

# Specialties

Jungbunzlauer



CITROFOL®



# CITROFOL®

## Range of Citric Acid Esters

CITROFOL® is our registered trademark for a range of versatile citric acid esters. Due to their pharmacological and ecological safety they can be used in a wide range of applications. Their chemical and physical properties lead to significant lower migration levels thus enabling them to replace non-ecological plasticisers.

Triethyl citrate	TEC	CITROFOL® AI
Acetyltriethyl citrate	ATEC	CITROFOL® AII
Tributyl citrate	TBC	CITROFOL® BI
Acetyltributyl citrate	ATBC	CITROFOL® BII

## What are Esters?

Esters are liquid products, made by the reaction of: **Acid + Alcohol → Ester + H<sub>2</sub>O**

The basic production process for CITROFOL® is as follow:

Citric acid	+	Ethanol	→	Triethyl citrate	=	CITROFOL® AI
Triethyl citrate	+	Acetic acid	→	Acetyltriethyl citrate	=	CITROFOL® AII
Citric acid	+	Butanol	→	Tributyl citrate	=	CITROFOL® BI
Tributyl citrate	+	Acetic acid	→	Acetyltributyl citrate	=	CITROFOL® BII



# Specification

The CITROFOL® range comprises clear, colourless liquids that are free of suspended solids and foreign matter. They are essentially odourless and grades are supplied according to the following purity criteria:

	CITROFOL® AI	CITROFOL® AII	CITROFOL® BI	CITROFOL® BII
Assay (GC)	min. 99.0%	min. 99.0%	min. 99.0%	min. 99.0%
Acidity (as citric acid)	max. 0.02%	max. 0.02%	max. 0.02%	max. 0.02%
Colour (APHA)	max. 30	max. 50	max. 50	max. 30
Turbidity (NTU)	max. 2	max. 5	max. 5	max. 2
Specific Gravity [a]25°	1.135 - 1.139	1.135 - 1.139	1.037 - 1.1047	1.045 - 1.1055
Refractive Index [a]25°	approx. 1.441	approx. 1.438	approx. 1.443	approx. 1.441
Water	max. 0.25%	max. 0.3%	max. 0.2%	max. 0.25%

Chemical specification	Triethyl citrate	Acetyltriethyl citrate	Tributyl citrate	Acetyltributyl citrate
Molecular formula	C <sub>12</sub> H <sub>20</sub> O <sub>7</sub>	C <sub>14</sub> H <sub>22</sub> O <sub>8</sub>	C <sub>18</sub> H <sub>32</sub> O <sub>7</sub>	C <sub>20</sub> H <sub>34</sub> O <sub>8</sub>
Molecular weight	276.3	318.3	360.4	402.5
Flash point °C	150	190	184	204
Boiling point (1,33mbar) °C	127	132	170	173
Pour point °C	-45.5	-42.8	-62	-59
Viscosity (25°C) mPa.s	35.2	53.7	32.9	32.7
Solubility in water (25°C) g/100 ml	6.5	0.72	insoluble	insoluble
Saponification value (DIN 53402)	610	705	467	558
Heat of combustion Kcal/mol	2.385	2.366	2.989	2.935
Heat of formation Kcal/mol	602	593	531	504
CAS-No.	77-93-0	77-89-4	77-94-1	77-90-7
EINECS	201-070-7	201-066-5	201-071-2	201-067-0
EU-No.	E 1505	-	-	-
FEMA	3083	-	-	3080

## Packaging

Storage in original or light sealed containers in a cool and dry place is recommended. CITROFOL® has a guarantee shelf life of 3 years when stored under this conditions (a retest is recommended after 3 years).

Optimum storage condition:  
temperature between 15-25°C



	CITROFOL® AI	CITROFOL® AII	CITROFOL® BI	CITROFOL® BII
Drum	25 kg	25 kg	-	25 kg
Drum	225 kg	225 kg	215 kg	215 kg
Container	1.000 kg	1.000 kg	1.000 kg	1.000 kg
Truck load	-	-	yes	yes



# Applications

## CITROFOL® in pharmaceuticals

- All CITROFOL® grades are safe products and recommended as plasticisers for medical applications.
- Enteric coatings for controlled release tablets with CITROFOL® provides a 37°C glass transition temperature with lower level of addition.
- For transdermal patches application CITROFOL® is recommended in hot-melt formulations.



## CITROFOL® in polymer products

- CITROFOL® exhibits very good compatibility with vinyl resins and cellulose derivatives. It also has a solvent action for natural resins. It is specially recommended as a solvent plasticiser for acrylate derivatives.
- CITROFOL® gives excellent heat and stability to resins, thus avoiding discoloration during sealing operations.
- CITROFOL® BII gives excellent flexibility to resins at low temperatures.
- CITROFOL® BII can be used to plasticise cellulose nitrate films. This gives them improved resistance to metals and thus confers better adhesion in comparison to conventional plasticisers.

## CITROFOL® in cosmetics and foodstuff

- CITROFOL® AI can be used as a solvent, diluent and as a fixative by the perfumers.
- CITROFOL® AI inhibits the enzymatic decomposition of the sweat components. It is therefore an excellent active agent for deodorants.
- CITROFOL® BII is used in new formulations of nail lacquers based on cellulose nitrate without phthalates, formaldehyde or toluene.
- CITROFOL® is used in the manufacture of low volatile hair sprays.
- CITROFOL® AI is a permitted food additive (E1505) as a carrier for flavours and processing aid to whip dried egg white.

## CITROFOL® in industrial uses

- CITROFOL® has only a little migration into greasy finished products because of its oil resistance and is therefore recommended for can coatings.
- CITROFOL® is stable to light and ideally suited for the manufacture of lacquers.
- CITROFOL® BII is used for the manufacture of special printing inks based on cellulose nitrate for food packaging.
- CITROFOL® BII improves the UV-resistance of acrylic glass used for solariums.



# What are Plasticisers?

Plasticisers are usually liquid, occasionally solid indifferent organic substances of a predominantly ester nature. They can physically interact with highly polymerised substances and form a homogenous system.

It imparts certain desired physical properties to these substances such as reduce hardness increased deformation power, plasticity, elasticity. Our range of CITROFOL® is efficient as a plasticiser with

excellent compatibility for all kinds of polymers. Due to their high boiling point they have very low volatility, thus losses from migration are insignificant.



	Symbols	TEC	ATEC	TBC	ATBC
Cellulose acetate	CA	C	C	S	S
Cellulose acetate-butyrate	CAB	C	C	S	S
Cellulose nitrate	CN	C	C	C	C
Ethyl cellulose	EC	O	O	C	C
Poly isobutylene	PIB	O	O	O	C
Poly methyl metacrylate	PMMA	C	C	C	C
Poly styrene	PS	S	S	O	C
Poly vinyl acetate	PVA	C	C	C	C
Poly vinyl butyral	PVB	C	C	C	C
Poly vinyl chloride	PVC	C	C	C	C
Vinyl chloride / Vinyl acetate copolymer	VC/VAC	C	C	C	C
Poly vinylidene chloride	PVDC	C	C	C	C
Poly vinyl pyrrolidone	PVP	C	C	C	C

Compatible           C  
 Slightly compatible   S  
 No data               O

The information contained herein has been compiled carefully to the best of our knowledge. We do not accept any responsibility or liability for the information given in respect to the described product. Our product has to be applied under full and own responsibility of the user, especially in respect to any patent rights of other and any law or government regulation.

# World-wide Distribution

The world-wide marketing and sales organisation of the Jungbunzlauer Group covers more than 130 countries. Jungbunzlauer operates through reputable local agencies and several wholly owned sales companies. Since 1993, the Jungbunzlauer headquarters are located in Basel, Switzerland.

Jungbunzlauer is an international company with roots dating back to 1867 when it was founded in the village of Jung Bunzlau, at that time part of the Austro-Hungarian Empire. Jungbunzlauer utilizes fermentation technology to produce natural, biodegradable additives.

Today Jungbunzlauer is one of the world's leading manufacturers of citric acid and citrates, xanthan gum, sodium gluconates and glucono-delta-lactone. Jungbunzlauer also offers a wide range of specialties such as dry vinegar powder, coated food acids, sodium diacetate and citric acid esters.

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