





## Why K-Mass<sup>®</sup>?

Specifically designed and formulated for Critical Control Components, K-Mass<sup>®</sup> has become the preferred choice of protection based on verified performance. K-Mass<sup>®</sup> provides superior insulation characteristics in high *heat flux*, rapid temperature rise hydrocarbon fires by maintaining cooler surface temperatures, lower heat transfer rates, and cools the components in sudden ambient temperature increases to 1093°C / 2000°F.

The moldable intumescent, chemically inert compound becomes reactive in the presence of heat, expanding to many times its original size as it develops the insulating char that inhibits Critical Control Component temperature rise.

The maintainability of the valve, actuator or Critical Control Component requires no separate motions or tools. Since the K-Mass<sup>®</sup> is molded to each individual exposed non-sacrificial part, the K-Mass<sup>®</sup> is removed with the component part. There are no additional labor or inspection costs to be added to the procured cost of the Passive Fire Protection.

K-Mass<sup>®</sup> and its application are tested in accordance with the 60,000 ± 5000 BTU/hr/ft<sup>2</sup> heat flux, UL 1709 Rapid Rise Fire Test of Protection Materials for Structural Steel.

The ability of process controls to operate, while the fire location is identified, decisions are made, and corrective action taken is the critical function in *minimizing* the size and *effect* of a hydrocarbon fire. K-Mass<sup>®</sup> provides the time to allow these activities to be successfully undertaken saving property, processes, products, personnel, and profits.

#### Why Thermal Designs, Inc.?

As a leader in the development of Passive Fire Protection Products for the Hydrocarbon and Chemical Process Industries, Thermal Designs, Inc. has researched and tested hundreds of materials enabling the offering of the current Passive Fire Protection Solutions. Quality and Craftsmanship are synonymous in the design and manufacture of our products. Over 42 years of experience have led the serious Fire & Safety professionals to Thermal Designs, Inc. in search of long term, reliable, low cost solutions for passive fire protection.

Registered and Trade Named Products, K-Mass<sup>®</sup>, Fireproof Enclosures<sup>™</sup>, K-Guards<sup>™</sup>, Ceramic Fiber Liners, and K-Cabs<sup>™</sup> are manufactured at facilities in Corsham, Wiltshire, UK, and Houston, TX, with sales offices also in Alberta, Canada for delivery anywhere in the world. Products have been *"Real World"* fire tested as well as laboratory Explosion, Jet Type and Hydrocarbon Pool Fire tested and / or certified to UL 1709, by Bureau Veritas, Faverdale Technology Centre, Sintef of Norway, and Southwest Research Institute.

Thermal Designs, Inc. is not only a manufacturer of passive fire protection; it is also a distributor of the 3M-product line of Endothermic Mats and Caulks. Why is TDI the preferred provider of Critical Control Circuit passive fire protection? TDI is the *"One Stop Shop"* for *"Tested Solutions"* applied to Critical Control Components and all operational equipment in the Fire Zone.





#### HOW K-MASS® WORKS



*Fire Starts* Upon exposure to fire, K-Mass® begins to intumesce in response to the heat by beginning a process of evaporative cooling and charring on the surface of the coating.



Short Term Exposure The surface char deepens in successive layers, filling voids, insulating the equipment, cooling, and reflecting the heat back in the fire.



Long Term Exposure As the heat penetrates the charred layers, more foaming, filling, and charring occurs with a subsequent release of moisture which cools the substrate. The process continues until the fire is extinguished, or the material is consumed.



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# K-Mass® Intumescent Coating - The "People Proof" Solution

**Pre-Fire** 

Post Fire



**Features** 

• Tested to Rigid Standards

Segment Molded Coating

Fixed Passive Fire Protection

No Interference with Local or Remote

Provides 30 Minute 2000°F Protection

of Electronic, Pneumatic & Hydraulic Equipment

• Chemically Inert

Controls





#### **Benefits**

- Adds nothing to the fire
- Original Equipment Design Features available and intact.
- Exceeds ANSI/API 607 and UL 1709
- Can be applied to all components in
- the Critical Control Circuit.
- Total access to any component part without removal of the fire protection "People Proof Design"
- Always there when needed Requires minimum space to accommodate

## A K-Mass<sup>®</sup> Advantage

#### Insulation vs. Intumescent

The success of insulation type passive fire protection methods at reflecting heat away from the materials being protected also enables the heat of operation to build up inside the protected component. The K-Factor of K-Mass® is 5 compared to the K-Factor of 1 for ceramic fiber insulation. This would indicate that if retained heat and temperature rise or maximum surface temperature are of concern, specification of K-Mass® as the proper fireproofing material is critical "to plant safety" applications and long-term safe equipment operation.



Insulation Blanket



Insulation Enclosure



K-Mass® Coating



## K-Mass<sup>®</sup> Protects Critical Control Components in the Fire Zone

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## K-Cabs™

**K-Cabs**<sup>™</sup> are custom designed and fabricated K-Mass® coated, stainless steel, instrument and electrical component cabinets. K-Cabs<sup>™</sup> are tested to provide a minimum of 30 minutes of protection in a 1093°C/2000°F Hydrocarbon Fire. The cabinet is designed to NEMA-4X requirements, which allow for mounting of non-arcing or sparking electrical components and terminal strips within the cabinet. K-Cabs<sup>™</sup> have been installed in many major Oil Producers' facilities in hazardous zones or locations.



#### Application Data

**K-Cabs**<sup>™</sup> have few restrictions in their design and application. Each application is custom designed to meet the space, mounting, connection, and equipment layout requirements of the specified application. A dimensioned drawing or sketch of the required components with orientation for mounting and equipment to be protected is required for accurate product quotation. Drawings are submitted for approval after receipt of purchase order.

#### Features of Construction

- Wall, Stanchion, or Actuator Mounting
- All 304 SS Welded Construction
- Reinforced Panel Construction
- Welded Full and Half Couplings 1/8" to 3" Rated 150 or 3000 psi
- Hinged or Threaded Fastener Cover
- Protected to 1093°C/2000°F for 30 Minutes

Available with or without Internal Mounting Plate
Components

- Intumescent Glass Optional
- Phenolic or SS Tags
- Installation of Hydraulic, Pneumatic or Electrical Components
- Extended Push Buttons

#### <u>Benefits</u>

- · Can be Installed in any Orientation or Location
- Durable Corrosion Resistant
- Prohibits Oil Canning
- Allows Connection of Pipe, Conduit and Tube Fittings for Electrical, Hydraulic or Pneumatic Components
- Conforms to Installation Application Standards
- Meets or Exceeds UL 1709 Fire Test Requirements
- Can be utilized for Mechanical or Electrical
- Permits Viewing of Gauges and IR Communication
- Identifies Instruments and Provides Instructions
- In Fire Zone, Protected Instrument Enclosure
- Permits Instant Control Access without Opening

## K-Guard<sup>™</sup> Passive Fireproofing Covers

**K-Guards**<sup>™</sup> are custom designed and manufactured Passive Fire Protection covers that allow field fit to existing Critical Controls. Constructed from cast K-Mass® and tested to the rigorous conditions of a UL1709 Fire Test, K-Guards<sup>™</sup> allow the protected equipment to operate and survive in exposures in excess of 1093°C/2000°F for 30 minutes. Levers and wheels extend outside the covers permitting operation without removal of covers. K-Guards<sup>™</sup> reduce the cost of fireproofing electrical, hydraulic and pneumatic controls allowing refit to meet new API or insurance carrier requirements.



Rack and Pinion Actuators



Accessories and Controls



**Electric and Pneumatic Actuators** 

## Fireproof Enclosures™

Fireproof Enclosures are Custom Designed to provide 30 or 60 minutes of protection in 1093°C/2000°F Hydrocarbon Fires. Originally produced in 1979 the latest designs are "option-engineered" to provide maximum flexibility of installation and maintenance while providing superior Fire Protection and greater product life than any other insulation type removable Passive Fire Protection in the market.



#### Application Data

Fireproof Enclosures<sup>™</sup> are *Custom Designed*, Captive Ceramic Fiber or K-Mass Lite<sup>®</sup> Insulated, Field Removable, Passive Fire Protective Enclosures. Only the item to be protected limits the product size. Traditionally specified to protect Valves, Actuators, Instruments and Electrical Panels. Fireproof Enclosures<sup>™</sup> can be used anywhere a rigid, corrosion and impact resistant product is preferred. Fireproof Enclosures contain no asbestos.

## Features of Construction

- Base, Valve, or Actuator Mounting
- All 304 SS Welded and Gusseted Construction
- Step Jointed Assembly Design
- Welded Pass-Thru Connections 1/8" to 3" Rated to 150 or 3000 psi
- Hinged Doors
- Durable, industrial lining exterior
- SS Tags (Optional)
- Extended Controls
- Optional protection to 1093°C/2000°F for 30 or 60 mins.

## **Benefits**

- Can be Installed in any Orientation or Location
- Durable, Corrosion Resistant
- Seals Out Flame Paths
- Allows Connection of Pipe, Conduit and Tube Fittings
- Allows Access to Operators for Adjustments
- Superior Chemical, Impact, and Moisture Protection
- Identifies Instruments and Provides Instructions
- Permits Instant Control Access without Opening
- Meets or Exceeds UL 1709 and ANSI/API 607 Fire Test Requirements

## FIRE TESTED MATERIALS

Passive Fire Protection Materials are tested to many different standards by many different methods. The real criterion for fireproof rating is test conditions to equipment failure under projected fire conditions. Be it Jet Fire, Pool Fire, or Pit Fire the pass failure criteria is the functional time gained for operations to isolate and remove the fuel from the fire allowing the processes to be controlled in an otherwise uncontrollable situation. Fire Testing is the only proof of valid exposure ratings. K-Mass® and K-Guards™ have undergone extensive testing allowing the coating thickness to be designed to the required fire rating.



Hydrocarbon Pool Fire



Gas Fired Furnace



Tested to Survive

Product Tests, Characteristics and Standards



#### Why UL 1709?

There are many industrial fire test standards. Determining which are applicable and which are not can be difficult for design, safety, and engineering professionals. API 2218 is a comprehensive source of information on Fireproofing Practices in Petroleum and Petrochemical Processing Plants. At Thermal Designs, Inc. we have solved the issue of which tests apply by examining how a fire starts, what contributes to an explosion, and critical events that occur after the explosion. We believe that most hydrocarbon fires can be mitigated at the fuel supply stage. This logic dictates that Critical Controls must perform in "Real World" fires. The UL 1709 Rapid Rise Fire Test, although designed for structural steel, represents the "Real World" Flame Temperature and Heat Flux that can be expected in any Hydrocarbon Fire. UL 1709 provides the test criteria; Thermal Designs, Inc. provides products allowing 30 minutes to locate the fire, determine the corrective action and bring the fire under control; good engineering practice will allow diverting or de-inventory of fluids enabling active protection methods to extinguish the flames.

## Material Properties of K-Mass®

<u>Physical</u>	<u>Test</u>	Value	Chemical and Corrosion Resistance	
Density	ASTM D-792	1305.5 kg/m³ 81.5 lb/ft³	Salt Fog ASTM B-11 Bases:	7 720 Hours No Effect
Thermal Conductivity	ASTM C-177	0.41 W/m°C 2 84 BTI lin/ft²-hr°F	20% Potassium Hydroxide	Submersion 24 Hours No Effect
Coefficient of Thermal Expansion	ASTM D-695 -11°C to 31°C	40.1 x 10 <sup>-6</sup> cm/cm°C	100% Ammonium Hydroxide Acids:	Submersion 24 Hours No Effect
	12°F to 91°F	22.3 x 10 <sup>-6</sup> in/in°F	20% SulfuricSubme30% HydrochloricSubme	rsion 24 Hours Slight Darkening rsion 24 Hours Slight Darkening
Maximum Continuous Service Temperature		85.6°C/185°F	50% Hydrofluoric Subme Concentrated Hydrochloric Temp. Cycle 12-weeks 18	rsion 110 Hours Slight Softening Moderate Darkening °C to 60°C / 0°F to 140°F No Effect
Thermal Shock Resista	nce			
Four 24hr Cycles from	-50°C to 30°C	Very Slight Microcracking		
Color		Blue		
<u>Mechanical</u>	<u>Test</u>	<u>Value</u>	Material Properties of Fiber Insulation	
Tensile Strength	ASTM D-638	> 159 kg/cm² > 2200 psi	Average Density	240.7 kg/m³ 15 lb/ft³
Compressive Strength	ASTM D-695	> 530 kg/cm <sup>2</sup> > 7520 psi	Compressive Strength	5.94 kPa 1240 lb/ft²
Impact Strength	ASTM D-256	0.13 J/cm of notch 2.8in-lb/in of notch	K-Value at 2000°F Melting Point	1.26 1760°C
Hardness	Shore D	> 75	Continuous Use Temperature	3200°F 1260°C
Bond Strength	ASTM D-1002	> 124 kg/cm²	Coromia Eibor is Ashastas Eraa	2300°F
Shear Strength	ASTM D-1002	> 119 kg/cm² > 1660 psi	Excellent Chemical Resistance to Bases and Weak Acids	

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