

# Energy Solutions Impregnating Resins

Voltatex<sup>®</sup> Product Overview  
Styrene diluted/Vinyltoluene diluted



# Energy Solutions Impregnating Resins

## Voltatex® Product Overview

| Product | Thermal Class                         | UL      | Chemical Base | Flow Time<br>DIN 53211 | Viscosity<br>DIN 53019 | Shelf Life /<br>Storage Time | Emissions<br>DIN EN 60455-3-5 | Thixotropic | Pigmented | VOC - Free |
|---------|---------------------------------------|---------|---------------|------------------------|------------------------|------------------------------|-------------------------------|-------------|-----------|------------|
|         | acc.to<br>IEC<br>60085 <sup>(1)</sup> | E101752 |               | 23°C<br>[sec.]         | 25°C<br>[mPas]         | 25°C<br>[months]             | [%]                           |             |           |            |

| Styrene-diluted       |         |   |                                      |         |                          |   |               |   |   |   |
|-----------------------|---------|---|--------------------------------------|---------|--------------------------|---|---------------|---|---|---|
| <b>Voltatex® 4000</b> | 180 (H) | X | Unsat. Polyesterimide                | 75 - 95 | 340 - 400                | 8 | 10            | - | - | - |
| <b>Voltatex® 4001</b> | 200 (N) | X | Unsat. Polyesterimide                | 55 - 75 | 210 - 270                | 8 | 6.8           | - | - | - |
| <b>Voltatex® 4002</b> | 180 (H) | X | Unsat. Polyesterimide                | 55 - 75 | 210 - 270                | 8 | 6.6           | - | - | - |
| <b>Voltatex® 4005</b> | 200 (N) | X | Unsat. Polyesterimide <sup>(2)</sup> | 35 - 50 | 120 - 180                | 8 | 8,0           | - | - | - |
| <b>Voltatex® 4010</b> | 180 (H) | X | Unsat. Polyesterimide <sup>(3)</sup> | 38 - 48 | 150 - 190                | 8 | 9.7           | - | - | - |
| <b>Voltatex® 4012</b> | 200 (N) | X | Unsat. Polyesterimide <sup>(3)</sup> | 58 - 72 | 220 - 260                | 8 | 7.9           | - | - | - |
| <b>Voltatex® 4020</b> | 200 (N) | X | Unsat. Polyesterimide                | 45 - 75 | 210 - 270                | 4 | 11.7          | - | X | - |
| <b>Voltatex® 4021</b> | 200 (N) | - | Unsat. Polyesterimide                | 25 - 35 | 75 - 125                 | 4 | 12.2          | - | X | - |
| <b>Voltatex® 4030</b> | 180 (H) | X | Unsat. Polyesterimide                | 81 - 99 | 350 - 500 <sup>(7)</sup> | 4 | 5.9           | X | - | - |
| <b>Voltatex® 4040</b> | 180 (H) | - | Unsat. Polyesterimide                | -       | 1,500 - 1,900            | 4 | <sup>-6</sup> | - | X | - |
| <b>Voltatex® 4050</b> | 180 (H) | X | Unsat. Polyesterimide                | 55 - 75 | -                        | 8 | 13.7          | - |   | - |

| Vinyltoluene (VT)-diluted |         |   |                       |         |                          |   |     |   |   |   |
|---------------------------|---------|---|-----------------------|---------|--------------------------|---|-----|---|---|---|
| <b>Voltatex® 4100</b>     | 180 (H) | X | Unsat. Polyesterimide | 57 - 73 | 220 - 280                | 6 | 5.7 | - | - | - |
| <b>Voltatex® 4130</b>     | 180 (H) | X | Unsat. Polyesterimide | 65 - 85 | 235 - 295 <sup>(7)</sup> | 6 | 5.2 | X | - | - |
| <b>Voltatex® 4141</b>     | -       | - | Unsat. Polyesterimide | -       | 4,000 - 6,000            | 4 | 1.6 | - | X | - |

(1) based on temperature index MW 35, Twisted Pair

(2) curing by peroxide

(3) highly reactive

(4) contains a small portion of reactive thinner to optimize the viscosity

(5) company standard Energy Solutions - Voltatex® 001 "measurement of gel time" in acc. with DIN 46448

(6) under consideration

(7) viscosity at 23°C

| Voltatex® | Gel Time             | Reaction Time        | Dip & Bake<br>(conventional) | VI<br>Vacuum<br>Impregnation | VPI<br>Vacuum Pressure<br>Impregnation | Hot-Dip /<br>Gel Inside Resin | Trickle | Special Properties |
|-----------|----------------------|----------------------|------------------------------|------------------------------|--|-------------------------------|---------|--------------------|
|           | [min] <sup>(5)</sup> | [min] <sup>(5)</sup> |                              |                              |  |                               |         |                    |

|             |             |             |   |   |   |  |   |  |
|-------------|-------------|-------------|---|---|---|--|---|--|
| <b>4000</b> | 7.0 - 14.0  | 10.0 - 25.0 | X | X | X |  |   | Low draining and evaporation losses, high bond strength, high resin retention, good resistance against solvent vapour, high thermal resistance; low tendency to crack                |
| <b>4001</b> | 8.0 - 14.5  | 13.5 - 27.5 | X | X | X |  |   | High efficiency due to favorable curing conditions and low material consumption, good resistance against solvent vapour, high thermal resistance; low tendency to crack              |
| <b>4002</b> | 9.0 - 15.0  | 13.5 - 27.5 | X | X | X |  | X | High efficiency due to favorable curing conditions and low material consumption, good resistance against solvent vapour, high thermal resistance                                     |
| <b>4005</b> | 20.0 - 35.0 | 25.0 - 45.0 | X | X | X |  |   | High efficiency due to favorable curing conditions and low material consumption, good resistance against solvent vapour, high thermal resistance                                     |
| <b>4010</b> | 5.0 - 8.0   | 7.0 - 12.0  |   |   |   |  | X | High efficiency due to favorable curing conditions and low material consumption, good resistance against solvent vapour, high thermal resistance                                     |
| <b>4012</b> | 5.0 - 7.5   | 7.5 - 11.5  |   |   |   |  | X | High efficiency due to favorable curing conditions and low material consumption, good resistance against solvent vapour, high thermal resistance; applicable by trickle-roll-process |
| <b>4020</b> | 11.0 - 19.0 | 22.0 - 40.0 | X | X | X |  |   | Enables coverage of flash rust by use of coloured resin, protection against climate influences; high efficiency, good resistance against solvent vapour, good thermal resistance     |
| <b>4021</b> | 10.0 - 16.0 | 26.0 - 40.0 | X | X | X |  |   | Enables coverage of flash rust by use of coloured resin, protection against climate influences; high efficiency, good resistance against solvent vapour                              |
| <b>4030</b> | 10.0 - 15.0 | 15.0 - 23.0 | X | X | X |  |   | Low draining and evaporation losses, high bond strength, high resin retention, good resistance against solvent vapour, high thermal resistance; low tendency to crack                |
| <b>4040</b> | 6.0 - 12.0  | 10.0 - 22.0 |   |   |   |  | X | Gel-coat for protection of rotor windings exposed to high mechanical stress, high bond strength and protection against abrasion; good adhesion                                       |
| <b>4050</b> | 5.5 - 9.5   | 9.0 - 16.0  | X | X | X |  |   | Applicable in the Electrical/UV-process, high resin retention, good resistance against solvent vapour  |

|             |             |             |   |   |   |  |   |   |
|-------------|-------------|-------------|---|---|---|--|---|---|
| <b>4100</b> | 6.0 - 12.0  | 14.0 - 24.0 | X | X | X |  |   | High efficiency due to favorable curing conditions and low material consumption, very good retention; high thermal resistance, styrene free                           |
| <b>4130</b> | 6.0 - 10.0  | 10.0 - 17.0 | X | X | X |  |   | High efficiency due to favorable curing conditions and low material consumption, very good retention; high thermal resistance, styrene free                           |
| <b>4141</b> | 13.0 - 21.0 | 16.0 - 28.0 |   |   |   |  | X | Gel-coat for protection of rotor windings exposed to high mechanical stress, high bond strength and protection against abrasion; good adhesion, low tendency to crack |

| Voltatex® | Transformer <100 kVA | Transformer >100 kVA | Rotors | Rotors, high speed | Stators, trickle | Stators, dip & bake process | Stators / Rotors up to 3 kV, vpi process | Stators, dipping, combined curing electrically and oven | Stators, dipping, electrical/uv process | Stators, dipping, hot dip/gel process | Wind Generators, < 1000 V | High Voltage Applications < 6,6 kV UN |
|-----------|----------------------|----------------------|--------|--------------------|------------------|-----------------------------|--|---|---|---------------------------------------|---------------------------|---------------------------------------|
|-----------|----------------------|----------------------|--------|--------------------|------------------|-----------------------------|--|---|---|---------------------------------------|---------------------------|---------------------------------------|

|      |   |   |   |   |   |   |   |   |   |   |   |   |
|------|---|---|---|---|---|---|---|---|---|---|---|---|
| 4000 | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| 4001 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4002 | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| 4005 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4010 | ○ | ○ | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4012 | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4020 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4021 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4030 | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| 4040 | ○ | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4050 | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ |

|      |   |   |   |   |   |   |   |   |   |   |   |   |
|------|---|---|---|---|---|---|---|---|---|---|---|---|
| 4100 | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| 4130 | ○ | ● | ● | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| 4141 | ● | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

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## Voltatex® Product Overview

| Product | Thermal Class                       | Flow Time<br>DIN 53211 | Shelf Life /<br>Storage Time | Special Properties |
|---------|-------------------------------------|------------------------|------------------------------|--------------------|
|         | acc. to<br>IEC 60085 <sup>(1)</sup> | 23 °C<br>[sec.]        | 25 °C<br>[months]            |                    |

| Finishing Varnish          |         |          |    |   |
|----------------------------|---------|----------|----|---|
| <b>Voltatex® 2010</b>      | -       | 30 - 40  | 24 | Quick single component air drying clear finishing varnish with excellent adhesion on metals and plastics, suitable as additional protection against external influences and corrosion.  |
| <b>Voltatex® 2020 red</b>  | -       | 75 - 125 | 8  | Quick single component air drying pigmented finishing varnish with excellent adhesion on metals and plastics, suitable as additional protection against external influences and corrosion, especially against humidity.           |
| <b>Voltatex® 2020 grey</b> | -       | 55 - 75  | 12 | Quick single component air drying pigmented finishing varnish with excellent adhesion on metals and plastics, suitable as additional protection against external influences and corrosion, especially against humidity.           |
| <b>Voltatex® 2040</b>      | 180 (H) | 45 - 65  | 12 | Clear, rapid drying overcoat for protection against climate conditions and mold. Suitable as a protection varnish for electric motors and transformers and as impregnating material for small transformers with low requirements. |

| Impregnating Varnish  |         |         |    |   |
|-----------------------|---------|---------|----|---|
| <b>Voltatex® 2100</b> | 180 (H) | 65 - 95 | 12 | Clear, fast curing ready-to-use varnish, thermosetting, delivers a hard and elastic compound with resistances against solvent gases, transformer oil, climate stresses, fungal investigation and acids, suds and ammonia. |

| Waterborne Impregnating Varnish |         |         |    |   |
|---------------------------------|---------|---------|----|---|
| <b>Voltatex® 2240</b>           | 180 (H) | 10 - 30 | 12 | Water based epoxy-emulsion, milky appearance in liquid form, non-flammable and not explosive. Suitable for electric motors (except high voltage applications), transformers and hermetic motors. Resistant to refrigerants. |

| Thinner               |  |
|-----------------------|--|
| <b>Voltatex® T022</b> | Voltatex® T022 can be added to Impregnating Varnish Voltatex® 2100 to adjust the required viscosity.                         |
| <b>Voltatex® T023</b> | Voltatex® T023 can be added to Finishing Varnishes Voltatex® 2020 & Voltatex® 2010 series) to adjust the required viscosity. |

| Reactive Thinner      |  |
|-----------------------|--|
| <b>Voltatex® T031</b> | Voltatex® T031 can be added to Impregnating Resins Voltatex® 4000 series to adjust the required viscosity. |
| <b>Voltatex® T032</b> | Voltatex® T032 can be added to Impregnating Resins Voltatex® 4100 series to adjust the required viscosity. |

| Cleaning Agent        |  |
|-----------------------|--|
| <b>Voltatex® T050</b> | Voltatex® T050 is a clear, transparent solvent mixture with excellent cleaning properties. |

| Service Products      |  |
|-----------------------|--|
| <b>Voltatex® H140</b> | 1K Hardener Voltatex® H140 is mixed into Voltatex® - Impregnating Resins based on unsaturated polyester/polyester imide chemistry for adjusting the reactivity.  |
| <b>Voltatex® H151</b> | Catalyst Voltatex® H151 is mixed into Voltatex® - Impregnating Resins based on unsaturated polyester/polyester imide chemistry for curing at low temperature.  |
| <b>Voltatex® A341</b> | Voltatex® A341 is mixed into Voltatex® - Impregnating Resins based on unsaturated polyester/polyester imide chemistry to allow "cold curing" at room temperature together with an MEK-peroxide. For further information please contact our Technical Service team. |

<sup>(1)</sup> based on Temperature Index MW 35, Twisted Pair

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