

# CELCON® M90 ECO-B

## CELCON®

Celcon® acetal copolymer grade M90 is a medium viscosity polymer providing optimum performance in injection molding and extrusion of thin walled tubing and thin gauge film. This grade provides overall excellent performance in many applications. Chemical abbreviation according to ISO 1043-1: POM Please also see Hostaform® C 9021.

ECO-B: Celcon® ECO-B POM-Copolymers have the same properties and performance as standard grades but produced with sustainability in mind. Using a mass-balance approach, biogenic feedstocks are used to offset the use of fossil-based raw materials and decrease greenhouse gas emissions. The process is audited and certified according to the ISCC Plus mass balance approach.

### Product information

|                      |       |           |
|----------------------|-------|-----------|
| Resin Identification | POM   | ISO 1043  |
| Part Marking Code    | >POM< | ISO 11469 |

### Rheological properties

|                                  |                          |                 |
|----------------------------------|--------------------------|-----------------|
| Melt volume-flow rate            | 8 cm <sup>3</sup> /10min | ISO 1133        |
| Temperature                      | 190 °C                   |                 |
| Load                             | 2.16 kg                  |                 |
| Melt mass-flow rate              | 9 g/10min                | ISO 1133        |
| Melt mass-flow rate, Temperature | 190 °C                   |                 |
| Melt mass-flow rate, Load        | 2.16 kg                  |                 |
| Moulding shrinkage, parallel     | 2.0 %                    | ISO 294-4, 2577 |
| Moulding shrinkage, normal       | 1.9 %                    | ISO 294-4, 2577 |

### Typical mechanical properties

|                                       |                       |              |
|---------------------------------------|-----------------------|--------------|
| Tensile modulus                       | 2760 MPa              | ISO 527-1/-2 |
| Tensile stress at yield, 50mm/min     | 65 MPa                | ISO 527-1/-2 |
| Tensile strain at yield, 50mm/min     | 10 %                  | ISO 527-1/-2 |
| Flexural modulus                      | 2550 MPa              | ISO 178      |
| Flexural stress at 3.5%               | 73 MPa                | ISO 178      |
| Compressive stress at 1% strain       | 31 MPa                | ISO 604      |
| Tensile creep modulus, 1h             | 2450 MPa              | ISO 899-1    |
| Tensile creep modulus, 1000h          | 1350 MPa              | ISO 899-1    |
| Charpy impact strength, 23°C          | 188 kJ/m <sup>2</sup> | ISO 179/1eU  |
| Charpy impact strength, -30°C         | 181 kJ/m <sup>2</sup> | ISO 179/1eU  |
| Charpy notched impact strength, 23°C  | 6 kJ/m <sup>2</sup>   | ISO 179/1eA  |
| Charpy notched impact strength, -30°C | 6 kJ/m <sup>2</sup>   | ISO 179/1eA  |
| Izod notched impact strength, 23°C    | 5.7 kJ/m <sup>2</sup> | ISO 180/1A   |
| Izod notched impact strength, -30°C   | 5.5 kJ/m <sup>2</sup> | ISO 180/1A   |
| Izod impact strength, 23°C            | 180 kJ/m <sup>2</sup> | ISO 180/1U   |
| Izod impact strength, -30°C           | 160 kJ/m <sup>2</sup> | ISO 180/1U   |
| Poisson's ratio                       | 0.4                   |              |

### Thermal properties

|  |           |                |
|--|-----------|----------------|
| Melting temperature, 10°C/min                            | 166 °C    | ISO 11357-1/-3 |
| Temperature of deflection under load, 1.8 MPa            | 101 °C    | ISO 75-1/-2    |
| Temperature of deflection under load, 0.45 MPa           | 158 °C    | ISO 75-1/-2    |
| Ball pressure test                                       | 150 °C    | IEC 60695-10-2 |
| Coefficient of linear thermal expansion (CLTE), parallel | 120 E-6/K | ISO 11359-1/-2 |

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|  |                           |                |
|--|---------------------------|----------------|
| Coefficient of linear thermal expansion (CLTE), normal | 120 E-6/K                 | ISO 11359-1/-2 |
| Thermal conductivity of melt                           | 0.155 W/(m K)             | ISO 22007-2    |
| Effective thermal diffusivity, flow                    | 4.85E-8 m <sup>2</sup> /s | ISO 22007-4    |
| Specific heat capacity of melt                         | 2210 J/(kg K)             | ISO 22007-4    |

## Flammability

|                                      |          |                 |
|--------------------------------------|----------|-----------------|
| Burning Behav. at 1.5mm nom. thickn. | HB class | IEC 60695-11-10 |
| Thickness tested                     | 1.5 mm   | IEC 60695-11-10 |
| UL recognition                       | yes      | UL 94           |
| Oxygen index                         | 14.9 %   | ISO 4589-1/-2   |

## Electrical properties

|                     |            |               |
|---------------------|------------|---------------|
| Volume resistivity  | 8E12 Ohm.m | IEC 62631-3-1 |
| Surface resistivity | 3E16 Ohm   | IEC 62631-3-2 |
| Arc Resistance      | 240 s      | UL 746B       |

## Physical/Other properties

|                          |                        |                |
|--------------------------|------------------------|----------------|
| Humidity absorption, 2mm | 0.2 %                  | Sim. to ISO 62 |
| Water absorption, 2mm    | 0.75 %                 | Sim. to ISO 62 |
| Density                  | 1410 kg/m <sup>3</sup> | ISO 1183       |

## Injection

|                                 |              |
|---------------------------------|--------------|
| Drying Recommended              | no           |
| Drying Temperature              | 100 °C       |
| Drying Time, Dehumidified Dryer | 3 - 4 h      |
| Processing Moisture Content     | ≤0.2 %       |
| Melt Temperature Optimum        | 185 °C       |
| Min. melt temperature           | 180 °C       |
| Max. melt temperature           | 190 °C       |
| Screw tangential speed          | ≤0.3 m/s     |
| Mold Temperature Optimum        | 100 °C       |
| Min. mould temperature          | 80 °C        |
| Max. mould temperature          | 120 °C       |
| Hold pressure range             | 60 - 120 MPa |
| Back pressure                   | 4 MPa        |
| Ejection temperature            | 130 °C       |

## Characteristics

|                |   |
|----------------|---|
| Processing     | Injection Moulding, Film Extrusion, Extrusion, Sheet Extrusion, Other Extrusion, Blow Moulding, Calendering, Compression moulding |
| Delivery form  | Pellets   |
| Sustainability | Bio-Content   |

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### Additional information

Injection molding

#### Preprocessing

Drying is generally not required because Celcon® and Hostaform® acetal copolymers are not hygroscopic nor are they degraded by moisture during processing. Excessive moisture can lead to splay (silver streaking) in molded parts. For better uniformity in molding especially when using regrind or material that has been stored in containers open to the atmosphere, recommended drying conditions are 80 C (180 F) for 3 hours. Desiccant hopper dryers are not required. Maximum water content = 0.35%

#### Processing

Standard reciprocating screw injection molding machines with a high compression screw (minimum 3:1 and preferably 4:1) and low back pressure (0.35 Mpa/50 PSI) are favored. Using a low compression screw (I.E. general purpose 2:1 compression ratio) can result in unmelted particles and poor melt homogeneity. Using a high back pressure to make up for a low compression ratio may lead to excessive shear heating and deterioration of the material.

Melt Temperature: Preferred range 182-199 C (360-390 F). Melt temperature should never exceed 230 C (450 F).

Mold Surface Temperature: Preferred range 82-93 C (180-200 F) especially with wall thickness less than 1.5 mm (0.060 in.). May require mold temperature as high as 120 C (250 F) to reproduce mold surface or to assure minimal molded in stress. Wall thickness greater than 3mm (1/8 in.) may use a cooler (65 C/150 F) mold surface temperature and wall thickness over 6mm (1/4 in.) may use a cold mold surface down to 25 C (80 F). In general, mold surface temperatures lower than 82 C (180 F) may hinder weld line formation and produce a hazy surface or a surface with flow lines, pits and other included defects that can hinder part performance.

#### Postprocessing

Postprocessing conditioning and moisturizing are not required. It may be necessary to fixture large or complicated parts with varying wall thickness to prevent warpage while cooling to ambient temperature.

Film extrusion

#### Preprocessing

Drying is generally not required because Celcon materials are not hygroscopic nor are they degraded by moisture during processing. Excessive moisture can cause surface defects on the extruded film. For better uniformity especially when using regrind or material that has been stored in containers open to the atmosphere, recommended drying conditions are 3 Hrs. at 80 C (180 F). Desiccant hopper dryers are not required. Max. moisture content = 0.35%.

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### Processing

Standard extruders with a length to diameter ratio of at least 20:1 are recommended. The screw should be a high compression ratio of at least 3:1 and preferably 4:1 to assure good melting and melt homogeneity. The design should be approximately 35% each for feed and metering sections with the remaining 30% as the transition zone.

Melt temperature: 160-220 C (320-430 F)

### Postprocessing

Postprocessing conditioning or moisturizing is not required.

#### Other extrusion

### Preprocessing

Drying is generally not required because Celcon materials are not hydroscopic nor are they degraded by moisture during processing. Excessive moisture can cause surface defects. For better uniformity especially when using regrind or material that has been stored in containers open to the atmosphere, recommended drying is 3 hours at 80 C (180 F). Desiccant hopper dryers are not required. Max. moisture content = 0.35%

### Processing

Standard extruders with a length to diameter ratio of at least 20:1 are recommended. The screw should be a high compression ratio of at least 3:1 and preferably 4:1 to assure good melting and uniform melt homogeneity. The design should be approximately 35% each for the feed and metering sections with the remaining 30% as transition zone.

Melt temperature 180-220 C (355-430F)

### Postprocessing

Postprocessing conditioning or moisturizing are not required. For thick walled sections (>3mm or 1/8 in.), annealing is recommended to reduce internal stresses.

Annealing temperature: 130-140 C (265-285 F)

Annealing time: 10 min/mm thickness

#### Profile extrusion

### Preprocessing

Drying is generally not required because Celcon materials are not hydroscopic nor are they degraded by moisture during processing. Excessive moisture can cause surface defects on the extrusion. For better uniformity especially when using regrind or material that has been stored in containers open to the

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atmosphere, recommended drying conditions are 3 Hrs. at 80 C (180 F).  
Desiccant hopper dryers are not required. Max. moisture content = 0.035%.

### Processing

Standard extruders with a length to diameter ratio of at least 20:1 are recommended. The screw should be a high compression ratio of at least 3:1 and preferably 4:1 to assure good melting and melt homogeneity. The design should be approximately 35% each for feed and metering sections with the remaining 30% as the transition zone.

Melt temperature: 180-220 C (360-430 F).

### Postprocessing

Postprocessing or moisturizing is not required. For thick walled extrusions (>3 mm or 1/8 in.), annealing is recommended to reduce internal stresses.

Annealing temperature: 130-140 C (265-285 F)  
Annealing time: 10 min/mm thickness

#### Sheet extrusion

### Preprocessing

Drying is generally not required because Celcon materials are not hygroscopic nor are they degraded by moisture during processing. Excessive moisture can lead to surface defects. For better uniformity in sheet extrusion especially when using regrind or material that has been stored in containers open to the atmosphere, recommended drying is 3 hours at 80 C (180 F). Desiccant hopper dryers are not required. Max. water content = 0.35%.

### Processing

Standard extruders with a length to diameter ratio of at least 20:1 are recommended. The screw should be a high compression ratio (at least 3:1 and preferably 4:1) to assure good melting and uniform melt homogeneity. The screw design should be approximately 35% each for the feed and metering sections with the remaining 30% as the transition zone.

Melt temperature 180-190 C (355-375 F).

### Postprocessing

Postprocessing conditioning or moisturizing is not required. For thick walled sections (>3mm or 1/8 in.), annealing is recommended to reduce internal stresses.

Annealing temperature: 130-140 C (265-285 F)

Annealing time: 10 min/mm wall thickness

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Blow molding

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### Preprocessing

Consult product information services.

### Processing

Consult product information services.

### Postprocessing

Consult product information services.

#### Calendering

### Preprocessing

Consult product information services.

### Processing

Consult product information services.

### Postprocessing

Consult product information services.

#### Compression molding

### Preprocessing

Consult product information services.

### Processing

Consult product information services.

### Postprocessing

Consult product information services.

#### Processing Notes

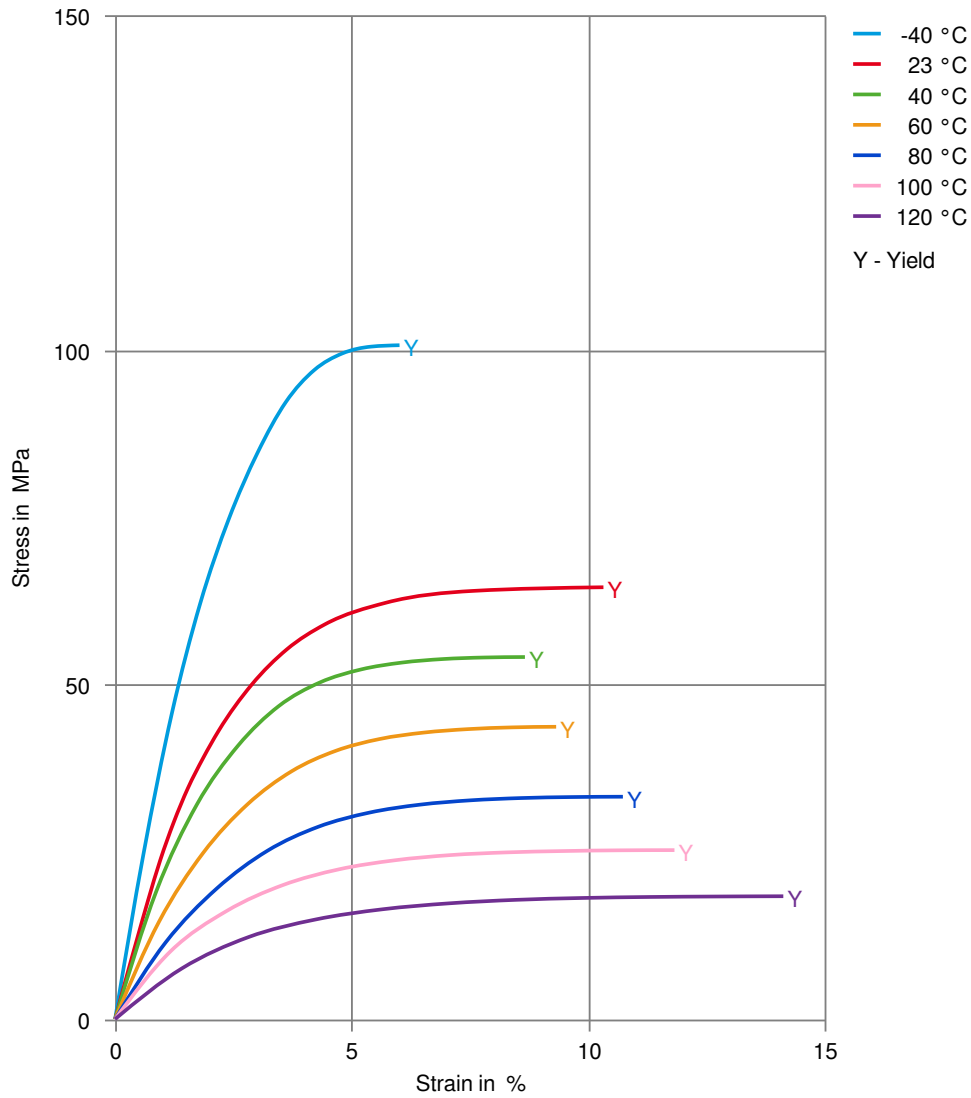
### Pre-Drying

Drying is not normally required. If material has come in contact with moisture through improper storage or handling or through regrind use, drying may be necessary to prevent splay and odor problems.

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## Stress-strain

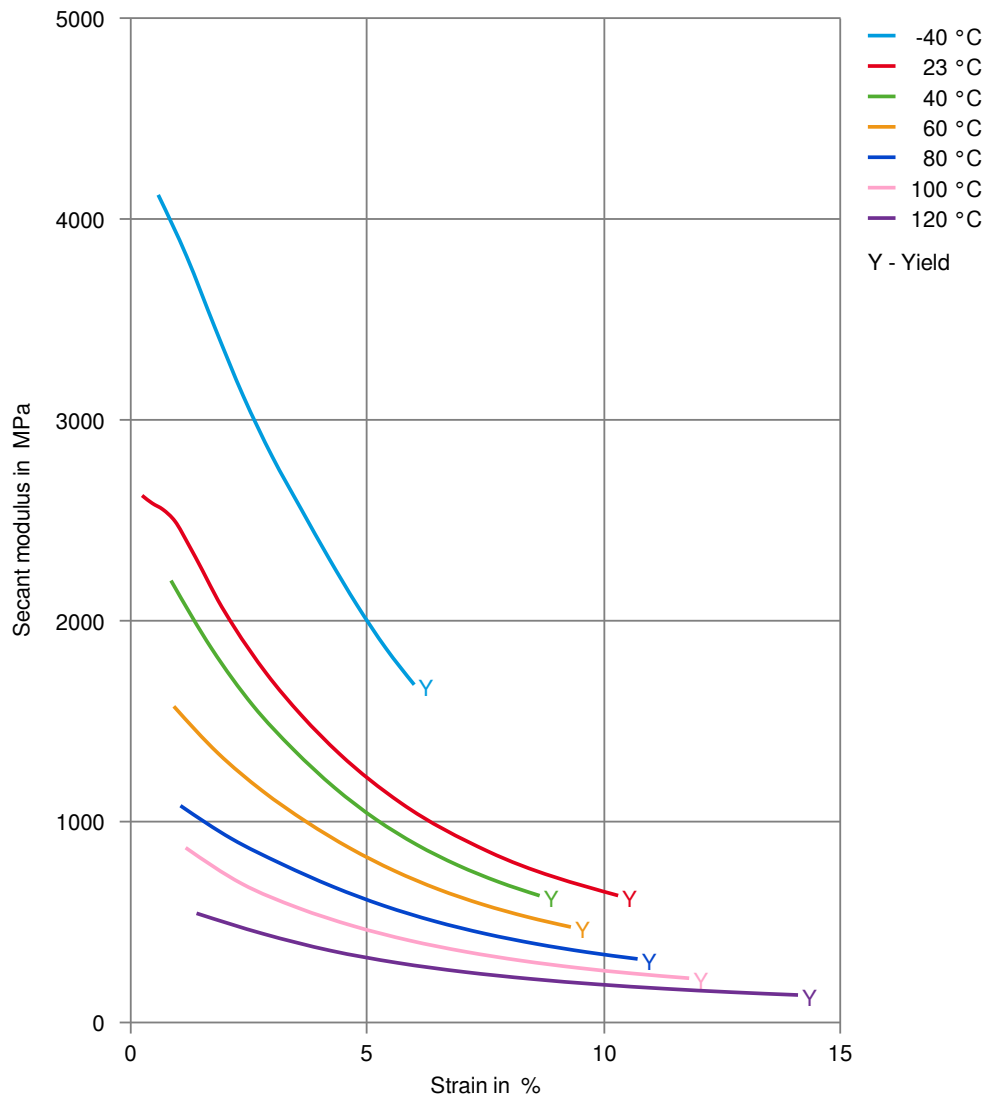




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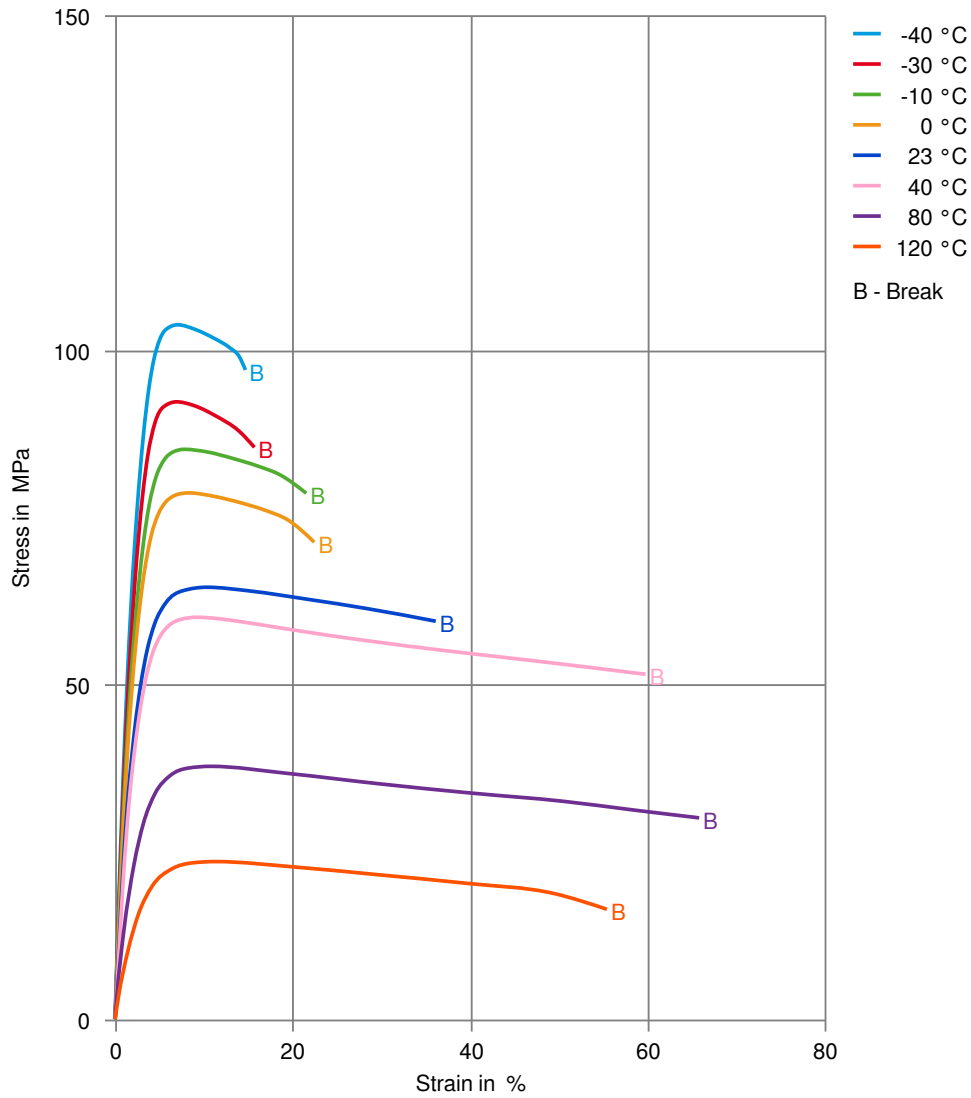
## Secant modulus-strain



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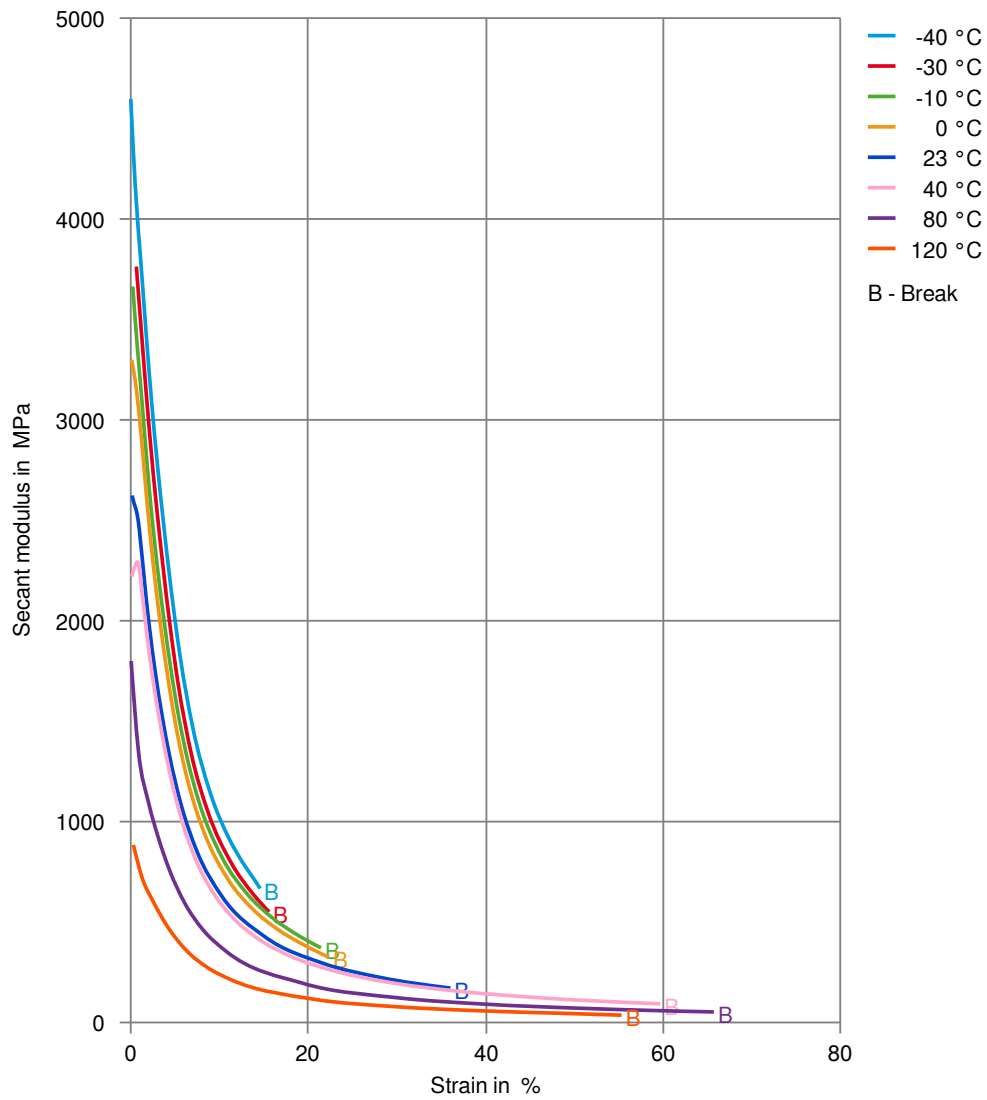
Stress-strain, 50mm/min



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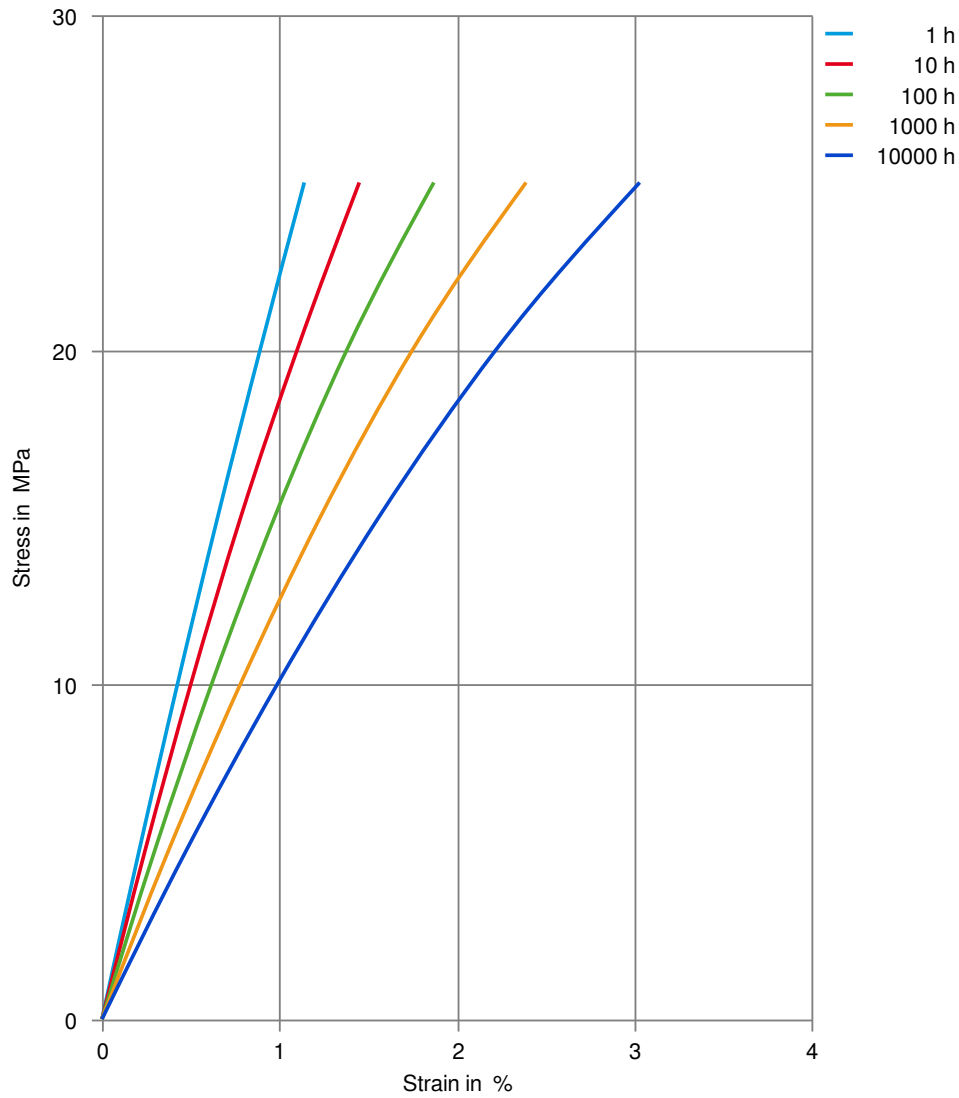
Secant modulus-strain, 50mm/min



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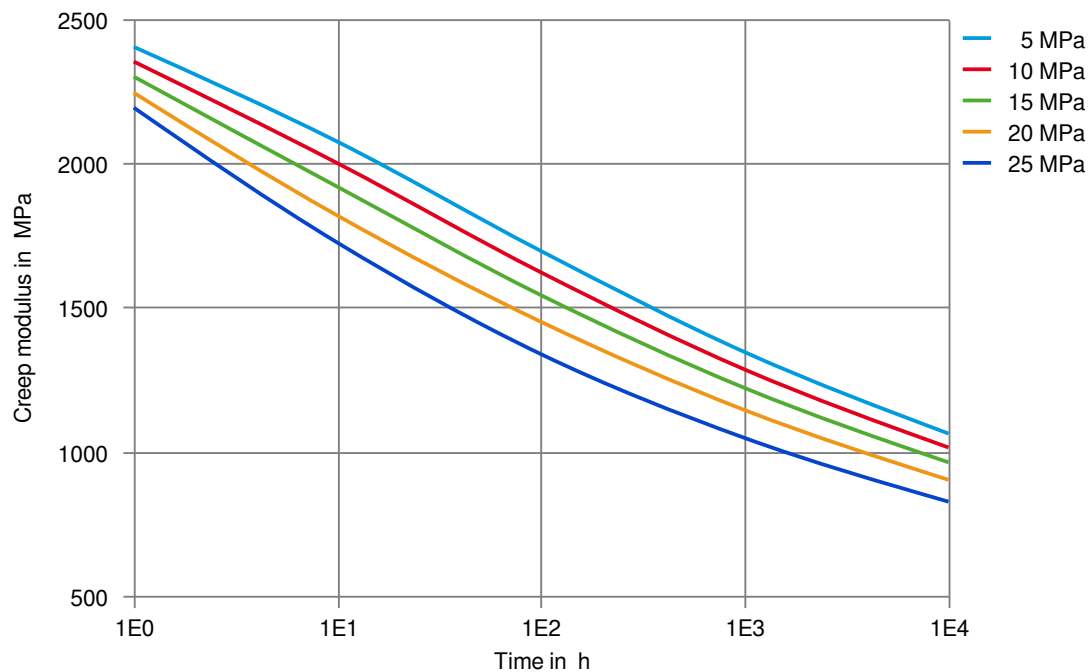
Stress-strain (isochronous) 23°C



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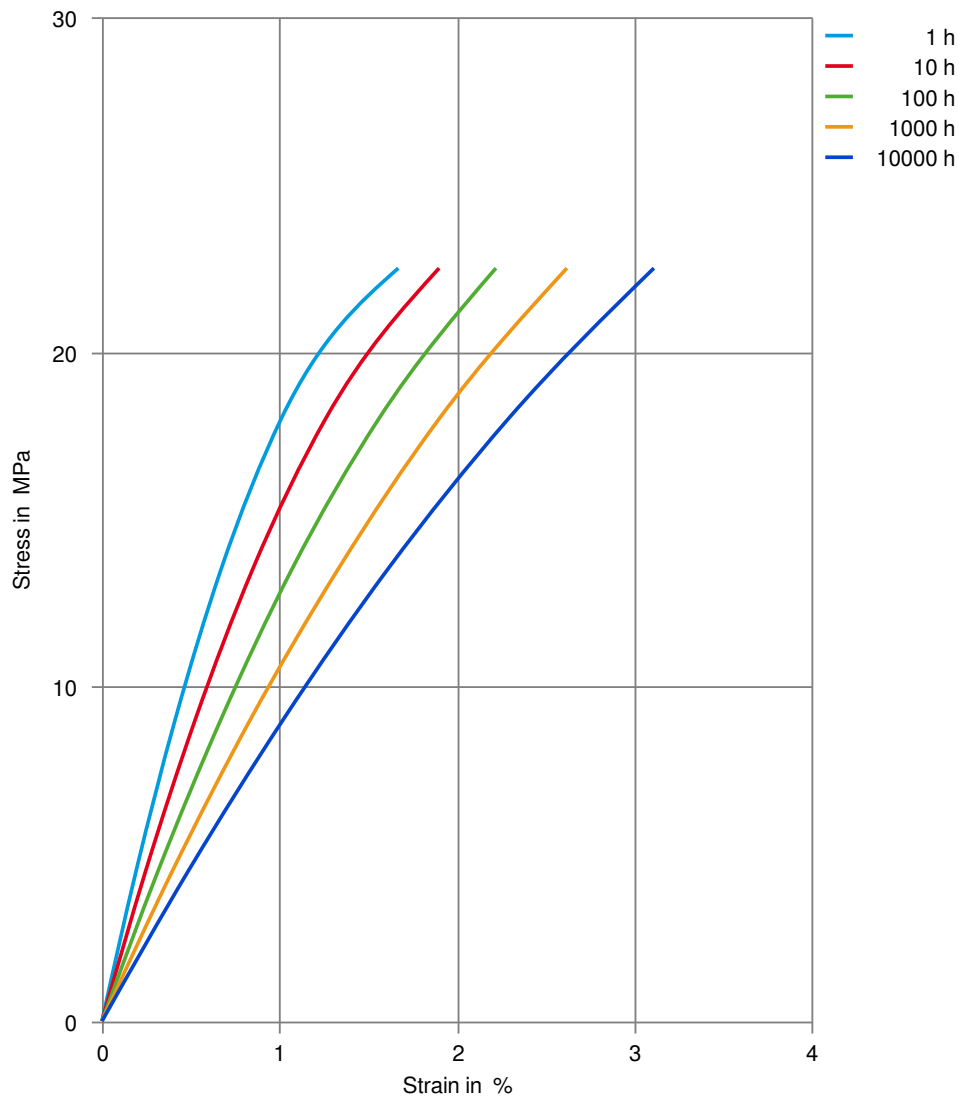
Creep modulus-time 23°C



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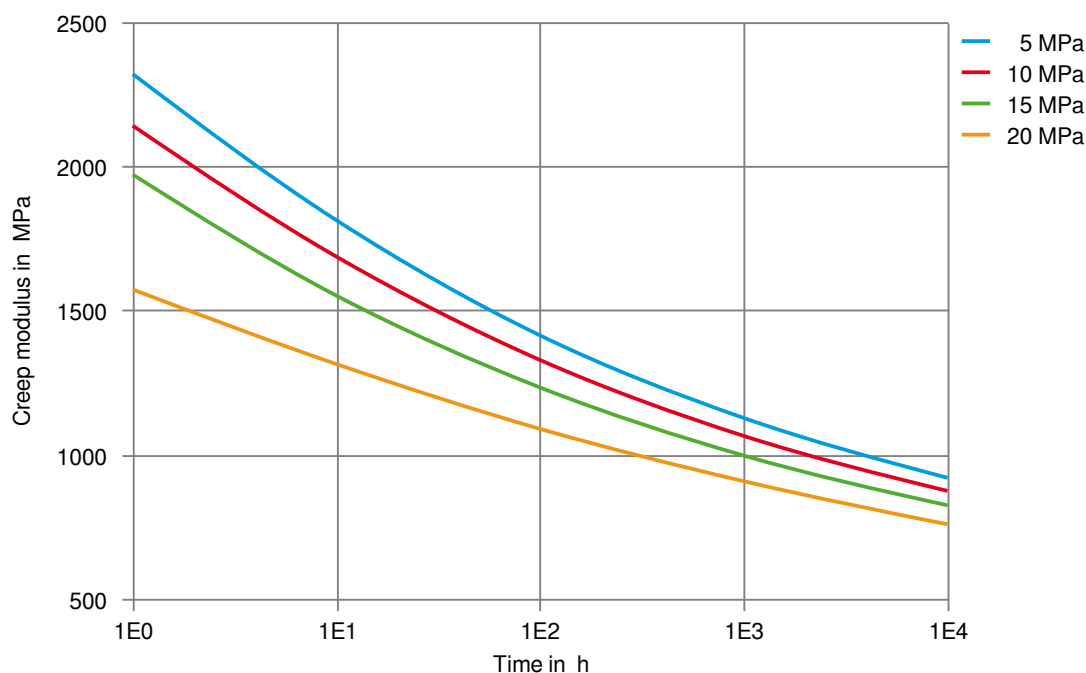
Stress-strain (isochronous) 40°C



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Creep modulus-time 40°C



Printed: 2025-05-30

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Revised: 2025-05-16 Source: Celanese Materials Database

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