ISO/~~DTR~~PRF TR 3151-1~~:2023(E)~~

ISO/TC 184/SC 4~~/JWG 16~~

Secretariat: ANSI

Date: ~~2022-09-29~~2023-04-27

Visualization elements of PLM-MES interface~~—~~ —

Part 1:
Overview

~~[~~*Éléments de visualisation pour l'échange de données entre systèmes d'information de gestion du cycle de vie de produits (PLM) et de pilotage de la production (MES) – vue d'ensemble*~~]~~ —

~~CD~~ *Partie 1: Vue d'ensemble*

FDIS stage

~~**Warning for WDs and CDs**~~

~~This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.~~

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11
~~Email~~E-mail: copyright@iso.org
Website: ~~www.iso.org~~www.iso.org

Published in Switzerland

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 procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO ~~documents~~document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Field Code Changed

~~Attention is drawn~~ISO draws attention to the possibility that ~~some of~~ the ~~elements~~implementation of this document may ~~be~~involve the ~~subject~~use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights~~.~~ in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights. ~~Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).~~

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see ~~www.iso.org/iso/foreword.html~~www.iso.org/iso/foreword.html.

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 3151 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.

Field Code Changed

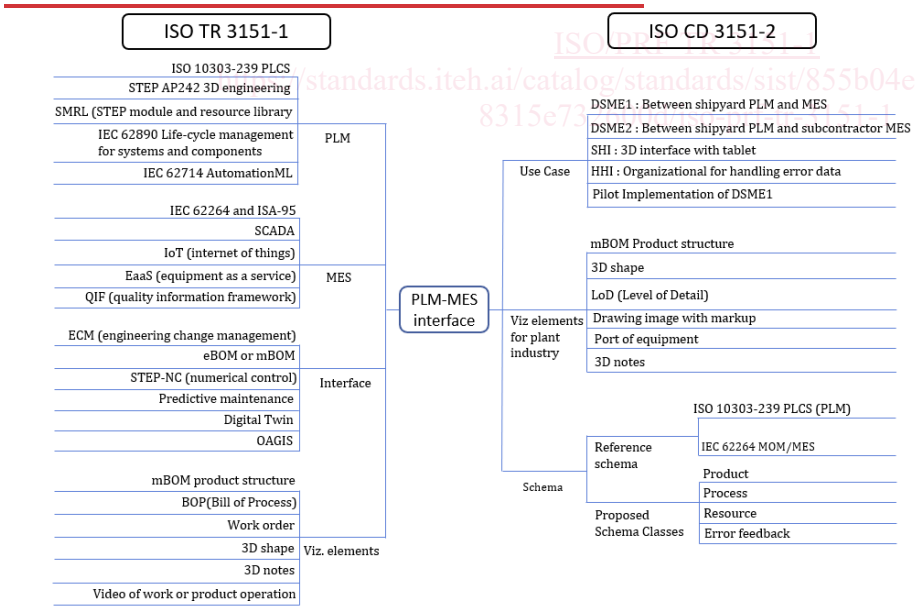
Introduction

This TRdocument is an overview part of the ISO 3151 series of standards, explaining. It explains the main scope of the ISO 3151 series as well as why the Product Lifecycle Management and Manufacturing Execution System (PLM-MES) interface is needed. It also describes the elements constituting the PLM-MES interface are briefly described, and the visualization elements of the PLM-MES interface, the main scope of ISO 3151, are also described.

Product Lifecycle Management (PLM) is a technical item often dealtcovered within ISO/TC 184/SC 4, and also in IEC TC65/TC 65 where there is a standard for different lifecycles of various product parts. On the other hand, Conversely, Manufacturing Execution System (MES) is a technical item dealtcovered within ISO TC184 /TC 184/SC5, IEC TC65/TC 65 and ISA (International Society of Automation). SC4 and SC1 of ISO/TC 184,/SC 4 and SC 1 also coverscover the standard technology for the automatic machining of the product. Standards for PLM-MES interface needs Cooperation between these standardizationstandards organizations. is needed for standards in a PLM-MES interface.

Although literatures areliterature is referenced to introduce the elements that make up the PLM-MES interface, more items are also referenced [1, 2, 3, 4, 5] for the configuration of the TRin [1-5] for the basis of this document.

Figure 1Figure 1 shows the overall PLM-MES interface defined by DTR 3151-1this document and PWIISO 3151-2[1]. The left side in Figure 1Figure 1 shows the contents of DTR 3151-1this document, and the right side shows the contents of PWIISO 3151-2.



[1] Under development. Stage at the time of publication: ISO/CD 3151-2.

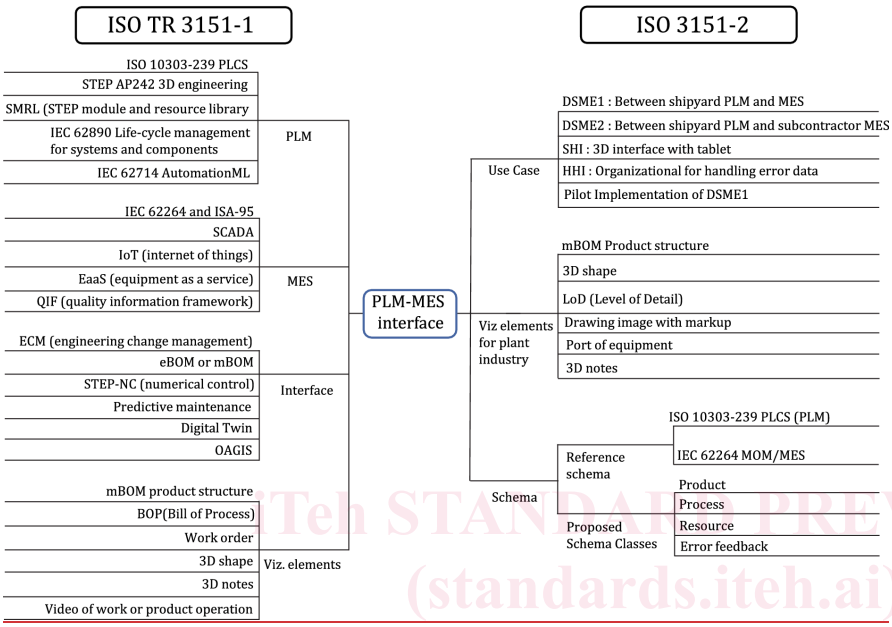


Figure 1 — Concept diagram of PLM-MES interface

The AP242 contains Product and Manufacturing Information (PMI), but its primary concern is to communicate design information to the manufacturing department. It is understood that the feedback loop from the manufacturing department to the design department is not well-supported. ISO ~~PWI~~ 3151-2 focuses on a 3D interface that feeds back errors found by the production department to the design department.

~~Title~~ Visualization elements of PLM-MES interface ~~–~~ —

Part 1:
Overview

~~DTR 3151-1~~

1 ~~1.~~Scope

This document ~~specified standard~~ outlines the visualization elements for data exchange between the Product Lifecycle Management ~~(PLM)~~ and Manufacturing Execution System (PLM-MES~~,~~) or ~~MOM -~~ Manufacturing Operations Management (MOM).

The following are within the scope of this ~~standard~~document:

— ~~a)~~ the need for a PLM-MES interface~~.~~;

— ~~b)~~ the technical elements that make up the PLM-MES interface~~.~~;

— ~~c)~~ the visualization elements of the PLM-MES interface.

The following is outside the scope of this document:

— ~~a)~~ application of the PLM-MES interface and its visualization elements.

2 ~~2.~~Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~ISO TR 24464:2020, *Automation systems and integration — Industrial data — Visualization elements of digital twins*~~

~~3.~~ISO/IEC 20924, *Information technology — Internet of Things (IoT) — Vocabulary*

3 Terms, definitions and ~~abbreviations.~~abbreviated terms

For the purposes of this document, the terms and definitions given in ISO/IEC 20924 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 ~~3.1Terms~~Terms and definitions

3.1.1
3D note
3D text information attached to graphical information of a digital shape model of a product

3.1.2
batch size
number of jointly processed (semi-finished) products~~.~~

Field Code Changed

Field Code Changed

[SOURCE: referenced from ISO 22468:2020(en), 3.1]

3.1.3
bill of material
BOM
listing of all the subassemblies, parts, and/or materials that are used in the production of a product, including the quantity of each material required to make a product

[SOURCE: referenced from IEC 62264-1:2013]

3.1.4
engineering bill of material
eBOM
the list of part numbers and assemblies that make up the design engineering configuration that contains the raw stock size and the material specification.

[SOURCE: ISO 10303-240:2005, 3.4.3]

3.1.5
lot size
quantity of an item ordered for delivery on a specific date or manufactured in a single production run.

[Source: referenced from [33]]

Note 1 to entry: See [33].

3.1.6
mBOM

A manufacturing bill of materials (MBOM) containsmaterial
mBOM
list of all the parts, labels, packaging, and assemblies required to build and ship a finished product to customers. It is different than an engineering bill of materials (EBOM) which provides the as-designed BOM

[Source: See Annex A]

Note 1 to entry: mBOM is different from an engineering bill of material (eBOM) which provides the as-designed BOM.

Note 2 to entry: See Annex A.

3.1.7
manufacturing execution system
MES
system for producing the desired products or services, including quality control, document management, plant floor dispatching, work-in-process tracking, detailed product routing and tracking, laborlabour reporting, resource and rework management, production measurement and data collection

[SOURCE: referenced from ISO 16100-1:2009, 3.14]

3.1.8
manufacturing operations management
MOM
activities within Level 3 of a manufacturing facility that coordinate the personnel, equipment and material in manufacturing

[SOURCE: ~~referenced from~~ IEC 62264-1:2013, 3.1.22]

~~3.2 **Abbreviations**~~

3D Three Dimensional
AAM Application Activity Model
AIC Application Interpreted Construct
AIM Application Interpreted Model
ANSI American National Standards Institute
AP Application Protocol
ARM Application Reference Model
ATO Assemble-To-Order
BOD Business Object Document
BOM Bill of Material
BOP Bill of Process
CAI Computer-Aided Inspection
CAPP Computer-Aided Process Planning
CC Conformance Class
CMM Coordinate Measuring Machine
DTO Design-To-Order
EaaS Equipment as a Service
eBOM Engineering BOM
ECM Engineering Change Management
ECN Engineering Change Notification
ECO Engineering Change Order
ECR Engineering Change Request
ERP Enterprise Resource Planning
ETO Engineer-To-Order
GD&T Geometric Dimensioning & Tolerancing
HVAC Heating Ventilation Air Conditioning
IEC International Electrotechnical Commission
IIoT Industrial Internet of Things
IoT Internet of Things
IR Integrated Resource
ISA International Society of Automation
ISO International Organization for Standardization
mBOM Manufacturing BOM
M2M Machine-to-Machine
MES Manufacturing Execution System
MOM Manufacturing Operations Management
MS Mapping specification
MTO Make-To-Order
MTS Make-To-Stock
NC Numerical Control
OAGIS Open Applications Group Interface Specification
OPC-UA Open Platform Communications Unified Architecture
PDA Personal Digital Assistant
PLC Programmable Logic Controller
PLCS Product Lifecycle Support
PLM Product Lifecycle Management
PMI Product Manufacturing Information
QIF Quality Information Framework
SCADA Supervisory Control And Data Acquisition
SMRL STEP Module and Resource Library
STEP Standard for the Exchange of Product model data
SW Software
WSN Wireless Sensor Network

3.2 ~~3.3~~ Abbreviated terms

3D	Three Dimensional
AAM	Application Activity Model
AIC	Application Interpreted Construct
AIM	Application Interpreted Model
ANSI	American National Standards Institute
AP	Application Protocol
ARM	Application Reference Model
ATO	Assemble-To-Order
BOD	Business Object Document
BOM	Bill of Material
BOP	Bill of Process
CAI	Computer-Aided Inspection
CAPP	Computer-Aided Process Planning
CC	Conformance Class
CMM	Coordinate Measuring Machine
DTO	Design-To-Order
EaaS	Equipment as a Service
eBOM	Engineering BOM
ECM	Engineering Change Management
ECN	Engineering Change Notification
ECO	Engineering Change Order
ECR	Engineering Change Request
ERP	Enterprise Resource Planning
ETO	Engineer-To-Order
GD&T	Geometric Dimensioning & Tolerancing
HVAC	Heating Ventilation Air Conditioning
IEC	International Electrotechnical Commission
IIoT	Industrial Internet of Things
IoT	Internet of Things
IR	Integrated Resource
ISA	International Society of Automation
ISO	International Organization for Standardization
mBOM	Manufacturing BOM
M2M	Machine-to-Machine
MES	Manufacturing Execution System
MOM	Manufacturing Operations Management

MS	Mapping specification
MTO	Make-To-Order
MTS	Make-To-Stock
NC	Numerical Control
OAGIS	Open Applications Group Interface Specification
OPC-UA	Open Platform Communications Unified Architecture
PDA	Personal Digital Assistant
PLC	Programmable Logic Controller
PLCS	Product Lifecycle Support
PLM	Product Lifecycle Management
PMI	Product Manufacturing Information
QIF	Quality Information Framework
SCADA	Supervisory Control and Data Acquisition
SMRL	STEP Module and Resource Library
STEP	Standard for the Exchange of Product model data
SW	Software
WSN	Wireless Sensor Network

~~3.2~~3.3 Difference between MES and MOM

The terms MES (manufacturing execution system) and MOM (manufacturing operations management) system are often used interchangeably, so that by defining different functional spaces for manufacturing professionals ~~leaves room for confusion~~it can be confusing.

The term MES is commonly used in commercial products, whereas the term MOM is often used to summarize the technical features. While MOM covers the set of functions defined in ~~the standard~~this document, MES is the commercial product that implements the set of functions as a SW system, so there are variations in MES ~~as~~ depending on the commercial product.

~~In this TR, according to Andrew Hughes' suggestion [6], it is classified as follows.~~ Because the term ~~Manufacturing Execution System (~~MES~~)~~ is used in many different senses, it is difficult to give an unambiguous, agreed-upon definition. However, many manufacturers mention MES in their daily work, and software vendors also use MES as their product name, so it is difficult to exclude the use of MES from a general discussion. Therefore, this ~~standard~~document uses the term MES in high-level abstractions where there is no confusion.

MOM is used to represent a standard management process, while MES is used to represent a software system for MOM. Therefore, MES has a different scope or level depending on the implementation of the system. In this ~~standard~~document, MES is mainly used, and if there is confusion and a clear definition is needed, the problem is solved by using the term of MOM defined by IEC and ISA.

As shown in ~~Figure 2, IEC and~~Figure 2, ISA-95 ~~define~~defines the term MOM ~~(Manufacturing Operations Management)~~ to cover Level 3 architecture and its functions. As smart manufacturing is integrated into the Industrial Internet of Things (~~IoT~~IIoT) in the future, changes to the ~~Figure 2~~Figure 2 model are expected~~, but that discussion can be covered in another specification~~.