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BSI Standards Publication

Mapping rules and exchange methods for heterogeneous electronic parts libraries

Part 1: Building an integrated search system

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National foreword

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Mapping rules and exchange methods for heterogeneous electronic parts libraries – Part 1: Building an integrated search system

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MAPPING RULES AND EXCHANGE METHODS FOR HETEROGENEOUS ELECTRONIC PARTS LIBRARIES –

Part 1: Building an integrated search system

FOREWORD

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IEC TR 62699-1, which is a technical report, has been prepared by IEC technical committee 91: Electronics assembly technology.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
91/1187/DTR	91/1200/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 62699 series, published under the general title *Mapping rules and exchange methods for heterogeneous parts libraries,* can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This technical report describes the methodology for integrated use of heterogeneous libraries of electric and electronic product parts to provide integrated services utilizing existing heterogeneous libraries. Integrated search of electronic parts information, for example, requires to integrate the electronic parts classification systems and the property classification systems that are possibly maintained by different nations in incompatible ways, in that not all the electronic parts information has one-to-one correspondence between parts libraries. Recently, Korea, China, and Japan jointly built an integrated search system to enable search of parts information across parts libraries that are independently operated by each country. The biggest challenge in this project was bridging the gap between these heterogeneous parts libraries by providing rules to integrate related parts information. The integration of information that has one-to-one (1:1) relation between different parts libraries is straightforward. However, integration of information that has one-to-many (1:N), or many-to-one (N:1) relation demands a standard rule of integration to provide a determinant search result, or service in general.

The integration rules specified in this technical report provide a foundation for utilization of the electronic parts libraries, possibly heterogeneously constructed by different organizations. The information systems constructed by the application of these integration rules can be the basis for constructing an integrated electronic parts e-sourcing system enabling real-time search of multinational electronic part databases with minimized loss of information.

MAPPING RULES AND EXCHANGE METHODS FOR HETEROGENEOUS ELECTRONIC PARTS LIBRARIES –

Part 1: Building an integrated search system

1 Scope

This part of IEC 62699 describes mapping rules and exchange methods for the development of general and extendable integrated services utilizing heterogeneous multi-national or multi-enterprise electronic parts library data. The scope of this technical report is as follows:

a) identification and classification of mapping types for mapping heterogeneous electronic parts libraries;

b) definition of general mapping rules and specific mapping rules commonly applying to various mapping types.

The following aspects are out of the scope of this technical report:

- schematic definition and management of the electronic parts libraries to be mapped;
- maintenance process for the parts libraries during changes.

2 Application architecture

2.1 General

This clause illustrates the application architecture on which the mapping rules and methods are based. The information exchange methodology and interoperability are required for performing an integrated search by linkage of heterogeneous electronic parts libraries on the basis of the mapping dictionary.

2.2 Interoperability system

Figure 1 shows an interoperability system (IOS). It is constructed with common exchange rules and a mapping dictionary that apply between parties A, B and C. Each system, connected with the Internet, provides the communications environment that enables data exchange.

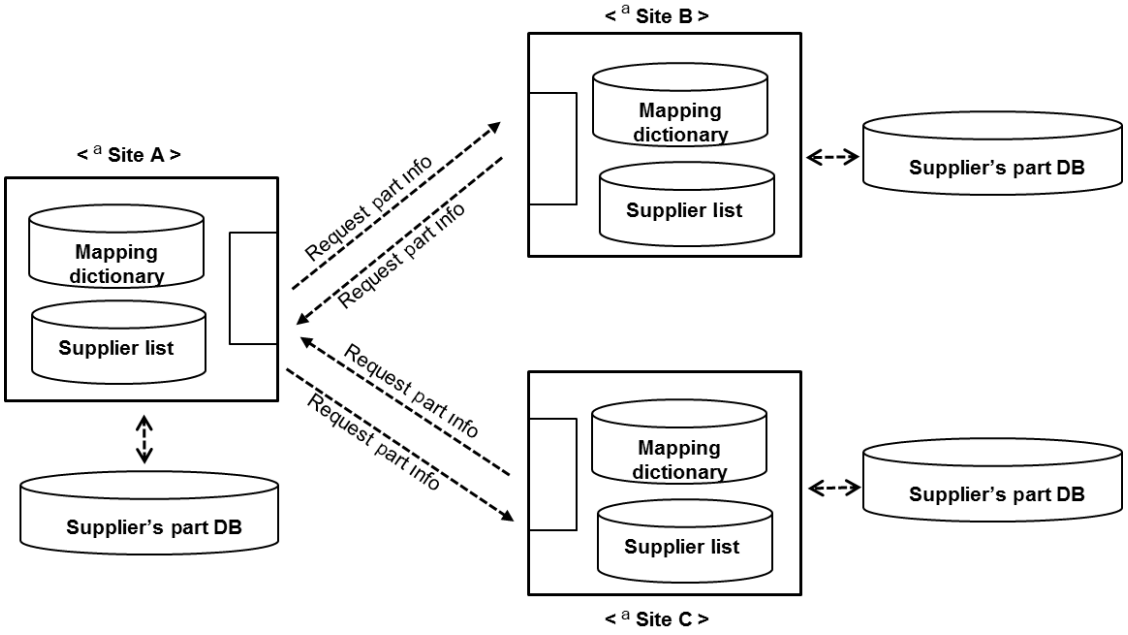


Figure 1 – Interoperability system status

The following items are involved in the construction of an application architecture.

- Interoperability system (IOS)

  It consists of the mapping dictionary, suppliers' list and the parts data base (DB) intended to design communications protocols and message exchange rules enabling interoperation, and to provide and exchange developed data communications programs and data.

- Mapping dictionary

  It constructs electronic parts libraries into the mapping dictionary for information exchange between sites.

- Part DB

  As detailed information of the parts listed in the mapping dictionary. It can be either operated on the same server as the interoperability system or constructed into a separate system depending on the information system environments of the concerned site.

2.3 Architecture

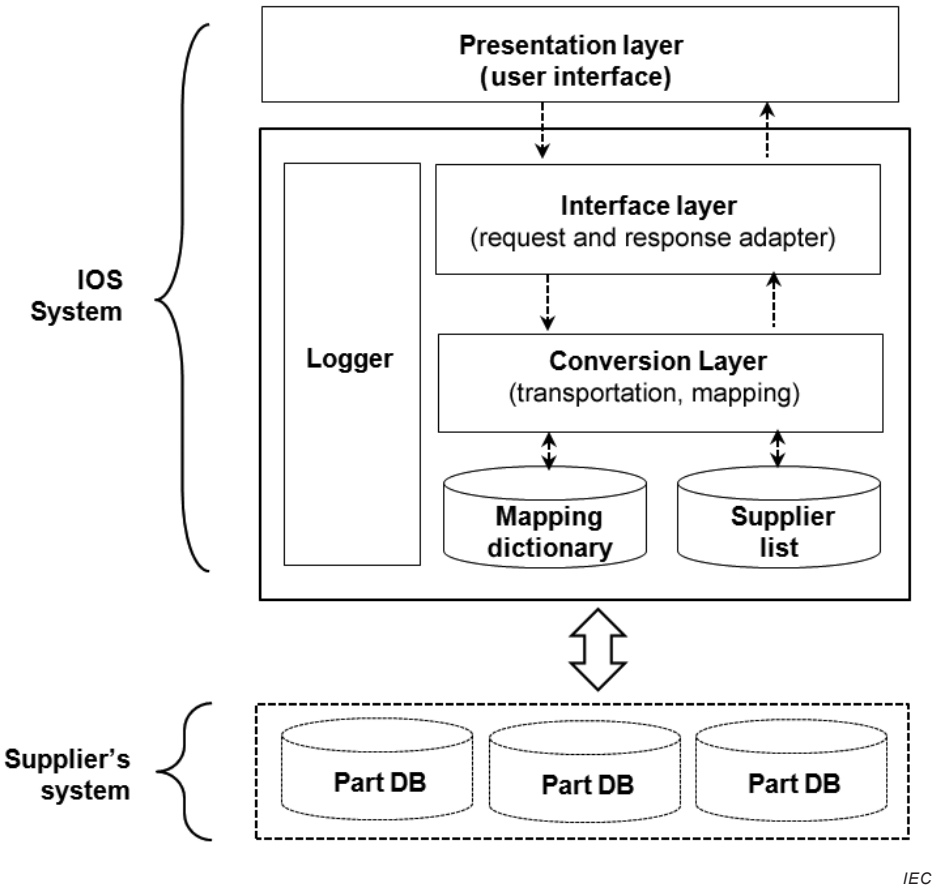


Figure 2 – Application architecture

Figure 2 shows the organization of the application architecture in which each component provides the functions as described below.

- Presentation layer (User Interface)

  It inputs search conditions for search of parts information and provides the user screen on which search results are displayed.

- Interface layer (request & response adapter)

  It consists of the request demanding the interoperability system to search the parts information according to search conditions (class, suppliers' list, property, etc.) and the response transporting the parts information search results corresponding to the requested search conditions in response to the request.

- Conversion layer (transportation, mapping)

  It executes data conversion and mapping in accordance with the requested search conditions and the IOS through the mapping dictionary and suppliers' list.

- Suppliers' list

  It is the supplier information corresponding to a parts class and includes information such as URL, address, etc.

- Mapping dictionary

  It is the repository in which parts classes of each interoperability system site to be exchanged are mapped. All the sites whose information will be exchanged should always be synchronized to ensure accurate information exchange.

- Part DB

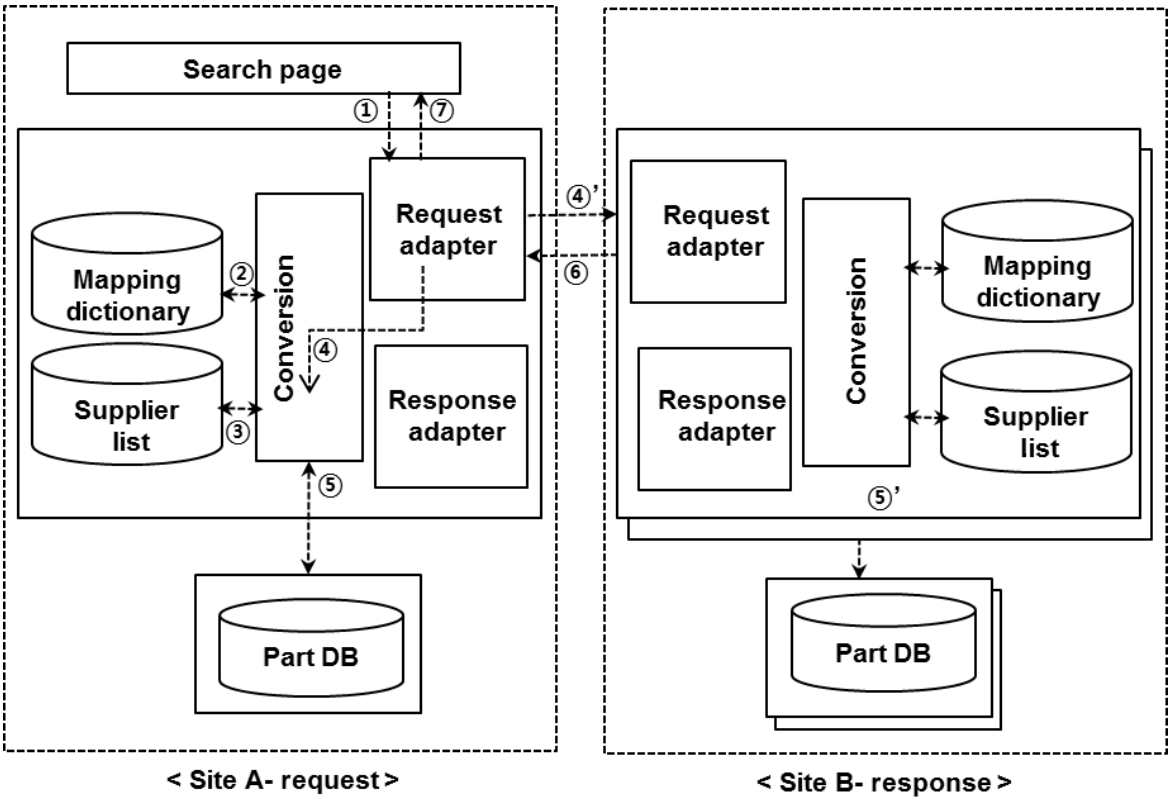
  As the repository of detailed information of supplier's parts, it is the supplier system which is constructed outside the interoperability system and configured to be linked to the interoperability system.

- Logger

  It monitors the transaction processing of the interoperability system such as request, response, etc., and the system management. It contains the standard message protocol, standard mapping dictionary and parts information for exchange of parts information. The standard message protocol defines the method of communications used for data transport and the method of packaging data in the message.

2.4 Data flow diagram

Figure 3 depicts the data flow in the application architecture.



Key

The following numbers represent a common data flow.

①. Selecting parts classes for search of parts information.

②. Mapping parts classes to the corresponding IOS classes through the mapping dictionary.

③. Bringing the suppliers' lists corresponding to the parts classes.

④. Requesting search of parts information to the IOS.

⑤. Bringing the detailed parts information of the IOS to be searched.

⑥. Transporting searched parts information to the requesting IOS.

⑦. Displaying search results on the user's screen.

Figure 3 – Data flow diagram

2.5 Sequence diagram

Figure 4 shows the sequence diagram for the components of the application architecture.

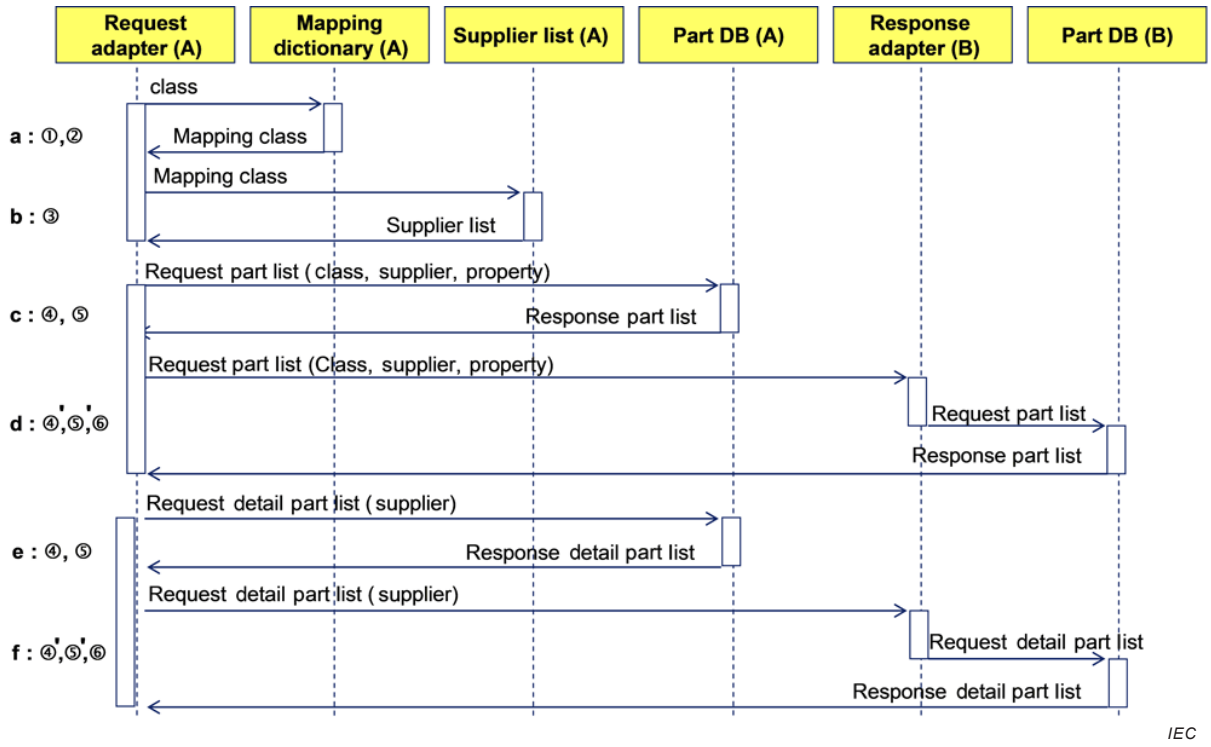
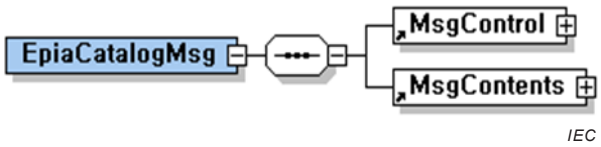


Figure 4 – Sequence diagram

2.6 Message block

On the interoperability system, the message for exchange of parts information consists of a control block and a contents block as shown in Figure 5.

The details of the message block are listed below.



Element			Attribute		Cardinality
Name		Description	Name	Description	
EpiaCatalogMsg		IOS message			
	MsgControl	Control block			1
	MsgContents	Contents block			1

Figure 5 – Message block

- Control block

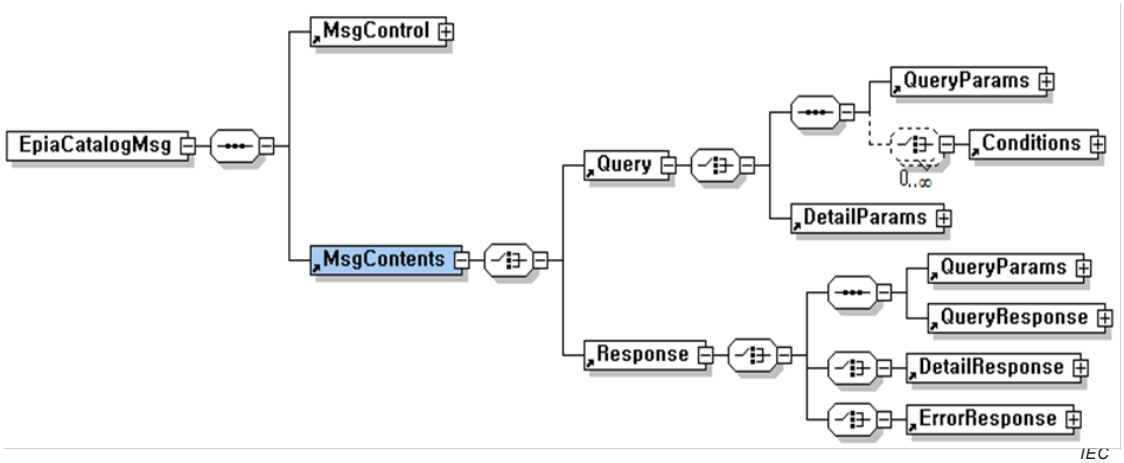
  It is the message header for exchange of message contents, and consists of the information such as message ID, message kind, status, etc., as shown in Figure 6.

Element			Attribute		Cardinality
Name		Description	Name	Description	
MsgControl		Header information for message exchange consisting of message kind, status, message ID, etc.	kind	"1": Query request "2": Detail request	
			status	"0": Request "1": Response (normal) "2": Response (error)	
			identifier	Used as check ID for information exchange in a request and response system MemberID + "YYYYMMDDHHMMSS"	
	MemberInfo	Message user ID and password for message security	identifier	Member ID	
			password	Member PASSWORD	

Figure 6 – Message control block

- Contents block

  It consists of the formats for request and response with the parts list and detailed parts information, and its contents depends on the type of message as shown in Figure 7.



Element			Attribute		Cardinality
Name		Description	Name	Description	
MsgContents		Containing message contents			
	Query	Request for information			1
	Response	Response with search results			1

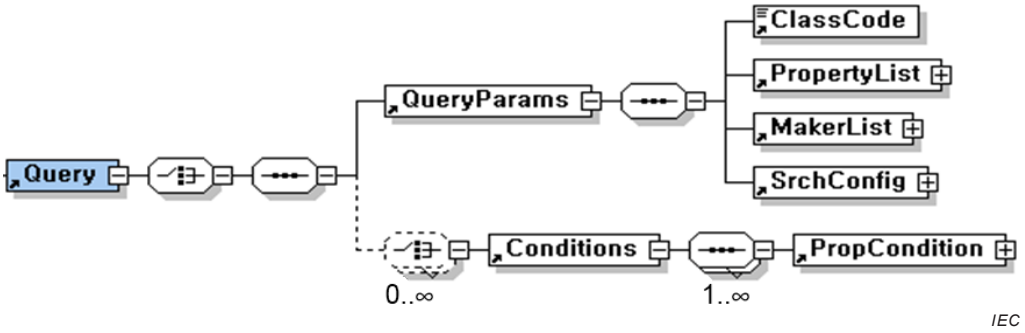
Figure 7 – Message contents block

The contents block consists of the “Query“ message requesting the parts information and the “Response“ message responding to the requested parts information as shown in Figure 8.

Depending on the message kind, “Query“ and “Response” messages are configured as follows:

- Query request

  Is the message requesting the parts list information to a counterpart enterprise (nation). It consists of the general search conditions and the specified property required for information request.

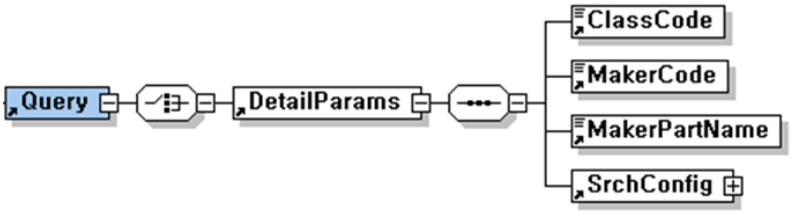


Element			Attribute		Cardi-nality
Name		Description	Name	Description	
Query		Request for parts list			1
	QueryParams	General query parameters set up by user and system			1
		ClassCode	Products (parts) class code			1
		PropertyList	Property list			1
		MakerList	Suppliers' list			1
		SrchConfig	Number of queries, response time			1
	Conditions		Specified property Search conditions			0..*n*
		PropCondition	Property condition	code	Property condition code	1..*n*
				prefix	Property condition prefix	1..*n*

Figure 8 – Message contents block (query request)

- Detail request

  Is the message requesting detailed parts list information to a counterpart enterprise (nation), it consists of the detailed search parameters required for information request as shown in Figure 9.

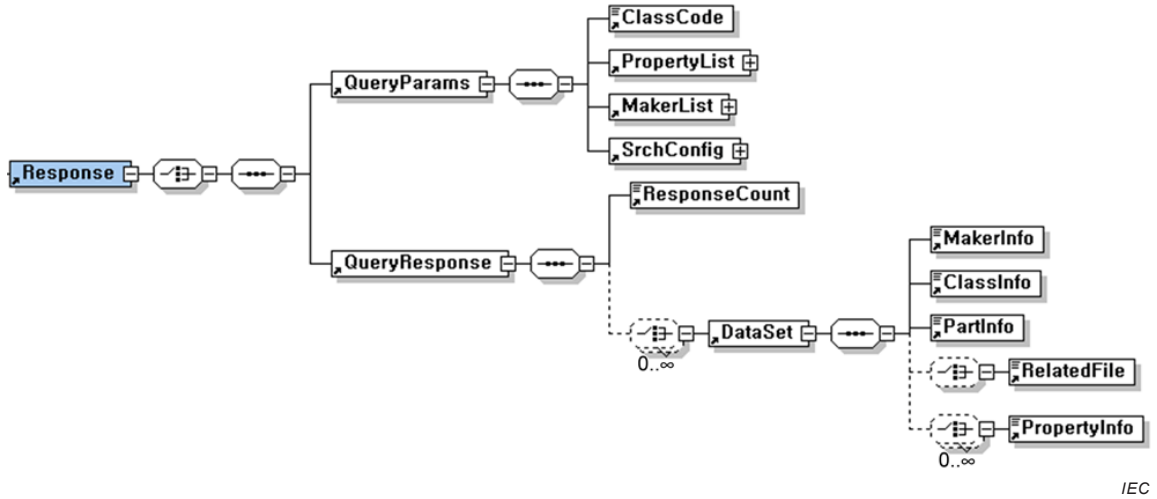


Element			Attribute		Cardinality
Name		Description	Name	Description	
Query		Request for detailed parts information			1
	DetailParams	Detailed search parameters			1
		ClassCode	Products (parts) class code			1
		MakerCode	Supplier code			1
		MakerPartName	Supplier parts name	code	Supplier parts code	1
		SrchConfig	Number of queries, response time			1

Figure 9 – Message contents block (detail request)

- Query response

  Is the message of response with search results to the request of a counterpart enterprise (nation) for the parts list information, it consists of the search conditions requested and the search results as shown in Figure 10.

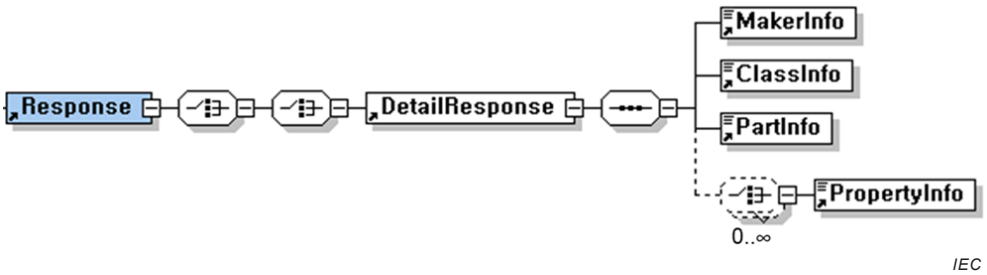


Element			Attribute		Cardinality
Name		Description	Name	Description	
Response		Response with search results			1
QueryParams		Query request message search conditions			1
ClassCode		Products (parts) class code			1
PropertyList		Property list			1
MakerList		Suppliers' list			1
SrchConfig		Number of queries, response time			1
QueryResponse		Response with search results			1
ResponseCount		Number of search results			1
DataSet		Searched data			0..*n*
MakerInfo		Supplier info	code	Supplier code	1
			url	Supplier URL	
ClassInfo		Parts class info	code	Class code	1
			level	Class level	
PartInfo		Parts info	code	Part code	1
RelatedFile		Related file info	type	Related file type	0..1
			url	Related file URL	
PropertyInfo		Property info	code	Property code	0..*n*
			name	Property name	
			unit	Property unit	
			prefix	Property prefix	
			data type	Property data type	

Figure 10 – Message contents block (query response)

- Detail response

  Is the message of response with search results to the request of a counterpart enterprise (nation) for the detailed parts information, it consists of the detailed search results for suppliers and parts as shown in Figure 11.



Element			Attribute		Cardinality
Name		Description	Name	Description	
Response		Response with search results			1
DetailResponse		Response with detailed search results			1
MakerInfo		Supplier info	code	Supplier code	1
			url	Supplier URL	
ClassInfo		Class info	code	Class code	1
			level	Class level	
PartInfo		Part info	code	Part code	1
PropertyInfo		Property info	code	Property code	0..*n*
			name	Property name	
			unit	Property unit	
			prefix	Property prefix	
			data type	Property data type	

Figure 11 – Message contents block (detail response)

- Error response

  It consists of an error code and error contents by type of error occurring in the search of parts information as shown in Figure 12.

Element			Attribute		Cardinality
Name		Description	Name	Description	
Response		Search results response			1
	ErrorResponse	Search error response	type	Error type	1
		ErrorCode	Error code		1
		ErrorDescription	Error description		1

Figure 12 – Message contents block (error response)

3 Format of the utilized dictionary

3.1 General

This clause presents the configuration and constraints to be used for integrating or linking different parts libraries using the utilized dictionary.

3.2 Format configuration of utilized dictionary

The utilized dictionary management format is divided into three parts as follows:

- UD_Class format;
- UD_Root property format;
- UD_Property format.

3.3 Rules for description of utilized dictionary

In these rules, each configuration item of the utilized dictionary is described based on the following elements.

- Objective: describing the objective of each configuration item.
- Description: prescribing the description method of each configuration item.
- Obligation: if the configuration item value is “obligation”, its property is required.
- Formulation: form of expression of an item. In case of a character string, its maximum length is included.
- Example: describing an example of an item.

3.4 UD_Class format

3.4.1 General

UD_Class defines separately the utilized class, utilized parent, etc. including all classes of each organization. Also each defined utilized class includes the class information of the dictionary of each organization as shown in Figure 13.

Utilized dictionary						SD1			SD2		
UD_Class code	UD_Parent code	UD_Leaf class	UD_ level	DISPLAY _ NO	UD_Class name	Class code	Parent class	Class name	Class code	Parent class	Class name
UTD0000	$ROOT$	N	L0	1	Utilized dictionary root	XEA000	$ROOT$	Root	XJA001	$ROOT$	Root
UTD0001	UDT0000	N	L1	2	Analog and mixed signal	XEA0061	XEA0000	Analog and mixed signal			
UTD0002	UDT0001	N	L2	3	Amplifier IC	XEA0062	XEA0061	Amplifier IC	XJA682	XJA001	Standard linear ICS
UTD0003	UDT0002	Y	L3	4	Instrumentation amplifier IC	XEA0069	XEA0062	Instrumentation amplifier IC			
UTD0004	UDT0002	Y	L3	5	Isolation amplifier IC	XEA0066	XEA0062	Isolation amplifier IC			
UTD0005	UDT0002	Y	L3	6	Operational amplifier IC	XEA0067	XEA0062	Operational amplifier IC	XJA683	XJA682	Operational amplifier

Figure 13 – Example of UD_Class format

3.4.2 Utilized class dictionary column

3.4.2.1 General

A utilized class dictionary includes the following columns.

- Objective: a utilized technical dictionary is made based on several standard dictionaries. The utilized class dictionary column defines the actual user-based Class_Name and hierarchical structure, etc.
- Description: prescribes the description method of each column.
- Obligation: describes whether the concerned item value is required or optional.
- Formulation: form of expression of an item value to be described.
- Example: example of item description.

3.4.2.2 UD_Class_Code

- Objective: 7-digit code to identify the concerned product class among others.
- Description: the first 3 English characters, UTD (Utilized Technical Dictionary), followed by a 4-digit numerical code which has no specific meaning, but is given sequentially.
- Obligation: required.
- Formulation: UTDnnnn (3 English characters, UTD, followed by a 4-digit number).
- Example: UTD0001.

3.4.2.3 UD_Parent_Code

- Objective: to identify the parent class of the concerned product class.
- Description: UD_Class_Code of parent class of the concerned product class.
- Obligation: required.
- Formulation: UTDxxxx (3 English characters, UTD, followed by a 4-digit number).
- Example: UTD0001.

3.4.2.4 UD_Leaf_Class

- Objective: to identify whether the concerned product class is the leaf class in the hierarchical structure.
- Description: describes Y if it is the leaf class, and N if it is not the leaf class but has a subclass.
- Obligation: required.

- Formulation: Y or N.
- Example: Y.

3.4.2.5 UD_Level

- Objective: level of the concerned product class in the hierarchical structure.
- Description: level L1 ~ Ln given for each product class, except L0 for ROOT class.
- Obligation: required.
- Formulation: L1 (level L2 for the next class).
- Example: L1.

3.4.2.6 Display_No

- Objective: display order of class, which is updated when a dictionary is added or changed.
- Description: digit string according to the display order of the parts class. The number is given according to display order. If the dictionary is changed, Display_No begins with number 1 again.
- Obligation: required.
- Formulation: 1 (the next Display_No is 2).
- Example: 1.

3.4.2.7 UD_Class_Name

- Objective: name representing the product class.
- Description: if SD1_Class exists, SD1_Class_Name is preferentially used. If not, the next lowest number is substituted for SDn_Class_Name in the order of SD2, SD3, etc.
- Obligation: required.
- Formulation: the concerned SDn_Class_Name is used without change as it is.
- Example: fixed ceramic capacitors.

3.4.3 Standard dictionary column

3.4.3.1 General

- Objective: standard dictionary matching with the utilized class. It ranges from SD1 to SDn. SD1 is normally based on the local standard dictionary.
- Description: prescribes the description method of each column.
- Obligation: describes whether an item value is required or optional.
- Formulation: form of expression of an item to be described.
- Example: example of item description.

3.4.3.2 SD1_Class_Code

- Objective: code to identify the SD1 product class.
- Description: describes the class code of the product class defined in SD1 matching with the utilized class.
- Obligation: optional.
- Formulation: according to the related standard dictionary.
- Example: XEA00001.

3.4.3.3 SD1_Parent_Code

- Objective: code to identify the parent class of SD1_Class_Code defined in SD1.
- Description: describes the class code of the parent of a class defined in SD1.

- Obligation: required (on the condition that SD1_Class_Code exists).
- Formulation: according to the related standard dictionary.
- Example: XEA00001.

3.4.3.4 SD1_Class_Name

- Objective: name representing a product class in SD1.
- Description: uses Class_Name of a product as defined in SD1.
- Obligation: required (on the condition that SD1_Class_Code exists).
- Formulation: uses SD1_Class_Name as defined.
- Example: fixed ceramic capacitors.

3.4.3.5 SDn_Columns

- Objective: same columns as in SD1, but they can increase from 2 to *n* depending on the base standard dictionary. Each column has the standard dictionary value matching the utilized class.

3.5 Root property format

3.5.1 General

The root property format defines the property commonly used in all classes when a buyer searches a product using the utilized dictionary. It also defines the common property independently administered in each organization. Figure 14 gives an example of this format.

MS	Property code	Property name	Unit	Level	Data type	Para-meterID	Parameter name	Standard unit		Data type	Edit
Q	XPA0017	Manufacturer parts number			Character	7276	Product type			W	
Q	XPA0019	Manufacturer vendor code			Character	7278	Manufacturer code			W	
Q	XPA0018	Manufacturer name			Character	7277	Manufacturer name			W	
Q	XPA0016	Manufacturer product name			Character	7275	Product name			W	
L	XPA0021	Environmental matter			Character						

Figure 14 – Example of root property format

3.5.2 Utilized root property dictionary column

3.5.2.1 General

A utilized root property dictionary includes the following columns.

- Objective: to define the property commonly used in all product classes based on each standard dictionary. SD1 to SDn may exist depending on the utilized class, but SD1 is normally based on the local standard dictionary. The property code is described on the basis of the standard dictionary without change.
- It also defines the property commonly used for each matching standard class on the basis of the matching utilized class.
- Description: prescribes the description method of each column.
- Obligation: prescribes whether an item value is required or optional.
- Formulation: form of expression of an item value to be described.
- Example: example of item description.

3.5.2.2 MS (mapping status)

- Objective: to establish whether the parts information can be searched based on a property.
- Description: describes whether a property can be searched.
- Obligation: required.
- Formulation: ‘Q’ if a property can be searched and ‘L’ if it cannot be searched but can be utilized in the result list.
- Example: Q.

3.5.2.3 SD1_Property_Code

- Objective: The Property Code based on the Standard Dictionary of SD1.
- Description: Describing the Property Code as it is according to the base Standard Dictionary.
- Obligation: Required.
- Formulation: Expressing the Property Code as it is according to the base Standard Dictionary.
- Example: XPA0017.

3.5.2.4 SD1_Property_Name

- Objective: Property Name defined in the Standard Dictionary.
- Description: describes the property name according to the base standard dictionary without change.
- Obligation: required.
- Formulation: expresses the property name according to the base standard dictionary without change.
- Example: Manufacturer parts number.

3.5.2.5 SD1_Property_Unit

- Objective: unit of the property value defined in the standard dictionary.
- Description: describes the property unit according to the the base standard dictionary without change.
- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: expresses the property unit according to the base standard dictionary without change.
- Example: uF, Mohm.

3.5.2.6 SD1_Property_Level

- Objective: level of the property value defined in the standard dictionary.
- Description: describes the property level according to the base standard dictionary without change.
- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: expresses the property level according to the base standard dictionary without change.
- Example: MinMax, Max, Min, Nor, Typ.

3.5.2.7 SDn_Property_Column

- Objective: Property information defined in the standard dictionary of SD2 or SD3 matching to SD1 (in SD2, for example, an item is defined as SD2_Property_xxxxx).
- Description: describes the property column according to the base standard dictionary without change.

- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: expresses the property column according to the base standard dictionary without change.

3.6 Property format

3.6.1 General

The property format defines properties for each class of the utilized dictionary. The defined properties include all properties administered in each organization, and also each property to be searched independently in each organization group that is administered through separate property items of UD_MS, SD1_MS, and SD2_MS. Figure 15 shows an example of a property format.

Among MS property items, Q (query property) is the property intended for searching in the integrated search system, and L (list property) is the property which is not used for searching but for the list display of search results.

UD		SD1								SD2							
UD_ Class_ Code	UD_ MS	SD1_ Class_ Code	SD1_ Property_ Code PROP_CD	SD1_ Property_ Name	SD1_ UNIT	SD1_L VL	SD1_ DATA_ TYPE	SD1_ DISP_ NO	SD1_M S	SD2_ Class_ Code	SD2_ Property_ CodePRO PCD	SD2_ Property_ Name	SD2_U NIT	SD2_L VL	SD2_ DATA_ TYPE	SD2_ DISP_ NO	SD2_M S
UTD0120	Q	XEA0925	XPA0095	Forward voltage	V	Max	Numeric	280	Q	XJA714	XJG297	Forward voltage	V	Max	RealM	2206	Q
UTD0120	L	XEA0925	XPA0092	Peak, forward surge current	A	Max	Numeric	250	Q	XJA714	XJH435	Non-repeat peak forward surge	A	Max	RealM	2201	L
UTD0120	L	XEA0925	XPA0096	Reverse current	uA	Max	Numeric	290	Q	XJA714	XJG298	Reverse current	A	Max	RealM	2207	L
UTD0120	L	XEA0925	XPA0093	Reverse recovery time	nS	Max	Numeric	300	Q	XJA714	XJG300	Reverse recovery time	S	Max	RealM	2209	L
UTD0120	L	XEA0925	XPA0084	Thermal resistance	Cel/W	Max	Numeric	310	Q	XJA714	XJG299	Thermal resistance	Cel/W	Max	RealM	2208	L
UTD0120	L	XEA0925	XPA0083	Junction femperature	Cel	Min Max	Character	320	Q	XJA714	XJG292	Junction temperature	Cel	Max	RealM	2195	L
UTD0120	Q	XEA0925	XPA0091	Average rectified current	A	Max	Numeric	210	Q	XJA714	XJG304	Average rectified current	A	Max	RealM	2200	Q
UTD0120	Q	XEA0925	XPA0089	Non-repetitive peak reverse surge voltage	V	Max	Numeric	220	Q	XJA714	XJG303	Non-repeat peak reverse surge voltage	V	Max	RealM	2199	Q
UTD0120		XEA0925	XPA0090	Repetitive peak reverse surge voltage	V	Max	Numeric	230	Q								
UTD0120	L	XEA0925	XPA0086	Diode application			Character	210	Q	XJA714	XJG290	Diode application			ENUM	2193	Q
UTD0120	L	XEA0925	XPA0082	Storage temperature range	Cel	Min Max	Character	325	Q	XJA714	XJG291	Storage temperature	Cel	Min Max	RealM	2194	L
UTD0120		XEA0925	XPA0087	Dimension	mm		Character	340	Q								
UTD0120		XEA0925	XPA0084	Package type			Character	330	Q								
UTD0120		XEA0925	XPA0085	Packing type			Enum	350	Q								
UTD0120										XJA714	XJJ012	Diode device number			Int	2196	Q
UTD0120										XJA714	XJG302	Rectifier diode application			ENUM	2197	Q
UTD0120										XJA714	XJH434	Peak reverse	V	Max	RealM	2198	Q

Figure 15 – Example of property formats

3.6.2 Utilized property dictionary column

3.6.2.1 General

A utilized property dictionary includes the following columns.

- Objective: to define the property used in the product class based on each standard dictionary depending on the utilized class. SD1 to SD*n* may exist depending on the utilized class, and SD1 is normally based on the local standard dictionary. The property code is described based on the related standard dictionary.

- Defines the commonly used property for each matching standard class based on the matching utilized class.
- Description: prescribes the description method of each column.
- Obligation: prescribes whether the concerned item value is required or optional.
- Formulation: form of expression of an item value to be described.
- Example: Example of item description.

3.6.2.2 UD_Class_Code

- Objective: UD_Class_Code of the product class to which the property belongs.
- Description: Describing according to the Utilized Class Dictionary.
- Obligation: required.
- Formulation: Expression according to the utilized class dictionary.
- Example: UTD0001.

3.6.2.3 UD_MS (mapping status)

- Objective: establishes whether the parts information can be searched based on the property.
- Description: describes whether the property is to be searched or not.
- Obligation: required.
- Formulation: ‘Q’ for the property to be searched and ‘L’ for the property which cannot be searched but can be used for the result list.
- Example: Q.
- Guide: In case of ‘Q’ indicating the property which can be searched, each property from SD1 to SD*n* shall satisfy the following conditions.
  - The matching property shall exist throughout SD1 to SD*n*.
  - The search shall be available in each standard dictionary.
  - Datatype of each property shall be the same. (Datatype consists of numbers and characters. For example: RealM, Real, IntM, Int, etc. are recognized as numbers.)
  - If the property consists of numbers, its unit shall be the same, unless conversion is possible. This means that the prefix is excluded in the comparison of units. (For example: mA, uA->A , kV, V, mV, uV->V).
  - No other problem shall exist in searching each standard dictionary and system.

3.6.2.4 SD1_Property_Code

- Objective: property code based on the standard dictionary of SD1.
- Description: description based on the standard dictionary.
- Obligation: required.
- Formulation: expression based on the standard dictionary.
- Example: XPA0925.

3.6.2.5 SD1_Property_Name

- Objective: property name defined in the standard dictionary.
- Description: description based on the standard dictionary.
- Obligation: required.
- Formulation: expression based on the standard dictionary.
- Example: forward voltage.

3.6.2.6 SD1_Property_Unit

- Objective: unit of the property value defined in the standard dictionary.
- Description: Description based on the standard dictionary.
- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: Expression based on the standard dictionary.
- Example: uF, Mohm.

3.6.2.7 SD1_Property_Level

- Objective: unit of the property level defined in the standard dictionary.
- Description: description based on the standard dictionary.
- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: Expression based on the standard dictionary.
- Example: MinMax, Max, Min, Nor, Typ.

3.6.2.8 SDn_Property_Column

- Objective: property information defined in the standard dictionary of SD2 or SD3 corresponding to SD1 (in case of SD2, the item is defined like SD2_Property_xxxxx).
- Description: description based on the standard dictionary.
- Obligation: required (on condition that it is defined in the standard dictionary).
- Formulation: Expression based on the standard dictionary.

4 Mapping types

4.1 General

Integration of two or more parts libraries is the methodology of generating an integrated parts library enabling to represent all parts-related properties in the individually existing libraries developed based on different schema structures. Integration of parts libraries performed in this method physically generates an integrated parts library, through which parts library information can be integrated between companies or nations. To apply this methodology, the following items are required.

a) Two or more parts libraries.

b) A neutral parts library required for mapping the parts included in individual parts libraries.

NOTE 1 The utilized dictionary can be used as the neutral parts library integrating the parts included in individual parts libraries.

c) Mapping rules required for generating the integrated parts library.

NOTE 2 Mapping rules can be changed depending on the data items in the parts library to be mapped. However, use of such rules can be a significant basis for the subsequent expansion and reutilization of the integrated parts library.

The items are depicted in Figure 16.

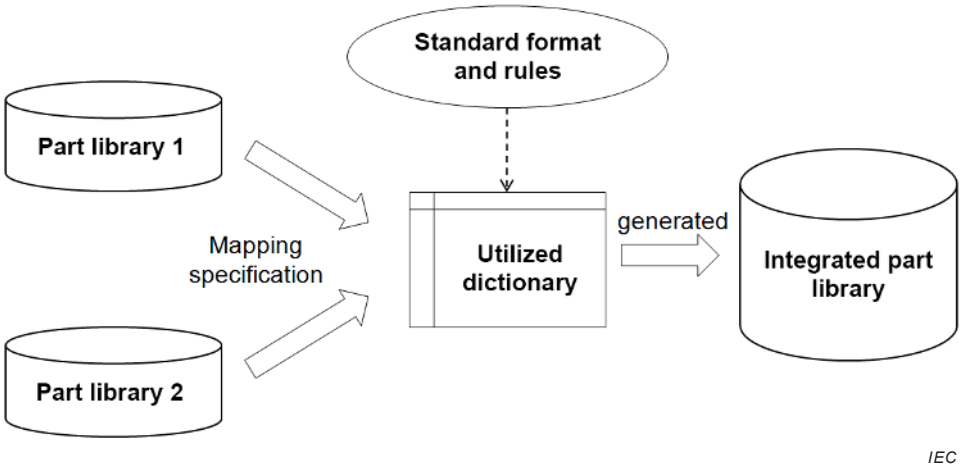


Figure 16 – Example of a case of integration of two parts libraries

To map two or more parts libraries based on the utilized dictionary, it is required to describe the parts library names enabling to identify individual parts libraries in the utilized dictionary. In this case, either the abbreviated English name of the concerned organization is used or the identifiable dictionary name is described for the name of the parts library to be integrated.

The file format of the dictionary shall be an EXCEL or CSV document, and the file name shall describe together the name of the parts libraries to be integrated and their versions as described in the utilized dictionary.

4.2 Identification of mapping types

Standard items to be identified in the utilized dictionary shall be selected for mapping between parts. The items enabling to identify parts in different parts libraries are as follows:

- Source: name and version of the original parts library.
- Class name: name of class in the original parts library.
- Class code: class code of class in the original parts library.
- Parent code: class code enabling to identify the subordinate relationship between classes in the original parts library.
- Property name: name of property included in a class.
- Property code: code for identifying a property.
- Property data type: data type of property value.

NOTE The integration of parts libraries based on the utilized dictionary is just a methodology for mapping between different parts libraries. Specific definitions and management of individual parts libraries to be integrated are according to the rules of each organization managing them, and this matter is beyond the scope of this Technical Report.

Figure 17 shows the mapping table between classes among the examples of a utilized dictionary configuration for mapping a standard dictionary 1 (SD1) and a standard dictionary 2 (SD2).

Utilized dictionary						SD1			SD2		
UD_Class code	UD_Parent code	UD_Leaf class	UD_ level	DISPLAY _NO	UD_Class name	Class code	Parent class	Class name	Class code	Parent class	Class name
UTD0000	$ROOT$	N	L0	1	Utilized dictionary root	SDA000	$ROOT$	Root	SDB001	$ROOT$	Root
UTD0001	UDT0000	N	L1	2	Analog and mixed signal	SDA061	SDA000	Analog and mixed signal			
UTD0002	UDT0001	N	L2	3	Amplifier IC	SDA062	SDA061	Amplifier IC	SDB082	SDB001	Standard linear ICS
UTD0003	UDT0002	Y	L3	4	Instrumentation amplifier IC	SDA066	SDA062	Instrumentation amplifier IC			
UTD0004	UDT0002	Y	L3	5	Isolation amplifier IC	SDA067	SDA062	Isolation amplifier IC			
UTD0005	UDT0002	Y	L3	6	Operational amplifier IC	SDA068	SDA062	Operational amplifier IC	SDB083	SDB082	Operational amplifier

Figure 17 – Example of mapping table between SD1 and SD2

Figure 18 shows the example of mapping the properties of the classes among the examples of a utilized dictionary configuration for mapping standard dictionary 1 and standard dictionary 2.

UD		SD1								SD2							
UD_ Class_ Code	UD_ MS	SD1_ Class_ Code	SD1_ Property_ Code PROP_CD	SD1_ Property_ Name	SD1_ UNIT	SD1_ LVL	SD1_ DATA_ TYPE	SD1_ DISP_ NO	SD1_ MS	SD2_ Class_ Code	SD2_ Property_ CodePRO PCD	SD2_ Property_ Name	SD2_ UNIT	SD2_ LVL	SD2_ DATA_ TYPE	SD2_ DISP_ NO	SD2_ MS
UTD0120	Q	SDA0925	SPA0095	Forward voltage	V	Max	Numeric	280	Q	SDB714	SPB297	Forward voltage	V	Max	RealM	2206	Q
UTD0120	L	SDA0925	SPA0092	Peak, forward surge current	A	Max	Numeric	250	Q	SDB714	SPB435	Non-repeat peak forward surge	A	Max	RealM	2201	L
UTD0120	L	SDA0925	SPA0096	Reverse current	uA	Max	Numeric	290	Q	SDB714	SPB298	Reverse current	A	Max	RealM	2207	L
UTD0120	L	SDA0925	SPA0093	Reverse recovery time	nS	Max	Numeric	300	Q	SDB714	SPB300	Reverse recovery time	S	Max	RealM	2209	L
UTD0120	L	SDA0925	SPA0084	Thermal resistance	Cel/W	Max	Numeric	310	Q	SDB714	SPB299	Thermal resistance	Cel/W	Max	RealM	2208	L
UTD0120	L	SDA0925	SPA0083	Junction temperature	Cel	Min Max	Character	320	Q	SDB714	SPB292	Junction temperature	Cel	Max	RealM	2195	L
UTD0120	Q	SDA0925	SPA0091	Average rectified current	A	Max	Numeric	210	Q	SDB714	SPB304	Average rectified current	A	Max	RealM	2200	Q
UTD0120	Q	SDA0925	SPA0089	Non-repetitive peak reverse surge voltage	V	Max	Numeric	220	Q	SDB714	SPB303	Non-repeat peak reverse surge voltage	V	Max	RealM	2199	Q
UTD0120		SDA0925	SPA0090	Repetitive peak reverse surge voltage	V	Max	Numeric	230	Q								
UTD0120	L	SDA0925	SPA0086	Diode application			Character	210	Q	SDB714	SPB290	Diode application			ENUM	2193	Q
UTD0120	L	SDA0925	SPA0082	Storage temperature range	Cel	Min Max	Character	325	Q	SDB714	SPB291	Storage temperature	Cel	Min Max	RealM	2194	L
UTD0120		SDA0925	SPA0087	Dimension	mm		Character	340	Q								
UTD0120		SDA0925	SPA0084	Package type			Character	330	Q								
UTD0120		SDA0925	SPA0085	Packing type			Enum	350	Q								
UTD0120										SDB714	SPB012	Diode device number			Int	2196	Q
UTD0120										SDB714	SPB302	Rectifier diode application			ENUM	2197	Q
UTD0120										SDB714	SPB434	Peak reverse	V	Max	RealM	2198	Q

Figure 18 – Example of mapping the properties of the classes

In order to link the parts that are integrated and generated in parts libraries, various mapping relationships can be identified, owing to different modelling concepts and environmental factors, as follows.

In the parts libraries to be mapped,

a) parts with the same name and definition exist;
b) the same parts with different names exist;
c) different parts with the same name exist;
d) the same parts with different names, having different structures and constraints, exist;
e) parts based on a complex concept consisting of two or more parts exist.

4.3 Classification of mapping types

The following mapping types exist in the mapping of heterogeneous parts libraries:

a) 1:1 mapping: if two different parts libraries have the same items;
b) 1:N or N:1 mapping: if an item in one parts library is classified in more detail in another parts library;
c) 1:0 or 0:1 mapping: if an item exists only in one parts library.

Figure 19 shows the cases of each mapping type on the utilized dictionary.

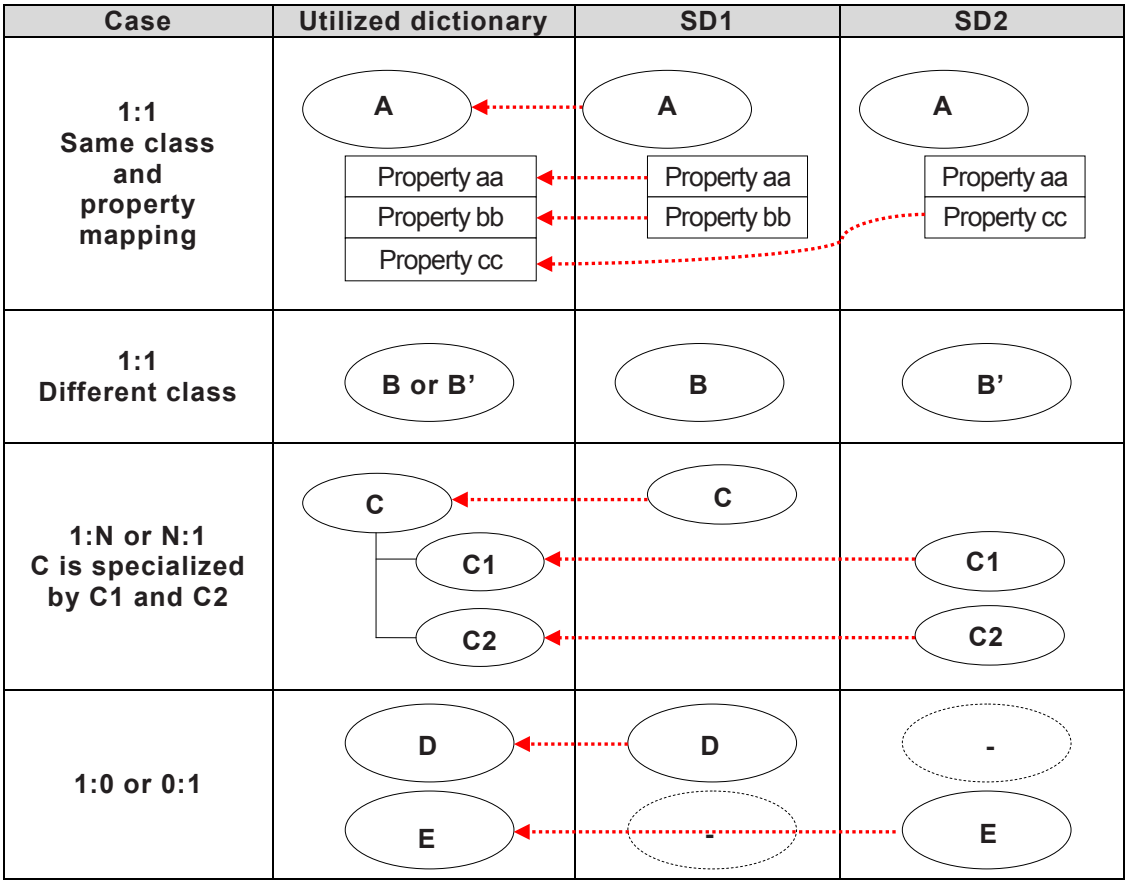


Figure 19 – Example of cases of each mapping type on the utilized dictionary

5 Mapping rules

5.1 General mapping model

In general, tems of parts libraries are mapped according to the following rules.

a) If items of the parts libraries to be mapped are in the unmatched 1:N, N:1 or 1:0, 0:1 mapping relationship, except in the 1:1 mapping (completed) relationship, all of them are included in the utilized dictionary.

b) Mapping between items is performed for the leaf class on which the parts information is based.

The parent class defining the super ordinate information of the leaf class is mapped by the same method of mapping the leaf class.

NOTE 1 In case of 1:1 mapping of leaf class, its parent class becomes the utilized dictionary parent class.

c) The code of the utilized dictionary is given sequentially.

d) A property of the utilized dictionary is mapped so as to ensure that the UD class has all the properties which the class to be mapped has.

NOTE 2 If data types of a property are not same, they can be indicated as Q (Query property) or L (List property) in the mapping status column.

5.2 Mapping rules for mapping types

5.2.1 Mapping rule for the 1:1 type

The mapping rule for the 1:1 type is defined as follows:

a) If the name and meaning of the classes to be mapped are the same, the class is included in the utilized dictionary.

b) If the meaning of the classes to be mapped is the same, either class name can be used as the utilized dictionary class name.

Table 1 shows the case of mapping parts libraries of SD1 and SD2 in which, as the meaning of the classes to be mapped is the same, but their names are different, the two organizations agree to use the SD1 class name as the utilized class name.

Table 1 – Example of a case of a 1:1 mapping type

Utilized dictionary	SD1	SD2
Fiber optic transmitters/receivers	Fiber optic transmitters/receivers	Optoelectronic transmitting device
Fiber optic jumper cords	Fiber optic jumper cords	Optical connector (optical jumper, fiber pigtail, optical adaptor)

5.2.2 Mapping rule for a 1:N, N:1 type

Mapping rule for a 1:N or N:1 type is defined as follows:

a) N number of classes are included in the utilized dictionary so as to map N number of classes for a class.

b) N number of class names are used as the utilized class name.

Table 2 shows the case of mapping parts libraries of SD1 and SD2 in which a class of SD1 is mapped for three subdivided classes of SD2, and the class name of SD2 is used as the utilized class name.

Table 2 – Example of a case of a 1:N, N:1 mapping type

Utilized dictionary	SD1	SD2
Synchronous voltage/frequency and frequency/voltage convertor	Voltage frequency convertor IC	Synchronous voltage/frequency and frequency/voltage convertor
Voltage/frequency or frequency/voltage convertor	Voltage frequency convertor IC	Voltage/frequency or frequency/voltage convertor
Voltage/frequency convertor	Voltage frequency convertor IC	Voltage/frequency convertor

5.2.3 Mapping rule for a 1:0, 0:1 type

Mapping rule for a 1:0 or 0:1 type is defined as follows:

a) The class from the original dictionary where the class appears is included in the utilized dictionary.

b) The class name from the original dictionary in which the class appears is used as the utilized dictionary class name.

Table 3 shows the case of mapping parts libraries of SD1 and SD2 in which, if the class included in the SD1 dictionary does not exist in the SD2 dictionary, the SD1 class is included in the utilized class.

Table 3 – Example of a case of a 1:0 mapping type

Utilized dictionary	SD1	SD2
AGC (automatic volume control) amplifier IC	AGC amplifier IC	
Al/Ni/Co alloy magnet	Al/Ni/Co alloy magnet	
Alumina macromolecule	Alumina macromolecule	
Amorphous alloy magnet	Amorphous alloy magnet	
Analog and mixed signal	Analog and mixed signal	

6 Interfaces and information processing

6.1 Information exchange

The purpose of mapping is to exchange information between two or more parts libraries. That is, it is establishing interoperability. This interoperability refers to communications, information exchange and a series of other processing between the systems constructed under different environments on the basis of the presented rules, specifications, etc. for the exchange of electronic parts library information request and reply messages. A prerequisite is the dictionary mapping for a electronic parts library between two systems by means of

a) prescribing the expression format, etc., enabling to transport electronic parts library data information to users' computer systems,

b) defining the systems enabling accurate execution of communications, information exchange and a series of other processes between homogeneous or heterogeneous electronic parts libraries.

Linkage of two or more parts libraries is the methodology that consists of enabling batch access to different parts libraries by giving standard identifiers that enable to identify parts data existing in individual parts libraries. It is the concept of making two parts libraries exist in their physical aspect, but generating an integrated parts library in their logical aspect. Through the integrated parts library, an integrated service can be provided by linking parts library information between companies and nations. To apply this methodology, the following items are required.

a) Two or more parts libraries and a web service function.

b) A neutral parts library required for mapping the parts included in individual parts libraries.

NOTE 1 The utilized dictionary can be used as the neutral parts library linking the parts included in individual parts libraries.

c) Standard format and mapping rules required for linking individual parts libraries and the neutral parts library.

NOTE 2 Mapping rules can be changed depending on the data items in the parts library to be mapped. However, use of such rules can be a basis required for accurately identifying parts information in system implementation through linkage of parts libraries.

The items are in described in Figure 20.

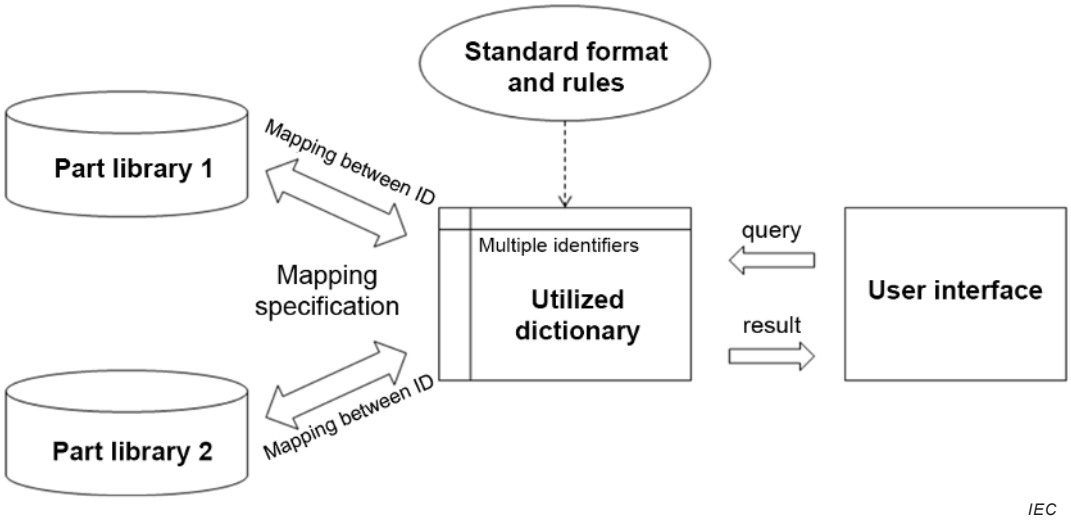


Figure 20 – Example of a case of user interface through a utilized dictionary

6.2 Message types

6.2.1 General

A message for the exchange of parts information is divided into three types as shown in Figure 21. The parts list exchange message searching the parts list information, the detail information exchange message searching the detailed parts information from the parts list information, and the error information message delivering the search error information as summarized in Table 4.

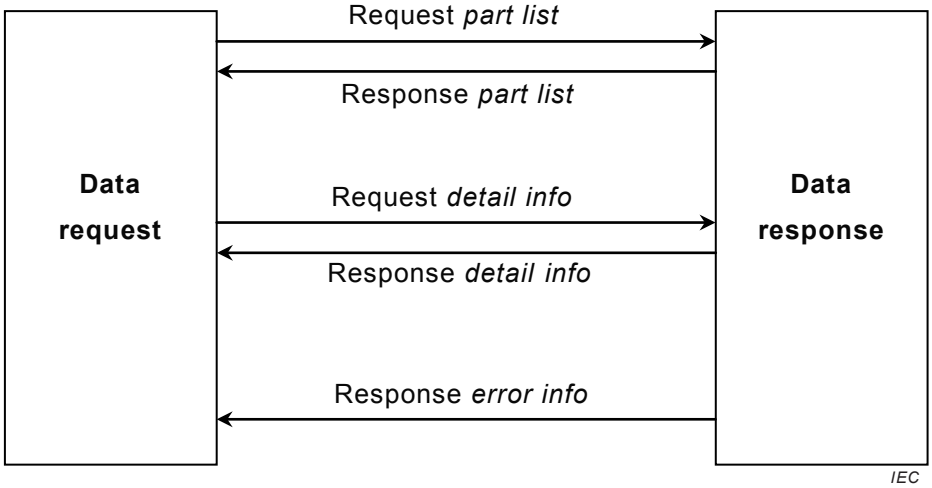


Figure 21 – Example of request and response on information exchange

6.2.2 Message for exchange of parts list information

Parts list information is exchanged using the following messages:

a) Request for parts list information (query request): message requesting the parts list of the search conditions set up by the user's system to the counterpart's system.

b) Response with parts list information searched (query response): response message transferring search results.

6.2.3 Message for detailed parts information exchange

Detailed parts information is exchanged using the following messages.

a) Request for detailed parts information (detail request): message requesting detailed parts information from the parts list searched.

b) Response with detailed parts information searched (detail response): message of response transporting the detailed parts information searched.

6.2.4 Message for indicating an error or a warning state

An error message is emitted when the information exchange cannot be processed normally.

Table 4 – Types of message

Message type		Description
Query	Query request	Requesting parts list information
	Detail request	Requesting detailed parts list information
Response	Query response	Transport of search results in response to request for parts list information
	Detail response	Transport of search results in response to request for detailed parts information
	Error response	Error message occurring in search

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