

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 6 AMENDEMENT 6

Double-capped fluorescent lamps – Performance specifications

Lampes à fluorescence à deux culots – Prescriptions de performance



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AMENDMENT 6 AMENDEMENT 6

Double-capped fluorescent lamps – Performance specifications

Lampes à fluorescence à deux culots – Prescriptions de performance

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FOREWORD

This amendment has been prepared by subcommittee 34A:Lamps, of IEC technical committee 34: Lamps and related equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
34A/2014/FDIS	34A/2026/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
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Annex E (informative)

Information for ballast and starter design

E.1 General

In order to safeguard proper functioning of the lamp, the relevant information, given on the lamp data sheet and in Annex E, should be taken into account when designing ballasts and starters.

E.2 Prestating conditions for high frequency operated lamps

For lamps operated on high frequency and having preheated cathodes, the requirements for proper preheating are specified on the relevant lamp data sheet. An explanation of these requirements is given in Annex D of IEC 60929 and in Annex B of IEC 60927.

For some lamps, additional information concerning high frequency non-preheat starting requirements is given on the relevant lamp data sheet.

E.3 Frequency to be used for high frequency operated lamps

For lamps designed for operation on high frequency, the lamp data sheets specify a frequency range for the reference ballast and for the testing of lamps (starting, electrical and photometric characteristics). This frequency range has been chosen for ease of reproducing test results and is not intended to restrict the design of high frequency ballasts, where for practical reasons a higher frequency may be appropriate.

E.4 Tolerable DC-offset during preheat

The peak-peak value of the open-circuit voltage shall be less than or equal to 2,8 times the maximum r.m.s value of the open-circuit voltage for $t \leq t_s$. Narrow voltage peaks during the first half period of the mains voltage after switching on preheat shall be disregarded when testing the control gear in accordance with Clause E.4.

The DC-offset (mean value) of the open-circuit voltage shall not exceed the r.m.s. open circuit voltage for $t \leq t_s$ as specified on the relevant lamp data sheet. In cases where the r.m.s. open circuit voltage for $t \leq t_s$ is specified to less than 200 V, the DC-offset of the open-circuit voltage shall be less than or equal to 200 V.

E.5 Tolerances on substitution resistors

E.5.1 Lamp electrode substitution resistors

The tolerance for the resistance values of electrode substitution resistors shall be ± 1 % of the resistance value or better.

Non-inductive resistors are recommended as substitution resistors.

E.5.2 Lamp impedance substitution resistors

The tolerance for the resistance values of the substitution resistors for the lamp discharge impedance shall be ± 5 % of the resistance value or better.

Non-inductive resistors are recommended as substitution resistors.

E.6 Maximum asymmetric power

Lamp caps may overheat at the end of the lamp life cycle. Limiting the power available to the electrodes at the end of the life cycle is considered as a way for the controlgear to mitigate this risk. The maximum control gear asymmetric power available to the electrodes should be equal or less than the power listed in Table E.1.

Table E.1 – Maximum asymmetric power

Sheet number 60901-IEC-	Nominal power W	Nominal dimensions mm	Cap	Maximum asymmetric power W
1020	4	16 × 150	G5	7,5
1030	6	16 × 225	G5	7,5
1040	8	16 × 300	G5	7,5
1060	13	16 × 525	G5	7,5
2120	15	26 × 450	G13	10
2215	15	26 × 550	G13	10
2220	18	26 × 600	G13	10
2230	20	32 × 600	G13	10
2240	20	38 × 600	G13	10
2315	25	38 × 970	G13	10
2320	30	26 × 900	G13	10
2340	30	38 × 900	G13	10
2420	36	26 × 1 200	G13	10
2425	38	26 × 1 050	G13	10
2430	40	32 × 1 200	G13	10
2440	40	38 × 1 200	G13	10
2520	58	26 × 1 500	G13	10
2530	65	32 × 1 500	G13	10
2540	65	38 × 1 500	G13	10
2620	70	26 × 1 800	G13	10
2640	75	38 × 1 800	G13	10
2660	80	38 × 1 500	G13	10
2670	85	38 × 1 800	G13	10
2840	100	38 × 2 400	G13	10
2880	125	38 × 2 400	G13	10
3020	4	16 × 150	G5	7,5
3030	6	16 × 225	G5	7,5
3040	8	16 × 300	G5	7,5
4240	20	38 × 600	G13	10
4340	30	38 × 900	G13	10
4440	40	38 × 1 200	G13	10
4540	65	38 × 1 500	G13	10
4640	75	38 × 1 800	G13	10
4660	80	38 × 1 500	G13	10
4670	85	38 × 1 800	G13	10
4880	125	38 × 2 400	G13	10

Sheet number 60901-IEC-	Nominal power W	Nominal dimensions mm	Cap	Maximum asymmetric power W
5230	20	32 × 600	G13	10
5240	20	38 × 600	G13	10
5340	30	38 × 900	G13	10
5430	40	32 × 1 200	G13	10
5440	40	38 × 1 200	G13	10
5540	65	38 × 1 500	G13	10
5840	85	38 × 2 400	G13	10
5960	60	38 × 1 200	R17d	10
5970	87	38 × 1 800	R17d	10
5980	112	38 × 2 400	R17d	10
6030	6	7 × 220	W4.3	3,5
6040	8	7 × 320	W4.3	3,5
6050	11	7 × 420	W4.3	3,5
6060	13	7 × 520	W4.3	3,5
6520	14	16 × 550	G5	7,5
6530	21	16 × 850	G5	7,5
6620	24	16 × 550	G5	7,5
6640	28	16 × 1 150	G5	7,5
6650	35	16 × 1 450	G5	7,5
6730	39	16 × 850	G5	7,5
6750	49	16 × 1 450	G5	7,5
6840	54	16 × 1 150	G5	7,5
6850	80	16 × 1 450	G5	7,5
7220	16	26 × 600	G13	10
7420	32	26 × 1 200	G13	10
7520	50	26 × 1 500	G13	10
8240	20	38 × 600	Fa6	10
8440	40	38 × 1 200	Fa6	10
8540	65	38 × 1 500	Fa6	10
8640	39	38 × 1 200	Fa8	10
8740	57	38 × 1 800	Fa8	10
8840	75	38 × 2 400	Fa8	10
9420	32	26 × 1 200	Fa6	10
9520	50	26 × 1 500	Fa6	10

DOUBLE-CAPPED FLUORESCENT LAMP

DATA SHEET

Page 1

ILCOS: FD-4-E-G5-16/150

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
4	With starter	Preheated	G5	16 × 150

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
135,9	140,6	143,0	150,1	16,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	110/120	103,5	30
60	110/120	103,5	30

Electrical characteristics						
Frequency	Rated power	Voltage (r.m.s.) at lamp terminals V			Rated lamp current	Rated preheat current
Hz	W	Rated	Minimum	Maximum	A	A
50	4,5	29	24	34	0,170	0,205
60	4,5	29	24	34	0,170	0,205

Chromaticity co-ordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,110	80	60	100

NOTE In Japan, the rated resistance of each cathode is 90 Ω and maximum is 120 Ω.

DOUBLE-CAPPED FLUORESCENT LAMP
DATA SHEET

Page 2

ILCOS: FD-4-E-G5-16/150

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,144	0,144
		Max.	0,275	0,275
Open circuit voltage across starter	V	Min. (r.m.s.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series	Ω		140	140
Voltage across starter with lamp operating	V	Max. (r.m.s.)	68	68

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
250	70

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DOUBLE-CAPPED FLUORESCENT LAMP

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DATA SHEET

ILCOS: FD-4-E-G5-16/150

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	4	48	150	160

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	3,6	24	0,15

Frequency				kHz		≥ 20	
Normal operation							
Lamp operating current		I_D	A	Min.		0,090	
				Max.		0,180	
Current in any lead to cathodes			A	Max.		0,190	
Dimming operation							
Lamp operating current		I_D	A	Min.		0,015	
				Max.		0,090	
Minimum sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$	A^2	X_1	A^2	0,022	
Target sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$		Y_1	A	0,205	
Maximum sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_2 - Y_2 I_D$	A^2	X_2	A^2	0,030	
				Y_2	A	-0,050	
Current in any lead to cathodes		I_{LH}	A	Max.		0,190	
		I_{LL}	A	Max.		0,120	
Substitution resistor for each cathode for testing dimming requirements				R_{Test1} Ω		80	
				R_{Test2} Ω		90	
Lamp substitution resistor at n % of the test current			$n =$	10 %	R_{10} Ω	Min.	1 500
						Max.	1 800
				30 %	R_{30} Ω	Nominal	510
				60 %	R_{60} Ω	Nominal	240

Starting requirements with cathode preheating, for starting times $0,4 \text{ s} < t_s < 3,0 \text{ s}$

Minimum cathode preheat energy $E_{\min} = Q_{\min} + P_{\min} t_s$			J	$Q_{\min}$ (J)	1,0	
				$P_{\min}$ (W)	0,7	
Voltage across each cathode for $E(t) < E_{\min}$			V	Max.(r.m.s.)	11	
Substitution resistor for each cathode, for testing minimum cathode preheat requirements					Ω	50
Maximum cathode preheat energy $E_{\max} = Q_{\max} + P_{\max} t_s$			J	$Q_{\max}$ (J)	1,5	
				$P_{\max}$ (W)	1,1	
Substitution resistor for each cathode, for testing maximum cathode preheat requirements					Ω	65
Open circuit voltage across lamp (with starting aid)	V	Non-ignition voltage	$t \leq t_s$	Max.(r.m.s.)	90	
		Ignition voltage	$t > t_s$ (+10 °C)	Min.(r.m.s.)	160	
			$t > t_s$ (-15 °C)	Min.(r.m.s.)	220	
Substitution resistor range for each cathode, for testing open circuit voltage requirements					Ω	50.....150

DOUBLE-CAPPED FLUORESCENT LAMP

Page 1

DATA SHEET

ILCOS: FD-6-E-G5-16/225

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
6	With starter	Preheated	G5	16 × 225

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
212,1	216,8	219,2	226,3	16,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	110/120	103,5	30
60	110/120	103,5	30

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	6	42	36	48	0,160	0,205
60	6	42	36	48	0,160	0,205

Chromaticity co-ordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,110	80	60	100

NOTE In Japan, the rated resistance of each cathode is 90 Ω and maximum is 120 Ω.

DOUBLE-CAPPED FLUORESCENT LAMP

Page 2

DATA SHEET

ILCOS: FD-6-E-G5-16/225

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,144	0,144
		Max.	0,275	0,275
Open circuit voltage across starter	V	Min. (r.m.s.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series	Ω		140	140
Voltage across starter with lamp operating	V	Max. (r.m.s.)	68	68

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
250	70

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DATA SHEET

Page 3

ILCOS: FD-6-E-G5-16/225

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	6	72	150	240

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	5,4	36	0,15

Frequency				kHz		≥ 20		
Normal operation								
Lamp operating current		I_D	A	Min.		0,090		
				Max.		0,180		
Current in any lead to cathodes			A	Max.		0,190		
Dimming operation								
Lamp operating current		I_D	A	Min.		0,015		
				Max.		0,090		
Minimum sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$	A^2	X_1	A^2	0,022		
Target sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$		Y_1	A	0,205		
Maximum sum of squares lead currents		$I_{LH}^2 + I_{LL}^2 = X_2 - Y_2 I_D$	A^2	X_2	A^2	0,030		
				Y_2	A	-0,050		
Current in any lead to cathodes		I_{LH} I_{LL}	A	Max.		0,190		
			A	Max.		0,120		
Substitution resistor for each cathode for testing dimming requirements			R_{Test1}		Ω	80		
			R_{Test2}		Ω	90		
Lamp substitution resistor at n % of the test current			$n =$	10 %	R_{10}	Ω	Min.	2 400
							Max.	3 000
				30 %	R_{30}	Ω	Nominal	820
							60 %	R_{60}
Starting requirements with cathode preheating, for starting times $0,4\text{ s} < t_s < 3,0\text{ s}$								
Minimum cathode preheat energy		$E_{min} = Q_{min} + P_{min} t_s$	J	Q_{min} (J)		1,0		
				P_{min} (W)		0,7		
Voltage across each cathode for $E(t) < E_{min}$			V	Max.(r.m.s.)		11		
Substitution resistor for each cathode, for testing minimum cathode preheat requirements					Ω	50		
Maximum cathode preheat energy		$E_{max} = Q_{max} + P_{max} t_s$	J	Q_{max} (J)		1,5		
				P_{max} (W)		1,1		
Substitution resistor for each cathode, for testing maximum cathode preheat requirements					Ω	65		
Open circuit voltage across lamp (with starting aid)		V	Non-ignition voltage		$t \leq t_s$	Max.(r.m.s.)		100
			Ignition voltage		$t > t_s$ (+10 °C)	Min.(r.m.s.)		185
					$t > t_s$ (-15 °C)	Min.(r.m.s.)		250
Substitution resistor range for each cathode, for testing open circuit voltage requirements					Ω	50.....150		

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ILCOS: FD-8-E-G5-16/300

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
8	With starter	Preheated	G5	16 × 300

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
288,3	293,0	295,4	302,5	16,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	110/120	103,5	30
60	110/120	103,5	30

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	7,1	56	48	64	0,145	0,205
60	7,2	57	48	64	0,145	0,205

Chromaticity co-ordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,110	80	60	100

NOTE In Japan, the minimum resistance of each cathode is 50 Ω and maximum is 110 Ω.

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ILCOS: FD-8-E-G5-16/300

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	6	127	0,160	700	0,12
60	6	118	0,160	650	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,144	0,144
		Max.	0,275	0,275
Open circuit voltage across starter	V	Min. (r.m.s.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series		Ω	140	140
Voltage across starter with lamp operating	V	Max. (r.m.s.)	68	68

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
250	70

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DATA SHEET

ILCOS: FD-8-E-G5-16/300

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	8	100	150	333

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	7,5	50	0,15

Frequency			kHz		≥ 20	
Normal operation						
Lamp operating current	I_D	A	Min.		0,090	
			Max.		0,180	
Current in any lead to cathodes		A	Max.		0,190	
Dimming operation						
Lamp operating current	I_D	A	Min.		0,015	
			Max.		0,090	
Minimum sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$	A^2	X_1	A^2	0,022	
Target sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$		Y_1	A	0,205	
Maximum sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_2 - Y_2 I_D$	A^2	X_2	A^2	0,030	
			Y_2	A	-0,050	
Current in any lead to cathodes	I_{LH}	A	Max.		0,190	
	I_{LL}	A	Max.		0,120	
Substitution resistor for each cathode for testing dimming requirements			R_{Test1}	Ω	80	
			R_{Test2}	Ω	90	
Lamp substitution resistor at n % of the test current	$n =$	10 %	R_{10}	Ω	Min.	3 300
					Max.	5 100
		30 %	R_{30}	Ω	Nominal	1 200
					60 %	R_{60}
Starting requirements with cathode preheating, for starting times $0,4\text{ s} < t_s < 3,0\text{ s}$						
Minimum cathode preheat energy	$E_{min} = Q_{min} + P_{min} t_s$	J	Q_{min} (J)		1,0	
			P_{min} (W)		0,7	
Voltage across each cathode for $E(t) < E_{min}$		V	Max.(r.m.s.)		11	
Substitution resistor for each cathode, for testing minimum cathode preheat requirements					Ω	50
Maximum cathode preheat energy	$E_{max} = Q_{max} + P_{max} t_s$	J	Q_{max} (J)		1,5	
			P_{max} (W)		1,1	
Substitution resistor for each cathode, for testing maximum cathode preheat requirements					Ω	65
Open circuit voltage across lamp (with starting aid)	V	Non-ignition voltage	$t \leq t_s$	Max.(r.m.s.)	100	
		Ignition voltage	$t > t_s$ (+10 °C)	Min.(r.m.s.)	200	
			$t > t_s$ (-15 °C)	Min.(r.m.s.)	280	
Substitution resistor range for each cathode, for testing open circuit voltage requirements					Ω	50.....150

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ILCOS: FD-13-E-G5-16/525

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
13	With starter	Preheated	G5	16 × 525

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
516,9	521,6	524,0	531,1	16,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	220	198	30
60	220	198	30

Electrical characteristics						
Frequency	Rated power	Voltage (r.m.s.) at lamp terminals			Rated lamp current	Rated preheat current
		V				
Hz	W	Rated	Minimum	Maximum	A	A
50	13	95	85	105	0,165	0,225
60	13	95	*	*	0,165	0,225

Chromaticity co-ordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,110	80	60	100

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ILCOS: FD-13-E-G5-16/525

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	13	220	0,165	1 070	0,12
60	13	236	0,165	1 200	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,146	0,146
		Max.	0,297	0,297
Open circuit voltage across starter	V	Min. (r.m.s.)	198	198
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series	Ω		140	140
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	128

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
400	140

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ILCOS: FD-13-E-G5-16/525

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	13	170	150	567

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	12,8	85	0,15

Frequency			kHz		≥ 20
Normal operation					
Lamp operating current		I_D	A	Min.	0,090
				Max.	0,180
Current in any lead to cathodes			A	Max.	0,190
Dimming operation					
Lamp operating current		I_D	A	Min.	0,015
				Max.	0,090
Minimum sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$	A^2	X_1	A^2	0,022
Target sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$		Y_1	A	0,205
Maximum sum of squares lead currents	$I_{LH}^2 + I_{LL}^2 = X_2 - Y_2 I_D$	A^2	X_2	A^2	0,030
			Y_2	A	-0,050
Current in any lead to cathodes	I_{LH}	A	Max.		0,190
	I_{LL}	A	Max.		0,120
Substitution resistor for each cathode for testing dimming requirements			R_{Test1} Ω		80
			R_{Test2} Ω		90
Lamp substitution resistor at n % of the test current	$n =$	10 %	R_{10} Ω	Min.	6 200
				Max.	9 100
		30 %	R_{30} Ω	Nominal	2 200
		60 %	R_{60} Ω	Nominal	1 000

Starting requirements with cathode preheating, for starting times $0,4 \text{ s} < t_s < 3,0 \text{ s}$

Minimum cathode preheat energy	$E_{min} = Q_{min} + P_{min} t_s$	J	Q_{min} (J) P_{min} (W)	1,0 0,7
Voltage across each cathode for $E(t) < E_{min}$		V	Max.(r.m.s.)	11
Substitution resistor for each cathode, for testing minimum cathode preheat requirements			Ω	50
Maximum cathode preheat energy	$E_{max} = Q_{max} + P_{max} t_s$	J	Q_{max} (J) P_{max} (W)	1,5 1,1
Substitution resistor for each cathode, for testing maximum cathode preheat requirements			Ω	65
Open circuit voltage across lamp (with starting aid)	Non-ignition voltage	$t \leq t_s$	Max.(r.m.s.)	120
	Ignition voltage	$t > t_s$ (+10 °C)	Min.(r.m.s.)	230
		$t > t_s$ (-15 °C)	Min.(r.m.s.)	330
Substitution resistor range for each cathode, for testing open circuit voltage requirements			Ω	50.....150

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ILCOS: FD-15-E-G13-26/450

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
15	With starter	Preheated	G13	26 × 450

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
437,4	442,1	444,5	451,6	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	110/120	103,5	30
60	110/120	103,5	30

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	15	55	46	64	0,310	0,440
60	15	55	46	64	0,305	0,550

Chromaticity coordinates: See Clause D.2.

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ILCOS: FD-15-E-G13-26/450

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	15	127	0,310	325	0,12
60	15	118	0,300	305	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,280	0,280
		Max.	0,650	0,650
Open circuit voltage across starter	V	Min. (r.m.s.)	103,5	103,5
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series	Ω		50	50
Voltage across starter with lamp operating	V	Max. (r.m.s.)	68	68

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
250	70

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ILCOS: FD-15-E-G13-26/450

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	15	90	310	145

Typical lamp characteristics

Frequency kHz	Lamp power W	Lamp voltage V	Lamp current A
≥ 20	13,5	45	0,310

Current in any lead to cathodes	A	Max.	*
Lamp operating current	A	Min.	*
		Max.	*

Current controlled preheating

Minimum preheat current I_k (A) to emission time t_e (s)	a		0,130*
$I_k = (a/t_e + I_m^2)^{0,5}$	I_m (A)		0,260*
Maximum preheat current	A	$t \leq 0,4$	1,400*
		$0,4 < t < 2,0$	1,580 - 0,450 t *
		$t \geq 2,0$	0,680*
Open circuit voltage across lamp	V	$t \leq t_e$	Max. (r.m.s.)
		$t > t_e$	Min. (r.m.s.)
Voltage to starting aid	V	$t \leq t_e$	Max. (peak)
		$t > t_e$	Min. (peak)
Substitution resistor for each cathode	Ω		12,5*

Voltage controlled preheating

*

Without preheating

Open circuit voltage across lamp	V	Min. (r.m.s.)	*
Current through lamp substitution resistor	A	Min.	*
Lamp substitution resistor	Ω		*
Substitution resistor for each cathode	Ω		*
Cathode current	A	Max.	*

* Under consideration.

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ILCOS: FD-18-E-G13-26/600

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
18	With starter	Preheated	G13	26 × 600

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
589,8	594,5	596,9	604,0	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	110	103,5	30
60	–	–	–

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	18	57	50	64	0,370	0,550
60	–	–	–	–	–	–

Chromaticity coordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,330	12,3	9,2	15,4

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ILCOS: FD-18-E-G13-26/600

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	20	127	0,370	270	0,12
60	–	–	–	–	–

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,333	–
		Max.	0,800	–
Open circuit voltage across starter	V	Min. (r.m.s.)	103,5	–
Open circuit voltage across lamp	V	Max. (peak)	400	–
Substitution resistor for both cathodes in series	Ω		50	–
Voltage across starter with lamp operating	V	Max. (r.m.s.)	68	–

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
800	70

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DATA SHEET

ILCOS: FD-18-E-G13-26/600

Information for high frequency ballast design

HF measurement ballast characteristics				
Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	18	110	0,290	190

Typical lamp characteristics			
Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	16	55	0,290

Normal and dimming operation

Frequency			kHz		≥ 20	
Transition current from normal to dimming operation			A	I_{Dtrans}	0,260	
Maximum lamp operating current			A	I_{Dmax}	0,430	
Maximum current in any lead to cathodes			A	I_{LHmax}	0,460	
Dimming ballast qualification with substitution resistors (Note 1)						
Electrode heating with arbitrary lamp operating current, measured on substitution resistors						
Parameters for minimum sum of squares lead currents to substitution resistor			A ²	X ₁	0,200	
(SoS _{min}): $I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$ for $I_{D30} < I_D \leq I_{Dtrans}$ (Note 2)			A	Y ₁	0,610	
Electrode heating at the specified operating currents, measured on substitution resistors						
Operating current		Heating parameters				
I _{Dmin} (A)	0,035	Minimum cathode voltage	V	CV _{Dmin}	3,5	
		Lamp discharge substitution resistors	Ω	R _{L10min}	1 300	
				R _{L10max}	2 700	
I _{D30} (A)	0,100	Minimum sum of squares lead currents	A ²	SoS ₃₀	X ₁ – Y ₁ I _{D30}	
		Lamp discharge substitution resistor	Ω	R _{L30}	620	
I _{D60} (A)	0,200	Minimum sum of squares lead currents	A ²	SoS ₆₀	X ₁ – Y ₁ I _{D60}	
		Lamp discharge substitution resistor	Ω	R _{L60}	270	
Maximum cathode voltage			V	CV _{max}	4,6	
Cathode substitution resistors for all dimming ballast qualification						
Substitution resistor for each cathode for testing dimming requirements				Ω	R _{Test1}	12,0
				R _{Test2}	13,0	
				R _{Test3}	11,0	

NOTE 1 This information is for normative ballast qualification only. For information on dimming operation with physical lamp-ballast systems see IEC TR 62750.

NOTE 2 Target sum of squares lead currents (SoS_{tgt}): $I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$

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ILCOS: FD-18-E-G13-26/600

Information for high frequency ballast design					
Starting requirements with cathode preheating, for starting times $0,4\text{ s} < t_s < 3,0\text{ s}$					
Minimum cathode preheat energy: $E_{\min} = Q_{\min} + P_{\min} t_s$		J	$Q_{\min}$	J	1,9
			$P_{\min}$	J/s	1,0
Voltage across each cathode for $E(t) < E_{\min}$		V	Max.(r.m.s.)		11
Substitution resistor for each cathode, for testing minimum cathode preheat requirements				Ω	7,5
Maximum cathode preheat energy: $E_{\max} = Q_{\max} + P_{\max} t_s$		J	$Q_{\max}$	J	2,9
			$P_{\max}$	J/s	1,7
Substitution resistor for each cathode, for testing maximum cathode preheat requirements				Ω	10,3
Open circuit voltage across lamp (with starting aid)	V	Non-ignition voltage	$t \leq t_s$	Max.(r.m.s.)	200
		Ignition voltage	$t > t_s (+10\text{ }^{\circ}\text{C})$	Min.(r.m.s.)	350
			$t > t_s (-15\text{ }^{\circ}\text{C})$	Min.(r.m.s.)	400
Substitution resistor range for each cathode, for testing open circuit voltage requirements				Ω	7,5...22,5

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ILCOS: FD-30-E-G13-26/900

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
30	With starter	Preheated	G13	26 × 900

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
894,6	899,3	901,7	908,8	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	220	198	30
60	220	198	30

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	30	96	86	106	0,365	0,550
60	30,5	99	89	109	0,355	0,530

Chromaticity coordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,375	10,9	8,2	13,6

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DATA SHEET

ILCOS: FD-30-E-G13-26/900

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	30	220	0,360	480	0,10
60	30	236	0,355	548	0,075

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,328	0,328
		Max.	0,766	0,766
Open circuit voltage across starter	V	Min. (r.m.s.)	198	198
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series		Ω	50	50
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	128

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
400	140

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ILCOS: FD-30-E-G13-26/900

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	30	190	260	365

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	24	95	0,260

Current in any lead to cathodes	A	Max.	0,630
Lamp operating current	A	Min.	*
		Max.	*

Current controlled preheating

Minimum preheat current I_k (A) to emission time t_e (s)		a		0,240*	
		I_m (A)		0,310*	
$I_k = (a/t_e + I_m^2)^{0,5}$	Maximum preheat current	A	$t \leq 0,4$		1,600*
			$0,4 < t < 2,0$		1,810 - 0,525 t *
			$t \geq 2,0$		0,760*
Open circuit voltage across lamp	V		$t \leq t_e$	Max. (r.m.s.)	*
			$t > t_e$	Min. (r.m.s.)	*
Voltage to starting aid	V		$t \leq t_e$	Max. (peak)	*
			$t > t_e$	Min. (peak)	*
Substitution resistor for each cathode					Ω 12,5*

Voltage controlled preheating

*

Without preheating

Open circuit voltage across lamp	V	Min. (r.m.s.)	*
Current through lamp substitution resistor	A	Min.	*
Lamp substitution resistor		Ω	*
Substitution resistor for each cathode		Ω	*
Cathode current	A	Max.	*

* Under consideration.

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ILCOS: FD-36-E-G13-26/1200

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
36	With starter	Preheated	G13	26 × 1 200

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
1 199,4	1 204,1	1 206,5	1 213,6	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	220	198	30
60	–	–	–

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	36	103	93	113	0,430	0,650
60	–	–	–	–	–	–

Chromaticity coordinates: See Clause D.2.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,375	10,9	8,2	13,6

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ILCOS: FD-36-E-G13-26/1200

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	40	220	0,430	390	0,10
60	–	–	–	–	–

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,387	–
		Max.	0,904	–
Open circuit voltage across starter	V	Min. (r.m.s.)	198	–
Open circuit voltage across lamp	V	Max. (peak)	400	–
Substitution resistor for both cathodes in series		Ω	40	–
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	–

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
800	140

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ILCOS: FD-36-E-G13-26/1200

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency kHz	Nominal power W	Rated voltage V	Calibration current A	Resistance Ω
20 to 26	36	204	0,320	320

Typical lamp characteristics

Frequency kHz	Lamp power W	Lamp voltage V	Lamp current A
≥ 20	32	102	0,320

Normal and dimming operation

Frequency	kHz	≥ 20
Transition current from normal to dimming operation	A	I_{Dtrans} 0,300
Maximum lamp operating current	A	I_{Dmax} 0,500
Maximum current in any lead to cathodes	A	I_{LHmax} 0,530

Dimming ballast qualification with substitution resistors (Note 1)

Electrode heating with arbitrary lamp operating current, measured on substitution resistors

Parameters for minimum sum of squares lead currents to substitution resistor	A^2	X_1	0,250
(SoS _{min}): $I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$ for $I_{D30} < I_D \leq I_{Dtrans}$ (Note 2)	A	Y_1	0,695

Electrode heating at the specified operating currents, measured on substitution resistors

Operating current		Heating parameters			
I_{Dmin} (A)	0,035	Minimum cathode voltage	V	CV_{Dmin}	3,5
		Lamp discharge substitution resistors	Ω	R_{L10min}	2 700
				R_{L10max}	5 100
I_{D30} (A)	0,115	Minimum sum of squares lead currents	A^2	SoS_{30}	$X_1 - Y_1 I_{D30}$
		Lamp discharge substitution resistor	Ω	R_{L30}	1 000
I_{D60} (A)	0,230	Minimum sum of squares lead currents	A^2	SoS_{60}	$X_1 - Y_1 I_{D60}$
		Lamp discharge substitution resistor	Ω	R_{L60}	420
Maximum cathode voltage			V	CV_{max}	4,8
Cathode substitution resistors for all dimming ballast qualification					
Substitution resistor for each cathode for testing dimming requirements			Ω	R_{Test1}	11,0
				R_{Test2}	12,0
				R_{Test3}	10,0

NOTE 1 This information is for normative ballast qualification only. For information on dimming operation with physical lamp-ballast systems see IEC TR 62750.

NOTE 2 Target sum of squares lead currents (SoS_{tgt}): $I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$

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ILCOS: FD-36-E-G13-26/1200

Information for high frequency ballast design					
Starting requirements with cathode preheating, for starting times $0,4 \text{ s} < t_s < 3,0 \text{ s}$					
Minimum cathode preheat energy: $E_{\min} = Q_{\min} + P_{\min} t_s$	J	$Q_{\min}$	J	2,2	
		$P_{\min}$	J/s	1,0	
Voltage across each cathode for $E(t) < E_{\min}$	V	Max.(r.m.s.)		11	
Substitution resistor for each cathode, for testing minimum cathode preheat requirements				Ω	6,4
Maximum cathode preheat energy: $E_{\max} = Q_{\max} + P_{\max} t_s$	J	$Q_{\max}$	J	3,8	
		$P_{\max}$	J/s	1,75	
Substitution resistor for each cathode, for testing maximum cathode preheat requirements				Ω	8,3
Open circuit voltage across lamp (with starting aid)	V	Non-ignition voltage	$t \leq t_s$	Max.(r.m.s.)	220
		Ignition voltage	$t > t_s (+10 \text{ }^{\circ}\text{C})$	Min.(r.m.s.)	370
			$t > t_s (-15 \text{ }^{\circ}\text{C})$	Min.(r.m.s.)	430
Substitution resistor range for each cathode, for testing open circuit voltage requirements				Ω	6,4...19,2

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ILCOS: FD-38-E-G13-26/1050

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
38	With starter	Preheated	G13	26 × 1 050

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
1 047,0	1 051,7	1 054,1	1 061,2	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	220	198	30
60	–	–	–

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	38,5	104	94	114	0,430	0,650
60	–	–	–	–	–	–

Chromaticity coordinates: See Clause D.3.

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ILCOS: FD-38-E-G13-26/1050

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	40	220	0,430	390	0,10
60	–	–	–	–	–

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,387	–
		Max.	0,904	–
Open circuit voltage across starter	V	Min. (r.m.s.)	198	–
Open circuit voltage across lamp	V	Max. (peak)	400	–
Substitution resistor for both cathodes in series		Ω	40	–
Voltage across starter with lamp operating	V	Max. (r.m.s.)	128	–

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
800	140

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ILCOS: FD-38-E-G13-26/1050

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency	Nominal power	Rated voltage	Calibration current	Resistance
kHz	W	V	A	Ω
20 to 26	38	210	310	340

Typical lamp characteristics

Frequency	Lamp power	Lamp voltage	Lamp current
kHz	W	V	A
≥ 20	32	105	0,310

Current in any lead to cathodes	A	Max.	0,750
Lamp operating current	A	Min.	*
		Max.	*

Current controlled preheating

Minimum preheat current I_k (A) to emission time t_e (s)	a		0,340*
$I_k = (a/t_e + I_m^2)^{0,5}$	I_m (A)		0,350*
Maximum preheat current	A	$t \leq 0,4$	1,900*
		$0,4 < t < 2,0$	2,150 - 0,630 t *
		$t \geq 2,0$	0,900*
Open circuit voltage across lamp	V	$t \leq t_e$	Max. (r.m.s.) 240*
		$t > t_e$	Min. (r.m.s.) 230*
Voltage to starting aid	V	$t \leq t_e$	Max. (peak) 340*
		$t > t_e$	Min. (peak) 325*
Substitution resistor for each cathode	Ω		10*

Voltage controlled preheating

*

Without preheating

Open circuit voltage across lamp	V	Min. (r.m.s.)	800
Current through lamp substitution resistor	A	Min.	0,200
Lamp substitution resistor	Ω		1 000
Substitution resistor for each cathode	Ω		2
Cathode current	A	Max.	2,200

* Under consideration.

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ILCOS: FD-58-E-G13-26/1500

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
58	With starter	Preheated	G13	26 × 1 500

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
1 500,0	1 504,7	1 507,1	1 514,2	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	220	198	30
60	–	–	–

Electrical characteristics						
Frequency Hz	Rated power W	Voltage (r.m.s.) at lamp terminals V			Rated lamp current A	Rated preheat current A
		Rated	Minimum	Maximum		
50	58	110	100	120	0,670	1,000
60	–	–	–	–	–	–

Chromaticity coordinates: See Clause D.3.

Cathode characteristics			
Test current A	Resistance of each cathode Ω		
	Rated	Minimum	Maximum
0,520	7,3	5,5	9,1

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ILCOS: FD-58-E-G13-26/1500

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	65	220	0,670	240	0,10
60	–	–	–	–	–

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,603	–
		Max.	1,410	–
Open circuit voltage across starter	V	Min. (r.m.s.)	198	–
Open circuit voltage across lamp	V	Max. (peak)	400	–
Substitution resistor for both cathodes in series		Ω	25	–
Voltage across starter with lamp operating	V	Max. (r.m.s.)	132	–

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
900	140

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ILCOS: FD-58-E-G13-26/1500

Information for high frequency ballast design

HF measurement ballast characteristics

Frequency kHz	Nominal power W	Rated voltage V	Calibration current A	Resistance Ω
20 to 26	58	222	0,455	245

Typical lamp characteristics

Frequency kHz	Lamp power W	Lamp voltage V	Lamp current A
≥ 20	50	111	0,455

Normal and dimming operation

Frequency kHz	≥ 20
Transition current from normal to dimming operation	A
Maximum lamp operating current	A
Maximum current in any lead to cathodes	A

Dimming ballast qualification with substitution resistors (Note 1)

Electrode heating with arbitrary lamp operating current, measured on substitution resistors

Parameters for minimum sum of squares lead currents to substitution resistor	A ²	X ₁	0,490
(SoS _{min}): $I_{LH}^2 + I_{LL}^2 = X_1 - Y_1 I_D$ for $I_{D30} < I_D \leq I_{Dtrans}$ (Note 2)	A	Y ₁	0,960

Electrode heating at the specified operating currents, measured on substitution resistors

Operating current	Heating parameters
I_{Dmin} (A)	Minimum cathode voltage V
	Lamp discharge substitution resistors Ω
	Minimum sum of squares lead currents A ²
I_{D30} (A)	Lamp discharge substitution resistor Ω
	Minimum sum of squares lead currents A ²
I_{D60} (A)	Lamp discharge substitution resistor Ω
	Maximum cathode voltage V
Cathode substitution resistors for all dimming ballast qualification	
Substitution resistor for each cathode for testing dimming requirements Ω	

NOTE 1 This information is for normative ballast qualification only. For information on dimming operation with physical lamp-ballast systems see IEC TR 62750.

NOTE 2 Target sum of squares lead currents (SoS_{tgt}): $I_{LH}^2 + I_{LL}^2 = X_1 - 0,3 Y_1 I_D$

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ILCOS: FD-58-E-G13-26/1500

Information for high frequency ballast design					
Starting requirements with cathode preheating, for starting times $0,4\text{ s} < t_s < 3,0\text{ s}$					
Minimum cathode preheat energy: $E_{\min} = Q_{\min} + P_{\min} t_s$	J	$Q_{\min}$	J	3,2	
		$P_{\min}$	J/s	1,1	
Voltage across each cathode for $E(t) < E_{\min}$	V	Max.(r.m.s.)		11	
Substitution resistor for each cathode, for testing minimum cathode preheat requirements				Ω	4,5
Maximum cathode preheat energy: $E_{\max} = Q_{\max} + P_{\max} t_s$	J	$Q_{\max}$	J	5,3	
		$P_{\max}$	J/s	1,8	
Substitution resistor for each cathode, for testing maximum cathode preheat requirements				Ω	5,5
Open circuit voltage across lamp (with starting aid)	V	Non-ignition voltage	$t \leq t_s$	Max. (r.m.s.)	230
		Ignition voltage	$t > t_s$ (+10 °C)	Min. (r.m.s.)	470
			$t > t_s$ (-15 °C)	Min. (r.m.s.)	600
Substitution resistor range for each cathode, for testing open circuit voltage requirements				Ω	4,5...13,5

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ILCOS: FD-70-E-G13-26/1800

Nominal power W	Circuit	Cathode	Cap	Nominal dimensions mm
70	With starter	Preheated	G13	26 × 1 800

Dimensions mm				
A	B		C	D
Max.	Min.	Max.	Max.	Max.
1 763,8	1 768,5	1 770,9	1 778,0	28,0

Starting characteristics			
Frequency Hz	Ballast rated voltage V	Test voltage (r.m.s.) V	Starting time s
50	240	216	30
60	240	216	30

Electrical characteristics						
Frequency	Rated power	Voltage (r.m.s.) at lamp terminals V			Rated lamp current	Rated preheat current
Hz	W	Rated	Minimum	Maximum	A	A
50	69,5	128	118	138	0,700	1,000
60	69,5	128	118	138	0,700	1,000

Chromaticity coordinates: See Clause D.3.

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ILCOS: FD-70-E-G13-26/1800

Reference ballast characteristics

Frequency Hz	Nominal power W	Rated voltage V	Calibration current A	Voltage/current ratio Ω	Power factor
50	70	240	0,700	240	0,10
60	70	240	0,700	240	0,10

Information for ballast design

Frequency		Hz	50	60
Preheat cathode current	A	Min.	0,590	0,590
		Max.	1,470	1,470
Open circuit voltage across starter	V	Min. (r.m.s.)	216	216
Open circuit voltage across lamp	V	Max. (peak)	400	400
Substitution resistor for both cathodes in series	Ω		25	25
Voltage across starter with lamp operating	V	Max. (r.m.s.)	160	160

Information for starter design

Pulse voltage V	Non-reclosure voltage V
Minimum	Maximum
900	170

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