

Plastics Technology, Lightweight Design Topics



- Lightweight structural and drive component
- Structural design and joining technology for functionalized and high-performance systems
- Functionalized automotive components, material systems and surfaces
- Flexible and efficient process chains for series production
- Environmental safety and processing of renewable raw material



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Plastics Technology, Lightweight Design

2. Measurement Systems



Plastics Technology Center

Single-screw extruder ES 45

- Plastification of plastic granules & powders
- Processing of plastic, production of films

Specification:

- Screw diameter: 45 mm
- Screw length: 25D bis 50D
- Screw speed max. 160 min⁻¹
- Drive power: 17,2 kW
- Extrusion level: 1000 mm
- Throughput PE: 150 kg/h
- Throughput PP: 150 kg/h
- Amount of sensors: 8
- Smooth und grooved feed zone



Source: WEBER

Cast film line TYP LCR 350 HD

- Production of organic sheets, films and boards

Specification:

- Rolls: 145mm Ø
- Roll width: 400 mm
- Production of boards with 0,3 to 2mm thickness and 350mm widthness





Twinscrewextruder ZSK 40

- Compounding thermoplastic materials
- To incorporating organic and inorganic fillers and reinforcing materials

Specifications:

- Screw diameter 40 mm
- Screw length :38D
- Screw speed max. 400 1/min



Twinscrewextruder ZSK 25

- Compounding thermoplastic materials
- To incorporating organic and inorganic fillers and reinforcing materials

Specifications:

- Screw diameter: 25 mm
- Screw length: 36D
- Screw speed max. : 600 1/min



Blown film line „Blowmaster“

- Own brand to manufacture of coextruded blown film

Specifications:

- Screw diameter: 25 mm
- Screw length: 22D
- Variable refrigeration process





Two-component injection molding

KraussMaffei Typ KM 160/750/180 CX V

- Extrusion coating of aluminum and organic sheets with suitable plastics
- Multiple component injection molding for manufacturing plastic components that conduct electricity

Specifications:

- Clamping force: 1600kN
- Fully hydraulic two-platen clamping system
- Injection unit 1: Size: 750; horizontal; Screw diameter: 45mm; Nozzle radius: 10mm; Nozzle bore: 4mm
- Injection unit 2: Size 180; vertical; Screw diameter: 30mm; Nozzle radius: 10mm; Nozzle bore: 4mm



Injection molding

KraussMaffei Typ KM 80 CX 380

- Single component injection molding

Specifications:

- Clamping force 800kN
- Fully hydraulic two-platen clamping system
- Injection unit : Size: 380; horizontal; Screw diameter: 35mm;
- Working volume: 154 cm³
- Injection pressure max.: 2429 bar





Fibre composite technology with the hydraulic 4-column press

ATM Typ RWP700

- RTM process and fibre composites
- **Specifications:**
 - Clamping force: 100 t
 - Opening stroke: 500 mm
 - Clamping area: 750x750 mm
 - Settable time and temperatures
 - Heating area: max. 250° C



Resin preparation systems and purifiers

Wolfangel 100/120/25/17

- Piston injection system
- Epoxy resin and unsaturated polyester resin

Specifications:

- Pressure: to 10 bar
- Vacuum-assisted
- Variable mixing ratio



Eldomix 103

- Heatable gear pump
- Epoxy resin, unsaturated polyester resin and polyurethane

Specifications:

- Mixing ratio: 100:100 to 100:20
- Volume flow: 0,1 – 1,0 Liter/min.
- Temperatures up to 80 ° C
- Vacuum-assisted

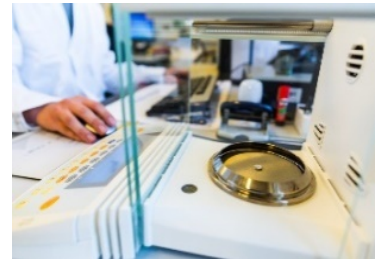




Thermal analysis

DSC Analysis (differential scanning calorimetry)

- Temperature range -170°C – 600°C DIN EN ISO 11357-1
- Glass transition temperature DIN EN ISO 11357-2,
- Melting temperature DIN EN ISO/DIS 11357-3,
- Melting enthalpy, specific warmth capacity DIN EN ISO 11357-4,
- crystallization behavior



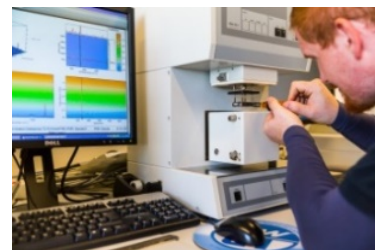
TGA (thermal gravimetric analysis)

- Temperature range 23°C – 1000°C DIN EN ISO 11358
- FTIR (infrared spectroscopy) with ATR Analysis
- Decomposition temperature, Analysis of gas phases and solid materials DIN 51006
- DIN EN ISO 9924-1; DIN EN ISO 9924-2; DIN EN ISO 21870



DMA (dynamic mechanical spectroscopy)

- Temperature range -170°C – 600°C
- Frequency range $0,01\text{Hz}$ – 100Hz
- Tensile test, three-point bend test and shearing test
- Dynamic viscosity, Glass transition temperature and temperature resistance
- DIN 53440, DIN 53513, DIN EN ISO 6721-1



TMA (Thermomechanical analysis)

- Temperature range -170°C – 600°C
- Temperature-dependent dimension variation,
- Glass transition temperature DIN 53752; ISO 11359-2
- DIN EN 14617-11





Thermal analysis

Light-Flash-Apparatur

- Thermal conductivity measurements
- ASTM E 1461
- Temperature range -100°C – 500 °C

HDT Vicat

- softening temperature measuring system
- DIN EN ISO 306
- Heat deflection temperature DIN EN ISO 75-1,-2,-3

High pressure Capillary viscometry

- Temperature range 23°C – 400°C
- Shear rate range 1/sek - 10000/sek
- Rheological behavior of polymer melts
- Viscosity testing
- DIN 54811

Rotation and oscillation type rheometer

- Temperature range 23°C – 300°C
- Shear rate range 0,0001/sek - 1000/sek
- Flow curves, hardening of the resin
DIN 53018, ISO 3210, DIN 53019, ISO 3219, DIN 54453

Melt Index Test

- MFI, MFR DIN EN ISO 1133



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2. Measurement Systems



Material analysis

Gel-Permeations-Chromatography (GPC)

- Molecular weight distribution, Chain lengths analysis
- Molecule chains degradation, ageing experiments

Oxygen transmission rate measurement

- barrier properties of plastics versus oxygen, Oxygen permeability measurements
- DIN 53380, ASTM F2622

Water vapour transmission rate measurement

- barrier properties of plastics versus water vapour
- water vapor permeability measurements
- ASTM F-1249, TAPPI T557, JIS K-7129

Moisture Analyzer

- Measurement of residual humidity content
- DIN EN ISO 15512

Density Analyzer Scale

- Density determination of products with buoyancy force
- DIN EN ISO 1183-1

Sieve analysis

- Grain size determination and grain size distribution
- DIN 66165

Infrared spectroscopy

- To analyse the composition

sample preparation

- Microtome, Grinding and Polishing





Analysis of the mechanical properties and behavior of materials

Universal test machine

- Tensile test, compression test, torsion test and bend test by max. 20kN
- optional thermal stress test (20 °C – 200 °C)
- DIN EN ISO 527-1, -2; DIN EN ISO 178



Universal test machine

- Tensile test, compression test, torsion test and bend test by max. 50kN
- DIN EN ISO 527-1, -2
- Special tests possible

Pendulum machine

- Impact strength test
- CHARPY DIN EN ISO 179-1
- IZOD DIN EN ISO 180



Hardness tester

- Testing the Shore hardness: HBA und HBD
- DIN EN ISO 868 and DIN ISO 7619-1
- Ball impression hardness DIN EN ISO 2039-1
- Microhardness of surface layers DIN EN ISO 4516





Analysis of surface functionalities

Stereomicroscope

- Optical assessment of the damage
- Measurements und visual checks
- Close-ups and overview scans

Polariscope

- Evaluation of stress conditions in transparent structural component

Roughness measurement

- Single test: 20 mm; +/- 300 μm
- Rz, Ra, AMax; waviness; DIN EN ISO 4287

Contact angle measurement with different test liquids

- Camera supported system, Sessile-Drop-Methode
Pendant-Drop-Methode; DIN EN 828; DIN EN ISO 15989
- Wettability analysis; incl. temperature chamber

Microhardness and Mechanical Properties

- DIN EN ISO 4516; Measurement of thin film systems,
• surface properties

Wallthickness analysis

