# Lasers make their mark

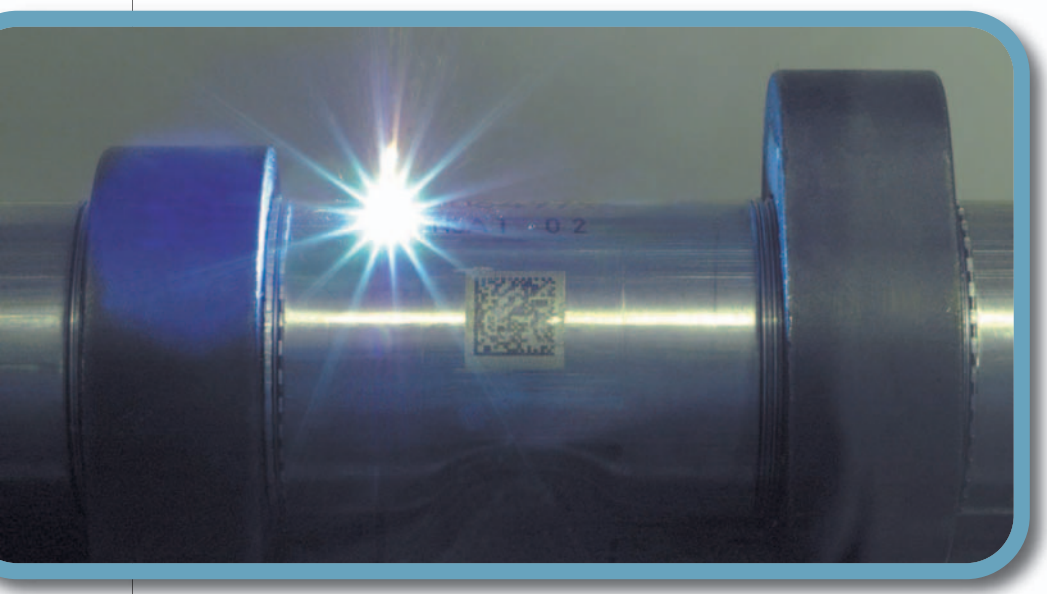
**Rofin-Baasel's systems allow F1 companies to mark just about everything, it is claimed, while new developments from Electrox and Trumpf have just been announced. Andrew Allcock reports**

F1 teams typically strip down and rebuild three cars (two race-cars and one spare) after every race or test event. Each car is assembled from some 3,500 components, all of which are subject to a process of continuous improvement, resulting in perhaps 10,000 components being associated with each car at any one time.

For some time now it has been standard practice for many of the larger components and assemblies to be marked with human readable information to enable traceability. As part of an ongoing effort to continuously improve reliability and safety, part marking and traceability is now becoming a must for even the smallest individual components, with F1 and other motor sport teams taking component identification very seriously.

Direct Part Marking makes it possible to track a product from the time of production to the point when it is scrapped. To achieve this, a high-quality permanent mark able to withstand extreme conditions such as heat, abrasion and caustic fluids etc. is required.

Due to their small size and large data capacity, the data matrix codes make it possible to identify nearly every component on the car from wishbones and steering racks, to pistons, fuel injectors and even nuts and bolts. The data matrix has a high degree of redundancy and is resistant to marking defects, providing high reliability. It has built-in error correction and a minimum print contrast requirement of 20 per cent when reading with an industrial-quality camera.



*Rofin-Baasel marking technology allows F1 teams to keep track of everything*

F1 teams have used lasers for many years for part marking. Recently the trend has been to not only to reduce the marking area but also to automate the reading process allowing faster and more reliable identification. The lasers being used however were unable to meet the challenge of marking small codes due to the relatively large focused spot – like painting with a broad brush.

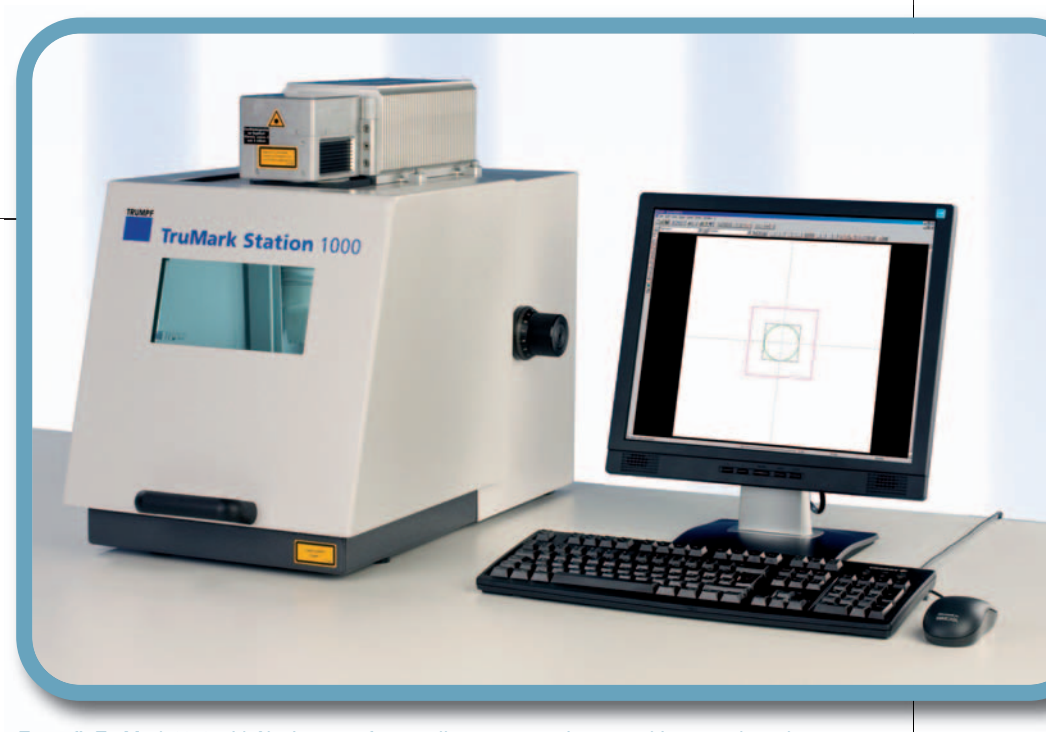
Small codes approaching just 1mm$^2$ can now be produced using the Rofin PowerLine E-10 laser, and, as a result, Rofin has now installed several of these end-pumped vanadate laser sources at a number of F1 facilities.

The PowerLine E-10 laser can actually produce much smaller codes but both the mechanic and the code reader would struggle to actually find and read the code. The ability to be able to produce such a small code means that nearly all components used in the car can now be permanently marked and subsequently identified and tracked.

## THROUGH THE LENSE

Continuing the product development theme and the marking of small, in this case man-readable characters, late last month, 600 Group laser marking specialist Electrox unveiled its Through The Lens (TTL) vision system. This sees a marking unit having a vision system viewing the exact same area as will be marked, from the same angle.

The system has so far been applied to three solutions, including the laser marking of electronic components and of medical screws used for such purposes as spinal surgery. The TTL system supports part present/not present analysis, part




*Trumpf's TruMark 3010 with Navigator software allows even novices to achieve good results*

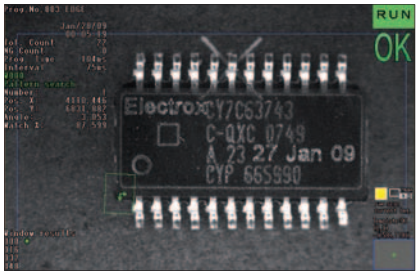
position and orientation, and the subsequent reading of marked characters in a single operation.

In the case of the electronic chips, the parts can be as small as 3 mm$^2$ and the marked characters are just 0.4 mm high. The system allows the user faster throughput, lower setting time per batch, plus elimination of setting scrap. The associated Electrox off-line software supports import of graphic files, establishment of imported mark position datum, plus drag-and-drop positioning of other text elements, these including incrementing serial numbers, for example, with data able to be drawn from an external source.

In the medical screw applications, in one case a Philips head screw sees text marked around the circumference of two of the head quadrants. The characters are 0.35 mm high and on one of the quadrants there are eight characters. In a second case, characters are marked at the bottom of a bore. Similar benefits to those achieved in the electronic component case are achieved here also.

Of course, non-man-readable codes can also be generatred and read.

While the camera and associated chip are bought in, the system software is written by Electrox. An important point made by the company is that while there are similar systems, typically they can only support a single colour light environment. So if parts are themselves different colours or different colour light illumination is required, a separate system would be required: this is not the case for the Electrox development.




*Electrox' TTL solution – electronic chip application*

The TTL system can be used with any Electrox laser marking system, and can be configured in any laser marking workstation. Customer implementations so far have varied from a Cobra 20 Watt diode pumped Nd:YAG laser in a standard Maxim workstation to a Raptor EF Technology laser in a special-purpose workstation.

## RAPTOR REFLECTIONS

Electrox has also further developed its Raptor EF technology (pumped diode), making available Raptor II and Raptor II*. Raptor II offers twice the power of the original Raptor, offering a range of from 2 to 10W but with a peak pulsed power of 25 kW versus Raptor I's 10 kW (pulses are 25 ns long). The product will replace some of the company's fibre lasers, offering lower initial cost and also lower running cost. Raptor's come with a four-year warranty: the life of the laser source itself is 360,000 hours, and in-field replacement can be undertaken.

Raptor II* is similar but with a degraded focus quality for applications in certain materials, such as plastics. In such cases, the high quality beam of the standard Raptor II causes surface finish problems (likened to a ploughed field) while the wider beam spot with hollow centre (TEM01 quality, or doughnut) eradicates this, producing a flat finish. Maximum peak pulsed power for the II* is 15 kW.

The company already has Raptor III and Raptor III* in its sights – it is nowhere near the limits of maximum power output from pumped diode lasers. Raptor III/III* models will also feature variable pulse duration, this allowing even better fine tuning in certain applications, specifically mentioned was mobile phone key marking.

A development which sits across all Electrox' systems is new packaging of electronics. The units are now smaller and offer additional connection possibilities, such as USB and SD card ports to support file storage negating the need for an attached PC, plus there's CANBUS connection, too.

Trumpf has also just announced a new pumped diode laser marker, the new TruMark 3010. It incorporates the company's new Navigator software, which, the company says, allows even users without special laser expertise to perform high quality laser marking on metals and plastics. The TruMark 3010 can be used with the TruMark Station 1000, 5000 and 7000 workstations. □