ZENTTO

USER & INTEGRATION

MANUAL

ZENTTO DIGITAL PRINT

Digital printer authorized by SENIAT — Venezuela

Architecture, operation, backoffice, web front-office, mobile and SENIAT compliance

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Version control

Version	Date	Description
1.0.0	Junio 2026	Initial published version — official document for SENIAT homologation.

Table of contents

1. Overview

Zentto Digital Print (Zentto Imprenta Digital) is the Zentto ecosystem's **SENIAT-authorized digital printer** for issuing **legal electronic fiscal documents** in Venezuela, **without a physical fiscal machine**.

Zentto generates **digital fiscal control numbers (NCF-D)** from its **own series**, with atomic gap-free assignment, cryptographic integrity chaining (SHA-256 hash-chain) and document retention, in line with **Providencia SNAT/2024/000102** (digital printer and NCF-D control number) and **Providencia SNAT/2024/000121** (compliance duties: immutable ledger, fiscal books and SENIAT transmission).

> **Company**
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For users

If your business **does not use a fiscal machine**, the digital printer is the legal way to issue invoices, credit notes and debit notes in Venezuela. Zentto, as the digital printer, assigns the **fiscal control number** to each document and produces its graphical representation (PDF).

What you get

- Legal issuance of invoices, credit/debit notes, dispatch guides and withholding vouchers (VAT and ISLR).
- Fiscal control number and lookup data per document.
- Document delivery to the customer by email.
- Operation that **does not block** on momentary unavailability: the document is queued and retried in the background.

Channel	For whom	Description
Zentto ERP / POS	Ecosystem merchants	Invoices issued in Sales or POS are sent to the digital printer automatically.
Web front (vertical)	Print operators	Own web console to issue, query, void and report documents. See Web front manual.
Mobile app	Operators on the go	Ionic/Capacitor app to query and operate from a phone. See Mobile app manual.
Integrator API	Third-party systems	Any system (POS, e-commerce) can issue against Zentto's series via API. See API reference.

For developers

Zentto Digital Print exposes a single **canonical contract** under the `/v1/imprenta` base (microservice `zentto-imprenta-seniat`). The NCF-D control number is generated **in-house** from internal series (`imprenta."ControlSerie"`), with an atomic counter (`fn_assign_control_serie`) and each issuance chained with a SHA-256 hash per issuer RIF.

Downloadable documentation

Document	Language	Download
API Technical Reference	English	PDF
Referencia Técnica de API	Spanish	PDF

Document	Language	Download
User & Integration Manual	English	PDF
Manual de Usuario e Integración	Spanish	PDF

Next steps

- Architecture — gateway, in-house generation, hash-chain.
- API Reference — `/v1/imprenta` and integrator API `/api/*`.
- Document examples — canonical JSON and graphical representation per type.
- Issuance flow — end-to-end cycle.
- Numbering & control — own series and atomic counter.
- Backoffice manual — series, tariffs, integrators, distributors, commissions.
- Web front manual — vertical screens.
- Mobile app manual — mobile operation.
- SENIAT Compliance — ledger, books and transmission (Prov. 121).
- SENIAT Compliance mapping — mapping to the regulations.
- Configuration — series setup and operation.

2. Technical architecture

Zentto Digital Print is implemented as the `zentto-imprenta-seniat` microservice (Node/Express + TypeScript + PostgreSQL), acting as a **fiscal issuance gateway**. The client system (ERP, POS or an integrator) builds a **canonical document** and sends it to the gateway; Zentto generates the **NCF-D control number** from its own series, chains the record with a SHA-256 hash and persists the result.

Arquitectura del Gateway Fiscal Zentto

Components

Component	Description
Client system (ERP / POS / Integrator)	Builds the canonical document and consumes the gateway. Persists the control number and lookup data.
Gateway `/v1/fiscal/gateway`	Fiscal operations layer: `ping`, `emit`, `status`, `download`, `annul`, `numbering/assign`, `numbering/query`. Authenticated by `X-API-Key` (internal channel).
Domain `/v1/imprenta`	Web vertical API: dashboard, branches, billing points, numberings, assignments, documents, reports, users, audit, configuration. JWT from zentto-auth.
Backoffice `/v1/imprenta/backoffice`	Administers own series, metering (billable consumption), tariffs, integrators, distributors and commissions.
Integrator API `/api/*`	Public API for third parties: `tokenUsuario` + `secret` → short JWT; issuance against own series.
In-house generation (`provider propio` **)**	Assigns the NCF-D locally from `imprenta."ControlSerie"`, chains with SHA-256 and records the billable event in `imprenta."ConsumoControl"`.
SENIAT endpoints `/seniat/*`	Read-only lookup (by NCF-D, listing, sales book) protected with `X-Seniat-Key`.

Component	Description
Transmission queue	`fiscal."SeniatDispatch"` — exponential backoff retry (`fn_backoff_next`) to SENIAT.

Design principles

- **In-house control-number generation.** Zentto assigns the NCF-D from internal series, with an atomic counter (`SELECT ... FOR UPDATE`), gap-free and collision-free under concurrency.
- **Chained integrity.** Each document stores the hash of the previous record of the same issuer RIF (SHA-256 hash-chain), forming an end-to-end verifiable chain.
- **Isolation.** The microservice has its own database (schemas `fiscal` , `imprenta` , `audit` , `ops`) and own domain (`imprenta.zentto.net`). If it is down, the ERP keeps operating.
- **Multi-tenant.** Series are assigned per client company (`CompanyId`); the backoffice manages series and consumption for all companies.
- **Non-blocking.** Unavailability never blocks the sale: the document is queued and a worker retries with backoff.

Issuance layer

Issuance implements the `FiscalProvider` interface with `ping` , `emit` , `getStatus` , `download` , `annul` , `assignNumbering` and `queryNumbering` . The client sends a canonical document (`CanonicalDocument`) and Zentto translates it to its internal model.

In **in-house** mode (`provider propio`):

1. `emit` invokes `imprenta.fn_assign_control_serie(companyId, documentType, serie)` , which takes the next number of the active series with a row lock (`FOR UPDATE`).
2. The SHA-256 hash is computed, chained to the previous hash of the issuer RIF.
3. A **billable event** is inserted into `imprenta."ConsumoControl"` (metering).
4. `controlNumber` is returned and `documentos.service` persists the document.

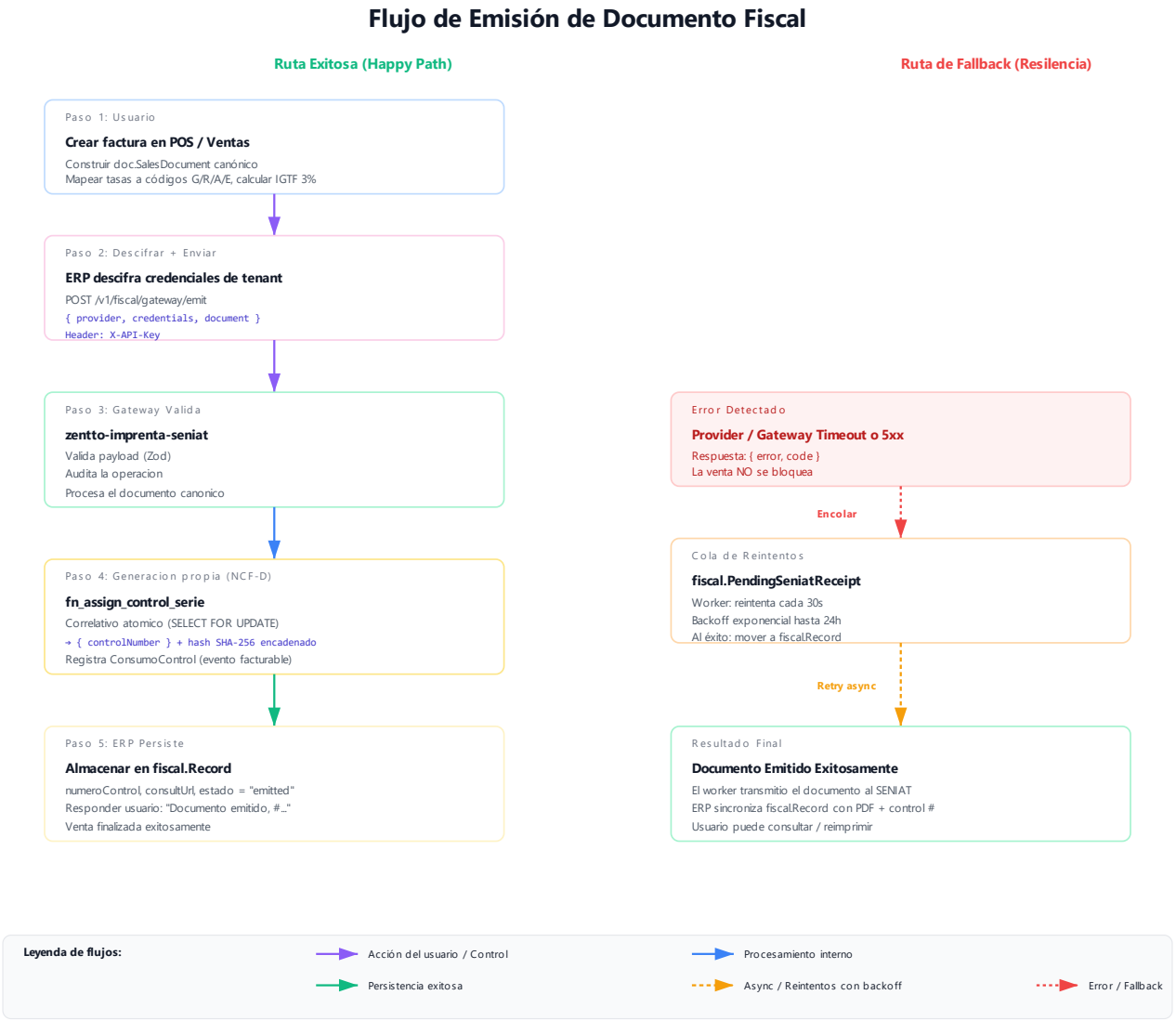
> **Business model**
>
> Zentto charges the client company by the **number of control numbers issued** (metering), with per-number or per-block tariffs. Consumption is measured in `imprenta."ConsumoControl"` and billed from the backoffice.

Database schemas

Schema	Main tables	Use
`fiscal`	`NcfdSequence` , `DigitalInvoice` , `SeniatDispatch`	NCF-D sequence, document store with hash-chain, transmission queue.
`imprenta`	`ControlSerie` , `ConsumoControl` , `TarifaPlan` , `Integrador` , `IntegradorCredential` , `Distribuidor` , `DistribuidorCartera` , `ComisionPlan` , `ComisionLiquidacion` , `Documento` , `Sucursal` , `PuntoFacturacion`	Print business domain.
`audit`	`AuditLog`	Operations audit trail.
`ops`	`Config` , `Tenant`	Runtime config and company registry.

3. Issuance flow

The diagram below summarizes the full issuance cycle in Zentto Digital Print, including the contingency path on unavailability.



Flow steps

1. **Sale.** The user issues an invoice from POS, the ERP Sales module, the vertical web front or an integrator.
2. **Canonical document build.** The client transforms the sales document into the canonical document: maps each line's rate to its tax code (`G` , `R` , `A` , `E`), computes the tax subtotals and IGTF (3%) on foreign-currency payments.
3. **Issuance.** `POST /v1/imprenta/documentos` (vertical) or `POST /api/emit` (integrator) is called. The service validates the schema (Zod) and audits the operation.
4. **Atomic control-number assignment.** In-house generation invokes `imprenta.fn_assign_control_serie(companyId, documentType, serie)` , which takes the next number of the active series with a row lock (`SELECT ... FOR UPDATE`). If the series is exhausted or missing, it returns `422` with `serie_agotada_o_inexistente` .
5. **Integrity chaining.** The SHA-256 hash is computed from `NCFD | RIF | Date | DocType | Total | PreviousHash | Timestamp` , chained to the last hash of the same issuer RIF.
6. **Consumption record (metering).** A billable event is inserted into `imprenta."ConsumoControl"` .

7. **Persistence.** The document is stored with its `controlNumber`, `documentNumber`, status and lookup data.

Contingency (non-blocking)

SENIAT compliance transmission is asynchronous: each document is queued in `fiscal."SeniatDispatch"` and a worker retries with **exponential backoff** (`fn_backoff_next`: 1, 2, 4, 8, … up to 60 minutes), up to `MaxAttempts`.

> **The sale is not blocked**
>
> If the transmission service is unavailable, issuance and control-number assignment still happen locally; SENIAT transmission is retried in the background.

4. Numbering & control (NCF-D)

Zentto Digital Print operates a **two-level** numbering model: the document number (issuer counter) and the fiscal control number (NCF-D), which Zentto generates **in-house** from its internal series.

Document number

The **issuer counter** per document type, controlled by the client system. Sent in the `documentNumber` field of each issuance.

Fiscal control number (NCF-D)

Assigned by **Zentto** at issuance time and returned in `controlNumber`. Formed as `Prefijo + LPAD(counter, 8, "0")` (e.g. `00012345`).

> **Mandatory persistence**
>
> The client system must **persist the returned control number**. Together with the hash chain, it is the document's verifiable fiscal evidence.

Own series

Each series is a `[Desde, Hasta]` range assigned to a client company for a document type, in the `imprenta."ControlSerie"` table:

Field	Description
`CompanyId`	Client company owning the series.
`Serie`	Series identifier.
`TipoDocumento`	`01` .. `07`.
`Prefijo`	Control number prefix.
`Desde` / `Hasta`	Range bounds.
`Correlativo`	Last number consumed (atomic).
`Estado`	`ACTIVA` · `AGOTADA` · `SUSPENDIDA`.

Atomic assignment — `fn_assign_control_serie`

The PL/pgSQL function `imprenta.fn_assign_control_serie(p_company_id, p_tipo_doc, p_serie)`:

1. Selects the `ACTIVA` series with `SELECT ... FOR UPDATE` (row lock).
2. Computes the next number (`Desde` on first use, then `Correlativo + 1`).
3. If it exceeds `Hasta`, marks the series `AGOTADA` and returns no number.
4. Updates `Correlativo` and returns `Prefijo + LPAD(number, 8, "0")`.

This guarantees a **gap-free, collision-free** counter under concurrency.

Range management (vertical / integrator)

Operation	Path	Who
Assign range	`POST /v1/imprenta/asignaciones`	Vertical (company)

Operation	Path	Who
List numberings	`GET /v1/imprenta/numeraciones`	Vertical
Generate series	`POST /v1/imprenta/backoffice/series`	`ZENTTO_SUPERADMIN` only
Extend / reassign series	`POST /v1/imprenta/backoffice/series/{id}/extender` · `/reasignar`	`ZENTTO_SUPERADMIN` only
Query integrator ranges	`GET /api/numeraciones`	Integrator

Summary

Level	Controlled by	Field	Assigned when
Document number	Client system	`documentNumber`	When building the document
NCF-D control number	Zentto (own series)	`controlNumber`	In the issuance response

5. Backoffice manual

The **backoffice** (`/v1/imprenta/backoffice`) is the print administration console. Two roles:

Role	Can
`ZENTTO_SUPERADMIN` (owner)	Generate series, define tariffs, reassign/extend series, manage distributors and commissions, see global metering.
`DISTRIBUIDOR` (reseller)	Query/assign already-generated series and see **their portfolio's** consumption. Cannot generate series or define tariffs (anti-IDOR: portfolio-scoped).

Own control-number series

Backoffice → Series.

Action	Endpoint	Role
List series	`GET /series` (filter `companyId` , `q`)	Both
Generate series	`POST /series`	SUPERADMIN only
Update (name, prefix, state)	`PUT /series/{id}`	Both (distributor portfolio only)
Reassign to another company	`POST /series/{id}/reasignar`	SUPERADMIN only
Extend the range top	`POST /series/{id}/extender`	SUPERADMIN only

Each series has `Serie` , `TipoDocumento` , `Prefijo` , range `[Desde, Hasta]` , `Correlativo` (last consumed), `Restantes` and `Estado` (`ACTIVA` · `AGOTADA` · `SUSPENDIDA`).

Client assignment

Series are assigned to a **client company** (`CompanyId`). **Reassign** moves a series to another company; **extend** raises the top (`Hasta`) without reassigning or recreating.

Consumption / metering

Backoffice → Consumption. Each control number issued creates a **billable event** in `imprenta."ConsumoControl"` .

View	Endpoint
Event detail	`GET /consumo` (filters `companyId` , `desde` , `hasta`)
Per-client summary (to bill)	`GET /consumo/resumen`

The summary shows per company: `Emitidos` , `Restantes` , `PrecioPorControl` , `IncluidoGratis` and `MontoEstimado = (Emitidos − IncluidoGratis) × PrecioPorControl` , plus global KPIs (clients, total issued, estimated revenue).

Tariffs

Backoffice → Tariffs (`GET/POST /tarifas`). Each plan (`TarifaPlan`) defines:

- `Moneda` , `PrecioPorControl` (price per control number).
- `TamanoBloque` + `PrecioBloque` (volume price).
- `IncluidoGratis` (free control numbers per period).

`CompanyId = 0` is the global **default tariff**; companies without their own plan fall back to it. Creating/updating tariffs is **SUPERADMIN only**.

Integrators and tokens

Backoffice → **Integrators**. An integrator is a client company that consumes the third-party API (`/api/*`).

Action	Endpoint
List / create	`GET/POST /integradores`
Detail / update / suspend	`GET/PUT/DELETE /integradores/{id}`
List tokens	`GET /integradores/{id}/tokens`
Issue token (returns the **secret once**)	`POST /integradores/{id}/tokens`
Revoke token	`POST /integradores/{id}/tokens/{tid}/revocar`
Integrator users	`GET/POST /integradores/{id}/usuarios`

Each token has `TokenUsuario` (public), `Ambiente` (`demo` / `production`) and `Estado` (`ACTIVO` / `REVOCADO`). The **secret** is shown only once at issuance and never recoverable.

Distributors and portfolio

Backoffice → **Distributors** (SUPERADMIN administers; distributor queries their portfolio).

Action	Endpoint
List / create distributor	`GET/POST /distribuidores`
Suspend distributor	`DELETE /distribuidores/{userId}`
View portfolio	`GET /distribuidores/{userId}/cartera`
Add company to portfolio	`POST /distribuidores/{userId}/cartera`
Remove company from portfolio	`DELETE /distribuidores/{userId}/cartera/{companyId}`

The **portfolio** is a distributor's set of client companies; their permissions are scoped to those companies.

Commissions

Backoffice → **Commissions**. Commissions are computed on the control numbers issued by the distributor's portfolio.

Action	Endpoint	Role
List plans	`GET /comisiones/planes`	Both (distributor sees own)
Define plan	`POST /comisiones/planes`	SUPERADMIN only
Accrued summary	`GET /comisiones/resumen` (`distribuidor`, `periodo`)	Both
Settlements	`GET /comisiones/liquidaciones`	Both
Settle (mark PAID)	`POST /comisiones/liquidar`	SUPERADMIN only

The plan (`ComisionPlan`) has `Modo` (`PORCENTAJE` or `MONTO`), `Porcentaje`, `MontoPorControl` / `MontoPorBloque`. Settlements move through `DEVENGADA` → `PENDIENTE` → `PAGADA`.

6. Web front-office manual

The vertical **web front** (Next.js) is the console where the print operator issues, queries and administers documents. Access is via the zentto-auth account (HttpOnly cookie login).

Login

Login screen: sign in with your Zentto username and password. The session is kept with a secure cookie; `companyId` is resolved from the token.

Dashboard

Shows the company **KPIs**: users, clients, products, branches and billing points. It is the entry point after signing in.

Documents

A tabbed section:

- **Sent** — paginated list of issued documents. Filters by document type, date range and search (buyer / RIF / document No. / control No.). Per document you can view the detail, its **status**, download the **PDF** and **void** it.
- **Assignments** — numbering ranges assigned per document type.

Issue a document

From Documents you build the document (type, buyer, items, tax codes) and issue it. Zentto assigns the control number and returns the lookup data. See Document examples.

Void

Open the document and click **Void** (with a reason). The document goes to `ANULADO`.

Catalogs

- **Branches** — create/edit branches (`Codigo` , `Descripcion` , `Activo`).
- **Billing points** — points with their counters per type (`CorrFactura` , `CorrDebito` , `CorrCredito` , `CorrGuias` , `CorrCompIva` , `CorrCompIslr`).

Numberings

Lists series and current counters; supports **CSV export**. **Reservations** (Other → Reservations) let you reserve numbering ranges.

Reports

Report	Content
Documents	Documents sent in the period.
Sales	Sales report.
Assignments	Assigned numbering ranges.
Monthly withholding	SENIAT withholdings (types 05 / 06).
Accounts payable / receivable	ERP AP/AR integration.

Users

Create/edit vertical users (`Nombre` , `Email` , `Rol` , `Estado`).

Audit

Lists the vertical's audit events (user, role, action, IP, date), with date-range and search filters.

Backoffice

For the `ZENTTO_SUPERADMIN` and `DISTRIBUIDOR` roles, the **Backoffice** menu exposes: **Series**, **Consumption**, **Tariffs**, **Integrators**, **Distributors** and **Commissions**. See the Backoffice manual.

7. Mobile app manual

The Zentto Digital Print **mobile app** (Ionic/Capacitor) lets you operate the printer from a phone. It consumes the same `/v1/imprenta` API with the zentto-auth session.

Login

Login screen: sign in with your Zentto username and password.

Dashboard

Shows the company's main KPIs (clients, documents, branches and billing points), adapted to a small screen.

Documents

- **Documents** — list of issued documents with search and filters.
- **Document detail** — open a document to view its fiscal data (type, document number, control number, buyer, totals, status) and available actions.

Assignments and Numberings

- **Assignments** — assigned numbering ranges.
- **Numberings** — series and current counter.
- **Reservations** — numbering range reservations.

Catalogs

- **Branches** — branch lookup.
- **Billing points** — points and their counters.

Reports

Access to the vertical's reports (documents, sales, assignments, monthly withholding) adapted to mobile.

Users and Audit

- **Users** — manage vertical users.
- **Audit** — query audit events.

> **Same data source**
>
> The mobile app and web front share Zentto Digital Print's API and database: what you see in one is reflected in the other.

8. SENIAT Compliance (Ruling 121)

Compliance with **Providencia SNAT/2024/000121** is implemented in the `zentto-seniat-compliance` microservice (Node/Express + PostgreSQL), independent from the issuance one. It covers three pillars: **immutable ledger**, **fiscal books** and **SENIAT transmission**.

For users

The system records every fiscal event (invoices, credit/debit notes, withholdings, period closes) in an **unalterable** way, generates the required **books** and makes them available to SENIAT. The operator does not interact with it directly: the ERP/printer publish events automatically.

For developers

Immutable ledger (event ledger)

Each fiscal event is recorded in `compliance."EventLedger"` and allows no UPDATE/DELETE. The event type (`EventType`) can be: `INVOICE_ISSUED`, `INVOICE_CANCELLED`, `CREDIT_NOTE`, `DEBIT_NOTE`, `WITHHOLDING_ISSUED`, `PERIOD_CLOSED`, `ADJUSTMENT`, `ERROR_CORRECTION`.

Per-tenant hash-chain. Each event's hash is computed as:

```
hashActual = SHA-256( tenantId | RifEmisor | EventType | ReferenceId | PayloadHash | HashAnterior |
OccurredAt )
```

Sequencing is protected with `pg_advisory_xact_lock(hashtext(tenantId))` inside the transaction: it locks the tenant, reads the last hash, computes the new one and inserts the event atomically. The payload is encrypted with **AES-256-GCM** before storage.

Endpoint	Purpose
`POST /v1/events`	Records a fiscal event (requires `X-API-Key`).
`GET /v1/events`	Queries events (filters `rif`, `eventType`, `desde`, `hasta`).
`GET /v1/ledger/{rif}`	RIF's chained ledger.
`GET /v1/ledger/verify/{rif}`	Verifies chain integrity.

Fiscal books

Endpoint	Book
`GET /v1/reports/libro-ventas/{rif}/{periodo}`	Sales book (`YYYY-MM`).
`GET /v1/reports/libro-compras/{rif}/{periodo}`	Purchase book.
`GET /v1/reports/libro-retenciones/{rif}/{periodo}`	Withholding book.

The sales book aggregates `INVOICE_ISSUED`, `CREDIT_NOTE`, `DEBIT_NOTE` and `INVOICE_CANCELLED` with per-line totals (subTotal, VAT, IGTF, total), cached in `compliance."FiscalReport"`.

SENIAT transmission

Each event is queued in `compliance."DispatchQueue"` (`QUEUED` → `SENDING` → `SUCCESS` / `FAILED` / `ABANDONED`) and a worker transmits with **exponential backoff** (`fn_backoff_next`: 1, 2, 4, 8, … up to 60 minutes, up to `MaxAttempts`).

SENIAT lookup

`/seniat/*` endpoints with `X-Seniat-Key` let SENIAT query events and verify chain integrity for any tenant. Each access is recorded in `audit."AccessLog"`.

Access audit

`audit."AccessLog"` records each operation (`EVENT_PUBLISHED`, `LEDGER_VIEWED`, `REPORT_GENERATED`, `SENIAT_QUERY`, `SENIAT_DISPATCH`, `VERIFY_INTEGRITY`) with actor, IP, user-agent, path and metadata.

Integration (SDK)

The ERP/printer use the `@zentto/seniat-compliance-client` (`ComplianceClient`) in fire-and-forget mode with a **circuit breaker** (failure threshold 5, reset 30 s, timeout 2 s). On failure, the `onFailure` callback lets the event be queued for retry, so issuance is never blocked.

> **Schemas and database**
>
> Schemas: `compliance` (events, reports, queue), `audit` (access), `ops` (config, tenants). Retention: `compliance.retention_years = 10`. Dates in UTC-0.

9. SENIAT compliance mapping

Regulatory framework

Rule	Scope
Providencia SNAT/2024/000102	Digital printer and Digital Fiscal Control Number (NCF-D) issuance.
Providencia SNAT/2024/000121	Compliance duties: immutable ledger, fiscal books and SENIAT transmission.

How Zentto Digital Print complies

Requirement	Zentto implementation
Issuance by authorized digital printer	Zentto assigns the NCF-D from its own series (`imprenta."ControlSerie"`).
Unique, gap-free control number	Atomic counter `fn_assign_control_serie` with `SELECT ... FOR UPDATE` .
Integrity and immutability	SHA-256 hash-chain per issuer RIF; chain verification (`verifyChainIntegrity`).
Two-level numbering	Document number (issuer) + control number (Zentto), tracked separately.
Document types	Invoice (01), CN (02), DN (03), guide (04), VAT withholding (05), ISLR withholding (06), ARCV (07 local).
Tax handling	Rates G (16%), R (8%), A, E and IGTF (3%) on foreign-currency payments, per tax subtotal.
UTC-0 dates	All dates stored in UTC; display converts to company timezone.
Immutable ledger + books + transmission	Compliance system `zentto-seniat-compliance` . See SENIAT Compliance.
SENIAT lookup	Read-only `/seniat/*` endpoints (by NCF-D, listing, sales book) with `X-Seniat-Key` .
Retention	`fiscal."DigitalInvoice"` store with 10-year retention (config `compliance.retention_years`).

Mapping to Providencia 102 (digital printer / NCF-D)

- **In-house NCF-D.** `fiscal."NcfdSequence"` + `fn_assign_ncfd(rif)` assign the number per issuer RIF in `Prefix-Series-Number` format, atomic and gap-free.
- **Graphical representation.** Each document produces its PDF with the fiscal data (see Document examples).
- **Permanent SENIAT access.** Endpoints `/seniat/consulta/{ncfd}` and `/seniat/listado` allow the Tax Administration to query; each access is recorded in the ledger.

Mapping to Providencia 121 (compliance)

- **Immutable ledger.** `compliance."EventLedger"` records each fiscal event (INVOICE_ISSUED, CREDIT_NOTE, DEBIT_NOTE, WITHHOLDING_ISSUED, ...) with SHA-256 hash-chain and per-tenant lock (`pg_advisory_xact_lock`).
- **Fiscal books.** `compliance."FiscalReport"` and the sales-book generator (`libro-ventas.generator`).
- **Transmission.** `compliance."DispatchQueue"` with exponential backoff to SENIAT.

Full detail in SENIAT Compliance.

Official documentation

For homologation, see the downloadable documents: User & Integration Manual (EN) · Manual de Usuario e Integración (ES).