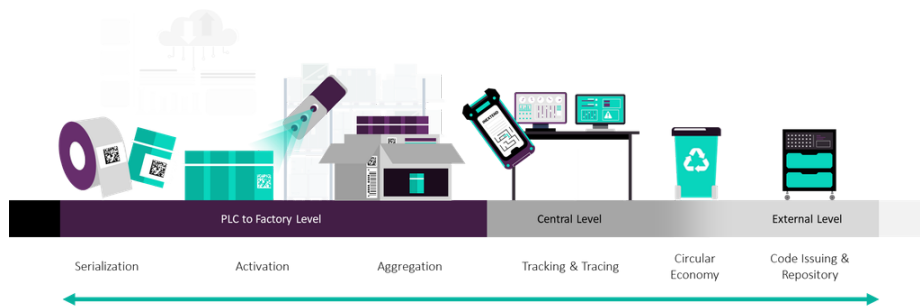


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Track and Trace industry

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Overview

Track and Trace is the process of determining the current and past locations (and other information) of a unique item.

Industry sectors such as beverage production, pharma production, textile production and tobacco production etc, are heavily regulated by most states, and all products and shipments must be traceable. Illicit trade is a major epidemic worldwide; exacerbated by a lack of full transparency from increasingly complex supply chains and growing trends towards cross-border trade. Be it smuggling, counterfeiting or undeclared production, governments and legitimate businesses lose billions of dollars in revenues each year, while consumers are exposed to poor quality and unregulated products.

In response to this global issue, manufacturers mark their production with codes (a process called *serialization*), which are used to track the product, to detect falsified products, and, in regulated markets, to validate the legal compliance of the manufacturer's production. Every code is unique and can be marked in any kind of format (human readable, machine readable code) and can follow any kind of recognized international standards.

When a factory wants to start a production of a given product on a production line, they must be able to mark the products with the required codes. They hence require a system which can obtain or generate codes, print those codes on the product, and keep track of the codes.

Manufacturing is organized based on the Production Order (also known as Work Order), which determines the number of codes which will be needed. In regulated markets, it will also determine the type of codes which must be printed.

Every product bears a [GTIN](#) (Global Trade Item Number) which is a unique identifier for this product. All items of this product bear the same GTIN (e.g.: pack of 20 units of brand ABC, model XYZ). Each packaging level of a product (pack, bundle, etc.) has a different GTIN.

A GTIN has a length of 14 characters (or less, but in that case it is padded with zeros to the left in order to reach 14 characters). The GTIN identifies the product, but does not uniquely identify a physical item. This means that GTINs are not sufficient to track production.

Examples of GTIN:



Regulated and unregulated markets

Regulated markets [🔗](#)

In certain markets, there exists a specific legal framework that governs the types of codes that are required to be printed on product packages. This legislation mandates that these codes must be procured from officially designated suppliers, referred to as ID Issuers. Furthermore, there is an obligation to report these codes to an organization that is under state control, ensuring compliance with the regulations. Markets that operate under these stringent guidelines are classified as regulated markets. This regulatory environment is crucial for maintaining standards and ensuring accountability within the industry.

i A few countries across the globe permit manufacturers the flexibility to utilize their own internal coding systems. However, these manufacturers are still mandated to report essential manufacturing and tracking data to the relevant authorities. This requirement ensures that there is a level of oversight and accountability in the production processes. Consequently, these markets are classified as regulated, as they adhere to specific standards and practices designed to maintain quality and safety in manufacturing.

Unregulated markets [🔗](#)

In all markets except for those that are regulated, manufacturers possess the freedom to create their own unique codes. They can print these codes directly on the packages of their products and are responsible for maintaining records of these codes. This practice is essential for track and tracing purposes, ensuring that products can be monitored throughout the supply chain. Such markets, where these practices are permitted, are referred to as unregulated markets.

Regulations supported by Inextor [🔗](#)

The following table provides a comprehensive summary of the various regulations that are currently supported by Inextor. For individuals seeking further information or clarification, it is advisable to refer to the corresponding section that delves into these regulations in greater detail.

It is important to note that the required events listed are exclusively those that Inextor is capable of reporting. In the context of these requirements, there exists a set of master data that is essential during the processes of code ordering or production. However, this master data is not enumerated in the table below, as it can encompass a wide array of entries. Typically, the master data consists of identifiers that relate to the company, factory, machine, and product, which are crucial for ensuring accurate reporting and operational efficiency.

Designation	When it applies			Requirements	
	Product type	Markets	Manufacturing location	Code type	Events
Mexico	Tobacco	Mexico	All	Pack codes provided by SAT	Commissioning
Tobacco Product Directive (Import)	Tobacco (Some product types will enter regulation at a later stage.)	EU countries	All	Pack codes provided by countries Id Issuer	None
Tobacco Product Directive (Export)		All	EU countries		

UK	Tobacco	GB (Northern Ireland is considered as EU)	NOT EU countries	Pack codes provided by Dentsu UK. Code printed	None
UK (paired)			EU countries	Pack codes provided by Dentsu UK. Code virtually paired	Code Pairing
Arabic gulf countries	Tobacco	United Arab Emirates Saudi Arabia Bahrain	NOT EU countries	Pack codes provided by DeLaRue Gulf. Code printed	Commissioning
Arabic gulf countries (paired)		Oman Qatar	EU countries	Pack codes provided by DeLaRue Gulf. Code virtually paired	Commissioning Code Pairing
CRPT tobacco	Tobacco	Russia Kazakhstan Kyrgyzstan	NOT EU countries	Pack and bundle codes signed by OMS.	Commissioning Aggregation Reimbursement
CRPT beverage	Beverage	Uzbekistan	All	Pack and bundle codes signed by OMS.	Commissioning Aggregation
Ecuador tobacco	Tobacco	Ecuador	NOT EU countries	Pack codes provided by Worldline Ecuador.	None
Ecuador alcoholic beverage	Alcoholic beverage		All	Any secure codes for bottle/can. (Inexto SUPI)	
Switzerland	Tobacco	Switzerland	NOT EU countries	Any secure codes for pack. (Inexto SUPI)	Commissioning
Jordan	Tobacco	Jordan	NOT EU countries	Any secure codes for pack. (Inexto SUPI)	Commissioning
Burkina Faso	Tobacco	Burkina Faso	NOT EU countries	Any secure codes for pack. (Inexto SUPI)	Commissioning

Production planning

Production planning is a crucial function carried out by specialized personnel knowledgeable in manufacturing processes. It can occur at the factory for immediate oversight or at a remote site like the manufacturer's headquarters for strategic decision-making. This flexibility ensures efficient and effective production planning tailored to the manufacturing environment's needs.

When planning production, it is essential to consider the following criteria:

- Which product is being produced?
- Which market is it intended for?
- When will the production take place?
- Where will it occur (specifically, in which factory and on which production line)?
- How much of the product will be manufactured?

TSignificant effort is dedicated to minimizing code loss during the planning phase. This objective is crucial in production planning for regulated markets, where codes are typically purchased at a cost.

Planners often implement strategies to reduce code loss and waste by:

- Rescheduling an order sooner if available codes are nearing expiration within the planned timeframe.
- Choosing an alternative production line for the order if more codes are set to expire on that line (as codes are line-dependent) or if the codes on the new line have an earlier expiration date than those on the originally assigned line.

Production workflow

Production workflow: [🔗](#)

A production workflow consists of a series of sequential events within a manufacturing environment, typically a factory, aimed at producing a manufactured product for release and sale in its intended market. An essential component of this workflow for many industries, is track and trace, which has become crucial in combating the illicit trade of certain product types. This system empowers manufacturers to integrate the application of Unit Unique Identifier (UUI) codes into their production processes to their manufactured product, a process known as serialization. This approach enables them to assign these codes to their products directly at the point of production.

Product information can be printed directly on carton packaging, bottle lids, or labels, as well as on the cellophane that wraps grouped products into bundles. The latter method employs a fiber laser printer, which effectively cuts through the cellophane.

In a production workflow, when a manufactured product experiences damage or a fault, it is removed from the production line. The product may either be destroyed or disassembled into components for reuse. In regulated markets*, if the product has already been printed with a code and that code has been activated, the code becomes unusable, resulting in financial loss. Conversely, if the code has been printed but not activated (i.e., reported to the authorities), there is a theoretical possibility of reusing it. However, this approach carries risks, as there is no guarantee that the product has been properly disposed of or broken down; it might have been inspected and deemed suitable for sale, for example. Additionally, since it is illegal to sell two products with the same code, any codes printed on products that have been diverted for any reason are not reused.

i *A market segment that necessitates the involvement of ID issuers for the distribution of printed codes, and is controlled by governmental regulations.

Some manufacturers activate codes immediately upon receipt from the ID issuer, while others do so at the time of printing. Additionally, some manufacturers choose to activate codes at a later stage, typically during palletization. This decision is influenced by various factors, including legal requirements (as codes are subject to legal time limit constraints), production limitations (which may involve technical issues), and specific technical choices made by the manufacturers.

Every customer makes unique technical manufacturing choices that significantly affect the serialization process. It is crucial to achieve serialization without disrupting the manufacturing process, particularly regarding efficiency. Additionally, in regulated markets (see [📘 Regulated and unregulated markets](#)), manufacturers incur costs for the codes. Therefore, it is vital to have the ability, when possible (not all regulations allow for this), to modify the production line in the event of a technical issue without losing the codes associated with the production order that have not yet been printed.

The longer a mistake in production and serialization goes unnoticed, the more costly it becomes. The most severe consequence for a manufacturer is having to remove products from store shelves, return them to their country of origin, and destroy them—often incurring substantial fines for having sold a product deemed illegal. Consequently, significant effort must be dedicated to validation and quality checks to prevent such scenarios.

Production workflow operations and serialization: [🔗](#)

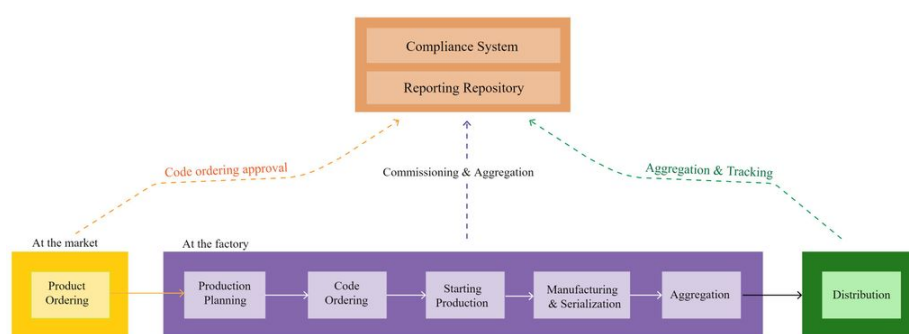


Figure 1: Production workflow operations and serialization

1. **Product Ordering:** The marketplace places orders for the specific quantities and types of products required.
2. **Production Planning:** To clarify the product details, target market, production timeline, factory location, production line, and pricing structure. For details, see [📘 Production planning](#).
3. **Code ordering:** Determining the appropriate source for ordering codes and the timing for such orders is essential for efficient operations. For details, see [📘 Codes and code ordering flow](#).
4. **Starting production:** Code availability, for details see [📘 Codes and code ordering flow](#).
5. **Manufacturing and serialization:** Product manufacturing and code application, for details see [📘 Inextor: Serialization](#).
6. **Aggregation:** Packaging arrangements for final distribution, for details see [📘 Inextor: Aggregation](#).

7. **Compliance and Reporting:** Code commissioning involves the verification of code validity and the consistency of aggregated data. For details see [Validation and checking](#).

Rework, refeed and reprocess

Definition [🔗](#)

Reworks are done when there has been a problem with packaging on the production line or when you have leftover stock in your factory. This practice is not necessarily problematic; in fact, it can be a standard part of your operational process. For instance, you might have Order A producing packs, while a designated area within your factory is responsible for repackaging these items under a separate Order B. This approach effectively facilitates the rework process.

When this happens, all chain elements (except packs) are disaggregated (down to the packs, or the bundles). The packs (and bundles, in the second case) must not be printed again, since the pack codes are still valid (if this is not the case, the packs themselves will be destroyed and this falls out of the scope of the Inexto Suite). However, all the codes of the other elements higher in the aggregation chain must be reprinted and reaggregated.

Terminology [🔗](#)

Common definitions may vary among customers. While some may have slight differences in interpretation, this documentation will standardize the following terms to refer to the same family of processes:

- Refeed
- Rework
- Reprocess

Refeed points [🔗](#)

In a production line, there are several points where products can be re-inserted, allowing for the repetition of aggregation steps. The specific locations for product insertion primarily depend on the type of bundles being used:

- **Carton bundle** - Manufactured products that are placed within a single outer carton.
- **Cellophane bundle** - Manufactured products that are wrapped together in cellophane.

Carton bundle [🔗](#)

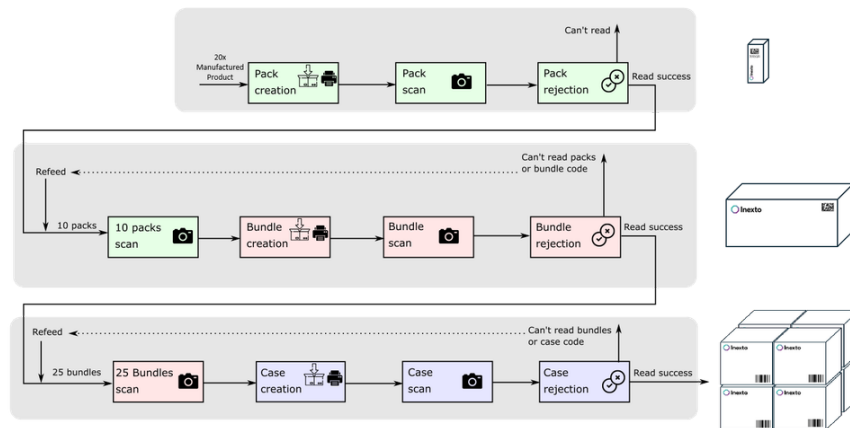


Figure 1: A simplified representation of the flow of a manufactured product within a carton bundle. Packs and bundles can be re-inserted, allowing for repackaging and re-aggregation.

Cellophane bundle

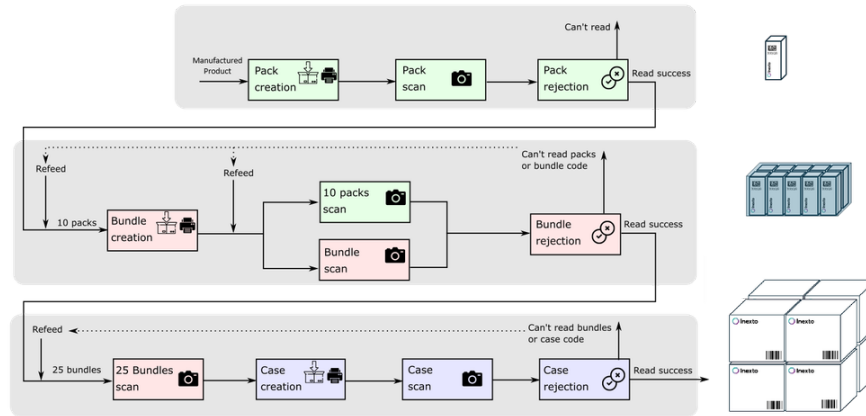


Figure 2: A simplified flow diagram illustrating a line with a clear wrap. Packs and bundles can be reinserted, allowing for repackaging and re-aggregation. Additionally, there is a refeed point that enables the aggregation process to be redone without the need for repackaging.

When using cellophane wrap, if the pack or bundle code is unreadable, the operator can attempt to rescan and aggregate without unwrapping the bundle. This approach minimizes waste.

Additionally, cellophane wrap significantly lowers the risk of incorrect aggregation. Since the scanning of pack and bundle codes occurs simultaneously, the possibility of mismatches is eliminated. In contrast, as illustrated in Figure 1, during the scanning of 10 packs and the bundle, the machine may halt, leading to potential pack swaps.

Cellophane wrap and pack code printed through wrap

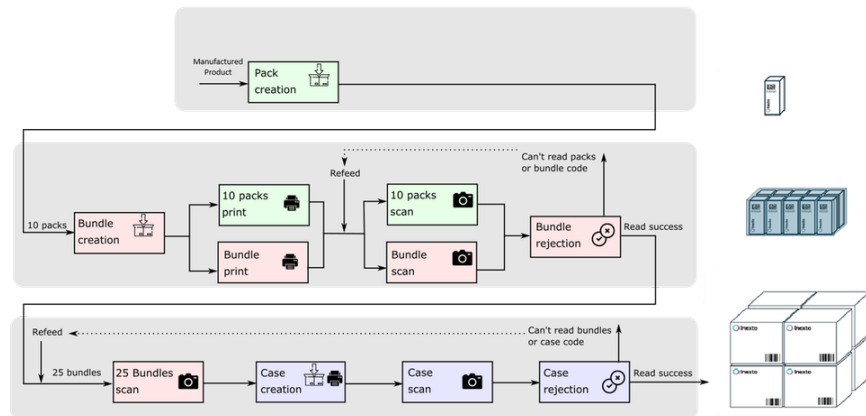


Figure 3: A simplified illustration of a line demonstrating the clear wrap and pack code printed through the wrap. Bundles can be reinserted, allowing for the re-aggregation of packs into bundles or the packaging of bundles into cases. With this option, the packs cannot be re-inserted in the line.

Rework order

Rework can occur independently of standard production processes, and in such instances, it is referred to it as a "Rework Order."

There are various reasons for initiating this type of order. Here are some common motivations:

- Wrong package used
- Damage during transport
- Bad quality of product
- Wrong aggregation
- Repackaging of old goods that were activated but left aside
- Special manufacturing involving packages produced and processed by different lines/orders (ie. "jumbo packs")

Rework order for Inextor

Since aggregation is not performed by Inextor, the impact is minimal.

Inextor must not consume external codes

During a rework order, new packs are not generated. Thus, there is no need to consume pack codes. This is especially true for external codes that cost money.

To avoid using external codes, a rework order on the Gate should be set with a Requested Quantity of zero (or, in the CRPT case, the relevant application setting should be set to **true** -

see page [CRPT Code Ordering](#)).

Inextor must inform Inexpress of the rework [🔗](#)

On the Gate, a Production Order for a rework order must specify it in the Inexpress tab.

- Order Type : Mono-Product Rework
- Rework : Set the lowest packaging that is re-aggregated. (Be careful, if you re-inject a clear-wrap inside the bundle labeler, even if the re-injected package is a bundle, the Rework IOT = Pack. This is because the clear-wrap label is re-created.)

Attributes	ExtendedFields	TPD	Inexpress
Production Order			
Order Type	Mono-Product Rework with check ▼		
Lot			
Leaving Item Object Type	Shipping Case ▼		
Reworked Item Object Type	▼		
Codes on reworked items are preserved. Higher packaging levels are marked with new codes.			
☐ Disaggregate/Deactivate on Inventory			

Validation and checking

Compliance

The compliance data must be reported to the relevant authorities (e.g. TPD Primary for the EU markets). This includes:

- Code usage. This is also called *code commissioning* or *code activation*.
- Aggregation of goods (as well as disaggregation).
- All tracking events, e.g. warehouse scan-in and scan-out, all shipping and transboarding, etc.

Reporting

Quality Assurance is not restricted anymore to the physical identity of the goods, it now also concerns the digital identity quality of the goods. Validation must be done at the earliest point in the chain as possible, in order to minimize costs and to avoid a cascading in case of issues. Early validation offers the advantage of catching problems before they become more complex. In essence, the type of issue that has to be avoided is to have one pallet blocked because it contains one invalid pack.

Codes can be checked at different stages of the product lifetime.

- **Before code ordering**

In regulated markets (see [Regulated and Unregulated Markets](#)), planners must validate that the order is compliant and coherent according to the regulation constraints (which can, for instance, dictate that the production line must be unique, or that the date of production must be the same).

- **After code ordering, before code application on product**

This happens only in regulated markets where codes have to be ordered from an issuer before being printed, and it is only important when the instance which issues codes is not the same as the instance which checks them. This means that currently, the only markets with such a need are the TPD-regulated markets. Users want to be able to check if codes orders have been received by the issuers, in order to avoid problems during or after production. They want to know if specific codes have been ordered, from whom, when, and with which product properties they are associated. They also want to verify that codes are consistent across systems to ensure that there will be no failure later on in the process (for instance, in the TPD regulated markets, they want to verify that the Primary repository also received the codes).

Example: Check for code XYZ, see that it has been ordered from issuer ABC on June 28, 2020 at 15:45, is meant to be printed on a pack of product FGH, size Small, price 4CHF, and has not yet been printed.

- **After code application on product, during manufacturing**

Codes can be checked an undetermined number of times all along the supply chain.

This type of checking is used by manufacturers for quality assurance checks and risk reduction checks (in order to avoid producing large quantities of items with incorrect codes, mostly).

After manufacturing, anywhere in the distribution chain

Users want to be able to verify a code (or a set of codes) in order to see

1. Where, when and by which factory a product has been manufactured (this can be used by the manufacturer itself, the police, customs personnel, etc.).
2. If product is counterfeit: if a product is checked by the end consumer more than one time (especially multiple times, and even more suspiciously, if it has been checked from different locations), it arises a strong suspicion of counterfeiting. If the same end customer checks a same item multiple times, it will raise a flag, as the system is not meant to be used that way.