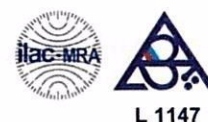




LABTECH s.r.o., Test Laboratory Brno
Authorised Hygienic Laboratory
According to the Law of Czech Republic No. 258/2000
Accredited Testing Laboratory No. 1147
Pod Nemocnicí 683, 339 01 Klatovy



The protocol on authorised examination - PSV 07/2022

According to the requirements of Law of Czech Republic No. 258/2000
About protection of public health

Order: see email
Sample No.: 12395-12403/2022
Sample receipt: 3. 5. 2022

Client:
WT czech s.r.o.
Smetanova 8
586 01 Jihlava

Purpose of examination:	Evaluation of Hygienic properties of the sample according to the Regulation of Ministry of Health of Czech Republic No. 409/2005 for product used in contact with drinking water as amended and the Law of Czech Republic No. 258/2000 about protection of the public health, as amended.		
Product name:	ARAGO™- ionic water treatment		
Producer:	WT czech s.r.o.		
Sample description:	Metal cylinder (stainless steel 1.4301), inner surface - polypropylene with carbon insert (PP-RCT Carbo). Inside the cylinder - a cascade of electrodes (copper/zinc) separated by a polyoxymethylene copolymer (Polyacetal POM C). Tube inner diameter 20 mm, length 130 mm.		
Function and practical scope	The product, by a suitable arrangement of electrodes, releases zinc ions into the flowing water, which affect the structure of the calcium carbonate (scale), which under these circumstances crystallizes in the form of aragonite - a more soluble form of CaCO ₃ .		
Sampling method used	Sampling was done by client. And was delivered in protective package. The laboratory is not responsible for mistake caused by the wrong way of sampling.		
Amount of delivered sample:	2 pieces		
Justification of the scope of the examination	The scope of testing was chosen according to the requirements of Decree No. 409/2005 Coll., Annex 1, paragraph 14 and the supplied data on the composition of the individual components of the tested equipment, including plastics.		
Test beginning:	5.5.2022	Tests termination:	30.5.2022

Procedure for preparation of leachates

The procedure was chosen according to the requirements of Decree No. 409/2005 Coll. The leaching ratios were as follows: the ratio of the test area (80 cm²) to the volume of leachate (80 cm³) was 1:1 (dm²:dm³) - see the following summary.

Leachate	type	Leaching condition	(A/V) ration
I.A, I.B	1. leachate	72 h, 22°C, A, B: volume 80±0,01dm ³	1:1
I.C (control)	control	72 h, 22°C	
II.A, II.B	2. leachate	72 h, 22°C, A, B: volume 80±0,01dm ³	1:1
II.C (control)	control	72 h, 22°C	
III.A, III.B	3. leachate	72 h, 22°C, A, B: volume 80±0,01dm ³	1:1
III.C (control)	control	72 h, 22°C	

Methods of analyses:

Table I. Basic chemo metric parameters of the analytical methods

Analyte	č.	Methods	Unit	Uncertainty (%)
pH	1	ECH 01A: ČSN ISO 10523 (4)		±0,05
Cadmium	2	ICP 02: ČSN EN ISO 11885 (1)	mg/l	20%
Chromium	3	ICP 02: ČSN EN ISO 11885 (1)	mg/l	20%
Copper	4	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Nickel	5	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Lead	6	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Antimony	7	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Zinc	8	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Tin	9	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Manganese	10	ICP 03A: ČSN EN ISO 17294-1, ČSN EN ISO 17294-2 (1)	mg/l	20%
Plastic additives	11	LC 07: ČSN EN 13130-1, ČSN P CEN/TS 13130-3, ČSN (4)	mg/l	20%
Sensory testing	12	SEN 03: ČSN 77 0226, ČSN ISO 13302, SZÚ AHEM 13/1982		

*Notes: the uncertainty of the measurement is determined as an expanded uncertainty with an expansion coefficient $k = 2$ for the 95% confidence interval;
* absolute value.*

Test results

The results of the tests are given in the following tables (Table V. shows the results of the migration numbers).

Table II. Results of the 1st leachate (after 72 hours stagnation)

Evaluated parameter	unit	K_{1A}	$K_{1,B}$	$K_{1,0}$
pH		6,79	6,68	6,47
TOC	mg/l	2,40	4,82	0,65
Manganese	mg/l	<0,01	<0,01	<0,01
Cadmium	mg/l	0,00013	<0,0001	<0,0001
Chromium	mg/l	<0,001	<0,001	<0,001
Copper	mg/l	0,029	0,018	<0,005
Nickel	mg/l	0,26	0,45	0,0016
Lead	mg/l	<0,001	<0,001	<0,001
Antimony	mg/l	<0,001	<0,001	<0,001
Tin	mg/l	<0,001	<0,001	<0,001
Zinc	mg/l	2,4	2,1	<0,02

Notes: $K_{1,A,B}$ - concentration of evaluated parameter after 72 hours of stagnation (two consecutive leachate), $K_{1,0}$ control (blank);

Table III. Results of the 2nd leachate (after 72 hours stagnation)

Evaluated parameter	unit	K _{2A}	K _{2,B}	K _{2,0}
pH		6,76	6,71	6,45
TOC	mg/l	3,7	2,8	0,86
Manganese	mg/l	<0,01	<0,01	<0,01
Cadmium	mg/l	<0,0001	0,00012	<0,0001
Chromium	mg/l	<0,001	<0,001	<0,001
Copper	mg/l	0,026	0,016	0,005
Nickel	mg/l	0,19	0,30	0,012
Lead	mg/l	<0,001	<0,001	<0,001
Antimony	mg/l	<0,001	<0,001	0,0012
Tin	mg/l	<0,001	<0,001	<0,001
Zinc	mg/l	4,18	2,02	0,18

Notes: K_{2,A,B} -concentration of evaluated parameter after 72 hours of stagnation (two consecutive leachate), K_{2,0}control (blank);

Table IV. Results of the 3st leachate (after 72 hours stagnation)

Evaluated parameter	unit	K _{3A}	K _{3,B}	K _{3,0}
pH		6,87	6,46	6,23
TOC	mg/l	2,54	2,65	0,70
Manganese	mg/l	<0,01	<0,01	<0,01
Cadmium	mg/l	<0,0001	<0,0001	<0,0001
Chromium	mg/l	<0,001	<0,001	<0,001
Copper	mg/l	0,012	0,014	0,008
Nickel	mg/l	0,180	0,140	0,007
Lead	mg/l	<0,001	<0,001	<0,001
Antimony	mg/l	0,0011	<0,001	<0,001
Tin	mg/l	<0,001	<0,001	<0,001
Zinc	mg/l	2,53	1,23	0,082
Irganox 3114	mg/l	<0,1	<0,1	<0,1
Irganox 1076	mg/l	<0,1	<0,1	<0,1
Irgafos 168	mg/l	<0,1	<0,1	<0,1
Irganox 1010	mg/l	<0,1	<0,1	<0,1
Irganox 245	mg/l	<0,1	<0,1	<0,1
Taste	TFN	1	1	0

Notes: K_{3,A,B} -concentration of evaluated parameter after 72 hours of stagnation (two consecutive leachate), K_{3,0}control (blank);

Table V. Evaluation of results of the 3st leachate

Evaluated parameter	$K^{23}_{72,3}$ (mg.dm ⁻³ .72 h ⁻¹)	$M^{23}_{24,3}$ (mg.dm ⁻³ .24 h ⁻¹)	C^{23}_{24} (mg.dm ⁻³) ($F=F_o \times F_g=0,05 \times 1$)	Limits given by the decree* [mg.dm ⁻³]
TOC	1,90	0,631	0,031583	1***
Manganese	<0,01	<0,0033	0,000167	0,005*
Cadmium	<0,0001	<3,33E-05	<1,67E-06	0,0005*
Chromium	<0,001	<0,0003	<1,67E-05	0,005*
Cooper	0,01	0,0043	0,000217	0,1*
Nickel	0,15	0,05	0,002	0,002*
Lead	<0,001	<0,00033	<1,67E-05	0,001*
Antimony	<0,001	<0,00033	<1,67E-05	0,0005*
Tin	<0,001	<0,00033	<1,67E-05	3,0****
Zinc	1,80	0,599	0,029967	3,0****
Irganox 3114	<0,1	<0,0333	<0,001667	5*****
Irganox 1076	<0,1	<0,0333	<0,001667	9*****
Irgafos 168	<0,1	<0,0333	<0,001667	6*****
Irganox 1010	<0,1	<0,0333	<0,001667	6*****
Irganox 245	<0,1	<0,0333	<0,001667	9*****
pH	6,67			6,5-9,5**
Taste [TFN]	1			2**

$K^{23}_{72,3}$ - Average value for concentration of analyte after reduction of the blank (control sample) with respect to ratio S/V 1:1 after 72 hours
 $M^{23}_{24,3}$ **Migration number** Average value for concentration of analyte after reduction of the blank (control) with respect to ratio S/V 1:1 after 24 hours
 C^{23}_{24} **Modified concentration:** concentration modified by the conversion factor F, $C=M \times F$, where $F = F_g \times F_o$, where F_g is the geometric factor (ratio of area per unit length of pipe) and F_o is the operational factor (expresses the water retention in the pipe)
Limit – the relevant hygiene limit based on Decree No. 252/2004 Coll. or Decree No. 409/2005 Coll. § 3. The limit values correspond to the requirements for **permanent contact with drinking water** (see: customer information)
* corresponds to 10% of the value of the limit specified in Decree No.252/2004 Coll.
** corresponds to the limit value specified in Decree No.252/2004 Coll.
*** corresponds to 20% of the limit value specified in Decree No. 252/2004 Coll.
**** corresponds to the limit specified in Decree No. 409/2005 Coll.
***** corresponds to Commission Regulation (EU) No. 10/2011
Chemical composition of plastic additives:
Irganox 1076 -Octadecyl 3-(3,5-di-*tert*-butyl-4- hydroxyphenyl)propionate
Irgafos 168 – Tris(2,4-di-*tert*- butylphenyl)phosphite
Irganox 3114 - 1,3,5-tris(3,5-di-*tert*-butyl-4-hydroxybenzyl)-1,3,5-triazin-2,4,6(1*H*,3*H*,5*H*)-trion
Irganox 1010 - Pentaerythritoltetrakis [3- [3,5-di-*tert*-butyl-4-hydroxyfenyl] propionate
Irganox 245 - triethyleneglycol bis[3-(3-*tert*- butyl-4-hydroxy-5-methylphenyl) propionate
< indicates the limit of quantification of the method

Expert opinions and interpretation of results:

The contracting authority has submitted for testing a sample of the **ARAGO™**, product for the prevention of lime scale formation in pipework, e.g. for drinking water. With the delivery of the product for testing, the basic technical data supplied by the customer were also available.

The purpose of the testing was to verify the health safety of the product intended for contact with drinking water in accordance with the applicable regulations (Decree 409/2005 Coll., Decree No. 252/2004 Coll., as amended, Act No. 258/2000 Coll., as amended).

✓ The results of the testing are presented in Tables I - IV and summarized in Table V. This table also presents the results of the modified concentration to account for the use of the product

under evaluation in the water management facility. This modified concentration is then used in the evaluation of the product.

- ✓ Evaluation: The product is intended for short-term contact with drinking water, i.e. for a condition where, under normal conditions, the entire volume of water inside the product is changed at least once during a 24-hour period, according to Decree 409/2005 Coll. as amended (Decree on hygiene requirements for products in direct contact with water and for water treatment, as amended on 1 January 2022). Since this Decree (409/2005 Coll.) does not consider internal coating of water supply systems to be products intended for short-term contact with drinking water, the assessment of this product was carried out by analogy, i.e. the requirements for the limit values set out in paragraph §3 of the above mentioned Decree applicable to permanent contact with drinking water were applied. These limits are derived from the hygiene limits applicable to drinking water quality indicators as listed in Decree No 252/2004 Coll.: The limits for the content of the analyte monitored in the third leachate must not exceed 10 % of the hygiene limit applicable to drinking water under the abovementioned Decree for most of the substances monitored. This requirement is reduced in the case of TOC (total Organic Carbon) to 20% of the limit. In the case of pH and sensory testing, the limit of the Decree applicable to drinking water is adopted. In the case where the indicator does not have the required limit in that Decree, the limits in Decree 409/2005 Coll. and in the case of plastic monomers, Commission Regulation (EU) Decree 10/2011 on plastic materials and articles intended to come into contact with food must be used.
- ✓ The results obtained from the analysis of aqueous leachates are presented in Table II., III. IV. The calculated migration numbers are given in Table V., together with the results of the third leachate. The leachates were monitored for organoleptic characteristics (colour, turbidity, taste and odour) and for parameters that could indicate imperfect product characteristics due to possible migration of organic substances (TOC, acrylates and phosphorus as part of the catalyst used), including selected inorganic compounds that may be released into the leachate (cadmium and lead).
- ✓ The results obtained in the third leachate test, which are crucial to demonstrate the suitability of the test article for contact with drinking water, showed that there were no exceedances for all the parameters tested and, indeed, this did not happen during the first leach test.

Conclusion:

On the basis of the documented results of leachate analyses and the applicable legislation, it can be stated that the ARAGO™ product meets the requirements for products intended for permanent contact with drinking water according to Decree No. 409/2005 Coll., on hygienic requirements for products in contact with drinking water and for water treatment and Decree No. 252/2004 Coll., which establishes hygienic requirements for drinking water, as amended. This conclusion also applies to other materially identical products.

Note: The Test Report may not be reproduced unless as a whole!

Head of authorized laboratory: Mgr. Jiří Míka
Report elaborated by: RNDr. Svatopluk Krýsl, CSc.
Number of pages: 5
Place and date of issue: In Klatovy on 31.5.2022

RNDr. Svatopluk Krýsl, CSc.
Head of Authorized set D1





LABTECH®

Labtech s.r.o., Hygienic Laboratory

Authorized Laboratory for examination of the health safety of products that come in to contact with drinking water and for water treatment
(Regulation of Czech Health Ministry No. 409/2005)

Pod Nemocnicí 683, Klatovy, Czech Republic

Client: WT czech s.r.o.
Smetanova 8
586 01 Jihlava

The final assessment for the product

ARAGO™

Based on the hygienic requirements for products that come into contact with drinking water and for water treatment given by regulation of Czech Health Ministry No. 409/2005 (On the hygienic requirements for products coming in contact with drinking water and for treatment of water) and according to the protocols No PSV 07/2022

We declare, that

Ionic water treatment, product for the prevention of lime scale formation in pipework

ARAGO™

Producer WT czech s.r.o.

Meets the requirements for products intended to come into contact with drinking water and for water treatment.

This statement is valid for the tested sample as well for all materially identical products.

Klatovy, 31 May 2022

RNDr. Svatopluk Krysl, CSc.
Head of Authorized set D1

