MES Production Confirmation POC - Complete User Guide

Application: MES Production Confirmation System (Bluemingo POC) **Version:** POC Build - February 2026 **Industry:** Manufacturing **URL:** `http://localhost:4200/#/login`

Table of Contents

1. Application Overview

The MES Production Confirmation system is a Manufacturing Execution System proof-of-concept. It manages production orders, production confirmation with material consumption tracking, and batch traceability with quality approval workflows.

Key Capabilities

- **Order Management** -- Create, track, and manage customer orders through their complete lifecycle
- **Production Confirmation** -- Confirm production operations with material consumption, equipment, and operator tracking
- **Batch Traceability** -- Track every batch of material through production, with genealogy showing parent-child relationships
- **Batch Quality Approval** -- Approve or reject batches through a quality pending workflow

Technology

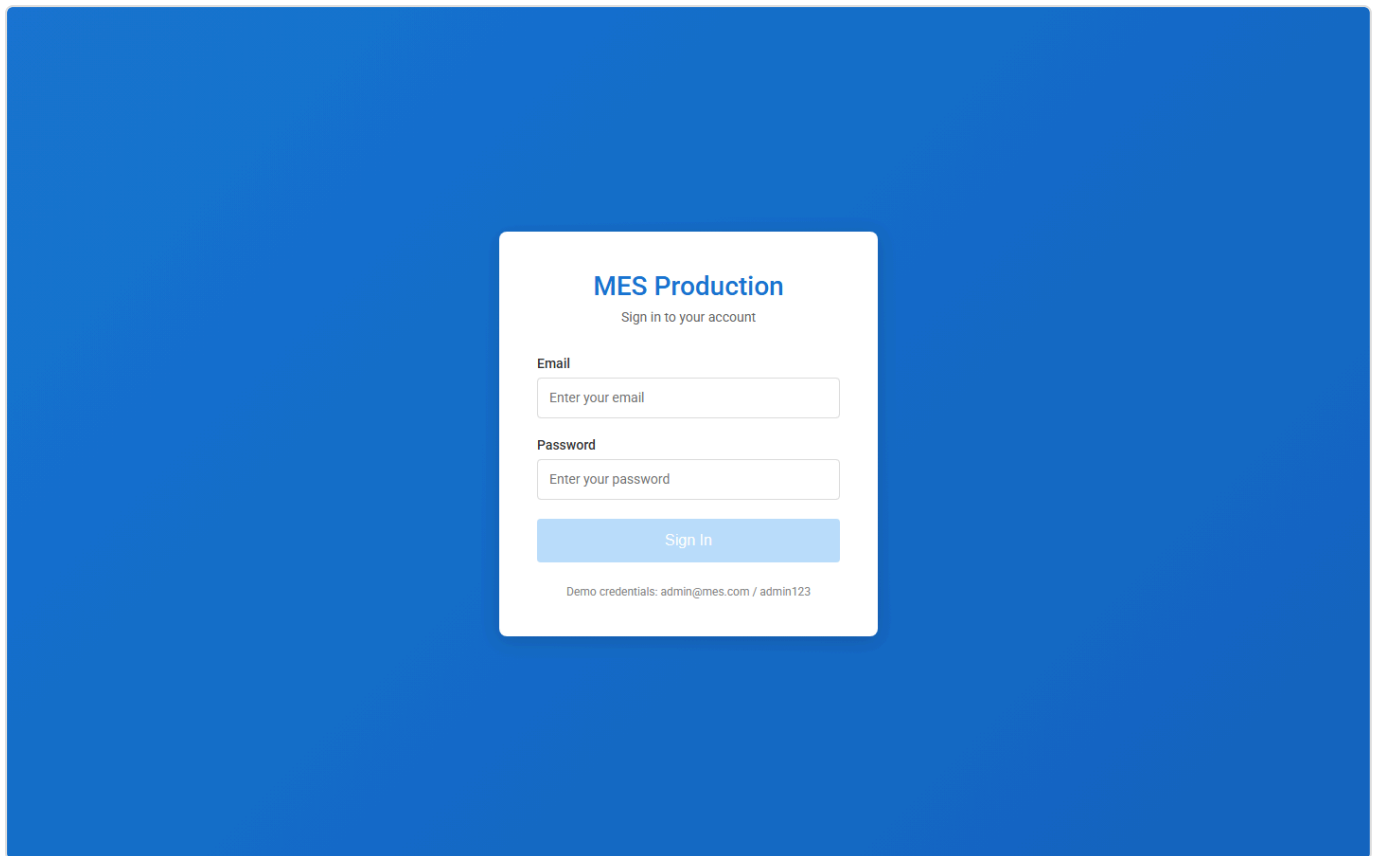- **Frontend:** Angular 17 single-page application
- **Backend:** Spring Boot 3.2 REST API
- **Database:** PostgreSQL 14+
- **Authentication:** JWT token-based authentication
- **URL Format:** Hash-based routing (all URLs contain `/#/` after the domain)

2. Login and Authentication

Login Page

The login page is the entry point for all users. It is displayed at `http://localhost:4200/#/login`.

The login page consists of:

- **Application title** -- "MES Production" displayed prominently at the top of the login card
- **Subtitle** -- "Sign in to your account" below the title
- **Email field** -- Text input for the user's email address
- **Password field** -- Masked input for the user's password
- **Sign In button** -- Submits the login form; disabled until both fields are valid
- **Demo credentials footer** -- Displays the POC credentials for quick reference

Entering Credentials
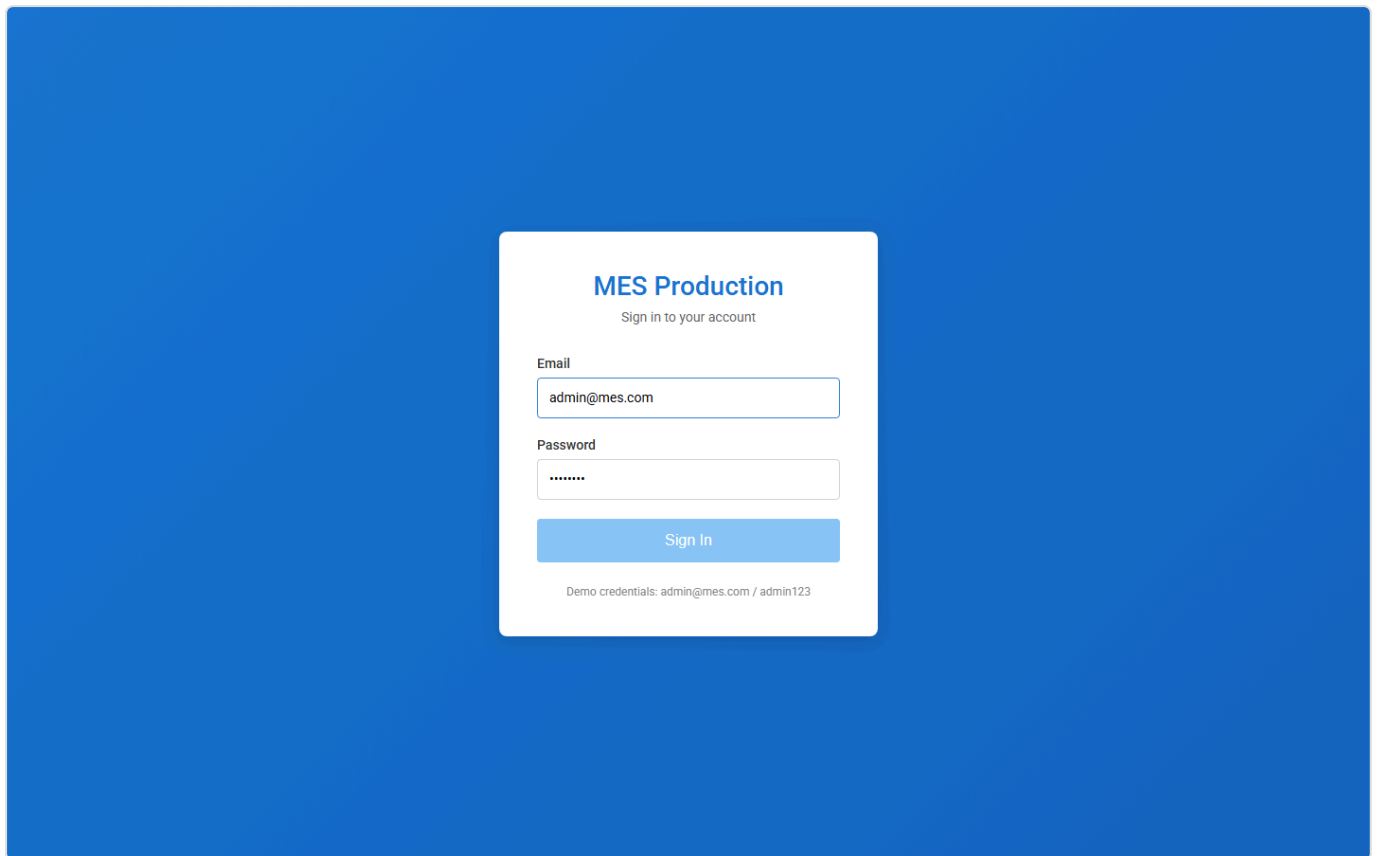
POC Credentials:

- **Email:** `admin@mes.com`
- **Password:** `admin123`

Validation Rules

Field	Rule	Error Message
Email	Required	"Email is required"
Email	Must be valid email format	"Please enter a valid email"
Password	Required	"Password is required"
Password	Minimum 6 characters	"Password must be at least 6 characters"

The **Sign In** button remains disabled (grayed out) until both fields pass validation. If login fails (wrong credentials), a red error alert appears below the form fields reading "Invalid email or password".

Login Flow

1. Navigate to `http://localhost:4200` -- the application automatically redirects to `/#/login`
2. Enter your email address in the Email field
3. Enter your password in the Password field
4. Click **Sign In** (or press Enter)
5. On success, the system redirects to the Dashboard at `/#/dashboard`
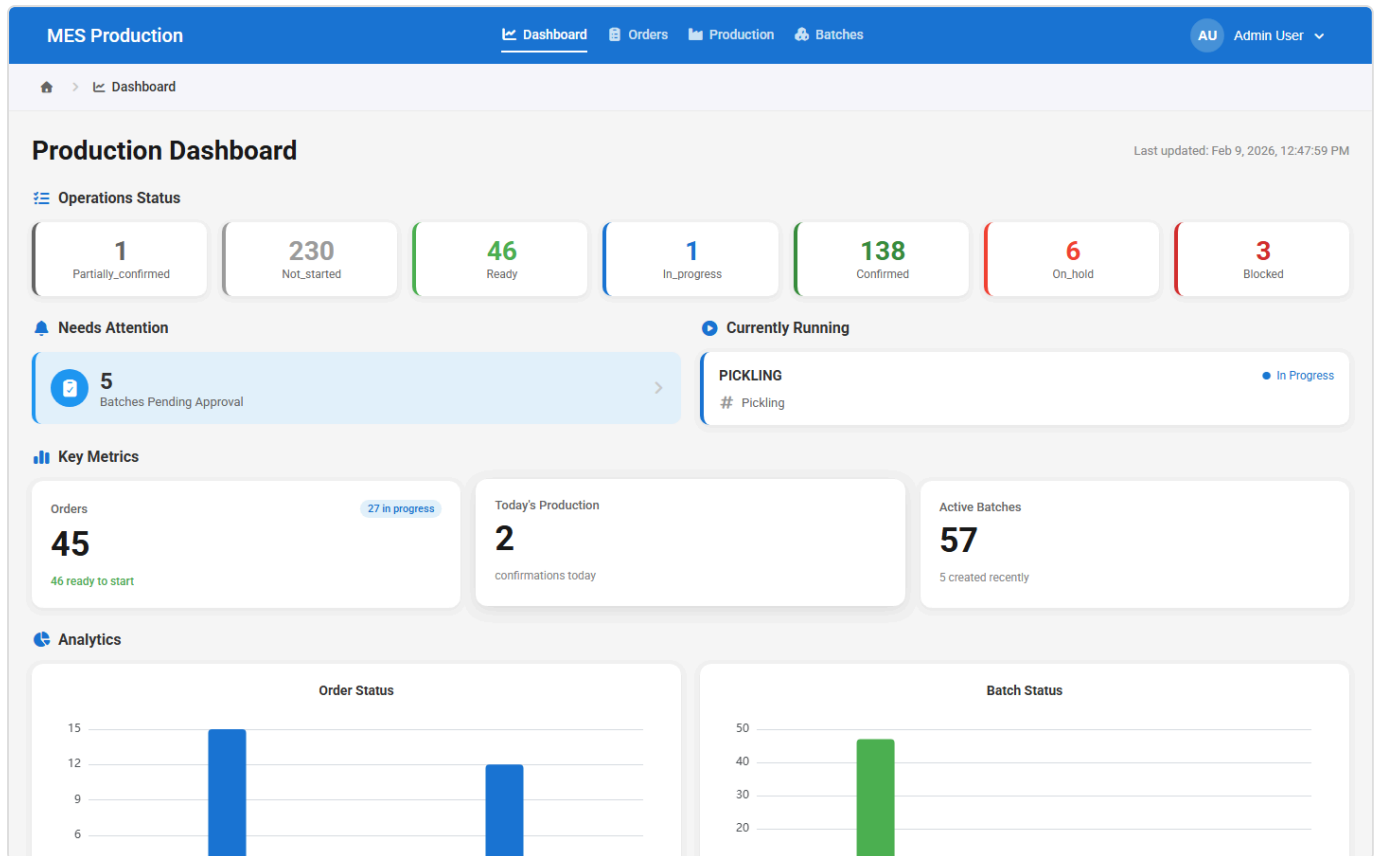
What Happens on Login

- The backend validates credentials and returns a JWT (JSON Web Token)
- The token is stored in the browser's local storage
- All subsequent API requests include this token in the `Authorization` header
- If the token expires, the user is redirected back to the login page
- If a user is already authenticated and visits `/login`, they are automatically redirected to the dashboard

3. Navigation and Layout

All authenticated pages use a consistent layout consisting of a top navigation header bar and a content area below it.

Header Bar


The header contains:

Left Side -- Logo:

- **"MES Production"** -- Clicking this text navigates to the Dashboard

Center -- Navigation Menu: Each menu item has an icon and label. The currently active page is highlighted.

Menu Item	Icon	URL	Description
Dashboard	Chart line icon	`/#/dashboard`	Production overview and KPIs

Orders	Clipboard list icon	`/#/orders`	Order management
Production	Industry/factory icon	`/#/production`	Production confirmation
Batches	Cubes icon	`/#/batches`	Batch tracking and traceability

Right Side -- User Profile:
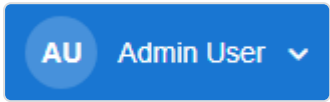
- **User Avatar** -- A circular badge showing the user's initials (e.g., "AD" for Admin)
- **User Name** -- The logged-in user's full name displayed next to the avatar
- **Chevron Arrow** -- A small down arrow indicating a dropdown menu

Clicking the user area opens a **Profile Dropdown Menu** containing:

- **Profile Header** -- Larger avatar with full name, email, and role
- **Divider line**
- **Logout** button -- Signs out the user after a confirmation dialog

The profile dropdown closes when:

- Clicking outside the dropdown
- Pressing the Escape key
- Clicking the Logout button

Mobile Responsiveness

On screens narrower than 992px:

- The main navigation collapses into a hamburger menu (three horizontal lines icon)
- Clicking the hamburger icon toggles the mobile navigation menu open/closed
- The mobile menu closes automatically when the window is resized above 992px
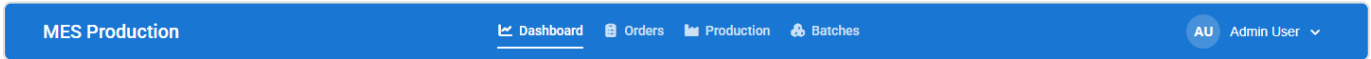
4. Dashboard

The Dashboard is the primary landing page after login. It provides a comprehensive overview of the entire manufacturing operation at a glance.
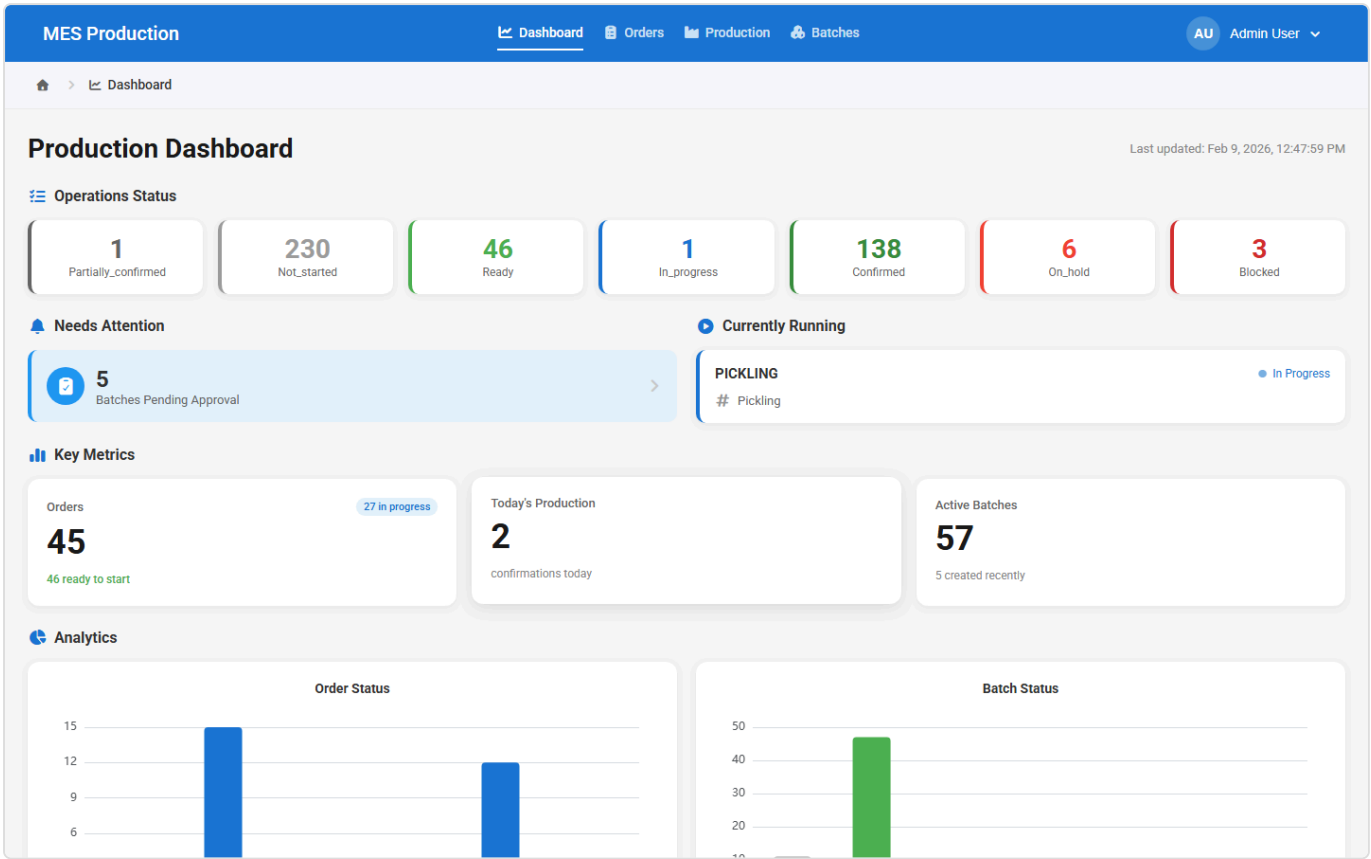
Page Header

- **Title:** "Production Dashboard"
- **Last Updated Timestamp:** Shows when the data was last refreshed (e.g., "Last updated: Feb 9, 2026, 7:17:42 AM")

Operations Status Summary

A horizontal row of colored status cards showing the count of operations in each status. Each card has a colored left border matching the status color and is clickable (navigates to Orders page).

Status	Border Color	Meaning
Not Started	Gray (#9e9e9e)	Operations that have not begun
Ready	Green (#4caf50)	Operations ready to start production
In Progress	Blue (#1976d2)	Operations currently being executed
Confirmed	Dark Green (#388e3c)	Completed and confirmed operations
On Hold	Red (#f44336)	Operations temporarily paused
Blocked	Dark Red (#d32f2f)	Operations blocked from proceeding

Needs Attention Panel

Appears only when there are items requiring action. A blue info card showing:

- **Batches Pending Approval** -- Count of batches in QUALITY_PENDING status. Clicking navigates to the Batches page filtered to show only pending batches.

Currently Running Panel

Shows up to 5 operations that are currently IN_PROGRESS, each displaying:

- Operation type (e.g., "MELTING", "CASTING")
- Operation name or ID
- Equipment name (if assigned)
- Operator name (if assigned)
- A pulsing green indicator dot showing "In Progress"

Clicking any active operation card navigates to the parent order's detail page.

Key Metrics Section

Three metric cards displayed in a horizontal grid:

Orders Card (Clickable):

- Main value: Total number of orders
- Sub-badge: Number of orders in progress
- Footer: Number of operations ready to start
- Clicking navigates to `/#/orders`

**Today's Production Card:**

- Main value: Number of production confirmations completed today
- Footer label: "confirmations today"

Active Batches Card (Clickable):

- Main value: Count of batches in AVAILABLE, QUALITY_PENDING, or PRODUCED status
- Footer: Number of recently created batches
- Clicking navigates to `/#/batches`

Analytics Charts

Two bar charts side by side, built using ECharts:

Order Status
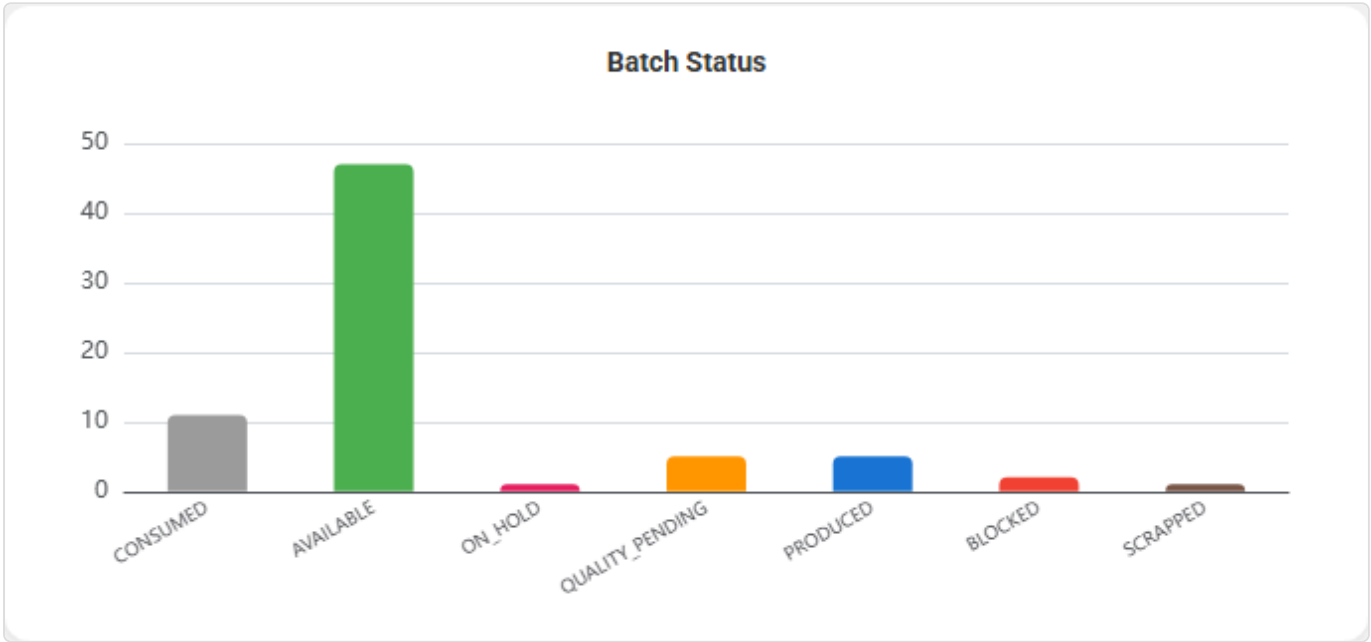
Batch Status

Order Status Chart:

- X-axis: Order statuses (CREATED, IN_PROGRESS, COMPLETED, ON_HOLD, CANCELLED)
- Y-axis: Count of orders
- Each bar is color-coded to match the order status color scheme
- Hover tooltip shows exact count

Batch Status Chart:

- X-axis: Batch statuses (QUALITY_PENDING, AVAILABLE, PRODUCED, CONSUMED, BLOCKED, SCRAPPED, ON_HOLD)
- Y-axis: Count of batches
- Each bar is color-coded to match the batch status color scheme
- Hover tooltip shows exact count

Orders Ready for Production Table

Orders Ready for Production

View All →

ORDER #	PRODUCT	CUSTOMER	STATUS
ORD-2026-001	Hot Rolled Coil 2mm	ABC Steel Corporation	IN PROGRESS
ORD-2026-002	Cold Rolled Sheet 1mm	Global Manufacturing Ltd	IN PROGRESS
ORD-2026-003	Reinforcement Bar 10mm	BuildRight Construction	IN PROGRESS
ORD-2026-011	Cold Rolled Sheet 2mm	Oceanic Metals Ltd	IN PROGRESS
ORD-2026-004	Hot Rolled Coil 2mm	Pacific Metal Works	CREATED

A table showing up to 5 orders that have operations in READY status:

Column	Description
Order #	The order number (e.g., "ORD-2026-001")
Product	Product name from the first line item
Customer	Customer name
Status	Status badge (color-coded)

- **"View All"** link in the header navigates to the full Orders list
- Clicking any row navigates to that order's detail page
- If no orders are ready, an empty state message reads "No orders ready for production"

Recent Confirmations Panel

Recent Confirmations

EAF Melting
HR-COIL-4MM   `127 units`

Scrap Charging
HR-COIL-4MM   `130 units`

Billet Reheating
REBAR-12MM   `178 units`

Bar Rolling
REBAR-12MM   `175 units`

Ladle Refining
REBAR-12MM   `182 units`

Shows the most recent production confirmations with:

- Green check icon
- Operation name
- Product SKU badge
- Quantity produced (e.g., "100 units")
- Timestamp of confirmation

If no recent activity exists, displays "No recent activity" with a history icon.

Recent Batches Table

Recent Batches   View All →

BATCH #	MATERIAL	QUANTITY	CREATED	STATUS
B-RM-001	Steel Scrap Grade A	500 T		CONSUMED
B-RM-002	Steel Scrap Grade A	350 T		AVAILABLE
B-RM-003	Steel Scrap Grade B	200 T		CONSUMED
B-RM-004	Iron Ore Pellets	400 T		AVAILABLE
B-RM-005	Limestone	150 T		AVAILABLE

A table showing up to 5 most recently created batches:

Column	Description

Batch #	Batch number (e.g., "MELT-20260209-001")
Material	Material name or material ID
Quantity	Quantity with unit (e.g., "50 T")
Created	Creation date/time
Status	Status badge (color-coded)

- **"View All"** link navigates to the full Batches list
- Clicking any row navigates to that batch's detail page

Quick Actions

Three action buttons at the bottom of the dashboard:

Button	Icon	Color	Action
Confirm Production	Factory icon	Primary blue (filled)	Navigate to `/#/production`
View Orders	List icon	Default (outlined)	Navigate to `/#/orders`
Batch Traceability	Cubes icon	Default (outlined)	Navigate to `/#/batches`

5. Orders Management

The Orders page (`/#/orders`) provides a complete list of all manufacturing orders with filtering, searching, and pagination.

Page Header

- **Title:** "Orders"
- **"+ New Order" Button:** Blue primary button in the top-right corner. Clicking navigates to `/#/orders/new` to create a new order.

Filter Area

| Search orders... | Status: | All ▾ |

The filter area contains:

Search Input:

- Text field with a search icon placeholder
- Searches across order number, customer name, and product name
- Results update immediately as you type (with debounce)
- Resets to page 1 when a new search term is entered

Status Filter Dropdown:

- Options: All, CREATED, IN_PROGRESS, COMPLETED, ON_HOLD
- Selecting a status filters the table to show only orders with that status
- "All" shows orders in all statuses
- Resets to page 1 when filter changes

Orders Table

Order Number	Customer	Product	Quantity	Status	Order Date	Actions
ORD-2026-045	Global Manufacturing Ltd	Steel Billet 100mm	470	CREATED	Feb 15, 2026	View Edit
ORD-2026-043	Oceanic Metals Ltd	Hot Rolled Coil 2mm	250	COMPLETED	Feb 15, 2026	View Edit
ORD-2026-044	South American Steel SA	Steel Billet 100mm	500	IN PROGRESS	Feb 15, 2026	View Edit
ORD-2026-042	European Auto Parts GmbH	Steel Billet 100mm	420	CREATED	Feb 14, 2026	View Edit
ORD-2026-041	European Auto Parts GmbH	Steel Billet 100mm	720	CREATED	Feb 14, 2026	View Edit
ORD-2026-040	Middle East Metals FZE	Hot Rolled Coil 3mm	210	CREATED	Feb 14, 2026	View Edit
ORD-2026-039	South American Steel SA	Hot Rolled Coil 2mm	570	COMPLETED	Feb 13, 2026	View Edit
ORD-2026-038	Nordic Steel Trading AB	Cold Rolled Sheet 1mm	120	IN PROGRESS	Feb 13, 2026	View Edit
ORD-2026-037	Nordic Steel Trading AB	Reinforcement Bar 10mm	300	COMPLETED	Feb 13, 2026	View Edit
ORD-2026-035	Middle East Metals FZE	Steel Billet 100mm	610	CREATED	Feb 12, 2026	View Edit
ORD-2026-034	Oceanic Metals Ltd	Hot Rolled Coil 3mm	310	CANCELLED	Feb 12, 2026	View Edit
ORD-2026-036	Asian Electronics Inc	Hot Rolled Coil 2mm	180	CREATED	Feb 12, 2026	View Edit
ORD-2026-032	African Mining Corp	Steel Billet 100mm	300	ON HOLD	Feb 11, 2026	View Edit
ORD-2026-031	European Auto Parts GmbH	Steel Billet 100mm	670	CREATED	Feb 11, 2026	View Edit
ORD-2026-033	Asian Electronics Inc	Hot Rolled Coil 2mm	530	IN PROGRESS	Feb 11, 2026	View Edit
ORD-2026-028	Pacific Metal Works	Hot Rolled Coil 4mm	280	ON HOLD	Feb 10, 2026	View Edit

Column	Description
Order #	The unique order number assigned by the system
Customer	Customer name from the order
Product	Product name from the first line item, or "N/A" if no line items
Total Qty	Sum of quantities across all line items
Order Date	Date the order was placed
Status	Color-coded status badge
Actions	"View" link to navigate to the order detail page

- Clicking the "View" link or the row navigates to `/#/orders/{orderId}`
- Table is sorted by order date in descending order by default (newest first)

Order Status Badges

Orders use color-coded status badges: **CREATED** (purple), **IN_PROGRESS** (blue), **COMPLETED** (green), **ON_HOLD** (amber), **CANCELLED** (brown). See Section 13: Status Color Reference for exact color values.

Pagination

Showing 1 - 20 of 45	« ‹ 1 2 3 › »	Items per page: 20 ⌄

See Section 14: Pagination and Sorting for detailed pagination controls documentation.

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6. Order Detail View

The Order Detail page (`/#/orders/{orderId}`) shows comprehensive information about a single order including its line items, operations, and a visual process flow chart.

In-Progress Order
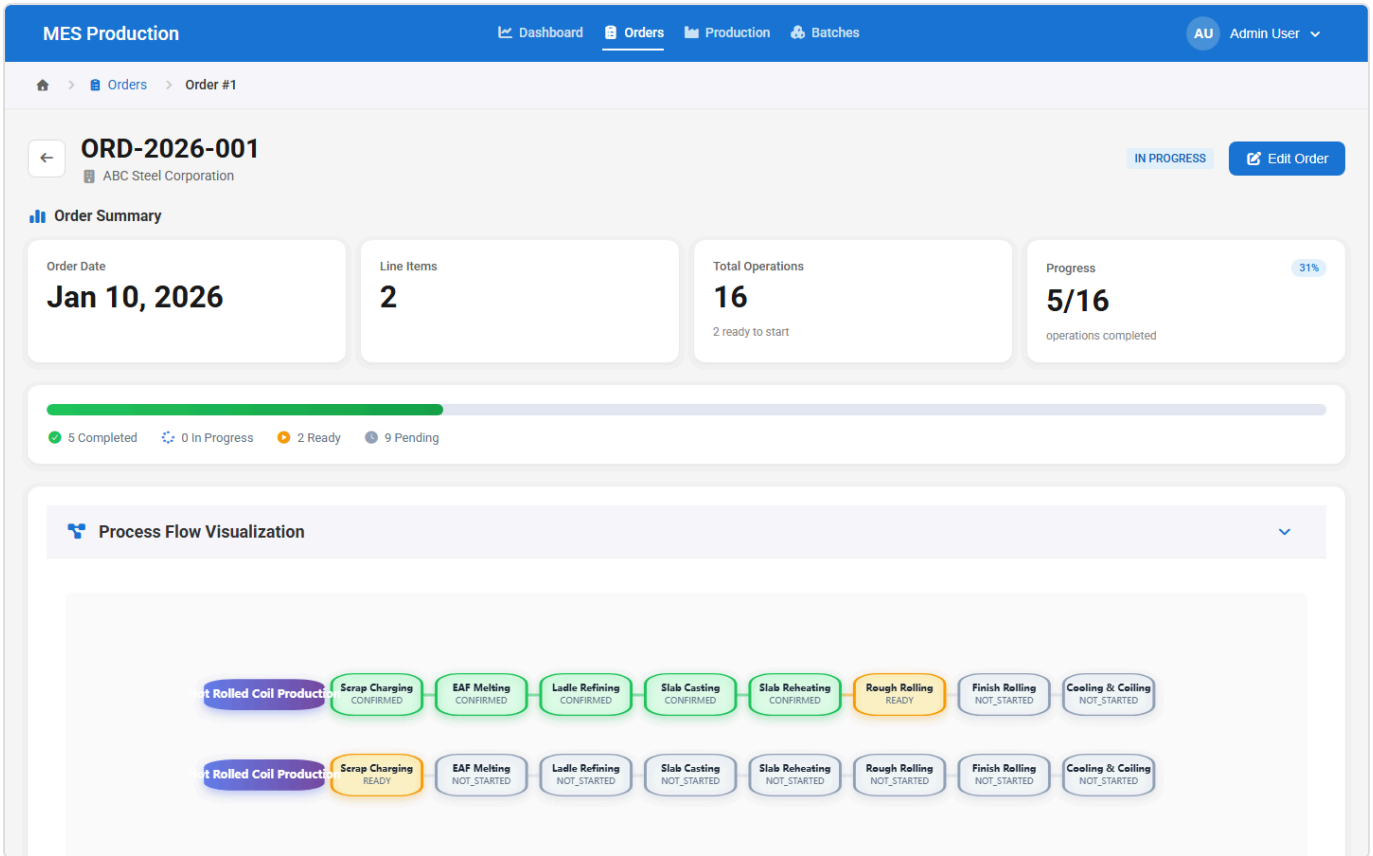
Header Section
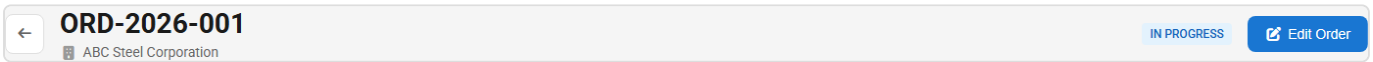
The header displays:

- **Back Arrow Button** -- Navigates back to the Orders list
- **Order Number** -- Large heading (e.g., "Order #ORD-2026-001")
- **Status Badge** -- Current order status with color coding
- **"Edit" Button** -- Navigates to the order edit form at `/#/orders/{orderId}/edit`

Order Summary Statistics

A row of statistic cards showing:

- **Total Operations** -- Count of all operations across all line items
- **Completed** -- Count of CONFIRMED/COMPLETED operations
- **In Progress** -- Count of IN_PROGRESS/PARTIALLY_CONFIRMED operations
- **Ready** -- Count of READY operations
- **Pending** -- Count of NOT_STARTED, ON_HOLD, or BLOCKED operations
- **Completion %** -- Percentage bar showing overall progress

Line Items Section

🏠 › 📄 Orders › Order #1

✓ **Slab Reheating** (ROLL-RHT) CONFIRMED
🏷 FURNACE ☰ Step 5

▶ **Rough Rolling** (ROLL-RGH) READY
🏷 ROLLING ☰ Step 6
▶ Start Production

○ **Finish Rolling** (ROLL-FIN) NOT STARTED
🏷 ROLLING ☰ Step 7

○ **Cooling & Coiling** (ROLL-COOL) NOT STARTED
🏷 COOLING ☰ Step 8

Hot Rolled Coil 3mm   **50 T**
SKU: HR-COIL-3MM   🚚 Feb 20, 2026

⚙ **Hot Rolled Coil Production**

▶ **Scrap Charging** (MELT-CHRG) READY
🏷 FURNACE ☰ Step 1
▶ Start Production

○ **EAF Melting** (MELT-EAF) NOT STARTED
🏷 FURNACE ☰ Step 2

Each line item is displayed as an expandable card showing:

- **Product SKU and Name** (e.g., "HR-COIL-001 -- Hot Rolled Coil")
- **Quantity with unit** (e.g., "100 T")
- **Delivery Date** (if specified)
- **Line Item Status badge**
- **Progress Percentage** bar for the line item
- **Collapse/Expand Toggle** -- Click the chevron to show/hide operations

Operations Timeline (within each Line Item)

Operations are grouped by their parent Process and displayed as a vertical timeline:

Process Group Header:

- Process name (e.g., "Melting", "Casting", "Rolling")
- Operations listed sequentially beneath

Each Operation shows:

- **Status Icon:**
  - Check mark (completed/confirmed)
  - Spinning icon (in progress)
  - Play icon (ready)
  - Pause icon (on hold)
  - Ban icon (blocked)
  - Circle icon (not started)
- **Operation Name** (e.g., "Electric Arc Furnace Melting")
- **Operation Status** as text label
- **"Start Production" Button** -- Blue button, only visible when the operation status is READY or IN_PROGRESS. Clicking navigates to
  `/#/production/confirm/{operationId}`

Operations List Panel (Cropped):

Process Flow Chart

An interactive ECharts graph visualization showing:

Process Nodes (left side):

- Purple gradient rectangular nodes with white text
- Show the process name (e.g., "Melting", "Casting")

Operation Nodes (right side, connected sequentially):

- Rounded rectangles with status-dependent colors:
    - Green border + light green background = CONFIRMED/COMPLETED
    - Blue border + light blue background = IN_PROGRESS
    - Amber/yellow border + light yellow background = READY
    - Orange border + light orange background = ON_HOLD
    - Red border + light red background = BLOCKED
    - Gray border + light gray background = NOT_STARTED
- Each node shows the operation name and status text
- Arrows connect operations in sequence order

Interactive Features:

- Hover over a node to see tooltip with name and status
- Adjacent nodes are highlighted on hover (focus: adjacency)
- Chart is zoomable and pannable (roam enabled)

Collapse Toggle:

- The flow chart section has a toggle button to collapse/expand it

Completed Order View
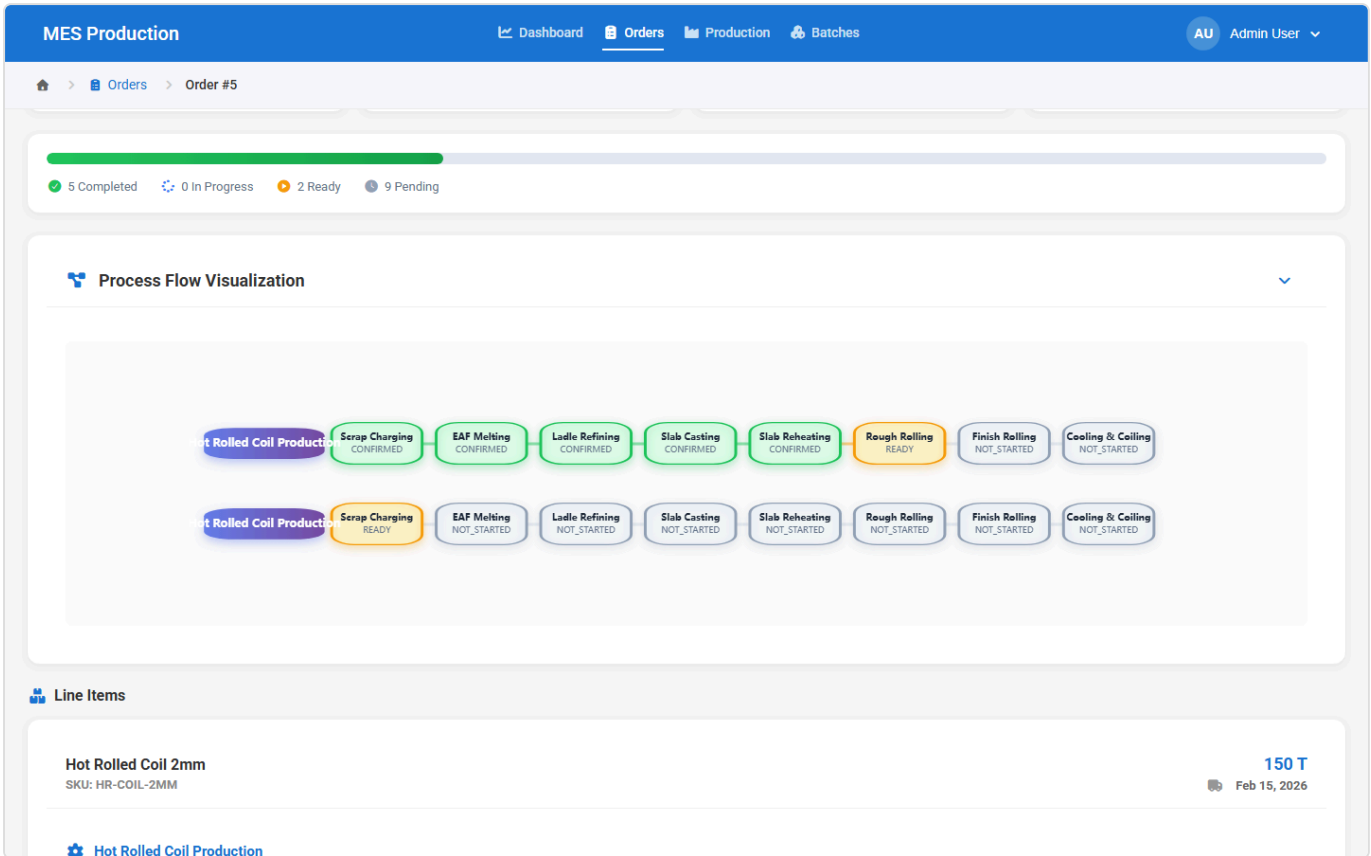
When all operations are confirmed, the completion percentage shows 100% and the order status badge shows COMPLETED in green.

Multi-Stage Process View
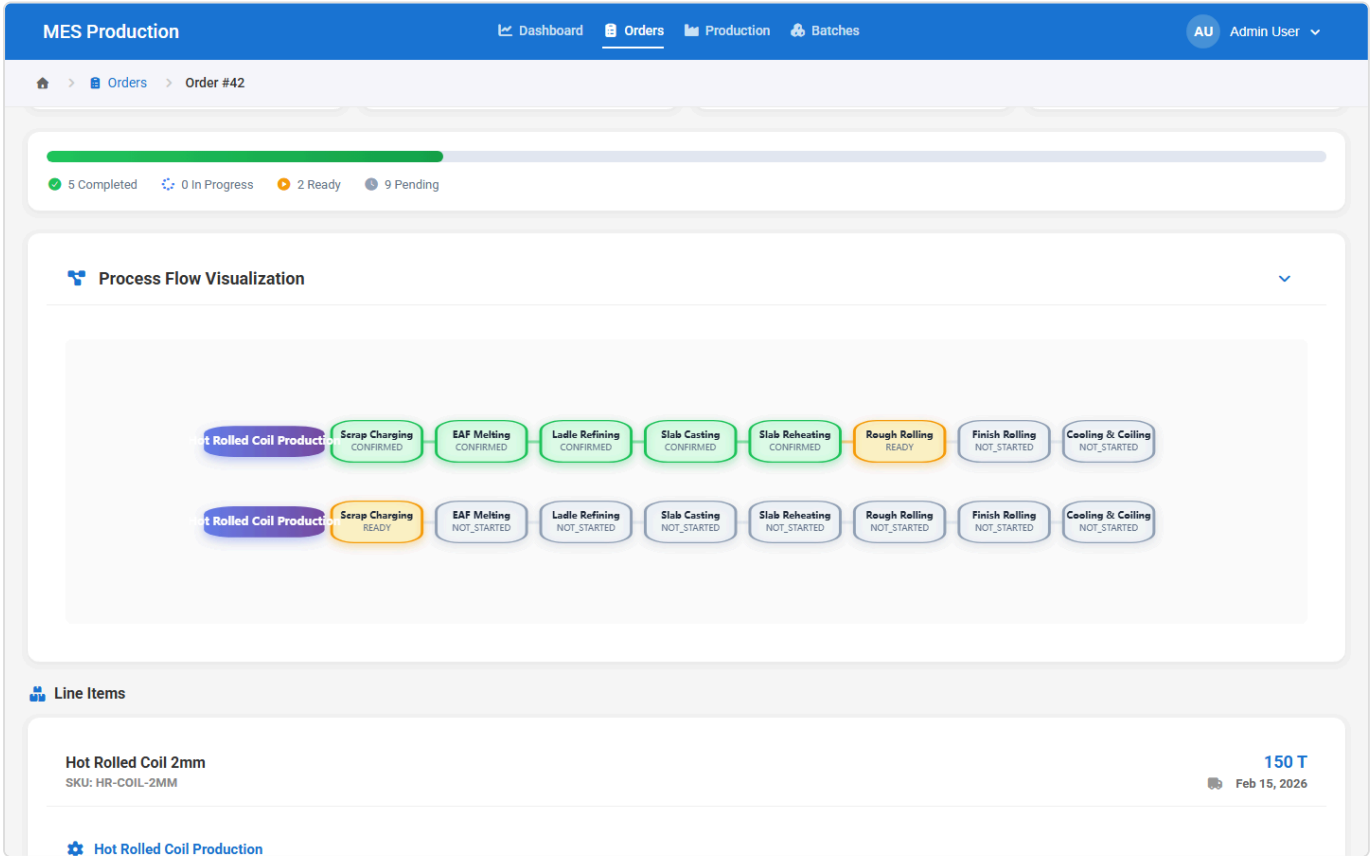
Orders with multiple processes (e.g., Melting, Casting, Rolling, Finishing) display each process group with its operations in the timeline and flow chart. The flow chart dynamically sizes its height based on the number of process rows.

On-Hold Order View

When an order is on hold, the status badge shows ON_HOLD in amber. Operations may show ON_HOLD status with pause icons. The "Start Production" button is hidden for operations that are on hold.

7. Order Create and Edit Forms

Create New Order

Navigate to `/#/orders/new` by clicking the **"+ New Order"** button on the Orders list page.

Form Fields:

Field	Type	Required	Validation	Description
Customer	Dropdown	Yes	Must select a customer	Populated from active customers list. Selecting a customer auto-fills Customer Name.
Customer Name	Text (auto-filled)	Yes	Max 200 characters	Auto-filled when customer is selected. Can be manually overridden.
Order Date	Date picker	Yes	Must be a valid date	Defaults to today's date
Order Number	Text	No	Auto-generated if blank	Optional manual order number. System generates one if left blank.

Line Items Section:

Each line item has these fields:

Field	Type	Required	Validation	Description
Product	Dropdown	Yes	Must select a product	Populated from active products list. Selecting auto-fills Product Name and Unit.
Product Name	Text (auto-filled)	Yes	Max 200 characters	Auto-filled from product selection
SKU	Text (auto-filled)	Yes	Max 50 characters	Auto-filled from product selection
Quantity	Number	Yes	Minimum 0.01	Production quantity
Unit	Text (auto-filled)	Yes	Max 20 characters	Unit of measure (e.g., "T" for tons)

| Delivery Date | Date picker | No | Valid date | Expected delivery date |

Buttons:

Button	Action
"+ Add Line Item"	Adds another line item row to the form
"Remove" (trash icon)	Removes a line item row (minimum 1 must remain)
"Save Order"	Validates and submits the form; on success, navigates to Orders list
"Cancel"	Discards changes and navigates back to Orders list

What happens when an order is created (database side effects):

1. An `Order` record is created with status `CREATED`
2. `OrderLineItem` records are created for each line item
3. The system automatically creates `Process` and `Operation` records based on the product's routing configuration
4. Operations are created in the correct sequence with status `NOT_STARTED`
5. The first operation in the sequence is set to `READY` status
6. An audit trail entry is logged for the order creation

Edit Order

Navigate to `/#/orders/{orderId}/edit` by clicking the **"Edit"** button on the Order Detail page.

The edit form pre-fills all fields with the existing order data. In edit mode:

- **Line items can only be modified** for orders in `CREATED` status
- Orders in other statuses allow editing only the basic info (customer, date)
- The status field may be shown but is typically managed through workflow actions, not manual editing

Validation on Submit:

- All required fields must be filled
- At least one line item must exist
- Quantity must be greater than 0.01
- If validation fails, fields with errors are highlighted in red with error messages displayed below each field

8. Production Module

Production Landing Page

The Production page (`/#/production`) serves as the gateway to production confirmation and history.

Production Confirmation

View History

Select Order & Operation

Order

-- Select an Order --

Available for Production

26	**46**
Orders	Ready Operations

The page shows:

Summary Information:

- Total number of READY operations across all available orders
- Count of available orders with READY operations

Step-by-Step Selection:

Step 1 -- Select Order:

- A dropdown showing all orders that have at least one READY operation
- Each option shows the order number and customer name
- Selecting an order populates the order context panel below

Order Context Panel (appears after selecting an order):

- Customer name
- Order date
- Status
- Product name and SKU
- Quantity with unit
- Due date (if available)

Step 2 -- Select Operation:

- A dropdown showing all READY operations for the selected order
- Each option shows the process name and operation name (e.g., "Melting - Electric Arc Furnace")
- Operation type and sequence number are displayed

Step 3 -- Confirm:

- **"Start Confirmation"** button -- Enabled only when both an order and an operation are selected. Clicking navigates to
  `/#/production/confirm/{operationId}`

Additional Button:

- **"View Production History"** -- Navigates to `/#/production/history`

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9. Production Confirmation Form

The Production Confirmation form (`/#/production/confirm/{operationId}`) captures all data for a production confirmation including time, quantities, materials, equipment, operators, and process parameters.

Operation Information Header

Displays read-only information about the selected operation:

- **Operation Name** (e.g., "Electric Arc Furnace Melting")
- **Operation Type** (e.g., "MELTING")
- **Operation Status** (READY or IN_PROGRESS)
- **Order Number** and order context

- **Product SKU** and product name
- **Target Quantity** from the order line item

Form Sections (Collapsible)

Each section of the form can be collapsed/expanded by clicking the section header. The toggle icon rotates to indicate state.

Section 1: Production Time

Production Time	^

Start Time *

09-02-2026 13:01 📅

End Time *

09-02-2026 13:01 📅

End time must be after start time

Field	Type	Required	Validation	Description
Start Time	DateTime picker	Yes	Must not be in the future	When production started
End Time	DateTime picker	Yes	Must be after Start Time	When production ended

Both fields default to the current date/time.

Calculated Display:

- **Duration** -- Automatically calculated and displayed (e.g., "2h 30m")

Validation Errors:

- "Start time cannot be in the future" -- if start time is after current time
- "End time must be after start time" -- if end time is before or equal to start time

Section 2: Production Quantities

Production Quantities ⌃

Quantity Produced *

150

Quantity Scrapped

0

Total Production: **150**   Yield: **100%**

● Good (>=95%)   ● Warning (80-95%)   ● Critical (<80%)

Field	Type	Required	Validation	Description
Quantity Produced	Number	Yes	Minimum 1	Amount of good product produced
Quantity Scrapped	Number	No	Minimum 0	Amount scrapped during production

Calculated Displays:

- **Total Production** = Quantity Produced + Quantity Scrapped
- **Yield Percentage** = (Quantity Produced / Total Production) * 100
- **Yield Indicator Color:**
  - Green (yield-good): 95% or above
  - Yellow (yield-warning): 80% to 94.99%
  - Red (yield-critical): Below 80%

Checkbox:

- **"Save as Partial Confirmation"** -- When checked, the confirmation is saved as partial (PARTIALLY_CONFIRMED status), allowing further confirmations for the same operation

Section 3: BOM Suggested Consumption

BOM Suggested Consumption

Target Quantity: **150 T**   Total Required: **791.1825 T**

[Apply Suggestions]

Material	Required Qty	Available	Yield Ratio	Stock Status
Finished HR Coil 2mm (FG-HR-2MM)	147 T	195 T	0.98	Sufficient
Hot Rolled Strip (IM-HR-ROUGH)	149.625 T	205 T	0.95	Sufficient
Surface Coating Oil (RM-COATING)	3 L	2000 L	1	Sufficient
Steel Slab 200mm (IM-SLAB)	156.24 T	355 T	0.93	Sufficient
Rolling Lubricant (RM-ROLL-LUB)	1.5 L	3000 L	1	Sufficient
Liquid Steel (IM-LIQUID)	155.76 T	480 T	0.88	Sufficient
Mold Powder (RM-MOLD-PWD)	0.75 KG	1000 KG	1	Sufficient
Steel Scrap Grade A (RM-SCRAP-A)	99.75 T	1030 T	0.95	Sufficient
Steel Scrap Grade B (RM-SCRAP-B)	27.6 T	420 T	0.92	Sufficient
Iron Ore Pellets (RM-IRON-ORE)	21.825 T	650 T	0.97	Sufficient
Limestone (RM-LIMESTONE)	12 T	350 T	1	Sufficient
Ferroalloy FeSi (RM-FESI)	0.75 KG	3500 KG	1	Sufficient
Coal / Coke (RM-COAL)	15 T	0 T	1	Insufficient
Graphite Electrodes (RM-GRAPHITE)	0.3825 EA	50 EA	0.85	Sufficient

Warning: Insufficient stock for some materials. Please review before proceeding.

If a Bill of Materials (BOM) exists for the product, this section shows:

- List of required materials with quantities
- Available stock for each material
- Stock status indicator: **"Sufficient"** (green) or **"Insufficient"** (red)
- Total required quantity

"Apply Suggestions" Button:

- Automatically selects inventory items and fills quantities based on BOM requirements
- Pre-fills the material consumption section

Section 4: Material Consumption

Batch #	Material ID	Available Qty	State	Action
B-RM-002	RM-SCRAP-A	350 T	AVAILABLE	Add
B-RM-004	RM-IRON-ORE	400 T	AVAILABLE	Add
B-RM-005	RM-LIMESTONE	150 T	AVAILABLE	Add
B-RM-006	RM-FESI	2000 KG	AVAILABLE	Add
B-RM-009	RM-GRAPHITE	50 EA	AVAILABLE	Add
B-RM-011	RM-SCRAP-B	120 T	AVAILABLE	Add
B-RM-012	RM-HCL	5000 L	AVAILABLE	Add
B-RM-013	RM-COATING	2000 L	AVAILABLE	Add
B-RM-014	RM-ROLL-LUB	3000 L	AVAILABLE	Add
B-RM-015	RM-MOLD-PWD	1000 KG	AVAILABLE	Add
B-RM-016	RM-AL-WIRE	500 KG	AVAILABLE	Add
B-RM-017	RM-SCRAP-C	250 T	AVAILABLE	Add
B-RM-018	RM-FEV	100 KG	AVAILABLE	Add
B-IM-002	IM-SLAB	155 T	AVAILABLE	Add
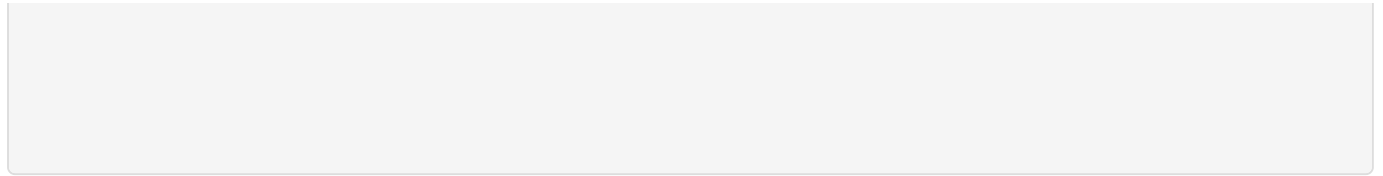
Available Inventory Table: Shows all AVAILABLE inventory items that can be consumed:

Column	Description
Batch #	Batch number of the inventory item
Material ID	Material identifier
Available Qty	Quantity available for consumption
Unit	Unit of measure
Location	Storage location
Action	"Add" button to select this material

"Open Material Picker" Button: Opens the Material Selection Modal (see below) for a more advanced selection interface with search and filtering.

Selected Materials Table: Once materials are added, they appear in a selected materials table:

Column	Description
Batch #	Selected batch number
Material ID	Material identifier
Available	Maximum quantity available
Consume Qty	Editable number input -- how much to consume
Action	"Remove" button to deselect

Quantity validation: The consume quantity cannot exceed the available quantity and must be >= 0.

BOM Validation: If BOM requirements exist, the system validates consumption against requirements and shows:

- Green checkmark for requirements met
- Yellow warning for partially met
- Red cross for missing requirements

Section 5: Batch Number Preview

OUTPUT BATCH NUMBER (PREVIEW)
HRC2-20260209-0001
This batch number will be assigned upon confirmation

Shows a preview of the output batch number that will be generated based on the configured batch numbering pattern:

- **Preview Batch Number** (e.g., "MELT-20260209-001")
- This is a preview only -- the actual number is generated on submit
- The pattern depends on configuration (operation type, product SKU, date format, sequence)

Section 6: Equipment & Operator Selection

Equipment & Operator ⌃

Equipment * (0 selected)

- ☐ Electric Arc Furnace #1 (EAF-001)
- ☐ Ladle Furnace #1 (LF-001)
- ☐ Ladle Furnace #2 (LF-002)
- ☐ Continuous Caster #1 (CCM-001)
- ☐ Hot Strip Mill #1 (HSM-001)

Operator * (0 selected)

- ☐ John Smith (OP-001)
- ☐ Mike Wilson (OP-002)
- ☐ Sarah Brown (OP-003)
- ☐ David Lee (OP-004)
- ☐ Emily Chen (OP-005)

Equipment Selection: Checkboxes for each available equipment item:

- Equipment code and name
- Checkbox to select/deselect
- Count of selected equipment displayed

Operator Selection: Checkboxes for each active operator:

- Operator code and name
- Checkbox to select/deselect
- Count of selected operators displayed

Validation: At least one equipment and at least one operator must be selected.

Section 7: Delay Tracking

Delay Tracking

Delay Duration (minutes)

0

Delay Reason

-- Select Reason --

Field	Type	Required	Validation	Description
Delay Duration	Number (minutes)	No	Minimum 0	Total delay time in minutes
Delay Reason	Dropdown	Conditionally	Required if delay > 0	Populated from configured delay reasons

Validation: If delay minutes is greater than 0, a delay reason must be selected.

Section 8: Process Parameters

Process Parameters ∧

Entry Temperature *(°C) [1100 - 1280]

    1200

Finish Temperature *(°C) [850 - 950]

    900

Coiling Temperature *(°C) [550 - 700]

    620

Thickness *(mm) [1.5 - 3]

    2

Speed *(m/s) [5 - 15]

    10

Dynamic form fields based on the operation type configuration:

Attribute	Description
Parameter Name	Display label (e.g., "Temperature", "Pressure")
Value Input	Number or text input
Min/Max Range	Shown if configured -- validation enforced
Required	Some parameters are mandatory

Validation:

- Required parameters must have a value
- Values must be within configured min/max range
- Warning displayed for values close to limits (within 10% of min or max)

Section 9: Notes

Field	Type	Required	Description
Notes	Textarea	No	Free-text notes about the production run

Submit Button

Cancel   Confirm Production

"Confirm Production" Button:

- Blue primary button at the bottom of the form
- Disabled while submitting (shows loading spinner)
- Validates all required fields before submitting

Error Messages on Submit:

- "Please fill in all required fields correctly."
- "Please select at least one equipment."
- "Please select at least one operator."
- "Please select a delay reason when delay duration is greater than 0."

Submission Success

On successful submission, a success panel replaces the form showing:

- **Confirmation ID** -- The unique ID of the production confirmation
- **Output Batch Information:**
  - Batch number
  - Material ID
  - Quantity produced
  - Unit
  - Link to view the batch detail
- **Next Operation Information** (if applicable):
  - Next operation name and status
  - Process name
- **Multiple Output Batches** -- If the quantity was split, all output batches are listed
- **Partial Confirmation Info** -- If saved as partial:
  - Remaining quantity to complete
  - Progress percentage bar
  - "Continue Confirmation" button to submit another confirmation for the same operation

What happens in the database when production is confirmed:

1. A `ProductionConfirmation` record is created with status CONFIRMED (or PARTIALLY_CONFIRMED)
2. The operation status changes to CONFIRMED (or PARTIALLY_CONFIRMED)
3. Input material inventory states change to CONSUMED
4. Input batch statuses change to CONSUMED
5. A new output `Batch` record is created with status PRODUCED
6. A new `Inventory` record is created for the output with state PRODUCED
7. `BatchRelation` records are created linking input batches to the output batch (type: CONSUME)
8. If all operations for a line item are confirmed, the next operation becomes READY
9. Equipment status changes to IN_USE during production and back to AVAILABLE after
10. Audit trail entries are logged for all changes
11. If all operations in the order are confirmed, the order status changes to COMPLETED

Material Selection Modal

The Material Selection Modal provides an advanced interface for selecting input materials:

Features:

- **Search field** -- Search by batch number, material ID, or material name
- **Material Type Filter** -- Dropdown to filter by material type prefix (RM, IM, FG, WIP)
- **Select All / Clear All buttons** -- Bulk selection operations
- **Selection Table:**
  - Checkbox for each inventory item
  - Batch number, material ID, material name

- Available quantity and unit
  - Location
  - Quantity input field (appears when item is selected)
- **Selection Summary:**
  - Count of selected items
  - Total quantity to consume
- **"Confirm Selection" Button** -- Applies selections and closes modal
- **"Cancel" Button** -- Discards changes and closes modal
- **Backdrop Click** -- Clicking outside the modal also cancels

10. Production History

The Production History page (`/#/production/history`) shows all past production confirmations.

Status Summary Cards

A row of cards showing counts by confirmation status:

- **CONFIRMED** -- Successfully completed confirmations
- **PENDING_REVIEW** -- Confirmations awaiting review
- **PARTIALLY_CONFIRMED** -- Partial confirmations (more production needed)
- **REJECTED** -- Rejected confirmations

Filters

Status Filter Dropdown:

- Options: All, CONFIRMED, PENDING_REVIEW, PARTIALLY_CONFIRMED, REJECTED

Search Input:

- Searches across operation name, output batch number, confirmation ID, and notes

Confirmations Table

Column	Description
ID	Confirmation ID number
Operation	Operation name
Qty Produced	Good quantity produced
Qty Scrapped	Scrapped quantity
Start Time	Production start date/time
End Time	Production end date/time
Duration	Calculated duration (e.g., "2h 30m")
Status	Color-coded status badge

Row Click: Clicking a row toggles the detail panel for that confirmation.

Detail Panel (Expandable)

Clicking a row expands an inline detail panel showing:

- Output batch information (batch number, material, quantity)
- Equipment used
- Operators involved
- Materials consumed (batch numbers and quantities)
- Process parameters recorded
- Delay information (if any)
- Notes

11. Batch Management

The Batches page (`/#/batches`) provides a list of all material batches in the system.

🏠 › 🔗 Batches

Batch Traceability

State: All States ⌄	Search: Search by batch number or material					

Batch Number	Material ID	Quantity	UoM	State	Created	Actions
B-FG-004	FG-HR-2MM	120	T	AVAILABLE		View
B-FG-003	FG-REBAR-10	180	T	AVAILABLE		View
B-WIP-003	WIP-CAST	78	T	AVAILABLE		View
B-FG-005	FG-REBAR-10	175	T	PRODUCED		View
B-FG-006	FG-CR-1MM	55	T	PRODUCED		View
B-RM-019	RM-SCRAP-A	100	T	BLOCKED		View
B-IM-017	IM-SLAB	45	T	BLOCKED		View
B-IM-018	IM-BILLET	60	T	QUALITY PENDING		View
B-FG-007	FG-HR-2MM	25	T	QUALITY PENDING		View
B-RM-020	RM-COAL	25	T	SCRAPPED		View
B-RM-021	RM-SCRAP-A	280	T	AVAILABLE		View
B-RM-022	RM-SCRAP-B	150	T	AVAILABLE		View

Filter Area

State: All States ⌄	Search: Search by batch number or material	

- **Search Input** -- Search by batch number, material ID, or material name
- **Status Filter** -- Dropdown: All, QUALITY_PENDING, AVAILABLE, PRODUCED, CONSUMED, BLOCKED, SCRAPPED

URL Parameter Support: The page accepts a `?status=` query parameter to pre-filter. For example, clicking "Batches Pending Approval" on the Dashboard navigates to `/#/batches?status=QUALITY_PENDING`.

Batches Table

Batch Number	Material ID	Quantity	UoM	State	Created	Actions
B-FG-004	FG-HR-2MM	120	T	AVAILABLE		View
B-FG-003	FG-REBAR-10	180	T	AVAILABLE		View
B-WIP-003	WIP-CAST	78	T	AVAILABLE		View
B-FG-005	FG-REBAR-10	175	T	PRODUCED		View
B-FG-006	FG-CR-1MM	55	T	PRODUCED		View
B-RM-019	RM-SCRAP-A	100	T	BLOCKED		View
B-IM-017	IM-SLAB	45	T	BLOCKED		View
B-IM-018	IM-BILLET	60	T	QUALITY PENDING		View
B-FG-007	FG-HR-2MM	25	T	QUALITY PENDING		View
B-RM-020	RM-COAL	25	T	SCRAPPED		View
B-RM-021	RM-SCRAP-A	280	T	AVAILABLE		View
B-RM-022	RM-SCRAP-B	150	T	AVAILABLE		View
B-IM-019	IM-HR-ROUGH	95	T	AVAILABLE		View
B-IM-020	IM-LIQUID	100	T	AVAILABLE		View
B-FG-008	FG-REBAR-10	150	T	AVAILABLE		View

Column	Description
Batch #	Unique batch number (clickable -- navigates to detail)
Material ID	Material identifier
Material Name	Human-readable material name
Quantity	Current batch quantity
Unit	Unit of measure
Created On	Date/time the batch was created
Status	Color-coded status badge

Batch Status Badges

Batches use color-coded status badges: **QUALITY_PENDING** (orange), **AVAILABLE** (green), **PRODUCED** (blue), **CONSUMED** (pink), **BLOCKED** (red), **SCRAPPED** (brown), **MERGED** (purple), **SPLIT** (orange). See Section 13: Status Color Reference for exact color values.

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12. Batch Detail and Genealogy

The Batch Detail page (`/#/batches/{batchId}`) shows comprehensive information about a single batch including its genealogy (traceability tree).

🏠 › 🔗 Batches › Batch #1

← Back to Batches

Batch Information

BATCH NUMBER
B-RM-001

MATERIAL ID
RM-SCRAP-A

QUANTITY
500 T

STATUS
CONSUMED

CREATED

Batch Genealogy (Traceability)

Visual Genealogy
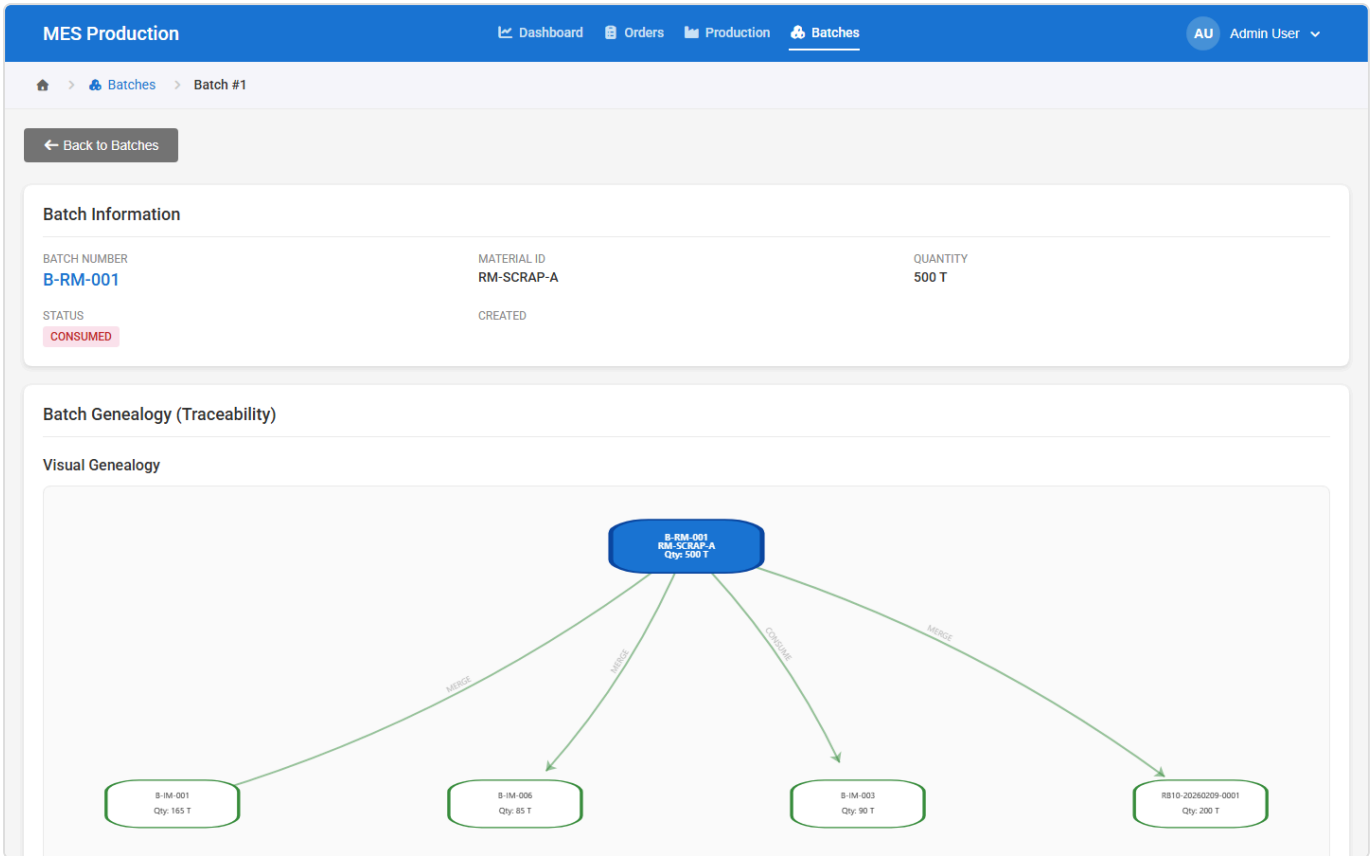
Batch Information Header

- **Back Button** -- Navigate back to Batches list
- **Batch Number** (large heading)
- **Status Badge** -- Current batch status
- **Created Via Badge** -- How the batch was created:
  - Production Confirmation (factory icon)
  - Batch Split (branch icon)
  - Batch Merge (merge icon)
  - Manual Entry (pen icon)
  - System Generated (robot icon)
  - Goods Receipt (truck icon)

Batch Details Panel

Field	Description
Material ID	Material identifier
Material Name	Material description
Quantity	Current quantity with unit
Created On	Creation date/time
Created Via	Source of the batch (PRODUCTION, SPLIT, MERGE, MANUAL, SYSTEM, RECEIPT)
Source Operation	Link to the operation that created this batch (for PRODUCTION batches)
Supplier Batch #	External supplier batch number (for RM batches via goods receipt)
Supplier ID	Supplier identifier (for RM batches)

Approved By	Who approved the batch (for quality-approved batches)
Approved On	When the batch was approved

Quality Approval Section

For batches in `QUALITY_PENDING` status, action buttons are displayed:

- **"Approve" Button** -- Changes batch status from QUALITY_PENDING to AVAILABLE
- **"Reject" Button** -- Prompts for a rejection reason, changes batch status to BLOCKED

Allocation Section

Shows how the batch is allocated across orders:

Batch Availability Summary:

- Total quantity
- Allocated quantity
- Available quantity
- Whether fully allocated (yes/no)

Active Allocations Table:

Column	Description
Order #	Order number
Product	Product name
Allocated Qty	Quantity allocated to this order
Timestamp	When the allocation was made
Status	ALLOCATED or RELEASED
Action	"Release" button (for active allocations)

"Allocate to Order" Button: Opens an allocation modal:

1. Select an order line from dropdown (shows orders with READY operations)
2. Enter allocation quantity (max = available quantity)
3. Click "Allocate" to confirm

Genealogy Tree

Batch Genealogy Panel (Cropped):
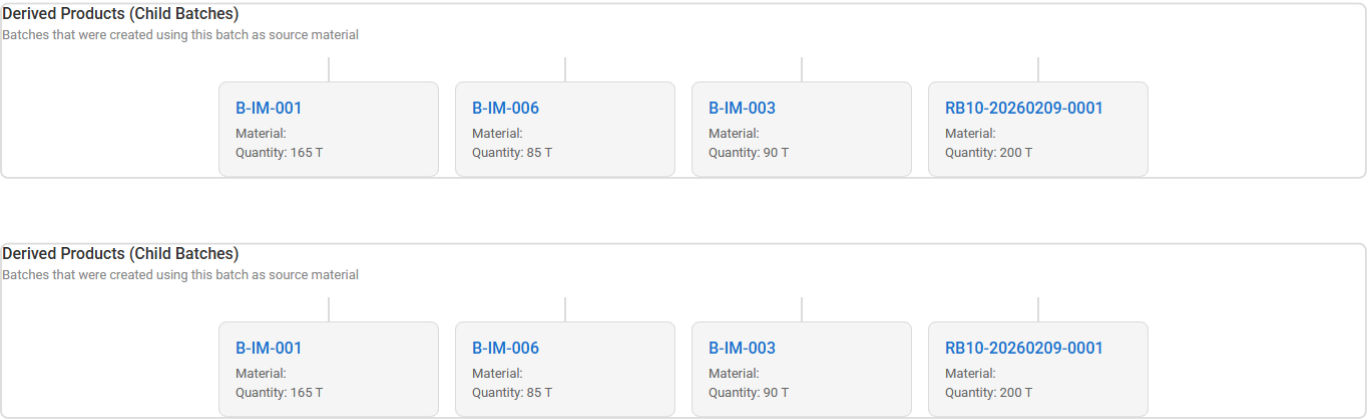
An interactive ECharts graph showing the batch's material traceability:

Three Levels:

1. **Parent Batches (top row)** -- Blue bordered rectangles showing:

    - Batch number
    - Material ID
    - Quantity consumed
    - Unit
    - Arrows flowing downward to the current batch
    - Relation type label on the edge (e.g., "CONSUME")

2. **Current Batch (center)** -- Large blue filled rectangle showing:

    - Batch number (white text, bold)
    - Material ID
    - Current quantity with unit

3. **Child Batches (bottom row)** -- Green bordered rectangles showing:

    - Batch number
    - Material ID
    - Quantity
    - Unit
    - Arrows flowing downward from the current batch
    - Relation type label on the edge

Interactive Features:

- **Click** any parent or child node to navigate to that batch's detail page
- **Hover** to see tooltip with batch information
- **Zoom and Pan** -- Chart supports mouse wheel zoom and drag to pan
- Adjacent nodes are highlighted on hover

Finished Goods Batch View
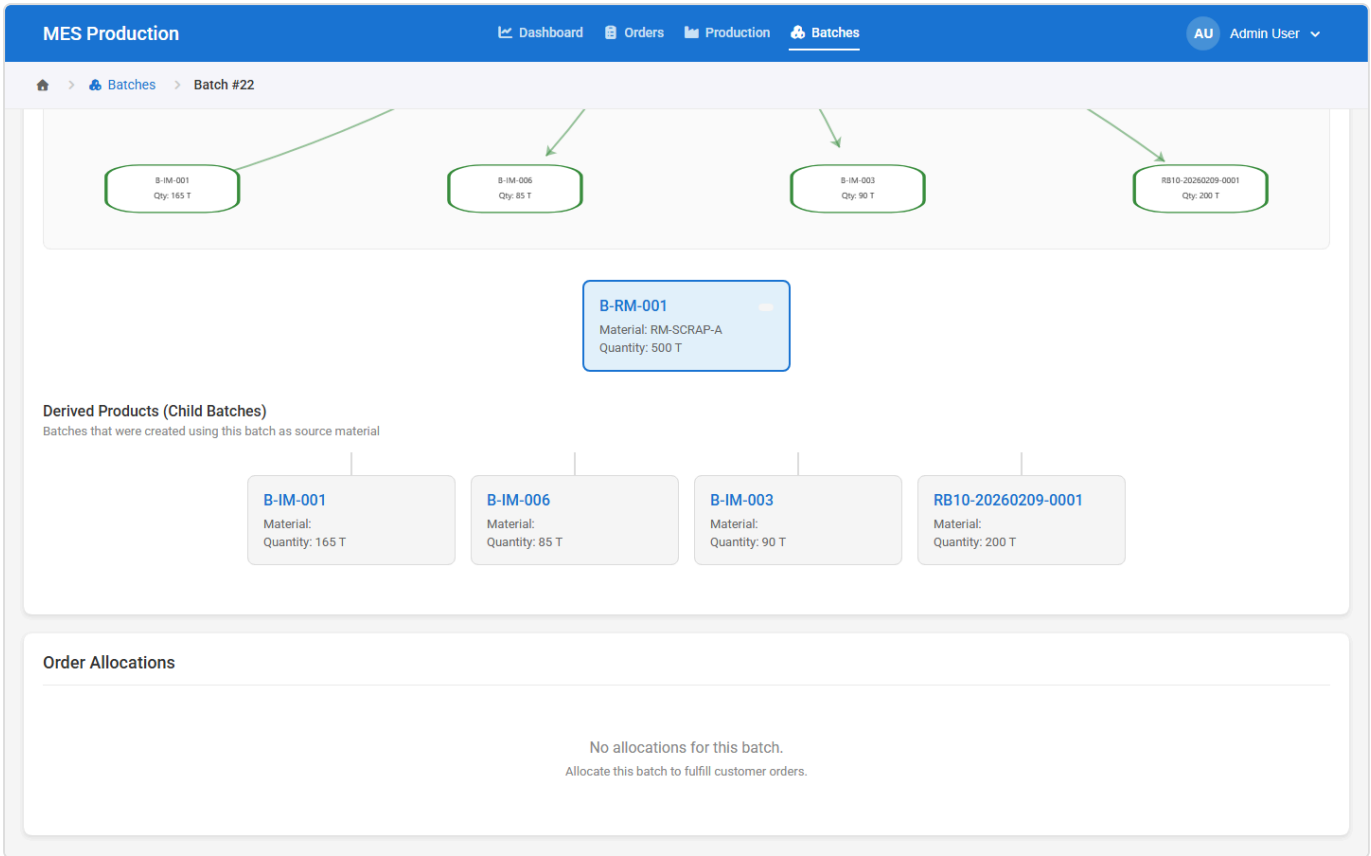
Finished goods batches typically show parent batches (the materials consumed to produce them) and may have no children (end of the production chain).

13. Status Color Reference

This section provides a complete reference of all status colors used throughout the application. Each status is rendered as a **badge** (small rounded label) with a distinct background and text color. The CSS is defined in `StatusBadgeComponent` which converts status strings to CSS classes (e.g., `IN_PROGRESS` becomes `badge-in-progress`).

Color Palette Overview

The application uses the **Material Design** color palette at the **50-level** (lightest) for badge backgrounds and **900-level** (darkest) for badge text:

Color Family	Badge Background (50)	Badge Text (900)	Used For
Green	`#e8f5e9`	`#2e7d32`	COMPLETED, AVAILABLE, CONFIRMED, ACTIVE
Blue	`#e3f2fd`	`#1565c0`	IN_PROGRESS, IN_USE, READY, PRODUCED
Amber/Yellow	`#fff8e1`	`#f57f17`	ON_HOLD
Red	`#ffebee`	`#c62828`	BLOCKED, REJECTED
Pink	`#fce4ec`	`#c62828`	CONSUMED
Purple	`#f3e5f5`	`#7b1fa2`	CREATED, PLANNED, MERGED
Orange	`#fff3e0`	`#e65100`	PENDING, QUALITY_PENDING, SPLIT
Blue-Grey	`#eceff1`	`#546e7a`	NOT_STARTED

Brown	#efebe9	#4e342e / #5d4037	SCRAPPED, CANCELLED

Order Statuses

| MES Production | | Dashboard | Orders | Production | Batches | AU Admin User ⌄ |

🏠 › 📄 Orders

Production Orders

+ New Order

Search orders...   Status: All ⌄

Order Number	Customer	Product	Quantity	Status	Order Date	Actions
ORD-2026-045	Global Manufacturing Ltd	Steel Billet 100mm	470	CREATED	Feb 15, 2026	View Edit
ORD-2026-044	South American Steel SA	Steel Billet 100mm	500	IN PROGRESS	Feb 15, 2026	View Edit
ORD-2026-043	Oceanic Metals Ltd	Hot Rolled Coil 2mm	250	COMPLETED	Feb 15, 2026	View Edit
ORD-2026-042	European Auto Parts GmbH	Steel Billet 100mm	420	CREATED	Feb 14, 2026	View Edit
ORD-2026-041	European Auto Parts GmbH	Steel Billet 100mm	720	CREATED	Feb 14, 2026	View Edit
ORD-2026-040	Middle East Metals FZE	Hot Rolled Coil 3mm	210	CREATED	Feb 14, 2026	View Edit
ORD-2026-039	South American Steel SA	Hot Rolled Coil 2mm	570	COMPLETED	Feb 13, 2026	View Edit
ORD-2026-038	Nordic Steel Trading AB	Cold Rolled Sheet 1mm	120	IN PROGRESS	Feb 13, 2026	View Edit
ORD-2026-037	Nordic Steel Trading AB	Reinforcement Bar 10mm	300	COMPLETED	Feb 13, 2026	View Edit
ORD-2026-036	Asian Electronics Inc	Hot Rolled Coil 2mm	180	CREATED	Feb 12, 2026	View Edit
ORD-2026-034	Oceanic Metals Ltd	Hot Rolled Coil 3mm	310	CANCELLED	Feb 12, 2026	View Edit
ORD-2026-035	Middle East Metals FZE	Steel Billet 100mm	610	CREATED	Feb 12, 2026	View Edit

Status	Badge Appearance	Background	Text Color	Chart Bar Color
CREATED	Purple text on light purple bg	#f3e5f5	#7b1fa2	#9e9e9e (gray)
IN_PROGRESS	Blue text on light blue bg	#e3f2fd	#1565c0	#1976d2 (blue)
COMPLETED	Green text on light green bg	#e8f5e9	#2e7d32	#388e3c (dark green)
ON_HOLD	Amber text on light yellow bg	#fff8e1	#f57f17	#f44336 (red)
CANCELLED	Brown text on light brown bg	#efebe9	#5d4037	#d32f2f (dark red)

Operation Statuses

Status	Badge Appearance	Background	Text Color	Flow Chart Node
NOT_STARTED	Gray text on blue-grey bg	#eceff1	#546e7a	Gray border #94a3b8 , light gray fill
READY	Blue text on light blue bg	#e3f2fd	#1565c0	Amber border #f59e0b , light yellow fill
IN_PROGRESS	Blue text on light blue bg	#e3f2fd	#1565c0	Blue border #3b82f6 , light blue fill
PARTIALLY_CONFIRMED	Orange text on light orange bg	#fff3e0	#ef6c00	Blue border #3b82f6 , light blue fill
CONFIRMED	Green text on light green bg	#e8f5e9	#2e7d32	Green border #22c55e , light green fill
ON_HOLD	Amber text on light yellow bg	#fff8e1	#f57f17	Orange border #f97316 , light orange fill

BLOCKED	Red text on light red bg	`#ffebee`	`#c62828`	Red border `#ef4444` , light red fill

Batch Statuses

Status	Badge Appearance	Background	Text Color	Chart Bar Color
QUALITY_PENDING	Orange text on light orange bg	`#fff3e0`	`#e65100`	`#ff9800`
AVAILABLE	Green text on light green bg	`#e8f5e9`	`#2e7d32`	`#4caf50`
PRODUCED	Blue text on light blue bg	`#e3f2fd`	`#1565c0`	`#1976d2`
CONSUMED	Red text on light pink bg	`#fce4ec`	`#c62828`	`#9e9e9e`
BLOCKED	Red text on light red bg	`#ffebee`	`#c62828`	`#f44336`
SCRAPPED	Brown text on light brown bg	`#efebe9`	`#4e342e`	`#795548`
MERGED	Purple text on light purple bg	`#f3e5f5`	`#7b1fa2`	N/A
SPLIT	Orange text on light orange bg	`#fff3e0`	`#e65100`	N/A

Production Confirmation Statuses

Status	Badge Appearance	Background	Text Color	Description
CONFIRMED	Green text on light green bg	`#e8f5e9`	`#2e7d32`	Successfully completed
PENDING_REVIEW	Orange text on light orange bg	`#fff3e0`	`#e65100`	Awaiting review
PARTIALLY_CONFIRMED	Orange text on light orange bg	`#fff3e0`	`#e65100`	Partially complete, more production needed
REJECTED	Red text on light red bg	`#ffebee`	`#c62828`	Rejected by reviewer

Dashboard Card Border Colors

The dashboard Operations Status Summary cards use a distinct left border color:

Status	Left Border Color	RGB Value
Not Started	Gray	`#9e9e9e`
Ready	Green	`#4caf50`
In Progress	Blue	`#1976d2`
Confirmed	Dark Green	`#388e3c`
On Hold	Red	`#f44336`
Blocked	Dark Red	`#d32f2f`

Yield Indicator Colors (Production Confirmation)

Range	Color	CSS Class	Meaning
>= 95%	Green `#2e7d32`	yield-good	Excellent yield
80% - 94.99%	Yellow/Amber `#f57f17`	yield-warning	Acceptable but below target
< 80%	Red `#c62828`	yield-critical	Below acceptable threshold

Process Flow Chart Node Colors

Status	Border Color	Fill Color	Text Color
NOT_STARTED	`#94a3b8` (slate gray)	`#f1f5f9` (light slate)	`#475569` (dark slate)
READY	`#f59e0b` (amber)	`#fef3c7` (light amber)	`#92400e` (dark amber)
IN_PROGRESS	`#3b82f6` (blue)	`#dbeafe` (light blue)	`#1e40af` (dark blue)
CONFIRMED	`#22c55e` (green)	`#dcfce7` (light green)	`#166534` (dark green)
ON_HOLD	`#f97316` (orange)	`#ffedd5` (light orange)	`#9a3412` (dark orange)
BLOCKED	`#ef4444` (red)	`#fee2e2` (light red)	`#991b1b` (dark red)
Process Node	`#7c3aed` (purple gradient)	`#5b21b6` to `#7c3aed`	`#ffffff` (white)

14. Pagination and Sorting

All list pages use server-side pagination with a consistent control layout.

Pagination Controls

The pagination bar appears below every data table and includes:

Left Side -- Record Count: "Showing X to Y of Z records" (e.g., "Showing 1 to 20 of 47 records")

Center -- Page Navigation:

Control	Icon/Label	Action
First Page	Double left arrow	Jump to page 1 (disabled if already on first page)
Previous Page	Single left arrow	Go to previous page (disabled if on first page)
Page Numbers	Numbered buttons (e.g., 1, 2, 3, 4, 5)	Jump to specific page. Up to 5 visible page numbers are shown. Current page is highlighted.
Next Page	Single right arrow	Go to next page (disabled if on last page)
Last Page	Double right arrow	Jump to last page (disabled if already on last page)

Right Side -- Page Size: "Items per page" dropdown with options: **10, 20, 50, 100** Default: 20 items per page

Sorting

- Tables are sorted by a default field (usually date descending)
- The sort field and direction are sent to the server with each request
- Changing filters or search resets to page 1

Combined Filtering

Filters, search, and pagination work together:

1. Setting a filter resets to page 1
2. Entering a search term resets to page 1
3. Changing page size resets to page 1
4. All parameters are sent to the server simultaneously

15. Keyboard Shortcuts and UI Behaviors

Global Behaviors

Action	Trigger	Behavior
Close Dropdown	Escape key	Closes the user profile dropdown menu
Close Mobile Menu	Escape key	Closes the mobile navigation menu
Close Mobile Menu	Window resize > 992px	Automatically closes mobile menu
Close Dropdown	Click outside	Clicking anywhere outside the dropdown closes it

Modal Behaviors

Action	Trigger	Behavior
Close Modal	Click backdrop	Clicking the dark overlay behind a modal closes it
Close Modal	Escape key	Pressing Escape closes the modal
Cancel Modal	Cancel button	Reverts any changes and closes the modal

Form Behaviors

Action	Trigger	Behavior
Submit Form	Enter key	Submits the form if the focused element is an input
Validation	On touch/blur	Field validation errors appear when a field is touched and then loses focus
Submit Validation	On submit	All fields are marked as touched, showing all validation errors at once

Loading States

All pages show a loading spinner with a message while data is being fetched:

- "Loading dashboard…"
- "Loading orders…"
- "Loading operation details…"

Buttons show a spinner and become disabled while an action is being processed to prevent double-submission.

---

16. Workflow Reference

Workflow 1: End-to-End Order Fulfillment

```
Prerequisites: Customer, Product, BOM, and Routing must be configured in the system.

1. Create Order (Orders > + New Order)
   -> Operations are auto-created based on routing
   -> First operation set to READY
2. Navigate to Production > Select Order > Select READY Operation
3. Fill Production Confirmation Form
```

```
      -> Select input materials
      -> Select equipment and operators
      -> Enter quantities and parameters
4. Submit Confirmation
      -> Input materials CONSUMED
      -> Output batch PRODUCED
      -> Next operation becomes READY
5. Repeat steps 2-4 for each operation
6. When all operations confirmed -> Order status = COMPLETED
```

Workflow 2: Batch Quality Approval

```
1. Navigate to Batches page (Batches menu)
2. Filter by status: QUALITY_PENDING
3. Click on a batch to view detail
4. Review batch information (material, quantity, source)
5. Click "Approve" -> Batch status changes to AVAILABLE
      -> OR Click "Reject" -> Enter reason -> Batch status changes to BLOCKED
6. Approved batches become available for production consumption
```

Workflow 3: Batch Split

```
1. Navigate to batch detail (Batches > Click batch row)
2. Click "Split Batch" button
3. Enter split portions:
   - Portion 1: quantity, optional suffix
   - Portion 2: quantity, optional suffix
   - (Add more portions as needed)
4. Enter optional reason
5. Submit split
      -> Original batch quantity is reduced
      -> New batches are created for each portion
      -> BatchRelation records created (type: SPLIT)
      -> Genealogy tree shows parent-child relationships
```

Workflow 4: Batch Merge

```
1. Navigate to batch detail
2. Click "Merge Batches" button
3. Select source batches to merge (must be same material)
4. Enter optional target batch number
5. Enter optional reason
6. Submit merge
      -> Source batches status changed to MERGED
      -> New merged batch created with combined quantity
      -> BatchRelation records created (type: MERGE)
      -> Genealogy tree shows multiple parents flowing into merged batch
```

Workflow 5: Batch Allocation to Order

```
1. Navigate to a batch detail (Batches > Click batch)
2. Check "Batch Availability" section for available quantity
3. Click "Allocate to Order" button
4. Select an order line from the dropdown
5. Enter allocation quantity (cannot exceed available)
6. Click "Allocate"
   -> Allocation record created (status: ALLOCATED)
   -> Available quantity decreases
7. To release an allocation:
   -> Click "Release" on the allocation row
   -> Confirm release
   -> Available quantity increases back
```

17. Validation Rules Reference

Login Form

Field	Rules
Email	Required, valid email format
Password	Required, minimum 6 characters

Order Form

Field	Rules
Customer	Required (must select from dropdown)
Customer Name	Required, max 200 characters
Order Date	Required, valid date
Order Number	Optional (auto-generated if blank)
Line Item Product SKU	Required, max 50 characters
Line Item Product Name	Required, max 200 characters
Line Item Quantity	Required, minimum 0.01
Line Item Unit	Required, max 20 characters
Line Item Delivery Date	Optional, valid date

Business Rules:

- At least one line item must exist
- Line items can only be modified for orders in CREATED status
- Cannot delete the last remaining line item

Production Confirmation Form

Field	Rules
Start Time	Required, cannot be in the future

End Time	Required, must be after start time
Quantity Produced	Required, minimum 1
Quantity Scrapped	Optional, minimum 0
Equipment	At least one must be selected
Operators	At least one must be selected
Delay Reason	Required when delay minutes > 0
Process Parameters	Required parameters must have values within min/max range
Material Quantity	Cannot exceed available quantity, minimum 0

Batch Form

Field	Rules
Batch Number	Required, max 100 characters
Material ID	Required, max 100 characters
Material Name	Optional, max 200 characters
Unit	Optional, max 20 characters
Quantity	Read-only in edit mode (use adjustment)

18. Troubleshooting

Common Issues

Issue: Page shows "Loading..." indefinitely

- **Cause:** Backend server is not running or not reachable
- **Solution:** Ensure the backend is running on `http://localhost:8080`. Check the browser console (F12) for network errors.

Issue: Login fails with "Invalid email or password"

- **Cause:** Wrong credentials or the user account does not exist
- **Solution:** Use the POC credentials: `admin@mes.com` / `admin123`. Verify the backend demo data has been loaded.

Issue: Redirected to login page unexpectedly

- **Cause:** JWT token has expired
- **Solution:** Log in again. Token expiration is configured in the backend.

Issue: Empty tables with no data

- **Cause:** The backend is running but demo data has not been loaded
- **Solution:** Ensure the backend is started with the demo profile: `./gradlew bootRun --args='--spring.profiles.active=demo'`

Issue: Production confirmation fails with "Failed to confirm production"

- **Cause:** Various validation failures on the backend
- **Solution:** Check the error message for specifics. Common causes:
  - Operation is not in READY or IN_PROGRESS status
  - Selected inventory items are no longer AVAILABLE
  - Equipment or operator is not in AVAILABLE status

- Process parameter values are outside configured min/max range

Issue: Cannot edit line items on an order

- **Cause:** Line item editing is restricted to CREATED orders
- **Solution:** Line items cannot be modified once the order has progressed beyond CREATED status.

Issue: "No orders ready for production" on Production page

- **Cause:** No orders have operations in READY status
- **Solution:** Check Orders page for orders. If orders exist but no operations are READY, check if operations are in NOT_STARTED, ON_HOLD, or BLOCKED status.

Issue: Batch genealogy chart shows blank

- **Cause:** The batch has no parent or child relationships
- **Solution:** This is expected for newly received raw material batches. Genealogy data is created during production confirmation and batch split/merge operations.

Issue: Charts on Dashboard appear blank

- **Cause:** No data loaded or ECharts library issue
- **Solution:** Refresh the page. The charts require at least one order and one batch to render.

Browser Requirements

- **Recommended:** Chrome (latest), Firefox (latest), Edge (latest)
- **Minimum:** Any browser supporting ES2017+ JavaScript
- **JavaScript:** Must be enabled
- **Cookies:** Must be enabled (for JWT token storage in localStorage)

Server Requirements

- **Backend:** `http://localhost:8080` -- Spring Boot application
- **Frontend:** `http://localhost:4200` -- Angular development server
- **Database:** PostgreSQL 14+ running on default port 5432

Network Ports

Port	Service	Description
4200	Frontend	Angular development server
8080	Backend	Spring Boot REST API
5432	PostgreSQL	Database server

Appendix A: URL Reference

All URLs use hash-based routing (contain `/#/` after the domain).

Main Application Pages

URL	Page
`/#/login`	Login page
`/#/dashboard`	Dashboard

`/#/orders`	Orders list
`/#/orders/new`	Create new order
`/#/orders/{id}`	Order detail
`/#/orders/{id}/edit`	Edit order
`/#/production`	Production landing
`/#/production/confirm/{operationId}`	Production confirmation form
`/#/production/history`	Production history
`/#/batches`	Batches list
`/#/batches/{id}`	Batch detail with genealogy

Appendix B: API Endpoint Reference (for Developers)

Authentication

Method	Endpoint	Description
POST	`/api/auth/login`	Authenticate and receive JWT token

Orders

Method	Endpoint	Description
GET	`/api/orders`	List all orders
GET	`/api/orders/paged`	Paginated orders with filters
GET	`/api/orders/available`	Orders with READY operations
GET	`/api/orders/{id}`	Get order by ID
POST	`/api/orders`	Create new order
PUT	`/api/orders/{id}`	Update order
DELETE	`/api/orders/{id}`	Cancel order (soft delete)

Production

Method	Endpoint	Description
POST	`/api/production/confirm`	Submit production confirmation
GET	`/api/production/confirmations`	List all confirmations

Batches

Method	Endpoint	Description
GET	`/api/batches`	List all batches

GET	`/api/batches/paged`	Paginated batches with filters
GET	`/api/batches/{id}`	Get batch by ID
GET	`/api/batches/{id}/genealogy`	Batch genealogy tree
POST	`/api/batches/{id}/split`	Split a batch
POST	`/api/batches/merge`	Merge multiple batches
POST	`/api/batches/{id}/approve`	Approve batch (quality)
POST	`/api/batches/{id}/reject`	Reject batch (quality)

Appendix C: Glossary

Term	Definition
Batch	A trackable unit of material with a unique batch number. Created during goods receipt, production, split, or merge operations.
BOM	Bill of Materials -- Defines the hierarchical material structure needed to produce a product.
Confirmation	The act of recording a completed production operation with all associated data (materials, quantities, parameters).
Equipment	A physical machine or device used in production (e.g., Electric Arc Furnace, Continuous Caster).
FG	Finished Goods -- Final products ready for shipment to customers.
Genealogy	The parent-child traceability tree showing how batches are related through production, split, and merge operations.
Hold	A temporary block placed on an entity (order, operation, batch, inventory, equipment) to prevent it from being used.
IM	Intermediate Material -- Semi-finished materials between production stages.
Inventory	A record of material at a specific location with a quantity and state.
JWT	JSON Web Token -- The authentication mechanism used by the application.
Line Item	A product within an order, specifying the SKU, quantity, and delivery date.
MES	Manufacturing Execution System -- Software that manages and monitors work-in-progress on the factory floor.
Operation	A specific production step within a process (e.g., "EAF Melting" within the "Melting" process).
Operator	A person who performs production operations on the factory floor.
Process	A design-time entity representing a production stage (e.g., Melting, Casting, Rolling).
RM	Raw Material -- Incoming materials from suppliers.
Routing	The sequence of process steps that define how a product is manufactured.
SKU	Stock Keeping Unit -- A unique identifier for a product.
WIP	Work In Progress -- Materials currently being processed in production.
Yield	The ratio of good product output to total production output (good + scrap).

This user guide was generated for the MES Production Confirmation POC (Bluemingo POC) application. All screenshots referenced are located in `e2e/output/user-guide-screenshots/2026-02-09T07-17-42/` *.*