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SPECIFICATION FOR
HACKSAW BLADES

BUREAU OF CEYLON STANDARDS

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SLS 577:1982

Gr.10

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SRI LANKA STANDARD
SPECIFICATION FOR HACKSAW BLADES

FOREWORD

This Sri Lanka Standard specification was authorised for adoption and publication by the Council of the Bureau of Ceylon Standards on 1982-09-30, after the draft, finalised by the Drafting Committee on Hacksaw Blades, had been approved by the Mechanical Engineering Divisional Committee.

All values in this specification have been given in SI units.

Hacksaw blades are commonly used for cutting bars, rolled or extruded sections and small pieces of metal plates. The blade is fixed at both ends in a frame which is usually adjustable. Hacksaws are operated by hand and also by power. The type and dimensions of the blades, such as length, thickness, width, pitch and type of teeth are determined by the individual job requirements and the available frame or machine.

This specification deals with most commonly used types of hand or power operated hacksaw blades, which are fixed at both ends and have teeth on one edge only. Bi-metallic and progressive tooth blades are not dealt with in this specification.

This specification takes into account the international agreement so far reached within ISO on hacksaw blades.

The cutting tests specified in this specification are applicable to hand operated blades only. Cutting tests for power operated blades have not been included as information available at present are not sufficient.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value should be the same as that of the specified value in this specification.

The assistance derived from the publications of the International Organization for Standardization (ISO), the British Standards Institution and the Indian Standards Institution in the preparation of this specification is gratefully acknowledged.

1 SCOPE

This specification covers requirements for single toothed edge hacksaw blades for hand and machine operation.

2 REFERENCES

ISO/R/643		ISO RECOMMENDATION - Micrographic determination of the austenitic grain size of steels.
CS	102	Presentation of numerical vlaues.
CS	122	Method for Vickers Hardness test.
SLS	428	Random sampling methods.
SLS	569	Part 1 ISO limits and fits.

3 DEFINITIONS

For the purpose of this specification the following definitions shall apply :

3.1 all hard blade : A blade which is hardened uniformly throughout.

3.2 back edge : The longitudinal edge parallel to the toothed edge.

3.3 blade length (l) : The dimension between the centres of the pin holes, measured along the centre line of the blade.

3.4 centre line : The longitudinal line which passes through the centres of the pin holes.

3.5 cutting edge : The transverse edge of each tooth, formed by the intersection of the flank and the face.

3.6 flexible blade : A blade which is hardened uniformly along the length of toothed edge only.

3.7 flexible centre blade : A blade which is hardened uniformly along the length of toothed edge and the back edge, the remainder being spring tempered.

3.8 face : The surface of the tooth adjacent to the cutting edge, on which the chips impinges as it is cut from the material being sawn.

3.9 **flank** : The surface behind the cutting edge which extends to the root radius.

3.10 **number of teeth (N)** : Number of complete teeth contained in any 25 mm length measured along the toothed edge.

3.11 **overall length** : The dimension between the ends of the blade measured along its centre line.

3.12 **pin hole** : The hole at each end of the blade by means of which the blade is held and tensioned when in use.

3.13 **pitch (P)** : The distance between adjacent cutting edges measured in millimetres.

3.14 **root radius** : The radius connecting the face of one tooth and the flank of the preceding one.

3.15 **spring back blade** : A blade which is hardened uniformly along the length of toothed edge, the remainder being spring tempered.

3.16 **side** : The flat surface between the toothed edge and the back edge.

3.17 **set** : The projection of teeth from the side of the blade, to provide cutting clearance.

3.18 **staggered set** : The transverse setting or staggering or individual teeth.

3.19 **toothed edge** : The longitudinal edge along which the teeth have been formed.

3.20 **teeth** : The serrations formed across the thickness of the blades to provide cutting edges.

3.21 **thickness (t)** : The dimension between the two sides excluding the set.

3.22 **wavy set** : The transverse setting, or staggering of groups of teeth in the form of a wave.

3.23 **width (b)** : The dimension between the toothed edge and the back edge.

4 ABBREVIATIONS

Following abbreviations are used in this specification :

HSS : High speed steel

LA : Low alloy steel

HCS : High carbon steel

5 TYPES AND DESIGNATION

5.1 Types

A hacksaw blade shall be of one of the following types;

a) All hard type ;

b) Flexible type ;

c) Spring back type ; and

d) Flexible centre type.

NOTE - See **6.1.2** *for usage of above types*

5.2 Designation

A hacksaw blade shall be designated as follows;

a) Usage of the hacksaw blade ;

b) Nominal length (l), width (b) and thickness (t) ;

c) Pitch (P), No. of teeth (N) contained in 25 mm may be given in parentheses ;

d) Material ; and

e) The type of the blade

Example :

A hacksaw blade of spring back type for hand operation having nominal length 300 mm width 13 mm thickness 0.65 mm pitch 1.4 mm (with 18 teeth along a distance of 25 mm) and made of low alloy steel will be designated as:

Hand Hacksaw Blade : 300 x 13 x 0.65 x 1.4 (18) L A Spring Back.

6 REQUIREMENTS

6.1 Material

6.1.1 The hacksaw blades shall be made of either low alloy steel (LA) or high speed steel (HSS) or high carbon steel (HCS) and shall be capable, after heat treatment (see **6.3.2**) of satisfying the test requirements given in **6.5.**

6.1.2 The types of hacksaw blades for different usages shall depend on the material of the blade and shall be as shown in Table 1.

TABLE 1 - Usage of hacksaw blades

Usage	All hard type	Flexible type	Spring back type	Flexible centre blade
(1)	(2)	(3)	(4)	(5)
Hand use	HCS, LA, HSS	HCS, LA HSS	LA	LA
Light power use	LA, HSS	LA	LA	LA
Heavy power use	LA, HSS	—	—	—

6.1.3 The hardness, when measured as near to the tip of the tooth as possible, shall be 760 HV minimum.

6.2 Construction

6.2.1 *Teeth*

The teeth shall be cut regularly and clearly along one edge of the blade. The pitch shall be as given in Table 5 to Table 10.

6.2.2 *Set*

The formulation of the set shall be symmetrical along the toothed edge of the blades. Typical types of set are staggered and wavy set (see Fig. 1 and **3.18** and **3.22**).

6.3 Workmanship and treatment

6.3.1 *Workmanship and finish*

The hacksaw blades shall be of uniform thickness, free from burrs, rust, scale and other defects. They shall be reasonably straight true to shape and size. The pin holes shall be neatly punched. The ends of hand hacksaw blades shall be rounded but for power hacksaw blades different shaped ends are permissible.

6.3.2 *Heat treatment*

6.3.2.1 The hacksaw blades shall be so heat treated that they satisfy requirements specified in **6.1.3** and **6.5.1** or **6.5.2** as relevant.

6.3.2.2 On all types of hacksaw blades the area adjacent to the pin holes shall be suitably softened where necessary to reduce the risk of end fracturing during use.

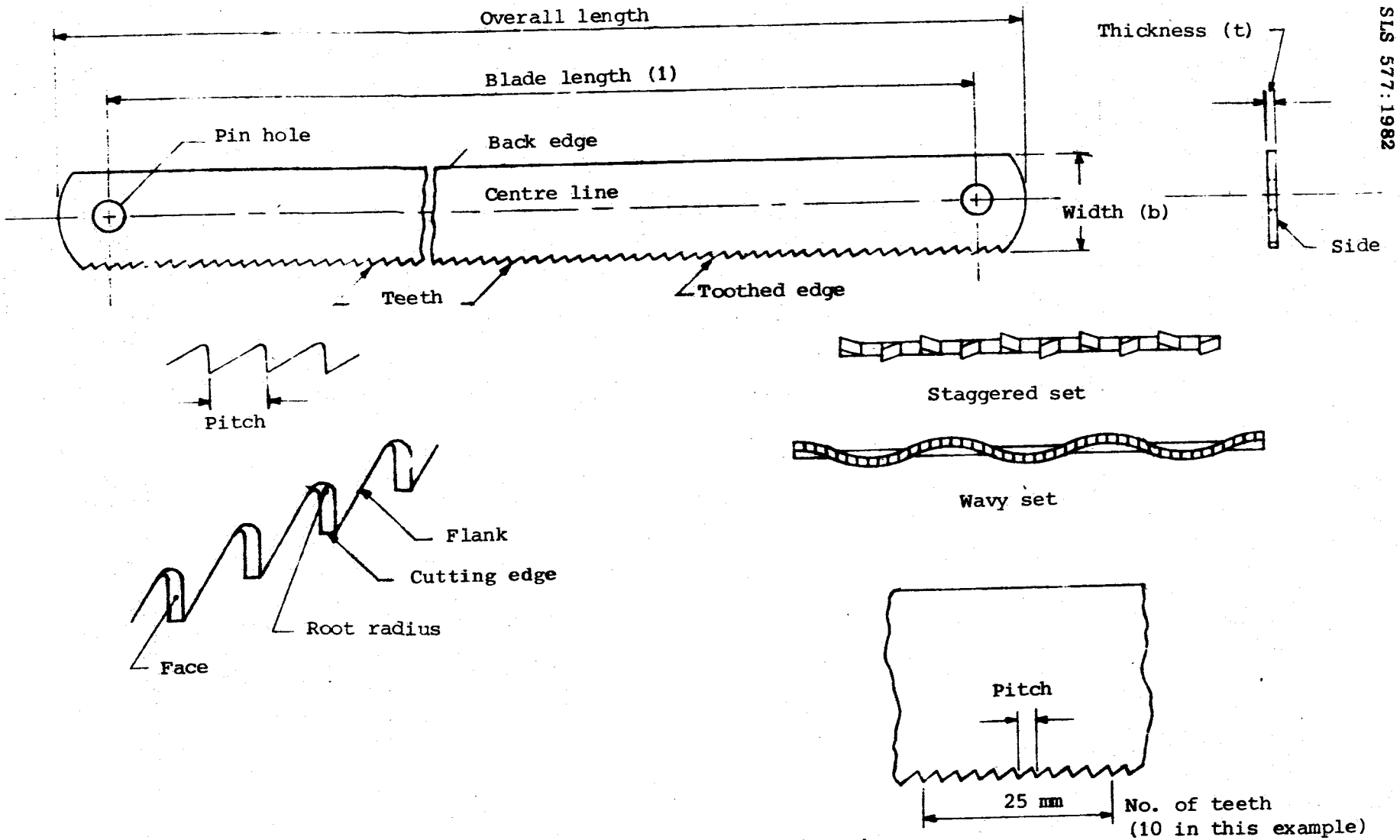


FIGURE 1 - Elements and linear dimensions

6.4 Dimensional characteristics

6.4.1 *Length, width and thickness*

The hacksaw blades shall conform to the dimensions given in Table 5 to Table 10.

6.4.2 *Tolerances*

6.4.2.1 Tolerances on length, width, thickness and pitch

The tolerances on above dimensions shall be as given in Table 2.

TABLE 2 - Tolerances on length, width, thickness and pitch

	dimension mm	**Tolerance** mm
Length (l)	Upto and including 300	± 2
	Over 300	± 3
Width (b)	Upto and including 16	± 1
	Over 16	± 2
Thickness (t)		± 0.1
Pitch (p)		± 0.05

6.4.2.2 Tolerance on back edge

When a straight edge is head against the back edge of a hacksaw blade, the gap between the two edges due to any bowing of the blade shall not exceed $\frac{\text{blade length}}{200}$.

6.4.2.3 Tolerance on side

When the hacksaw blade is tensioned in a hand frame or a machine, according to the frame or machine manufacturer's recommendations, and a straight edge is held against the side of the blade along the centre line, any gap between the straight edge and the side of the blade shall not exceed $\frac{\text{blade length}}{200}$.

6.5 **Properties and performence**

6.5.1 *Bend test*

The hacksaw blades when tested accordance with **9.1** shall satisfy following requirements.

6.5.1.1 All hard type, spring back type and flexible centre type

The blade shall straighten again without fracture or permanent bend.

6.5.1.2 Flexible type

The blade, with the exception of the hardened portion, shall be capable of being straightened again without fracture.

6.5.2 *Cutting test (for hand operated blades)*

The hacksaw blades when tested in accordance with **9.2** shall cut the number of sections specified in Columns 3, 4 or 6 of Table 3 and the maximum time to be taken for the final section shall conform to the time specified in Columns 3, 5 and 7 of Table 3 respectively.

TABLE 3 - Cutting test for hand operated blades

1	2	3	4	5	6	7
Tooth pitch mm	HCS and LA types		HSS all hard type		HSS flexible type	
	No. of sections to be cut	Max. cutting time for final section in min.	No. of sections to be cut	Max. cutting time for final section in min.	No. of sections to be cut	Max. cutting time for final section in min.
1.8	16	6	36	6	24	6
1.4	16	6	36	7	24	7
1.0	16	6	36	9	24	7
0.8	12	12	12	11	8	11

7 PACKAGING

The blades shall be coated with a suitable preservative or paint. Each wrapped packet shall contain five or ten blades and a suitable number of such packets shall be packed in a suitable carton.

8 MARKING

8.1 Marking of each blade

Each blade shall be legibly and indelibly marked with the following:

a) Size designation of the blade (see 5.2); and

b) Name or registered trade mark of the manufacturer or both.

8.2 Marking of cartons

Each carton shall be legibly and indelibly marked with the following:

a) Size designation of the blade (see 5.2); and

b) Distinguishing name or mark which ensures the identity of the manufacturing origin of the blades.

9 METHODS OF TEST

9.1 Bend test

9.1.1 *All-hard type*

Each sample blade of this type shall be bent to lie on the periphery of a test block 250 mm in diameter (see Fig. 2a).

9.1.2 *Flexible type*

Each sample blade shall be bent around the whole circumference of a test bar 60 mm in diameter (see Fig. 2b).

9.1.3 *Spring-back and flexible-centre types*

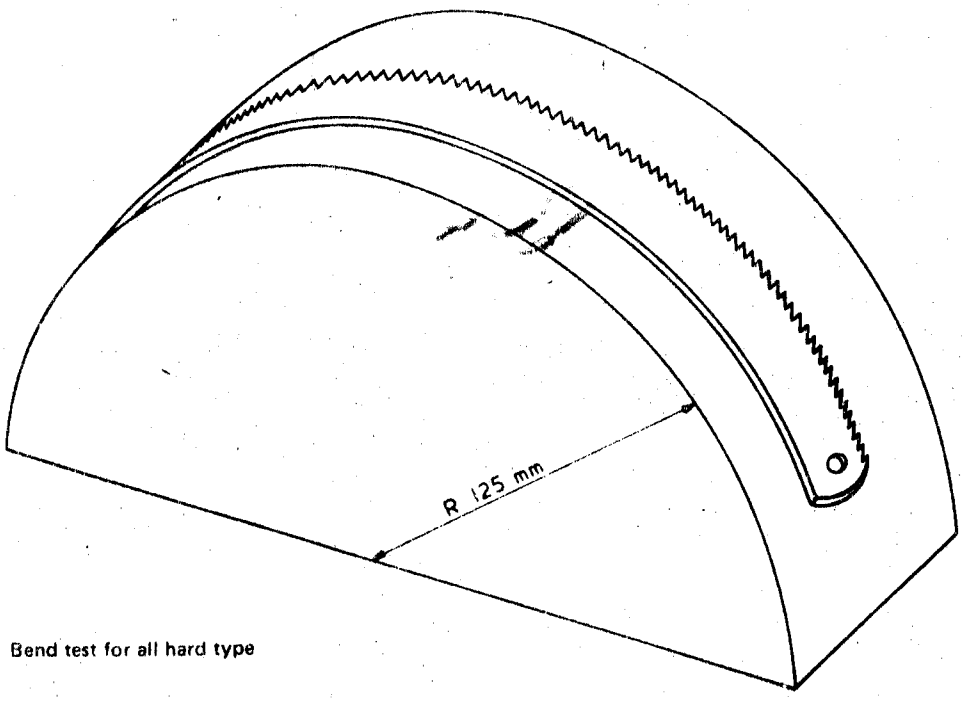
Each sample blade shall be bent around half the circumference of a test bar 100 mm in diameter (see Fig. 2c).

9.2 Cutting tests

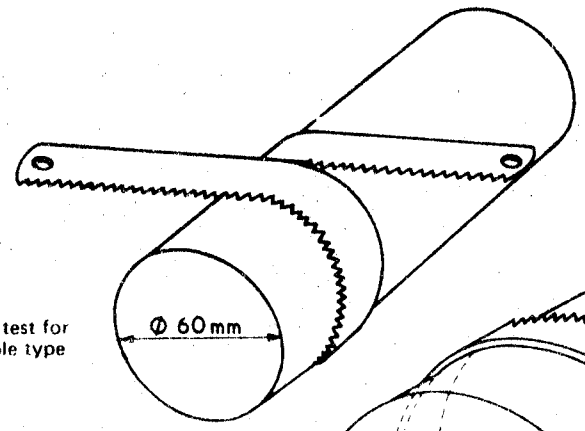
9.2.1 *Machine for tests*

The cutting tests shall be carried out on a suitable hacksaw machine which shall be in good condition, particularly in respect of storke alignment and freedom from excessive vibration. The machine shall have gravity feed, shall cut on the forward stroke and shall present the blade at an inclination of between $1\frac{1}{2}^{\circ}$ and 3° relative to the machine slides, as shown in Fig. 3. The speed of the machine shall be 64 ± 2 cutting strokes per minute and the length of the stroke shall be 150 mm.

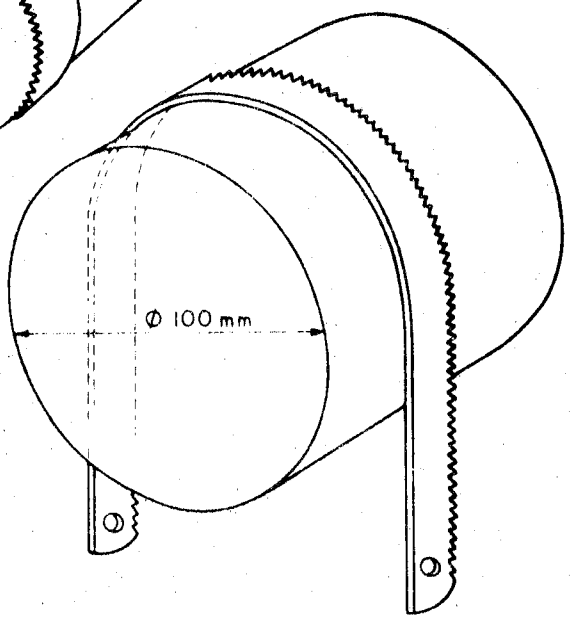
The test bar shall be so located that, when the machine is at mid-stroke, the bar is positioned in the central portion of the blade.



a. Bend test for all hard type



b. Bend test for flexible type



c. Bend test for spring-back type

FIGURE 2 - Bend tests

The total mass of the reciprocating arm, measured by a spring balance hanging vertically above the test bar when the machine is at mid-stroke, shall be 5.5 kg.

The method of measuring the load (That is the total mass of the reciprocating arm) is shown in Fig. 3.

The reciprocating arm shall not be lifted on the return stroke.

No cutting lubricant shall be used.

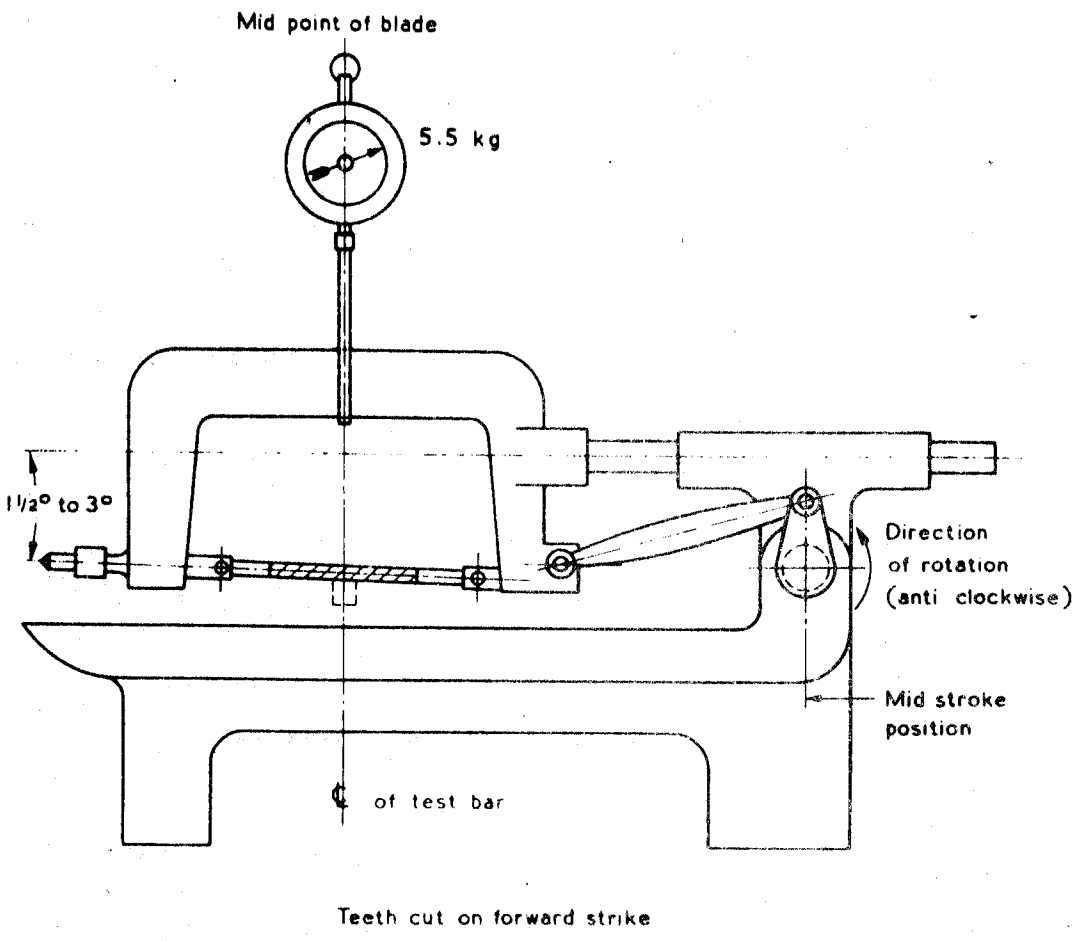


FIGURE 3 - Correct method of positioning test bar and measuring load

9.2.2 *Test bar*

9.2.2.1 The test bar for use during cutting test shall be prepared from steel having the following chemical analysis:

Carbon	:	not less than 0.60% nor more than 0.65%
Silicon	:	not less than 0.15% nor more than 0.30%
Manganese	:	not less than 0.60% nor more than 0.70%
Sulphur	:	not less than 0.025% nor more than 0.05%
Phosphorus	:	not more than 0.05%

The steel shall have a McQuid-Ehn grain size of from 3 to 5 (determined in accordance with ISO/R/643). The hardness of the test bar shall comply with 9.2.2.3 and the bar shall be free from residual magnetism.

9.2.2.2 When blades of the low alloy steel and high carbon steel types are to be tested, the selection of the test bar shall be 25 mm square machined on all sides and heat treated by normalizing to a hardness within the range 200-220 HV 30 (See CS 122).

9.2.2.3 When blades of the high speed steel type are to be tested, the section of the test bar shall be 28 mm diameter machined on the periphery and heat treated by hardening and tempering to a hardness within the range 305-335 HV 30 (See CS 122).

9.2.2.4 The position of the test bar shall not be changed for the purpose of causing any unused portion of the blade to cut.

10 SCALE OF SAMPLING

10.1 In any consignment, all blades of one type and designation belonging to the one batch of manufacture shall constitute a lot.

10.2 The samples shall be inspected from every lot for ascertaining its conformity to the requirements of this specification.

10.3 The number of blades to be selected from the lot shall be in accordance with Column 1 and 2 of the Table 4.

TABLE 4 - Scale of sampling

No. of blades in the lot (1)	No. of blades to be selected (2)	Acceptance No. (3)	Sub-sample size (4)
Upto 1000	20	1	3
1001 to 3000	32	2	5
3001 and above	50	3	8

10.4 If the blades are packed in packets, as a first step packets shall be selected. The number of packets to be selected from the lot shall be same as the corresponding number of blades to be selected from the lot. One blade shall be taken from each packet selected to form a sample.

10.5 Packets and blades shall be selected at random.. In order to ensure randomness of selection, random number tables as given in **SLS 428** shall be used.

11 NUMBER OF TESTS

11.1 All the blades in the sample shall be inspected for the following requirements:

a) Construction;

b) Workmanship; and

c) Dimensional requirements.

11.2 A sub-sample of size as given in Column 4 of Table 4 shall be selected at random and shall be subjected to the tests given in **9** as applicable.

12 CRITERIA FOR CONFORMITY

The lot shall be considered as conforming to the requirements of this specification if the following conditions are satisfied.

12.1 The number of blades not conforming to any one or more requirements inspected as in 11.1 is less than or equal to the corresponding acceptance number given in Column 3 of Table 4.

12.2 All blades of the sub-sample tested as in 11.2 satisfy the relevant requirements.

TABLE 5 - Dimensions of blades for hand use: low alloy steel; all hard, flexible, flexible centre and spring-back types

Size designation	Blade length (l)	Width (b)	Thickness (t)	Pitch (P)	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm			mm
250 x 13 x 0.65 x 1.4(18)	250	13	0.65	1.4	18	4	265
250 x 13 x 0.65 x 1.0(24)	250	13	0.65	1.0	24	4	265
300 x 13 x 0.65 x 1.8(14)	300	13	0.65	1.8	14	4	315
*300 x 13 x 0.65 x 1.4(18)	300	13	0.65	1.4	18	4	315
*300 x 13 x 0.65 x 1.0(24)	300	13	0.65	1.0	24	4	315
*300 x 13 x 0.65 x 0.8(32)	300	13	0.65	0.8	32	4	315

TABLE 6 - Dimensions of blades for light power use: low alloy steel, all hard, flexible, flexible-centre and spring-back types

Size designation	Blade length (l)	Width (b)	Thickness (t)	Pitch (P)	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm		mm	mm
300 x 16 x 0.8 x 1.8(14)	300	16	0.8	1.8	14	5	315
300 x 16 x 0.8 x 1.4(18)	300	16	0.8	1.4	18	5	315
300 x 16 x 0.8 x 1.0(24)	300	16	0.8	1.0	24	5	315

* *In accordance with ISO 2336*

\+ *See SLS 569:Part 1*

TABLE 7 - Dimensions of blades for heavy power use: low alloy steel: all-hard type

Size designation	Blade length (1)	Width	Thickness	Pitch	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm		mm	mm
*300 x 25 x 1.25 x 2.5(10)	300	25	1.25	2.5	10	8.2	330
*300 x 25 x 1.25 x 1.8(14)	300	25	1.25	1.8	14	8.2	330
*350 x 25 x 1.25 x 2.5(10)	350	25	1.25	2.5	10	8.2	380
*350 x 25 x 1.25 x 1.8(14)	350	25	1.25	1.8	14	8.2	380
*350 x 32 x 1.6 x 2.5(10)	350	32	1.6	2.5	10	8.2	380
400 x 25 x 1.25 x 2.5(10)	400	25	1.25	2.5	10	8.2	430
400 x 25 x 1.25 x 1.8(14)	400	25	1.25	1.8	14	8.2	430
*400 x 32 x 1.6 x 2.5(10)	400	32	1.6	2.5	10	8.2	430

* *In accordance with ISO 2336*

\+ *See SLS 569:Part 1*

TABLE 8 - Dimensions of blades for hand use: high speed steel: and high carbon steel all-hard and flexible type

Size designation	Blade length (l)	Width (b)	Thickness (t)	Pitch (P)	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm		mm	mm
250 x 13 x 0.65 x 1.4(18)	250	13	0.65	1.4	18	4	265
250 x 13 x 0.65 x 1.0(24)	250	13	0.65	1.0	24	4	265
300 x 13 x 0.65 x 1.8(14)	300	13	0.65	1.8	14	4	315
*300 x 13 x 0.65 x 1.4(18)	300	13	0.65	1.4	18	4	315
*300 x 13 x 0.65 x 1.0(24)	300	13	0.65	1.0	24	4	315
*300 x 13 x 0.65 x 0.8(32)	300	13	0.65	0.8	32	4	315

TABLE 9 - Dimensions of blades for light power use: high speed steel: all-hard type

Size designation	Blade length (l)	Width (b)	Thickness (t)	Pitch (P)	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm		mm	mm
300 x 16 x 0.8 x 1.8(14)	300	16	0.8	1.8	14	5	315
300 x 16 x 0.8 x 1.4(18)	300	16	0.8	1.4	18	5	315
300 x 16 x 0.8 x 1.0(24)	300	16	0.8	1.0	24	5	315

**In accordance with ISO 2336*

+See SLS 569:Part 1

TABLE 10 - Dimensions of blades for heavy power use: high speed steel: all-hard type

Size designation	Blade length (l)	Width (b)	Thickness (t)	Pitch (P)	No. of teeth per 25 mm (N)	Pin hole diameter (tolerance H14)+	Overall length (max.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	mm	mm	mm	mm		mm	mm
*300 x 25 x 1.25 x 2.5(10)	300	25	1.25	2.5	10	8.2	330
*300 x 25 x 1.25 x 1.8(14)	300	25	1.25	1.8	14	8.2	330
*350 x 25 x 1.25 x 2.5(10)	350	25	1.25	2.5	10	8.2	380
*350 x 25 x 1.25 x 1.8(14)	350	25	1.25	1.8	14	8.2	380
*350 x 32 x 1.6 x 4.0(6)	350	32	1.6	4.0	6	8.2	380
*350 x 32 x 1.6 x 2.5(10)	350	32	1.6	2.5	10	8.2	380
*400 x 32 x 1.6 x 4.0(6)	400	32	1.6	4.0	6	8.2	430
*400 x 32 x 1.6 x 2.5(10)	400	32	1.6	2.5	10	8.2	430
*400 x 40 x 2.0 x 6.3(4)	400	40	2.0	6.3	4	8.2	430
*400 x 40 x 2.0 x 4.0(6)	400	40	2.0	4.0	6	8.2	430
*450 x 32 x 1.6 x 4.0(6)	450	32	1.6	4.0	6	10.2	485
*450 x 32 x 1.6 x 2.5(10)	450	32	1.6	2.5	10	10.2	485
*450 x 40 x 2.0 x 6.3(4)	450	40	2.0	6.3	4	10.2	485
*450 x 40 x 2.0 x 4.0(6)	450	40	2.0	4.0	6	10.2	485
525 x 40 x 2.0 x 4.0(6)	525	40	2.0	4.0	6	10.2	560
525 x 45 x 2.25 x 4.0(6)	525	45	2.25	4.0	6	10.2	560
600 x 45 x 2.25 x 4.0(6)	600	45	2.25	4.0	6	10.2	635
600 x 50 x 2.5 x 6.3(4)	600	50	2.5	6.3	4	10.2	635
600 x 50 x 2.5 x 4.0(6)	600	50	2.5	4.0	6	10.2	635
750 x 63 x 2.5 x 6.3(4)	750	63	2.5	6.3	4	10.2	805

* *In accordance with ISO 2336*
\+ *See SLS 569:Part 1*

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