

## FORTRON® 1140L4 - PPS

### Description

Fortron 1140L4 is a 40% glass-reinforced grade that is the strongest and toughest product available. It exhibits excellent heat and chemical resistance, good electrical properties and is inherently flame-retardant. The high hardness and rigidity at elevated temperatures allows for good load bearing performance. This product has good weldability due to the modest filler level. Applications made of this grade are electrical components (i.e. bobbins, lamp housings, brush holders) and various other components requiring strength and resistance to aggressive chemicals (i.e. automotive heaters, pumps, valves, fuel rails, microwave oven rings and distillation column packings).

| Physical properties         | Value | Unit              | Test Standard   |
|-----------------------------|-------|-------------------|-----------------|
| Density                     | 1650  | kg/m <sup>3</sup> | ISO 1183        |
| Molding shrinkage, parallel | 0.3   | %                 | ISO 294-4, 2577 |
| Molding shrinkage, normal   | 0.6   | %                 | ISO 294-4, 2577 |
| Water absorption, 23°C-sat  | 0.02  | %                 | ISO 62          |
| Bulk density                | 0.721 | g/cm <sup>3</sup> | ISO 60          |

| Mechanical properties                 | Value | Unit              | Test Standard |
|---------------------------------------|-------|-------------------|---------------|
| Tensile modulus                       | 14700 | MPa               | ISO 527-2/1A  |
| Tensile stress at break, 5mm/min      | 195   | MPa               | ISO 527-2/1A  |
| Tensile strain at break, 5mm/min      | 1.9   | %                 | ISO 527-2/1A  |
| Flexural modulus, 23°C                | 14500 | MPa               | ISO 178       |
| Flexural stress at break              | 285   | MPa               | ISO 178       |
| Charpy impact strength, 23°C          | 53    | kJ/m <sup>2</sup> | ISO 179/1eU   |
| Charpy impact strength, -30°C         | 53    | kJ/m <sup>2</sup> | ISO 179/1eU   |
| Charpy notched impact strength, 23°C  | 10    | kJ/m <sup>2</sup> | ISO 179/1eA   |
| Charpy notched impact strength, -30°C | 10    | kJ/m <sup>2</sup> | ISO 179/1eA   |
| Izod impact notched, 23°C             | 10    | kJ/m <sup>2</sup> | ISO 180/1A    |
| Izod impact notched, -30°C            | 10    | kJ/m <sup>2</sup> | ISO 180/1A    |
| Izod impact unnotched, 23°C           | 34    | kJ/m <sup>2</sup> | ISO 180/1U    |
| Izod impact unnotched, -30°C          | 34    | kJ/m <sup>2</sup> | ISO 180/1U    |
| Compressive modulus                   | 15000 | MPa               | ISO 604       |
| Rockwell hardness (M-Scale)           | 100   | M-Scale           | ISO 2039-2    |

| Thermal properties                         | Value | Unit   | Test Standard     |
|--|-------|--------|-------------------|
| Melting temperature, 10°C/min              | 280   | °C     | ISO 11357-1/-3    |
| Glass transition temperature, 10°C/min     | 90    | °C     | ISO 11357-1,-2,-3 |
| DTUL at 1.8 MPa                            | 270   | °C     | ISO 75-1, -2      |
| DTUL at 8.0 MPa                            | 215   | °C     | ISO 75-1, -2      |
| Coeff. of linear therm expansion, parallel | 0.26  | E-4/°C | ISO 11359-2       |
| Coeff. of linear therm expansion, normal   | 0.42  | E-4/°C | ISO 11359-2       |
| Limiting oxygen index (LOI)                | 47    | %      | ISO 4589-1/-2     |
| Flammability @1.6mm nom. thickn.           | V-0   | class  | UL 94             |
| thickness tested (1.6)                     | 1.5   | mm     | UL 94             |
| Flammability at thickness h                | V-0   | class  | UL 94             |
| thickness tested (h)                       | 0.38  | mm     | UL 94             |
| Flammability 5V at thickness h             | 5VA   | class  | UL 94             |
| thickness tested (5V)                      | 3.0   | mm     | UL 94             |

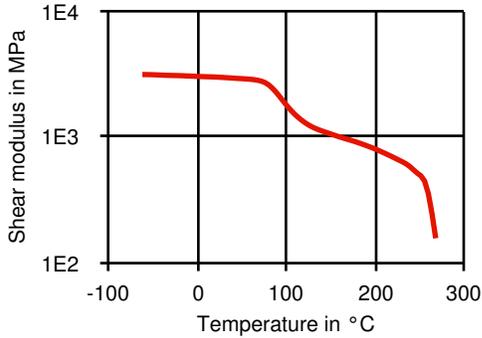
| Electrical properties       | Value  | Unit  | Test Standard |
|-----------------------------|--------|-------|---------------|
| Relative permittivity, 1MHz | 4.1    | -     | IEC 60250     |
| Dissipation factor, 1MHz    | 20     | E-4   | IEC 60250     |
| Volume resistivity          | >1E13  | Ohm*m | IEC 60093     |
| Surface resistivity         | 6.6E11 | Ohm   | IEC 60093     |
| Electric strength           | 28     | kV/mm | IEC 60243-1   |

| Rheological calculation properties | Value | Unit     | Test Standard |
|------------------------------------|-------|----------|---------------|
| Spec. heat capacity melt           | 1500  | J/(kg K) | Internal      |

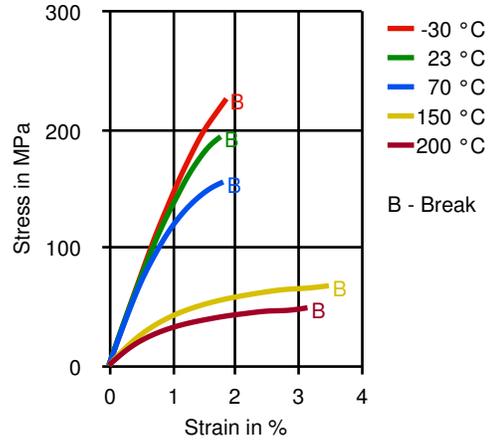
# FORTRON® 1140L4 - PPS

## Diagrams

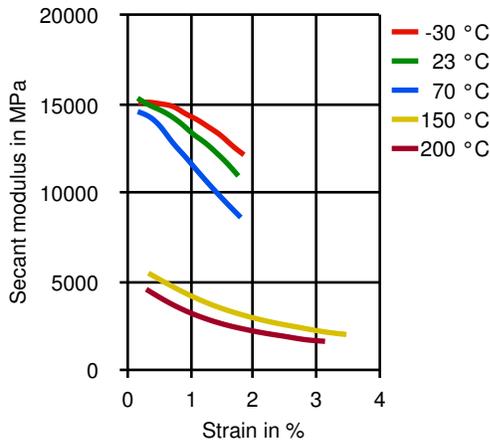
Dynamic Shear modulus-temperature



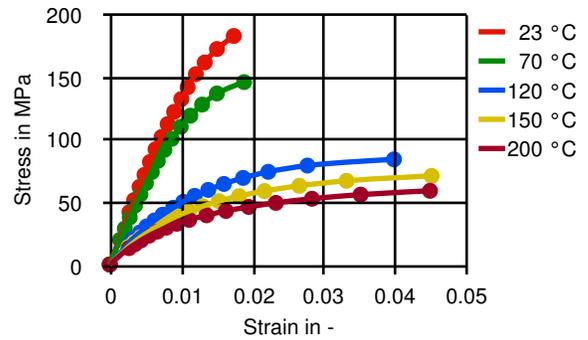
Stress-strain



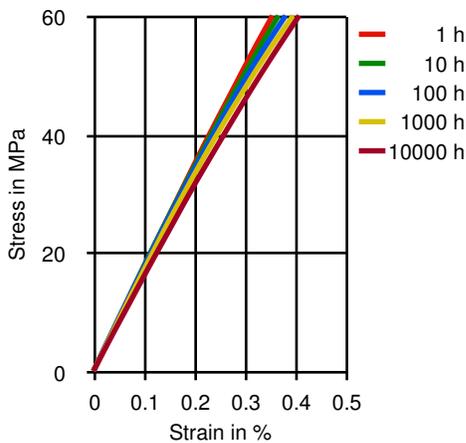
Secant modulus-strain



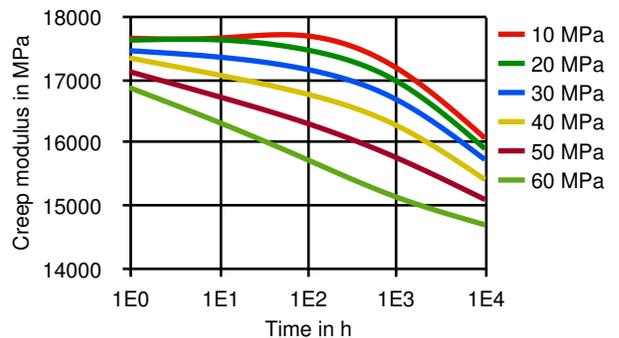
True Stress-strain



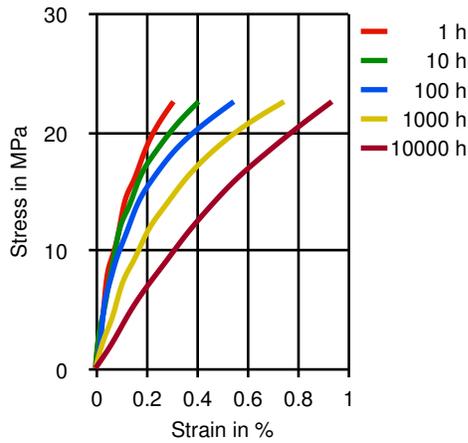
Stress-strain (isochronous) 23 °C



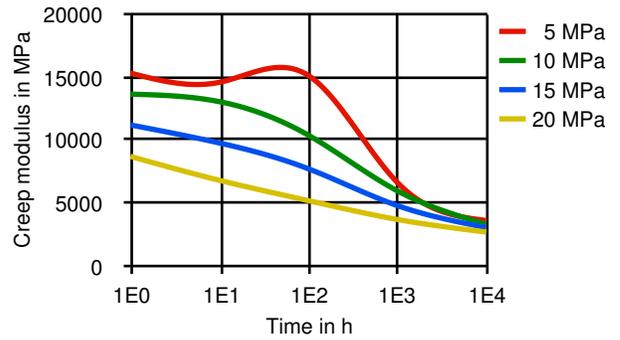
Creep modulus-time 23 °C



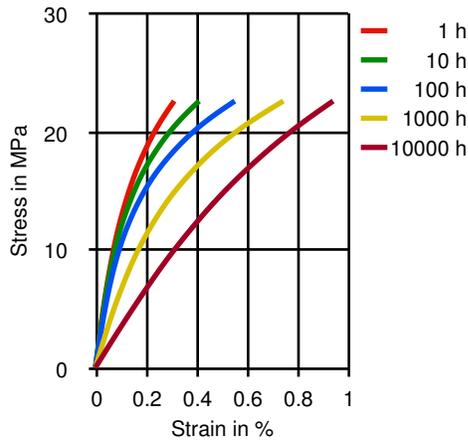
**Stress-strain (isochronous) 120°C**



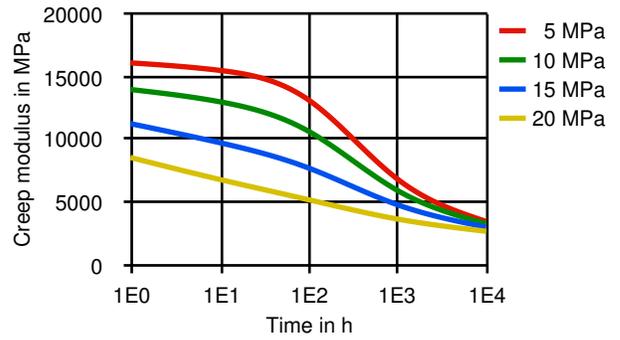
**Creep modulus-time 120°C**



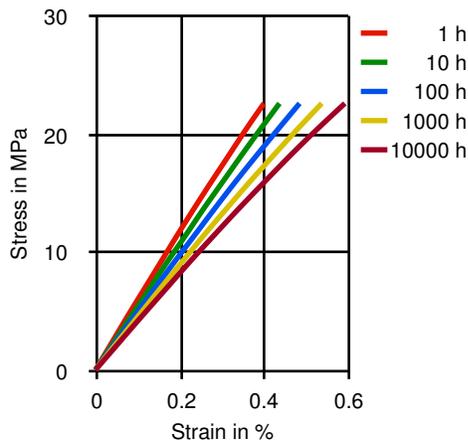
**Stress-strain (isochronous) 150°C**



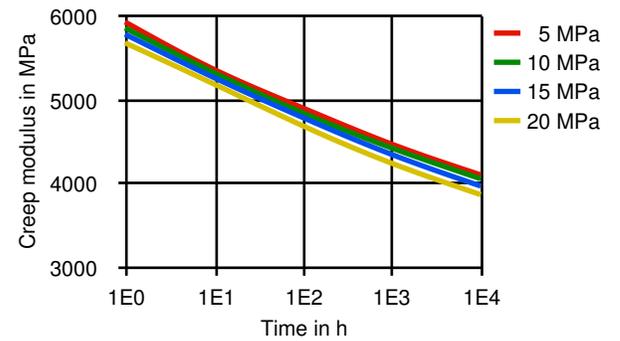
**Creep modulus-time 150°C**



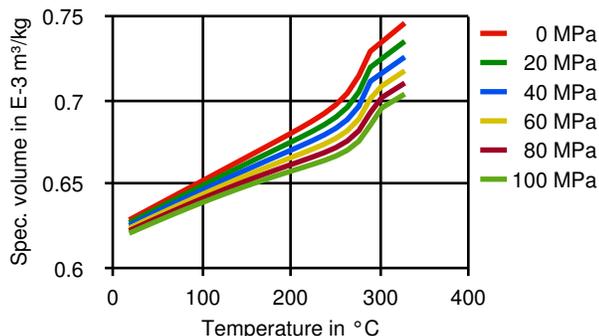
**Stress-strain (isochronous) 200°C**



**Creep modulus-time 200°C**



**Moldflow Specific volume-temperature (pvT)**



**Typical injection moulding processing conditions**

|   | Value        | Unit        | Test Standard        |
|---|--------------|-------------|----------------------|
| <b>Pre Drying</b>                               |              |             |                      |
| Necessary low maximum residual moisture content | 0.02         | %           | -                    |
| Drying time                                     | 3 - 4        | h           | -                    |
| Drying temperature                              | 130 - 140    | °C          | -                    |
| <b>Temperature</b>                              | <b>Value</b> | <b>Unit</b> | <b>Test Standard</b> |
| Hopper temperature                              | 20 - 30      | °C          | -                    |
| Feeding zone temperature                        | 60 - 80      | °C          | -                    |
| Zone1 temperature                               | 290 - 300    | °C          | -                    |
| Zone2 temperature                               | 310 - 320    | °C          | -                    |
| Zone3 temperature                               | 330 - 340    | °C          | -                    |
| Zone4 temperature                               | 330 - 340    | °C          | -                    |
| Nozzle temperature                              | 310 - 330    | °C          | -                    |
| Melt temperature                                | 330          | °C          | -                    |
| Mold temperature                                | 140 - 160    | °C          | -                    |
| Hot runner temperature                          | 330 - 340    | °C          | -                    |
| <b>Pressure</b>                                 | <b>Value</b> | <b>Unit</b> | <b>Test Standard</b> |
| Back pressure max.                              | 30           | bar         | -                    |
| <b>Speed</b>                                    | <b>Value</b> | <b>Unit</b> | <b>Test Standard</b> |
| Injection speed                                 | fast         | -           | -                    |
| <b>Screw Speed</b>                              | <b>Value</b> | <b>Unit</b> | <b>Test Standard</b> |
| Screw speed diameter, 25mm                      | 120          | RPM         | -                    |
| Screw speed diameter, 40mm                      | 75           | RPM         | -                    |
| Screw speed diameter, 55mm                      | 50           | RPM         | -                    |
| <b>Other</b>                                    | <b>Value</b> | <b>Unit</b> | <b>Test Standard</b> |
| Specimen thickness (shrinkage)                  | 3.18         | mm          | Internal             |

**Other text information**

**Pre-drying**

FORTRON should in principle be predried. Because of the necessary low maximum residual moisture content the use of dry air dryers is recommended. The dew point should be  $\leq -30^{\circ}\text{C}$ . The time between drying and processing should be as short as possible.

**Longer pre-drying times/storage**

For subsequent storage the material should be stored dry in the dryer until processed ( $\leq 60$  h).

**Injection molding**

On injection molding machines with 15-25 D long three-section screws, as are usual in the trade, the FORTRON is processable. A shut-off nozzle is preferred to a free-flow nozzle.

Melt temperature 320-340 degC  
 Mold wall temperature at least 140 degC

A medium injection rate is normally preferred. All mold cavities must be effectively vented.

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## FORTRON® 1140L4 - PPS

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### Characteristics

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#### Special Characteristics

Flame retardant

#### Delivery Form

Pellets

#### Product Categories

Glass reinforced

#### Additives

Release agent

### Processing

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Injection molding

### Contact Information

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### General Disclaimer

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NOTICE TO USERS: Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colorants or other additives may cause significant variations in data values. Properties of molded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any equipment, processing technique or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards. We strongly recommend that users seek and adhere to the manufacturer's current instructions for handling each material they use, and entrust the handling of such material to adequately trained personnel only. Please call the telephone numbers listed for additional technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before attempting to process our products. The products mentioned herein are not intended for use in medical or dental implants.

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