



EPA/DHA Omega-3 Oils with
Distinct Purity Criteria

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TECHNICAL GUIDANCE DOCUMENT FOR: **CALANUS OIL**

Type of EPA/DHA product class: **Calanus Oil**

Brief description of product class:

Calanus oil is a neutral lipid oil obtained from the species *Calanus finmarchicus*. The main lipid class is wax esters with levels above 80 %, and this is one of the main signifiers of the oil. Oil from *Calanus finmarchicus* does not have standardized levels of omega-3, although typically contains a minimum of 185 mg/g omega-3, with a content of minimum 30 mg/g EPA, 40 mg/g DHA and 40 mg/g stearidonic acid (SDA). Due to high levels of astaxanthin (typically above 600 mg/kg) the oil has a rich ruby red color.

Calanus oil is produced from sea frozen *Calanus finmarchicus*. The frozen raw material is grounded and suspended in water in the presence of food grade enzymes in order to hydrolyse the proteins and aid release of the lipid fraction, then heated to deactivate the enzyme and sterilize the product. The lipid (oil) fraction is separated from the remaining solids (protein and shell/chitin) and water ("stick-water") fractions by decanting and centrifugation. Separation is repeated until there is no sedimentation (protein or water) identified in the lipid fraction. The resultant crude oil is then refined by conventional techniques such as evaporation and filtration in order to provide the finished, consumer-ready oil. The oil from *C. finmarchicus* is packed under an inert (N₂) atmosphere and stored in the dark.

Table 1. Lipid composition of Calanus oil (ranges)

Lipid class	Lower limit (g/100 g lipid)	Upper limit (g/100 g lipid)
Wax ester	80	99

Table 2. Fatty acid composition of Calanus oil (ranges)

Trivial name of fatty acid	Nomenclature	Lower limit* (g/100 g lipid)	Upper limit* (g/100 g lipid)
<i>Saturated fatty acids:</i>			
Myristic	C14:0	5.5	9.2
Pentadecanoic	C15:0	0.2	0.5
Palmitic	C16:0	4.3	5.8
Heptadecanoic	C17:0	ND	0.2
Stearic	C18:0	0.3	0.7
Arachidic	C20:0	ND	0.2
<i>Mono-unsaturated fatty acids:</i>			
Palmitoleic	C16:1n7	1.5	3.7
Oleic	C18:1n9	1	2.3
Vaccenic	C18:1n7	0.2	0.4
Eicosenoic	C20:1n9	1.3	2.8
Eicosenoic	C20:1n11	ND	0.7
Cetoleic	C22:1n11	1.8	4.3
Erucic	C22:1n9	ND	0.3

Poly-unsaturated fatty acids:

Linoleic	C18:2n6	0.3	0.7
Linolenic	C18:3n3	0.5	2
Alpha Linolenic	C18:3n6	0.1	0.3
Moroctic or Stearidonic	C18:4n3	4.3	9.2
Arachidonic	C20:4n6	0.1	0.3
Eicosatetraenoic (ETA)	C20:4n3	0	0.7
Eicosapentaenoic (EPA)	C20:5n3	4.9	9.7
Heneicosapentaenoic (HPA)	C21:5n3	0.2	0.4
Docosapentaenoic (DPA)	C22:5n3	0	0.9
Docosahexaenoic (DHA)	C22:6n3	3.5	7.2

ND: Not detected. Please be aware that the lipid composition may vary, and these values are not absolute.

Table 3. Fatty alcohol composition

Trivial name of fatty alcohol	Nomenclature	Lower limit* (g/100 g lipid)	Upper limit* (g/100 g lipid)
Myristyl alcohol	C14:0	0.4	0.7
	C16:0	4.1	5.4
	C16:1 n-7	0.5	1.7
	C18:1 n-9	1	1.6
Eicosenol	C20:1 n-9	10	12.9
	C22:1 n-9	0.4	2
Docosenol	C22:1 n-11	12	18.8

Please be aware that the lipid composition may vary, and these values are not absolute.

Reason for classification as a separate product class: Species of origin EPA/DHA-containing oil

GOED members that want to produce and/or sell oils under the scope of the GOED Voluntary Monograph are obliged to measure the following parameters using assays specified in the GOED Voluntary Monograph (on Wax Ester Oils) and further detailed in the Guidance on Methods:

A. Oxidation: as specified in the GOED Voluntary Monograph

PV: Max 5

p-AV: Cannot be measured in Calanus oil

Totox: Cannot be determined

B. Environmental contaminants as specified in the GOED Voluntary Monograph:

PCBs (209 congeners): Max 0.09 mg/kg

PCDDs and PCDFs: Max 1.75 pg WHO-PCDDs/F-TEQ/g

Dioxin-like PCBs: Max 3 pg/g (WHO-TEQ)

Total Dioxins, Furans and Dioxin-like PCBs: Max 3 pg WHO-TEQ/g

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Heavy metals:

Lead* : Max 0.08 mg/kg

Cadmium* : Max 1.0 mg/kg (Calanus oil cannot comply with lower maximum limits such as 0.1 mg/kg)

Mercury : Max 0.1 mg/kg

Inorganic arsenic : Max 0.1 mg/kg

Not following the GOED Voluntary Monograph*C. Fatty acids (EPA and DHA): *as specified in the GOED Voluntary MonographNote: Methods recommended in the GOED Monograph for EPA, DHA and Total Omega-3 Quantification are also suitable for calanus oil.*

The following suggestions for assay methods to be used and limits to take into account for a number of additional parameters can be of guidance to GOED members on a voluntary basis to produce and sell quality oils further detail can be found in the Guidance on methods):

- Wax esters: AOCS Ch 8-02 "Determination of Wax Content by Capillary Column Gas-Liquid Chromatography", modified for Calanus oil

Species identification : *Calanus finmarchicus* oil can be distinguished from other marine oils by its characteristic content of wax-esters

Specific comments : Calanus oil is listed under the category "Oils with Distinct Purity Criteria", since it contains levels of lead and cadmium that are above the maximum limits of the GOED Voluntary Monograph.

Anisidine Value cannot be measured in Calanus oil since the oil is too strongly colored.