

Material Formability Testing

EWI's Forming Center offers material formability testing of various types of sheet material including steel, aluminum, titanium, and nickel alloys. These tests include cup draw testing, biaxial bulge testing, and forming limit diagram (FLD) testing. EWI engineers evaluate the results of these tests to provide recommendations on lubricants, coatings, and materials for your specific application.

For additional information or a quote please contact Laura Zoller, Project Engineer, at lzoller@ewi.org or Brad Nagy, Engineering Manager, at bnagy@ewi.org.



| Cup Drawing Testing | | |
|--|------------|---|
| Name | Reference | Description |
| Cup Draw Test for Evaluating Stamping Lubricants | | Evaluation of the material drawability and/or performance of stamping lubricants in hydraulic press using 6-in. diameter punch. Nine circular blanks of 12-in. diameter are required for each lubricant or material. Maximum sheet thickness is 2.54 mm (0.1 in.). Maximum tensile strengths 1200 MPa with a maximum gage of 12 mm (0.048 in.). |
| Cup Draw Test – Additional Materials | | Additional testing with pre-defined testing conditions such as forming speed, blank holder force and lubricant. |
| B2 Erichsen Deep Draw Test for Evaluating Drawability | ISO 11 531 | Evaluation of the material drawability and/or earing tendency using Erichsen Sheet Metal Machine with 2-in. drawing punch. Ten 5 x 5-in. square blanks are required for testing 0.2–3.0 mm. |
| B2 Erichsen Deep Draw Test – Additional Materials | | Additional testing with pre-defined testing conditions. |
| B2 Erichsen Deep Draw Test at Elevated Temperatures | | Standard deep draw test at Elevated Temperature (up to 932°F). |
| B2 Erichsen Deep Draw Test at Elevated Temperatures – Additional Materials | | Additional testing at Elevated Temperature with pre-defined testing conditions. |
| Erichsen Cupping Test | ISO 20482 | Evaluate of the material's ability to undergo plastic deformation in stretch forming conditions with a 20-mm or 15-mm punch diameter. Material range 0.2–3.0 mm. |
| Erichsen Cupping Test – Additional Materials | | Additional testing with pre-defined testing conditions. |

Material Formability Testing *cont.*

| Biaxial Bulge Testing | | |
|---|-----------|---|
| Name | Reference | Description |
| Hydraulic Bulge Test with Digital Image Correlation (DIC) | | Equi-biaxial tension test using compressed oil to obtain the flow stress-strain curve of the sheet material using DIC. Square blanks that are 10 x 10 in. are required for testing. Five samples used for setup, and five samples for testing. Maximum tensile strength for this testing is 1100 MPa (160 ksi) with a maximum gage of 3.0 mm (0.118 in.). |
| Hydraulic Bulge Test with Digital Image Correlation – Additional Material | | Additional testing with pre-defined testing conditions. |
| Forming Limit Diagram (FLD) Testing | | |
| Forming Limit Diagram 5-point Test | ISO 12004 | Standard Nakajima or Marciniak (4-in. drawing punch) testing to obtain a full scale 5-point FLD using DIC with Erichsen Sheet Metal Machine. A set of 20 blanks (10-in. square) is required for testing. Maximum tensile strength for this testing is 1100 MPa (160 ksi) with a maximum gage of 3.0 mm (0.118 in.). |
| Forming Limit Diagram 5-point Test – Additional Materials | | Additional testing with DIC using pre-defined testing conditions. |
| Limiting Dome Height (LDH) Testing | | |
| Limiting Dome Height Testing Full Sample | | Evaluation of the material stretch forming ability (4-in drawing punch) using DIC with Erichsen Sheet Metal Machine. Square blanks that are 10 x 10-in. are required for testing. Five samples used for setup, and five samples for testing. Maximum tensile strength for this testing is 1100 MPa (160 ksi) with a maximum gage of 3.0 mm (0.118 in.). |
| Limiting Dome Height Testing Full Sample – Additional Materials | | Additional testing with DIC using pre-defined testing conditions. |
| Limiting Dome Height Testing Full Sample at Elevated Temperatures | | Standard LDH Testing at elevated temperatures (up to 932°F) with DIC. |
| Limiting Dome Height Testing Full Sample at Elevated Temperatures – Additional Material | | Additional testing at elevated temperatures (up to 932°F) with DIC using pre-defined testing conditions. |
| Limiting Dome Height Testing Half Sample | | Evaluation of the edge cracking failures (4-in. drawing punch) using DIC with Erichsen Sheet Metal Machine. Ten 5 x 10-in. blanks are required for testing. Five samples used for setup and five samples for testing. |
| Limiting Dome Height Testing Half Sample – Additional Materials | | Additional testing with DIC using pre-defined testing conditions. |

Material Formability Testing *cont.*

| Hole Expansion Testing (HET) | | |
|---|-------------|---|
| Name | Reference | Description |
| Hole Expansion Testing – Additional Materials | | Additional testing with DIC using pre-defined testing conditions. |
| Hole Expansion Testing – Punching Holes | | Shearing 10-mm or 40-mm holes at various clearances to be used in hole expansion testing. |
| Bend Testing | | |
| VDA Tight Bend Testing | VDA 238-100 | Evaluation of the bendability of a material using DIC. Twenty samples 60 mm x 60-mm samples are required. |
| VDA Tight Bend Testing – Additional Materials | | Additional testing with DIC using pre-defined testing conditions. |
| Other Forming Center Resources | | |
| Simulation Services | | Sheet metal forming simulation support using commercial finite element method (FEM) codes such as Autoform, LS-DYNA, and PAM-STAMP. |
| Servo Press Die Trial (Full Day) | | Die trial using EWI's 3000 kN AIDA Servo Press with 250 kN blank holder force. EWI provided die or customer die. Contact EWI for press specifications. |
| Hydraulic Press Die Trial (Full Day) | | Die trial using EWI's 160-ton kN Minster Hydraulic Press with 100-ton CNC-controlled hydraulic cushion system for blank holder force. EWI provided die or customer die. Contact EWI for press specifications. |
| Hydraulic Press Die Trial with Warm Forming Cell (Full Day) | | Die trial using EWI's 160-ton kN Minster Hydraulic Press with 100-ton CNC-controlled hydraulic cushion system for blank holder force with warm forming cell (up to 1832°F). EWI provided die or customer die. Contact EWI for press specifications. |
| ARGUS Strain Analysis using EWI Part | | ARGUS strain analysis of one part stamped at EWI's stamping press. Outputs are final forming strains and thickness of formed part. |
| ARGUS Strain Analysis using Customer Part | | ARGUS strain analysis of one industry sized part stamped at customer's facility. Outputs are final forming strains and thickness of formed part. |
| ATOS Blue Light Scanner using EWI Part | | ATOS Blue Light scan data of one part stamped at EWI's stamping press. Outputs dimensional accuracy checks using CAD data. |
| ATOS Blue Light Scanner using Customer Part | | ATOS Blue Light scan data of one industry-sized part stamped at customer's facility. Outputs dimensional accuracy checks using CAD data. |

* Not included in scope of A2LA accreditation.