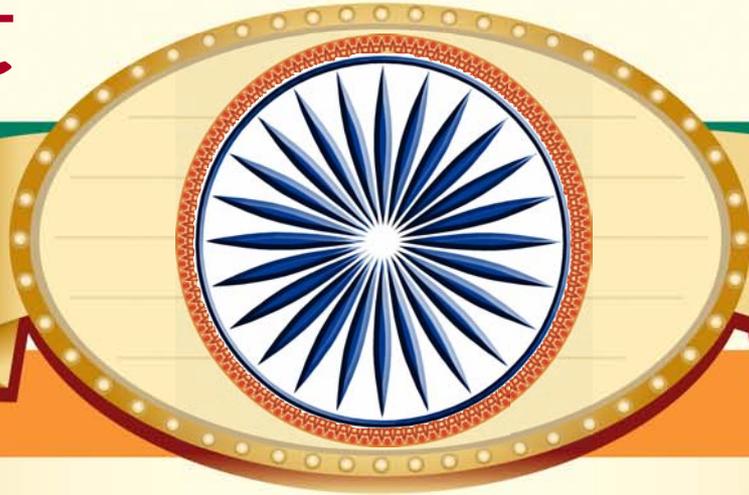


इंटरनेट

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

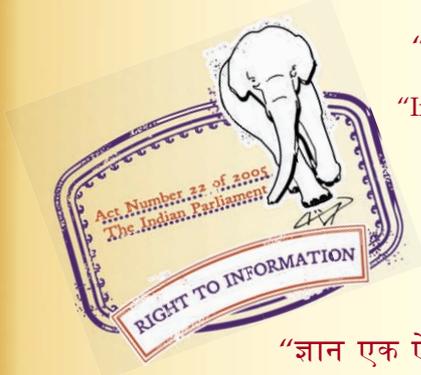
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8789 (1996): Values of performance characteristics for three-phase induction motors [ETD 15: Rotating Machinery]



“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



भारतीय मानक  
तीन-फेजवाली प्रेरण मोटरों की कार्यकारिता लक्षणों संबंधी मान  
( पहला पुनरीक्षण )  
*Indian Standard*

**VALUES OF PERFORMANCE  
CHARACTERISTICS FOR THREE-PHASE  
INDUCTION MOTORS**

( *First Revision* )

---

First Reprint APRIL 2000

ICS 29.160.30

© BIS 1996

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

## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rotating Machinery Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was issued in 1978. The standard has been taken up for revision to enlarge the scope by adding 8 pole motors also. The value of efficiency of motors has been given replacing the earlier value of 'product of efficiency and power factor' in the Tables 1 to 8. This would permit the user to choose the motor with higher efficiency essentially as step towards specifying energy conservation features.

The requirements of three-phase induction motors are covered in IS 325 : 1996 'Three phase induction motors (*fifth revision*)'.

This standard has been prepared with a view to cover the values of performance characteristics for three-phase induction motors having output rating up to 37 kW. The performance characteristics of motors above 37 kW may be declared by the motor manufacturer and these values are subject to tolerances specified in Table 1 of IS 325 : 1996 (*fifth revision*).

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.

**AMENDMENT NO. 1 MAY 2002**  
**TO**  
**IS 8789 : 1996 VALUES OF PERFORMANCE**  
**CHARACTERISTICS FOR THREE-PHASE INDUCTION**  
**MOTORS**

*( First Revision )*

*( Page 2, Table 1, col 2, row 1 ) — Substitute '2720' for '2790'.*

*( Page 2, Table 2, col 2, row 1 ) — Substitute '2720' for '2790'.*

*( Page 2, Table 3, col 4, row 6 ) — Substitute '160' for '170'.*

*( Page 3, Table 4, col 4, row 6 ) — Substitute '160' for '170'.*

( ET 15 )

---

Reprography Unit, BIS, New Delhi, India

*Indian Standard*

# VALUES OF PERFORMANCE CHARACTERISTICS FOR THREE-PHASE INDUCTION MOTORS

( *First Revision* )

**1 SCOPE**

1.1 This standard covers the performance characteristics of 2, 4, 6 and 8 pole three-phase squirrel cage induction motors having output ratings up to and including 37 kW at rated voltage and frequency of 415 V and 50 Hz for continuous duty type  $S_1$ .

**2 REFERENCE**

2.1 The standards listed in Annex A are necessary adjuncts to this standard.

**3 TERMINOLOGY**

3.1 For the purpose of this standard, the definitions given in IS 1885 (Part 35) : 1993/IEC 50 (411) : 1993 shall apply.

**4 OUTPUT RATINGS**

4.1 This standard covers the values of performance characteristics for the following output ratings :

0.37, 0.55, 0.75, 1.1, 1.5, 2.2, 3.7, 5.5, 7.5, 9.3, 11, 15, 18.5, 22, 30 and 37 kW.

**5 TYPE OF ENCLOSURES**

5.1 The values of performance characteristics are applicable for motors having enclosures with degree of protection IP 44 or superior or IP 21, IP 22 or IP 23 (see IS 4691 : 1985).

**6 METHODS OF COOLING**

6.1 This standard covers motors having internal and external cooling methods IC 41 or IC 01 (see IS 6362 : 1995/IEC Pub 34-6 : 1991).

**7 PERFORMANCE VALUES**

7.1 The values of the performance characteristics of motors are covered under Tables 1 to 8 as follows:

No. of Poles	Type of Enclosures	Methods of Cooling	Table No.
2	IP 44 or superior	IC 41	1
2	IP 21, IP 22 or IP 23	IC 01	2
4	IP 44 or superior	IC 41	3
4	IP 21, IP 22 or IP 23	IC 01	4
6	IP 44 or superior	IC 41	5
6	IP 21, IP 22 or IP 23	IC 01	6
8	IP 44 or superior	IC 41	7
8	IP 21, IP 22 or IP 23	IC 01	8

**NOTES**

1 The values of performance characteristics specified in Tables 1 to 8 may not be applicable to motors whose minimum breakaway torque is higher than 180 percent of the full load torque.

2 The minimum breakaway torque values specified for the motor are at room temperature. The other values relating to speed, current, and efficiency apply to the motor when it has attained thermal equilibrium while delivering the rated output.

3 Test procedures for determination of the performance values shall be conducted in accordance with IS 4029 : 1967.

4 The value of full load current shall be taken as the average value of the currents measured in the three phases.

5 For motors having rated voltage other than 415 V, values given in Tables 1 to 8 shall be applicable except for value of maximum full load current which would be changed in the inverse proportion of the voltage.

6 For tolerance on performance characteristics, Table 1 of IS 325 : 1996 shall be referred.

**Table 1 Values of Performance Characteristics of 2-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP44 or Superior and Method of Cooling IC 41 ( Clause 7.1 )**

Rated Output kW	Full Load Speed, Min	Full Load Current, Max	Breakaway Torque in Terms of Full Load Torque, Min	Efficiency Nominal Percent
	rev/min	A	Percent	
0.37	2 790	1.20	170	63
0.55	2 760	1.6	170	67
0.75	2 790	2.00	170	71
1.1	2 790	2.80	170	73
1.5	2 800	3.70	170	76
2.2	2 810	5.00	170	78
3.7	2 820	8.00	160	81
5.5	2 830	11.00	160	82
7.5	2 840	15.00	160	83
9.3	2 850	18.50	160	83.5
11	2 860	21.50	160	84
15	2 870	29.00	160	85
18.5	2 880	35.00	160	85.5
22	2 890	41.50	160	86
30	2 900	54.00	160	86.5
37	2 900	67.00	160	87.0

**Table 2 Values of Performance Characteristics of 2-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 and Method of Cooling IC 01 ( Clause 7.1 )**

Rated Output kW	Full Load Speed, Min	Full Load Current, Max	Breakaway Torque in Terms of Full Load Torque, Min	Efficiency Nominal Percent
	rev/min	A	Percent	
0.37	2 790	1.20	170	63
0.55	2 760	1.60	170	67
0.75	2 780	2.00	170	71
1.1	2 790	2.80	170	73
1.5	2 800	3.70	170	76
2.2	2 810	5.00	170	78
3.7	2 820	8.00	160	81
5.5	2 830	11.00	160	82
7.5	2 840	15.00	160	83
9.3	2 840	19.50	160	82
11	2 860	23.50	160	83
15	2 860	31.00	160	84
18.5	2 870	38.00	160	84.5
22	2 870	44.00	160	85
30	2 880	57.00	160	85.5
37	2 880	70.00	160	86

**Table 3 Values of Performance Characteristics of 4-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 44 or Superior and Method of Cooling IC 41 ( Clause 7.1 )**

Rated Output kW	Full Load Speed, Min	Full Load Current, Max	Breakaway Torque in Terms of Full Load Torque, Min	Efficiency Nominal Percent
	rev/min	A	Percent	
0.37	1 330	1.40	170	64
0.55	1 340	1.70	170	69
0.75	1 360	2.20	170	71
1.1	1 370	2.90	170	73
1.5	1 380	3.80	170	76
2.2	1 390	5.10	170	79
3.7	1 410	8.10	160	83
5.5	1 420	11.40	160	84
7.5	1 430	15.40	160	85
9.3	1 430	18.50	160	85.5
11	1 440	22.00	160	85.5
15	1 440	30.00	160	86
18.5	1 440	36.00	160	87
22	1 440	43.00	160	87.5
30	1 450	56.00	160	88.5
37	1 450	69.00	160	88.5

**Table 4 Values of Performance Characteristics of 4-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01 (Clause 7.1)**

Rated Output kW	Full Load Speed, Min rev/min	Full Load Current, Max A	Breakaway Torque in Terms of Full Load Torque, Min Percent	Efficiency Nominal Percent
0.37	1 330	1.40	170	64
0.55	1 340	1.70	170	69
0.75	1 360	2.20	170	71
1.1	1 370	2.90	170	73
1.5	1 380	3.80	170	76
2.2	1 390	5.10	170	79
3.7	1 410	8.10	160	83
5.5	1 420	11.40	160	84
7.5	1 430	15.40	160	85
9.3	1 430	19.50	160	84
11	1 430	23.00	160	84.5
15	1 430	32.00	160	85
18.5	1 435	38.50	160	86
22	1 440	45.00	160	86.5
30	1 440	59.00	160	87.5
37	1 440	71.00	160	87.5

**Table 5 Values of Performance Characteristics of 6-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 44 or Superior and Method of Cooling IC 41 (Clause 7.1)**

Rated Output kW	Full Load Speed, Min rev/min	Full Load Current, Max A	Breakaway Torque in Terms of Full Load Torque, Min Percent	Efficiency Nominal Percent
0.37	870	1.40	160	63
0.55	870	1.90	160	65
0.75	890	2.30	160	68
1.1	900	3.20	160	71
1.5	900	4.00	160	74
2.2	910	5.50	150	77
3.7	920	8.80	150	79
5.5	920	12.70	150	81
7.5	930	16.70	150	82
9.3	930	20.50	140	82
11	935	23.00	140	84
15	940	30.50	140	85
18.5	940	37.00	140	86.5
22	945	44.00	140	87
30	945	59.00	140	87.5
37	950	72.00	140	88

**Table 6 Values of Performance Characteristics of 6-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01 (Clause 7.1)**

Rated Output kW	Full Load Speed, Min rev/min	Full Load Current, Max A	Breakaway Torque in Terms of Full Load Torque, Min Percent	Efficiency Nominal Percent
0.37	870	1.40	160	63
0.55	870	1.90	160	65
0.75	890	2.30	160	68
1.1	900	3.20	160	71
1.5	900	4.00	160	74
2.2	910	5.50	150	77
3.7	920	8.80	150	79
5.5	920	12.70	150	81
7.5	920	17.5	150	80
9.3	925	22.00	140	80.5
11	925	24.0	140	83.0
15	930	32.5	140	84
18.5	935	39.0	140	85.5
22	940	45.0	140	86
30	945	60.0	140	86.5
37	950	73.0	140	87

**Table 7 Values of Performance Characteristics of 8-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 44 or Superior and Method of Cooling IC 41 (Clause 7.1)**

Rated Output kW	Full Load Speed, <i>Min</i>	Full Load Current, <i>Max</i>	Breakaway Torque in Terms of Full Load Torque, <i>Min</i>	Efficiency Nominal Percent
	rev/min	A	Percent	
0.37	640	1.5	150	60
0.55	640	2.1	150	65
0.75	650	2.7	150	68
1.1	660	3.5	150	70
1.5	670	4.5	150	72
2.2	680	6.10	140	74
3.7	690	9.80	140	76
5.5	690	14.20	140	78
7.5	695	19.00	140	80
9.3	700	23.00	140	81
11	700	26.00	140	82
15	705	35.00	130	83.5
18.5	705	45.00	130	85.0
22	710	52.00	130	86
30	710	70.00	130	87
37	710	86.00	130	88

**Table 8 Values of Performance Characteristics of 8-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01 (Clause 7.1)**

Rated Output kW	Full Load Speed, <i>Min</i>	Full Load Current, <i>Max</i>	Breakaway Torque in Terms of Full Load Torque, <i>Min</i>	Efficiency Nominal Percent
	rev/min	A	Percent	
0.37	640	1.5	150	60
0.55	640	2.1	150	65
0.75	650	2.7	150	68
1.1	660	3.5	150	70
1.5	670	4.5	150	72
2.2	680	6.10	140	74
3.7	680	10	140	74
5.5	680	14.6	140	76
7.5	685	19.5	140	78
9.3	690	24.0	140	79.5
11	690	27	140	81
15	695	36	140	82.5
18.5	695	46	130	84
22	700	53	130	85
30	700	71	130	86
37	700	87	130	87

## ANNEX A

(Clause 2.1)

### LIST OF INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>
325 : 1996	Three-phase induction motors ( <i>fifth revision</i> )
1885 (Part 35) : 1993/IEC 50(411) : 1993	Electrotechnical vocabulary: Part 35 Rotating machinery
4029 : 1967	Guide for testing three-phase induction motors
4691 : 1985	Degrees of protection provided by enclosures for rotating electrical machinery ( <i>first revision</i> )
6362 : 1995/IEC Pub 34-6 : 1991	Designation of methods of cooling of rotating electrical machines

## 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.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

### 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. ET 15 ( 3374 ).

### 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 83 75, 323 94 02

Telegrams : Manaksanstha  
(Common to all offices)

### Regional Offices :

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

Telephone

{ 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 91 20

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.