

White Paper

Introducing the ISO 22400 standard

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Are you interested in or curious about Key performance Indicators, KPIs, for Manufacturing Operations Management (MOM), then the standard ISO 22400 as well as this whitepaper is for you.

In the following three pages you will learn the basics about Key Performance Indicators for Manufacturing Operations (KPIs for MOM) and ISO 22400, and you will understand how you can benefit from knowing them. For a deeper understanding I recommend you to read the full ISO 22400 standard.

ISO 22400 is an international standard. But what is a standard?

A standard does not tell you what you have to do (regulations do), but rather what you should do in order to be successful. A standard has normally been developed with lots of thought and with input from many-many people with different knowledge and experience, i.e. a standard contains common and good knowledge. An international ISO standard has been developed according to a well defined procedure, and, through voting, accepted by a majority of the word-wide countries that participate.

ISO 22400 is a four part standard

The ISO 22400 will eventually consist of four parts; two parts are under development, and two parts under consideration:

- ISO 22400-1: Key Performance indicators (KPIs) for Manufacturing Operations Management. Part 1: Overview, concepts and terminology
- ISO 22400-2: Key Performance indicators (KPIs) for Manufacturing Operations Management. Part 2: Definitions and Descriptions
- ISO 22400-3: Key Performance indicators (KPIs) for Manufacturing Operations Management. Part 3: Exchange and use
- ISO 22400-4: Key Performance indicators (KPIs) for Manufacturing Operations Management. Part 4: Relationships and dependencies

ISO 22400 is about KPIs for MOM, but what is a KPI and what is MOM?

ISO 22400 defines a Key Performance Indicator as a “Quantifiable level of achieving a critical objective” (definition 3.1.4. in ISO 22400-part1). ISO 22400-Part1 also states that “the

KPIs are derived directly from or through an aggregation function of, physical measurements, data and/or other key performance indicators.“

ISO 22400 defines a KPI by giving its content and its context.

- Content: a quantifiable element with a specific unit of measure (including the formula that should be used to derive the value of the KPI).
- Context: a verifiable list of conditions that are met.

MOM is defined as the set of activities within Level 3 of a manufacturing facility that coordinate the personnel, equipment and material in manufacturing, more about MOM is found in the ISA 95 standard, also referred to as the IEC 62264 standard (Enterprise-Control System integration).

ISO 22400 defines 34 (thirtyfour) KPIs

The KPIs defined in the standard are intended to be examples of the most frequently used KPIs at the Manufacturing Operations level in industry today, i.e. a palette of KPIs from which companies can select the one that best corresponds to their business objective. It is recognized that some of the KPIs are better suited for discrete industry and others are better suited for continuous/process industry. ISO 22400-2 defines thirtyfour (34) KPIs,see Table 1:

Worker Efficiency	Production process ratio	Finished goods ratio
Allocation Ratio	Actual to planned scrap ratio	Integrated goods ratio
Throughput rate	First pass yield	Production loss ratio
Allocation efficiency	Scrap ratio	Storage and transportation loss ratio
Utilization efficiency	Rework ratio	Other loss ratio
Overall equipment effectiveness index	Fall off ratio	Equipment load ratio
Net equipment effectiveness index	Machine capability index	Mean operating time between failures
Availability	Critical machine capability index	Mean time to failure
Effectiveness	Process capability index	Mean time to restoration
Quality Ratio	Critical process capability index	Corrective maintenance ratio
Setup Rate	Comprehensive energy consumption	
Technical efficiency	Inventory turns	

Each KPI is defined through a formula, a time model and an effect model.

- The formula presents the equation that should be used for deriving the numerical value of the KPI. The equation is an aggregation function of, physical measurements, data and/or other key performance indicators.
- The time model is used to visualize information about physical measurements used in the aggregation functions. The time models visualize start/stop time for specific measurements, as well as its relationship to other physical measurements etc.
- The effect model can be seen as a root-cause diagram. Each KPI has its own Effect model. The effect model is a picture that highlights the relationship between the KPI and its parameters.

ISO 22400 will define how to exchange KPIs, and the relationship between KPIs.

A KPI may be exchanged from one MOM application to another, or from a MOM application to other enterprise applications in the business domain. The KPI exchange may occur periodically, be event-driven, or be on demand. In order to realize the interoperability of the applications, these applications shall have access to the formal KPI templates. Part 3 of the ISO 22400 will discuss the exchange issue in more detail and will define a formal KPI template using UML.

A KPI is derived through its formula, which is an aggregation function of, physical measurements, data and/or other key performance indicators. Even though each KPI has a unique formula, the elements in its aggregation formula might be included in several KPI formulas. This means that there will be a relationship between the KPIs. The relationship between the KPIs will be dealt with in ISO 22400 Part 4.

ISO 22400 provides value for you

It has been identified that companies that improve their financial performance also have well defined KPIs, have informed employees and use IT-systems to measure, calculate and display their results. The ISO 22400 standard provides value for you by facilitating selection and definition of useful KPIs for use in your production and MOM.

More info

The standard can be purchased from ISO (www.iso.org), the organization that manages the development of the standard. The standard can also be bought from the mirror committees of each participating country of ISO.
