

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 1224-2 (1977): Determination of fat by the gerber method, Part 2: Milk products [FAD 19: Dairy Products and Equipment]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard
DETERMINATION OF
FAT BY THE GERBER METHOD
PART II MILK PRODUCTS
(*First Revision*)

Second Reprint AUGUST 1997

UDC 637.127.6

© *Copyright* 1977

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG.
NEW DELHI 110002

Indian Standard
**DETERMINATION OF
 FAT BY THE GERBER METHOD**
PART II MILK PRODUCTS
(First Revision)

Dairy Products Sectional Committee, AFDC 34

<i>Chairman</i>	<i>Representing</i>
DR D. SUNDARESAN	National Dairy Research Institute (ICAR), Karnal
<i>Members</i>	
DR N. C. GANGULI (<i>Alternate to</i> Dr D. Sundaresan)	
AGRICULTURAL MARKETING ADVISER TO THE GOVERNMENT OF INDIA	Directorate of Marketing & Inspection (Ministry of Agriculture & Irrigation), Faridabad
SHRI S. JAYARAMAN (<i>Alternate</i>)	
DR R. P. ANEJA	National Dairy Development Board, Anand
SHRI B. R. BEDEKAR	Hindustan Milkfood Manufacturers Ltd, Nabha
SHRI M. P. RAJEN PILLAI (<i>Alternate</i>)	
SHRI V. R. BHALERAO	Indian Council of Agricultural Research, New Delhi
SHRI P. H. BHATT	Kaira District Co-operative Milk Producers' Union Limited, Anand
DR I. M. PATEL (<i>Alternate</i>)	
SHRI D. S. CHADHA	Central Committee for Food Standards (Ministry of Health & Family Welfare), New Delhi
ASSISTANT SECRETARY (PFA) (<i>Alternate</i>)	
CHAIRMAN	Technical Standardization Committee (Foodstuffs) (Ministry of Agriculture & Irrigation), New Delhi
SECRETARY (<i>Alternate</i>)	
BRIG R. C. DATTA	Directorate of Military Farms, Quartermaster General's Branch (Army Headquarters), New Delhi
LT-COL K. A. PATIL (<i>Alternate</i>)	
SHRI S. V. GUPTA	National Physical Laboratory (CSIR), New Delhi
SHRI MOHINDER NATH (<i>Alternate</i>)	
SHRI R. S. IYER	Glaxo Laboratories (India) Ltd, Bombay
SHRI S. M. KHAN (<i>Alternate</i>)	

(Continued on page 2)

Copyright 1977

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act (XIV of 1957)* and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

IS : 1224 (Part II) - 1977

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SHRI G. M. JHALA JOINT COMMISSIONER (DAIRY DEVELOPMENT) DEPUTY COMMISSIONER (DAIRY DEVELOPMENT) (<i>Alternate</i>)	National Dairy Development Board, Anand Ministry of Agriculture & Irrigation (Department of Agriculture), New Delhi
SHRI I. K. KAPUR	Directorate General of Technical Development, New Delhi
MANAGER (QUALITY CONTROL) SHRI S. C. SAXENA (<i>Alternate</i>)	Delhi Milk Scheme, New Delhi
SHRI K. PADAMABHAIAH	Dairy Development Commissioner, Government of Maharashtra, Bombay
SHRI N. D. KOTNIS (<i>Alternate</i>)	National Co-operative Development Corporation, New Delhi
SHRI A. RAMANATHAN	National Co-operative Development Corporation, New Delhi
SHRI S. P. SHARMA (<i>Alternate</i>)	Milk Commissioner, Government of Tamil Nadu, Madras
SHRI C. R. SEETHARAMAN	Milk Commissioner, Government of Tamil Nadu, Madras
SHRI K. SHRIKRISHNA (<i>Alternate</i>)	Milk Commissioner, Government of West Bengal, Calcutta
DR A. SEN GUPTA	Milk Commissioner, Government of West Bengal, Calcutta
SHRI K. K. GUPTA (<i>Alternate</i>)	Haryana Dairy Development Corporation Ltd, Chandigarh
SHRI Y. M. SOOD	Haryana Dairy Development Corporation Ltd, Chandigarh
CAPT H. S. OBEROI (<i>Alternate</i>)	National Dairy Research Institute (ICAR), Karnal
SHRI M. R. SRINIVASAN	Central Food Technological Research Institute (CSIR), Mysore
SHRI N. SUBRAMANIAN	Central Food Technological Research Institute (CSIR), Mysore
SHRI G. RAMANATHAN (<i>Alternate</i>)	Food Inspection Organization, Quartermaster General's Branch (Army Headquarters), New Delhi
COL R. N. TANEJA	Food Inspection Organization, Quartermaster General's Branch (Army Headquarters), New Delhi
LT-COL D. D. VOHRA (<i>Alternate</i>)	Hindustan Lever Ltd, Bombay
DR P. J. THOMAS	Hindustan Lever Ltd, Bombay
SHRI B. K. CHAUDHURY (<i>Alternate</i>)	Food Specialities Limited, Moga
SHRI W. VONCKX	Food Specialities Limited, Moga
DR M. K. K. IYENGAR (<i>Alternate</i>)	Director General, BIS (<i>Ex-officio Member</i>)
SHRI T. PURNANANDAM, Deputy Director (Agri & Food)	Director General, BIS (<i>Ex-officio Member</i>)

Secretary

SHRI S. K. SUD

Deputy Director (Agri & Food), BIS

Methods of Test and Laboratory Apparatus Subcommittee, AFDC 34 : 2

Convener

DR V. R. BHALERAO

Indian Council of Agricultural Research, New Delhi

Members

SHRI B. R. BEDEKAR

Hindustan Milkfood Manufacturers Ltd, Nabha

SHRI M. P. RAJEN PILLAI (*Alternate*)

(Continued on page 10)

Indian Standard
DETERMINATION OF
FAT BY THE GERBER METHOD
PART II MILK PRODUCTS
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (Part II) (First Revision) was adopted by the Indian Standards Institution on 30 May 1977, after the draft finalized by the Dairy Products Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The Gerber method for determination of fat in milk and milk products depends on the liberation of the fat by the action of sulphuric acid on milk or milk products in specially shaped, calibrated glass containers, called butyrometers which are then centrifuged to aid the separation of fat, the volume of which is finally read off against the percentage scale etched on the butyrometer. This method is widely used in India for the rapid determination of fat in milk and other milk products when a large number of samples is to be analyzed at a time.

0.2.1 With the increasing application of the Gerber method for determination of fat in milk and milk products for commercial need in India, it has become necessary to prescribe a uniform method, using standard apparatus designed to meet the Indian conditions, so that the results obtained in different laboratories and by different workers are comparable within a reasonable degree of accuracy.

0.3 This standard was first issued in 1958 as IS : 1224-1958*. It has now been decided to issue the revised version of the standard into two parts. Part I deals with determination of fat in milk. This part (Part II) deals with the determination of milk fat in milk products, such as cream, milk powder and cheese, the last two products had not been included in the earlier version of the standard.

0.4 It should be emphasized that the methods prescribed in this standard are designed for routine purposes only, and while these give results comparable with gravimetric methods, these cannot be substituted for gravimetric methods, which will have to be used for reference purposes.

*Determination of fat in milk, evaporated (unsweetened) milk, separated milk skimmed milk, buttermilk and cream by the Gerber method.

IS: 1224 (Part II) - 1977

0.5 In the formulation of this standard, considerable assistance has been derived from BS 696: Part II: 1969 Gerber method for the determination of fat in milk and milk products: Part II Methods, issued by the British Standards Institution.

0.6 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS: 2-1960*.

1. SCOPE

1.1 This standard (Part II) prescribes the procedure for the determination of fat in milk products by the Gerber method.

1.1.1 The methods for milk powders is applicable to powders containing not less than 10 percent fat.

2. APPARATUS

2.1 The apparatus given in **2.1.1** to **2.1.8** conforming to the provisions of IS: 1223 (Part I)-1970†, IS: 1223 (Part II)-1972‡ and IS: 1223 (Part III)-1977§ are required.

2.1.1 *Butyrometer, 70 Percent Scale* — for estimating fat in cream.

2.1.2 *Butyrometer, 6 Percent, 8 Percent and 10 Percent Scale* — for estimating fat in milk powders.

2.1.3 *Cheese Butyrometer, 40 Percent Scale* — for estimating fat in cheese.

2.1.4 *10-ml Pipette or Automatic Measure for Sulphuric Acid*

2.1.5 *1-ml Pipette or Automatic Measure for Amyl Alcohol*

2.1.6 *Stoppers for Butyrometers*

2.1.7 *Centrifuge*

2.1.8 *Water-Bath*

2.2 Other Apparatus

2.2.1 *Weighing Balance* — suitable for weighing to 0.01 g.

2.2.2 *Small Scoop* — of suitable material (for example, aluminium, nickel or plastics). It is convenient if this scoop has a counterpoise.

*Rules for rounding off numerical values (revised).

†Specification for apparatus for determination of milk fat by Gerber method: Part I Butyrometers and stoppers (first revision).

‡Specification for apparatus for determination of milk fat by Gerber method: Part II Pipettes and automatic measures (first revision).

§Specification for apparatus for determination of milk fat by Gerber method: Part III Centrifuges and water-baths (first revision).

2.2.3 Stemless Funnel

2.2.4 Glass Rod — of such diameter (6 mm is convenient) that the rod will pass through the hole at the base of the funnel (**2.2.3**).

2.2.5 Small Camel Hair Brush

2.2.6 Wash Bottles — containing cold and hot distilled water (*see* IS : 1070-1977*) at about 30 to 40°C and 70°C.

2.2.7 Stopped Funnel**2.2.8 Grater or Pestle and Mortar****3. REAGENTS**

3.1 Sulphuric Acid — Sulphuric acid shall have a density of 1.807 to 1.812 g/ml at 27°C corresponding with a concentration of sulphuric acid from 90 to 91 percent by mass.

3.1.1 The sulphuric acid shall be colourless or not darker than pale amber in colour.

3.1.2 When diluted with distilled water to a density of 1.4 g/ml, not more than a very slight turbidity shall occur.

3.2 Amyl Alcohol — It shall conform to Grade 1 of IS : 360-1964†.

4. METHOD FOR CREAM

4.1 Mixing of Sample — Stir the sample thoroughly but not so vigorously as to cause undue froth or churning. If the cream is very thick, warm to a temperature between 30°C and 40°C to facilitate mixing. Mix immediately before weighing the required amount of cream for the test.

4.1.1 If it is not possible to achieve complete mixing, the sample should not be tested by this method.

4.2 Method 1

4.2.1 Weighing of Sample — Weigh 5.00 ± 0.01 g of sample into a dried and tared beaker of about 50-ml capacity.

4.2.2 Addition of Acid and Alcohol — Add in small quantities freshly prepared mixture of one volume of sulphuric acid (*see* **3.1**) and one volume of distilled water to the cream in the beaker. Dissolve the cream and transfer the mixture carefully, with the help of a dry funnel, to the butyrometer for testing cream (*see* **2.1.1**). Rinse the beaker about six times

*Specification for water for general laboratory use (*second revision*).

†Specification for amyl alcohol (*revised*).

with small quantities of the dilute acid to make sure that all cream has been transferred to the butyrometer. Altogether 18 to 20 ml of the diluted acid should suffice to fill the butyrometer, leaving sufficient space for the addition of amyl alcohol and mixing. Add one millilitre of amyl alcohol (see 3.2) by means of the 1-ml pipette or the automatic measure (see 2.1.5). Do not wet the neck of the butyrometer with alcohol.

4.2.3 Insertion of Stopper — Close the neck of the butyrometer firmly with the stopper (see 2.1.6) without disturbing the contents. When a double-ended stopper is used, screw it in until the widest part is at least level with the top of the neck. When a lock stopper is used, insert it until the rim is in contact with the neck of the butyrometer.

4.2.4 Mixing of Contents — Shake the butyrometer carefully, without inverting it, until the contents are thoroughly mixed, the curd is dissolved and no white particles are seen in the liquid. Then invert the butyrometer a few times to mix the contents thoroughly.

NOTE — When a large number of samples is to be mixed, shake the butyrometers in a protected stand until the contents are thoroughly mixed and no white particles are seen. Invert once or twice during the process.

4.2.5 Temperature Adjustment — Transfer the butyrometer quickly, with the bulb uppermost, into a water-bath having a temperature of $65 \pm 2^\circ\text{C}$ and leave it there for not less than 3 minutes and not more than 10 minutes. Take care to have the water level in the bath above the top of the fat column in the butyrometer. Meanwhile, adjust the stopper so that the fat column should be on the scale after centrifuging.

4.2.6 Centrifuging — Take the butyrometer out of the water, dry it with a cloth and transfer it to the centrifuge, placing two butyrometers diametrically opposite so as to balance the rotating disc. Centrifuge at the maximum speed for 5 minutes. Bring the centrifuge to stop gradually. Transfer the butyrometers, stoppers downwards, into a water-bath having a temperature of $65 \pm 2^\circ\text{C}$ as in 4.2.5, and allow the butyrometers to stand in the water-bath for at least 3 minutes and not more than 10 minutes.

4.2.7 Reading of Butyrometer — Before taking a reading, adjust the position of the fat column to bring the lower end of the column on to a main graduation mark. When double-ended stoppers are used, do this by slightly withdrawing the stopper and not by forcing it further into the neck. Note the scale readings corresponding to the lowest point of the fat meniscus and the surface of separation of the fat and acid; the difference between the two readings gives the percentage by mass of fat in the cream. When readings are being taken, hold the butyrometer with the graduated portion vertical, keep the point read in level with the eye, and then read the butyrometer to the nearest 0.5 percent that is, half of the smallest scale division.

4.2.8 Second Centrifuging — If after centrifuging there is not a sharp dividing line between the fat and the acid, or if the acid layer is not clear,

repeat the temperature adjustment (see 4.2.5) and centrifuging (see 4.2.6) before taking the reading.

4.2.9 Precautions — If a fluffy layer is observed at the base of the fat column in the butyrometer, reject the test. Examine the stopper to see if it is in good condition, repeat the test and take care to ensure that the curd is completely dissolved.

4.2.9.1 If the fat column is so dark as to make reading difficult, reject the test and check the strength of the sulphuric acid.

4.2.9.2 If a large number of samples has to be tested, it is preferable to use automatic measures for measuring the sulphuric acid and amyl alcohol, especially the latter, otherwise there is a possibility of injurious effects to the health arising from the inhalation of amyl alcohol vapours by the use of 1-ml pipette.

4.2.10 Check Reading — Replace the butyrometer in the bath for another 3 minutes and then take a check reading of the butyrometer as rapidly as possible.

4.3 Method 2

4.3.1 Addition of Acid to Butyrometer — Transfer 10 ml of sulphuric acid (see 3.1) into the butyrometer by means of the 10-ml pipette for sulphuric acid or the automatic measure (see 2.1.4) taking care not to wet the neck of the butyrometer with the sulphuric acid.

4.3.2 Weighing of Sample — Mix, and immediately weigh 5 ± 0.01 g of sample into the butyrometer without soiling the neck, using any suitable form of support for the butyrometer on the balance.

4.3.3 Addition of Water and Amyl Alcohol — Add about 6 ml of the hot water (70°C) to the butyrometer. Measure 1 ml of amyl alcohol into the butyrometer by means of the alcohol pipette or automatic measure. Adjust the level of the contents to about 5 mm below the shoulder by further additions of hot water. In no circumstances shall the amyl alcohol be added to the butyrometer before the cream.

4.3.4 Follow the procedures described in 4.2.3 to 4.2.10.

5. METHOD FOR MILK POWDERS

5.1 Weighing of Sample — Mix the sample thoroughly, and weigh 1.69 ± 0.01 g of milk powder into the counterpoised scoop.

5.2 Addition of Acid to Butyrometer — Follow the procedure prescribed in 4.3.1 using the butyrometer (see 2.1.2).

5.3 First Addition of Water—Add gently from the wash bottle sufficient cold water to form a layer about 6 mm deep on top of the acid, allowing the water to flow down the side of the bulb.

5.4 Addition of Sample—Insert the narrow end of the stemless funnel (*see* 2.2.3) into the neck of the butyrometer. Transfer the contents of the scoop to the funnel, removing the last particles with the camel hair brush. Tap the funnel gently until most of the powder is in the butyrometer. Transfer the powder remaining in the funnel to the butyrometer with the aid of the glass rod and the camel hair brush. Remove the funnel.

5.5 Addition of Amyl Alcohol—Measure one millilitre of amyl alcohol (*see* 3.2) into the butyrometer by means of the 1-ml pipette for amyl alcohol or the automatic measure (*see* 2.1.5). Do not wet the neck of the butyrometer with alcohol.

5.6 Second Addition of Water—Add hot water (70°C) from the wash bottle until the butyrometer is filled to about 5 mm below the shoulder, allowing all air entrained in the powder to escape.

5.7 Follow the procedures prescribed in 4.2.3 to 4.2.10. Read the butyrometer to the nearest 0.05 percent.

5.8 Third Centrifuging—Repeat the procedure described in 4.2.8 if the reading obtained after the second centrifuging is higher than that obtained after the first centrifuging.

5.9 Calculation of Percentage of Fat—Multiply the scale reading of the butyrometer by the factor 20/3 to obtain the percentage of fat in milk powders.

6. METHOD FOR CHEESE

6.1 Preparation of Sample—Grate samples of hard cheese. Grind samples of soft cheese. Mix thoroughly.

6.2 Weighing of Sample—Counterbalance the stoppered funnel (*see* 2.2.7) with its stopper inserted. Weigh 3 ± 0.01 g of the sample into the funnel.

6.3 Addition of Acid to Butyrometer—Follow the procedure prescribed in 4.3.1 using the cheese butyrometer (*see* 2.1.3).

6.4 First Addition of Water—Add gently from the wash bottle sufficient warm water (30 to 40°C) to form a layer about 6 mm deep on top of the acid, allowing the water to flow down the side of the bulb.

6.5 Addition of Sample—Insert the neck of the funnel containing 3 g of cheese into the neck of the butyrometer. Withdraw the stopper from the neck of the funnel and transfer all the cheese to the butyrometer with the aid of the glass rod or spatula.

6.6 Addition of Amyl Alcohol — Follow the procedure prescribed in 5.5.

6.7 Second Addition of Water — Add warm water (30 to 40°C) from the wash bottle until the butyrometer is filled to about 5 mm below the shoulder.

6.8 Follow the procedures described in 4.2.3 to 4.2.10. Read the butyrometer to the nearest 0.3 percent, that is, one-third of the smallest scale division.

NOTE — For cheese containing more than 40 percent of fat, 1.5 g of cheese should be taken for the test and the butyrometer reading multiplied by 2.

(Continued from page 2)

<i>Members</i>	<i>Representing</i>
SHRI P. H. BHATT	Kaira District Co-operative Milk Producers' Union Limited, Anand
DR I. M. PATEL (Alternate)	
SHRI V. M. BHUCHAR	Chemical Department, National Physical Laboratory (CSIR), New Delhi
DR T. J. BOMAN	Department of Panchayats and Health, Government of Gujarat, Ahmadabad
DIRECTOR	Central Food Laboratory, Calcutta
SHRI J. M. DOSHI	Doshi & Sons, Anand
SHRI D. M. DOSHI (Alternate)	
DR N. C. GANGULI	National Dairy Research Institute (ICAR), Karnal
DR B. RANGANATHAN (Alternate)	
SHRI S. V. GUPTA	National Physical Laboratory (CSIR), New Delhi
SHRI R. S. IYER	Glaxo Laboratories (India) Ltd, Bombay
DR V. S. MOHAN (Alternate)	
JOINT COMMISSIONER (DAIRY DEVELOPMENT)	Ministry of Agriculture & Irrigation (Department of Agriculture), New Delhi
ASSISTANT COMMISSIONER (DAIRY DEVELOPMENT) (Alternate)	
SHRI N. D. KOTNIS	Dairy Development Commissioner, Government of Maharashtra, Bombay
MANAGER (QUALITY CONTROL)	Delhi Milk Scheme, New Delhi
SHRI S. C. SAXENA (Alternate)	
SHRI YASH PAUL NANGIA	Jupiter Glass Works, Delhi
SHRI V. S. PANDYA	Venus Trading Company, Anand
SHRI PARAMIK	Public Analyst, Government of West Bengal, Calcutta
SHRI B. P. S. PURI	Larsen & Toubro Ltd, Bombay
SHRI B. KHANNA (Alternate)	
SECRETARY	Central Committee for Food Standards (Ministry of Health & Family Welfare), New Delhi
SHRI N. SRINIVASAN	Government Analyst, Government of Tamil Nadu, Madras
COL R. N. TANEJA	Food Inspection Organization, Quartermaster General's Branch (Army Headquarters), New Delhi
LT-COL D. D. VOHRA (Alternate)	
SHRI W. VONCKX	Food Specialities Limited, Moga
DR M. K. K. IYENGAR (Alternate)	
SHRI J. K. WAD	Borosil Glass Works Ltd, Bombay

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 323 0131, 323 3375, 323 9402

Fax : 91 11 3234062, 91 11 3239399, 91 11 3239382

Telegrams : Manaksanstha
(Common to all Offices)

Central Laboratory:

Plot No. 20/9, Site IV, Sahibabad Industrial Area, SAHIBABAD 201010

Telephone

8-77 00 32

Regional Offices:

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002 323 76 17

*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054 337 86 62

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022 60 38 43

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 235 23 15

†Western : Manakalaya, E9 Behind Marol Telephone Exchange, Andheri (East),
MUMBAI 400093 832 92 95

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001 550 13 48

‡Peenya Industrial Area, 1st Stage, Bangalore - Tumkur Road,
BANGALORE 560058 839 49 55

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003 55 40 21

Plot No. 62-63, Unit VI, Ganga Nagar, BHUBANESHWAR 751001 40 36 27

Kalaikathir Buildings, 670 Avinashi Road, COIMBATORE 641037 21 01 41

Plot No. 43, Sector 16 A, Mathura Road, FARIDABAD 121001 8-28 88 01

Savitri Complex, 116 G. T. Road, GHAZIABAD 201001 8-71 19 96

53/5 Ward No. 29, R. G. Barua Road, 5th By-lane, GUWAHATI 781003 54 11 37

5-8-58C, L. N. Gupta Marg, Nampally Station Road, HYDERABAD 500001 20 10 83

E-52, Chitaranjan Marg, C-Scheme, JAIPUR 302001 37 29 25

117/418 B, Sarvodaya Nagar, KANPUR 208005 21 68 76

Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road,
LUCKNOW 226001 23 89 23

Patliputra Industrial Estate, PATNA 800013 26 23 05

T. C. No. 14/1421, University P. O. Palayam,
THIRUVANANTHAPURAM 695034 6 21 17

NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010 52 51 71

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005 32 36 35

*Sales Office is at 5 Chowringhee Approach, P. O. Princep Street,
CALCUTTA 700072 27 10 85

†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007 309 65 28

‡Sales Office is at 'F' Block, Unity Building, Narashimaraja Square,
BANGALORE 560002 222 39 71