



HABITAT OPTIMISÉ, MAÎTRISE DE L'ÉNERGIE & SERVICES

## Synthesis: light sources state of art

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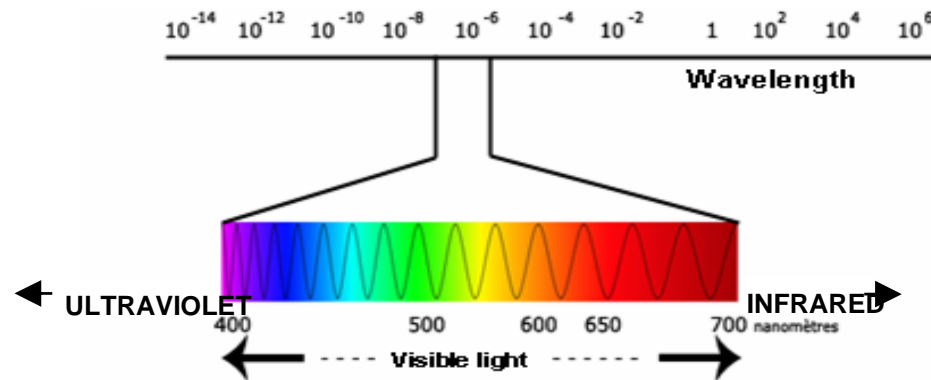
WP 5.3: L532A

## Summary

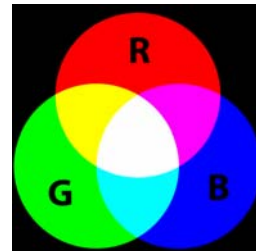
1. The light: an electromagnetic radiation
2. Lighting Vocabulary
3. Lamps type classification
4. Lamps control
5. Light cost comparison

## The light: an electromagnetic radiation

- The wavelengths perceptible by the human eye extend from 400 nm to approximately 700 nm and are associated with the concept of color.



- Ideally, white light is composed of all the wavelengths of the electromagnetic spectrum in the same proportion.



# Lighting Vocabulary

**Luminous intensity (expressed in candela: Cd):**  
measurement of “the quantity” of the luminous flux

**Luminous flux (expressed in lumen: lm):**  
quantity of energy emitted by a light source

**Illuminance (expressed in lux: lx):**  
quantity of light uniformly received on a surface

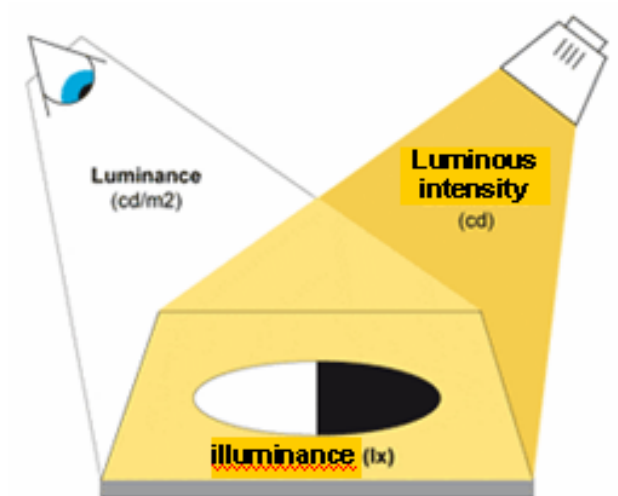
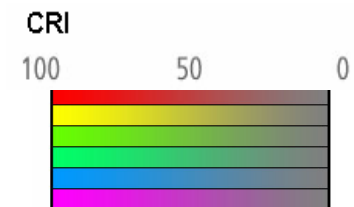
**Luminance (expressed in candela per square meter:  $\text{cd/m}^2$ ):**  
measurement of the luminous aspect of an enlightened surface

**Luminous efficacy (expressed in lumen per Watt:  $\text{lm/W}$ ):**  
ratio of the luminous flux to the electrical power consumed

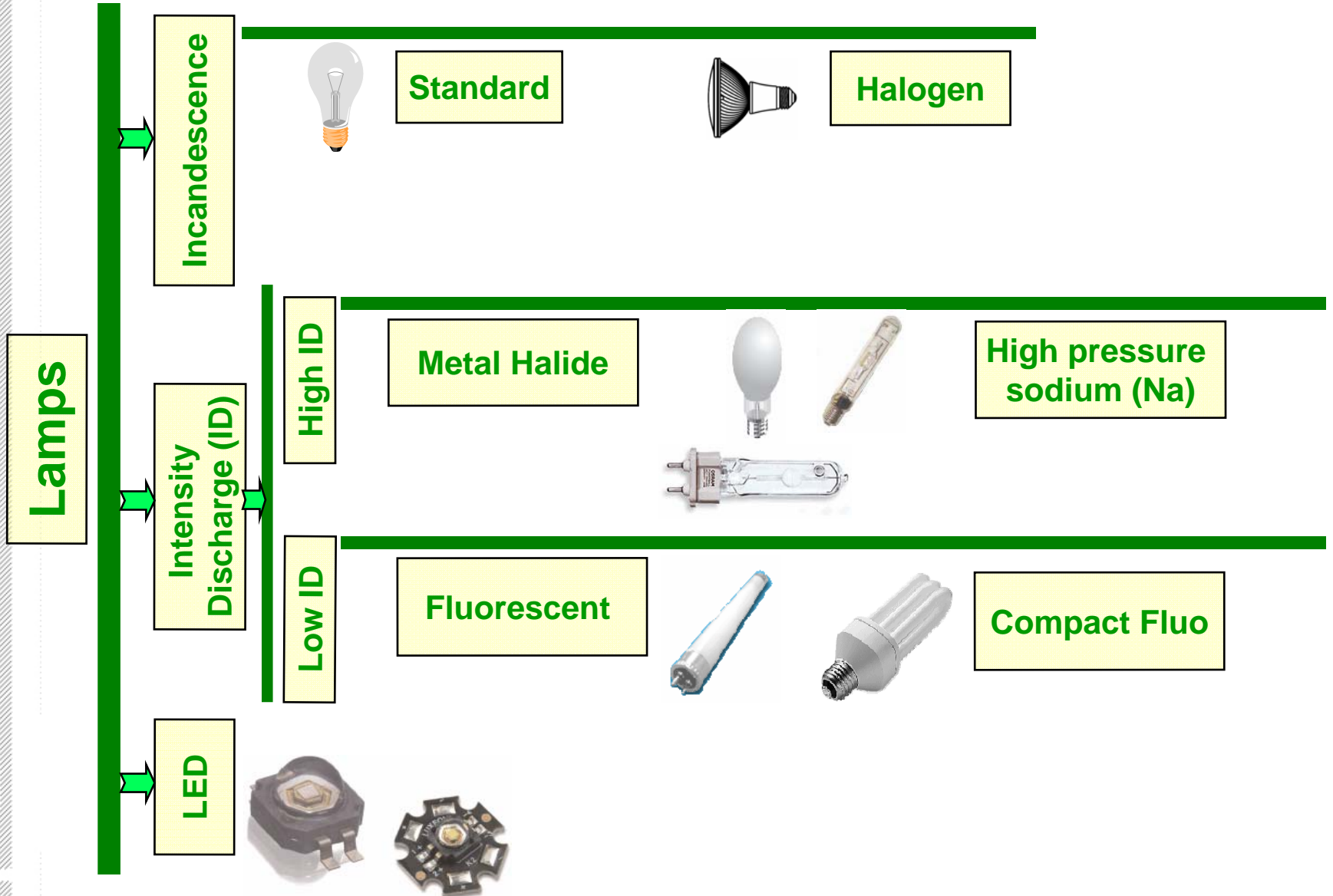
**Color Temperature (expressed in degree Kelvin:  $^{\circ}\text{K}$ ):**  
color of the white shades (from cool to warm)



**Color rendering index (expressed without unit, between 0 and 100):**  
Capacity, for a light source, of correct recognition and differentiation of colours

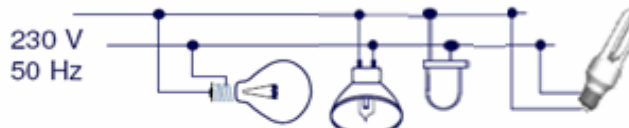
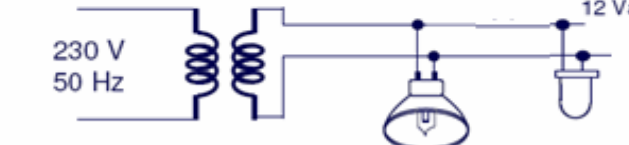
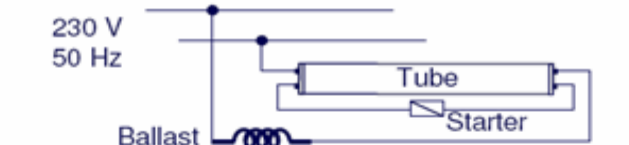
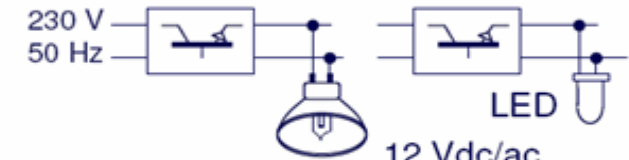
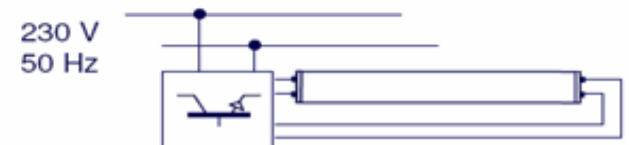


# Lamps type classification



# Lamps control

What is needed for a lamp to work:

Supply types		Mounting diagram	Lighting source types
Direct on mains			Incandescent lamps LV Halogen lamps Electronic lamps (CFLi, LEDi: integrating electronics) for substitution
Electromagnetic device	changing voltage		ELV halogen lamps ELV LED lamps (minority)
	for ignition and stabilization		HID lamps Fluorescent tubes CFLni (electronics non integrated) for integration
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Adapted from « Introduction à l'éclairage électrique et bases d'éclairagisme » from Olivier Normand

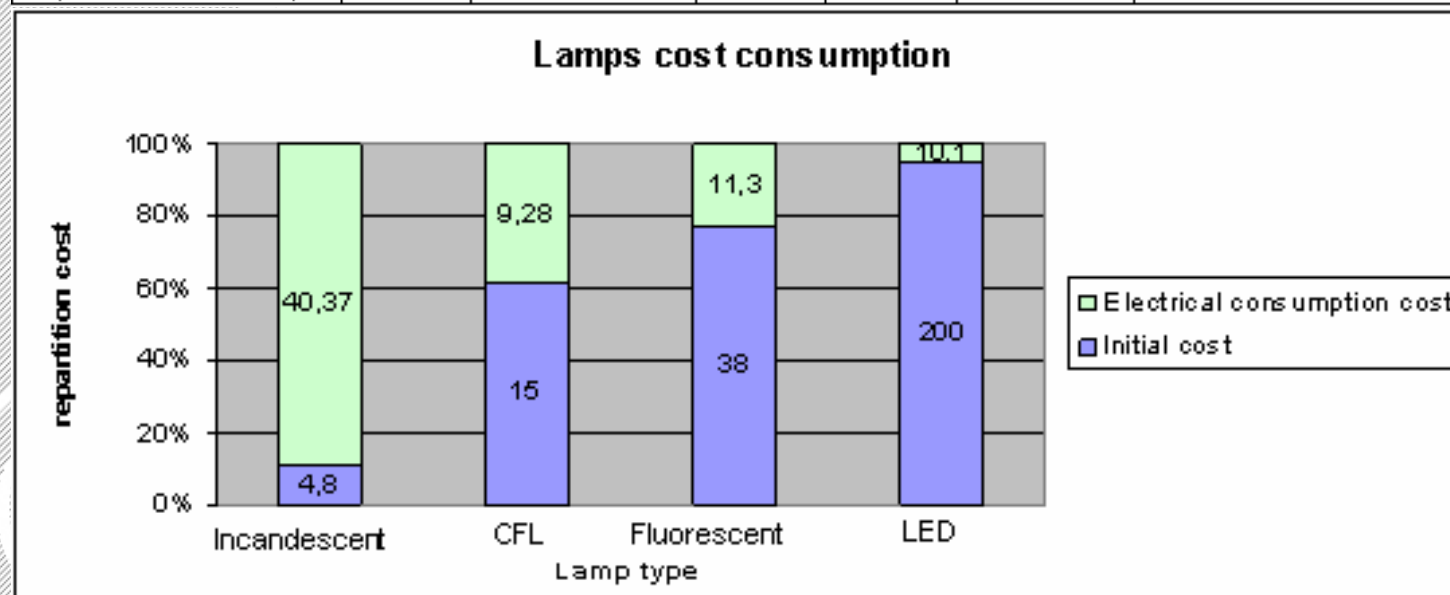
## Lamps cost comparison (initial+consumption) for 1 year

Lamp types	Power (W)	Luminous efficacy (lm/W)	Lifespan (hours)	Initial cost $C_i$ (€)	Electrical consumption cost $C_c$ (€)	Total consumption cost for 1 year (€)
Incandescent	100	15	1000 (x4)	1,2 (x4)	40,37	45,17
Fluorescent tube (Philips Master TL5) + Electronic ballast	28	85	20000	8 + 30	11,3	49,3
CFLi (Master PL-E)	23	65	10000	15	9,28	24,28
LED (12 W LED bulb x 2)	25	60	50000	200	10,1	210,1

→ Total cost per year of each light sources for a daily use of 10 hours

→ Working hours: 3650 h/year .

→ Electricity cost is:  $0,1106 \cdot 10^{-3} \text{ €/W.h}$



## Lamps cost comparison (initial+consumption) for 10 years

Lamp types	Power (W)	Luminous efficacy (lm/W)	Lifespan (hours)	Initial cost $C_i$ (€)	Electrical consumption cost $C_c$ (€)	Total consumption cost for 10 years (€): $C_i + C_c$
Incandescent	100	15	1000 (x37)= 37000	1,2 (x37)= 44,4	403,7	448,1
Fluorescent tube (Philips Master TL5) + Electronic ballast	28	85	• Tube : 20000 (x2)= 40000 • Ballast= 50000	8 (x2) + 30 = 46	113	159
CFLi (Master PL-E)	23	65	10000 (x4)= 40000	15 (x4) = 60	92,8	152,8
LED (12 W LED bulb x 2)	25	60	50000	200	101	301

→ Total cost for 10 years of each light sources for a daily use of 10 hours

→ Working hours: 3650 h/year, i.e. 36500hours

→ Electricity cost is:  $0,1106 \cdot 10^{-3} \text{ €/W.h}$

