ULTIMHEAT

JPC

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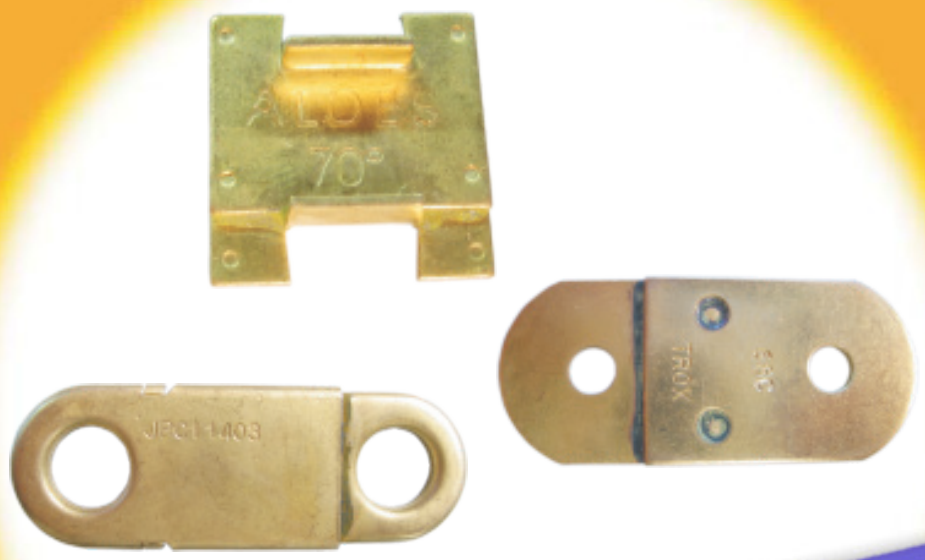

FIRE DETECTION FUSIBLE LINKS

A fusible link is a mechanical part that breaks at a preset temperature, they are used in fire detection system to open or close door, dampers, vents etc..., if ambient temperature rise upon a certain value.

The professional solution: an extended, rational, and consistent range of products

Technical catalogue for R&D department

Edition 27/02/2013

JPC

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
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General Terms of Sales

GENERAL: our sales are made under the here below terms of sales. Any contrary conditions provided by the buyer shall not be binding and shall not have any legal effect.
The execution and delivery of any purchase order is made in conformity with the present general terms of sales and it is noted that the buyer first has full knowledge of these terms.
In case of dispute on any of the herein below terms, we will consider ourselves as completely free from any contract related to the execution of any pending order.
If some specific conditions are stated by the buyer, these conditions will be considered by us as a formal acceptance only after our written consent.

ORDER: we will commit only on orders for which an order acknowledgement has been issued. The sale is regarded executed at the date of order acceptance by JPC.
Any cessation or cancellation of pending orders, for whatever reasons, cannot be accepted by JPC without a compensation equal to the ordered goods value.
Any manufactured product being subjected of a prototype or a pre-serie accepted by the customer will be regarded as in compliance with the customer's specifications.
No goods can be returned without JPC's written consent. In this case, a credit note valuable on a further purchase order will be issued only if the goods are returned in the original delivery conditions. All manufactured goods made upon a specific order cannot be either returned or be subjected to a credit note.

PRICES: our price offers are remitted under the existing conditions at the date of offer, for mentioned quantities. They can be revised after the call period has expired.
Orders for lower quantities than quoted: our offers are subjected to price revisions.
Orders with prices related to our general price list can be revised at any time, in accordance to the existing terms at the delivery date. Our prices are VAT exclusive for unpacked materials according to the EXW Incoterm.
For orders less than € 75 Excl. tax exclusive of fees, administrative costs amounting to € 7.62 Excl. tax will be charged to customer.

DELIVERY TIME: our delivery times are estimated bona fide. They are purely informative and cannot be considered as commitments. Unless our prior express consent, no overrun will be regarded as a justification of order cancellation or set rights to any compensation or deduction.

DELIVERY: Whatever mean of transportation, all risk of loss or damage in transit shall be borne by the purchaser.
The buyer must ensure of the good conditions of the delivered goods and he must make, within the legal terms, all necessary reserves and legal actions in order to preserve his rights against the carrier.
Regarding the conformity and visible quality of delivered goods related to an order, the buyer must send his eventual written claim within an 8 days legal notice from the collection date. Claims will be taken into account only if the goods are kept in the consignment conditions.
For manufacturing reasons, we reserve the right of delivering plus or minus 10 percent of the ordered quantities.

PAYMENT TERMS: unless other arrangements expressly provided by special conditions at the bottom of our order acknowledgment, our invoice is resolvable by draft accepted at 30 days end of month .
The invoices less than € 150 Excl. tax, the first order and the files not accepted by our factoring company are resolvable cash on order.
No discount for pre-payment is accepted.
Whatever the mean of payment, we reserve the ability of cancelling or postponing any blanket or purchase order, invoicing any related charges and to ask for an immediate payment of all pending invoices and all implemented collection charges until total settlement has been completed.
In no way, payments due to JPC can be postponed or be subjected to either deduction nor compensation unless JPC's express written consent.
We reserve the right to require an agreed guarantee of the customer's execution of commitments, even during the execution of a blanket or purchase order.
Any refuse from the customer will open JPC's right to partial or total order cancellation.
Any payment to JPC will apply to due amounts whatever the cause, starting with the oldest due amounts.

RETENTION OF PROPERTY: our goods are sold with a retention of property.: according to the terms of the 1980/05/12 Law and the 1985/01/25 Law (amended 1994/06/10), the Seller shall keep the ownership of the Products until the full payment of the agreed price is made including any other payments outstanding, if any, from the Purchaser to the Seller. However, the Purchaser shall bear the risk of the loss, damages, harms, deterioration or destruction of the sold Products since such Products are at the disposal of the Purchaser and he must have subscribed any related insurance.
In the event of payment delayed by the Purchaser and 8 days after receipt of a registered reminder letter remained unfruitful, the contract shall be regarded as executed. In such an event, JPC will reserve the right to take back the goods and all related settlements by the Purchaser will not be refunded and regarded as damages, without any restitution or compensation claim from the Purchaser related to an eventual resell.
To prevail over the aforesaid clause and in the event of collective judicial proceedings, JPC will notify its such express will to the Purchaser or to its official representative, by registered letter, to have the goods returned.

PROPERTY OF TOOLS: the tools that have been fully settled to JPC are the customer's property. They remain at his entire disposal at JPC's facility if the end product is made by JPC, or in the sub-contractor's French or Foreign facility if the product is sub-contracted or imported.
Unless otherwise written consent from the Purchaser, all tools unused for more than 2 years will be considered as abandoned and will be destroyed. Storage charges can be invoiced if the customer wishes to keep unused tools.
Tools for which a partial amount has been invoiced to the Purchaser remain the property of JPC. The tools are made to fit the manufacturing equipment, Norms or Standards in force at JPC's or at its sub-contractors. Unless otherwise specified, their lifetimes are equal to 3 years life according to the annual quantities provided by the Purchaser during original negotiation or on the original order. In the meantime, all maintenance and repairs charges shall be borne by JPC. For additional quantities than provided, all maintenance and repairs charges shall be borne by the Purchaser.

WARRANTY: goods manufactured by JPC are covered by a 1 year warranty coming into force at the delivery date.
For all imported good, our warranty period is limited to the manufacturer's warranty. We cannot be held as responsible for any manufacturing ascertained default on goods re-sold as are. We forward the claims on delivered goods and apply the eventual warranty clauses after agreement receipt from our constituents.
To benefit the warranty, The Purchaser must send a written claim to JPC, providing all ascertained defaults and give JPC all means to ascertain and bring corrective actions.
Packing, freight, return, carriage, un-assembly and re-assembly charges shall be borne by the Purchaser.

LIABILITY LIMITATIONS: the buyer must ensure that the use of the purchased products complies with Norms and Rules into force, whatever the advices or recommendations shown in the seller's documents. De facto, he resigns all claims against the Seller. No request for compensations for direct or indirect damages or loss is receivable.
JPC's liability is strictly limited to the aforesaid obligations.

APPROPRIATE COURT – APPLICABLE LAWS: all sales by JPC are subjected to French Laws including the 1980 Vienna Convention on International Sales. Any controversy, dispute or claim arising out of or related to this contract or breach thereof shall be settled by arbitration of The Tribunal de Commerce Court held in Meaux, 77, France.

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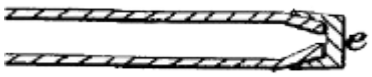
RCS Meaux 302 236 641 00049 – APE 2651B - FR10 302 236 641

Historical and technical introduction of fusible alloys and fire safety fusible links

The first set of low temperature melting alloys was reported by Isaac Newton in 1701 for use as temperature standards.
In 1753, the French scientist Claude Geoffroy Le Jeune discovered Bismuth, previously confused with lead. However, he died before completing his research on the metal.
A set of low melting Bi/Pb/Sn alloys of varying composition were reported posthumously in 1772 by the German pharmacist, Valentin Rose the Elder (1736-1771), and are commonly referred to as "Rose's Metal,"
In 1775, the French chemist Jean Arcet provided to the Royal Academy of Sciences a report of his experiences on a fusible alloy of lead, bismuth and tin, which had the characteristic of melting at the water boiling temperature. A set of more than ten compositional variations for this system was reported and are known collectively as "D'Arcet's Alloys"
The first application of one of these alloy melting at 98 °, made of three parts of tin, eight parts of bismuth and five parts of lead was the manufacturing of stereotype printing plates.
But quickly, due to the development of steam boilers and steam engines, a new application was found as the ultimate safety device in steam boilers.
To overcome the frequent explosions occuring in early steam engines, the fusing plugs were invented, opening a safety valve when the steam temperature became too high.
Ternary alloys of bismuth, tin and lead, alloys took the name of their inventors:

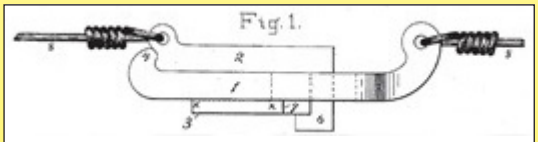
- Rose's alloy (50% bismuth, 25-28% lead and 22-25% tin, with a melting point between 94° C and 98° C),
- Newton's alloy (50% bismuth, 31% lead and 19% tin, with a melting point at 95° C).
- Lichtenberg's alloy, melting at 92°C, contains 50% bismuth, 30% lead, and 20% tin.
- Homberg's alloy, melting at 121°C, contains 3 parts lead, 3 tin, and 3 bismuth.
- Malotte's metal, melting astatine 203°F (95°C), has 46% bismuth, 20 lead, and 34 tin.

Fusible plugs quickly became mandatory: October 29, 1813, a governement decree obliged manufacturers of steam engines, in addition to safety valves, to apply a fusible cap on the boiler, melting at a temperature lower than the maximum allowed steam temperature.
Friedrich Stromeyer in 1817 was the first to produce cadmium. The addition of cadmium to bismuth, lead and tin alloys allowed, more than 30 years later to discover lower melting temperature alloys. The 28 October 1823 a imposed the use of two fusible plugs of different sizes on high pressure boilers (over 2 kg / cm ²), one at 10°C, the other at 20°C below the maximum limit of the boiler.

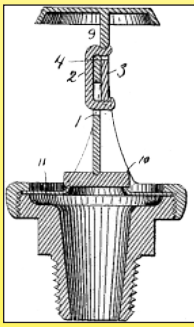


Fusible plugs on boilers of steam locomotives (1842). Cap "e" melts and releases steam

The discovery of Indium and the beginning of its production in 1867 made it possible to further reduce the melting points: Field alloy (32.5% Bismuth, 51% indium, tin 16.5%, fuses at 62 ° C)
In many fusible alloys, a small amount of Indium lowers the melting point of about 19°C for 1%
The need of fire detection systems between 1860 and 1890 (alarm or sprinklers) gave rise to the development of all current fire detection fusible links.
Wood's alloy, or Wood's fusible metal, was patented in 1860 and was the first metal used for automatic sprinkler plugs. It contains 50% bismuth, 27.6% lead, 13.3% tin and 10% cadmium, melting at 70°C ,and this point was adoptive as the operating temperature of sprinkler plugs in the United States and most of other countries; in England it is 155°F (68°C).
At the same time were invented Lipowitz's alloy (50% Bismuth, 27% lead, 13% tin, 10 % Cadmium, melting between 70-74 ° C, but very ductile),and Guthrie's alloy has 47.4% bismuth, 19.4% lead, 20 % tin, and 13.2% cadmium.
Problems of false tripping quickly appeared on links under permanent stress, because of the fusible alloys creep phenomena. Although the mechanical strength of the alloy is important, when subjected to a permanent constraint, near its melting point, it slides slowly and breaks. Manufacturers therefore invented mechanism to reduce the permanent stress on the fusible alloy solder, and soon appeared de-multiplied fuses and sprinkler heads.



1890 : de-multiplied fusible link assembled on a cable (Grinnel)

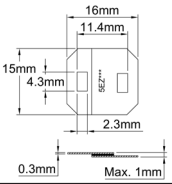
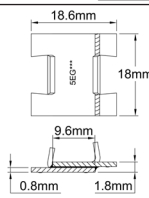
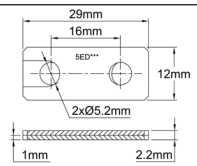
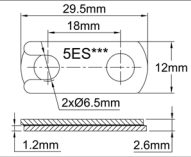
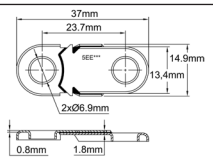
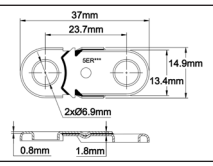
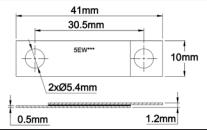
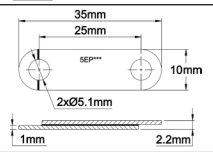
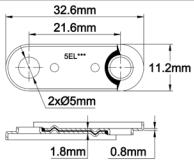
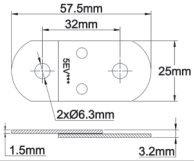


1890: Grinnell sprinkler head using parts welded together with a fusible alloy and a leveraging effort mechanism

From that time, many ternary and quaternary alloys were discovered to span values operating values between 17°C and 330°C
JPC fire detection fusible links are designed to use fusible alloys selected for their operating temperature, but also for their resistance to creeping.
The important cost of some alloys is due to the rarity of their components (Indium, Gold, Gallium)
Current trend to standards prohibiting heavy metals or toxic substances such as lead and cadmium are not currently applicable to mechanical fuses. However, there are a few alternatives to avoiding alloys using these metals, but they do not cover a large span of temperatures. If you are concerned with the use of heavy metals in fire safety fuses, please contact us.
As they do not rely on external energy to operate, these mechanical fusible links, when properly sized and installed, are reliable and safe.
The mechanical and thermal stresses to which they are subjected in normal use should be properly analyzed so as not to reach the creep zone. Thermal stress during transport and storage must also be taken into account in order not to overheat the alloy. Remember that a container stored in direct sunlight on a dock of a tropical country can reach 80°C ! Some countries have issued standards, but they are disparate and do generally not take into account the creeping drift. This is why we provide, besides the nominal melting temperature (Tm), the maximum permissible continuous temperature (Tc) and the maximum load below the Tf value which they may be subjected to.
This approach is similar to that of TCO (Electrical thermal fuses).
To reduce the risk of accidental opening due to creep or oxidation of metal parts, some countries recommend changing the fusible links during the annual maintenance. Please observe the local regulations.
Some fusible link models include bumping or ramps intended to provide a positive separation of the two parts to avoid resealing after breaking.
Fire detection fusible links are intended to react quickly in case of fast temperature rise, so it is important to place them in an appropriate location, and limit their mass, because their breaking time is proportional to their mass.

Main types of fire detection fusible links

A fire detection fusible link is a mechanical component that breaks at a preset temperature.
They are used in fire protection systems to open and close doors, vents, dampers, valves if the ambient temperature exceeds a certain value.

	Type	Holes diameter (mm)	Standard hole distance (mm)	Standard thickness (mm)	Average welding surface (mm²)	Maximum permanent load (T<Tc) in DaN*	Dimensions
	5EZ	4.3x2.3	9.1	0.3	72	7	
	5EG	2 clamps	10	0.8	144	14	
	5ED	5.2	16	1	192	19	
	5ES	6.5	18	1.2	198	20	
	5EE	6.9	23.7	0.8	216	21	
	5ER	6.9	23.7	0.8	216	21	
	5EW	5.4	30.5	0.5	220	22	
	5EP	5.1	25	0	230	23	
	5EL	5	21.6	0.8	280	28	
	5EV	6.3	32	1.5	450	45	

Because of permanent improvement of our products, drawings, descriptions, features used on these data sheets are for guidance only and can be modified without prior advice

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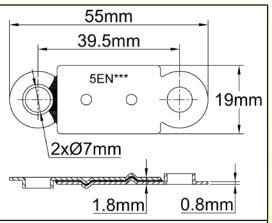
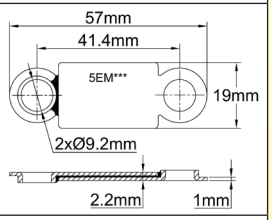
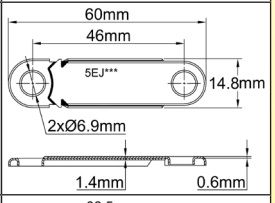
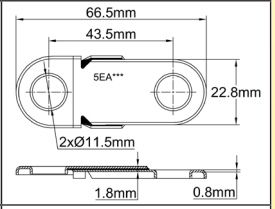
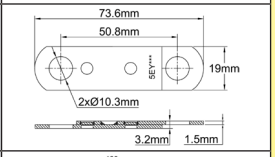
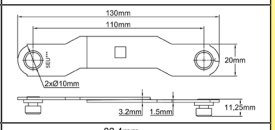
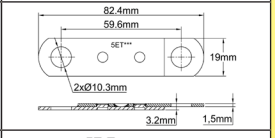
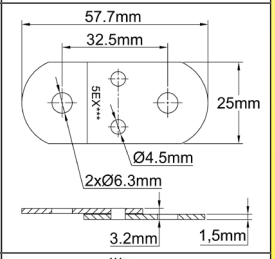
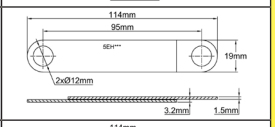
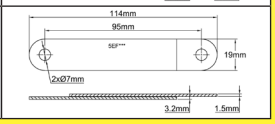
Main types of fire detection fusible links

	5EN	7	39.5	0.8	513	51	
	5EM	9.2	41.4	1	513	51	
	5EJ	6.9	46	0.8	544	54	
	5EA	12.5	43.5	0.8	720	42	
	5EY	10.3	50.8	1.5	722	72	
	5EU	8	110	1.6	760	76	
	5ET	10.3	59.6	1.6	798	80	
	5EX	6.3	32.5	1.5	798	80	
	5EH	12	95	1.5	1007	100	
	5EF	7	95	1.5	1178	120	

*Maximum permanent load depends of alloy composition and ambient temperature.
Values in this collumn are given for guidance only, and for a 70-72°C alloy.
The following formula can be used as a first estimation of values:
L= S/10, with L= maximum permanent load in DaN at temperature T<Tc, and S= Average welding surface in mm².
Some links with separating bumps or ramps may have sligthly higher values.
Specific testing for a combination of alloy and fusible link type is made on request.

Main types of fire detection fusible links

References codification

Fusible links are usually identified with coded manufacturing date, rated functioning temperature Tf in °C, manufacturer's logo or name (JPC, JPCI, Ultimheat). A color code spot can be added on request, for customer using various temperatures of the same link type.

Standard functioning temperatures*

Tf(°C)	47	65	68	70-72	92	96	103	120	138	175	182	221	227	280	327
Tc(°C)	25	40	42	45	66	71	77	94	110	145	152	187	195	245	288
Tf(°F)	115	150	155	165	195	205	220	250	280	350	360	430	440	540	620
Tc(°F)	77	104	108	113	151	160	171	201	230	293	306	369	383	473	550

Tc (Holding temperature): the fusible link must not open or be destroyed when subjected to a temperature equal to Tc-6 °C (Tc-11°F) for a period of 168 hours under nominal strength
Tf (Rated functioning temperature): It is the opening temperature of the fusible link in a calibration oven, when subjected to a strength equal to 1/10 of its nominal value, when temperature rises at a speed of 0.5 to 1°C / min (1 to 2°F/min). The opening temperature must not be lower than Tf-10°C or above Tf.
Tf value is printed on the fusible link
Fuses frame material: Unless otherwise specified, the fuses are made of brass without plating.
Upon request, they can be made of copper or steel, with plating (tin or zinc)
Welding: the welds are performed by induction in order to ensure complete melting of the alloy between the metal parts
Development: we carry all models according to customers drawings and achievable quality control specifications are available on request (depending on the specifications of the country of use)
*Most of these alloy use lead and cadmium .Many other temperatures are available, consult our engineering department

Available temperatures using alloys without lead or cadmium: 60, 72, 79, 139 °C (Ternary alloys of Bismuth, Indium and tin. consult engineering department for MOQ and technical specs)

Eutectic alloys

A eutectic alloy is a mixture of chemical elements that has a single chemical composition that solidifies at a lower temperature than any other composition made up of the same ingredients.
This composition is known as the eutectic composition and the temperature is known as the eutectic temperature.
A eutectic alloy solidifies at a single, sharp temperature and when it melts it does so at a single temperature
Alloys used in fusible links in our standard temperature ranges are eutectic, and their melting temperature (liquidus) and freezing temperature (solidus) are the same, without plastic melting range.
When a non-eutectic alloy solidifies, its components solidify at different temperatures, exhibiting a plastic melting range, and when they are used in fusible links there is no accuracy in the breaking temperature.
In some specific applications, because there is no existing eutectic alloy available for the temperature requested by a customer, we are then obliged to use non eutectic alloys. In this case we cannot guarantee the breaking temperature accuracy

De-multiplied fusible link mechanisms type 55

On request, we produce OEM de-multiplied actuating mechanisms, to reduce constraints on the fusible links

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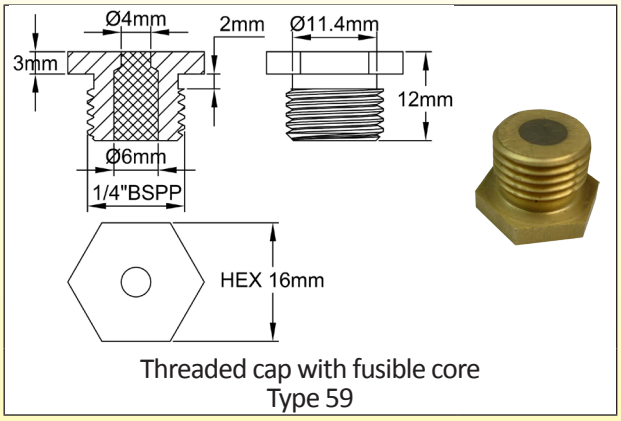
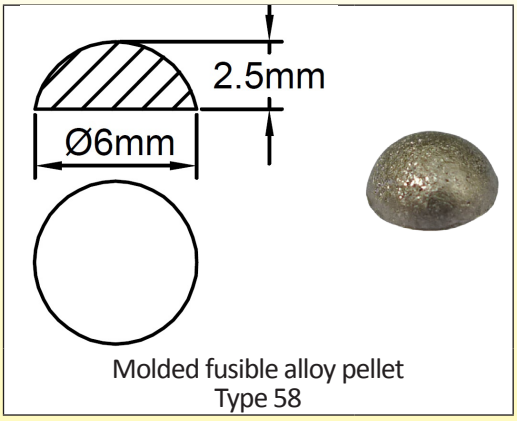
Fusible alloy molded parts, fittings and caps

On request, we produce OEM fusible alloy molded parts and threaded caps for pressure vessels and pressure regulators



Threaded cap with fusible core
Type 59



Molded fusible alloy pellet
Type 58

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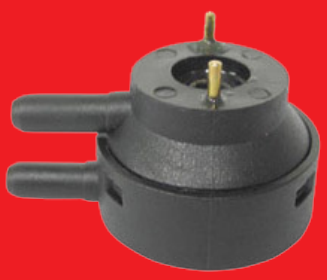
Other products in the Ultimheat range that can be used in fire detection devices

Thermal cut off
One shot electrical devices, open an electrical circuit at a preset temperature

Bulb and capillary thermostats
Open or close an electrical contact at a preset temperature (up to 760°C) by a remote sensing bulb

Disc thermostat
Open or close an electrical contact at a preset temperature, on site sensing

Positive pressure switches
Detect abnormal pressure value in sprinkler water circuit

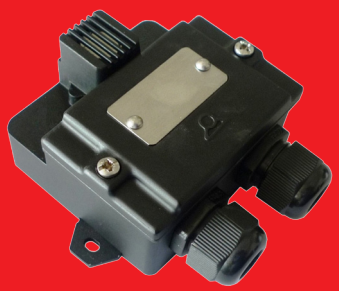


Differential pressure switches
Detect flow or no flow conditions in ventilation pipes

Thermo-velocity sensors
Detect fast temperature changes

Flow switches
Detect flow in sprinkler water circuit

Ceramic connection blocks
High temperature resistant electrical connections



Ambient temperature sensors
Remote indication of room ambient temperature

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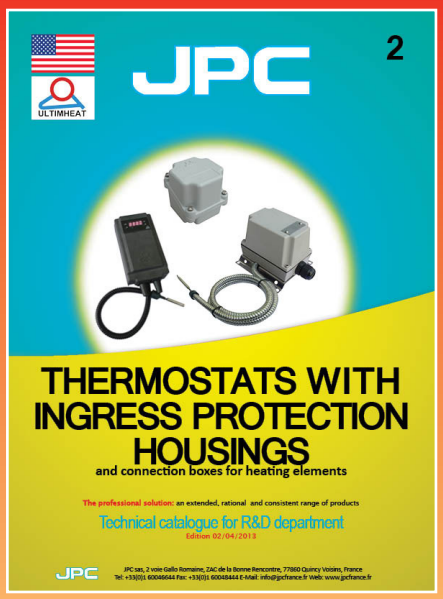
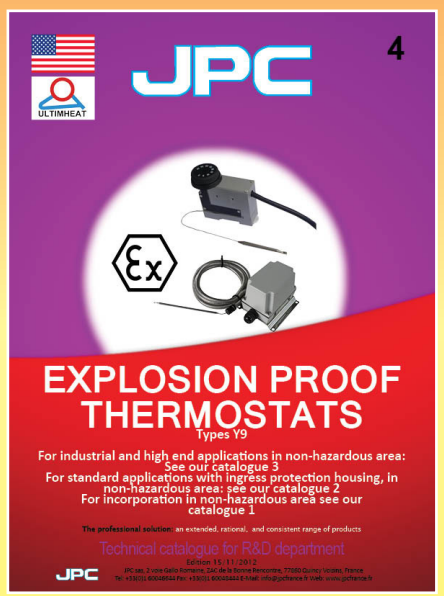
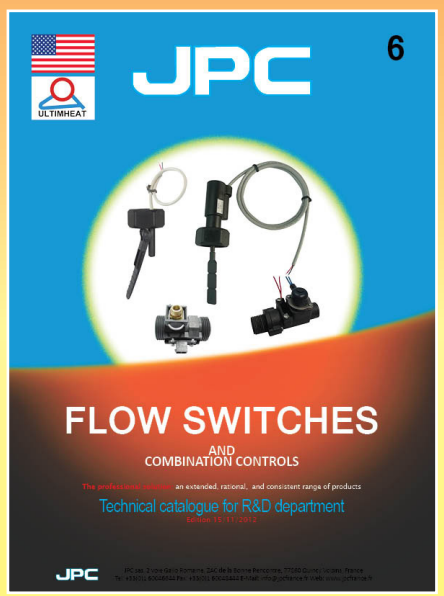
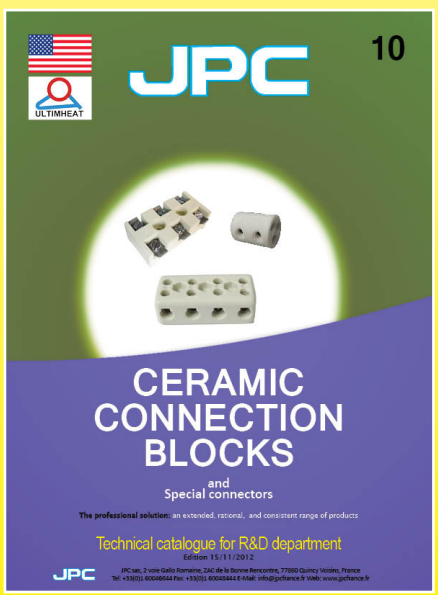
Other catalogues









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