

Electrical protection

Class 1 - fittings comply with class 1 (I) earthed electrical requirements i.e. functional insulation in all parts and earth termination.

Class 2 - fittings comply with class 2 (II) double insulated electrical requirements i.e. complete insulation in all parts and earth termination. In the event of an electrical fault, no dangerous voltage can reach touchable metal parts.

Class 3 - fittings comply with class (III) triple insulated electrical requirements i.e. Where protection against electrical shock relies on supply at safely extra-low (SELV) and in which voltages higher than those of SELV are not generated.



Class 1



Class 2



Class 3

Degree of protection

The resistive performance of fittings to solids and liquids is indicated by the IP (Ingress Protection) prefix followed by two numbers. The first number indicates the measure of protection against the ingress of solids. The second number indicates the measure of protection against the ingress of liquids.

First identification number. Protection against the ingress of solids

Symbol	Number	Measure of protection	Test
	IP 2X	Against foreign bodies $\geq 12.5\text{mm } \varnothing$	Ball 12mm \varnothing and finger test
	IP 3X	Against foreign bodies $\geq 2.5\text{mm } \varnothing$	Steel wire 2.5mm \varnothing
	IP 4X	Against foreign bodies $\geq 1.0\text{mm } \varnothing$	Steel wire 1.0mm \varnothing
	IP 5X	Against harmful dust deposits (dust proof)	Talcum powder - particles 1 $\mu\text{m } \varnothing$
	IP 6X	Against any entry of dust (dust tight)	Talcum powder - particles 1 $\mu\text{m } \varnothing$

Second identification number. Protection against the ingress of liquids

Symbol	Number	Measure of protection	Test
	IP X1	Against falling drops of water	Water falling vertically
	IP X2	Against falling drops of water	Water falling up to 15° from vertical
	IP X3	Against spraying water (rain proof)	Water sprayed at 60° from vertical
	IP X4	Against splashed water (splash proof)	Water from all directions
	IP X5	Against jets of water jets	Water from all directions projected by a nozzle
	IP X6	Against heavy seas or powerful water jets	Water from all directions projected by a nozzle
	IP X7	Against temporary immersion effects, and not for continuous underwater application	Immersion in water $< 1\text{m}$ for 30 minutes
	IP X8	Against continuous submersion (pressure water-tight)	Immersion in water $\geq 1\text{m}$ for 30 minutes - max. depth tested indicated after symbol

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Class 1



Class 2



Class 3

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First identification number. Protection against the ingress of solids

Symbol	Number	Measure of protection	Test
	IP 2X	Against foreign bodies $\geq 12.5\text{mm } \varnothing$	Ball 12mm \varnothing and finger test
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Photometric Data

Polar Diagram of luminous intensity distribution.

These provide a graphic representation of the distribution of light from a luminaire. Often referred to as polar curves, they indicate the intensity, measured in candelas (cd) per 1000 lumens.

Photometrics Demonstration

Photometric measurements indicate how a particular lamp or luminaire "sends out" light. The actual photometric data describe a luminaire's light distribution in terms of intensity (candela) and direction (degrees). Graphic representation of this information, referred to as photometric distribution or candlepower distribution curves, provides intuitive information, indicating how the luminaire will perform in a space. The actual candela values enable calculations to predict light levels and/or brightness level within a space.

Polar Diagram

The polar diagram is the graphic representation of the luminous intensity in different directions.

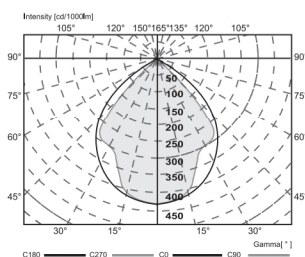
The value of the luminous intensity is indicated in candelas per 1000 lumen (cd/klm). This value must be multiplied by the luminous flux of the used lamp(s). Example: 1000 cd/klm corresponds with 400 cd with a 400 lm lamp and with 1100 cd with an 1100 lm lamp.

If two curves are plotted in one diagram, the intensity distributions are different in two vertical planes or in all four half planes : C0, C90, C180 and C270.

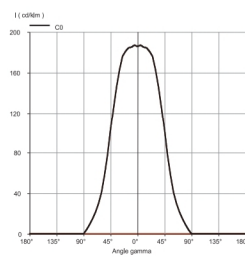
C0 is one of the two half planes perpendicular to the axis of the lamp. The half plane in which the highest luminous intensity has been measured is taken as C0 in Lumiance data files.

Gamma(°) is the angle between the optical axis of the luminaire and the direction in which a particular luminous intensity value has been measured.

light distribution:



Polar Diagram



Cartesian Diagram

Cartesian Diagram

The cartesian diagram is the graphic representation of the luminous intensity in different directions.

The difference with the polar diagram is that rectangular coordinates are used in the Cartesian diagram instead of polar coordinates. The scales are therefore easier to read, but the shape of the light distribution is more difficult to assess.

The values are indicated in candelas per 1000 lumen (cd/klm). This value must be multiplied by the luminous flux of the used lamps. Example: 1000 cd/klm corresponds with 400 cd with a 400 lm lamp and with 1100 cd with an 11000 lm lamp.

If two curves are plotted in one diagram, the distribution is different in two vertical planes.

TM5 Utilization Factors

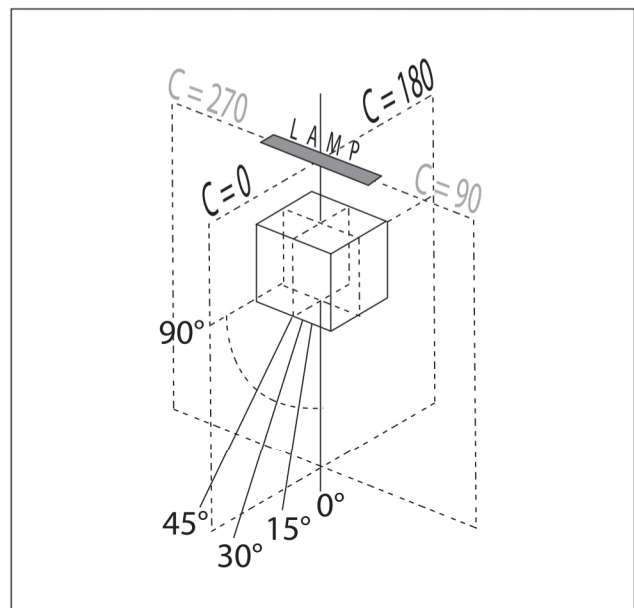
Utilization factors			LOR =72.2%									DLOR =72.2%					ULOR =0.0%				
Room reflection			Room index																		
C	W	F	0.75	1	1.25	1.5	2	2.5	3	4	5										
0.7	0.5	0.2	57	62	66	68	72	74	76	77	79										
	0.3		53	58	62	65	69	72	73	76	77										
	0.1		50	56	60	63	67	69	71	74	76										
0.5	0.5	0.2	56	61	64	67	70	72	73	75	76										
	0.3		52	58	61	64	68	70	71	73	75										
	0.1		50	55	59	62	66	68	70	72	73										
0.3	0.5	0.2	55	60	63	65	68	70	71	72	73										
	0.3		52	57	60	63	66	68	69	71	72										
	0.1		50	55	58	61	64	67	68	70	71										
0.0	0.0	0.0	49	53	57	59	62	64	65	67	68										
			SHR NOM =1.50					SHR MAX =1.52					SHR MAX								
			TR =1.61																		

Utilization Factor (UF)

The Utilization Factor indicates which percentage of the light reaches the working surface. The UF depends on the shape of the room (see room index) and on the reflection factors of reflecting surfaces.

Example: From the table, we can read that UF = 78% with room index k = 2 and with reflecting factors ceiling 70% Wall 50% Floor 20%.

With UF = 78%, the average illuminance is E = 998 lx if 10 fixtures with 4 lamps of 3200 lm are placed in a room of 100m². (E = 0.78 x 10 x 4 x 3200/100 = 998 lx)



The tables provided use luminaire Photometric data that has been measured and tested in accordance with British Standard 5225 Parts 1 & 3 'Photometric Data for Luminaires'.



Additional photometric data can be provided upon request.

All data is also available in CIBSE TM14, EULUMDAT and IES NA formats.







A complementary lighting design service is also available, to provide guidance and recommendations and to ensure lighting solutions are tailored to customer requirements. Supporting this service are the latest computer software facilities enabling accurate predictions and performance checks to be carried out.

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Fluorescent Lamps


CODE	Lamp base	Wattage (W)	Flux (lm)	OSRAM	PHILIPS
T5 (T 16) 	G5	14	200	FH 14W HE	Master TL5 HE 14W
		21	1900	FH 21W HE	Master TL5 HE 21W
		28	2600	FH 28W HE	Master TL5 HE 28W
		35	3300	FH 35W HE	Master TL5 HE 35W
		24	1750	FQ 24W HO	Master TL5 HO 24W
		39	3100	FQ 39W HO	Master TL5 HO 39W
		49	4300	FQ 49W HO	Master TL5 HO 49W
		54	4450	FQ 54W HO	Master TL5 HO 54W
		80	6150	FQ 80W HO	Master TL5 HO 80W
T8 (T 26) 	G13	15	1000	L 15W	Master TL-D Super 80 15W
		18	1350	L 18W	Master TL-D Super 80 18W
		30	2450	L 30W	Master TL-D Super 80 30W
		36	3350	L 36W	Master TL-D Super 80 36W
		58	5200	L 58W	Master TL-D Super 80 58W
		70	6200	-	Master TL-D Super 80 70W
T5 (T 16)	G5	8	400	L 8W	TL Mini 8W
T29R	G10q	22	1250	L 22W C	TL-E Circular 22W
		32	2100	L 32W C	TL-E Circular 32W
		40	2800	L 40W C	TL-E Circular 40W

Non Integrated Compact Fluorescent Lamps



CODE	Lamp base	Wattage (W)	Flux (lm)	OSRAM	PHILIPS
TC-S 	G23	5	250	Dulux S 5W	Master PL-S 2p 5W
		7	400	Dulux S 7W	Master PL-S 2p 7W
		9	600	Dulux S 9W	Master PL-S 2p 9W
		11	900	Dulux S 11W	Master PL-S 2p 11W
TC-SEL 	2G7	5	250	Dulux S/E 5W	Master PL-S 4p 5W
		7	400	Dulux S/E 7W	Master PL-S 4p 7W
		9	600	Dulux S/E 9W	Master PL-S 4p 9W
		11	900	Dulux S/E 11W	Master PL-S 4p 11W
TC-L 	2G11	18	1250	Dulux L 18W	Master PL-L 4p 18W
		24	1800	Dulux L 24W	Master PL-L 4p 24W
		36	2900	Dulux L 36W	Master PL-L 4p 36W
		40	3500	Dulux L 40W	Master PL-L 4p 40W
		55	4850	Dulux L 55W	Master PL-L 4p 55W
TC-D 	G24d-1	10	600	Dulux D 10W	Master PL-C 2p 10W
		13	900	Dulux D 13W	Master PL-C 2p 13W
	G24d-2	18	1200	Dulux D 18W	Master PL-C 2p 18W
	G24d-3	26	1800	Dulux D 26W	Master PL-C 2p 26W
TC-DEL 	G24q-1	10	600	Dulux D/E 10W	Master PL-C 4p 10W
		13	900	Dulux D/E 13W	Master PL-C 4p 13W
	G24q-2	18	1200	Dulux D/E 18W	Master PL-C 4p 18W
	G24q-3	26	1800	Dulux D/E 26W	Master PL-C 4p 26W
TC-TEL 	G24q-4	42	3200	Dulux T/E 42W	Master PL-T 4p 42W

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



Integrated Compact Fluorescent Lamps

CODE	Lamp base	Wattage (W)	Flux (lm)	OSRAM	PHILIPS
TC-TSE 	E27	15	900	Dulux EL LL 15W	
		20	1200	Dulux EL LL 20W	Master PL Electronic 20W
		23	1400	Dulux EL LL 23W	Master PL Electronic 23W
		30	1900	Dulux EL LL 30W	-

Sodium Lamps

CODE	Lamp base	Wattage (W)	Flux (lm)	OSRAM	PHILIPS
HST (HS) 	E27	70	6500	NAV T 70	SON-T 70
		100	10000	NAV T 100	SON-T 100
		150	17500	NAV T 150	SON-T 150
		250	33000	NAV T 250	SON-T 250
		400	55500	NAV T 400	SON-T 400
		1000	130000	NAV T 1000	SON-T 1000
HSE (HS) 	E27	50	3500	NAV T 50	SON-E 50
		70	5600	NAV T 70	SON-E 70
	E40	100	9500	NAV T 100	SON-E 100
		150	17000	NAV T 150	SON-E 150
		250	32000	NAV T 250	SON-E 250
		400	54000	NAV T 400	SON-E 400
		1000	120000	NAV T 1000	SON-E 1000
HST-DE	Rx7s	70	6800	NAV TS 70W	-
		150	15000	NAV TS 150W	-

Sodium Lamps

CODE	Lamp base	Wattage (W)	Flux (lm)	OSRAM	PHILIPS
HIT 	G12	35	3300	HCI-T 35	CDM-T 35
		70	6600	HCI-T 70	CDM-T 70
		150	14000	HCI-TS 150	CDM-T 150
HIT-DE 	Rx7s	70	5500	HCI-TS 70	CDM-TD 70
		150	11200	HCI-TS 150	CDM-TD 150
	Fc2	250	20000	HCI-TS 250	CDM-TD 250
HIT (HI) 	E40	150	14000	HCI-TT	CDO-TT
		250	22000	HCI-T 250	HPI-T Plus 250
		400	34000	HCI-T 400	HPI-T Plus 400
HIE (HI) 	E27	70	5200	HQI-E 70	CDO-ET 70
		100	7300	HQI-E 100	CDO-ET 100
		150	12000	HQI-E 150	-
	E40	150	12500	-	CDO-ET 150
		250	19000	HQI-E 250	HPI-E 250
		400	43000	HQI-E 400	HPI-E 400

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