-standard, publicly available data sheet information for this product type; they serve as an aid to material selection and are not a legally binding assurance of specific properties. Actual values may vary slightly depending on manufacturer and sheet thickness. Hgw 2372.4 (EP GC 203) is not declared for direct food contact.