BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY
(*Not to be reproduced without permission of BIS or used as an Indian Standard*)

भारतीय मानक ***मसौदा***

साइकल – क्रैंक्स और चेन व्हील्स – विनिर्देशन

(*चौथा पुनरिक्षण*)

***Draft** Indian Standard*

BICYCLES – CRANKS AND CHAIN WHEELS – SPECIFICATION

(Fourth Revision)

ICS 43.150

Bicycles Sectional Committee TED 16	Last Date of comments **08.02.2025**

FOREWORD

(*Adoption clause will be added later*)

This standard was first published in 1958 and subsequently revised in 1968, 1996 and 2014. This revision has been undertaken to update in the light of experience gained during these years and the present trade practices that have followed. In this revision following significant technical changes have been made:

a) Drop Impact Test for the Crank in Horizontal Position (Cotter-Less), has been removed

b) Drop Impact Test for the Crank in Vertical Position (Cotter-Less), has been removed

c) Chemical Test for Finish, has been included

d) Chain Wheel Fixing Strength Test (Cotter and Cotter-Less), has been removed

e) Static Load Strength for Pedal Fixing Point (Cotter-Less), has been removed.

f) Fatigue test details are updated for all bicycle categories

The composition of the Committee responsible for the formulation of this standard is given at **Annex A (Will be added later).**

For deciding whether a particular requirement of this Standard has complied with value, observed or calculated, expressing the result of a test or the analysis shall be rounded off as per 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.

Notwithstanding what is stated in this standard, applicable National, State, and Local bodies regulations shall apply. In the case of exports corresponding regulations of exporting countries shall apply.

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.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. 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.

IS No.	Title
734: 1975	Wrought aluminium and aluminium alloys, forging stock and forgings for general engineering purposes (*second revision*)
1068:1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium (*third revision*)
2062: 2011	Hot rolled medium and high tensile structural steel - Specification (*Seventh Revision*)
1570 (Pt 1): 1978	Schedules for wrought steels Part 1 Steels specified by tensile and/or yield properties (*First Revision*)
2403:2014	Short-pitch transmission precision roller and bush chains, attachments and associated chain sprockets (*third revision*)
3203: 1982	Methods of testing local thickness of electroplated coatings (*first revision*)
10613: 2023	Cycles - Safety and performance requirements for bicycles (third revision)
DOC: TED 16 (18837)	BMX bicycles - Safety requirements and test methods
DOC: TED 16(23113)	Cycles - Safety requirements for bicycles for young children (Second revision of IS 15533:2018/ISO 8098: 2014)
DOC: TED 16 (23339)	Cycles — Electrically power assisted cycles (EPAC)- Pedal assisted bicycles

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. *See* Fig. 1 to 5 for details.

Table 1 Classification of Chain Wheels and Cranks
(*Clause* 3)

Sl No	Type	No. of Chain Wheels	Type of Assembling to Bottom Bracket Axle
(1)	(2)	(3)	(4)
1	Single cotter type	Single	Cotter type
2	Single cotter-less type		
3	Double cotter-less type	Double	Cotter-less type
4	Triple cotter-less type	Triple	
5	One Piece crank type	Single	-

NOTES:

1 The words single, double and triple indicate the number (one, two and three) of the chain wheels
2 In the case of cotter-less fixing, chain wheels and cranks are fixed to a bottom bracket axle in such a way as square taper fitting which is normally used or serration fitting.

4 MATERIALS

4.1 Cranks

The cranks shall be made from steel designation Fe 540 conforming to IS 1570-1 or any suitable steel meeting the tests mentioned at **8** and may be plastic coated without covering the functional areas.

4.1.1 Alternatively, the cranks shall be made of aluminium alloy conforming to the designation 65032 of IS 734 meeting the tests mentioned at **8**.

The cranks may be plastic coated without covering the functional areas.

4.2 Chain Wheels

The chain wheels shall be made of steel conforming to IS 2062. Chain wheels can also be made any other suitable material which would pass the testing requirement specified in **8**.

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 to 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 the buyer and the supplier the dimensions may be changed, wherever applicable.

NOTE — Fig. 6 and Table 2 & 3 are given to set a general guideline for thickness and other dimensions.

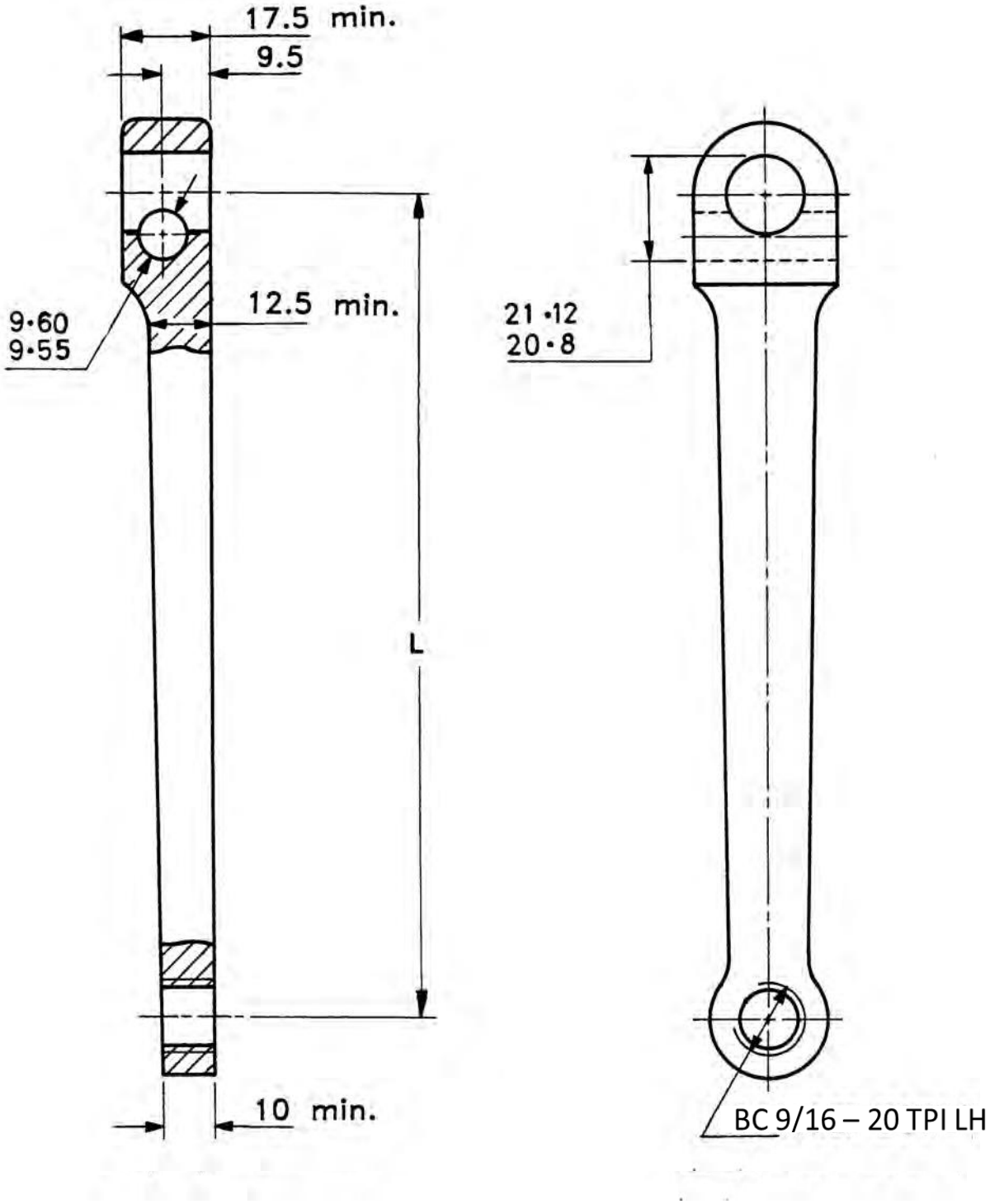
5.2 In case of plastic-coated cranks, the thickness of plastic coating shall be as agreed to between the buyer and the supplier.

5.3 Length of the crank shall be as per the agreement between the buyer and the 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

5.4 A chain wheel disc guard shall exceed the diameter of the outer wheel by not less than 10 mm, when

measured across the tips of the tooth.

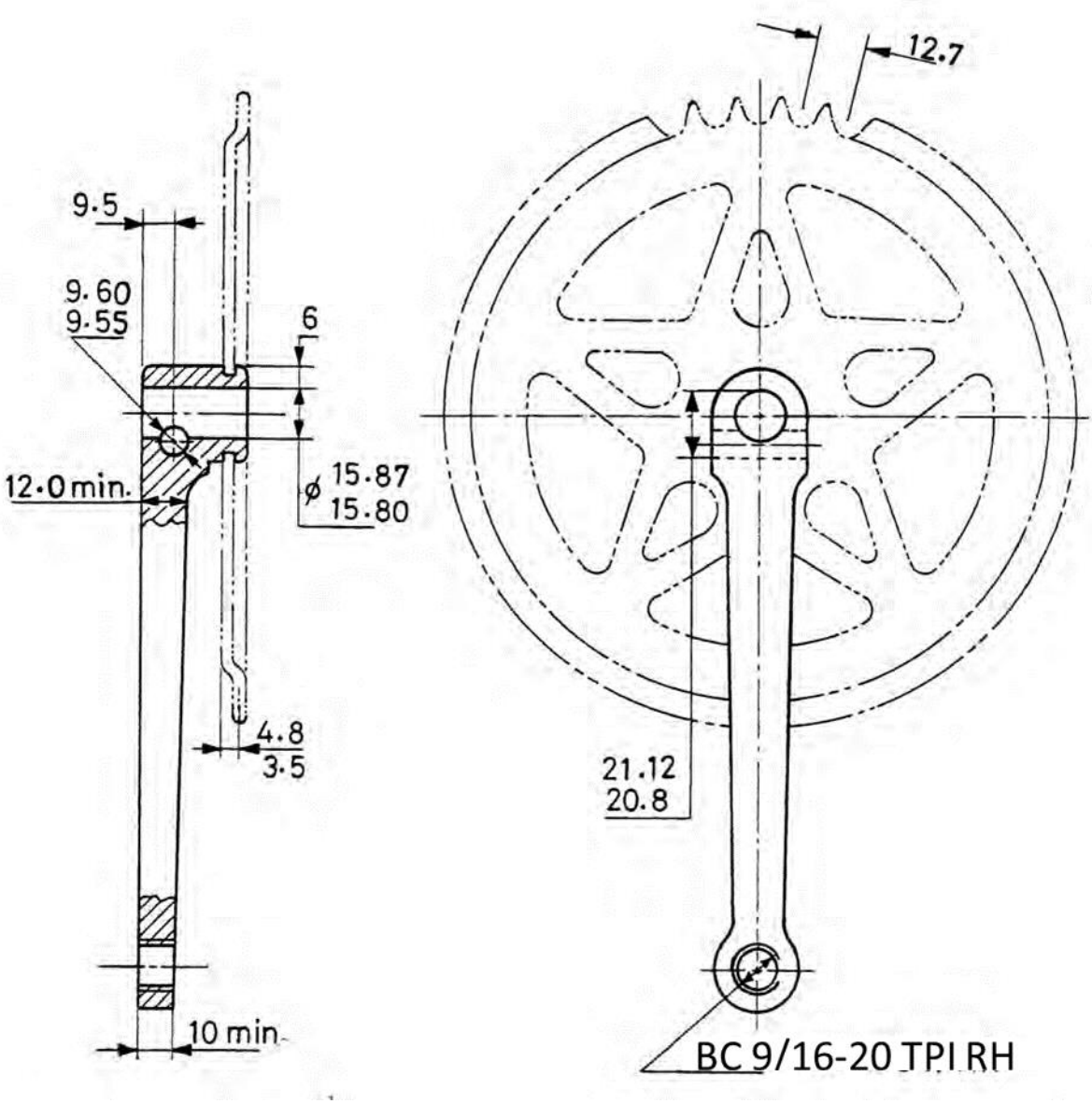


NOTES

1 All dimensions in millimetres.

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

FIG. 1 LEFT CRANK — COTTER TYPE

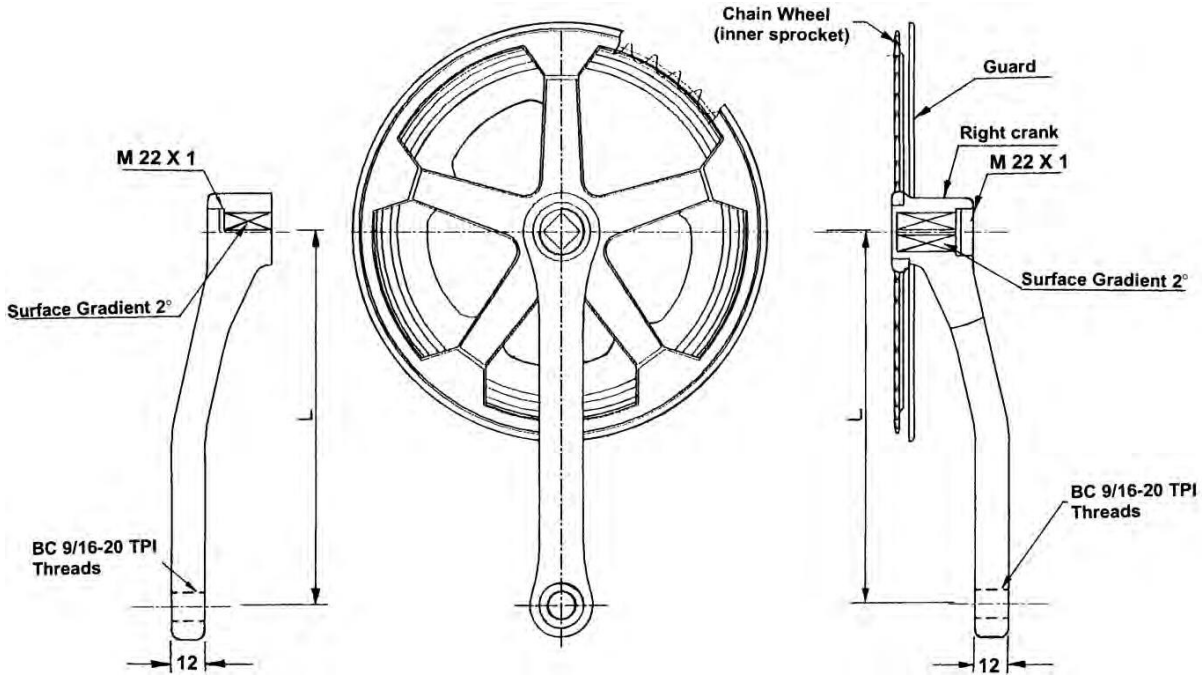


NOTES

1 All dimensions in millimetres.

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

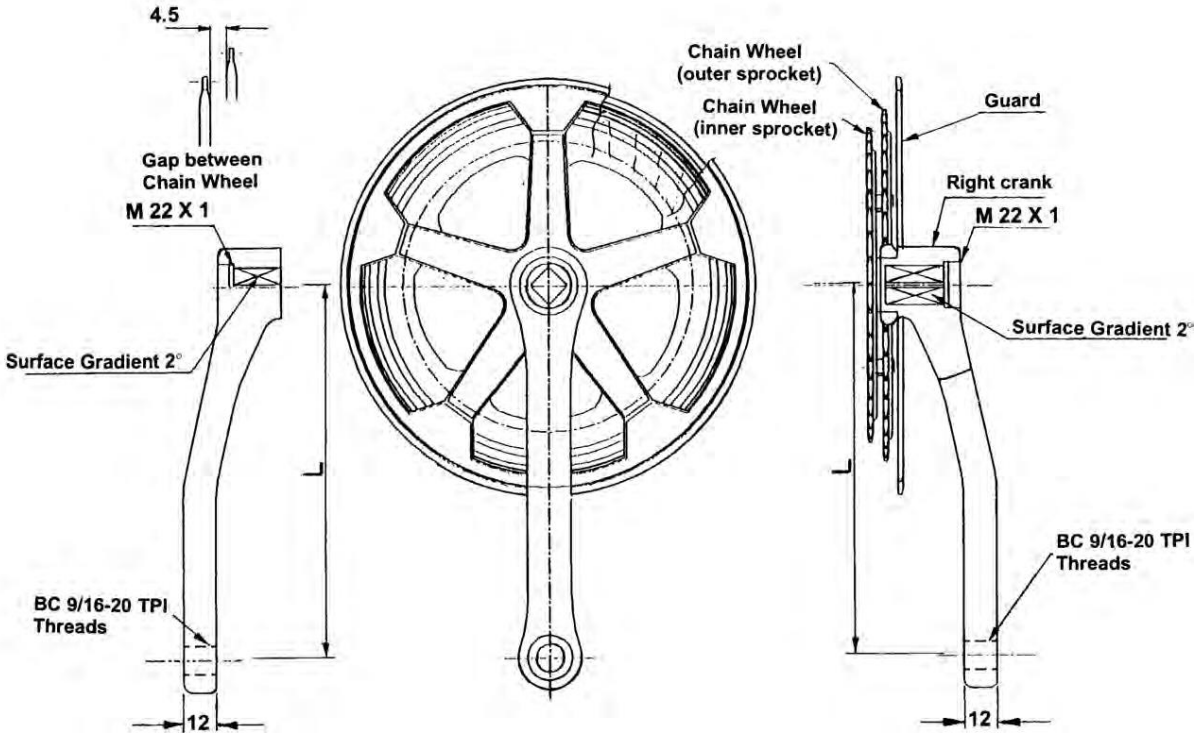
FIG. 2 RIGHT CRANK WITH CHAIN WHEEL — COTTER TYPE



NOTES:

1) All dimensions in millimetres.
2) The illustration is diagrammatic only and is not intended to illustrate details of design.

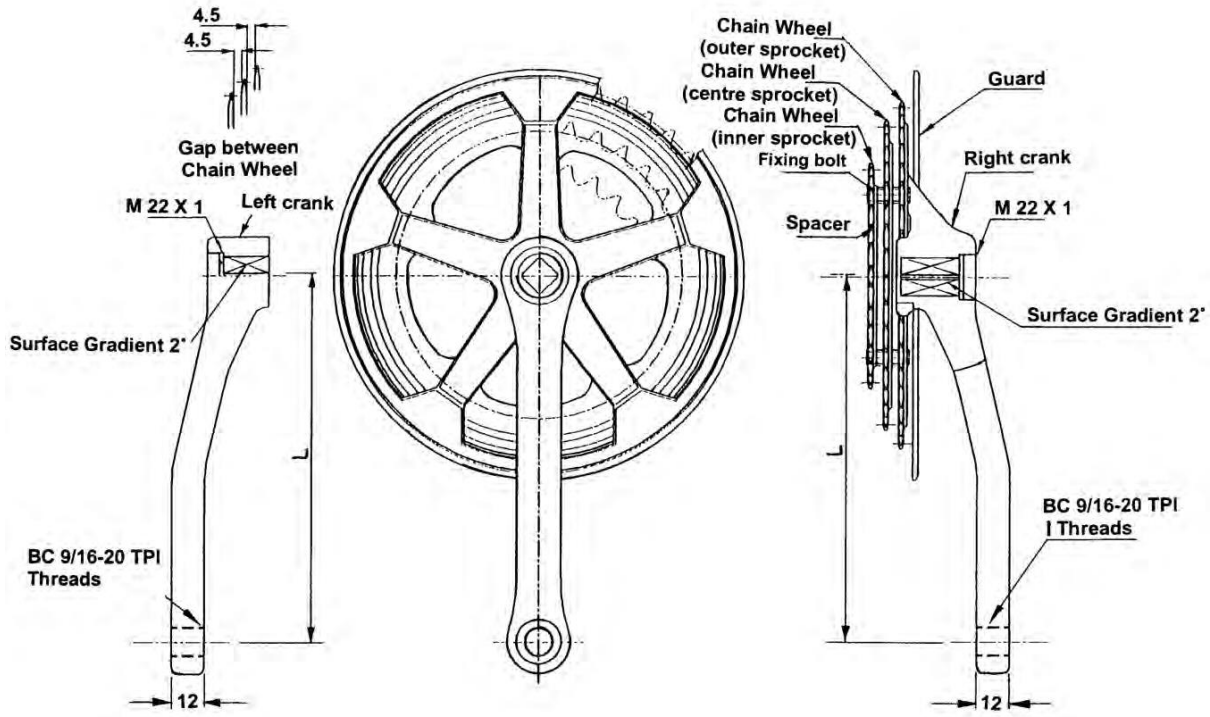
FIG. 3 SINGLE SPEED — LEFT CRANK AND RIGHT CRANK WITH CHAIN WHEEL — COTTER-LESS TYPE



NOTES:

1) All dimensions in millimetres.
2) The illustration is diagrammatic only and is not intended to illustrate details of design.

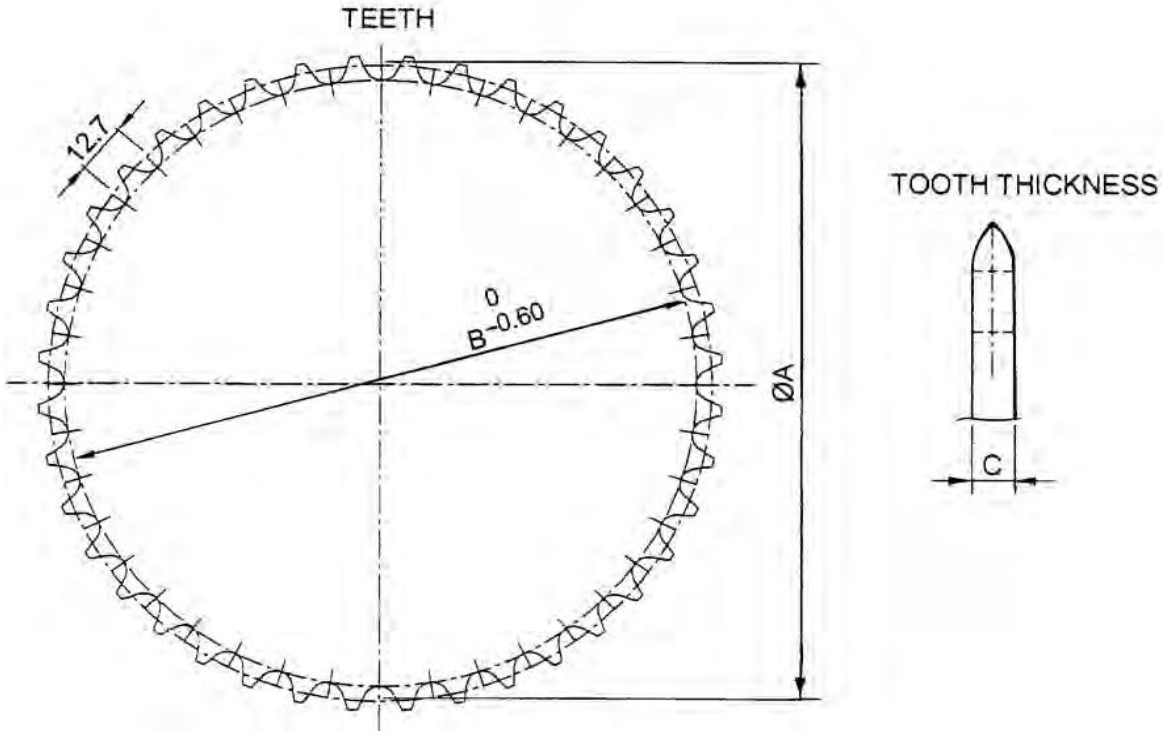
FIG. 4 DOUBLE SPEED — LEFT CRANK AND RIGHT CRANK WITH CHAIN WHEEL — COTTER-LESS TYPE



NOTES:

1) All dimensions in millimetres.
2) The illustration is diagrammatic only and is not intended to illustrate details of design.
3) The gap between chain wheels can vary based on design.

FIG. 5 TRIPLE SPEED — LEFT CRANK AND RIGHT CRANK WITH CHAIN WHEEL — COTTER-LESS TYPE



NOTES:

1) All dimensions in millimetres.
2) The illustration is diagrammatic only and is not intended to illustrate details of design.

FIG. 6 DIMENSIONS OF CHAIN WHEEL

Table 2 Tooth Thickness 'C'
(*Clause* 5.1)

All dimensions in millimetres.

Sl No.	Tooth Thickness Designation	Tooth Thickness	
		Maximum Thickness	Tolerance
(1)	(2)	(3)	(4)
i)	3/32	2.1	0 –0.3
ii)	1/8	3.0	0 –0.4

Table 3 Dimensions of Chain Wheel (Clause 5.1)

All dimensions in millimetres

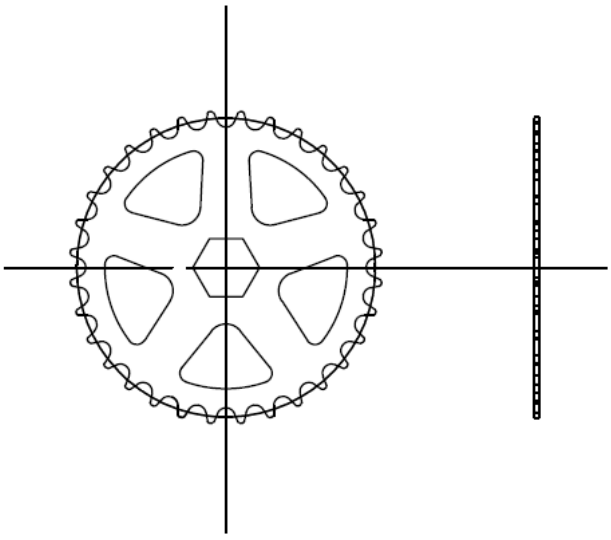
Sl No	Number of Teeth	Dimensions		
		Pitch Circle Diameter B	Root Circle Diameter B	Distance Between Roots of Tooth
(1)	(2)	(3)	(4)	(5)
i)	24	97.30	89.55	—
ii)	26	105.36	97.61	—
iii)	28	113.43	105.68	—

iv)	30	121.50	113.75	—
v)	31	125.53	117.78	117.62
vi)	32	129.57	121.82	—
vii)	33	133.61	125.86	125.70
viii)	34	137.65	129.90	—
ix)	35	141.68	133.93	133.79
x)	36	145.72	137.97	-
xi)	37	149.75	142.00	141.87
xii)	38	153.79	146.04	-
xiii)	39	157.83	150.08	149.95
xiv)	40	161.87	154.12	-
xv)	41	165.91	158.16	158.03
xvi)	42	169.95	162.20	-
xvii)	43	173.98	166.23	166.12
xviii)	44	178.02	170.27	—
xix)	45	182.06	174.31	174.20
xx)	46	186.10	178.35	—
xxi)	47	190.14	182.39	182.29
xxii)	48	194.18	186.43	—
xxiii)	49	198.22	190.47	190.37
xxiv)	50	202.26	194.51	—
xxv)	51	206.30	198.55	198.45
xxvi)	52	210.34	202.59	—
xvii)	53	214.38	206.63	206.54
xxviii)	54	218.42	210.67	—
xxix)	55	222.46	214.71	214.62
xxx)	56	226.50	218.75	—
xxxi)	57	230.54	222.75	222.7

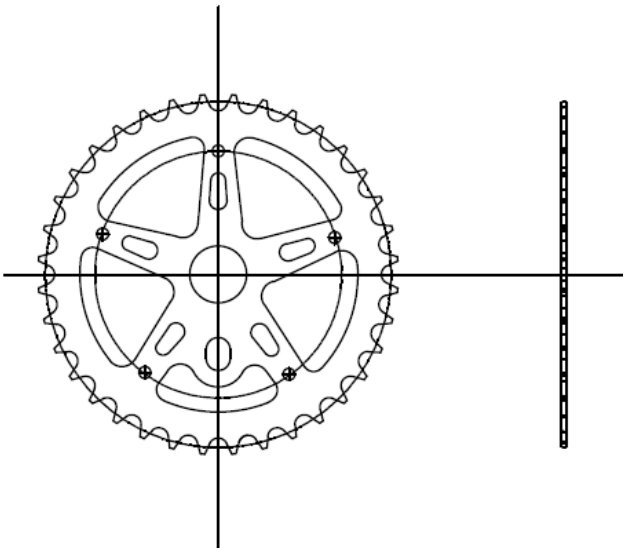
5.5 Chain wheels for one piece crank shall be supplied with hexagonal centre or Centre hole along with chain ring locating pin hole; *see* Fig. 7**.** Dimensions of chain shall be as per Table 2 and Table 3**.** Design of chain wheel is given only for illustration; chain wheel designs may vary as per the agreement between the buyer and the supplier.

5.6 One piece crank types and their dimensions may be according to Fig 8 and Table 4. Length of the crank shall be as per agreement between the buyer and the 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

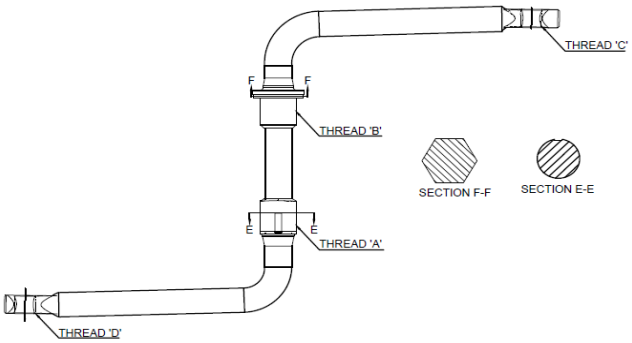


CHAIN RING WITH HEXAGONAL CENTRE

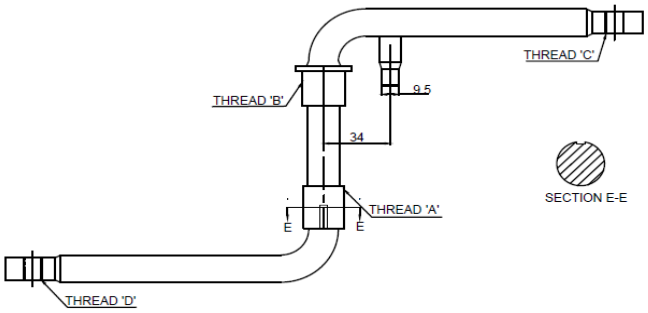


CHAIN RING WITH HOLE AND LOCATING PIN

FIG. 7 CHAIN WHEEL FOR ONE PIECE CRANKS



ONE PIECE CRANK WITH HEXAGONAL CENTRE MOUNT HOLE AND LOCATING PIN MOUNT
TYPE 1 & 2



ONE PIECE CRANK WITH
TYPE 3 & 4

FIG. 8 ONE PIECE CRANKS

Table 4 OPC Types and Thread Details
(*Clause* 5.6)

Sl.No	Crank type	Chain Ring Mount	Thread A	Thread B	Thread C	Thread D	Pin Pitch in mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Type 1	Crank with Hexagonal Centre	3/4" X 24 TPI B.S.Cycle Thread LH	13/16" X 24 TPI B.S.Cycle Thread RH	1/2" BSW X 20 TPI Thread LH	1/2" BSW X 20 TPI Thread RH	-
2	Type 2	Crank with Hexagonal Centre	7/8" X 24 TPI B.S.Cycle Thread LH	15/16" X 24 TPI B.S. Cy Thread RH	1/2" BSW X 20 TPI Thread LH	1/2" BSW X 20 TPI Thread RH	-
3	Type 3	Crank with Hole and Locating Pin	3/4" X 24 TPI B.S.Cycle Thread LH	13/16" X 24 TPI B.S.Cycle Thread RH	1/2" BSW X 20 TPI Thread LH	1/2" BSW X 20 TPI Thread RH	34
4	Type 4	Crank with Hole and Locating Pin	7/8" X 24 TPI B.S.Cycle Thread LH	15/16" X 24 TPI B.S. Cy Thread RH	1/2" BSW X 20 TPI Thread LH	1/2" BSW X 20 TPI Thread RH	34

Note - Dimension given in the images are for reference only. Design can be modified basis the agreement between buyer and the supplier

6 WORKMANSHIP

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

a) The joints between each part shall be firm, reliable, free from looseness and play.

b) The deflection of chain wheels at tooth bottom shall be in accordance with Table 5; *see* also Fig. 9

c) The crank spindle bore and pedal spindle bore shall be parallel, and the surface contacting the barrelled part of the pedal spindle shall be perpendicular to the pedal spindle bore.

d) 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. 10 are measured, *b* shall not be smaller than *a.*

e) 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°.

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.

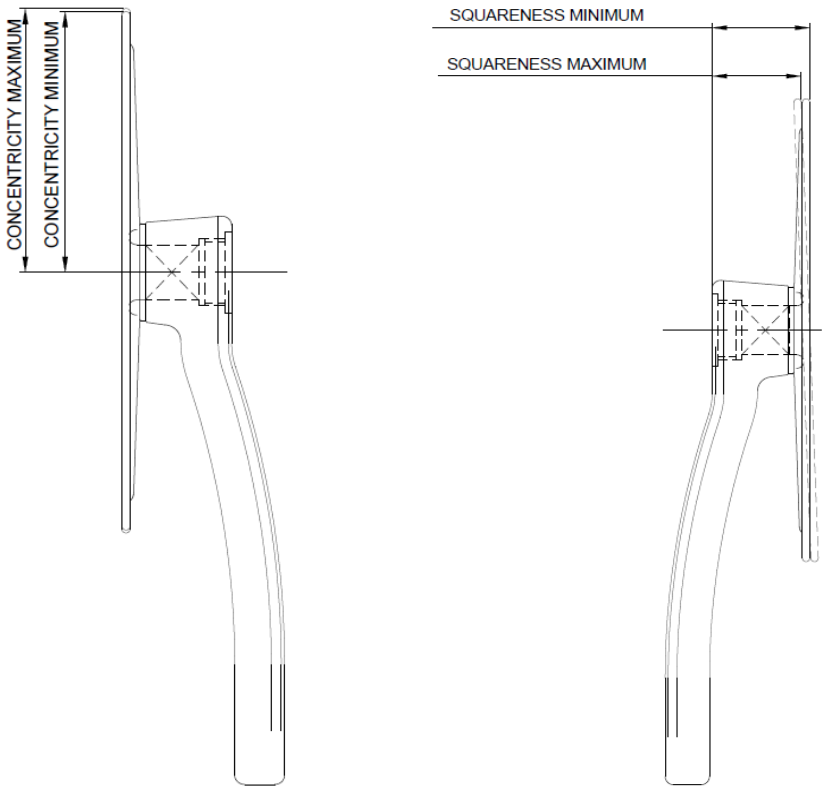
6.4 Punching marks shall be free from deficient stamping, displacement of position and other defects

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

Table 5 Deflection of Chain Wheel

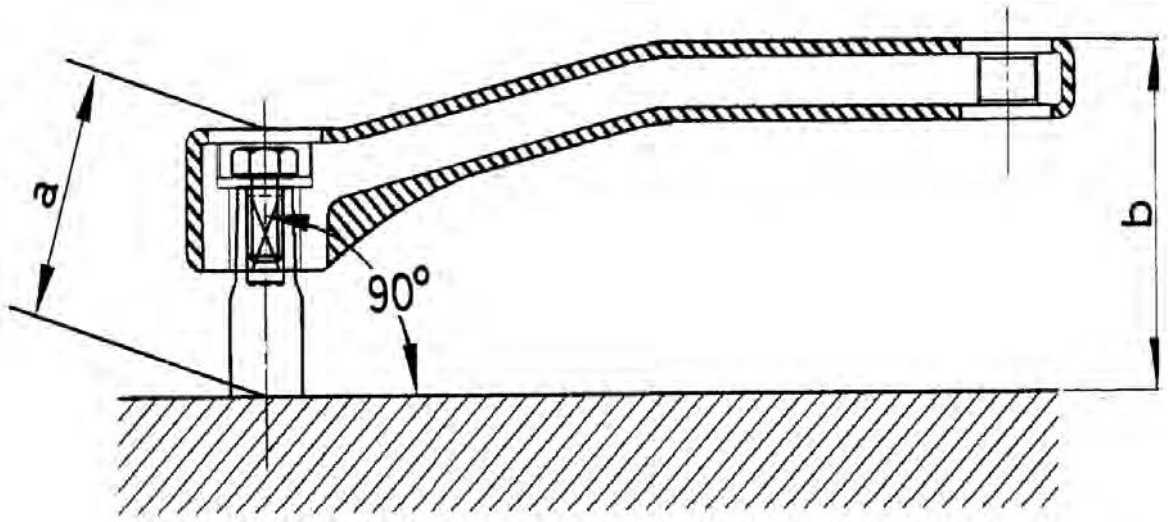
[*Clause* 6.1(b)]

Sl No.	Division	Single Type		Double and Triple Type
		Cotter Type	Cotter-Less Type	Cotter-Less Types
(1)	(2)	(3)	(4)	(5)
i)	Concentricity	0.5 mm or under	0.5mm or under	1mm or under
ii)	Squareness	1 mm or under	1 mm or under	1 mm or under



CONCENTRICITY MEASUREMENT SQUARENESS MEASUREMENT

Fig. 9 CONCENTRICITY AND SQUARENESS MEASUREMENT



Remarks: The value (b – a) is called crank-offset**.**

FIG. 10 OFFSET OF CRANK

7 FINISH

7.1 Cranks and chain wheels shall have no sharp edges other than tooth tips. There shall be no significant flashes, burrs or other defects on any part of the chain- wheels and cranks. The surfaces before plating or painting shall be free from rust, cracks, or other significant defects.

7.2 Cranks and chain wheels shall be nickel and chromium plated or powder coated. The nickel and chrome plating shall conform to 'service condition No. 1' of IS 1068. The method described in IS 3203 may be used to measure the coating thickness of the individual layer. For Nickel and Chrome plated chain wheel and cranks, coating thickness shall be kept not less than 10 microns Nickel and 0.3 Microns chromium. In case of powder coating thickness of coating shall be kept not be less than 40 microns without affecting the functional requirements.

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

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

7.5 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 and splash.

8 TESTS

8.1 Chain Wheel Fixing Strength Test (Cotter and Cotter-Less)

The assembly (*see* Fig. 11) 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 2 270 N (227 kgf), minimum for cotter type chain wheel and 2 000 N (200 kgf), minimum for cotter-less chain wheel without showing any sign of yielding at the point. The crank bending shall not start till the load increases above 1 800 N (180 kgf).

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

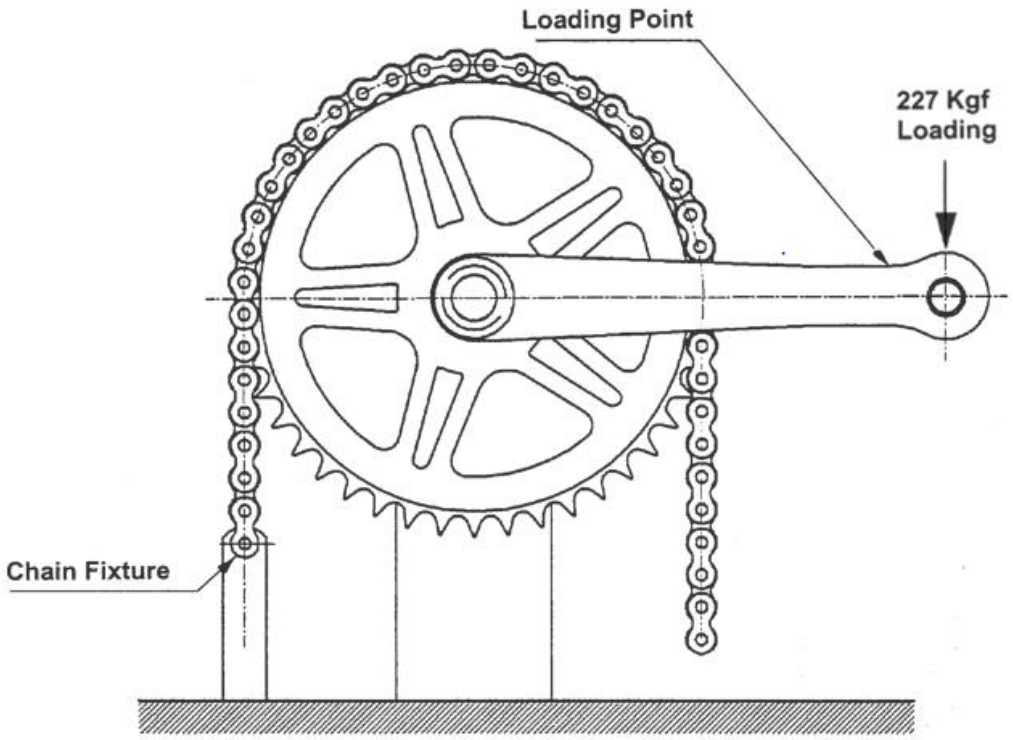
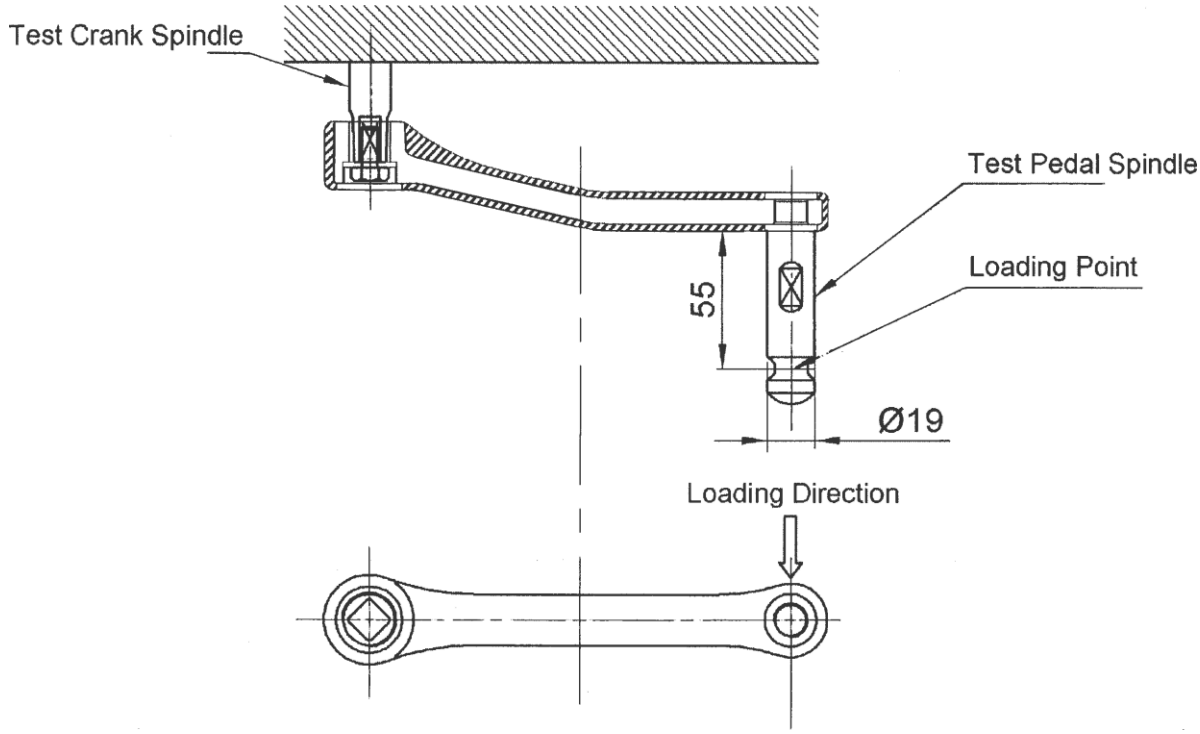


FIG. 11 TESTING DETAILS OF CHAIN WHEEL FIXING STRENGTH TEST (COTTER AND COTTER-LESS)

8.2 Static Load Strength for Pedal Fixing Point(Cotter-Less)

When the crank is fixed horizontally with a test crankspindle and with a test pedal spindle fitted to the crank a vertical load of 1 500 N (150 kgf) is gently applied to the loading point as shown in Fig. 12 for 1 min and when the load is removed, the displacement of the loading point shall be within 2 mm.

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 Nm (400 ± 50 kgf.cm)



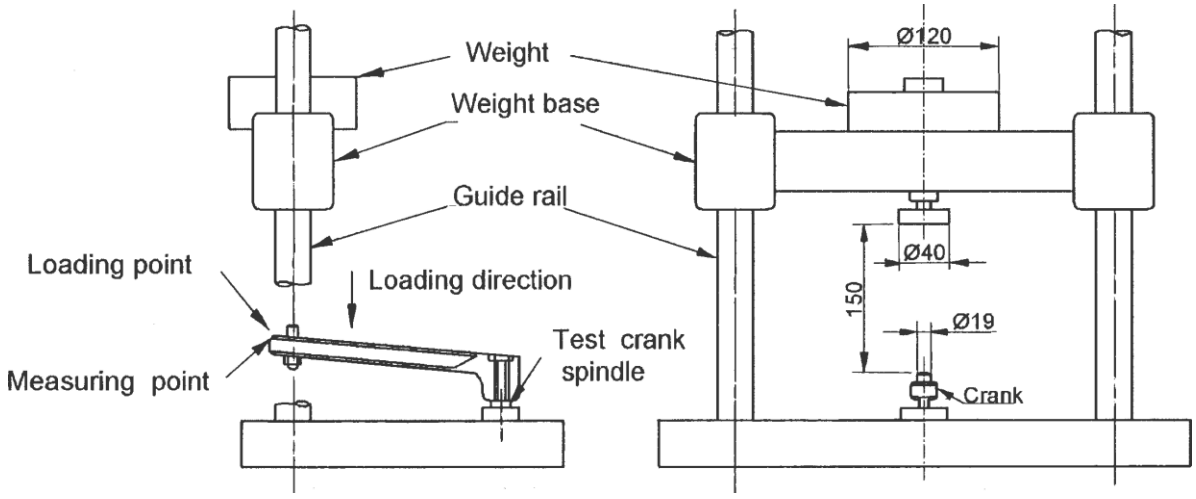
All dimensions in millimetres.

FIG. 12 STATIC LOADING TEST FOR PEDAL FITTING POINT

8.3 Drop Impact Test for the Crank in HorizontalPosition (Cotter-Less)

When a mass of 10 kg (including a mass base) being dropped ten times from a height of 150 mm to the test crank which is fixed to the vertical set test crank spindle as shown in Fig. 13, the crank shall not break and the permanent strain at the measuring point shown in Fig 13 shall not exceed 5 mm.

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 Nm (400 ± 50 kgf.cm).



All dimensions in millimetres.

FIG. 13 DROP IMPACT TEST FOR CRANK IN HORIZONTAL POSITION

8.4 Drop Impact Test for the Crank in VerticalPosition (Cotter-Less)

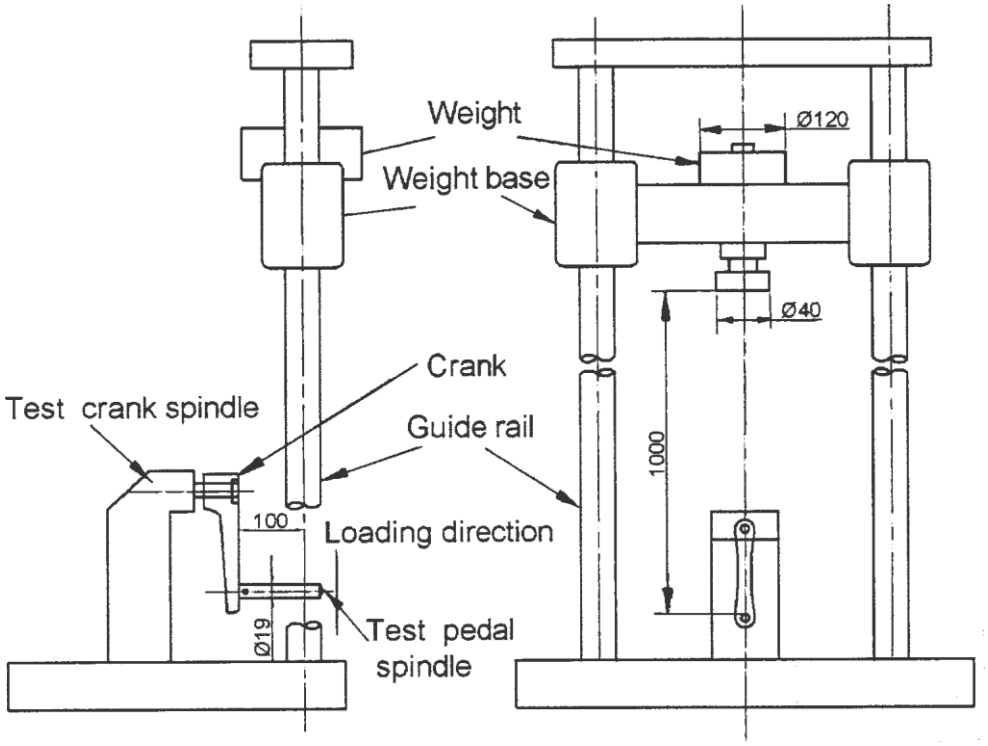
When a mass of 10 kg (including a mass base) being dropped from a height of 1 000 mm (500 mm if the length of the crank is 140 mm or less) to the test crank, which is fixed as shown in Fig. 14, the crank shall not break. In case the crank is made of steel this test can be omitted.

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 Nm (400 ± 50 kgf.cm).

8.5 Repeated Fatigue Strength for Crank (Cotter-Less)

When tested in accordance with **4.8.3** of IS 10613 thereshall not be any breakage in the crank slackening in the fixing part of the crank and the crank spindle.

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 Nm (400 ± 50 kgf.cm).



All dimensions in millimetres.

FIG. 14 DROP IMPACT TEST FOR CRANK IN VERTICTAL POSITION

8.6 Fatigue Test

There shall not be any breakage in the crank slackening in the fixing part of the crank and the crank spindle, when tested in accordance with

a) **4.12.6** of DOC: TED 16(23113) for Young children's bicycles

b) **4.10.9** of IS 10613 for 'Young adult bicycles', 'City and Trekking', 'Roadster', 'SLR bicycles', 'Mountain bicycles', and 'Racing bicycles'

c) **4.14.7** of DOC: TED 16 (18837) for BMX bicycles

d) **4.3.12.7** of DOC: TED 16 (23339) for EPAC bicycles.

8.6.1 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 Nm (400 ± 50 kgf.cm).

8.7 Chemical Test for Finish

Painted, powder coated or plated crank assemblies shall be tested according to one of the applicable tests as described in Table 6. After the test, in case of painted surface, the paint shall not soften, peel off or show any change in colour. In case of powder coating or plating, it shall not have any adhesion loss, blisters or flaking on an area more than 3mm on either side from X-cut.

Table 6 Chemical Tests
(*Clause* 8.7)

Test/Test conditions/Suitability	**Dip Coating Teat**	**Salt Spray Test**	
		Neutral Salt Spray (NSS)	**Copper-accelerated Acetic acid Salt Spray (CASS)**
(1)	(2)	(3)	(4)
Temperature	Black enamel paint 80°C other enamel paints 60°C	35 °C ± 2 °C	50 °C ± 2 °C
Concentration of Salt Solution	5% NaCl	5% NaCl	5% NaCl
pH (Solution)	6.5 to 7.2	6.5 to 7.2	3.1 to 3.3
Test duration	1 h	96* h	168* h
Recovery period	Nil	1 h	1 h
Air Pressure	Atmospheric Pressure	70 to 170 kPa	70 to 170 kPa
Suitability **	Painted, Coating with metals and their alloys, Metallic coatings (Anodic & Cathodic)	Coating with metals and their alloys, Metallic coatings (Anodic & Cathodic), Conversion coatings Anodic oxide coatings.	Copper + Nickel + Chromium coatings, Nickel + Chromium coatings, Anode coating on Aluminium.

* Subject to agreement between customer and manufacturer, duration of salt spray test both for NSS and CASS can be 96, 168, 240, 480, 720 or 1 000 h. Wherever there is no such agreement the duration of test indicated in the Table 6, shall apply.

** In-case of suitability of more than one test, only one test as per manufacturer and supplier agreement shall be done.

9 MARKING

9.1 Each Chain wheels and cranks shall be marked visibly, legibly and indelibly with the following minimum particulars:

1) Manufacturers name, initials or trade-mark;
2) Batch/Lot number
3) Date of manufacture;
4) Name of the country of origin.
5) Classification type;
6) No. of Chain wheels;
7) Cotter/Cotter-less;
8) Material;
9) Nominal length of crank;
10) Tooth thickness; and

11) No. of teeth.

9.2 The marking at Sl No. of **9.1** shall be visibly and permanently marked by punching of sufficient depth for easy reading on 'Chain wheels and cranks'. The marking at Sl No.2 & 3 shall be visibly and permanently marked by punching of sufficient depth or by printing or by affixing labels as may be considered appropriate. All marking listed at **9.1,** including those marked on 'Chain wheels and cranks' shall be suitably indicated on the packing.

9.3 BIS Certification Marking

Each Chain wheels and cranks may also be marked with the Standard Mark.

9.3.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

BICYCLES SECTIONAL COMMITTEE, TED 16

Will be added later