

Maximum Strain



Deep Drawing Cup Test

## Universal Sheet Metal Testing Machine Model 142



Square Deep Drawing Cup Test



Software for  
Data Evaluation and  
Processing

testing equipment for quality management

**ERICHSEN**

**FLC-Test**  
**Bulge-Test**  
**High Speed Test**

**Extensive**  
**Tools/Accessories**

**With**  
**electro-hydraulic**  
**Drive and PLC**

## Product

Universal Sheet Metal Testing Machine with electro-hydraulic drive, fully automatic test sequence and switch off at specimen failure, max. drawing forces 200 kN or 400 kN - **Model 142-20** and **Model 142-40**.

## Application

This Testing Machine can be used not only to perform effortlessly, quickly and accurately all important and known deep drawing tests for ferrous and non-ferrous metals, but it is also designed for a large number of additional technological investigations:

### **ERICHSEN Cupping Test** in accordance with

ISO 8490	JIS Z-2247
EN 14-58	JIS Z-7729
EN 14-67	UNI 3037
EN ISO 20482	UNE 7080
BS 3855	GOST 10510
NF A 03-602	ICONTEC 21
NF A 03-652	SIS 11 26 35
ASTM E 643-84	SABS 0132-197
GB 4156-84	

### **ERICHSEN Deep Drawing Cup Test**

in accordance with

ISO 11 531	MSZ 5731-68
DIN 50 155	UNI 6124-67
EN 16-69	JIS Z 2249
GB/T 15825	

on sheet and strip 0.1 to 6.0 mm thick.

**Square Cup Test** (40 x 40 mm)

**Bore Expanding Test D, E, F (KWI Test)**

**Olsen Cupping Test**

**Persoz Cupping Test**

**Deep Drawing Cup Test acc. to Swift I** (32 mm dia.)

**Deep Drawing Cup Test acc. to Swift II** (50 mm dia.)

**Fukui Test**

**Engelhardt Test**

**Determination of the Forming Limit Curves (FLC)**

**LDH Test**

**High Speed Cupping Test**

**Deep Drawing Test with Blankholder Quick**

**Release** (for Earing Test)

**Deep Drawing Test with Preselected Punch Stroke**

**Deep Drawing Test at High Temperatures up to**

**550 °C/ High Temperature Facility up to 900 °C**

**Bulge Test** (50 mm dia. or 100 mm dia.)

**Counter Draw**

**Low Die Clearance Blanking Test**

**Lubricant Test**

**Tensile Test**

**Drift Expanding Test on Tubes** acc. to

DIN EN 10234

**Ring Expanding Test on Tubes** acc. to

DIN EN 10236

**ERICHSEN Cupping Test for Lacquer and Paint**

in accordance with DIN ISO 1520

**Stamping Lacquer Test and Deep Drawing Cup Test on Coil Coatings**

## Description

The Testing Machine is driven electro-hydraulically. The test sequence can be controlled automatically or manually, as desired. A programme logic control is used to control the functions of the machine. Drawing force and blankholder force as well as the drawing punch stroke are displayed digitally. The triple-acting hydraulic system in conjunction with the general design results in the following cost saving simplifications:

- ◆ Blanking press in the test head
- ◆ Hydraulic cup ejector
- ◆ Fully-automatic test sequence.

### **Further technical advantages:**

- ◆ *Cylinder head with bayonet lock* permitting direct access to drawing dies, blanking rings, blank holders etc. and quick and convenient changing of the drawing and blanking tools.
- ◆ *Infinitely variable drawing speed* once set it remains constant throughout the drawing movement, independent of any change of load
- ◆ *Cardanic drawing die retention* ensures the consistent, parallel clamping of the specimen, independent of variations in thickness.

The Sheet Metal Testing Machine, Model 142, was developed not only for testing as a means for continuous production control, using standardised and other established methods, but also for research into all aspects of testing of sheet metal for deep drawing by studying all that is relevant to sheet metal forming.

## Additional Control Functions and Test Methods

Upon request, Model 142, can be equipped with analogue outputs for connection of a PC (incl. software pack).

### **PC and Software Package**

A special software programme has been developed for the modified ERICHSEN cupping test. The signals for the drawing punch stroke, the drawing force and the blankholder force can also be transmitted to a PC via an appropriate amplifier and A/D converter. A force/displacement diagram appears on the VDU.

For conducting the Deep Drawing Cup Test, for example in accordance with DIN 50 155, a special software pack is available producing a force/displacement diagram over the full forming range as well as numerical results for drawing punch stroke, drawing force and blankholder force.

### Hot Drawing Equipment up to 550 °C

A further valuable addition to the possibilities offered by Model 142 is provided by the additional hot drawing equipment (Fig. 1). In this, the blankholder and drawing die are heated in an insulated container and special provision is made to enable these then to be set up without difficulty on the machine. An electronic temperature measuring device is incorporated, and on this the preset intended temperature and the current measure temperature are displayed. The preset temperature can be set up to 550 °C, and in the test, the temperature remains constant within  $\pm 10$  °C.



Fig. 1

### High Temperature Facility up to 900 °C

Due to the close co-operation between ERICHSEN with universities, research institutes and the industry, the possibilities of application of sheet metal testing have multiplied.

A high temperature facility (Fig. 2) enables to characterize the forming behaviour of metal sheets at up to 900 °C. Contrary to the already existing hot drawing equipment (550 °C), here the test panel is inserted directly into the sheet metal testing machine. By means of a temperature measurement temperature profiles can be established.



Fig. 2

### Equipment for High Speed Tests

This optional equipment enables deep drawing tests to be conducted at elevated speeds that arise in practise. The speed of the drawing punch is preselected from 3 m/min to 25 m/min and is digitally displayed. (see Fig. 3)

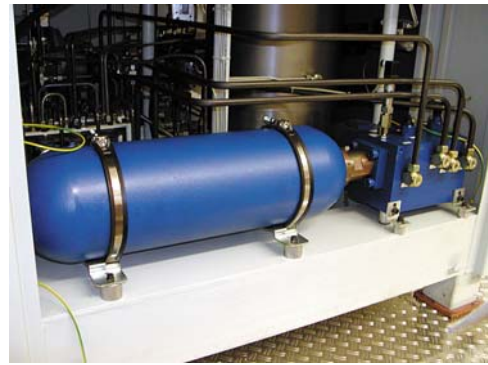


Fig. 3

The Sheet Metal Testing Machines, Models 142, and also all the accessories, can be varied within wide limits to suit special individual requirements. Please let us have details, therewith we shall be pleased to offer equipment to match your needs.

### Technical Data

Drawing force	142-20	200 kN
	142-40	400 kN
Blanking force	142-20	200 kN
	142-40	600 kN
Blankholder force	142-20	up to 100 kN
	142-40	up to 220 kN
Drawing punch stroke	142-20	approx. 80 mm
	142-40	approx. 120 mm
Blankholder stroke		approx. 38 mm
Drawing punch dia.	142-20	up to 50 mm
	142-40	up to 75 mm
FLC test (drawing punch- $\emptyset$ )		up to 100 mm
Bulge test (bulge- $\emptyset$ )		up to 100 mm
Blank diameter	142-20	up to 120 mm
	142-40	approx. 170 mm
Drawing speed	142-20	approx. 800 mm/min
	142-40	approx. 900 mm/min
Digital displays		Resolution:
Drawing punch stroke		0.1 mm
		(on request 0.01 mm)
Drawing force		0.1 kN
Blankholder force		0.1 kN
Mains supply		400 V / 3-, 50/60 Hz
(other voltages on request)		
Power required	142-20	3.0 kW
	142-40	7.5 kW
Dimensions (H x W x D)		
142-20		approx. 1250 x 1250 x 960 mm
142-40		approx. 1250 x 1500 x 1160 mm
Weight, net	142-20	approx. 600 kg
	142-40	approx. 800 kg

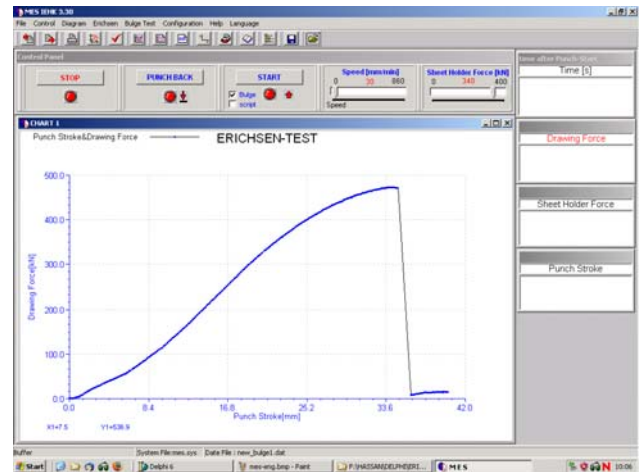
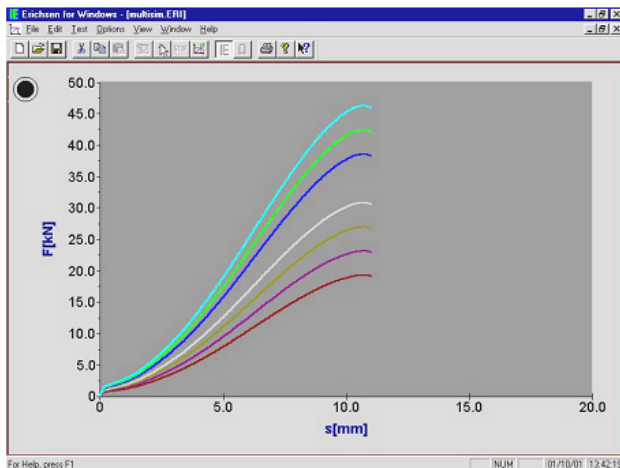
## For the modified ERICHSEN Cupping Test the user can search between two versions of user test software:

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.

The Universal Sheet Testing Machine, Model 142, (as is the case with all the modern electro-hydraulic ERICHSEN Testing Machines) can as an option be equipped with analogue measuring outputs for

- ◆ drawing punch movement,
- ◆ drawing force, and
- ◆ blankholder force.

These analogue measuring signals are transmitted to a PC via an integrated amplifier and an A/D converter and a force/displacement diagram appears on the VDU.



## 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  $A_E$ , tensile strength  $R_{mE}$ , 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.

## Universal User Software

The software enables the control, adjustment, documentation and filing of measuring data of the sheet metal testing machine. Software for recording of force-displacement diagrams such as drawing force and blank holder force, stroke. Creation of scripts (test sequences); presetting of freely selectable parameters such as drawing and blank holder force as well as drawing speed.

The measuring system integrated in the sheet metal testing machine is designed in modular system with analogue and digital inputs and outputs. Hereby drawing force, blank holder force and stroke are acquired. The data will be exchanged with the PC via a USB connection. This programme enables to create and evaluate test sequences for tests e.g. Erichsen deep-drawing cup test, bore expanding test, bulge test, Erichsen deep drawing test (only in connection with the proportional valve technique).

The scope of supply includes PC, VDU and printer.

The right of technical modifications is reserved.  
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