

## Schedule - 15

### **Ballasts – Electromagnetic & Electronic ballasts**

#### **1. SCOPE**

1.1 This schedule specifies the requirements for participating in the energy efficiency labeling scheme for ballasts covering electromagnetic ballasts and electronic ballasts for tubular fluorescent lamps (TFL) and single capped fluorescent lamps. This schedule also includes built-in ballasts where the ballast is inbuilt in the luminaire. The ballasts which are integral to the lamps are excluded from the scope of this schedule.

The Indian standards referred in this schedule are IS 1534 (Part 1): 1977 for electromagnetic ballasts and IS 13021 (Part 1 & 2): 1991 for electronic ballasts. The following standards and their amendments are necessary adjunct to this schedule.

IS 1534 (Part 1)	Ballasts for tubular fluorescent lamps – performance requirements– Part 1 For switch start circuits
IEC 61347-2-8 / IS15885(part2/Section 8)	Lamp control gear Part 2-8 Particular requirements for ballasts for fluorescent lamps
IEC 61347-2-3 / IS 15885 (part 2 / Section 3)	Lamp control gear Part 2-3 Particular requirements for ac supplied electronic ballast for fluorescent lamps
IEC 60929 / IS13021 (Part 1 and Part 2)	AC supplied electronic ballast for tubular fluorescent lamps – performance requirement
IS 14700 (Part 3/Sec 2)/IEC 61000-3-2	Electromagnetic compatibility Part 3 Limits for harmonic current emissions (equipment input current $\leq 16$ A per phase)
IS6873(Part5) /CISPR 15	Limits and methods of measurement of radio disturbance characteristics Part 5 Electrical lighting and similar equipment

1.2 The minimum Efficiency values covered in this schedule shall be as per **Annexure - I** of this schedule for each type of lamps.

#### **2. PRE-QUALIFICATION**

- a) The products shall conform to the requirements of relevant Indian standards for both safety and performance requirements to participate in BEE energy efficiency labeling program.
- b) Quality System Certification as per ISO : 9001 shall be mandatory

### 3. SCHEDULE OF TESTS

#### 3.1 Method of Tests

The electromagnetic ballasts shall be tested as per method prescribed in IS 1534 (Part 1) with all its relevant amendments and revisions and for electronic ballasts will be as per IS 13021 (Part I) for general and safety requirements and IS 13021(Part II) for Performance requirements with all its relevant amendments and revisions.

#### 3.2 Parameters to be tested

- ◆ Ballast efficiencies shall be as per **Annexure - I** of this schedule.
- ◆ For all electronic ballasts, Maximum THD shall be as per IS 13021 : Part 2
- ◆ The minimum Power Factor in case of electromagnetic ballasts shall be 0.85 and in case of electronic ballasts shall be 0.9.

**3.3** The designed life of the product shall be declared by the manufacturer in terms of burning hours of the lamp at defined ambient temperature and case temperature of the ballast.

**3.4** The test report shall be submitted as per the performa given in **Annexure - II** of this schedule.

### 4. RATING PLAN

**4.1** The star rating plan for the ballasts specified in **Annexure - I**, of this schedule shall be as given in the following table:

Star Rating	Ballast Efficiency Class
<b>1 Star</b>	$\geq B1$ and $< A3$
<b>2 Star</b>	$\geq A3$ and $< A2$
<b>3 Star</b>	$\geq A2$ and $< A2$ BAT
<b>4 Star</b>	$\geq A2$ BAT and $< A1$
<b>5 Star</b>	= A1

- BAT Best Available Technology
- B1 Electromagnetic ballasts

- A3, A2, A2 (BAT)      Non Dimmable Electronic ballasts
- A1                              Dimmable Electronic ballasts

**NOTE**

In the case of dimmable ballasts, the dimming position corresponding to 25 % of the lumen output of the operated lamp, the input power ( $P_{in}$ ) of the lamp-ballast circuit shall not exceed fifty percent of the ratio the ( $P_{Lrated}/\hat{I}_{ballast}$ ):

$$P_{in} < 50\% \text{ of } P_{Lrated}/\hat{I}_{ballast}$$

Where,

- $P_{Lrated}$  is the rated lamp power and  $\hat{I}$  ballast is the minimum energy efficiency limit (which is A2 BAT here).
- The power consumption of the ballasts shall not exceed 1.0 W when lamps do not emit any light in normal operating conditions and when other possible connected components (network connections, sensors etc.) are disconnected. If they cannot be disconnected, their power shall be measured and deducted from the result.
- Star Rating will be based on the ballast efficiencies (IEC 62442-1) as per the requirements mentioned in the attached table in **Annexure - I**.

**4.2** The ballast efficiency & losses are calculated as per below:

$$\text{Ballast efficiency (\%)} = P_{lamp} / P_{in}$$

$$\text{Losses in Watts} = ((P_{lamp}/\text{Ballast efficiency}) \times 100) - P_{lamp}$$

Where,

$P_{in}$       - input power

$P_{lamp}$    - Lamp Power

**5. Sampling plan:**

The samples shall be picked up by Bureau of Energy Efficiency or its designated agency for testing at NABL accredited laboratory. Sample size shall be in accordance with the guidelines set by BEE from time to time.

## 6. Label design, manner of display:

6.1. The energy star label shall be displayed on the packaging as shown in Fig. 6.1. The other details shall be marked as given in relevant Indian standards both on the product as well as on the packaging/card board cartons.

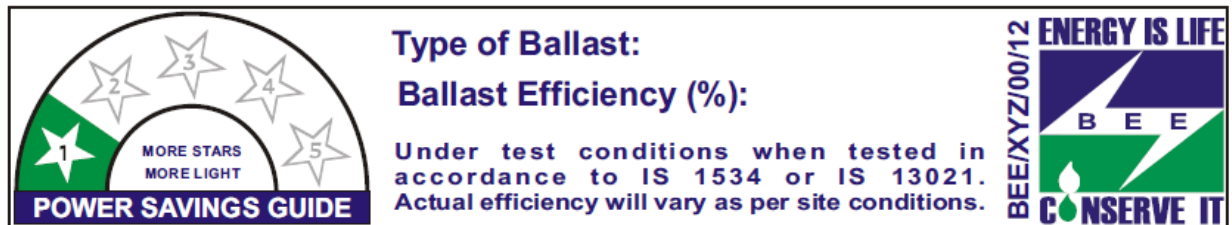


Figure 6.1: Sample Label of Ballast

## 6.2. Manner of display of label:

The label design with colour scheme is as shown in figure 6.2. The dimensions of the label can be proportionately changed with respect to the size of the cover of the ballast, however, the label should be prominently visible.

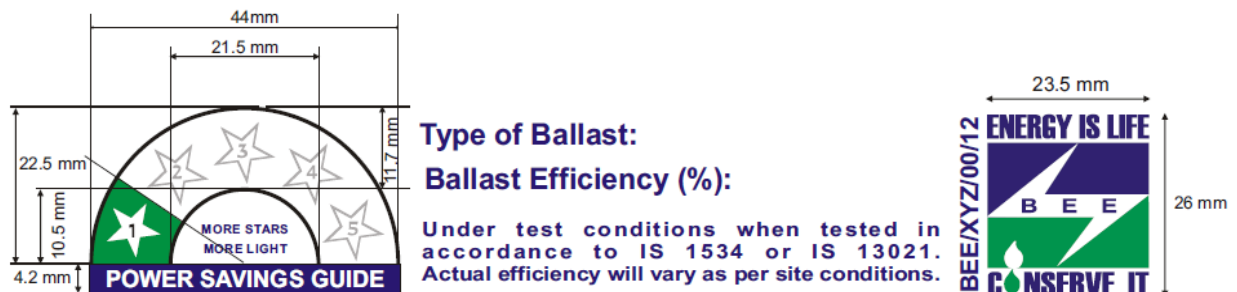


Fig 6.2: Sample Label of Ballast on the Packing Case

The Options for the Type of ballasts (to be shown in label on the packing case of the ballast) are the following:

- Electromagnetic ballasts
- Non Dimmable Electronic ballasts
- Dimmable electronic ballasts

The star marking label shall also be applied on the name plate of the ballast as per the required rating as shown in the figure 6.3 which should be prominently visible.

The star marking label shall be displayed on the top left side of the name plate of ballast.



Fig 6.3: Sample label on the Name plate of one star Ballast

The actual dimension of the star label of Ballast to be engrossed on the name plate of the Ballast is shown in figure 6.4.

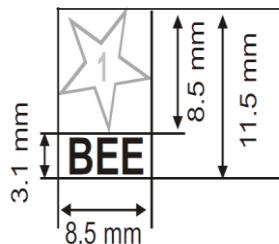


Figure 6.4: Sample label on the Name plate of one star Ballast

## 7. Fees & other conditions:

- i. Registration Fee payable on application (for each model or family of model) for authority to affix labels is Rs. 1000/- ( Rupees one thousand only)
- ii. Registration Fee payable on application for renewal (of each application) of authority to affix labels is Rs. 500/ (Rupees five hundred only)
- iii. The labelling Fee for affixing label on each piece of Ballasts is Rs. 0.10 (10 Paise only).
- iv. The time and procedure laid down in the manner of submission of labelling fees has been listed in 'General Instructions' manual (available on BEE website)
- v. For other Terms & Conditions regarding participation in the voluntary programme the BEE scheme for Energy Efficiency Labelling should be referred (available on BEE website)

## 8. Definition:

**Family of models:** Family of models is the range of models of one particular brand, to which a single set of test reports is applicable and where each of the models has the same relevant physical characteristics, comparative energy consumption, and energy efficiency rating and performance characteristics. The term 'model' is synonymous with 'family of models'.

**ANNEXURE - I Requirements for Ballasts for Fluorescent Lamps**

LampType	Nominal Wattage	ILCOS Code (Refer IEC 61231 Edition 1)	Rated / Typical Wattage		DIMMABLE BALLASTS		NON DIMMABLE ELECTRONIC BALLASTS						NON DIMMABLE MAGNETIC BALLASTS	
			50 Hz	HF	A1(**)		A2 BAT		A2		A3		B1	
			Plamp		STAR 5		STAR 4		STAR 3		STAR 2		STAR 1	
				Efficiency	Losses	Efficiency	Losses	Efficiency	Losses	Efficiency	Losses	Efficiency	Losses	
T8	15	FD-15-E-G13-26/450	15	13.5	75.0	4.50	87.8	1.88	84.4	2.50	75.0	4.50	67.9	6.74
T8	18	FD-18-E-G13-26/600	18	16	76.2	5.00	87.7	2.24	84.2	3.00	76.2	5.00	71.3	7.25
T8	30	FD-30-E-G13-26/900	30	24	72.7	9.01	82.1	5.23	77.4	7.01	72.7	9.01	79.2	7.48
T8	36	FD-36-E-G13-26/1200	36	32	84.2	6.00	91.4	3.01	88.9	4.00	84.2	6.00	83.4	6.81
T8	38	FD-38-E-G13-26/1050	38.5	32	80.0	8.00	87.7	4.49	84.2	6.00	80.0	8.00	84.1	6.91
T8	58	FD-58-E-G13-26/1500	58	50	84.7	9.03	93.0	3.76	90.9	5.01	84.7	9.03	86.1	8.90
T8	70	FD-70-E-G13-26/1800	69.5	60	83.3	12.03	90.9	6.01	88.2	8.03	83.3	12.03	86.3	10.48
TC-L	18	FSD-18-E-2G11	18	16	76.2	5.00	87.7	2.24	84.2	3.00	76.2	5.00	71.3	6.88
TC-L	24	FSD-24-E-2G11	24	22	81.5	4.99	90.7	2.26	88.0	3.00	81.5	4.99	76.0	7.20
TC-L	36	FSD-36-E-2G11	36	32	84.2	6.00	91.4	3.01	88.9	4.00	84.2	6.00	83.4	6.81
TCF	18	FSS-18-E-2G10	18	16	76.2	5.00	87.7	2.24	84.2	3.00	76.2	5.00	71.3	6.88
TCF	24	FSS-24-E-2G10	24	22	81.5	4.99	90.7	2.26	88.0	3.00	81.5	4.99	76.0	7.20
TCF	36	FSS-36-E-2G10	36	32	84.2	6.00	91.4	3.01	88.9	4.00	84.2	6.00	83.4	6.81
TC-D / DE	10	FSQ-10-E-G24q=1 FSQ-10-I-G24d=1	10	9.5	73.1	3.50	89.4	1.13	86.4	1.50	73.1	3.50	67.9	4.49
TC-D / DE	13	FSQ-13-E-G24q=1 FSQ-13-I-G24d=1	13	12.5	78.1	3.51	91.7	1.13	89.3	1.50	78.1	3.51	72.6	4.66
TC-D / DE	18	FSQ-18-E-G24q=2 FSQ-18-I-G24d=2	18	16.5	78.6	4.49	89.8	1.87	86.8	2.51	78.6	4.49	71.3	6.88
TC-D / DE	26	FSQ-26-E-G24q=1 FSQ-26-I-G24d=1	26	24	82.8	4.99	91.4	2.26	88.9	3.00	82.8	4.99	77.2	7.29
TC-T / TE	13	FSM-13-E-GX24q=1 FSM-13-I-GX24d=1	13	12.5	78.1	3.51	91.7	1.13	89.3	1.50	78.1	3.51	72.6	4.66
TC-T / TE	18	FSM-18-E-GX24q=2 FSM-18-I-GX24d=2	18	16.5	78.6	4.49	89.8	1.87	86.8	2.51	78.6	4.49	71.3	6.88
TC-T / TC-TE	26	FSM-26-E-GX24q=3 FSM-26-I-GX24d=3	26.5	24	82.8	4.99	91.4	2.26	88.9	3.00	82.8	4.99	77.5	7.31
TC-DD / DDE	10	FSS-10-E-GR10q FSS-10-L/P/H-GR10q	10.5	9.5	70.4	3.99	86.4	1.50	82.6	2.00	70.4	3.99	68.8	4.52
TC-DD / DDE	16	FSS-16-E-GR10q FSS-16-I-GR10q FSS-10-L/P/H-GR10q	16	15	75.0	5.00	87.0	2.24	83.3	3.01	75.0	5.00	72.4	5.79
TC-DD / DDE	21	FSS-21-E-GR10q FSS-21-I-GR10q FSS-21-L/P/H-GR10q	21	19	79.2	4.99	89.4	2.25	86.4	2.99	79.2	4.99	73.9	7.05
TC-DD / DDE	28	FSS-28-E-GR10q FSS-28-I-GR10q FSS-28-L/P/H-GR10q	28	26	81.3	5.98	89.7	2.99	86.7	3.99	81.3	5.98	78.2	7.42
TC-DD / DDE	38	FSS-38-E-GR10q FSS-38-L/P/H-GR10q	38.5	36	85.7	6.01	92.3	3.00	90.0	4.00	85.7	6.01	84.1	6.91
TC	5	FSD-5-I-G23 FSD-5-E-2G7	5.4	5	58.8	3.50	72.7	1.88	66.7	2.50	58.8	3.50	49.3	5.28
TC	7	FSD-7-I-G23 FSD-7-E-2G7	7.1	6.5	65.0	3.50	77.6	1.88	72.2	2.50	65.0	3.50	55.7	5.36
TC	9	FSD-9-I-G23 FSD-9-E-2G7	8.7	8	66.7	3.99	78.0	2.26	72.7	3.00	66.7	3.99	60.3	5.44
TC	11	FSD-11-I-G23 FSD-11-E-2G7	11.8	11	73.3	4.01	83.0	2.25	78.6	2.99	73.3	4.01	66.7	5.60
T5	4	FD-4-E-G5-16/150	4.5	3.6	50.0	3.60	64.9	1.95	58.1	2.60	50.0	3.60	45.0	5.23
T5	6	FD-6-E-G5-16/225	6	5.4	58.1	3.89	71.3	2.17	65.1	2.89	58.1	3.89	51.8	5.30
T5	8	FD-8-E-G5-16/300	7.1	7.5	58.6	5.30	69.9	3.23	63.6	4.29	58.6	5.30	48.9	7.05
T5	13	FD-13-E-G5-16/525	13	12.8	75.3	4.20	84.2	2.40	80.0	3.20	75.3	4.20	72.6	4.66
T9-C	22	FSC-22-E-G10q-29/200	22	19	79.2	4.99	89.4	2.25	86.4	2.99	79.2	4.99	74.6	7.12
T9-C	32	FSC-32-E-G10q-29/300	32	30	81.1	6.99	88.9	3.75	85.7	5.01	81.1	6.99	80.0	7.60
T9-C	40	FSC-40-E-G10q-29/400	40	32	82.1	6.98	89.5	3.75	86.5	4.99	82.1	6.98	82.6	8.00

LampType	Nominal Wattage	ILCOS Code (Refer IEC 61231 Edition 1)	Rated / Typical Wattage		DIMMABLE ELECTRONIC BALLASTS		NON DIMMABLE ELECTRONIC BALLASTS						NON DIMMABLE MAGNETIC BALLASTS	
			50 Hz	HF	A1(**)		A2 BAT		A2		A3		B1	
			Plamp		Efficiency	Losses	Efficiency	Losses	Efficiency	Losses	Efficiency	Losses	Efficiency	Losses
						STAR 5	STAR 4	STAR 3	STAR 2	STAR 2	STAR 2	STAR 2	STAR 2	
T2	8	FDH-8-L/P-W4.3x8.5d-7/320	7.8		65.0	4.20	76.5	2.40	70.9	3.20	65.0	4.20		
T2	11	FDH-11-L/P-W4.3x8.5d-7/420	10.8		72.0	4.20	81.8	2.40	77.1	3.21	72.0	4.20		
T2	13	FDH-13-L/P-W4.3x8.5d-7/520	13.3		76.0	4.20	84.7	2.40	80.6	3.20	76.0	4.20		
T2	21	FDH-21-L/P-W4.3x8.5d-7/	21		79.2	5.52	88.9	2.62	85.7	3.50	79.2	5.52		
T2	23	FDH-23-L/P-W4.3x8.5d-7/	23		80.7	5.50	89.8	2.61	86.8	3.50	80.7	5.50		
T5-E	14	FDH-14-G5-L/P-16/550	13.7		72.1	5.30	84.7	2.47	80.6	3.30	72.1	5.30		
T5-E	21	FDH-21-G5-L/P-16/850	20.7		79.6	5.31	89.3	2.48	86.3	3.29	79.6	5.31		
T5-E	24	FDH-24-G5-L/P-16/550	22.5		80.4	5.49	89.6	2.61	86.5	3.51	80.4	5.49		
T5-E	28	FDH-28-G5-L/P-16/1150	27.8		81.8	6.19	89.8	3.16	86.9	4.19	81.8	6.19		
T5-E	35	FDH-35-G5-L/P-16/1450	34.7		82.6	7.31	91.5	3.22	89.0	4.29	82.6	7.31		
T5-E	39	FDH-39-G5-L/P-16/850	38		82.6	8.00	91.0	3.76	88.4	4.99	82.6	8.00		
T5-E	49	FDH-49-G5-L/P-16/1450	49.3		84.6	8.97	91.6	4.52	89.2	5.97	84.6	8.97		
T5-E	54	FDH-54-G5-L/P-16/1150	53.8		85.4	9.20	92.0	4.68	89.7	6.18	85.4	9.20		
T5-E	80	FDH-80-G5-L/P-16/1150	80		87.0	11.95	93.0	6.02	90.9	8.01	87.0	11.95		
T5-E	95	FDH-95-G5-L/P-16/1150	95		84.1	17.96	92.7	7.48	90.5	9.97	84.1	17.96		
T5-E	120	FDH-120-G5-L/P-16/1450	120		84.5	22.01	92.5	9.73	90.2	13.04	84.5	22.01		
T5-C	22	FSCH-22-L/P-2GX13-16/225	22.3		78.8	6.00	88.1	3.01	84.8	4.00	78.8	6.00		
T5-C	40	FSCH-40-L/P-2GX13-16/300	39.9		83.3	8.00	91.4	3.75	88.9	4.98	83.3	8.00		
T5-C	55	FSCH-55-L/P-2GX13-16/300	55		84.6	10.01	92.4	4.52	90.2	5.98	84.6	10.01		
T5-C	60	FSCH-60-L/P-2GX13-16/375	60		85.7	10.01	93.0	4.52	90.9	6.01	85.7	10.01		
TC-LE	40	FSDH-40-L/P-2G11	40		83.3	8.02	91.4	3.76	88.9	4.99	83.3	8.02		
TC-LE	55	FSDH-55-L/P-2G11	55		84.6	10.01	92.4	4.52	90.2	5.98	84.6	10.01		
TC-LE	80	FSDH-80-L/P-2G11	80		87.0	11.95	93.0	6.02	90.9	8.01	87.0	11.95		
TC-TE	32	FSMH-32-L/P-2GX24q=3	32		82.1	6.98	91.4	3.01	88.9	4.00	82.1	6.98		
TC-TE	42	FSMH-42-L/P-2GX24q=4	43		86.0	7.00	93.5	2.99	91.5	3.99	86.0	7.00		
TC-TE	57	FSM6H-57-L/P-2GX24q=5 FSM8H-57-L/P-2GX24q=5	56		83.6	10.99	91.4	5.27	88.9	6.99	83.6	10.99		
TC-TE	70	FSM6H-70-L/P-2GX24q=6 FSM8H-70-L/P-2GX24q=6	70		85.4	11.97	93.0	5.27	90.9	7.01	85.4	11.97		
TC-TE	60	FSM6H-60-L/P-2G8=1	63		84.0	12.00	92.3	5.26	90.0	7.00	84.0	12.00		
TC-TE	62	FSM8H-62-L/P-2G8=2	62		83.8	11.99	92.2	5.25	89.9	6.97	83.8	11.99		
TC-TE	82	FSM8H-82-L/P-2G8=2	82		83.7	15.97	92.4	6.74	90.1	9.01	83.7	15.97		
TC-TE	85	FSM6H-85-L/P-2G8=1	87		84.5	15.96	92.8	6.75	90.6	9.03	84.5	15.96		
TC-TE	120	FSM6H-120-L/P-2G8=1 FSM8H-120-L/P-2G8=1	122		84.7	22.04	92.6	9.75	90.4	12.96	84.7	22.04		
TC-DD	55	FSSH-55-L/P-GR10q	55		84.6	10.01	92.4	4.52	90.2	5.98	84.6	10.01		

\*\* Refer note in para 4 of the schedule

Ballast efficiency in %age =

Plamp / Pinput

Losses in Watts =

(Plamp/Ballast eff) \*100 - Plamp

**DRAFT TEST REPORT FORMAT FOR BEE FOR BALLAST LABLING  
PROGRAM**

Sheet No.

<b>NAME &amp; ADDRESS OF CUSTOMER</b>	<b>REPORT NO.:</b>	
	<b>DATE :</b>	
	<b>CUSTOMER REF. NO. :</b>	
	<b>DATE OF SAMPLE RECEIPT</b>	<b>DATE OF TESTING</b>
<b>SAMPLE DESCRIPTION</b>	<b>SAMPLE IDENTIFICATION</b>	
<b>TEST DETAILS</b>	<b>TEST SPECIFICATION</b>	
Enclosures :		
Test results :		
Remarks :		
Note :		
<b>PREPARED BY</b>	<b>CHECKED BY</b>	<b>APPROVED BY</b>



**Report No.**

**date:**

**Sheet 2 of**

**Sr. Particulars of test  
No. and clause no.**

**Requirement as per  
specification.**

**Obtained value**

**Remarks**

1.	Total Circuit Power			Conforms / Does not conform
2.	Total Lamp Power			Conforms / Does not conform
3.	Ballast efficiencies			Conforms / Does not conform
4.	THD			Conforms / Does not conform
5.	THD with Capacitor			Conforms / Does not conform
6.	Power factor			Conforms / Does not conform
7.	Power Factor with capacitor			Conforms / Does not conform
8.	Designed Life in burning hours at defined ambient temperature			Conforms / Does not conform

**PREPARED BY**

**CHECKED BY**

**Details required for testing of magnetic ballasts**

Ref. Standards		Rated Voltage (V)	
Mark of origin		Rated frequency (Hz)	
Type		Rated current (A)	
Model No.		Rated Lamp Wattage (W)	
Serial No.		Power factor ( $\lambda$ )	
Efficiency		Watt loss (W)	
Efficiency class		Rated Circuit Power (W)	
Avg. Life (hrs.)		THD	
Ambient Temp. ( $^{\circ}\text{C}$ )		Year of mfg.	
Rated Max.operating Temp. of winding (tw)		Wiring diagram indicating clear position of terminals	
Rated Temp.rise of the winding ( $\Delta\text{T}$ )		Country of mfg.	

**Details required for testing of Electronic ballasts:**

Ref. Standards		Rated Supply Voltage (V)	
Mark of origin		Supply frequency (Hz)	
Type		Supply current (A)	
Model No.		Rated Lamp Wattage (W)	
Serial No.		Circuit Power factor ( $\lambda$ )	
Efficiency		Watt loss (W)	
Efficiency class		Total Circuit Power (W)	
THD		Ballast lumen factor	
Avg. Life (hrs.)		Year of mfg.	
Symbol for earthing		Country of mfg.	
Control terminals for Controllable ballast if any		Wiring diagram indicating clear position of terminals	
Symbol for independent ballast		Value of $t_c$ along with indication $t_c$ point on ballast	
Limits of ambient temperature range within which the ballast will operate satisfactorily at the declared voltage (range).		The Symbol Z which indicates that the ballast is designed to comply with the conditions for audio frequency impedance.	
The symbol for H which indicates that ballast is not of the low distortion type		Rated output frequency at rated voltage with and without lamp operating.	
A clear indication regards the type of starting, namely, preheat or non-preheat.			