



The Groz-Beckert central laboratory

Overview and service specifications

Material testing

Determination of the chemical composition of inorganic materials

- Emission spectroscopy (Fe, Ni, Al, Cu basis)
 - C, Si, Mn, P,S, Cr, Ni, Mo, Cu, Nb, V, Ti, Al, W, Co, As, Pb, Sn, Zr, Bi, B, Zn,Ca, Sb, Ta, N
- Glow discharge optical emission spectroscopy (GDOES)
 - Bulk and depth profile analysis, e.g. of nitriding and PVD coating
 - DC and RF excitation
- Energy-dispersive measurements (EDX) in scanning electron microscope
 - Qualitative surface analysis
 - Elemental mapping images
 - Linescan and point analysis
- Determination of elements with X-ray fluorescence analysis RFA
 - 40 Elements of the periodic table
 - Solid and liquid samples
- Determination of elements via inductively coupled plasma spectrometer ICP
 - Trace analysis in ppm range (DIN EN 10351, DIN EN ISO 11885)

Dilatometer testing

- Setup of time-temperature-transformation curve for ferrous alloys (SEP1680 1990-2)

Corrosion testing

- Current density-potential corrosion measurements ASTM G59
- Stress corrosion cracking DIN EN ISO 7539
- Intercrystalline corrosion (Huey, Strauss Test) DIN EN ISO 3651-1,-2
- Salt-spray tests according to DIN EN ISO 9227
- Corrosion tests in artificial atmospheres from -70 °C to +180 °C, variably selected humidity, freely programmable cycles

Mechanical-technological tests on various materials

- Tensile testing according to DIN EN ISO 6892-1
- Shear strength of riveted and adhesive connections
- 3-point and 4-point bending test to 150 kN
- Various other strength tests
- Hardness testing:
 - according to Brinell DIN EN ISO 6506-1
 - according to Vickers DIN EN ISO 6507-1
 - according to Rockwell DIN EN ISO 6508-1
 - Shore hardness according to DIN ISO 7619
 - Nano hardness testing DIN EN ISO 14577
 - Roughness testing DIN EN 10049
 - Scratch test of layers (ASTM C1624)

Metallographic testing

- Structures on steel and non ferrous metals (copper, nickel, aluminum, titanium etc.)
- Determination of grain size (DIN EN ISO 643, DIN 50601)
- Case depth DIN EN 10328
- Nitriding depth (DIN EN 50190-3)
- Decarburization (DIN EN ISO 3887)
- Non-metallic inclusions
- Carbide structure

Coating thickness testing

- Calotte grinding for PVD, galvanic layers
- X-ray fluorescence analysis of coating thickness
- Admittance measurement
- Determination of thickness of anodic film and lacquer coating

Microscopy

- Scanning electron microscope Zeiss Sigma VP for non-conductive samples
- Various stereo and light microscopy up to 1,500x optical magnification

Metrology

- Tactile and optical measuring machine to 600 x 600 mm component size
- Fringe light projection for 3D measurements on small components, e.g. cutting edge of tools

Hot gas and melt extraction

- Determination of:
 - oxygen content (DIN EN 10276-2)
 - hydrogen content
 - nitrogen content
 - carbon and sulfur content of steel (ASTM E1019)

Polymer and oil or lubrication analysis

Polymer analysis

- Basic principles according to DIN EN ISO 1043-1 to DIN EN ISO 1043-4
- FTIR analysis
- Determination of:
 - melting point according to DIN EN ISO 11357-1
 - glass transition according to DIN EN ISO 11357-2
 - enthalpy of melting and crystallization according to DIN EN ISO 11357-3
 - specific heat capacity according to DIN EN ISO 11357-4
 - reaction times and temperatures according to DIN EN ISO 11357
 - density according to DIN 1183-1
 - water absorption according to DIN 53475
 - ash in muffle furnaces or with TGA according to DIN EN ISO 3451
 - MFR/MVR according to DIN EN ISO 1133-1
 - stress crack sensitivity

Analysis cooling lubricants according to TRGS 611

- Determination of Co and Cu via ICP according to DIN 51399
- Determination of pH value according to DIN EN ISO 10523
- Bacteria test via dipslide
- Determination of:
 - concentration via refractometer
 - water hardness according to DIN 38406 H6
 - nitrite content according to:
 - DIN EN 26777 (spectrometer) or with test strips
 - DIN EN ISO 10304-1 (IC) or with test strips

Minimum requirements for lubricating oils according to DIN 51517, DIN 51520, DIN 51521, DIN 51524

- Sampling according to DIN 51570-1, DIN 51570-2, DIN EN ISO 3170
- FTIR analysis
- Determination of viscosity according to DIN EN ISO 3104, DIN 51659-2 (draft)
- Tribological testing according to DIN 51834-1 to DIN 51834-4
- Characterization of textile oils according to DIN 62136-1, DIN 62136-2
- Lini test: washability of oils
- Determination of:
 - viscosity index according to DIN 51563, DIN ISO 2909
 - density according to DIN 51757
 - flash and fire points according to DIN EN ISO 2592
 - aromates content
 - oxidation stability with Rancimat
 - pH value according to DIN EN ISO 20843
 - neutralization number according to DIN 51558-2
 - saponification number according to DIN 51559-1 and DIN 51559-2
 - pour point via DSC or according to DIN ISO 3016
 - water content according to DIN 51777-1 and DIN 51777-2
 - metals (RFA) according to DIN 51363-2, DIN 51390-2, DIN 51391-2, DIN 51577-4, DIN ISO 15597, DIN EN ISO 8754
 - chlorine content (RFA) according to DIN 51577-4, DIN EN ISO 15597
 - boiling range according to DIN 51435
 - contamination (centrifuge) according to DIN 51365
 - Bruggen number according to DIN 51347-1, DIN 51347-2
 - BHT content

Special testing

- Particle-size analysis according to ISO 13320
- UV stability testing
- color fastness

Chemical analyses

Water and wastewater analysis according to DIN 38402

- Bacteria test via dipslides
- Determination of concentration via ICP
- Determination of:
 - chloride ions according to DIN 38405-1
 - fluoride according to DIN 38405-4
 - sulfate according to DIN 38405-5
 - phosphate according to DIN 38405-9
 - bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate according to DIN EN ISO 10304-1
 - chromate, iodide, sulfite, thiocyanate, thiosulfate according to DIN EN ISO 10304-3
 - chloride, chlorate, chlorite according to DIN EN ISO 10304-4

Instrumental analysis

- GC-MS: Analysis of organic connections to 300 °C evaporation point
- HPLC- MS
- Titrimetry
- Ion chromatography IC
- Wet chemical analysis
- Analysis galvanic baths

Textile testing on fibers

- Breaking force and elongation according to DIN EN ISO 5079
- Friction behavior (fiber/metal)
- Determination of:
 - Linear density according to DIN EN ISO 1973 (vibroscope method)
 - Fiber diameter
 - Crimp properties (Hoechst (Trevira) method)
 - Fiber length according to DIN 53808-1 (measuring of individual fibers)

Textile testing on yarns and threads

- Determination of:
 - Linear density by the skein method according to DIN EN ISO 2060 (yarn from packages)
 - Linear density of monofilaments according to DIN EN 13392
 - Linear density of single and plied yarns based on DIN 53830 (short length method)
 - Single-end breaking force and elongation of yarn according to DIN EN ISO 2062
 - Tensile properties of monofilaments according to DIN EN 13895
 - Twist in yarns according to DIN EN ISO 2061 (direct counting method)
- Knot tensile test for single and plied yarns according to DIN 53842-1
- Loop tensile test according to DIN 53843-1
- Elastic behavior according to DIN 53835-2
- Friction measuring on yarns

Textile testing on fabrics

Analysis of textile structure

- Determination of:
 - number of stitches per unit length and unit area according to DIN EN 14971
 - number of threads per unit length DIN EN 1049-2
 - yarn length ratios in woven and knitted fabrics according to DIN 53852
 - the mass portion of warp and weft according to DIN 53856
 - mass per unit area according to DIN EN 12127 and DIN EN 29073-1
 - thickness of textiles and textile products according to DIN EN ISO 5084 and DIN EN ISO 9073-2
 - compression of textiles and textile products according to DIN 53885

Investigation of performance characteristics

- Static puncture test (CBR test) according to DIN EN ISO 12236

- Determination of bursting properties, bursting strength and bursting distension according to DIN EN ISO 13938-2 (pneumatic method)

- Determination of permeability of fabrics to air according to DIN EN ISO 9237 and DIN EN ISO 9073-15

- Behavior when exposed to abrasion
 - Determination of the abrasion resistance by Martindale method:
 - of specimen breakdown according to DIN EN ISO 12947-2
 - of mass loss according to DIN EN ISO 12947-3
 - assessment of appearance change according to DIN EN ISO 12947-4
 - fabric propensity to surface fuzzing and to pilling according to DIN EN ISO 12945-2 (modified Martindale method)
 - of abrasion resistance according to DIN EN ISO 5470-2 (rubber- or plastics-coated fabrics)

- Behavior when exposed to water
 - Determination of:
 - water absorption of textile fabrics according to DIN 53923
 - resistance of textile fabrics to water permeation according to DIN EN 20811, DIN EN ISO 9073-16 (hydrostatic pressure test)

Investigation of tensile properties

- Determination of maximum tensile force/elongation:
 - Strip method according to DIN EN ISO 13934-1
 - Grab method according to DIN EN ISO 13934-2
 - of nonwovens according to DIN EN 29073-3

- Testing of tenso-elastic behavior according to:
 - DIN 53835-13 (single application of tensile load between constant extension limits)
 - DIN 53835-14 (single strain between two force limits)

- Determination of tear properties
 - with single-tear method according to DIN EN ISO 13937-2
 - with trapezoid test according to DIN EN ISO 53859-5
 - of nonwovens according to DIN EN ISO 9073-4

- Determination of adhesive force
 - Delamination testing according to DIN 54310, DIN 53530

- Seam tests
 - Determination of slippage resistance of yarns in woven fabrics according to:
 - DIN EN ISO 13936-1 (Fixed seam opening method)
 - DIN EN ISO 13936-2 (Fixed load method)
 - Determination of maximum tensile force with:
 - Strip method according to DIN EN ISO 13935-1
 - Grab method according to DIN EN ISO 13935-2

Other analyses

Optical analyses

- Stereo microscope, light microscope 630x magnification with different contrasting methods and scanning electron microscope for:
 - longitudinal- and cross-section investigation, et al. microtom sections
 - Structure and surface investigation
 - Thermo-microscopy

Textile-chemical analyses

- Determination of impurities, fiber additives and extractable substances
- Material identification and composition
- Determination of density based on DIN EN ISO 1183-1 (immersion method)
- Quantitative, chemical fiber analysis, separation of binary mixtures according to DIN EN ISO 1833
- Determination of pH value according to DIN EN ISO 3071, DIN 54275

Other methods of analysis

- Examination of delustering content
- Creation of surface replica
- Testing of thermal behavior (DSC, TGA)
- Spectral analysis via infrared spectroscopy (FTIR)
- X-ray fluorescence analysis (RFA)
- Tests for analytical reactions
- Rheologic testing (viscosity, viscoelastic behavior)





Groz-Beckert KG

Parkweg 2

72458 Albstadt, Germany

Phone +49 7431 10 -0

Fax +49 7431 10-2777

contact@groz-beckert.com

www.groz-beckert.com

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