Briefing on IEC 62368-1

Cerpass Group
世騰認證集團

Version and Enforcement

- IEC 62368-1: 1st Edition
  - Publication date: 2010-01-21
  - CENELEC no publication accordingly
  - UL 62368-1:1st edition issued at 2012-02-17
- IEC 62368-1: 2nd Edition
  - Publication date: 2014-02-28 (forecast)
  - EN 62368-1 to be issued at Q1 of 2014
  - UL 62368-1:2nd edition to be issued at Q2 of 2014
- Enforcement:

Today	2013/2014	2018 & beyond
60065 60950 62368-1 Ed 1.0	60065 60950 62368-1 Ed 1.0 62368-1 Ed 2.0	62368-1 Ed 2.0

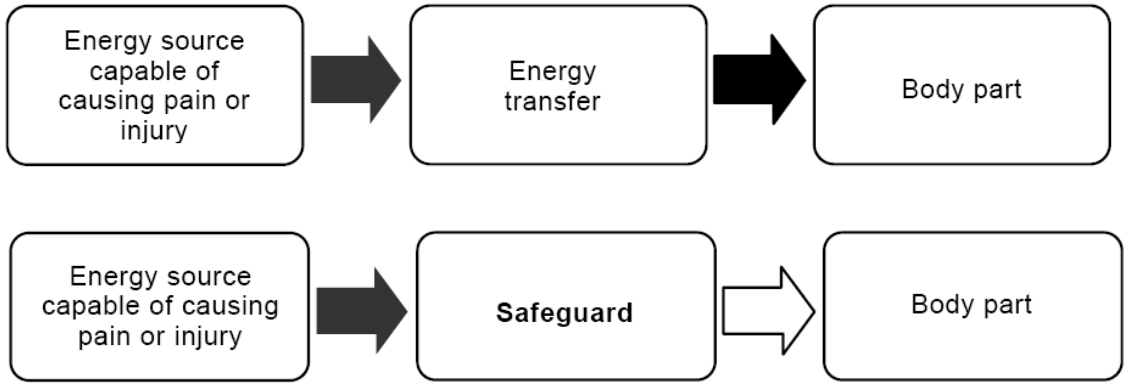
Scope and Principle of IEC62368-1

- Electrical and electronic equipment within the field of audio, video, information and communication technology, and business and office machines
- Excluding the UPS
- Excluding the wet location. IEC 60950-22 is referred.
- Principle concept of IEC 62368-1:
  - HBSE: Hazard-Based Safety Engineering
  - “We cannot solve problems by using the same kind of thinking we used when we created them”

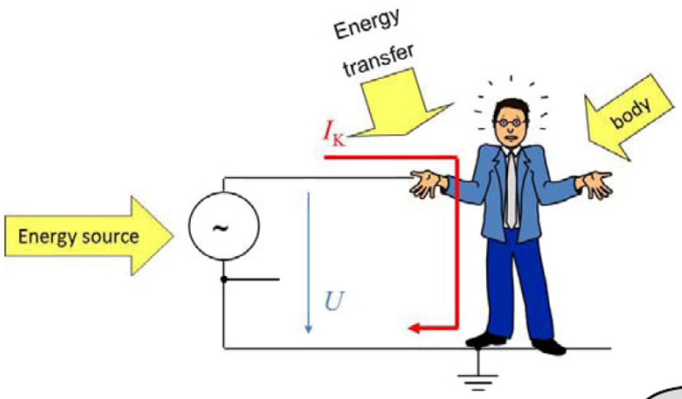
    - Albert Einstein

What is HBSE

- Is a process
- Utilizes a three block model to address the transfer of hazardous energy to a body part
- Identify limits defining hazardous and non-hazardous energy
- Describe methods to mitigate hazards and measurement of safeguard effectiveness
- This provides more design options, and provides a framework for addressing new technology
- Non-prescriptive



What is HBSE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body
Energy source
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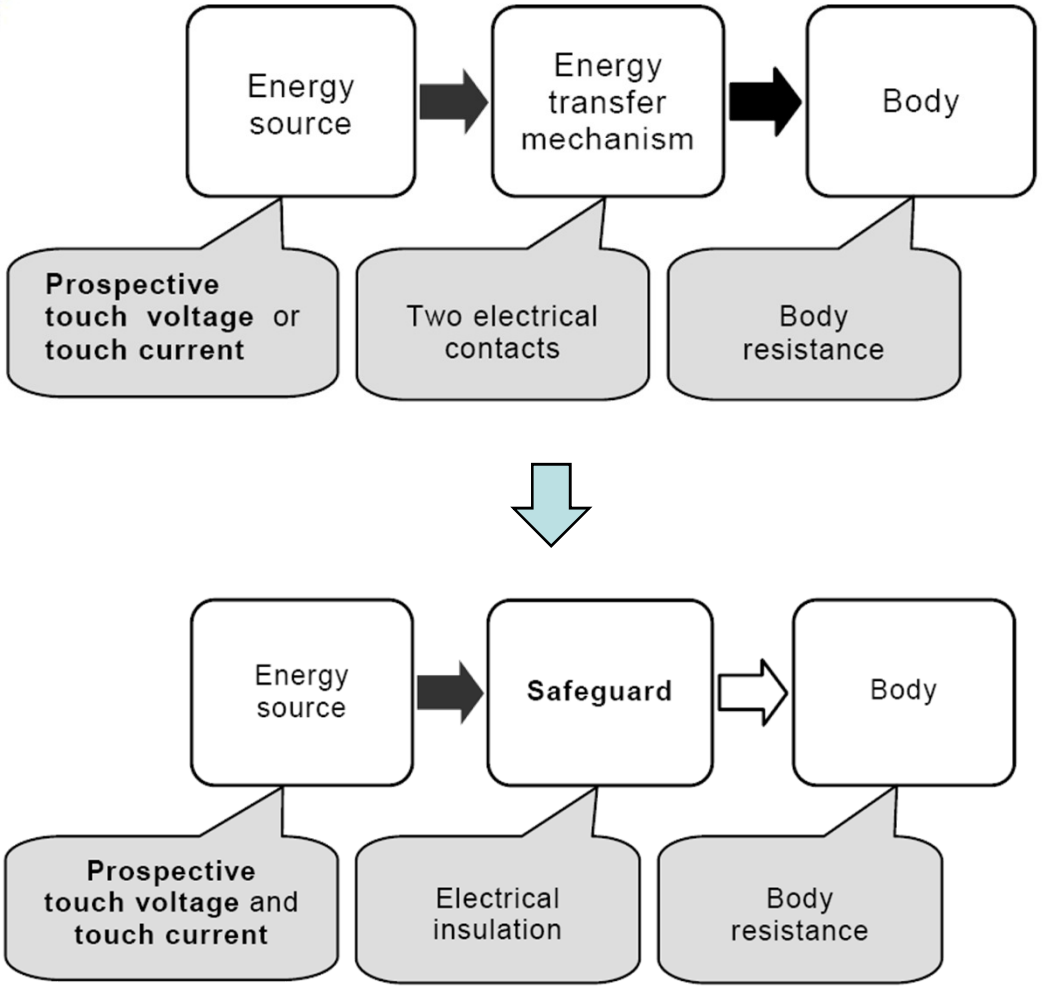
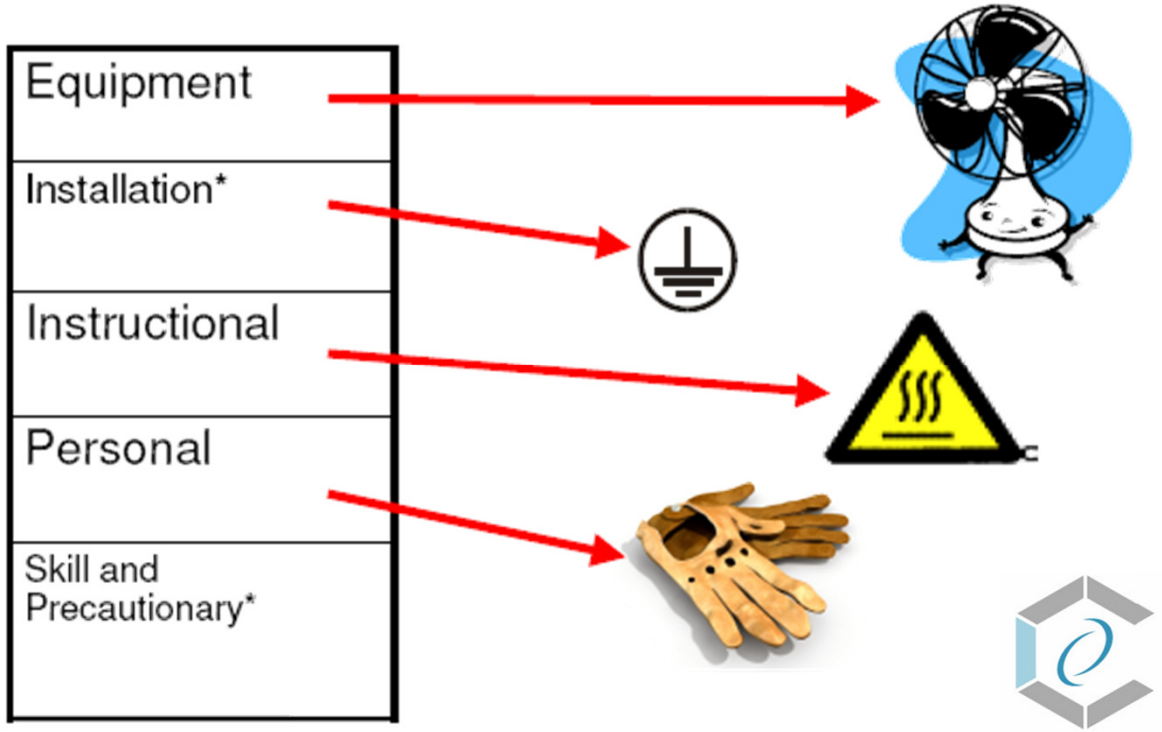

Energy source
Energy transfer mechanism
Body
Prospective touch voltage or touch current
Two electrical contacts
Body resistance
Energy source
Safeguard
Body
Prospective touch voltage and touch current
Electrical insulation
Body resistance

What is HBSE

- Energy Source Classification

Energy source	Effect on the body	Effect on combustible materials
Class 1	Not painful, but may be detectable	Ignition not likely
Class 2	Painful, but not an injury	Ignition possible, but limited growth and spread of fire
Class 3	Injury	Ignition likely, rapid growth and spread of fire

- Safe Guards



What is HBSE

- Examples of body response or property damage related to energy sources

Forms of energy	Examples of body response or property damage	Clause
Electrical energy (for example, energized conductive parts)	Pain, fibrillation, cardiac arrest, respiratory arrest, skin burn, or internal organ burn	5
Thermal energy (for example, electrical ignition and spread of fire)	Electrically-caused fire leading to burn-related pain or injury, or property damage	6
Chemical reaction (for example, electrolyte, poison)	Skin damage, organ damage, or poisoning	7
Kinetic energy (for example, moving parts of equipment, or a moving body part against an equipment part)	Laceration, puncture, abrasion, contusion, crush, amputation, or loss of a limb, eye, ear, etc.	8
Thermal energy (for example, hot **accessible** parts)	Skin burn	9
Radiated energy (for example, electromagnetic energy, optical energy, acoustic energy)	Loss of sight, skin burn, or loss of hearing	10

Terminology

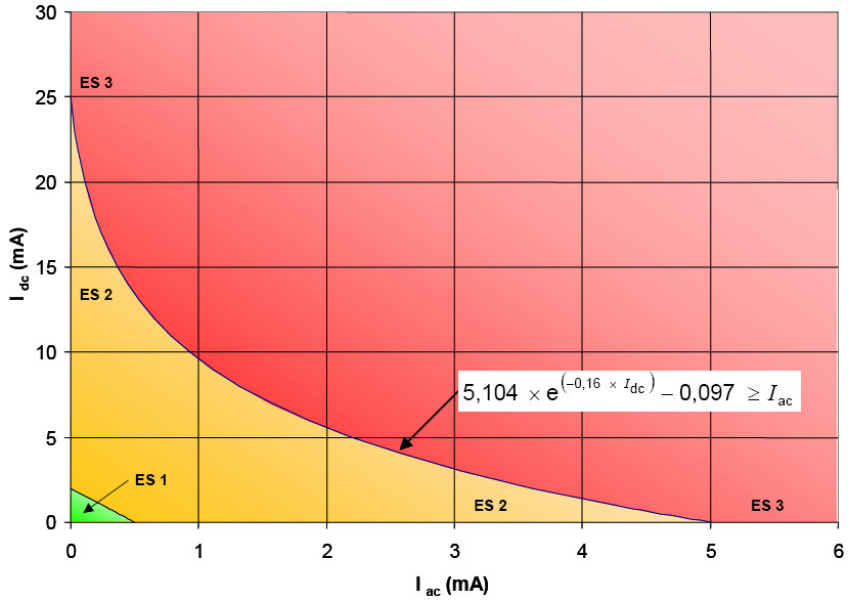
- Ordinary Person
  - person who is neither a skilled person nor an instructed person
- Instructed Person
  - person instructed or supervised by a skilled person as to energy sources and who can responsibly use equipment safeguards and precautionary safeguards with respect to those energy sources
- Skilled Person
  - person with relevant education or experience to enable him or her to identify hazards and to take appropriate actions to reduce the risks of injury to themselves and others

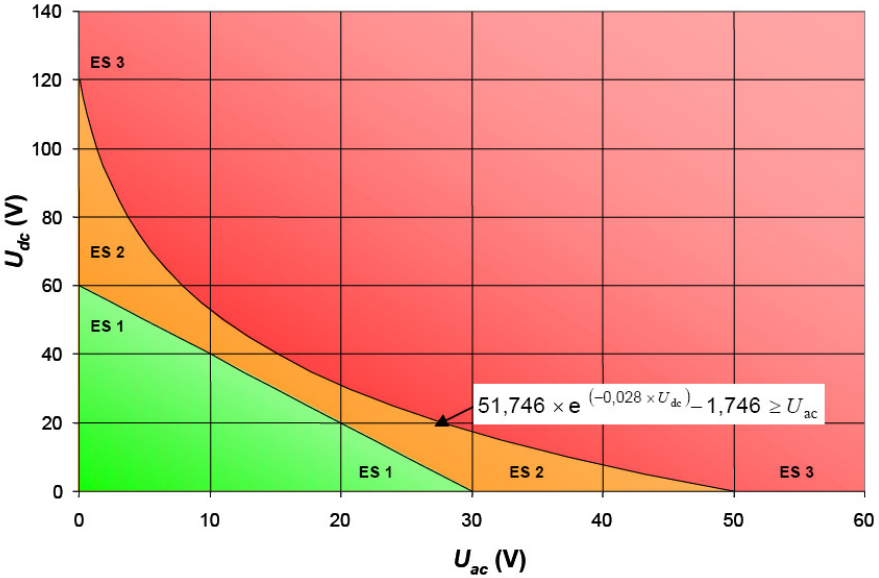
Terminology

- Energy source abbreviations

ES	Electrical energy source
ES1	Electrical energy source class 1
ES2	Electrical energy source class 2
ES3	Electrical energy source class 3
PS	Power source
PS1	Power source class 1
PS2	Power source class 2
PS3	Power source class 3
TS	Thermal energy source
TS1	Thermal energy source class 1
TS2	Thermal energy source class 2
TS3	Thermal energy source class 3
MS	Mechanical energy source
MS1	Mechanical energy source class 1
MS2	Mechanical energy source class 2
MS3	Mechanical energy source class 3
RS	Radiation energy source
RS1	Radiation energy source class 1
RS2	Radiation energy source class 2
RS3	Radiation energy source class 3

Electrical Energy Source Limits





- Limits of current and voltage for ES1 to ES3

Electrical Energy Source Limits

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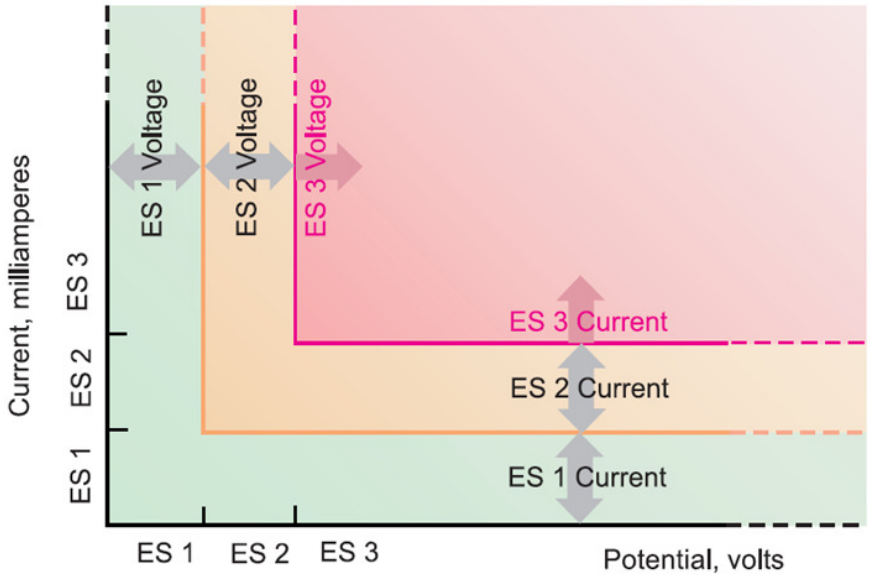
Energy source	ES1 limits		ES2 limits		ES3
	Voltage	Current [a, c]	Voltage	Current [b, c]	
d.c.	60 V	2 mA	120 V	25 mA	> ES2
a.c up to 1 kHz	30 V r.m.s. 42,4 V peak		50 V r.m.s. 70,7 V peak		
a.c. > 1 kHz up to 100 kHz	30 V r.m.s. + 0,4 f	0,5 mA r.m.s 0,707 mA peak	50 V r.m.s. + 0,9 f	5 mA r.m.s. 7,07 mA peak	
a.c above 100 kHz	70 V r.m.s.		140 V r.m.s.		
Combined a.c. and d.c.	$\frac{U_{dc}\ V}{60} + \frac{U_{ac}\ V\ r.m.s.}{30} \le 1$ $\frac{U_{dc}\ V}{60} + \frac{U_{ac}\ V\ peak}{42,4} \le 1$	$\frac{I_{dc}\ mA}{2} + \frac{I_{ac}\ mA\ r.m.s.}{0,5} \le 1$ $\frac{I_{dc}\ mA}{2} + \frac{I_{ac}\ mA\ peak}{0,707} \le 1$	See Figure 23	See Figure 22	

The formulation below as a function of frequency may be of interest to designers for sinusoidal waveforms

Energy source	ES1 limits	ES2 limits	ES3
	Current [c] r.m.s.	Current [c] r.m.s.	
a.c up to 1 kHz	0,5 mA	5 mA	> ES2
a.c. > 1 kHz up to 100 kHz	0,5 mA x f [d]	5 mA + 0,95 f [e]	
a.c above 100 kHz	50 mA [d]	100 mA [e]	

Electrical Energy Source Limits

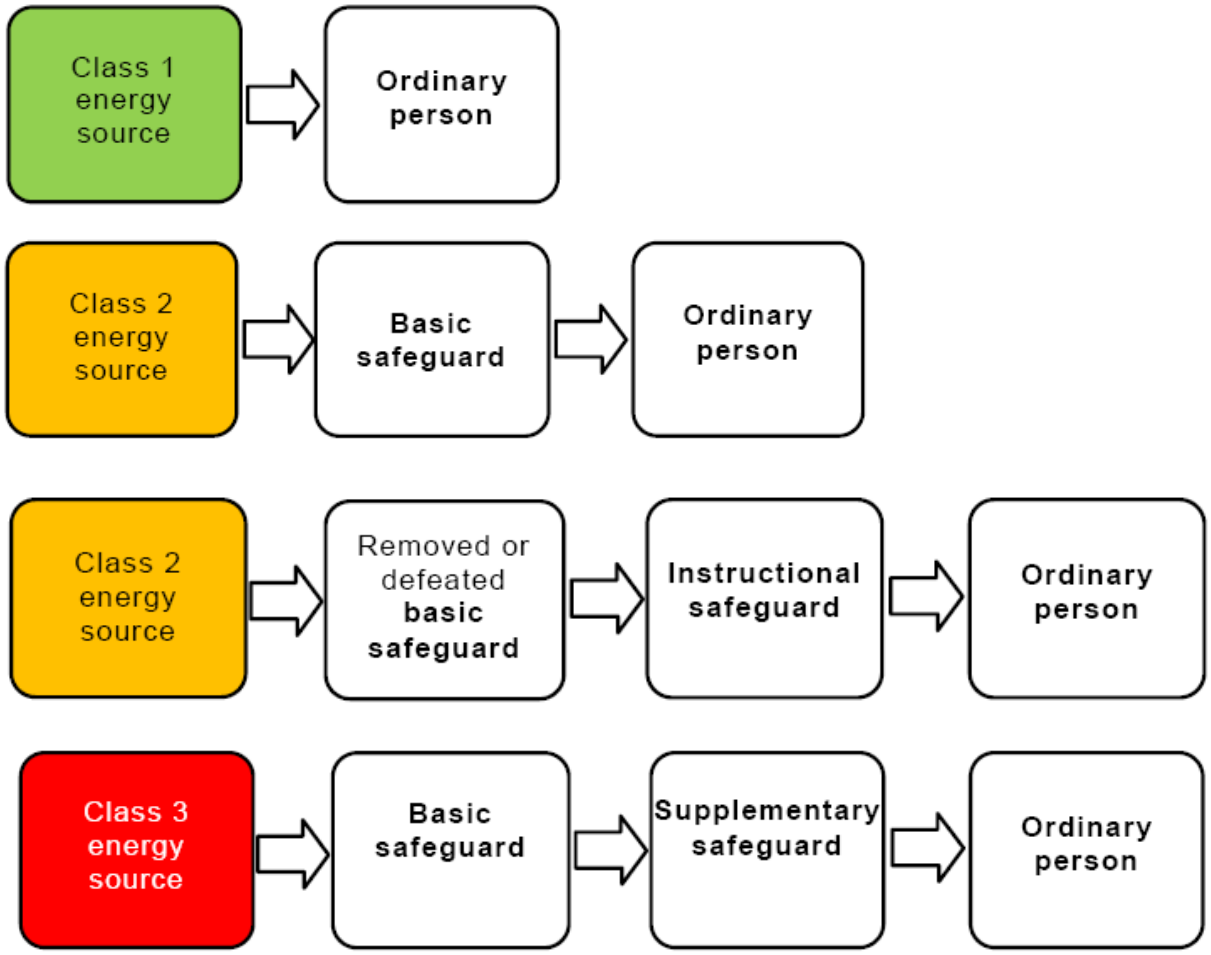
- For any voltage up to the voltage limit, there is no limit for the current. Likewise for any current up to the current limit, there is no limit for the voltage



Person	Required number of equipment safeguards interposed between an electrical energy source and persons		
	ES1	ES2	ES3
Ordinary person	0	1	2
Instructed person	0	0	2
Skilled person	0	0	0 or 1 [a]

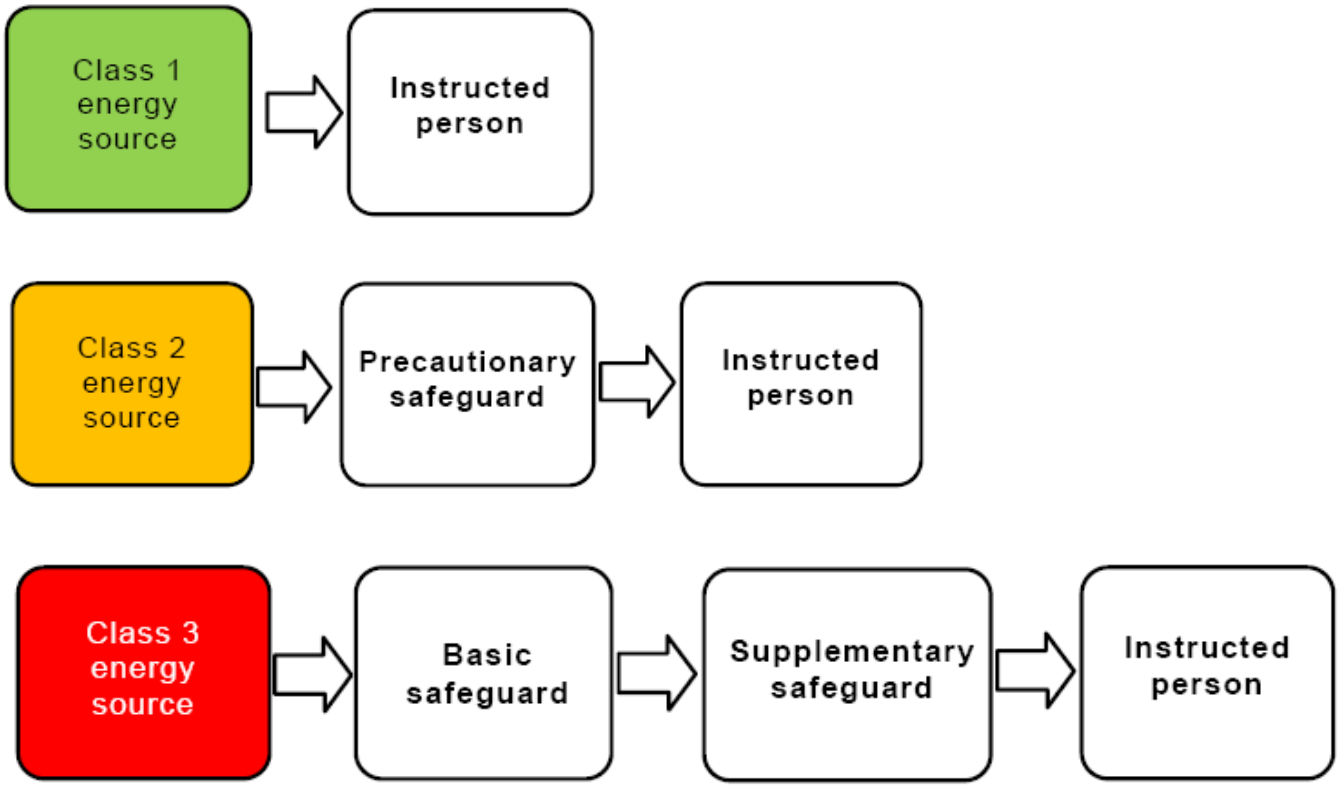
Safeguard for ES

- Safeguards for protection of an ordinary person



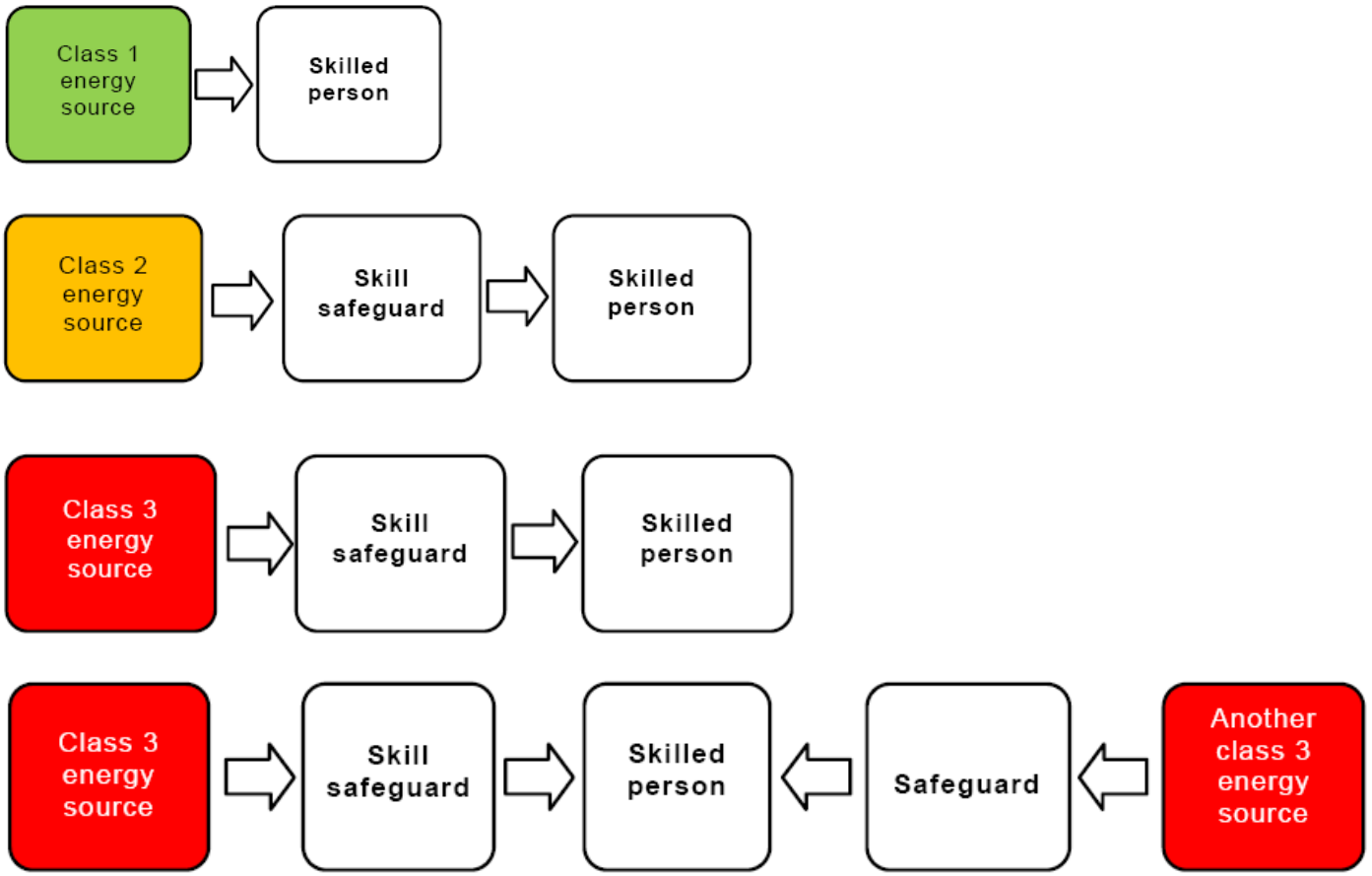
Safeguard for ES

- Safeguards for protection of an instructed person



Safeguard for ES

- Safeguards for protection of a skilled person



Touch Temperature Levels

	Accessible parts [a]	Maximum temperature (T_{max}) °C			
		Metal [f]	Glass, porcelain and vitreous material	Plastic and rubber	Wood
TS1	Handles, knobs, grips, etc., and external surfaces either held, touched or worn against the body in normal use (> 1 min) [b, c]	48	48	48	48
	Handles, knobs, grips, etc., and external surfaces held for short periods of time or touched occasionally (> 10 s and < 1 min) [c]	51	56	60	60
	Handle, knobs, grips etc., and external surfaces touched occasionally for very short periods (>1 s and < 10 s) [c]	60	71	77	107
	External surfaces that need not be touched to operate the equipment (<1 s) [c]	70 [d]	80 [d]	94 [d]	140
TS2	Handles, knobs, grips, etc., and external surfaces held in normal use (> 1 min) [c]	58	58	58	58
	Handles, knobs, grips, etc., and external surfaces held for short periods of time or touched occasionally (> 10 s and < 1 min) [d]	61	66	70	70
	Handle, knobs, grips etc., and external surfaces touched occasionally for very short periods (> 1 s and < 10 s) [d]	70	81	87	117
	External surfaces that need not be touched to operate the equipment (< 1 s) [d]	80 (100) [e]	90 (100) [e]	104	150
TS3	Higher than the TS2 limits				

What's Changed?

- Clearance Measurement

To determine the clearance, the highest value of the following two procedures shall be used:

Procedure 1: Determine clearances according to 5.4.2.2 using the peak working voltage.

Procedure 2: Determine clearances according to 5.4.2.3 using the required withstand voltages. Alternatively, the adequacy of clearances may be determined using an electric strength test according to 5.4.2.4, in which case the values according to procedure 1 shall be maintained.

- Touch Current Test
  - ES consideration
- Steady Force Test
  - 100N for Transportable Equipment, Hand-held Equipment and Direct Plug-in Equipment (formerly 250N)

What's Changed?

Electric Strength Test

*Unless otherwise specified elsewhere in this standard, the test voltage for the electric strength of **basic insulation**, **supplementary insulation** or **reinforced insulation** is the highest value of the following three methods:*

*Method 1: Determine the test voltage according to Table 27 using the **required withstand voltage** (based on transient voltages from the a.c. **mains** or d.c. **mains** or from **external circuits**).*

*Method 2: Determine the test voltage according to Table 28 using the **peak working voltage**.*

*Method 3: Determine the test voltage according to Table 29 using the nominal **mains** voltage (to cover **temporary overvoltages**).*

The insulation is subjected to the highest test voltage as follows:

- *by applying an a.c. voltage of substantially sine-wave form having a frequency of 50 Hz or 60 Hz; or*
- *by applying a **d.c. voltage** in one polarity and then in reverse polarity.*

*The voltage applied to the insulation under test is gradually raised from zero to the prescribed voltage and maintained at that value for 60 s (for **routine tests** see 5.4.9.2).*

What's Changed?

- Electric Strength Test

Table 27 – Test voltages for electric strength tests based on transient voltages

Required withstand voltage up to and including	Test voltage for basic insulation or supplementary insulation	Test voltage for reinforced insulation
kV peak	kV peak or d.c.	
0,33	0,33	0,5
0,5	0,5	0,8
0,8	0,8	1,5
1,5	1,5	2,5
2,5	2,5	4
4	4	6
6	6	8
8	8	12
12	12	18
U_R [a]	U_R [a]	1,5 × U_R [a]
Linear interpolation may be used between the nearest two points.		

What's Changed?

- Electric Strength Test

Table 28 – Test voltages for electric strength tests based on peak working voltages

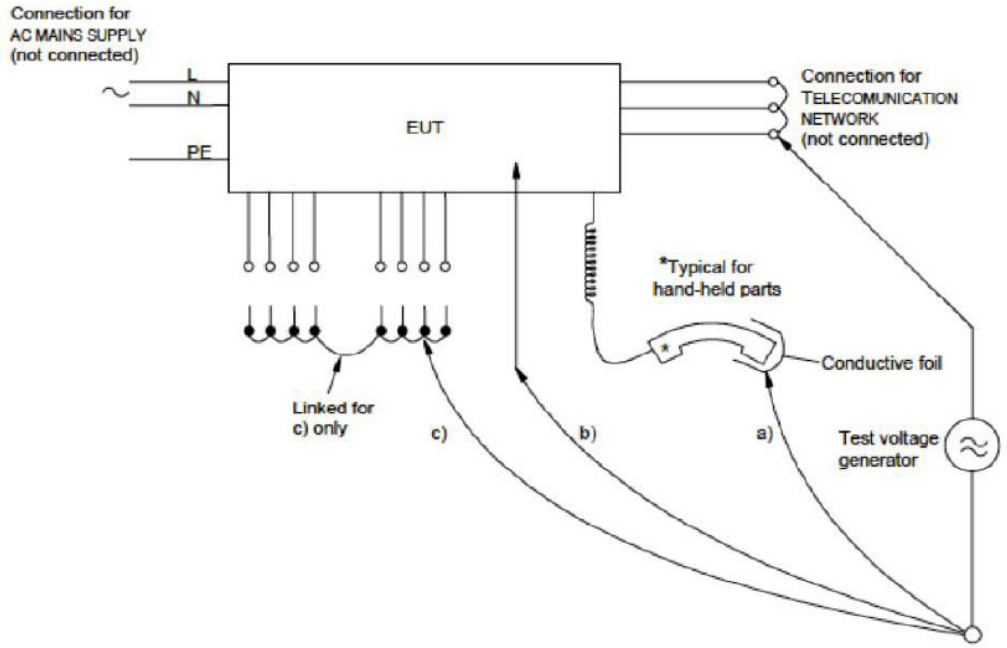
Peak working voltage up to and including	Test voltage for basic insulation or supplementary insulation	Test voltage for reinforced insulation
kV peak	kV peak or d.c.	
0,33	0,43	0,53
0,5	0,65	0,8
0,8	1,04	1,28
1,5	1,95	2,4
2,5	3,25	4
4	5,2	6,4
6	7,8	9,6
8	10,4	12,8
12	15,6	19,2
U_P [a]	$1,3 \times U_P$ [a]	$1,6 \times U_P$ [a]
Linear interpolation may be used between the nearest two points.		

What's Changed?

- Electric Strength Test

Table 29 – Test values for electric strength tests

Parts	Impulse test	Steady state test
Parts indicated in 5.4.10.1 a) [1]	2,5 kV 10/700 µs	1,5 kV
Parts indicated in 5.4.10.1 b) and c) [2]	1,5 kV 10/700 µs [3]	1,0 kV



Thanks a lot……