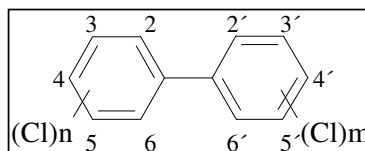




BMF 14 - Polychlorinated biphenyls (PCBs)



Polychlorinated biphenyls (PCBs) have been the subject of a broad range of studies and investigations because of their environmental persistency and bioaccumulation. Their abundance as pollutants stems from their worldwide manufacture as heavy-used industrial chemicals, *e.g.* Aroclors with the main application as dielectric fluid in capacitors and transformers. PCBs are formed as mixtures by the addition of chlorine to biphenyl.

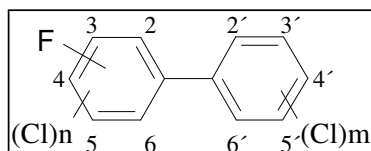
PCB congeners can be classified as coplanar, dioxinlike with none or one orthosubstitution and non-planar with substitutions in the *ortho*-positions. The coplanar PCBs shows a similar toxicity as the dibenzofurans and the dioxins.

F-PCBs®, An overview of advantages

F-PCBs® Fluorinated Internal Standards for PCB analysis - A flexible and cost-efficient alternative:

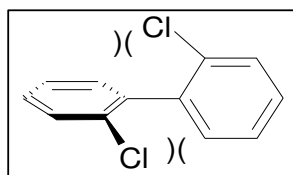
Mono- and difluorinated PCBs are closely similar to the parent PCBs in terms of physico-chemical properties, and are ideal internal or surrogate standards for GC-MS, GC-ECD, GC-FID and two-dimensional GC. The F-PCB® internal standards offered by Chiron have several advantages over the more traditionally used ^{13}C isotopes and unlabelled internal standards:

- Cost efficient. Much cheaper than the ^{13}C isotopes.
- Gives one single, pure isotope (F has only one isotope)
- Can be used with GC-ECD detection, ^{13}C can not since they coelute with the native.
- Do not discriminate from the native upon work-up.
- “Designer retention times” (*ortho*-, *meta*-, *para*-F) possible for optimal elution rate.





Native Non-coplanar PCBs: "Dutch Seven PCBs"



IUPAC No.	Compound	Cat. No.	Cat. No. neat
Trichloro: CB-28	2,4,4'-Trichlorobiphenyl	1999.12-100-IO	1999.12-10MG
Tetrachloro: CB-52	2,2',5,5'-Tetrachlorobiphenyl	2000.12-100-IO	2000.12-25MG
Pentachloro: CB-101	2,2',4,5,5'-Pentachlorobiphenyl	2001.12-100-IO	2001.12-5MG
CB-118	2,3',4,4',5'-Pentachlorobiphenyl	2002.12-100-IO	2002.12-10MG
Hexachloro: CB-138	2,2',3,4,4',5'-Hexachlorobiphenyl	2003.12-100-IO	2003.12-10MG
CB-153	2,2',4,4',5,5'-Hexachlorobiphenyl	2004.12-100-IO	2004.12-10MG
Heptachloro: CB-180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	2005.12-100-IO	2005.12-10MG
Multiple components	Dutch Seven PCBs	S-4236	
Multiple components	Seven Dutch single components, Neat Mix, 1 mg each		S-4418-7x1MG
Multiple components	Deuterated PCBs	S-4724	
KIT	Seven Dutch single components, Solution-KIT	8549.7-KIT	

Single standards solution available in 100 µg/mL in isooctane (IO), 1 mL or as neat.
Multiple component solutions are available in various concentrations. Please inquire.

Internal Standards (IS) for Non-coplanar PCBs: "Dutch Seven F-PCBs®"

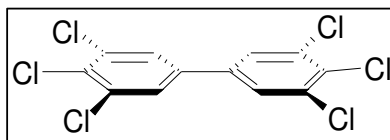
IUPAC No.	Compound	Cat. No.
Trichloro: 3'-F-CB-28	3'-Fluoro-2,4,4'-trichlorobiphenyl	2228.12-100-IO
Tetrachloro: 3-F-CB-52	3-Fluoro-2,2',5,5'-tetrachlorobiphenyl	2660.12-100-IO
Pentachloro: 5'-F-CB-118	5'-Fluoro-2,3',4,4',5-pentachlorobiphenyl	2865.12-50-IO
3'-F-CB-101	3'-Fluoro-2,2',4,5,5'-pentachlorobiphenyl	8353.12-50-IO
Hexachloro: 5'-F-CB-156	5'-Fluoro-2,3,3',4,4',5-hexachlorobiphenyl	2871.12-50-IO
3'-F-CB-166	3'-Fluoro-2,3,4,4',5,6-hexachlorobiphenyl	2746.12-50-IO
Heptachloro: 5'-F-CB-190	5'-Fluoro-2,3,3',4,4',5,6-heptachlorobiphenyl	3730.12-50-IO
Multiple components	Dutch Seven F-PCBs®	S-4617 (Please inquire)
KIT	Dutch Seven F-PCBs®, single components	8550.7-KIT

Solutions of single reference substances, internal standards and multiple component solution, 50 or 100 µg/mL in isooctane, 1 mL.



Native Coplanar PCBs:

"Dioxin-like PCBs"



IUPAC No.	Compound	Cat. No.	Cat. No. neat
Tetrachloro: CB-77	3,3',4,4'-Tetrachlorobiphenyl	2006.12-100-IO	2006.12-25MG
CB-81	3,4,4',5-Tetrachlorobiphenyl	2007.12-100-IO	2007.12-5MG
Pentachloro: CB-105	2,3,3',4,4'-Pentachlorobiphenyl	2008.12-100-IO	2008.12-5MG
CB-114	2,3,4,4',5-Pentachlorobiphenyl	2009.12-100-IO	-
CB-118	2,3',4,4',5-Pentachlorobiphenyl	2002.12-100-IO	2002.12-10MG
CB-123	2',3,4,4',5-Pentachlorobiphenyl	2011.12-100-IO	-
CB-126	3,3',4,4',5-Pentachlorobiphenyl	2012.12-100-IO	2012.12-5MG
Hexachloro: CB-156	2,3,3',4,4',5-Hexachlorobiphenyl	2013.12-100-IO	2013.12-5MG
CB-157	2,3,3',4,4',5'-Hexachlorobiphenyl	2014.12-100-IO	-
CB-167	2,3',4,4',5,5'-Hexachlorobiphenyl	2015.12-100-IO	2015.12-5MG
CB-169	3,3',4,4',5,5'-Hexachlorobiphenyl	2220.12-100-IO	-
CB-189	2,3,3',4,4',5,5'-Heptachlorobiphenyl	2016.12-100-IO	-
Multiple components	Dioxin-like PCBs, WHO+ISO/DIS 17858	S-4590	2ug/mL each, 12 comp.
KIT	Dioxin-like PCB-Kit, solutions	8551.12-KIT	-

Solutions of single reference substances, internal standards and multiple component solutions, 100 µg/mL in isooctane, 1 mL or as neat.

Dioxin-like PCBs: Optional calibration standards

IUPAC No.	Compound	Cat.No.
CB-170	2,2',3,3',4,4',5-Heptachlorobiphenyl	2267.12-10-IO
CB-180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	2005.12-10-IO

10 µg/mL in isooctane, 1 mL.



Internal Standards (IS) for Coplanar PCBs: "Dioxinlike F-PCBs ®"

IUPAC No.	Compound	Cat.No.
Tetrachloro: 5-F-CB-77	5-Fluoro-3,3',4,4'-tetrachlorobiphenyl	2863.12-50-IO
3'-F-CB-81	3'-Fluoro-3,4,4',5-tetrachlorobiphenyl	2344.12-50-IO
Pentachloro: 5'-F-CB-105	5'-Fluoro-2,3,3',4,4'-pentachlorobiphenyl	2864.12-50-IO
3'-F-CB-114	3'-Fluoro-2,3,4,4',5-pentachlorobiphenyl	2870.12-50-IO
5'-F-CB-118	5'-Fluoro-2,3',4,4',5-pentachlorobiphenyl	2865.12-50-IO
5'-F-CB-126	5'-Fluoro-3,3',4,4',5-pentachlorobiphenyl	2866.12-50-IO
Hexachloro: 5'-F-CB-156	5'-Fluoro-2,3,3',4,4',5-hexachlorobiphenyl	2871.12-50-IO
3'-F-CB-166	3'-Fluoro-2,3,4,4',5,6-hexachlorobiphenyl	2746.12-50-IO
Heptachloro: 5'-F-CB-190	5'-Fluoro-2,3,3',4,4',5,6-heptachlorobiphenyl	3730.12-50-IO
Multiple components	Dioxin-like F-PCB Multiple-component solution	S-4615 (Please inquire)
KIT	Dioxin-like F-PCB Kit, all single solutions	3087.9-KIT

Solutions of single reference substances, internal standards and multiple component solution, 10 µg/mL in isooctane, 1mL.

Technical Mixtures

Chiron No.	Name
2124.12	Arochlor 1016
2125.12	Arochlor 1221
2661.12	Arochlor 1232
2126.12	Arochlor 1242
2127.12	Arochlor 1248
2128.12	Arochlor 1254
2129.12	Arochlor 1260
2326.12	Arochlor 5460

Available in concentrations 10-1000 µg/mL in isooctane 1mL.

International Standard Methods for PCB Analysis

ISO 17858-2004	Water quality - Dioxin-like PCBs by GC-MS
ISO 10382-2002	Soil quality - Organochlorine pesticides and PCBs by GC-ECD
ISO 6468-1996	Water quality - Organochlorine insecticides and PCBs by GC methods
ISO 8260-2008	Milk and milk products—pesticides and PCBs via GC-ECD
ISO 16000	Indoor air - PCB analysis by GC-MS
EPA 505-1995	Organohalide pesticides and PCBs in water by GC
EPA 608-1984	Organochlorine pesticides and PCBs by GC and GC-MS (cf methods 625) in municipal discharges.
EPA 8082-1996	PCBs from solid and aqueous matrices by GC-ECD or GC-ELCD.
EPA 1668A-1999	PCB congeners in water, soil, sediments and tissue by HRGC/HRMS
EPA 8270C-1996	Semivolatile compounds from solid waste, soil, air, and water by GC-MS



Native PCBs, Complete list of most relevant PCB congeners:

IUPAC No.	Compound	Cat. No.
8810.12-100-IO	4-Chlorobiphenyl	PCB-3
8880.12-100-IO	2,4-Dichlorobiphenyl	PCB-7
9317.12-100-IO	2,4'-Dichlorobiphenyl	PCB-8
8811.12-100-IO	2,6-Dichlorobiphenyl	PCB-10
3731.12-100-IO	3,5-Dichlorobiphenyl	PCB-14
3732.12-100-IO	4,4'-Dichlorobiphenyl	PCB-15
2263.12-100-IO	2,2',5-Trichlorobiphenyl	PCB-18
9313.12-100-IO	2,3,3'-Trichlorobiphenyl	PCB-20
3734.12-100-IO	2,3,4'-Trichlorobiphenyl	PCB-22
1999.12-100-IO	2,4,4'-Trichlorobiphenyl	PCB-28
8813.12-10MG	2,4,5-Trihlorobiphenyl	PCB-29
3619.12-100-IO	2,4,6-Trichlorobiphenyl	PCB-30
2264.12-100-IO	2,4',5-Trichlorobiphenyl	PCB-31
8814.12-100-IO	2',3,5-Trichlorobiphenyl	PCB-34
9314.12-100-IO	3,3',4-Trichlorobiphenyl	PCB-35
3735.12-100-IO	3,4,4'-Trichlorobiphenyl	PCB-37
3736.12-100-IO	3,4',5-Trichlorobiphenyl	PCB-39
3737.12-100-IO	2,2',3,4'-Tetrachlorobiphenyl	PCB-42
2265.12-100-IO	2,2',3,5'-Tetrachlorobiphenyl	PCB-44
3738.12-100-IO	2,2',4,4'-Tetrachlorobiphenyl	PCB-47
9886.12-100-IO	2,2',4,5'-Tetrachlorobiphenyl	PCB-49
2000.12-100-IO	2,2',5,5'-Tetrachlorobiphenyl	PCB-52
9388.12-100-IO	2,2',5,6'-Tetrachlorobiphenyl	PCB-53
8701.12-100-IO	2,2',6,6'-Tetrachlorobiphenyl	PCB-54
8815.12-100-IO	2,3,3',4-Tetrahlorobiphenyl	PCB-55
3739.12-100-ME	2,3,5,6-Tetrachlorobiphenyl	PCB-65
9658.12-100-ME	2,3',4,4'-Tetrachlorobiphenyl	PCB-66
3740.12-100-IO	2,3',4,5-Tetrachlorobiphenyl	PCB-67
2904.12-100-IO	2,4,4',5-Tetrachlorobiphenyl	PCB-74
2006.12-100-IO	3,3',4,4'-Tetrachlorobiphenyl	PCB-77
8819.12-100-IO	3,3',4,5-Tetrachlorobiphenyl	PCB-78
2007.12-100-IO	3,4,4',5-Tetrachlorobiphenyl	PCB-81
2906.12-100-IO	2,2',3,5',6-Pentachlorobiphenyl	PCB-95
8702.12-100-IO	2,2',4,4',5-Pentachlorobiphenyl	PCB-99
8703.12-100-IO	2,2',4,4',6-Pentachlorobiphenyl	PCB-100
2001.12-100-IO	2,2',4,5,5'-Pentachlorobiphenyl	PCB-101
8816.12-100-IO	2,2',4,6,6'-Pentachlorobiphenyl	PCB-104
2008.12-100-IO	2,3,3',4,4'-Pentachlorobiphenyl	PCB-105
8704.12-100-IO	2,3,3',4',6-Pentachlorobiphenyl	PCB-110
2720.12-100-IO	2,3,3',5,5'-Pentachlorobiphenyl	PCB-111
8356.12-100-IO	2,3,3',5,6-Pentachlorobiphenyl	PCB-112
2009.12-100-IO	2,3,4,4',5-Pentachlorobiphenyl	PCB-114
3741.12-100-IO	2,3,4',5,6-Pentachlorobiphenyl	PCB-117
2002.12-100-IO	2,3',4,4',5-Pentachlorobiphenyl	PCB-118
8817.12-10MG	2,3',4,4',6-Pentachlorobiphenyl	PCB-119
2011.12-100-IO	2',3,4,4',5-Pentachlorobiphenyl	PCB-123
9657.12-100-IO	2',3',4',5',6-Pentachlorobiphenyl	PCB-125
2012.12-100-IO	3,3',4,4',5-Pentachlorobiphenyl	PCB-126
2895.12-100-IO	2,2',3,4,4',5-Hexachlorobiphenyl	PCB-137
2003.12-100-IO	2,2',3,4,4',5'-Hexachlorobiphenyl	PCB-138
8820.12-100-IO	2,2',3,4,5,5'-Hexachlorobiphenyl	PCB-141
3252.12-100-IO	2,2',3,4,5,6'-Hexachlorobiphenyl	PCB-143
2266.12-100-IO	2,2',3,4',5',6-Hexachlorobiphenyl	PCB-149
2004.12-100-IO	2,2',4,4',5,5'-Hexachlorobiphenyl	PCB-153
3308.12-100-IO	2,2',4,4',6,6'-Hexachlorobiphenyl	PCB-155
2013.12-100-IO	2,3,3',4,4',5-Hexachlorobiphenyl	PCB-156
2014.12-100-IO	2,3,3',4,4',5'-Hexachlorobiphenyl	PCB-157
9516.12-100-IO	2,3,3',4,5,6-Hexachlorobiphenyl	PCB-160
8711.12-100-IO	2,3,3',4',5,6-Hexachlorobiphenyl	PCB-163

9667.12-100-IO	2,3,3',5,5',6-Hexachlorobiphenyl	PCB-165
3742.12-100-IO	2,3,4,4',5,6-Hexachlorobiphenyl	PCB-166
2015.12-100-IO	2,3',4,4',5,5'-Hexachlorobiphenyl	PCB-167
2220.12-100-IO	3,3',4,4',5,5'-Hexachlorobiphenyl	PCB-169
2267.12-100-IO	2,2',3,3',4,4',5-Heptachlorobiphenyl	PCB-170
8705.12.100-IO	2,2',3,3',4',5,6-Heptachlorobiphenyl	PCB-177
8799.12.100-IO	2,2',3,3',4',5,6-Heptachlorobiphenyl	PCB-178
2005.12-100-IO	2,2',3,4,4',5,5'-Heptachlorobiphenyl	PCB-180
8706.12-100-IO	2,2',3,4,4',5',6-Heptachlorobiphenyl	PCB-183
8707.12-100-IO	2,2',3,4',5,5',6-Heptachlorobiphenyl	PCB-187
2016.12-100-IO	2,3,3',4,4',5,5'-Heptachlorobiphenyl	PCB-189
3743.12-100-IO	2,3,3',4,4',5,6-Heptachlorobiphenyl	PCB-190
2268.12-100-IO	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	PCB-194
8712.12-100-IO	2,2',3,3',4,4',5',6-Octachlorobiphenyl	PCB-196
8818.12-100-IO	2,2',3,3',4,5,5',6-Octachlorobiphenyl	PCB-198
8713.12-100-IO	2,2',3,3',4',5,5',6-Octachlorobiphenyl	PCB-199
8822.12.5MG	2,2',3,3',4,5',6,6'-Octachlorobiphenyl	PCB-201
2477.12-100-IO	2,2',3,4,4',5,6,6'-Octachlorobiphenyl	PCB-204
3604.12-100-IO	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	PCB-207
8708.12-100-CY	Decachlorobiphenyl	PCB-209

Solutions of single reference materials are available in 100 µg/mL, 1 mL or as neat. Please inquire.

Internal Standards (IS) F-PCBs ®: Complete list

Cat No.	Compound	IUPAC No
1601.12-100MG	2-Fluorobiphenyl	2-F-PCB-0
1712.12-100MG	4-Fluorobiphenyl	4-F-PCB-0
8359.12-100-IO	3,3'-Di fluorobiphenyl	3,3'-F ₂ -PCB-0
8238.12-100MG	4,4'-Di fluorobiphenyl	4,4'-F ₂ -PCB-0
2654.12-100-IO	4-Chloro-4'-fluorobiphenyl	4-F-PCB-3
9513.12-100-IO	4-Chloro-2'-fluorobiphenyl	2'-F-PCB-3
2745.12-100-IO	3'-Fluoro-3,5-dichlorobiphenyl	3'-F-PCB-14
2655.12-100-IO	3-Fluoro-4,4'-dichlorobiphenyl	3-F-PCB-15
2656.12-100-IO	3-Fluoro-2,2',5-trichlorobiphenyl	3-F-PCB-18
2657.12-100-IO	3'-Fluoro-2,3,4'-trichlorobiphenyl	3'-F-PCB-22
2228.12-100-IO	3'-Fluoro-2,4,4'-trichlorobiphenyl	3'-F-PCB-28
2223.12-100-IO	3'-Fluoro-2,4,5-trichlorobiphenyl	3'-F-PCB-29
2224.12-100-IO	2'-Fluoro-2,4,6-trichlorobiphenyl	2'-F-PCB-30
2225.12-100-IO	3'-Fluoro-2,4,6-trichlorobiphenyl	3'-F-PCB-30
2229.12-100-IO	4'-Fluoro-2,4,6-trichlorobiphenyl	4'-F-PCB-30
2658.12-100-IO	3'-Fluoro-3,4,4'-trichlorobiphenyl	3'-F-PCB-37
2666.12-100-IO	3'-Fluoro-3,4',5-trichlorobiphenyl	3'-F-PCB-39
2177.12-100-IO	3-Fluoro-2,2',4,4'-tetrachlorobiphenyl	3-F-PCB-47
2660.12-100-IO	3-Fluoro-2,2',5,5'-tetrachlorobiphenyl	3-F-PCB-52
2869.12-100-IO	3'-Fluoro-2,3,5,6-tetrachlorobiphenyl	3'-F-PCB-65
2222.12-100-IO	4'-Fluoro-2,3',4,5-tetrachlorobiphenyl	4'-F-PCB-67
9514.12-100-IO	5'-Fluoro-2,3',4,5-tetrachlorobiphenyl	5'-F-PCB-67
9515.12-100-IO	3-Fluoro-2,3',4',5-tetrachlorobiphenyl	3-F-PCB-70
3800.12-100-IO	3'-Fluoro-2,4,4',5-tetrachlorobiphenyl	3'-F-PCB-74
2863.12-50-IO	5-Fluoro-3,3',4,4'-tetrachlorobiphenyl	5-F-PCB-77
8358.12-50-IO	5,5'-Di fluoro-3,3',4,4'-tetrachlorobiphenyl	5,5'-F ₂ -PCB-77
2344.12-50-IO	3'-Fluoro-3,4,4',5-tetrachlorobiphenyl	3'-F-PCB-81
8353.12-50-IO	3'-Fluoro-2,2',4,5,5'-pentachlorobiphenyl	3'-F-PCB-101
2864.12-50-IO	5'-Fluoro-2,3,3',4,4'-pentachlorobiphenyl	5'-F-PCB-105
2870.12-50-IO	3'-Fluoro-2,3,4,4',5-pentachlorobiphenyl	3'-F-PCB-114
3801.12-50-IO	3'-Fluoro-2,3,4,4',5,6-pentachlorobiphenyl	3'-F-PCB-116
2868.12-50-IO	3'-Fluoro-2,3,4',5,6-pentachlorobiphenyl	3'-F-PCB-117
2865.12-50-IO	5'-Fluoro-2,3',4,4',5-pentachlorobiphenyl	5'-F-PCB-118
2866.12-50-IO	5'-Fluoro-3,3',4,4',5-pentachlorobiphenyl	5'-F-PCB-126
2871.12-50-IO	5'-Fluoro-2,3,3',4,4',5-hexachlorobiphenyl	5'-F-PCB-156
3727.12-50-IO	2'-Fluoro-2,3,3',4,5,6-hexachlorobiphenyl	2'-F-PCB-160
3728.12-50-IO	5'-Fluoro-2,3,3',4,5,6-hexachlorobiphenyl	5'-F-PCB-160
3729.12-50-IO	4'-Fluoro-2,3,3',4,5,6-hexachlorobiphenyl	4'-F-PCB-160
2746.12-50-IO	3'-Fluoro-2,3,4,4',5,6-hexachlorobiphenyl	3'-F-PCB-166
3730.12-50-IO	5'-Fluoro-2,3,3',4,4',5,6-heptachlorobiphenyl	5'-F-PCB-190
1958.12-2K-AN	Decafluorobiphenyl	
1958.12-100MG	Decafluorobiphenyl	

Solutions of single reference materials are available in 50 or 100 µg/mL, 1 mL. Please inquire.

