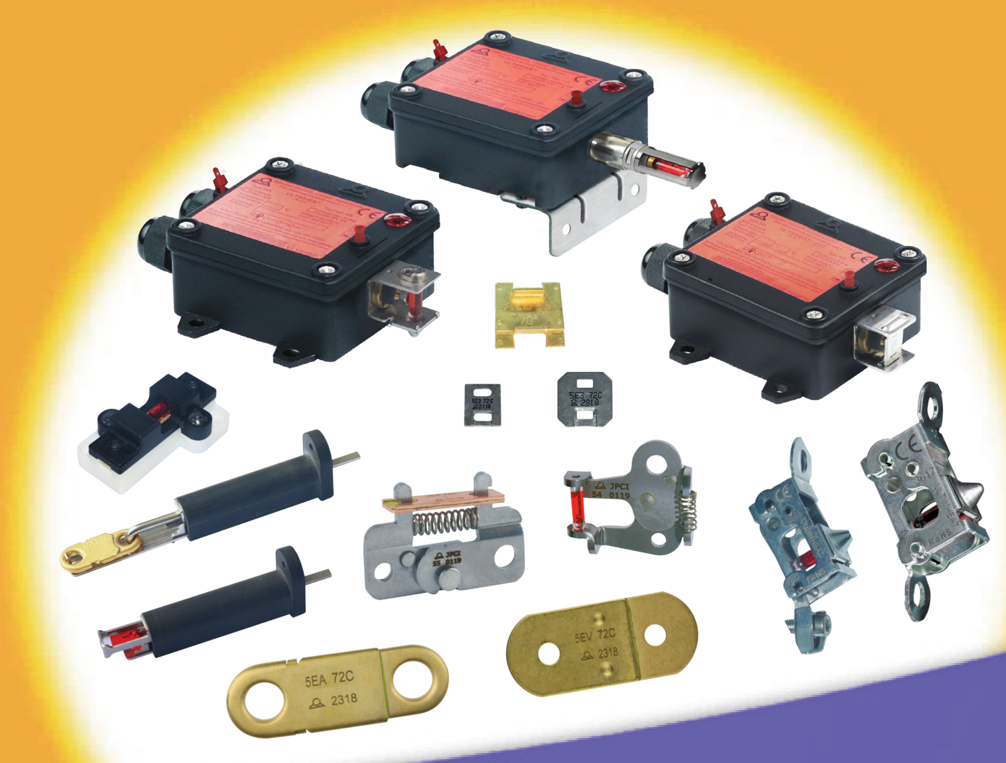
ULTIMHEAT

JPC

9
(2ND EDITION)



THERMALLY RESPONSIVE DEVICES FOR FIRE DETECTION

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

Technical catalogue for R&D department

Edition 19/12/2018

JPC

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

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.

JPC sas- 2 voie Gallo-Romaine - ZAC de la Bonne Rencontre - 77860 Quincy Voisins - France
RCS Meaux 302 236 641 00049 – APE 2651B - FR10 302 236 641

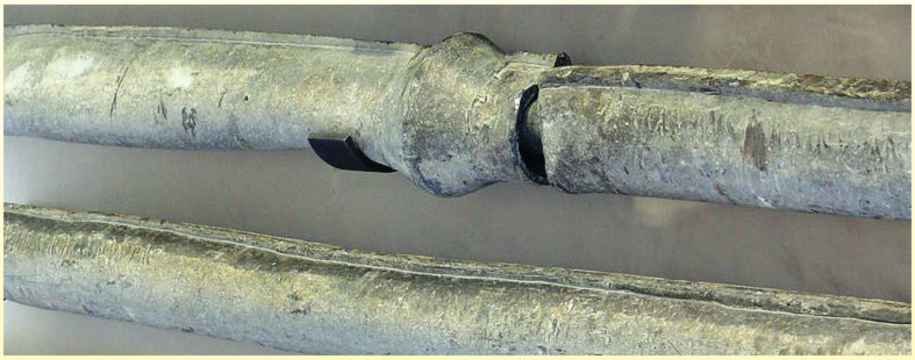
Summary of catalogue 9 (second edition)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

History of low temperature eutectic alloys,

© by Jacques Jumeau

The history of low temperature fusible alloys is a succession of stages, spread over two millennia, according to the successive discoveries of metals and experiments.



Roman waterpipe, made of soldered lead strips (Museum of Arles et de la Provence antique
(extraite de https://commons.wikimedia.org/w/index.php?curid=10214375)

The 183°C limit: The binary alloys of lead and tin

The earliest known piece made of lead and tin alloy seems to be an Egyptian vase found in Abydos, dated around 1400 BC.
During the Roman Empire, lead was used for the construction of water pipes. Melting at 325 ° C, it was easily melted into strips. As it does not self-weld, it was a mixture of lead and tin that was used to weld the strips rolled together into hoses. Although they did not have temperature measuring devices, the Romans had noticed that by adding a certain percentage of tin (melting at 235°C) imported from Cornwall to the lead, the mixture melted at a temperature less than that of lead. In his Natural History, Pliny the Elder, in the course of the first century, gave the formula for welding the lead tubes: two parts of lead for a part of tin. (Melting range of the alloy 66.7-33.3: 185-250°C).
Alloys with 4 parts of lead and one part of tin (melting range for the 80-20 alloy: 183-275°C) and 5 parts of lead and one part of tin (melting range of the alloy 83.3-16.7: 225-290°C) are then given for a temperature of 81.3.3 / 4 according to the Isaac Newton scale in 1701.
Still in the middle of the 18th century, this anomaly in the alloys always intrigued and remained unexplained "One thing that is still rather singular; it is because any two metals mixed together are melted at a lower fire than if they were separated. " (Dissertation on the nature and propagation of fire, by the Marquise Du Chatelet, 1744)
In the 18th century, tinsmiths used a solder with 50% lead and 50% tin (melting range 183-216°C). For tin potters it was still not enough because too close to the melting temperature of the tin. It is likely that it was the Cornish tin potters who found the binary alloy with the lowest melting point, made of 63% tin and 37% lead (3 parts of lead and 5 parts of tin). At the beginning of the 18th century this eutectic alloy melting at 183 ° C was commonly used for tinning copper kitchen vessels. Nowadays is still used as a welding alloy in the industry.

The 96°C limit: The Bismuth

It seems that the ancient Egyptians used bismuth oxide as a component of makeup and cosmetics "The White of Egypt". In 1413, Basil Valentine recorded it for the first time in the following terms: "Antimony is the bastard of lead, just as wismulh, or marcasite, is the bastard of tin". In a treatise of Agricola dating from the beginning of the 16th century (1529) it is described as being well known in Germany and considered as a particular metal. Others considered it a kind of lead.
Bismuth was later extensively described in Moyse Charas's "Royal Galenic and Chymyque Royal Pharmacopoeia" in 1676, but its extraction and purification from tin or copper ores was complex.
The miners of the time considered bismuth as silver not yet completely transmuted and named its ore "Argenti tectum" (M. Hellot, Memoirs of the French Academy, 1737, p 231) In 1701, the first low-temperature ternary alloys using bismuth tin and lead were described by Isaac Newton in his article "Scalum graduum Caloris" (Philosophical Transactions, 1701, 270, P824-82) to serve as a reference point for thermometer calibrations. In this article in Latin, he described in particular an alloy consisting of 2 parts of lead (20%), 3 parts of tin (30%) and 5 parts of Bismuth (50%). This alloy is the one he considered to have the lowest melting point. He gave its temperature (graduated 34 1/2 in its scale) as being slightly higher than that of boiling water. (An alloy of this composition made with current pure metals is characterized by a liquidus temperature at 123 ° C and solidus at 96 ° C). He explored other ternary alloys of the same type, and also tin bismuth binary alloys. At that time, tin ore founders in the province of Cornwall used bismuth to make their tin shiny, hard and sonorous.

34	2 ½	Calor quo aqua vehementer ebullit & miſtura duarum partium plumbi trium partium ſtanni & quinque partium biſmuti defervendo rigeſcit. Incipit aqua ebullire calore partium 33 & calorem partium pluſquam 34 ½ ebulliendo vix concipit. Ferrum verò deferveſcens calore partium 35 vel 36, ubi aqua calida & 37 ubi frigida in ipſum guttatim incidit, deſinit ebullitionem excitare.

1701 description of an alloy comprising 2 parts of lead, 3 parts of tin and 5 parts of bismuth by Isaac Newton in "Scalum graduum caloris"

Studied empirically from the second half of the 18th century, the composition of these alloys varied as the development of increasingly pure metals.
In the second half of the eighteenth century, tin potters used many different types of welding, more or less secret, composed of lead, tin and bismuth (article "soudure"of the Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, 1775)
In 1753, the French scientist Claude Geoffroy The Young devoted himself to the study of Bismuth, which he described as a new metal and no longer as a semi-metal close to lead as it was previously considered. He died unfortunately before finishing his work. During his life, the German pharmacist Valentin Rose the Elder (1736-1771), studied different compositions of Bismuth, lead, tin alloys with low melting point of variable composition, which were only posthumously published in 1772. He left his name to one of them. In 1775, the French chemist Jean d'Arcet provided the Academy of Sciences with a report of his experiments on fusible alloys of lead, bismuth and tin, which had the particularity of melting in boiling water. They differed from previous alloys whose melting points (liquidus) were always higher than 100°C and only solidification (solidus) was below the boiling water. He described a set of more than ten compositional variations that were then known as D'Arcet or Darcet's Alloys. It was not until 1898 that the French chemist Georges Charpy revealed that there was only one eutectic point at 96°C for these ternary alloys, for a combination by weight of 52% Bismuth, 32% lead , and 16% tin. ("On the constitution of eutectic alloys, G. Charpy"). Many compositional variations close to this eutectic gave melting points approaching a few degrees, with a more or less extensive pasty zone, and could not therefore be considered as eutectic alloys.
The first application of one of these alloys melting at 98°C, consisting of three parts of tin, eight parts of bismuth and five parts of lead, were anatomical injections, and the manufacture of stereotyped printing plates.
Some of these ternary alloys of bismuth, tin and lead, took the name of their inventors:

- The Rose's alloy (50% bismuth, 25-28% lead and 22-25% tin, with a melting point between 94°C and 98°C),
- The Newton's alloy, with a melting point at 95°C, comprising 50% of bismuth, 31% of lead and 19% of tin (NB:This composition does not correspond to its description of 1701).
- The Lichtenberg's alloy, melting at 92°C, contains 50% bismuth, 30% lead and 20% tin.
- The Malotte's metal melting at 95 ° C (203 ° F) contains 46% bismuth, 20% lead and 34% tin.
- The Homberg's alloy, melting at 121 ° C, contains 3 parts of lead, 3 of tin and 3 of bismuth.

In 1802 the British Richard Trevithick and Andrew Vivian invented the first high-pressure steam engine that opened the way for locomotives, the first of which was used in February 1804. In this vehicle, a fuse plug in lead in the bottom of the boiler served as a temperature safety device, and its melting was supposed to send a jet of steam, extinguishing the hearth below. A second plug, made of lower temperature fusible alloy, and located at the top of the boiler, in contact with the steam was supposed to melt when the temperature of it became too high. Although quickly considered unreliable and usable only as an auxiliary safety device, fusing plugs and fusible washers quickly became mandatory on steam engines: as of October 29, 1813, a decree of the French government forced the steam engine manufacturers, in addition to the safety valves, to apply a fusible plug on the boiler melting at a temperature below the maximum permitted temperature.
As early as 1821, it is proposed to make them mandatory also on pressure cookers of the “Papin’s pot” type (Annals of the National and Foreign Industry, or Technological Mercury, 1821, p14).
A little after, the decree of October 28, 1823 imposed in France the use of two fusible plugs of different sizes on high pressure boilers (more than 2 kg/cm²), one at 10°C, the other at 20°C in below the maximum limit of the boiler. In 1828, the fusible alloy washers melting temperature, already used since several years on the safety valves of the steam locomotives, must melt at 20°C higher than that of the stamp of the boiler. The 100°C alloy is then given as composed of 8 parts of Bismuth, 5 parts of lead and 3 parts of tin. (Steam Engineers’ Manual, by Janvier, 1828). In 1830, the bulletin of the laws further enacts “It will be further adapted to the upper part of each boiler, and near one of the safety valves, a metal washer fusing at the temperature of 127°C “
Different tables were established for the realization of fusible alloys for boilers. This elaboration of fusible alloys at various temperatures did not take in account the notion of eutectics, and was fatal to this application on boilers: the most fusible part of these alloys (the eutectic) gradually melting and disappearing and leaving in the washer the surplus of metals melting at a significantly higher temperature. The mandatory use of these fusible alloys washers and plugs for the safety of steam boilers. was abandoned in the government ordinances dated 22 and 23 of May 1843.

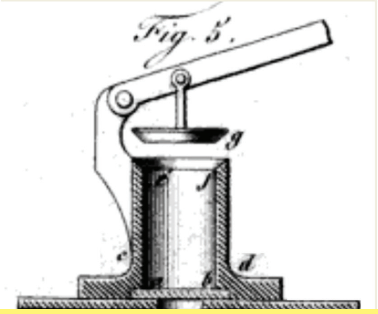
	PLOMB.	ÉTAIN.	BISMUTH.	DEGRÉS de fusion.
ALLIAGES. . . .	1 partie.	3 parties.	5 parties.	Fond à 100°
	1	4	5	120
		1	1	152
		2	1	170
	2	3		168
		8	1	200
L’étain seul fond à.				228
Le bismuth				245
Le plomb				320
Le zinc.				333

Fusible alloy composition used in steam machines (1828, Traité des machines à vapeur et de leur application à la navigation, Thomas Tredgold)

Bismuth	Lead	Tin	"Vapour pressure in Atmosphère"	Corresponding temperatures
Parts	Parts	Parts	Atmospheres	Degrees (°C)
8	6,44	3	1	100
8	8	3.80	1 1/2	112.2
8	8	7,5	2	122
8	9,69	8	2 1/2	129
8	12,64	8	3	135
8	13,30	8	3 1/2	140,7
8	15	8	4 1/2	145,2
8	16	9	5	150
8	16	19	5 1/2	154
8	25,15	24	6	158
8	27,33	24	6 1/2	164
8	28,66	24	7	168
8	29,41	24	7 1/2	170
8	35,24	24	8	173

Fusible alloy for steam machines (1875 Grand dictionnaire universel, volume 15, Larousse)

1847 Fusible plugs on boilers of steam locomotives. Cap “e” melts and releases steam (US patent # N°5022, Alfred Stillman)



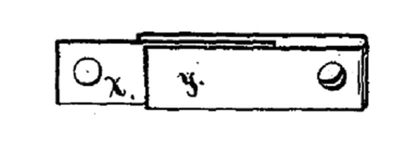
1832 Locomotive fuse plug (b), combined with a shut-off valve from Mr. Edward Hall (Bulletin de la Société d’Encouragement pour l’Industrie Nationale)

However, in the middle of the 19th century, Darcet’s low-temperature fusible alloys were widely used in industry, including metal molds for electroplating, which after use only left the outer layer of copper, thus realizing hollow objects, also allowed easier bending of tubes filled with these alloys, but also a machine named of “internal combustion” supposed to replace the steam engines to pump the water, invented in 1839 by Antoine Galy-Cazalat (often taken under the name of Galli by his laudators), professor of physics at the Royal College of Versailles, in which the fusible alloy, heated, served as a movable liquid plug and whose displacement in a spiral produced a movement.

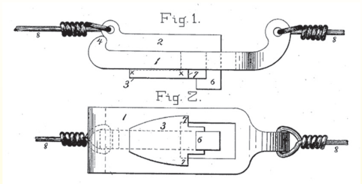
The 72°C limit: Cadmium

In 1817 Friedrich Stromeyer was the first to produce cadmium. But it was not until more than 30 years ago that lead, tin, bismuth and cadmium quaternary alloys appeared. The addition of cadmium reduced the melting temperature from 20 to 25°C, and went down to 72°C.
The arrival of the fire detection systems between 1860 and 1890 (alarm or sprinklers) led to the development of all current fire detection fusible links.
The alloy invented and patented in the USA in 1860 by the American dentist Barnabas Wood, who was later named in his honor “Wood Alloy”, was first used in dentistry. It was then the first metal used for automatic sprinklers. It contains 50% bismuth, 27.6% lead, 13.4% tin and 10% cadmium. His discovery was widely commented on in Europe. (“On a New Highly Fusible Alloy,” Appl. Chem. Rep., 1860, 2, 313-314 and Wood’s Leichtflüssiges Metall, “Dingler’s Polytech, J., 1860, 158, 271-272.). It melted at 70-72°C (158-160°F) and was then adopted as the operating temperature for sprinkler plugs in the United States and most other countries. This alloy was long time given to the USA as a 155°F alloy (68°C).
In the same year, the Berlin chemist Friedrich Julius Alexander Lipowitz, referring to the discovery of Wood, invented a close alloy: with 50% bismuth, 27% lead, 13% tin, 10% cadmium, very ductile, melting between 70-74°C. The melting point of the Lipowitz alloy, which it says is at 60°C, is only 70°C, but the confusion may be due to the fact that it also tried to introduce mercury into this alloy, which lowered its melting point to 60°C. (Polytechnisches Journal, 158, 376, 1860).
A few years later, Frederick Guthrie, in the articles he wrote in the Philosophical Magazine between 1875 and 1884 on eutectic alloys, described among others the alloy at 47.4% of bismuth, 19.4% of lead, 20% tin and 13.2% cadmium. He created in 1875, on a Greek root, the term “eutectic”. (N.B.: The compositions and melting temperatures of these various alloys are clearly described in the “Encyclopedie Chimique” of Fremy, published in 1888, and may vary according to the sources, the names of the inventors being often associated with several alloy compositions).
The first fusible links appeared around 1882, and were used to command the opening of valves sending water into the fire pipes. Very quickly, the creep under permanent stress and temperature of the fusible alloys showed the possible load limits, and as early as1883 appeared the de-multiplied mechanisms.
Around 1880, the development of electrical appliances and electrical distribution networks brought out a new family of devices using fusible alloys: the fire detection electric switch, in which the melting of the alloy closed an electric circuit of alarm, either powered by batteries is powered by the network.
It was not until 1912 that the melting temperature of the eutectic alloy made of lead cadmium, tin, bismuth was confirmed at 70°C as being as low as possible with these components, but the habit was taken of naming it alloy to 72°C. (Parravano and Sirovich, Quaternary Alloys of Lead, Cadmium, Bismuth and Tin, Gazz. Chim. Ital., 42, I, p. 630; 1912)

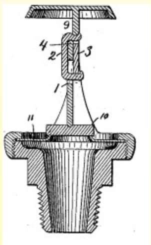
JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr



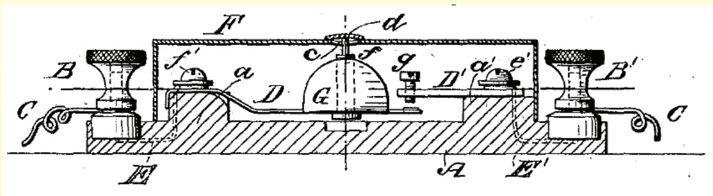
1882 Simple Fusible link used on a cable, invented by Frederick Grinnel (US patent #269.199)



1890 De-multiplied fusible link assembled on a cable (Frederick Grinnel's patent N°432403)



1890: Sprinkler head using parts welded together with a Wood's fusible alloy and a leveraging effort mechanism (Frederick Grinnel's patent N°432403)



1884 Fire alarm closing an electrical contact using fusible alloy washer (d) (US Pat. Ross No. 298121)

The 47°C limit: Indium

It was discovered by spectroscopy, in 1863, in a Freiberg blende, by Reich and Richter, who characterized it by an indigo blue line, hence the name of indium they gave it. It is related to zinc and cadmium and is extracted from their minerals. In many fusible alloys, an amount of Indium of 10 to 20% significantly lowers the melting point.

The beginning of its production in 1867 thus made it possible to further reduce the melting points: eutectic alloy of Simon Quellen Field (called Field alloy), comprising 32.5% of bismuth, 51% of indium, and 16.5%, of tin melting at 62°C (144°F)

Indium also allows to made alloys melting at a true value 155°F (68°C), still widely used in England and its former empire.

The lower limit of possible melting points with these quinquenary indium-based alloys was reached in 1935, when the American scientist Sidney J. French, described a eutectic alloy melting at 47°C composed of 8.3% tin, 44.7% Bismuth, 22.6% lead, 5.3% Cadmium, 19.1% Indium (A New Low-Melting Alloy, Ind. Eng Chem., 1935, 27, 1464-1465, Civil Engineering, August 8, 1936)

Liquid alloys at room temperature: Gallium

In 1875 the French chemist Paul-Emile Lecoq de Boisbaudran discovered Gallium. This metal, liquid at 30°C and boiling at 2200°C, will be added to tin and indium alloys to produce alloys whose melting point can be well below 20 ° C. Pure gallium or alloys containing it were not used in the fusible links, but as early as 1920 to replace mercury in high temperature thermometers, and in some thermostats. Its very high price allows its use only in laboratory applications.

The appearance of the notion of eutectic (1875-1898)

The characterization of the differences between eutectic and non-eutectic alloys only appeared in the last years of the19th century, with the work of Georges Charpy. It was then realized that in the cooling of a molten non-eutectic alloy, the metals with the highest solidification temperature first began to cool and harden, leaving the liquid in the middle of the crucible an alloy whose composition eventually reached its freezing temperature. The composition of this alloy in the center was then that of the eutectic. And it was definitely lower than that of the constituent metals. The mechanisms involved in the pasty areas of non-eutectic alloys, which had caused the disappearance of fusible alloy washers in the safety systems of steam engines, were then better understood: after a while, the composition of the alloy of the washers or plugs changed: the most fusible part (the eutectic part of the alloy) was starting to melt, and the remaining metals in the washer or in the plug were melting well beyond the primitive degree. (Bismuth, tin, lead by A. Bouchonnet, 1920)

Since the fuse washer disappeared from the normative obligations of the railway boilers at the middle of the 19th century, manufacturers of industrial boilers, using only eutectic alloys, mounted them at least until 1925 (Catalog of the industrial society of Creil of 1925). Fusible alloys were still used for a long time on boiler alarm systems, and kitchen pressure cooker used eutectic alloy plugs until 1929, when they were replaced by valves (Catalog of Ateliers de Boulogne, 1929). Fusible alloys continued to be used in the safety devices, valves and thermostats of water heaters and boilers until the 1980s. (1934 Catalog of Chaffoteaux et Maury Réunis Tank)

But alloys at 70°C/72°C, whose composition was very close to the eutectic, which had only a pasty zone of 1 or 2°C are still widely used, especially in fire detection systems.

The arrival of standards concerning fire protection systems.

Many scientific publications were issued on fusible alloys. The oldest issue by a standards body seems to be "The Use of Bismuth in Fuse Alloys", Bureau of Standards » Circular No.388, 1930

In November 1968 was published in the USA the first standard (UL-33) relating to thermal links for fire protection systems "Fuse Links for Fire-Protection Service". In France, it was not until December 1990 that the standard NF S 61-937 was published where fusible links are described.

In 2005, for the first time, the ASTM B774 (Standard Specification for Low Melting Point Alloys) standard, updated in 2014, was published, which attempts to standardize fusible alloys, but gives very wide tolerances for their composition.

The binary alloys of lead and tin, in welding applications, were standardized in 1990 by the EN ISO 9453 standard.

Polemics on the measurement of liquidus and solidus temperature of eutectic and non-eutectic alloys.

This temperature measurement, complicated by the appearance of a pasty zone when the compositions of the alloys are not exactly those of the eutectics, has been the subject of numerous scientific publications since 1701, and often gave very different results. The purity of the metals used, the temperature measuring devices and their accuracy, the location of the measuring point, the phenomena of super-fusing and recrystallization, the variation of the mechanical strength of the alloys over time, the various measuring devices of the viscosity of the alloys, the thermal differences between the center and the edges of the crucibles, the annealing and heat treatments, etc. have all participated in the melting point differences given by scientists, including even nowadays.

The arrival of Rohs environmental constraints

In 2002, the RoHS (Restriction of Hazardous Substances) European directive was published to limit the use of ten dangerous substances, including lead and cadmium, two main components of low-temperature fusible alloys. The production of low-temperature fusible alloys in accordance with this standard made it necessary to replace these two components with indium, without, however, allowing the production of entirely equivalent products. Low temperature Rohs alloys are significantly more expensive, and their mechanical strength is on average halved compared to previous ones.

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

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Technical introduction on heat responsive links for fire-protection service using eutectic alloys

Summary of the technical introduction

Technical conditions of operation and control of eutectic alloy thermal links and thermo-frangible bulb mechanisms

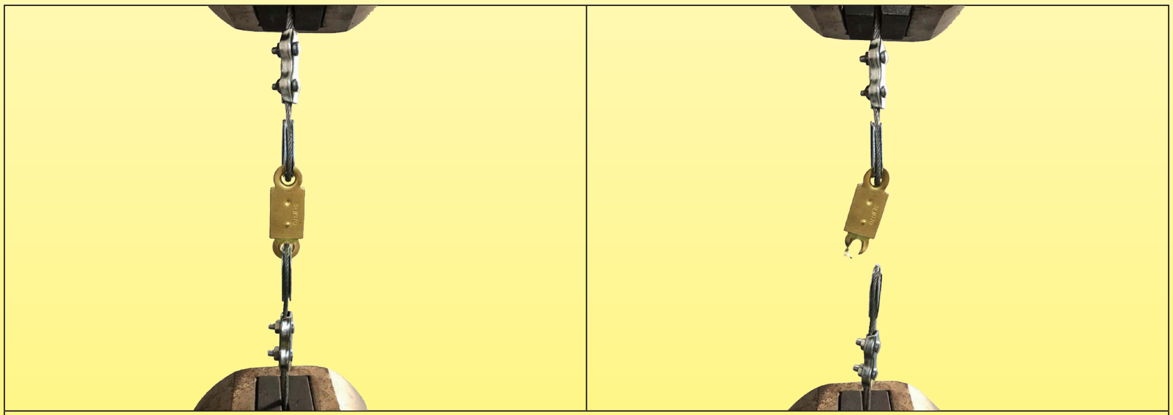
1 - Applicable standards

There is currently no international standard (ISO) or European standard (EN) specific to these components. However their test conditions have been defined in some standards for products using them, in particular:
-The old French standard of December 1990. NF S 61-937 of December 1990 Fire safety systems (S.S.I.) - Operated safety devices (D.A.S.)
- ISO10294-4 Fire resistance tests. Fire dampers for air distribution systems. Part 4: Test of thermal release mechanism
- ISO DIS 21925-1-2017 Fire resistance tests Fire dampers for air distribution systems Part 1: Mechanical dampers (Draft)

A number of foreign standards, with sometimes very different test procedures, exist but are not addressed in this document.
The most important is the American standard UL 33-2015 (Heat Responsive Links for Fire-Protection Service), whose ISO DIS 21925 standard draws some of its provisions.
It is also possible to quote:
- EN 60691: 2016 Thermal protectors - Requirements and application guide: This standard only applies to temperature limiting fuses used in electrical and electronic circuits, and does not apply to appliances with only a mechanical function.
- AS 1890-1999, Thermally released links (Australia)
- Hong Kong Standards Test laboratory, Instructions of Lam Chun Man §2.3.7

2 - Definition of the breaking load at ambient temperature also named maximum design load.

The breaking load, also known as the breaking strength of a fusible link, was a parameter of the old French standard NF S 61-937 of December 1990. It expressed resistance to longitudinal traction. It was up to the builder of the fuse link to determine a maximum load under which the fuse link did not open at the temperature of 20°C, whether by mechanical failure of the metal of the body, or by mechanical failure, creep or melting of the eutectic alloy. The standard gave no details on how to determine this value, nor the duration of the charge, but it was on the basis of one-third of this force that the temperature-rupture limit tests were conducted.
A similar notion is repeated in the UL33 standard, under the name of "maximum design load". at which the fuse links must withstand an ambient temperature of 70 ° F (21 ° C), for 150 hours, and 1/5 of that value is retained.
The European standards (ISO10294-4 and Iso Dis 2195-1-2017) which took over from the French standard NFS 61-937 have eliminated this notion of breaking strength and replaced it by the concept of faulty triggering.
However, the measurement of this value makes it possible, in particular for fusible links made of thin metals with low thermal inertia, to limit the stress to which they can be subjected to ambient temperature, independently of the measurement of the welded surface. It also makes it possible to check if the design tips used to limit tearing of the fixing holes are effective.



Measurement of the breaking load of a fusible link (Ultimheat Laboratory)

3 - Definition of the maximum force limit in use, and concept of faulty triggering (Faulty set-off)

Problems of false-tripping quickly appeared on links under permanent stress, because of the creep phenomena of fusible alloys, especially near their melting temperature.
A rule of thumb, allowing a rough approximation of this value, is for fusible links with a flat welded surface, to use the value of this welded surface in mm² divided by 10 as the maximum use limit in decanewton (kg).
This value must then be corrected according to the mechanical resistance of the alloy (see correction table below).
From this table, it was possible, in the old French standard, to define the maximum force, and applying a reduction coefficient of 2/3, the maximum force limit of use. This standard, which did not refer to the melting temperatures of eutectic alloys, however, defined two classes: Class 1 fusible links, which should not open when subjected to this force for one hour at 60°C with an air velocity of 1m/s, and class 2 fusible links, where the temperature was raised to 90°C
The international standards (ISO10294-4 and Iso Dis 2195-1-2017) which took over from the French standard NFS 61-937 have eliminated this notion of breaking strength and replaced it by the concept of faulty triggering. The maximum operating limit force is replaced by the load applied under normal conditions of use, approaching UL33 in this way.
The temperature conditions for maintaining this charge are 60±2 °C standard, with an air speed of 1m/s. Other temperatures such as 90°C are provided, and are linked of the maximum trigger temperature.
For example, for a fuse link with a maximum tripping value of 105°C (corresponding to the old Type 1 link definition), the fuse link will have to withstand a temperature of 60°C for one hour without tripping
For a maximum tripping value at 140°C (corresponding to the old Type 2 link definition), the fuse link will have to withstand a temperature of 90°C for one hour without tripping.
This test is part of the standard tests carried out by statistical sampling in production.

4 - Solder tensile strength testing in production

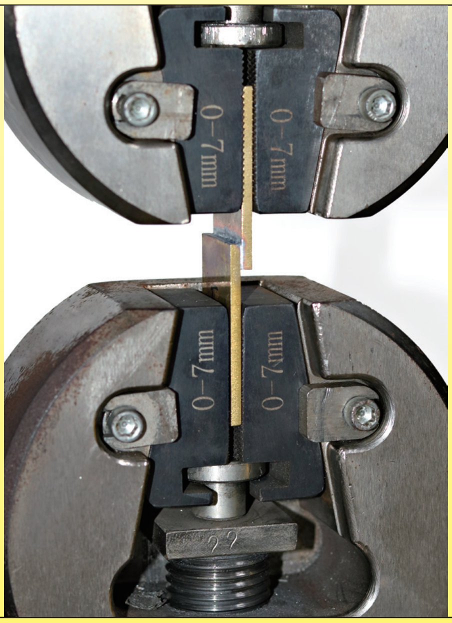
One faulty triggering parameter, which has not been described in the standards, is the "Cold Joint". However, it is the one who is responsible for the largest number of false triggers after installation. It is characterized by a weld that does not cover the entire weld surface, or where the solder did not melt completely. Cold joints are unreliable. The solder bond will be poor This defect is mostly invisible.
To eliminate this risk, the fuse links are 100% tested at the end of production, automatically applying a load calculated according to the weld surface.

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Automated testing of the solder strength in production at ambient temperature

5 - Measurement and verification of the mechanical strength of the alloy

The ultimate tensile strength of Rohs and non-Rohs eutectic alloys greatly affects the mechanical strength of welds. In order to verify under conditions close to their use, respecting the cleaning procedure of the surfaces and the quality of the soldering flux used, a test procedure on specimens, using an amount of alloy always identical to +/- 0.1gr, and a calibrated weld thickness was developed. This IQC process is used to validate each delivery of eutectic alloy.



Specimen during test

Testing equipment in our laboratory

6 - Measurement of alloy melting temperature

The melting temperature of the alloy (or explosion of the thermal glass bulb), is a critical parameter in the design of a fire safety mechanism. Its checking is not requested in the standards ISO10294-4, Iso Dis 2195-1-2017 and NFS 61-937, nor in the UL33 standard.
This is likely due to the difficulty of this measurement.
In order to provide reproducible and reliable measurement values, we have developed our own method for the validation of eutectic alloys and thermal glass bulbs, particularly suitable for normal use of these components.
In this test procedure for receiving alloys, carried out in our laboratory, 10 fusible link specimens, of a special model, are welded 24 hours before the test, and soldered with the alloy to be checked, are placed in a stirred liquid* bath **, and subject to a load of 4N. The temperature is then raised at a rate of 0.5°C per minute from 17°C (30°F) below the liquidus temperature of the alloy. The opening temperatures are recorded in 10 individual tests and their unit values are compared to the specifications of the alloy used. The average trigger value is used as the reference value of the melting point, and the average deviation x 2 is used as tolerance limit.
For the verification of the glass bulbs, 10 samples of these are individually mounted in suitable supports, subjected to a load of 10N and tested under the same temperature conditions as the fuse links.
The acceptability limits on the reference value of the melting point of the alloy or the explosion of the glass bulb to which the reference tolerance is applied are -7% / + 10% in °C of the temperature liquidus of the alloy given the specifications of it, or the nominal temperature of the glass bulb. If necessary, the measured values can then be classified in the levels defined by the different standards.
*: the liquid is water for temperatures from 20 to 90°C, and the oil with a flash point higher than the maximum temperature of the test is used for higher temperatures.
**: The measurement of the bath temperature is taken at 4 separate locations by 4 calibrated Pt100 class A probes, located at the same level as the fuse and at less than 50mm distance, are used to validate its homogeneity around the trigger being tested. The concordance at ± 0.2°C between the 4 values is required to start the tests.

Technical conditions of operation and control of eutectic alloy thermal links and thermo-frangible bulb mechanisms



Special fusible links specimens for fusing temperature test of the alloy, before and after melting	Automatic equipment for controlling the melting temperature of eutectic alloys in our laboratory

7 - Minimum operating force

The minimum operating force is a critical parameter in the design of a fire safety mechanism. The design of certain fusible links or thermal triggers, in particular with ramps, joints or bosses, may lead to the risk of non-opening due to the friction forces. Its verification is not provided in the ISO10294-4, Iso Dis 2195-1-2017 and NFS 61-937 standards. The UL33 standard has defined a number of discontinuous ranges of temperature, and how to check the operation of the link under minimum loads. This measurement is performed in a stirred liquid bath, with a temperature rise rate of 0.5°C (1°F) per minute. The minimum load is provided by the manufacturer, but cannot be less than 4N. The trip must occur during warm-up, while the temperature of the liquid bath is less than 11°C (20°F) above the minimum value of the temperature class used. This value is raised to 17°C (30°F) for temperature classes of 163 ° C (325°F) and above.
The testing of these parameters in our laboratory was inspired by the UL33, but adapted to each alloy and no longer to a discontinuous range.
The thermal links (glass bulb or eutectic alloy) are placed, in the 24 hours after their welding, in a stirred liquid bath and subjected to the weakest force to which they can be subjected in normal operation, and at least to 4N. The temperature is then raised at a rate of 0.5°C per minute from 17°C (30°F) below the solidus temperature of the alloy, or the nominal temperature of the glass bulb. The tolerances of acceptability limits are a trigger of -7% and+ 10% in °C of the liquidus temperature of the alloy, or the nominal temperature of the glass bulb.

Temperature classifications upon UL33 (informative)

Temperature class name	Maximum and minimum values of the temperature class (°C, °F)	Minimum triggering temperatures under the minimum load (°C, °F)
Low	51-54°C (125-130°F)	< 62°C, (< 145°F)
Ordinary	57-77°C (135-170°F)	< 68°C, (< 155°F)
Intermediate	79-107°C (175-225°F)	< 90°C, (< 195°F)
High	121-149°C (250-300°F)	< 132°C, (<270°F)
Extra high	163-191°C (325-375°F)	< 180°C, (<355 °F)
Very extra high	204-246°C (400-475°F)	<221°C, (<430 °F)
Ultra high	260-302°C (500-575°F)	<277°C, (<605 °F)



Typical assembly of a thermal glass bulb device to check its minimum trip threshold (view out of test tank)	Typical assembly of a fusible link to check its minimum trip threshold (view out of test tank)	Automatic control equipment for checking the minimum force of thermal links in our laboratory

8 - Threshold response time limit.

On this type of measurement, French, ISO and UL33 standards have completely different approaches.
The ISO and French standards measure the response time at a temperature rise rate of 20 ° C per minute for a fixed maximum duration, which is supposed to represent the temperature rise during a fire, while the UL33 standard measures the time triggering an instantaneous variation in temperature, a variable temperature step according to the classes of triggers, similar to what is done to define the response times of the temperature sensors.
Both methods give completely different trigger times, and in order to be able to classify the large variations that exist between products, the UL33 standard has been obliged to define devices with a fast response time, a standard reaction time and those equipped with a protective coating against corrosion.

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

	
Test equipment, allowing: - Measurement of the triggering time of eutectic alloy links or thermo-frangible bulb during a normalized fast temperature rise at 20°C per minute, starting from a plateau at 20 or 25°C, according to NFS 61-937, ISO 10294-4, and ISO DIS 2195-1 - The mechanical resistance test at constant temperature for one hour, according to NFS 61-937, ISO 10294-4, and ISO DIS 2195-1 - It works with loads from 5 to 320 DaN.	Test equipment allowing: - The measurement of the response time at an instantaneous temperature step according to UL33-11-2. The temperature steps are a function of the thermal links temperature classes. The most common are: 24 ± 1°C and 135 ± 1°C (72 ± °F and 275°F ± 2°F) 24 ± 1°C and 197 ± 1°C (72 ± °F and 386°F ± 2°F) - The mechanical resistance test at constant temperature for 90 days according to UL33-12. - It works with loads from 5 to 320 DaN.

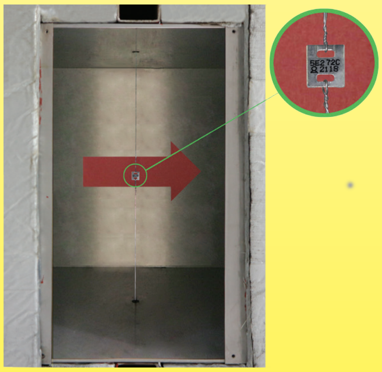
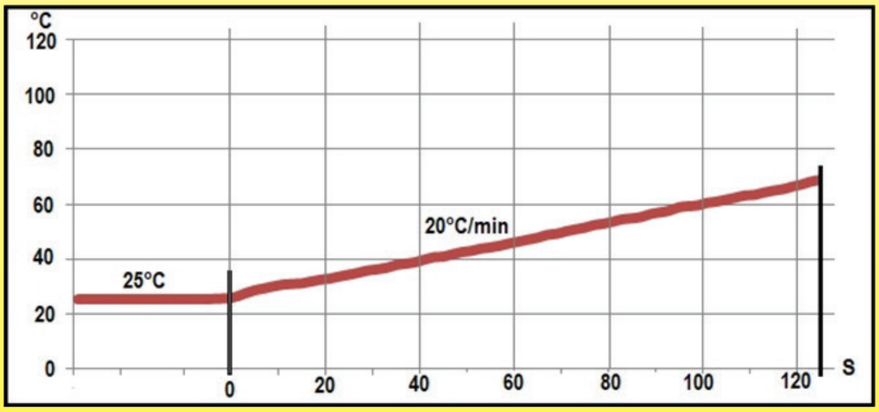
9 - Threshold temperature limit

This value should not be confused with the melting temperature of the alloy (or rupture of the bulb), because this trigger value involves the parameter “thermal response time”.

The standards agree on the rate of rise in temperature when measuring the tripping time. The threshold temperature limit is the temperature at which the thermal link must have tripped when subjected to a fast temperature rise of 20°C ± 2°C per minute, starting at an ambient temperature of 25°C ± 2°C . (NB: this ambient temperature was defined at 20°C in the old standard NF S 61-937).

ISO 10294-4 allows the definition of different trigger limit values such as 50° C, 105°C, 120°C, 180°C, 350°C or others depending on the specificities of the device.

According to ISO DIS 2195-1-2017, it is up to the manufacturer of the fuse link to determine this value.

	
Position of the thermal links or thermal bulbs mechanisms in the air stream for threshold temperature limit measurement	**Example chart of temperature rise at 20°C per minute, starting from a plateau at 25°C**

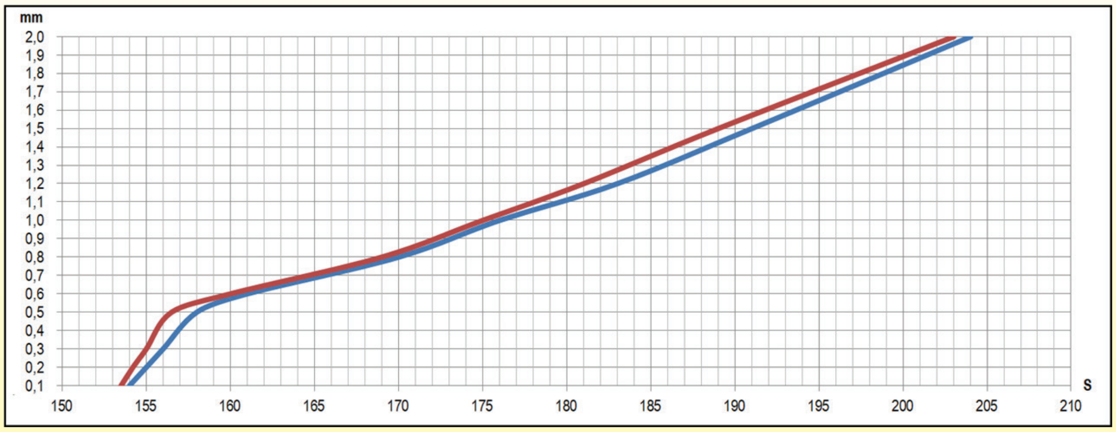
10 - Influence of the material and its thickness on the response time

The response time of a thermal link to a rise in temperature depends of course on the melting temperature of the alloy used, but also on the thermal inertia of the link, itself a function of the thermal conductivity of its constituents, and the ratio between its surface and its thickness. A good balance must be found between the mechanical strength at break (the link becomes more and more fragile when its thickness decreases) and its response time increases with thickness.

In order to quantify these effects, we realized response time measurements in different thicknesses of links of the same model, using the same fusible alloy.

Technical conditions of operation and control of eutectic alloy thermal links and thermo-frangible bulb mechanisms

Average threshold response time and threshold temperature on one single model of fusible link, soldered with non-Rohs eutectic alloy at 72°C, for various thicknesses. (Tests made on a 15x42mm fusible link, in brass (in blue) and in copper (in red), with thicknesses of 0.1mm to 2mm, and 225mm² soldering surface).



Average threshold response time and threshold temperature on the full range of existing models against thickness, soldered with non-Rohs eutectic alloy at 72°C

Metal thickness (mm)	0.3	0.5	0.6	0.8	1	1.2	1.5
Threshold time	2min 50s	3min 3s	3min 6s	3min 10s	3min 15s	3min 32s	3min 39s
Threshold temperature*	81.7	86	87	88	90	95.7	98

* The triggering temperature, measured by two thermocouples of very low thermal inertia, located near the link in the air duct is the result of several concomitant parameters: the thermal inertia of the link, the reduction of the mechanical resistance of the link alloy near the melting point, and the load applied to the link. In the hundreds of tests used for these measurements, the load is the maximum load given in the table in Appendix 1, depending on the weld surface. The test method and equipment comply with ISO10294-4.and ISO DIS 21925-1 2017, fig. C1.

11-Reliability tests after corrosion

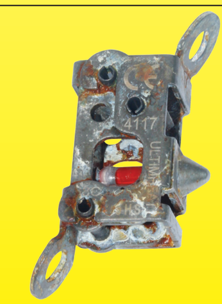
Previously, the corrosion resistance tests for metal parts in the old NF S 61-937 standard of December 1990 referred to chapter 4 of the basic text of standard NF P 24-351 concerning surface protection in buildings.
In the ISO10294-4-2001 standard, specific corrosion resistance tests were introduced as an option. In the new ISO DIS 2195-1-2017 standard being consulted, these tests, identical to those of ISO10294-4, are no longer optional but mandatory, thus approximating the UL33 tests.
These tests consist in submitting batches of 5 samples of links to tests of resistance to different atmospheres, supposed to represent the different types of atmospheric pollution:
- Salt spray test with 20% sodium chloride for 120 hours at 35°C (5 days) Important note: the sodium chloride concentration of this test is 400% higher than the standard salt spray tests at Neutral PH (NSS) given in the classical ISO 9227 standard.
- A test of resistance to a mixture of moist air and hydrogen sulphide (H_2S) at 10,000 PPM *, at an unspecified room temperature during 5 days **
- A test of resistance to a mixture of moist air, carbon dioxide (CO_2) at 10,000 PPM and sulfur dioxide (SO_2) at 10,000 PPM *, at an unspecified room temperature during5 days **

After having been subjected to these three different environmental conditions, the samples of each batch are again tested in response time and in load-bearing capacity.
* Hydrogen sulphide and sulfur dioxide are toxic gases, and hydrogen sulphide is flammable.
**Caution: UL33 standards give standard test times of 10 days instead of 5 days and also provide a test period of 30 days for links intended for corrosive environments. In view of the severity of the UL corrosion resistance tests, this standard also provides that the links may be additionally protected by wax, lead, teflon, polyester or other. This protective layer must then withstand the Faulty set-off test.

Note on accelerated tests of resistance in air with a high concentration of hydrogen sulphide (H_2S). Concentration of 1% (10,000 Ppm).
1 / - The temperature is not indicated in the draft ISO standard, but these tests having been copied from the UL33 standard, the latter specifies: 75 ± 5°F (24 ± 3°C).
2 / - These tests are similar to those prescribed by the environmental standard EN 60068-2-43-2003 (Kd tests), intended to verify the behavior of silver parts of electrical contacts and silver-plated metals, with a concentration in H^2S of 10 to 15 ppm.
It is important to note the standards UL33, ISO10294 and ISO DIS 21925 give a concentration in H^2S 1000 times higher.
In the particular case of alloys used in fusible links, it is found that the hydrogen sulphide reacts with copper and copper and zinc alloys to form copper sulphide (CuS). The reaction rate depends on the composition.
Wet hydrogen sulphide corrodes little alloys with more than 20% zinc such as C26000 (CuZn30) with 70 % copper; C28000 (CuZn40) with 60% copper, and C44300 called "Admiralty brass" (70% copper and low percentage of arsenic and tin) for which the rate of corrosion is limited to 50 to 75 microns / year.
For cuprous alloys containing less than 20% zinc, such as C11000 (99.9% electrolytic copper) and C23000 (CuZn15) at 85% copper, this corrosion rate reaches 1250 to 1625 microns per year (1.2 to 1.6mm / year).
Tin is little attacked below 100 ° C, but above this temperature forms tin sulphide (SnS).
Zinc is not very sensitive to hydrogen sulphide corrosion because an insoluble layer of zinc sulphide (ZnS) is formed.

Test equipment to salt spray in our laboratory

Copper, brass, and coated fusible links after 300h salt spray at 20%



Zinc plated steel fire detection mechanism after 240h salt spray at 20%

Annex 1

Relation between weld surface and maximum load*

The following formula can be used as the first estimate of the maximum load of a fusible link:

$$L = S / 10$$

with L = maximal force of use in DaN, for a non-Rohs eutectic alloy at 72°C, and S = average surface of the weld in mm².
In this formula, the maximum force limit of use is that defined by the test of 1h at 60 ° C.
It is possible to slightly increase this maximum use limit by adding bosses or separation ramps.
Corrections must be made according to the alloy used (see annex 2) and the standard to be complied with. In particular, after correction according to the alloy, these values must be divided by 5 to meet the UL33 standard.
Specific tests by fuse model and tripping temperature are available on request.

* The threshold temperature limit depends on alloy composition and ambient temperature. Values are given for guidance only, and for a 72°C non ROHS alloy. Alloys with temperatures below 72°C and those that are ROHS compliants, generally have a high proportion of Indium, which greatly reduces the mechanical strength.

Annex 2

Correction coefficients to be applied to the maximum permissible loads according to the most usual eutectic alloys used ***

Alloy type	Non-Rohs alloys, with Lead and /or Cadmium and with Indium or Gallium				Non-Rohs alloys, with Lead and /or Cadmium but without Indium or Gallium						Rohs alloy
Melting temperature	47°C (117°F) 19 % Indium	57°C (135°F) 21% Indium	65-66°C (149-151°F) 1,4% Gallium	68°C (155°F) 25% Indium	72°C (162°F)	96°C (205°F)	103°C (218°F)	120°C (248°F)	140°C (284°F)	182°C (360°F)	72°C (162°F) 66% Indium
Correction ratio versus non-Rohs 72°C alloy	0.41	0.39	0.76	0.31	1	0.77	1.65	0.9	1.45	1.78	0.65

*** According to comparative tests carried out on specimens with a welding surface of 225mm², tests carried out at ambient temperature, at a tensile strength test speed of 0.5mm/min.

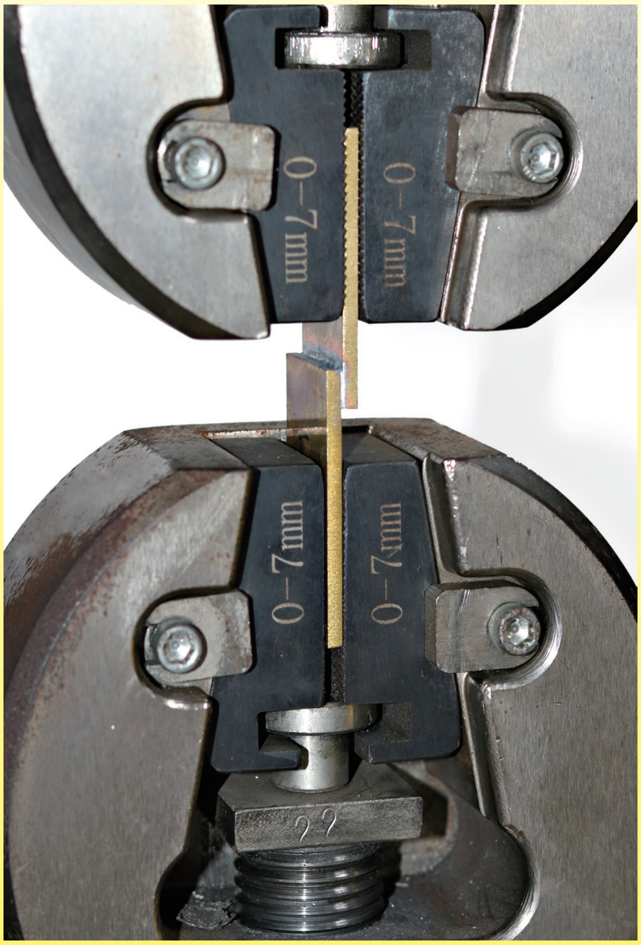
JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Annex 3

Examples of changes of ultimate tensile strength and elongation at break of eutectic alloys in 30 days (Compared with the same alloy)

Alloy type	Non-Rohs alloys, with Lead and /or Cadmium and with Indium or Gallium				Non-Rohs alloys, with Lead and /or Cadmium but without Indium or Gallium						Rohs alloy
Melting temperature	47°C (117°F) 19 % Indium	57°C (135°F) 21% Indium	65-66°C (149-151°F) 1,4% Gallium	68°C (155°F) 25% Indium	72°C (162°F)	96°C (205°F)	103°C (218°F)	120°C (248°F)	140°C (284°F)	182°C (360°F)	72°C (162°F) 66% Indium
Ultimate tensile strength change after 30 days	79%	104%	102%	148%	70%	102%	106%	97%	129%	87%	48%

Tensile strength and elongation at break equipment



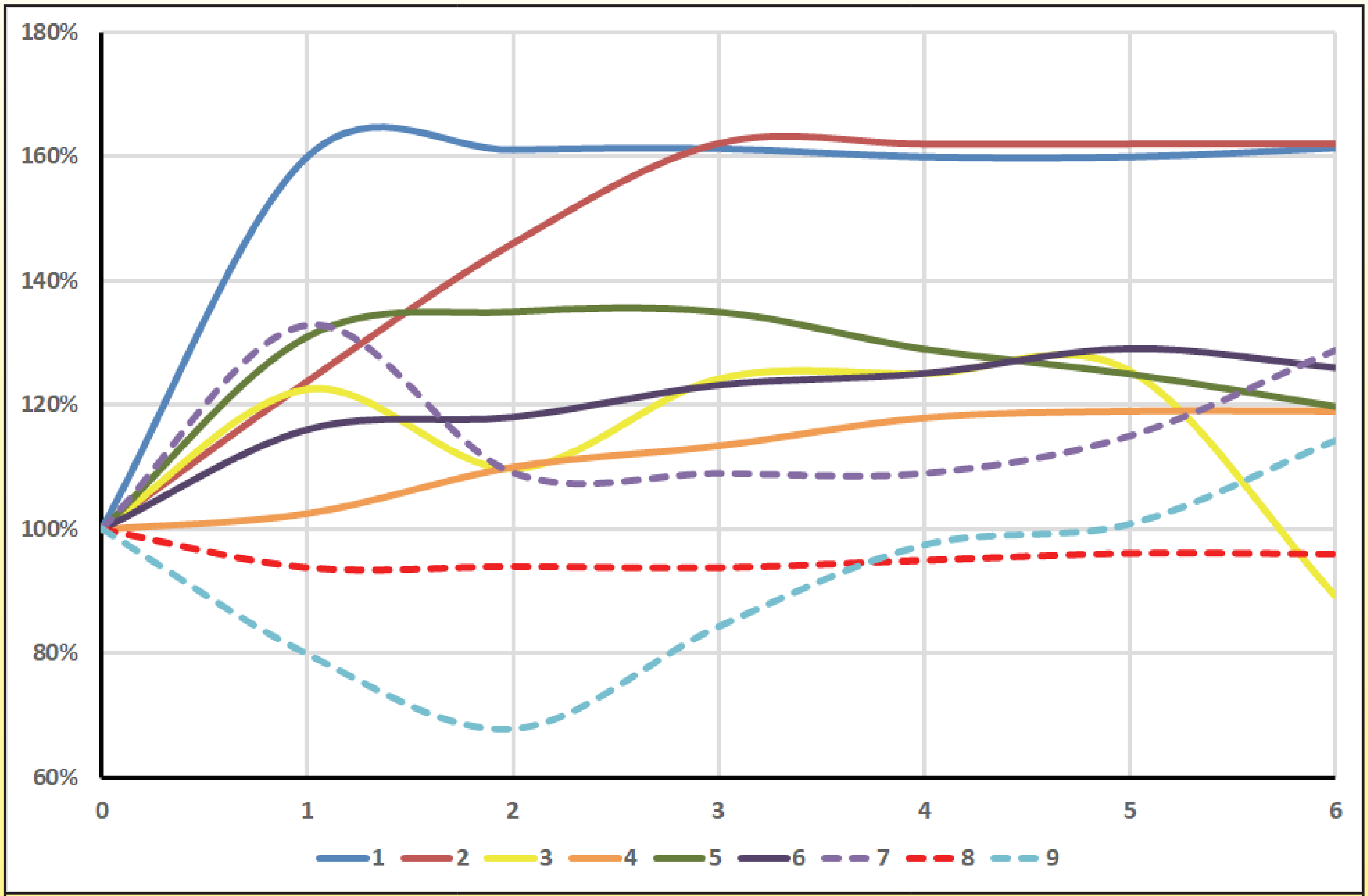
Specimens tested upon the weld ultimate tensile strength.
Values measured in our own testing equipment at a 0.05mm/min speed

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

Annex 4

Change in ultimate tensile strength and creeping of quaternary eutectic fusible alloys versus time

The quaternary alloys (Pb, Sn, Bi, Cd) undergo a change in their mechanical strength and their elongation rate for a long time after their melting. This is due to a slow reorganization of the crystallization. In 42 days (6 weeks), the breaking strength can vary up to tenths of percent.



1: Alloy at 47°C	4: Alloy at 70-72°C (Non Rohs)	7: Alloy at 125°C
2: Alloy at 57°C	5: Alloy at 92°C	8: Alloy at 103°C
3: Alloy at 70-72°C (Rohs)	6: Alloy at 96°C	9: Alloy at 140°C

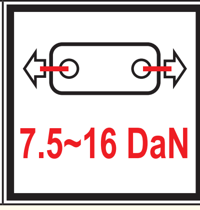
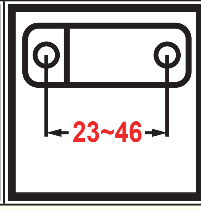
The above curve represents the variation of the resistance, in % of the value measured immediately after soldering, over 6 weeks, of welded test specimens, using a 225mm² surface weld, made with various fusible alloys.
Values measured in our own test equipment at a slow pulling speed of 0.05mm/min.

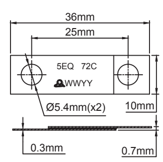
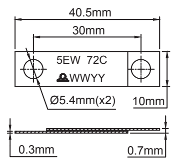
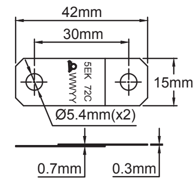
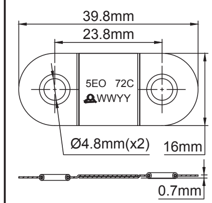
JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Mechanical action fusible links

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Fast triggering eutectic alloys fusible links

Material	Max load	Hole distances	Thickness	Types
Brass or copper			**0.3mm**	**5EQ, 5EW, 5EK,5EO**

 	 	 	 
5EQ	**5EW**	**5EK**	**5EO**

Made of thin metal, these fusible links have the shortest response time, between 2 minutes 50 seconds and 3 minutes, for a temperature rise rate of 20°C/min from 25°C, but the fineness of the metal limits their mechanical strength.

Material: Brass (red copper possible on request).
Surface Protection: No special surface protection
ROHS compliance: These fusible links are available in two versions
- Non-ROHS compliant, using traditional alloys containing lead and cadmium, for temperatures 68°C (155°F); 72°C (162°F); 96°C (205°F); 103°C (218°F); 120°C (248°F).
- ROHS compliant, using ternary alloys based on bismuth, tin and indium, (the high cost of indium makes these models 2 to 3 times more expensive than non-Rohs types) for temperatures 60°C (140°F); 72°C (162°F); 79°C (174°F); 109°C (228°F); 117°C (242°F)

Identification: Model, temperature in °C and date of manufacture are stamped on each fusible link
Tests:
- Mechanical resistance at ambient temperature: 100% in production
- Trip temperature under static load: by statistical sampling
- Trip time in temperature rise under load according to ISO 10294-4: by statistical sampling.
- Holding load 1h at 60°C or 90°C: compliant and verified by statistical sampling in production (Test according to ISO 10294-4)
- Triggering under minimum load: compliant and verified by statistical sampling in production (Test according to UL33)

Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the fusible links retain their aptitude for the function, in the response times specified by the standard.

Type	5EQ	5EW	5EK	5EO (Improved mechanical breaking load model)
Welding surface (mm²)	175 mm²	230 mm²	225mm²	205mm²
Maximum permissible permanent load (DaN)	18 DaN theoretical * but limited to 9 DaN because of the low mechanical breaking load at 25°C **	23 DaN theoretical * but limited to 9 DaN because of the low mechanical breaking load at 25°C **	23 DaN theoretical * but limited to 9 DaN because of the low mechanical breaking load at 25°C **	20 DaN theoretical but limited to 16 DaN because of the low mechanical breaking load at 25°C *
Minimum triggering load	4N	4N	4N	4N
Mechanical breaking load at 25°C for brass fusible links	27 DaN	28 DaN	28 DaN	48 DaN
Mechanical breaking load at 25°C for copper fusible links	26 DaN	27 DaN	26 DaN	46 DaN
Response time according to ISO 10294-4 under maximum load * **	2 min. 55 sec.	2 min. 58 sec.	2 min. 53 sec.	2 min. 53 sec

* Maximum permanent load depends on alloy composition and ambient temperature on 72°C fusible links. Values are given for guidance only, and for a 72°C non ROHS eutectic alloy. Alloys with temperatures below 72°C and those that are ROHS compliant, generally have a high proportion of Indium, which greatly reduces the mechanical strength.
** The maximum permanent load is limited to 1/3 of the mechanical breaking load at 25°C
*** Values measured in our own testing equipment. Testing conditions and equipment comply with ISO10294-4 and ISO DIS 21925-1 2017, fig. C1

Main references in brass* (Non-ROHS)

Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
68°C (155°F)	5EK	5EK0680030000000	5EQ	5EQ0680030000000	5EW	5EW0680030000000	5EO	5EO0680030000000
72°C (162°F)	5EK	5EK0720030000000	5EQ	5EQ0720030000000	5EW	5EW0720030000000	5EO	5EO0720030000000
96°C (205°F)	5EK	5EK0960030000000	5EQ	5EQ0960030000000	5EW	5EW0960030000000	5EO	5EO0960030000000
103°C (218°F)	5EK	5EK1030030000000	5EQ	5EQ1030030000000	5EW	5EW1030030000000	5EO	5EO1030030000000
120°C (248°F)	5EK	5EK1200030000000	5EQ	5EQ1200030000000	5EW	5EW1200030000000	5EO	5EO1200030000000

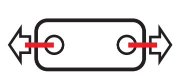
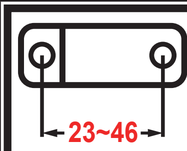
Main references in brass* (ROHS compliant)

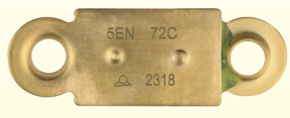
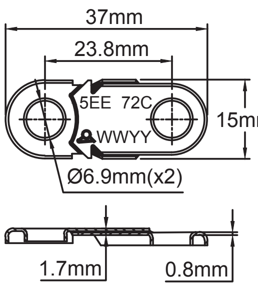
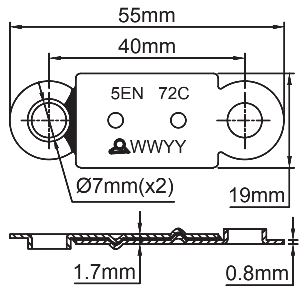
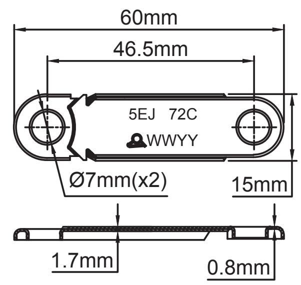
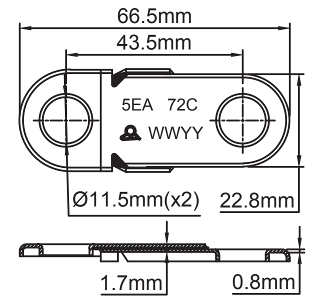
Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
60°C (140°F)	5EK	5EK0600030R00000	5EQ	5EQ0600030R00000	5EW	5EW0600030R00000	5EO	5EO0600030R00000
72°C (162°F)	5EK	5EK0720030R00000	5EQ	5EQ0720030R00000	5EW	5EW0720030R00000	5EO	5EO0720030R00000
79°C (174°F)	5EK	5EK0790030R00000	5EQ	5EQ0790030R00000	5EW	5EW0790030R00000	5EO	5EO0790030R00000
109°C (228°F)	5EK	5EK1090030R00000	5EQ	5EQ1090030R00000	5EW	5EW1090030R00000	5EO	5EO1090030R00000
117°C (242°F)	5EK	5EK1170030R00000	5EQ	5EQ1170030R00000	5EW	5EW1170030R00000	5EO	5EO1170030R00000

*** : for same models in red copper, replace the 8th character of the reference (0) by C**

Page (.pdf) | Drawing 2D (.dwg) | Drawing 3D (.stp)

Eutectic alloys fusible links for medium loads

Material	Max load	Hole distances	Thickness	Types
Brass	 20~64 DaN		0.8mm	5EE, 5EJ, 5EN, 5EA

5EE	5EN	5EJ	5EA
			
			
5EE	5EN	5EJ	5EA

These fusible links have a medium response time, between 3 minutes and 3 minutes 10 seconds, for a temperature rise rate of 20°C/min from 25°C and their thickness of metal gives them sufficient strength for their use in multiplied mechanisms supporting a maximum load of 300DaN.
The holes have a lip to improve their resistance to mechanical break at 25°C by avoiding the tearing of the metal.

Material: Brass
Surface Protection: No special surface protection.
ROHS compliance: These fusible links are available in two versions.
- Non-ROHS compliant, using traditional alloys containing lead and cadmium, for temperatures 68°C (155°F); 72°C (162°F); 96°C (205°F); 103°C (218°F); 120°C (248°F).
- ROHS compliant, using ternary alloys based on bismuth, tin and indium, (the high cost of indium makes these models 2 to 3 times more expensive than non-Rohs types) for temperatures 60°C (140°F); 72°C (162°F); 79°C (174°F); 109°C (228°F); 117°C (242°F).

Identification: Model, temperature in °C and date of manufacture are stamped on each fusible link.
Tests:
- Mechanical resistance at ambient temperature: 100% in production.
- Trip temperature under static load: by statistical sampling.
- Trip time in temperature rise under load according to ISO 10294-4: by statistical sampling.
- Holding load 1h at 60°C or 90°C: compliant and verified by statistical sampling in production (Test according to ISO 10294-4).
- Triggering under minimum load: compliant and verified by statistical sampling in production (Test according to UL33)

Salt spray resistance: According to ISO9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the fusible links retain their aptitude for the function, in the response times specified by the standard.

Type	5EE	5EN	5EJ	5EA
Welding surface (mm²)	200	545	544	640
Maximum permissible permanent load * (DaN)	20	54	54	64
Minimum triggering load	4N	4N	4N	4N
Mechanical breaking load at 25°C	125 DaN	187 DaN	125 DaN	95 DaN
Response time according to ISO 10294-4 under maximum load **	3 min. 2 sec.	3 min. 17 sec.	3 min. 18 sec.	3 min. 10 sec.

* Maximum permanent load depends on alloy composition and ambient temperature on 72°C fusible links. Values are given for guidance only, and for a 72°C non ROHS eutectic alloy. Alloys with temperatures below 72°C and those that are ROHS compliant, generally have a high proportion of Indium, which greatly reduces the mechanical strength.
** Values measured in our own testing equipment. Testing conditions and equipment comply with ISO10294-4 and ISO DIS 21925-1 2017, fig. C1

Main references (Non-ROHS)

Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
68°C (155°F)	5EE	5EE0680080000000	5EJ	5EJ0680080000000	5EN	5EN0680080000000	5EA	5EA0680080000000
72°C (162°F)	5EE	5EE0720080000000	5EJ	5EJ0720080000000	5EN	5EN0720080000000	5EA	5EA0720080000000
96°C (205°F)	5EE	5EE0960080000000	5EJ	5EJ0960080000000	5EN	5EN0960080000000	5EA	5EA0960080000000
103°C (218°F)	5EE	5EE1030080000000	5EJ	5EJ1030080000000	5EN	5EN1030080000000	5EA	5EA1030080000000
120°C (248°F)	5EE	5EE1200080000000	5EJ	5EJ1200080000000	5EN	5EN1200080000000	5EA	5EA1200080000000

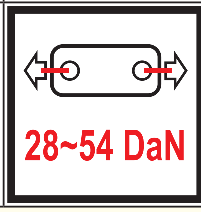
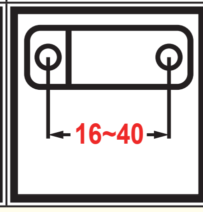
Main references (ROHS compliant)

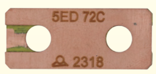
Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
60°C (140°F)	5EE	5EE0600080R00000	5EJ	5EJ0600080R00000	5EN	5EN0600080R00000	5EA	5EA0600080R00000
72°C (162°F)	5EE	5EE0720080R00000	5EJ	5EJ0720080R00000	5EN	5EN0720080R00000	5EA	5EA0720080R00000
79°C (174°F)	5EE	5EE0790080R00000	5EJ	5EJ0790080R00000	5EN	5EN0790080R00000	5EA	5EA0790080R00000
109°C (228°F)	5EE	5EE1090080R00000	5EJ	5EJ1090080R00000	5EN	5EN1090080R00000	5EA	5EA1090080R00000
117°C (242°F)	5EE	5EE1170080R00000	5EJ	5EJ1170080R00000	5EN	5EN1170080R00000	5EA	5EA1170080R00000

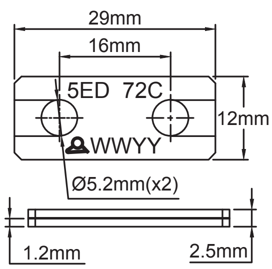
Page (.pdf) | Drawing 2D (.dwg) | Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

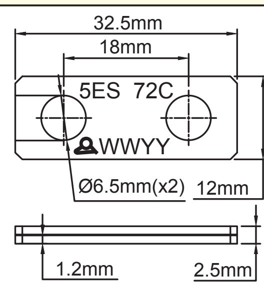
Copper fusible links with eutectic alloys, for medium loads

Material	Max load	Hole distances	Thickness	Types
Copper			1.2mm	5EP, 5ES, 5ED, 5EH

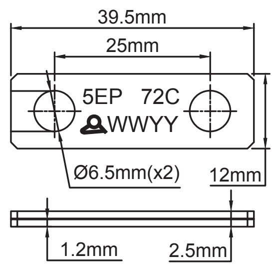




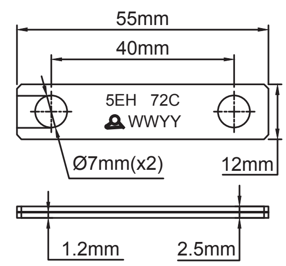
5ED



5ES



5EP



5EH

These fusible links have a medium response time, between 3 minutes 25 seconds and 3 minutes 30 seconds, for a temperature rise rate of 20°C/min from 25°C, and their thickness of metal is thicker than brass models to gives them sufficient strength for their use in multiplied mechanisms supporting a maximum stress of 300DaN. The use of red copper instead of brass provides a better corrosion resistance but substantially increases the price.

Material: Electrolytic copper
Surface Protection: No special surface protection
ROHS compliance: These fusible links are available in two versions
- Non-ROHS compliant, using traditional alloys containing lead and cadmium, for temperatures 68°C (155°F); 72°C (162°F); 96°C (205°F); 103°C (218°F); 120°C (248°F).
- ROHS compliant, using ternary alloys based on bismuth, tin and indium, (the high cost of indium makes these models 2 to 3 times more expensive than non-Rohs types) for temperatures 60°C (140°F); 72°C (162°F); 79°C (174°F); 109°C (228°F); 117°C (242°F)

Identification: Model, temperature in °C and date of manufacture are stamped on each fusible link
Tests:
- Mechanical resistance at ambient temperature: 100% in production
- Trip temperature under static load: by statistical sampling
- Trip time in temperature rise under load according to ISO 10294-4: by statistical sampling.
- Holding load 1h at 60°C or 90°C: compliant and verified by statistical sampling in production (Test according to ISO 10294-4)
- Triggering under minimum load: compliant and verified by statistical sampling in production (Test according to UL33)

Salt spray resistance: According to ISO9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the fusible links retain their aptitude for the function, in the response times specified by the standard.

Type	5ED	5ES	5EP	5EH
Welding surface (mm²)	280	290	370	545
Maximum permissible permanent load * (DaN)	28	29	37	54
Minimum triggering load	4N	4N	4N	4N
Mechanical breaking load at 25°C	165	165	165	165
Response time according to ISO 10294-4 under maximum load **	3 min. 30 sec.	3 min. 30 sec.	3 min. 25 sec.	3 min. 30 sec.

* Maximum permanent load depends on alloy composition and ambient temperature on 72°C fusible links. Values are given for guidance only, and for a 72°C non ROHS eutectic alloy. Alloys with temperatures below 72°C and those that are ROHS compliant, generally have a high proportion of Indium, which greatly reduces the mechanical strength.
In addition, maximum permanent loads are limited to 1/3 of the mechanical breaking load at 25°C.
** Values measured in our own testing equipment. Testing conditions and equipment comply with ISO10294-4 and ISO DIS 21925-1 2017, fig. C1

Main references (Non-ROHS)

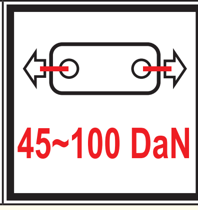
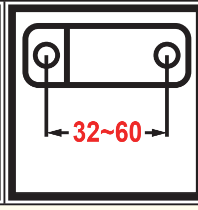
Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
68°C (155°F)	5EP	5EP0680CB0000000	5ES	5ES0680CB0000000	5ED	5ED0680CB0000000	5EH	5EH0680CB0000000
72°C (162°F)	5EP	5EP0720CB0000000	5ES	5ES0720CB0000000	5ED	5ED0720CB0000000	5EH	5EH0720CB0000000
96°C (205°F)	5EP	5EP0960CB0000000	5ES	5ES0960CB0000000	5ED	5ED0960CB0000000	5EH	5EH0960CB0000000
103°C (218°F)	5EP	5EP1030CB0000000	5ES	5ES1030CB0000000	5ED	5ED1030CB0000000	5EH	5EH1030CB0000000
120°C (248°F)	5EP	5EP1200CB0000000	5ES	5ES1200CB0000000	5ED	5ED1200CB0000000	5EH	5EH1200CB0000000

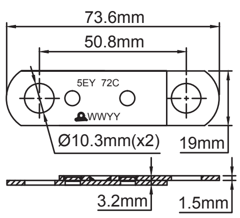
Main references (ROHS compliant)

Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
60°C (140°F)	5EP	5EP0600CB0R00000	5ES	5ES0600CB0R00000	5ED	5ED0600CB0R00000	5EH	5EH0600CB0R00000
72°C (162°F)	5EP	5EP0720CB0R00000	5ES	5ES0720CB0R00000	5ED	5ED0720CB0R00000	5EH	5EH0720CB0R00000
79°C (174°F)	5EP	5EP0790CB0R00000	5ES	5ES0790CB0R00000	5ED	5ED0790CB0R00000	5EH	5EH0790CB0R00000
109°C (228°F)	5EP	5EP1090CB0R00000	5ES	5ES1090CB0R00000	5ED	5ED1090CB0R00000	5EH	5EH1090CB0R00000
117°C (242°F)	5EP	5EP1170CB0R00000	5ES	5ES1170CB0R00000	5ED	5ED1170CB0R00000	5EH	5EH1170CB0R00000

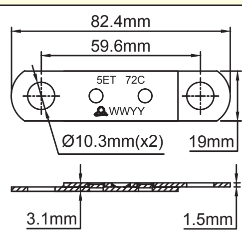
Page (.pdf)   Drawing 2D (.dwg)   Drawing 3D (.stp)

Eutectic alloys fusible links, for direct handling of heavy loads

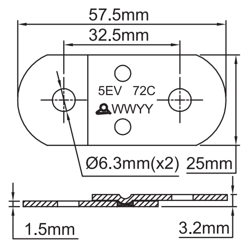
Material	Max load	Hole distances	Thickness	Types
Brass	 45~100 DaN	 32~60	1.5mm	5EY, 5ET, 5EV, 5EX



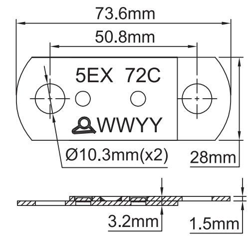
5EY



5ET



5EV



5EX

These fusible links have a response time near the highest limit requested by standard (whose threshold is 4 minutes), between 3 minutes 30 seconds and 3 minutes 50 seconds, for a temperature rise rate of 20°C/min from 25°C. Their 1.5mm metal thickness and their soldering surface make it possible to withstand directly and without multiplying mechanism the loads encountered in the opening or closing mechanisms of fire doors and shutters.

Material: Brass (Copper possible)
Surface Protection: No special surface protection
ROHS compliance: These fusible links are available in two versions
- Non-ROHS compliant, using traditional alloys containing lead and cadmium, for temperatures 68°C (155°F); 72°C (162°F); 96°C (205°F); 103°C (218°F); 120°C (248°F).
- ROHS compliant, using ternary alloys based on bismuth, tin and indium, (the high cost of indium makes these models 2 to 3 times more expensive than non-Rohs types) for temperatures 60°C (140°F); 72°C (162°F); 79°C (174°F); 109°C (228°F); 117°C (242°F)

Identification: Model, temperature in °C and date of manufacture are stamped on each fusible link
Tests:
- Mechanical resistance at ambient temperature: 100% in production
- Trip temperature under static load: by statistical sampling
- Trip time in temperature rise under load according to ISO 10294-4: by statistical sampling.
- Holding load 1h at 60°C or 90°C: compliant and verified by statistical sampling in production (Test according to ISO 10294-4)
- Triggering under minimum load: compliant and verified by statistical sampling in production (Test according to UL33)

Salt spray resistance: According to ISO9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the fusible links retain their aptitude for the function, in the response times specified by the standard.

Type	5EV	5EY	5ET	5EX
Welding surface (mm²)	450	650	730	1000
Maximum permissible permanent load * (DaN)	45	65	73	100
Minimum triggering load	8N	8N	8N	8N
Mechanical breaking load at 25°C	425 DaN	430 DaN	428 DaN	620 DaN
Response time according to ISO 10294-4 under maximum load **	3 min. 41 sec.	3 min. 46 sec.	3 min. 42 sec.	3 min. 43 sec.

* Maximum permanent load depends on alloy composition and ambient temperature on 72°C fusible links. Values are given for guidance only, and for a 72°C non ROHS eutectic alloy. Alloys with temperatures below 72°C and those that are ROHS compliant, generally have a high proportion of Indium, which greatly reduces the mechanical strength.
** Values measured in our own testing equipment. Testing conditions and equipment comply with ISO10294-4 and ISO DIS 21925-1 2017, fig. C1

Main references (Non-ROHS)

Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
68°C (155°F)	5EY	5EY06800E0000000	5ET	5ET06800E0000000	5EV	5EV06800E0000000	5EX	5EX06800E0000000
72°C (162°F)	5EY	5EY07200E0000000	5ET	5ET07200E0000000	5EV	5EV07200E0000000	5EX	5EX07200E0000000
96°C (205°F)	5EY	5EY09600E0000000	5ET	5ET09600E0000000	5EV	5EV09600E0000000	5EX	5EX09600E0000000
103°C (218°F)	5EY	5EY10300E0000000	5ET	5ET10300E0000000	5EV	5EV10300E0000000	5EX	5EX10300E0000000
120°C (248°F)	5EY	5EY12000E0000000	5ET	5ET12000E0000000	5EV	5EV12000E0000000	5EX	5EX12000E0000000

Main references (ROHS compliant)

Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
60°C (140°F)	5EY	5EY06000E0R00000	5ET	5ET06000E0R00000	5EV	5EV06000E0R00000	5EX	5EX06000E0R00000
72°C (162°F)	5EY	5EY07200E0R00000	5ET	5ET07200E0R00000	5EV	5EV07200E0R00000	5EX	5EX07200E0R00000
79°C (174°F)	5EY	5EY07900E0R00000	5ET	5ET07900E0R00000	5EV	5EV07900E0R00000	5EX	5EX07900E0R00000
109°C (228°F)	5EY	5EY10900E0R00000	5ET	5ET10900E0R00000	5EV	5EV10900E0R00000	5EX	5EX10900E0R00000
117°C (242°F)	5EY	5EY11700E0R00000	5ET	5ET11700E0R00000	5EV	5EV11700E0R00000	5EX	5EX11700E0R00000

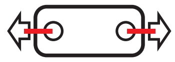
*** : for same models in red copper, replace the 8th character of the reference (0) by C.**

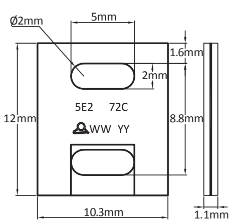
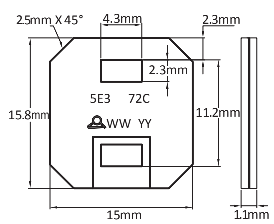
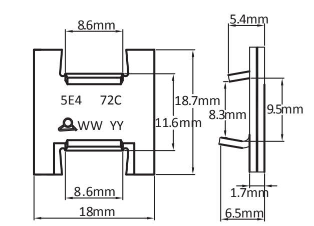
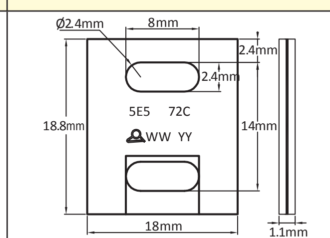
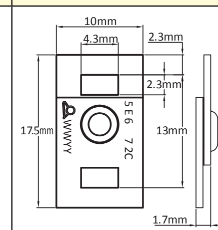
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Miniature eutectic alloy fusible links for large or very large series applications

P1

Material	Max Force	Quantities	Hole distances	Models
Plated Brass	 8 ~ 26DaN	>10, 000	6.8 ~ 10.7MM	5E2, 5E3, 5E4, 5E5, 5E6

				
				
5E2	5E3	5E4	5E5	5E6

Manufactured in a fully automated way, these fire detection fuses are particularly economical for domestic applications in mechanical ventilation, extractor hoods. They are also externally coated with an alloy protecting them from corrosion.

Material: Brass (possible realization in red copper if shorter response times are required).
Surface Protection: Eutectic alloy.
ROHS compliance: These fusible links are available in two versions.
- Non-ROHS compliant, using traditional alloys containing lead and cadmium, for temperatures 68°C (155°F); 72°C (162°F); 96°C (205°F); 103°C (218°F); 120°C (248°F).
- ROHS compliant, using ternary alloys based on bismuth, tin and indium, (the high cost of indium makes these models 2 to 3 times more expensive than the previous ones) for temperatures 60°C (140°F); 72°C (162°F); 79°C (174°F); 109°C (228°F); 117°C (242°F).

Identification: Model, temperature in °C and date of manufacture are printed on each fusible link.
Tests:
- Mechanical resistance at ambient temperature: 100% in production.
- Trip temperature under static load: by statistical sampling.
- Trip time in temperature rise under load according to ISO 10294-4: by statistical sampling.
- Holding load 1h at 60°C or 90°C: compliant and verified by statistical sampling in production (Test according to ISO 10294-4).
- Triggering under minimum load: compliant and verified by statistical sampling in production (Test according to UL33).

Salt spray resistance: According to ISO9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the apparatuses retain their aptitude for the function, in the response times specified by the standard.

Type	5E2	5E3	5E4	5E5	5E6
Welding surface (mm²)	84 mm²	159 mm²	224 mm²	258 mm²	80 mm²
Maximum permissible permanent load * (DaN)	8.5 DaN	16 DaN	22 DaN	26 DaN	8 DaN

Miniature eutectic alloy fusible links for large or very large series applications

P2

Type	5E2	5E3	5E4	5E5	5E6
Minimum breaking load	2N	4N	4N	4N	3N
Response time according to ISO 10294-4 under maximum load **	2min 43 sec	2min 46 sec	2min 51sec	2min 51sec	2min 38sec

* Maximum permanent load depends on alloy composition and ambient temperature. Values are given for guidance only, and for a 72°C non ROHS eutectic alloy. Alloys with temperatures below 72°C and those that are RoHS compliant, generally have a high proportion of Indium, which greatly reduces the mechanical strength.
** Values measured in our own testing equipment. Testing conditions and equipment comply with ISO10294-4 and ISO DIS 21925-1 2017, fig. C1.

Main references (Not RoHS)

Model	Temperature	Reference
5E2	68°C (155°F)	5E2068H050000000
5E2	72°C (162°F)	5E2072H050000000
5E2	96°C (205°F)	5E2096H050000000
5E2	103°C (218°F)	5E2103H050000000
5E2	120°C (248°F)	5E2120H050000000
5E3	68°C (155°F)	5E3068H050000000
5E3	72°C (162°F)	5E3072H050000000
5E3	96°C (205°F)	5E3096H050000000
5E3	103°C (218°F)	5E3103H050000000
5E3	120°C (248°F)	5E3120H050000000
5E4	68°C (155°F)	5E4068H050000000
5E4	72°C (162°F)	5E4072H050000000
5E4	96°C (205°F)	5E4096H050000000
5E4	103°C (218°F)	5E4103H050000000
5E4	120°C (248°F)	5E4120H050000000
5E5	68°C (155°F)	5E5068H050000000
5E5	72°C (162°F)	5E5072H050000000
5E5	96°C (205°F)	5E5096H050000000
5E5	103°C (218°F)	5E5103H050000000
5E5	120°C (248°F)	5E5120H050000000
5E6	68°C (155°F)	5E6068H050000000
5E6	72°C (162°F)	5E6072H050000000
5E6	96°C (205°F)	5E6096H050000000
5E6	103°C (218°F)	5E6103H050000000
5E6	120°C (248°F)	5E6120H050000000

Main references (RoHS compliant)

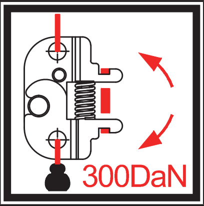
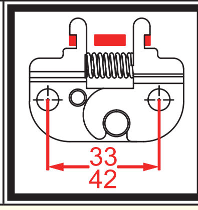
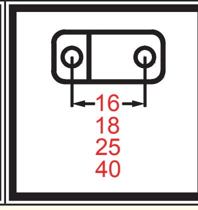
Model	Temperature	Reference
5E2	60°C (140°F)	5E2060H050R00000
5E2	72°C (162°F)	5E2072H050R00000
5E2	79°C (174°F)	5E2079H050R00000
5E2	109°C (228°F)	5E2109H050R00000
5E2	117°C (242°F)	5E2117H050R00000
5E3	60°C (140°F)	5E3060H050R00000
5E3	72°C (162°F)	5E3072H050R00000
5E3	79°C (174°F)	5E3079H050R00000
5E3	109°C (228°F)	5E3109H050R00000
5E3	117°C (242°F)	5E3117H050R00000
5E4	60°C (140°F)	5E4060H050R00000
5E4	72°C (162°F)	5E4072H050R00000
5E4	79°C (174°F)	5E4079H050R00000
5E4	109°C (228°F)	5E4109H050R00000
5E4	117°C (242°F)	5E4117H050R00000
5E5	60°C (140°F)	5E5060H050R00000
5E5	72°C (162°F)	5E5072H050R00000
5E5	79°C (174°F)	5E5079H050R00000
5E5	109°C (228°F)	5E5109H050R00000
5E5	117°C (242°F)	5E5117H050R00000
5E6	60°C (140°F)	5E6060H050R00000
5E6	72°C (162°F)	5E6072H050R00000
5E6	79°C (174°F)	5E6079H050R00000
5E6	109°C (228°F)	5E6109H050R00000
5E6	117°C (242°F)	5E6117H050R00000

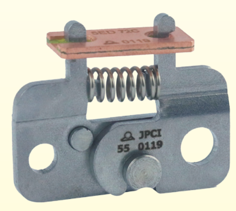
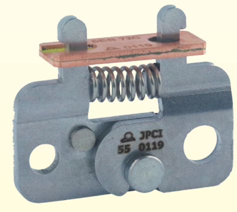
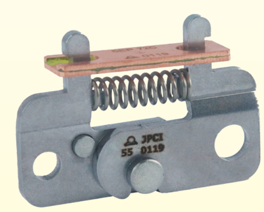
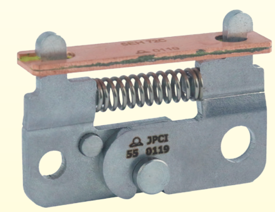
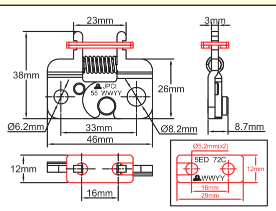
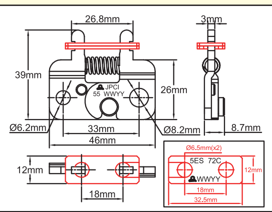
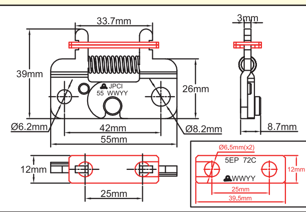
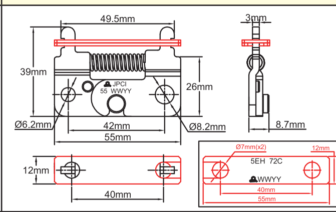
* : for same models in red copper, replace the 8th character of the reference (0) by C.

Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Multiplied action mechanisms for eutectic fusible links, for application in smoke outlets

Material	Max. Load	Mounting hole distances (mm)	Fusible link hole distances (mm)	Types
Zinc plated steel				**5516, 5518, 5525, 5540**

			
			
5516 Permanent maximum load*: 170 DaN	**5518** Permanent maximum load*: 180 DaN	**5525** Permanent maximum load*: 230 DaN	**5540** Permanent maximum load**: 300 DaN

* Maximum continuous load at ambient temperature calculated as a function of fuse link welding area, (with non-ROHS eutectic alloy at 72 ° C). Moderator coefficients are applicable for other alloys. (See technical introduction)
** For model 5540, the maximum continuous load at ambient temperature calculated as a function of the fuse weld surface, (with a non-ROHS eutectic alloy at 72°C), exceeds the mechanical strength limit of the device.

Made of 3mm thick galvanized steel, these reduction mechanisms are compatible with most fusible links available on the market. Their high coefficient of reduction enables them to be used with links with a small welding area. Indeed, the traction on the fusible links is only 15% of that applied to the mechanism. The annual replacement of the links is simple and can be done without special tools.
Equipped with an appropriate fusible link, they withstand the 300 DaN overload during 5 minutes, required for smoke extraction applications.

Material: Zinc plated steel.
- On two steel cables equipped with rope thimble.
- On a steel cable equipped with rope thimble in the 6.2mm hole and a wall mounting bracket in the 8.2mm hole. These accessories are described at the end of this catalog.

ROHS compliance: These mechanisms are ROHS compliant, but the conformity of the assembly when fitted with fusible links depends on the conformity of the fusible link (See the technical data sheets of the fusible links).
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a fusible link, the link has its own identification (See the technical data sheets of the fusible links).
Functional Tests:
- Mechanical strength at ambient temperature with a 300 DaN overload during 5 minutes: checked by statistical sampling in production.
- Triggering in temperature under minimum load of 27 DaN, fitted with a fusible link having a minimum triggering load of 4 N: checked by statistical sampling in production.

Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the fusible links retain their aptitude for the function.
Options : AISI 304 Stainless steel models.

Main references (Not ROHS)

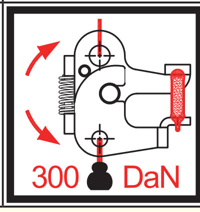
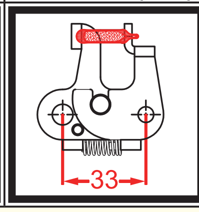
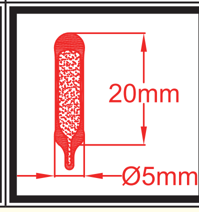
Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
Without fusible link	5516	551615S333A00000	5518	551815S333A00000	5525	552515S342A00000	5540	554015S342A00000
68°C (155°F)	5516	551615S333AD1680	5518	551685S333AS1680	5525	552515S342AP1680	5540	554015S342AH1680
72°C (162°F)	5516	551615S333AD1720	5518	551815S333AS1720	5525	552515S342AP1720	5540	554015S342AH1720
96°C (205°F)	5516	551615S333AD1960	5518	551815S333AS1960	5525	552515S342AP1960	5540	554015S342AH1960
103°C (218°F)	5516	551615S333AD1A30	5518	551815S333AS1A30	5525	552515S342AP1A30	5540	554015S342AH1A30
120°C (248°F)	5516	551615S333AD1C00	5518	551815S333AS1C00	5525	552515S342AP1C00	5540	554015S342AH1C00

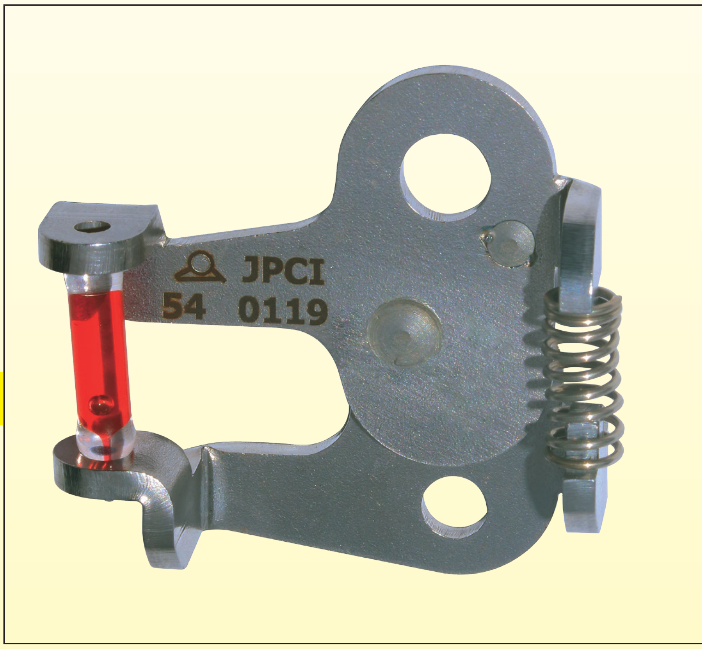
Main references (ROHS compliant)

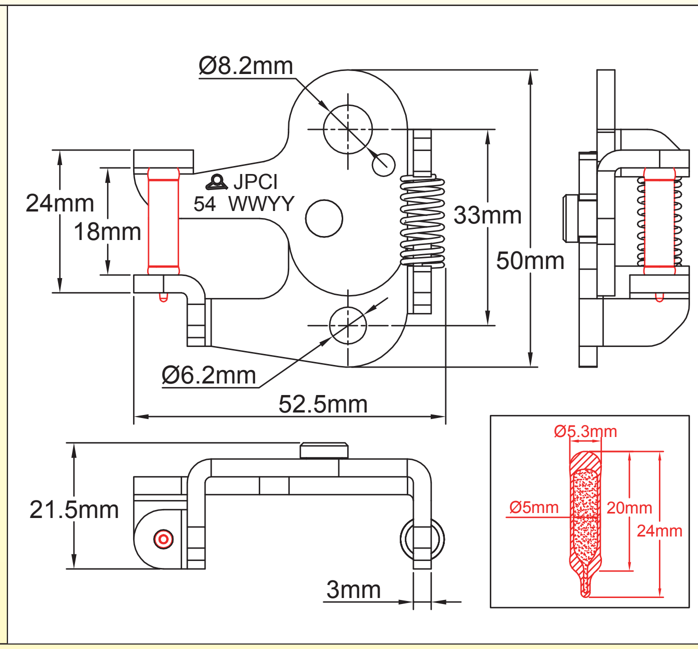
Temperature	Model	Reference	Model	Reference	Model	Reference	Model	Reference
Without fusible link	5516	551615S333A00000	5518	551815S333A00000	5525	552515S342A00000	5540	554015S342A00000
60°C (140°F)	5516	551615S333ADR600	5518	551685S333ASR600	5525	552515S342APR600	5540	554015S342AHR600
72°C (162°F)	5516	551615S333ADR720	5518	551815S333ASR720	5525	552515S342APR720	5540	554015S342AHR720
79°C (174°F)	5516	551615S333ADR790	5518	551815S333ASR790	5525	552515S342APR790	5540	554015S342AHR790
109°C (228°F)	5516	551615S333ADRA90	5518	551815S333ASRA90	5525	552515S342APRA90	5540	554015S342AHRA90
117°C (242°F)	5516	551615S333ADRB70	5518	551815S333ASRB70	5525	552515S342APRB70	5540	554015S342AHRB70

Page (.pdf) Drawing 2D (.dwg) Drawing 3D (.stp)

Multiplied action mechanisms with thermal glass bulbs, for application in smoke outlets

Material	Max. Load	Mounting hole distances (mm)	Thermal glass bulb size	Types
Zinc plated steel				**5420A**





Made of 3mm thick galvanized steel, these reduction mechanisms are compatible with 20x5mm thermal glass bulbs. Their huge multiplying coefficient reduces the force applied to the thermal glass bulb to only 15% of that applied to the mechanism. The replacement of the glass bulb is simple and can be done without special tools.
They withstand the 300 DaN overload during 5 minutes, and a minimal load of 0.4 DaN.

Material: Zinc plated steel.
- On two steel cables equipped with rope thimble.
- On a steel cable equipped with rope thimble in the 6.2mm hole and a wall mounting bracket in the 8.2mm hole. These accessories are described at the end of this catalog.

ROHS compliance: These mechanisms are fully ROHS compliant.
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a thermal glass bulb, temperature set point is given by the glass bulb color.
Tests:
- Mechanical resistance at ambient temperature with a 300DaN overload during 5 minutes: checked by statistical sampling in production.
- Triggering in temperature under minimum load of 0.4 DaN: checked by statistical sampling in production.

Salt spray resistance: According to ISO9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the mechanism retains its aptitude for the function.
Options : 304 Stainless steel models.

Main references

Temperature	Without thermal glass bulb	57°C (135°F)	68°C (155°F)	79°C (174°F)	93°C (199°F)	141°C (286°F)	182°C (360°F)
Thermal glass bulb color	-	Orange	Red	Yellow	Green	Blue	Purple
Reference	5420AS3330000	5420AS3330570	5420AS3330680	5420AS3330790	5420AS3330930	5420AS3331410	5420AS3331820

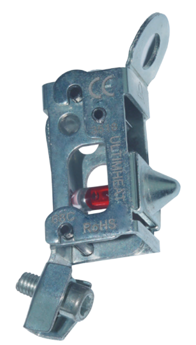
(Thermal glass bulb colors are standardized by EN 12259-1 and ISO 6182-1.)

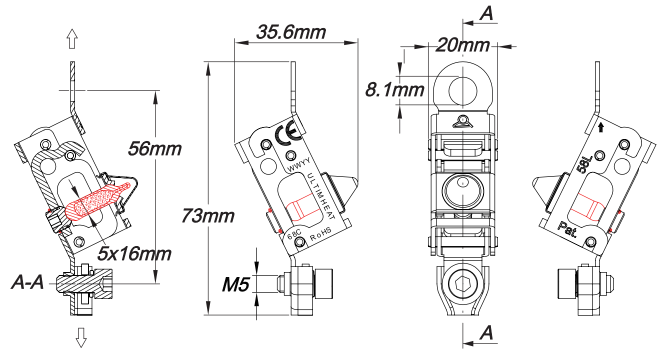
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Breakable glass bulb fire detection link, miniature type

Material	Max Force		Hole distance	Models
Galvanized steel	100 DaN	RoHS REACH	56MM	58L





Applications

Patented mechanical system of fire detection by liquid filled glass bulb breaking. In case of fire, when the temperature reaches the liquid boiling temperature, it causes the explosion of the glass bulb, which releases the mechanism. This self-powered mechanism does not require power supply such as electricity or compressed air. It can open smoke vents, skylights, in buildings, but also actuates fire doors, air conditioning dampers, store curtains, flammable gas or liquid valves, range hood exhausts, paint and solvent exhaust fans and dampers, etc.

Dimensions: Very small foot print, can replace most of devices using fusible links. In addition, having a very high tensile strength, this device does not require a demultiplying system.
Creep sensitivity: Insensitive to creep, even close to the tripping temperature.
ROHS compliance: For most of temperature calibration, fusible fire detection systems cannot be achieved, as they use alloys containing lead and cadmium, materials that are not allowed by the RoHS standard. This glass bulb operated device does not use fusible alloy and therefore contains no prohibited metal and meets the RoHS standard.
Material: Galvanized steel
Fail safe operation: When opening, the internal lever falls unhindered by any other part, irreversibly releasing the two halves of the mechanism.
This mechanism has no spring because, due to their susceptibility to corrosion and to permanent deformation, the use of springs may cause a malfunction.
Glass bulbs: Dia. 5mm, 16mm nominal length, filled with alcohol blends.
Response time index (RTI) of bare bulbs: <25 $m.s^{1/2}$
Maximum permanent load: 100 DaN Tensile strength at break: ≥ 150 DaN
Minimum load: 5 DaN
Nominal opening temperatures: 57 °C (135 °F) orange bulb; 68 °C (155° F) red. The bulb coloring complies with EN 12259-1 and ISO 6182-1 international standards for color/temperature ratings. Other temperatures, consult us.
Mounting: This model features
- one side with a hole allowing the connection either on a cable, or on a bracket integral with the opening (available as accessories)
- One side with integrated clamping device on steel cable, simplifying assembly.

Mounting position: When used in vertical position, the glass bulb must be downside. No preferential position when mounted horizontally.
Options: Rope thimble assembled on the 8mm hole
Glass bulb replacement: Replacement is possible, by using a locking pin, which must be removed after bulb replacement.
Certifications: according to ISO 10294-4.

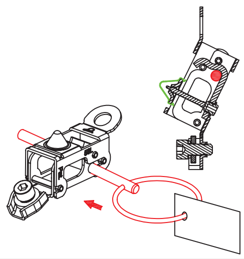
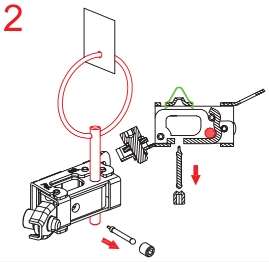
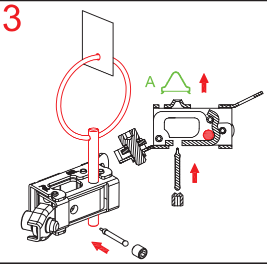
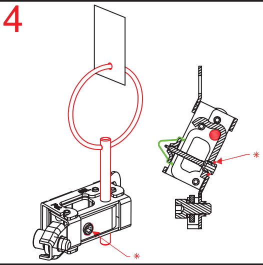
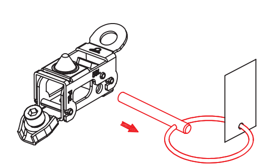
Breakable glass bulb fire detection link, miniature type

Main references

Temperature (°C/°F)	Dia. 8mm holes without rope thimble	Dia. 8mm holes with rope thimble
57°C (135°F)	58LFF08250B057C0	58LFF08250B057C2
68°C (155°F)	58LFF08250B068C0	58LFF08250B068C2

Replacement of glass bulb

(when requested by preventive maintenance rules)

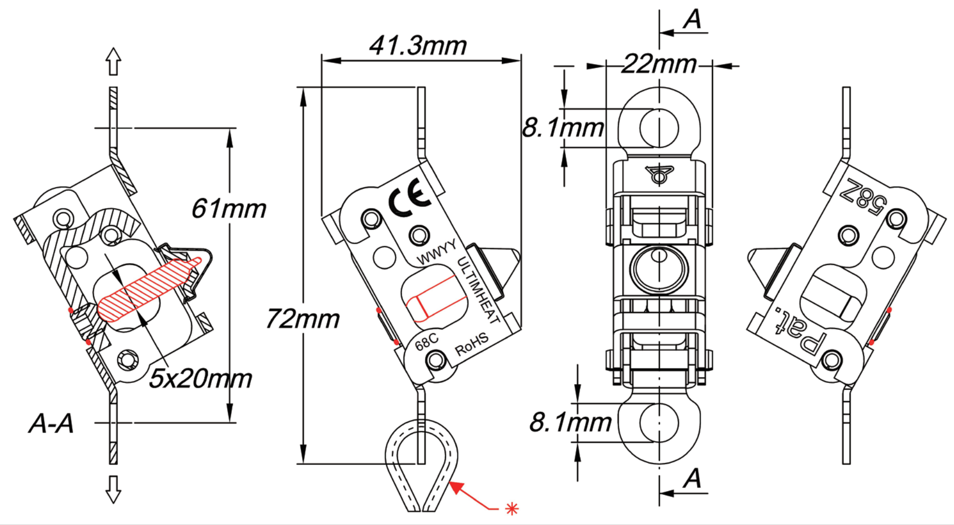
1	2	3	4	5
				
Glass bulb replacement must be made by trained technicians. Only genuine glass bulbs with the same calibration temperature must be used. *1/ Check the reference printed on the product (58Z or 58L). Secure the link with this pin before and during glass bulb replacement.*	*2/ Remove the screw with hexagonal key wrench. Size is 2.5mm for 58L, and 1/8 inch, (3.17mm) for 58Z. Remove the old glass bulb.*	*3/ Put carefully a new glass bulb inside (Dia.5mm). Put the screw and tighten lightly it by hand. Don't break the bulb filling needle. If any doubt, unclip the bulb needle cap (A) with a small screw driver, and check visually that the filling needle is not broken. Do not miss to clips again the cap after inspection.*	*4/ Tighten the screw with a torque controlled wrench. (Torque must be 0.5-0.6N.m.) Seal the screw thread* with a low strength sealant like Loctite 222. Be careful to not glue the lever to the frame with excess sealant.*	*5/ Important: Don't miss to remove the safety pin when you have finished.*

Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

High load breakable glass bulb heat responsive link
for heavy loads

Material	Max Force		Hole distance	Models
Galvanized steel	200 DaN	RoHS REACH	61MM	58Z



Applications

Patented mechanical system of fire detection by liquid filled glass bulb breaking. In case of fire, when the temperature reaches the liquid boiling temperature, it causes the explosion of the glass bulb, which releases the mechanism. This self-powered mechanism does not require power supply such as electricity or compressed air. It can open smoke vents, skylights, in buildings, but also actuate fire doors, air conditioning dampers, store curtains, flammable gas or liquid valves, range hood exhausts, paint and solvent exhaust fans and dampers, etc.

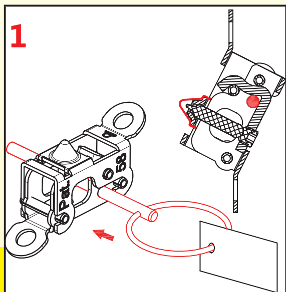
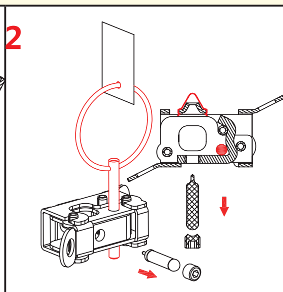
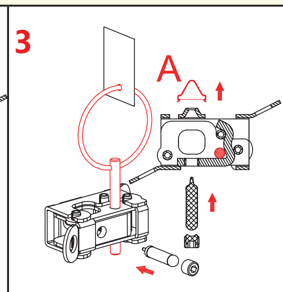
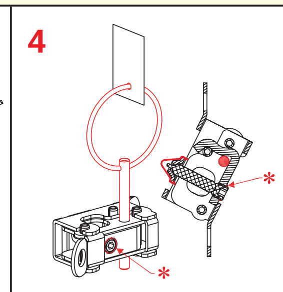
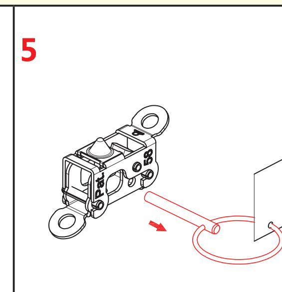
Dimensions: Small foot print, can replace most of devices using fusible links. In addition, having a very high tensile strength, this device requires no auxiliary strength demultiplication system.
Creep sensitivity: Insensitive to creep, even close to the tripping temperature.
ROHS compliance: For most of temperature calibration, fusible fire detection systems cannot be achieved, as they use alloys containing lead and cadmium, materials that are not allowed by the RoHS standard. This glass bulb operated device does not use fusible alloy and therefore contains no prohibited metal and meets the RoHS standard.
Material: Galvanized steel
Fail safe operation: When opening, the internal lever falls unhindered by any other part, irreversibly releasing the two halves of the mechanism.
This mechanism has no spring because, due to their susceptibility to corrosion and to permanent deformation, the use of springs may cause a malfunction.
Heat responsive bulbs: Glass, dia. 5mm, 20mm nominal length, filled with alcohol blends. They are protected against hits.
Response time index (RTI) of bare bulbs: 90 m.s$^{1/2}$
Maximum permanent load: 200 DaN
Tensile strength at break: ≈350 DaN
Minimum load: 10 DaN
Nominal opening temperatures: 57 °C (135 °F) orange bulb; 68 °C (155° F) red; 79 °C (175 °F) yellow; 93 °C (200 °F) green; 141 °C (285°F) blue; 182 °C (360 °F) mauve. The bulb coloring complies with EN 12259-1 and ISO 6182-1 international standards for color/temperature ratings. Other temperatures, consult us.
***Options:** Rope thimble assembled on one hole. Caution: this thimble may be destroyed by high loads.
Mounting position: When used in vertical position, the glass bulb must be downside. No preferential position when mounted horizontally.
Glass bulb replacement: Replacement is possible, by using a locking pin, which must be removed after bulb replacement.
Certifications: according to ISO 10294-4.
Other types: for load ≤150DaN, see 58L type.

High load breakable glass bulb heat responsive link
for heavy loads

Main references

Temperature (°C/°F)	2 holes dia.8mm, without rope thimble	2 holes dia. 8mm, downside with rope thimble
57°C (135°F)	58ZFA08300B057C0	58ZFA08300B057C1
68°C (155°F)	58ZFA08300B068C0	58ZFA08300B068C1
79°C (175°F)	58ZFA08300B079C0	58ZFA08300B079C1
93°C (200°F)	58ZFA08300B093C0	58ZFA08300B093C1
141°C (285°F)	58ZFA08300B141C0	58ZFA08300B141C1
182°C (360°F)	58ZFA08300B182C0	58ZFA08300B182C1

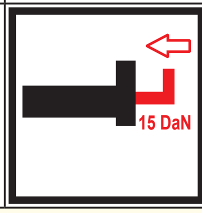
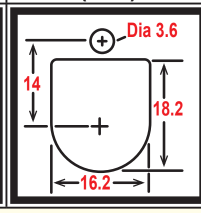
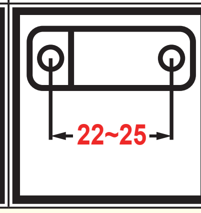
Replacement of glass bulb
(When requested by preventive maintenance rules)

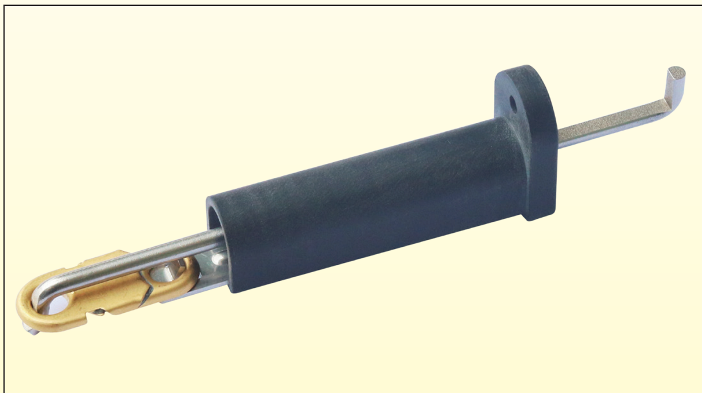
1	2	3	4	5
				
Glass bulb replacement must be made by trained technicians. Only genuine glass bulbs with the same calibration temperature must be used. *1/ Check the reference printed on the product (58Z or 58L). Secure the link with this pin before and during glass bulb replacement.*	*2/ Remove the screw with hexagonal key wrench. Size is 2.5mm for 58L, and 1/8 inch, (3.17mm) for 58Z. Remove the old glass bulb.*	*3/ Put carefully a new glass bulb inside (Dia.5mm). Put the screw and tighten lightly it by hand. Don't break the bulb filling needle. If any doubt, unclip the bulb needle cap (A) with a small screw driver, and check visually that the filling needle is not broken. Do not miss to clips again the cap after inspection.*	*4/ Tighten the screw with a torque controlled wrench. (Torque must be 0.5-0.6N.m.) Seal the screw thread * with a low strength sealant like Loctite 222. Be careful to not glue the lever to the frame with excess sealant.*	*5/ Important: Don't miss to remove the safety pin when you have finished.*

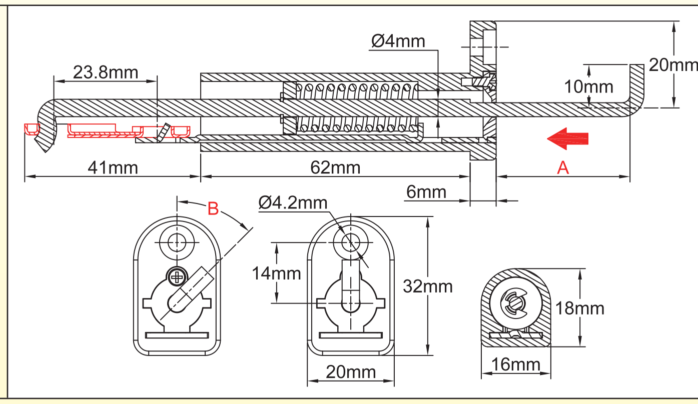
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Thermal actuators with pulling action, for fire dampers, operated by eutectic fusible link

Material	Tripping force	Mounting hole dimensions (mm)	Fusible link hole distances (mm)	Types
304 Stainless steel				**52A**





These mechanical thermal actuators are intended to close the fire dampers used on the ventilation ducts. Their large operating force unlocks the spring actuating the damper. Requiring no power supply, these devices are particularly simple and reliable. They are mandatory for all fire dampers to meet the NF-S 61.937 standard. The force they develop is compatible with eutectic alloy fusible links with a soldering surface equal to or greater than 200mm² *. However, some local regulations may require periodic replacement of the fuse link or the thermal actuator.

Straight length (A) of the actuating rod before release: 30mm or 25mm
(This length is given for a type 5EE fusible link with 23.8mm between holes axis, and varies proportionally to the fusible link holes axis distance)
Stroke of the actuating rod when triggering: ≥ 20 mm
Traction force of the actuating rod: ≥ 15 DaN (at the beginning of the stroke)
Orientation of the actuating rod bending: Aligned with the axis of the fixing screw. Other possible orientations: every 15° angular (MOQ apply)
Communication with the external environment: The mechanisms are equipped with a low leakage wall, separating the air of the ventilation duct from that of the external environment.
Installation: Through the wall of the ventilation duct, with M4 screws or self-tapping screws of similar dimensions. See the metal sheet cutting drawing above.
Body material: PA66 glass fiber reinforced, withstand temperature 200 C
Mechanism material: Stainless steel Aisi 304
ROHS compliance: These mechanisms are ROHS compliant, but the conformity of the assembly when fitted with fusible links depends on the conformity of the fusible link (See the technical data sheets of the fusible links).
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a fusible link, the link has its own identification (See the technical data sheets of the fusible links).
Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the mechanisms retain their aptitude for the function.
* The permanent mechanical strength of a eutectic fusible link depends on the soldering surface, but also on the composition of the alloy and the ambient temperature. See the limiting coefficients given in the technical introduction.

Main references with 5EE fusible link (Non-ROHS)

Temperature	Length A	Reference	Length A	Reference
Without fusible link	25mm	52A20062150E0000	30mm	52A20062150F0000
68°C (155°F)	25mm	52A2006215EE0680	30mm	52A2006215EF0680
72°C (162°F) *	25mm	52A2006215EE0720	30mm	52A2006215EF0720
96°C (205°F)	25mm	52A2006215EE0960	30mm	52A2006215EF0960
103°C (218°F)	25mm	52A2006215EE1030	30mm	52A2006215EF1030
120°C (248°F)	25mm	52A2006215EE1200	30mm	52A2006215EF1200

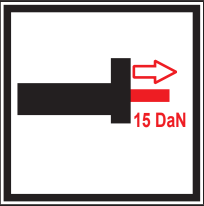
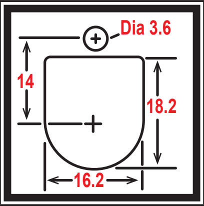
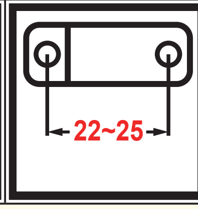
Main references with 5EE fusible link (RoHS compliant)

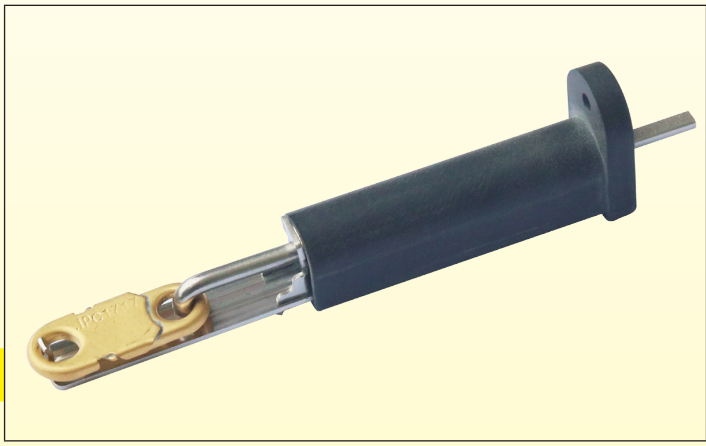
Temperature	Length A	Reference	Length A	Reference
60°C (140°F)	25mm	52A2006215RE0600	30mm	52A20062152RF0600
72°C (162°F) *	25mm	52A2006215RE0720	30mm	52A20062152RF0720
79°C (174°F)	25mm	52A2006215RE0790	30mm	52A20062152RF0790
109°C (228°F)	25mm	52A2006215RE1090	30mm	52A20062152RF1090
117°C (242°F)	25mm	52A2006215RE1170	30mm	52A20062152RF1170

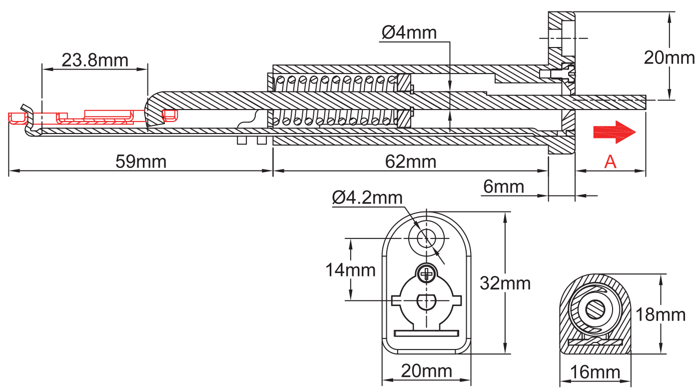
* : tripping value often described by mistake as 70°C (158°F)

Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

Thermal actuators with pushing action, for fire dampers, operated by eutectic fusible link

Material	Tripping force	Mounting hole dimensions (mm)	Fusible links holes distance (mm)	Types
304 Stainless steel				52B





These mechanical thermal actuators are intended to close the fire dampers used on the ventilation ducts. Their large operating force unlocks the spring actuating the damper. Requiring no power supply, these devices are particularly simple and reliable. They are mandatory for all fire dampers to meet the NF-S 61.937 standard. The force they develop is compatible with eutectic alloy fusible links with a soldering surface equal to or greater than 200mm² *. However, some local regulations may require periodic replacement of the fuse link or the thermal actuator.

Length (A) of the actuating rod before release: 5, 10 or 15mm
(This length is given for a type 5EE fusible link with 23.8mm between holes axis, and varies proportionally to the fusible link holes axis distance).
Stroke of the actuating rod when triggering: ≥ 20 mm
Pushing force of the actuating rod: ≥ 15 DaN (at the beginning of the stroke).
Communication with the external environment: The mechanisms are equipped with a low leakage wall, separating the air of the ventilation duct from that of the external environment.
Installation: Through the wall of the ventilation duct, with M4 screws or self-tapping screws of similar dimensions. See the metal sheet cutting drawing above.
Body material: PA66 glass fiber reinforced, withstands temperature 200 C.
Mechanism material: Stainless steel Aisi 304.
ROHS compliance: These mechanisms are ROHS compliant, but the conformity of the assembly when fitted with fusible links depends on the conformity of the fusible link (See the technical data sheets of the fusible links).
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a fusible link, the link has its own identification (See the technical data sheets of the fusible links).
Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the mechanisms retain their aptitude for the function.
* The permanent mechanical strength of a eutectic fusible link depends on the soldering surface, but also on the composition of the alloy and the ambient temperature. See the limiting coefficients given in the technical introduction.

Main references with 5EE fusible link (Non-ROHS)

Temperature	Length A	Reference	Length A	Reference	Length A	Reference
Without fusible link	5mm	52B20062150B0000	10mm	52B20062150C0000	15mm	52B20062150C0000
68°C (155°F)	5mm	52B2006215EA0680	10mm	52B2006215EB0680	15mm	52B2006215EC0680
72°C (162°F) *	5mm	52B2006215EA0720	10mm	52B2006215EB0720	15mm	52B2006215EC0720
96°C (205°F)	5mm	52B2006215EA0960	10mm	52B2006215EB0960	15mm	52B2006215EC0960
103°C (218°F)	5mm	52B2006215EA1030	10mm	52B2006215EB1030	15mm	52B2006215EC1030
120°C (248°F)	5mm	52B2006215EA1200	10mm	52B2006215EB1200	15mm	52B2006215EC1200

Main references with 5EE fusible link (ROHS compliant)

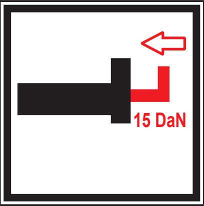
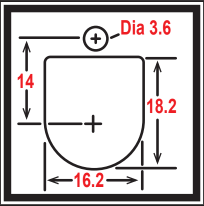
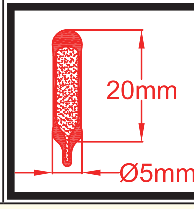
Temperature	Length A	Reference	Length A	Reference	Length A	Reference
60°C (140°F)	5mm	52B2006215RA0600	10mm	52B2006215RB0600	15mm	52B2006215RC0600
72°C (162°F) *	5mm	52B2006215RA0720	10mm	52B2006215RB0720	15mm	52B2006215RC0720
79°C (174°F)	5mm	52B2006215RA0790	10mm	52B2006215RB0790	15mm	52B2006215RC0790
109°C (228°F)	5mm	52B2006215RA1090	10mm	52B2006215RB1090	15mm	52B2006215RC1090
117°C (242°F)	5mm	52B2006215RA1170	10mm	52B2006215RB1170	15mm	52B2006215RC1170
120°C (248°F)	5mm	52B2006215EA1200	10mm	52B2006215EB1200	15mm	52B2006215EC1200

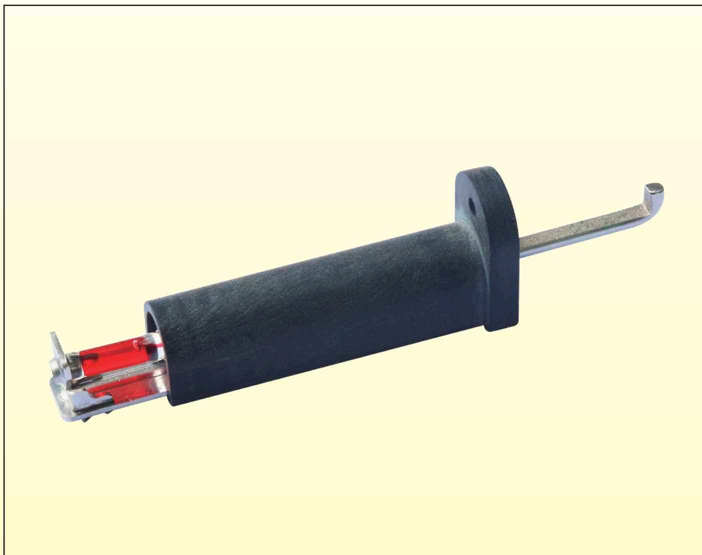
* : tripping value often described by mistake as 70°C (158°F)

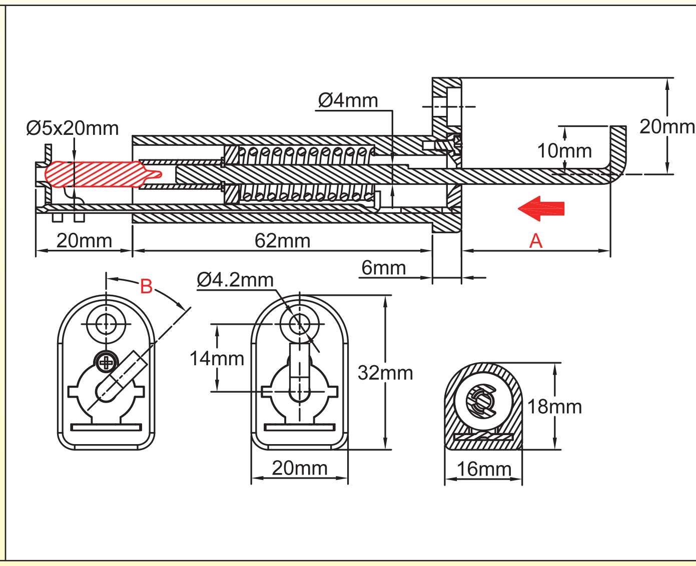
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Thermal actuators with pulling action, for fire dampers, operated by thermal bulb

Material	Tripping force	Mounting hole dimensions (mm)	Thermal bulb dimensions	Types
304 Stainless steel				**51A**





These mechanical thermal actuators are intended to close the fire dampers used on the ventilation ducts. Their large operating force unlocks the spring actuating the damper. Requiring no power supply, these devices are particularly simple and reliable. They are mandatory for all fire dampers to meet the NF-S 61.937 standard. Since thermal bulbs are not subject to creep, their periodic replacement is not necessary.

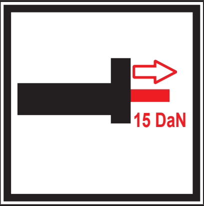
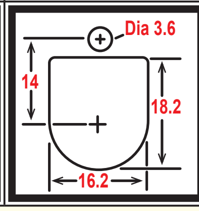
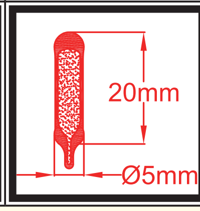
Straight length (A) of the actuating rod before release: 30mm or 25mm
Stroke of the actuating rod when triggering: ≥ 20 mm
Traction force of the actuating rod: ≥ 15 DaN (at the beginning of the stroke).
Orientation of the actuating rod bending: Aligned with the axis of the fixing screw. Other possible orientations: every 15° angular (MOQ apply)
Communication with the external environment: The mechanisms are equipped with a low leakage wall, separating the air of the ventilation duct from that of the external environment.
Installation: Through the wall of the ventilation duct, with M4 screws or self-tapping screws of similar dimensions. See the metal sheet cutting drawing above.
Body material: PA66 glass fiber reinforced, withstands temperature 200 C.
Mechanism material: Stainless steel Aisi 304.
ROHS compliance: These mechanisms are ROHS compliant.
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a thermal bulb, it has its own color identification (see the data sheets of the thermal bulbs).
Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the mechanisms retain their aptitude for the function.

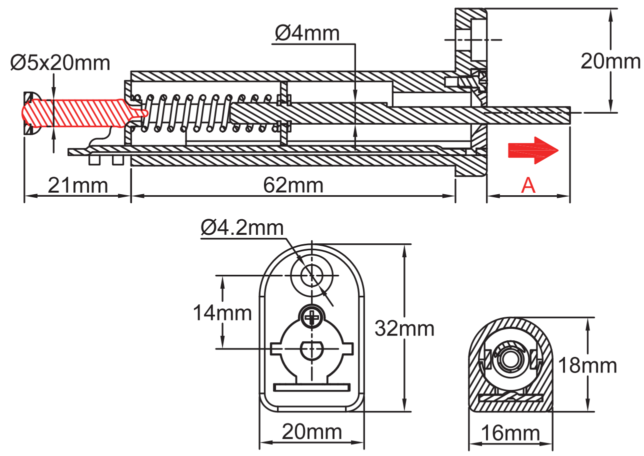
Main references

Temperature	Length A	Reference	Length A	Reference
Without thermal bulb	25mm	51A2006215PE0000	30mm	51A2006215PF0000
57°C (135°F)	25mm	51A20062152E0570	30mm	51A20062152F0570
68°C (155°F)	25mm	51A20062152E0680	30mm	51A20062152F0680
79°C (174°F)	25mm	51A20062152E0790	30mm	51A20062152F0790
93°C (199°F)	25mm	51A20062152E0930	30mm	51A20062152F0930
141°C (286°F)	25mm	51A20062152E1410	30mm	51A20062152F1410

Page (.pdf) | Drawing 2D (.dwg) | Drawing 3D (.stp)

Thermal actuators with pushing action, for fire dampers, operated by thermal glass bulb

Material	Tripping force	Mounting hole dimensions (mm)	Thermal bulb dimensions	Types
304 Stainless steel				**51B**



These mechanical thermal actuators are intended to close the fire dampers used on the ventilation ducts. Their large operating force unlocks the spring actuating the damper. Requiring no power supply, these devices are particularly simple and reliable.
They are mandatory for all fire dampers to meet the NF-S 61.937 standard. Since thermal bulbs are not subject to creep, their periodic replacement is not necessary.

Length (A) of the actuating rod before release: 5, 10 or 15mm
Stroke of the actuating rod when triggering: ≥ 20 mm
Pushing force of the actuating rod: ≥ 15 DaN (at the beginning of the stroke)
Communication with the external environment: The mechanisms are equipped with a low leakage wall, separating the air of the ventilation duct from that of the external environment.
Installation: Through the wall of the ventilation duct, with M4 screws or self-tapping screws of similar dimensions. See the metal sheet cutting drawing above.
Body material: PA66 glass fiber reinforced, withstands temperature 200 C
Mechanism material: Stainless steel Aisi 304
ROHS compliance: These mechanisms are ROHS compliant.
Identification: Model and date of manufacture are stamped on each mechanism. When equipped with a thermal bulb, it has its own color identification (see the data sheets of the thermal bulbs).
Salt spray resistance: According to ISO 9227-2012, subjected to a mist formed of 20% by weight of sodium chloride in distilled water, at 35°C for 5 days (120h), the mechanisms retain their aptitude for the function.

Main references

Temperature	Length A	Reference	Length A	Reference	Longueur A	Référence
Without thermal bulb	5mm	51B2006215PA0000	10mm	51B2006215PB0000	15mm	51B2006215PC0000
57°C (135°F)	5mm	51B20062152A0570	10mm	51B20062152B0570	15mm	51B20062152C0570
68°C (155°F)	5mm	51B20062152A0680	10mm	51B20062152B0680	15mm	51B20062152C0680
79°C (174°F)	5mm	51B20062152A0790	10mm	51B20062152B0790	15mm	51B20062152C0790
93°C (199°F)	5mm	51B20062152A0930	10mm	51B20062152B0930	15mm	51B20062152C0930
141°C (286°F)	5mm	51B20062152A1410	10mm	51B20062152B1410	15mm	51B20062152C1410

Page (.pdf) Drawing 2D (.dwg) Drawing 3D (.stp)

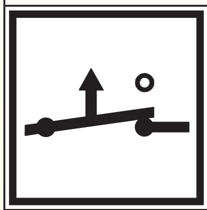
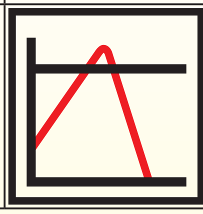
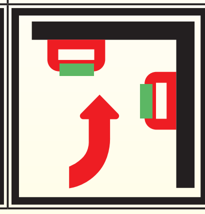
JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

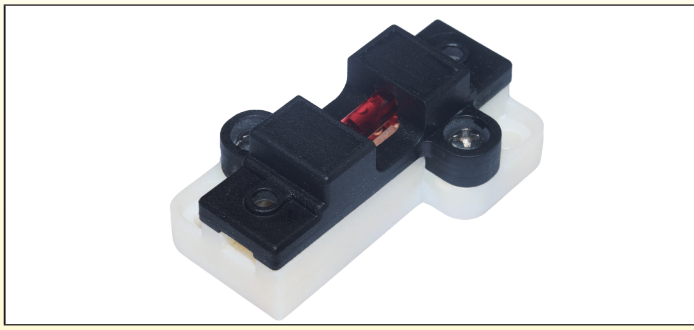
Devices operating an electric contact

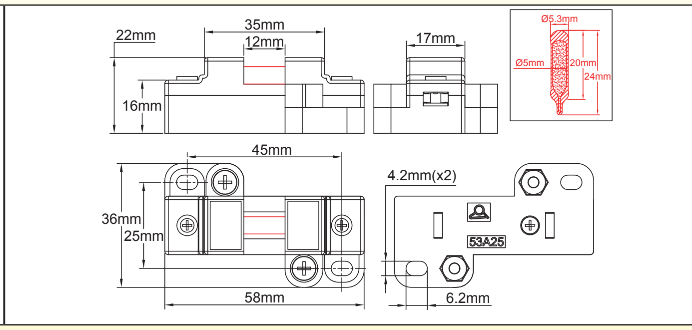
Because of permanent improvement of our products, drawings, descriptions, features used on these data sheets are for guidance only and can be modified without prior advice

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Miniature electric fire detection switches with thermal glass bulb

Open on temperature rise	Rating	Manual reset	Wall or ceiling mounting		Model
	16A 250V 10A 400V 4A 24V DC			RoHS REACH	**53A25**





Applications

Simple device for fire detection in buildings. This device is operating electrical contacts for remote alarm and simultaneous control of electrical servo-controls such as electric cylinders, electric motors or solenoids, for opening or closing air conditioning dampers, doors, sunroofs, and openings in building facades.

Main Features

Thermal sensitive part: Thermal bulb.
Operation: The break of the bulb operates an electric switch.
Mounting: Body with 2 holes for mounting on the wall or ceiling.
Electrical contact: Opening when the bulb breaks.
Rating: 16A (4A) 250V alt.; 10A (1A) 400V alt.; 4A (100mA) 24 and 48VDC. Compatible with 24V and 48V, 500 N electro-magnet.
Selection of gold-plated silver contact avoids oxidation, and allows use on low level electronic circuits.
NB: use on circuits with a voltage greater than 12V and at more than 1A may vaporize the protective gold layer.
Body: 17 x 58 x 22 mm ceramic, with UV-resistant black PA66 cover,
- Flammability: UL94V0 and GWFI 960°C.
- Deformation temperature under load: 225°C. (ISO 75-2, 1.8 MPa).
- Room temperature class T200°C.

Electrical connection: Screw terminals for wires up to 2.5mm².
Maintenance: The replacement of the 5x20mm thermal bulb is possible after unscrewing the PA66 cover
Options: Customization and customer labelling, plastic cover in red or cream color

Main references

Operating temperature	References with silver contact	References with gold plated silver contact
Without thermal bulb	53A25PS000	53A25PG000
57°C (135°F), orange color bulb	53A25PS057	53A25PG057
68°C (155°F) red color bulb	53A25PS068	53A25PG068
79°C (174°F) yellow color bulb	53A25PS079	53A25PG079
93°C (199°F) green color bulb	53A25PS093	53A25PG093
141°C (286°F) blue color bulb	53A25PS141	53A25PG141
182°C (360°F) purple color bulb	53A25PS182	53A25PG182

Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

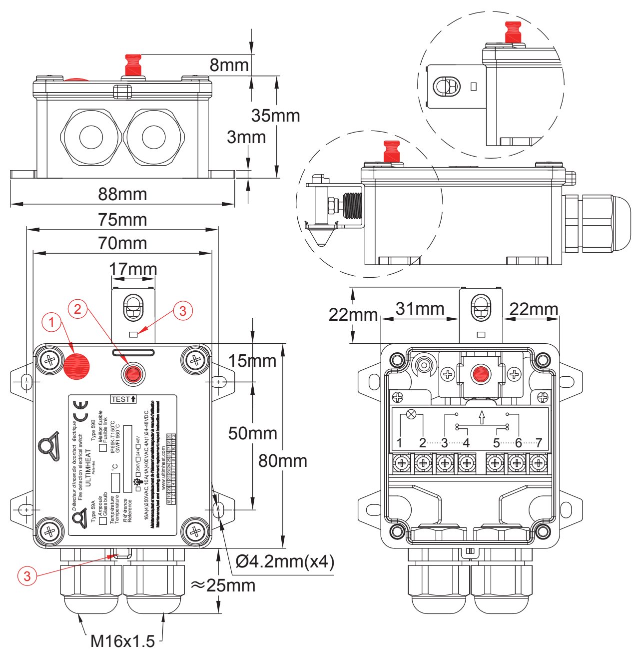
Electric fire detection switches with thermal glass bulb or fusible link, wall mounting

P1

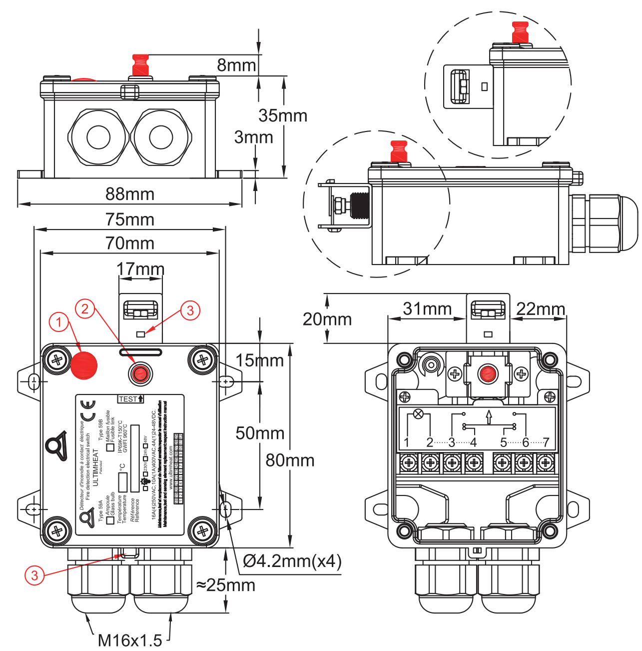
Double break SPDT	Rating	Manual reset	Wall mounting		Models
	16A 250V 10A 400V 4A 24V DC			RoHS REACH	**59A7, 59B7**

59A7 (Thermal glass bulb)

59B7 (Fusible link)



59A7 (Thermal glass bulb)
1: Pilot light (option)
2: Test button (option)
3: security seal holes



59B7 (Fusible link)
1: Pilot light (option)
2: Test button (option)
3: security seal holes

Applications

Fire detection in buildings. This device operates electrical contacts for remote alarm and simultaneous control of electrical servo-controls such as electric cylinders, electric motors or solenoids, for opening or closing air conditioning dampers, doors, sunroofs, and openings in exterior building walls.

Main Features

Thermal sensitive part: Thermo-breakable bulb or eutectic alloy link.
Operation: The break of the bulb or the melting of the fusible link activates, by means of a ceramic pusher, an electric switch.
Mounting: Enclosure with 4 removable legs, allowing mounting on the wall or ceiling. If the mounting is done on a particular board, removing the 4 legs on the back provides access to 4 M4 threads available for

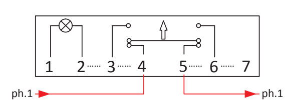
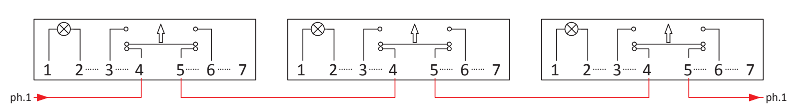
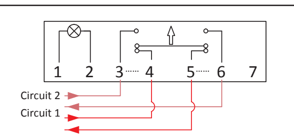
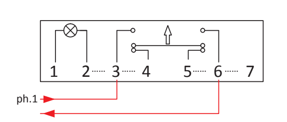
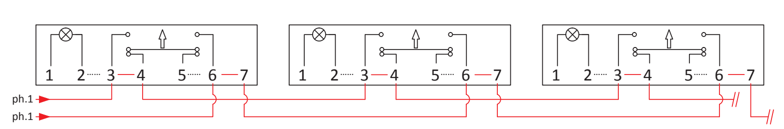
JPC
JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

this purpose.
Orientation: The temperature-sensitive part (glass bulb or fusible link) is mounted on a stainless-steel support that can be rotated every 90° to position it in the most favourable direction to the air flow.
Electrical contact: Double snap action contact with two independent circuits, one normally open and the other normally closed. Total contact spacing is larger than 3mm, providing full disconnection upon IEC standards.
Electrical rating: 16A (4A) 250VAC; 10A (1A) 400VAC; 4A (100mA) 24 and 48VDC. Compatible with electric door magnets in 24V and 48V, 500 N.
(Version with gold plated contacts for low level electronic circuits available on request).
Enclosure: 70 x 80 x 45mm in UV resistant black PA66, with captive lid screws in stainless steel.
- Flammability: UL94V0 and GWFI 960°C.
- Deformation temperature under load: 225°C. (ISO 75-2, 1.8 MPa).
- Ambient temperature class T150°C.
- Resistance to corrosion better than 1000 hours in salt spray fog at 5%.
- Ingress resistance: The highest class, IP69K (washable at high pressure hot water cleaner).
- Impact resistance: The highest class, IK10 (except stainless steel support for temperature-sensitive parts and glass bulbs).

Electrical connection: On screw terminal block, 7 terminals 2.5mm². Shipped with a 3-way shunt and a 2-way shunt, allowing different contact and connection arrangement solutions. Cable outlet by two M16 cable glands.
Maintenance:
- Replacement of the temperature-sensitive part can be made without tools
- A test button (option) accessible from the outside allows to check instantly the operation of the switch without any disassembly or opening.
- The enclosure has holes for the installation of seals preventing unauthorized opening.
- Temperature sensitive parts may also be sealed to prevent unauthorized replacement.

Visualization: Optional 230 V, 24V or 48V pilot light. This pilot light can be used to visualize the presence of voltage on the line, a critical parameter for "contact closes on fire" detection systems.
Rod type sensor: This device, in the thermal bulb version, is also available with a rod-type sensor for wall-mounted air duct use (see type 59A8).
Other options: Customization and customer labelling. Output by a single cable gland.

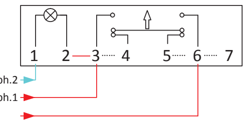
Wiring diagrams

Contact opens when the device triggers.	
Wiring in serial of devices whose contact opens when the device triggers.	
Contact opens circuit 1 when the device triggers, and closes circuit 2 for alarm. The 2 circuits may have different voltages.	
Contact closes when the device triggers.	
Wiring in serial of devices whose contact closes when the device triggers.	

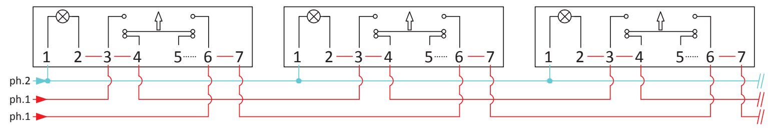
Electric fire detection switches with thermal glass bulb or fusible link, wall mounting

P3

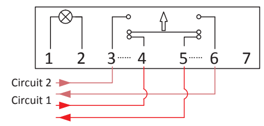
Contact closes when the device triggers, with pilot light showing that power supply is on.



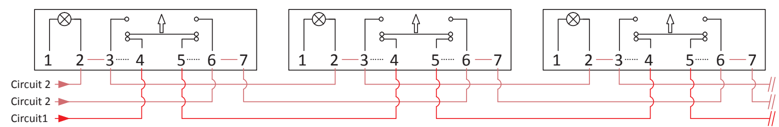
Connection in parallel of many devices with contact closes when the device triggers, with pilot light showing that power supply is on.



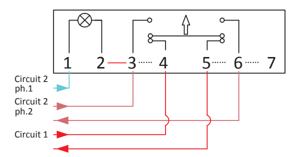
Serial connection of open on trigger contact (Circuit 1) and in parallel of close on trigger contact (Circuit 2). The 2 circuits may have different voltages.



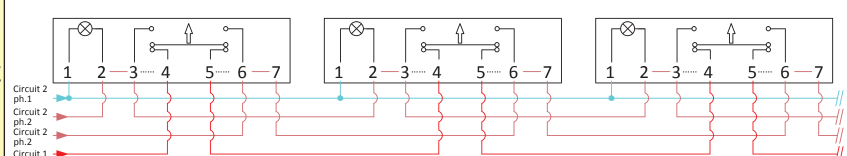
Connection of many devices in serial of open on trigger contacts (Circuit 1) and in parallel of close on trigger contacts (Circuit 2). The 2 circuits may have different voltages.



Serial connection of open on trigger contact (Circuit 1) and in parallel of close on trigger contact (Circuit 2), with pilot light on circuit 2 showing that power supply is on. The 2 circuits may have different voltages.



Connection of many devices in serial of open on trigger contacts (Circuit 1) and in parallel of close on trigger contacts (Circuit 2), with pilot light on circuit 2 showing that power supply is on. (The 2 circuits may have different voltages).



Main references

Thermal glass bulb types (Type 59A)

Operating temperature	Reference without test button, without pilot light	Reference without test button, with 230V pilot light*	Reference with test button, without pilot light	Reference with test button and 230V pilot light**
Without thermal bulb	59A70PS1630003C	59A71PS1630003C	59A7AP2S1630003C	59A7BP2S1630003C
57°C (135°F) orange color bulb	59A70PS1630573C	59A71PS1630573C	59A7AP2S1630573C	59A7BP2S1630573C
68°C (155°F) red color bulb	59A70PS1630683C	59A71PS1630683C	59A7AP2S1630683C	59A7BP2S1630683C
79°C (174°F) yellow color bulb	59A70PS1630793C	59A71PS1630793C	59A7AP2S1630793C	59A7BP2S1630793C
93°C (199°F) green color bulb	59A70PS1630933C	59A71PS1630933C	59A7AP2S1630933C	59A7BP2S1630963C
141°C (286°F) blue color bulb	59A70PS1631413C	59A71PS1631413C	59A7AP2S1631413C	59A7BP2S1631413C

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Electric fire detection switches with thermal glass bulb or fusible link, wall mounting

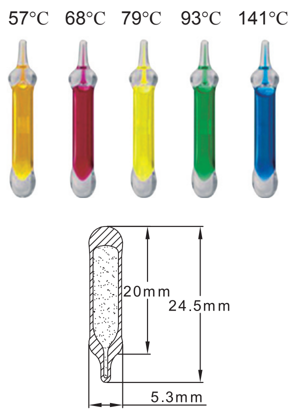
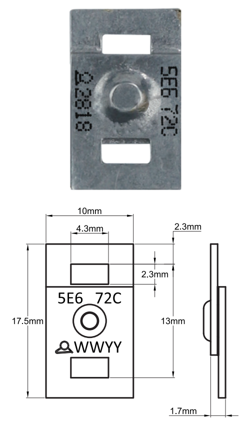
Eutectic alloy fusible link device (Type 59B)

Operating temperature	Reference without test button, without pilot light	Reference without test button, with 230V pilot light*	Reference with test button, without pilot light	Reference with test button and 230V pilot light**
Without fusible link	59B70PS1630003C	59B71PS1630003C	59B7AP2S1630003C	59B7BP2S1630003C
70°C (158°F), non Rohs alloy	59B70PS1630703C	59B71PS1630703C	59B7AP2S1630703C	59B7BP2S1630703C
72°C (162°F), Rohs alloy	59B70PS1630723C	59B71PS1630723C	59B7AP2S1630723C	59B7BP2S1630723C
92°C (198°F), non Rohs alloy	59B70PS1630923C	59B71PS1630923C	59B7AP2S1630923C	59B7BP2S1630923C
96°C (205°F), non Rohs alloy	59B70PS1630963C	59B71PS1630963C	59B7AP2S1630963C	59B7BP2S1630963C
138°C (280°F), Rohs Alloy	59B70PS1631383C	59B71PS1631383C	59B7AP2S1631383C	59B7BP2S1631383C

* - For models without test button with 24V pilot light, replace 1P by 2P in the reference
- For models without test button with 48V pilot light, replace 1P by 3P in the reference

** - For models with test button with 24V pilot light, replace BP by CP in the reference
- For models with test button with 48V pilot light, replace BP by DP in the reference

Spare parts references*

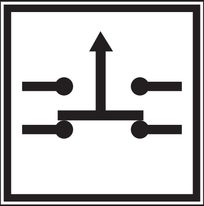
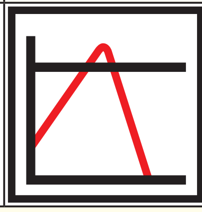
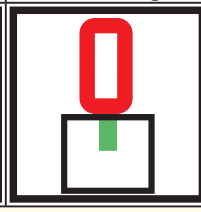
Thermal glass bulbs for 59A7 (Packing units 50 and 250p)			Eutectic alloy fusible links for 59B7 (Packing units 50 and 250p)		
	57°C (135°F)	6658GBB057		70°C (158°F), non RoHS alloy	5E6070H080000000
	68°C (155°F)	6658GBB068		72°C (162°F), RoHS alloy	5E6072H080R00000
	79°C (174°F)	6658GBB079		92°C (198°F), non RoHS alloy	5E6072H092000000
	93°C (199°F)	6658GBB093		96°C (205°F), non RoHS alloy	5E6072H096000000
	141°C (286°F)	6658GBB141		138°C (280°F), RoHS Alloy	5E6072H138R00000

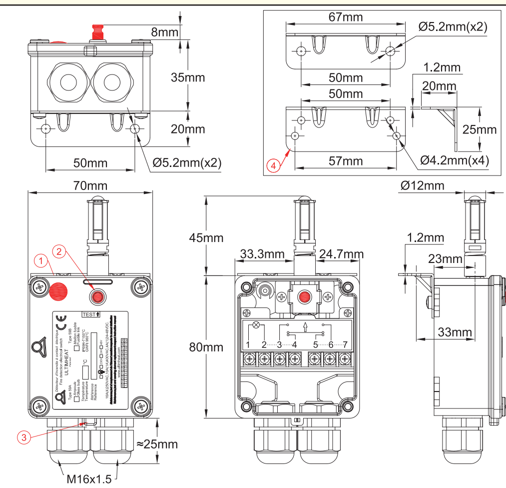
* Maintenance or replacement of thermal bulbs or fusible links must be made by specially trained personnel and in accordance with our technical instructions.

Page (.pdf)	Drawing (.dwg)	Drawing (.stp)

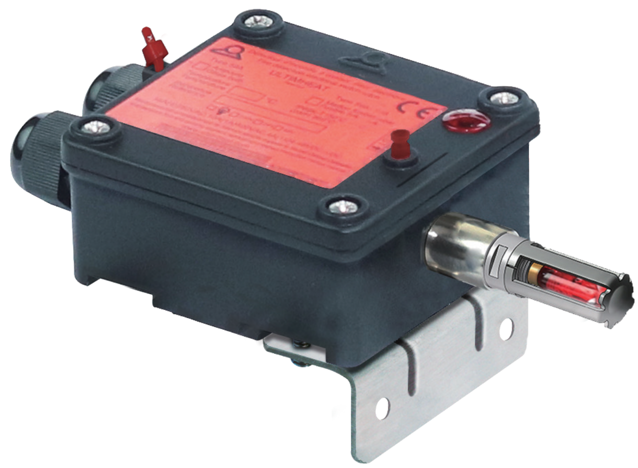
Electric fire detection switches with thermal glass bulb for air duct

P1

Double break SPDT	Rating	Manual reset	Air duct mounting		Models
	16A 250V 10A 400V 4A 24V DC			RoHS REACH	**59A8**



1: Pilot light (option)
2: Test button (option)
3: security seal hole
4: Mounting bracket (removable)



Applications

Fire detection in air ducts. This device operates electrical contacts for remote alarm and simultaneous control of electrical servo-controls such as electric cylinders, electric motors or solenoids, for opening or closing air conditioning dampers.

Main Features

Thermal sensitive part: Thermo-breakable bulb Operation: The break of the bulb activates, by means of a pusher, an electric switch.
Mounting: Enclosure with stainless steel bracket for mounting on air duct wall, with sensing element located inside the air flow.
Electrical contact: Double snap action contact with two independent circuits, one normally open and the other normally closed. Total contact spacing is larger than 3mm, providing full disconnection upon IEC standards.
Electrical rating: 16A (4A) 250VAC; 10A (1A) 400VAC; 4A (100mA) 24 and 48VDC. Compatible with electric door magnets in 24V and 48V, 500 N.
(Version with gold plated contacts for low level electronic circuits available on request).
Enclosure: 70 x 80 x 40mm in UV resistant black PA66, with captive lid screws in stainless steel.
- Flammability: UL94V0 and GWFI 960°C.
- Deformation temperature under load: 225°C. (ISO 75-2, 1.8 MPa).
- Ambient temperature class T150°C.
- Resistance to corrosion better than 1000 hours in salt spray fog at 5%.
- Ingress resistance: The highest class, IP69K (washable at high pressure hot water cleaner).
- Impact resistance: The highest class, IK10 (except stainless steel support for temperature-sensitive parts and glass bulbs).

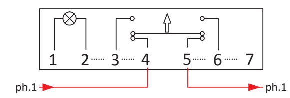
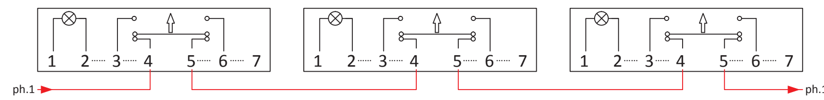
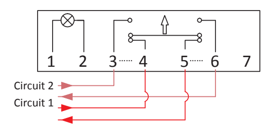
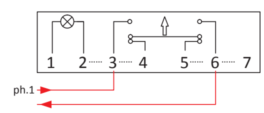
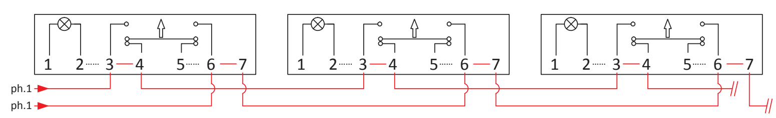
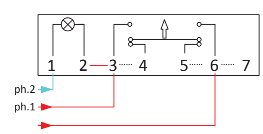
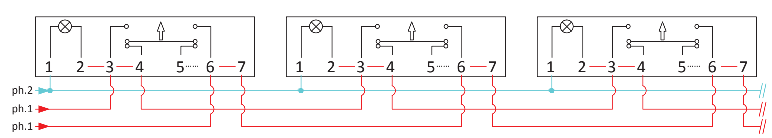
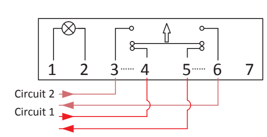
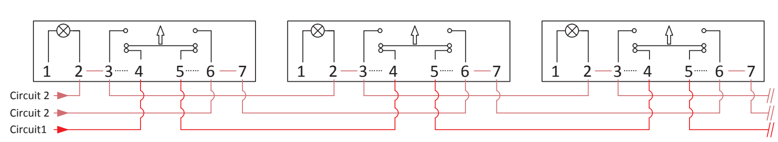
Electrical connection: On screw terminal block, 7 terminals 2.5mm². Shipped with a 3-way shunt and a 2-way shunt, allowing different contact and connection arrangement solutions. Cable outlet by two M16 cable glands.
Maintenance:
- Easy replacement of the temperature-sensitive part.
- A test button (option) accessible from the outside allows to check instantly the operation of the switch without any disassembly or opening.

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Electric fire detection switches with thermal glass bulb for air duct

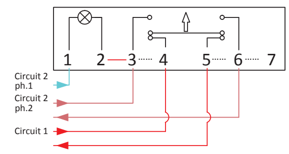
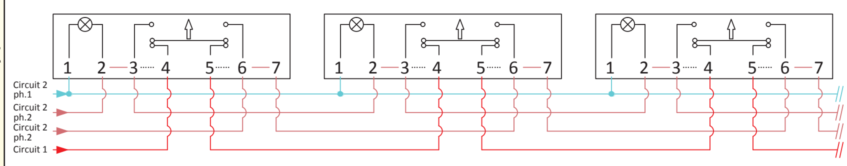
- The enclosure has holes for the installation of seals preventing unauthorized opening.
Visualization: Optional 230 V, 24V or 48V pilot light. This pilot light can be used to visualize the presence of voltage on the line, a critical parameter for “contact closes on fire” detection systems.
Other options: Customization and customer labelling. Output by a single cable gland.

Wiring diagrams

Contact opens when the device triggers.	
Wiring in serial of devices whose contact opens when the device triggers.	
Contact opens circuit 1 when the device triggers, and closes circuit 2 for alarm. The 2 circuits may have different voltages.	
Contact closes when the device triggers.	
Wiring in serial of devices whose contact closes when the device triggers.	
Contact closes when the device triggers, with pilot light showing that power supply is on.	
Connection in parallel of many devices with contact closes when the device triggers, with pilot light showing that power supply is on.	
Serial connection of open on trigger contact (Circuit 1) and in parallel of close on trigger contact (Circuit 2). The 2 circuits may have different voltages.	
Connection of many devices in serial of open on trigger contacts (Circuit 1) and in parallel of close on trigger contacts (Circuit 2). The 2 circuits may have different voltages.	

Electric fire detection switches with thermal glass bulb for air duct

P3

Serial connection of open on trigger contact (Circuit 1) and in parallel of close on trigger contact (Circuit 2), with pilot light on circuit 2 showing that power supply is on. The 2 circuits may have different voltages.	
Connection of many devices in serial of open on trigger contacts (Circuit 1) and in parallel of close on trigger contacts (Circuit 2), with pilot light on circuit 2 showing that power supply is on. (The 2 circuits may have different voltages).	

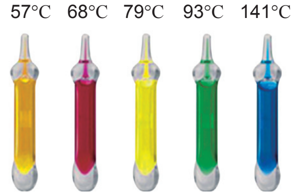
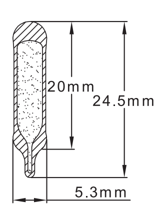
Main references (type 59A8)

Operating temperature	Reference without test button, without pilot light	Reference without test button, with 230V pilot light*	Reference with test button, without pilot light	Reference with test button and 230V pilot light**
Without thermal bulb	59A80PS1630003C	59A81PS1630003C	59A8AP2S1630003C	59A8BP2S1630003C
57°C (135°F), orange color bulb	59A80PS1630573C	59A81PS1630573C	59A8AP2S1630573C	59A8BP2S1630573C
68°C (155°F)red color bulb	59A80PS1630683C	59A81PS1630683C	59A8AP2S1630683C	59A8BP2S1630683C
79°C (174°F) yellow color bulb	59A80PS1630793C	59A81PS1630793C	59A8AP2S1630793C	59A8BP2S1630793C
93°C (199°F) green color bulb	59A80PS1630933C	59A81PS1630933C	59A8AP2S1630933C	59A8BP2S1630963C
141°C (286°F) blue color bulb	59A80PS1631413C	59A81PS1631413C	59A8AP2S1631413C	59A8BP2S1631413C

* - For models without test button with 24V pilot light, replace 1P by 2P in the reference
- For models without test button with 48V pilot light, replace 1P by 3P in the reference

** - For models with test button with 24V pilot light, replace BP by CP in the reference
- For models with test button with 48V pilot light, replace BP by DP in the reference

Spare parts references*

Thermal glass bulbs for 59A7 (Packing units 50 and 250p)		
	57°C (135°F)	6658GBB057
	68°C (155°F)	6658GBB068
	79°C (174°F)	6658GBB079
	93°C (199°F)	6658GBB093
	141°C (286°F)	6658GBB141

* Maintenance or replacement of thermal bulbs must be made by specially trained personnel and in accordance with our technical instructions.

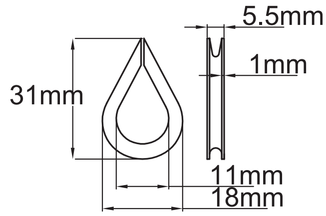
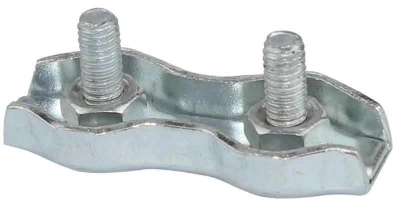
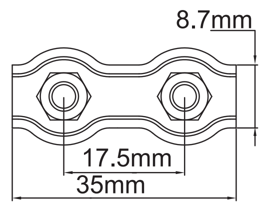
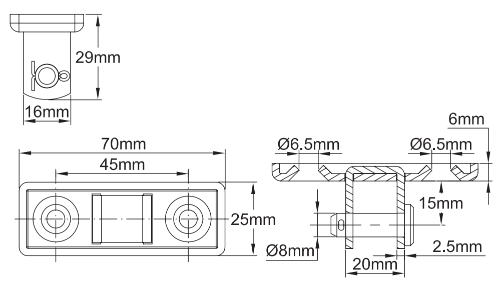
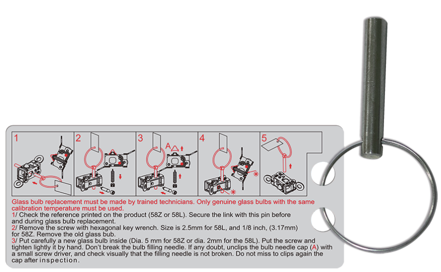
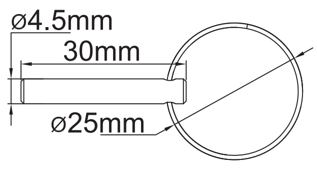
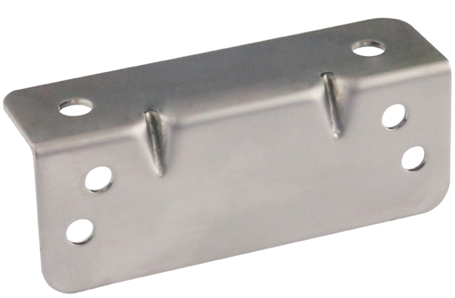
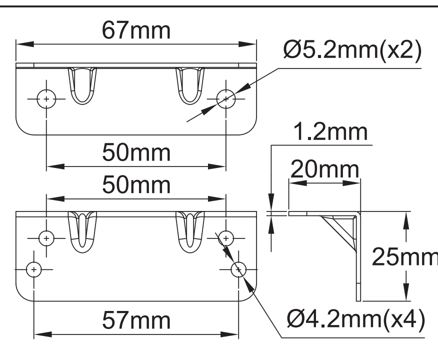
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Mechanism mouting devices and accessories

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

6658R and 6658P

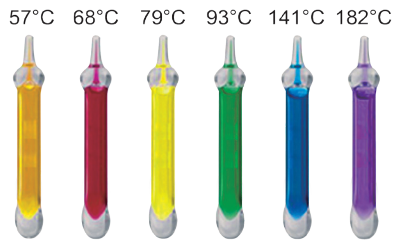
		Zinc plated steel rope thimble (DIN6899A) for steel wire ropes dia. 3 to 3.5mm (Packing unit 20p)	6658RT034Z
		Zinc plated rope clamp for steel wire ropes dia. 3 to 3.5mm (Packing unit 10p)	6658RC036Z
		Zinc plated wall mounting bracket for types 58Z and 58L (Packing unit 1p)	6658RW035Z
		Safety pin for glass bulb replacement (Packing unit 1p)	6658PG001Z
		Stainless steel bracket for side mounting in types 59A7 and 59B7. (Packing unit 1p)	6659RW035Z

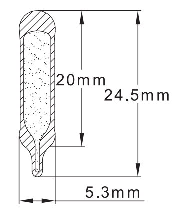
Page (.pdf) Drawing 2D (.dwg) Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

6658Z and 6658L

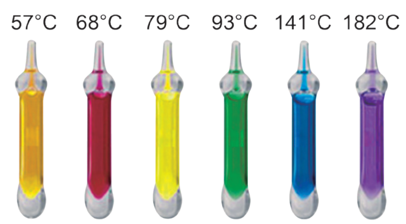
Long thermal glass bulbs, 5x20mm, for 53, 54, 58Z, 59A7, 59B
(Packing units 50 and 250p)

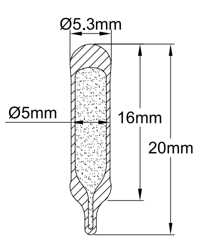




57°C (135°F)	6658ZGBB057
68°C (155°F)	6658ZGBB068
79°C (174°F)	6658ZGBB079
93°C (199°F)	6658ZGBB093
141°C (286°F)	6658ZGBB141
182°C (360°F)	6658ZGBB182

Short thermal glass bulbs, 5x16mm, for 58L
(Packing units 50 and 250p)





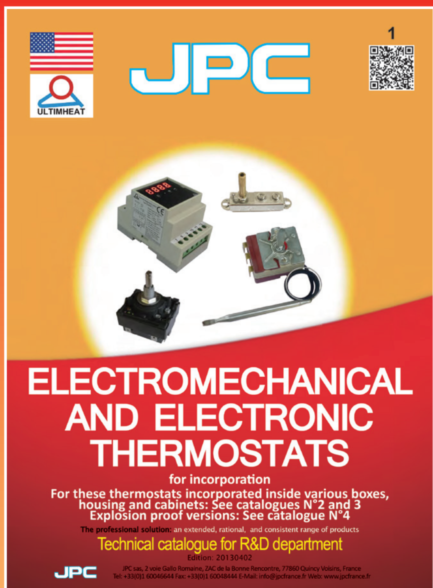
57°C (135°F)	6658LGBB057
68°C (155°F)	6658LGBB068
79°C (174°F)	6658LGBB079
93°C (199°F)	6658LGBB093
141°C (286°F)	6658LGBB141
182°C (360°F)	6658LGBB182

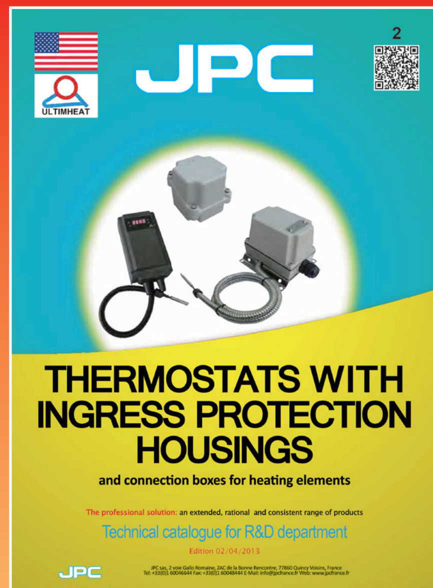
* Maintenance or replacement of thermal bulbs must be made by specially trained personnel and in accordance with our technical instructions.

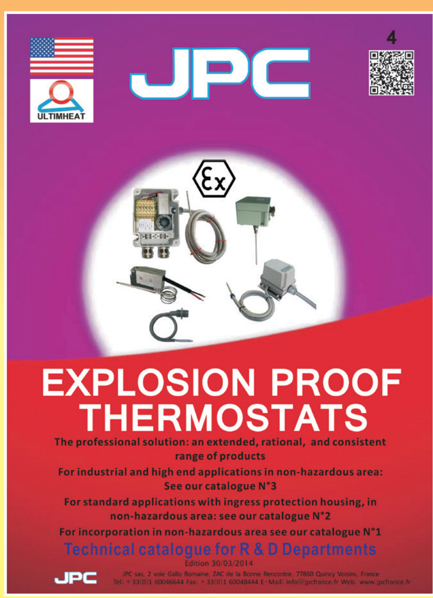
Page (.pdf)	Drawing 2D (.dwg)	Drawing 3D (.stp)

JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel: +33(0)1 60046644 Fax: +33(0)1 60048444 E-Mail: info@jpcfrance.fr Web: www.jpcfrance.fr

Other catalogues







JPC sas, 2 voie Gallo Romaine, ZAC de la Bonne Rencontre, 77860 Quincy Voisins, France
Tel : +33(0)1 60046644 Fax : +33(0)1 60048444 E-Mail : info@jpcfrance.fr
Web: www.jpcfrance.fr

9 (2ND EDITION)

THERMALLY RESPONSIVE DEVICES FOR FIRE DETECTION