Sheet Metal Testing Machine Model 102

ERICHSEN Cupping Test

Deep Drawing Cup Test

Bore Expanding Test

testing equipment for quality management

Data Evaluation Software with User Test Software

Data logger for recording the measurements such as drawing and blank holder force and stroke

ERICHSEN Cupping Test

Deep Drawing Cup Test

Bore Expanding Test

With electro-hydraulic drive and fully automatic test sequence

Technical Description
Product

Sheet Metal Testing Machine, Model 102, with electro-hydraulic drive, max. drawing force of 60 kN and automatic switch off at specimen failure.

Application

This Sheet Metal Testing Machine is intended for testing materials in the medium thickness range (0.1 to approx. 3.5 mm). It provides rapid and reliable quality monitoring for sheet metal producers and users.

Model 102 is suitable for:

- the **ERICHSEN Cupping Test** on all ferrous and non-ferrous metals in accordance with:
  - ISO 8490
  - EN 14-58
  - EN 14-67
  - EN ISO 20482
  - BS 38 55
  - NF A 03-602
  - NF A 03-652
  - ASTM 643-84

In addition, the Olsen Test as used in the USA can be performed on the testing machine when appropriate tools are set up.

- the **Deep Drawing Cup Test** for the determination of the ear forming tendency and maximum drawing ratio according to:
  - DIN EN 1669
  - DIN 50 155
  - UNI 6124-67

- the **Bore Expanding Test**
  - in accordance with Siebel and Pomp (KWI)
  - ISO 16630

Depending of the testing method the following sheet metal thicknesses can be tested:

- **Erichsen Cupping Test**: 0.1 - 3.5 mm
- **Deep Drawing Cup Test**: 0.2 - 1.5 mm
- **Bore Expanding Test**: 0.2 - 2.0 mm

The above mentioned maximum sheet thicknesses are based on material with a tensile strength of 400 N/mm².

There are important reasons for using the **Sheet Metal Testing Machine, Model 102**, for quality assurance:

- Lowering of manufacturing costs by making spot checks on the drawing quality of cold rolled sheet during production or in the process department.
- Sorting out of material of lower quality arriving at the Goods Inwards Department. Without special test preparation it is immediately possible to establish if the material supplied has the prescribed drawing quality.
- Determining the most appropriate sheet thickness for a particular drawn workpiece to optimise the ratio of price to suitability for the manufacturing process.

Quantitative measurement of sheet quality by means of the ERICHSEN Cupping Test provides a basis of communication between sheet metal producers and users.

The form of the crack and the surface roughness (grain size) also provide information on the quality of the sheet metal and is suitability for drawing, giving valuable information especially to the sheet metal producer.

The good functional layout of Model 102 makes this machine particularly user friendly. Operators without previous knowledge or experience can be quickly trained to operate the machine continuously. All relevant test tools can be set up in the test cylinder quickly and without difficulty.

The sturdy design and the hydraulic system employed ensure that minimum wear is experienced so that accurate test results are assured over a long period of time.

Description

The machine consists of a sturdy sheet metal housing into which the test aggregate (test cylinder with work piston, sheet holder piston) and the test tools as well as the hydraulic system are integrated. The operator's controls are arranged conveniently on a control panel. As an option, an electro-hydraulic blanking press for the manufacture of blanks for the Deep Drawing Cup Test can be fitted into the machine housing.

When carrying out the **ERICHSEN Cupping Test**, the sheet metal specimen in the form of strip is inserted into the test cylinder and centralised by locating diagonally. The sheet holder force of 10 kN (in accordance with the standard) is adjusted using a special regulating valve, and the actual cupping process is initiated by selecting the standardised drawing speed on the speed regulator.
Since the testing machine is equipped with the function "automatic stop at specimen failure" the forward speed is automatically stopped when the crack occurs, so that in any case an objective test result is achieved. The ERICHSEN cupping value is displayed with an accuracy of 0.1 mm on the digital counter.

When carrying out the Deep Drawing Cup Test, the round blank manufactured by the electro-hydraulic blanking press, is placed into an infinitely variable centring device located in the test cylinder. After preselection of the sheet holder pressure the blank is drawn by a drawing punch (normally 33 mm dia.) to a cylindrical hollow part, the so-called cup. The inner diameter of the drawing die used, corresponds to the sheet thickness to be tested. After return of the drawing piston to the starting position, the cup can be removed from the test head without any difficulty.

When carrying out the Bore Expanding Test (KWI) the initial bore (in accordance with the dimensions of the tools, i.e. normally 7.5 mm or 12 mm) is applied to the sheet metal specimen by drilling and reaming. Afterwards this initial bore is expanded until a crack appears.

Accessories
The various accessories make this sheet metal testing machine particularly versatile. For further detailed specifications please see our Price List No. 102.

Data Evaluation System with user test software, PC, monitor and printer for data evaluation (under WIN 2000/XP) for the ERICHSEN Cupping Test and Deep Drawing Cup Test. Details see back page.

Data logger for recording the measurements such as drawing and blank holder force and stroke by time; the connection is made by a USB connection to an external PC (to be supplied by the user). The software included in the scope of supply runs under WIN 2000/XP. The system consisting of measuring transducer for drawing force and analogue output for the stroke as well as the corresponding interfaces, A/D converter module.

Technical Data

| Dimensions | Width | 650 mm |
| Format | Height | 1100 mm |
| Depth | 620 mm |

- **Weight, net**: approx. 150 kg
- **Main supply**: 230 or 400 V, 3~, 50 Hz
- **Motor performance**: 1 kW
- **Drawing force**: max. 60 kN
- **Blank holder force**: max. 12 kN
- **Drawing speed**: max. 220 mm/min
- **Punch stroke**: max. approx. 40 mm
- **Indication of punch stroke**: digital (accuracy 0.1 mm)
- **Drawing punch diameter**: max. 33 mm
- **Blank diameter**: max. 75 mm

Order Informations

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Supplied with:
- **Test Tool No. 27**
- **One Filling of Hydraulic Oil**
- **Operating Manual**

Test Tools for the ERICHSEN Cupping Test
- Test tools for the ERICHSEN Cupping Test in accordance with EN ISO 20482.

Test Tools for the Deep Drawing Cup Test
- **Electro-hydraulic Blanking Press** (blanking force 200 kN)
- **Deep Drawing Cup Test Tool B1** (drawing punch 33 mm dia.)
- **Test Tools for Earing Test** on non-ferrous metals in accordance with DIN 50 155

- **Ear Measuring Instrument, Model 126**, for rapid measurement of ears formed on cylindrical cups of diameters from 15 to 50
- **Ear Measuring Instrument, Model 126 C**, for rapid measurement of ears formed on cylindrical cups of diameters from 20 to 100 mm.

Test Tools for the Deep Draw Bore Expanding Test acc. to Siebel and Pomp (KWI)
- Bore expanding test tool D (initial bore 12 mm)
- Bore expanding test tool E (initial bore 7.5 mm)
- Boring jig for drilling the initial bores
- Drills, drilling bushes and reamers

Additional Facilities for Tests on lacquered sheet metal specimens according to DIN ISO 1520
- Special microscope with holder and illumination for optical observation of the test procedure

Further details and accessories please see our Price List No. 102.
Modified ERICHSEN Cupping Test

The ERICHSEN Cupping Test (in accordance with EN ISO 20482, and corresponding to national and international standards) is a test providing simple and quick means of assessing the multi-axis ductility of sheet and strip using a procedure that relates closely to practical processes. The depth range reached at failure is, however, only an initial guide to the evaluation of the forming properties of the sheet metal.

Data Evaluation System with User Test Software

The software enables the continuous acquisition of measured values with simultaneous display of the force/displacement diagram throughout the forming process. Once the maximum force has been reached, the movement of the drawing punch is stopped automatically and the diagram is evaluated by the PC.

Simultaneously, the measurements taken are processed further using a theoretical model for the plastic deformation of the material based on work done in association with the University of Siegen/Germany. On this basis, the equipment not only provides values for the normal ERICHSEN Cupping Test result - ERICHSEN Index \( I_E \) - but also for elongation at failure \( \varepsilon_E \), tensile strength \( Rm_E \), and the \( n \)-value \( n_E \). (The suffix \( E \) indicates that the parameter has been measured using the ERICHSEN process.)

This data is presented immediately on the VDU on completion of the test alongside the graph of the force against displacement. Either a printout can then be obtained and the data saved or the data can be easily transferred to other evaluation programmes (e.g. Microsoft Excel). Practical experience has shown that these new ERICHSEN parameters have a good correlation with corresponding values obtained conventionally, with the significant advantage that the considerable effort required to prepare conventional test specimens is eliminated.

The scope of supply includes PC, VDU and printer.

The right of technical modifications is reserved.

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