ANSI C78.41-2001
Revision of ANSI C78.41-1987 (R1991, R1995)

American National Standard

Approved August 15, 2001 Secretariat: ANSLG-- National Electrical Manufacturers Association

for electric lamps:

Guidelines for Low Pressure Sodium Lamps

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Foreword

(This Foreword is not part of ANSI C78.41-2001.)

Suggestions for improvement of this standard should be submitted to the C78 Secretariat, American National Standard Lighting Group, ? NEMA, 1300 North 17th Street, Suite 1847, Arlington, VA 22209.

This American National Standard has been approved by the ANSI Accredited Standards Committee, C78, and its Subcommittee C78-4 for High-Intensity Discharge Lamps, which covers low pressure sodium lamps. At the time it approved (revision of) this standard, the C78 Committee had the following members:

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American National Standard **ANSI C78.41-2001**

for electric lamps --

Guidelines for Low Pressure Sodium Lamps

CHAPTER I: GENERAL INFORMATION

1 Scope

This standard describes the physical and electrical requirements of the principal types of single-ended low pressure sodium lamps. The electrical data provides the specific basis for ballast requirements for these lamps.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI C78.30—1997
Procedure for Use in Preparation of Lamp Space Drawings
ANSI C78.380—1997
Electric Lamps - High-Intensity-Discharge Lamps - Method of Designation
ANSI C78.386—1989 (R94)
Electric Lamps - Mercury Lamps - Methods of Measuring Characteristics
ANSI C79.1—1994
Nomenclature for Glass Bulbs Intended for Use with Electric Lamps
ANSI C81.61—1990 (R96)
Electric Lamp Bases
ANSI C81.62—1991 (R96)
Lampholders for Electric Lamps

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ANSI C81.63—1991 (R96)
Gauges for Electric Lamp Bases and Lampholders

ANSI C81.64—1993 (R98)
Guidelines and General Information for Electrical Lamp Bases, Lampholders, and Gauges
ANSI C82.4—1992 (R97)
Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple Supply Type)
ANSI C82.5—1990 (R95)
Reference Ballasts for High-Intensity-Discharge Lamps
ANSI C82.9-1996
Definitions for High-Intensity-Discharge and Low Pressure Sodium Lamps, Ballasts, and Transformers
IEC 60061-1--2001
Lamp Caps (the first part of IEC 60061, *Lamp Caps and Holders Together with Gauges for the Control of Interchangeability and Safety)*
IEC 60192--2001, *Low Pressure Sodium Vapour Lamps*

3 Lamp designations

Designations for low pressure sodium lamps are assigned in accordance with ANSI C78.380. For reference, the older designations are shown in parentheses in the lamp data sheets.

4 Bulb Designations

Bulb designations are defined in ANSI C79.1. Due to the long term use of the conventional method of bulb designations, their use will continue herein with the equivalent metric bulb designations shown in parentheses (i.e. BT28 [BT90]) in contrast with the use of metric primary dimensions elsewhere in this standard.

5 Base specifications

The BY22d base is described in ANSI C81.61.

6 Maximum outline drawings

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The maximum outline drawings in Chapter III of this standard show the maximum limits of the space that may be occupied by any part of the bulb for each lamp type. These limits are in accordance with IEC 60192. Most luminaires for low pressure sodium lamps constrain the dome end of the lamp and take up any eccentricity of the lamp by means of a moveable base holder. Accordingly, the maximum outline drawings allow for the maximum bulb diameter at the dome end and for eccentricity at the base end.

7 Methods of measurement

An American National Standard for methods of measuring the electrical characteristics and the bulb and base temperatures of low pressure sodium lamps has not yet been written. Until such a standard is written, general guidelines for these measurements may be found in ANSI C78.386 and IEC 60192.

8 Electrical characteristics

8.1 Lamp operating characteristics. The values of lamp volts, amperes, and watts shown on the individual lamp data sheets in Chapter II of this standard apply for lamps that have aged 100 hours. Lamp rms voltage may increase with operating hours; contact lamp manufacturer for details.

8.2 Warm-up time. Bare lamps operating in still air shall reach a stabilized voltage within the time limit and at the ambient temperature specified on the applicable lamp data sheet in Chapter II of this standard. For the purposes of this test, low pressure sodium lamps have reached a stabilized voltage when their voltage does not vary more than 2% in any one-minute period. Lamps shall meet this requirement when operated on the appropriate reference ballast specified in Chapter II, Section 4, and in the allowed operating position most adverse to warm-up.

9 Reference ballasts

Reference ballasts shall meet the general requirements described in ANSI C82.5.

10 Ballast design

General ballast requirements are described in ANSI C82.4. The following requirements shall be met over the full range of input voltage allowed for the ballast.

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10.1 Open circuit voltage. The minimum ballast open circuit voltages shown on the individual lamp data sheets assure starting and operating reliability over lamp life. The percentage probability has not yet been determined.

10.2 Starting current. Starting current shall be measured 5 to 15 seconds after the lamp has been energized and shall be within the limits shown on the applicable lamp data sheet.

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CHAPTER II
LAMP DATA SHEETS

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18-W Low Pressure Sodium Lamp, L69

Bulb: T16 (T51) clear Base: Bayonet, BY22d

1 Lamp designation

L69RA-NOUA[1] (old designation: L69RA-18)

2 Physical characteristics

Nominal diameter .....51 mm (2.01 in)
Maximum overall length (MOL).....216 mm (8.50 in)
Light center length (LCL).....135 mm ± 20 mm (5.31 in ± 0.79 in)
Effective arc length [2] .....85 mm ± 10 mm (3.35 in ± 0.39 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[3].....150°C (302°F)
Maximum permissible base temperature[4].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms).....	47	57	67
Lamp current (A, rms).....	-	0.35	-
Lamp wattage (W).....	-	18	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[1] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[2] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[3] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[4] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....300
Reference current (A, rms).....0.35
Impedance (ohms).....829
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 300 V, rms
450 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.28
Maximum current (A, rms).....0.43

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

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35-W Low Pressure Sodium Lamp, L70

Bulb: T16 (T51) clear Base: Bayonet, BY22d

1 Lamp designation

L70RB-NOUA[5] (old designation: L70RB-35)

2 Physical characteristics

Nominal diameter .....51 mm (2.01 in)
Maximum overall length (MOL).....311 mm (12.24 in)
Light center length (LCL).....185 mm ± 20 mm (7.28 in ± 0.79 in)
Effective arc length [6] .....190 mm ± 10 mm (7.48 in ± 0.39 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[7].....150°C (302°F)
Maximum permissible base temperature[8].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms).....	60	70	80
Lamp current (A, rms).....	-	0.60	-
Lamp wattage (W).....	-	37	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[5] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[6] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[7] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[8] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....480
Reference current (A, rms).....0.60
Impedance (ohms).....775
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 390 V, rms
552 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.49
Maximum current (A, rms).....0.74

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

Note: The rated wattage for this lamp is 37 W (see 3.1).

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55-W Low Pressure Sodium Lamp, L71

Bulb: T16 (T51) clear Base: Bayonet, BY22d

1 Lamp designation

L71RC-NOUA[9] (old designation: L71RC-55)

2 Physical characteristics

Nominal diameter .....51 mm (2.01 in)
Maximum overall length (MOL).....425 mm (16.73 in)
Light center length (LCL).....240 mm ± 20 mm (9.45 in ± 0.79 in)
Effective arc length [10] .....300 mm ± 10 mm (11.81 in ± 0.39 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[11].....150°C (302°F)
Maximum permissible base temperature[12].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms).....	98	109	120
Lamp current (A, rms).....	-	0.59	-
Lamp wattage (W).....	-	56	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[9] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[10] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[11] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[12] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....480
Reference current (A, rms).....0.60
Impedance (ohms).....775
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 410 V, rms
580 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.48
Maximum current (A, rms).....0.73

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

Note: The rated wattage for this lamp is 56 W (see 3.1).

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90-W Low Pressure Sodium Lamp, L72

Bulb: T20.5 (T65) clear Base: Bayonet, BY22d

1 Lamp designation

L72RD-NOUA[13] (old designation: L72RD-90)

2 Physical characteristics

Nominal diameter .....65 mm (2.56 in)
Maximum overall length (MOL).....528 mm (20.79 in)
Light center length (LCL).....290 mm ± 20 mm (11.28 in ± 0.79 in)
Effective arc length [14] .....400 mm ± 15 mm (15.75 in ± 0.59 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[15].....150°C (302°F)
Maximum permissible base temperature[16].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms).....	99	112	125
Lamp current (A, rms).....	-	0.94	-
Lamp wattage (W).....	-	91	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[13] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[14] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[15] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[16] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....480
Reference current (A, rms).....0.90
Impedance (ohms).....500
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 420 V, rms
594 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.76
Maximum current (A, rms).....1.16

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

Note: The rated wattage for this lamp is 91 W (see 3.1).

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135-W Low Pressure Sodium Lamp, L73

Bulb: T20.5 (T65) clear Base: Bayonet, BY22d

1 Lamp designation

L73RE-NOUA[17] (old designation: L73RE-135)

2 Physical characteristics

Nominal diameter .....65 mm (2.56 in)
Maximum overall length (MOL).....775 mm (30.51 in)
Light center length (LCL).....415 mm ± 25 mm (16.34 in ± 0.98 in)
Effective arc length [18] .....650 mm ± 15 mm (25.59 in ± 0.59 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[19].....150°C (302°F)
Maximum permissible base temperature[20].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms)	143	164	185
Lamp current (A, rms)	-	0.95	-
Lamp wattage (W)	-	135	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[17] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[18] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[19] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[20] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....650
Reference current (A, rms).....0.92
Impedance (ohms).....655
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 540 V, rms
764 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.77
Maximum current (A, rms).....1.17

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

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180-W Low Pressure Sodium Lamp, L74

Bulb: T20.5 (T65) clear Base: Bayonet, BY22d

1 Lamp designation

L74RF-NOUA[21] (old designation: L74RF-180)

2 Physical characteristics

Nominal diameter .....65 mm (2.56 in)
Maximum overall length (MOL).....1120 mm (44.09 in)
Light center length (LCL).....580 mm ± 30 mm (22.83 in ± 1.18 in)
Effective arc length [22] .....945 mm ± 25 mm (37.20 in ± 0.98 in)
Operating position limitation .....as indicated by lamp manufacturer
Maximum permissible bulb temperature[23].....150°C (302°F)
Maximum permissible base temperature[24].....150°C (302°F)
Maximum outline dimensions .....see Chapter III

3 Electrical characteristics

3.1 Lamp operating characteristics. The following lamp operating characteristics apply for lamps that have aged 100 hours. The characteristics shall be measured for lamps operating in a horizontal position in still air at an ambient temperature of 25°C " 5°C (77°F " 9°F). The lamps shall be operated on a reference ballast having the characteristics listed in Section 4 with a 60 Hz sinusoidal power supply.

	Min	Nom	Max
Voltage at lamp terminals (V, rms)	210	240	270
Lamp current (A, rms)	-	0.91	-
Lamp wattage (W)	-	185	-

3.2 Warm-up time. The warm-up time shall be measured for lamps operating on a reference ballast at rated input voltage in still air at an ambient temperature of 0°C (32°F).

Maximum time for lamp voltage to stabilize .....15 minutes

[21] The safety portion of the designation consists of the last four letters and is assigned by lamp manufacturers. In the event of different safety characteristics of lamps from individual lamp manufacturers, the safety portion of the designation for those lamps may differ from that shown here. Refer to ANSI C78.380 for details.

[22] Effective arc length is defined as the distance between the midpoint of the line through the electrode tips and the midpoint of the arc tube at the U-bend.

[23] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

[24] This temperature may be exceeded if allowed by the lamp manufacturer. Consult lamp manufacturer's literature.

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4 Reference ballast characteristics

The following ballast characteristics apply for horizontal lamp operation.

Rated input voltage (V, rms).....650
Reference current (A, rms).....0.92
Impedance (ohms).....655
Power factor.....0.06 " 0.005

5 Information for ballast design

5.1 Open circuit voltage. The minimum open circuit voltage at and above an ambient temperature of -40°C (-40°F) shall be : 600 V, rms
849 V, peak

5.2 Starting and warm-up current. The minimum current shall be measured at the minimum allowed ballast input voltage. The maximum current shall be measured at the maximum allowed ballast input voltage.

Minimum current (A, rms).....0.74
Maximum current (A, rms).....1.12

5.3 Crest factor of lamp operating current. The maximum crest factor for any operating position shall not exceed 1.6.

5.4 Maximum voltage across lamp terminals. The maximum voltage applied by a ballast across the lamp terminals shall not exceed 1500 V, peak.

Note: The rated wattage for this lamp is 185 W (see 3.1).

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CHAPTER III
MAXIMUM OUTLINE DRAWING and DIMENSIONS

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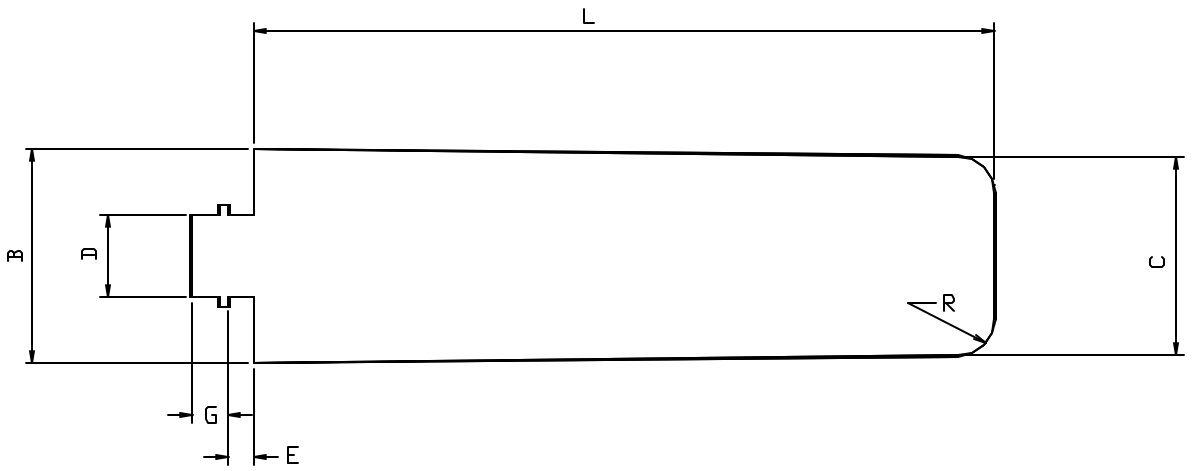

Lamp type	L	B	C	R	E	D	G
18W L69	200.5	58	54	10	6.7	22.3	10.2
35W L70	295.5	58	54	10	6.7	22.3	10.2
55W L71	409.5	58	54	10	6.7	22.3	10.2

Maximum outline drawing for L69, L70, L71 low pressure sodium lamps. All dimensions in mm.

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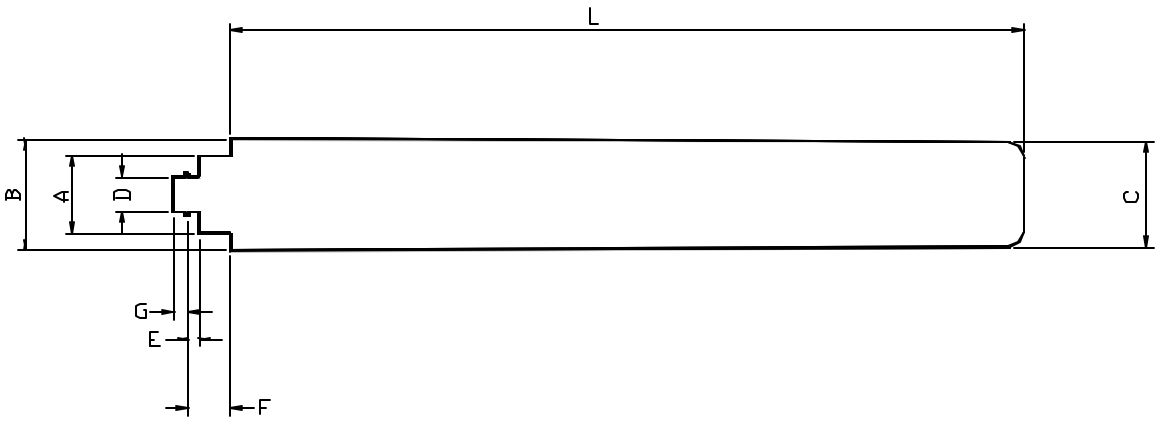

Lamp type	L	B	C	A	R	E	F	D	G
90W L72	512.5	72	68	50	10	6.7	27	22.3	10.2
135W L73	759.5	72	68	50	10	6.7	27	22.3	10.2
180W L74	1104.5	72	68	50	10	6.7	27	22.3	10.2

Maximum outline drawing for L72, L73, L74 low pressure sodium lamps. All dimensions in mm.

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