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Industrial automation systems and integration — Standardized procedures for production systems engineering —

Part 1: Overview

Systèmes d'automatisation industrielle et intégration — Procédures normalisées pour l'ingénierie des systèmes de production —

Partie 1: Aperçu général

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Foreword

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This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration,* Subcommittee SC 4, *Industrial data.*

A list of all parts in the ISO 18828 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 18828 series addresses standardized procedures for production systems engineering. A production planner can be a major beneficiary of a framework which approaches aspects such as production processes, information flows, key performance indicators (KPIs) and manufacturing changes. The composition of the ISO 18828 series at the time of publication is illustrated in Figure 1.

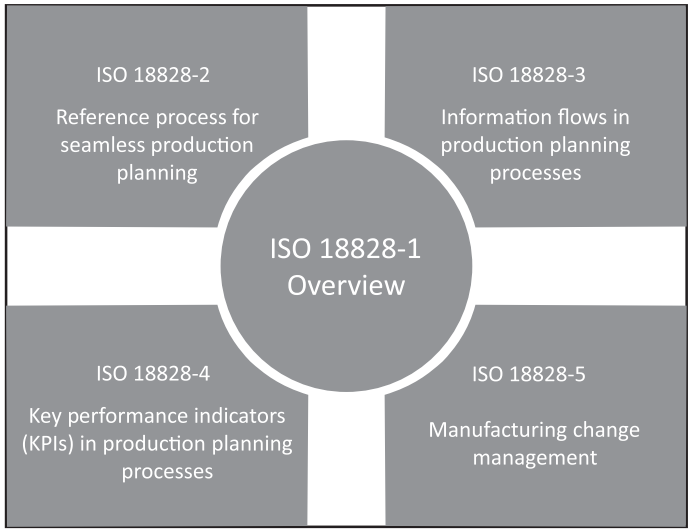

Figure 1 — Composition of the ISO 18828 series

Each part of the ISO 18828 series stands as a single document and can be understood in the context of its content without the other parts. However, ISO 18828-2, ISO 18828-3 and ISO 18828-4 are closely linked and there is added value in implementing them together. Annex A illustrates the domain and life-cycle context of the ISO 18828 series.

Figure 2 shows possible links and relations in between each part of ISO 18828 and their basic information flows. The overall recipient of all ISO 18828 activities is given within the standardized procedures for production systems engineers. Planning process information is the main outcome for production systems engineers derived from ISO 18828-2. However, planning process information can be seen as input to information flows (ISO 18828-3) and KPIs (ISO 18828-4) respectively. Data flows derive from information flows (ISO 18828-3) and statistical data from KPIs (ISO 18828-4). Both planning process information and statistical data can influence manufacturing change processes and they are input to manufacturing change (ISO 18828-5). From there, change process information is provided to the production system engineer in return.

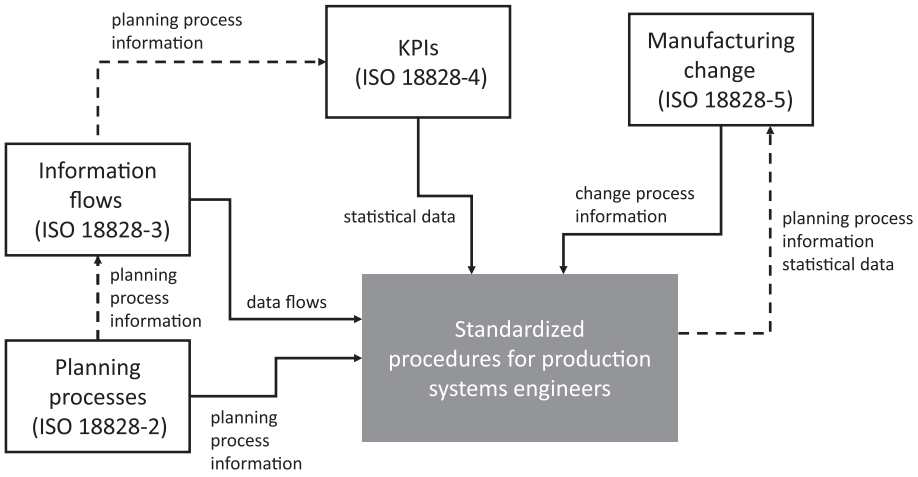

Figure 2 — Interrelations between the different parts of the ISO 18828 series

This document provides an overview of the ISO 18828 series:

— Clause 4 provides an overview of each part of the ISO 18828 series individually;

— Clause 5 describes the interrelations between the various parts of the ISO 18828 series and industrial use cases are used to explain the generic appliance of the standardized parts: ISO 18828-2, ISO 18828-3 and ISO 18828-4 are interrelated, whereas ISO 18828-5 provides details on the manufacturing change process that can be understood not only within the scope of work of production systems engineers, but also with respect to changes within whole production systems.

Industrial automation systems and integration — Standardized procedures for production systems engineering —

Part 1: Overview

1 Scope

This document describes the framework of the ISO 18828 series in seamless production planning.

The following are within the scope of this document:

— general overview of the framework of the ISO 18828 series:

— quintessential description of each part;

— inter-relational aspects and appliance of the framework.

The following are outside the scope of this document:

— detailed process descriptions;

— detailed data flows;

— detailed KPIs;

— detailed data models;

— in-depth discussion of the parts of the ISO 18828 series.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18828-2, *Industrial automation systems and integration — Standardized procedures for production systems engineering — Part 2: Reference process for seamless production planning*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO 18828-2 apply.

4 Overview and context of the individual parts of the ISO 18828 series

4.1 Overview of ISO 18828-2

ISO 18828-2 describes a reference planning process intended to establish a consistent understanding of production planning processes in the life-cycle stage of production preparation. This reference planning process is embedded between the product design process and the production process.

The reference planning process consists of two dimensions, the first of which is the dimension of planning disciplines. In order to identify the most important planning disciplines that can occur in manufacturing companies, data from various companies indicate a main focus. Four distinct planning disciplines are identified:

a) production;

b) assembly;

c) logistics;

d) layout planning.

Each process derived from these planning disciplines traverses all product design phases, and the product phases constitute the second dimension of the reference planning process. The reference planning process extends from the later stages of product design phases to the production phase. In the stage of production preparation, ISO 18828-2 identifies four different maturity-level related phases:

— the concept planning phase;

— the rough planning phase;

— the detailed planning phase;

— a subsequent optimization phase that reaches into the early production stages of the product life-cycle.

Based on two dimensions, i.e. planning discipline and maturity level, the reference planning process contains for each intersection a distinct, generic process step. Each process step includes a function, incoming information, controlling information and outgoing information. The structure follows a hierarchical approach: the interrelations at the higher levels occur rather densely, whereas the detailed levels resolve to clear process flow charts.

The detailed process models represented in ISO 18828-2 express and implement a uniform designation of input, control and output parameters involved in the production planning process and reflect the structuring of the planning process. Systematic narrowing of the scope under consideration of the basis of the planning dimensions, i.e. planning disciplines and maturity levels, permits a clear overview of the interfaces between processes and possible grouping effects. This representation can enable, for example, methodological and technical process chain support.

The main focus of ISO 18828-2 is on the detailed introduction of the focused planning disciplines with regard to maturity levels, as well as comprehensive, common patterns used to increase understanding. In addition, elaborative figures provide a graphical explanation of the process flows for each process level. An informative summary of the level structure precedes the detailed sector descriptions and conveys a clear and transparent picture of the overall structure of content, purpose and application of the document.

4.2 Overview of ISO 18828-3

ISO 18828-3 specifies the main information flows in production planning. These information flows derive from process steps identified in the context of the reference planning process. However, each flow stands alone and therefore can be regarded as an individual, isolated information flow, describing necessary data flows for the main objective. The information flows originate from the reference planning process. They represent an information-oriented view of the overall planning process and take into account both the planning disciplines and planning phases and provide additional information that focuses on the transparency of the flows. The process interfaces include the process phases, i.e. conceptual, rough and detailed planning and the planning disciplines.

Within ISO 18828-3, identified planning disciplines are restricted to the most important, fundamental planning disciplines found in many manufacturing companies. An introduction to planning disciplines provides the main section of the reference planning process for seamless production planning

(ISO 18828-2). In accordance with ISO 18828-2, the main information flows employ the same production planning disciplines:

— manufacturing;

— assembly;

— logistics;

— layout planning.

ISO 18828-3 provides a general overview of the main information flows within the reference planning process. It also describes the five identified main information flows and their distinct setup and process models. Each information model takes all process interfaces that derive from the reference planning process. They describe the total information exchange between the accompanying activities and the type of data exchanged. In this respect, they resemble Unified Modelling Language (UML) activity diagrams.

All information flows follow a basic pattern, which describes them uniformly. In addition, a detailed description of each part of the information flow explains its purpose and the related data objects, as well as the interconnection between the planning disciplines. All diagrams use a common state notation structure. Next to the detailed description of the process parts of the information flows, an in-depth explanation of each information object adds more substance to the involved entities.

Each information flow revolves around a specific flow object. Such a concentrated focus increases the transparency of interactions and data flows for each object and thereby the benefits of the flow itself. End users who have interest in a specific flow can easily check the entirety of their data and traverse along their specific flow. Software providers can also benefit from the object/process oriented approach. Defining inputs and outputs for each activity enables the rapid derivation of an initial rough information flow. In addition, the function flow indirectly defines user interfaces, existing business and application logic, and applicable programming environments.

The annexes include a proposal of checklists for benchmarking information objects and apply the contents of ISO 18828-3 to a business case.

4.3 Overview of ISO 18828-4

ISO 18828-4 elaborates the usage of KPIs in the production planning phase. It originates from the identified lack of adequate control parameters and results in the development of a framework to monitor and improve the production planning processes. The KPIs described in ISO 18828-4 concern basically performance tracking of planning processes for engineering production systems. They aim to improve the process of standardizing the quality of production process monitoring. Key indicators identified in ISO 18828-4 describe an abstract mathematical condition in such a way that they are consistently applicable, according to their definition, in the various planning areas and, if adapted accordingly, in other areas as well.

The KPIs discussed in ISO 18828-4 relate to the tasks carried out within production planning process. However, all key indicators presented are recommendations and can also be used in accordance with general validity of the reference process from ISO 18828-2 and relate to content described there.

Due to their nature, KPIs can only be set in relation to, and used for purposes of continuous comparison with process improvement, if thresholds are well defined and applied. Therefore, with regards to the production planning processes, paying attention to the system boundaries of the analysis is imperative.

ISO 18828-4 describes the organization of KPIs in a multi-level system that provides different key indicator levels for processes, ranging from evaluation of the planning processes in process-oriented key indicators to evaluation of the specific results of planning tasks. In this organizational structure, while the more process-oriented key indicators are valid across different disciplines, the result-oriented key indicators tend to bear a strong relationship to the predefined planning disciplines of the production planning processes. The employed multi-level system indicates a significant key indicator

