

TECHNICAL REPORT

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Industrial automation — Shop floor production —

Part 1:

Reference model for standardization and a
methodology for identification of requirements

Automation industrielle — Production en atelier —

*Partie 1: Modèle de référence pour la normalisation et une méthodologie en vue de
l'identification des prescriptions*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 10314-1, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*.

This document is being published in the form of a Technical Report because it is not possible, in view of the current state of the art of modelling for manufacturing, to draw up an International Standard which would be complete and precise, and which would not be too restrictive in this rapidly changing field. This Technical Report is intended as a guideline and will be reviewed and augmented periodically.

ISO/TR 10314 consists of the following parts, under the general title *Industrial automation — Shop floor production*:

- *Part 1: Reference model for standardization and a methodology for identification of requirements*
- *Part 2: Application of the reference model for standardization and methodology*

Introduction

This report is intended to provide a tool to help identify and co-ordinate present and future activities involving ISO and IEC standards work in the field of industrial automation. Specifically, the Reference Model developed within the technical report is to be applied to the area of Discrete Parts Manufacturing. For the purposes of this report the word “manufacturing” should hereafter be interpreted to mean Discrete Parts Manufacturing. While the Reference Model may have application beyond the area of Discrete Parts Manufacturing, the developers of the Reference Model have not tested the Reference Model in other areas of industrial automation activities.

Since the model and the methodology will need to be refined so as to adjust to emerging technologies, a technical report rather than an international standard has been chosen as the means of presentation.

This technical report does not include the development of individual standards themselves, but rather the establishment of a common framework, in terms of a Reference Model, to assist future standards development.

The Reference Model for standardisation must be:

- simply structured, flexible, modular and generic,
- based upon readily available and acceptable terminology,
- able to be applied to a wide range of manufacturing operations and organisations, recognising the need to interface equipment and systems to human beings,
- independent of any given, predetermined realisations in terms of system configurations or implementations,

- open-ended in its ability to be extended, and in its ability to encompass new technologies without unreasonably invalidating current realisations
- independent of existing technologies in manufacturing automation and computer science.

This Reference Model and its methodology are to be used to identify areas for standardisation and will benefit organisations involved in developing such manufacturing standards. It will also be of interest to the manufacturing community consisting of both suppliers and users, but it is not intended to be a design for system integration of manufacturing.

The report for the Reference Model for Shop Floor Production Standards is comprised of two parts. Part 1 describes the Reference Model and methodology for identification of possible standards requirements. It addresses the following issues:

- a) a review of existing models and modelling methodologies,
- b) the derivation of an initial, generic, standards classification scheme for manufacturing,
- c) the adoption of a functional view of a manufacturing enterprise,
- d) the establishment of an initial reference model according to the results of a) - c),
- e) the development of a methodology for extracting areas of standards.

Part 2 describes the application of this Reference Model and methodology for extracting areas of standards. It addresses:

- i) the application of the methodology in order to derive a particular list of areas for required standards,
- ii) the identification of areas for standards,
- iii) the derivation of standards requirements.

The separate development of Part 2 may show that modifications are necessary to the highly interrelated Part 1. Normal ISO procedures will address this issue.

This document is Part 1 and consists of this introduction and seven chapters. In Chapters 1, 2, and 3 respectively, the scope and the field of application, description of terms and abbreviations are described. The objectives of standardisation for manufacturing are described in Chapter 4. Chapter 5 contains the Reference Model. Chapter 6 introduces the methodology for applying the Reference Model to clarify and extract areas of standards and this methodology is further amplified in Part 2. Chapter 7 provides an overall summary of the document.

Industrial automation — Shop floor production —

Part 1:

Reference model for standardization and a methodology for identification of requirements

1 Scope and Field of Application

1.1 Scope

This report presents and describes a means of identifying where new or revised manufacturing standards may be required. It establishes a Reference Model for Shop Floor Production, which is then used as the basis for developing a methodology for the identification and extraction of areas for standards. The assumptions used to develop the Reference Model are:

- the field of interest is the manufacture of discrete parts and in particular the production (physical realisation) of these parts,
- the Reference Model needs to be open-ended so that it can be revised to incorporate new technologies, and
- the Reference Model needs to be generic in nature so that it can be applied to a wide range of applications and is not directed to a particular organisational structure of manufacturing.

It is emphasised that the Reference Model:

- provides a conceptual framework for understanding manufacturing and
- can be used to identify areas of standards necessary to integrate manufacturing systems.

The Reference Model does not however provide a methodology for designing, implementing, operating and maintaining any existing or future manufacturing automation system. There may be a need to develop

other Reference Models which can be used for those purposes, perhaps based on the work described in this report. The development of such models is beyond the scope of this technical report.

1.2 Field of Application

The Reference Model described in this report is intended for use in the identification of standards within the Shop Floor Production area of manufacturing.

Manufacturing is perceived to be all inclusive, from customer order through to delivery of the product. Twelve manufacturing functions have been identified as being a part of manufacturing. The following is a list of these twelve functions, together with illustrative, non-exhaustive activities typically related to these functions:

- 1) Corporate management, e.g.
 - Direction of enterprise
 - Strategic planning
 - Feasibility study for investment
 - Risk management
- 2) Finance, e.g.
 - Financial planning
 - Corporate budgeting
 - Financial accounting
- 3) Marketing and sales, e.g.
 - Marketing research
 - Advertising
 - Sales forecasting
 - Sales scheduling
 - Pricing
 - Sales (order, delivery, invoice)
 - Product service
- 4) Research and Development, e.g.
 - R & D planning
 - Basic research
 - Applied research
 - Product development
 - Manufacturing development

- 5) Product design and Production engineering. e.g.
 - Define product specifications
 - Preliminary design and testing
 - Detailed design
 - Design analysis, test, evaluation
 - Revise design
 - Release design for production planning
 - Project management
 - Process planning
 - Programming of numerical control and programmable control
 - Tooling
 - Plant engineering
 - Bill of material
 - Quality assurance planning of production
 - Production configuration
- 6) Production management, e.g.
 - Production scheduling
 - Product and Inventory control
 - Production monitoring
 - General maintenance request
 - Quality control
 - Cost control and cost management
- 7) Procurement, e.g.
 - Vendor performance
 - Purchasing
 - Receiving
 - General stores
- 8) Shipping, e.g.
 - Product storage
 - Distribution
- 9) Waste material treatment, e.g.
 - Waste material processing
 - Waste material storage