

# Lighting Tools Interior

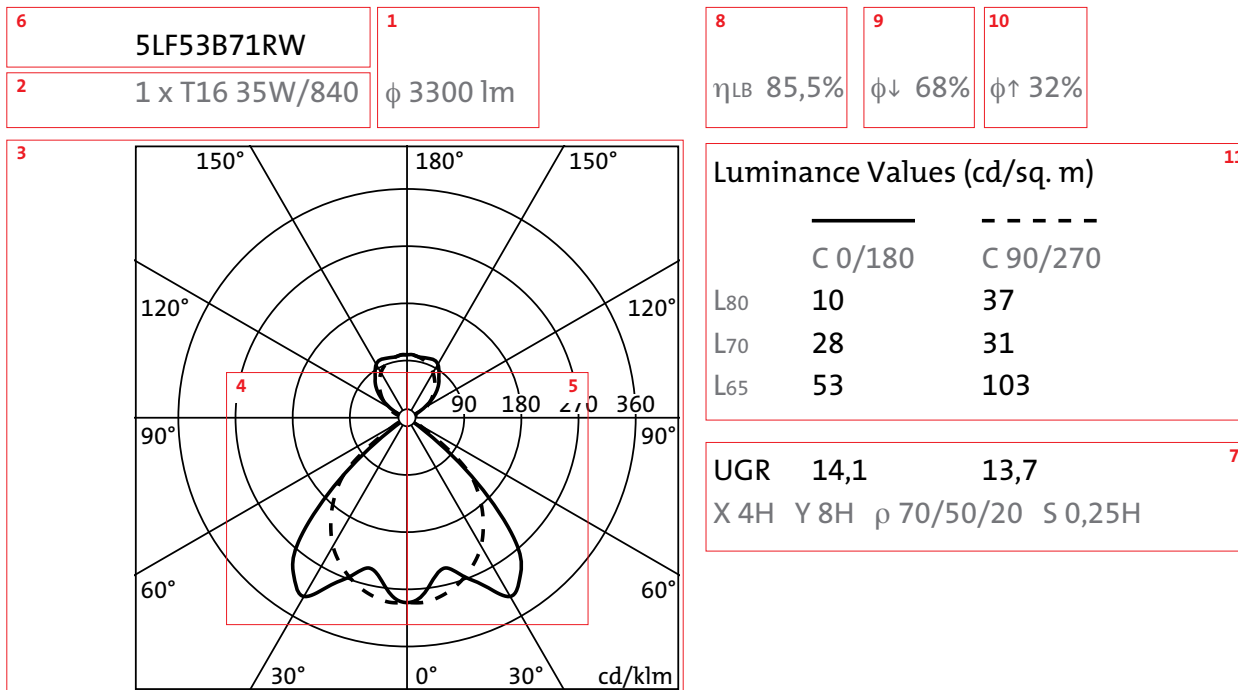
Chapter 12  
Appendix



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## Photometric explanations; light distribution curve



- 1**  $\phi$ : luminous flux of lamp in [lm] according to manufacturer specifications, measured at 25°C ambient temperature and unshielded. With LED, the net luminaire luminous flux.
- 2** Quantity, type and light colour of lamp, usually according to the ZVEI lamp designation system
- 3** Light distribution as polar curve. Specification of  $\gamma$  angle in [°]. Specification of luminous intensities I in [cd/klm]. The actual luminous intensities are calculated via multiplication with luminous flux of the lamp in [lm] divided by 1000. The centre of the auxiliary circle (scale of luminous intensities I) or initial point of the auxiliary lines (scale of  $\gamma$  angle) is the light focal point of the luminaire or median point of the light emission aperture
- 4** Continuous line:  
Luminous intensities I at C180°  
Dotted line:  
Luminous intensities I at C270°
- 5** Continuous line:  
Luminous intensities I at C0°  
Dotted line:  
Luminous intensities I at C90°
- 6** Order number of luminaire, with accessories where applicable
- 7** UGR value: Specification for direct glare control (unified glare rating) with indoor luminaires. Extract from the standard table for room width  $X = 4 \times H$ , room length  $Y = 8 \times H$ , with reflection factors  $\rho_{\text{ceiling}} = 70\%$ ,  $\rho_{\text{wall}} = 50\%$  and  $\rho_{\text{floor}} = 20\%$   
H: distance between eye level of seated viewer (1.2m) and luminaire level.  
Value left: with luminaire/lamp axis parallel to X, across direction of view.  
Value right: with luminaire/lamp axis parallel to Y and along direction of view.  
 $S = 0.25 \times H$ : axis distance of luminaires among each other. This is not realistic but is used for the specification of the table.  
With luminaires having more than 15% indirect component, these are determined with 50cm suspension distance from ceiling.  
The UGR process cannot be used for luminaires with more than 65% indirect component.
- 8** Luminaire light output ratio  $\eta_{LB}$  in [%]:  
This specifies how much (%) of the luminous flux  $\Phi$  of the lamps actually leaves the luminaire at an ambient temperature of 25°C. Siteco specifies this at 100% for luminaires with LED (see 1).
- 9**  $\phi_{\downarrow}$ : Component of luminous flux emitted to the lower hemisphere (direct component,  $\gamma \leq 90^\circ$ ), in [%] from total luminous flux  $\phi \times \eta_{LB}$  leaving the luminaire.
- 10**  $\phi_{\uparrow}$ : Component of luminous flux emitted to the upper hemisphere (indirect component,  $\gamma > 90^\circ$ ), in [%] from total luminous flux  $\phi \times \eta_{LB}$  leaving the luminaire.
- 11** Luminance levels L at luminaire in [cd/sq. metre] on levels C0° and C180° or C90° and C270° with various  $\gamma$  angles:  
L80: Luminance with  $\gamma = 80^\circ$ ,  
L70: Luminance with  $\gamma = 70^\circ$ ,  
L65: Luminance with  $\gamma = 65^\circ$   
VDU-screen-compliant glare reduction (CAT) when for  $\gamma \geq 65^\circ$  the following applies in all C levels:  $L < 1000 \text{cd/sq.m}$
- The specifications in the photometric data are based upon measurement results with goniophotometers and Ulbricht spheres according to valid measurement criteria and are only significant for the specified luminaire type in combination with the specified light sources. Depending upon the type of luminaire, the most reasonable or possible specifications are selected.**
- More detailed photometric specifications for all products at [www.siteco.com](http://www.siteco.com)

## Supplementary photometric explanations for downlights and suspended hall luminaires.

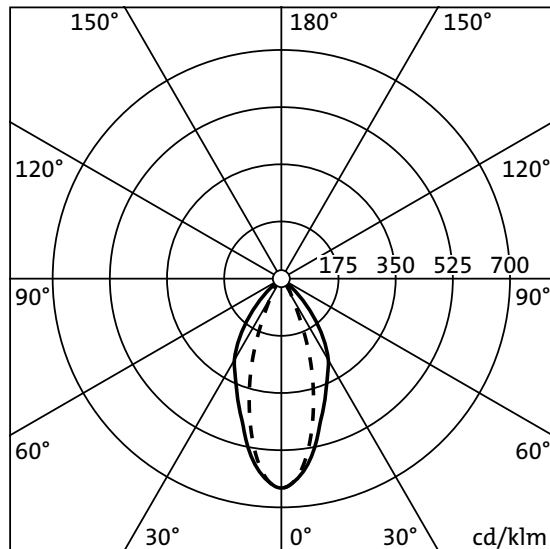
### 5NG15603QM1

1 x HIT-DE-h45 150W/730  $\phi$  11700 lm

$\eta_{LB}$  41%

$I_{max}$  641 cd/klm at  $\gamma$  0°

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#### Luminance values (cd/sq. m)

	—————	- - - - -
	C 0/180	C 90/270
L <sub>80</sub>	1778	1778
L <sub>70</sub>	1805	1354
L <sub>65</sub>	4383	2557

$\alpha_{50\%}$	2 x 26,2°	2 x 17,4°
$\alpha_{10\%}$	2 x 47,3°	2 x 30,4°

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UGR 28,4      21,6

X 4H Y 8H  $\rho$  70/50/20 S 0,25H

**12**  $I_{max}$  : maximum value of luminous intensity  $I$  in [cd/klm] and  $\gamma$  angle at which this is emitted.

consists of 50% of maximum value.

**14** Light distribution as Cartesian diagram with levels C0° and C180°, and C90° and C270°

**13**  $\alpha_{50\%}$ : half-peak divergence in [°]. This specifies at which angle the luminous intensity  $I$  still

$\alpha_{10\%}$ : One-tenth peak divergence in [°]. This specifies at which angle the luminous intensity  $I$  still consists of 10% of maximum value.

Angle specifications usually define the sum of angles in the levels C0° and C180° or C90° and C270°, e.g. 2 x 10°

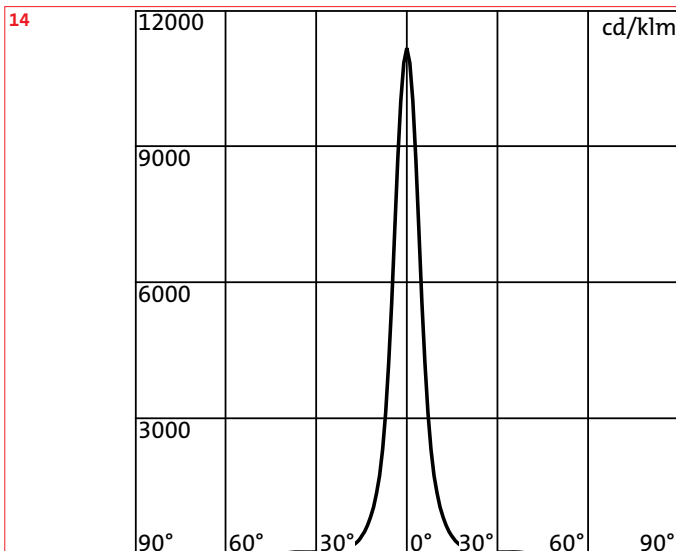
## Additional photometric explanations for narrow distribution spotlights/projectors for outdoor applications

### 5AA32270K

1 x HIT-TC-CE 20W/830  $\phi$  1615 lm

$\eta_{LB}$  58,5%

$I_{max}$  11162 cd/klm bei  $\gamma$  0°



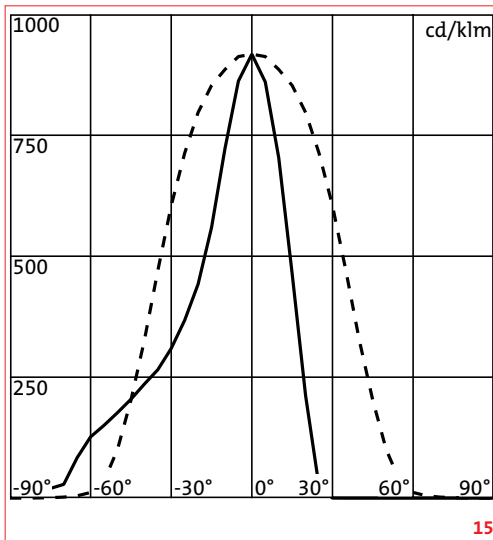
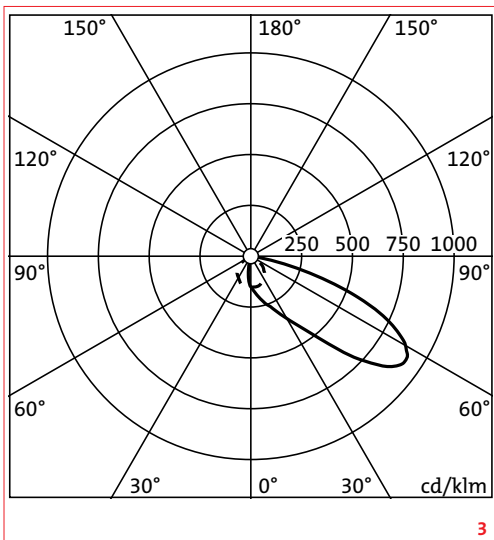
	—————	- - - - -
	C 0/180	C 90/270
$\alpha_{50\%}$	2 x 5,0°	2 x 5,0°
$\alpha_{10\%}$	2 x 10,8°	2 x 10,8°

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## Supplementary photometric explanations for asymmetric floodlights

### 5NA75901WS03

1x HIT-DE-h15 2000W/854 I=274  $\phi$   
230000 lm



$I_{max}$  917 cd/klm Tilt angle  $56^\circ$

— A 0 (C 0/180)    - - - B 0

15 Light distribution as Cartesian diagram with levels A0° (identical with levels C0° and C180°) and level B0°

16 Inclination: with floodlights the luminaire is tilted before measuring so far that the maximum in levels A0 and B0 is equivalent to  $\gamma = 0^\circ$ . In this way, the width of the light emission can be more precisely determined than with a measurement with C levels, thus enabling a higher measurement accuracy.

Some luminaires were measured with C levels; here no tilt is specified. The tilt angle in the Cartesian diagram corresponds to the angle to which the floodlight in the polar curve emits light asymmetrically to the vertical.

## Light cone diagram

In the case of rotosymmetrical distribution luminaires, the light cone diagram describes the illuminance values occurring on the measuring plane with respect to the distance to the luminaire, vertically to the light direction. The cone shell and thus the circular intersections between cone and planes are described by the half-peak divergence, i.e. the angle at which light output is still 50% of maximum light output. Within these circles the medial illuminance  $E_m$  and the maximal illuminance  $E_{max}$  are specified with a maintenance factor of 0.8.

17	18	19	20
H(m)	$\phi$ (m)	$E_{max}$ (lx)	$E_m$ (lx)
1	1,78	422	267
2	3,55	106	67
3	5,33	47	30
4	7,10	26	17
5	8,88	17	11

Maintenance factor = 0.8

17 Distance of plane to luminaire in [m]

18 Diameter of light cone in [m]

19 Maximal horizontal illuminance  $E_{max}$  within light cone in [lx]

20 Medial horizontal illuminance  $E_m$  within light cone in [lx]

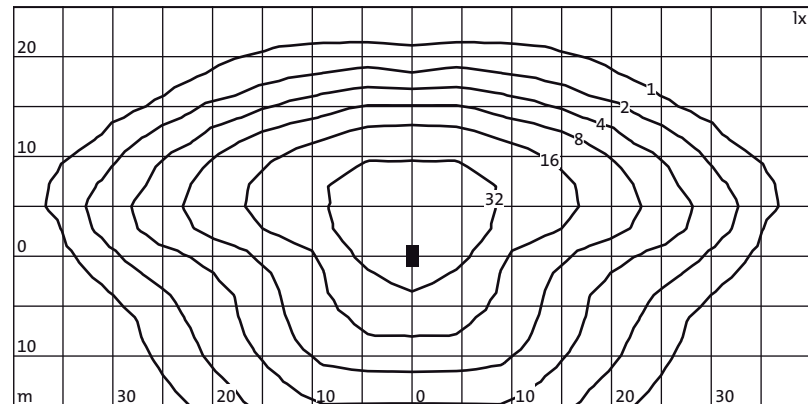
## Isolux curves/individual luminaire

Isolux curves represent illuminance distribution upon virtual or real surfaces, e.g. on a road, on a floor or a wall. Points of equal illuminance  $E$  in [lx] ('Isolux') are connected with a curve.

The illuminance values are dependent upon the distance between luminaire and surface. A maintenance factor of 0.8 is applied.

Isolux curves demonstrate the effect of the lighting characteristics of a luminaire (rotosymmetrical / asymmetric / linear).

Mounting height 10m Tilt 0°



## Number of luminaires in room

A tabular representation of the required number of luminaires per square metre for a specified nominal horizontal illuminance value  $E_m$  in [lx], on the working plane 0.75m for two standard mounting heights  $L_h$  [m]. With surface-mounted and recessed luminaires the mounting height corresponds to the room height. With suspended luminaires the room height  $R_h$  increases compared to the mounting height  $L_h$  by the length of suspension. These values are based upon standard reflection factors  $\rho_{\text{ceiling}} = 70\%$ ,  $\rho_{\text{wall}} = 50\%$ ,  $\rho_{\text{floor}} = 20\%$  and a maintenance factor of 0.8.

For calculating the tabular values according to other lamp variations, the specified number of luminaires in the table must be multiplied by the corresponding factor.

### No. Luminaires in room

Reflection factor 70/50/20

$E_m$ (lx)	100		200		500	
$L_h$ (m)	2,5	3,0	2,5	3,0	2,5	3,0
20 m <sup>2</sup>	0,7	0,8	1,4	1,6	3,6	3,9
30 m <sup>2</sup>	1,1	1,3	2,2	2,5	5,6	6,3
40 m <sup>2</sup>	1,4	1,5	2,8	3,1	7,1	7,7
50 m <sup>2</sup>	1,7	1,9	3,4	3,7	8,6	9,3
75 m <sup>2</sup>	2,5	2,7	5,0	5,4	12	13
100 m <sup>2</sup>	3,2	3,4	6,5	6,8	16	17
500 m <sup>2</sup>	15	15	29	30	73	75

### Factors for other lamp configurations

2x 54W 0.6

Maintenance factor 0.8  $R_h = L_h + 0.5m$

## Isolux curves/ workstation illumination

The Isolux diagram represents the distribution of the horizontal illuminance  $E$  in [lx] upon a virtual plane at a height of 0.75 m above the floor (the working plane).

An all-round distance of 0.5 m to the wall surface is maintained. Points of equal illuminance ('Isolux') are connected with a curve. A standard room is used with length of 5 m, width of 3.5m and clearance height of 2.7m.

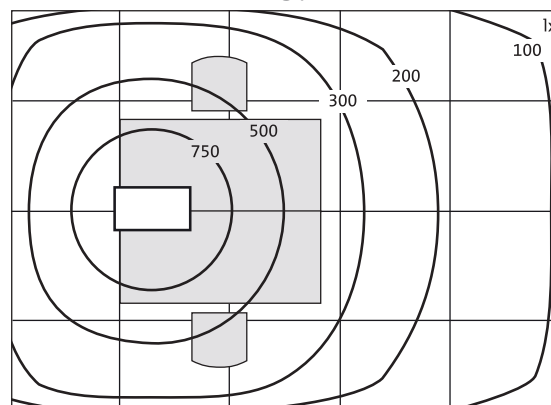
The room surfaces have the reflection factors

$\rho_{\text{ceiling}} = 80\%$ ,  $\rho_{\text{wall}} = 50\%$ ,  $\rho_{\text{floor}} = 30\%$ .

The room contains a double workstation with table length of 1.6m and table width of 2 x 0.8m. The room is illuminated with a floorstanding luminaire. A maintenance factor of 0.8 was used. Below the diagram the medial horizontal illuminance  $E_m$  in [lx] is specified within the room or on the table surface at a height of 0.75m.

### Office with double workstation

Room 5 x 3.5 x 2.7m, working plane h 0.75m



Reflection grade 80/50/30, maintenance factor 0.8

$E_m$  Room 447lx  $E_m$  table 643lx

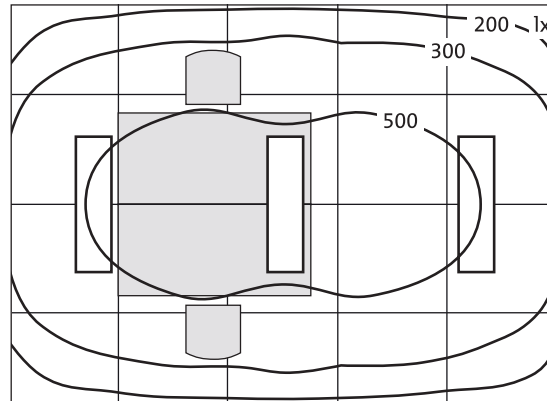
### Isolux curves/ room illumination

The Isolux diagram represents the distribution of the horizontal illuminance  $E$  in [lx] upon a virtual plane at a height of 0.75m above the floor (the working plane). An all-round distance of 0.5m to the wall surface is maintained.

Points of equal illuminance ('Isolux') are connected with a curve. A standard room is used with length of 5m, width of 3.5m and clearance height of 2.7m. The room surfaces have reflection values of  $\rho_{\text{ceiling}} = 70\%$ ,  $\rho_{\text{wall}} = 50\%$ ,  $\rho_{\text{floor}} = 20\%$ .

The room contains a double workstation with table length of 1.6m and table width of 2 x 0.8m. The room is illuminated with three direct/indirect distribution suspended luminaires. A maintenance factor of 0.8 was used. Below the diagram the medial horizontal illuminance  $E_m$  in [lx] is specified within the room or on the work surface at a height of 0.75m. According to DIN EN 12464-1 the following uniform values  $g_1 = E_{\text{min}} / E_m$  must be maintained:  
table:  $g_1 \geq 0.7$ ; room:  $g_1 \geq 0.5$

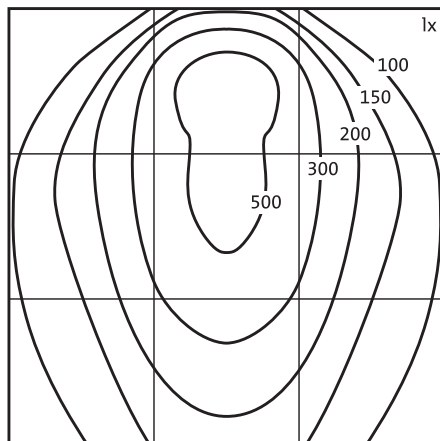
### Office with double workstation Room 5 x 3.5 x 2.7m, working plane h 0.75m



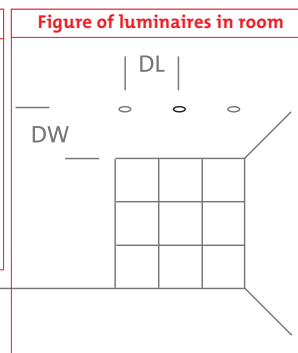
Reflection grade 70/50/20, maintenance factor 0.8  
 $E_m$  Room 481lx  $E_m$  table 535lx

### Isolux curves/ wallwasher table

5LR73501HA51 1xHIT-CE 70W  
Wall distance (DW) 1m



**Planning parameters**  
Reflection grade 70/50/20  
maintenance factor 0.8  
Room height 3.0m  
Tilt 20°



DW (m)	1,00	1,00	1,25	1,25	1,50	1,50	DW distance of luminaire/wall in m
DL (m)	1,00	1,25	1,25	1,50	1,50	1,75	DL distance of luminaire/vertical luminaire in m
$E_m$ (lx)	353	349	306	304	263	260	$E_m$ [lx] mean vertical illuminance

The Isolux diagram represents the distribution of the vertical illuminance  $E_v$  in [lx] upon a virtual wall surface of 3 x 3m or 6 x 6m height (vertical working plane).

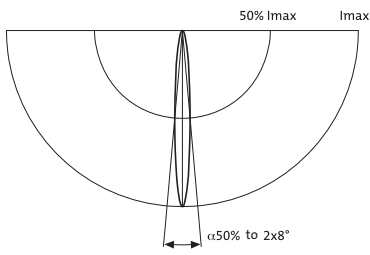
Points of equal illuminance ('Isolux') are connected with a curve.

The room surfaces have reflection values of  $\rho_{\text{ceiling}} = 70\%$ ,  $\rho_{\text{wall}} = 50\%$ ,  $\rho_{\text{floor}} = 20\%$ .

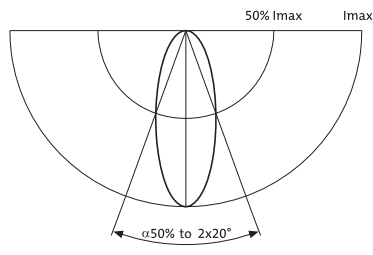
The wall is targeted with a luminaire with asymmetrical distribution, positioned with a specified distance to the wall (DW) and centric to the wall.

The table shows the medial vertical illuminance values  $E_m$  in [lx] of two luminaires with the specified distance to the wall (DW) and the distance of luminaire to luminaire (DL).

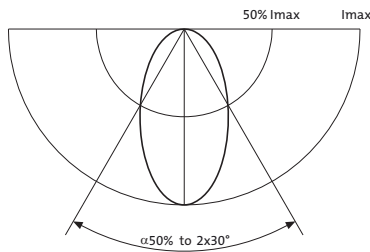
A maintenance factor of 0.8 was used.



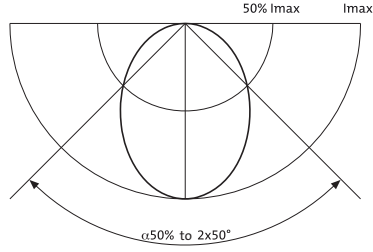
extremely narrow distribution



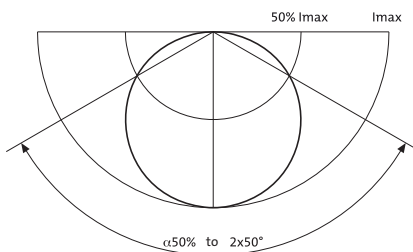
narrow distribution



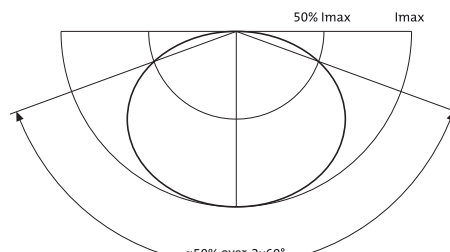
medium distribution



wide distribution



extremely wide distribution



diffuse distribution

For describing the beam distribution characteristic, with Siteco the designations specified above are used with a half-peak divergence of  $\alpha_{50\%}$ .

This specifies at which angle the luminous intensity  $I$  still consists of 50% of maximum value.

## Certification symbols

	Luminaires with the VDE symbol have been approved by the VDE inspection and certification institute. The basis for approval are the safety regulations applicable in Germany		Dust and water jet-protected luminaire		Luminaires with the D symbol are according to EN 60 598-2-24 suitable for workplaces in danger of fire from dust or fibres.
	The ENEC symbol (European Norm Electrical Certification) is a European inspection and certification symbol for luminaires and electrical components within luminaires. It testifies to compliance with the European standards for safety and work practice. A 10 signifies that inspection was carried out by the VDE. The VDE symbol can be additionally attached to the luminaire		Dust-tight luminaire	The luminaire, in addition to the D symbol requirement, also corresponds to VDS 2499 requirements with the specified material for the optical enclosure.	
	Protection against touching active, live parts with fingers		Dust-tight and water-jet protected luminaire	The FF designation is still used due to its high level of familiarity. The requirements of the no longer valid VDE 0710-5 are complied to with the specified diffuser material and distances. A label in the luminaire informs about further characteristics	
	Protection against touching live parts with fingers and against the ingress of spray water (e.g. rain). According to EN 60598, luminaires are inspected in their specific installation situations. With indoor luminaires this is the normative recess box that protects against the ingress of water into the luminaire. This special protection can be recognised by the specification IPX3 'Lichtaustrittsöffnung/aperture'		Dustproof and protected against strong water jets. Note: With tunnel luminaires with the additional specification of 6 bars. The luminaire is tested with a pressure of 6 bars with a water jet nozzle according to RVS 09.02.41 Section 6.3.8.		Luminaires approved for explosion-hazard zone 2 according to Ex-guideline 94/9/EG. Explosion-hazard zone 2 according to ElexV 1996: areas where explosive atmospheres from gases, vapours or haze are not expected, but if they still occur then probably only seldom and for a short time
	Protection against access into luminaire housing via a 1 mm thick wire		Dust and water-tight luminaire	Luminaires approved for explosion-hazard zone 22 according to Ex-guideline 94/9/EG.	
	Protection against access into luminaire housing via a 1 mm thick wire and against ingress of spray water		Protection against electric shock is implemented with basis isolation and connection of all touchable metal components with the earth conductor		Explosion-hazard zone 22 according to ElexV 1996: areas where explosive atmospheres from whirled-up dust are not expected, but if they still occur then probably only seldom and for a short time
	Protection against access into luminaire housing via a 1 mm thick wire and against ingress of splash water		Live parts are equipped with protective isolation in addition to the basis isolation. Connection of an earth conductor is not permitted unless a special terminal for through-wiring is integrated	Luminaires with F designation are suitable for direct mounting to normally flammable surfaces.	
	Dust-protected luminaire		Protection against electric shock is based on the use of safety extra-low voltage	The F designation, as requirements of the DIN VDE 0100 series of standards, can be used until the end of the transition period to 11.04.2012. Following this time the designation may no longer be applied to luminaires. There is then only the negative designation with the two following symbols	
	Dust and splash water-protected luminaire		Luminaires with F designation are suitable for direct mounting to normally flammable surfaces. The F designation, as requirements of the DIN VDE 0100 series of standards, can be used until the end of the transition period to 11.04.2012. Following this time the designation may no longer be applied to luminaires. There is then only the negative designation with the two following symbols	Luminaires with FF designation are suitable for environments that are subject to danger from dust or fibres according to VDE 0710, Section 5 (no longer valid since 08/2005). Luminaires corresponding with the EN 60 589-2-24 standard are designated with the D symbol	
	Dust and splash water-protected luminaire		Luminaires with FF designation are suitable for environments that are subject to danger from dust or fibres according to VDE 0710, Section 5 (no longer valid since 08/2005). Luminaires corresponding with the EN 60 589-2-24 standard are designated with the D symbol		

## Certification symbols



Successful vibration testing for verification of safety with vibration induced from earthquakes and comparable load cases. (e.g. required for use in nuclear power plants).

Test certificates on request



Luminaires tested for protection against flying balls according to the latest European standard EN 12 193 (or DIN VDE 0710)

IK 09

Luminaire tested for impact energy of 10.00 joules. IK 09 designation according to EN 50102



Luminaire is suitable for max. temperatures deviating from EN 60 598. In compliance with EN 60 598, luminaires are designed for nominal ambient temperatures of +25°C. Partial operation at +35°C is possible.



Luminaire tested for protection against flying balls in tennis areas according to DIN VDE 0710

IK 10

Luminaire tested for impact energy of 20.00 joules. IK 10 designation according to EN 50102



Luminaire is suitable for use with railway platforms/tracks. The angle-dependent maximum luminous intensities correspond to the specifications of German Railways.



IK 07

Luminaire tested for impact energy of 2.00 joules. IK 07 designation according to EN 50102

## Product technology/quality criteria



### Siteco Savelight

Safety and convenience package for protecting luminaire and for gentle lamp operation

- Ignitor with digital automatic power disconnection
- Ballast with thermal protection
- Power reduction (ECO) with integral timer for lamp start at full load



Radio management for transmission of control commands in 433.42 MHz ISM band



The CE symbol only documents compatibility with European guidelines valid for the product.

The CE symbol is applied on the manufacturer's own responsibility and as such is not an approval designation



Recycling symbol of the corrugated cardboard industry



DALI (Digital Addressable Lighting Interface) is an interface definition for controlling digitally dimmable ballasts.

A maximum of 64 DALI ballasts can be operated on one control line. These can be grouped in a maximum of 16 overlapped groups. A maximum of 16 lighting scenes can be stored. The definition of the protocol is regulated in the appendix of EN 60929



Symbol for good industrial design. Products designated with the IF logo have been distinguished by the IndustrieForum Design Hanover for outstanding product design



No application for our packaging (see Interseroh)



All luminaire packaging from Siteco Beleuchtungstechnik GmbH is accepted free of charge by the company of Interseroh and disposed of in an environmentally friendly way

## Product technology/quality criteria for lighting management systems



Entry into detection range



Exit of the detection range



Infrared sensor



Sensor area



Daylight control



Button activation (via button input)

Information symbols with installation instructions

	Wear protective gloves (avoid fingerprints)		Do not use countersunk screws for installation		Luminaire suitable for looping through
	Luminaire is suitable for use indoors and in unprotected installations outdoors		Note end mark/identification (no limit stop fitted)		Luminaire not suitable for looping through
	Luminaire is suitable for use indoors		Precise alignment must be ensured		The connection cable must not be subjected to tensile loads after installation
	Luminaire is suitable for use in unprotected installations outdoors		Adjustment possibilities for lamp position are specified		Luminaire may only be installed in open ceiling cavities. Installation in noise/fire prevention boxes is impermissible
	Luminaire may only be mounted away from the hand area. This area consists of 2.5m upwards and 1.25m to the side and below from the stand location of the person		Adjustment possibilities for reflector position are specified		After installation, luminaire must not be too near lower edge of unfinished ceiling otherwise function or safety is impaired. Notes on required distances in installation instructions
	Luminaire is suitable for use in protected installations outdoors. It must not be exposed to outdoor weathering. X and Y are minimal dimensions for protruding over luminaire edge. Indoor luminaires are fundamentally unsuitable for use in unprotected installations outdoors		Capacitance of the PF correction capacitor		A minimum distance (e.g. 0.8m here) to illuminated surfaces must be maintained
			Watt rating and number of lamps to be fitted		Recessed luminaire not suitable for direct fixing to normal, flammable surfaces (only suitable for fixing to non-flammable surfaces)
			Circuit with PF correction		The recessed luminaire is not suitable for covering with thermal insulating material
	'Two-man mounting' recommended due to reasons of safety		Control gear suitable for specified lamp rating		Surface-mountable luminaire not suitable for direct fixing to normal, flammable surfaces (only suitable for fixing to non-flammable surfaces)
	Installation and maintenance only by duly qualified personnel		Caution: the luminaire contains a conventional ballast with two power tappings. With device replacement, correct clamping according to state of delivery must be observed		
	Sections of the installation instructions bearing this symbol refer to the condition on delivery		Caution! voltage, disconnect from power before opening		
	<ul style="list-style-type: none"> <li>Further information in the installation instructions for accessory parts</li> <li>Please observe specifications of lamp manufacturers for application of lamps</li> </ul>		Disconnect mains plug		
	CAUTION! Pay special attention during installation		Unplug mains connector before starting any maintenance work		

## Information symbols with installation instructions



Warning of danger to hands from e.g. crushing or sharp edges



Cleaning with Hoover with suitable attachment nozzle



Warning of hot lamp bulbs. Danger of burning exists with all lamps shortly after switching off



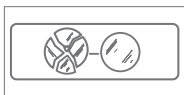
At end of service life, luminaire must be recycled. See [www.siteco.com](http://www.siteco.com) for recycling companies  
EAR number for Siteco: DE 84791082



Luminaire only suitable for operation with a cover glass



Windage area in shown projection without evaluation with air resistance coefficient (max. value is 1.2 acc. to EN 60598-2-3)



Damaged protective covers must be replaced immediately. Operation with damaged cover not permissible



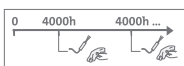
Protective earth. Earthing of product in system, installation or device required for correct functionality, but not part of protection against electric shock



Lamp must be approved for use in "open" luminaires. ("open" luminaires also include luminaires with plastic enclosure or with plastic reflector)



Hot surface e.g. in ballast area: only use suitable cables or observe suitable cable routing



Specification of recommended cleaning intervals and processes (e.g. clean luminaire with water jet and soft lint-free cloth every 4000 hours)



Cleaning only with a soft lint-free cloth
































Must not be cleaned with a damp cloth
























Special cleaning instruction for specific luminaire materials














## Light distribution

	Recessed ceiling luminaire, direct narrow distribution		Surface-mounted ceiling luminaire, direct asymmetric narrow distribution		Asymmetric floodlight ceiling surface mounting
	Recessed ceiling luminaire, direct medium/wide distribution		Surface-mounted ceiling luminaire, direct narrow distribution		Suspended luminaire, direct narrow distribution
	Recessed ceiling luminaire, direct wide/diffuse distribution		Surface-mounted ceiling luminaire, direct medium/wide distribution		Suspended luminaire, direct medium/wide distribution
	Recessed ceiling wallwasher		Surface-mounted ceiling luminaire, direct wide/diffuse distribution		Suspended luminaire, direct wide/diffuse distribution
	Recessed ceiling ground wallwasher		Surface-mounted ceiling luminaire, direct diffuse distribution		Suspended luminaire, direct/indirect wide/diffuse distribution
	Recessed ceiling directional spot tiltable narrow distribution		Surface-mounted ceiling luminaire, direct, narrow distribution with ceiling illumination		Suspended luminaire, indirect medium/wide distribution
	Recessed ceiling directional spot tiltable medium distribution		Surface-mounted ceiling luminaire, direct, medium/wide distribution with ceiling illumination		Suspended luminaire, direct/indirect narrow distribution with ceiling illumination
	Recessed ceiling wallwasher tiltable		Surface-mounted ceiling luminaire, direct, wide/diffuse distribution with ceiling illumination		Suspended luminaire, direct/indirect medium/wide distribution
	Semi-recessed ceiling luminaire, direct narrow distribution		Surface-mounted ceiling wallwasher		Suspended luminaire, direct/indirect wide/diffuse distribution
	Semi-recessed ceiling luminaire, direct medium/wide distribution		Surface-mounted ceiling ground wallwasher		Suspended ceiling washer
	Semi-recessed ceiling luminaire, direct wide/diffuse distribution		Symmetric floodlight/projector/spot in system rail ceiling surface mounting narrow distribution		Suspended ground wallwasher
	Semi-recessed ceiling luminaire, direct wide/diffuse distribution with ceiling illumination		Symmetric spot ceiling surface mounting direct medium/wide distribution		Suspended luminaire, direct asymmetric distribution






























## Light distribution

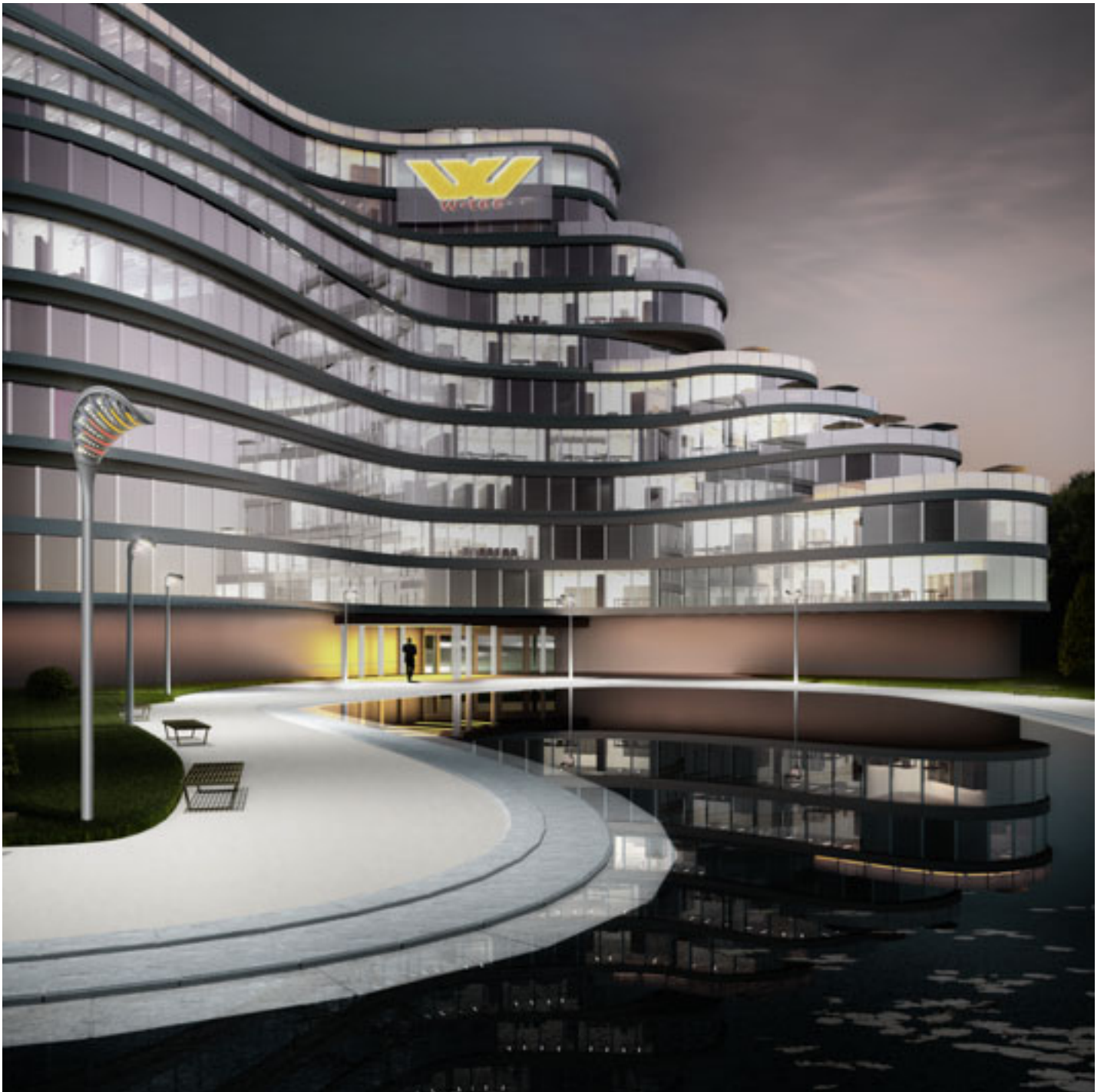
	Spot in suspended system rail, direct narrow distribution		Surface-mounted wall luminaire, direct/indirect medium/wide distribution		Recessed wall ceiling washer
	Symmetric spot in suspended system rail, direct, medium/wide distribution		Surface-mounted wall luminaire, direct medium/wide distribution		Symmetric floodlight/projector installation in ground narrow distribution
	Suspended wallwasher		Surface-mounted wall luminaire, direct narrow distribution		Symmetric floodlight/projector wall surface mounting medium/wide distribution
	Surface-mounted wall luminaire indirect asymmetric narrow distribution		Surface-mounted wall luminaire, direct asymmetric narrow distribution		Asymmetric floodlight installation in ground
	Surface-mounted wall luminaire indirect narrow distribution		Surface-mounted wall luminaire diffuse distribution		Floorstanding uplight, direct/indirect medium/wide distribution
	Surface-mounted wall luminaire indirect medium/wide distribution		Asymmetric floodlight wall surface mounting		Symmetric floodlight/projector mast mounting narrow distribution
	Wall surface-mounted ceiling washer		Symmetric floodlight/projector wall surface mounting narrow distribution		Asymmetric floodlight mast mounting
	Surface-mounted wall luminaire, direct/indirect narrow distribution		Symmetric floodlight/projector wall surface mounting wide/medium distribution		

## Light Sources

	Light emitting diodes		Twin tube compact fluorescent lamp for ECG, plug-in base		Triple double tube compact fluorescent lamp for ECG, plug-in base
					
	Fluorescent tube, d= 16mm, for ECG, double-ended		Twin double tube compact fluorescent lamp for LLCG, plug-in base		Triple double tube compact fluorescent lamp for higher ambient temperatures, for ECG, bayonet base
	Fluorescent tube, d= 26mm, for ECG or LLCG, double-ended		Twin double tube compact fluorescent lamp for ECG, plug-in base		Twin tube compact fluorescent lamp for LLCG and ECG, plug-in base
	Twin tube compact fluorescent lamp for LLCG, plug-in base		Triple double tube compact fluorescent lamp for LLCG, plug-in base		Triple double tube reflector compact fluorescent lamp, integrated ECG

## Light Sources

 T16-R 2GX13	Circular fluorescent lamp for ECG, plug-in base	 HIT-CE GY22	Metal halide lamp with tubular bulb and ceramic burner, suitable for hot re-ignition, plug-in base	 HSE-I E27	High pressure sodium vapour lamp with ellipsoid bulb, internal ignitor, screw base
 TC-DD GR8	Fluorescent lamp with loop form for LLCG, plug-in base	 HIT-CE-od PG212	Metal halide lamp with tubular bulb and ceramic burner, bayonet base	 HSE E27	High pressure sodium vapour lamp with ellipsoid bulb, screw base
 HIE E27	Metal halide lamp with ellipsoid bulb and quartz burner, screw base	 HIT-CE-P E27	Metal halide lamp with ellipsoid bulb and ceramic burner, burst-proof, screw base	 HST E27	High pressure sodium vapour lamp with tubular bulb, screw base
 HIE-CE E27	Metal halide lamp with ellipsoid bulb and ceramic burner, screw base	 HIT-CE/ S-od E27	Metal halide lamp with tubular bulb and ceramic burner, for HS ballast, plug-in base	 HST-DE RX7s	High pressure sodium vapour lamp with tubular bulb, double-ended
 HIPAR51 CE-P GX10	Metal halide lamp with reflector and ceramic burner, burst-proof, bayonet base	 HIT G12	Metal halide lamp with tubular bulb and quartz burner, plug-in base	 HST-CRI GX12-1	High pressure sodium vapour lamp with tubular bulb and ceramic burner, plug-in base
 HIR111- CE-P GX8.5	Metal halide lamp with reflector and ceramic burner, burst-proof, bayonet base	 HIT G22	Metal halide lamp with tubular bulb and quartz burner, suitable for hot re-ignition, plug-in base	 QT12 GV6.35	Low voltage tungsten halogen lamp with tubular bulb, plug-in base
 HIT-TC-CE PG15	Metal halide lamp with tubular bulb and ceramic burner, bayonet base	 HIT GY22	Metal halide lamp with tubular bulb and quartz burner, suitable for hot re-ignition, plug-in base	 QR-CBC 51/IRC GU5.3	Low voltage tungsten halogen lamp with reflector, plug-in base
 HIT-TC-CE GU6.5	Metal halide lamp with tubular bulb and ceramic burner, bayonet base	 HIT E40	Metal halide lamp with tubular bulb and quartz burner, screw base	 QT32 E27	High voltage tungsten halogen lamp with tubular bulb, screw base
 HIT-TC-CE GU8.5	Metal halide lamp with tubular bulb and ceramic burner, plug-in base	 HIT-DE-CE RX7s	Metal halide lamp with tubular bulb and ceramic burner, double-ended	 QT-DE11/12 R7s	High voltage tungsten halogen lamp with tubular bulb, double-ended
 HIT-CE G12	Metal halide lamp with tubular bulb and ceramic burner, plug-in base	 HIT-DE RX7s	Metal halide lamp with tubular bulb and quartz burner, double-ended	 QPAR51 GU10	High voltage tungsten halogen lamp with reflector, bayonet base
 HIT-CE G12	Metal halide lamp with tubular bulb and ceramic burner, plug-in base	 HIT-DE K12s-36 I=187	Metal halide lamp with quartz burner, double-ended	 A E27	High voltage incandescent lamp with ellipsoid bulb, screw base
 HIT-CE G22	Metal halide lamp with tubular bulb and ceramic burner, suitable for hot re-ignition, plug-in base	 HIT-DE K12s-36 I=274	Metal halide lamp with quartz burner, double-ended	 IT E14	High voltage incandescent lamp with tubular bulb, screw base
		 HME E27	Mercury vapour lamp with ellipsoid bulb, screw base		



ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Fluorescent tubes</b>											
T16	13	G5	1150	88	ww	18	FDH-13/30/18-L/P-G5-16/550	-	MASTER TL5 HE Eco 13=14W/830	-	-
T16	13	G5	1150	88	nw	18	FDH-13/40/18-L/P-G5-16/550	-	MASTER TL5 HE Eco 13=14W/840	-	-
T16	14	G5	1200	86	ww	18	FDH-14/30/18-L/P-G5-16/549	HE 14 W/830	MASTER TL5 HE 14W/830	FHE 14W/830	F14W/T5/830/WM
T16	14	G5	1200	86	nw	18	FDH-14/40/18-L/P-G5-16/549	HE 14 W/840	MASTER TL5 HE 14W/840	FHE 14W/840	F14W/T5/840/WM
T16	21	G5	1900	90	ww	18	FDH-21/30/18-L/P-G5-16/849	HE 21 W/830	MASTER TL5 HE 21W/830	FHE 21W/830	F21W/T5/830/WM
T16	21	G5	1900	90	nw	18	FDH-21/40/18-L/P-G5-16/849	HE 21 W/840	MASTER TL5 HE 21W/840	FHE 21W/840	F21W/T5/840/WM
T16	25	G5	2450	98	ww	18	FDH-25/30/18-L/P-G5-16/1150	HE 25 W/830 ES	MASTER TL5 HE Eco 25=28W/830	-	-
T16	25	G5	2450	98	nw	18	FDH-25/40/18-L/P-G5-16/1150	HE 25 W/840 ES	MASTER TL5 HE Eco 25=28W/840	-	-
T16	28	G5	2600	93	ww	18	FDH-28/30/18-L/P-G5-16/1149	HE 28 W/830	MASTER TL5 HE 28W/830	FHE 28W/830	F28W/T5/830/WM
T16	28	G5	2600	93	nw	18	FDH-28/40/18-L/P-G5-16/1149	HE 28 W/840	MASTER TL5 HE 28W/840	FHE 28W/840	F28W/T5/840/WM
T16	32	G5	3100	97	ww	18	FDH-32/30/18-L/P-G5-16/1450	HE 32 W/830 ES	MASTER TL5 HE Eco 32=35W/830	-	-
T16	32	G5	3100	97	nw	18	FDH-32/40/18-L/P-G5-16/1450	HE 32 W/840 ES	MASTER TL5 HE Eco 32=35W/840	-	-
T16	35	G5	3300	94	ww	18	FDH-35/30/18-L/P-G5-16/1449	HE 35 W/830	MASTER TL5 HE 35W/830	FHE 35W/830	F35W/T5/830/WM
T16	35	G5	3300	94	nw	18	FDH-35/40/18-L/P-G5-16/1449	HE 35 W/840	MASTER TL5 HE 35W/840	FHE 35W/840	F35W/T5/840/WM
T16	20	G5	1650	83	ww	18	FDH-20/30/18-L/P-G5-16/550	-	MASTER TL5 HO Eco 20=24W/830	-	-
T16	20	G5	1650	83	nw	18	FDH-20/40/18-L/P-G5-16/550	-	MASTER TL5 HO Eco 20=24W/840	-	-
T16	24	G5	1750	73	ww	18	FDH-24/30/18-L/P-G5-16/549	HO 24 W/830	MASTER TL5 HO 24W/830	FHO 24W/830	F24W/T5/830/WM
T16	24	G5	1750	73	nw	18	FDH-24/40/18-L/P-G5-16/549	HO 24 W/840	MASTER TL5 HO 24W/840	FHO 24W/840	F24W/T5/840/WM
T16	39	G5	3100	79	ww	18	FDH-39/30/18-L/P-G5-16/849	HO 39 W/830	MASTER TL5 HO 39W/830	FHO 39W/830	F39W/T5/830/WM
T16	39	G5	3100	79	nw	18	FDH-39/40/18-L/P-G5-16/849	HO 39 W/840	MASTER TL5 HO 39W/840	FHO 39W/840	F39W/T5/840/WM
T16	50	G5	4400	88	ww	18	FDH-50/30/18-L/P-G5-16/1150	HO 50 W/830 ES	MASTER TL5 HO Eco 50=54W/830	-	-
T16	50	G5	4400	88	nw	18	FDH-50/40/18-L/P-G5-16/1150	HO 50 W/840 ES	MASTER TL5 HO Eco 50=54W/840	-	-
T16	54	G5	4450	82	ww	18	FDH-54/30/18-L/P-G5-16/1149	HO 54 W/830	MASTER TL5 HO 54W/830	FHO 54W/830	F54W/T5/830/WM
T16	54	G5	4450	82	nw	18	FDH-54/40/18-L/P-G5-16/1149	HO 54 W/840	MASTER TL5 HO 54W/840	FHO 54W/840	F54W/T5/840/WM
T16	45	G5	4100	91	ww	18	FDH-45/30/18-L/P-G5-16/1450	HO 45 W/830 ES	MASTER TL5 HO Eco 45=49W/830	-	-
T16	45	G5	4100	91	nw	18	FDH-45/40/18-L/P-G5-16/1450	HO 45 W/840 ES	MASTER TL5 HO Eco 45=49W/840	-	-
T16	49	G5	4300	88	ww	18	FDH-49/30/18-L/P-G5-16/1449	HO 49 W/830	MASTER TL5 HO 49W/830	FHO 49W/830	F49W/T5/830/WM
T16	49	G5	4300	88	nw	18	FDH-49/40/18-L/P-G5-16/1449	HO 49 W/840	MASTER TL5 HO 49W/840	FHO 49W/840	F49W/T5/840/WM
T16	73	G5	6150	84	ww	18	FDH-73/30/18-L/P-G5-16/1450	HO 73 W/830 ES	MASTER TL5 HO Eco 73=80W/830	-	-
T16	73	G5	6150	84	nw	18	FDH-73/40/18-L/P-G5-16/1450	HO 73 W/840 ES	MASTER TL5 HO Eco 73=80W/840	-	-
T16	80	G5	6150	77	ww	18	FDH-80/30/18-L/P-G5-16/1449	HO 80 W/830	MASTER TL5 HO 80W/830	FHO 80W/830	F80W/T5/830/WM
T16	80	G5	6150	77	nw	18	FDH-80/40/18-L/P-G5-16/1449	HO 80 W/840	MASTER TL5 HO 80W/840	FHO 80W/840	F80W/T5/840/WM
T16-I	24	G5	1950	81	ww	18	FDH-24/30/18-L/P-G5-16/550	HO 24 W/830 CONSTANT	-	-	-
T16-I	24	G5	1950	81	nw	18	FDH-24/40/18-L/P-G5-16/550	HO 24 W/840 CONSTANT	-	-	-
T16-I	39	G5	3400	87	ww	18	FDH-39/30/18-L/P-G5-16/850	HO 39 W/830 CONSTANT	-	-	-
T16-I	39	G5	3400	87	nw	18	FDH-39/40/18-L/P-G5-16/850	HO 39 W/840 CONSTANT	-	-	-
T16-I	49	G5	4650	95	ww	18	FDH-49/30/18-L/P-G5-16/1450	HO 49 W/830 CONSTANT	-	-	-
T16-I	49	G5	4650	95	nw	18	FDH-49/40/18-L/P-G5-16/1450	HO 49 W/840 CONSTANT	MASTER TL5 HO TOP 49W/840	-	-
T16-I	54	G5	4850	90	ww	18	FDH-54/30/18-L/P-G5-16/1150	HO 54 W/830 CONSTANT	-	-	-
T16-I	54	G5	4850	90	nw	18	FDH-54/40/18-L/P-G5-16/1150	HO 54 W/840 CONSTANT	MASTER TL5 HO TOP 54W/840	-	-
T16-I	80	G5	6800	85	ww	18	FDH-80/30/18-L/P-G5-16/1450	HO 80 W/830 CONSTANT	-	-	-
T16-I	80	G5	6800	85	nw	18	FDH-80/40/18-L/P-G5-16/1450	HO 80 W/840 CONSTANT	MASTER TL5 HO TOP 80W/840	-	-
T26	18	G13	1350	75	ww	18	FD-18/30/18-E-G13-26/590	L 18 W/830	MASTER TL-D Super 80 18W/830	F18W/830	F18W/T8/830/POLYLUX
T26	18	G13	1350	75	nw	18	FD-18/40/18-E-G13-26/590	L 18 W/840	MASTER TL-D Super 80 18W/840	F18W/840	F18W/T8/840/POLYLUX
T26	36	G13	3350	93	ww	18	FD-36/30/18-E-G13-26/1200	L 36 W/830	MASTER TL-D Super 80 36W/830	F36W/830	F36W/T8/830/POLYLUX
T26	36	G13	3350	93	nw	18	FD-36/40/18-E-G13-26/1200	L 36 W/840	MASTER TL-D Super 80 36W/840	F36W/840	F36W/T8/840/POLYLUX
T26	38	G13	3300	87	ww	18	FD-38/30/18-E-G13-26/1047	L 38 W/830	MASTER TL-D Super 80 38W/830	F38W/830	-
T26	38	G13	3300	87	nw	18	FD-38/40/18-E-G13-26/1047	L 38 W/840	MASTER TL-D Super 80 38W/840	F38W/840	-
T26	58	G13	5200	90	ww	18	FD-58/30/18-E-G13-26/1500	L 58 W/830	MASTER TL-D Super 80 58W/830	F58W/830	F58W/T8/830/POLYLUX
T26	58	G13	5200	90	nw	18	FD-58/40/18-E-G13-26/1500	L 58 W/840	MASTER TL-D Super 80 58W/840	F58W/840	F58W/T8/840/POLYLUX
<b>Compact fluorescent lamps</b>											
TC-S	9	G23	600	67	ww	18	FSD-9/30/18-I-G23	DULUX S 9 W/830	MASTER PL-S 9W/830/2P	Lymx-S 9W 830	F98X/830
TC-S	9	G23	600	67	nw	18	FSD-9/40/18-I-G23	DULUX S 9 W/840	MASTER PL-S 9W/840/2P	Lymx-S 9W 840	F98X/SPX41/840
TC-S	11	G23	900	82	ww	18	FSD-11/30/18-I-G23	DULUX S 11 W/830	MASTER PL-S 11W/830/2P	Lymx-S 11W 830	F118X/830
TC-S	11	G23	900	82	nw	18	FSD-11/40/18-I-G23	DULUX S 11 W/840	MASTER PL-S 11W/840/2P	Lymx-S 11W 840	F118X/840
TC-SEL	9	G27	600	67	ww	18	FSD-9/30/18-E-2G7	DULUX S/E 9 W/830	MASTER PL-S 9W/830/4P	Lymx-SE 9W 830	-
TC-SEL	9	G27	600	67	nw	18	FSD-9/40/18-E-2G7	DULUX S/E 9 W/840	MASTER PL-S 9W/840/4P	Lymx-SE 9W 840	F98X/840/4P
TC-SEL	11	G27	900	82	ww	18	FSD-11/30/18-E-2G7	DULUX S/E 11 W/830	MASTER PL-S 11W/830/4P	Lymx-SE 11W 830	-
TC-SEL	11	G27	900	82	nw	18	FSD-11/40/18-E-2G7	DULUX S/E 11 W/840	MASTER PL-S 11W/840/4P	Lymx-SE 11W 840	F118X/840/4P
TC-D	10	G24d-1	600	60	ww	18	FSQ-10/30/18-I-G24d=1	DULUX D 10 W/830	MASTER PL-C 10W/830/2P	Lymx-D 10W 830	F10DBX/T3/830/2P
TC-D	10	G24d-1	600	60	nw	18	FSQ-10/40/18-I-G24d=1	DULUX D 10 W/840	MASTER PL-C 10W/840/2P	Lymx-D 10W 840	F10DBX/T3/840/2P
TC-D	13	G24d-1	900	69	ww	18	FSQ-13/30/18-I-G24d=1	DULUX D 13 W/830	MASTER PL-C 13W/830/2P	Lymx-D 13W 830	F13DBX/T3/830/2P
TC-D	13	G24d-1	900	69	nw	18	FSQ-13/40/18-I-G24d=1	DULUX D 13 W/840	MASTER PL-C 13W/840/2P	Lymx-D 13W 840	F13DBX/T3/840/2P
TC-D	18	G24d-2	1200	67	ww	18	FSQ-18/30/18-I-G24d=2	DULUX D 18 W/830	MASTER PL-C 18W/830/2P	Lymx-D 18W 830	F18DBXT4/SPX30/830
TC-D	18	G24d-2	1200	67	nw	18	FSQ-18/40/18-I-G24d=2	DULUX D 18 W/840	MASTER PL-C 18W/840/2P	Lymx-D 18W 840	F18DBXT4/SPX41/840
TC-D	26	G24d-3	1800	69	ww	18	FSQ-26/30/18-I-G24d=3	DULUX D 26 W/830	MASTER PL-C 26W/830/2P	Lymx-D 26W 830	F26DBXT4/SPX30/830
TC-D	26	G24d-3	1800	69	nw	18	FSQ-26/40/18-I-G24d=3	DULUX D 26 W/840	MASTER PL-C 26W/840/2P	Lymx-D 26W 840	F26DBXT4/SPX41/840
TC-DEL	10	G24q-1	600	60	ww	18	FSQ-10/30/18-E-G24q=1	DULUX D/E 10 W/830	MASTER PL-C 10W/830/4P	Lymx-DE 10W 830	F10DBX/T3/830/4P
TC-DEL	10	G24q-1	600	60	nw	18	FSQ-10/40/18-E-G24q=1	DULUX D/E 10 W/840	MASTER PL-C 10W/840/4P	Lymx-DE 10W 840	F10DBX/T3/840/4P
TC-DEL	13	G24q-1	900	69	ww	18	FSQ-13/30/18-E-G24q=1	DULUX D/E 13 W/830	MASTER PL-C 13W/830/4P	Lymx-DE 13W 830	F13DBX/T3/830/4P
TC-DEL	13	G24q-1	900	69	nw	18	FSQ-13/40/18-E-G24q=1	DULUX D/E 13 W/840	MASTER PL-C 13W/840/4P	Lymx-DE 13W 840	F13DBX/T3/840/4P
TC-DEL	18	G24q-2	1200	67	ww	18	FSQ-18/30/18-E-G24q=2	DULUX D/E 18 W/830	MASTER PL-C 18W/830/4P	Lymx-DE 18W 830	F18DBX/SPX30/830/4P
TC-DEL	18	G24q-2	1200	67	nw	18	FSQ-18/40/18-E-G24q=2	DULUX D/E 18 W/840	MASTER PL-C 18W/840/4P	Lymx-DE 18W 840	F18DBX/SPX41/840/4P
TC-DEL	26	G24q-3	1800	69	ww	18	FSQ-26/30/18-E-G24q=3	DULUX D/E 26 W/830	MASTER PL-C 26W/830/4P	Lymx-DE 26W 830	F26DBX/SPX30/830/4P
TC-DEL	26	G24q-3	1800	69	nw	18	FSQ-26/40/18-E-G24q=3	DULUX D/E 26 W/840	MASTER PL-C 26W/840/4P	Lymx-DE 26W 840	F26DBX/SPX41/840/4P
TC-T	26	GX24d-3	1800	69	ww	18	FSM-26/30/18-I-GX24d=3	DULUX T 26 W/830 PLUS	MASTER PL-T 26W/830/2P	Lymx-T 26W 830	F26T8X/SPX30/830/A/2P
TC-T	26	GX24d-3	1800	69	nw	18	FSM-26/40/18-I-GX24d=3	DULUX T 26 W/840 PLUS	MASTER PL-T 26W/840/2P	Lymx-T 26W 840	F26T8X/SPX41/840/A/2P
TC-TEL	13	GX24q-1	900	69	ww	18	FSMH-13/30/18-CX24q=1	DULUX T/E 13 W/830 PLUS	MASTER PL-T 13W/830/4P	-	-
TC-TEL	13	GX24q-2	900	69	nw	18	FSMH-13/40/18-CX24q=1	DULUX T/E 13 W/840 PLUS	MASTER PL-T 13W/840/4P	-	-
TC-TEL	14	GR14q-1	1050	75	ww	18	FSM6H-14/30/18-L/P-GR14q=1	DULUX T/E 14 W/830 HE	MASTER PL-R Eco 14W/830/4P	-	-
TC-TEL	14	GR14q-1	1050	75	nw	18	FSM6H-14/40/18-L/P-GR14q=1	DULUX T/E 14 W/840 HE	MASTER PL-R Eco 14W/840/4P	-	-

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ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Compact fluorescent lamps (cont.)</b>											
TC-TEL	17	GR14q-1	1250	74	ww	1B	FSM6H-17/30/1B-L/P-GR14q-1	DULUX T/E 17 W/830 HE	MASTER PL-R Eco 17W/830/4P	-	-
TC-TEL	17	GR14q-1	1250	74	nw	1B	FSM6H-17/40/1B-L/P-GR14q-1	DULUX T/E 17 W/840 HE	MASTER PL-R Eco 17W/840/4P	-	-
TC-TEL	18	GX24q-2	1200	67	ww	1B	FSMH-18/30/1B-GX24q-2	DULUX T/E 18 W/830 PLUS	MASTER PL-T 18W/830/4P	Lynx-TE FSD 18W 830	-
TC-TEL	18	GX24q-2	1200	67	nw	1B	FSMH-18/40/1B-GX24q-2	DULUX T/E 18 W/840 PLUS	MASTER PL-T 18W/840/4P	Lynx-TE FSD 18W 840	-
TC-TEL	26	GX24q-3	1800	69	ww	1B	FSMH-26/30/1B-GX24q-3	DULUX T/E 26 W/830 PLUS	MASTER PL-T 26W/830/4P	Lynx-TE FSD 26W 830	-
TC-TEL	26	GX24q-3	1800	69	nw	1B	FSMH-26/40/1B-GX24q-3	DULUX T/E 26 W/840 PLUS	MASTER PL-T 26W/840/4P	Lynx-TE FSD 26W 840	-
TC-TEL	32	GX24q-3	2400	75	ww	1B	FSMH-32/30/1B-GX24q-3	DULUX T/E 32 W/830 PLUS	MASTER PL-T 32W/830/4P	Lynx-TE FSD 32W 830	-
TC-TEL	32	GX24q-3	2400	75	nw	1B	FSMH-32/40/1B-GX24q-3	DULUX T/E 32 W/840 PLUS	MASTER PL-T 32W/840/4P	Lynx-TE FSD 32W 840	-
TC-TEL	42	GX24q-4	3200	76	ww	1B	FSMH-42/30/1B-GX24q-4	DULUX T/E 42 W/830 PLUS	MASTER PL-T 42W/830/4P	Lynx-TE FSD 42W 830	-
TC-TEL	42	GX24q-4	3200	76	nw	1B	FSMH-42/40/1B-GX24q-4	DULUX T/E 42 W/840 PLUS	MASTER PL-T 42W/840/4P	Lynx-TE FSD 42W 840	-
TC-TEL	57	GX24q-5	4300	75	ww	1B	FSMH-57/30/1B-E-GX24q-5	-	MASTER PL-T 57W/830/4P	-	F57QBX/830/A/AP/LL
TC-TEL	57	GX24q-5	4300	75	nw	1B	FSMH-57/30/1B-E-GX24q-5	-	MASTER PL-T 57W/840/4P	-	F57QBX/840/A/AP/LL
TC-TELU	13	GX24q-1	900	69	ww	1B	FSM-13/30/1B-E-GX24q-1	-	-	-	F13TBX/SPX30/830/A/AP
TC-TELU	13	GX24q-2	900	69	nw	1B	FSM-13/40/1B-E-GX24q-1	-	-	-	F13TBX/SPX41/840/A/AP
TC-TELU	18	GX24q-2	1200	67	ww	1B	FSM-18/30/1B-E-GX24q-2	-	MASTER PL-T TOP 18W/830/4P	Lynx-TE Amalgam 18W 830	F18TBX/SPX30/830/A/AP
TC-TELU	18	GX24q-2	1200	67	nw	1B	FSM-18/40/1B-E-GX24q-2	-	MASTER PL-T TOP 18W/840/4P	Lynx-TE Amalgam 18W 840	F18TBX/SPX41/840/A/AP
TC-TELU	26	GX24q-3	1800	69	ww	1B	FSM-26/30/1B-E-GX24q-3	DULUX T/E 26 W/830 CONSTANT	MASTER PL-T TOP 26W/830/4P	Lynx-TE Amalgam 26W 830	F26TBX/SPX30/830/A/AP
TC-TELU	26	GX24q-3	1800	69	nw	1B	FSM-26/40/1B-E-GX24q-3	DULUX T/E 26 W/840 CONSTANT	MASTER PL-T TOP 26W/840/4P	Lynx-TE Amalgam 26W 840	F26TBX/SPX41/840/A/AP
TC-TELU	32	GX24q-3	2400	75	ww	1B	FSM-32/30/1B-E-GX24q-3	DULUX T/E 32 W/830 CONSTANT	MASTER PL-T TOP 32W/830/4P	Lynx-TE Amalgam 32W 830	F32TBX/SPX30/830/AP4P
TC-TELU	32	GX24q-3	2400	75	nw	1B	FSM-32/40/1B-E-GX24q-3	DULUX T/E 32 W/840 CONSTANT	MASTER PL-T TOP 32W/840/4P	Lynx-TE Amalgam 32W 840	F32TBX/SPX41/840/A/AP
TC-TELU	42	GX24q-4	3270	78	ww	1B	FSM-42/30/1B-E-GX24q-4	DULUX T/E 42 W/830 CONSTANT	MASTER PL-T TOP 42W/830/4P	Lynx-TE Amalgam 42W 830	F42TBX/830/A/AP
TC-TELU	42	GX24q-4	3270	78	nw	1B	FSM-42/40/1B-E-GX24q-4	DULUX T/E 42 W/840 CONSTANT	MASTER PL-T TOP 42W/840/4P	Lynx-TE Amalgam 42W 840	F42TBX/841/A/AP
TC-TELU	57	GX24q-5	4300	75	ww	1B	FSMH-57/30/1B-GX24q-5	-	MASTER PL-T TOP 57W/830/4P	-	-
TC-TELU	57	GX24q-5	4300	75	nw	1B	FSMH-57/40/1B-GX24q-5	-	MASTER PL-T TOP 57W/840/4P	-	-
TC-TELU	60	2G8-1	4000	67	ww	1B	FSM6H-60/30/1B-L/P-2G8-1	-	MASTER PL-H 60W/830/4P	-	-
TC-TELU	60	2G8-1	4000	67	nw	1B	FSM6H-60/40/1B-L/P-2G8-1	-	MASTER PL-H 60W/840/4P	-	-
TC-TELU	85	2G8-1	6000	71	ww	1B	FSM6H-85/30/1B-L/P-2G8-1	-	MASTER PL-H 85W/830/4P	-	-
TC-TELU	85	2G8-1	6000	71	nw	1B	FSM6H-85/40/1B-L/P-2G8-1	-	MASTER PL-H 85W/840/4P	-	-
TC-TELU	120	2G8-1	9000	75	ww	1B	FSM-8H-120/30/1B-L/P-2G8-1	-	MASTER PL-H 120W/830/4P	-	-
TC-TELU	120	2G8-1	9000	75	nw	1B	FSM-8H-120/40/1B-L/P-2G8-1	DULUX 120 W/840 HO CONSTANT	MASTER PL-H 120W/840/4P	-	-
TC-LEL	18	2G11	1200	67	ww	1B	FSD-18/30/1B-E-2G11	DULUX L 18 W/830	MASTER PL-L 18W/830/4P	Lynx-L 18W 830	F18BX/830
TC-LEL	18	2G11	1200	67	nw	1B	FSD-18/40/1B-E-2G11	DULUX L 18 W/840	MASTER PL-L 18W/840/4P	Lynx-L 18W 840	F18BX/840
TC-LEL	24	2G11	1800	75	ww	1B	FSD-24/30/1B-E-2G11	DULUX L 24 W/830	MASTER PL-L 24W/830/4P	Lynx-L 24W 830	F24BX/830
TC-LEL	24	2G11	1800	75	nw	1B	FSD-24/40/1B-E-2G11	DULUX L 24 W/840	MASTER PL-L 24W/840/4P	Lynx-L 24W 840	F24BX/840
TC-LEL	36	2G11	2900	81	ww	1B	FSD-36/30/1B-E-2G11	DULUX L 36 W/830	MASTER PL-L 36W/830/4P	Lynx-L 36W 830	F36BX/830
TC-LEL	36	2G11	2900	81	nw	1B	FSD-36/40/1B-E-2G11	DULUX L 36 W/840	MASTER PL-L 36W/840/4P	Lynx-L 36W 840	F36BX/840
TC-LEL	40	2G11	3500	88	ww	1B	FSDH-40/30/1B-2G11	DULUX L 40 W/830	MASTER PL-L 40W/830/4P	Lynx-LE 40W 830	F40BX/830
TC-LEL	40	2G11	3500	88	nw	1B	FSDH-40/40/1B-2G11	DULUX L 40 W/840	MASTER PL-L 40W/840/4P	Lynx-LE 40W 840	F40BX/840
TC-LEL	55	2G11	4800	87	ww	1B	FSDH-55/30/1B-2G11	DULUX L 55 W/830	MASTER PL-L 55W/830/4P	Lynx-LE 55W 830	F55BX/830
TC-LEL	55	2G11	4800	87	nw	1B	FSDH-55/40/1B-2G11	DULUX L 55 W/840	MASTER PL-L 55W/840/4P	Lynx-LE 55W 840	F55BX/840
TC-LEL	80	2G11	6500	81	ww	1B	FSDH-80/30/1B-2G11	DULUX L 80 W/830	MASTER PL-L 80W/830/4P	-	F80BX/830
TC-LEL	80	2G11	6500	81	nw	1B	FSDH-80/40/1B-2G11	DULUX L 80 W/840	MASTER PL-L 80W/840/4P	-	F80BX/840
TC-LELU	40	2G11	3500	88	nw	1B	FSDH-40/40/1B-2G11	DULUX L 40 W/840 CONSTANT	-	-	-
TC-LELU	55	2G11	4800	87	nw	1B	FSDH-55/40/1B-2G11	DULUX L 55 W/840 CONSTANT	-	-	-
TC-LELU	80	2G11	6500	81	nw	1B	FSDH-80/40/1B-2G11	DULUX L 80 W/840 CONSTANT	-	-	-
TCR-TSE flat	6	GX53	235	39	ww	1B	-	-	-	Micro-Lynx Luna 6W CX53 830 White	-
TCR-TSE flat	6	GX53	235	39	nw	1B	-	-	-	Micro-Lynx Luna 6W CX53 840 White	-
<b>Circular fluorescent lamps</b>											
T16-R	22	2GX13	1800	82	ww	1B	FC-22/30/1B-E-2GX13-16	FC 22 W/830	-	-	FC22W/T5/830
T16-R	22	2GX13	1800	82	nw	1B	FC-22/40/1B-E-2GX13-16	FC 22 W/840	-	-	FC22W/T5/840
T16-R	40	2GX13	3200	80	ww	1B	FC-40/30/1B-E-2GX13-16	FC 40 W/830	-	-	FC40W/T5/830
T16-R	40	2GX13	3200	80	nw	1B	FC-40/40/1B-E-2GX13-16	FC 40 W/840	-	-	FC40W/T5/840
T16-R	55	2GX13	4200	76	ww	1B	FC-55/30/1B-E-2GX13-16	FC 55 W/830	-	-	FC55W/T5/830
T16-R	55	2GX13	4200	76	nw	1B	FC-55/40/1B-E-2GX13-16	FC 55 W/840	-	-	FC55W/T5/840
T16-RI	22	2GX13	1800	82	ww	1B	FSCH-22/30/1B-L/P-2GX13-16	-	MASTER TL5 Circular 22W/830	-	-
T16-RI	22	2GX13	1800	82	nw	1B	FSCH-22/40/1B-L/P-2GX13-16	-	MASTER TL5 Circular 22W/840	-	-
T16-RI	40	2GX13	3300	83	ww	1B	FSCH-40/30/1B-L/P-2GX13-16	-	MASTER TL5 Circular 40W/830	-	-
T16-RI	40	2GX13	3300	83	nw	1B	FSCH-40/40/1B-L/P-2GX13-16	-	MASTER TL5 Circular 40W/840	-	-
T16-RI	55	2GX13	4200	76	ww	1B	FSCH-55/30/1B-L/P-2GX13-16	-	MASTER TL5 Circular 55W/830	-	-
T16-RI	55	2GX13	4200	76	nw	1B	FSCH-55/40/1B-L/P-2GX13-16	-	MASTER TL5 Circular 55W/840	-	-
<b>Fluorescent lamps, loop-shaped</b>											
TC-DD	16	GR8	1050	66	ww	1B	FSS-16/27/1B-I-GR8	CFL SQUARE 16 W/827 2-Pin	PL-Q 16W/827/2P	Lynx-Q 16W 827	F162D/827
TC-DD	16	GR8	1050	66	ww	1B	FSS-16/30/1B-I-GR8	-	PL-Q 16W/830/2P	-	-
TC-DD	16	GR8	1050	66	nw	1B	FSS-16/35/1B-I-GR8	CFL SQUARE 16 W/835 2-Pin	-	Lynx-Q 16W 835	F162D/835
TC-DD	16	GR8	1050	66	nw	1B	FSS-16/40/1B-I-GR8	-	-	Lynx-Q 16W 840	-
TC-DD	16	GR8	1050	66	tw	1B	FSS-16/60/1B-I-GR8	-	-	-	F162D/860
<b>Metal halide lamps with elliptical bulb and quartz burner</b>											
HIE m	70	E27	4700	67	ww	1B	MES/UB-70/30/1B-H-E27-55/144	HQI-E 70/WDL coated	-	HSI-MP 70W CO 3K E27	-
HIE m	70	E27	5100	73	nw	1B	MES/UB-70/38/1B-H-E27-55/144	HQI-E 70/NDL coated	-	HSI-MP 70W CO 4K E27	-
HIE m	100	E27	7900	79	ww	1B	MES/UB-100/29/1B-H-E27-55/144	HQI-E 100/WDL coated	-	HSI-MP 100W CO 3K E27	-
HIE m	100	E27	7700	77	nw	1B	MES/UB-100/38/1B-H-E27-55/144	HQI-E 100/NDL coated	-	HSI-MP 100W CO 4K E27	-
HIE m	150	E27	11600	77	ww	1B	MES/UB-150/29/1B-H-E27-55/144	HQI-E 150/WDL coated	-	HSI-MP 150W CO 3K E27	-
HIE m	150	E27	11500	77	nw	1B	MES/UB-150/38/1B-H-E27-55/144	HQI-E 150/NDL coated	-	HSI-MP 150W CO 4K E27	-
HIE/S m	250	E40	18000	72	nw	2A	ME-250/45/2A-H-E40-V	-	MASTER HPI Plus 250W/745 BU E40	Britelux HSI-SX 250W/CO	ARC250/D/H/740/E40
HIE/S m	250	E40	17000	68	tw	1A	MES/UB-250/52/1A-H-E40-90/226	HQI-E/P 250/D coated	-	-	-

ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Metal halide lamps with elliptical bulb and quartz burner (cont.)</b>											
HIE/S m	250	E40	19000	76	tw	1A	ME/UB-250/52/1A-H-E40-90/226	HQI-E 250/D PRO	–	–	–
HIE/S m	250	E40	17000	68	tw	1A	ME/UB-250/60/1A-H-E40-90/226	–	–	–	ARC250/D/H/960/E40
HIE/S m	250	E40	18000	72	tw	2A	ME-250/67/2A-H-E40-90/225/V	–	MASTER HPI Plus 250W/767 BU E40	–	–
HIE/S m	400	E40	40000	100	nw	2B	ME/UB-400/46/2B-H-E40-120/285/H45	HQI-E 400/N	–	Britelux HSI-SX 400W/CO/P	–
HIE/S m	400	E40	32500	81	nw	2A	ME-400/45/2A-H-E40-/V	–	MASTER HPI Plus 400W/745 BU E40	–	–
HIE/S m	400	E40	31000	78	tw	1A	MES/UB-400/45/1A-H-E40-120/290	HQI-E/P 400/D coated	–	–	–
HIE/S m	400	E40	34000	85	tw	1A	ME/UB-400/52/1A-H-E40-120/290	HQI-E 400/D PRO	–	–	–
HIE/S m	400	E40	32500	81	tw	2A	ME-400/67/2A-H-E40-90/225/V	–	MASTER HPI Plus 400W/767 BU E40	–	–
HIE m	1000	E40	100000	100	nw	2B	ME-1000/37/2B-H-E40-165/380/H45	HQI-E 1000/N	–	–	–
<b>Metal halide lamps with elliptical bulb and ceramic burner</b>											
HIE-CE/S-od m	50	E27	4000	80	nw	1B	ME-50/28/1B-H-E27	–	MASTER CityWhite CDO-ET 50W/828 E27	–	–
HIE-CE/S-od m	70	E27	5600	80	ww	1B	ME-70/28/1B-H-E27	–	MASTER CityWhite CDO-ET 70W/828 E27	–	–
HIE-CE/S-od m	70	E27	5300	76	ww	1B	ME-70/30/1B-H-E27	–	–	–	CMH70/E/UVCL/830/E27/D
HIE-CE/S-od m	70	E27	5600	80	ww	1A	ME-70/40/1A-H-E27	–	–	–	CMH70/UVCL/O/U/940/E27/D
HIE-CE/S-od m	100	E27	8500	85	ww	1B	ME-100/30/1B-H-E27	–	–	–	CMH100/E/UVCL/830/E27/D
HIE-CE/S-od m	100	E40	8300	83	ww	1B	ME-100/28/1B-H-E40	–	MASTER CityWhite CDO-ET 100W/828 E40	–	–
HIE-CE/S-od m	150	E27	12300	82	nw	1A	ME-150/40/1A-H-E27	–	–	–	CMH150/UVCL/O/U/940/E27/D
HIE-CE/S-od m	150	E40	12500	83	ww	1B	ME-150/28/1B-H-E40	–	MASTER CityWhite CDO-ET 150W/828 E40	–	–
HIE-CE/S m	250	E40	24500	98	ww	1B	ME/UB-250/30/1B-H-E40-90/226	HCI-E 250/830 WDL PB	–	–	CMH250/E/UVCL/830/E40/D
HIE-CE/S m	250	E40	22500	90	nw	1A	ME/UB-250/42/1A-H-E40-90/226	HCI-E 250/942 NDL PB	–	–	–
<b>Metal halide lamps with elliptical bulb and ceramic burner, burst-proof</b>											
HIE-CE-P m	35	E27	3300	94	ww	1B	MES/UB-35/30/1B-H-E27-54/138	HCI-E/P 35/830 WDL PB coated	–	–	–
HIE-CE-P m	35	E27	3100	89	nw	1A	MES/UB-35/42/1A-H-E27-54/138	HCI-E/P 35/942 NDL PB coated	–	–	–
HIE-CE-P m	50	E27	4000	80	ww	1B	MES/UB-50/30/1B-H-E27-54/138	HCI-E/P 50/830 WDL PB coated	–	–	–
HIE-CE-P m	70	E27	6700	96	ww	1B	MES/UB-70/30/1B-H-E27-54/138	HCI-E/P 70/830 WDL PB coated	–	–	–
HIE-CE-P m	70	E27	6300	90	nw	1A	MES/UB-70/42/1A-H-E27-54/138	HCI-E/P 70/942 NDL PB coated	–	–	–
HIE-CE-P m	100	E27	8500	85	ww	1B	MES/UB-100/30/1B-H-E27-54/138	HCI-E/P 100/830 WDL PB coated	–	–	–
HIE-CE-P m	100	E27	8300	83	nw	1A	MES/UB-100/42/1A-H-E27-54/138	HCI-E/P 100/942 NDL PB coated	–	–	–
HIE-CE-P m	150	E27	13700	91	ww	1B	MES/UB-150/30/1B-H-E27-54/138	HCI-E/P 150/830 WDL PB coated	–	–	–
HIE-CE-P m	150	E27	13700	91	nw	1A	MES/UB-150/42/1A-H-E27-54/138	HCI-E/P 150/942 NDL PB coated	–	–	–
<b>Metal halide lamps with tubular bulb and ceramic burner</b>											
HIT-TC-CE	20	PGJ5	1650	83	ww	1B	MC-20/30/1B-H-PGJ5	–	MASTERCLOUR CDM-Tm Mini 20W/830 PGJ5	–	–
HIT-TC-CE	35	PGJ5	3000	86	ww	1A	MC-35/30/1A-H-PGJ5	–	MASTERCLOUR CDM-Tm Mini 35W/930 PGJ5	–	–
HIT-TC-CE	20	GU6.5	1700	85	ww	1B	MT/UB-20/30/1B-H/E-GU6.5-13/57	HCI-TF 20/830 WDL PB	MASTERCLOUR CDM-Tm Mini 20W/830 GU6.5	CMI-Tmini 20W/WDL UVS	CMH20/TC/UVCL/830/GU6.5
HIT-TC-CE	35	GU6.5	3400	97	ww	1A	MT/UB-35/30/1A-H/E-GU6.5-13/57	HCI-TF 35/930 WDL PB	MASTERCLOUR CDM-Tm Mini Elite 35W/930 GU6.5	–	CMH35/TC/UVCL/830/GU6.5 Ultra
HIT-TC-CE	35	GU6.5	3400	97	nw	1A	MT/UB-35/42/1A-H/E-GU6.5-13/57	–	–	–	CMH35/TC/UVCL/942/GU6.5
HIT-TC-CE	20	G8.5	1700	85	ww	1B	MT/UB-20/30/1B-H/E-G8.5-15/81	HCI-TC 20/830 WDL PB	MASTERCLOUR CDM-TC 20W/830 G8.5	–	CMH20/TC/UVCL/830/G8.5 PLUS
HIT-TC-CE	35	G8.5	3400	97	ww	1B	MT/UB-35/30/1B-H-E-G8.5-15/81	HCI-TC 35/830 WDL PB	MASTERCLOUR CDM-TC 35W/830 G8.5	CMI-TC 35W/WDL UVS	CMH35/TC/UVCL/830/G8.5 PLUS
HIT-TC-CE	35	G8.5	2800	80	ww	1A	MT/UB-35/30/1A-H-G8.5-15/81	HCI-TC 35/930 WDL PB Shoplight	MASTERCLOUR CDM-TC Elite 35W/930 G8.5	–	CMH35/TC/UVCL/930/G8.5 Ultra
HIT-TC-CE	35	G8.5	3900	111	ww	1A	MT/UB-35/30/1A-H-G8.5-15/81	–	MASTERCLOUR CDM-TC Elite Light Boost 35W/930 G8.5	–	–
HIT-TC-CE	35	G8.5	3200	91	nw	1A	MT/UB-35/42/1A-H-G8.5-15/81	HCI-TC 35/942 NDL PB	MASTERCLOUR CDM-TC 35W/942 G8.5	–	CMH35/TC/UVCL/942/G8.5
HIT-TC-CE	50	G8.5	5400	108	ww	1A	MT/UB-50/30/1A-H-G8.5-15/81	–	MASTERCLOUR CDM-TC Elite 50W/930 G8.5	–	–
HIT-TC-CE	70	G8.5	6900	99	ww	1B	MT/UB-70/30/1B-H-G8.5-15/81	HCI-TC 70/830 WDL PB	MASTERCLOUR CDM-TC 70W/830 G8.5	CMI-TC 70W/WDL UVS	CMH70/TC/UVCL/830/G8.5 PLUS
HIT-TC-CE	70	G8.5	6300	90	ww	1A	MT/UB-70/30/1A-H-G8.5-15/81	HCI-TC 70/930 WDL PB Shoplight	MASTERCLOUR CDM-TC Elite 70W/930 G8.5	–	CMH70/TC/UVCL/930/G8.5 ULTRA
HIT-TC-CE	70	G8.5	7800	111	ww	1A	MT/UB-35/30/1A-H-G8.5-15/81	–	MASTERCLOUR CDM-TC Elite Light Boost 70W/930 G8.5	–	–
HIT-TC-CE	70	G8.5	5900	84	nw	1A	MT/UB-70/42/1A-H-G8.5-15/81	HCI-TC 70/942 NDL PB	MASTERCLOUR CDM-TC 70W/942 G8.5	–	CMH70/TC/UVCL/942/G8.5
HIT-CE c	20	G12	1800	90	ww	1B	MT-20/30/1B-H-G12	–	MASTERCLOUR CDM-T 20W/830 G12	–	CMH20/T/UVCL/830/G12 PLUS
HIT-CE c	35	G12	3600	103	ww	1B	MT/UB-35/30/1B-H-G12-19/100	HCI-T 35/830 WDL PB	MASTERCLOUR CDM-T 35W/830 G12	CMI-T 35W/WDL UVS	CMH35/T/UVCL/830/G12 PLUS
HIT-CE c	35	G12	2800	80	ww	1A	MT/UB-35/30/1A-H-G12-19/100	HCI-T 35/930 WDL PB Shoplight	MASTERCLOUR CDM-T Elite 35W/930 G12	–	CMH35/T/UVCL/930/G12 Ultra
HIT-CE c	35	G12	3900	111	ww	1A	MT/UB-35/30/1A-H-G12-19/100	–	MASTERCLOUR CDM-T Elite Light Boost 35W/930 G12	–	–
HIT-CE c	35	G12	3500	100	nw	1A	MT/UB-35/42/1A-H-G12-19/100	HCI-T 35/942 NDL PB	MASTERCLOUR CDM-T 35W/942 G12	–	CMH35/T/UVCL/942/G12
HIT-CE c	50	G12	5400	108	ww	1A	MT/UB-50/30/1A-H-G12-19/100	–	MASTERCLOUR CDM-T Elite 50W/930 G12	–	–
HIT-CE c	70	G12	7300	104	ww	1B	MT/UB-70/30/1B-H-G12-19/100	HCI-T 70/830 WDL PB	MASTERCLOUR CDM-T 70W/830 G12	CMI-T 70W/WDL UVS	CMH70/T/UVCL/830/G12
HIT-CE c	70	G12	6300	90	ww	1A	MT/UB-70/30/1A-H-G12-19/100	HCI-T 70/930 WDL PB Shoplight	MASTERCLOUR CDM-T Elite 70W/930 G12	–	CMH70/T/UVCL/930/G12 ULTRA
HIT-CE c	70	G12	7800	111	ww	1A	MT/UB-35/30/1A-H-G8.5-15/81	–	MASTERCLOUR CDM-T Elite Light Boost 70W/930 G12	–	–
HIT-CE c	70	G12	6800	97	nw	1A	MT/UB-70/42/1A-H-G12-19/100	HCI-T 70/942 NDL PB	MASTERCLOUR CDM-T 70W/942 G12	CMI-T 70W/WDL UVS	CMH70/T/UVCL/942/G12
HIT-CE c	100	G12	9500	95	ww	1B	MT/UB-100/30/1B-H-G12-19/100	HCI-T 100/830 WDL PB	–	–	–
HIT-CE c	100	G12	11000	110	ww	1A	MT/UB-100/30/1A-H-G12-19/100	–	MASTERCLOUR CDM-T Elite 100W/930 G12	–	–
HIT-CE c	100	G12	9300	93	nw	1A	MT/UB-100/42/1A-H-G12-19/100	HCI-T 100/942 NDL PB	–	–	–
HIT-CE c	150	G12	15000	100	ww	1B	MT/UB-150/30/1B-H-G12-25/105	HCI-T 150/830 WDL PB	MASTERCLOUR CDM-T 150W/830 G12	CMI-T 150W/WDL UVS	CMH150/T/UVCL/830/G12
HIT-CE c	150	G12	15000	100	ww	1A	MT-150/30/1A-H-G12	–	MASTERCLOUR CDM-T Elite 150W/930 G12	–	–
HIT-CE c	150	G12	14500	97	nw	1A	MT/UB-150/42/1A-H-G12-25/105	HCI-T 150/942 NDL PB	MASTERCLOUR CDM-T 150W/942 G12	CMI-T 150W/WDL UVS	CMH150/T/UVCL/942/G12
HIT-CE-od c	45	PGZ12	4300	96	ww	2B	MT-45/28/2B-H-PGZ12	–	MASTER CosmoWhite CPO-TW 45W/628 PGZ12	CMO-TW 45W	–
HIT-CE-od c	60	PGZ12	6800	113	ww	2A	MT-60/28/2A-H-PGZ12	–	MASTER CosmoWhite CPO-TW 60W/728 PGZ12	CMO-TW 60W	–
HIT-CE-od c	90	PGZ12	10450	116	ww	2A	MT-90/28/2A-H-PGZ12	–	MASTER CosmoWhite CPO-TW 90W/728 PGZ12	CMO-TW 90W	–
HIT-CE-od c	140	PGZ12	16500	118	ww	2A	MT-140/28/2A-H-PGZ12	–	MASTER CosmoWhite CPO-TW 140W/728 PGZ12	CMO-TW 140W	–
HIT-CE/S c	250	G22	26000	104	ww	1A	MT/UB-250/30/1A-H-G22-28/175	HCI-TM 250/930 WDL MD PB	–	–	–
HIT-CE/S c	250	G22	26000	104	ww	1A	MT/UB-250/30/1A-H-GY22-28/175	HCI-TM 250/930 WDL HR PB	–	–	–
HIT-CE/S c	250	G22	25000	100	nw	1A	MT/UB-250/42/1A-H-G22-28/175	HCI-TM 250/942 NDL MD PB	–	–	–
HIT-CE/S c	250	G22	25000	100	nw	1A	MT/UB-250/42/1A-H-GY22-28/175	HCI-TM 250/942 NDL HR PB	–	–	–
HIT-CE/S c	400	G22	41000	103	ww	1A	MT/UB-400/30/1A-H-G22-34/175	HCI-TM 400/930 WDL PB	–	–	–
HIT-CE/S c	400	G22	41000	103	ww	1A	MT/UB-400/30/1A-H-GY22-34/175	HCI-TM 400/930 WDL HR PB	–	–	–
HIT-CE/S c	400	G22	40000	100	nw	1A	MT/UB-400/42/1A-H-G22-34/175	HCI-TM 400/942 NDL PB	–	–	–
HIT-CE/S c	400	G22	40000	100	nw	1A	MT/UB-400/42/1A-H-GY22-34/175	HCI-TM 400/942 NDL HR PB	–	–	–
HIT-CE/S-od c	50	E27	4150	83	ww	1B	MT-50/28/1B-H-E27	–	MASTER CityWhite CDO-TT 50W/828 E27	–	–
HIT-CE/S-od c	50	E27	5000	100	ww	2A	MT-50/30/2A-H-E27	–	–	–	CMH50/TT/UVCL/730/E27 STREETWISE

ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Metal halide lamps with tubular bulb and ceramic burner (cont.)</b>											
HIT-CE/S-od c	70	E27	6300	90	ww	1B	MT-70/28/1B-H-E27	-	MASTER CityWhite CDO-TT 70W/828 E27	-	-
HIT-CE/S-od c	70	E27	7640	109	ww	1B	MT-70/30/2A-H-E27	-	-	-	CMH70/TT/UVC/730/E27 STREETWISE
HIT-CE/S-od c	70	E27	7000	100	ww	1B	MT/UB-70/30/1B-H-E27-30/150	HCI-TT 70/830 WDL PB	-	-	CMH70/TT/UVC/830/E27
HIT-CE/S-od c	70	E27	6400	91	nw	1A	MT-70/42/1A-H-E27	-	MASTERColour CDM-TT 70W/942 E27	-	-
HIT-CE/S-od c	100	E40	8800	88	ww	1B	MT-100/20/1B-H-E40	-	MASTER CityWhite CDO-TT 100W/828 E40	-	-
HIT-CE/S-od c	100	E40	10900	109	ww	1B	MT-100/30/2A-H-E40	-	-	-	CMH100/TT/UVC/730/E40 STREETWISE
HIT-CE/S-od c	100	E40	10000	100	ww	1B	MT/UB-100/30/1B-H-E40-46/204	HCI-TT 100/830 WDL PB	-	-	CMH100/TT/UVC/830/E40
HIT-CE/S-od c	150	E40	13500	90	ww	1B	MT-150/28/1B-H-E40	-	MASTER CityWhite CDO-TT 150W/828 E40	-	-
HIT-CE/S-od c	150	E40	16300	109	ww	1B	MT-150/30/2A-H-E40	-	-	-	CMH150/TT/UVC/730/E40 STREETWISE
HIT-CE/S-od c	150	E40	14500	97	ww	1B	MT/UB-150/30/1B-H-E40-46/204	HCI-TT 150/830 WDL PB	-	-	CMH150/TT/UVC/830/E40
HIT-CE/S-od c	150	E40	12000	80	nw	1A	MT-150/42/1A-H-E40	-	MASTERColour CDM-TT 150W/942 E40	-	CMH150/UVC/T/U/842/E40
HIT-CE/S-od c	250	E40	22500	90	ww	1B	MT-250/28/1B-H-E40	-	MASTER City White CDO-TT 250W/828	-	-
HIT-CE/S c	250	E40	26000	104	ww	1B	MT/UB-250/30/1B-H-E40-46/226	HCI-T 250/830 WDL PB	-	-	CMH250/TT/UVC/U/830/E40
HIT-CE/S c	250	E40	25000	100	nw	1A	MT/UB-250/42/1A-H-E40-46/226	HCI-T 250/942 NDL PB	-	-	-
HIT-CE/S c	400	E40	42000	105	ww	1B	MT/UB-400/30/1B-H-E40	-	-	-	CMH400/TT/UVC/VBU/830/E40
HIT-DE-CE	35	RX7s	3400	97	ww	1B	MD/UB-35/30/1B-H-RX7s-21/114,2/P45	-	-	-	CMH35/TD/UVC/830/RX7s
HIT-DE-CE	70	RX7s	6800	97	ww	1B	MD/UB-70/30/1B-H-RX7s-21/114,2/P45	HCI-TS 70/830 WDL PB	MASTERColour CDM-TD 70W/830 RX7s	CMI-TD 70W/WDL UVS	CMH70/TD/UVC/830/RX7s
HIT-DE-CE	70	RX7s	6700	96	nw	1A	MD/UB-70/42/1A-H-RX7s-21/114,2/P45	HCI-TS 70/942 NDL PB	MASTERColour CDM-TD 70W/942 RX7s	CMI-TD 70W/NDL UVS	CMH70/TD/UVC/942/RX7s
HIT-DE-CE	150	RX7s-24	14800	99	ww	1B	MD/UB-150/30/1B-H-RX7s-24/132/P45	HCI-TS 150/830 WDL PB	MASTERColour CDM-TD 150W/830 RX7s	CMI-TD 150W/WDL UVS	CMH150/TD/UVC/830/RX7s-24
HIT-DE-CE	150	RX7s-24	14200	95	nw	1A	MD/UB-150/42/1A-H-RX7s-24/132/P45	HCI-TS 150/942 NDL PB	MASTERColour CDM-TD 150W/942 RX7s	CMI-TD 150W/NDL UVS	CMH150/TD/UVC/942/RX7s-24
HIT-DE-CE	250	Fc2	25000	100	ww	1B	MD/UB-250/30/1B-H-Fc2-25/163/P45	HCI-TS 250/830 WDL PB	-	-	-
HIT-DE-CE	250	Fc2	23000	92	nw	1A	MD/UB-250/42/1A-H-Fc2-25/163/P45	HCI-TS 250/942 NDL PB	-	-	-
<b>Metal halide lamps with tubular bulb and ceramic burner, burst-proof</b>											
HIT-CE-P c	35	E27	3150	90	ww	1B	MTS/UB-35/30/1B-H-E27-30/130	-	-	-	<<CMT35/DW>>
HIT-CE-P m	35	E27	3000	86	ww	1B	MTS coated/UB-35/30/1B-H-E27-30/130	-	-	-	<<CMT35F/DW>>
HIT-CE-P c	70	E27	6700	96	ww	1B	MTS/UB-70/30/1B-H-E27-32/128	HCI-T/P 70/830 WDL PB clear	-	-	-
HIT-CE-P c	70	E27	6600	94	nw	1A	MTS/UB-70/42/1A-H-E27-32/128	HCI-T/P 70/942 WDL PB clear	-	-	-
HIT-CE-P c	100	E27	9000	90	ww	1B	MTS/UB-100/30/1B-H-E27-40/133	HCI-T/P 100/830 WDL PB clear	-	-	-
HIT-CE-P c	100	E27	8800	88	nw	1A	MTS/UB-100/42/1A-H-E27-40/133	HCI-T/P 100/942 WDL PB clear	-	-	-
HIT-CE-P c	150	E27	14500	97	ww	1B	MTS/UB-150/30/1B-H-E27-40/133	HCI-T/P 150/830 WDL PB clear	-	-	-
HIT-CE-P c	150	E27	14500	97	nw	1A	MTS/UB-150/42/1A-H-E27-40/133	HCI-T/P 150/942 WDL PB clear	-	-	-
<b>Metal halide lamps with tubular bulb and quartz burner</b>											
HIT/S c	250	E40	20500	82	nw	2B	MT-250/45/2B-H-E40-/H	-	MASTER HPI-T Plus 250W/645 E40	Britelux HSI-TSX 250W	ARC250/T/H/742/E40
HIT/S c	250	E40	20000	80	tw	1A	MT-250/53/1A-H-E40	HQI-T 250/D	-	HSI-T 250W / 6K	ARC250/T/H/960/E40
HIT/S c	400	E40	35000	88	tw	1A	MC/UB-400/52/1A-H-E40-62/285	HQI-BT 400/D	-	HSI-T 400W / 6K	-
HIT/S c	400	E40	35000	88	nw	2B	MT-400/45/2B-H-E40-/H	-	MASTER HPI-T Plus 400W/645 E40	Britelux HSI-TSX 400W	ARC400/T/H/742/E40
HIT/S c	400	E40	42000	105	nw	2B	MT/UB-400/35/2B-H-E40-46/273/P45	HQI-T 400/N	-	-	-
HIT/S c	600	G22	55000	92	nw	1B	MT/UB-600/45/1B-H-G22-34/188	HQI-TM 600/NDL	-	-	-
HIT/S c	600	GY22	55000	92	nw	1B	MT/UB-600/45/1B-H-GY22-34/188	HQI-TM 600/NDL HR	-	-	-
HIT/S c	600	G22	58000	97	tw	1A	MT/UB-600/60/1A-H-G22-34/188	HQI-TM 600/D	-	-	-
HIT/S c	600	GY22	58000	97	tw	1A	MT/UB-600/60/1A-H-GY22-34/188	HQI-TM 600/D HR	-	-	-
HIT c	1000	G22	92000	92	nw	1B	MT/UB-1000/45/1B-H-G22-38/188	HQI-TM 1000/NDL	-	-	-
HIT c	1000	GY22	92000	92	nw	1B	MT/UB-1000/45/1B-H-GY22-38/188	HQI-TM 1000/NDL HR	-	-	-
HIT c	1000	E40	110000	110	nw	2B	MT-1000/35/2B-H-E40-76/345/P30	HQI-T 1000/N	-	-	-
HIT c	1000	E40	85000	85	nw	2B	MT-1000/43/2B-H-E40-/H	-	HPI-T 1000W/643 E40 220V	HSI-T 1000W/4K	-
HIT c	1000	E40	85000	85	tw	1A	MT-1000/60/1A-H-E40-76/340/P30	HQI-T 1000/D	-	-	SPL1000/T/H/960/E40
HIT-I c	2000	E40	190000	95	nw	2B	MT-2000/40/2B-E/-E40-100/430/P30	-	-	-	SPL2000/I/T/H/640/E40
HIT-I c	2000	E40	200000	100	nw	2B	MT-2000/45/2B-E/-E40-100/430/P30	HQI-T 2000/N	-	HSI-T 2000W-54K 380V/I	-
HIT-I c	2000	E40	180000	90	tw	1A	MT-2000/60/1A-E/-E40-100/430/P30	HQI-T 2000/D/I	-	-	SPL2000/I/T/H/960/E40
HIT-DE/S	400	Fc2	36000	90	nw	1B	MD/UB-400/42/1B-H-Fc2-31/206/P45	HQI-TS 400/NDL	-	-	-
HIT-DE/S	400	Fc2	37000	93	tw	1A	MD/UB-400/52/1A-H-Fc2-31/206/P45	HQI-TS 400/D PRO	-	-	-
HIT-DE I=187	1000	K12s-36	90000	90	nw	1B	MN-1000/44/1B-H-Kabelschuh-36/187/P15	HQI-TS 1000/NDL/S	-	-	-
HIT-DE I=187	1000	K12s-36	90000	90	tw	1A	MN-1000/59/1A-H-Kabelschuh-36/187/P15	HQI-TS 1000/D/S	-	SA HSI-TD 1000W/D CABLE SLV	-
HIT-DE I=187	2000	K12s-36	215000	108	nw	1B	MN-2000/44/1B-H-Kabelschuh-36/187/P15	HQI-TS 2000/NDL/S	-	-	-
HIT-DE I=187	2000	K12s-36	200000	100	tw	1A	MN-2000/59/1A-E-Kabelschuh-36/187/P15	HQI-TS 2000/D/S	MHN-SB 2000W/956 400V K12s-7	HSI-TD 2000W/D	-
HIT-DE I=274	2000	K12s-36	230000	115	nw	2B	MN-2000/42/2B-E-Kabelschuh-32/274/P15	HQI-TS 2000W/N/L	-	-	-
HIT-DE I=274	2000	K12s-36	205000	103	tw	1B	MN-2000/54/1B-E-Kabelschuh-32/274/P15	HQI-TS 2000W/D/L	-	-	-
<b>Metal halide lamps with reflector and ceramic burner</b>											
HIPAR51-CE-P/10°	20	GX10	-	-	ww	1B	MRS/UB-20/30/1B-H-GX10	-	MASTERColour CDM-R Mini 20W/830 GX10 MR16 10D	-	CMH20/MR16/UVC/830/GX10/SP
HIPAR51-CE-P/25°	20	GX10	-	-	ww	1B	MRS/UB-20/30/1B-H-GX10	-	-	-	CMH20/MR16/UVC/830/GX10/FL
HIPAR51-CE-P/40°	20	GX10	-	-	ww	1B	MRS/UB-20/30/1B-H-GX10	-	MASTERColour CDM-R Mini 20W/830 GX10 MR16 40D	-	CMH20/MR16/UVC/830/GX10/NFL
HIPAR51-CE-P/10°	35	GX10	-	-	ww	1A	MRS/UB-35/30/1A-H-GX10	-	MASTERColour CDM-R Mini Elite 35W/930 GX10 10D	-	CMH35/MR16/UVC/930/GX10/SP Ultra
HIPAR51-CE-P/25°	35	GX10	-	-	ww	1A	MRS/UB-35/30/1A-H-GX10	-	MASTERColour CDM-R Mini Elite 35W/930 GX10 25D	-	CMH35/MR16/UVC/930/GX10/FL Ultra
HIPAR51-CE-P/40°	35	GX10	-	-	ww	1A	MRS/UB-35/30/1A-H-GX10	-	MASTERColour CDM-R Mini Elite 35W/930 GX10 40D	-	CMH35/MR16/UVC/930/GX10/NFL Ultra
HIPAR51-CE-P/12°	35	GX10	-	-	nw	1A	MRS/UB-35/42/1A-H-GX10	-	-	-	CMH35/MR16/UVC/942/GX10/SP
HIPAR51-CE-P/25°	35	GX10	-	-	nw	1A	MRS/UB-35/42/1A-H-GX10	-	-	-	CMH35/MR16/UVC/942/GX10/FL

ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Metal halide lamps with reflector and ceramic burner (cont.)</b>											
HIPAR51-CE-P/40°	35	GX10	-	-	nw	1A	MRS/UB-35/42/1A-H-GX10	-	-	-	CMH35/MR16/UVC/942/GX10/WFL
HIR111-CE-P	20	GX8.5	-	-	ww	1B	MRS/UB-20/30/1B-H-GX8.5-111/95/10	HCI-R111 20W/830 PB 10D	MASTERColour CDM-R111 20W/830 GX8.5 10D	-	-
HIR111-CE-P	20	GX8.5	-	-	ww	1B	MRS/UB-20/30/1B-H-GX8.5-111/95/24	HCI-R111 20W/830 PB 24D	MASTERColour CDM-R111 20W/830 GX8.5 24D	-	-
HIR111-CE-P	20	GX8.5	-	-	ww	1B	MRS/UB-20/30/1B-H-GX8.5-111/95/40	HCI-R111 20W/830 PB 40D	-	-	-
HIR111-CE-P	35	GX8.5	-	-	ww	1B	MRS/UB-35/30/1B-H-GX8.5-111/95/10	HCI-R111 35W/830 PB 10D	MASTERColour CDM-R111 35W/830 GX8.5 10D	-	-
HIR111-CE-P	35	GX8.5	-	-	ww	1B	MRS/UB-35/30/1B-H-GX8.5-111/95/24	HCI-R111 35W/830 PB 24D	MASTERColour CDM-R111 35W/830 GX8.5 24D	-	-
HIR111-CE-P	35	GX8.5	-	-	ww	1B	MRS/UB-35/30/1B-H-GX8.5-111/95/40	HCI-R111 35W/830 PB 40D	MASTERColour CDM-R111 35W/830 GX8.5 40D	-	-
HIR111-CE-P	35	GX8.5	-	-	nw	1A	MRS/UB-35/42/1A-H-GX8.5-111/95/10	HCI-R111 35W/942 PB 10D	MASTERColour CDM-R111 35W/942 GX8.5 10D	-	-
HIR111-CE-P	35	GX8.5	-	-	nw	1A	MRS/UB-35/42/1A-H-GX8.5-111/95/24	HCI-R111 35W/942 PB 24D	MASTERColour CDM-R111 35W/942 GX8.5 24D	-	-
HIR111-CE-P	35	GX8.5	-	-	nw	1A	MRS/UB-35/42/1A-H-GX8.5-111/95/40	HCI-R111 35W/942 PB 40D	MASTERColour CDM-R111 35W/942 GX8.5 40D	-	-
HIR111-CE-P	70	GX8.5	-	-	ww	1B	MRS/UB-70/30/1B-H-GX8.5-111/95/10	HCI-R111 70W/830 PB 10D	MASTERColour CDM-R111 70W/830 GX8.5 10D	-	-
HIR111-CE-P	70	GX8.5	-	-	ww	1B	MRS/UB-70/30/1B-H-GX8.5-111/95/24	HCI-R111 70W/830 PB 24D	MASTERColour CDM-R111 70W/830 GX8.5 24D	-	-
HIR111-CE-P	70	GX8.5	-	-	ww	1B	MRS/UB-70/30/1B-H-GX8.5-111/95/40	HCI-R111 70W/830 PB 40D	MASTERColour CDM-R111 70W/830 GX8.5 40D	-	-
HIR111-CE-P	70	GX8.5	-	-	nw	1A	MRS/UB-70/42/1A-H-GX8.5-111/95/10	HCI-R111 70W/942 PB 10D	MASTERColour CDM-R111 70W/942 GX8.5 10D	-	-
HIR111-CE-P	70	GX8.5	-	-	nw	1A	MRS/UB-70/42/1A-H-GX8.5-111/95/24	HCI-R111 70W/942 PB 24D	MASTERColour CDM-R111 70W/942 GX8.5 24D	-	-
HIR111-CE-P	70	GX8.5	-	-	nw	1A	MRS/UB-70/42/1A-H-GX8.5-111/95/40	HCI-R111 70W/942 PB 40D	MASTERColour CDM-R111 70W/942 GX8.5 40D	-	-
<b>High pressure sodium vapour lamps with ellipsoid bulb</b>											
HSE-I	50	E27	3800	76	ww	4	SE-50/20/4-H/E-27-70/156	NAV-E 50/I 4Y	SON 50W/220 I E27	SHP 50W/CO-I	LU50/85/MQ/D/I/E27 1/12
HSE-I	70	E27	6300	90	ww	4	SE-70/20/4-H/E-27-70/156	NAV-E 70/I 4Y	SON 70W/220 I E27	SHP 70W/CO-I	LU70/90/MQ/D/I/E27 1/12
HSE-MF	50	E 27	3500	70	ww	4	SE-50/20/4-H-E27-70/156	NAV-E 50 SUPER 4Y	MASTER SON PIA 50W/220 E27	SHP-S 50W/CO-E	LU50/85/XO/D/I/27
HSE-MF	70	E 27	5600	80	ww	4	SE-70/20/4-H-E27-70/156	NAV-E 70 SUPER 4Y	MASTER SON PIA 70W/220 E27	SHP-S 70W/CO-E	LU70/XO/SBY/D/E27
HSE-MF	100	E40	10200	102	ww	4	SE-100/20/4-H-E40-75/186	NAV-E 100 SUPER 4Y	MASTER SON PIA Plus 100W/220 E40	SHP-S 100W	LU100/XO/SBY/D/E40
HSE-MF	150	E40	17000	113	ww	4	SE-150/20/4-H-E40-90/226	NAV-E 150 SUPER 4Y	MASTER SON PIA Plus 150W/220 E40	SHP-S 150W	LU150/100/XO/D/40
HSE-MF	250	E40	31100	124	ww	4	SE-250/20/4-H-E40-90/226	NAV-E 250 SUPER 4Y	MASTER SON PIA Plus 250W/220 E40	SHP 250W	LU250/XO/D/40
HSE-MF	400	E40	55500	139	ww	4	SE-400/20/4-H-E40-120/290	NAV-E 400 SUPER 4Y	MASTER SON PIA Plus 400W/220 E40	SHP 400W	LU400/SBY/D/40
HSE	1000	E40	120000	120	ww	4	SE-1000/20/4-H-E40-165/370	NAV-E 1000	SON 1000W/220 E40	-	LU1000/110/D/40
<b>High pressure sodium vapour lamps with tubular bulb</b>											
HST-MF	50	E27	4400	88	ww	4	ST-50/20/4-H-E27-38/156	NAV-T 50 SUPER 4Y	MASTER SON-T PIA Plus 50W/220	SHP-TS 50W	LU 50/XO/SBY/T/E27
HST-MF	70	E27	6600	94	ww	4	ST-70/20/4-H-E27-38/156	NAV-T 70 SUPER 4Y	MASTER SON-T PIA Plus 70W/220 E27	SHP-TS 70W	LU 70/XO/SBY/T/E27
HST-MF	100	E40	10700	107	ww	4	ST-100/20/4-H-E40-47/210	NAV-T 100 SUPER 4Y	MASTER SON-T PIA Plus 100W/220 E40	SHP-TS 100W	LU 100/XO/SBY/T/E40
HST-MF	150	E40	17500	117	ww	4	ST-150/20/4-H-E40-47/210	NAV-T 150 SUPER 4Y	MASTER SON-T PIA Plus 150W/220 E40	SHP-TS 150W	LU 150/XO/SBY/T/E40
HST-MF	250	E40	33200	133	ww	4	ST-250/20/4-H-E40-47/257	NAV-T 250 SUPER 4Y	MASTER SON-T PIA Plus 250W/220 E40	SHP-TS 250W	LU 250/XO/SBY/T/E40
HST-MF	400	E40	56500	141	ww	4	ST-400/20/4-H-E40-47/285	NAV-T 400 SUPER 4Y	MASTER SON-T PIA Plus 400W/220 E40	SHP-TS 400W	LU 400/XO/SBY/T/E40
HST-MF	600	E40	90000	150	ww	4	ST-600/20/4-H-E40-47/285	NAV-T 600 SUPER 4Y	MASTER SON-T PIA Plus 600W/220 E40	SHP-TS 600W	LU600/XO/T/40
HST	1000	E40	130000	130	ww	4	ST-1000/20/4-H-E40-65/355	NAV-T 1000	SON-T 1000W/220 E40	SHP-T 1000W	LU1000/110/T/40 4pk
HST-DE-MF-h45	70	RX7s	6800	97	ww	4	SD-70/20/4-H-RX7s-20/1142/P45	NAV-TS 70 SUPER 4Y	-	SHP - TD 70W	-
HST-DE-MF-h45	150	RX7s-24	15000	100	ww	4	SD-150/20/4-H-RX7s-24/132/P45	NAV-TS 150 SUPER 4Y	-	SHP - TD 150W	-
HST-DE-h45	250	Fc2	25500	102	ww	4	SD-250/20/4-H-Fc2-23/206/P45	NAV-TS 250	-	-	-
HST-DE-h45	400	Fc2	48000	120	ww	4	SD-400/20/4-H-Fc2-23/206/P45	NAV-TS 400	-	-	-
HST-CRI	50	GX12-1	2400	48	ww	1B	STH-50/25/1B-GX12-1	-	MASTER SDW-TG Mini 50W/825 GX12-1	-	-
HST-CRI	100	GX12-1	4900	49	ww	1B	STH-100/25/1B-GX12-1	-	MASTER SDW-TG Mini 100W/825 GX12-1	-	-
<b>Low voltage tungsten halogen lamps with tubular bulb</b>											
QT12-UVr-ax 12V	20	GY6.35	290	15	ww	1A	HSGST/UB-20-12-GY6.35-15	644275	Capsuleline 20W GY6.35 12V CL 4000h	-	M76/Q20/GY6.35
QT12-UVr-ax 12V IRC	20	GY6.35	420	21	ww	1A	HSG/F-20-12-GY6.35	-	MASTERCapsule 20W GY6.35 12V IR	-	-
QT12-UVr-ax 12V IRC	25	GY6.35	500	20	ww	1A	HSGST/UB/IB-25-12-GY6.35	64429 ECO	-	-	-
QT12-UVr-ax 12V IRC	28	GY6.35	500	18	ww	1A	HSGST/UB/IB-28-12-GY6.35	-	-	Capsule ECO 12V 28W LP GY6.35	-
QT12-UVr-ax 12V IRC	30	GY6.35	750	25	ww	1A	HSG/F-30-12-GY6.35	-	MASTERCapsule 30W GY6.35 12V IR	-	-
QT12-UVr-ax 12V	35	GY6.35	580	17	ww	1A	HSGST/UB-35-12-GY6.35-15	644325	-	Capsule 12V 35W LP GY6.35	M75/Q35/GY6.35
QT12-UVr-ax 12V IRC	35	GY6.35	860	25	ww	1A	HSGST/UB/IB-35-12-GY6.35	64432 ECO	-	-	-
QT12-UVr-ax 12V IRC	40	GY6.35	900	23	ww	1A	HSGST/UB/IB-40-12-GY6.35	-	-	Capsule ECO 12V 40W LP GY6.35	-
QT12-UVr-ax 12V IRC	45	GY6.35	1250	28	ww	1A	HSG/F-45-12-GY6.35	-	MASTERCapsule 45W GY6.35 12V IR	-	-
QT12-UVr-ax 12V	50	GY6.35	900	18	ww	1A	HSGST/UB-50-12-GY6.35-15	644405	Capsuleline 50W GY6.35 12V CL 4000h	Capsule 12V 50W LP GY6.35	M74/Q50/GY6.35
QT12-UVr-ax 12V IRC	50	GY6.35	1180	24	ww	1A	HSGST/UB/IB-50-12-GY6.35	64440 ECO	-	-	-
QT12-UVr-ax 12V IRC	60	GY6.35	1700	28	ww	1A	HSG/F-60-12-GY6.35	-	MASTERCapsule 60W GY6.35 12V IR	-	-
QT12-UVr-ax 12V IRC	60	GY6.35	1650	28	ww	1A	HSGST/UB/IB-60-12-GY6.35	64447 ECO	-	-	-
QT12-UVr-ax 12V	75	GY6.35	1450	19	ww	1A	HSGST/UB-75-12-GY6.35-15	644505	Capsuleline 75W GY6.35 12V CL 4000h	Capsule 12V 75W HP GY6.35	M73/Q75/GY6.35
QT12-UVr-ax 12V	90	GY6.35	1800	20	ww	1A	HSGST/UB-90-12-GY6.35-15	644585	-	-	-
QT12-UVr-ax 12V	100	GY6.35	2200	22	ww	1A	HSG/C/UB-100-12-GY6.35	-	Capsuleline 100W GY6.35 12V CL 4000h	Capsule 12V 100W HP GY6.35	M180/Q100/GY6.35
<b>Low voltage tungsten halogen lamps with reflector</b>											
QR-CBCS1/10° IRC	20	GU5.3	380	19	ww	1A	HRGS/UB/IB 20-12-GU5.3-51/10	48860 ECO SP	-	-	Q20MR16HIR/CCG10
QR-CBCS1/24° IRC	20	GU5.3	365	18	ww	1A	HRGS/UB/IB 20-12-GU5.3-51/24	48860 ECO FL	-	-	Q20MR16HIR/CCG24
QR-CBCS1/36° IRC	20	GU5.3	403	20	ww	1A	HRGS/UB/IB 20-12-GU5.3-51/36	48860 ECO WFL	MASTERLine ES 20W GU5.3 12V 36D	-	Q20MR16HIR/CCG36
QR-CBCS1/60° IRC	20	GU5.3	373	19	ww	1A	HRGS/UB/IB 20-12-GU5.3-51/60	48860 ECO WWFL	-	-	-
QR-CBCS1/10° IRC	28	GU5.3	-	-	ww	1A	HRGS/UB/IB 28-12-GU5.3-51/10	-	-	FMT 28W SP 10° ECO	-
QR-CBCS1/38° IRC	28	GU5.3	-	-	ww	1A	HRGS/UB/IB 28-12-GU5.3-51/38	-	-	FMW 28W WFL 38° ECO	-
QR-CBCS1/8° IRC	30	GU5.3	-	-	ww	1A	HRGS-30-12-GU5.3-50/8	-	MASTERLine ES 30W GU5.3 12V 8D	-	-
QR-CBCS1/10° IRC	30	GU5.3	-	-	ww	1A	HRGS-30-12-GU5.3-50/10	-	-	-	Q30MR16HIR/CCG10
QR-CBCS1/24° IRC	30	GU5.3	-	-	ww	1A	HRGS-30-12-GU5.3-50/24	-	MASTERLine ES 30W GU5.3 12V 24D	-	Q30MR16HIR/CCG24
QR-CBCS1/36° IRC	30	GU5.3	-	-	ww	1A	HRGS-30-12-GU5.3-50/36	-	MASTERLine ES 30W GU5.3 12V 36D	-	Q30MR16HIR/CCG36
QR-CBCS1/60° IRC	30	GU5.3	-	-	ww	1A	HRGS-30-12-GU5.3-50/60	-	MASTERLine ES 30W GU5.3 12V 60D	-	-
QR-CBCS1/8° IRC	35	GU5.3	-	-	ww	1A	HRGS-35-12-GU5.3-50/8	-	MASTERLine ES 35W GU5.3 12V 8D	-	-
QR-CBCS1/10° IRC	35	GU5.3	-	-	ww	1A	HRGS/UB/IB-35-12-GU5.3-51/10	48865 ECO SP	-	-	Q35MR16HIR/CCG10
QR-CBCS1/24° IRC	35	GU5.3	902	26	ww	1A	HRGS/UB/IB-35-12-GU5.3-51/24	48865 ECO FL	MASTERLine ES 35W GU5.3 12V 24D	-	Q35MR16HIR/CCG24
QR-CBCS1/36° IRC	35	GU5.3	1137	32	ww	1A	HRGS/UB/IB-35-12-GU5.3-51/36	48865 ECO WFL	MASTERLine ES 35W GU5.3 12V 36D	-	Q35MR16HIR/CCG36
QR-CBCS1/60° IRC	35	GU5.3	1127	32	ww	1A	HRGS/UB/IB-35-12-GU5.3-51/60	48865 ECO WWFL	MASTERLine ES 35W GU5.3 12V 60D	-	-
QR-CBCS1/10° IRC	40	GU5.3	-	-	ww	1A	HRGS/UB/IB-40-12-GU5.3-51/10	-	-	EXT 40W SP 10° ECO	-
QR-CBCS1/38° IRC	40	GU5.3	-	-	ww	1A	HRGS/UB/IB-40-12-GU5.3-51/38	-	-	EXN 40W WFL 38° ECO	-
QR-CBCS1/60° IRC	40	GU5.3	-	-	ww	1A	HRGS/UB/IB-40-12-GU5.3-51/60	-	-	FNW 40W WWFL 60° ECO	-

ZVEI	Wattage	Base	Luminous flux	Efficiency (lm/W)	Light colour	Colour rendering	ILCOS	OSRAM	PHILIPS	Havells Sylvania	GE
<b>Low voltage tungsten halogen lamps with reflector (cont.)</b>											
QR-CBC51/8° IRC	45	GUS.3	–	–	ww	1A	HRGS-45-12-GU5.3-50/8	–	MASTERline ES 45W GU5.3 12V 8D	–	–
QR-CBC51/8° IRC	45	GUS.3	–	–	ww	1A	HRGS-45-12-GU5.3-50/10	–	–	–	Q45MR16HIR/CCG10
QR-CBC51/24° IRC	45	GUS.3	–	–	ww	1A	HRGS-45-12-GU5.3-50/24	–	MASTERline ES 45W GU5.3 12V 24D	–	Q45MR16HIR/CCG24
QR-CBC51/36° IRC	45	GUS.3	–	–	ww	1A	HRGS-45-12-GU5.3-50/36	–	MASTERline ES 45W GU5.3 12V 36D	–	Q45MR16HIR/CCG36
QR-CBC51/60° IRC	45	GUS.3	–	–	ww	1A	HRGS-45-12-GU5.3-50/60	–	MASTERline ES 45W GU5.3 12V 60D	–	–
QR-CBC51/10° IRC	50	GUS.3	1455	29	ww	1A	HRGS/UB/IB-50-12-GU5.3-51/10	48870 ECO SP	–	–	–
QR-CBC51/24° IRC	50	GUS.3	1549	31	ww	1A	HRGS/UB/IB-50-12-GU5.3-51/24	48870 ECO FL	–	–	–
QR-CBC51/36° IRC	50	GUS.3	1466	29	ww	1A	HRGS/UB/IB-50-12-GU5.3-51/36	48870 ECO WFL	–	–	–
QR-CBC51/60° IRC	50	GUS.3	1474	29	ww	1A	HRGS/UB/IB-50-12-GU5.3-51/60	48870 ECO VWFL	–	–	–
QR111/8° IRC	30	G53	–	–	ww	1A	HMGCS/UB/IB-30-12-G53-111/8	–	MASTERline 111 30W G53 12V 8D	–	–
QR111/24° IRC	30	G53	–	–	ww	1A	HMGCS/UB/IB-30-12-G53-111/24	–	MASTERline 111 30W G53 12V 24D	–	–
QR111/6° IRC	35	G53	–	–	ww	1A	HMGCS/UB/IB-35-12-G53-111/6	48832 ECO SP	–	–	–
QR111/24° IRC	35	G53	–	–	ww	1A	HMGCS/UB/IB-35-12-G53-111/24	48832 ECO FL	–	–	–
QR111/8° IRC	45	G53	–	–	ww	1A	HMGCS/UB/IB-45-12-G53-111/8	–	MASTERline 111 45W G53 12V 8D	–	–
QR111/24° IRC	45	G53	–	–	ww	1A	HMGCS/UB/IB-45-12-G53-111/24	–	MASTERline 111 45W G53 12V 24D	–	–
QR111/45° IRC	45	G53	–	–	ww	1A	HMGCS/UB/IB-45-12-G53-111/45	–	MASTERline 111 45W G53 12V 45D	–	–
QR111/6° IRC	50	G53	–	–	ww	1A	HMGCS/UB/IB-50-12-G53-111/6	48835 ECO SP	–	–	–
QR111/24° IRC	50	G53	–	–	ww	1A	HMGCS/UB/IB-50-12-G53-111/24	48835 ECO FL	–	–	–
QR111/40° IRC	50	G53	–	–	ww	1A	HMGCS/UB/IB-50-12-G53-111/40	48835 ECO WFL	–	–	–
QR111/6° IRC	60	G53	–	–	ww	1A	HMGCS/UB/IB-60-12-G53-111/6	48837 ECO SP	–	–	–
QR111/8° IRC	60	G53	–	–	ww	1A	HMGCS/UB/IB-60-12-G53-111/8	–	MASTERline 111 60W G53 12V 8D	–	–
QR111/24° IRC	60	G53	–	–	ww	1A	HMGCS/UB/IB-60-12-G53-111/24	48837 ECO FL	MASTERline 111 60W G53 12V 24D	–	–
QR111/40° IRC	60	G53	–	–	ww	1A	HMGCS/UB/IB-60-12-G53-111/40	48837 ECO WFL	–	–	–
QR111/45° IRC	60	G53	–	–	ww	1A	HMGCS/UB/IB-60-12-G53-111/45	–	MASTERline 111 60W G53 12V 45D	–	–
QR111/6°	100	G53	–	–	ww	1A	HMGCS-100-12-G53-111/6	41850 SP	–	–	–
QR111/8°	100	G53	–	–	ww	1A	HMGCS-100-12-G53-111/8	–	–	SA111 SP 8°	AR111 100W12V SP
QR111/24°	100	G53	–	–	ww	1A	HMGCS-100-12-G53-111/24	–	–	SA111 SP 24°	AR111 100W12V FL
QR111/40°	100	G53	–	–	ww	1A	HMGCS-100-12-G53-111/40	41850 WFL	–	–	–
QR111/45°	100	G53	–	–	ww	1A	HMGCS-100-12-G53-111/45	–	–	SA111 WFL 45°	AR111 100W12V WFL
<b>High voltage tungsten halogen lamps with tubular bulb</b>											
QT32/c	70	E27	1180	17	ww	1A	HSGST/F/UB-70-230-E27	64400	EcoClassic30 70W E27 230V T32 CL	–	–
QT32/c	100	E27	1800	18	ww	1A	HSGST/F/UB-100-230-E27	64401	–	–	–
QT32/c	105	E27	1980	19	ww	1A	HSGST/F/UB-105-230-E27	–	EcoClassic30 105W E27 230V T32 CL	–	–
QT32/c	150	E27	2870	19	ww	1A	HSGST/F/UB-150-230-E27	64402	–	–	–
QT32/c	205	E27	4200	20	ww	1A	HSGST/F/UB-205-230-E27	64404	–	–	–
QT-DE12 IRC	48	R7s	815	17	ww	1A	HDG-48-230-R7s-74.9	64684 ECO	Plusline ES Compact 78mm 2y 48W R7s 230V 18B	DE ECO 78MM 48W 230V R7S	–
QT-DE12	60	R7s	840	14	ww	1A	HDG-60-230-R7s-74.9	64688	–	–	–
QT-DE12 IRC	80	R7s	1450	18	ww	1A	HDG-80-230-R7s-74.9	64490 ECO	Plusline ES Compact 78mm 2y 80W R7s 230V 18B	DE ECO 78MM 80W 230V R7S	–
QT-DE12	100	R7s	1900	19	ww	1A	HDG-100-230-R7s-74.9	–	–	–	K12 C100W 230V R7S
QT-DE12 IRC (I=74,9)	120	R7s	2300	19	ww	1A	HDG-120-230-R7s-74.9	64695 ECO	Plusline ES Compact 78mm 2y 120W R7s 230V 18B	DE ECO 78MM 120W 230V R7S	–
QT-DE12 IRC (I=114,2)	120	R7s	2300	19	ww	1A	HDG-120-230-R7s-114,2	64696 ECO	Plusline ES Small 118mm 2y 120W R7s 230V 18B	DE ECO 118MM 120W 230V R7S 2000H	–
QT-DE12 IRC (I=114,2)	130	R7s	2440	19	ww	1A	HDG-130-230-R7s-114,2	–	–	–	K11 C130W 230V R7S
QT-DE12 IRC	160	R7s	3300	21	ww	1A	HDG-160-230-R7s-114,2	64698 ECO	Plusline ES Small 118mm 2y 160W R7s 230V 18B	DE ECO 118MM 160W 230V R7S 2000H	–
QT-DE12 IRC	200	R7s	4000	20	ww	1A	HDG-200-230-R7s-114,2	–	–	–	K9 C200W 230V R7S
QT-DE12 IRC	225	R7s	5000	22	ww	1A	HDG-225-230-R7s-114,2	–	–	–	K9/Q225 T3/230V HIR
QT-DE12 IRC	230	R7s	5000	22	ww	1A	HDG-230-230-R7s-114,2	64701 ECO	–	DE ECO 118MM 230W 230V R7S 2000H	–
QT-DE12	240	R7s	4900	20	ww	1A	HDG-240-230-R7s-114,2	–	Plusline ES Small 118mm 2y 240W R7s 230V 18B	–	–
QT-DE12 IRC	330	R7s	7400	22	ww	1A	HDG-330-230-R7s-114,2	–	–	–	K1 C330W 230V R7S
QT-DE12 IRC	375	R7s	9400	25	ww	1A	HDG-375-230-R7s-114,2	–	–	–	K1/Q375 T3/230V HIR
QT-DE12 IRC	400	R7s	9000	23	ww	1A	HDG-400-230-R7s-114,2	64702 ECO	Plusline ES Small 118mm 2y 400W R7s 230V 18B	DE ECO 118MM 400W 230V R7S 2000H	–
QT-DE12	500	R7s	9500	19	ww	1A	HDG-500-230-R7s-114,2	–	–	–	K1/Q500 T2.5/CL
QT-DE12-h15	750	R7s	16100	21	ww	1A	HDG-750-230-R7s-185,7	64560	Plusline Large 750W R7s 230V	DE 230V 750W	–
QT-DE12-h15	1000	R7s	22000	22	ww	1A	HDG-1000-230-R7s-185,7	64740	Plusline Large 1000W R7s 230V	DE 230V 1000W	K4/Q1000 T3/CL
<b>High voltage tungsten halogen lamps</b>											
QPARS1/25°	18	GU10	–	–	ww	1A	HAGS-18-230-GU10-51/25	–	EcoH TWIST 18W GU10 230V 25D	HI-SPOT ESSO ECO 18W FL 25°	–
QPARS1/36°	20	GU10	–	–	ww	1A	HAGS-20-230-GU10-51/36	–	–	–	Q20MR16/230/FL
QPARS1/25°	25	GU10	–	–	ww	1A	HAGS-25-230-GU10-51/25	–	Twistline Alu 2000h 25W GU10 230V 25D	–	–
QPARS1/50°	25	GU10	–	–	ww	1A	HAGS-25-230-GU10-51/50	–	EcoH TWIST 25W GU10 230V 50D	–	–
QPARS1/25°	28	GU10	–	–	ww	1A	HAGS-28-230-GU10-51/25	–	–	HI-SPOT ESSO ECO 28W FL 25°	–
QPARS1/30°	28	GU10	–	–	ww	1A	HAGS-28-230-GU10-51/30	64819 ECO	–	–	–
QPARS1/20°	35	GU10	–	–	ww	1A	HAGS-35-230-GU10-51/20	–	Twistline Alu 2000h 35W GU10 230V 20D	HI-Spot ESSO 20° 35W 230V Superia ECO	–
QPARS1/35°	35	GU10	–	–	ww	1A	HAGS/UB-35-230-GU10-51/35	64820 FL	–	–	Q35MR16/230/FL
QPARS1/40°	35	GU10	–	–	ww	1A	HAGS-35-230-GU10-51/40	–	Twistline Alu 2000h 35W GU10 230V 40D	HI-Spot ESSO 40° 35W 230V Superia ECO	–
QPARS1/50°	35	GU10	–	–	ww	1A	HAGS-35-230-GU10-51/50	–	EcoH TWIST 35W GU10 230V 50D	–	–
QPARS1/25°	40	GU10	–	–	ww	1A	HAGS-40-230-GU10-51/25	–	–	HI-SPOT ESSO ECO 40W FL 25°	–
QPARS1/30°	40	GU10	–	–	ww	1A	HAGS-40-230-GU10-51/30	64823 ECO	–	–	–
QPARS1/50°	40	GU10	–	–	ww	1A	HAGS-40-230-GU10-51/50	–	–	HI-SPOT ESSO ECO 40W WFL 50°	–
QPARS1/20°	50	GU10	–	–	ww	1A	HAGS-50-230-GU10-51/20	–	Twistline Alu 2000h 50W GU10 230V 20D	HI-Spot ESSO 20° 50W 230V Superia ECO	–
QPARS1/25°	50	GU10	–	–	ww	1A	HAGS-50-230-GU10-51/25	–	Twistline Alu 3000h 50W GU10 230V 25D	–	Q50MR16/230/25°
QPARS1/35°	50	GU10	–	–	ww	1A	HAGS/UB-50-230-GU10-51/35	64824 FL	–	–	Q50MR16/230/36°
QPARS1/40°	50	GU10	–	–	ww	1A	HAGS-50-230-GU10-51/40	–	Twistline Alu 2000h 50W GU10 230V 40D	HI-Spot ESSO 40° 50W 230V Superia ECO	–
QPARS1/50°	50	GU10	–	–	ww	1A	HAGS-50-230-GU10-51/50	–	Twistline Alu 3000h 50W GU10 230V 50D	–	–

Please note: Subject to alteration. The list represents a selection from manufacturers' lamp ranges.

Specifications for luminous flux, efficiency, colour temperature, colour rendition and burning position as well as the ILCOS code mostly correspond to the first specified manufacturer's lamp designation in a row. It is the responsibility of the user to ascertain suitability of lamps for Sateco luminaires.

## Information about power factor correction

### In General

At the end of 2002 the Ordinance on Maximum Energy Consumption (EnVHV) came into effect. This is the implementation of the 2000/55/EG European Directive, which forms the basis for the designation of ballasts with energy classes. In the past, series power factor correction was the norm due to power authorities. This has changed as a result of technical connection conditions, Edition 2000 (TAB2000). Apart from a few exceptions, parallel power factor correction is now standard.

### Energy Classification

Electrical consumers are divided into 7 energy classes (A1, A2, A3, B1, B2, C, D), whereby Class A1 represents the greatest energy efficiency.

With luminaires, energy efficiency is specified as a complete system of light source, control gear and power factor correction. As such, luminaire switching for fluorescent lamps is divided into the following:

A1:	... with ECG dimming and daylight-similar control
A2, A3:	... with ECG
B1, B2:	... with LLCG (not power factor corrected)
C:	... with CCG (not permissible since 11/2005)
D:	... with poor CCG (not permissible since 11/2003)

With series power factor correction (capacitive switching), energy classification fundamentally leads to a lower classification compared to inductive switching (without power factor correction). This is the reason why inductive ballasts of classes B1 and B2 have been integrated into energy class C or even in specific cases into energy class D.

The difference in power consumption may make up to 15 % here.

### Power Factor Correction

Luminaires with **electronic control gear** represent lighting solutions with greatest energy savings and cost-efficiency. Additional power factor correction is not necessary. For luminaires with **inductive control gear** we recommend parallel power factor correction as the most energy-efficient solution (if no limitations are made by power authorities and if no central correction facility is available).

### Power Factor Correction in Delivery State

- Siteco luminaires for fluorescent lamps are available either with ECG (additional correction not necessary), with parallel power factor correction ex-works (with installed capacitor) or inductive (not prepared for correction).
- Downlights for compact fluorescent lamps are factory-set for parallel power factor correction (please note specifications in product descriptions).
- Luminaires for fluorescent lamps for series correction are available as customer-specific variations.
- Luminaires for high pressure discharge lamps are with parallel power factor correction ex-works (with installed capacitor).

### Subsequent On-Site Correction

For retroactive conversion of luminaires to parallel p. f. correction on-site, capacitors (equipped with plug-in terminals) are necessary. Capacitance of capacitors is dependent upon the complete lamp rating of each luminaire (selection from list opposite).

**Retroactive correction must only be carried out by a qualified electrician. Installation instructions must be followed.**

- Retroactive correction is only permissible for insulation class I indoor and damp-proof luminaires for tubular and compact fluorescent lamps.
- Insulation class II luminaires and luminaires for high pressure discharge lamps must not be retroactively corrected.
- With luminaires featuring electronic control gear, no correction is necessary

**Capacitors include plug-in terminal for power factor correction.**

for lamps (W)	PF Correction Capacitor Amount/Capacity	Amount/Order No.
<b>Compact Fluorescent Lamps</b>		
<b>TC-S</b>		
1x TC-S 5/7/9/11W	1x 2μ	1x 5LY5020
2x TC-S 5/7/9/11W	1x 4μ	1x 5LY5018
<b>TC-D</b>		
1x TC-D 10/13W	1x 2μ	1x 5LY5020
1x TC-D 26W	1x 4μ	1x 5LY5018
2x TC-D 10/13W	1x 4μ	1x 5LY5018
2x TC-D 18W	1x 5μ	1x 5LY5013
2x TC-D 26W	1x 8μ	1x 5LY5015
<b>TC-T</b>		
1x TC-D 10/13W	1x 2μ	1x 5LY5020
1x TC-D 26W	1x 4μ	1x 5LY5018
2x TC-D 10/13W	1x 4μ	1x 5LY5018
2x TC-D 18W	1x 5μ	1x 5LY5013
2x TC-D 26W	1x 8μ	1x 5LY5015
<b>TC-L</b>		
1x TC-LEL 18W	1x 4,5μ	1x 5LY5016
1x TC-LEL 24W	1x 4μ	1x 5LY5018
1x TC-LEL 36W	1x 4,5μ	1x 5LY5016
2x TC-LEL 18W	1x 4,5μ <sup>1)</sup>	1x 5LY5016
2x TC-LEL 24W	1x 8μ	1x 5LY5015
2x TC-LEL 36W	1x 9μ	1x 5LY5003
3x TC-LEL 18W	1x 9μ <sup>1)</sup>	1x 5LY5003
3x TC-LEL 24W	1x 10μ	1x 5LY5014
3x TC-LEL 36W	1x 13,5μ	1x 5LY5005
<b>Tubular Fluorescent Lamps</b>		
<b>T26</b>		
1x 18W	1x 4,5μ	1x 5LY5016
1x 36W	1x 4,5μ	1x 5LY5016
1x 38W	1x 4,5μ	1x 5LY5016
1x 58W	1x 7μ	1x 5LY5002
2x 18W	1x 4,5μ <sup>1)</sup>	1x 5LY5016
2x 36W	1x 9μ	1x 5LY5003
2x 38W	1x 9μ	1x 5LY5003
2x 58W	1x 13,5μ	1x 5LY5005
3x 18W	1x 9μ <sup>1)</sup>	1x 5LY5003
3x 36W	1x 13,5μ	1x 5LY5005
3x 58W	1x 20μ	1x 5LY5008
4x 18W	1x 9μ <sup>1)</sup>	1x 5LY5003
4x 36W	1x 18μ	1x 5LY5007
4x 58W	2x 13,5μ	2x 5LY5005
	or	
	1x 25μ	1x 5LY5028

<sup>1)</sup> Only when two lamps are in tandem connection (2 lamps 18W on one control gear unit 36W).

– the capacitors are approved according to EN 61048 as Type B and comply with the requirements of VDE 0560-6 for flame-resistance and burst-resistance.

## EuP regulation with regard to technical luminaires

A complete description of the EuP regulation can be found for example at [www.eur-lex.europa.eu](http://www.eur-lex.europa.eu)

For luminaires containing these components, documentation regarding efficiency, disposal, maintenance and cleaning is required. Valid specifications can be found on our website at [www.siteco.com](http://www.siteco.com).

Ballasts integrated in luminaires correspond at least to energy efficiency class EEI = B2 (conventional ballasts) or A3 (electronic ballasts, non-dimmable). We do however aim to use devices with designation EEI = A2 or A1 if possible and available.

The symbols used in instructions for maintenance and disposal are detailed in the Symbol explanations section.

It must be fundamentally indicated that luminaires contain components that are subject to maintenance or repair. This includes optical enclosures, sealing materials, electrical components and lamps. The state of ageing, soiling, wear or damage is dependent on specific operating conditions and cannot be randomly specified. As a result it is in the interests of system operators to define reasonable cycles for monitoring, repair and maintenance.



## Luminaires with integral emergency inverter

### Equipping and functionality:

Luminaires wired ready for connection, with 4-pole mains connection (3-pole for 'normal mains' with switched phase\* + single pole for additional unswitched phase\* for integral emergency inverter) | with ECG for normal operation and with integral emergency inverter\* for emergency operation (control device, battery for 1 hour or 3 hour operation and with LED for optical self-test functioning control of battery)

$U_N = 220..240V/AC\ 50..60Hz$

- \* The switched phase (mains supply) and the unswitched phase must have the same phase angle | the emergency battery is charged via the non-switched phase and the luminaire is informed of the operational condition (mains or emergency):
- non-switched phase in operation: → normal operation (luminaire operation via mains, normal on/off switching)
- non-switched phase missing: → emergency operation with reduced luminous flux (operation with battery) | luminaire is switched on, even when luminaire was switched off with mains operation

### LED signals:

- green LED: battery connected and charged
- green blinking LED: battery being charged
- red blinking LED: battery not connected or defect
- yellow blinking LED: automatic discharging/charging of battery

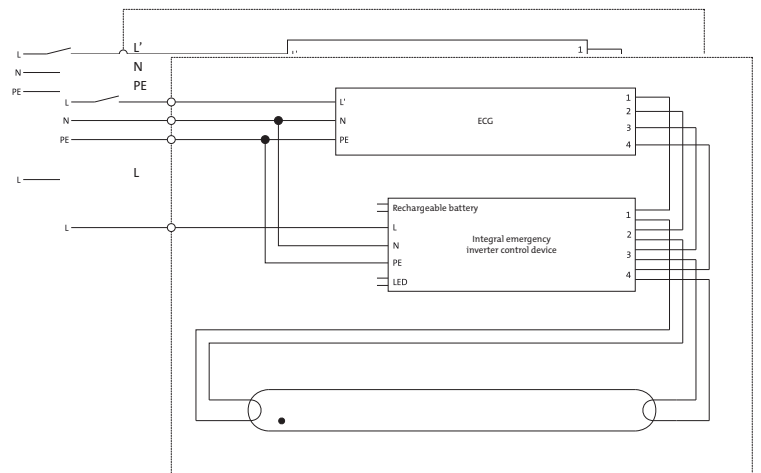
### Emergency operation with reduced lumen output:

reduced lumen output (see table)  
with 2-lamp luminaires: operation with one lamp  
luminaires with ECG DALI or ECG dimming (1...10V):  
lumen output as given, independent of dimming status

### Permissible ambient temperature for luminaire use with integral emergency inverter:

0°C..25°C

### Schematic circuit diagram:



## Integral emergency inverter for on-site installation

### Kurzbeschreibung

Integral emergency inverter for retroactive, on-site installation, consisting of control device, NiMH or NiCd battery for 1h or 3h operation and LED for optical self-testing. Suitable for emergency operation of fluorescent lamps (T16, T26 or TC lamps without integral glow starter), for single-lamp and multi-lamp ECG, ECG dimming or LLCG.

### Scope of Delivery

Housing of control device of sheet steel (for screw fixing). Gas-tight and maintenance-friendly battery (with cable retainers and self-adhesive mounting elements, LED (with LED clip) and self-adhesive colour spots (for colour-identification of luminaire and lamp).

### Electrics

All components wired ready for connection: control device with screwless terminals, max. 1.5mm<sup>2</sup>, battery and LED with pre-assembled connection cable.

$U_N = 220..240V/50..60\ Hz; I_N (230V) = 4..40mA; \lambda = 0.8$

For luminaires with integral emergency inverter, a 4-pole mains connection is required (3-pole for 'normal mains' with switched phase\* + 1-pole for additional unswitched phase\* for integral emergency inverter).

### Functionality and further explanation

(see description 'Luminaires with Integral Emergency Inverter')

Emergency operation with reduced luminous flux (see table) with twin- and multi-lamp luminaires: operation with one lamp (independent of ballast) luminaires with ECG DALI or ECG dimming (1...10V): lumen output as given, independent of dimming status

### Recommended applications

For installations according to VDE0108 or EN 60598-2-22

**Integral emergency inverter for on-site installation**

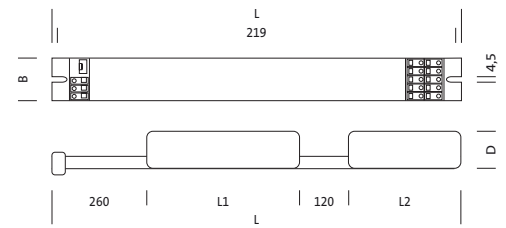


**Integral Emergency Inverter**

Integral emergency inverter for on-site installation in luminaires | for 1 hour or 3 hour operation | components: control unit, battery (capacitance according to required operating life and selected lamp rating) and LED (for optical self-testing of battery) | suitable for emergency operation of fluorescent lamps (T16, T26 or TC lamps without integral glow starter) | for installation in luminaires with single or multi-lamp ECG, ECG dimming or LLCG

Protection rating: IP20  
Insulation class: I

Permissible ambient temperature:  
-for integral emergency inverter: 0°C to 45°C  
-for luminaire with integral emergency inverter: 0°C to 25°C



Configuration	L (mm)	W (mm)	H (mm)	L1 (mm)	L2 (mm)	D (mm)	Order no.
<b>Integral Emergency Inverter</b>							
Inverter	235	30	21				5LY11103R
+ NiMh battery 3.0 Ah	740			215	145	19	
Inverter	235	30	21				5LY11104R
+ NiCd battery 4.5 Ah	680			180	120	33	
Inverter	235	30	21				5LY11105R
+ NiCd-Akku 7,0 Ah	830			270	260	33	

Inverter dimensions: L x B x H; mounting distance l = 225 mm  
Dimensions battery 1: L1 x D; connection cable to inverter: l1 = 260 mm  
Dimensions battery 2: L2 x D; connection cable between batteries: l2 = 120 mm

**Luminous flux with emergency operation (% of nominal luminous flux)**

Lamp	T26				T16					T16					
	18W	36W	38W	58W	8W	11W	14W	21W	28W	35W	24W	39W	49W	54W	80W
Lumin. flux	18%	13%	13%	10%	31%	28%	26%	22%	21%	15%	19%	14%	9%	14%	9%
required battery capacitance dependent upon required operational life and lamp															
1h (Ah)	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
3h (Ah)	4,5	4,5	7,0	7,0	4,5	4,5	4,5	7,0	7,0	7,0	4,5	7,0	7,0	7,0	7,0

Lamp	TC-LEL						TC-DEL			TC-TEL				TC-SEL		
	18W	24W	36W	40W	55W	80W	13W	18W	26W	18W	26W	32W	42W	7W	9W	11W
Lumin. flux	17%	17%	16%	14%	12%	8%	27%	26%	22%	26%	18%	19%	16%	31%	30%	28%
required battery capacitance dependent upon required operational life and lamp																
1h (Ah)	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
3h (Ah)	4,5	4,5	4,5	7,0	7,0	7,0	4,5	4,5	4,5	4,5	4,5	7,0	7,0	4,5	4,5	4,5

- with twin- and multi-lamp luminaires: operation with one lamp

## Lighting quality

### Quality of Light

For the assessment of a lighting situation, a whole range of criteria can be considered. Quantifiable, optical magnitudes play as important a role as factors that cannot be numerically described and that are strongly influenced from subjective perceptions. The so-called 'lighting design quality attributes' that are often referenced to in practise have become a centre of interest, and are often discussed in detail in trade magazines.

### Lighting Level

Eyestrain and accurate viewing depend to a very large extent upon the lighting level. The lighting level is measured in terms of the illuminance (in Lux/lx). The higher the lighting level, the higher the viewing performance, i.e. the accuracy and promptness with which the eye can gather visual information.

The lighting level in natural conditions, depending upon weather, time and location lies between 5 000 and 100,000 Lux. Indoors, such high levels are impractical because of the required artificial light levels. A minimum value of 500 lux now exists for typical viewing tasks such as office work. New studies however confirm that a higher lighting level has a positive effect upon the general well-being of people and their work performance.

The relevant norms contain minimum lighting levels for varying indoor and outdoor situations.

### Lighting Direction and Shadow

The interplay of light and shadow is decisive for the spacial perception of rooms. Light direction and shadowing allow objects to appear three-dimensional and also give them depth. For the faultless recognition of objects, surfaces and structures, a suitable lighting installation is required. A bright space with solely diffuse light without shadowing has the effect of being monotonous. Lack of orientation and the inadequate recognition of objects and distances leads to discomfort.

In contrast, a correct ratio of diffuse light (e.g. with indirect distribution) to directional light results in a pleasant shadow effect. Directional light models structures and creates dramaturgy.

Typical instruments for directional light are narrow beam spots or downlights that are equipped with spot sources and bundled reflector systems. These luminaires are adjustable for situations where a spacial setting of the light output is required (i.e. rotational, pivotable, focussable).

### Glare

Basically, two forms of glare can be distinguished. Firstly, glare resulting from physiological conditions and secondly a psychological glare. Physiological glare designates the situation in which too high or too low a level of contrast occurs, leading to an acute and measurable reduction of visual performance.

Psychological glare signifies when a lighting situation either short-term or long-term has a disturbing influence. This is statistically determined (by surveys). Both forms of glare can be caused by the light source itself (direct glare) or through reflections of light sources on surfaces (reflected glare). This leads to discomfort and impairs performance and concentration ability. On the basis of occupational safety and ergonomics, glare should therefore be avoided.

Brightness is measured in terms of luminance (candela/square metre, cd/m<sup>2</sup>). The luminance values are evaluated with the light emission aperture of a luminaire that lies within the field of vision or the direction of viewing.

The degree of (psychological) direct glare from luminaires as part of a lighting system in indoor spaces is measured today with the CIE Unified Glare Rating System (UGR). Here the absolute luminance value of the light emission aperture

of the luminaire is not alone decisive, but also the luminance ratio of room surfaces, the alignment of the luminaire in the field of vision and the room size.

With reflected glare, the glare occurs indirectly. The light of the luminaire is mirrored with a medium (for example a magazine or computer monitor) into the field of view of the observer. This can be reduced or completely avoided if the brightness of the luminaire is reduced or the geometrical proportions of the luminaire to the surface and the eye are changed, or when the surface is matt, thus avoiding glare.

### Flickering and Stroboscopic Effects

With luminaires with discharge lamps, flickering and stroboscopic effects can occur as a result of AC current. Flickering causes visual impairments, tiredness and headaches.

Objects that move quickly (for example rotating machine parts) can under adverse lighting conditions be perceived as stationary in cases where the chronological change in luminous flux runs simultaneously to the actual movement itself (stroboscopic effect). This can in certain circumstances be exceedingly dangerous.

In order to eliminate flicker and stroboscopic effects it is recommended to operate lamps with an electronic ballast. The use of electronic ballasts saves energy in comparison to conventional ballasts, extends the life cycle of the lamps and provides a high level of convenience when controlling and maintaining the lighting system.

### Colour Rendering and Light Colour

In natural daylight the surfaces of objects appear in their true colours. This lighting situation forms the benchmark for colour perception with artificial light. The colour rendering characteristics of an artificial light source are expressed in terms of the colour rendering index (CRI). This measures the degree to which objects illuminated by the source conform with the same objects illuminated by a reference illuminant. Incandescent lamps, due to their continuous colour spectrum, have the best colour rendition. Discharge lamps have all colour rendition grades. It is currently being debated whether to amend the index, because LEDs are adversely evaluated.

The area of use determines the colour rendering properties of a light source.

Where colour authenticity is important, eg. for inspection tasks, retail spaces for foodstuffs, textiles, print media, the automotive industry and in museums, light sources with good colour rendition are used.

With the illumination of products in retail areas (especially fresh produce such as meat, fruit, vegetables, etc.), lamps and luminaire systems are implemented that emphasise the red spectral components of fresh goods and give these an appetising appearance.

In the area of all-purpose lighting for indoor spaces, fluorescent lamps, metal halide lamps and tungsten halogen lamps are generally used. Incandescent lamps usually have a warm white colour temperature (2700 – 3000 Kelvin), but with fluorescent lamps and metal halide lamps there is a selection of various white tones:

Warm white light has a higher red component. This gives the room a somewhat warmer appearance.

Colour temperature to 3300K.

Neutral white

Colour temperature 3300 – 5300K.

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Daylight white light has a higher blue component. This makes the room cooler. Colour temperature above 5300K.

At the present time, fluorescent lamps with colour temperatures of 8000K and greater are being introduced. The very high blue component in the spectrum of these lamps is intended to influence the receptors in the eye that regulate the hormone Melatonin, controlling the Circadian rhythm (day/night rhythm) of the body. It is hoped to achieve a similarly inspiring/awaking effect as with a blue sky on a sunny day.

### Coloured Light

With coloured light, the colour perception of surfaces can be influenced. This can be deployed for orientation purposes, for signalling or for reasons of effect. The random creation of colours with RGB colour mixing is often to be found with contemporary lighting designs. Here the red, green and blue light components are layered on top of each other with the help of a lighting control system. Coloured fluorescent lamps or LED's are used here as light sources.

### Light distribution and Light Characteristics

The distribution of deployed luminaires influences to a great extent the effect of illuminated spaces or objects.

#### Indoor Lighting

Direct light distribution is characterised by light that is radiated directly into the room or directly onto the working surface. In terms of lighting levels, direct distribution offers the highest efficiency. Depending upon the optical system of the luminaire, a direct viewing of the lamp and a corresponding glare effect should be taken into account.

With the deployment of suitable optical components such as diffusers (opalcent covers), refractors (prismatic enclosures), ELDACON® technology and secondary systems, direct distribution luminaires can be designed with glare-free characteristics. Louvre optics ensure an absence of glare above a specific beam angle area.

With secondary luminaire systems, the light from the lamp is initially reflected from a primary reflector to a secondary reflector that are both enclosed in the luminaire, and from there it is directed into the room. The lamp cannot be seen. Secondary reflector systems also use secondary light distribution, however the light point resolution reflector and the projector are spatially separated from each other.

With indirect distribution, the light output from a luminaire is radiated into the room via a reflecting surface such as a wall or ceiling. A bright, friendly room appearance is created with glare-free illumination. However a purely indirect illumination creates a diffuse light atmosphere with a low level of shadows that may become monotonous and tiring.

Composite distribution characteristics, i.e. direct-indirect or indirect-direct distribution combine the advantages of both approaches and are frequently used for indoor lighting.

With reference to the beam angle, diffuse, wide, medium and narrow distribution characteristics are deployed. For a highest possible uniformity of surface illumination, diffuse, wide or medium distribution luminaires are predominantly used, whereas for accenting and the lighting of higher spaces narrow distribution is used.

Narrow beam characteristics are usually created with spot sources such as tungsten halogen lamps, metal-halide lamps and LEDs. Wide, medium and diffuse distribution can be created with the complete spectrum of lamps.

## Standards, directives and lighting information

With the calculation of lighting installations the lighting designer is recommended to abide by technological directives (e.g. DIN or EN standards) and legal stipulations (e.g. workplace guidelines, computer screen directives, professional association regulations), and he can also make use of explanatory information made available by professional associations, publications and lighting profession associations.

For particular environments (e.g. rail marshalling yards), requirements may be made that exceed normal standards. As such, all rules and directives applicable for a lighting installation must be used and the highest demands specified must be fulfilled.

### Relevant standards:

DIN 5035	Lighting with Artificial Light Section 3: Lighting for Health Care Section 6: Measurement and Evaluation Section 7: Lighting of Rooms with DSE Workstations Section 8: Workstation Luminaires Requirements, Recommendations and Inspection
DIN 5039	Light, Lamps, Luminaires – Concepts and Classification
DIN 5040	Luminaires for Lighting Uses; Section 1: Optical Characteristics and Classification Section 2: Indoor Luminaires, Concepts and Classification Section 3: Outdoor Luminaires, Concepts and Classification Section 4: Projectors; Concepts and Optical Evaluation Parameters
DIN 5044-1	Stationary Traffic Lighting; lighting of roads for motor vehicle traffic; general quality attributes and guidelines
DIN EN 12665	Light and Lighting Basic concepts and criteria for specification of requirements for lighting
DIN EN 12464	Light and Lighting – Illumination of Workplaces Section 1: Indoor Workplaces Section 2: Outdoor Workplaces
DIN EN 13201	Road Lighting Section 1: Selection of Lighting Classifications Section 2: Quality Criteria Section 3: Calculation of Quality Attributes Section 4: Methods for Measurement of Quality Criteria for Streetlighting Installations
DIN EN 13032	Light and Lighting – Measurement and Presentation of Photometric Data for Lamps and Luminaires
DIN V 18599	Energy Evaluation of Buildings – Calculation of effective, end and primary energy requirements for heating, cooling, ventilation, drinking water and lighting Section 1: General evaluation process, concepts, zoning and evaluation of energy carriers Section 4: Effective and End Energy Requirements for Luminaires

DIN EN ISO 9241	Ergonomic Requirements for Office Activities with DSE screens Section 7: Requirements for Visual Presentation with Regard to Reflections
DIN EN 1838	Applied Lighting Technology – Emergency Lighting
CIE S 015:2005	Lighting of Outdoor Work Places

### Relevant Regulations:

Workplace Guidelines (ASR)	ASR 7/3 Artificial Lighting ASR 7/4 Security Lighting ASR 41/3 Artificial Lighting for Workplaces and Outdoor Traffic Routes
DSE Workstation Work Provision (BildscharbV)	
Assembly Points Provision (country-specific)	
Federal Immission Protection Law	
BGR 131	Natural and Artificial Lighting of Workplaces; Section 1: Practical Aid for Business Section 2: Guidelines for Planning and Operation of Lighting
BGR 216	Optical Emergency Signal Systems (including security lighting)
D954.9103	Electrical Energy Facilities; lighting installations near to tracks and/or security relevant areas
D954.9103/LAWL*	Luminaire selection lists
D954.9103/MB1	Data sheet 1: luminaire clearance for German Railways
Helpful information:	
BGI 650	DSE and Office Workstations - Design Guidelines
BGI 856	Office Lighting; aids for the planning of lighting installations for rooms with DSE and office workstations
LiTG Publication	The UGR process for evaluation of direct glare for artificial lighting of indoor areas
CIE 97-1992	Maintenance of indoor electric lighting systems
CIE 140-2000	Road lighting calculations
D81304	Designing Railway Stations for People; Planning Handbook for Equipping of Technical Buildings
ZVEI publication	Guidelines for DIN EN 12464-1

## Technology- and Design Centre – TDC



The Technology- and Design Centre from Siteco offers scope for technology, know-how, dialogue and inspiration – the experience of light and transfer of knowledge under one roof.

Let yourself be inspired by our lighting forum. Just speak to your sales representative.

We can organise your personal training programme selected from our wide spectrum of training components, and can also organise the entire planning from arrival until departure.

Ergonomics, cost efficiency and environmental compatibility are the focus of our activities and also of course of our seminars. You can experience lighting in our lighting laboratory at first hand and find out more about:

- Energy-efficient solutions for indoors and outdoors with the aid of innovative lighting systems.
- The contribution of daylight systems, lighting control and LED for ergonomics, safety and environmental compatibility.
- Lighting solutions for special applications such as offices, retail spaces, industry, roads and public spaces
- Design possibilities with light
- Current standards and their consequences for lighting design

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5AA17470V	10.17	5DC11J77VL335K	3.49	5DNA350SW	3.72	5LA91111FA308	10.43
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5AA27371V	10.21	5DC12KD7VL353E	3.50	5DNA73002	3.75	5LE14502UR	6.101
5AA27470V	10.21	5DCA2100	3.72	5DNA7501	3.74	5LE14601RR	6.101
5AA27471V	10.21	5DCA230A	3.72	5DQ11W67VL102A	3.78	5LE14601RR1	6.93, 6.102
5AA32000M	10.27	5DCA230B	3.72	5DQ11W67VL302A	3.78	5LE14601RR2	6.93, 6.102
5AA32000ME	10.28	5DCA230S	3.72	5DQ11W67VL402A	3.78	5LE14601UR	6.101
5AA32090E	10.27	5DCA230W	3.72	5DQ11WX7VL102A	3.78	5LE14601UR1	6.93, 6.102
5AA32090EE	10.28	5DCA3480W	3.72	5DQ11WX7VL302A	3.78	5LE14601UR2	6.93, 6.102
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5AA32290GE	10.25	5DCA4100W	3.73	5EA6Y00L06	10.68	5LE78032EG0	6.96, 6.128
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5AA35609X	10.29	5DCA73002	3.75	5GK51A07NV31	5.5	5LE98111UG	6.143
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5AA40006X	10.55	5DN11A01NQ30	3.67	5GK51A07NX71	5.6	5LE98211RR2	6.142
5AA40007X	10.55	5DN11B01MD30	3.63	5GK52A07GA51	5.7	5LE98211UR2	6.142
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5AA42172K	10.52	5DN11H01MD30	3.65	5GK52A07NL51	5.7	5LF11472XN	2.164
5AA43171K	10.53	5DN11H01NQ30	3.70	5GK52A07NL71	5.9	5LF11473MN	2.165
5AA43171T	10.53	5DN11J01MD30	3.66	5GK52S07GA21	5.17	5LF11473YN	2.165
5AA43172K	10.53	5DN11J01NQ30	3.71	5GK52S07NE21	5.17	5LF11474MN	2.165
5AA43172T	10.53	5DN11K77VL336C	3.56	5GK61A07AA51	5.13	5LF11474YN	2.165
5AA44171K	10.54	5DN11K77VL336E	3.56	5GK61A07GA51	5.13	5LF114D1HN	2.164
5AA44171T	10.54	5DN11K78VL3W3C	3.60	5GK61A07NE51	5.13	5LF114D2HN	2.164
5AA44172K	10.54	5DN11K78VL3W3E	3.60	5GK61A07TL51	5.13	5LF114D2QN	2.164
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5AA52002M	10.11	5DN12B77VL336E	3.59	5GK90004LG	5.11, 5.14, 5.18	5LF11671HN	2.166
5AA52090E	10.11	5DN12BD7VL356C	3.59	5GK90006LG	5.11, 5.14, 5.18	5LF11672HN	2.166
5AA52091E	10.11	5DN12BD7VL356E	3.59	5GK90011C	5.10	5LF11672WN	2.166
5AA53092E	10.12	5DN12K77VL336C	3.58	5GK90012C	5.10	5LF11672XN	2.166
5AA53270K	10.12	5DN12K77VL336E	3.58	5GK90013E	5.10, 5.14	5LF11673MN	2.167
5AA53271K	10.12	5DN12K78VL3W3C	3.61	5GK90014E	5.10	5LF11673YN	2.167
5AA61000M	10.7	5DN12K78VL3W3E	3.61	5GK90014R	5.10, 5.18	5LF11674MN	2.167
5AA62000M	10.7	5DN12KD7VL356C	3.58	5GK90105LG	5.11, 5.14, 5.18	5LF11674YN	2.167
5AA62090E	10.7	5DN12KD7VL356E	3.58	5GK90150VG	5.11, 5.14, 5.18	5LF116D1HN	2.166
5DC11A77VL333C	3.47	5DN16074L	3.74	5LA52822KS28	10.71	5LF116D2HN	2.166
5DC11A77VL333E	3.47	5DN16075L	3.74	5LA52822KS38	10.71	5LF116D2QN	2.166
5DC11AD7VL353C	3.47	5DN16076L	3.74	5LA52822KS58	10.72	5LF116D2WN	2.166
5DC11AD7VL353E	3.47	5DN16077L	3.74	5LA52822KS68	10.72	5LF116D3BN	2.167
5DC11B01KE30	3.51	5DNA2100	3.72	5LA52922KS28	10.73	5LF116D4BN	2.167
5DC11B01LQ30	3.53	5DNA220W	3.72	5LA52922KS28D	10.75	5LF11B71HN	2.162
5DC11B77VL333C	3.48	5DNA2300	3.72	5LA52922KS38	10.73	5LF11B72HN	2.162
5DC11B77VL333E	3.48	5DNA230A	3.72	5LA75771TS0108	8.40	5LF11B72WN	2.162

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5LF11B73MN	2.163	5LF41671P	2.156	5LF41W72P	2.152	5LF53B71RW	2.37
5LF11B73YN	2.163	5LF41671PW	2.157	5LF41W72PW	2.153	5LF53B71XW	2.37
5LF11B74MN	2.163	5LF41671R	2.156	5LF41W72R	2.152	5LF53B72FW	2.37
5LF11B74YN	2.163	5LF41671RW	2.157	5LF41W72RW	2.153	5LF53B72HW	2.37
5LF11BD1HN	2.162	5LF41671X	2.156	5LF41WD1H	2.152	5LF53B72JW	2.37
5LF11BD2HN	2.162	5LF41671XW	2.157	5LF41WD1HW	2.153	5LF53B72PW	2.37
5LF11BD2QN	2.162	5LF41672F	2.156	5LF41WD2W	2.152	5LF53B72RW	2.37
5LF11BD2WN	2.162	5LF41672FW	2.157	5LF51661HW	2.86	5LF53B72WW	2.37
5LF11BD3BN	2.163	5LF41672J	2.156	5LF51661QW	2.86	5LF53B72XW	2.37
5LF11BD4BN	2.163	5LF41672JW	2.157	5LF51662HW	2.86	5LF53BD1HW	2.37
5LF12471HN	2.164	5LF41672P	2.156	5LF51662WW	2.86	5LF53BD1QW	2.37
5LF12472HN	2.164	5LF41672PW	2.157	5LF51671FW	2.86	5LF53BD2HW	2.37
5LF12473MN	2.165	5LF41672R	2.156	5LF51671HW	2.86	5LF53BD2WW	2.37
5LF12473YN	2.165	5LF41672RW	2.157	5LF51671JW	2.86	5LF90001L	2.7, 2.11, 2.39, 2.68
5LF12474MN	2.165	5LF41672X	2.156	5LF51671PW	2.86	5LF90002L	2.7, 2.11, 2.39, 2.68, 2.81
5LF12474YN	2.165	5LF41672XW	2.157	5LF51671QW	2.86	5LF90003L	2.21, 2.68, 2.81, 2.193
5LF124D1HN	2.164	5LF416D1H	2.156	5LF51671RW	2.86	5LF90005L	2.7, 2.11, 2.39, 2.68, 2.81
5LF124D2HN	2.164	5LF416D1Q	2.156	5LF51672FW	2.86	5LF90006L	2.21, 2.68, 2.81, 2.193
5LF124D3BN	2.165	5LF416D1QW	2.157	5LF51672HW	2.86	5LF90011	2.158
5LF124D4BN	2.165	5LF416D2HW	2.157	5LF51672JW	2.86	5LF90012	2.158
5LF12671HN	2.166	5LF41B61H	2.154	5LF51672PW	2.86	5LF90014XC	2.166
5LF12672HN	2.166	5LF41B61HW	2.155	5LF51672RW	2.86	5LF90021	2.158
5LF12673MN	2.167	5LF41B61LW	2.155	5LF51672WW	2.86	5LF90022	2.158
5LF12673YN	2.167	5LF41B61Q	2.154	5LF516D1HW	2.86	5LF90024XC	2.166
5LF12674MN	2.167	5LF41B61QW	2.155	5LF516D1QW	2.86	5LF9011	2.158
5LF12674YN	2.167	5LF41B62H	2.154	5LF516D2HW	2.86	5LF90110XC	2.167
5LF126D1HN	2.166	5LF41B62HW	2.155	5LF516D2WW	2.86	5LF9012	2.158
5LF126D2HN	2.166	5LF41B62W	2.154	5LF51961HW	2.195	5LF90210XC	2.167
5LF126D3BN	2.167	5LF41B62WW	2.155	5LF51961QW	2.195	5LF9084	8.11, 8.15
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5LF12B73YN	2.163	5LF41B71P	2.154	5LF51971XW	2.195	5LF91302	2.7
5LF12B74MN	2.163	5LF41B71PW	2.155	5LF519D1HS	2.195	5LF913020D	2.80
5LF12B74YN	2.163	5LF41B71R	2.154	5LF519D1HW	2.195	5LF91302A	2.7
5LF12BD1HN	2.162	5LF41B71RW	2.155	5LF519D1QS	2.195	5LF91302AD	2.80
5LF12BD2HN	2.162	5LF41B71X	2.154	5LF519D1QW	2.195	5LF91302BD	2.33
5LF12BD3BN	2.163	5LF41B71XW	2.155	5LF51B61HW	2.85	5LF91305B	2.39
5LF12BD4BN	2.163	5LF41B72F	2.154	5LF51B61QW	2.85	5LF91305BA	2.39
5LF28662H	8.13	5LF41B72FW	2.155	5LF51B62BW	2.85	5LF91306B	2.39
5LF28662Q	8.13	5LF41B72J	2.154	5LF51B62HW	2.85	5LF91306BA	2.39
5LF28663H	8.13	5LF41B72JW	2.155	5LF51B62QW	2.85	5LF91311	2.7, 2.39
5LF28663Q	8.13	5LF41B72P	2.154	5LF51B62WW	2.85	5LF91311A	2.7, 2.39
5LF28672F	8.13	5LF41B72PW	2.155	5LF51B71FW	2.85	5LF91312	2.7
5LF28672J	8.13	5LF41B72R	2.154	5LF51B71HW	2.85	5LF91312A	2.7
5LF28672X	8.13	5LF41B72RW	2.155	5LF51B71JW	2.85	5LF91401	2.39
5LF28673F	8.13	5LF41B72X	2.154	5LF51B71PW	2.85	5LF91401A	2.39
5LF28673J	8.13	5LF41B72XW	2.155	5LF51B71QW	2.85	5LF91411	2.39
5LF28673X	8.13	5LF41BD1H	2.154	5LF51B71RW	2.85	5LF91411A	2.39
5LF286D3H	8.13	5LF41BD1HW	2.155	5LF51B71XW	2.85	5LF915010D	2.81
5LF286D3Q	8.13	5LF41BD1L	2.154	5LF51B72FW	2.85	5LF91501AD	2.81
5LF28762Q	8.14	5LF41BD1Q	2.154	5LF51B72HW	2.85	5LF91502BD	2.33
5LF28763H	8.14	5LF41BD1QW	2.155	5LF51B72JW	2.85	5LJ10001AB	2.108
5LF28763Q	8.14	5LF41BD2HW	2.155	5LF51B72PW	2.85	5LJ10001CB	2.108
5LF28772F	8.14	5LF41BD2Q	2.154	5LF51B72RW	2.85	5LJ10001EB	2.108
5LF28772J	8.14	5LF41BD2QW	2.155	5LF51B72WW	2.85	5LJ10001UB	2.108
5LF28772X	8.14	5LF41W61H	2.152	5LF51B72XW	2.85	5LJ10001XB	2.108
5LF28773F	8.14	5LF41W61HW	2.153	5LF51BD1HW	2.85	5LJ10002CB	2.108
5LF28773J	8.14	5LF41W61W	2.152	5LF51BD1QW	2.85	5LJ10002EB	2.108
5LF28773X	8.14	5LF41W62W	2.152	5LF51BD2HW	2.85	5LJ10002UB	2.108
5LF41661H	2.156	5LF41W62WW	2.153	5LF51BD2QW	2.85	5LJ10010XC	2.108
5LF41661HW	2.157	5LF41W71F	2.152	5LF51BD2WW	2.85	5LJ10021EK	2.108
5LF41661Q	2.156	5LF41W71FW	2.153	5LF53B61HW	2.37	5LJ10061A	2.107
5LF41661QW	2.157	5LF41W71J	2.152	5LF53B61QW	2.37	5LJ10061C	2.107
5LF41662HW	2.157	5LF41W71JW	2.153	5LF53B62HW	2.37	5LJ10061E	2.107
5LF41662W	2.156	5LF41W71P	2.152	5LF53B62WW	2.37	5LJ10061H	2.106
5LF41662WW	2.157	5LF41W71PW	2.153	5LF53B71FW	2.37	5LJ10061Q	2.106
5LF41671F	2.156	5LF41W71R	2.152	5LF53B71HW	2.37	5LJ10062C	2.107
5LF41671FW	2.157	5LF41W71RW	2.153	5LF53B71JW	2.37	5LJ10062E	2.107
5LF41671J	2.156	5LF41W72F	2.152	5LF53B71PW	2.37	5LJ10062H	2.106

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5U10071E	2.107	5U23201AW	4.21	5U80002XW	3.169	5U90910XD	6.81
5U10071F	2.106	5U23201CW	4.21	5U80003XK	2.87, 6.81, 6.121	5U90910XV	2.82, 6.81, 6.121, 7.70
5U10071H	2.106	5U23201EW	4.21	5U80005XK	6.81, 6.121	5U90911XC	6.115, 6.131, 7.71
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5U10071P	2.106	5U23202CW	4.21	5U90010ED	6.143	5U90920E	2.82, 6.80, 6.120
5U10071Q	2.106	5U23202EW	4.21	5U90010XC	6.146	5U90920E1	6.80
5U10071R	2.106	5U23204AW	4.21	5U90010XV1	6.143	5U90920U	2.82, 6.80
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5U10071X	2.106	5U23471C	4.20	5U90020XC2	6.145	5U90920XV	6.81
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5U10072R	2.106	5U23571C	4.19	5U90030XC2	6.144	5U90930XC	6.114, 6.130, 7.70
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5LJ93371QMD	6.139	5LM70171C	2.189	5LP51675C	2.90	5LR11471VA61	3.160
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5LJ933D1HMA	6.140	5LM70171EX2	2.192	5LP51B71E	2.89	5LR11472VA61	3.160
5LJ933D1HMD	6.139	5LM70171F	2.189	5LP51B75C	2.89	5LR11472VA6102	3.161
5LJ933D1HX03D	6.139	5LM70171J	2.189	5LP51B75E	2.89	5LR114D1VA61	3.160
5LJ933D1HX04D	6.139	5LM70171P	2.189	5LP90000XC	2.158, 2.176, 2.177, 2.181	5LR114D2NA61	3.160
5LJ933D1Q	6.139	5LM70171R	2.189	5LP90010XC	2.158, 2.176, 2.177, 2.181	5LR114D2VA61	3.160
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5LJ933D1QMD	6.139	5LM70261C	2.187	5LP90012	2.176	5LR12201JA51	3.155
5LJ933D1QX03D	6.139	5LM70261E	2.187	5LP91202X	6.114	5LR12201SA51	3.156
5LJ933D1QX04D	6.139	5LM70261F	2.187	5LP91212X	6.114	5LR13461VA61	3.162
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5LL21273A	2.99	5LM70271P	2.187	5LQ11273A	2.179	5LR13472VA61	3.162
5LL21274A	2.99	5LM70271R	2.187	5LQ11274A	2.179	5LR134D1VA61	3.162
5LL21275C	2.98	5LM70271X	2.187	5LQ11673A	2.180	5LR134D2NA61	3.162
5LL21275E	2.98	5LM82001	2.193	5LQ11674A	2.180	5LR134D2VA61	3.162
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5LL21671E	2.100	5LP11671E	2.173	5LQ11774A	2.181	5LR14462NA61	3.163
5LL21673A	2.101	5LP11672C	2.173	5LR0003RA	3.169	5LR14462VA61	3.163
5LL21674A	2.101	5LP11672E	2.173	5LR0003SA	3.169	5LR14471FA61	3.163
5LL21675C	2.100	5LP11771C	2.175	5LR0008AA	3.110	5LR14471GA61	3.163
5LL21675E	2.100	5LP11771E	2.175	5LR0008GA	3.110	5LR14471VA61	3.163
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5LM59307	2.11	5LP41671C	2.172	5LR11272GA61	3.158	5LR21471VA6302	3.21
5LM59311A	2.7	5LP41671E	2.172	5LR11272LA51	3.153	5LR21471VA64	3.20
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5LM593120W	2.11	5LP41672E	2.172	5LR11272VA5102	3.154	5LR21472GA63	3.20
5LM70100	2.193	5LP41771C	2.174	5LR11272VA61	3.158	5LR21472GA64	3.20
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5LZ9059242	11.26	5MC11BD2RS	2.126	5MC22B74MS	2.53	5MC61B71JS	2.131
5LZ9059300049	11.42	5MC11BD2RW	2.126	5MC22B76YS	2.53	5MC61B71JW	2.131
5LZ905942	11.29	5MC11BD4MS	2.127	5MC22BD1FS	2.52	5MC61B71XS	2.131
5LZ906202	11.38	5MC11BD4MW	2.127	5MC22BD1JS	2.52	5MC61B71XW	2.131
5LZ914001	11.46	5MC12671JS	2.128	5MC22BD1XS	2.52	5MC61B71YS	2.131
5LZ914002	11.47	5MC12671JW	2.128	5MC22BD2PS	2.52	5MC61B71YW	2.131
5LZ914003	11.46, 11.47	5MC12671YS	2.128	5MC22BD2RS	2.52	5MC61B72MS	2.131
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5LZ914006	11.51	5MC12672JW	2.128	5MC24B71XS	2.19	5MC61B72PW	2.131
5LZ914007	11.52	5MC12672MS	2.128	5MC24B72FS	2.19	5MC61B72RS	2.131

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5MC61B74MW	2.132	5MD1990201	4.11	5MF43B75HS	2.26	5MJ223D1BS	2.75
5MC61BD1FS	2.131	5MD1990202	4.11	5MF43B75WS	2.26	5MJ223D1HS	2.75
5MC61BD1JS	2.131	5MD1990301	4.11	5MF43BD5WS	2.26	5MJ223D1QS	2.75
5MC61BD2PS	2.131	5MD1990302	4.11	5MF43W71HS	2.28	5MJ223D2HS	2.75
5MC61BD2PW	2.131	5MD22372T	4.11	5MF43W71WS	2.28	5MJ223D2WS	2.75
5MC61BD2RS	2.131	5MD22471D	4.11	5MF90001	2.28, 2.73	5MJ23102HW	2.83
5MC61BD2RW	2.131	5MD22472S	4.11	5MJ20001	2.80	5MJ23102QW	2.83
5MC61BD4MS	2.132	5MD22475D	4.11	5MJ20002	2.80	5MJ23161H	2.79
5MC61BD4MW	2.132	5MD229020W	4.11	5MJ20002BS	2.80	5MJ23161Q	2.79
5MC61BD6YS	2.132	5MD36371G	4.9	5MJ20002HA	2.80	5MJ23162H	2.79
5MC62671JS	2.133	5MD36371V1	4.9	5MJ20002HS	2.80	5MJ23162W	2.79
5MC62671JW	2.133	5MD36371V2	4.9	5MJ20002QA	2.80	5MJ23171H	2.79
5MC62671YS	2.133	5MD36372G	4.9	5MJ20002QS	2.80	5MJ23171Q	2.79
5MC62671YW	2.133	5MD36372G1	4.9	5MJ20004BW	2.82	5MJ23172H	2.79
5MC62672JS	2.133	5MD369020W	4.9	5MJ20005BW	2.82	5MJ23172W	2.79
5MC62672JW	2.133	5MD81471M1	4.8	5MJ21102BW	2.83	5MJ231D1H	2.79
5MC62672MS	2.133	5MD81471M3	4.8	5MJ21102HW	2.83	5MJ231D1Q	2.79
5MC62672MW	2.133	5MD81471Y1	4.8	5MJ21102QW	2.83	5MJ231D2H	2.79
5MC62672PS	2.133	5MD81471Y3	4.8	5MJ21161B	2.76	5MJ231D2W	2.79
5MC62672PW	2.133	5MD819010W	4.8	5MJ21161H	2.76	5MJ24302HW	2.83
5MC62672YS	2.133	5MD82471K1	4.8	5MJ21161Q	2.76	5MJ24302QW	2.83
5MC62672YW	2.133	5MD82471K3	4.8	5MJ21162H	2.76	5MJ24361HS	2.78
5MC62674MS	2.135	5MD829020W	4.8	5MJ21162W	2.76	5MJ24361QS	2.78
5MC62674MW	2.135	5MD85471M1	4.7	5MJ21171B	2.76	5MJ24362HS	2.78
5MC62674YS	2.135	5MD85471M3	4.7	5MJ21171H	2.76	5MJ24362WS	2.78
5MC62674YW	2.135	5MD85471W1	4.7	5MJ21171Q	2.76	5MJ24371HS	2.78
5MC626D1JS	2.133	5MD85471W3	4.7	5MJ21172H	2.76	5MJ24371QS	2.78
5MC626D1JW	2.133	5MD85471Y1	4.7	5MJ21172M	2.76	5MJ24372HS	2.78
5MC626D2PS	2.133	5MD85471Y3	4.7	5MJ21172W	2.76	5MJ24372WS	2.78
5MC626D2PW	2.133	5MD859010W	4.8	5MJ21172X	2.76	5MJ243D1HS	2.78
5MC626D4MS	2.135	5MF21471HS	2.72	5MJ21172Y	2.76	5MJ243D1QS	2.78
5MC626D4YW	2.135	5MF21471LS	2.72	5MJ211D1B	2.76	5MJ243D2HS	2.78
5MC62B71JS	2.131	5MF21471QS	2.72	5MJ211D1H	2.76	5MJ243D2WS	2.78
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5MC62B72MS	2.131	5MF21B71LS	2.71	5MJ22202BW	2.83	5MM12475UX	2.32
5MC62B72MW	2.131	5MF21B71QS	2.71	5MJ22202HW	2.83	5MM12476YX	2.32
5MC62B72PS	2.131	5MF21BD1QS	2.71	5MJ22202QW	2.83	5MM12477TJ	2.32
5MC62B72PW	2.131	5MF21W71HS	2.73	5MJ22261B	2.77	5MP12130H	2.140, 2.141, 2.142, 2.143, 2.147
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5MC62B74MW	2.132	5MF23471HS	2.27	5MJ22261Q	2.77	5MP12230H	2.140, 2.141, 2.142, 2.143
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5MC91002	2.21	5MF23B75LS	2.26	5MJ222D2H	2.77	5MP21130W	2.58, 2.59, 2.60, 2.61, 2.65
5MC91003	2.21	5MF23B75WS	2.26	5MJ222D2W	2.77	5MP21230H	2.58, 2.59, 2.60, 2.61
5MC91004	2.21	5MF23BD1HS	2.26	5MJ22302BW	2.83	5MP21230W	2.58, 2.59, 2.60, 2.61
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5MD119010W	4.11	5MF23BD1QS	2.26	5MJ22302QW	2.83	5MP21330W	2.65
5MD119020W	4.11	5MF23BD5WS	2.26	5MJ22361BS	2.75	5MP21430H	2.59, 2.61
5MD119030W	4.11	5MF23W71HS	2.28	5MJ22361HS	2.75	5MP21430W	2.59, 2.61
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5MD13471P	4.10	5MF43871WS	2.25	5MJ22372HS	2.75		
5MD13472H	4.10	5MF438D1HS	2.25	5MJ22372MS	2.75		
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		5MQ218D2N	2.8, 2.48	5NA75700ES	10.39	5NJ14301XC	8.25
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## General sales conditions

### I. GENERAL

1. The scope of deliveries and/or services (hereinafter referred to as „Supplies“) shall be determined by the written declarations of both Parties. General terms and conditions of the Purchaser shall apply only if and when expressly accepted by the supplier or the provider of services (hereinafter referred to as „Supplier“) in writing.

2. The Supplier herewith reserves any industrial property rights and/or copyrights pertaining to its cost estimates, drawings and other documents (hereinafter referred to as „Documents“). The Documents shall not be made accessible to third parties without the Supplier's prior consent and shall, upon request, be returned without undue delay to the Supplier if the contract is not awarded to the Supplier. Sentences 1 and 2 shall apply mutatis mutandis to documents of the Purchaser; these may, however, be made accessible to third parties to whom the Supplier may rightfully transfer Supplies.

3. The Purchaser shall have the non-exclusive right to use standard software, provided that it remains unchanged, is used within the agreed performance parameters, and on the agreed equipment. The Purchaser may make one back-up copy without express agreement.

4. Partial Supplies shall be allowed, unless they are unreasonable to accept for the Purchaser.

### II. PRICES AND TERMS OF PAYMENT

1. Prices shall be ex works and exclude packaging; value added tax shall be added at the then applicable rate.

2. If the Supplier is also responsible for assembly or erection and unless otherwise agreed, the Purchaser shall pay the agreed remuneration and any incidental costs required, e. g. travel costs, costs for the transport of tools and equipment, and personal luggage as well as allowances.

3. Payments shall be made free Supplier's paying office.

4. The Purchaser may set off only those claims that are undisputed or against which no legal recourse is possible.

### III. RETENTION OF TITLE

1. Items pertaining to the Supplies („Retained Goods“) shall remain the property of the Supplier until each and every claim the Supplier has against the Purchaser on account of the business connection has been fulfilled. If the combined value of the security interests of the Supplier exceeds the value of all secured claims by more than 20%, the Supplier shall release a corresponding part of the security interest if so requested by the Purchaser.

2. For the duration of the retention of title, the Purchaser may not pledge the Retained Goods or use them as security, and resale shall be possible only for resellers in the ordinary course of their business and only on condition that the reseller receives payment from its customer or makes the transfer of property to the customer dependent upon the customer fulfilling its obligation to effect payment.

3. The Purchaser shall inform the Supplier forthwith of any seizure or other act of intervention by third parties.

4. Where the Purchaser fails to fulfil its duties, including failure to make payments due, the Supplier shall be entitled to cancel the contract and take back the Retained Goods in the case of continued failure following expiry of a reasonable time set by the Supplier; the statutory provisions that a time limit is not needed remain unaffected. The Purchaser shall be obliged to surrender the Retained Goods.

### IV. TIME FOR SUPPLIES; DELAY

1. Times set for Supplies can only be observed if all Documents to be supplied by the Purchaser, necessary permits and releases, especially concerning plans, are received in time and if agreed terms of payment and other obligations of the Purchaser are fulfilled. Unless these conditions are fulfilled in time, times set shall be extended appropriately; this shall not apply where the Supplier is responsible for the delay.

2. If non-observance of the times set is due to force majeure such as mobilization, war, rebellion or similar events, e. g. strike or lockout, such time shall be extended accordingly.

3. If the Supplier is responsible for the delay (hereinafter referred to as „Delay“) and the Purchaser demonstrably suffered a loss therefrom, the Purchaser may claim a compensation as liquidated damages of 0.5 % for every completed week of Delay, but in no case more than a total of 5 % of the price of that part of the Supplies which because of the Delay could not be put to the intended use.

4. Purchaser's claims for damages due to delayed Supplies as well as claims for damages in lieu of performance exceeding the limits specified in No. 3 above shall be excluded in all cases of delayed Supplies even upon expiry of a time set to the Supplier to effect the Supplies. This shall not apply in cases of mandatory liability based on intent, gross negligence, or due to injury of life, body or health. Cancellation of the contract by the Purchaser based on statute shall be limited to cases where the Supplier is responsible for the delay. The above provisions do not imply a change in the burden of proof to the detriment of the Purchaser.

5. At the Supplier's request the Purchaser shall declare within a reasonable period of time whether the Purchaser cancels the contract due to the delayed Supplies or insists on the Supplies to be carried out.

6. If dispatch or shipment is delayed at the Purchaser's request by more than one month after notice of the readiness for dispatch was given, the Purchaser may be charged, for every month commenced, storage costs of 0.5 % of the price of the items of the Supplies, but in no case more than a total of 5 %. The parties to the contract may prove that higher or, as the case may be, lower storage costs have been incurred.

### V. TRANSFER OF RISK

1. Even where delivery has been agreed freight free, the risk shall pass to the Purchaser as follows: a) if the Supplies do not include assembly or erection, at the time when the Supplies are shipped or picked up by the carrier. Upon request of the Purchaser, the Supplier shall insure the Supplies against the usual risks of transport at the expense of the Purchaser; b) if the Supplies include assembly or erection, at the day of taking over in the own works or, if so agreed, after a fault-free trial run.

2. The risk shall pass to the Purchaser if dispatch, shipping, the start or performance of assembly or erection, the taking over in the own works or the trial run is delayed for reasons for which the Purchaser is responsible or if the Purchaser has otherwise failed to accept the Supplies.

### VI. ASSEMBLY AND ERECTION

Unless otherwise agreed in writing, assembly/erection shall be subject to the following provisions: 1. The Purchaser shall provide at its own expense and in good time: a) all earth and construction work and other ancillary work outside the scope of the Supplier, including the necessary skilled and unskilled labour, construction materials and tools,

b) the equipment and materials necessary for assembly and commissioning such as scaffolds, lifting equipment and other devices as well as fuels and lubricants,

c) energy and water at the point of use including connections, heating and lighting,

d) suitable dry and lockable rooms of sufficient size adjacent to the site for the storage of machine parts, apparatus, materials, tools, etc. and adequate working and recreation rooms for the erection personnel, including sanitary facilities as are appropriate in the specific circumstances. Furthermore, the Purchaser shall take all measures it would take for the protection of its own possessions to protect the possessions of the Supplier and of the erection personnel at the site,

e) protective clothing and protective devices needed due to particular conditions prevailing on the specific site.

2. Before the erection work starts, the Purchaser shall make available of its own accord any information required concerning the location of concealed electric power, gas and water lines or of similar installations as well as the necessary structural data.

3. Prior to assembly or erection, the materials and equipment necessary for the work to start must be available on the site of assembly/erection and any preparatory work must have advanced to such a degree that assembly/erection can be started as agreed and carried out without interruption. Access roads and the assembly/erection site itself must be level and clear.

4. If assembly, erection or commissioning is delayed due to circumstances for Translation of the original German text which the Supplier is not responsible, the

Purchaser shall bear the reasonable costs incurred for idle times and any additional travelling of the Supplier or the erection personnel.

5. The Purchaser shall attest to the hours worked by the erection personnel towards the Supplier at weekly intervals and the Purchaser shall immediately confirm in writing if assembly, erection or commissioning has been completed.

6. If, after completion, the Supplier demands acceptance of the Supplies, the Purchaser shall comply therewith within a period of two weeks. In default thereof, acceptance is deemed to have taken place. Acceptance is also deemed to have been effected if the Supplies are put to use, after completion of an agreed test phase, if any.

#### VII. RECEIVING OF SUPPLIES

The Purchaser shall not refuse to receive Supplies due to minor defects.

#### VIII. DEFECTS AS TO QUALITY

The Supplier shall be liable for defects as to quality („Sachmängel“, hereinafter referred to as „Defects“) as follows:

1. All parts or services where a Defect becomes apparent within the limitation period shall, at the discretion of the Supplier, be repaired, replaced or provided again free of charge irrespective of the hours of operation elapsed, provided that the reason for the Defect had already existed at the time when the risk passed.

2. Claims based on Defects are subject to a limitation period of 12 months. This provision shall not apply where longer periods are prescribed by law according to Sec. 438 para. 1 No. 2 (buildings and things used for a building), Sec. 479 para. 1 (right of recourse), and Sec. 634a para. 1 No. 2 (defects of a building) German Civil Code („BGB“), as well as in cases of injury of life, body or health, or where the Supplier intentionally or grossly negligently fails to fulfil its obligation or fraudulently conceals a Defect. The legal provisions regarding suspension of expiration („Ablaufhemmung“), suspension („Hemmung“) and recommencement of limitation periods remain unaffected.

3. The Purchaser shall notify Defects to the Supplier in writing and without undue delay.

4. In the case of notification of a Defect, the Purchaser may withhold payments to a reasonable extent taking into account the Defect occurred. The Purchaser, however, may withhold payments only if the subject-matter of the notification of the Defect occurred is justified beyond doubt. Unjustified notifications of Defect shall entitle the Supplier to have its expenses reimbursed by the Purchaser.

5. The Supplier shall first be given the opportunity to supplement its performance („Nacherfüllung“) within a reasonable period of time.

6. If supplementary performance is unsuccessful, the Purchaser shall be entitled to cancel the contract or reduce the remuneration, irrespective of any claims for damages it may have according to Art. XI.

7. There shall be no claims based on Defect in cases of insignificant deviations from the agreed quality, of only minor impairment of usefulness, of natural wear and tear or damage arising after the transfer of risk from faulty or negligent handling, excessive strain, unsuitable equipment, defective workmanship, inappropriate foundation soil or from particular external influences not assumed under the contract, or from non-reproducible software errors. Claims based on defects attributable to improper modifications or repair work carried out by the purchaser or third parties and the consequences thereof shall be likewise excluded.

8. The Purchaser shall have no claim with respect to expenses incurred in the course of supplementary performance, including costs of travel and transport, labour, and material, to the extent that expenses are increased because the subject-matter of the Supplies was subsequently brought to another location than the Purchaser's branch office, unless doing so complies with the intended use of the Supplies.

9. The Purchaser's right of recourse against the Supplier pursuant to Sec. 478 BGB is limited to cases where the Purchaser has not concluded an agreement with its customers exceeding the scope of the statutory provisions governing claims based on Defects. Moreover, No. 8 above shall apply mutatis mutandis to the scope of the right of recourse the Purchaser has against the Supplier pursuant to Sec. 478 para. 2 BGB.

10. Furthermore, the provisions of Art. XI (Other Claims for Damages) shall apply in respect of claims of damages. Any other claims of the Purchaser against the Supplier or its agents or any such claims exceeding the claims provided for in this Art. VIII, based on a Defect, shall be excluded.

#### IX. INDUSTRIAL PROPERTY RIGHTS AND COPYRIGHT; DEFECTS IN TITLE

1. Unless otherwise agreed, the Supplier shall provide the Supplies free from third parties' industrial property rights and copyrights (hereinafter referred to as „IPR“) with respect to the country of the place of destination. If a third party asserts a justified claim against the Purchaser based on an infringement of an IPR with respect to the Supplies made by the Supplier and then used in conformity with the contract, the Supplier shall be liable to the Purchaser within the time period stipulated in Art. VIII No. 2 as follows:

a) The Supplier shall choose whether to acquire, at its own expense, the right to use the IPR with respect to the Supplies concerned or whether to modify the Supplies such that they no longer infringe the IPR or replace them. If this would be unreasonable to demand from the Supplier, the Purchaser may cancel the contract or reduce the remuneration pursuant to the applicable statutory provisions.

b) The Supplier's liability to pay damages shall be governed by Art. XI.

c) The above obligations of the Supplier shall only apply if the Purchaser (i) immediately notifies the Supplier of any such claim asserted by the third party in writing, (ii) does not concede the existence of an infringement and (iii) leaves any protective measures and settlement negotiations to the discretion of the Supplier. If the Purchaser stops using the Supplies in order to reduce the damage or for other good reason, it shall be obliged to point out to the third party that no acknowledgement of the alleged infringement may be inferred from the fact that the use has been discontinued.

2. Claims of the Purchaser shall be excluded if it is itself responsible for the infringement of an IPR.

3. Claims of the Purchaser shall also be excluded if the infringement of the IPR is caused by specifications made by the Purchaser, to a type of use not foreseeable by the Supplier or to the Supplies being modified by the Purchaser or being used together with products not provided by the Supplier.

4. In addition, with respect to claims by the Purchaser pursuant to No. 1 a) above, Art. VIII Nos. 4, 5, and 9 shall apply mutatis mutandis in the event of an infringement of an IPR.

5. Where other defects in title occur, Art. VIII shall apply mutatis mutandis.

6. Any other claims of the Purchaser against the Supplier or its agents or any such claims exceeding the claims provided for in this Art. IX, based on a defect in title, shall be excluded.

#### X. IMPOSSIBILITY OF PERFORMANCE; ADAPTATION OF CONTRACT

1. To the extent that Supplies are impossible to be carried out, the Purchaser shall be entitled to claim damages, unless the Supplier is not responsible for the impossibility. The Purchaser's claim for damages shall, however, be limited to an amount of 10 % of the value of the part of the Supplies which, owing to the impossibility, cannot be put to the intended use. This limitation shall not apply in the case of mandatory liability based on intent, gross negligence or injury of life, body or health; this does not imply a change in the burden of proof to the detriment of the Purchaser. The right of the Purchaser to cancel the contract shall remain unaffected.

2. Where unforeseeable events within the meaning of Art. IV No. 2 substantially change the economic importance or the contents of the Supplies or considerably affect the Supplier's business, the contract shall be adapted taking into account the principles of reasonableness and good faith. Where doing so is economically unreasonable, the Supplier shall have the right to cancel the contract. If the Supplier intends to exercise its right to cancel the contract, it shall notify the Purchaser thereof without undue delay after having realised the repercussions of the event; this shall also apply even where an extension of the delivery period had previously been agreed with the Purchaser.

#### XI. OTHER CLAIMS FOR DAMAGES

1. Any claims for damages and reimbursement of expenses the Purchaser may have (hereinafter referred to as „Claims for Damages“), based on whatever legal reason, including infringement of duties arising in connection with the contract or tort, shall be excluded.

2. The above shall not apply in the case of mandatory liability, e. g. under the German Product Liability Act („Produkthaftungsgesetz“), in the case of intent, gross negligence, injury of life, body or health, or breach of a condition which goes to the root of the contract („wesentliche Vertragspflichten“). However, Claims for Damages arising from a breach of a condition which goes to the root of the contract shall be limited to the foreseeable damage which is intrinsic to the contract, unless caused by intent or gross negligence or based on liability for injury of life, body or health. The above provision does not imply a change in the burden of proof to the detriment of the Purchaser.

3. To the extent that the Purchaser has a valid Claim for Damages according to this Art. XI, it shall be time-barred upon expiration of the limitation period applicable to Defects pursuant to Art. VIII No. 2. In the case of claims for damages under the German Product Liability Act, the statutory provisions governing limitation periods shall apply.

## XII. VENUE AND APPLICABLE LAW

1. If the Purchaser is a businessperson, sole venue for all disputes arising directly or indirectly out of the contract shall be the Supplier's place of business. However, the Supplier may also bring an action at the Purchaser's place of business.

2. Legal relations existing in connection with this contract shall be governed by German substantive law, to the exclusion of the United Nations Convention on Contracts for the International Sale of Goods (CISG).

## XIII. SEVERABILITY CLAUSE

The legal invalidity of one or more provisions of this contract shall in no way affect the validity of the remaining provisions. This shall not apply if it would be unreasonable for one of the parties to continue the contract.

# Supplementary Sales Conditions

## I. Applicability, Relative Authority of Contractual Conditions

1. The sale of goods/services by Siteco (hereunder referred to as the "supplier"), will, first of all, occur in accordance with the given particular written agreements with the purchaser and then, supplementary to these, the general conditions of supply of electrical products and services (Green Supply Conditions) including their supplementary section of point III on reserving ownership, that is, the supplementary clause concerning extended reservation of ownership, will apply; as a further supplement, the present supplementary sales conditions (hereunder referred to as the "Siteco terms and conditions"), in the valid version at the time of entry into the given contract, will apply. The Siteco terms and conditions can, from among other places, be viewed and downloaded, over the internet, from [www.siteco.de](http://www.siteco.de). You can also request them, by telephone or in writing, from Siteco Beleuchtungstechnik GmbH, Georg-Simon-Ohm-Str. 50, 83301 Traunreut, phone: +49 8669 33-0.

2. The inclusion of the purchaser's general terms and conditions is hereby discounted. Contrary terms and conditions, or such as depart from the Siteco terms and conditions, will only form a part of the contract where they have, in the given separate case, been expressly accepted in writing. Any general terms and conditions of the purchaser will also not be held to have been acknowledged if we do not again expressly discount them following receipt of them (eg. on the purchaser's standard forms).

## II. Due Date Conditions of Payment, Offset

1. In the absence of diverging agreements, payments must be made, without deduction, free of charge to the supplier's point of payment. For all payments, the fulfilment date is the day on which the supplier has the payment available to it. Where delivery is delayed for reasons for which the purchaser is responsible, the delivery date will be the date on which readiness to dispatch is announced and, at the latest, the date on which the purchaser communicates that it cannot accept the goods.

2. Insofar as nothing to the contrary is agreed, the following due dates for payment apply:

- In the case of transactions with an order value of up to EUR 10,000.-: net cash upon delivery and receipt of the invoice.
- In the case of transactions with an order value exceeding EUR 10,000.- and a delivery period of up to 3 months: 1/3 of the order value upon signing of the contract, the balance upon delivery.
- In the case of transactions with an order value exceeding EUR 10,000.- and a delivery period of more than 3 months: 30% of the order value upon signing of the contract, 30% of the order value on expiry of the first third of the agreed delivery period, 30% of the order value upon expiry of the second third of the agreed delivery period, the balance upon delivery.

3. Bills of exchange shall not be accepted in settlement of payments due other than with the supplier's prior approval. Bill charges and interest paid on bills shall be refunded to the supplier separately. Cheques or drafts cannot be accepted in place of payment.

4. The client only has the right to offset claims against payments or to retain payments insofar as its claim is established as being legally valid or is undisputed. The supplier is entitled to offset, against the client's claims, throughout the Group.

## III. Default

1. Where the purchaser is in default with the payment, arrears charges will, reserving the right to further claims, be calculated in accordance with §§247, 288 of the German Civil Code. In the event of delays in payment, the supplier moreover reserves the right, following relevant written communication, to discontinue the fulfilment of its obligations until the payment due has been received.

2. Where payment stops or there is an application for the opening of insolvency proceedings, the supplier's total amount receivable is immediately due for payment.

3. Where the purchaser is in default of acceptance of products or services, the supplier is entitled to demand compensation for damages, including additional costs (eg. storage costs), arising because of this. The supplier can charge a flat rate of compensation for this. It is 0.5% for every full week of delay in acceptance, but not more than 5%, in total, of the price for the given part of the supply for which the purchaser is delayed in giving its acceptance, the said delay beginning with the due date for delivery or, in the absence of a stated delivery period, with the supplier's notification that it is ready to dispatch the given goods. The supplier's right to demonstrate further damages and legal claims (particularly the compensation of additional costs, appropriate compensation, withdrawal from a contract, notice of termination of a contract) remain unaffected; the flat rate compensation will however be charged on further money claims. The purchaser is authorized to demonstrate that the supplier has incurred either no damages at all or substantially lower ones than the flat rate of compensation. Section IV, sub-section 6 of the green supplier's conditions remains unaffected by this.

## IV. Other

1. With reference to the EC Directive "Waste Electrical and Electronic Equipment (WEEE)", and the corresponding national regulations, the supplier shall resort to the possibility of a bilateral agreement as follows: Unless expressly agreed otherwise, the purchaser shall be responsible for proper waste management and shall recycle/dispose of the products supplied in accordance with the WEEE regulations in force at the time. If the goods are resold, the purchaser shall impose this same obligation upon the party or parties to whom the goods are sold. The supplier shall be prepared, subject to mutual agreement, to attend to recycling/disposal at the terms and conditions prevailing in the market at the time the goods are taken back.

2. Goods Returned: Credits for goods returned shall be conditional on the supplier's prior written consent. Undamaged goods in their original packing shall, subject to the supplier's prior consent, be credited to the purchaser in an amount of 70% of the price invoiced, less the costs for packaging, transport and any necessary reprocessing. No custom-made goods nor goods modified for specific projects shall be taken back. The same shall apply to any items designated as sold-off.

3. In the case of orders valued at less than EUR 500.- the supplier shall reserve the right to apply a service charge of EUR 50.-

4. Appropriate use of goods and adherence to the instructions on assembly or use are prerequisites for claims made under guarantee. Unauthorized, arbitrary changes to our products will mean that product liability, and guarantee and warranty obligations no longer apply.

5. Concerning LED components: LED components are, as a result of innovations, currently subject to a fast rate of change. The supplier therefore reserves the right to change components of lights, fitted with LEDs, as part of additional or replacement deliveries. The brightness and useful life of LEDs depend on temperature and power supply. Claims concerning faults will be limited to those existing at the time of the handing over of the given product with its given fault or faults. Faults or defects arising as a result of normal wear and tear are not covered by guarantee. Insofar as Siteco has not assured any other characteristics or qualities, in the case of LEDs that are inseparably and fixedly connected to each other in a lighting block, the failure of individual light diodes during the guarantee period does not give rise to a guarantee claim, insofar as the average luminous flux does not fall below a value of 70% of the initial light given with appropriate use and standardized measurement. Our contact for services in connection with our LED products, in the sales regions, or on our site at [www.siteco.de](http://www.siteco.de), will be happy to answer any questions you may have. 6. These supplementary Siteco Beleuchtungstechnik GmbH terms and conditions, and the additional, supplementary terms and conditions stated in them, continue to be binding even in the case of the legal invalidity of individual points. Only in the case where adherence to the contract would be an undue hardship for one of the parties, does this not apply. Insofar as nothing to the contrary is expressly agreed in writing between the contracting parties, German law, to the exclusion of UN sale of goods law, alone applies to the present contractual relationship.

The place of fulfilment of the contract and the place of jurisdiction is Traunstein, Bavaria, Germany, alone.



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