

# **Miniature Glass & Ceramic Fuses**

**Introduction to Electronic fuses**

**COOPER** Bussmann



T.V.



DVD player



Computers



Printers / Copiers

Audio Systems



-N (シャンパンゴールド)

# Miniature Glass & Ceramic Fuses

## Some Examples



# What is a miniature fuse?

**“FOR THE PROTECTION OF ELECTRICAL  
APPLIANCES, ELECTRONIC EQUIPMENT AND  
COMPONENT PARTS THEREOF, NORMALLY  
FOR USE INDOORS”**

**Required to be RoHS Compliant!!!**

**Small dimensions**

**High Volumes – 1000 or more typical**

**Low Cost**

**Up to 250 Volts**

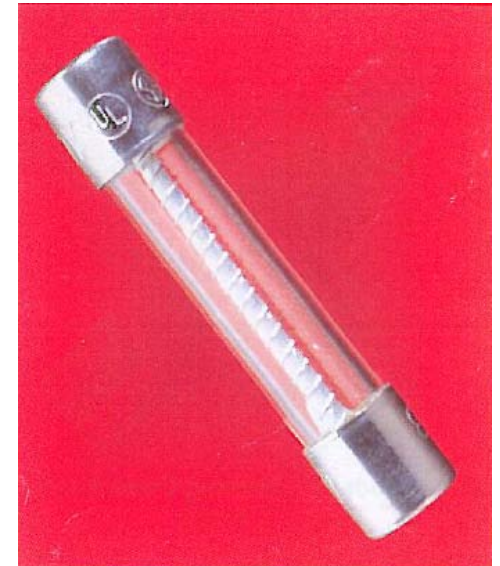
**Few Milliamps to around 30 Amps**

**Glass (LBC) & Ceramic Fuse links (HBC)**

**Modern “Sub-Miniature” and “Chip” Fuse links**

**6.3 x 32 mm (1/4 X 1.1/4 inches)**

- North America hence UL approvals



**5 x 20 mm**

- International Usage



**5 x 15 mm**

- International Usage



# How are they made?

**Some fuses made by hand as the delicate assembly procedure cannot be performed by machine.**



**Some elements are straight wire elements some are wound around fibre for extra strength.**

**Element is inserted into tube and end caps fitted.**

**Some elements are soldered to end cap.**

**Some fitted between the body of the fuse and end cap**

# Why aren't they all sand filled?

## Unfilled

- Glass Fuselinks Elements Visible
- Low Breaking Capacity (L) 35A, 250V a.c.
- Enhanced Breaking Capacity (E) 150A at 250V a.c.

## Sand Filled

- Usually Ceramic
- High Breaking Capacity (H) 1500A



## All have Limited Breaking Capacity

- Unlike Low & High Voltage Fuselinks

## D.C. Performance

- Half of AC rating

# What are their Characteristics?

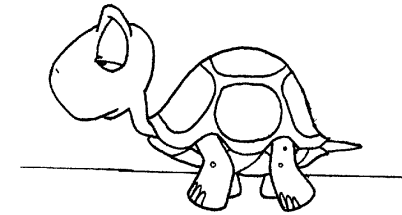
## **'F' Fast Acting**

- **No Circuit Surges**
- **Protect Sensitive Components, e.g. Semiconductors**



## **'T' Time Lag**

- **Withstand Circuit Surges**
- **Switching on Transformers**
- **Capacitors: Charge, Discharge**



# How are they achieved?

The physics for fuse technology are the same for small fuses as they are for large fuses.

For fast acting fuses normally a straight element is used. For time delay or slow blow fuse there are two methods of element design employed.

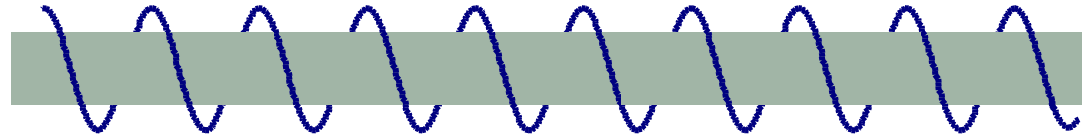
“M” effect is added to the straight element which allows the fuse to clear low over load faults.

A spiral wound element is used for circuits with in rush current. The spiral allows the element to expand and contract without damage under inrush conditions.

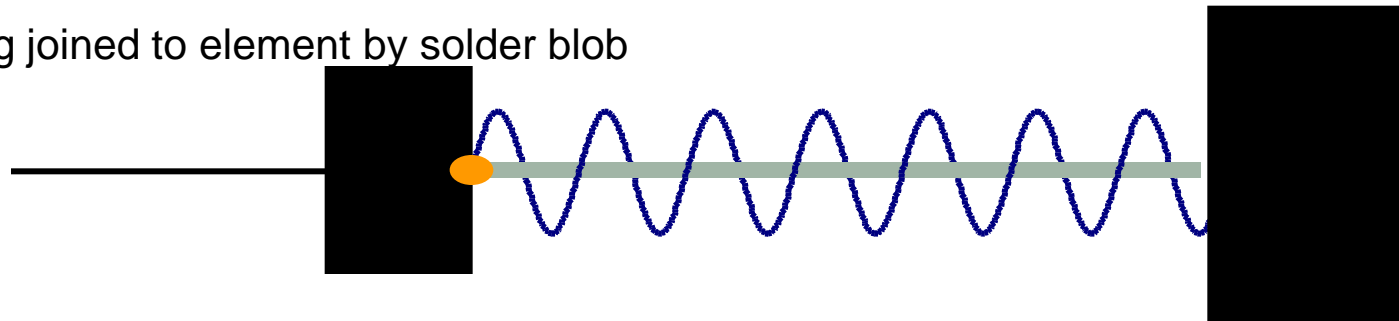


# Time delay Fuse-links

Longer, Thicker element wound on core



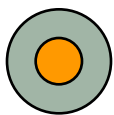
Coil-Spring joined to element by solder blob



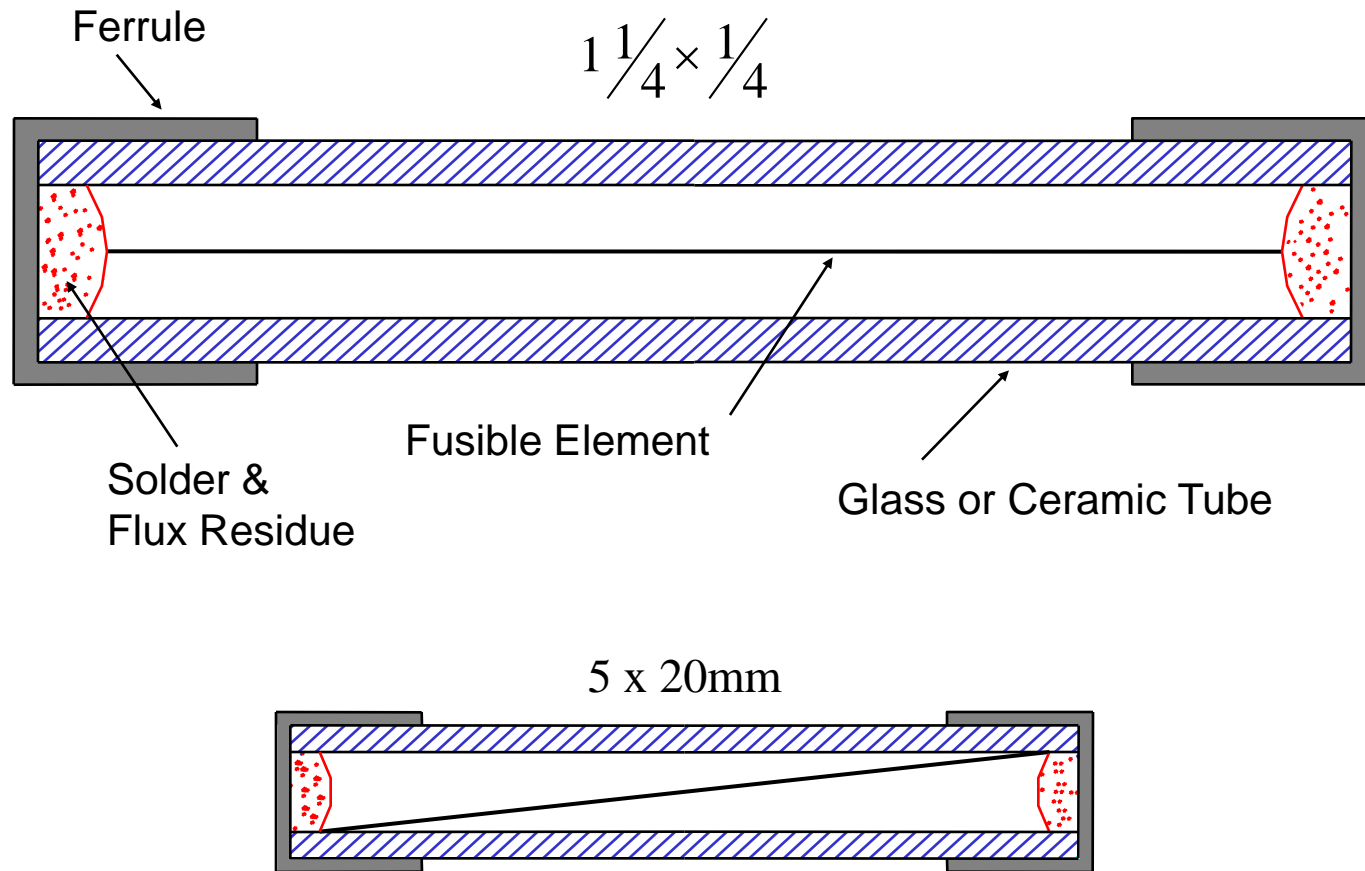
Wire with 'M' effect blob



Copper element with tin outer



# Traditional Fuse Construction



## IEC 60127 : Part 2

5 x 20 fuses IEC only to 6.3A

## UL248-14 (CSA)

## Approvals Marks



BSI VDE SEMKO IMQ<sub>(Italy)</sub> UL

# So What markings are used?

**T 3.15 H 250V Buss S**

**T** Characteristic:- Time Lag

**3.15** Current Rating:- Amps

**H** Breaking Capacity:- High

**250V** Voltage Rating:- Volts

**Buss** Manufacturers Trade Mark:- Bussmann



**Mandatory Approvals Symbol's**

# Are these markings part numbers?

**NO!** but they can identify the type.

## UL/CSA

- **6.3 x 32 : A or M Series : AGC, MDC**
- **5 x 20 : G M Series : GMA, GMD**
- **5 x 15 : C 500 Series : C519, C520**

## IEC

- **Dual References : S500 & GDB**
- **: S506 & GDC**

## British

- **6.3 x 32 : TD Series : TDC10,  
TDC11**

**Now known as C10 and C11**

## Surface mount fuses

Typical part numbers

0603FA1-R

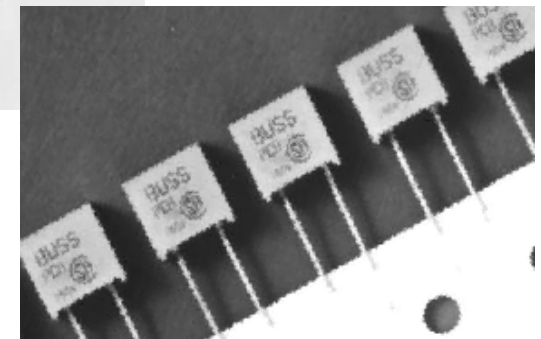
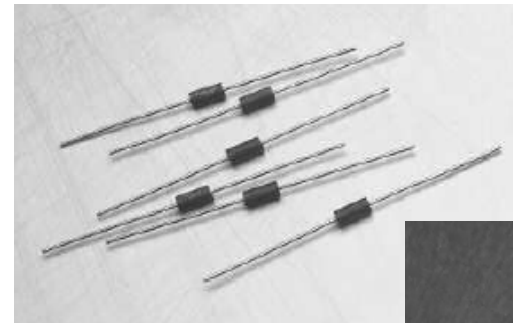
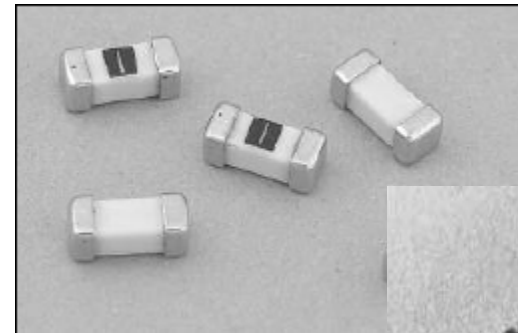
3216TD1-R

## Sub-miniature fuses

Typical part numbers

MCRW-amps

PCB-amps



# How are the fuse links fitted?

**Panel Mounting Fuseholders**

**Base Mounting (Chassis) Types**

**PCB Fuseholders, Bases or Clips**

**Leaded Fuselinks for PCB's**

# Panel mounted fuse holders

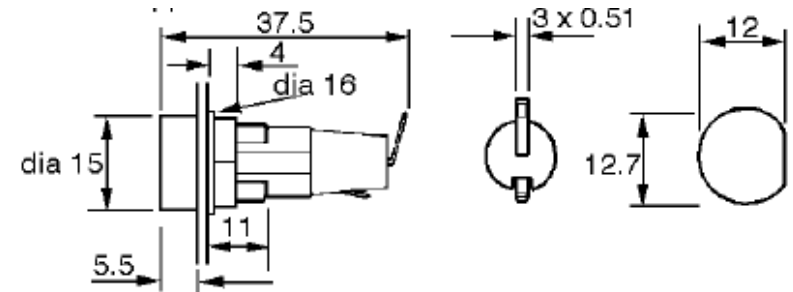
**‘D’ Shaped Hole**

**Fixed with Front or Back Nut**

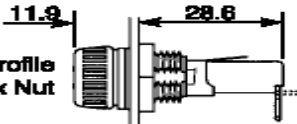
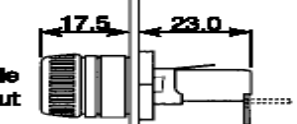
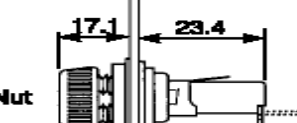
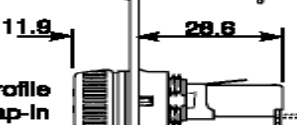

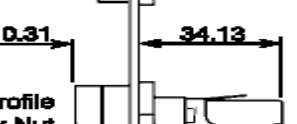
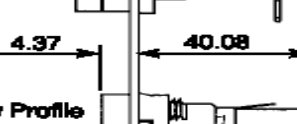
**Finger or Screw Driver Carrier Tightening**

**Cable Connections Push-On or Solder Tags**

**HTB and HTC - 70M Typical**



# Panel mounted fuse holders

	Common dimensional data: length (finger grip) - 42.9mm plus in-line terminal (screwdriver slotted) 44.5mm	Max. Panel Thickness	Terminal Options				Carrier Options			
			Solder/4.8mm Quick Connect		6.35 Quick Connect		6.35 x 31.75		5 x 20	
			In-line	Right Angle	In-line	Right Angle	Finger Grip	Screw- driver	Finger Grip	Screw- driver
K N O B  T Y P E  C A R R I E R	 Low Profile Rear Hex Nut HTB-2	7.62	HTB-22I	HTB-24I	HTB-26I	HTB-28I	✓	☒	☒	☒
		7.62	HTB-22M	HTB-24M	HTB-26M	HTB-38M	☒	☒	✓	☒
	 High Profile Rear Hex Nut HTB-4	3.175	HTB-42I	HTB-44I	HTB-46I	HTB-48I	✓	☒	☒	☒
		3.175	HTB-42M	HTB-44M	HTB-46M	HTB-48M	☒	☒	✓	☒
	 Front Hex Nut HTB-6	7.62	HTB-62I	HTB-64I	HTB-66I	HTB-68I	✓	☒	☒	☒
		7.62	HTB-62M	HTB-64M	HTB-66M	HTB-68M	☒	☒	✓	☒
	 Low Profile Snap-In HTB-8	3.175	HTB-82I	HTB-84I	HTB-86I	HTB-88I	✓	☒	☒	☒
		3.175	HTB-82M	HTB-84M	HTB-86M	HTB-88M	☒	☒	✓	☒
	S C R E W D R I V E R  S L O T	 Low Profile Rear hex Nut HTB-3	7.62	HTB-32I	HTB-34I	HTB-36I	HTB-38I	☒	✓	☒
7.62			HTB-32M	HTB-34M	HTB-36M	HTB-38M	☒	☒	☒	✓
 High Profile Rear Hex Nut HTB-5		3.175	HTB-52I	HTB-54I	HTB-56I	HTB-58I	☒	✓	☒	☒
		3.175	HTB-52M	HTB-54M	HTB-56M	HTB-58M	☒	☒	☒	✓
 Low Profile Snap-in HTB-9		3.175	HTB-92I	HTB-94I	HTB-96I	HTB-98I	☒	✓	☒	☒
		3.175	HTB-92M	HTB-94M	HTB-96M	HTB-98M	☒	☒	☒	✓

## Open Types Inside Equipment

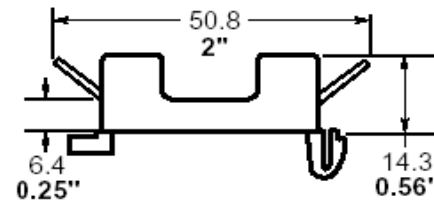
Snapped or

Screwed into Position

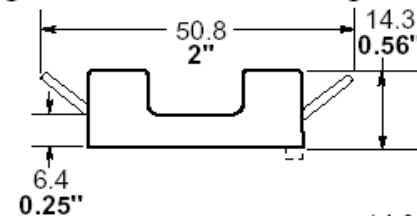
S-8000 Series for 6.3 x 32 mm

HTC-10M for 5 x 20 mm

Single Pole Snap-in Mounting

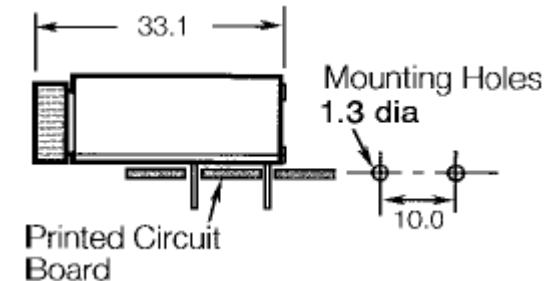


Single Pole Bolt-in Mounting



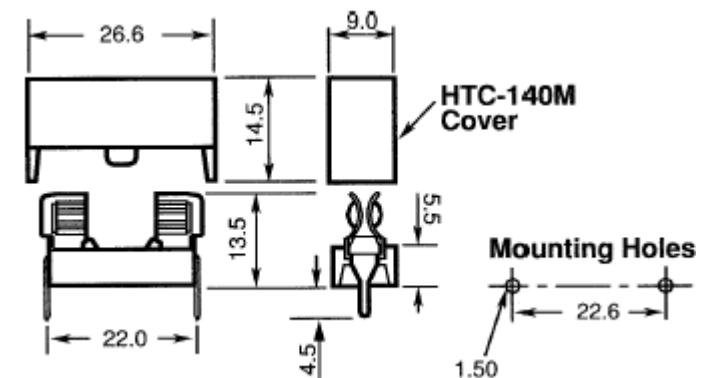
## Fuseholders

- Similar to Panel Types
- Connection Pins Project Through PCB
- Horizontal or Vertical - HTC50M, HTC45M



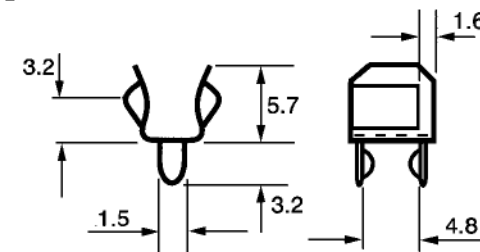
## Bases or Blocks

- Open Clip - HTC15M
- Snap-on Covers HTC140M

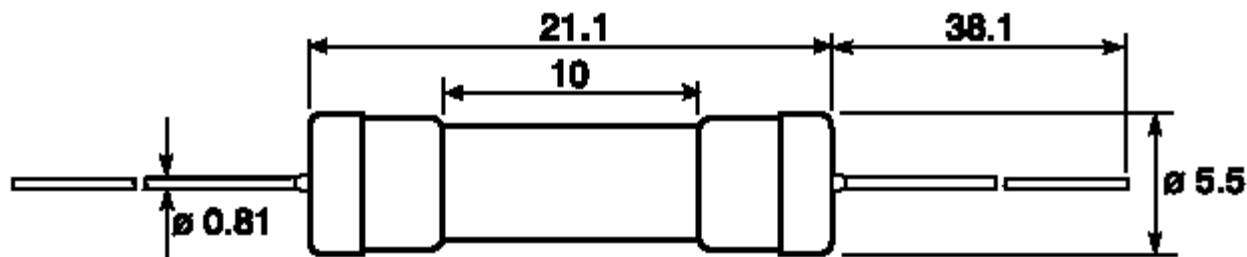


## Clips

- Special solder in clips
- Can be Packaged for Automatic Insertion (Ammo packs)



- **Wire Leads Attached to End Caps**
- **Pass Through Holes in PCB**
- **Prefix-V for 6.3 x 32mm and 5 x 20mm : AGC-V**
- **5 x 15 Unique Part Numbers : C515**
- **5 x 15 Automatic Insertion : Tape & Reel : TR**



<b>Bel Fuse</b>	-	<b>USA, Asia Pacific</b>
<b>China</b>	-	<b>Local Manufacturers</b>
<b>ELU</b>	-	<b>Germany</b>
<b>Ferraz</b>	-	<b>France, Asia Pacific</b>
<b>Gould</b>	-	<b>USA, Asia Pacific</b>
<b>LITTEL fuse</b>	-	<b>Global</b>
<b>Shurter (Cehess)</b>	-	<b>Switzerland, France</b>
<b>SIBA</b>	-	<b>Germany</b>
<b>Wickmann</b>	-	<b>Germany, Asia Pacific</b>

Bussmann has a large range of electronic fuses

Can meet the requirements for most applications

All fuses meet the RoHS and WEEE directives

Large customer base

Product preferred for new designs by many large brand electrical manufacturers.

ANY QUESTIONS??