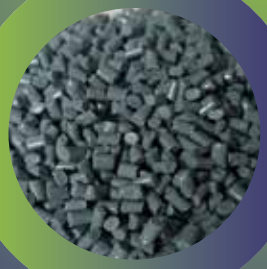

Laser Marking and Structuring Additives

IRASORB | STANOSTAT

AMC
Member of the AMC Group

Keeling & Walker
World Leader in Tin Oxide

OUR ORIGINAL
PREMISES FROM 1916

Based in Stoke-on-Trent, the heartland of the British ceramics industry, Keeling & Walker Limited is the world's leading supplier of tin oxides and related materials.

The company was founded in 1916 as a supplier to the local potteries and subsequently became a major supplier of ceramic materials, consumables, plants and equipment.

Keeling & Walker quickly realised the importance of tin oxides as a key raw material for ceramic pigments and as a glaze opacifier. By 1932 it had established a unique manufacturing process which has set the industry standard to the present day.

In the early 1980s Keeling & Walker pioneered the development of ATO (Antimony Tin Oxide) materials and has created over the following years a range of grades, which show high a photothermal effect and high absorption of near-infrared light. Today they form the basis for many Laser Marking and Laser Direct Structuring (LDS) products.

Keeling & Walkers´s continuous investment in R&D has pushed beyond the boundaries of Tin Oxide related materials and ventured into new metal chemistries.

The result is a new generation of Laser Marking and LDS additives.

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LASER MARKING ADDITIVES

The ability to make permanent, indestructible marks on plastic surfaces can be highly advantageous in a variety of industrial contexts. It can improve quality control, help protect brands against product piracy and lessens environmental impact.

Laser marking technology is used to achieve these outcomes. Laser marking is a flexible technology suitable for both high volume products and small lot sizes. It is also cost-efficient. Laser marking generates virtually no waste, and there is no need for solvents, inks, cleaning processes or surface pre-treatments. All end users need is a master-batch of the laser marking additive.

Abrasion resistant laser marks can be applied to soft or hard surfaces which don't even need to be flat. 3D marking is also possible. Whether it's for technical applications such as bar codes and lot numbers or for decorative purposes, laser marking is a great choice for those looking for a long-lasting solution.

Not all polymers mark the same way, some polymers like PE or PP are almost transparent for Near Infrared Lasers with a wavelength around 1064 nm. Other polymers interact better with NIR Laserlight.

Whether or not a laser marking additive is needed depends on the wavelength of the laser light. Laser machines are distinguished by their operating wavelength. The UV-Laser (355 nm), Green Laser (532 nm), NIR/Fibre Laser (808, 940, 1064 nm etc.) and CO_2-Laser (10,6 µm) are the most common. NIR lasers are a popular choice in the polymer industry thanks to their excellent cost-performance ratio.

A suitable polymeric substrate, top-class machinery and favourable operating conditions on the manufacturing line are all required to achieve desirable results with laser marking additives.

HOW DO LASER MARKING ADDITIVES WORK?

Laser marking additives work in a variety of ways. In many cases, laser additives absorb laser light and convert it into heat.

The heat turns the surrounding polymer to carbon, which – being black in colour – creates a visible mark. Greater conversion efficiency improves the colour of the marking.

StanoStat CP products belong to this group of additives. They are particularly good at absorbing laser light emitted by NIR and Fibre Lasers. If the particle size is reduced to nanosize it is also possible to mark transparent polymers.

A different way for creating the marks works with laser sensitive pigments. In their normal state they will be colourless or only slightly coloured, but when irradiated by laser light they decompose to produce coloured materials. A number of Keeling & Walker's IRASORB LM products function in this way.

Both decomposition reactions typically create dark marks on colourless or lightly coloured plastics. The reverse – a white mark on a dark polymer – is also possible. In such cases the laser light forms foam around the pigment. The foam reveals the original colour of the base polymer, which will typically be white or light yellow. The laser additive helps to transform the polymer matrix into CO_2, which produces the foaming effect. The contrast of the mark can be improved by introducing additional pigments to the laser additive formulation.

When laser marking coloured polymers it is important to ensure that the absorption profile of the colourant doesn't interfere with the wavelength of the laser light.

OVERVIEW

Name	Product	Composition	Laser type	Key feature	Colour
StanoStat	CP5C	ATO	1064 nm / Fibre laser		Grey
StanoStat	CP150C	ATO	1064 nm / Fibre laser	Light coloured	Light grey
StanoStat	CP8C	ATO	1064 nm / Fibre laser	Light coloured	Light grey
StanoStat	CPM10F	ATO	1064 nm / Fibre laser	Laser welding, white on black	Blue
IRASORB	BITO	BITO	1064 nm / Fibre laser	For transparent polymers & laser welding	Blue
IRASORB	CTOM10	Tungsten oxides	1064 nm / Fibre laser	White on black	Blue
IRASORB	LM 001	Mixed metal oxides	1064 nm / Fibre laser		Cream
IRASORB	LM 002	Mixed metal oxides	1064 nm / Fibre laser	Antimony free	Light yellow
IRASORB	LM 004	Mixed metal oxides	1064 nm / Fibre laser		Light yellow
IRASORB	LM 005	Mixed metal oxides	1064 nm / Fibre laser	White on black	Very light grey
IRASORB	LM 007	Copper tungstate	1064 nm / Fibre laser	Under development	Yellow

APPLICATION

Product	ABS	LDPE	PA	PBT	PC	PMMA	PP	PVC	TPU
CP5C	✔	✔		✔		✔	✔	✔	
CP8C/CP150C		✔					✔		
CPM10F		✔			✔				✔
BITO	✔				✔				✔
CTOM10			✔						
LM 001	✔	✔			✔			✔	✔✔
LM 002	✔✔	✔✔	✔	✔	✔		✔✔	✔	✔✔
LM 004		✔✔		✔✔	✔		✔✔	✔✔	
LM 005	✔✔	✔	✔✔	✔✔	✔✔	✔✔	✔	✔	✔✔
LM 007			✔✔		✔✔				

1 tick = suitable, good results
2 ticks = recommended, excellent result

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KEY PRODUCTS

IRASORB LM002
- Low coloured material
- Suitable for most thermoplastic polymers
- Antimony free formulation

IRASORB LM005
- High temperature stability
- Suitable for a variety of polymers
- Suitable for fibres and thin materials

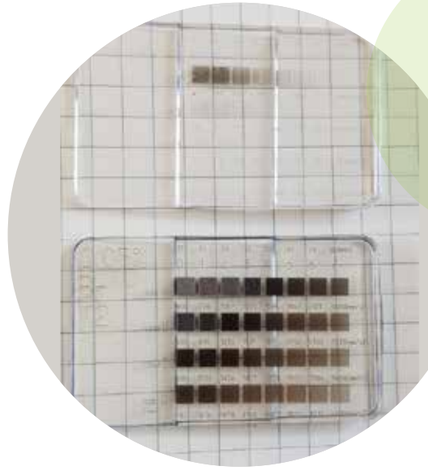
IRASORB LM004
- Strong contrast
- Low colouration and low colour impact
- Low concentration required

IRASORB BITO
- Used for laser marking of transparent polymers
- Used for laser welding
- Laser marking booster in combination with other additives

MARKING TRANSPARENT POLYMERS

Only nanoscale additives provide the necessary degree of transparency and laser sensitivity to generate good marking results on transparent polymers.

IRASORB BITO disperses very well in polymers such as polycarbonate, providing high contrast laser marks at exceptionally low addition levels. Other laser marking additives such as IRASORB LM007 will provide strong, dark marks, but with an opaque or translucent appearance due to their larger particle size.



LASER WELDING

Laser welding is used to fuse polymer parts. The process involves the mechanical connection of polymeric materials, which can be differently coloured or have different functionalities.

Laser welding can create multiple material combinations, but not every blend is possible. To achieve optimal results care must to be taken to adapt each individual component.

A laser transparent top part and a laser absorbing bottom part are required in such cases. Laser light passes through the top layer and triggers the foaming or softening of the bottom layer, resulting in a strong bond at the interlayer of both parts.

StanoStat CP and CPM products can be used to laser weld non-transparent substrates, while IRASORB BITO is the best choice for transparent polymer combinations.

LASER DIRECT STRUCTURING (LDS)

Miniaturisation and raw material efficiency are the watchwords of the electronics industry.

LDS has been used widely in recent years to attach electronic circuitry directly to the structural parts of electronic components. Most mobile phone antennas are manufactured this way today.

LDS is an advanced process consisting of four major steps.

Most engineered polymers respond poorly to laser light, but this can be improved by incorporating an LDS additive into the polymer. The additive interacts with the laser light to sensitise the polymer, preparing the surface for the next stage of the process – metallising.

After a cleaning step the activated polymer parts are immersed in a plating bath which deposits copper and other metals onto their surface. This plating will only appear on areas of the polymer's surface that have been activated by the LDS additive and the laser light. The LDS additive serves additionally as a catalyst for the copper deposition, providing seeding points from which the copper layer can develop.

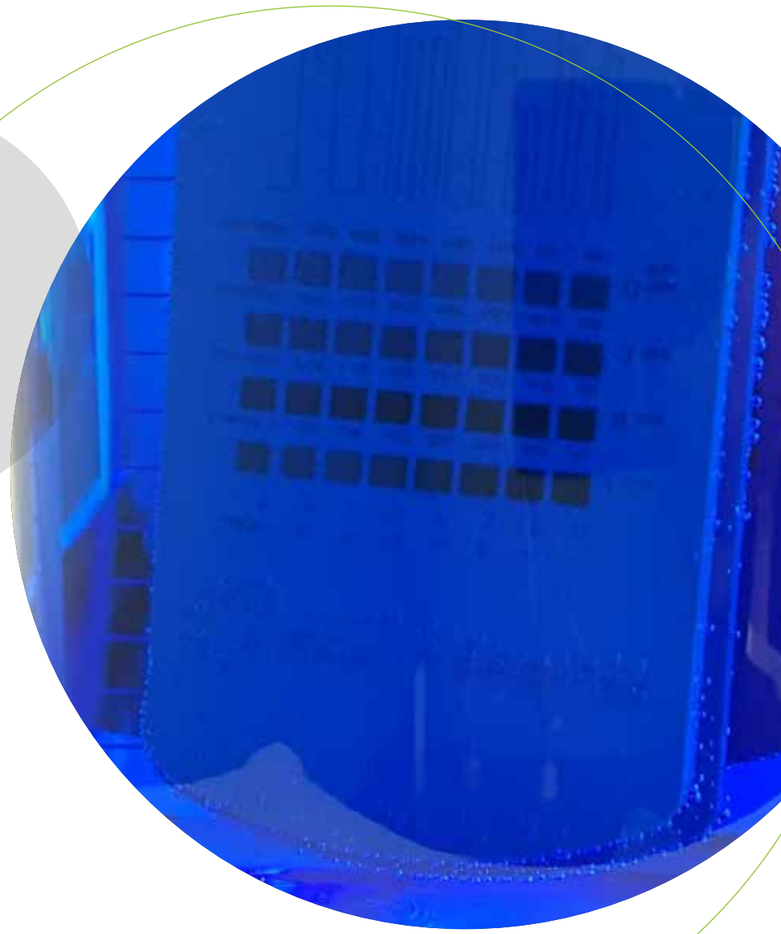
The final stage of the process is the mounting of electronic components.

Keeling & Walker´s LDS additives are designed to suit a variety of processing conditions and are compatible with most polymers. Our ATO-based grades are chemically stable, so they won't compromise the stability of your chosen polymer.

LDS additives also work on ceramic substrates.

PRODUCT RANGE

Name	Product	Composition	Colour	Laser Direct Structuring (LDS)	Key feature
StanoStat	CP5C	ATO	Grey-blue	1064 nm / NIR / CO_2 laser	Multipurpose additve for polymer and ceramic substrates
StanoStat	CP05	ATO	Dark grey-blue	1064 nm / NIR / CO_2 laser	High plating speed
StanoStat	CPM10C	ATO	Dark blue	1064 nm / NIR / CO_2 laser	High catalytical activity
IRASORB	BITO	BITO	Light blue	1064 nm / NIR	For transparent polymers, Sb-free addtive
IRASORB	LM 005	Mixed oxides	Light grey	1064 nm / NIR / CO_2 laser	For light colouration
IRASORB	LM 007	Copper tungstate	Yellow	1064 nm / NIR	Sb-free additive
IRASORB	CCTO	Calcium Copper Titanate	Brown	1064 nm / NIR	Sb-free additive



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