Exemption Request Form

Date of submission: 20 January 2023

1. Name and contact details

1) Name and contact details of applicant:

Company:	Test & Measurement Coalition	Tel.:	+32 2 735 82 30
Name:	Meglena Mihova	E-Mail:	meglena.mihova@eppa.com
Function:	TMC Secretariat	Address:	Place du Luxembourg 2, 1050 Brussels, Belgium

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

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

---

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: 8(b)

Proposed or existing wording: Existing.

"Cadmium and its compounds in electrical contacts."

Duration where applicable: Maximum validity period.

☐ Other: _____

3. Summary of the exemption request / revocation request

Under Exemption 8(b) cadmium and its compounds, such as silver cadmium oxide (AgCdO) are used for electrical isolation purposes in electrical contacts. The need for creating an open contact (vs solid state switching) is typically for electrical isolation purposes, where the safety standards require a minimum electrical clearance between contacts if it is being relied upon for safety isolation. A common example includes supplemental circuit breakers on equipment for configuration or servicing, where relying on the power cord as the disconnect device is not practical.[1]

The function of Cd and AgCdO as well as the chemical and physical advantageous properties of Cd/AgCdO in the components used for T&M instruments include:

- Resistance to arcing
- Resistance to corrosion / pitting / material transfer
- Resistance to oxidation in order to keep the electrical contacts clean and free of insulating oxides. This enhances the life-span of connectors, especially those that are high frequency.
- Resistance against contact welding
- High electrical conductivity
- High thermal conductivity, which helps the effective dissipation of heat
- High melting point, which is required to avoid accidental overheating as a consequence of the fusion of contact points.

Since the RoHS directive was adopted, electric contact and switch manufacturers have researched potential alternative materials. The substitution or elimination of cadmium and its compounds is, in principle, scientifically and technically practicable for *some* applications. Each substitute that has been evaluated had differing properties and therefore, to the best knowledge of the Test & Measurement Coalition, no single "drop-in" replacement exists for cadmium and its compounds for all applications.

Pursuant to Article 5 of the RoHS Directive a continuation of exemption 8(b) should thus be granted on the basis that **alternatives are not suitable for substitution or replacement for all applications**. These applications include circuit breakers, thermal sensing controls, and high power / high frequency switches. This echoes the stance of the Öko-Institut Report published in 2016.[2]

A thorough Socio-Economic Analysis was conducted in addition to the technical assessment and attached to this submission, further illustrating the negative socio-economic impacts a non-renewal of exemption 8(b) would have. Overall, the analysis concludes that the **total impact of a non-renewal of this exemption is monetized in**

[1] See EN 61010-1:2017 clause 6.11 for disconnect requirements for Category 9, industrial equipment. Additionally, the circuit breaker itself needs to comply with IEC 60947-2.

[2] Assistance to the Commission on Technological Socio-Economic and Cost-Benefit Assessment Related to Exemptions from the Substance Restrictions in Electrical and Electronic Equipment. Available at: https://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_Pack_9/RoHS-Pack_9_Part_SOLDERS_06-2016.pdf

the range of 1.6 billion EUR and 2.3 billion EUR (conservative lower bound estimate).

---

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 test and measurement instruments (category 9 – Industrial under the RoHS Directive) are very different from low mix, high-volume consumer products which are frequently re-designed to follow consumer trends and are placed on the market for a limited duration. Industrial test and measurement are high mix, low volume producers, managing portfolios of thousands of highly complex instruments. Each instrument is intentionally designed for high reliability and serviceability to support long useful lifespans, and are made available on the market for at least a decade. These instruments are designed: exclusively for professional and industrial use; to meet high performance requirements in critical applications; and last up to 40 years. Redesign is not frequent and happens every seven years on average (as compared to every 1.5 years or less for consumer products). Once test and measurement instruments are placed onto the market, they are typically accompanied with a long-term customer support arrangement to maintain reliability and calibration.

Product portfolios are widely diversified, with TMC members each having typically 2,000 to 3,000 products currently made available on the market. These are highly complex, sophisticated electronic instruments such as signal generators, power analysers, oscilloscopes, spectrum analysers, digital multi-meters, electron microscopes, chemical and biological analysers, complex chromatography systems and their detectors, each having many necessary options and accessories. Each instrument can have a minimum of 2,000 and up to 40,000 parts; requiring a vast supply chain involving tens of thousands of suppliers and hundreds of thousands of unique components.

Considering the EU added-value, test and measurement equipment is manufactured and sold in relatively small volumes (per instrument design) and placed on the global market. There is an added value in community level action, which guarantees more coherent and consistent rules across Europe. But with the expansion of RoHS-like requirements beyond the EU, this creates a risk of discrepancies in RoHS-like national laws adopted in third countries.

The professional test and measurement products provide the tools for engineers to develop new solutions and businesses to bring them to market.

These instruments are used in Research, Quality Control and Testing laboratories (including field testing) in Universities, Manufacturing and clinical facilities and by Governmental Agencies for conformance verification and environmental testing. They are essential to the good functioning of electronic communications networks, heavy industrial processes such as steel manufacturing, the testing of vehicles for compliance with emissions standards, and the monitoring of complex and critical systems of all types. The nature of the tests and measurements made by industrial equipment necessitates that the equipment itself is highly complex; with upwards of 40,000 components necessary to produce a single instrument. Even a relatively simple hand-held instrument incorporates significantly more components that a typical consumer product.

Historically, between 25 - 35% of the components used in test & measurement products are custom designed. The features of the TMC manufacturers' equipment necessitate the development and production of unique components that are not commercially made available on the open market and are typically made by sole, boutique suppliers. These components have their own development lifecycle and take years to bring into production. When these suppliers are unable to deliver compliant parts that meet current RoHS regulations, the product would be stopped from being sold into the EU.

Refer to the table below for a comprehensive list of the relevant product groupings and equipment types relevant to exemption 8(b).

Product Grouping	Equipment Types
Test and measurement upgrades and accessories	
Oscilloscopes, Analyzers & Meters	Oscilloscopes
	Spectrum Analyzers (Signal Analyzers)
	Network Analyzers
	Logic Analyzers
	Protocol Analyzers and Exercisers
	Bit Error Ratio Testers
	Noise Figure Analyzers and Noise Sources
	High-Speed Digitizers and Multichannel DAQ Solutions
	AC Power Analyzers
	DC Power Analyzers
	Materials Test Equipment
	Device Current Waveform Analyzers
	Parameter and Device Analyzers, Curve Tracers
	Digital Multimeters
	Phase Noise Measurement
	Power Meters and Power Sensors
	Counters

Product Grouping	Equipment Types
	LCR Meters and Impedance Measurement Products
	Picoammeters & Electrometers
Generators, Sources and Power	Signal Generators (Signal Sources)
	Waveform and Function Generators
	Arbitrary Waveform Generators
	Pulse Generator Products
	HEV/EV/Grid Emulators and Test Systems
	DC Power Supplies
	Source Measure Units
	DC Electronic Load
	AC Power Sources
Wireless	Wireless Network Emulators
	Channel Emulation Solutions
	Nemo Wireless Network Solutions
	5G OTA Chambers
	Wireless Analyzers
	IoT Regulatory Compliance Solutions
Modular Instruments	PXI Products
	AXIe Products
	Data Acquisition – DAQ
	USB Products
	VXI Products
	Reference Solutions
Network Test, Security & Network Visability	Protocol and Load Test
	Network Test Hardware
	Cloud Test
	Performance Monitoring
	5G NR Base Station Test
	Radio Access and Core Network Test
	Network Security
	Cyber Training Simulator
	Network Modeling
	Application and Threat Intelligence
	Network Packet Brokers
	Cloud Visibility
	Network Taps
	Bypass Switches
	Clock Synchronization
Application-Specific Test Systems and Components	
Photonic Test & Measurement Products	
Laser Interferometers and Calibration Systems	
In-circuit Test Systems	
Used Equipment	

Product Grouping	Equipment Types
Probe	
Semiconductor Characterization System	
Laboratory Products	Autoclave Sterilizers
	Baths and Circulators
	Biological Safety Cabinets
	Blood Culturing Devices
	Centrifuges
	Chillers
	Electrophoresis
	Environmental Chambers
	Freeze Dryers
	Furnaces
	Heat Controllers/Exchangers
	Ovens
	Refrigerators
	Freezers
	Mixers
	Water Purification
Chemical Analysis	Handheld XRF Analyzers
	Dosimetry Personnel Contamination Monitors
	(Laser) Spectroscopy
Material and structural analysis	Electron Microscopes
Clinical Diagnostics	Therapeutic drug monitoring
	Quality control
	Sepsis diagnosis
	Prenatal screening
Other	Liquid Chromatography
	Gas Chromatography
	Mass Spectrometry
	Molecular Spectroscopy
	Smart Docking Solutions
	Cell Analysis
	Vacuum Products

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: _____

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

Function of the substance: The function of Cd and AgCdO as well as the chemical and physical advantageous properties of Cd/AgCdO in the components used for T&M instruments are similar to those outlined in the exemption renewal request submitted on 16th January for exemptions Annex III 8(b) and 8(b)-I by the Umbrella Project. These properties include:

- Resistance to arcing
- Resistance to corrosion / pitting / material transfer
- Resistance to oxidation in order to keep the electrical contacts clean and free of insulating oxides. This enhances the life-span of connectors, especially those that are high frequency.
- Resistance against contact welding
- High electrical conductivity
- High thermal conductivity, which helps the effective dissipation of heat
- High melting point, which is required to avoid accidental overheating as a consequence of the fusion of contact points.

3. Content of substance in homogeneous material (%weight): The quantity of cadmium utilized in the TMC's homogeneous materials varies based on the application. Therefore, the homogeneous materials can contain between 10%

and 25% cadmium by weight. Nevertheless, fixed electrical contacts contain typically about 1% cadmium in the homogeneous material of the paste/ink.

4. Amount of substance entering the EU market annually through application for which the exemption is requested: Approximately between 5 and 6 kg of Cd.
   Please supply information and calculations to support stated figure.
   The amount of substance entering the EU market annually through application for which the exemption is requested is based on the replies provided by the TMC members (for the preparation of the Socio-Economic Analysis – see attached).
5. Name of material/component: electrical contacts.

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?

The silver cadmium oxide (AgCdO) is a thin layer coating on the surface face of open switching contacts utilized when physical isolation is required. Whenever that open contact de-energizes a circuit which has any level of inductance to it, the inductive fly-back voltage causes electrical arcing (which makes it a potential ignition source if it were in an explosive atmosphere). This arcing can cause pitting on the surface which can ultimately cause the contacts to weld shut.

The need for creating an open contact (vs solid state switching) is typically for electrical isolation purposes, where the safety standards require a minimum electrical clearance between contacts if it is being relied upon for safety isolation. A common example includes supplemental circuit breakers on equipment for configuration or servicing, where relying on the power cord as the disconnect device is not practical.[3]

Other examples of use include whenever high voltages are being actively applied and disconnected or where inductive loads (e.g., motors, pumps, compressors) are being energised via relays which are especially prone to creating arcs whenever they are switched (which could be multiple times an hour) due to the running load currents. If the open contact is being relied upon as a safety critical component, then it is essential that arc welding does not occur as the point of operation is at the worst-case current load for the motor (e.g., a locked centrifugation rotor condition, or thermal current trip where the instantaneous current of the motor is 20 times the normal run load amps).

[3] See EN 61010-1:2017 clause 6.11 for disconnect requirements for Category 9, industrial equipment. Additionally, the circuit breaker itself needs to comply with IEC 60947-2.

The types of components that utilize this specific exemption are as follows:

Motor start relays		Control relays	
Motor Pumps		Pumps	
Safety Switches		Contactor	
Rocker switches		Circuit breaker	

These isolating components are utilized in turn in the following T&M products and instruments:

- Photon emission microscopy and laser scanning for electrical fault localisation
- Semiconductor packaging instrumentation using Lock-in IR Thermography
- Recirculating Chillers
- Thermo Cyclers & lab ovens
- Laboratory Refrigerators / Freezers / Ultra-low temperature freezers
- Liquid Chromatography / Mass Spectrometry
- CO2 Incubators
- Environmental Chambers
- Thermoluminescence dosimetry
- Spectroscopy Equipment
- Electron Microscopes
- 6A power switches with unique package used in signal sources
- High performance RF connectors used in performance signal generators

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

Please refer to point (B).

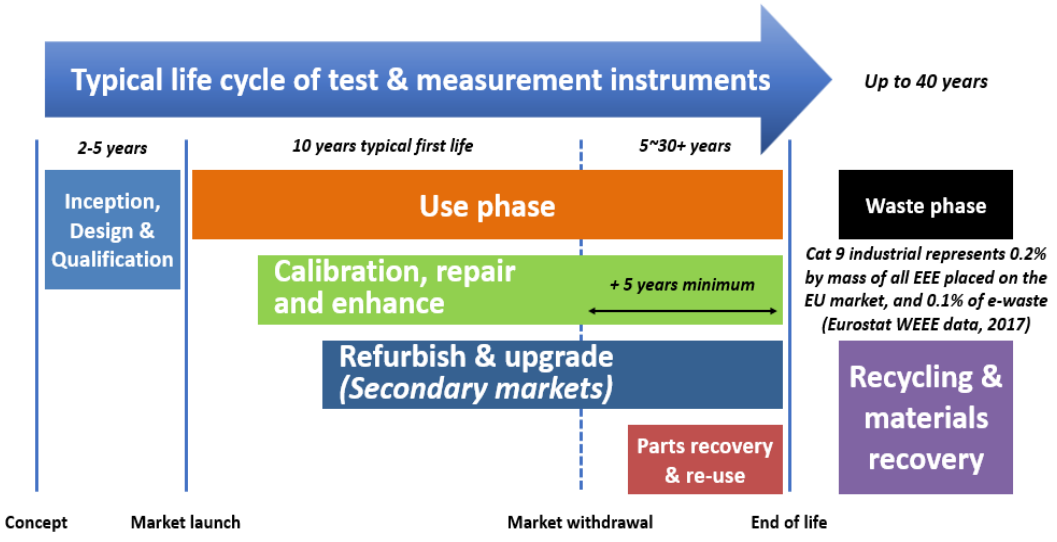
---

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.)

There is no specific closed loop system in place. Please find below some specific considerations on the typical End-to-Life Cycle of category 9 industrial Test and Measurement instruments:

The market sectors addressed by industrial test and measurement equipment can in some cases require that the instruments can be maintained in use for decades. The end-to-end lifecycle model below helps to illustrate how the members contribute to the circular economy by assuring the materials they consume to produce the equipment are kept in use for as long as possible.



The nature of industrial test and measurement instrument applications demand highly accurate and reproducible results throughout their life. With a typical first use of 10 years and a total life of up to 40 years, great care is taken during the design and qualification phases to ensure that the stringent performance and reliability requirements are met and must incorporate design for serviceability. This provides a continuous supply chain of equipment for refurbishment with extended life through resale providing great economic and environmental benefit. Whilst the instruments are designed for long-term reliability, failures do occur during such an extended period of use requiring ability to service and replace parts. After market withdrawal, equipment is normally supported for a minimum of five years. Moreover, refurbishing and reselling on the secondary market are crucial in this sector and often account for 4–5% of producer turnover for test and measurement manufacturers.

Due to the cost, reliability, and unique applications of T&M equipment, many customers do not dispose of the equipment, but instead keep it for use at a later date or place it on the secondary market. Therefore, Category 9 Industrial equipment's contribution to the Waste Electrical and Electronic Equipment stream is very small (0.2% by weight of EU WEEE) with industrial WEEE being collected through B2B systems. Consequently, the environmental impact of industrial test and measurement products is negligible. Nevertheless, test and measurement equipment does enter the waste stream, typically many decades after it is placed on the EU market.

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:

- ☒ The following parts are refurbished for use as spare parts: PCAs, microcircuits
- ☒ The following parts are subsequently recycled: cables, metal

☐ Article cannot be recycled and is therefore:

- ☐ Sent for energy return
- ☐ Landfilled

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

No detailed data available.

☐ In articles which are refurbished _____

☐ In articles which are recycled _____

☐ In articles which are sent for energy return _____

☐ In articles which are landfilled _____

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

Cd and AgCdO exhibit certain unique physical and technical characteristics. The advantageous properties of AgCdO especially in relation to the impact of repeated arcs from high current DC loads is further outlined in a dissertation by Frederic Pons from the Georgia Institute of Technology.[4] The study investigates said impacts switched from a resistive load for a uniform and repeatable arc format and analysed the results on the contact faces using a scanning electron microscope to compare the response of AgCdO coated contact to arcs to $AgSnO_2$.[5] When the arc occurs, it causes the silver to melt but due to the close melting point temperature of the silver and CdO, there are CdO clusters finely distributed in the layer. This effectively restores the contact material skin reducing the impact of repeated arcs and yielding a consistent contact resistance. The AgSnO2 did does not yield as good as a result as predicted by the dissimilar decomposition temperature of the alternate oxide to silver (see the extracted table below for reference).

Table 3.3-1: Thermal properties of the major constituents in AgCdO and $AgSnO_2$

Material	Decomposition Temperature (°C)	Melting Temperature (°C)	Boiling Temperature (°C)	Density (kg/m^3)
Ag	--	962	2162	10490
Sn	--	232	2602	7360
SnO_2	1625	--	2250	7010
Cd	--	321	765	8650
CdO	1000	--	1385	7280

[4] F.Pons, "Electrical contact material arc erosion: experiments and modelling towards the design of an AgCdO substitute", PhD Thesis, May 210, Georgia Institute of Technology, https://smartech.gatech.edu/bitstream/handle/1853/33816/pons_frederic_201005_phd.pdf

[5] Ibid, chapters 2 and 3.

Based on additional available information and technical background, the substitution or elimination of cadmium and its compounds in electrical contacts is, in principle, scientifically and technically practicable for *some* applications. To the best knowledge of the Test & Measurement Coalition there is no single substitute available that would be suitable for all the applications identified and accordingly match the technical performance of cadmium-based electrical contacts. Each substitute that has been evaluated had differing properties and therefore no single "drop-in" replacement exists for cadmium and its compounds.

Since the RoHS directive was adopted, electric contact and switch manufacturers have researched potential alternative materials to the above-mentioned applications. There are "apparent" substitutes for several applications that rely on cadmium-based electrical contacts; when the chemical and physical properties of substitutes are compared with those of cadmium and its compounds, however, it becomes clear why these substitutes are not suitable for all applications:[6]

- **Nickel-PTFE** is not qualified for all applications. It is, in addition, a persistent bioaccumulative toxin
- **Silver Tin Indium Oxide** is presently not available from suppliers
- **Silver Copper Nickel**. Corrosion is likely to occur
- **Alloys with silver, gold, nickel, palladium, and tungsten** have technical limitations.

Scientific research, as well as testing by several manufacturers, has shown that alternative substances are more prone to electrical arc erosion and tack welding.[7] This will result in more product failures that are anticipated to impact product safety. Each substitute that has been evaluated had differing properties and therefore no single "drop-in" replacement exists for all applications that rely on cadmium and its compounds.

Therefore, based on the current state of the art, AgCdO still represents a stable solution to the repeated arc model which is inherent to an inductive switching load or other high voltage switching that currently continues to require the 8(b) and 8(b)-I exemption. The alternatives, thus far, will yield a poorer contact surface which will ultimately lead to premature component failure and potential unreliable results leading up to total component failure.

The renewal of exemption 8(b) should be granted on the basis that **currently available alternatives are not suitable for substitution or replacement in T&M instruments' critical components and their applications**. These

[6] Building a Better Cadmium Replacement. Available at: https://connectorsupplier.com/a-mil-plating-cadmium-061912/

applications include circuit breakers, thermal sensing controls, and high power / high frequency switches. More time is required to adapt designs, find contact materials, and for qualifying cadmium-free solutions in the supply chain and in the products of EEE manufacturers. This is required since the cadmium-free contact materials are not “drop-in” replacements. This echoes the stance of the Öko-Institut Report published in 2016.8 No further technological developments have, to the best knowledge of the participating companies, occurred since then.

Thus, the unavailability of alternatives for all applications that use cadmium-based electrical contacts warrants the renewal of this exemption.

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

Please refer to point A.

---

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.

Since the RoHS directive was adopted, electric contact and switch manufacturers have researched potential alternative materials. The substitution or elimination of cadmium and its compounds is, in principle, scientifically and technically practicable for *some* applications.

Each substitute that has been evaluated had differing properties and therefore, to the best knowledge of the Test & Measurement Coalition, no single “drop-in” replacement exists for cadmium and its compounds for all applications. The renewal of exemption 8(b) should thus be granted on the basis that **alternatives are not suitable for substitution or replacement for all applications**. These applications include circuit breakers, thermal sensing controls, and high power / high frequency switches. This echoes the stance of the Öko-Institut Report published in 2016.[9]

---

[7] RoHS Umbrella Industry application (2019/2020). Previous RoHS (renewal) exemption requests are publicly available and downloadable from the Commission webpages via https://environment.ec.europa.eu/topics/waste-and-recycling/rohs-directive/implementation-rohs-directive_en.

[8] Assistance to the Commission on Technological Socio-Economic and Cost-Benefit Assessment Related to Exemptions from the Substance Restrictions in Electrical and Electronic Equipment. Available at: https://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_Pack_9/RoHS-Pack_9_Part_SOLDERS_06-2016.pdf

[9] Assistance to the Commission on Technological Socio-Economic and Cost-Benefit Assessment Related to Exemptions from the Substance Restrictions in Electrical and Electronic Equipment. Available at: https://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_Pack_9/RoHS-Pack_9_Part_SOLDERS_06-2016.pdf

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

As outlined above, there are currently **no suitable alternatives for all applications** of cadmium and its compounds in electrical contacts that meet the required technical standards and performance expectations of their customers. The lack of a "drop-in" alternative enhances the difficulty of replacing or substituting cadmium in several applications especially (i.e., circuit breakers, thermal sensing controls, and high power / high frequency switches).

Members of the Test & Measurement Coalition have pointed out that they principally rely on their suppliers to find alternatives since most of the exemptions used in their products are not produced by the suppliers but bought off-the-shelf from their suppliers (and so forth, potentially many levels down). Therefore, meeting with suppliers to understand their (potential) alternatives, getting samples, measuring, and testing are part of the typical process to evaluate the suitability of potential alternatives. The process would then be followed by the validation of the potential suitable alternatives.

The companies reported that the validation period alone would take a minimum of 6 months and up to a year after the delivery of suitable alternatives per product. It is significant to note that this validation period would only apply if the component were a fit, form, and function drop-in replacement. If any design changes to the exemption-free part of the product would be required to accommodate for the alternative, an additional validation period would be required for each redesigned product that used to utilize the component that relied on the exemption. Moreover, the validation would lead to the organizations incurring additional expenses. These include labour costs and costs arising from potential product resubmission requirements for testing to various notified bodies to ensure that substitution does not create any electrical and functional safety concerns.

If a new cadmium free part is available, this part must be qualified for use by performing a variety of tasks, as described above. Due to the complexity and diversity of the applications, this must be done individually by each company for each product group. This process would divert resources from other projects and increase the cost to ensure continued availability of these products. This validation and testing process varies according to part complexity; which can be categorised as low, medium, and high:

- **Low complexity** parts are the off-the-shelf components or hardware parts that do not have a substantial performance impact. Replacement can be done based on supplier information, assuming a form/fit/function compliance, with standard manufacturing, testing, and validation processes. Based on process timescales reported by a T&M coalition company, the average time that it can take for these parts to be replaced ranges from **3 to 6 months**.

- **Medium complexity** parts are more complex sub-assembly electronic parts, such as small motors which need additional validation for their performance. These parts are often commercial assemblies that are generally available to the electronic industry, and are utilised by the Test & Measurement coalition companies. Replacement of these assemblies, like-for-like, requires testing and validation prior to being integrated into the manufacturing process. The average time to find an alternative for medium complexity parts for production is reported to range from **6 to 12 months**.

  High complexity parts are complex sub-assembly parts and have a significant impact on the performance of the companies' products. These also have a critical role in the overall safety of the products. These parts need to go through extensive validation for performance and/or compliances, according to varying regulations, before the appropriate files can be updated and the proper competent authorities or regulatory bodies can be notified prior to the purchase of parts for validation. The average time that it would take to find an alternative for high complexity parts for production is up to 1 year of additional testing. Where the exemption directly impacts the performance of that component (e.g., a centrifuge rotor) the evaluation of the replacement could take **3 to 5 years**.

---

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: _____

(B) Elimination/substitution:

1. Can the substance named under 4.(A)1 be eliminated?

☐ Yes. Consequences? _____

☒ No. Justification: Technically not feasible.

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

     Justification: Technically not feasible.
3. Give details on the reliability of substitutes (technical data + information): _____
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: _____

⇨ Do impacts of substitution outweigh benefits thereof?
Please provide third-party verified assessment on this: _____

(C) Availability of substitutes:

a) Describe supply sources for substitutes: Please refer to point 7 of the submission form.

b) Have you encountered problems with the availability? Describe: Please refer to point 7 of the submission form.

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? _____

(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: Possible economic impacts in the EU.

⇨ Provide sufficient evidence (third-party verified) to support your statement:
A thorough Socio-Economic Analysis has been performed by EPPA[10] at the request of Test & Measurement Coalition (TMC), in view of providing regulators with strong evidence-based findings on the expected social and economic impacts

[10] www.eppa.com

that are expected to occur should the use of cadmium be impacted by the non-renewal of the RoHS exemption.

In line with the existing official guidance from ECHA on the preparation of the Socio-Economic Analysis,[11] the SEA therefore gathers technical and economic information to describe ex-ante in both qualitative and (if feasible) quantitative terms the (orders of magnitude of) socio-economic impacts TMC as well as the relevant EEA supply chain and society are expected to face from the non-renewal of the exemption 8(b) on cadmium and its compounds in electrical contacts, which would otherwise expire on 21 July 2024. Please see the respective SEA attached.

Overall, the main findings from the SEA conclude that, the total impact of a non-renewal is monetized in the range of 1.6 billion EUR and 2.3 billion EUR (conservative estimates in net losses; potential gains for suppliers of other components have been already taken into account), consisting of: economic impacts (EBIT loss); social impacts (i.e., unemployment in the EU-27); and substitution costs for test and measurement industrial type products' manufacturers.

9. Other relevant information

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

See Socio-Economic Analysis report attached.

---

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:

---

[11] The ECHA Guideline for the SEA preparation as a part of Application for Authorization is available at:
https://echa.europa.eu/documents/10162/23036412/sea_authorisation_en.pdf/aadf96ec-fbfa-4bc7-9740-a3f6ceb68e6e ;
The ECHA layout for an SEA to be used in Application for Authorization is available at:
https://echa.europa.eu/documents/10162/13637/sea_format_with_instructions_v4_en.docx/0cbc5102-6ba2-2170-480a-0061d2798f55