

*For comments only**Draft**Indian Standard***BICYCLES – CRANKS AND CHAIN WHEELS – SPECIFICATION***(Third Revision of IS 1281)*

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FOREWORD

(Formal clauses will be added later)

This standard was first issued in 1958 and subsequently revised in 1968 and 1996. The present revision has been taken up to make it up to date and to take into account the experience gained since the adoption and the present trade practices.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard covers the requirements for cranks and chain wheels intended for the chain drive and fitted on the bottom bracket axle of bicycles in use in the country.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of the standards. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
2062: 2006	Hot rolled low, medium and high tensile structural steel (<i>sixth revision</i>)
734:1975	Wrought aluminium and aluminium alloys, forging stock and forgings for general engineering purposes (<i>second revision</i>)
1283: 1995	Bicycles - Free-wheels – Specification (<i>second revision</i>)

3203: 1982	Methods of testing local thickness of electroplated coatings (<i>first revision</i>)
1068: 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium (<i>third revision</i>)
2403: 1991	Short pitch transmission precision roller chains and chain wheels (<i>second revision</i>)
2500 (Part 1): 2000	Sampling inspection procedures: Part 1 Attribute sampling plans indexed by acceptable quality limit (AQL) for lot-by-lot inspection (<i>third revision</i>)

3 CLASSIFICATIONS

Chain wheels and cranks shall be classified as shown in Table 1 according to the number of chain wheels and the type of assembling to the bottom bracket axle. The cranks shall be the right crank and the left crank. This term means the same hereafter. Refer figs 1, 2, 3, 4 and 5 for details.

Table 1 Classification of chain wheels and cranks
(Clause 3)

Type	No. of Chain Wheels	Type of Assembling to Bottom Bracket Axle
Single cotter type	Single	Cotter type
Single cotter-less type		Cotter-less type
Double cotter-less type	Double	
Triple cotter-less type	Triple	
Note: The words single, double and triple indicate the number (one, two and three) of the chain wheels		

4. MATERIAL

4.1 Cranks

The cranks shall be made from steel designation Fe 540 conforming to IS 2062 or any suitable steel meeting the requirements laid down in **8** and shall be plastic coated without covering the functional areas as per the agreement between buyer and supplier.

4.1.1 Alternatively the cranks shall be made of aluminium alloy conforming to designation 65032 of IS 734 meeting the requirements laid down in **8**.

4.2 Chain Wheels

The chain wheels shall be made of steel conforming to IS 2062.

Note. -- In addition to minimum properties specified the steels used for the manufacture of cranks and chain wheels shall have other metallurgical properties, which would make them suitable for fabrication of the particular component as agreed between the buyer and the supplier

5 DIMENSIONS

5.1 The main dimensions of cranks, chain wheels and crank chain wheel assembly shall be as indicated in Fig. 1 to 6 and Tables 2 and 3. These dimensions are indicative dimensions only and in case of specific agreements between buyer and supplier the dimensions may be changed wherever applicable.

Note: Fig 6 and Table 2 and 3 are given to set a general guideline for thickness and other dimensions.

Table 2 Tooth Thickness ‘C’

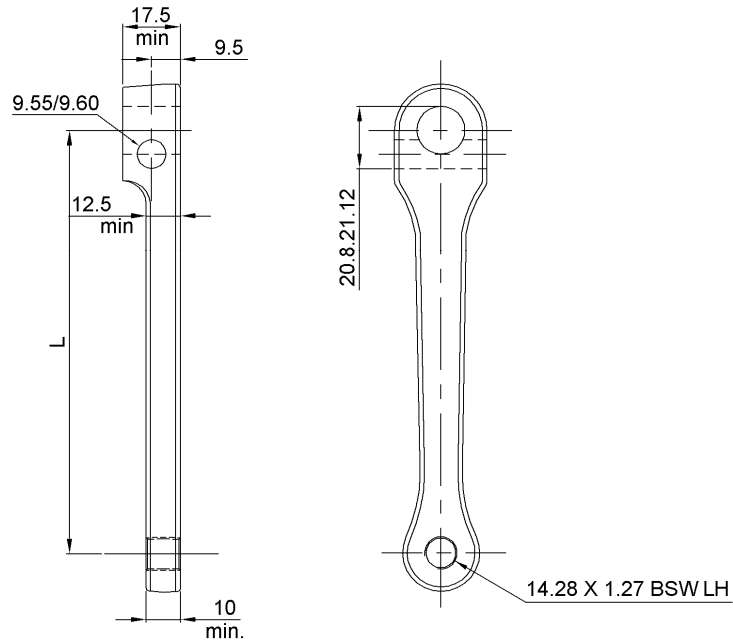
(Clause 5.1, Fig 6)

Tooth Thickness Designation	Tooth Thickness (mm)	
	Maximum Thickness	Tolerance
3/32	2.1	0 / -0.3
1/8	3.0	0 / -0.4

Table 3 Dimensions of Chain Wheel

(Clause 5.1, Fig 6)

Number of Teeth	Dimensions (mm)			Number of Teeth	Dimensions (mm)		
	Pitch Circle Diameter A	Root Circle Diameter B	Distance Between Roots of Tooth		Pitch Circle Diameter A	Root Circle Diameter B	Distance Between Roots of Tooth
24	97.3	89.55	-				
26	105.36	97.61	-	43	173.98	166.23	166.12
28	113.43	105.68	-	44	178.02	170.27	-
30	121.5	113.75	-	45	182.06	174.31	174.2
31	125.53	117.78	117.62	46	186.1	178.35	-
32	129.57	121.82	-	47	190.14	182.39	182.29
33	133.61	125.86	125.7	48	194.18	186.43	-
34	137.65	129.9	-	49	198.22	190.47	190.37
35	141.68	133.93	133.79	50	202.26	194.51	-
36	145.72	137.97	-	51	206.3	198.55	198.45
37	149.75	142	141.87	52	210.34	202.59	-
38	153.79	146.04	-	53	214.38	206.63	206.54
39	157.83	150.08	149.95	54	218.42	210.67	-
40	161.87	154.12	-	55	222.46	214.71	214.62
41	165.91	158.16	158.03	56	226.5	218.75	-
42	169.95	162.2	-	57	220.57	222.75	222.7

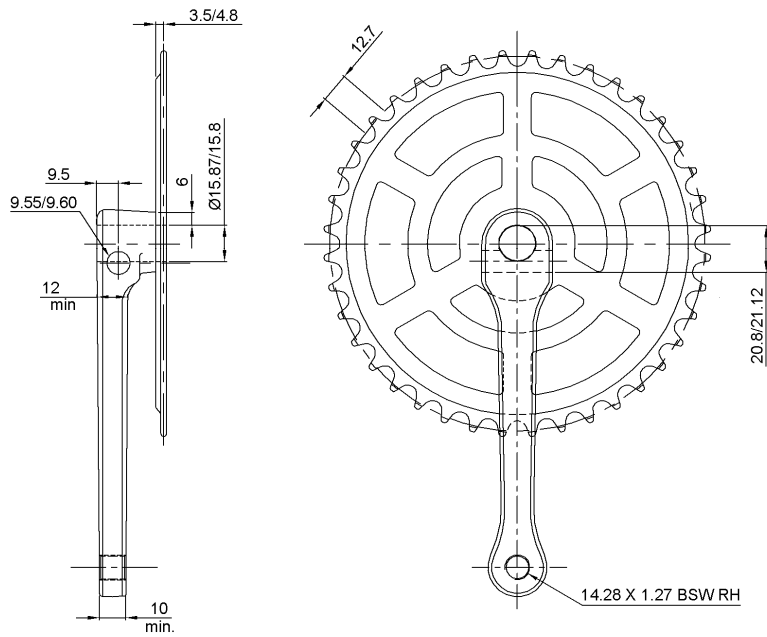


Unit :- mm

NOTE:-

The illustration is diagrammatic only & is not intended to illustrate details of design.

Fig 1 Left Crank - Cotter type



Unit :- mm

NOTE:-

The illustration is diagrammatic only & is not intended to illustrate details of design.

Fig:- 2 Right Crank with Chain Wheel - Cotter type

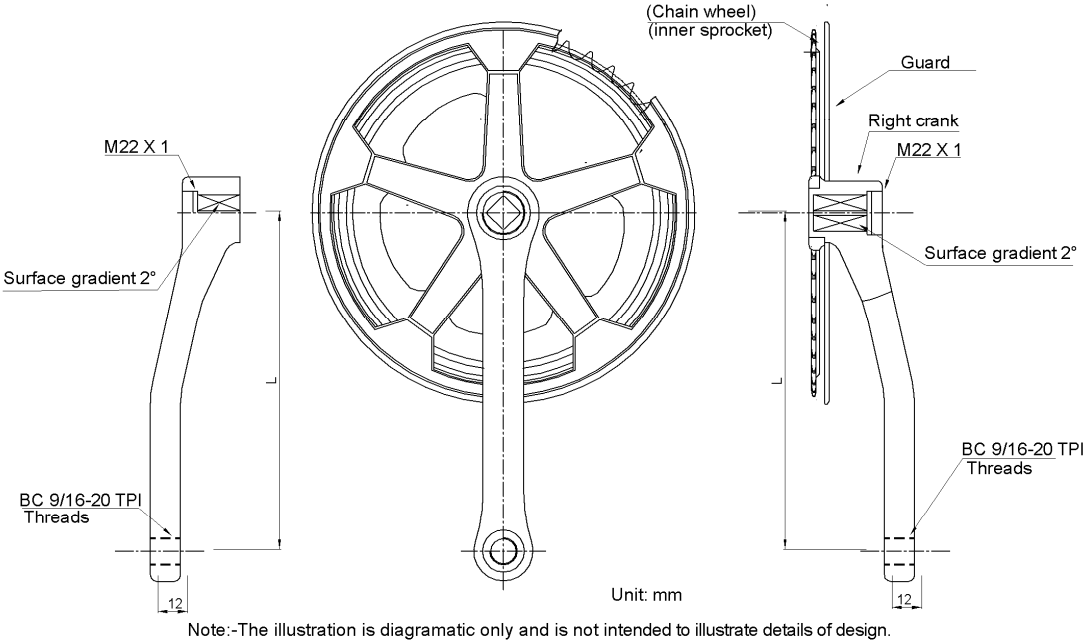


Fig 3 Single Speed - Left Crank & Right Crank with Chain Wheel - Cotter-less Type

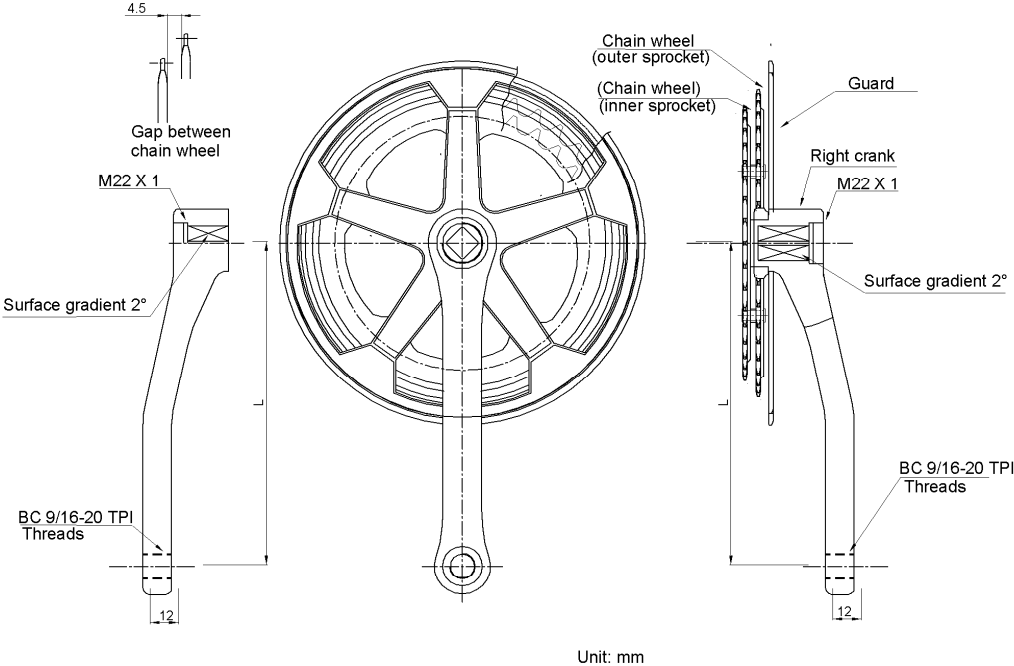
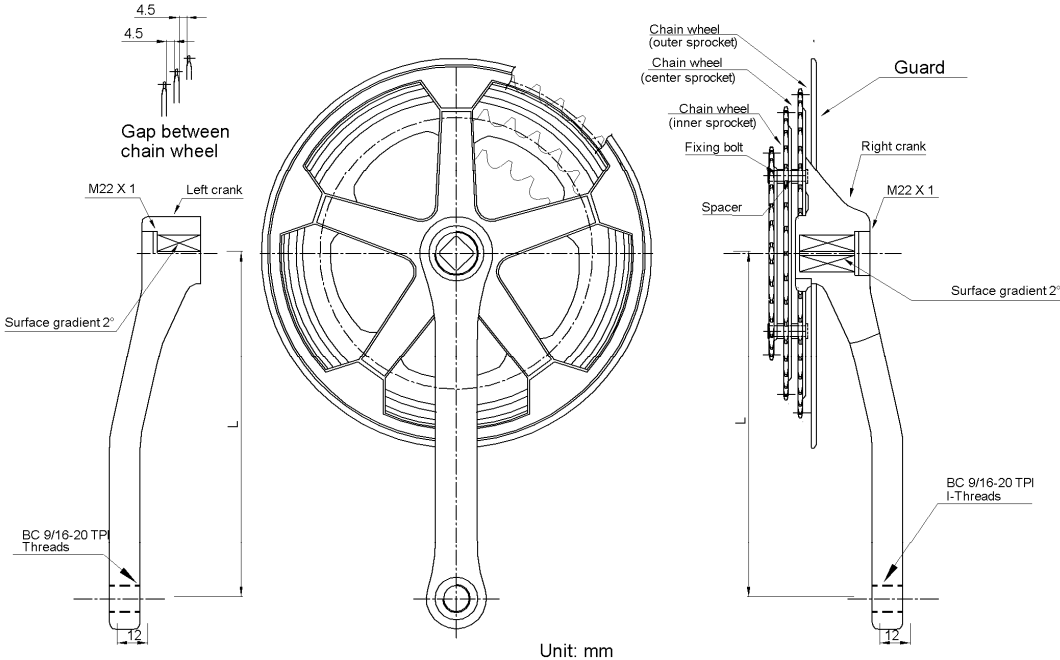
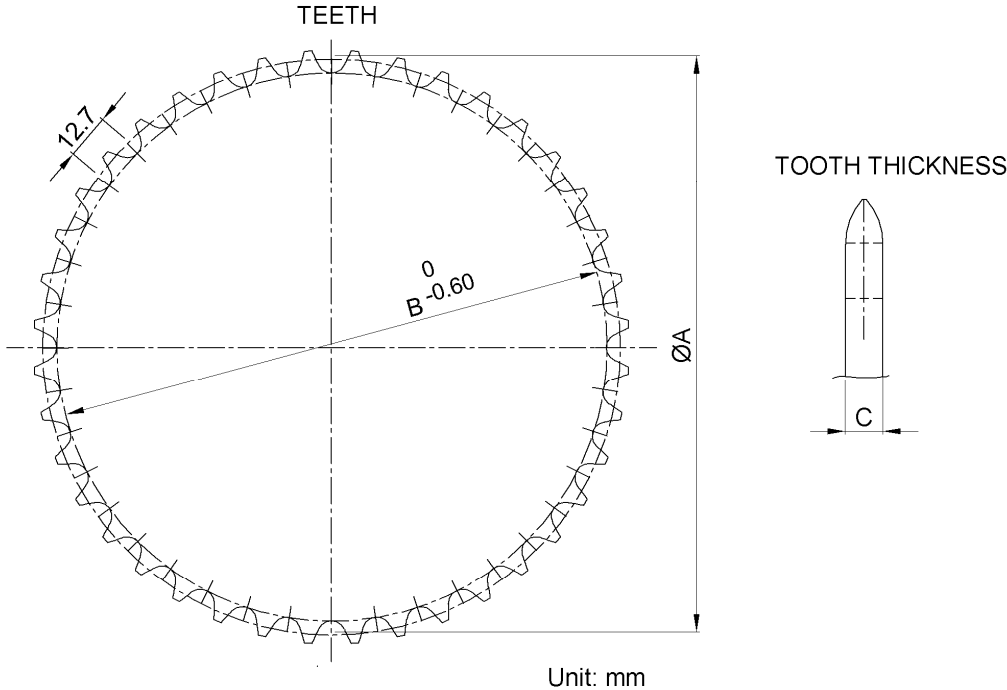


Fig 4 Double Speed - Left Crank & Right Crank with Chain Wheel - Cotter-less Type



Note:-The illustration is diagrammatic only and is not intended to illustrate details of design.

Fig 5 Triple Speed - Left Crank & Right Crank with Chain Wheel - Cotter-less Type



Note:-The illustration is diagrammatic only and is not intended to illustrate details of design.

Fig - 6 Dimensions of Chain Wheel

5.2 In case of plastic coated cranks the thickness of plastic coating shall be as agreed between the buyer and the supplier.

5.3 Length of the crank shall be as agreed to between buyer and supplier. However the nominal length of the crank given below is for guidance only:

Length of crank L (mm)	89, 102, 114, 127, 140, 152, 165, 170, 175 or 178
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6. WORKMANSHIP

6.1 The construction of the respective parts of the chain wheel and crank shall be as follows:

6.1.1 The joints between each part shall be firm, reliable and free from looseness, play and so on.

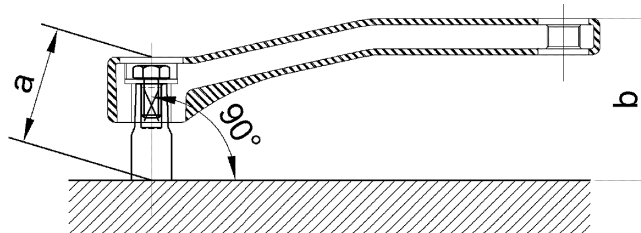
6.1.2 The deflection of chain wheels at tooth bottom shall be in accordance with Table 4.

Table 4 Deflection of Chain wheel
(Clause 6.1.2)

Division	Cotter type	Cotter-less type	Cotter-less type
	Single		Double and Triple types
Concentricity	0.5mm or under	-	-
Squareness	1mm or under	1mm or under	1mm or under

6.1.3 The crank spindle bore and pedal spindle bore shall be parallel, and the surface contacting the barreled part of the pedal of the pedal spindle shall be perpendicular to the pedal spindle bore.

6.1.4 When the crank is fitted to a test crank spindle installed vertically on a flat surface by the same method as in service condition, and the dimensions a and b shown in Fig 7 are measured, b shall not be smaller than a .



Remarks:-

The value $b-a$ is called crank - offset.

Fig 7 Offset of Crank

6.1.5 When cotter-less type cranks are fitted to a test crank spindle, the phase difference between the left crank and the right crank shall be within 2 degrees.

6.2 Cranks shall not show any forging defects, such as cracks, pitting, scales, and burrs etc. Cranks shall have sufficient material all round, the cranks shall be finished smooth. All sharp edges shall be rounded off.

6.3 The teeth shall be accurate and true and shall suit the bicycles chain (see IS 2403). The tooth tips of the chain wheels shall be chamfered. It shall be free from burrs, flash, cracks and others defects and concentric with the hole on the crank for bottom bracket axle.

6.4 Punching marks shall be free from deficient stamping, displacement of position and other defects.

6.5 The axle hole shall have a minimum of 6.5 mm material all around.

7. FINISH

7.1 Cranks and chain wheels shall be nickel and chromium plated or powder coated. The Nickel and Chrome plating shall conform to 'service grade No-1'. The method described in IS 3203 or IS 1068 may be used to measure the coating thickness of the individual layer. In case of powder coating thickness of coating shall be kept not less than 40 microns without affecting the functional requirements.

7.2 In case of plastic coated cranks colour and texture shall be based on the agreement between buyer and seller.

7.3 In case of alloy cranks colour, finish & texture shall be based on the agreement between buyer and seller.

7.4 The plated / powder coated surface shall be free from visible surface defects, such as pits, blisters, cloudy patches, uncovered areas, spot cracks or stains. The surface coating shall adhere firmly to the base metal and shall be non porous. Plastic coating shall be free from excess fins & splash.

8. TESTS

8.1 Chain Wheel Fixing Strength Test (cotter & cotter less)

The assembly (*see* Fig. 8) shall be rigidly fixed in a vertical plane having the crank horizontal. Through suitable means, load shall be applied on the hole for the pedal spindle. The assembly shall sustain a load of 2270 N (227 kgf) minimum without showing any sign of yielding at the point. The crank bending shall not start till the load increases above 1800 N (180 kgf).

In case of double or triple type chain wheel, the outer chain wheel is taken as the reference for loading.

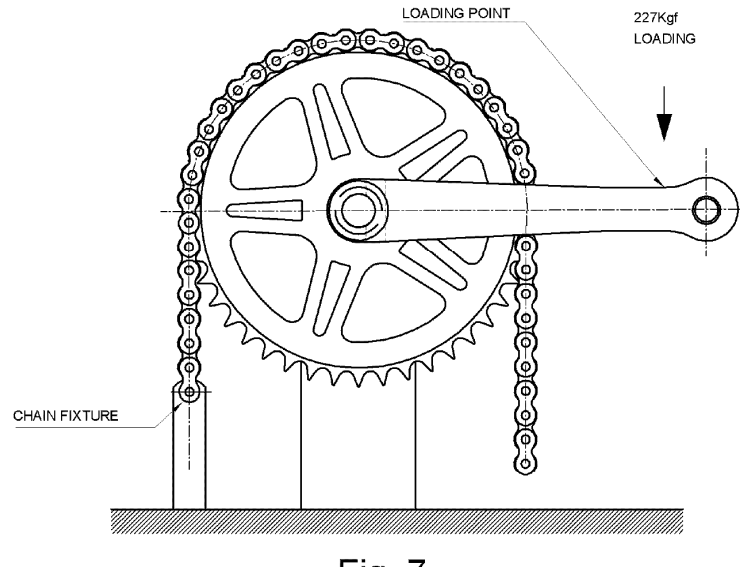


Fig 8 Testing Details

8.2 Static Load Strength for Pedal Fixing Point (cotter less)

When the crank is fixed horizontally with a test crank spindle and with a test pedal spindle fitted to the crank, a vertical load of 1500 N (150 kgf) is gently applied to the loading point as shown in Fig 9 for one minute and then when the load is removed, the displacement of the loading point shall be within 2mm.

The fastening torque of the fixing nut or fixing bolt used to fix the cotter-less type crank to the test crank spindle shall be 40 ± 5 N-m (400 ± 50 kgf-cm)

8.3 Drop Impact Test for the Crank in Horizontal Position (cotter less)

When a mass of 10 kg (including a weight base) being dropped from a height of 150mm to the test crank which is fixed to the vertical set test crank spindle as shown in the Fig. 10, the crank shall not break and the permanent strain at the measuring point shown in Fig 10 shall not exceed 5mm.

The fastening torque of the fixing nut or fixing bolt used to fix the cotter-less type crank to the test crank spindle shall be 40 ± 5 N-m (400 ± 50 kgf-cm)

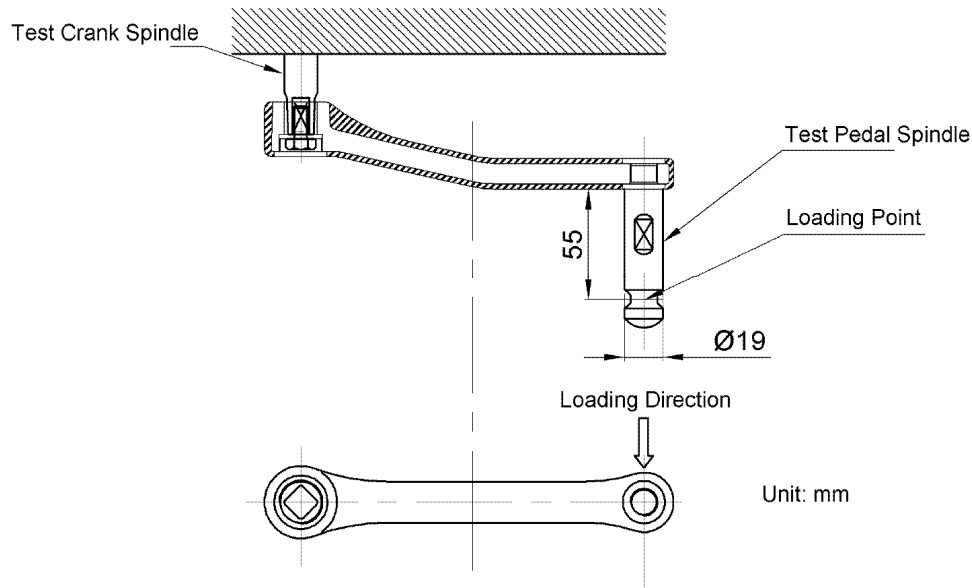


Fig 9 Static Loading Test for Pedal Fitting Point

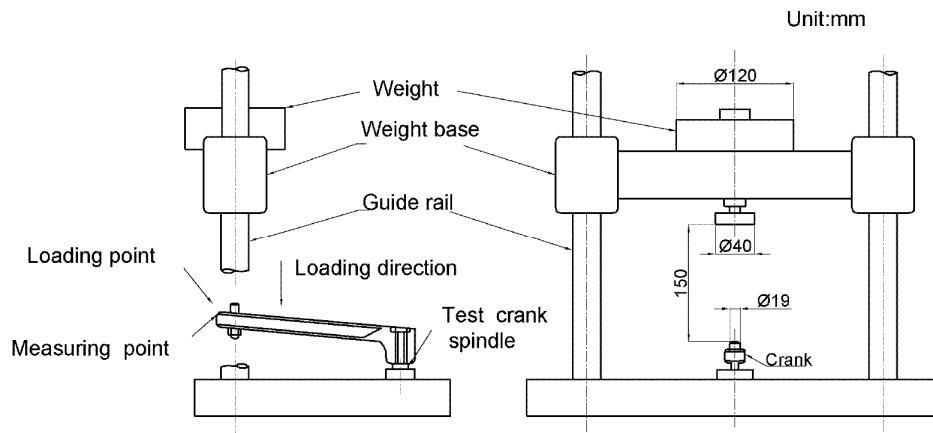


Fig 10 Drop Impact Test for Crank in Horizontal Position

8.4 Drop Impact Test for the Crank in Vertical Position (cotter less)

When a mass of 10 kg (including a weight base) being dropped from a height of 1000mm (500mm if the length of the crank is 140mm or less) to the test crank, which is fixed as shown in Fig 11, the crank shall not break. In case the crank is made of steel this test can be omitted.

The fastening torque of the fixing nut or fixing bolt used to fix the cotter-less type crank to the test crank spindle shall be 40 ± 5 N-m (400 ± 50 kgf-cm)

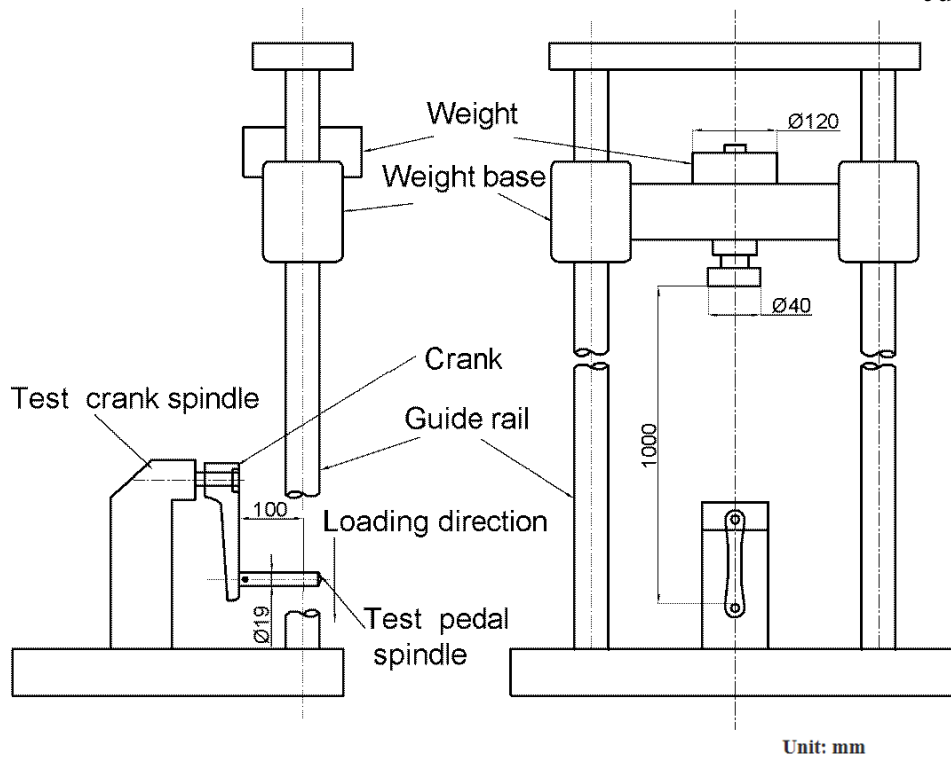


Fig: - 11 Drop Impact Test for Crank in Vertical Position

8.5 Repeated Fatigue Strength for Crank (cotter less)

When the crank is fixed to the test pedal spindle and the test crank spindle, the crank lowering angle is made $35 \pm 2^\circ$ and the chain wheel is fixed with the chain as shown in Fig 12 and the load of 1200 N (120 kgf), {600 N (60 kgf) for cranks having length 140mm or less} is applied 1,00,000 times to the position 110mm apart from the fitting point of the crank of test pedal spindle at a rate of 60 times per minute. There shall not be any breakage in the crank slackening in the fixing part of the crank and the crank spindle. In case of crank made of steel this test can be omitted.

The fastening torque of the fixing nut or fixing bolt used to fix the cotter-less type crank to the test crank spindle shall be 40 ± 5 N-m (400 ± 50 kgf-cm)

9 MARKING

9.1 Chain wheels and cranks shall bear manufacturers name, initials or registered trade mark and name of the country of origin.

9.2 BIS Certification Mark

Each Chain wheel and crank assembly may also be marked with BIS Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of

conditions under which the licence for the use of Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards

10 PACKING

Crank and chain wheels shall be suitably wrapped and packed in accordance with best prevalent trade practice.

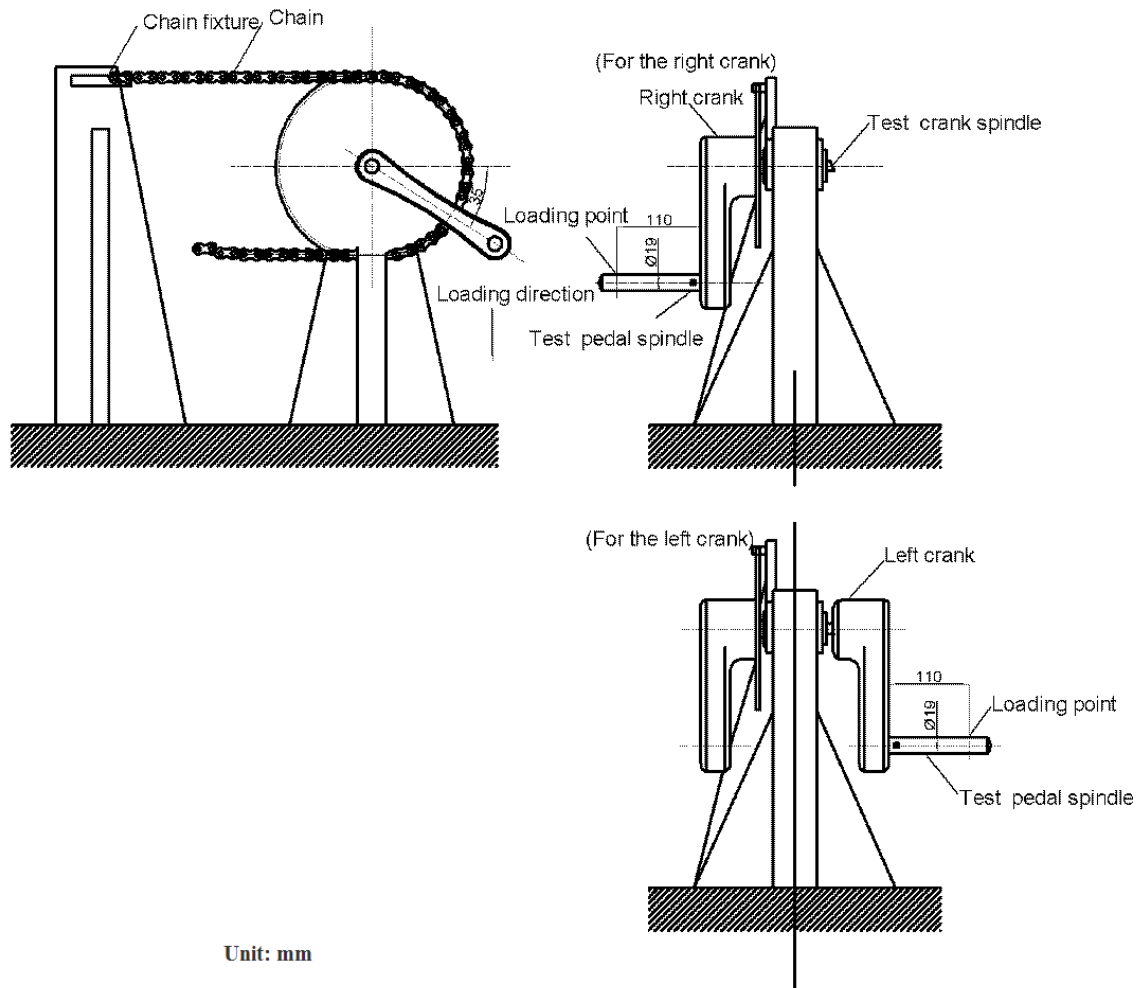


Fig 12 Repeated Fatigue Test for Crank

11 SAMPLING

11.1 Unless otherwise agreed to between the buyer and the supplier the procedure as given in IS 2500 part 1 shall be followed for sampling inspection. The inspection level and the sampling plan for various characteristics as given in **11.1.1** to **11.1.4** shall be followed.

11.1.1 For the characteristics, dimensions workmanship and finish, the scale of sampling shall be corresponding to inspection level 1 given in Table 1 of IS 2500 (Part 1).

11.1.2 For test, the scale of sampling shall be corresponding to inspection level S-3 given in Table 1 of IS 2500 (Part 1).

11.1.3 For the characteristics given in **8.1**, the sampling plan to be followed shall be corresponding to Acceptable Quality Level (AQL) value of 1.5 percent given in the Table 2-A of IS 2500 (Part 1).

11.1.4 For test, the sampling plan to be followed shall be corresponding to Acceptable Quality Level (AQL) of 1.0 percent given in Table 2 of IS 2500 (Part 1).