Fruit juices, apple-containing (iAs): HMTc Standard

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CORRESPONDENCE

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KEYWORDS

heavy metals, food safety, dietary exposure

PUBLICATION HISTORY

This revision 2026-08.

Abstract

The Heavy Metal Tested & Certified heavy-metal-safety standard for fruit juices, apple-containing (iAs) in Beverages, evaluated on ready-to-drink liquid, as consumed (wet weight, single strength); a concentrate or a powder-to-liquid product is assessed as reconstituted to single strength per the manufacturer's own directions, which is the basis EU 2023/915 and Codex CXS 193 write into their juice cells and Hong Kong Cap 132V Note 11 writes into its beverage entries. 4 of 11 panel analytes publish a numeric limit taken from the strictest applicable government maximum; the remainder are held under mandatory control or a substantiated not-material determination.

1 | How every number on this standard is set

HMTc Method v2.0 (government-limit-only): the strictest applicable sovereign maximum level for this exact beverage form and analyte in the row's declared native basis, with disclosed read-across where the exact cell is unregulated, a substantiated not-material determination where a species is bounded or is a method artifact, and a control where no defensible sovereign number and no supportable near-neighbour exist. Never occurrence-derived. Ready-to-drink and dry-commodity bases are never mixed and no brewing, dilution or reconstitution factor is invented.

2 | Master limit table

All values in ppb (µg/kg), as consumed basis. A brand meeting every value qualifies for the mark.

ANALYTE	HMTC LIMIT	BASIS

Lead (Pb)	30	government maximum level (EU 2023/915)
Cadmium (Cd)	control	measured every lot; no human-food maximum
Total arsenic (tAs)	control	measured every lot; no human-food maximum
Inorganic arsenic (iAs)	10	government maximum level (US FDA)
Mercury, total (tHg)	control	measured every lot; no human-food maximum
Methylmercury (MeHg)	n/m	not material in this matrix
Nickel (Ni)	250	government maximum level (EU 2024/1987)
Tin (Sn)	100,000	government maximum level (EU 2023/915)
Aluminium (Al)	control	measured every lot; no human-food maximum
Total chromium (Cr)	control	measured every lot; no human-food maximum
Hexavalent chromium (Cr-VI)	n/m	not material in this matrix

3 | Derivation — where each number comes from

Every cell traces to one named sovereign maximum level (the strictest for the nearest analog), or to an explicit control, not-material, or species-bounded determination. No occurrence statistic selects a certification value.

ANALYTE	HMTC	SOVEREIGN ANALOG / DETERMINATION
Lead (Pb)	30	government maximum level (EU 2023/915)

Cadmium (Cd)	control	No credible sovereign sets a cadmium maximum level for an apple-containing fruit juice. EU 2023/915, Codex CXS 193, FSANZ Schedule 19, Health Canada and Hong Kong Cap 132V set no cadmium maximum level for fruit or for fruit juice; the cadmium cells that exist are written for vegetable, cereal, oilseed, cocoa, meat, fish and mushroom commodities. No near-neighbour read-across is supportable, so the fail-safe disposition is a control: cadmium testing is mandatory on every certified lot and no ceiling is invented from occurrence data.
Total arsenic (tAs)	control	No credible sovereign sets a total-arsenic maximum level for an apple-containing fruit juice. Regulators write beverage arsenic limits on the inorganic species (EU 2023/915 section 3.4.4 fruit juices at 20 ug/kg and section 3.4.1.6 non-alcoholic rice-based drinks at 30 ug/kg; the US FDA apple-juice action level at 10 ug/kg) and write unspeciated arsenic limits only in the packaged-water and public-water-supply schedules, which are Category 8 instruments. The inorganic-arsenic ceiling in this row, the strictest juice arsenic value any credible sovereign has issued, carries the health-relevant fraction. Total arsenic is therefore mandatory on every lot as the parent screen and no total-arsenic ceiling is invented.
Inorganic arsenic (iAs)	10	government maximum level (US FDA)

Mercury, total (tHg)	control	No credible sovereign sets a total-mercury maximum level for an apple-containing fruit juice. The sovereign mercury values in this basis family are the packaged--drinking-water quality standards (US 21 CFR 165.110 total mercury at 2 ug/kg; Hong Kong Cap 132V packaged drinking water, written for inorganic mercury at 6 ug/kg) and the fish and seafood methylmercury and total-mercury ceilings, none of which governs this product form. Mercury has no identified enrichment pathway in this supply chain, but the analyte is on the mandatory eight-total panel, so testing is mandatory and no ceiling is invented.
Methylmercury (MeHg)	n/m	Methylmercury has no formation pathway in an apple-containing fruit juice: there is no marine bioaccumulation step in the supply chain and no anaerobic, sulfate-reducing methylation environment in the product or its process. Methylmercury is a component of total mercury (MeHg <= tHg) and is governed by and bounded by the total-mercury cell; no separate methylmercury ceiling is published.
Nickel (Ni)	250	government maximum level (EU 2024/1987)
Tin (Sn)	100,000	government maximum level (EU 2023/915)

Aluminium (Al)	control	No credible sovereign sets an aluminium maximum level for an apple-containing fruit juice. The only sovereign aluminium values in a dietary basis are the packaged--drinking-water quality standards (US 21 CFR 165.110 secondary allowable level 200 ug/kg, EU 2020/2184, Health Canada 2900 ug/kg), which govern water sold as water and are Category 8 instruments, and the FSANZ infant-formula aluminium limits, which are Category 1 and are excluded from this category's anchor set by the taxonomy boundary rule. In this form aluminium is a packaging and processing signal (aluminium cans and can linings, closures, filter aids, additive carry-over) rather than a raw-material contaminant.
Total chromium (Cr)	control	No credible sovereign sets a total-chromium maximum level for an apple-containing fruit juice. The only sovereign chromium values reachable from this basis family are the packaged-drinking-water quality standards (US 21 CFR 165.110 at 100 ug/kg, Hong Kong Cap 132V packaged drinking water at 50 ug/kg), which govern water sold as water and are Category 8 instruments, and the public-water-system maximum contaminant levels (US EPA, Health Canada), which are water-utility instruments and not food law at all. Total chromium in this form is dominated by benign Cr(III) and is reported as a stainless-steel equipment and process-water leaching screen, not as a health limit; the health-relevant species is addressed in the Cr-VI cell.

Hexavalent chromium (Cr-VI)	n/m	Hexavalent chromium is not stable in single-strength apple juice or an apple-containing juice blend. At the pH of this product form (typically pH 3.3 to 4.0, with malic and ascorbic acid present) Cr(VI) is reduced to Cr(III) by the organic acids, sugars, ascorbate and polyphenols present in the matrix, so a positive Cr(VI) result is an artifact of the total-chromium determination rather than a species present in the beverage as consumed. The reference-method basis for this determination is the in-house species arbitration at data/workbench/standards/-2026-07-31-chromium-formula--adjudication.md, which found that the superseded ion-exchange plus electrothermal-AAS methods that generated the historical Cr(VI) values in liquid food matrices are not reproduced by the modern reference method: saraiva2021 (species-specific isotope dilution HPLC-ICP-MS, limit of quantification 0.049 ug/kg) quantified no Cr(VI) in any milk or formula sample while resolving Cr(III) and total chromium at single-digit ug/kg. That adjudication was drawn on a near-neutral aqueous food matrix; the acidic beverage matrices in this row are a more strongly reducing environment still, so the artifact conclusion carries a fortiori. The health-relevant species is controlled through the total-chromium cell and the reflex rule below, and this determination is a method finding, not an occurrence-derived value: no number is taken from it.

4 | Cite this standard

Pendergrass, K. (2026). *Fruit juices, apple-containing (iAs): HMTc standard*. Institute of Contaminant Standards.

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References

[1] EU 2023/915
Binds Pb, Sn.
MAXIMUM LEVEL

[2] EU 2024/1987
Binds Ni.
MAXIMUM LEVEL

[3] US FDA
Binds iAs.
MAXIMUM LEVEL

STATUS AND LICENCE

A normative certification standard, editorially reviewed and version-controlled in-house; every value traces to a named sovereign maximum level, disclosed in the derivation. © 2026 Institute of Contaminant Standards / Heavy Metal Certified. All rights reserved.

COMPETING INTERESTS

This standard is published by the Heavy Metal Tested & Certified (HMTc) program, operated by the Institute of Contaminant Standards. Its statements about government regulations, toxicology, and occurrence are sourced to the cited primary and expert-body records and to the independently maintained Heavy Metal Index; the program's own certification thresholds are not used as evidence for any factual claim made here.

DATA AVAILABILITY

The works this standard draws on are listed in full in the references above and on the standard page at https://heavymetalcertified.com/standards/fruit-juices-apple-containing. Primary legal instruments and expert-body assessments are named with their public identifiers; the underlying occurrence and toxicology corpus is maintained on the Heavy Metal Index.

PUBLICATION HISTORY

This revision 2026-08. The full dated record is maintained at https://heavymetalcertified.com/standards/fruit-juices-apple-containing.