



# Creep testing on plastics and composites



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### Agenda



**Standards / Requirements** 

Working principles plastics / composites

**Characteristics of creep testing systems** 

Zwick Roell

#### **Common test types - Overview**





#### **Tensile test**





#### **Creep test on plastics**



#### **Results:**

- Initial plastic strain
- Creep strain
- Time to specific creep strain
- Creep strength (time to fracture acc. to stress level)
- Creep limits (time to strain limit acc. to stress level)
- Creep modulus (stress to strain versus time)





The Stepped Isothermal Method (SIM) offers savings of time and costs by temperature steps on 1 specimen.





With temperature steps the creep strain is increasing.





According to SIM the steps are handled as separate virtual creep tests.



Source: SKZ (http://www.skz.de)



With SIM the separate creep strain curves are combined to a master curve.



Source: SKZ (http://www.skz.de)

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### Working principles – plastics and composites Z

Zwick Roell

Electromechanical Multistation Creep testers offer most flexible range of applications.



# Working principles – plastics and composites

Zwick Roell

The electromechanical Kappa Multistation can be used for flexible loads and flexible applications.

#### Characteristics

- Load range: 20N 10.000N
- Application range: tensile, flexure, compression load (stress) control, strain control
- 5 to 6 test axes per load frame
- Central spindle with each test axis and individual closed-loop-control
- One temperature chamber for all test axes
- Alternatively two temperature chambers in one load frame (each for maximum 3 test axes)
- Non-contacting strain measurement (recommended by testing standards)



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#### Strain measurement

Non-contacting videoXtens for strain measurement with accuracy class 1 without any influence on the specimen.

#### Non-contacting video-extensometer

- 1 videoXtens system
- 1 camera for each test axes
- Strain measurement accuracy class 1 (class 0.5 on request)
- Quick set up for testing
- No influence (notching) on specimen
- Stable temperature (view through glass window)
- Flexible gauge length and measurement range
- Range of application: Tensile, Flexure, compression



**Front view** 



**Rear view** 



## **Test types**



Non-contacting videoXtens for strain and deformation measurement on different applications.







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### **Kappa Multistation**



The basic system features 5 or 6 testing axis incl. temperature chamber.



#### Temperature range: (LN2: - 30°C) ... 35°C ... + 250°C



### **Types of tests**



#### Different applications can be operated in 1 testing system.



### Temperature chamber "Fridge-type"



Kappa Multistation with fridge-type temperature chamber is used for long term test at sub-zero temperatures.



Temperature range: - 10°C ... + 100°C

#### **Temperature + Climatic Chamber**



Creep tests on plastics in controlled humidity environment from +20°C to 90°C – without humidity control -30°C up to +180°C.



#### Fiber Reinforced Polymer Matrix Composite Bars



Testing plastics and composites according to ISO 899-1 and ASTM D7337 up to 50 kN per load line at elevated temperatures.



Load range: 100N ... 50.000N



Ambient temperature creep tensile test at 20 MPa and a test duration of 100 hours.

