Exemption Request Form

Date of submission: 27 June 2017

1. Name and contact details

1) Name and contact details of applicant:

Company:	ASCO Numatics	Tel.:	33 2 37 24 47 10
Name:	Thierry Filley	E-Mail:	Thierry.Filley@emerson.com
Function:	Engineering	Address:	53 rue de Beauce, BP 30017, Luce, France

1.

2) Name and contact details of responsible person for this application
2. (if different from above):

Company:	_____	Tel.:	_____
Name:	_____	E-Mail:	_____
Function:	_____	Address:	_____

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2. Reason for application:

Please indicate where relevant:

☒ Request for new exemption in:

☐ Request for amendment of existing exemption in

☐ Request for extension of existing exemption in

☐ Request for deletion of existing exemption in:

☐ Provision of information referring to an existing specific exemption in:

☒ Annex III ☒ Annex IV

No. of exemption in Annex III or IV where applicable: _____

Proposed or existing wording: Lead in thermal cutoff fuses overmolded into solenoid coils used in industrial monitoring and control instruments (Category 9) and EEE falling under Category 11

Duration where applicable: 5 Years

☐ Other: _____

3. Summary of the exemption request / revocation request

This exemption request is for the lead used in eutectic alloy base thermal cut-off fuses molded into Hazardous Location/Area (as defined by IEC 60079-0:2011) solenoid coils used in industrial monitoring and control instruments (Category 9) and EEE falling under Category 11. The fuses are used to restrict the maximum surface temperature of the solenoid coils. In order to ensure safe operation in hazardous location environments and the personnel working there all electrical operated devices must not be capable of creating a thermal or sparking incident that would cause the ignition of the hazardous atmosphere or dust that may be present. There are many protection methods to deal with various system conditions, but what we are focused on in this discussion is the surface temperature of the solenoid coil. If the surface temperature of the solenoid coil exceeds certain limits, the result is the possible ignition of the hazardous vapour, gases or dust. The method that is used to ensure the thermal limit is not exceeded by the surface temperature of the solenoid valve coil is the use of a thermal cut-off device. This device will interrupt the electrical circuit powering the solenoid coil thus removing all sources of heating preventing the surface temperature from exceeding the proper limit. Because of application requirements, temperature limitations based on the hazardous environment and the temperature required during coil molding only a lead based eutectic allow thermal fuse can be used. ASCO manufactures solenoid valves for fluid control market mostly used in LSFI applications. However, some applications cross over to the industrial monitoring and control instruments (Category 9) and other EEE not covered by categories 1-10 (category 11). For example, cleaning equipment for Hazardous Locations/Areas, electrical enclosure air conditioning units for use in Hazardous Locations/Areas, small batch/pilot run pharmaceutical processing equipment for use in Hazardous Locations/Areas, small mobile generator units used in Hazardous Locations/Areas and small standalone and/or mobile equipment used in Hazardous Locations/Areas. It should be noted that ASCO does not manufacture thermal cut-off fuses but purchases them for use in its products.

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4. Technical description of the exemption request / revocation request

(A) Description of the concerned application:

1. To which EEE is the exemption request/information relevant?

   Name of applications or products: Industrial monitoring and control instruments (Category 9) and EEE falling under Category 11

   a. List of relevant categories: (mark more than one where applicable)

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ 7
☐ 8
☒ 9
☐ 10
☒ 11

b. Please specify if application is in use in other categories to which the exemption request does not refer: No.

c. Please specify for equipment of category 8 and 9:
The requested exemption will be applied in
☒ monitoring and control instruments in industry
☐ in-vitro diagnostics
☐ other medical devices or other monitoring and control instruments than those in industry

2. Which of the six substances is in use in the application/product?
(Indicate more than one where applicable)

☒ Pb ☐ Cd ☐ Hg ☐ Cr-VI ☐ PBB ☐ PBDE

3. Function of the substance: The lead contained in the eutectic alloy solder is required to obtain specific eutectic melting temperatures (to open the fuse) that are high enough to withstand the coil molding process, but still low enough to ensure safe coil operation in hazardous location environments. The lead containing eutectic alloy connects to two electrical leads in a ceramic tube with epoxy sealed ends creating a thermal fuse. When the alloy melts it disconnects the conductive path between the lead wires. The temperature of the fusing is dictated by the choice of the appropriate alloy. The only commercially available fuses that open at the required temperature, and meet all other application requirements specified in this document, utilize lead alloys

Content of substance in homogeneous material (%weight): 2.02% max. See confidential document for details.

4. Amount of substance entering the EU market annually through application for which the exemption is requested: the total weight is expected to be less than 2kg. Please refer to the enclosed confidential information for details.
Please supply information and calculations to support stated figure. See enclosed confidential document for details

5. Name of material/component: Thermal cut-off fuse

6. Environmental Assessment: _____

LCA: ☐ Yes
☒ No

(B) In which material and/or component is the RoHS-regulated substance used, for which you request the exemption or its revocation? What is the function of this material or component?

We request an exemption for the use of lead in thermal cut-off fuses overmolded into solenoid coils used in industrial monitoring and control instruments (Category 9) and EEE falling under Category 11. For example, cleaning equipment for Hazardous Locations/Areas, electrical enclosure air conditioning units for use in Hazardous Locations/Areas, small batch/pilot run pharmaceutical processing equipment for use in Hazardous Locations/Areas, small mobile generator units used in Hazardous Locations/Areas and small standalone and/or mobile equipment used in Hazardous Locations/Areas

In these applications a thermal cut-off device has to meet the following criteria:

1. The device cannot interfere with the proper operation and reliability of the solenoid valve in the environment that it must operate. Although the solenoid valve is a simple component it must be extremely reliable. For example, a solenoid valve that is a safety shutoff valve is designed to run continuously in an energized state for years at a time, and is required to only close when a condition occurs that would jeopardize the safety of the applications. A premature failure in this application would shut down a section of the process and the economic ramifications of this type of occurrence could be significant.
   a. The solenoid valve must operate over a wide range of ambient environments from -40C to 80C. The coil can be constructed with a class F or class H insulation system, which translates into maximum wiring temperatures of 160°C or 180°C respectively. (This requires fuse operating temperatures above 160°C and 180°C)) A thermal cut-off device needs to be able to survive this range of temperature and not open the coil under the above conditions and still be able to operate as safety device in the case of over temperature over the product life of 5 to 10 years.
   b. The thermal cut-off device must be non-resettable (once the device trips off it will never reapply power to the coil). If there is a degraded or fault condition the system must be shut down. A device that would reset after cooling will create an unsafe condition.
2. The thermal cut-off device must be able to be molded into the coil in close proximity to the coil windings:
   a. The physical size has to be consistent with the dimensions and space available in the coil and physically be able to maintain good thermal contact.
   b. The temperature at which the thermal cut-off device operates needs to be greater than the molding temperature of the encapsulation material of the coil. See proprietary document for specific details.

(C) What are the particular characteristics and functions of the RoHS-regulated substance that require its use in this material or component? The eutectic melting point required in thermal

fuses used in our Hazardous Location/Area coils is only achievable with eutectic alloys containing lead. Melting temperature of eutectic alloy is determined by alloying elements and percentage. All available commercial thermal fuses with melting temperature between 160°C to 180°C require a lead containing eutectic alloy. The acceptable alloy melting point range is defined at the minimum by the molding process and at the maximum by ignition temperature of Hazardous Location/Area, gases/dusts. See confidential documents enclosed for specific T codes and thermal fuses/lead alloys.

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5. Information on Possible preparation for reuse or recycling of waste from EEE and on provisions for appropriate treatment of waste

1) Please indicate if a closed loop system exist for EEE waste of application exists and provide information of its characteristics (method of collection to ensure closed loop, method of treatment, etc.)

The coil including the thermal fuse is overmolded with epoxy resin and this cannot be recycled. However, valve parts can be collected and dismantled.

2) Please indicate where relevant:

☐ Article is collected and sent without dismantling for recycling

☐ Article is collected and completely refurbished for reuse

☒ Article is collected and dismantled: All valve parts can be collected and dismantled except for the coil.

☐ The following parts are refurbished for use as spare parts: _____

☐ The following parts are subsequently recycled: _____

☒ Article cannot be recycled and is therefore: Coil

☐ Sent for energy return

☒ Landfilled

3) Please provide information concerning the amount (weight) of RoHS substance present in EEE waste accumulates per annum:

☐ In articles which are refurbished _____

☐ In articles which are recycled _____

☐ In articles which are sent for energy return _____

☒ In articles which are landfilled <2kg/year

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6. Analysis of possible alternative substances

(A) Please provide information if possible alternative applications or alternatives for use of RoHS substances in application exist. Please elaborate analysis on a life-cycle basis, including where available information about independent research, peer-review studies development activities undertaken

There are three major technologies that exist to construct a thermal cut-off device, see section 9 for additional detail. Emerson, as a major manufacturer of thermal cut off fuses, is extremely familiar with the technologies described in points II and III including their limits/performances.

I - Eutectic Alloy Thermal Element

- Eutectic alloy solder that connects to two electrical leads in a ceramic tube with epoxy sealed ends. This construction relies on the eutectic melting properties of certain metallic alloys. When the alloy melts it disconnects the conductive path between the lead wires. The temperature of the fusing is dictated by the choice of the appropriate alloy. Fuse alloy contains lead for the temperatures required and size required for our application.
  ASCO has been investigating eutectic thermal cut off devices that do not contain lead (Pb). We identified patent (#US7042327 B2) for a non-leaded thermal cut off device that was granted to Uchihashi Estec Co., Ltd., Osaka (JP). However, upon contacting the vendor, we were informed that the technology is not commercialized at this time nor has the vendor provided a time frame as to when it will be made available. Based on this we are unable to test samples to confirm suitability for our products. We are continuing our search for alternative technologies.

II – Organic Thermal Pellet

- An organic thermal pellet holds a spring loaded sliding contact in place to create an electrical connection between the leads of the device. At the desired operating temperature, the thermal pellet melts thus allowing the sliding contact to move and open the connection between the leads of the device. Demerit of this kind of fuse is, the thermal pellet will shrink in volume if the fuse is subjected to high temperature for an extended period of time. This will cause the fuse to open prematurely.

III – Bimetallic Mechanical Element

Bimetallic Mechanical Element converts a temperature change into mechanical displacement. The element consists of two different metals which expand at different rates as they are heated. Bimetallic element in contact with heat source changes position and disconnects circuit between its terminals. Demerit of the kind of fuse is that they are resettable and reset temperatures are within the product operating temperature range (-40C to 80C) therefore it cannot comply since the fuse could reset in the field. Additionally, the size is much larger than the other technologies and may not fit all the applications.

(B) Please provide information and data to establish reliability of possible substitutes of application and of RoHS materials in application:

Based on the above information in 6(A) the only feasible technology at this time is eutectic alloy thermal element. Organic thermal pellet technology does not have reliability

of requirement for **safe operation in hazardous environments**. Furthermore, discussing organic pellet technology with industry technical experts, it was deemed high risk for this application.

The organic pallet will shrink over the period of time when exposed to temperatures that the solenoid valve could be exposed to. This will result in a premature failure of the solenoid valve and could result in shut down of the customer's application.

Bimetallic elements cannot be assured to be non-resettable which is a basic requirement for proper operation of the solenoid valve in its intended application. Furthermore, the physical size of this technology exceeds the available space in our product

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7. Proposed actions to develop possible substitutes

(A) Please provide information if actions have been taken to develop further possible alternatives for the application or alternatives for RoHS substances in the application.

ASCO does not have the internal knowledge or capability to design or manufacture thermal cut-off fuses. We are at the mercy of commercially available technology and products. Our annual spend on fuses is approximately $50,000. This volume is much too small to influence industry offerings or spur technology growth based on our demand. We have conducted an extensive industry search to identify appropriate alternatives with no acceptable products found. Additionally, we conducted IP searches to identify possible future products not yet available. One lead free option was found during the patent search; however, it is not commercially available with no information on if/when this will be the case. Based on this we are unable to test samples to confirm suitability for our products. We are continuing our search for alternative technologies.

(B) Please elaborate what stages are necessary for establishment of possible substitute and respective timeframe needed for completion of such stages.

Suppliers data sheets indicate that products will not comply with our requirement and does not indicate any suitable substitute. ASCO will continue to search new vendor product offering components for technology that will function correctly in our application. If and when ASCO does find a possible candidate then, we would need approximately 3-4 year for full approvals required by certified testing agencies (UL, CSA, ATEX, FM etc), and internal qualification.

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8. Justification according to Article 5(1)(a):

(A) Links to REACH: (substance + substitute)

1) Do any of the following provisions apply to the application described under (A) and (C)?

☐ Authorisation

- ☐ SVHC
- ☐ Candidate list
- ☐ Proposal inclusion Annex XIV
- ☐ Annex XIV

☐ Restriction

- ☐ Annex XVII
- ☐ Registry of intentions

☐ Registration

2) Provide REACH-relevant information received through the supply chain.
Name of document: REACH declaration letter from supplier (see inclosed)

(B) Elimination/substitution:

1. Can the substance have named under 4. (A)1 be eliminated?
   - ☐ Yes. Consequences? _____
   - ☒ No. Justification: _____

2. Can the substance named under 4.(A)1 be substituted?
   - ☐ Yes.
     - ☐ Design changes:
     - ☐ Other materials:
     - ☐ Other substance:
   - ☒ No.

   Justification: There is no lead free technical solution that provides reliable operation at body temperature exceeding 160°C or 180°C. Thermal cut-offs based on organic formulations are available but not recommended for use in applications where the body temperature exceeds 160°C or 180°C. Or when operated for extended periods of time that the solenoid coil will experience. Similarly, bimetallic elements cannot provide required proper operation in the environment our product needs to operate in. Furthermore, the physical size of this technology exceeds the available space in our products.

3. Give details on the reliability of substitutes (technical data + information): No acceptable substitutes available.

4. Describe environmental assessment of substance from 4.(A)1 and possible substitutes with regard to
    1) Environmental impacts: _____
    2) Health impacts: _____
    3) Consumer safety impacts: It will never be used in consumer products.

⇨ Do impacts of substitution outweigh benefits thereof?
Please provide third-party verified assessment on this: No acceptable substitutes available.

(C) Availability of substitutes:

a) Describe supply sources for substitutes: None

b) Have you encountered problems with the availability? Describe: There are no lead free technical solutions that provides reliable operation at body temperature exceeding 160°C. Thermal cut-offs based on organic formulations are available but not recommended for use in applications where the body temperature greater than 160°C for the required 30,000 hrs. Substitute technology found in reference patent is not commercially available on the market.

c) Do you consider the price of the substitute to be a problem for the availability?
☐ Yes ☒ No

d) What conditions need to be fulfilled to ensure the availability? New thermal fuse technology needs to be introduced into the commercial market that meets our application requirements.

(D) Socio-economic impact of substitution:

⇨ What kind of economic effects do you consider related to substitution?

☐ Increase in direct production costs

☐ Increase in fixed costs

☐ Increase in overhead

☐ Possible social impacts within the EU

☐ Possible social impacts external to the EU

☒ Other: No acceptable substitutes available.

⇨ Provide sufficient evidence (third-party verified) to support your statement: _____

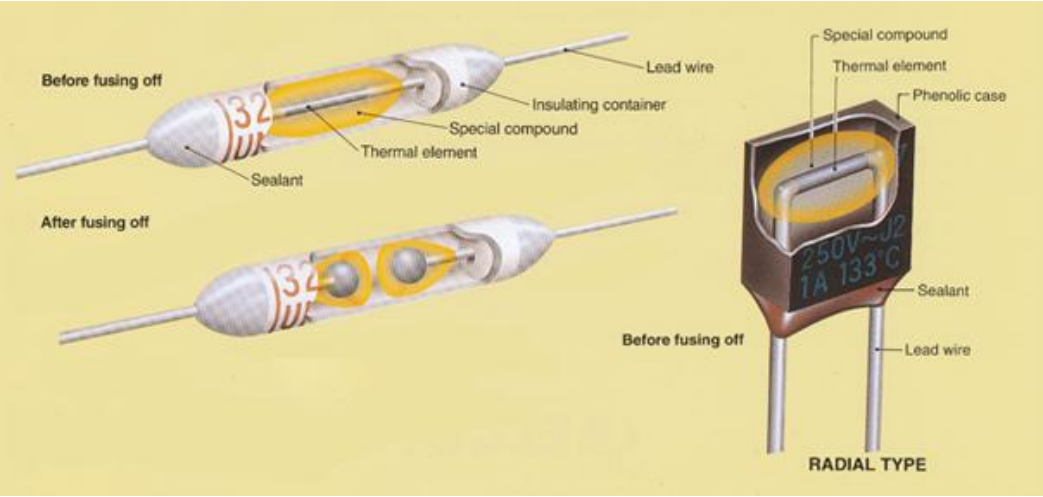
+9. Other relevant information

Please provide additional relevant information to further establish the necessity of your request:

There are three major technologies that exist to construct a thermal cut-off device. Emerson, as a major manufacturer of thermal cut off fuses, is extremely familiar with the technologies described in points II and

III including their limits/performances. Emerson as a thermal cut off fuses manufacturer, has been extremely familiar with technologies II and III and their limits/performances.

I - Eutectic Alloy Thermal Element



Eutectic alloy solder that connects to two electrical leads in a ceramic tube with epoxy sealed ends. This construction relies on the eutectic melting properties of certain metallic alloys. When the alloy melts it disconnects the conductive path between the lead wires. The temperature of the fusing is dictated by the choice of the appropriate alloy.

To see A.1, A.2 and B.1, B.2 conditions, please see page 9 under clause **3. Summary of the exemption request/revocation request.**

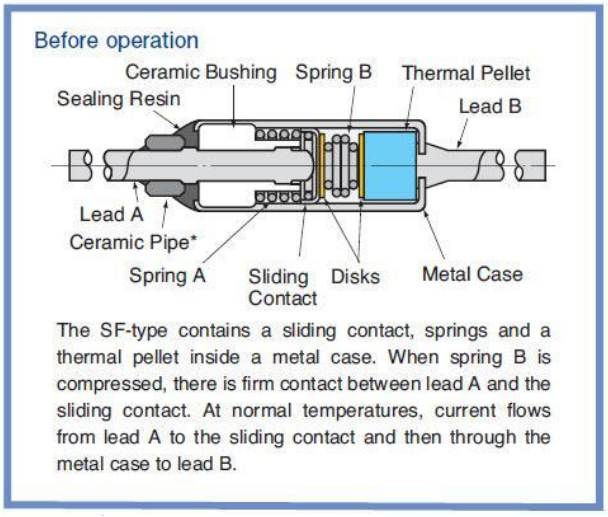
A.1 – Compiles, but fuse alloy contains lead for the temperatures required

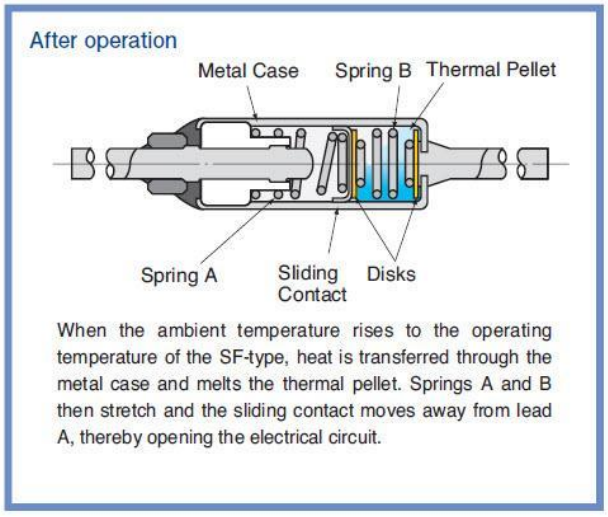
A.2 – Device is non-resettable.

B.1 – Size is good.

B.2 – Complies. The temperatures are higher than the transfer molding epoxy compound.

II – Organic Thermal Pellet





An organic thermal pellet holds a spring loaded sliding contact in place to create an electrical connection between the leads of the device. At the desired operating temperature, the thermal pellet melts thus allowing the sliding contact to move and open the connection between the leads of the device.

A.1 – The organic thermal pellet will shrink in volume if the fuse is subjected to high temperatures for an extended period of time. This will cause the fuse to fail positive, therefore fails to comply.

A.2 – Non-resettable complies.

B.1 – Complies

B.2 - Complies

III – Bimetallic Mechanical Element

FEATURES

- Conductive bimetal construction; the bimetalic element carries the circuit currentfor maximum current sensitivity under short circuit conditions.
- Snap action device; quick make/quick break switching action.
- Single operation type device. The reset temperature is less than 0°C. This prevents the thermostat from resetting under normal operating conditions.
- Case is electrically alive, insulation material is available to provide isolation from the circuit.
- Preset calibration temperature, not adjustable in the field.
- Available with factory applied leads.

Bimetallic element in contact with heat source changes position and disconnects circuit between its terminals.

A.1 – Complies, but has issue as explained below.

A.2 – The standard devices are resettable, therefore do not comply with the application requirement.

B.1 – Device size is much larger than the other technologies and may not fit all the applications.

B.2 – Complies.

Conclusion:

Based on the comparative analysis of the available technologies available to provide the safety function for hazardous location coils the only viable option is to use a thermal cut-off constructed with Eutectic Alloy Thermal Element, (item 'I'). However due to the fact that the alloy in question contains lead, an exemption is required.

10. Information that should be regarded as proprietary

Please state clearly whether any of the above information should be regarded to as proprietary information. If so, please provide verifiable justification: see enclosed confidential document including specific product information and REACH document.