भारतीय मानक **IS 8929 : 2023**

Indian Standard

विद्युत सम्पर्कों के लिए उच्च शुद्धता वाले सोने के तार — विशिष्टि

(पहला पुनरीक्षण)

High Purity Gold Wire for Electrical Contacts — Specification

(First Revision)

ICS 77.120.99

भारतीय मानक ब्यूरो
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August 2023 **Price Group 5**

Precious Metals Sectional Committee, MTD 10

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Precious Metals Sectional Committee, had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1978. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

In addition, following significant changes have been made:

a) Reference clause has been included; and

b) Reference to IS 16901 has been provided in **4** for chemical testing.

High purity gold wire is used in various types of contacts for low and medium energy circuits in semiconductor devices. This standard lays down chemical composition and physical requirements of high purity gold, so that it may serve as suitable material for electrical contacts.

The composition of the Committee responsible for formulation of this standard is given in Annex B.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified in this standard.

Indian Standard

HIGH PURITY GOLD WIRE FOR ELECTRICAL CONTACTS — SPECIFICATION

(First Revision)

1 SCOPE

This standard specifies requirements for high purity gold wire used for electrical contacts.

2 REFERENCES

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

IS No.	*Title*
IS 1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
IS 16901 : 2022/ ISO 15093 : 2020	Jewellery and precious metals — Determination of high purity gold, platinum and palladium — Difference method using ICP-OES (*first revision*)

3 SUPPLY OF MATERIAL

3.1 General requirements relating to the supply of material shall conform to IS 1387.

3.2 The material shall be supplied either in annealed or in hard condition.

4 CHEMICAL COMPOSITION

When tested in accordance with IS 16901 the purity of gold shall be 99.99 percent minimum and the impurities shall not exceed the limits as specified below:

Sl No.	*Constituents*	*Percent, Max*
(1)	(2)	(3)
i)	Copper	0.009
ii)	Silver	0.009
iii)	Any other metallic impurities, such as bismuth	0.003
iv)	Total of all metallic impurities including silver and copper	0.010

5 FREEDOM FROM DEFECTS

The surface of wire shall be clean and free from lubricants, oils, dirt when viewed under 30X magnification.

6 DIMENSIONS

6.1 The wire shall have the following dimensions. If required, the wire may be annealed suitably before the measurement of dimensions:

Sl No.	*Diameter*	*Tolerance*
	mm	mm
(1)	(2)	(3)
i)	0.013	± 0.001
ii)	0.020	± 0.001
iii)	0.023	± 0.001
iv)	0.03	± 0.002
v)	0.05	± 0.002
vi)	0.08	± 0.003
vii)	0.13	± 0.004

6.2 For measuring the average diameter, the method given in **6.2.1** shall be employed.

6.2.1 *Procedure*

Select a test specimen at least 1 m from the end of a spool or sufficiently far from either end to be free from bends, kinks or other damage resulting in lack of straightness of the cut length. The wire shall be drawn from the spool under a low even tension so that no elongation of the wire takes place.

6.2.1.1 Cut each test specimen to a length of 200 mm ± 0.1 mm. To prevent stretching, care shall be taken so that the tension is just sufficient to eliminate the sag and curl.

6.2.1.2 Fold the test specimen upon itself several times and twist to make a compact bundle with a loop consisting of a single strand for hanging it on the balance beam. In case the specimens are more than one, they shall be twisted together and hung by a loop consisting of a single strand. The specimen shall be handled as little as possible and the operator's hands shall be cleaned and dried.

6.2.1.3 Weigh in a micro-balance capable of reading up to 0.0 002 mg with an accuracy of 0.004 mg. Handle and use the balance as recommended by the manufacturer. Report average weight of the wire to three significant figures in mg/200 mm.

6.2.2 *Calculation*

$$\text{Diameter, mm} = \sqrt{\frac{M}{1.90}} \times 0.025$$

where

M = mass, in mg, of 200 mm of wire.

NOTE — Density of gold is to be taken as 19.34 g/cm^3.

7 TENSILE PROPERTIES

7.1 The wire in annealed and hard condition shall meet the requirements given in Table 1 and Table 2 respectively when tested by methods given in **7.2** and **7.3**.

Table 1 Elongation and Breaking Load for Annealed Wire

(*Clause* 7.1)

Sl No.	Diameter	Elongation Percent on Gauge Length of 200 mm	Breaking Load,
	mm		g, *Min*
(1)	(2)	(3)	(4)
i)	0.013	1.0 to 3.0	1
ii)	0.020	1.0 to 8.0	3
iii)	0.023	1.0 to 8.0	4
iv)	0.03	1.0 to 12.0	5
v)	0.05	2.0 to 20.0	20
vi)	0.08	4.0 to 25.0	45
vii)	0.13	5.0 to 25.0	120

Table 2 Elongation and Breaking Load for Head Wire

(*Clause* 7.1)

Sl No.	Diameter	Elongation Percent on Gauge Length of 200 mm	Breaking Load,
	mm		g, *Min*
(1)	(2)	(3)	(4)
i)	0.013	0.5 to 1.5	3
ii)	0.020	0.5 to 2.0	8
iii)	0.023	0.5 to 2.0	13
iv)	0.03	0.5 to 2.5	17
v)	0.05	0.5 to 3.0	70
vi)	0.08	0.5 to 3.0	150
vii)	0.13	0.5 to 4.0	420

7.2 Procedure for Testing Tensile Properties

Cut a test piece which shall be 250 mm. Mark on the test piece, gauge length of 200 mm with an accuracy of ± 0.25 mm. The test piece shall be straight before it is marked and marking shall be done by fine scribed lines taking care not to cause fracture at the gauge marks. Hold the test piece between the screwed holders in such a way that the load is applied axially. Increase the load as uniformly as possible and measure the maximum load which it can withstand during the test.

7.3 Elongation

Put the fractured parts of the test piece carefully so that they fit together, so that they lie in a straight line. Measure the increase in the length of the gauge length and calculate the percentage elongation.

8 SAMPLING

8.1 Lot

A lot shall consist of all the material from one melt or bar supplied against a single order.

8.2 Select one percent of spools, but not less than two from each lot. Take specimens sufficiently far from either end of the spool of wire to be free of kinks, bends or distortion.

9 PACKING

The material may be spooled on aluminium spools and should be wound in such a way that it de-spools freely. It should be free of any kinks. A specimen of a spool with typical dimensions is given in Annex A for information.

10 MARKING

10.1 The material shall be marked with the name or trade-mark of the manufacturer, purity of gold, diameter of wire and weight of the contents of the package.

10.2 BIS Certification Marking

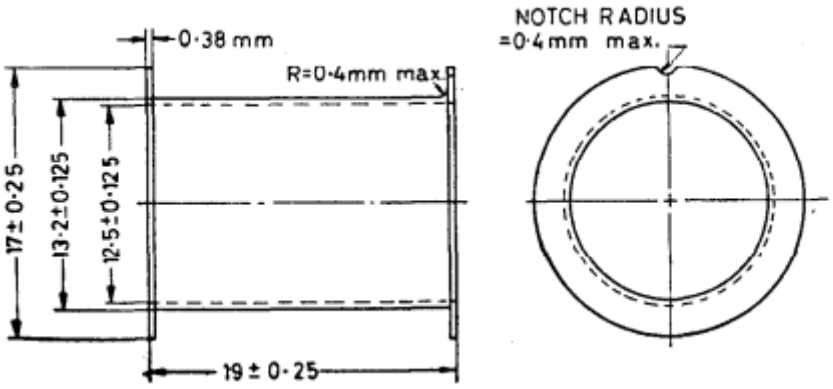
The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

ANNEX A

(*Clause* 9)

SPECIMEN OF A SPOOL WITH TYPICAL DIMENSIONS

A-1 A sketch of a spool with typical dimensions is given in Fig. 1 for information.



All dimensions in millimetres.

FIG. 1 SKETCH OF THE SPOOL

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Precious Metals Sectional Committee, MTD 10

Organization	*Representative(s)*
Geological Survey of India, New Delhi	SHRI PARAVJEET SINGH **(*Chairperson*)**
All India Gems and Jewellery Trade Federation, Mumbai	SHRI D. D. KAREL SHRI SURESH I. DHRUV (*Alternate*)
Association of Gold Refineries and Mints, New Delhi	SHRI ANIL C. KANSARA (*Alternate*)
Bhartiya Swarnkar Sangh, Jaipur	SHRI DULI CHAND KAREL SHRI PREM KUMAR SONI (*Alternate*)
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Institute of Chemical Technology, Mumbai	DR B. M. BHANAGE SHRI RADHE V. JAYARAM (*Alternate*)

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World Gold Council, New Delhi	SHRI P. R. SOMASUNDARAM
BIS Directorate General	SHRI SANJIV MAINI, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (METALLURGICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI SHIV PRAKASH
SCIENTIST 'D'/JOINT DIRECTOR
(METALLURGICAL ENGINEERING), BIS

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Review of Indian Standards

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