1st Questionnaire Exemption No. 6c (renewal request)

Exemption for „Copper alloy containing up to 4 % lead by weight“

Abbreviations and Definitions

EEE Electrical and Electronic Equipment

Background

The Oeko-Institut and Fraunhofer IZM have been appointed within a framework contract[1] for the evaluation of applications for the renewal of exemptions currently listed in Annexes III of the new RoHS Directive 2011/65/EU (RoHS 2) by the European Commission.[1]

Bourns, Inc. has submitted a request for the renewal of the above mentioned exemption, which has been subject to a first evaluation. The information you have referred has been reviewed and as a result we have identified that there is some information missing and have formulated a few questions to clarify some aspects concerning your request.

Questions

1. You mention that “360 Brass’ applications include screw machine parts, couplings, bushings, connectors, electronic components, valve components, pump shafts, plumbing to name a few.” Please specify the components that are used in EEE which are manufactured from C36000.

   Bourns model families of electronic components including C36000 brass material:

   Counting Dials CT23, CT26 (Brass pins)

   Encoders: (brass backup strips, shafts, terminals, terminal strip, switch element/terminal) 3315, EM14, EN, PEC09, PEC11R, PEC12R, PEL12D, PEL12S, PEL12T, PES12

   Panel controls: (Brass shafts, terminals) 37, 39, 51,53,54,56,81,82,83,84,85,86,95,97,99, 3851, 3852, 3856, PC, PSM , PTH,

   Precision Potentiometers: (Brass shafts, terminals) 3500S-L, 3540S-L, 3541H-L, 3543S-L, 3545S-L, 3547S, 3548H/S, 3549H/S,3590P-2, 3590S-2, 3590S-3, 3590S-6, 3700S-L, 3701H-L, 3750S-L, 3751H-L, 6534S, 6537S, 6538S, 6539S, 6574S, 6630S, 6637S, 6638S, 6639S,

   Rotary Sensors: (Brass bushings) AMM20B, AMS22B

   Trimming potentiometers: (Brass shafts) 20, 3005, 3006, 3009, 3057, 3059, 3082, 3214, 3223, 3224, 3250, 3252, 3260, 3262, 3266, 3269, 3290, 3292, 3296, 3299, 3057L

[1] Contract is implemented through Framework Contract No. ENV.C.2/FRA/2011/0020 led by Eunomia

2. In the description of the concerned application you mention "*Components including brass shafts/bushings/other brass applications*". Please specify the applications that are manufactured by Bourns. Please provide an exhaustive list of applications that are manufactured by Bourns from C36000 and for which Bourns Inc. requests the exemption renewal.

   For use in Bourns parts: bushings, terminals, shafts, pins, backup strips, terminal strips, switch elements/terminals, rivets.

3. Please provide the amount of lead in copper alloys per electronic component used as sub-component in various EEE categories. Could you estimate the share of these EEE that are equipped with the Bourns Inc. components?

   The C36000 used for the various applications listed in question 2 contains approximately 3.1% lead. The following table lists the various Bourns product categories/models containing lead due to C36000 usage. The unit weight in grams is provided as well as the % Pb in total unit based on C36000.

Product type	Model	unit weight (g)	% Pb in finish unit due to C36000	use
Precision Potentiometers				
	3500	23.16	0.04	wiper terminal
	3540	13.114	0.27	wiper terminal
	3541	13.657	0.27	shaft
	3543	11.698	0.3	shaft
	3545	12.731	0.28	shaft
	3547	19.352	1.706	shaft and bushing
	3548	19.87	1.661	shaft and bushing
	3590	21.702	1.358	shaft and bushing
	3700	8.428	0.11	wiper terminal
	3701	8.876	0.063	wiper terminal
	3750	7.769	0.065	terminals
	3751	8.762	0.065	terminals
	6534	23.496	0.002	terminals
	6537	14.302	0.026	terminals
	6538	14.302	0.026	terminals
	6539	11.92	0.094	terminals
	6574	81.159	0.002	terminals
	6630	15.759	2.17	shaft, terminal, bush-ing
	6637	21.993	0.202	terminals
	6638	21.993	0.004	terminals
	6639	16.85	0.067	terminals, bushing
Panel Controls				
	3851	10.216	1.835	shaft
	3852	10.216	1.835	shaft
	3856	10.216	1.835	shaft
	39	3.578	0.8543	shaft, strip
	51	10.56	1.94	shaft

	53	10.56	1.94	shaft
	54	10.01	0.995	shaft
	56	10.172	1.711	shaft, rivet
	81	13.65	1.42	shaft
	82	13.65	1.42	shaft
	83	18.69	1.043	shaft
	84	19.75	1.133	shaft
	85	17.778	1.097	shaft
	86	17.778	1.097	shaft
	95	14.08	0.015	shaft
	96	14.08	0.015	shaft
	PC	6.737	0.98	shaft
Encoders				
	3315	1.8	0.006	backup strip
	EM14	12.812	1.336	terminals, shaft
	EN	20.857	0.039	terminal strip
	PEC09	4.6	0.003	terminal
	PEC11R	4.068	0.264	terminal
	PEC12R	2.6	0.416	Terminals
	PEL12D	2.9	0.001	terminals
	PEL12S	2.6	0.001	terminals
	PEL12T	2.9	0.001	terminals
	PES12	1.4	0.001	terminals
	PTH	9.13	0.85	shaft
	PTM	9.967	0.695	shaft
Counting Dials				
	CT23	7.69	0.181	pins
	CT26	7.94	0.175	pins
Rotary Position Sensor				
	AMS22	15.166	0.849	bushing
	AMM20	17.529	0.738	bushing
Slide Potentiometers				
	PSM01	67.8	0.011	rivet
Trimming Potentiometers				
	20	0.339	0.006	shaft
	3005	1.304	0.5478	shaft
	3006	1.114	0.6195	shaft
	3009	1.3742	0.5324	shaft
	3057	2.69	0.4	shaft
	3057L	2.9654	0.53	shaft
	3059	2.27	0.4738	shaft
	3082	0.285	0.5793	shaft
	3214	0.191	0.1947	shaft
	3223	0.105	0.33	shaft
	3224	0.1906	0.195	shaft
	3250	1.9316	0.1677	shaft
	3252	1.705	0.2286	shaft
	3260	0.39	0.3462	shaft

3262	0.3834	0.3834	shaft
3266	0.3834	0.3962	shaft
3269	0.3834	0.3881	shaft
3290	0.39	0.3462	shaft
3292	0.789	0.4	shaft
3296	0.8324	0.3799	shaft
3299	0.8374	0.3776	shaft

With the wide use of applications for electronic components, subassemblies containing electronic components and finished products containing electronic components, it is not possible for Bourns to determine the final use in the various EEE categories. Some, such as EEE categories 1-9 are highly likely along with 11. Once our parts are sold either directly or through distribution, we do not have information on how all parts are used. Bourns' parts are not finished parts but used in the assembly of other goods such as cell phones and computers to name a few. Bourns cannot determine where the global parts that claim exemption 6c are used and the final destination of that finished product. Further, the end products that use these parts may not be under the RoHS scope. There may be other applications using this exemption that are out of the scope of Bourns customer base. There are just too many unknowns to provide accurate information.

4. Can you confirm that lead is needed to ensure the machinability of such components in light of their small size or complex details? Can components needing the exemption be characterized on the basis of (small) size, complexity of details and/or other dimension and/or form characterisations?

   Many parts use small brass shafts with close tolerances and complex details (e.g. chevron seal). Lead in the brass is necessary for lubrication and chip control in order to run on automatic screw machines. Since there is no definition of 'small', we can only assume based on Bourns parts that the both dimensions and small screw machines require small bar sizes with good machinability to product good shafts, bearings, rivets, etc. Many of the trimming potentiometers in question are less than 1 gram total weight. Other encoders, panel controls and precision potentiometers are larger but still use small internal parts.

5. You mention overall the favourable machinability of C36000. Please specify which machining processes are applied and specify where the absence of lead would affect the efficiency of the machining process.

   For automatic screw machines (turning), the absence of lead which serves as a lubricant will increase the heat generated requiring a lower surface speed thus slowing down the cycle time. The absence of lead will also make chip control much more difficult. The lead causes the chips to break up into small fragments. If the chip cannot be broken, the material will tangle up and cannot be machined in automatic mode.

6. In the summary you also state that "Brass forms a tin protective patina." Is e.g. corrosion resistance also relevant to your applications? Please exhaustively detail all technical properties /qualities provided by lead which are of importance for your applications.

The discussion of a 'thin protective patina" is part of a literature search regarding C360 Brass attributes. http://www.speedymetals.com/information/material13.html

Important technical properties/qualities of C360 Brass:

- Highest machinability of all copper alloys (allows good capacity/yield)
- Mechanical strength
- Available in bar sizes to reduce waste
- Chip control
- Lead reduces heat generation during screw machine process
- Competitive cost
- Less wear on tooling

7. Please provide information how Bourns, Inc. stimulates its supply chain towards the development of possible alternatives to lead containing copper alloys. Which substitutes have been tested so far? Did Bourns or its suppliers test the lead free copper alloys Ecobrass that Mitsubishi Shindoh Co., Ltd.[2] proposes as direct substitute for C36000 or other alternatives? Please summarize results and provide supporting data of such research into substitutes.

   In January 2001, ECO brass was evaluated for machining capability. Our plant had difficulty in machining this material at that time. We recently spoke to an ECO brass distributor. The problem for Bourns is the smallest diameter bar available is 0.250". For example, some trimming potentiometers require a diameter size of 0.075". Using a 0.250" would mean 91% waste if machined down to 0.075". Distributor stated no valid replacement for current C36000 for shaft fabrication.

   Some alternatives tested and problem areas include:
   - Aluminum – slow machining
   - Zinc die cast – seal integrity issues
   - Nickel silver – required slowing screw machine by 50%; material finish not as good as brass.

   All three alternatives have a higher raw material cost, a slower machining rate which reduces our capacity and shortens tool life.

   Bourns continues to work with our suppliers, explore possible solutions, experiment with possible alternatives. It is a slow process with research, experimentation, testing, scale-up, qualification & reliability testing. If there is a failure along the way, the process starts over.

Please note that answers to these questions are to be published as part of the available information relevant for the stakeholder consultation to be carried out as part of the evaluation of this request. If your answers contain confidential information, please

[2] Mitsubishi Shindoh Co., Ltd. (2014), Contribution of Mitsubishi Shindoh Co., Ltd., submitted during the online ELV stakeholder consultation, retrieved from http://elv.exemptions.oeko.info/fileadmin/user_upload/Consultation_2014_1/Ex_3/2014-12-10_Mitsubishi_elv-exception-main-en.pdf

provide a version that can be made public along with a confidential version, in which proprietary information is clearly marked.