

## LUMINAIRES FOR USE IN FREEZER ROOMS

**This Technical Bulletin shall serve as a reminder of all relevant lighting issues, relating to Cold Room applications.**

Before we can select a luminaire for a cold room or freezer room application, we need to understand the effect of ambient temperature on the lamps and control gear in luminaires.

### EFFECT ON LAMPS

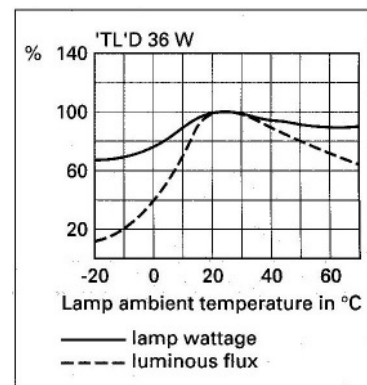
#### Tungsten lamps

Because tungsten lamps operate on the principle of a current being passed through a resistor, there is no significant effect on the lamp. The efficacy of the lamp is a function of the filament temperature, thus, in cold rooms there is a possibility that the lamp can be running at a slightly reduced lumen output. However, there are no graphs available from manufacturers to indicate what this value would be.

#### Fluorescent lamps

Most fluorescent lamps have a decreased light output when operating in cold conditions. The bulb wall temperature has to be maintained at +25°C to +40°C. When this is not the case the light output for a bare lamp can reduce drastically as shown in the graph.

It is clear that if the lamp is enclosed in a luminaire, the fall off in light output will be less drastic. Supplied with the nominal voltage, fluorescent lamps will start quite normally at temperatures down to -20°C. The allowed minimum temperature depends on lamp type and starting system.



Lumen output of a fluorescent lamp under different ambient temperatures.

#### High intensity discharge lamps (HID)

Although the temperature of the discharge is of prime importance for the operation of HID lamps, these lamps are not very sensitive to changes in ambient temperature. There are two major reasons for this.

- The discharge tube of most lamps is enclosed in an outer lamp bulb and most of the HID lamps for freezer room applications are placed in an enclosed luminaire, so that there is no direct contact between the outside air and the gas discharge tube.
- HID lamps operate at fairly high temperatures in the discharge, so that the changes in ambient temperature are relatively small compared to the actual burner temperature of a working HID lamp.

Provided that HID lamps are operated on the correct ballast and igniter, all HID lamps will ignite at  $-20^{\circ}\text{C}$ , while HPS will even ignite at  $-40^{\circ}\text{C}$ .

In practice, there is no difference in light output within the normal ambient temperature range of  $-30^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$  during stable operation. However, the run-up time can be longer at lower temperatures.

For MV lamps, in an ambient temperature of  $-20^{\circ}\text{C}$  a minimum supply voltage of 210V is required for proper ignition.





## EFFECT ON CONTROL GEAR AND LUMINAIRES

- The ambient temperature is of great importance for the control gear, due to the fact that certain minimum and maximum operating temperatures are specified for the various components.
- The minimum temperature for some electronic components such as igniters and compensating capacitors, is  $-25^{\circ}\text{C}$ . The capacitance declines steeply below this temperature. The encapsulation of ballasts or potted igniters can show cracking, although proper operation is not affected. For this reason, control gear should be installed in places where the ambient temperature will not fall below  $-25^{\circ}\text{C}$ .
- At low temperatures it is quite possible that condensation will form on the ballast, as the temperature of the ballast will be above  $0^{\circ}\text{C}$  when the lamp is operating, but will sink below the freezing point if the lamp is switched off. This is why it may be necessary sometimes, when luminaires are used in deep-freezing rooms, to have the control gear installed outside the room.
- In general, low ambient temperatures down to  $-25^{\circ}\text{C}$  do not affect the construction and optics of luminaires. However, plastic parts, such as clips, are more brittle at low temperatures and should then be handled with care.
- For electronic ballasts, the specifications for the electrical components are not valid under  $-15^{\circ}\text{C}$ , so below these temperatures there is, therefore, no guarantee for proper functioning of the ballasts.

## CHOICE OF LUMINAIRES

- For cold rooms and freezer rooms, the food hygiene regulations require that there be no likelihood of any part of the luminaire or lamp falling into food-stuffs. The lamps should be enclosed to ensure that accidental lamp breakage does not allow debris to fall into the product. Also, from a lamp and gear operating point of view, it would be desirable for luminaires to be enclosed and have an IP rating of 54 or higher.

The attached Annexure A shows a matrix recommending different types of luminaires for different classifications of temperature ranges.

Temperature Classification	BEKA Luminaire Types										
	VAPOURLUX DSR ROUGH LUX BEKABULK 	BEKANOVA HID 			BEKATEC  BEKATEC TH      BEKATEC HID				BEKABAY ENCLOSED HID 		
	Fluorescent	MV	HPS	MH	TH <sup>2)</sup>	MV	HPS	MH	MV	HPS	MH
Loading Dock    +7 °C to +0 °C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chiller Room      +4 °C to -1 °C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Freezer Room      Not colder than -18 °C	Yes use electronic starter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Freezer Room      Not colder than -25 °C	No	Yes	Yes	Yes with Autolight <sup>3)</sup>	Yes	Yes	Yes	Yes with Autolight <sup>3)</sup>	Yes	Yes	Yes with Autolight <sup>3)</sup>
Freezer Room      Not colder than -35 °C	No	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>	Yes	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>
Freezer Room      Not colder than -40 °C	No	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>	Yes	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup>	Yes <sup>1)</sup> with Autolight <sup>3)</sup>

## NOTES:

- 1) For these very low temperatures, it is required to place the control gear remotely.
- 2) In some freezer rooms, the positions of the shelves are dynamic and move all the time with the result that it is a requirement to switch the luminaire rows on and off. In such cases, if fluorescent lamps are not used, it is recommended to use 1.0 kW tungsten halogen lamps in the BEKATEC luminaire.
- 3) The purpose of an AUTOLIGHT unit in a HID luminaire is to pre-heat the ambient temperature to a level, where the HID lamp can start and ignite reliably.