

SunPak® FSP

1. Description

SunPak FSP is a series of low migration* sheetfed offset process and base inks for sensitive (food, cosmetics, healthcare, pharmaceutical and tobacco) packaging, based on high bio-renewable content.

2. Product features

SunPak FSP inks:

- support the production of food contact materials which comply with all relevant regulations in EU, US and China. For further details see chapter 7.
- allow the production of food packaging with very good organoleptic (low odour*, taint*, hexanal*) properties as well as safe migration* levels far below the overall (or global) migration limit of 60mg per 1 kg food (60ppm) or 10mg/dm² of packaging surface area referring to the "EU cube" where 1 kg food is packed in a surface of 600 cm².
- are based on oils and esters which are evaluated as non-toxic for the human body. There are no restrictions for the daily intake. Consequently, the European Food Safety Authority (EFSA) does not assign a Specific Migration Limit.
- The SunPak FSP process and base ink formulations have received a C2C Certified Material Health Certificate™ at the Bronze level.
- do not use Triarylcarbonium-pigments with complex anions (so-called "Fanal" pigments), due to their low resistances and potential contamination by cleavage products
- are vegetable based and mineral oil free. SunPak FSP inks do not contain Bisphenol A.
- contain 68-84% of renewable materials determined by an independent institute by the so called C14 method
- are available as a 4-process colour ink set, a range of base inks for spot colour mixing and metallics
- the process colours comply with ISO 2846-1 (colour standard) and allow printing in accordance to ISO 12647-2 (print standardisation)
- do not dry by oxidation and therefore do not contain drying catalysts, based on heavy metals such as cobalt, manganese, etc.
- are roller fresh

*See glossary at the end of this document

3. Product Suitability

3.1 Applications

The main application of SunPak FSP inks is low odour and low migration packaging (folding cartons, wrappers, etc.) for the food, cosmetic, pharmaceutical or tobacco industry.

Preferred press configurations are straight 4+ colour sheetfed offset presses of all makes and sizes with a unit for aqueous coatings.



Packaging converters should assure themselves that the use of this product has been fully assessed for risk and that the packaging produced meets regulatory requirements for the intended use.

Whilst SunPak FSP inks are versatile in performance, they may not be suitable if used outside the above described applications. If in doubt, please check suitability with your local Sun Chemical representative.

SunPak FSP inks should not be used in the following areas:

- Where the application of an aqueous coating is not an option.
- Printing on non-absorbent substrates (films, foils, metal plates, metallised paper, PE layer of laminated boards, etc.)
- Poster printing
- Skin-or Blister Packaging
- Direct Food Contact applications

SunPak FSP inks are not designed for direct food contact (physical contact between ink and food). In case of questions an individual risk assessment is mandatory.

3.2 Substrate

SunPak FSP inks are suitable for the following substrates:

- Single- or double side coated carton board
- Single- or double side coated paper

Please make sure that these substrates comply with the end use requirements (organoleptics, migration).

3.3 Varnishability

Inline overprinting with an aqueous coating is mandatory. Please make sure that these coatings comply with the end use requirements (organoleptics, migration).

FSB11, FSB33, FSP27, FSB35 and FSB42 are not resistant to either alcohol or alkali. Since the testing agents specified in ISO 2836 are more severe than solvent-free aqueous coatings, problems linked to the use of the aforesaid bases are not expected. As a precaution, Sun Chemical recommends the use of solvent-free coatings.

FSB65 and FSB 95 are based on so-called Alkaliblu pigment. This class of pigments has very limited resistances against alcohol and solvents and tend to bleed when being over-varnished. A test under industrial conditions is absolutely mandatory to avoid customer complaints. Wherever possible, FSB65 and FSB95 should be replaced by other FSB bases.



3.4 Interaction with plastic films

In some cases printed material is wrapped with plastic films (e.g. tobacco or confectionary packaging). Some polymers (like Polyethylene or Polypropylene) tend to absorb (liquid) ink components resulting in a cloudy appearance of the film or a dimension change, often described as "swelling".

SunPak FSP has a significantly reduced potential of solvent migration, however a test under industrial condition is advised if film swelling could be an issue.

3.5 Hot Foil stamping

The adhesion between the different layers carton board, ink, varnish and lamination foil is essential for the final result. Therefore, for hot foil stamping applications a waiting time of minimum 48 hours is requested. A suitable combination of water-based coating and foil is mandatory for the application of hot foil stamping.



4. Colour Range

4.1 Metallic Inks

ONE PACK METALLIC INKS	PRODUCT CODE
SUNPAK FSP Pale Gold	MT651
SUNPAK FSP Rich Pale Gold	MT652
SUNPAK FSP Rich Gold	MT653
SUNPAK FSP Silver	MT661
TWO PACK METALLIC INKS	
SUNPAK FSP Pale Gold 2P	MT621
SUNPAK FSP Rich Pale Gold 2P	MT622
SUNPAK FSP Rich Gold 2P	MT623
SUNPAK FSP Premium Silver 2P	MT611
SUNPAK FSP Varnish untoned	MT691

If SunPak FSP Metallics are supplied as a 2 pack system (see table above), it is recommended to mix the two components directly before printing. The mixing ratios are:

Gold Bronze : Varnish = 1 : 1 (weight/weight)

Depending on the substrate the ratio can be raised up to 6 : 4 to increase the metallic sheen

Silver Bronze : Varnish = 1 : 3 (weight/weight)

The addition of any other additives is not advised. Please note that mixed ink (two pack system) will deteriorate by time concerning organoleptic properties. Therefore, the storage of (mixed) finished inks should be limited to 2 weeks maximum.
Press returns have to be disposed.

Onepack SunPak FSP Metallics are ready to print and do not require the addition of other compounds.



4.2 Process and base Inks

SunPak FSP inks are available as bespoke finished process and base inks.

PROCESS COLOURS	PROD. CODE		LIGHT ISO12040	ALCOHOL ISO2836	SOLVENT ISO2836	ALKALI ISO2836
SUNPAK FSP Process Black	FSP46	Toned Black	8	+	+	+
SUNPAK FSP Process Cyan	FSP25	Standard Cyan	8	+	+	+
SUNPAK FSP Process Magenta	FSP27	Standard Magenta [#]	5	+	+	-
SUNPAK FSP Process Yellow	FSP26	Standard Yellow	5	+	+	+
STANDARD BASE INKS						
SUNPAK FSP Yellow	FSB18	Mid Shade Yellow	5	+	+	+
SUNPAK FSP Orange	FSB21	Orange	5	+	+	+
SUNPAK FSP Orange	FSB07	Resistant Orange	6	+	+	+
SUNPAK FSP Red	FSB33	Warm Red ^{**}	5	-	-	+
SUNPAK FSP Resistant Red	FSB66	Resistant Red	7	+	+	+
SUNPAK FSP Rubine	FSB42	Red Shade Magenta [#]	5	+	+	-
SUNPAK FSP Rubine	FSB35	Blue Shade Magenta [#]	5	+	+	-
SUNPAK FSP Red	FSB36	Resistant Magenta	6	+	+	+
SUNPAK FSP Carmine	FSB37	Res. Blue Shade Magenta	6	+	+	+
SUNPAK FSP Resistant Pink	FSB54	Resistant Pink	7	+	+	+
SUNPAK FSP Violet	FSB53	Resistant Violet	7	+	+	+
SUNPAK FSP Blue	FSB17	Cyan	8	+	+	+
SUNPAK FSP Reflex Blue	FSB95	Reflex Blue Shade [#]	3	-	-	+
SUNPAK FSP Green	FSB71	Green	8	+	+	+
SUNPAK FSP Black	FSB50	Untoned Black	8	+	+	+



ADDITIONAL SPECIAL BASES						
SUNPAK FSP Yellow	FSB11	Green Shade Yellow [#]	7	-	-	+
SUNPAK FSP RUBINE	FSX35	Blue Shade Magenta conc.#, ##	5	+	+	-
SUNPAK FSP BLUE	FSX17	Cyan concentrated ##	8	+	+	+
SUNPAK FSP RESISTANT REFLEX BLUE	FSB63	Resistant Blue	7	+	+	+
WHITES						
SUNPAK FSP TRANSPARENT WHITE	FSB48	Transparent White				
SUNPAK FSP OPAQUE WHITE	FSB45	Opaque White				

[#]See chapter 3.3 Varnishability.

*Please note that this base ink may tend to fade in particular in conjunction with elevated temperatures and when being used in small proportions.

FSX35 and FSX17 are highly concentrated and should be used if the relevant FSB bases do not reach the expected colour strength.

5. General Handling

5.1 Storage

SunPak FSP inks should be stored at ambient temperature between 5°C and 35°C. Under these conditions SunPak FSP inks have a shelf life of at least 36 months in an unopened vacuum-packed tin.

Inks supplied in drums or pails should be used within 24 months after production. Drums and pails having exceeded 24 months may be fit for purpose but must be inspected before usage. Inks in drums or pails should be worked off within 6 months after the removal of the lid.

SunPak FSP bronze pastes and SunPak FSP Silver (one pack) have a shelf life of 12 months after production. SunPak FSP Golds (one pack) have a shelf life of 6 months. The shelf life of SunPak FSP Gold is currently further tested and will most likely be extended to one year.

When storing opened containers, it is advised not to apply any chemicals (e.g. antioxidants) onto the surface.

5.2 Waste disposal

SunPak FSP ink waste can be handled as any other sheetfed ink waste. This should be carried out in accordance with good industrial practice, observing all the appropriate local, national and regional regulations and guidance.

6. Printing Conditions and press room consumables

All press room consumables could have a negative influence on the organoleptic properties and could be potential migrants. Therefore a careful selection considering these impacts needs to be carried out.



6.1 Fount Solution

Fountain solution additives are available for all water qualities, press types and IPA (alcohol) levels. For achieving best values regarding odour and taint as well as migration the selection of the right fountain solution additive is vital. With regard to fountain solution related press performance other parameters such as water quality and press conditions have to be considered.

6.2 Printing Ink auxiliaries

The addition of up to 5% of SunPak LMQ Tack Reducer Gel LMC70 enables printing on difficult cardboards.

6.3 Printing Plates

SunPak FSP can be run with any type of aluminium based printing plates (CtP plates, conventional positive or negative plates).

6.4 Print density of metallic inks

Depending on the press conditions and substrates we recommend a wet colour density for gold of OD 1.4 to OD 1.6. The density should be measured with the filter for Yellow, using the polarisation filter. The wet density for silver should be in the range of OD 0.9 to OD 1.1 measured with the filter for cyan, using the polarisation filter.

6.5 Press cleaning

To avoid contamination from standard print shop consumables the press should be ideally dedicated to food packaging printing and only run with SunPak FSP inks and press aids appropriate for food packaging. If this is not possible, we recommend cleaning the press thoroughly in order to extract absorbed substances from rollers and printing blankets.

For more specific handling advice refer to the Sun Chemical Best Practice Guide for food packaging printing and the Safety Data Sheet (SDS).

6.6 Influence of IR drier

The use of IR drier is not recommended as it might lead to an increased risk of blocking in the delivery pile.

7. End-use safety / Regulations

The SunPak FSP ink range is designed for use on the non-food-contact side of food packaging provided that the inks are applied under the relevant Good Manufacturing Practices (GMP) and according to the recommendations of this Technical Data Sheet.

SunPak FSP inks allow the production of food packaging compliant with these relevant requirements. However, the printer, converter and the packer/filler have the legal responsibility to



ensure that the finished article is fit for the intended purpose and that the ink and coating components do not migrate into the food at levels that exceed legal and industry requirements as outlined in the EU Framework Regulation (EC) No 1935/2004, the GMP Regulation (EC) No 2023/2006, Swiss Ordinance on Materials and Articles in Contact with Food (SR 817.023.21), as well as the US FDA regulations and the Chinese Standard GB 9685-2016. We recommend that the finished packaging is tested under appropriate representative conditions of use, if there are any doubts regarding compliance.

All Sun Chemical Europe printing inks and related materials are formulated in accordance with the CEPE/EuPIA Exclusion Policy. This excludes from use all materials classified according to the CLP Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures as carcinogenic, mutagenic or toxic for reproduction in categories 1A or 1B with hazard statements H340, H350 or H360, in addition to toxic or highly toxic materials with hazard statements H300, H301, H310, H311, H330, H331, H370 or H372. None of the raw materials used in inks supplied intentionally contain the heavy metals Antimony, Arsenic, Cadmium, Chromium (VI), Lead, Mercury, Selenium. A copy of the document is available on the EuPIA website: <http://www.eupia.org>

SunPak FSP also complies with the EuPIA “Guideline on Printing Inks applied to the non-food Contact Surface of Food Packaging Materials and Articles”, the EuPIA “Good Manufacturing Practices – Printing inks for food contact materials” which is in compliance with the European Regulation (EC) No 2023/2006. Copies of these documents are available on the EuPIA website: <http://www.eupia.org>.

SunPak FSP is produced in a dedicated printing ink plant avoiding cross-contamination to an utmost degree. In this plant, various HACCP principles are realised to provide maximum working hygiene.

All components of SunPak FSP are listed in Annex 10 of the Swiss Ordinance on Materials and Articles in Contact with Food (SR 817.023.21).

The migratory substances are listed as a “generally recognised as safe” (GRAS) food ingredient or direct food additive by the US FDA.

A “Statement of Composition” is available on request for SunPak FSP to assist risk assessment calculations. SunPak FSP is regularly tested by an accredited 3rd party institute regarding the use for food packaging. A relevant certificate is available on request.

SunPak FSP inks fulfil the demands on heavy metals of the Packaging and Packaging Waste Directive (94/62/EC) as well as the CONEG heavy metal limits.

SunPak FSP inks do not contain chemical catalysts based on Cobalt (Co), Manganese (Mn) or other metal catalysts.



8. Technical Glossary

Aldehydes are a family of chemical compounds, as pentanal, hexanal*, heptanal and octanal. They can easily be quantified by means of analytical chemistry such as gas chromatography (GC*).

FDA: The Food and Drug Administration of the United States is a respected consumer protection agency which promotes and protects the public health and sets rules and approves materials.

GC separates mixtures of chemical compounds and indicates their concentration. Subsequent in-line analysis, e.g. mass spectrometry (MS), identifies every compound. There is no international standard for the determination of aldehydes in prints. Laboratories who wish to compare their results with other partners have to agree on specific details of the test procedure.

Hexanal is an odorous compound which is created by oxidative decomposition of vegetable oils, common in conventional sheetfed offset inks. SunPak FSP inks do not undergo such a chemical reaction with oxygen.

Migration is the (unwanted) transfer of substances from the packaging or its components (printing ink, substrate, varnish etc.) into the packaged product (e.g. foodstuff). Solvents used in standard (oxidative drying) sheetfed offset inks may show a significant migration potential. Migration is assessed by appropriate test methods and can occur whilst the organoleptic properties maintain unaffected.

The **Specific Migration Limit (SML)** is the maximum permitted amount of a given substance that can be released into food or an appropriate food simulant. SML is generally expressed in mg/kg of food.

Overall Migration Limit (OML) means the maximum total permitted amount of non-volatile substances released from a material or article into food or simulants, also expressed as mg/kg of food. The Overall Migration Limit is 60mg per kg of food or 10mg/dm² of packaging surface area is sometimes also called Global Migration Limit.

Odour/taint can be assessed in organoleptic tests, as EN 1230-1 (odour) and EN 1230-2 (taint).

High temperature applications

Caution should be used when creating print designs containing large areas of carbon black for applications where microwave heating is used. There have been a small number of reported instances of a potential fire hazard when packaging printed with a printing ink based on carbon black pigment were heated in a microwave oven. These incidents appear to be rare and specific to design and pack geometry. Consequently, Sun Chemical advises that products printed with carbon black containing inks, FSP46 and FSB50 or blends out of either product, intended for microwave applications be assessed under appropriate conditions to ensure they are fit for that purpose. If necessary, a trichromatic black blend can be used in place of a carbon black based ink.

The use of printing inks and coatings for domestic **oven applications** is critical for several reasons:



1. Chemical compounds may decompose under the influence of heat. This is obvious when the substrate or the printing ink begin to discolour, which is standard under oven temperature. Further to this, decomposition may happen without being visually noticed. It is therefore important to check not only the migration of the substances originally present in the dried ink film but in addition the decomposition products that may have formed during the heating process.
2. The following SunPak FSP products shall never be used for high temperature applications: Metallics (MTxxx), FSP26, FSB11, FSB18, FSB21, FSB33 and FSB95. For recommendations on products that may be suitable for ovenable applications, dependent on ink coverage, pack geometry, food type and temperature then please consult a Sun Chemical representative.
3. Printed carton board packaging exposed to heat releases volatile compounds which are constitutional parts of the substrate, the printing ink or the overprint varnish. SunPak FSP is not based on volatile chemicals. For conventional sheetfed applications it represents a technically viable solution regarding migration even under elevated temperature conditions.
4. The surface of inks and coatings will soften at oven temperatures. This may result in set-off when being touched by the consumer. Although this is not likely to be harmful, it might be negatively recognised.

Sun Chemical strongly recommend that the food is removed from the printed packaging before heating. As we are not able to test printed packaging under all kinds of conditions at elevated temperatures the performance and the suitability of the final packaging must be checked under the intended conditions of use.

Further information is available in the EuPIA Information Note "Inks and coatings for High Temperature Applications" which you can find on the EuPIA website: <http://www.eupia.org> .

Oxidation is a chemical reaction with oxygen, often initiated by a drying catalyst. By-products of this chemical reaction are aldehydes and other odorous compounds. Unlike oxidative drying sheetfed offset inks, SunPak FSP inks do not contain any drying catalyst to support drying by oxidation.

9. Technical Assistance / Contacts

For further information, please contact your local Sun Chemical team.

All aspects of safe food packaging printing are compiled in a Best Practice Guide for Food Packaging printing.



10. Disclaimer

Our Products are intended for sale to professional users. The information herein is general information designed to assist customers in determining the suitability of our products for their applications. All recommendations are made without guarantee, since the application and conditions of use are beyond our control. We recommend that customers satisfy themselves that each product meets their requirements in all respects before commencing a print run. There is no implied warranty of merchantability or fitness for purpose of the product or products described herein. In no event shall Sun Chemical be liable for damages of any nature arising out of the use or reliance upon this information. Modifications of the product for reasons of improvements might be made without further notice.



Appendix

Spot Colour Management

For optimum colour consistency it is recommended to use precise proofing equipment and a colour computer. For SunPak FSP users Sun Chemical provide colour data bases for effective colour matching. They are available for various substrates as coated and uncoated papers and for cardboards.

Depending on their colour (whiteness) and on the oil-absorbency one and the same spot colour ink might look differently when being printed on various substrates. Further to this it must be noted that most colours change during the drying process of the ink. If the print is in-line varnished this effect is minimised. These effects must be respected if a precise colour specification is agreed.

Dark colours and those of high colour strength often show the so-called bronzing effect which is a colour impression varying with the observation angle. This is not a product failure and influenced by the surface of the substrate. In-line coating or foil lamination eliminates the bronzing effect.

If (proof) prints are not over coated, the level of gloss, which is substrate depending, will have an impact on the reading of spectrophotometers.

The human eye and spectrophotometers assess bronzing and gloss differently. The make of spectrophotometers, in particular the geometry and the software used, respect gloss and bronzing in the calculation of the colour data in a different way. Therefore, specifying colour data must always include the substrate, the conditions of proof printing, the use of an overprint coating (or not) and the time between printing and assessment.

Fastness and resistance requirements

During its lifetime, a print might change its colour. Light fastness and resistance parameters describe the ability of the print to maintain the colour under the conditions of its application. The product table (see page 4 of this document) contains the parameters evaluated using test methods agreed in international standards.

The parameters of the pure base inks are unlike to those of a blended spot colour. As a general rule, it is the base ink with the lowest resistance that defines the overall fastness/resistance value. Higher pigmented inks are usually more persistent, the resistance is reduced the more the strength of the shade is reduced. Resistance levels can also vary in practice caused by a number of factors as pigment compositions, substrate, colour strength, film weight used, the printed picture (solids, screened half-tones), storage conditions, exposure time etc.

Light fastness

Light fastness is important where prints are exposed to sunlight.

The light fastness for packaging inks varies with the intended use. Packaging which are supposed to be stored close to a window should have a light fastness of at least WS 5.



Chemical resistances

Resistance properties play a role when the prints are processed (coating, foil-laminating) or the prints are exposed to chemicals, as detergents. Water-based overprint varnishes may contain solvents or high percentage of ammonia, which can require the resistance against alkaline and alcohol. A test under practice conditions is advised.

UV coatings contain monomers which might have an impact on the print. Often alkaline, alcohol and solvent resistance are demanded. Again, a test under industrial conditions is recommended.

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C2C Certified Material Health Certificate™ is a trademark of the Cradle to Cradle Products Innovation Institute.

