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Suitable
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SunChemical®
Coates Screen Inks

PLASTIC SUBSTRATES & SCREEN PRINTING INKS BIBLE

THERMOPLASTICS

ABS: Acrylonitrile Butadiene Styrene

- DESCRIPTION

ABS is a graft copolymer made by dissolving styrene-butadiene copolymer in a mixture of acrylonitrile and styrene monomers, then polymerizing the monomers with free-radical initiators in an emulsion process. ABS is a tough, heat-resistant thermoplastic. The three structural units provide a balance of properties, the butadiene groups imparting good impact strength, the acrylonitrile affording heat resistance, and the styrene units giving rigidity.

- PROPERTIES

The mechanical properties for ABS are good for impact resistance even at low temperatures. The weather resistance for ABS is restricted, but can be drastically improved by additives as black pigments. The chemical resistance for ABS is relatively good and water, non-organic salts, acids and basic do not affect it. The material will dissolve in aldehyde, ketone, ester and some chlorinated hydrocarbons.

Dilute Acid	*Very good*
Dilute Alkalis	*Very good*
Oils and Greases	*Very good*
Aliphatic Hydrocarbons	*Moderate*
Aromatic Hydrocarbons	*Poor*
Halogenated Hydrocarbons	*Poor*
Alcohols	*Poor (variable)*

- APPLICATIONS

Because of its good balance of properties, toughness/strength/temperature resistance coupled with its ease of moulding and high quality surface finish, ABS has a very wide range of applications. These include domestic appliances, telephone handsets computer and other office equipment housings, lawn mower covers, safety helmets, luggage shells, pipes and fittings. Because of the ability to tailor grades to the property requirements of the application and the availability of electroplatable grades ABS is often found as automotive interior and exterior trim components

- IDENTIFICATION

Blue flame with yellow edges, acrid odour.

- TRADE NAMES

Cycolac, Lustran, Magnum, Novodur, Polylac, Terluran, Toyolac

ABS Blends

- ABS + PA *Triax*
- ABS + PC *Bayblend, Cycoloy, Iupilon, Pulse, Terblend*
- ABS + PVC *Lustran ABS, Novaloy, Royalite*
- ABS + TPU *Desmopan, Estane, Prevail*

- SUITABLE INKS

SCREEN	
CP	
HG	
PK/PK-Jet	
XL	
YN	
Z/PVC	
Z	
ZM	
ZMN	
UVU	
UVPO	
UVE	
UV-650018	

CA: Cellulose Acetate

- DESCRIPTION

Cellulose Acetate is a natural plastic, which is manufactured from purified natural cellulose. Natural cellulose of the appropriate properties is derived primarily from two sources, cotton linters and wood pulp. In the manufacturing process of Cellulose Acetate, natural cellulose is reacted with acetic anhydride to produce Cellulose Acetate.

- PROPERTIES

Cellulose Acetate granules are a high performance thermoplastic with a unique combination of properties that make it the material of choice for many applications. These properties include high transparency, high impact and mechanical strength. Cellulose Acetate has good chemical resistance to diluted aqueous solutions with acidic base and inorganic salts, paraffinic hydrocarbons. Alcohols, aromatic hydrocarbons or solvents with chlorine, nitro benzene, or similar aromatic solvents chemically affect Cellulose Acetate.

Dilute Acid	*Moderate*
Dilute Alkalis	*Poor*
Oils and Greases	*Very good*
Aliphatic Hydrocarbons	*Very good*
Aromatic Hydrocarbons	*Poor*
Halogenated Hydrocarbons	*Poor*
Alcohols	*Poor*

- APPLICATIONS

Cellulose Acetate is used in shoe heels, eyeglass frames, toothbrush handles, pen and pencil barrels, piano keys, beads, toys, fisherperson's floats and tackle, cutlery handles, combs and steering wheels.

- IDENTIFICATION

Yellow flame with sparks, vinegar odour.

- TRADE NAMES

Cellidor A, Cellon, Lumarith, Rhodialite, Rhodoïd, Setilitte, Trialithe

- SUITABLE INKS

Upon receipt of the substrate, a suitable ink test compatibility will be carried.

CAB: Cellulose Acetate Butyrate

- DESCRIPTION

Cellulose acetate butyrate is a thermoplastic that can be produced in clear form or a wide variety of translucent or opaque tints and colors. It is a plastic vulnerable to damage from ketones or alcohols due to its soft, pliable nature, which allows it to be stretched up to 60% of its original length before it breaks.

- PROPERTIES

One of the unique features of cellulose acetate butyrate is its ultraviolet resistance, which gives it applications where high surface gloss is needed, such as in the production of lacquers for outdoor surfaces, for lenses, and for various forms of plastic film. Though alkalis, acetones in paint remover, and alcohols can break down the chemical structure of cellulose acetate butyrate, it is otherwise resistant to common household chemicals.

- APPLICATIONS

The versatile and inert properties of the compound also make it useful for the manufacture of many types of toys and sporting goods, tool handles, panels for illuminated signs, steering wheels, goggles, bathroom fittings, decorative trim for cars and consumer durables, drawing stencils, pens, pneumatic system traps, blister packaging, laminating with aluminum foil.

- IDENTIFICATION

Yellow flame with blue tip, rancid butter odour.

- TRADE NAMES

Cellidor B, Tenite, Uvex

- SUITABLE INKS

Upon receipt of the substrate, a suitable ink test compatibility will be carried.

EVA: Ethylene Vinyl Acetate

- DESCRIPTION

Ethylene can be copolymerized with a number of other compounds. Ethylene-vinyl acetate copolymer (EVA), for instance, is produced by the copolymerization of ethylene and vinyl acetate under pressure, using free-radical catalysts. Many different grades are manufactured, with the vinyl acetate content varying from 5 to 50 percent by weight. EVA copolymers are more permeable to gases and moisture than polyethylene, but they are less crystalline and more transparent, and they exhibit better oil and grease resistance.

- PROPERTIES

The material has good clarity and gloss, low-temperature toughness, stress-crack resistance, hot-melt adhesive waterproof properties, and resistance to UV radiation.
EVA is softer, clearer and more permeable than LDPE. Compared to LDPE, EVA has better stress cracking resistance, is tougher and will accept fillers more readily.

Dilute Acid	*Very good*
Dilute Alkalis	*Very good*
Oils and Greases	*Good*
Aliphatic Hydrocarbons	*Very good*
Aromatic Hydrocarbons	*Poor*
Halogenated Hydrocarbons	*Poor*
Alcohols	*Very good*

- APPLICATIONS

Principal uses are in packaging film, adhesives, toys, tubing, gaskets, wire coatings, drum liners, and carpet backing. EVA has a distinctive "vinegar" odor and is competitive with rubber and vinyl products in many electrical applications.
EVA is used in biomedical engineering applications as a drug delivery device.
EVA foam is used as padding in equipment for various sports such as ski boots, bicycle saddles, hockey pads, boxing and mixed martial arts gloves, helmets, wakeboard boots, waterski boots, fishing rods, and fishing reel handles. In fishing rods, it is used to construct handles on the rod-butt end. EVA can be used as a substitute for cork in many applications. One prominent ethylene-methacrylic acid copolymer is Surlyn, which is made into hard, tough, abrasion-resistant golf-ball covers.

- IDENTIFICATION

Vinegar odour.

- TRADE NAMES

Elvax, Hanwha, Levaprene, Melthene, Rexene, Surlyn, Soarnol, Ultrathene

- SUITABLE INKS

SCREEN
ZE 1690

PA: Polyamide

- DESCRIPTION

A polyamide is a polymer that contains recurring amide groups (R-CO-NH-R') as integral parts of the main polymer chain. Synthetic polyamides are produced by a condensation reaction between monomers, in which the linkage of the molecules occurs through the formation of the amide groups. The most important amide polymers are the nylons, an extremely versatile class of material that is an indispensable fibre and plastic.
Nylons are typified by amide groups and encompass a range of material types (e.g. Nylon 6,6; Nylon 6,12; Nylon 4,6; Nylon 6; Nylon 12 etc.), providing an extremely broad range of available properties. Nylon is used in the production of film and fibre, but is also available as a moulding compound.

- PROPERTIES

The majority of nylons tends to be semi-crystalline and is generally very tough materials with good thermal and chemical resistance. The different types give a wide range of properties with specific gravity, melting point and moisture content tending to reduce as the nylon number increases.
Nylons tend to absorb moisture from their surroundings. In general, the impact resistance and flexibility of nylon tends to increase with moisture content, while the strength and stiffness below the glass transition temperature (< 50-80 °C) decrease. The extent of moisture content is dependent on temperature, crystallinity and part thickness. Nylons tend to provide good resistance to most chemicals; however can be attacked by strong acids, alcohols and alkalis.
Nylons can be used in high temperature environments.

Dilute Acid	*Poor*
Dilute Alkalis	*Good*
Oils and Greases	*Very good*
Aliphatic Hydrocarbons	*Very good*
Aromatic Hydrocarbons	*Very good*
Halogenated Hydrocarbons	*Good (variable)*
Alcohols	*Poor*

- APPLICATIONS

Glass reinforced polyamides are the material of choice for applications such as power tool housings. Transparent amorphous polyamides are available and find application in sterilisable medical components and sight glasses.
Moulding and extrusion compounds find many applications as replacements for metal parts, for instance in car engine components. Intake manifolds in nylon are tough, corrosion resistant, lighter and cheaper than aluminum (once tooling costs are covered) and offer better airflow due to a smooth internal bore instead of a rough cast one.
Electrical insulation, corrosion resistance and toughness make nylon a good choice for high load parts in electrical applications as insulators, switch housings and the ubiquitous cable ties. Another major application is for power tool housings.

- IDENTIFICATION

Blue flame with yellow tip, burnt wool or hair odour.

- TRADE NAMES

Akulon, Altech, Amilan, Bylon, Capron, Celanese, Estamid, Gapex, Grilamid, Kevlar, Lauramid, Nomex, Nylon, Perlon, Ultramid

- SUITABLE INKS

SCREEN		
PF	□	Flame pre-treatment recommended
TZ	□	Flame pre-treatment recommended
YN	□	Flame pre-treatment recommended
Z	□	Flame pre-treatment recommended
ZMN	□	Flame pre-treatment recommended

PC: Polycarbonate

- DESCRIPTION

Marketed under the trademarked names Lexan and Merlon, among others, PC is a special type of polyester used as an engineering plastic. It has exceptional stiffness, mainly by virtue of having more aromatic rings incorporated into the polyester chain. This structure is arrived at by reacting bisphenol A, an aromatic derivative of benzene, with phosgene, a highly reactive and toxic gas.
Polycarbonate is highly transparent, has impact strength considerably higher than most plastics, and can be injection-molded, blow-molded, and extruded. These properties lead to its fabrication into large carboys for water, shatterproof windows, safety shields, and safety helmets.

- PROPERTIES

Polycarbonates are strong, stiff, hard, tough, transparent engineering thermoplastics that can maintain rigidity up to 140°C and toughness down to -20°C or special grades even lower. The material is amorphous (thereby displaying excellent mechanical properties and high dimensional stability), is thermally resistant up to 135°C and rated as slow burning. Constraints to the use of PC include limited chemical and scratch resistance and its tendency to yellow upon long-term exposure to UV light. However, these constraints can be readily overcome by adding the right additives to the compound or processing through a co-extrusion process.
Polycarbonate is available in a number of different grades dependent on the application and chosen processing method. In addition, blends of PC are available with e.g. ABS or Polyesters, widely used in automotive industry.

Dilute Acid	*Good*
Dilute Alkalis	*Poor*
Oils and Greases	*Moderate*
Aliphatic Hydrocarbons	*Good*
Aromatic Hydrocarbons	*Poor*
Halogenated Hydrocarbons	*Poor*
Alcohols	*Good*

- APPLICATIONS

Applications of PC include safety glazing, safety shields, non-breakable windows, automotive taillights, electrical relay covers, various appliance parts and housings, power tool housings, automotive exterior parts, and blow-molded bottles, glazing panels, light fittings, safety helmets and medical components. PC/ABS is used in automotive body panels (doors) and housewares (small appliances).
In recent years, Polycarbonate blends have become increasingly commercially important. PC is widely used in blends due to its excellent compatibility with a range of polymers. Typical blends include rubber modified PC, improving impact properties, PC/PBT blends, which allow toughness to be retained at lower temperatures and having improved fuel and weather resistance. Amongst the most significant are those incorporating ABS (Acrylonitrile Butadiene Styrene). PC/ABS blends exhibit high melt flow, very high toughness at low temperatures and improved stress crack resistance compared to PC.
PC finds usage in a host of markets, notably in the automotive, glazing, electronic, business machine, optical media, medical, and lighting and appliance markets.

IDENTIFICATION

Orange or yellow flame, phenol odour.

- TRADE NAMES

Apec, Calibre, Lexan, Makrolon, Merlon

PC Blends

- PC + PBT *Azloy, Iupilon, Valox, Xenoy*
- PC + PET *Makroblend, Sabre*

- SUITABLE INKS

SCREEN	
CP	
CX	
HG	
J	
PK/PK-Jet	
RF/K	
XL	
YN	
Z/PVC	
Z	
ZM	
ZMN	
UVU	
UVPO	
UVE	
MTR	
UV-650018	

PE: Polyethylene

- DESCRIPTION

Polyethylene (PE) is a light, versatile synthetic resin made from the polymerization of ethylene. Polyethylene is a member of the important family of polyolefin resins. It can also be slit or spun into synthetic fibres or modified to take on the elastic properties of a rubber.
Ethylene (C_2H_4) is a gaseous hydrocarbon commonly produced by the cracking of ethane. Under the influence of polymerization catalysts, the double bond can be broken and the resultant extra single bond used to link to a carbon atom in another ethylene molecule. Thus, made into the repeating unit of a large, polymeric (multiple-unit) molecule.
This simple structure, repeated thousands of times in a single molecule, is the key to the properties of polyethylene. The long chain like molecules can be produced in linear or branched forms. Branched versions are known as low-density polyethylene (LDPE) or linear low-density polyethylene (LLDPE); linear versions are known as high-density polyethylene (HDPE) and ultrahigh-molecular-weight polyethylene (UHMWPE).

- PROPERTIES

Polyethylene polymers are crystalline thermoplastics that exhibit toughness, near-zero moisture absorption, excellent chemical resistance, excellent electrical insulating properties, low coefficient of friction, and ease of processing. HDPE exhibits greater stiffness, rigidity, improved heat resistance, and increased resistance to permeability than LDPE and LLDPE. HDPE is a stiffer and harder material. The colour is white/colourless. The electrical properties for PE are very good.
PE will get brittle and crack after some time exposed to sunlight. To partly overcome this effect UV stabilising additives can be added. PE has very good chemical resistant properties. It can withstand most chemicals with the exception of strong oxidant acids and some organic solvents. PE does not absorb water.

Dilute Acid	*Very good*
Dilute Alkalis	*Very good*
Oils and Greases	*Moderate (variable)*
Aliphatic Hydrocarbons	*Poor*
Aromatic Hydrocarbons	*Poor*
Halogenated Hydrocarbons	*Poor*
Alcohols	*Very good*

- APPLICATIONS

LDPE is a very flexible material. Principal uses are in packaging film, trash and grocery bags, agricultural mulch, wire and cable insulation, squeeze bottles, toys, and housewares.
The lack of branches in HDPE structure allows the polymer chains to pack closely together, resulting in a dense, highly crystalline material of high strength and moderate stiffness. With a melting point more than 20 °C higher than LDPE, it can withstand repeated exposure to 120 °C so that it can be sterilized.
Products include blow-molded bottles for milk and household cleaners, blow-extruded grocery bags, construction film, and agricultural mulch, and injection-molded pails, caps, appliance housings, toys, shipping drums, carboys, automotive gasoline tanks, injection-molded material-handling pallets, crates, totes, trash and garbage containers, household and automotive parts.

- IDENTIFICATION

Blue flame with yellow tip, paraffin odour.

- TRADE NAMES

Alathon, Dowlex, Eltex, Forar, Fortiflex, HiVal, Hostalen, Kemcor, Lactene, Öupolen, Microthene, Novapol, Paxon, Petrothene, Stamylan, Supralen, Zemid

- SUITABLE INKS

SCREEN		
PF	□	Pre-treatment
YN	□	Pre-treatment
Z/PVC	□	Pre-treatment
Z	□	Pre-treatment
Z/DD	□	Pre-treatment
ZM	□	Pre-treatment
ZMN	□	Pre-treatment
UVP	□	Coated
80UV	□	Pre-treatment

PET/PET-G: Polyethylene Terephthalate/Polyester

- DESCRIPTION

PET is produced by the step-growth polymerization of ethylene glycol and terephthalic acid. The stiffness of PET fibres makes them highly resistant to deformation, so that they impart excellent resistance to wrinkling in fabrics. At a slightly higher molecular weight, PET is made into a high-strength plastic that can be shaped by all the common methods employed with other thermoplastics. Recording tape and magnetic film is produced by extrusion of PET film (often sold under the trademarks Mylar and Melinex). Molten PET can be blow-molded into a transparent container of high strength and rigidity that also possesses good impermeability to gas and liquid. In this form, PET has become widely used in carbonated-beverage bottles and in jars for food processed at low temperatures.
Polybutylene terephthalate (PBT), a strong and highly crystalline engineering plastic, is similar in structure to PET but has a lower melting point, so it can be processed at lower temperatures. Either

unmodified or reinforced with glass fibres or mineral fillers, it is used in numerous applications, especially electrical and small machine parts, owing to its excellent electrical resistance, surface finish, and toughness.

- PROPERTIES

PET in its natural state is a colorless, semi-crystalline resin. Based on how it is processed, PET can be semi-rigid to rigid, and it is very lightweight. It makes a good gas and fair moisture barrier, as well as a good barrier to alcohol and solvents. It is strong and impact-resistant. PET becomes white when exposed to chloroform and certain other chemicals such as toluene.
PET and PBT blends are engineering plastics with excellent processing characteristics and high strength and rigidity for a broad range of applications. Typically properties in which they differentiate themselves from other engineering plastics are extreme low water absorption, in particular comparison to Nylon, excellent electrical properties, excellent resistance to chemical attack and high environmental stress crack resistance, in particular in comparison to polycarbonates and very good heat and heat ageing resistance.

Dilute Acid	*Very good*
Dilute Alkalis	*Moderate*
Oils and Greases	*Very good*
Aliphatic Hydrocarbons	*Very good*
Aromatic Hydrocarbons	*Moderate*
Halogenated Hydrocarbons	*Moderate*
Alcohols	*Very good*

- APPLICATIONS

Among the industrial applications of PET are automobile tire yarns, conveyor belts and drive belts, reinforcement for fire and garden hoses, seat belts (an application in which it has largely replaced nylon), nonwoven fabrics for stabilizing drainage ditches, culverts, and railroad beds, and nonwovens for use as diaper top sheets and disposable medical garments.
Because PET is an excellent water and moisture barrier material, plastic bottles made from PET are widely used for soft drinks. For certain specialty bottles, such as those designated for beer containment, PET sandwiches an additional polyvinyl alcohol (PVOH) layer to further reduce its oxygen permeability.
Primary applications of PET include blow-molded beverage bottles, fibers for wash-and-wear, wrinkle-resistant fabrics, and films that are used in food packaging, electrical applications (capacitors, etc.), and graphic arts.
Applications of PBT include gears, rollers, bearing, and housings for pumps, and appliances, impellers, pulleys, switch parts, automotive components, and electrical /electronic components.

- IDENTIFICATION

Yellow flame with blue edges, sour cinnamon odour.

- TRADE NAMES

Arnite, Dacron, Duraloy, Eastabond, Eastapak, Grilpet, Impet, Kodar, Melinex, Mylar, Petra, Pocan, Raditer, Rynite, Valox

- SUITABLE INKS

SCREEN			
CP	□		
HG	□	Polyester foil	□
J	□	Polyester foil	□
PF	□		
XL	□	Polyester foil	□
YN	□		
Z	□		
UVU	□		
UVPO	□		
MTR	□		

PI: Polyimide

- DESCRIPTION

Polyimides are polymers that usually consist of aromatic rings coupled by imide linkages.
Typical of the condensation type is the polyimide sold under the trademarked name of Kapton by DuPont, which is made from a dianhydride and a diamine. Unlike the polyamide, the polyimide is insoluble and infusible. Kapton is stable in inert atmospheres at temperatures up to 500° C. Related commercial products are polyamideimide (PAI; trademarked as Torlon by Amoco Corporation) and polyetherimide (PEI; trademark Ultem); these two compounds combine the imide function with amide and ether groups, respectively.

- PROPERTIES

In general, polyimides have high heat resistance, high deflection temperatures, very good electrical properties, very good wear resistance, superior dimensional stability, outstanding flame resistance, and very high strength and rigidity.

- APPLICATIONS

PEI is used in transportation (under-the-hood temperature sensors, fuel system components, high-strength transmission and jet engine parts), medical (autoclave able parts), electrical /electronics, packaging, appliances, industrial (heat and corrosion resistance, air and fluid handling components), cooking utensils, microwave oven components, and structural components. PAI is used in automobile transmissions (thrust washers and seal rings), parts for gas turbine engines, business machines, hot glass-handling equipment, plasma-cutting torches.

- IDENTIFICATION

Does not burn.

- TRADE NAMES

Aurum, Avimid K, Torlon, Vespel

- SUITABLE INKS

SCREEN		
LAB-N 331213	□	Oven drying

PMMA: Polymethyl Methacrylate

- DESCRIPTION

Methyl methacrylate is polymerized in bulk or suspension methods using free-radical initiators. PMMA is a transparent and rigid plastic. Because it retains these properties over years of exposure to ultraviolet radiation and weather, PMMA is an ideal substitute for glass. A most successful application is in internally lighted signs for advertising and directions. PMMA is also employed in domed skylights, swimming pool enclosures, aircraft canopies, instrument panels, and luminous ceilings. For these applications, the plastic is sold in the form of sheets that are machined or thermoformed, but it is also injection-molded into headlights and taillights and lighting-fixture covers. The material is more known as "Plexiglas".

- PROPERTIES

PMMA is a hard and stiff material with a very good weather resistance. The material is clear as glass, but is also well suited for dying.
PMMA has excellent resistance to weathering, low water absorption, and good electrical resistivity. The impact resistance is 10 times higher than glass. PPMA has the highest surface hardness of all common thermoplastics. The scratch resistance can compare to the metals aluminum and brass. The electrical properties are very good.
PMMA is resistant to water, basics, inorganic salts diluted in water, most diluted acids. It is not resistant to strong acids, basics and polar solvents.

- APPLICATIONS

PMMA is used for glazing, lighting diffusers, skylights, outdoor signs, and exterior lighting lenses in cars and trucks. The "glass looks" and the water resistant property of PMMA makes it commonly used for decoration articles, transparent tubes, signs, windows, level glass etc.

- IDENTIFICATION

Shiny flame with blue center, sweetish/fruity odour.

- TRADE NAMES

Acrigel, Acrylite, Altuglas, Cyrolite, Oroglas, Degalan, Lucite, Perspex, Plexiglas, Sumiplex

- SUITABLE INKS

SCREEN	
A	□
CP	□
CX	□
HG	□
J	□
PK/PK-Jet	□
RF/K	□
XL	□
YN	□
Z/PVC	□
Z	□
ZM	□
ZMN	□
UVU	□
UVPO	□
MTR	□

POM: Polyacetals

- DESCRIPTION

Also called polyoxymethylene (POM) or simply acetal, polyacetal has the simplest structure of all the polyethers. DuPont markets the end-capped polymer under the trademarked name of Delrin. It is a high-strength, highly crystalline engineering plastic that exhibits a low coefficient of friction and excellent resistance to oils, greases, and solvents. Also marketed is a copolymer (trademarked as Celcon by Hoechst Celanese Corp.) prepared from trioxane (a trimer of formaldehyde) and small amounts of ethylene oxide to prevent the polymer from decomposing to formaldehyde on heating.

- PROPERTIES

Polyacetals exhibit rigidity, high strength, solvent resistance, fatigue resistance, toughness, self-lubricity, and cold-flow resistance.
Properties are enhanced by the addition of glass fiber or mineral fillers. POMs are superior to PAs in stiffness, creep resistance, fatigue strength and water absorption, but have inferior impact and abrasion resistance.

- APPLICATIONS

Both polyacetal and the copolymer have been used as a replacement for metal in plumbing and automotive parts. Principal uses include appliance parts, electronics components, gears, bushings, bearings, plumbing fixtures, appliances, toys, toiletry and cosmetic articles, food-processing equipment, zippers, and belt buckles.

- IDENTIFICATION

Blue flame, formaldehyde odour.

- TRADE NAMES

Acetron, Bergaform, Celcon, Delrin, Hostaform, Iupital, Kematal, Kocetal, Kepital, Lucel, Ultraform

- SUITABLE INKS

SCREEN		
YN	□	Post-treatment
Z	□	Post-treatment
ZM	□	Post-treatment
ZMN	□	Post-treatment

PP: Polypropylene

- DESCRIPTION

Polypropylene (PP) is a synthetic resin built up by the polymerization of propylene. One of the important family of polyolefin resins, polypropylene is molded or extruded into many plastic products in which toughness, flexibility, lightweight, and heat resistance are required. It is also spun into fibres for employment in industrial and household textiles.

- PROPERTIES

PP is a highly crystalline thermoplastic that exhibits low density, rigidity, and good chemical resistance to hydrocarbons, alcohols and oxidizing agents, negligible water absorption, excellent chemical properties, and excellent impact/stiffness balance. It has a high stiffness, good strength even in relatively high temperatures, abrasion resistant, good elastic properties and a hard glossy surface. In low temperatures PP gets brittle (< 0°C). The electrical properties are very good. The PP material has a white/colourless colour.
The chemical properties are good. PP is resistant to inorganic chemicals and water. It is resistant to most strong mineral acids and basics. PP is not resistant to nitrous gasses, halogens and strong oxidising acids. The chemical properties will alter in high temperatures. PP will degrade exposed to direct sunlight. Adding additives as UV stabiliser or carbon black can compensate for this effect.

- APPLICATIONS

Polypropylene is blow-molded into bottles for foods, shampoos, and other household liquids. It is also injection-molded into many products, including appliance housings, dishwasher-safe food containers, toys, automobile battery casings, and outdoor furniture.

- IDENTIFICATION

Blue flame with yellow tip, acrid or diesel fumes.

- TRADE NAMES

Adpro, Appryl, Cefor, Eltex P, Escalloy, Ferrex, Fortilene, Hostalen PP, Latene, Moplen, Multi-Flam, Oleplate, Propak, Polyflam, Vestolen P

PP Blends

- PP + EP(D)M *Keltan, Santoprene*

- SUITABLE INKS

SCREEN		
PP		Untreated
PP		Pre-treatment
YN		Pre-treatment
Z/PVC		Pre-treatment
Z		Pre-treatment
Z/DD		Pre-treatment
ZM		Pre-treatment
ZMN		Pre-treatment
UVX2		Pre-treatment
UVN		Pre-treatment
UVP		Pre-treatment
80UV		Pre-treatment
UVPO		Pre-treatment

PS: Polystyrene

- DESCRIPTION

Polystyrene (PS) is a hard, stiff, brilliantly transparent synthetic resin produced by the polymerization of styrene. It is widely employed in the food-service industry as rigid trays and containers, disposable eating utensils, and foamed cups, plates, and bowls. Polystyrene is also copolymerized, or blended with other polymers, lending hardness and rigidity to a number of important plastic and rubber products.
In order to reduce brittleness and improve impact strength, more than half of all polystyrene produced is blended with 5 to 10 percent butadiene rubber. This blend, suitable for toys and appliance parts, is marketed as high-impact polystyrene (HIPS).

- PROPERTIES

It is a clear, amorphous polymer that exhibits high stiffness, good dimensional stability, moderately high heat deflection temperature, and excellent electrical insulating properties. However, it is brittle under impact and exhibits very poor resistance to surfactants and solvents.
It has good mechanical properties, but is not resistant to weather exposure (the resistant to weather can be improved by introducing additives).
PS is resistant to water, diluted acids and basics. It is non-resistant to oxidising acids, aliphatic and aromatic hydrocarbons, esters, ethers and ketones.

- APPLICATIONS

Solid polystyrene products include injection-molded eating utensils, videocassettes and audiocassettes, and cases for audiocassettes and compact discs. Many fresh foods are packaged in clear vacuum-formed polystyrene trays, owing to the high gas permeability and good water-vapour transmission of the material. The clear windows in many postage envelopes are made of polystyrene film.
The ease of processing, rigidity, clarity, and low cost combine to support applications in toys, displays, consumer goods, and housewares such as food packaging, audio/video consumer electronics, office equipment, and medical devices.

- IDENTIFICATION

Yellow flame, illuminating gas or marigold odour.

- TRADE NAMES

Dylene, Edistir, Ferroflo, Ladene, Lustrex, Multi-Hips, Polystyrol, Replay, Styron, Styropor, Valtra
PS Blends

- PS + PE *Styroblend*
- PS + PP *Hivalloy*

- SUITABLE INKS

SCREEN	
CP	
CX	
HG	
J	
PK/PK-Jet	
RF/K	
XL	
YN	
UVU	
UVPO	
UVE	
MTR	
UVP	
UV-650018	

PVC: Polyvinyl Chloride

- DESCRIPTION

Second only to PE in production and consumption, PVC is most often obtained by reacting ethylene with oxygen and hydrogen chloride over a copper catalyst.
Normally, PVC has a low degree of crystallinity and good transparency. The high chlorine content of the polymer produces advantages in flame resistance, fair heat deflection temperature, good electrical properties, and good chemical resistance. However, the chlorine also makes PVC difficult to process. Therefore, special stabilizer systems are often used with PVC to retard degradation.
PVC is resistant to commonly used chemicals with the exception of specific organic connections as ketone (i.e. acetone), chlorinated and aromatic hydrocarbons and low molecular esters.
There are two major sub classifications of PVC: rigid and flexible (plasticized).

 PVC rigid

PVC alone is a fairly good rigid polymer, but it is difficult to process and has low impact strength. Both of these properties are improved by the addition of elastomers or impact-modified graft copolymers—such as ABS and impact acrylic polymers.

- PROPERTIES

  Hard PVC has a high mechanical strength and stiffness with a good resistance to chemicals and weather. PVC can be mixed with stabilisers and lubricants and made into products with a high degree of transparency and/or softness. Hard PVC is from start a brittle material that can be made extremely impact resistant by the introduction of additives.

- APPLICATIONS

  With this improved balance of properties, rigid PVCs are used in such applications as pipe, fittings, and conduit; building panels and siding and credit cards.

- IDENTIFICATION

  Yellow flame with green edges, hydrochloric acid odour.

- TRADE NAMES

  Benvic, Darvic, Duraform, Genotherm, Hostalit, Lacovyl, Lucalor, Nakan, Novatemp, Polyvin, Solvic, Superkleen, Trovidur, Unichem, Vinidur

- SUITABLE INKS

SCREEN	
A	
CP	
CX	
HG	
J	
PK/PK-Jet	
RF/K	
XL	
YN	
Z/PVC	
UVU	
UVX	
UVN	
UVPO	
UVE	
MTR	
UVP	

 PVC plasticized

Flexible PVC is a plasticized material. The PVC is softened by the addition of compatible, nonvolatile, liquid plasticizers. The plasticizers, which are usually used in more than 20 parts per hundred resins, lower the crystallinity in PVC and act as internal lubricants to give a clear, flexible plastic. Plasticized PVC is also available in liquid formulations known as plastisols.

- PROPERTIES

The properties of the soft PVC cannot be generalised, as they are dependent of the type and content of softener. Soft PVC can be tailor made for many applications by adding the feasible additives. Soft PVC can be delivered as transparent or dyed.

- APPLICATIONS

Plasticized PVC is used for wire and cable insulation, outdoor apparel, rainwear, flooring, interior wall covering, upholstery, automotive seat covers, garden hose, toys, clear tubing, shoes, tablecloths, and shower curtains. Plastisols are used in coating fabric, paper, and metal and rotationally cast into balls, dolls, etc.

- IDENTIFICATION

Yellow flame with green edges, hydrochloric acid odour.

- TRADE NAMES

Any Rigid PVC trade names with plasticizers

- SUITABLE INKS

SCREEN	
CP	□
CX	□
HG	□
J	□
PK/PK-Jet	□
RF/K	□
XL	□
Z/PVC	□
UVU	□
UVX	□
UVN	□
UVPO	□
UVE	□
MTR	□
UVP	□

SAN: Styrene Acrylonitrile

- DESCRIPTION

Styrene and acrylonitrile, in a ratio of approximately 70 to 30, are copolymerized. The copolymer is a rigid, transparent plastic that displays better resistance to heat and solvents than does polystyrene alone. Much of the SAN produced is blended with ABS.

- PROPERTIES

SAN is a clear, amorphous polymer with increased heat defection temperature and chemical resistance compared to polystyrene. However, its impact resistance is still poor.

- APPLICATIONS

SAN is utilized in typical PS-type applications where a slight increase in heat deflection temperature and/or chemical resistance is needed, such as housewares and appliances. Principal uses are in automotive parts, battery cases, kitchenware, appliances, furniture, and medical supplies.

- IDENTIFICATION

Does melt with bubbles showing up.

- TRADE NAMES

Cevian, Kibisan, Lupan, Luran, Lustran, Novodur, Tyril

- SUITABLE INKS

SCREEN	
CP	
HG	
PK/PK-Jet	
XL	
YN	
Z/PVC	
Z	
ZM	
ZMN	
UVU	
UVPO	
UVE	
MTR	
UV-650018	

THERMOSETS

General

- SUITABLE INKS

SCREEN		
A		
LAB-N 331213		Oven drying
YN		
Z		
Z/DD		
Z/GL		
UVK		

EP: Epoxide

- DESCRIPTION

While many variations exist, the most common epoxy resin is formed from epichlorohydrin and bisphenol A.

Epoxy resins are also made into structural parts such as laminated circuit boards, laminates and composites for aerospace applications, and flooring. For these applications epoxies show high strength when reinforced with fibres of glass, aramid, or carbon.

- PROPERTIES

Cured epoxy resins exhibit hardness, strength, heat resistance, electrical resistance, and broad chemical resistance.

- APPLICATIONS

Epoxy resins are used in glass reinforced, high-strength composites in aerospace, pipes, tanks, pressure vessels; encapsulation or casting of various electrical and electronic components (printed wiring boards, etc.), adhesives, protective coatings in appliances, flooring, industrial equipment and sealants.

- IDENTIFICATION

Yellow flame, pungent amine odour

- TRADE NAMES

Araldite, Devcon, Epikote, Epotek, Lopox, Rutapox

- SUITABLE INKS

SCREEN	
Z	
Z/GL	

MF & UF: Melamine Formaldehyde & Urea Formaldehyde

- DESCRIPTION

Resins made from urea-formaldehyde polymers are processed in much the same way as are resoles (i.e., using excess formaldehyde). Like phenolics, the polymers are used as wood adhesives, but, because they are lighter in colour, they are more suitable for interior plywood and decorative paneling. They are less durable, however, and do not have sufficient weather resistance to be used in exterior applications.
In addition, their greater hardness and water resistance makes them suitable for decorative dinnerware and for fabrication into the tabletop and countertop product developed by the Formica Corporation and sold under the trademarked name Formica.

- PROPERTIES

In general, these materials exhibit extreme hardness, scratch resistance, electrical resistance, and chemical resistance.

- APPLICATIONS

Melamine resins find use in colorful, rugged dinnerware, decorative laminates (countertops, tabletops, and furniture surfacing), electrical applications (switchboard panels, circuit breaker parts, arc barriers, and armature and slot wedges), and adhesives and coatings.
Urea resins are used in particleboard binders, decorative housings, closures, electrical parts, coatings, and paper and textile treatment.

- MF: Melamine Formaldehyde
  - IDENTIFICATION

    Yellow flame with blue tip, fish like odour.
  - TRADE NAMES

    Formica, Hostaset MF, Melochem, Melopas
  - SUITABLE INKS

    Upon receipt of the substrate, a suitable ink test compatibility will be carried.
- UF: Urea Formaldehyde
  - IDENTIFICATION

    Yellow flame with greenish blue edges, formaldehyde odour.
  - TRADE NAMES

    Beetle
  - SUITABLE INKS

Upon receipt of the substrate, a suitable ink test compatibility will be carried.

PF: Phenol Formaldehyde

- DESCRIPTION

Two methods are used to make phenol-formaldehyde polymers. In one, an excess of formaldehyde is reacted with phenol in the presence of a base catalyst in water solution to yield the resole. The other method involves reacting formaldehyde with an excess of phenol using an acid catalyst to produce prepolymers called novolacs.

- PROPERTIES

Phenolics are hard, rigid, heat resistant, and brittle. Fillers are used in order to improve their toughness. They have excellent insulating properties and are heat resistant to 260°C. They are chemically inert to most common solvents and weak acids. They absorb very little moisture.

- APPLICATIONS

Phenolic applications include automotive uses (distributor caps, rotors, brake linings), appliance parts (pot handles, knobs, bases, electrical /electronic components (connectors, circuit breakers, switches), and as an adhesive in laminated materials (e.g., plywood).

- IDENTIFICATION

Yellow flame, phenol odour.

- TRADE NAMES

Bakelite, Celoron, Hostaset PF, Micarta, Peracite, Tufnol

- SUITABLE INKS

Upon receipt of the substrate, a suitable ink test compatibility will be carried.

PUR: Polyurethane

- DESCRIPTION

Polyurethanes are a class of extremely versatile polymers that are made into flexible and rigid foams, fibres, elastomers, and surface coatings. They are formed by reacting an isocyanate with an alcohol. The largest segment of the market for polyurethanes is in rigid and flexible foams.
Rigid foams are made with PMDI and polyether glycols, along with low-molecular-weight dialcohols to increase the rigidity. Rigid polyurethane foam is used in insulation, packaging, marine flotation equipment, and lightweight furnishings. Polyurethanes form some of the highest-performance coatings available.

- PROPERTIES

Polyurethanes are naturally amber in colour. They are easily stretched, a property which has earned them the nickname 'elastomers'. Polyurethanes are scratch, tear, and shock resistant. They are very tough but have good cushioning properties. Polyurethanes are not easily damaged by chemicals including solvents, acids, and oils.

- APPLICATIONS

The principal uses of flexible foam are in upholstery, bedding, automobile seats, crash panels, carpet underlays, textile laminates, and sponges. Polyurethane surface coatings are applied to wood, concrete, and automobile and machine parts. They also have marine applications.

- IDENTIFICATION

Yellow flame, faint apple odour.

- TRADE NAMES

Baydur, Bayflex, Baygal, Desmodur, Estolan, Lupranol, Lycra, Spandex

- SUITABLE INKS

SCREEN	
HG	
J	
TZ	
ZE 1690	

SI: Silicone

- DESCRIPTION

Polysiloxanes are polymers whose backbones consist of alternating atoms of silicon and oxygen. They can exist as elastomers, greases, resins, liquids, and adhesives. Their great inertness, resistance to water and oxidation, and stability at high and low temperatures has led to a wide range of commercial applications. As a result, silicone rubbers are remarkably stable, and they have the lowest glass transition temperature and the highest permeability to gases of any elastomer.

- PROPERTIES

Silicones are odorless, colorless, water resistant, chemical resistant, and oxidation resistant, stable at high temperature, and have weak forces of attraction, low surface tension, and low freezing points and do not conduct electricity.

- APPLICATIONS

Silicone rubber is used mainly in O-rings, heat-resistant seals, caulks and gaskets, electrical insulators, flexible molds, and (owing to its chemical inertness) surgical implants.

- IDENTIFICATION

Bright yellow flame, no odour.

- TRADE NAMES

Baysilone, Silastic

- SUITABLE INKS

SCREEN		
TP 253L + TP 219/L		Oven drying

UP: Unsaturated Polyester

- DESCRIPTION

Unsaturated polyesters are linear copolymers containing carbon-carbon double bonds that are capable of undergoing further polymerization in the presence of free-radical initiators. Glass-fibre reinforcement is usually used in products made of unsaturated polyesters. The principal applications are boat hulls, appliances, business machines, automobile parts, automobile body patching compounds, tubs and shower stalls, flooring, translucent paneling, storage tanks, corrosion-resistant ducting, and building components.

- PROPERTIES

In combination with reinforcing materials such as glass fiber, cured resins offer outstanding strength, high rigidity, impact resistance, high strength-to-weight ratio, and chemical resistance.

- APPLICATIONS

The applications include transportation markets (large body parts for automobiles, trucks, trailers, buses, and aircraft), marine markets (small- to medium-sized boat hulls and associated marine equipment), building panels, housing and bathroom components (bathtub and shower stalls), appliances, and electrical /electronic components.

- IDENTIFICATION

Yellow flame, black smoke with carbon particles.

- TRADE NAMES

Hostaset UP, Leguval, Palatal, Vestopol

- SUITABLE INKS

Upon receipt of the substrate, a suitable ink test compatibility will be carried.

ELASTOMERS

Elastomers are polymers that can be stretched substantially beyond their original length and can retract rapidly and forcibly to essentially their original dimensions (on release of the force).The optimum properties and/or economics of many rubbers are obtained through formulating with reinforcing agents, fillers, extending oils, vulcanizing agents, antioxidants, pigments, etc.

TPE: Thermoplastic Elastomer

- DESCRIPTION

Thermoplastic elastomers (TPE), sometimes referred to as thermoplastic rubbers, are a class of copolymers or a physical mix of polymers (usually a plastic and a rubber) which consist of materials with both thermoplastic and elastomeric properties. While most elastomers are thermosets, thermoplastics are in contrast relatively easy to use in manufacturing, for example, by injection molding. Thermoplastic elastomers show advantages typical of both rubbery materials and plastic materials. The principal difference between thermoset elastomers and thermoplastic elastomers is the type of crosslinking bond in their structures. In fact, crosslinking is a critical structural factor, which contributes to impart high elastic properties.

There are six generic classes of commercial TPEs:

1. Styrenic block copolymers (TPE-S)
2. Polyolefin blends (TPE-O)
3. Elastomeric alloys (TPE-V)
4. Thermoplastic polyurethanes (TPE-U)
5. Thermoplastic copolyester (TPE-E)
6. Thermoplastic polyamides (TPE-A)

- PROPERTIES

Even though TPEs are thermoplastic, they exhibit elasticity similar to that of a cross-linked rubber. A key indicator is their softness or hardness value as measured on the Shore durometer scale.

Designers increasingly use TPEs due to the significant cost savings possible because their ability to be processed on plastics machinery. Conventional rubber, whether natural or synthetic, is a thermosetting material that must undergo a chemical cross-linking reaction during moulding or extrusion, typically called curing or vulcanization Additional advantages over thermoset rubber provided by TPEs include excellent colourability and a lower density.

- APPLICATIONS

TPEs are used where conventional elastomers cannot provide the range of physical properties needed in the product. These materials find large application in the automotive sector and in household appliances sector. Thus copolyester TPEs are used in snowmobile tracks where stiffness and abrasion resistance are at a premium. They are also widely used for catheters where nylon block copolymers offer a range of softness ideal for patients. Styrene block copolymers are used in shoe soles for their ease of processing, and widely as adhesives. TPE is commonly used to make suspension bushings for automotive performance applications because of its greater resistance to deformation when compared to regular rubber bushings. TPE may also be used in products meant for bodily insertion, such as menstrual cups, and sex toys. TPE is also finding more and more uses as electrical cable jacket/inner insulation.

- IDENTIFICATION

Depending upon the type of compounds.

- TRADE NAMES
- TPE-S *Septon*
- TPE-O *Santoprene*
- TPE-V *Forprene*
- TPE-U *Desmopan, Texin*
- TPE-E *Hytrel, Ritaflex*
- TPE-A *Pebax*
- SUITABLE INKS

SCREEN		
TZ	□	Pre-treatment
ZE 1690	□	Pre-treatment