IS 14372 (1996): Volt-ampere hour meters for full power factor range [superseding IS:722(Part 7/Sections 1, 2 and 3)-1987] [ETD 13: Equipment for Electrical Energy Measurement and Load Control]

BLANK PAGE

IS 14372 : 1996
[Superseding IS 722 (Part 7/Sec 1 to 3) : 1987]

भारतीय मानक

पूर्ज पावर गुणक रेंज के लिए वोल्ट-ऐम्पीयर ऑवर मीटर — विशिष्टि

Indian Standard

VOLT-AMPERE HOUR METERS FOR FULL POWER FACTOR RANGE — SPECIFICATION

ICS 17.220.20

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

October 1996

Price Group 4

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Equipment for Electrical Energy Measurements and Load Control Sectional Committee had been approved by the Electrotechnical Division Council.

The requirements of Vector sum VAh meters with or without maximum demand indicators were covered in three sections of IS 722 (Part 7) : 1987 'AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range', which was published in 1969. This standard was then revised in 1987 to take into account two measurement techniques being adopted for the measurement of volt-ampere-hour for the entire power factor range. These two techniques achieve vector sum definition of total equivalent volt-ampere-hour (VAh) of the polyphase circuit which were covered separately by IS 722 (Part 7/Sec 2) : 1987 'AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 2 Vector sum VAh meters (*first revision*)' and IS 722 (Part 7/Sec 3) : 1987 'AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 3 Arithmetic sum VAh meters (*first revision*)' respectively.

This standard takes into account the requirements of VAh meters specified in IS 722 (Part 7/Sec 1 to 3) and in addition, covers conditions for tests and speed of rotation which were found suitable by the utilities based on their practical experience. This standard would supersede IS 722 (Part 7/ Sec 1) : 1987 'AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 1 General requirements (*first revision*)', IS 722 (Part 7/ Sec 2) : 1987, and IS 722 (Part 7/Sec 3) : 1987 in accordance with the date from which the standard is implemented.

Generally two measurement techniques are adopted for VAh measurement for full power factor range. One of these techniques is by incorporating ferraris induction elements, which uses an apparent energy computer of mechanical or solid state design actuated by one watthour meter and one var-hour meter. This computer achieves the vector sum definition of the total equivalent volt-ampere hour of the polyphase circuit (*see* **3.4**).

The other method employs an electronic circuit so as to make the voltage/current vector lose its individual phase identity with respect to the current/voltage vector respectively. Thus, the arithmetic sum definition of the total equivalent volt-ampere hour (VAh) of the polyphase circuit is achieved.

Earlier the requirement of watt-hour meters, VA-hour, and VAR-hour meter were covered in IS 722 as follows:

IS 722 (Part 1) : 1986 AC elctricity meters : Part 1 General requirements and tests

IS 722 (Part 2) : 1977 AC electricity meters : Part 2 Single-phase whole-current watt-hour meters, Class 2 (*superseded by* IS 13010 : 1990)

IS 722 (Part 3) : 1977 AC electricity meters : Part 3 Three-phase whole-current and transformer operated and single-phase transformer operated watt-hour meters, Class 2 (*superseded by* IS 13010 : 1990)

IS 722 (Part 5) : 1980 AC electricity meters : Part 5 Volt-ampere hour meters for restricted power factor range, Class 3.5 (*superseded by* IS 14415 : 1996)

IS 722 (Part 6) : 1980 AC electricity meters : Part 6 Var-hour meters, Class 2.5 (*superseded by* IS 14390 : 1996)

IS 722 (Part 7/ Sec 1) : 1987 AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 1 General requirements (*first revision*) (*superseded by* IS 14372 : 1996)

IS 722 (Part 7/Sec 2) : 1987 AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 2 Vector sum VAh meters (*first revision*) (*superseded by* IS 14372 : 1996)

IS 722 (Part 7/Sec 3) : 1987 AC electricity meters : Part 7 Volt-ampere hour meters for full power factor range, Section 3 Arithmetic sum VAh meters (*first revision*) (*superseded by* IS 14372 : 1996)

IS 722 (Part 8) : 1972 AC electricity meters : Part 8 Single-phase 2-wire whole current watt-hour meters (Class 1.0) (*superseded by* IS 13010 : 1990)

(*Continued on third cover page*)

Indian Standard

VOLT-AMPERE HOUR METERS FOR FULL POWER FACTOR RANGE — SPECIFICATION

1 SCOPE

1.1 This standard specifies the general requirements of volt-ampere hour (VAh) meter for full power factor range.

2 REFERENCES

2.1 The Indian Standards given in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions in addition to those given in IS 722 (Part 1) : 1986 and IS 8530 : 1977, shall apply.

3.1 Vector Sum Volt-Ampere

This is the vector sum of active energy and reactive energy in a 3-phase balanced or unbalanced circuit.

3.2 Arithmetic Sum Volt-Ampere

This is the arithmetical sum of the three products of line current and associated phase voltage in a three phase balanced or unbalanced circuit.

3.3 Auxiliary Current and Voltage Transformers

Set of three current transformers used to step down the input currents and a voltage transformer used to energize the saturable reactor or the transistor switching circuit with or without operational amplifiers. These transformers also provide a galvanic isolation between the circuit to be measured and the actual measuring circuits.

3.4 Apparent Energy Computer

That part of the vector sum VAh meter which is actuated mechanically or by electrical pulses from separate active and reactive energy meters forming an integral part of the meter, and mechanically or electrically generated output pulses proportional to the apparent energy is passed through the metered circuits.

The output shall finally drive a mechanical register and maximum demand indicator where provided. It constitutes a mechanical gear train or a solid state digital integrated circuit.

4 RATINGS

4.1 Current

4.1.1 The preferred rated currents for meters connected to current transformers shall be 5 and 1A [*see* IS 2705 (Part 1) : 1981].

4.1.2 Rated or basic current shall be marked on the meter as shown in Table 6 of IS 722 (Part 1) : 1986.

5 TYPES

5.1 There are two types :

a) Vector sum VAh meters, and
b) Arithmetic sum VAh meters.

6 RATED POWER FACTOR RANGE

6.1 Vector Sum VAh Meters

The vector sum VAh meters shall be:

a) 0.00 lag to unity, or
b) 0.00 lead to unity.

6.2 Arithmetic Sum VAh Meters

Arithmetic sum VAh meters shall be 0.00 lag through unity to 0.00 lead.

7 CONDITION FOR TESTS

7.1 Unless otherwise specified, tests shall be carried out under the following conditions.

7.1.1 The meter cover shall be in position.

7.1.2 For drum type registers, only the most rapidly moving drum shall be turning.

7.1.3 Before any tests are made, the voltage circuits shall have been energized for at least:

a) 4 h for Class 0.5 meters,
b) 2 h for Class 1 meters, and
c) 1 h for Class 2 meters and worse.

The measuring currents shall be set progressively to increasing or decreasing values and the current circuits shall be energized at each value for a sufficient time to obtain thermal stability with corresponding constant speed of rotation.

7.1.4 In addition, for polyphase meters:

a) the phase sequence shall be as marked on the diagram of connections and

b) the voltages and currents shall be substantially balanced (*see* Table 1).

7.1.5 The reference conditions for various influence quantities shall be as specified in Table 2.

8 SPEED OF ROTATION

8.1 The speed of the meter rotor shall not exceed 72 rev/min and 50 rev/min at rated maximum current for single phase and three phase meters respectively.

9 TERMINALS

9.1 The diameter of terminal holes of the meters, for introducing the external conductors, shall be as given in Table 3 of IS 722 (Part 1) : 1986.

9.2 The tapered entry hole in the insulating terminal block shall have a diameter slightly larger than the terminal hole and shall be not less than 3 mm in depth to allow for a part of the conductor with insulation to remain inside the terminal compartment.

9.3 Transformer

Operated meters shall have separate terminals for the voltage and current circuits.

10 PACKING AND MARKING OF METERS

10.1 The relevant provisions of 7 and 8 of IS 722 (Part 1) : 1986 shall apply.

10.2 The rated power factor range shall be marked on the nameplate of the meter.

11 PHASE SEQUENCE

11.1 Polyphase meters are required to comply with this part of the standard only when they are connected to a system in which the phase voltage reaches their maximum positive instantaneous values in the order shown on the diagrams of connection supplied with the meters.

11.2 A polyphase meter should be connected to the system in such a manner that the voltage applied to the terminals of the meter reach their maximum in the correct sequence (*see* 6.1), otherwise the accuracy of the meter may be impaired. Therefore, unless the phase sequence of the mains at the point,where the meter is tested or installed is known with certainty, it shall be determined by one of the devices available for this purpose.

12 ENERGY REGISTER

12.1 The apparent energy register shall comply with 5.7 of IS 722 (Part 1) : 1986.

13 MAXIMUM DEMAND INDICATOR

13.1 Wherever volt ampere maximum demand indicator is provided, it shall generally comply with the requirements given in IS 8530 : 1977.

14 MECHANICAL BURDEN

14.1 The mechanical burden of the apparent energy computer mechanism should be such that the total

Table 1 Voltage and Current Balance

(*Clause* 7.1.4)

Polyphase Meters	Class of Meter		
	0.5	1	2 and Worse
(1)	(2)	(3)	(4)
Each of the voltage between line and neutral or between any two lines shall not differ from the average corresponding voltage by more than	±0.5 percent	±1 percent	±1 percent
Each of the current in the conductors shall not differ from the average current by more than	±1 percent	±2 percent	±2 percent
The phase displacements of each of these currents from the corresponding line-to-neutral voltage, irrespective of the power factor, shall not differ from each other by more than	2°	2°	2°

Table 2 Reference Conditions for Influence Quantities

(*Clause* 7.1.5)

Influence Quantity	Reference Value	Permissible Tolerance for Meters of Class		
		0.5	1	2 and Worse
(1)	(2)	(3)	(4)	(5)
Ambient temperature	Reference temperature or in its absence 27°C (*see* Note 1)	±1 °C	±2 °C	±2 °C
Working position	Vertical working position (*see* Note 2)	±0.5°	±0.5°	±0.5°
Voltage (*see* Note 3)	Reference voltage	±0.5 percent	±1 percent	±1 percent
Frequency	Reference frequency, or in its absence 50 Hz	±0.2 percent	±0.3 percent	±0.5 percent
Magnetic induction of external origin at the reference frequency (*see* Note 4)	Magnetic induction equal to zero	Induction value which caused a variation of error not greater than		
		0.1 percent	0.2 percent	0.3 percent

NOTES

1 If the tests are made at a temperature other than the reference temperature, including permissible tolerances, the results shall be corrected by applying appropriate temperature coefficient of the meter.

2 Determination of vertical working position (*see* **6.2**). The construction and assembly of the meter should be such that the correct vertical position is ensured (in both the front-to-back and left-to-right vertical planes), when:

a) the base of the meter is supported against a vertical wall, and

b) a reference edge (such as the lower edge of the terminal block) or a reference line marked on the meter case is horizontal.

3 When testing polyphase varhour meters, errors may arise if the testing method used and the meter under test are differently affected by voltage unbalance. In such cases, the reference voltage shall be carefully adjusted to a high degree of symmetry.

4 The test consists of:

a) *For a single-phase meter* — Determining the errors, at first with the meter normally connected to the mains and then after inverting the connections to the current circuits as well as to the voltage circuits. Half of the difference between the two errors is the value of the variation of error. Because of the unknown phase of the external field the test has to be made at 0.1 I_b at cos ϕ (of sin ϕ) = 1, as applicable, and 0.2 I_b at 0.5 power factor.

b) *For a three-phase meter* — Making three measurements, at 0.1 I_b at cos ϕ (or sin ϕ) = 1, as applicable after each of which the connections to the current circuits and to the voltage circuits are changed over 120°, while the phase sequence is not altered. The greatest difference between each of the errors so determined and their average value is the value of variation of error.

disconnection of the mechanism shall not affect the speed of the active or reactive energy meter by more than 2.5 percent at 20 percent rated current, rated voltage and cos ϕ = 1or sin ϕ = 1 respectively.

15 REQUIREMENTS FOR VECTOR SUM VAh METERS

15.1 Active Energy Meter

The active energy meter forming an integral part of the meter shall conform to IS 13010 : 1990 when the apparent energy computer is disconnected.

15.2 Reactive Energy Meter

The reactive energy meter forming an intergral part of the meter shall conform to IS 722 (Part 6) : 1980 when the apparent energy computer is disconnected.

15.2.1 The reactive energy meter shall be fitted with a reverse running stop.

16 TESTS FOR VECTOR SUM VAh METERS

16.1 General

Unless otherwise specified in the standard, the

built-in active and reactive energy meters shall be tested for conformity to the routine and type tests specified in IS 13010 : 1990 and IS 14390 : 1996 respectively with the apparent energy computers disconnected.

16.2 Starting

The meter rotor(s) shall start and continue to run when the meter carries one percent of the basic current at minimum rated voltage (the maximum demand pointer not being driven) and at power factor giving maximum torque. When the meter is provided with a reverse running and/or contacting device, the starting current shall not exceed 2 percent of the basic current at the power factor giving maximum torque.

16.3 Limits of Energy

16.3.1 *Apparent Energy Computer*

The apparent energy computer shall have a maximum error of ±1.5 percent over the rated power factor range. This error is over and above the error of the built-in active and reactive energy meters.

16.3.1.1 The construction of the mechanical apparent energy computer is to be such that if the reactive energy tends to run backward due to power factor falling not within the rated power factor range specified in **6.1** of this standard and is consequently stopped by reverse running stop of the rotors, the output of the apparent energy computer (kVah) shall be equal to the input of the active energy meter (kWh) within the limits of permissible tolerance specified in **16.3.1** of this standard.

16.3.2 *Maximum Demand Indicator*

Whenever a maximum demand indicator is provided on the apparent energy computer, the error of indication from full-scale to 20 percent of full-scale value shall not exceed ±1 percent of the full-scale value. This error is in addition to the error of the apparent energy computer given in **16.3.1**.

16.3.2.1 When a contacting device or reverse running stop or both are operated by the meter, the limit of negative error at 5 percent of rated current shall be subject to a permissible increase of 1.5 percent.

16.3.2.2 For observing the error of the maximum demand indicator, the meter shall be allowed to run so as to register not less than 20 percent of the full scale value (rated maximum demand).

16.3.2.3 Whenever a synchronous motor is used for operating the timing element (*see* **2.11** of IS 8530 : 1977), the frequency of the supply during the test shall be maintained substantially stable and/or proportionate allowance shall be given in calculating the error of the maximum demand registration since the speed of the synchronous motor is directly proportional to the frequency of supply.

17 REQUIREMENTS AND TESTS FOR ARITHMETIC SUM VAh METERS

17.0 General

The requirements of this standard shall be verified with the provisions laid down in the relevant requirements of IS 722 (Part 1) : 1986.

17.1 Classification of Tests

The provisions of **10.1.1**, **10.1.2** and **10.1.3** of IS 722 (Part 1) : 1986 shall apply.

17.2 Insulation Resistance

The provisions of **10.2** of IS 722 (Part 1) : 1986 shall apply.

17.3 Running with No Load

The provisions of **10.3** of IS 722 (Part 1) : 1986 shall apply.

17.4 Starting [*see* **10.4** of IS 722 (Part 1) : 1986]

The starting current shall be 2.0 percent of basic current at any power factor. If the meter is provided with a reverse running stop and/or contacting device, the starting current shall be 3.0 percent of the basic current at any power factor.

17.5 Limits of Error [*see* **10.5** of IS 722 (Part 1) : 1986]

The percentage errors shall not exceed the limits given in Tables 3 and 4 for full power factor range.

Table 3 Limits of Errors (3-Phase Meters with Balanced Loads)

Value of Current (1)	Percentage Error Limits (2)
5 percent I_b	± 3.5
10 percent I_b to I_{Max}	± 3.0

17.5.1 The limits of error of the supporting meter and conditions for tests shall be the same as specified in the relevant part of IS 722 except that the tests shall be made so as to take into account the effect of the maximum demand indicator which shall be coupled to the supporting meter but which shall not be driving

its indicator pointer or drum(s). In these conditions, the errors shall be within the required limits for the meter without the maximum demand indicator.

17.5.2 The difference between the percentage error when the meter is carrying a 1-phase load as basic current and percentage error when the meter is carrying a balanced 3-phase load at basic current shall not exceed 2.5 percent, when the tests are done at the same power factor.

17.5.3 For acceptance and routine tests, the errors shall be determined at the test points specified as below:

Current	*Power Factor*
5 percent I_b	1.0
10 percent I_b	0.5 lagging
10 percent I_b	0.5 leading
100 percent I_b	0.5 leading
100 percent I_b	1.0

Table 4 Limits of Error (3-Phase Meters Carrying a 1-Phase Load But with Balanced 3-Phase Voltage Applied to Voltage Circuits)

(*Clause* 17.5)

Value of Current (1)	Percentage Error Limits (2)
20 percent I_b to I_b	± 4.0
Above I_b to I_{Max}	± 4.5

NOTE — When testing for compliances with Table 4 the test current shall be applied to each element in sequence.

17.5.3.1 Type test shall, however, prove conclusively that the meter as tested above would satisfy the limits of errors as specified above.

17.5.4 If the meter is provided with a reverse running stop and/or contacting device, the limit of negative percentage error at 5 percent basic current and unity power or 10 percent basic current and 0.5 power factor lagging shall be subjected to an allowable increase of 1.5.

17.6 Interpretation of Test Results and Adjustment (if Required)

The permissible displacement of zero line shall be not more than 1 percent [*see* **10.6** of IS 722 (Part 1) : 1986].

17.7 Test of Meter Constant

The provisions of **10.7** of IS 722 (Part 1) : 1986 shall apply.

17.8 Power Loss

The provisions of **10.8** of IS 722 (Part 1) : 1986 shall apply.

17.8.1 *Meter Voltage Circuit*

The power loss in each voltage circuit at reference voltage, reference temperature and reference frequency shall not exceed 3.0 watts and 15 VA.

17.8.2 *Current Circuit*

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 2.5 VA.

17.8.3 *Auxiliary Voltage Circuit*

The loss in each continuously energized auxiliary voltage circuit at the marked voltage shall not exceed 6.0 W at any voltage up to 240 V and an additional 2.0 W for every 100 V or part thereof above 240 V.

17.9 Heating

The provisions of **10.9** of IS 722 (Part 1) : 1986 shall apply.

17.10 Dielectric Strength

The provisions of **10.10** of IS 722 (Part 1) : 1986 shall apply.

17.11 Effects of Influence Quantities

The variation in errors due to influence quantities shall not exceed the limits specified in Table 5 [*see* **10.11** of IS 722 (Part 1) : 1986] at power factor specified.

17.12 Effect of Short Circuits

The variation of error shall not exceed the values specified in Table 6 [*see* **10.12** of IS 722 (Part 1) : 1986].

17.13 Effect of Self-Heating

The variation of error shall not exceed the value specified in Table 7 [*see* **10.13** of IS 722 (Part 1) : 1986].

17.14 Range of Adjustment

The minimum range of adjustment shall be as specified in Table 8 [*see* **10.14** of IS 722 (Part 1) : 1986].

Table 5 Limits of Variation in Errors

(*Clause* 17.11)

Change in Value of Influence Quantities with Respect to Reference Conditions	Value of Current	Limit of Variation in Percentage Error
(1)	(2)	(3)
Ambient temperature ±10°C	10 percent I_b to I_{Max}	0.25/ °C
Oblique suspension 3° in any direction	5 percent I_b	4.0
	I_b and I_{Max}	1.0
Voltage ±10 percent	10 percent I_b	2.0
	I_b	1.5
Frequency ±5 percent	10 percent I_b	2.5
	I_b	2.0
Magnetic induction of external origin 0.5 mT	I_b	3.0
Magnetic field of an accessory	5 percent I_b	1.0
Mechanical load of energy register	5 percent I_b	2.0

NOTE — Tests shall be made at the following power factors:

a) Unity,

b) 0.5 lag, and

c) 0.5 lead.

Table 6 Variations Due to Short Circuit

(*Clause* 17.12)

Meters for	Value of Current	Power Factor (cos)	Limits of Variation in Percentage Error
(1)	(2)	(3)	(4)
Direct connection	I_b	1	1.5
Connection through current transformer	I_b	1	1.5

Table 7 Variation Due to Self-Heating

(*Clause* 17.13)

Value of Current	Power Factor	Limits of Variations in Percentage Error
(1)	(2)	(3)
I_{Max}	1	1.5

Table 8 Minimum Range of Adjustment

(*Clause* 17.14)

Sl No.	Adjustment	Value of Current	Power Factor (cos)	Minimum Range of Ajustment Speed of Rotor in Percentage
(1)	(2)	(3)	(4)	(5)
i)	Braking element	I_b	1	±4.0
ii)	Low load	5 percent I_b	1	±4.0

ANNEX A

(*Clause* 2.1)

LIST OF INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
722 (Part 1) : 1986	ac electricity meters : Part 1 General requirements and tests (*third revision*)	8530 : 1977	Maximum demand indicators (Class 1)
		13010 : 1990	AC watt-hour meters, Class 0.5, 1 and 2
2705 (Part 1) : 1992	Current transformers : Part 1 General requirements (*second revision*)	14390 : 1996	Var-hour meters, Class 3.0

(*Continued from second cover page*)

IS 722 (Part 9) : 1972 AC electricity meters : Part 9 Three-phase whole current and transformer operated watt-hour meters and single-phase two-wire transformer operated watt-hour meters (Class 1.0) (*superseded by* IS 13010 : 1990)

This standard shall be read in conjunction with IS 722 (Part 1) : 1986. In the preparation of this standard, assistance has also been derived from IEC Publication IEC 211 : 1966 'Maximum demand indicators, Class 1.0 (first edition)'.

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, 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.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ETD 13 (3259).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 83 75

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17, 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	337 84 99, 337 85 61, 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43, 60 20 25
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16, 235 04 42, 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East), MUMBAI 400093	832 92 95, 832 78 58, 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. PATNA. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India