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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Earth-moving machinery — Lighting, signalling and marking lights, and reflex-reflector devices

AMENDMENT 1

Engins de terrassement — Feux d'éclairage, de signalisation, de position et d'encombrement, et catadioptres

AMENDEMENT 1

ICS 53.100

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Annex E
(normative)

Lighting, signaling and marking lights, and reflex-reflector devices

Data sheets no.

Lighting

E.1.....Dipped/lower Beam headlamp (dipped-beam light)
E.2.....Main/upper Beam (driving light)
E.3.....Work lamp (working light)

Signaling lights

E.4.....Reversing lamp
E.5.....Direction-indication lamp
E.6.....Hazard warning lamp
E.7.....Stop lamp

Marking lights

E.8.....Rear registration-plate lamp
E.9.....Front position lamp
E.10.....Rear position lamp
E.11.....Rear fog lamp
E.12.....Special warning lamp

Reflex-reflectors

E.13.....Rear reflex-reflector
E.14.....Front reflex-reflector
E.15.....Side-reflex-reflector
E.16.....Slow-moving vehicle plate

Note 1) In the data sheets E.1 to E.16 of this Annex three symbols are used for different applications:

S .....specifies minimum requirements regarding lighting, signaling and marking lights, and reflex-reflector devices for on and/or off-road use.

O .....optional lighting, signaling and marking lights, and reflex-reflector devices which may be installed on machines. When these lighting, signaling and marking lights, and reflex-reflector devices are used they should be in accordance to this standard.

na....not applicable.

Note 2) The dimensions an geometric visibility specifications in the data sheets are based on transport and/or carry position of the earth-moving machines as specified by the manufacturer.

Note 3) Where national requirements differ from these requirements, the national requirements may be used.

E.1.2 Requirements for dipped/lower beam headlamp

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	O	O	O	S	S[1]	S[1]	n a	O	O
b) Number	Two[2]						n a	Two[2]	
c) Dimensions in mm									
H_1	≤ 1500[3]						n a	≤ 2100[4]	
H_2	> 500						n a	> 500	
E	≤ 400[5]						n a	≤ 400[5]	
D	n a								
d) Geometric visibility, min angles									
α_1	10°						n a	10°	
α_2	10°[6]						n a	10°[6]	
β_1	45°						n a	45°	
β_2	5°[7]						n a	5°[7]	
e) Electrical connections	The dipped/lower beam light may remain switched on at the same time as the main/upper beam light. When the control switch for dipped/lower beam light is activated, all main/upper beam lights shall be switched off simultaneously.								
f) Tell-tale	n a								
g) Other requirements	Symmetrically in relation to the median longitudinal plane[9]								

Exceptions

1) Not applicable to steel tracked and steel pad foot wheeled machines.

2) At front of the earth-moving machinery as far ahead as possible. The light may not cause discomfort to the operator/driver either directly or indirectly through the rear-view mirror and/or other reflecting surfaces. Two additional dipped/lower beam lights are optional. For additional lamps, when used on road, exception shall be granted.

3) May be > 1500 mm if the design of the bodywork makes it impossible to keep within 1500 mm, but maximum speed may be limited by national regulations.

4) May be > 2100 mm if the design of the bodywork makes it impossible to keep within 2100 mm.

5) May due to the design be > 400 mm from the extreme outer edge of the earth-moving machinery.

6) May be reduced to 5° if the design of the bodywork makes it necessary.

7) May be reduced to 3° if the design of the bodywork makes it necessary.

8) Initial adjustment of the cut-off line. The distance between the screen and the headlamp centre of reference shall be at 10 m.

When the highest point of the illuminating surface of the headlamp is:
- 1200 mm; the dipped/lower beam headlamp inclination shall be between 1,0 - 3 %.
- > 1200 mm; the adjustment of the additional dipped/lower beam headlamps mounted higher than 1200 mm shall be such that the horizontal part of the cut-off line at a distance of 15 m in front of the earth-moving machinery is half of the height of the centre of the dipped/lower beam headlamp.

E.2.2 Requirements for main/upper beam headlamp

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	n a			O	O	S[1]	n a	O	O
b) Number	n a			Two or four[2]			n a	Two or four[2]	
c) Dimensions in mm									
H_1	n a								
H_2	n a								
E	n a			3)			n a	3)	
D	n a								
d) Geometric visibility, min angles									
α_1	n a								
α_2	n a								
β_1	n a								
β_2	n a								
e) Electrical connections	n a			4)			n a	4)	
f) Tell-tale	n a			5)			n a	5)	
g) Other requirements	n a			6)			n a	6)	

Exceptions:

1) Not applicable to steel-tracked and steel pad foot wheeled machines.

2) At front of the earth-moving machine as far ahead as possible. The light may not cause discomfort to the operator/drive either directly or indirectly through the rear-view mirror and/or other reflecting surfaces.

3) The outer edges of the illuminating surfaces shall in no case be closer to the extreme outer edge of the earth-movin machine than the outer edges of the illuminating surfaces of the dipped/lower beam headlamp.

4) Shall be switched on either simultaneously or in pairs. For changing over from the dipped/lower beam headlamps to th main/upper beam headlamps, at least one pair of main/upper beam headlamps shall be switched on. For changing ove from main/upper beam headlamps to dipped/lower beam headlamps, all main/upper beam headlamps shall be switche off simultaneously.

5) A blue warning light shall be visible in the operator's/driver's field of view, when the main-beam headlamps are switche on.

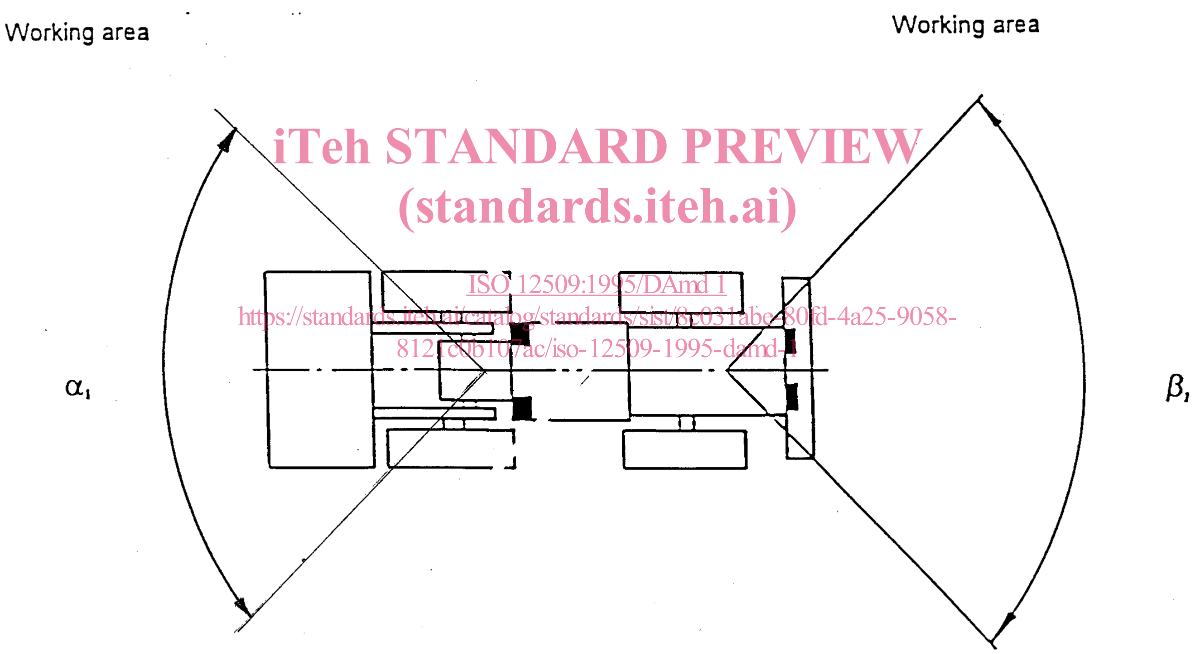
6) Symmetrical in relation to the median longitudinal plane of the earth-moving machinery. The total maximum intensity of th main/upper beam headlamps which can be switched on simultaneously shall not exceed 225 000 cd.

E.3 - Data sheet

E.3.1 Work lamp: the lamp used for illuminating the working area to the front, or to the rear, or to the side of the earth-moving machine and/or it's attachment.

E.3.1.1 Colour of the light: white

E.3.1.2 Alignment: any direction, or all around where necessary.



E.3.1.3 Configuration:

Work lamp:

- may not be grouped with:
    - another lamp

- may not be combined with:
    - another lamps

- may not be reciprocally incorporated with:
    - another lamp

E 3.2 Requirements for work lamp [3)]

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	0	0	0	0	0	0	0	0	0
b) Number	One or more 1)								
c) Dimensions in mm									
H_1	n a								
H_2	n a								
E	n a								
D	n a								
d) Geometric visibility, min angles									
α_1	90°								
α_2	n a								
β_1	90°								
β_2	n a								
e) Electrical connections	Shall have a separate switch on control								
f) Tell-tale	n a								
g) Other requirements	Working lights shall not be switched on when driving on roads 2)								

Exceptions:

1) Such a number, that makes it possible to observe the actual working area of the machine and if necessary also the attachment.

2) On machines used for construction, maintenance or cleaning public roads or installations at or on public roads, working lights may be switched on when driving, if driving is part of the work process. Working lights may only be switched on if no other road users and workers can be dazzled. If the machine is equipped with front and rear position lamps, the working lights may only be switched on when the front and rear position lamps are switched on.

3) Where national requirements differ from these requirements, the national requirements may be used.

4) The angle sector line shall cover the front-end corners of the base machine.

5) The angle sector lines shall cover the rear-end corners of the base machine.

E.4.2 Requirements for reversing lamp

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	n a	O	O	O	O	O	n a	O	O
b) Number	One or two								
c) Dimensions in mm									
H_1	≤ 1500[1)]								
H_2	> 400								
E	n a								
D	n a								
d) Geometric visibility, min angles									
α_1	15°								
α_2	5°								
β_1	45° [2)]								
β_2	45°								
e) Electrical connections	3)								
f) Tell-tale	Optional								
g) Other requirements	n a								

Exceptions:

1) In a longitudinal direction at the rear portion of the earth-moving machinery. May be fitted higher if the design of the bodywork makes it impossible to keep within 1500 mm.

2) May be reduced to 10° if the design of the bodywork makes it necessary.

3) The reversing lamp shall be illuminated when the operator has actuated the control for the reverse direction and if the device which controls the starting or stopping of the engine is in such position that operation of the engine is possible. The reversing lamp shall not be illuminated if either of the above conditions are not satisfied. The reversing lamp shall not be illuminated when the direction control is in the neutral or forward direction positions.

E.5.2.3 Requirements for front direction indicator lamp
Category 1, 1a and 1b (See E.5.1.4)

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	n a	O	S[1]	S[1]	S[1]	S[1]	n a	O	S[1]
b) Number	n a	Two or four [2]					n a	Two or four [2]	
c) Dimensions in mm									
H_1	n a	≤ 1500[3]		≤ 1500[4]			n a	≤ 1500[3]	
H_2	n a	> 400					n a	> 600	
E	n a	≤ 400[5]		≤ 400			n a	≤ 400[5]	
D	n a	> 500[6]					n a	> 500[6]	
d) Geometric visibility, min angles									
α_1	n a	15° latitude					n a	15° latitude	
α_2	n a	15° latitude[7]					n a	15° latitude[7]	
β_1	n a	80°[8]					n a	80°[8] [9]	
β_2	n a	45°[8]					n a	45°[8] [9]	
e) Electrical connections	n a	See E.5.1.5					n a	See E.5.1.5	
f) Tell-tale	n a	See E.5.1.5					n a	See E.5.1.5	
g) Other requirements	n a	See E.5.1.5					n a	See E.5.1.5	

Exceptions:

1) Not applicable to steel-tracked and steel pad foot wheeled machines.

2) Four allowed if two don't comply with the angle β_1 (outward) and angle β_2 (inward). If four, one pair shall meet the angle β and the other pair angle β_2.

3) May be fitted higher if the design of the bodywork makes it impossible to meet 1500 mm.

4) May be fitted higher if the design of the bodywork makes it impossible to meet 1500 mm, maximum height 2100 mm.

5) May be > 400 mm if the design of the bodywork makes it impossible to meet 400 mm.

6) May be < 500 mm if the design of the bodywork makes it impossible to meet 500 mm.

7) May be reduced to 5° due to the earth-moving machinery bodywork.

8) If two pair, one pair shall meet the angle 80° and the other pair the angle 45°.

9) May be reduced if the design of the bodywork makes it impossible to meet 80° or 45°.

E.5.3.3 Requirements for rear direction indicator lamp
Category 2a and 2b (See E.5.1.4)

Lighting groups (see Annex A)	I			II			III		
	A	B	C	A	B	C	A	B	C
a) Application to machines	n a	O	S[1]	S[1]	S[1]	S[1]	n a	O	S[1]
b) Number	n a	Two or four[2]					n a	Two or four[2]	
c) Dimensions in mm									
H_1	n a	≤ 1500[3]		≤ 1500[4]			n a	≤ 1500[3]	
H_2	n a	> 400					n a	> 600	
E	n a	≤ 400[5]		≤ 400			n a	≤ 400[5]	
D	n a	> 500[6]					n a	> 500[6]	
d) Geometric visibility, min angles									
α_1	n a	15° latitude[7]					n a	15° latitude[7]	
α_2	n a	15° latitude[8]					n a	15° latitude[8]	
β_1	n a	80°[9]					n a	80°[9, 10]	
β_2	n a	45°[9]					n a	45°[9, 10]	
e) Electrical connections	n a	See E.5.1.5					n a	See E.5.1.5	
f) Tell-tale	n a	See E.5.1.5					n a	See E.5.1.5	
g) Other requirements	n a	See E.5.1.5					n a	See E.5.1.5	

Exceptions:

1) Not applicable to steel-tracked and steel pad foot wheeled machines.

2) Four shall be used if two don't comply with the angle β_1 (outward) and angle β_2 (inward). If four are used, one pair shall meet the angle β_1 and the other pair angle β_2.

3) May be fitted higher if the design of the bodywork makes it impossible to meet 1500 mm.

4) May be fitted higher if the design of the bodywork makes it impossible to meet 1500 mm, maximum height 2100 mm.

5) May be > 400 mm if the design of the bodywork makes it impossible to meet 400 mm.

6) May be reduced if the design of the bodywork makes it impossible to meet 500 mm. For example, on rear dump dumper.

7) May be reduced to 10° due to the earth-moving machinery bodywork.

8) May be reduced to 5° due to the earth-moving machinery bodywork.

9) If two pair, one pair shall meet the angle of 80° and the other pair the angle of 45°.

10 May be reduced if the design of the bodywork makes it impossible to meet 80° or 45°. For example, on machine with rear mounted working equipment and rear dump dumper.