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Laboratório Qualidade do Ar Interior



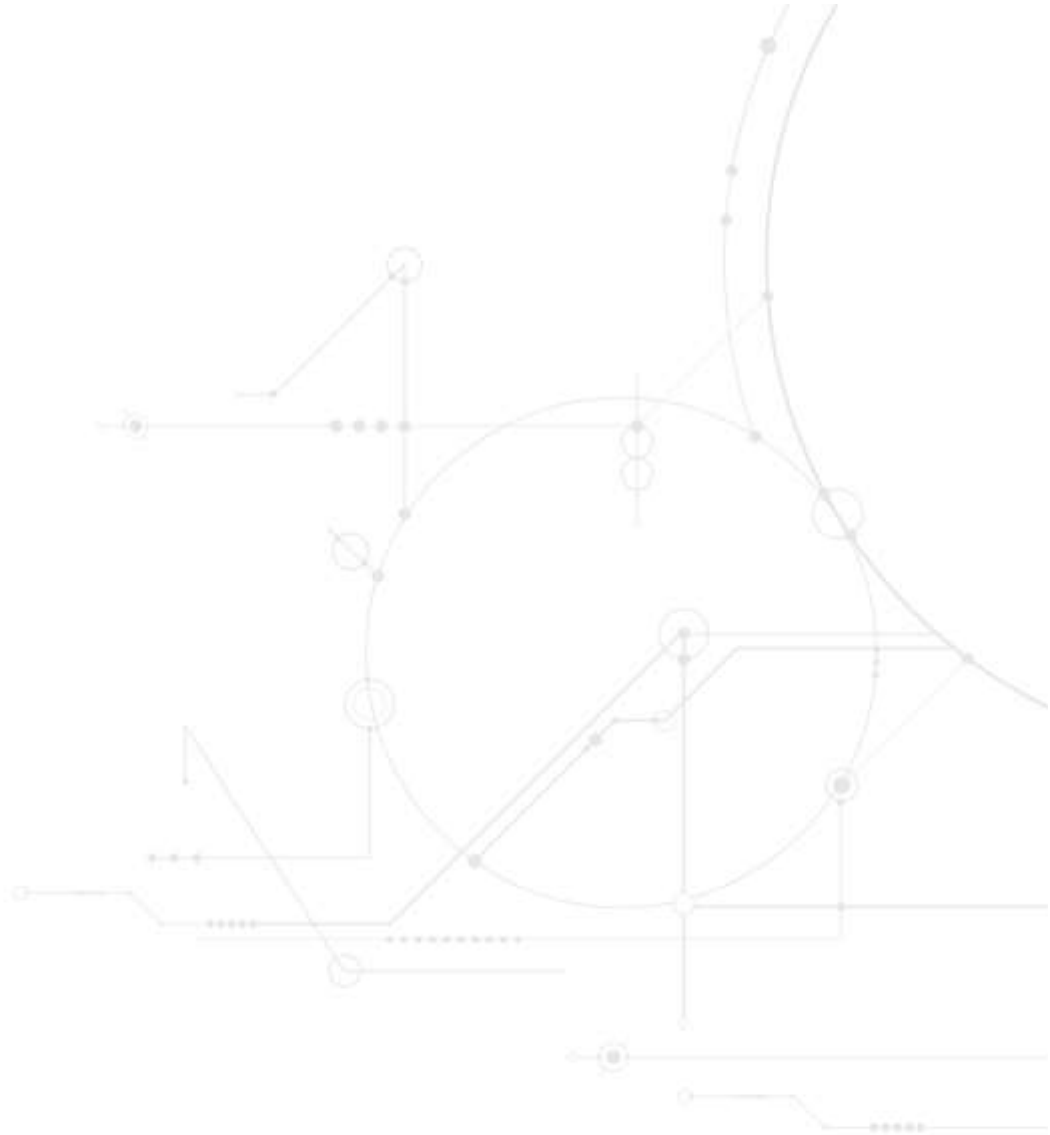
Determination of VOC emissions, formaldehyde, acetaldehyde and other CMR substances from building products (French Legislation)

Process: LQAI.MC.68/23

Report No. LQAI.2023.477

Identification of the Material: Esmalte Waterplus

Client: Indústrias Juno S.A.



IPAC is a signatory to the EA MLA and ILAC MRA for testing.

The results presented refer only to the item tested.

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0. DOCUMENTAL CONTROL

0.1 IDENTIFICATION OF DOCUMENT

Projet	---
Name of Document	Determination of VOC emissions, formaldehyde, acetaldehyde and other CMR substances from building products (French Legislation)
Name of file	---

0.2 CONTROL OF VERSIONS

Version	Edition	Revision	Date	Description	Approved by
1	1	0	2023/12/19	Original version	SM

0.3 AUTHOR(S)

Name	Entity	Initials
Susana Martins / Responsável Técnico do Laboratório	INEGI	SM

0.4 REVISER(S)

Name	Entity	Initials

0.5 LIST OF DISTRIBUTION

Name	Entity	Initials
Laboratório Qualidade Ar Interior	INEGI	LQAI
	Indústrias Juno, S.A.	

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1. OBJECTIVE

Determination of emitted volatile organic compounds, formaldehyde, acetaldehyde and some CMR substances (carcinogenic, mutagenic and reprotoxic) intending the material classification according to the criteria established by the French legislation.

2. CLIENT

Indústrias Juno S.A.
Barrio Saconi 10 s/n
48950 Erandio – Espanha

Reference of Proposal: PE30231037 de 04/10/2023

3. SAMPLE IDENTIFICATION

Sample name: Esmalte Waterplus

Product type: paint

Production date: 07/09/2023

Batch no.: 230831278

Sampling: client

Sampling date: 10/10/2023

Packing material: metal can

number of packages: 1

Sample reception at LQAI: 2023/10/16

For more information see Annex A: Sampling report completed by the client.

4. METHODOLOGIES USED

The selection of the product sample was the sole responsibility of the client. Results apply to sample as received. The tests and analysis presented were carried out in the permanent facilities of the laboratory.

The sample was applied in a glass on 2023/11/06 according ISO 16000-11¹ and according to the instructions provided by the client (picture of sample in annex B). Note that sample preparation is outside the scope of laboratory accreditation.

The characteristics of the product are as follows:

δf (μm)	ρ (g/cm ³)	$\emptyset$ (%)	S (m ² /L)	nc	m (g/m ²)
39 (class: medium)*	1,27	39	10	1	127

*Classification of dry film thickness according ISO16000-11¹

where, δ_r is the dry film thickness following recommendations of the manufacturer, ρ is the density of wet product, $\varnothing$ is the solid content of the product, expressed as a volume, S is the recommended spreading rate of the product, n_c is the number of coats and m is the amount of wet product to be applied per square meter.

The application conditions were:

m_a (g)	A (m ²)	C (kg/m ²)	δ_r (mm)
1,2	0,009	0,13	39

where, m_a is the mass of the applied product, A is the glass area, C is the total amount of applied product per area, and δ_r is the real dry film thickness.

The test in the test chamber started on 2023/11/06 and was performed in accordance with the internal procedure IT.403 (annex C). This test is accredited in accordance with EN ISO/IEC 17025² for the compounds:

Test	Method
Determination of the emission of benzene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of toluene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of ethylbenzene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of 2-ethyl-1-hexanol from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of limonene from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of tridecane from building products and furnishing — Emission test chamber method	IT.403.07
Determination of the emission of 1,2,4-trimethylbenzene from building products and furnishing — Emission test chamber method	IT.403.07

Note: IT.nnn.nn indicates internal laboratory procedure.

It should be noted that the remaining compounds determined in this test and are out the scope of accreditation, are determined using the same quality standards that apply to them.

The VOCs samples were collected, in tubes with Tenax TA, when the test chamber was empty (2023/11/06, volume: 5.56 l) and 28 days (2023/12/04, volume: 6.21 l) after starting the test. The uncertainty associated with this sampling, calculated using the expansion factor of 2.01 which corresponds to a 95% confidence level, was 5.3%.

Formaldehyde and acetaldehyde were collected in cartridges impregnated with DNPH when the test chamber was empty (2023/11/06, volume: 85.1 l) and 28 days (2023/12/04, volume: 94.2 l) after starting the test. The collection of formaldehyde and acetaldehyde is out the scope of accreditation.

The experimental conditions in the chamber during the conditioning time and the study were:

Period	T (°C)	HR (%)	v (m/s)	n (h ⁻¹)	A/V (m ² /m ³)
28 days	22.3±0,4	52.2±2.0	0.17	0.64	0.06

where T is the temperature, HR the relative humidity, v the air velocity at the surface of the material, n the air exchange rate and A/V the ratio of sample area to chamber volume (loading factor). The volume of the chamber used is 0.141 m³.

For the analysis, thermal desorption on line with gas chromatography coupled to a mass spectrometer detector for VOC identification and quantification (GC/MSD) was used. The GC used is from Agilent Technologies, model 7890 and the mass spectrometer detector is from Agilent also, model 5975C. The thermal desorption system is from DANI, model TD Master. The analysis was conducted on 2023/11/13 and 2023/12/07 and was performed in accordance to the internal procedure IT.401 (annex C). This test is accredited in accordance with EN ISO/IEC 17025² for the compounds:

Test	Method
Determination of Benzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Toluene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Octane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of Ethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-Ethoxyethylacetate by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 1,2,4-trimethylbenzene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-ethyl-1-hexanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of limonene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of dodecane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-phenoyethanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of tridecane by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of styrene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of tetrachloroethylene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of 2-butoxyethanol by thermal desorption and Gas chromatography with mass selective detector	IT.401.09
Determination of naphthalene by thermal desorption and Gas chromatography with mass selective detector	IT.401.09

Nota: IT.nnn.nn indicates internal laboratory procedure.

It should be noted that the remaining compounds determined in this test which are not covered by the accreditation are determined using the same quality standards as applied to them.

The emission factors of the identified compounds were determined using the specific response factor. Total volatile organic compounds (TVOC) concentration was calculated for all compounds eluted between hexane and hexadecane, using the toluene response factor.

The global expanded uncertainties (resulting from the combination of sampling and analysis uncertainties – IT401 and IT.403) obtained for each of the compounds are shown below. The expanded uncertainty was calculated using the expansion factor of 2.01, corresponding to a 95% confidence level.

Compound	Global Expanded Uncertainty
Benzene (IT401 and IT403)	34%
Toluene (IT401 and IT403)	28%
Ethylbenzene (IT401 and IT403)	28%
2-ethyl-1-hexanol (IT401 and IT403)	28%
Limonene (IT401 and IT403)	27%
Tridecane (IT401 and IT403)	28%
1,2,4-Trimethylbenzene (IT401 and IT403)	26%

Formaldehyde and acetaldehyde were determined according to ISO 16000-3³ and the internal procedure IT.402. Specifically, the compounds were analysed by high performance liquid chromatography (HPLC) using a chromatograph Agilent Technologies brand, model 1220 Infinity LC. The emission factor of the compounds was calculated based on the specific response factor of the analytical method. The analysis took place on 2023/11/13 and 2023/12/13. The uncertainty of the analytical method is $\pm 8.4\%$ for formaldehyde and $\pm 8.6\%$ for acetaldehyde. This analysis is out the scope of accreditation.

5. RESULTS

Table 1 shows the concentrations of substances or groups of substances, obtained for a specific ventilation rate of $10 \text{ m}^3 \text{ h}^{-1} \text{ m}^{-2}$ (test scenario: doors), as well as the concentration limits ($\mu\text{g}/\text{m}^3$) for different classes established by the French legislation (DEVL1101903D and DEVL1104875A)⁴.

Table 1. Limit values established by the French legislation and concentrations observed for the material after 28 days of exposure for a specific ventilation rate of $10 \text{ m}^3 \text{ h}^{-1} \text{ m}^{-2}$.

		Concentration (µg/m³)				
Compound	CAS	Classes				MC.68/23
		C	B	A	A+	28 days
Formaldehyde ⁺	50-00-0	>120	<120	<60	<10	< 2.43*
Acetaldehyde ⁺	75-07-0	>400	<400	<300	<200	< 3.37*
Toluene	108-88-3	>600	<600	<450	<300	<0.81*
Tetrachloroethylene ⁺	127-18-4	>500	<500	<350	<250	< 0.83*
Xylene ⁺	1330-20-7	>400	<400	<300	<200	<0.81* ^T
1,2,4-trimethylbenzene	95-63-6	>2000	<2000	<1500	<1000	< 0.79*
1,4-dichlorobenzene ⁺	106-46-7	>120	<120	<90	<60	< 0.81* ^T
Ethylbenzene	100-41-4	>1500	<1500	<1000	<750	< 0.79*
2-butoxyethanol ⁺	111-76-2	>2000	<2000	<1500	<1000	< 4.3*
Styrene	100-42-5	>500	<500	<350	<250	< 0.82*
TVOC ⁺		>2000	<2000	<1500	<1000	11.0

* Limit of quantification.

*^T Limit of quantification calculated for toluene

⁺ Out of the scope of accreditation.

Table 2 lists the concentration limits ($\mu\text{g}/\text{m}^3$) for CMR substances, imposed by the French legislation (DEVP0908633A and DEVP0910046A)⁵ and the observed values for the material under study to a specific ventilation rate of $10 \text{ m}^3 \text{ h}^{-1} \text{ m}^{-2}$.

Table 2. Limit values established by the French legislation and concentrations observed for the material after 28 days of exposure for a specific ventilation rate of $10 \text{ m}^3 \text{ h}^{-1} \text{ m}^{-2}$.

Compound	CAS	Concentration ($\mu\text{g}/\text{m}^3$)	
		Limit	MC.68/23 28 days
Trichloroethylene ⁺	79-01-6	< $1 \mu\text{g}/\text{m}^3$	n.d.
Benzene	71-43-2	< $1 \mu\text{g}/\text{m}^3$	n.d.*
Bis(2-ethylhexyl) phthalate ⁺ (DEHP)	117-81-7	< $1 \mu\text{g}/\text{m}^3$	n.d.**
Dibutyl phthalate (DBP) ⁺	84-74-2	< $1 \mu\text{g}/\text{m}^3$	n.d.

n.d. – not detected, which means lower than the limit of detection.

* Limit of quantification for benzene = $0.71 \mu\text{g}/\text{m}^3$.

** Although it has not been evaluated analytically it is considered that this compound is not present in the emissions of the material under study, as stated by the manufacturer in the attached declaration

⁺ Out of the scope of accreditation.

6. GENERAL CONCLUSIONS

By customer request, the results obtained are compared with the criteria established by French regulations^{4,5}. The decision rule chosen is that uncertainty is not applied to the final result. In other words, the result obtained is directly compared with the established criteria, without considering the uncertainty associated with this result.

The results presented in Table 1 and 2 shows that the material "Esmalte Waterplus" is rated **A+** according to the French regulations and meets the criteria established by legislation^{4,5}.

7. REFERENCES

- 1- ISO 16000-11 (2006). Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens (2006).
- 2- NP EN ISO/IEC 17025:2018 – Requisitos gerais de competência para laboratórios de ensaio e calibração
- 3- ISO 16000-3 (2011). Determination of formaldehyde and other carbonyl compounds - Active sampling method.
- 4- Décret n° 2011-321 du 23 mars 2011 (DEVL1101903D) y Arrêté du 19 avril 2011 (DEVL1104875A) relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils.
- 5- Arrêté du 30 avril 2009 (DEVP0908633A) y Arrête du 28 mai 2009 (DEVP0910046A) relatif aux conditions de mise sur le marché des produits de construction et de décoration contenant des substances cancérigènes, mutagènes ou reprotoxiques de catégorie 1 ou 2.

Porto, 19 December 2023

(Head of Laboratory)

Report of the Sampling Procedure

Testing laboratory / certification body:		Sampler (name , company, telephone):	
Name of the manufacturer at the place of sampling (address/stamp):	INDUSTRIAS JUNO S.A BARRIO SACIONI 10 48950 ERANDIO BIZKAIA ESPAÑA	Manufacturer (if deviating from company's name at the place of sampling):	
Name of the product:	ESMALTE WATERPLUS	Type of product (e.g. paint, laminate, textile flooring, PVC-flooring).	PAINT
Model/program/series:		Batch nº:	230831278
Article Nº:		Date of batch production:	5/9/23
Sample is taken from:	☒ Production ☐ Store ☐ Retain samples ☐ Miscellaneous	How had the product been stored prior to sampling?	☐ Open ☒ Wrapped up
	Place of storage:		Packing material: metal can

Sample Description/ Application <i>mention where applicable:</i> Density % Solids by weight Spread rate Application type (e.g. walls, floor, doors, sealants)	1.27 g/lit 42% 10 m2/lit doors
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Specifics (Possible negative influences by emission at the place of taking the sample, petrol emissions, solvent emissions from production, uncertainties, questions, etc.):	
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Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test):	
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Confirmation The signer herewith confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of samples.	
Date 10/10/23	Signature (stamp)

Please attach the Technical Data Sheet of the product.

INDUSTRIAS JUNO, S.A.
Barrio Sacioni, 10
48950 ERANDIO (BIZKAIA)
Tel. 94.467.00.62 - Fax: 94.467.00.63

Annex B – Photo of the sample of the material under study



Annex C – Bibliography that supported the elaboration of the internal procedures IT403 and IT401:

- ISO 16000-6 (2021): Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID.
- ISO 16000-9 (2006): Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method.
- ISO 16000-11 (2006): Determination of the emission of volatile organic compounds from building products and furnishing — Sampling, storage of samples and preparation of test specimens.
- EN 16516:2017. Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air



Industrias JUNO, S.A.
B.º Saconi, 10
48950 Erandio. Vizcaya
Tel. 944 670 062
Fax 944675832
Apdo. 461 - 48080 BILBAO

IDMEC - Instituto de Engenharia Mecânica
Campus da FEUP, Edif. INEGI/IDMEC
Laboratório da Qualidade do Ar Interior
Rua Dr. Roberto Frias
4200-465 Porto -Portugal

SU REFERENCIA

SU ESCRITO DEL

N/ESCRITO DEL

N/REFERENCIA

FECHA

ASUNTO: DEHP

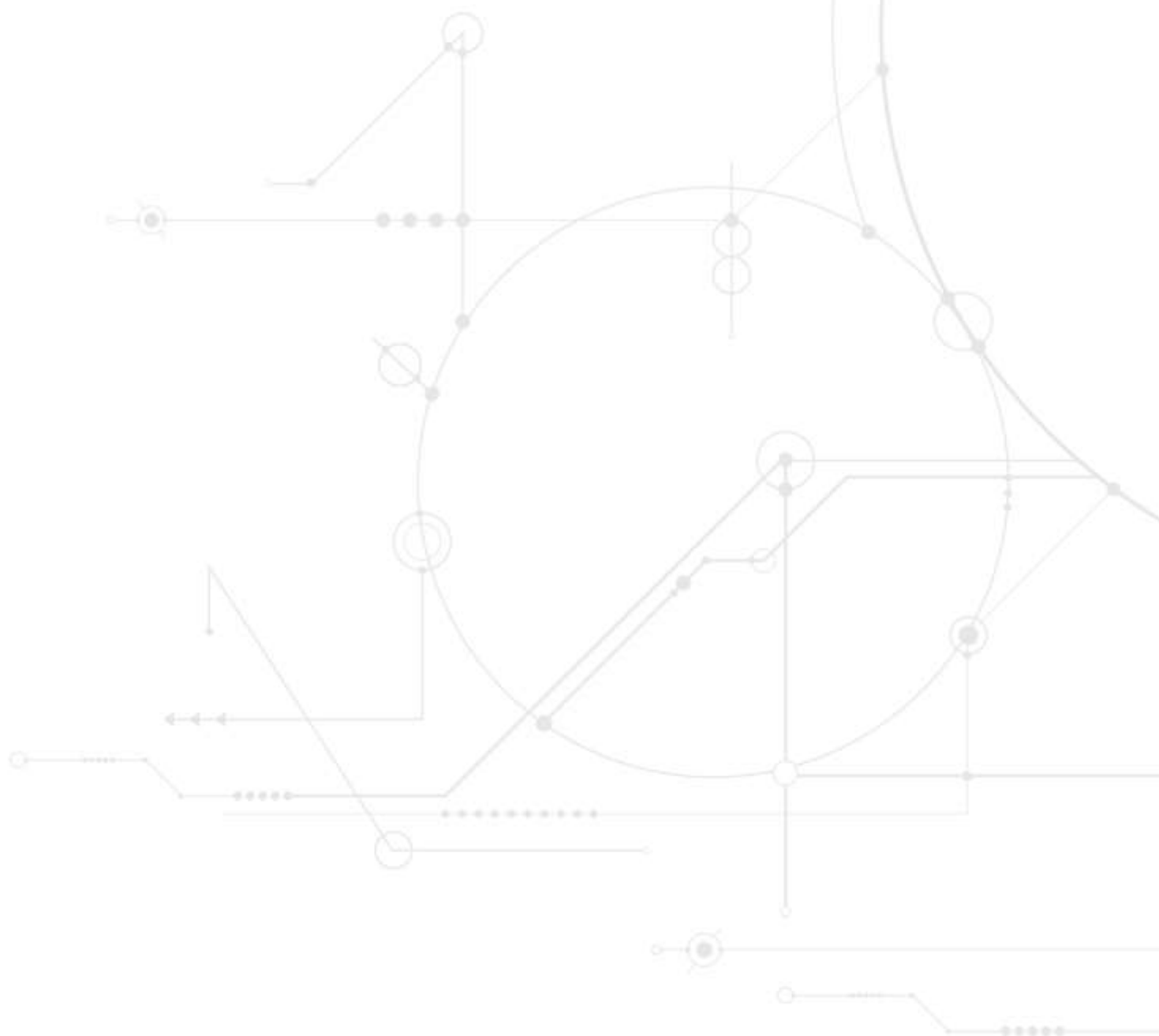
L.G

16.12.23

To whom it may concern

We hereby certify that our product Esmalte Waterplus do not contain DEHP (Bis(2-ethylhexyl) phthalate).

Luis Gil
Director Técnico



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**INEGI - Instituto de Ciência e Inovação
em Engenharia Mecânica e Engenharia Industrial**

Campus da FEUP | Rua Dr. Roberto Frias, 400 | 4200-465 Porto | PORTUGAL
T. +351 22 957 87 10 | F. +351 22 953 73 52 | inegi@inegi.up.pt

www.inegi.up.pt

