

SEMI E160-1211 (Reapproved 0317)

SPECIFICATION FOR COMMUNICATION OF DATA QUALITY

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NOTICE: This Document was reapproved with minor editorial changes.

1 Purpose

1.1 With the semiconductor industry deploying e-Manufacturing, the data equipment generates is critical to improving equipment productivity. The quality of that reported data is of paramount importance to ensure successful use of software applications that use and/or analyze the data. It impacts communications including SECS (SEMI Equipment Communications Standard) and Equipment Data Acquisition (EDA) interfaced systems. The purpose of this Standard is to provide a generally acceptable specification for communicating the quality of semiconductor equipment data. This Standard is intended to be used in the following ways:

-) To establish a set of metrics for communication of quality of data produced by semiconductor equipment.
-) To communicate the quality of selected data parameters produced by semiconductor equipment.
-) To provide a measurable level of data quality to ensure quality of service and/or quality of performance of applications used by equipment suppliers, semiconductor manufacturers, equipment subsystem suppliers, and control system suppliers.
-) To provide data quality reporting compliance methods.

2 Scope

2.1 This Specification defines metrics and calculations for reporting equipment data quality. The data within scope of this Standard is any data that is retrievable from semiconductor equipment via electronic interfaces. Data quality metrics allow for the quantification of a data quality attribute or element so that this attribute or element can be communicated and verified. This Document defines data quality metrics corresponding to the Aspects, Attributes, and Elements of data quality as defined in SEMI E151, Guide for Understanding Data Quality.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 This Standard does not specify how the quality of reported data shall or could be improved. It provides a method to communicate the existing quality of reported data.

3.2 The term 'data' as used in this version of the Standard, is currently limited to data that is or can be collected from production equipment in the semiconductor industry via an electronic interface. In the future the Standard may be expanded to address data that can be collected from other entities within the semiconductor factory.

3.3 This Standard does not address the protocol or structures of messaging used to transport or communicate data values. That messaging infrastructure is dealt with in other SEMI Standards.

3.4 The data quality metrics contained in this Standard are intended to apply specifically to the variable value content of those messages, which constitutes the data.

3.5 This Specification does not cover the methodology for communication of data.

3.6 This Specification does not provide test methods for verification of data quality.

3.7 This Standard does not specify which parameters should be subjected to this Specification of data quality.

4 Referenced Standards and Documents

4.1 SEMI Standards and Safety Guidelines

SEMI E5 — SEMI Equipment Communications Standard (SECS-II)

SEMI E30 — Generic Model for Communications and Control of SEMI Equipment (GEM)

SEMI E37 — High-Speed SECS Message Services (HSMS) Generic Services

SEMI E54 — Specification for Sensor/Actuator Network

SEMI E120 — Specification for the Common equipment Model (CEM)

SEMI E125 — Specification for Equipment Self Description (EqSD)

SEMI E128 — Specification for XML Message Structures

SEMI E132 — Specification for Equipment Client Authentication and Authorization

SEMI E134 — Specification for Data Collection Management (DCM)

SEMI E138 — Specification for XML Semiconductor Common Components

SEMI E145 — Classification for Measurement Unit Symbols in XML

SEMI E151 — Guide for Understanding Data Quality

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 EDA — Equipment Data Acquisition Interface

5.1.1.1 *Discussion* — This refers to the suite of Standards including SEMI E120, SEMI E125, SEMI E128, SEMI E132, SEMI E134, SEMI E138, and SEMI E145.

5.1.2 SECS-II — SEMI Equipment Communications Standard

6 Conventions

6.1 *Requirements Identification* — The following notation specifies the structure of requirement identifiers.

6.1.1 The following requirements prefix format is (see Table 1) used at the beginning of the requirement text.

) [Esss.ss-RQ-nnnnnn-nn]

6.1.2 The following suffix format is used to mark the end of the requirement text.

) [/RQ]

6.1.3 Requirement IDs apply across the row (left to right) of a table.

Table 1 Requirement Identifiers

<i>Format Notation</i>	<i>Purpose</i>
E	SEMI Standards volume designator. Example: E for Equipment, M for Metrics.
sss.ss	SEMI Standards Specification identifier. Examples: E087.00, E087.01, E134.00.
RQ	Indicates this is a requirement identifier.
nnnnn	Unique five digit number within this Specification 90000-99999 is reserved for use by SEMI.
nn	Unique two digit version number for this requirement. Value 00 is the first version.

7 Overview

7.1 SEMI E151, Guide for Understanding Data Quality defines three aspects of Data Quality: Availability, Interpretability, and Usability. These aspects have attributes and elements as defined in SEMI E151. These attributes and elements are of interest in the reporting of data quality.

8 Data Quality Metrics

8.1 Tables 2 through 4 list the data quality metrics, delineated by Aspect, Attribute, and Element, as defined in SEMI E151. This includes listing the data quality aspects associated with the parameter and the metrics used to evaluate the related data quality attribute or element of interest. These metrics can be applied to a single data parameter or a group of data parameters from a single interface.

[E160.00-RQ-00001-00] When a user wishing to comply with this Standard is defining a particular data parameter they shall use Tables 2 through 4 when defining a particular data parameter. The user shall specify the appropriate data quality attribute or element from the defined tables by selecting the appropriate subset of rows that relate to the Specification or definition of that data parameter[/RQ].

NOTE 1: A 'user' is an entity that makes use of this Standard to obtain a data quality assessment.

[E160.00-RQ-00002-00] The supplier shall enter the values for the selected attributes or elements using the defined formats or metrics [/RQ].

NOTE 2: A 'supplier' is an entity that provides data quality information per this Standard.

8.2 Note that not all metrics are required for the elements shown in Tables 2 through 4 when assessing the data quality of a particular data parameter. The Requirement Identifier's Requirement Type indicates whether or not metrics for these elements or attributes are required to be specified to describe the data quality aspects of the selected data parameter in consideration; the notation used in the column is defined in § 6.

Table 2 Data Quality Metrics – Availability

Requirement ID	Attribute	Element	Metric	Reqd	Metric Unit	Calculation/ Validation Method	Value Expression	Comments Including Specifications on Conditional
[E160.00-RQ-00003-00]	Interface	N/A	Interface	Y	Enumerated list consisting of at least: <'SECS-II', 'EDA', or 'Sensor Actuator Network'>	Selection of exactly one element from the list	Text string equal to exactly one element from list	SECS-II (SEMI E5, SEMI E30, SEMI E37) Sensor Actuator Network (SEMI E54) EDA (SEMI E125, SEMI E134) The row indicates the interface used for communicating data. When using multiple interfaces use multiple instances of the communication template; one for each interface.

Requirement ID	Attribute	Element	Metric	Reqd	Metric Unit	Calculation/ Validation Method	Value Expression	Comments Including Specifications on Conditional
[E160.00-RQ-00004-00]	Mechanism	N/A	Mechanism	Y	Any text	Existence of Text	Text	A description of the mechanism by which the data is communicated over the interface (e.g., response to S1F3 Selected Equipment Status Request in SECS-II or response to GetParameter ValueRequest() in EDA).

#1 'Reqd' means 'Required'.

Table 3 Data Quality Metrics – Interpretability

Requirement ID	Attribute	Element	Metric	Reqd	Metric Unit	Calculation/ Verification Method	Value Expression	Comments Including Specifications on Conditional
[E160.00-RQ-00005-00]	Protocol	N/A	Protocol	C	Enumerated list of protocols including those referenced used in SEMI E54, Specification for Sensor Actuator Network, for example, 'LonWorks', 'Profibus', 'Modbus/TCP', 'CC-Link', 'Ethernet-IP', 'Profinet', 'SafetyBus p', 'A-Link', 'EtherCAT', or other defined protocols	Selection of one or more protocols from the enumerated list	List of one or more text strings where each element is one protocol from the enumerated list	The associated language or sensor actuator network communication protocol. Conditionality is that this metric shall only be used if the value of the Interface metric is 'Sensor Actuator Network'.

Requirement ID	Attribute	Element	Metric	Reqd	Metric Unit	Calculation/ Verification Method	Value Expression	Comments Including Specifications on Conditional
								A zero length list means that none of the listed protocols are supported. If the Interface is SECS-II or EDA then this field is not applicable.
[E160.00-RQ-00006-00]	Format	N/A	Format	Y	Finite list of formats provided over the Interface	Selection of one or more formats from list where each of these formats are provided in the dictionary associated with the Interface	List of one or more text strings where each element is one format from the list. The list consists of formats from SEMI E5 (SECS), SEMI E138 (EDA), or SEMI E54 (Sensor Actuator Network).	Format relates back to the parameter data type definition for the interface selected. All the formats in the list shall be associated with the same data quality. If a particular format results in different data quality then that data element shall be listed separately.
[E160.00-RQ-00007-00]	Units	N/A	Units	Y*	Finite list of units provided over the Interface	Selection of one or more units from the list where each of these units is identified in the standard associated with Interface. *If a parameter is not associated with a unit then the parameter shall be unit less (e.g., a ratio).	Finite list consisting of units from SEMI E5, § 12, SEMI E145, § 9, or SEMI E54.1, Appendix 1	Units normally apply only to a limited number of numeric parameters. All of the units in the list shall be associated with the same data quality. If a particular unit results in different data quality, then that data element shall be listed as separate rows in the communication template instance, one for each set of units that are associated with a different data quality.