



Application Note



Pharmaceuticals Coding solutions for star wheel applications

When it comes to coding in a star wheel, you have a choice.

Star wheels are commonly used in the pharmaceutical industry to guide vials, cartridges, ampoules, or bottles safely throughout the production process. To simplify aggregation and enable internal traceability, substrates are usually marked with helper codes before being bundled into a unit carton. Marking internal traceability information on vials, cartridges, and ampoules is challenging due to their small size and limited space typically found within star wheels.

Depending on the substrate, the code, and the space limitations, different coding technologies can be used to meet the application requirements.

Coding in a star wheel

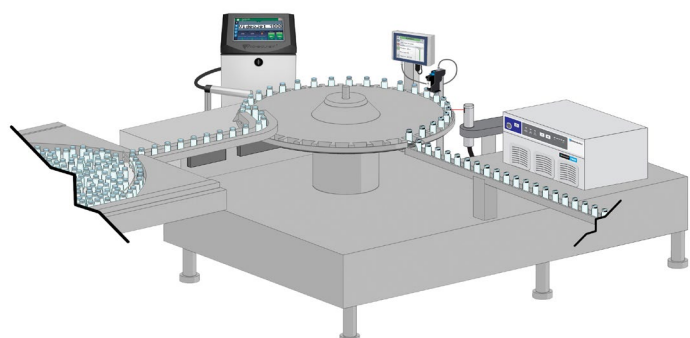
Star wheels are a preferred transport system in the pharmaceutical industry and can be found on a number of packaging machines, including liquid filling and capping machines. Different star wheels on different machine types can serve one or more purposes; from simply separating substrates to acting as the heart of the entire process. Transport and feed can be precisely adapted to the high requirements of pharmaceutical production.

Typically, a star wheel consists of a solid plastic wheel in which pockets are machined at specific intervals to hold and carry the substrate. Within a star wheel, the substrates are accurately positioned and guided, which not only facilitates the production and coding processes but also the subsequent vision inspection.

Vials, cartridges, ampoules, bottles, and in some cases prefilled syringes, are commonly conveyed on a star wheel. Various substrate sizes and shapes allow for different coding options.

- **Vials:** on top of the cap, on the cap rim, and on the glass or plastic body
- **Cartridges:** on the aluminum cap and on the glass body
- **Ampoules:** on the glass body

Depending on the substrate, type, and content of the code, Continuous Inkjet (CIJ), Thermal Inkjet (TIJ), or laser are suitable coding solutions. Videojet recommends substrate-specific sampling to help ensure that print quality and code quality meet the application requirements.



The right coding solution for your star wheel application

Continuous inkjet

Continuous inkjet (CIJ) is a non-contact printing technology that can print on almost any flat or curved surface. Continuous inkjet printers are versatile for marking in a star wheel as they can mark vials, cartridges, and ampoules at any available location: on top of the cap, on the rim, and on the glass or plastic body. Continuous inkjet printers achieve particularly good code results up to a matrix of 24 modules, yet are limited when it comes to very small codes.

UV ink – visible when you need it

The CIJ ink range includes not only visible inks, but also invisible UV inks. The **UV ink** allows codes for internal traceability and aggregation without being visible at the point of use. UV codes on the glass bodies can be read properly by a camera system, as background effects can be minimized and reflections can be suppressed.



Unique printhead options

The Videojet 1880 **dynamic printhead** rotating through 350° helps to save space and allow for better integration in a star wheel with more mounting options.

As a CIJ printhead requires cleaning, the printhead should be accessible within the star wheel. To help schedule cleanings, the Videojet 1880 printhead incorporates an industry first **build-up sensor** that detects build up in the printhead and alerts when cleaning is required. This allows interventions in production to be made when it best fits the production schedule and helps avoid unnecessary printhead cleanings, and unplanned downtime.

Thermal inkjet

Thermal inkjet (TIJ) is a non-contact printing technology that enables high-speed, high-resolution printing on flat and slightly uneven surfaces. In star wheels, TIJ is used to code on top of the vial cap or, depending on the size of the code and proximity to the product, on the aluminum rim of vials and cartridges. Special TIJ inks are available to help ensure great adhesion to plastic and aluminum.

Thermal inkjet printers offer superior print quality with **clean, no-mess operation** and solid-state electronics requiring no controller maintenance. Compared to CIJ technology, TIJ allows for smaller codes with more content as well as higher production speeds. Operating with HP cartridges minimizes the risk of liquid spills and pollution of the production environment. Within a star wheel, the TIJ printhead needs to be accessible as it has no IP protection class requiring the printhead to be disassembled for washdowns.



Permanent, crisp codes with laser marking systems



Laser marking systems

Laser marking is a non-contact printing method that marks or engraves permanent, high-quality codes on many hard plastics, glass, metal, or cartons. For marking the glass body of vials, cartridges, or ampoules, CO₂ lasers are suitable, while for marking on the aluminum rim, fiber lasers are the ideal solution.

Laser marking systems require no consumables and run virtually maintenance-free, minimizing the need to interrupt production. For marking substrates on the top or bottom while in a star wheel, Videojet laser marking systems offer **Arc Compensation** as a standard feature. Arc Compensation helps compensate the non-linear motion in order to mark a straight, clean code on the desired location. Laser markers offer advantages over other coding technologies including excellent mark quality, and **permanent codes** that cannot be removed by moisture, solvents, or other substances. If residues of silicone oil used in the manufacture of vial and cartridge closures remain on the product, ink adhesion could be impaired. In this case, laser is an ideal coding technology as silicone residues do not affect the marking.

Fiber laser

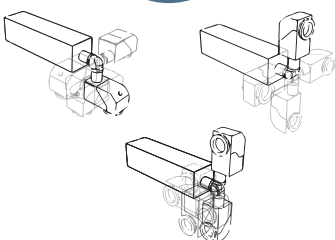
Fiber laser marking systems apply high-contrast marks at ultra-fast speeds on many robust, high-density materials that withstand sterilization or intensive wear. The Videojet 7340 and 7440 fiber lasers feature the **Lightfoot™** marking head, the most compact fiber laser marking head on the market, offering easy and versatile installation opportunities in tight spaces, like in star wheels. The water and dust-tight **IP69** marking head eliminates the need for additional housings or equipment and enables worry-free usage during washdowns. The 0° and 90° options allow the marking head to be adapted to production and space requirements within a star wheel, ensuring excellent coding results on vials and cartridges.

Fiber lasers offer a wide range of possible code sizes allowing for large code content in very small areas. Thus, the laser can mark on both the aluminum rim and on the narrow top of the aluminum closure.



0° & 90°
marking
head

32 beam
delivery
options



CO₂ laser

Even though the CO₂ laser is more of a niche application for marking vials, cartridges, and ampoules, it offers great flexibility and versatility when installed in a star wheel. The laser marking head and the beam source can be separated by a number of different **beam turning units (BTU)** or beam extensions (beam unit straight, BUS), offering a wide range of beam delivery options and space-optimized installation. With the variable beam source placement options, the supply unit does not have to be placed directly in or close to the star wheel.

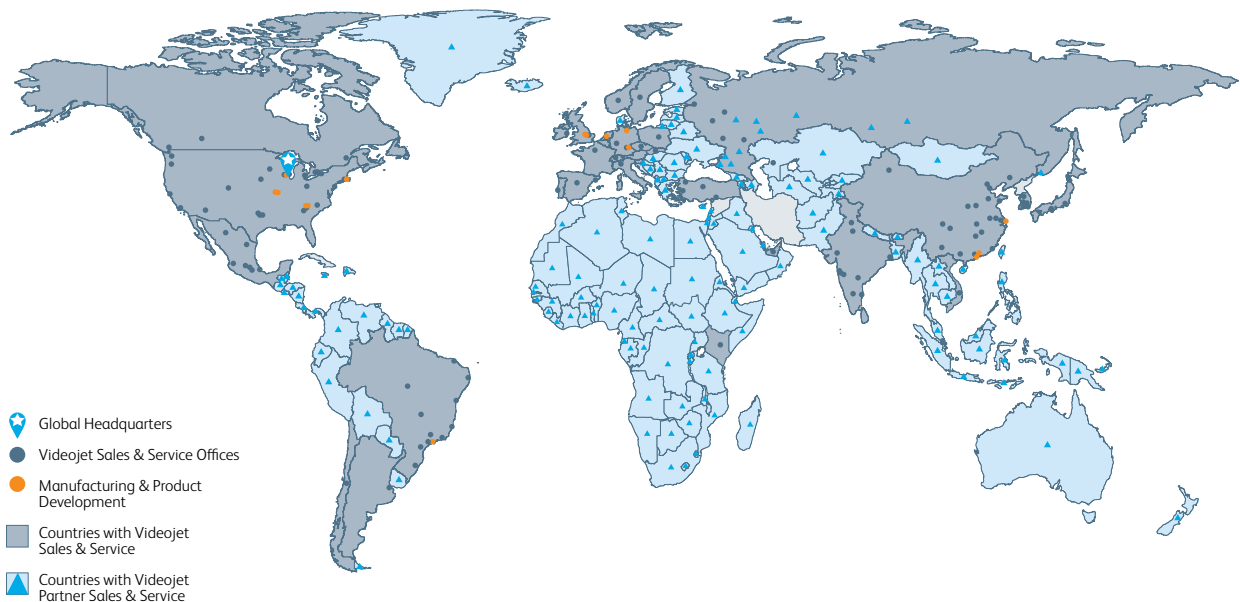
The Videojet CO₂ laser is available with **IP65** protection and integrated air conditioning allowing for a self-contained system that helps eliminate particle turbulences and air circulation in the machine.

Peace of mind comes as standard

Videojet Technologies is a world leader in industrial coding and marking solutions with a dedicated global healthcare team supporting organizations and supply chain partners with solutions, certifications and fast, reliable service.

A product portfolio including thermal inkjet, laser marking, continuous inkjet and labeling provides consistent, high-quality serialization and traceability codes, helping the pharmaceutical and medical device industries safeguard their products against counterfeiting and protect consumer safety. With a wide range of technologies addressing virtually any application, Videojet is the expert in realizing the specific requirements of a wide range of healthcare applications.

With decades of knowledge, Videojet Technologies' expertise in industry standards and global regulations makes them the right partner for understanding complex coding needs. Videojet solutions code 10 billion products a day worldwide, playing a vital and responsible role in the world. With over 4,000 associates serving 135 countries, Videojet has the capability to provide local service through global resources.



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