



Materials testing and certification

Technology and expertise for speed to market



Safety. Science. Transformation.™



Advanced technology. Extensive capabilities.

Being one of the leading global providers of testing and certification of thermoplastics, elastomers, thermosets and composites, our facilities offer a broad range of services: from compounding and test specimen production to testing and certification of high-performance plastics and components.

Let us apply our experience, resources and creativity to solve your compliance challenges.

When choosing UL Solutions, you are opting for the proven performance of an independent and accredited testing partner. Benefit from our highly experienced team of experts and long history of expertise in plastics testing.

UL Solutions offers comprehensive services and competitive turnaround times.

Faster, more efficient market launch thanks to:

- Advanced production systems.
- Electronic processing from receipt of order to delivery of results.
- Comprehensive service packages streamline the processing of complex orders.

Production of test specimens

Compounding

Twin screw extrusion

Small quantity compounds up to 200 kg*

The main thermoplastics processed are:

- Polycarbonates (PC, PC-HT).
- Polyamides and polyesters (PA 6, PA 6.6, Co-PA, PET, PBT).
- Styrenics (ABS, ASA and SAN).
- Blends of the above-mentioned plastics.

Weighing in of formulations

Mixing of raw materials in high-speed mixer

Determination of processing properties

- Injection pressure.
- Gate open time.
- Plasticising performance.
- Demoulding properties/friction coefficient.
- Shrinkage

Test specimens from semi-finished and finished parts

- Produced by high-speed cutting, sawing and punching.

*Other quantity on request





Flat test specimens

80x10x	1,0/3,0/4,0
125x13x	0,75/0,80/0,85/0,90/1,0/1,2/1,6/1,8/2,2/2,6/2,8/3,2
127x12,7x	0,75/0,8/1,0/1,2/1,4/1,5/1,6/2,0/2,2/2,4/2,6/2,8/3,0/3,2/3,8/6,4

Thin wall test specimens (compression moulding)

60x60x	0,4/0,5/0,6/0,7/0,8/0,9/1,0
125x13x	0,4/0,5/0,6/0,7/0,8

Sheet production

Sheets with optical quality

(only unreinforced materials)

150 x 105 x 1,5	150 x 105 x 4,0	250 x 105 x 3,2
150 x 105 x 1,6	150 x 105 x 6,0	250 x 105 x 6,4
150 x 105 x 2,0	150 x 105 x 6,4	220 x 140 x 4,0
150 x 105 x 3,0	250 x 105 x 1,6	
150 x 105 x 3,2	250 x 105 x 2,3	

Sheets with grained surfaces

150 x 105 x 3,0	150 x 105 x 4,0
150 x 105 x 3,2	220 x 140 x 4,0

Sheets 150 x 105 x d

d = 1,0/1,2/1,5/2,0/2,2/2,4/2,5/2,7/3,0/3,2/

4,0/6,0/10,0

(shrinkage marks on one side)

Sheets 150 x 150 x d

d = 2,0/2,5/3,0

Sheets for shrinkage measurement

Rectangular sheet	60 x 60 x 2,0
Rectangular sheet	150 x 105 x 3,0

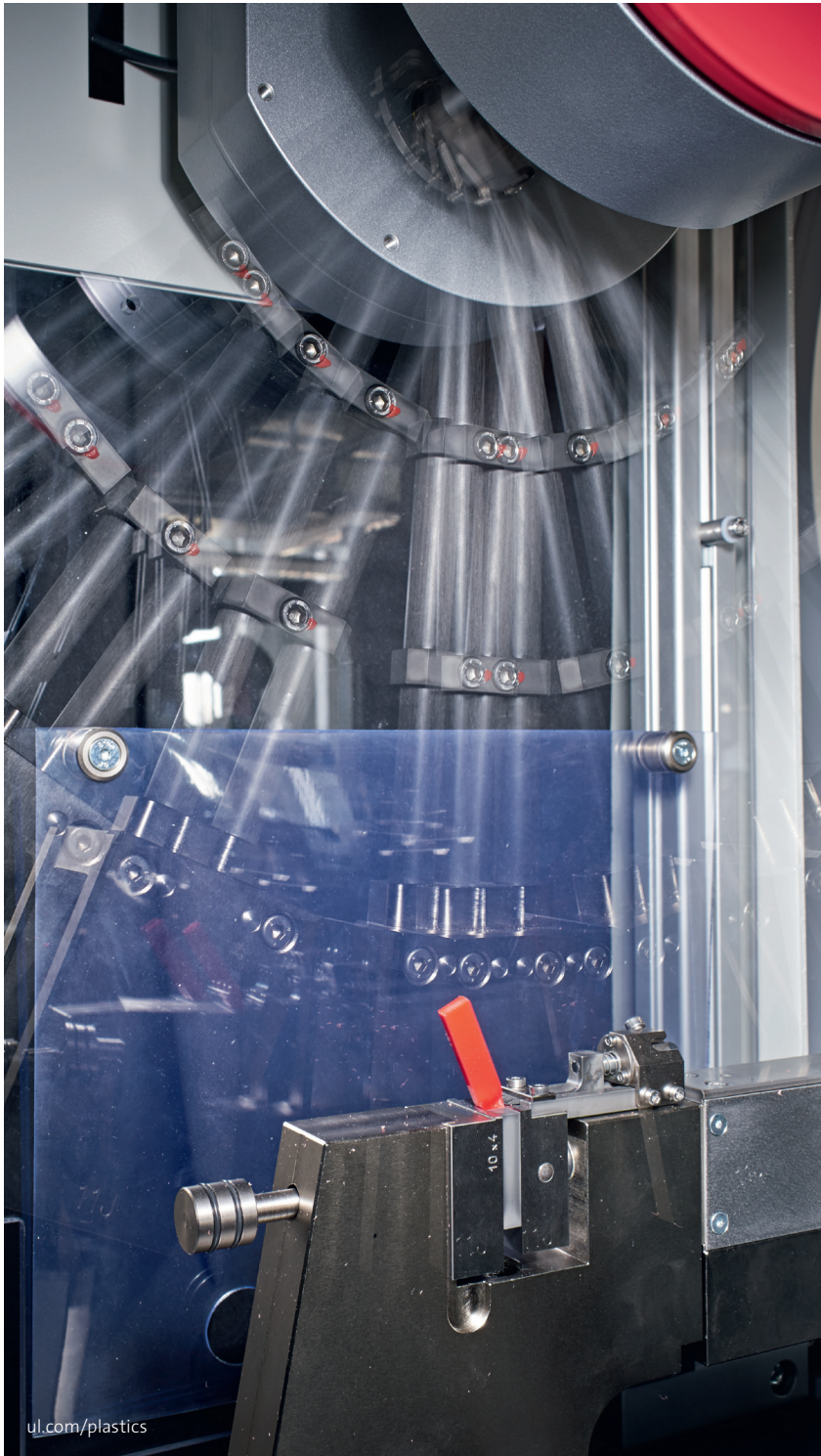
Rectangular sheets; also with optical quality

Sample sheet	60 x 40 x 2,0
Sample sheet	60 x 40 x 4,0
Sample sheet with step	60 x 40 x 4/2-step
Rectangular sheet	150 x 38 x 2,0
Rectangular sheet	155 x 75 x 2,3
Rectangular sheet with hole	155 x 75 x 2,3
Rectangular sheet with hole and ribs	155 x 75 x 2,3
Rectangular sheet	60 x 60 x 1,0
Rectangular sheet	60 x 60 x 2,0
Rectangular sheet	60 x 60 x 3,0
Rectangular sheet	75 x 50 x 2,0
Rectangular sheet	75 x 50 x 4,0
Sample sheet with step	75 x 50 x 4/1-step
Sample sheet with step	75 x 50 x 3/2-step

Round test specimen; also with optical quality

D25 x 1,7	D80 x 0,8	D80 x 2,5
D60 x 1,0	D80 x 1,0	D80 x 3,0
D60 x 2,0	D80 x 1,2	D80 x 3,2
D60 x 3,0	D80 x 1,5	D80 x 4,0
D60 x 4,0	D80 x 1,6	D100 x 0,75
D80 x 0,5	D80 x 2,0	





Special test specimens

Flat test specimens

50 x 6 x 4,0
60 x 10 x 1,0
63,5 x 12,7 x 3,2
80 x 10 x 1,0
80 x 10 x 4,0
80 x 10 x 4,0 (with weld line)
120 x 10 x 4,0
120 x 15 x 4,0

Dumbbell test specimens

63,5 x 3,2 x 0,8 (Type L)
63,5 x 3,2 x 0,8 (Type S)
63,5 x 3,2 x 1,5 (Type L)
63,5 x 3,2 x 1,5 (Type S)
63,5 x 3,2 x 3,0 (Type L)
63,5 x 3,2 x 3,0 (Type S)
85 x 5,0 x 1,5 (ISO 527-2 Typ 1BA)
105 x 6 x 1,5
105 x 6 x 2,0
105 x 6 x 3,0
105 x 6 x 4,0
105 x 10 x 0,75
105 x 10 x 1,5
105 x 10 x 3,0
120 x 7 x 2,0

130 x 10 x 1,5
130 x 10 x 2,0
130 x 10 x 3,0
130 x 10 x 4,0
170 x 10 x 1,0
170 x 10 x 1,5
170 x 10 x 2,0
170 x 10 x 3,0 (according to ISO 527-2 Typ 1A)
170 x 10 x 3,2 (according to ISO 527-2 Typ 1B)
170 x 10 x 4,0
170 x 10 x 4,0 with weld line
170 x 13 x 3,2 (ASTM D638 Typ 1)

Others

Flow strip 440 x 50 x 1,0
Flow strip 440 x 50 x 1,5
Flow strip 440 x 50 x 2,0
Flow strip 440 x 50 x 3,0
Flow spiral – flat 1150 x 5 x 2,0
Flow spiral – flat 1170 x 8 x 2,0

Other test specimens on request.
All dimensions listed in mm.

Test procedures

Mechanical test procedures

Tensile test

- 40 C to +230 C
- ISO 37
- ISO 527
- ASTM D638

High speed tensile test

- Optical deformation measurement by ultra high speed camera
- 40 C to +200 C
- 0,1 m/s to 20 m/s
- In-house standard

Flexural test with modulus of elasticity

- 40 C to +230 C
- ISO 178
- ASTM D790

Izod and Charpy flexural impact tests (notched and unnotched)

- 60 C to +80 C
- ISO 179-1
- ISO 180
- ASTM D256

Penetration test

- 60 C to +80 C
- ISO 6603-2
- ASTM D3763

Determination of hardness

Ball indentation hardness

- ISO 2039-1
- Micro hardness IRHD
- ISO 48
- Rockwell hardness

- ISO 2039-2
- ASTM D785
- Shore A/Shore D
- ISO 868
- ASTM D2240

Tensile impact test

- ISO 8256
- ASTM D1822

Tear propagation/separation/peeling tests

- ISO 34-1
- DIN 53507*
- DIN 53515*
- ASTM D1004
- ASTM D624
- ASTM D1938

Compression test (to max. 100kN)

- ISO 604
- ASTM D695

Shear test

- ASTM D732

Tensile creep test

Room temperature to 250 C

- ISO 899-1
- DIN 53444*
- ASTM D2990

Compression set

- ISO 815
- ASTM D395

Rheological test procedures

Melt index

Melt volume flow rate (MVR)

Melt mass flow rate (MFR)

Time-dependent melt volume rate (IMVR)

Time-dependent melt flow rate (IMFR)

- ISO 1133-1
- ASTM D1238
- ISO 1133-2

Melt shear viscosity

- ISO 11443
- DIN 54811*

Solution viscosity

of polycarbonate with/without film

- ISO 1628-1/-4

Oscillatory shearing

(rotational rheometer), e.g., zero shear viscosity, frequency sweep, time sweep/thermal stability

- ISO 6721-10
- ASTM D4440

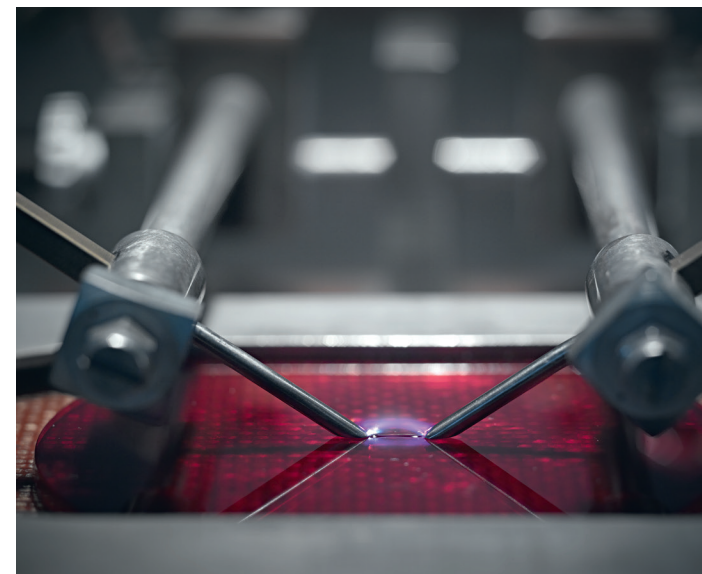
Special rheological tests

- Capillary and rotational rheometer

PvT behaviour

- ISO 17744

*Standard is inactive, but we can test to them if required.





Heat resistance

Vicat

Temperature to 300 C

- ISO 306
- ASTM D1525

Heat distortion temperature (HDT)

Temperature to 290 C

- ISO 75-1,-2,-3
- ASTM D648

Ball pressure

- IEC 60695-10-2 (IEC 60335-1)

Electrical test procedures

Dielectric measurement

Dielectric constant ϵ_r /
dissipation factor $\tan \delta$)

- IEC 62631-2-1

Electrostatic charging

- On the basis of IEC 61340
- In-house standard
- PV 3977

Electrical Resistance

Surface resistivity of insulating material

- IEC 62631-3-2
- UL 746A, the Standard for Polymeric Materials - Short Term Property Evaluations
- ASTM D257

Volume resistivity of insulating material

- IEC 62631-3-1
- UL 746A
- ASTM D257

Volume resistivity of conductive plastics

- ISO 3915

Dielectric strength

- IEC 60243-1
- ASTM D149
- UL 746A

Comparative tracking index (CTI)

- IEC 60112
- ASTM D3638

Arc resistance

- IEC 61621
- ASTM D495
- VDE 0303 Part 70

Electrolytic Corrosion

- IEC 60426

Inclined plane tracking (IPT)

- IEC 60587
- ASTM D2303

Flammability

Flame Tests ANSI/UL 94, the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

- HB - Horizontal Burning
- V - 50 watt-20mm vertical burning
- 5V - 500 watt-125mm vertical burning
- VTM - thin material vertical burning
- HBF - horizontal burning foamed material

Flame Tests UL 746C, the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations

- 20 mm (3/4 inch) flame
- 127 mm (5 inch) flame

Density

- ASTM D1622
- ISO 845

Limiting oxygen index (LOI)

- ISO 4589-2 (Procedure A)
- ASTM D2863

Test with electrical ignition source

- IEC 60695-2-11 glow wire end product testing (GWEPT)
- IEC 60695-2-12 glow wire flammability index (GWFI)
- IEC 60695-2-13 glow wire ignition temperature (GWIT)
- ANSI/UL 746A

- ASTM D3874 hot wire ignition (HWI)

Needle flame test

- IEC 60695-11-5

Ash content

- ISO 3451-1
- In-house standard (rapid ash)
- ISO 1172

Automotive

- DIN 75200 (KFZ-interior)
- ISO 3795 (KFZ-interior)
- TL 1010 (KFZ-interior)
- PV 3357 (insulation material)
- DBL 5307
- TSM0500G
- 7-G2000
- GMW 3232
- VCS 5031,19
- GB 8410-2006
- SAE J369
- GS 97038
- D45 1333/--G
- ASTM D5132-20
- M0094
- STD 4466
- VW 96243 - PTL 8501
- RNES-B-00071
- ISO 3795
- UN Regulation No. 118
- 49 CFR 571.302

Thermal aging

Hot air aging in no-load conditions

- DIN 53497
- ISO 188

Determination of relative temperature index (RTI)

- IEC 60216
- UL 746B, the Standard for Polymeric Materials - Long Term Property Evaluations
- VDE 0304

Weathering

Artificial weathering

Many standards available on request for accelerated aging test with various customer specifications with different machines like Xenon-WOM, Xenotest, Fluorescence (UVA/UVB Light 313 nm, 340 nm, 351 nm)

- AATCC TM 16
- AATCC TM 169
- ASTM G154
- ASTM G155
- ASTM D7869
- ISO 4892-2,-3
- ISO 105-B 06
- DIN EN ISO 16474
- SAE J 2412 (SAE J1885)
- SAE J 2527 (SAE J1960)

Automotive

- PV 1303
- PV 1306
- PV 3929 Kalahari test
- PV 3930 Florida test
- FLTMB BO 116-01
- D27 1389
- D27 1911
- NES M 0135
- GMW 14650
- VDA 75202

Climate testing

Climate tests

On request various standards for climate change tests and constant climate conditions

Autoclave storage

- Up to +150 C

Automotive

- PV 1200
- PV 2005
- PR 303.5

Optical test procedures

Color measurement Delta E

- ISO 13468
- ASTM E179
- ASTM E308
- DIN 5033
- DIN 5036
- DIN 6174

Gray scale determination

- ISO 105-A02

Gloss factor

- ISO 2813
- ASTM D523

Haze

- ASTM D1003

Yellowness index

- DIN 6167
- ASTM E313

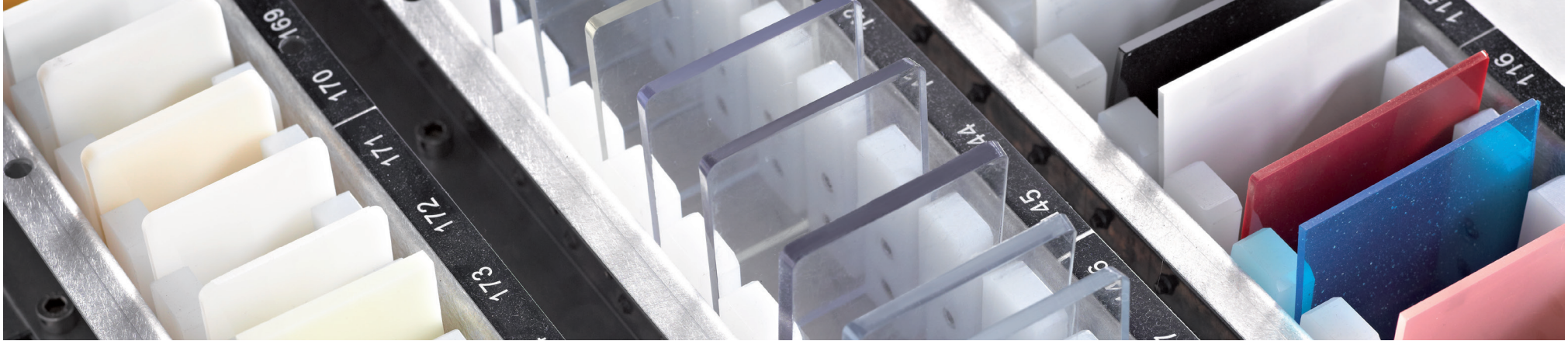
Spectroscopic methods

UV-VIS-NIR spectroscopy

- 175 nm to 3300 nm

Additional standards and tests (as well automotive and electrical test regulations) on request.





Thermal analyses

Thermomechanical analysis (TMA)

Coefficient of linear thermal expansion

- 150 C to 600 C
- ISO 11359-1/-2
- ASTM E831

Differential scanning calorimetry (DSC)

Also temperature modulated method

- ISO 11357
- ASTM D3418

Thermogravimetric analysis (TGA)

- ISO 11358
- DIN 51006
- ASTM D3850
- ASTM E1131

Torsion pendulum test

(shear modulus determination)

- ISO 6721-7 forced vibration

Chemical resistance

Environmental stress cracking (ESC)

Bent strip test

- ISO 22088-3

Internal stresses

TnP test

- In-house standard

Petrol test

(isooctane/toluene)

Fuel resistance

- DIN 51604-1
- DBL 5416

Media aging, no load

- ISO 175
- ISO 1817

Physical test procedures

Thermal conductivity

NanoFlash™ test method

- ISO 22007-4
- ASTM E1461

Determination of density

- ISO 1183
- ASTM D792

Density

- ISO 845

Apparent density

- ISO 60

Determination of water content

- ISO 760
- DIN 53715*
- ISO 15512

Water absorption

- ISO 62
- ISO 1110

Shrinkage

Production and measurement of shrinkage sheets on fully-automated shrinkage station

- ISO 294-4
- In-house standard

Emissions testing

Odor

- VDA 270
- PV 3900

Fogging

- DIN 75201-11
- PV 3015
- ISO 6452
- SAE J1756
- TP0000912 (Tesla)

Formaldehyd

- VDA 275
- PV 3925

Chamber test

- VDA 276
- PV 3942
- DIN ISO 12219-4
- ISO 16000-6

Thermodesorption

- VDA 278

Expertise. Quality. Dedication.

Reliable test data

ISO/IEC 17025 accreditation

The ISO/IEC 17025 accreditation of our laboratory in Krefeld confirms the competence and ability to conduct selected physical and technological tests on innovative plastics.

Dedicated to safety and performance

Safety and performance are crucial. UL Solutions helps increase consumer confidence that your plastic components, like the ones in electronic appliances or motor vehicles, have been reliably tested to comply with the latest safety and performance standards.

The added value of experience

UL Solutions employees make the difference

UL Solutions experts offer a wealth of experience. They constantly advance their professional skills with hands-on experience and regular training sessions conducted both externally and on-site.

UL Solutions expertise worldwide

Our laboratory in Krefeld is known as a Center of Excellence for plastics testing within UL Solutions. By supporting the development of new laboratories and contributing to the on-site training of our colleagues around the world, we can continue to offer industry-leading service to our customers.





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