Min-Max Control: Inventory Management with Fixed Reorder Points and Order Quantities

Min-max control is a classic method of planning-oriented inventory management in which items are controlled via a minimum and a maximum stock level. If the stock level falls below the minimum level, the system automatically triggers replenishment in a defined quantity until the maximum level is reached again. For technical buyers, it is a pragmatic instrument for systematically balancing availability and capital commitment for C-parts, standard components and consumables.

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Key facts at a glance

01 Min-max control automatically generates order proposals once the reorder point is reached.

02 The minimum level serves as a buffer against forecast and delivery uncertainties.

03 The maximum level limits capital commitment and storage space requirements.

04 The method is typically suitable for items with stable, continuous demand.

05 It works stock-based rather than demand-based and can lead to misplanning with discontinuous consumption.

06 Benchmark values such as service level, turnover rate and coverage make the parameters verifiable.

Definition: Min-Max Control

Min-max control is an inventory management method that defines a lower threshold (minimum or reorder level) and an upper threshold (maximum level) for every item. If the available stock falls to or below the minimum level, the ERP system generates a purchase requisition, often in the amount of the difference between the current and maximum level. Replenishment can take the form of a fixed order

quantity or a replenishment up to the maximum level.

Distinction from demand-driven planning

Unlike demand-driven planning, which derives order quantities from specific production or customer orders, min-max control works on a consumption-driven basis using historical withdrawal quantities. It does not require detailed scheduling of date-related requirements and is therefore easy to administer. The price of this is a weaker link to the actual production plan.

Typical fields of application

In practice, the method is used mainly for C-parts, standard and purchased parts, wear parts, operating and auxiliary materials and spare parts. These items are characterised by comparatively low individual value, a high share of the item range and frequently constant consumption. For expensive A-parts with inventory-intensive production coordination, scheduling agreements or call-off orders are often used instead.

Fixed order quantity or replenishment principle

Two variants are common: with a fixed order quantity, the same quantity is always ordered once the reorder point falls below the threshold, for example one packaging unit or one price break quantity. With the replenishment principle, the system orders the difference to the maximum level. The choice influences transport costs, early payment discount effects and the exploitation of volume price scales with the supplier.

Methods and procedure for parameterisation

The success of min-max control stands or falls with the appropriate setting of the parameters. All values should be derived on a data-driven basis and reviewed periodically, not set once and forgotten.

Determining the minimum level and safety time buffer

The minimum level typically covers consumption during the replenishment lead time, supplemented by a safety time buffer for delivery delays, scrap or demand peaks. In practice, factors such as the average replenishment lead time, the variation in daily consumption and the defined service level target per product group are incorporated. A high service level requires a larger buffer and therefore more tied-up capital.

Setting the maximum level

The maximum level is often derived from the minimum level plus the order quantity, but may also be capped by storage capacity, shelf life, value thresholds or financing considerations. For items with a short shelf life or expensive storage, the maximum level is deliberately set low. For low-value items, a higher capacity threshold can in contrast save transport and ordering costs.

Master data quality and periodic review

Min-max parameters are item master data and, like all procurement and logistics master data, require ongoing maintenance. A regular review, for example quarterly per product group, supported by indicators such as turnover rate, coverage and stockout notifications, has proven its worth. Items with a changed demand profile should be removed from consumption-driven planning and addressed via demand-driven planning or alternative procurement.

Key KPIs for steering and monitoring

Without KPIs, min-max control degenerates into an unmonitored automation. Customary monitoring indicators make both supply quality and economic efficiency visible.

Service level and availability

The availability level or service level measures how often demand could be covered from stock. Typical benchmark values are 95 to 99 per cent depending on the product group; critical parts are managed at higher levels, high-turnover and consumable materials more moderately. The service level target per product group prevents blanket buffers from bloating the warehouse.

Turnover rate and coverage

The inventory turnover rate and the average coverage show whether maximum levels have been set too generously. Falling turnover with stable sales is a classic warning signal for oversized min-max values. In addition, stock values per item class provide insight into capital commitment.

Shortages, processing effort and price deviations

Also relevant are stockout rates, the number of manual corrections to system proposals and the frequency of price deviations at order receipt, which are clarified via a deviation workflow. Creditworthiness and quality aspects of the supplier also come into play: a rising complaint rate justifies higher buffer stocks, which makes the cost of poor quality directly visible.

Risks and controls in min-max planning

The method is robust but not self-healing. Those who ignore fluctuating demands, poor master data or dependent suppliers pay for it with excess stock or supply interruptions.

Susceptibility to disruption with fluctuating demand

With seasonal or project-dominated consumption, the consumption-driven logic does not match the demand pattern: it orders too late or too much, sprinkler-style. Affected items should be switched to demand-driven methods or integrated into an agile procurement environment with shorter planning cycles. Flexibility can also be achieved through safety time buffers and reorder points that can be adjusted at short notice.

Capital commitment and fragmentation

Maximum levels that are too high tie up capital and storage space, minimum levels that are too low generate frequent, small orders. This creates a small-quantity problem that can be mitigated through a structured small-order process with consolidated orders, catalogue solutions or release thresholds. Supplier coordination on bonus agreements or purchase price improvements helps to remain attractive despite small individual quantities.

Supplier and quality risks

Since min-max planning relies on reliable replenishment, supplier failures are particularly critical. Controls include quality inspection at goods receipt, clearly defined quality gates and, for system-critical parts, a documented supplier development concept. For risk-prone items, prepared alternative procurement is part of the standard toolkit, especially with global sourcing and long transport times.

Current developments: automation and digital integration

The basic logic of min-max control is old, but its implementation is modernising considerably. ERP systems, inventory sensors and AI-supported planning tools are making the parameters more dynamic and replenishment largely touchless.

Automated order processing

Classic purchase requisitions from min-max planning are increasingly converted automatically into purchase orders, for example via a scheduling agreement framework coordinated with suppliers or established call-off orders. Creditor master data with correct contacts, delivery terms and price determination is a prerequisite for this. Release thresholds and exception rules replace the full manual checking of every line item.

Dynamic parameters and forecasts

Newer systems no longer calculate minimum and maximum levels statically but on a rolling basis from consumption forecasts and supplier performance. Fluctuations in lead time or complaint rate can thus flow automatically into the buffers. Likewise, recommendations for volume price scales can be derived from suppliers found via reverse auction or e-auction tenders.

Connection to procurement and quality processes

Min-max control does not replace a procurement strategy but presupposes one. Only once prices, qualification status and performance capability have been clarified – for example through a pilot project with a supplier or a proof-of-concept procurement for new technologies – can reliable replenishment parameters be defined. Incentive models for innovation or an early payment programme to secure critical suppliers can likewise be combined with a stable planning picture.

Typical metrics

Metric	Typical value
Service level / availability	typically 95–99 % *tiered by product group, critical parts higher*
Inventory turnover rate	often 4–12 turnovers per year *depends on product group; falling values indicate maximum levels that are too high*
Stockout rate	< 2–5 % *keep low, as shortages indicate direct supply risks*
Proportion of automated purchase orders	in practice over 80 % for min-max items *measures the relief effect on planning*

Practical example

A medium-sized mechanical engineering company with around 12,000 procured items introduced min-max control for standard parts, bearing components and lubricants after individual buyers were manually placing hundreds of small orders every day. First, service levels and buffer sizes were defined per product group, then the system parameters were set on a data-driven basis and reviewed quarterly. Within one year, manual processing effort fell significantly, while availability in the core product groups remained stable.

- Introduction of a small-order process with consolidated orders and release thresholds for line items below a defined value threshold
- Derivation of the minimum level from average replenishment lead time plus a safety time buffer, tiered by service level target per product group
- Quarterly review of turnover rate and shortages with adjustment of maximum levels
- Switching seasonally dependent items from min-max to demand-driven planning, coordinated with the supplier via a scheduling agreement

Conclusion

Min-max control is a proven, easy-to-handle method for replenishing items with stable consumption automatically and economically. Its strength lies in relieving the planning function and standardising replenishment for C-parts and standard components. Its limits become apparent with fluctuating demands, expensive A-parts and dependent supplier sources. Those who set minimum and maximum levels on a data-driven basis, review them regularly via KPIs and interlock them with a robust supplier and quality process achieve high availability with controllable capital commitment. Min-max control thus becomes a reliable building block of a hybrid planning concept.

Frequently asked questions

? What is meant by min-max control in the warehouse?

Min-max control is an inventory management method in which every item is assigned a minimum and a maximum stock level. As soon as stock falls to the minimum level, the system automatically triggers a purchase order, frequently up to the maximum level. The method is consumption-driven and does not require order-related scheduling. It is particularly suitable for items with constant, predictable consumption.

? When does min-max control pay off and when does it not?

It pays off for C-parts, standard parts, consumables and wear parts with stable consumption figures and moderate individual value, because it significantly reduces processing effort. It is unfavourable for seasonal demands, expensive A-parts, long or fluctuating replenishment lead times and strongly project-dominated demands. In such cases, consumption-driven proposals lead to shortages or excess stock. In these situations demand-driven methods or scheduling agreement solutions are usually better.

? How do you calculate the minimum and maximum stock level?

The minimum level typically covers consumption during the replenishment lead time, plus a safety time buffer for delivery and demand fluctuations. The maximum level is often derived from the minimum level plus the order quantity and is limited by storage capacity, shelf life or value thresholds. Concrete values should be derived from historical consumption data and the defined service level target per product group. Periodic review and adjustment is essential.

? What is the difference between min-max control and reorder point?

The reorder point is part of min-max control: it is the threshold value which, once reached, triggers a purchase order. Min-max control adds the maximum level to it, which limits the replenishment quantity. In many ERP systems the terms are used synonymously or as the planning method 'reorder point'. Strictly speaking, min-max describes the complete logic, whereas the reorder point only describes the trigger point.

? Which KPIs belong to monitoring min-max control?

Key indicators are service level or availability, inventory turnover rate, average coverage and stockout rate. In addition, stock value per item class, the number of manual correction postings and the complaint rate with the supplier provide insight into the quality of the parameterisation. Falling turnover with stable sales indicates maximum levels that are too high. Rising shortages indicate minimum levels set too tightly.

? How is min-max control related to the small-order process?

Min-max planning generates many small orders with small order quantities, which can become administratively expensive. A structured small-order process with consolidated orders, catalogue orders, release thresholds and standardisation must then apply downstream to limit the effort. Combined with bonus agreements or suitable volume price scales, the method remains economical

even for small-volume items.

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