



ILCO Chemikalien GmbH

ILCO PHOS

Phosphorus-Chemicals Product Portfolio



ILCO PHOS Product Range

Mono-Phosphate Esters

	Alcohol	P-Content [%]	pH-Value	Acid Value [mgKOH/g]	Solubility in Water	Colour	Form/Viscosity (20 °C)	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)
ILCO PHOS 100	C1	25.9 - 28.1	~1.5	930 - 1030	completely	colourless - yellowish	clear liquid approx. 200 mPas	13 / 21 / 29
ILCO PHOS 101	C16/K-salt	~8.6	7.0-7.5	-	completely	beige	Paste	- / 14 / -
ILCO PHOS 102	C13/15 3EO	8.2 - 9.4	1 - 2	290 - 350	dispersible	colourless - yellowish	clear liquid at 25 °C	7 / 15 / 19
ILCO PHOS 103	C4	~20.1	~1.5	-	completely	brownish	liquid	-

ILCO PHOS 100/101/102/103 = MTO

Mono/Di-Phosphate Esters

	Alcohol	P-Content [%]	pH-Value	Acid Value [mgKOH/g]	Solubility in Water	Colour	Form/ Viscosity (20 °C)	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)
ILCO PHOS 200	C2	22.0 - 23.2	~1.5	670 - 710	partial soluble, dispersible	colourless	liquid approx. 300 mPas	12 / 20 / 24
ILCO PHOS 201	i-C4	15.8 - 17.0	1 - 2	410 - 470	partial soluble, dispersible	colourless	liquid	10 / 18 / 22
ILCO PHOS 202	n-C4	16.6 - 17.8	1 - 3	440 - 490	partial soluble, dispersible	colourless - yellowish	clear liquid approx. 200 mPas	10 / 18 / 22
ILCO PHOS 203	2 EH	10.9 - 12.1	1 - 3	280 - 330	dispersible	yellow	clear liquid approx. 300 mPas	8 / 15 / 19
ILCO PHOS 204	C8/C10	11.6 - 12.8	<3	270 - 330	dispersible	colourless - yellowish	clear liquid	7 / 15 / 19
ILCO PHOS 205	C12	8.0 - 9.2	1 - 3	210 - 250	dispersible	white - yellowish	solid	5 / 13 / 17
ILCO PHOS 206	C16/C18	6.7 - 7.9	1 - 3	180 - 220	insoluble	yellowish - brownish	flakes	0 / 9 / 13
ILCO PHOS 207	C18	6.3 - 7.5	1 - 3	185 - 215	insoluble	yellow - brownish	flakes	0 / 8 / 12
ILCO PHOS 208	Oleyl	6.1 - 7.3	0 - 4	170 - 190	insoluble	brown	liquid	1 / 8 / 12
ILCO PHOS 209	C10 4EO	4.2 - 5.4	1 - 3	125 - 145	dispersible	colourless - yellowish	clear liquid	8 / 16 / 20
ILCO PHOS 210	C12 4EO	4.2 - 5.4	2 - 3	125 - 155	dispersible	colourless - yellowish	liquid approx. 500 mPas	7 / 15 / 18
ILCO PHOS 211	i-C13 6EO	3.6 - 4.8	1.5 - 3.5	100 - 140	dispersible	colourless - light yellowish	liquid approx. 700 mPas	7 / 15 / 19



	Alcohol	P-Content [%]	pH-Value	Acid Value [mgKOH/g]	Solubility in Water	Colour	Form/ Viscosity (20 °C)	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)
ILCO PHOS 212	i-C13 8EO	3.2 - 3.8	2 - 3	95 - 115	dispersible	colourless - light yellowish	liquid	8 / 16 / 20
ILCO PHOS 213	C12-C15 7EO	3.2 - 4.0	0 - 3	62 - 70 (pH 5.2)	dispersible	colourless - yellowish	liquid/paste	8 / 16 / 24
ILCO PHOS 214	C16/C18 11EO	1.8 - 3.0	1 - 3	66 - 76	dispersible	colourless - yellowish	solid, clear liquid at 70 °C	7 / 14 / 18
ILCO PHOS 215	Oleyl 5EO	3.6 - 4.2	1.5 - 3.5	100 - 125	dispersible	yellow	liquid at 30 °C	3 / 11 / 15

ILCO PHOS 200/208/213 = MTO

Tris-Phosphate Esters

	Alcohol	P-Content [%]	pH-Value	Acid Value [mgKOH/g]	Solubility in Water	Colour	Form/ Viscosity (20 °C)	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)
ILCO PHOS 300	C12/C14 4EO (mono, di, tri)	-	6.5 - 7.5	Na-neutralized	completely soluble	clear - opaque	liquid max. 400 mPas	- / 14 / -
ILCO PHOS 302	Ethylhexyl	~8	6.5 - 7.5	<0.1	insoluble	clear	liquid 3 - 15 mPas	-
ILCO PHOS 358	Butyl	~11	-	<0.1	insoluble	clear	liquid 2.5 - 3.5 (38°C)	-
ILCO PHOS 356	2-Butoxyethyl	-	-	<0.1	insoluble	clear	liquid 12 mPas (25°C)	-

Phosphate Esters are available from various short to long chain alkyl alcohols like methanol (C1) up to octadecanol (C18), various alcohol ethoxylates and aryl alcohols. Please contact us for special requests.

Hydrophilic-Lipophilic Balance (HLB) is a calculated value to measure the degree to which a surfactant is hydrophilic or lipophilic. A HLB-values of <10 is obtained for oil soluble, a value of >10 for water soluble and values between 6 - 10 for water dispersible surfactants. The following properties can be derived HLB values:

HLB Value	Properties	HLB Value	Properties
0 - 3	Anti-foam	3 - 6	w/o Emulsifier
7 - 9	Wetting Agent	8 - 16	o/w Emulsifier
13 - 15	Detergent	15 - 18	Solubiliser



Triaryl Phosphate Esters

Anti-wear additive, Lubricant additive

	Alcohol	P-Content [%]	Acid Value [mgKOH/g]	Colour	Form/Viscosity [mm ² /s]	Pour Point [°C]	Flash Point [°C]	Water content [%]
ILCO PHOS 360*	Cresyl	-	<0.1	clear	Liquid 21 - 26 (40 °C)	-25	~241	<0.1
ILCO PHOS 361	t-butylated phenyl	~7.7	<0.1	clear	liquid 42 - 50 (40 °C)	-18	>258	<0.1
ILCO PHOS 362	t-butylated phenyl	~8.0	<0.1	clear	liquid 31 - 39 (38 °C)	-23	~260	<0.05
ILCO PHOS 363	t-butylated phenyl	~8.5	<0.1	clear	liquid 25 - 32 (38 °C)	-26	>237	<0.1
ILCO PHOS 365*	isoproylated phenyl	-	<0.1	clear	liquid 27 - 33 (38 °C)	< -30	>240	<0.1
ILCO PHOS 366	t-butylated phenyl	~8.0	<0.1	clear	liquid 39 - 50 (38 °C)	-	>235	<0.1

* not actively promoted due to toxicity reasons

Polymeric Phosphate Esters

Wetting agent, Anti-wear additive, Lubricant additive (Even number products are water and odd numbered products are oil soluble)

	Alcohol	P-Content [%]	pH-Value	Acid Value [mgKOH/g]	Solubility in Water	Colour	Form/Viscosity [mm ² /s]
ILCO PHOS 12	Aliphatic Alcohol, neutral	<12.1	4 - 8 (2%)	<1.0	soluble	clear	liquid 40 - 52 (40 °C)
ILCO PHOS 13	Aliphatic Alcohol, neutral	<12.1	4 - 8 (2%)	<5.0	insoluble	clear	liquid 38 - 52 (40 °C)
ILCO PHOS 16	Aliphatic Alcohol, neutral	<7.5	-	-	soluble	-	solid
ILCO PHOS 17	Aliphatic Alcohol, neutral	<7.5	-	-	insoluble	-	solid
ILCO PHOS 18	Aliphatic Alcohol, unsaturated, neutral	<7.3	4 - 7 (2%)	<5.0	soluble	clear	liquid 90 - 112 (40 °C)
ILCO PHOS 19	Aliphatic Alcohol, unsaturated, neutral	<7.3	4 - 8 (2%)	<5.0	insoluble	clear	liquid 75 - 89 (40 °C)



Phosphites

Antioxidants, Intermediates, AW/EP Additives in Lubricants

	Substituent	P-Content [%]	Acid Value [mgKOH/g]	Colour	Form	Flash Point [°C]
ILCO PHOS 401	C1 (di)	~28.1	-	<25 Hazen	clear liquid	~70
ILCO PHOS 404	C4 (di)	16.45 - 16.15	<4.0	<120 APHA	clear liquid	>125
ILCO PHOS 408	C8 (di)	9.85 - 10.25	<10	<2 Gardner	clear liquid	>165
ILCO PHOS 412 S	thiolauryl (tri)	4.15 - 4.75	<1.0	<50 APHA	liquid - solid	>210
ILCO PHOS 418	Oleyl (di)	5.0 - 5.75	<5.0	<250 APHA	clear liquid	>115
ILCO PHOS 468	2,4-di-tert-butyl-phenyl (tri)	~4.8	-	white	solid	-

Phosphorus-Based Ionic Liquids

Phosphorus-based Ionic Liquids may be used as AW/EP additives in lubricants or as floatation agents or extraction agents in the mining industry. Other Ionic Liquids on request.

	Structure	P-Content [%]	Colour	Form	Flash Point [°C]	Solubility in Water
ILCO IoLi E 8	EMIM Dithiophosphate	~6.7	pale yellow	liquid	>100	insoluble
ILCO IoLi E 10	EMIM Dithiophosphate	~6.0	pale yellow	liquid	>100	insoluble



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Product & Applications/Properties Overview

	Anticaking	Anticorrosive	Antistat	Antioxidants	Antiwear	Chelating	Degreasing	Dispersing	Dye stabilisation	Emulsifying	Friction modifier	Fuel additive	Galvanic	Good stability against acids	Good stability against alkalis	Hydrotrope	Indirect food contact additive /FDA	Low foam	Lubricating	Mining	Mould release agent	Soldering flux	Viscosity regulation /water	Washing/Cleaning /especially I&I	Wetting
ILCO PHOS 102								X																	X
ILCO PHOS 202													X	X				X	X					X	X
ILCO PHOS 203	X	X	X		X			X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
ILCO PHOS 204		X						X	X					X	X			X						X	
ILCO PHOS 205		X						X	X					X	X			X						X	
ILCO PHOS 206		X	X					X	X					X	X			X					X	X	
ILCO PHOS 207		X	X					X	X					X	X			X						X	
ILCO PHOS 208		X	X					X	X					X	X			X						X	
ILCO PHOS 209									X					X	X									X	X
ILCO PHOS 210		X	X				X		X				X	X	X			X	X				X	X	X
ILCO PHOS 211		X				X			X				X	X					X	X				X	X
ILCO PHOS 212						X			X					X	X				X					X	X
ILCO PHOS 213								X	X					X	X									X	
ILCO PHOS 214			X						X							X								X	
ILCO PHOS 215		X			X				X										X						
ILCO PHOS 300									X																
ILCO PHOS 302					X														X						
ILCO PHOS 366					X														X						
ILCO PHOS 12																									X
ILCO PHOS 404				X	X																				
ILCO PHOS 408				X	X																				
ILCO PHOS 412 S				X	X																				
ILCO PHOS 418				X	X																				
ILCO PHOS 468				X																					



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Phosphate Esters are used e.g. in the following industries:

Adhesives, Cosmetics/ Hair care, Coatings, Crop protection, Detergents/ Cleaners, Emulsion polymerization, Galvanic, Inks, Lubricants, Metal working, Mining, Oilfield, Paints/ Varnishes, Paper, Surface treatment, Textile/ Leather

Phosphites are used e.g. in the following industries:

Lubricants, Plastics



Properties & Applications - Phosphate Esters

	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)	Properties	Applications
ILCO PHOS 100	13 / 21 / 29	Acidic, water soluble under acidic conditions, less corrosive than mineral acids, provides high grease and lime-dissolving power, low foam, free rinsing, hard water stable, compatible with anionic and non-ionic surfactants.	<p>ILCO PHOS 100 is used as mild acid with low corrosion potential in acid cleaning agents. In aqueous solution, it acts as proton donator but it's much less corrosive than free mineral acids.</p> <p>Cleaners are notable for having a powerful acidic cleaning action without damaging surfaces or installations such as plastic surfaces, fittings, showers, bathtubs, acid-resistant enamel, toilettes and sinks.</p> <p>ILCO PHOS 100 is typically used in applications like bathroom cleaners, institutional cleaners, aluminium/stainless steel cleaners, plastic cleaners, filter cleaners for water treatment, railway carriage cleaners, maintenance chemicals.</p>
ILCO PHOS 101	- / 14 / -	-	<p>ILCO PHOS 102 is a mild on skin, anionic, non-ethoxylated O/W-emulsifier for cosmetic products. It supports the solubility of non-soluble liquids by modifying the surface tension. The reduced surface tension of the cosmetic products allows an equal distribution during application.</p> <p>INCI: POTASSIUM CETYL PHOSPHATE</p>
ILCO PHOS 102	7 / 15 / 19	Fast wetting, excellent dispersing power.	ILCO PHOS 103 is an excellent wetting and dispersing agent and is used as alternative to exchange nonylphenol ethoxylate based phosphate esters.
ILCO PHOS 200	12 / 20 / 24	Acidic, less corrosive than mineral acids, provides high grease and lime-dissolving power, low foam, free rinsing, hard water stable, compatible with anionic and non-ionic surfactants, soluble in oil and water, corrosion-inhibition, flame retardancy.	<p>ILCO PHOS 200 is employed in acid pickling and degreasing agents which are used for derusting and degreasing in the surface treatment of metals. It produces high-gloss effect on chromium, brass, stainless steel, copper, etc.</p> <p>Efficient acid cleaning agents for sanitary and building sector can be formulated with ILCO PHOS 200. Cleaners achieve high lime-dissolving power coupled with corrosion-inhibition properties.</p> <p>It works also as an antistatic agent. High phosphorus content and good water solubility enable this product to be used in water based flame retardant formulations for textiles.</p>
ILCO PHOS 201	10 / 18 / 22	High alkali stable, low foam, emulsifier, free rinsing, hard water stable, solubilization/hydrotrope.	ILCO PHOS 201 is used in textile industry as very effective antistatic agent with good wetting properties on low energy surfaces like polyolefines.



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	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)	Properties	Applications
ILCO PHOS 202	10 / 18 / 22	Antistatic agent, adhesion promoter, high alkaline stable, hard water stable.	ILCO PHOS 202 is used as a hardener for acid-curing paint systems as well as a pickling and anchoring agent for the application of paints. In printing inks ILCO PHOS 202 acts as flexibiliser. It can be used as adhesion promoter by interacting with polar groups of the substrate to the surface. Furthermore, it is used as antistatic agent especially on plastic film and as dispersing agent.
ILCO PHOS 203	8 / 15 / 19	High alkali stable, low foam, strong emulsifying and dispersing properties, high cleaning efficiency, free rinsing, hard water stable, solubilization/hydrotrope, corrosion-inhibition of metals.	ILCO PHOS 203 is mainly used as a wetting agent with defoaming ability in alkaline cleaning agents and in surface treatment for the printing and coating industry. Furthermore, it is known as a dispersing agent in pigment pastes. In metal pigment pastes the ester acts as corrosion inhibitor. ILCO PHOS 203 is also used as extraction and flotation agents.
ILCO PHOS 204	7 / 15 / 19	High alkali stable, low foam, strong emulsifying and dispersing properties, high cleaning efficiency, free rinsing, hard water stable, solubilization/hydrotrope, corrosion-inhibition of metals.	ILCO PHOS 204 can be used in neutral and alkaline cleaners with high cleaning power. It is also found in fibre finishes as antistatic additive.
ILCO PHOS 205	5 / 13 / 17	High alkali stable, low foam, strong emulsifying and dispersing properties, high cleaning efficiency, hard water stable, corrosion-inhibition of metals.	ILCO PHOS 205 can be used in neutral and alkaline cleaners with high cleaning power. It is also found in fibre finishes as antistatic additive.
ILCO PHOS 206	0 / 9 / 13	Defoamer, solid, aqueous thickener.	ILCO PHOS 206 is often used as efficient defoamer for high-temperature detergents. Foam regulation effect is activated between 60°C and 90°C. Defoaming works in soft and hard water. It can also be used as a thickener of aqueous solutions.
ILCO PHOS 207	0 / 8 / 12	Defoamer, solid.	ILCO PHOS 207 is often used as efficient defoamer for high-temperature detergents. Foam regulation effect is activated between 60°C and 90°C. Defoaming works in soft and hard water. It may be also used as a thickener of aqueous solutions.
ILCO PHOS 208	1 / 8 / 12	Defoamer, liquid at room temperature.	-
ILCO PHOS 209	8 / 16 / 20	Wetting, solubilization/hydrotrope, highly alkaline stable, emulsification, free rinsing.	Detergents, maintenance chemicals, textiles, agriculture.



ILCO CHEMIKALIEN

	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)	Properties	Applications
ILCO PHOS 210	7 / 15 / 18	The product is chemically stable in acidic & alkaline solutions and compatible with anionic & non-ionic surfactants. It shows good wetting and dispersing effects.	<p>ILCO PHOS 210 exhibits excellent dispensability for solid particles and can be used in acidic, neutral and alkaline cleaners.</p> <p>It is used as EP additive for metal working fluids and as dispersing agent in pigment preparations. It shows good antistatic and softening action on laundry. ILCO PHOS 210 exhibits excellent emulsifying action for water in chlorinated hydrocarbons and petroleum spirit.</p> <p>ILCO PHOS 210 is also used in cosmetic formulations. It acts as O/W emulsifier to promote the formation of intimate mixtures of non-miscible liquids by altering the interfacial tension. Its cleansing power helps to keep the body surface clean. The surfactant property lowers the surface tension of cosmetic formulations as well as aids the even distribution of the product when used.</p> <p>INCI: LAURETH-4 PHOSPHATE</p>
ILCO PHOS 211	7 / 15 / 19	Excellent wetting action, strong dispersing properties, effective corrosion inhibitor at pH > 6, acts as metal deactivator, chemically stable in acidic & alkaline solutions, compatible with anionic & non-ionic surfactants, can be used for the prevention of scale.	ILCO PHOS 211 can be used as detergent booster due to its good wetting and dispersing ability. It is also often found in formulations for crop protection and as emulsifier for the emulsion polymerization. In many cases ILCO PHOS 211 is also a good alternative to exchange nonylphenol ethoxylate based phosphate esters.
ILCO PHOS 212	8 / 16 / 20	Excellent wetting action, strong dispersing properties, effective corrosion inhibitor at pH > 6, acts as metal deactivator, chemically stable in acidic & alkaline solutions, compatible with anionic & non-ionic surfactants, can be used for the prevention of scale.	ILCO PHOS 212 can be used as detergent booster due to its good wetting and dispersing ability. It is also often found in formulations for crop protection and as emulsifier for the emulsion polymerization. In many cases ILCO PHOS 212 is also a good alternative to exchange nonylphenol ethoxylate based phosphate esters.
ILCO PHOS 213	8 / 16 / 24	ILCO PHOS 213 is a colourless to yellowish paste (liquid at >25°C) with a faint ester-like odour. It can be emulsified in water. The Product is chemically stable in acidic & alkaline solutions and compatible with anionic & non-ionic surfactants.	ILCO PHOS 213 is an excellent dispersing agent and is used as alternative to exchange nonylphenol ethoxylate based phosphate esters.
ILCO PHOS 214	7 / 14 / 18	-	ILCO PHOS 214 can be used in cosmetics e.g. in hair care applications.



ILCO CHEMIKALIEN

	HLB acidic (pH <5) / neutral (pH 6-9) / alkaline (pH > 10)	Properties	Applications
ILCO PHOS 215	3 / 11 / 15	ILCO PHOS 215 is a clear yellowish liquid with an ester-like odour. Water soluble after neutralization.	<p>Multifunctional additive for water based lubricants providing emulsification, anti-wear, extreme pressure, and corrosion inhibition. Preferred antiwear/emulsifier for water based metal working lubricants.</p> <p>ILCO PHOS 215 is also used in cosmetic formulations e.g. in hair cosmetics. It acts as O/W emulsifier to promote the formation of intimate mixtures of non-miscible liquids by altering the interfacial tension. The surfactant property lowers the surface tension of cosmetic formulations as well as aids the even distribution of the product when used.</p> <p>INCI: OLETH-5 PHOSPHATE</p>
ILCO PHOS 300	- / 14 / -	ILCO PHOS 300 is produced by direct esterification of phosphorus acid with C12/14 natural alcohol ethoxylate and subsequent neutralization with sodium hydroxide. Esterification degree: 15% Neutral Components, 5-10 % Monoesters, 45-50 % Diesters 24-28 % Triesters.	<p>ILCO PHOS 300 is an effective O/W emulsifier for the cosmetic industry. Low amounts (1.0 - 3.0%) are sufficient to achieve highly stable emulsions. It allows the manufacture of emulsions with polar oils and UV filters. Lotions and creams can be processed cold since ILCO PHOS 300 is liquid at room temperature.</p> <p>INCI: TRILAURETH-4 PHOSPHATE</p>



ILCO CHEMIKALIEN

ILCO Chemikalien GmbH

Brüsseler Allee 18 Phone: +49 (0) 2431 / 7 64 17
D - 41812 Erkelenz Fax: +49 (0) 2431 / 7 65 19
www.ilco-chemie.de info@ilco-chemie.de

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