

Notched bar tests —

Part 7: Specification for verification of the test machine used for precision determination of Charpy V-notch impact energies for metals

UDC 620.178.746:006.3/.8

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- British Gas plc
- British Non-Ferrous Metals Federation
- British Railways Board
- British Steel Industry
- Copper Development Association
- Department of Trade and Industry (National Engineering Laboratory)
- Department of Trade and Industry (National Physical Laboratory)
- ERA Technology Ltd.
- GAMBICA (BEAMA Ltd.)
- Ministry of Defence
- Society of British Aerospace Companies Ltd.
- Welding Institute

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- BCIRA
- BEAMA Ltd.
- Electricity Supply Industry in England and Wales
- Lloyds Register of Shipping
- Steel Casting Research and Trade Association
- United Kingdom Atomic Energy Authority

This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee and the Non-ferrous Metals Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1990

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The following BSI references relate to the work on this standard:
Committee reference ISM/NFM/4
Draft for comment 87/37111 DC

ISBN 0 580 17753 X

Amendments issued since publication

Amd. No.	Date of issue	Comments

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Foreword

This Part of BS 131, has been prepared under the direction of the Iron and Steel Standards Policy Committee and the Non-ferrous Metals Standards Policy Committee as an addition to the existing Parts of BS 131. It is intended that this Part of this British Standard should be used in conjunction with BS 131-6 *“Method for precision determinations of Charpy V-notch impact energies for metals”*.

BS 131-6 and BS 131-7 are designed to satisfy the demand from sectors of British Industry for a more stringent standard of Charpy impact testing appropriate to the needs of specific applications where a more precise measure of Charpy impact energy is required.

This Part imposes stricter control on machine parameters than does BS 131-4 and introduces a dynamic validation using reference specimens from a nationally accredited source. Corresponding changes for test method and test pieces are covered by BS 131-6. These changes also mean that the precision test now defined by BS 131-6 and BS 131-7 encompasses the Charpy requirements of ASTM E23-86 published by the American Society for the Testing of Materials¹⁾ (ASTM), and includes the adoption of the ASTM E23 striker.

The requirements of quality control testing will continue to be met by BS 131-1 to BS 131-5 unless BS 131-6 and BS 131-7 are specified in the production standard.

A machine that has been calibrated to BS 131-7 may be used for test to BS 131-2 and BS 131-3 provided that the minimum specified energy is equal or less than 100 J. A machine calibrated to BS 131-4, may not be used to test to BS 131-6. Caution should be exercised when comparing results obtained on machines calibrated to different Parts of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Available from BSI Sales Department, Linford Wood, Milton Keynes, MK14 6LE.

0 Introduction

In an ideal impact machine the energy in the pendulum will be delivered to the test piece at the instant of maximum velocity of the pendulum and all the energy will be available at the centre of percussion. BS 131-6 seeks to approach more closely to this ideal by specifying tolerances for the constructional parameters of the machine which are stricter than those in BS 131-4, yet still readily attainable.

1 Scope

This Part of BS 131 specifies the way in which the test machine used to carry out precision Charpy V-notch impact tests is verified.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purpose of this Part of this British Standard the following definitions apply.

2.1

compensated machine

a machine in which correction for the loss in energy of the pendulum due to windage and friction has been made such that on a free half-cycle of swing of the pendulum from the release position the indicated absorbed energy is zero

2.2

non-compensated machine

a machine in which no correction for loss of energy due to windage and friction has been made

NOTE With a machine of this type the indicated absorbed energy on a free half-cycle of swing of the pendulum will have a small positive value.

2.3

centre of strike

that point on the striking edge of the pendulum at which, in the free hanging position of the pendulum, the vertical plane of the striking edge meets the upper horizontal plane of a test piece of half standard height or equivalent gauge bar resting on the test piece supports

2.4

centre of percussion

that point in a body at which, on striking a blow, the percussive action is the same as if the whole mass of the body were concentrated at that point. When the pendulum delivers a blow along a horizontal line passing through the centre of percussion there is no resulting reaction at the axis of rotation

2.5

initial potential energy

the energy theoretically available when the pendulum is located in the release position

2.6

reference specimen

the test piece of known impact value which can be used as a reference sample for testing the conformity of a machine to the required accuracy of performance

2.7

gauge bar

an unnotched bar made to the same nominal dimensions as a full size test piece

3 Symbols

For the purposes of this Part of this British Standard the following symbols apply.

A	Initial potential energy of pendulum
A_v	Calculated absorbed energy
F_1	Force at centre of strike when the pendulum is horizontal (see Figure 1)
H_f	Height of fall of centre of strike of pendulum (see Figure 1)
H_r	Height of rise of centre of strike of pendulum (see Figure 1)
L_a	Distance between anvils (see Figure 2 and Figure 3)
L_r	Distance of centre of percussion of pendulum from axis of rotation (the radius of gyration) (see Figure 1)
L_s	Length of pendulum from centre of strike of pendulum to axis of rotation (see Figure 1)
M	Moment of pendulum at its centre of strike
R_a	Radius of curvature of anvils (see Figure 2)
t	Time for complete oscillation of pendulum
V	Impact velocity of pendulum at instant of strike
θ_a	Angle of taper of anvils (see Figure 2)
θ_f	Angle of fall of pendulum (see Figure 1)
θ_r	Angle of rise of pendulum (see Figure 1)

4 Principle

Individual details of the machine, i.e. all the dimensional features, are first verified. The overall performance of the machine is then verified by checking that it correctly records the energy values when breaking reference test pieces (see clause 6).

5 Verification of details of test machine

5.1 General

The machine shall be calibrated in joules²⁾ and shall have one or more ranges. The nominal potential energy of these ranges shall be 150 J, 300 J, 450 J and greater in increments of 150 J.

The calibration of measuring apparatus shall be traceable to the National Physical Laboratory either directly or indirectly through a hierarchical chain such as that provided by the British Calibration Service in accordance with the accuracy demanded by the test.

5.2 Frame

In order to minimize undue energy losses in the machine itself the machine shall be made of rigid construction. Looseness of parts shall be avoided.

NOTE The fastening of the anvils to the frame and the bolting of the machine to the foundation are particularly critical in this respect.

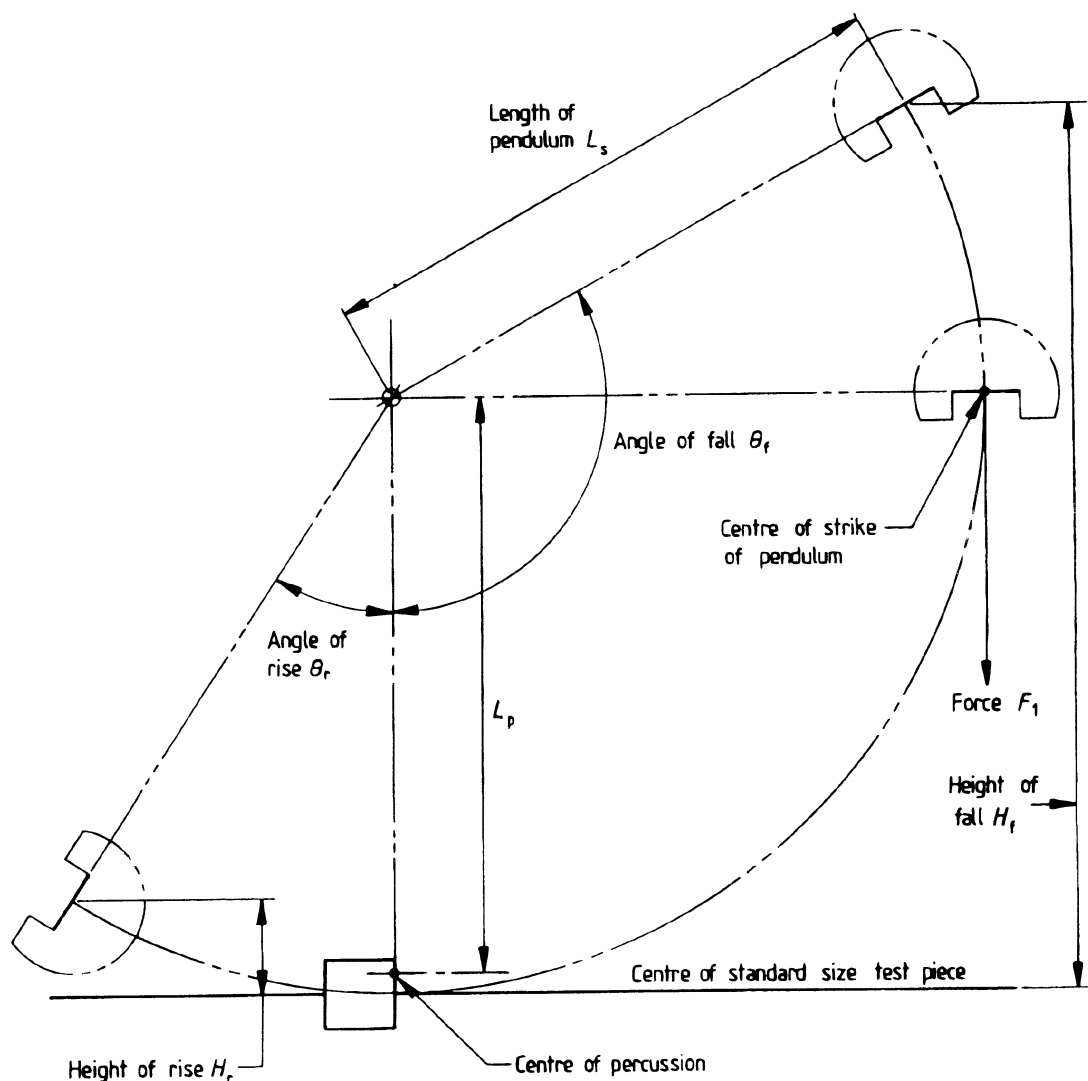


Figure 1 — Relationship of parameters used in calibration of machine

²⁾ 1 J = 1 N m.