

# Industrial automation: shop floor production —

**Part 1: Reference model for  
standardization and a methodology for  
identification of requirements**

# Committees responsible for this Draft for Development

The preparation of this Draft for Development was entrusted by the Advanced Manufacturing Technology Standards Policy Committee (AMT/-) to Technical Committee AMT/5, upon which the following bodies were represented:

- British Computer Society
- Department of Trade and Industry
- EEA (The Association of Electronics, Telecommunications and Business Equipment Industries)
- Gauge and Tool Makers' Association
- Institution of Electrical Engineers
- Institution of Manufacturing Engineers
- Institution of Mechanical Engineers
- Machine Tool Technologies Association

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## National foreword

This Draft for Development is to be published in two Parts. This Part of DD 203 has been prepared under the direction of the Advanced Manufacturing Technology Standards Policy Committee and is identical with Technical Report ISO/TR 10314-1:1990 “*Industrial automation — Shop floor production — Part 1: Reference model for standardization and a methodology for identification of requirements*”, published by the International Organization for Standardization (ISO).

This Draft for Development presents and describes a means of identifying where new or revised standards may be required. It establishes a reference model for shop floor production, which is then used as a basis for developing a methodology for the identification and extraction of areas for standards based on the assumptions made in the scope (1.1).

ISO/TR 10314-2 is in preparation and reference is made to it. ISO/TR 10314-2 deals with the general application of the reference model and methodology to the general area of shop floor production standardization.

The UK actively participated in the development of ISO/TR 10314-1 and ISO/TR 10314-2 through BSI Technical Committee AMT/5 and ISO Technical Committee ISO/TC 184.

International and European Standards, as well as overseas standards, are available from BSI Sales Department, BSI, Linford Wood, Milton Keynes MK14 6LE.

Information on the availability of developing and published international and European Standards, as well as up-to-date information on existing and projected British Standards publications in the general area of information technology, is included in the “BASIC LIST” and regular Newsletter published as part of the BSI Information Technology Service (BITS) initiative. For details of the BITS scheme, contact Mr Julian Bogod, 205 Holland Park Avenue, London W11 4XB.

### **This publication is not to be regarded as a British Standard**

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is still under technical development requiring wider exposure. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. According to the replies received, the responsible BSI committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of the BSI Technical Committee AMT/5 at the BSI London address as shown on the back cover.

### **Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 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.

## 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
- 10) Resource management, e.g.
  - Facility management
  - Tool control
  - Energy management
  - Time and Attendance