

Andler lot size: determining the optimal order quantity for stock items

The Andler lot size is a classic method for determining the economic order quantity for stock items with constant demand. It balances procurement costs and inventory carrying costs in such a way that the total annually relevant costs are minimised. For technical buyers, it remains a proven instrument for operational planning, in particular for C and B items with steady demand.

Key facts

- The Andler formula calculates the optimal lot size as a function of demand, fixed procurement and inventory cost rates.
- It assumes constant demand, immediate availability and price-stable conditions.
- In practice, it is typically suitable for C and B items according to the ABC analysis.
- The formula corresponds to the EOQ formula by Harris/Wilson and is also referred to as the economic order quantity.
- Sensitivity analyses show that deviations from the optimal quantity often cause only minor additional costs.
- Modern systems link Andler calculations to order history and procure-to-pay (P2P) processes.

Definition: Andler lot size

The Andler lot size denotes the optimal order or stock quantity at which the sum of fixed procurement costs and inventory carrying costs reaches its minimum. It was formulated by Kurt Andler in the 1920s for German cost accounting conditions and is substantively identical to the Economic Order Quantity (EOQ).

Core message of the model

The larger the order quantity, the less frequently orders are placed and the lower the fixed costs per order – at the same time, however, capital tied up, inventory costs and obsolescence risk increase. Andler determines the point at which the two cost drivers are exactly in balance. Mathematically, this optimum lies where the marginal costs of both cost groups are equal.

Distinction from other lot sizing methods

Andler assumes demand that is constant over time. For discontinuous or quantity-dependent demand, methods such as the Wagner-Whitin method, the part-period method or dynamic lot sizing procedures are more suitable. For series production with set-up processes, the Harris lot size or variants of production lot size planning are used.

Formula and derivation

The Andler formula reads: optimal lot size = square root of $(2 \times \text{annual demand} \times \text{fixed ordering costs})$

per order) divided by (purchase price × inventory carrying cost rate). The inventory carrying cost rate is usually applied as a percentage of the purchase price per year.

The input variables in detail

Annual demand is often derived from forecasts or from order history. Fixed ordering costs include processing effort, transport, incoming goods inspection and, where applicable, customs clearance – in practice, typical values range between 20 and 150 euros per order. The inventory carrying cost rate includes interest, storage space, insurance, shrinkage and loss and typically lies between 10 and 30 per cent per year.

Worked example

With an annual demand of 4,000 units, ordering costs of 80 euros, a purchase price of 25 euros and an inventory cost rate of 20 per cent, the result is: square root of $(2 \times 4,000 \times 80 / 5)$ = square root of 128,000, i.e. approximately 358 units per order. This arithmetically yields an order frequency of about eleven orders per year.

Prerequisites and model assumptions

The validity of the Andler formula stands and falls with its assumptions. Anyone applying it should know the model limits and check whether the item in question meets them.

Constant, stochastically smooth demand

The model assumes evenly distributed, known annual demand. For seasonal goods, project components or strongly fluctuating call-offs under framework agreements, the result is distorted. In such cases, demand segmentation and bottleneck analysis provide better decision-making bases.

Constant prices and no quantity discounts

Discount tiers, price escalation clauses in purchasing terms or market volatility break the model assumptions. In such cases, optimisation models with price tiers (EOQ with all-unit discounts) extend the picture. Alternative sourcing from multiple sources also changes the cost structure.

Immediate, complete delivery

Andler assumes delivery in one go without lead time and without partial deliveries. For long lead times, the formula is combined with safety stocks and reorder point models; for staggered deliveries, with adapted lot size formulas.

Methods and approach for application

Practical application usually follows a multi-stage approach: classification of items, cost parametrisation, calculation and subsequent plausibility checking before operational implementation.

Selecting the item class via the ABC analysis

An ABC analysis prioritises items by consumption value. A items often require individual planning and supplier cooperation, while C items can be managed with standard procedures. This is where the Andler formula has its strongest effect, because automatable routine procurement delivers the main benefit.

Determining cost parameters reliably

The most common source of error is estimated ordering and inventory cost rates. It makes sense to gather these jointly with controlling and logistics: actual processing times per order, actual warehouse space costs and calculated capital costs. Uncertainties can be monitored via data quality KPIs for master data quality.

Operationalising the result in the planning system

The calculated lot size is stored in the ERP as the reorder quantity and linked to the reorder point derived from lead time and safety stock. In modern procure-to-pay (P2P) systems, purchase order creation is largely automatic; maintaining framework agreements ensures that conditions match the planning logic.

Key KPIs for evaluating lot size control

The effectiveness of the lot size policy is reflected in a handful of metrics that jointly represent availability and capital tied up.

Inventory and turnover metrics

Inventory coverage, inventory turnover frequency and average stock levels show whether the chosen lot sizes match the capital tied up. Increasing coverage with stable demand indicates lots that are too large.

Process and quality metrics

Order frequency per item, the number of emergency orders and incoming delivery quality from the supplier complete the picture. Frequent small lots drive up process costs; lots that are too large increase the risk of quality problems in later series. Supplier development metrics such as the supplier PPM target round off the assessment.

Risks and controls in practice

The Andler formula provides a sound first approximation but generates systemic risks if parameters become outdated or special cases are not taken into account.

Parameter drift and outdated master data

Demand, prices and cost rates change. Without regular recertification of parameters, order quantities gradually drift away from the optimum. Semi-annual or annual reviews per item class are common in practice.

Quantity discounts, falling purchase prices and obsolescence

With discounted tiered prices, a quantity higher than the calculated optimum may be more economical – the formula then overestimates inventory costs. Likewise, Andler calculations ignore obsolescence risks in fast-moving assortments or in the event of engineering changes; here, a targeted case-by-case review helps.

Control through plausibility checks and governance

Effective controls include: sample calculations by controlling, sensitivity analyses on the robustness of the lot size and clear approval rules for deviations. Cross-functional sourcing between procurement, logistics and production prevents locally optimal lot sizes from leading to higher costs globally.

Current developments: automation and AI in procurement

The classic formula remains relevant but is increasingly complemented by data-driven methods. Modern planning systems combine deterministic optimal quantities with dynamic demand forecasts.

AI-supported planning

Approaches involving AI in procurement use machine learning to forecast demand fluctuations and continuously re-adjust lot sizes. The Andler formula often serves as a benchmark and fallback logic for stable standard items.

Standardisation and data models

High-quality master data is a prerequisite for any automation. Standardised product classifications such as ECLASS and a consistent procurement data model improve parameter quality and enable automated price enquiries, for example via a quick price enquiry process for routine requirements.

Typical metrics

Order frequency per item: derived from the formula

Optimised lot sizes reduce unnecessary small orders.

Inventory coverage: typically 4–12 weeks

Usual benchmark for C items with Andler logic; varies by industry.

Inventory cost rate: 10–30% p. a.

Commonly applied range; should be calculated individually per company.

Inventory turnover: > 6 per year (often lower for C items)

Indicator of whether lot sizes match capital tied up.

Emergency orders: < 5% of all orders

High proportions indicate unsuitable planning parameters.

Practical example

A medium-sized mechanical engineering company had previously planned standard parts and wear parts on the basis of experience, which led to highly fluctuating order frequency and above-average inventory levels. The procurement team introduced a uniform Andler-based planning logic for around 2,500 C items.

- Determining actual ordering costs through time studies in procurement and goods receipt
- ABC analysis to distinguish Andler-suitable items from critical A components
- Semi-annual recertification of demand, purchase price and inventory cost rate
- Linking the calculated lot sizes to the automated purchase order proposal in the P2P system

Conclusion

Despite its age, the Andler lot size is no museum piece but a robust, transparent tool for the routine procurement of stock items. Its strength lies in its simplicity: with just a few verifiable parameters, a traceable ordering policy emerges. What is required is an honest examination of the model assumptions and a well-maintained master data foundation. Where demand is irregular or discount structures dominate, complementary methods are needed. Those who use Andler as the standard logic for C and

B items and deliberately exempt special cases will noticeably reduce process and inventory costs.

Frequently asked questions

What is the formula for the optimal lot size according to Andler?

The optimal lot size is the square root of twice the product of annual demand and fixed ordering costs, divided by the unit purchase price multiplied by the inventory carrying cost rate. Formally: $x_{\text{opt}} = \sqrt{2 \times B \times K_f / (p \times I)}$. It is identical to the EOQ formula by Harris and Wilson.

Which items is the Andler formula suitable for?

It is suitable for items with constant, easily forecastable demand, a stable purchase price and no particular criticality – in practice typically C and B items from the ABC analysis. For critical A items, project components or seasonal goods, dynamic methods and individual assessment are more appropriate.

What is the difference between Andler and Harris/EOQ?

In substance, both describe the same optimum: the minimisation of the sum of ordering and inventory carrying costs. Andler developed the logic independently for German cost accounting and based it on the inventory carrying cost rate, while Harris published the formula in the USA. In practice, the terms are used synonymously.

How are quantity discounts taken into account in lot size calculation?

With quantity discounts, first calculate the Andler lot size and then check whether the next higher discount tier is more economical despite higher inventory costs. To do this, compare the total costs (material costs plus ordering plus inventory costs) across all relevant tiers. Many ERP systems offer built-in routines for this.

What inventory carrying costs should realistically be assumed?

The inventory carrying cost rate covers capital costs, storage space, personnel, insurance, shrinkage and obsolescence and typically lies between 10 and 30 per cent per year in industry. What matters is a consistent, documented definition within the company, because the result of the formula is highly sensitive to this rate.

How often should lot size parameters be updated?

In practice, semi-annual to annual reviews have proven effective, depending on price volatility and demand dynamics. After significant events – price increases, shifts in demand, engineering changes – an unscheduled adjustment should additionally be carried out. AI-supported systems can partially automate the re-adjustment.