

## IEC 60335-1:2001

### Safety of appliances

#### Introduction

The safety related requirements for materials to be used in appliances are based on the function of the part and the kind of use of the appliance. For this reason it is very important to know the construction of the equipment to be able to come to a correct choice of a material.

IEC 60335-1 provides general requirements for all appliances. For almost every specific appliance a part 2 in the IEC 60335-2-XX exist. In these Parts 2 all detailed additional requirements, not already described in part 1, can be found.

With the publication of IEC 60335-1:2001 two important requirements for materials are changed:

#### ▪ *CTI requirements*

Minimum creepage distances are made dependent on:

- Working voltage of the equipment
- Pollution degree of the environment in which the part is used (micro-environment in the equipment). Normally pollution degree 2 will be applicable.
- Kind of insulation (basic insulation, supplementary insulation, reinforced insulation, functional insulation)
- CTI value of the insulation material used

On page 2 some examples of minimum required creepage distances are given.

These new requirements for creepage distances in appliances will cause customer requests for higher CTI values.

#### ▪ *Important changes improving resistance to fire:*

- Decreasing the criterion for the current through electrical connections
- Increase of Glow-wire temperatures on end-products
- Introduction of GWFI and GWIT

On pages 3 an overview of the requirements for Ball Pressure Temperatures is presented.

On page 4, 5 and 6 overviews of the requirements for Flammability and Glow Wire are presented.

**The introduced GWFI (850°C) and GWIT (775°C and 675°C) requirements will lead to customer requests for these stringent material ratings.**

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## Minimum creepage distances for basic or supplementary insulation

Working voltage V	Creepage distance mm						
	Pollution degree						
	1	2			3		
		Material group			Material group		
	I	II	IIIa / IIIb	I	II	IIIa / IIIb	
= 50	0,2	0,6	0,9	1,2	1,5	1,7	1,9
> 50 and = 125	0,3	0,8	1,1	1,5	1,9	2,1	2,4
> 125 and = 250	0,6	1,3	1,8	2,5	3,2	3,6	4,0
> 250 and = 400	1,0	2,0	2,8	4,0	5,0	5,6	6,3
> 400 and = 500	1,3	2,5	3,6	5,0	6,3	7,1	8,0

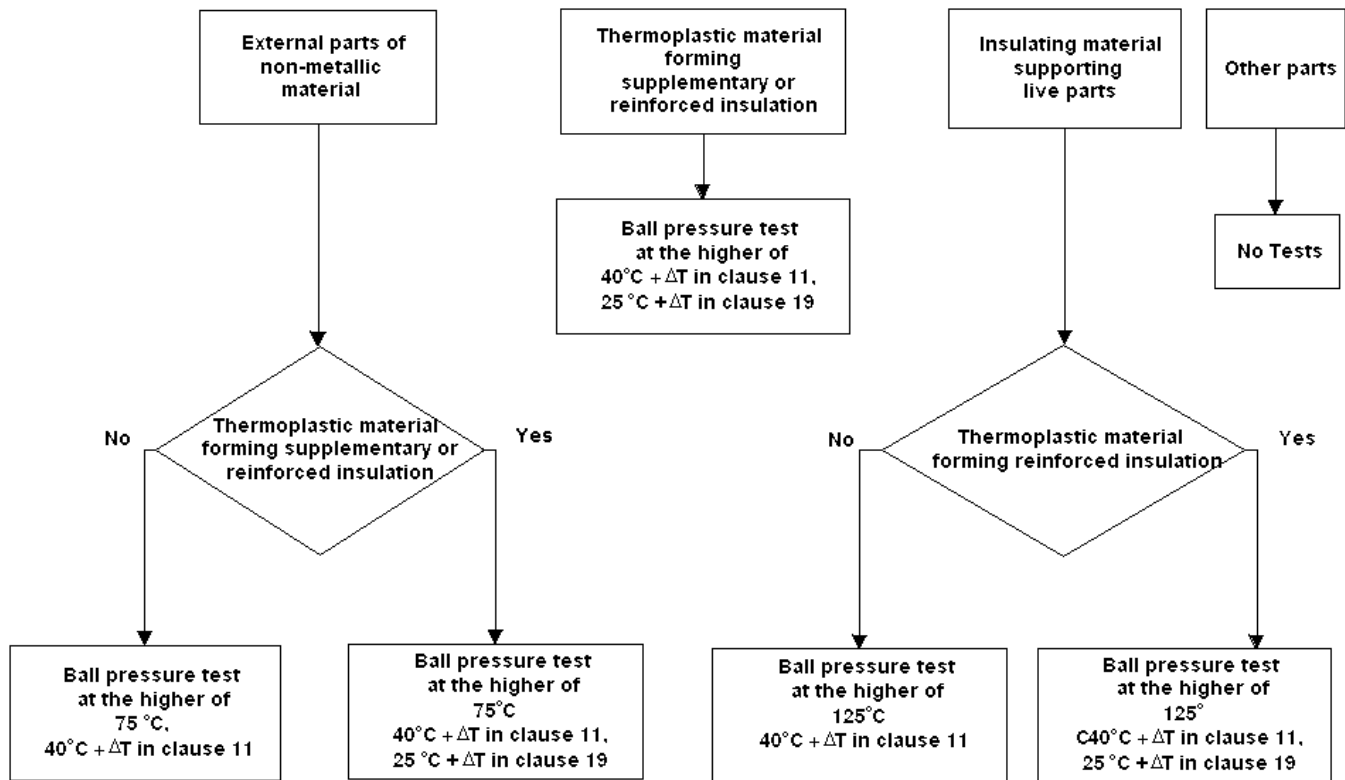
## Minimum creepage distances for reinforced insulation

Working voltage V	Creepage distance mm						
	Pollution degree						
	1	2			3		
		Material group			Material group		
	I	II	IIIa / IIIb	I	II	IIIa / IIIb	
= 50	0,4	1,2	1,8	2,4	3,0	3,4	3,8
> 50 and = 125	0,6	1,6	2,2	3,0	3,8	4,2	4,8
> 125 and = 250	1,2	2,6	3,6	5,0	6,4	7,2	8,0
> 250 and = 400	2,0	4,0	5,6	8,0	10,0	11,2	12,6
> 400 and = 500	2,6	5,0	7,2	10,0	12,6	14,2	16,0

## Relation Material group and CTI

Material Group	CTI acc. to IEC 60112
I	600 = CTI
II	400 = CTI < 600
IIIa	175 = CTI < 400
IIIb	100 = CTI < 175

## Resistance to heat Ball Pressure requirements



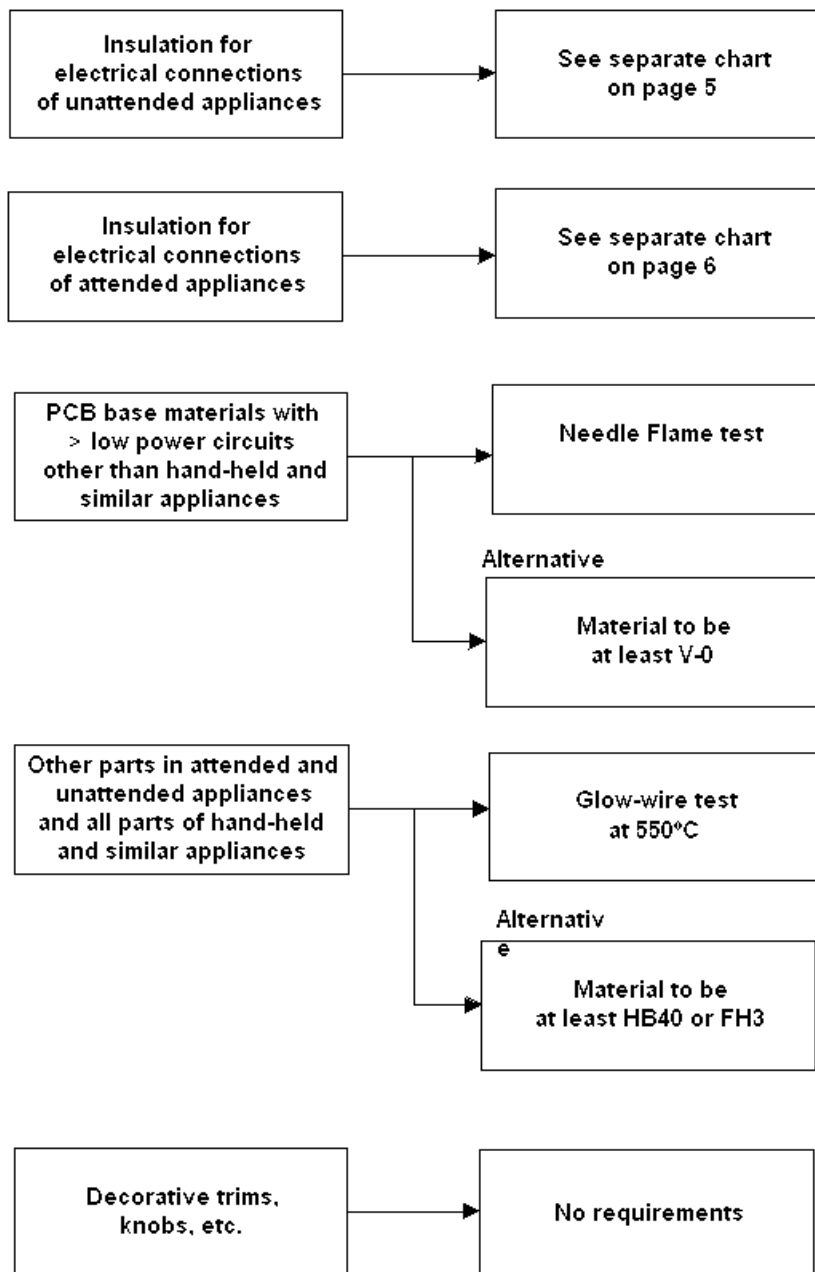
Ball Pressure acc. to IEC 60695-10-2

Clause 11 gives the maximum temperatures rises during normal use

Clause 19 gives the maximum temperatures rises during abnormal use

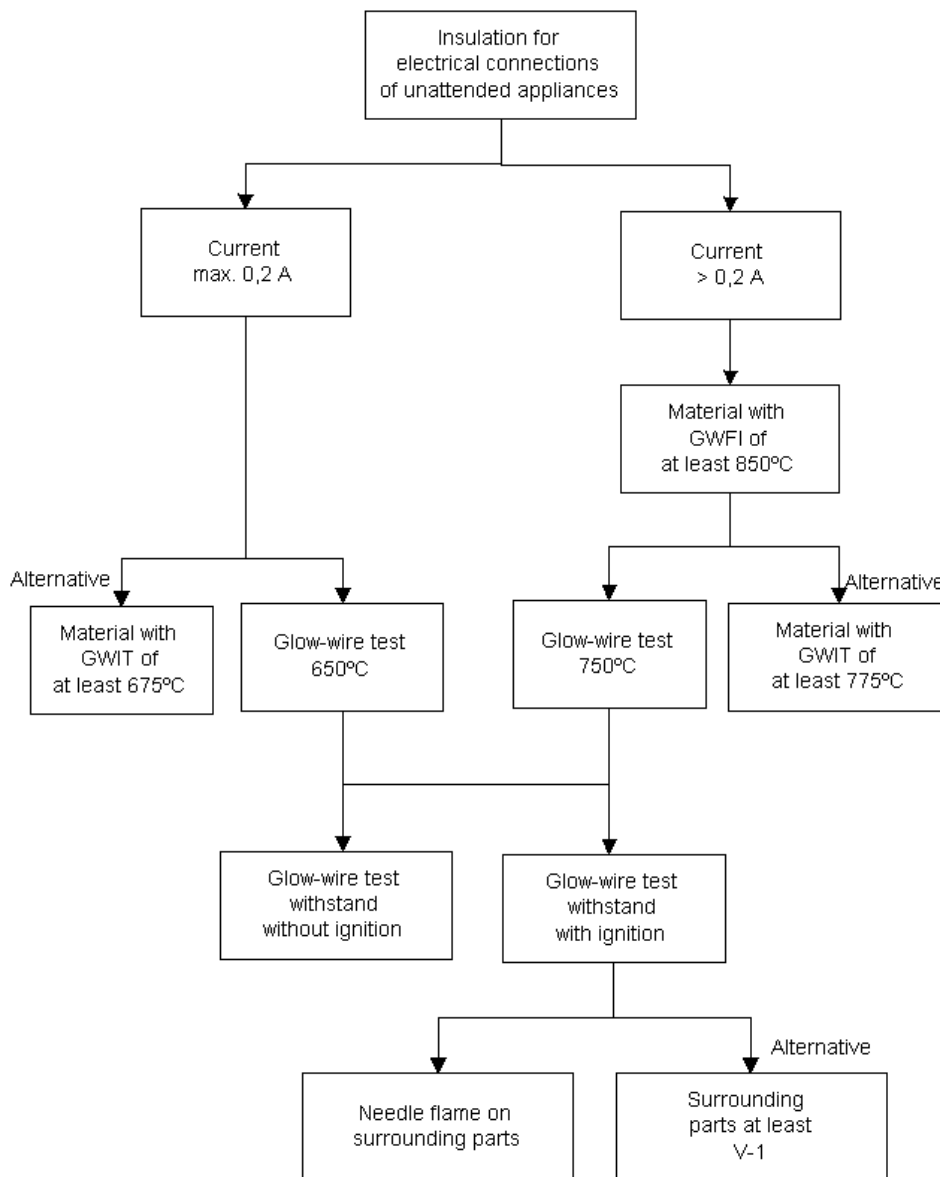
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## Resistance to fire



HB40 / HB75 and V-0 acc. to IEC 60695-11-10  
Needle flame acc. to IEC 60695-2-2 (End-product test)  
FH3 acc. to ISO 9772  
Glow wire test acc. to IEC 60695-2-11 (End-product test)

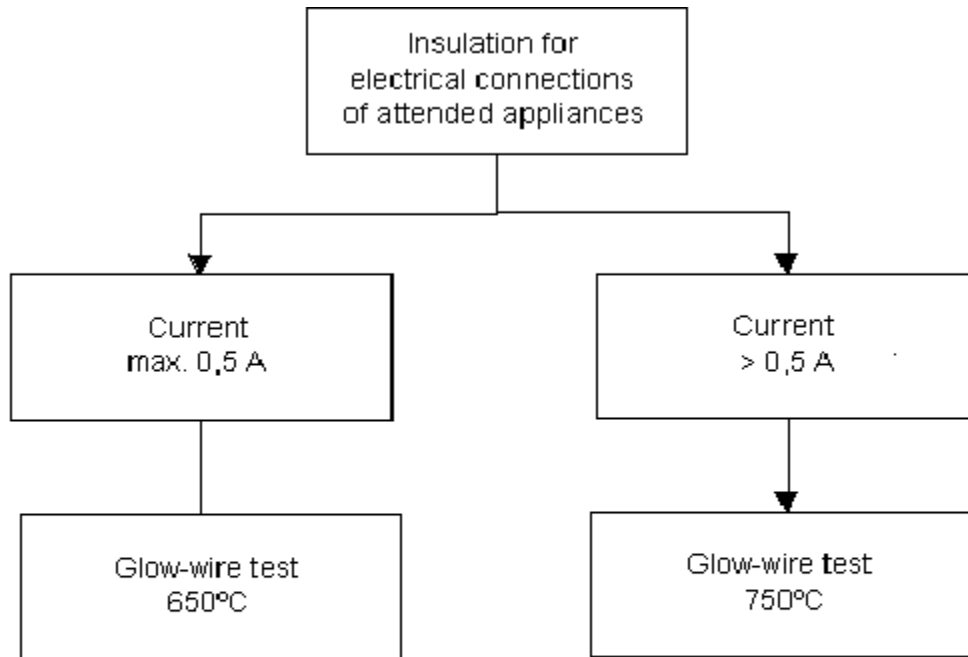
## Resistance to fire Unattended Appliances



GWFI acc. to IEC 60695-2-12  
 GWIT acc. to IEC 60695-2-13  
 Glow wire acc. to IEC 60965-2-11 (End-product test)  
 V-1 acc. to IEC 60695-11-10  
 Needle flame acc. to IEC 60695-2-2 (End-product test)

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## Resistance to fire Attended appliances



Glow wire acc. to IEC 60965-2-11(End-product test)