



# Exchange of component/part lifecycle data in the rail industry Application Standard

Exchange of visibility event data for lifecycle tracking of crucial and safety relevant MRO-objects across manufacturing, maintenance, repair and overhaul processes.

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# 1 Introduction

In December 2016 GS1 published the application standard for the [Identification of Components and Parts in the Rail Industry - Application Standard](#).

This new application standard builds on this foundation and explains how to implement the GS1 EPCIS standard to exchange of component/part lifecycle data in the rail industry.

The scope of this document includes:

- Lifecycle/business events that will require a set of key data elements to be recorded (and shared)
- Roles and responsibilities related to recording and data sharing
- Data structures and definitions
- XML-syntax representations for each message
- Message exchange scenarios

## 1.1 Business intention

GS1 standards can help to make manufacturing & maintenance programmes more effective. By uniquely identifying MRO-objects in a way that is universally recognised, rail stakeholders can develop and share manufacturing & maintenance and usage information, enabling rail equipment operators to consistently fulfil tracking and tracing needs while reducing overall costs.

The harmonisation of the data exchange schemes related to crucial and safety relevant MRO-objects within the rail industry, in both rolling stock and infrastructure, will:

- strongly facilitate tracking and tracing throughout the complete lifecycle of, for instance, an individual object, across companies and borders;
- unify the data exchange process requirements by rail and rail network operators in regards to unit suppliers and manufacturers; and
- thereby allow for new supply chain design possibilities (e.g., stock and supply sharing, pay per use, user specific R&D programmes, etc.).

## 1.2 Interplay with Vehicle Visibility Standard

Basic data that is generated during the passing of a train, or that is created from wayside monitoring equipment with respect to the train or cars as a top instance, is specified in the GS1 EPCIS for Rail Vehicle Visibility application standard.

Data that pertains to specific sub-components is specified in GS1's "Exchange of component/part lifecycle data in the rail industry" (aka "EPCIS for Rail MRO") application standard.

If an infrastructure operator can identify both levels, there should be a preference to send operational data for specific subcomponents also on sub-component level.

## 1.3 Audience

The Manufacturing & MRO processes involve a wide range of stakeholders, each playing a different role in the process. Within each role, there are a large number of companies providing products and services. For example, the supplier network for SBB (Swiss Rail) includes approximately 2,000 MRO component suppliers.

Stakeholders include:

- Rail operators
- Railway network operators
- System manufacturers
- Component suppliers

- System integrators
- Repair and maintenance service providers
- Service/spare parts warehousing service providers

## 2 References

Document	Author / Year
GS1 General Specifications	GS1, 2017
GS1 Tag Data Standard (TDS)	GS1, 2017
Identification of Components and Parts in the Rail Industry – Application Standard	GS1, 2016
EPCIS & CBV Implementation Guideline	GS1, 2017
EPCIS Standard	GS1, 2016
Core Business Vocabulary (CBV)	GS1, 2017
GS1 EPCIS for Rail Vehicle Visibility	GS1, 2015
GS1 in Europe Rail Identification Guideline	GS1 in Europe, 2012
GDSN Package Measurement Rules	GS1, 2017

## 3 Terms and definitions

Please refer to the documents referenced in section 2, particularly the *GS1 General Specifications*, the *Identification of Components and Parts in the Rail Industry* application standard and the *GS1 EPCIS for Rail Vehicle Visibility* application standard.

## 4 EPCIS overview

The decision was made to build on EPCIS as a technical foundation, as EPCIS is an open GS1 and ISO standard that has emerged as an existing, well defined and stable enabler for visibility of supply chain events, with suitable extension mechanisms to integrate rail needs. EPCIS’ architecture also supports centralised and mixed communication modes, as requested. Moreover, EPCIS is already applied in parts of the rail industry through the Rail Vehicle Visibility Standard.

*Note that data ownership and access rights are part of neither the EPCIS standard nor this Rail sector application standard, and need to be regulated individually between data exchange parties using EPCIS access functions.*

Use of this application standard assumes that the decision has already been taken (i.e., by an organisation/consortium or partners to leverage the EPCIS standard. A more general overview, including argumentation supporting the implementation of EPCIS, can be found in the EPCS & CBV Implementation Guideline (referenced in section 2, above).

### 4.1 EPCIS event dimensions

#### 4.1.1 WHAT

The “WHAT” dimension of an EPCIS event specifies the object(s) observed at the focus of a given business process step. In a Rail Rolling Stock MRO & Infrastructure context, these are typically:

- GTIN: The Global Trade Item Number (GTIN) is a class-level GS1 identification key used to identify trade items.



- GTIN + lot number: The Global Trade Item Number + Lot Number (LGTIN) is a class-level GS1 identifier used to identify trade items further qualified by their lot/batch.
- GTIN + serial number: The Serialised Global Trade Item Number (SGTIN) is an instance-level GS1 identifier, corresponding to the combination of GTIN and Serial Number, used to uniquely identify an individual trade item.
- GIAI: The Global Individual Asset Identifier (GIAI) is an instance-level GS1 identification key used to uniquely identify an individual asset.

A Rail MRO EPCIS document SHOULD use these identifiers, expressed as EPC URIs . . .

- SGTIN EPC URI `urn:epc:id:sgtin:CompanyPrefix.ItemRefAndIndicator.SerialNumber`
- GIAI EPC URI `urn:epc:id:giai:CompanyPrefix.IndividualAssetReference`
- LGTIN EPC URI `urn:epc:class:lgtin:CompanyPrefix.ItemRefAndIndicator.Lot`
- EPC Pure Identity Pattern URI (for GTIN) `urn:epc:idpat:sgtin`

. . . for object identifiers, unless there are strong reasons to do so.

Details on the EPC URI syntax and encoding/decoding rules for the aforementioned identifiers are specified in sections 6 and 7 (“EPC URI” and “Correspondence between EPCs and GS1 Keys”) of GS1’s EPC Tag Data Standard (TDS, <https://www.gs1.org/epcrfid-epcis-id-keys/epc-rfid-tds/1-11> ).

 Note that the GTIN check digit is not included in the EPC URI.

#### 4.1.2 WHEN

The “WHEN” dimension of an EPCIS event is expressed as the `eventTime`, specifying the precise date, time, and time zone locally in effect at the point in time of an observation and/or at which a given process step is completed.

The format is of type `xsd:dateTime`, for example:

```
<eventTime>2017-08-16T13:26:00.000+02:00</eventTime>
```

 **Event Time of Commissioning is synonymous with date and time of production**

The `eventTime` of an object’s Commissioning (Object Event/action ADD/business step “Commissioning”/disposition “active”) simultaneously serves as the date and time of that object’s **production**. For this reason, production date is not indicated separately in an EPCIS document.

#### 4.1.3 WHERE

The “WHERE” dimension of an EPCIS event specifies the **read point**, which identifies the location at which an observation and/or process step took place, as well as the **business location**, which identifies the whereabouts of the observed object(s) subsequent to the event in question.

A Rail MRO EPCIS document SHOULD use GLNs expressed as SGLN EPC URIs (`urn:epc:id:sgln:...`) for location identifiers, unless there are strong reasons preventing this.

In case it is not possible to populate the `readPoint` and `businessLocation` fields with SGLN EPC URIs, a Rail Component/Part EPCIS document MAY use:

- a private or industry-wide URN as specified in the CBV;
- a geographic location URI as specified in [RFC5870].

By means of geo-fencing, geo-coordinates can be mapped to SGLNs, which are declared and exchanged in master data shared between trading partners and other stakeholders.

##### 4.1.3.1 Read Point

The read point is the location, identified by Global Location Number (GLN), at which the observation of object(s) and/or process step took place.

For vehicles and pieces of infrastructure along stretches of track, a geographic location URI may be used instead of a GLN.

#### 4.1.3.2 Business Location

The business location, identified by Global Location Number (GLN), specifies the whereabouts of the object(s) immediately subsequent to the event, until this information is superseded by the business location of a later event.

For objects in transit, the business location is unknown and therefore omitted.

#### 4.1.4 WHY

The "WHY" dimension puts the EPCIS event into a specific business context, specifying the process step associated with the observation of the object(s), the disposition of the object(s) subsequent to the event, related business transactions and the source and destination of the object(s).

##### 4.1.4.1 Business Step

The business step identifies what was taking place from a business perspective at the time of the event; that is, what step of a business process was occurring. Examples include "commissioning", "creating\_class\_instance", "inspecting", "packing", "picking", "shipping", "retail\_selling." The GS1 Core Business Vocabulary (CBV) standard specifies a list of cross-sector, standardised business step values; this application standard adds a set of values specific to Rail Component/Part applications.

##### 4.1.4.2 Disposition

The disposition identifies the business condition subsequent to the event of the physical or digital objects named in the WHAT dimension. Example dispositions include "active", "in\_progress", "in\_transit", "expired", "recalled", "retail\_sold" and "stolen." The GS1 CBV includes a list of standard Disposition values; this application standard adds a set of values specific to Rail Component/Part applications.

##### 4.1.4.3 Business transactions

A business transaction list identifies one or more particular business transactions that are relevant to an event. A business transaction is identified by a pair of identifiers: one identifier that says what type of business transaction is referenced, and a second identifier that names the particular business transaction of that type. Examples of business transaction types are purchase order ("po"), bill of lading ("bol"), despatch advice ("desadv"). The GS1 CBV includes a list of standard business transaction type values.

## 4.2 EPCIS event types

EPCIS offers four different event types to record visibility event data: Object event, Aggregation event, Transaction event, Transformation event. Each event type is associated with action values that further qualify the nature of the event.

### 4.2.1 Object event

An object event applies to one or more objects participated in the event in the same way. This is by far the most common event type.

Object event action values are:

- ADD if the event marks the beginning of the life of the object(s). No other events for the same objects should precede this one. This is most often used when the business step is "commissioning."
- DELETE if the event marks the end of the life of the object(s). No other events for the same object(s) should follow this one. This is most often used when the business step is an end-of-life

step such as “decommissioning,” “destroying,” or a business step involving a sale to a consumer (if there is no possibility to track the object post-sale).

- OBSERVE in all other cases.

#### 4.2.2 Aggregation event

An aggregation event involves a physical aggregation involving a “parent” object and one or more “child” objects. An example of an aggregation is an assembly consisting of multiple sub-components. Each child retains its identity even while aggregated to the parent, and the aggregation is reversible (that is, it may be “disaggregated”).

Aggregation event action values are:

- ADD if children are added to the aggregation during the event; e.g., when assembling an assembly comprised of multiple components.
- DELETE if children are removed from the aggregation during the event; e.g., when unpacking items from a case.
- OBSERVE if the parent and children are “seen” in a state of aggregation during the event but no children are added or removed.

#### 4.3 EPCIS document types

EPCIS applies two document types:

1. EPCIS Document: An “EPCIS Document” is an XML file comprising one or more EPCIS events, optionally also including class-level master data (CMD) and party/location master data in the document’s EPCIS header.
2. EPCIS Master Data Document: An “EPCIS Master Data Document” is an XML file comprising only master data and no EPCIS events.

In this application standard the EPCIS Master Data Document is used for transmission of class-level master data at the time of design freeze, prior to production.

## 5 Visibility events for rail manufacturing and MRO

### 5.1 Mapping of rail business processes to visibility events

For each business process step, the corresponding visibility event is listed below.

Additional data appearing in EPCIS documents has been indicated in the last column as follows:

#### Master data

**CMD** = **class-level** (GTIN) master data, specified in **EPCIS Document Header**

**ILMD** = **instance/lot** master data (LGTIN, SGTIN or GIAI), specified in **ILMD extension of EPCIS event**

#### Rail-specific extensions to EPCIS events

**Updated configuration data** (UCD), updates to CMD and ILMD for a specific instance/lot at time of repair/refurbishment

**Runtime/condition data** (RCD) at instance level (SGTIN or GIAI)

**Relative position of child** (CRP), per values specified in **EN 15380**

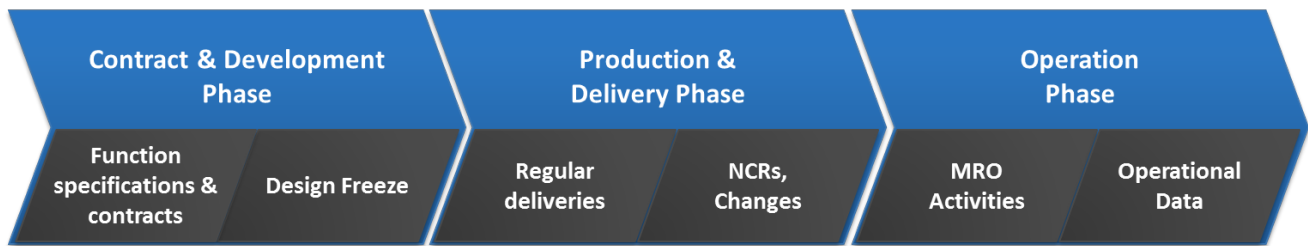
**Leading part** (LP) of an assembly

**Inspection report** (IR)

**Planned replacement** (PR)

## 5.2 Rolling stock visibility events

**Figure 5-1** Data exchanges during lifecycle of rolling stock



**Table 5-1** Rolling stock visibility events

ROLLING STOCK	event ID	EPCIS event type	action	business step	disposition	MD / ext
<b>Design freeze</b>						
Communication of item and location master data in advance of events.	EPCIS Master Data Document					
<b>Regular delivery</b>						
Production <sup>1</sup>	V1	ObjectEvent	ADD	commissioning	active	ILMD
Commissioning of individual asset <sup>2</sup>	V2	ObjectEvent	ADD	commissioning	active	ILMD
Assembly/composition  <i>...with Leading Part information, where applicable</i>	V3 – V4  <i>iterative as required</i>  V18-20	AggregationEvent	ADD	assembling <sup>3</sup>	active	LP CRP  with LP
<i>Packing/staging of shipment</i>	V5	AggregationEvent	ADD	staging_outbound OR packing	in_progress	
Delivery	V6	ObjectEvent	OBSERVE	shipping	in_transit	
<i>Transport</i>	V7  <i>optional; iterative as required</i>	ObjectEvent	OBSERVE	transporting	in_transit	
Receiving	V8	ObjectEvent	OBSERVE	receiving	in_progress	
<i>Unpacking/staging inbound</i>	V9	AggregationEvent	DELETE	unpacking	in_progress	
<i>Storing</i>	V10	ObjectEvent	OBSERVE	storing	<b>rail:available</b>	

<sup>1</sup> Please refer to section [4.1.2](#), which explains the correlation between the Event Time of Commissioning and the date/time of production.

<sup>2</sup> Individual asset is linked to class-level GTIN at time of asset commissioning, in order to also link the asset to class-level master data, which can be expressed in the EPCIS Header

<sup>3</sup> For the sake of simplicity, implementations SHALL use business steps “assembling” and “disassembling” (instead of “installing” and “removing”, respectively) for all MRO processes involving components being taken out of and/or added to an assembly comprised of multiple parts.

ROLLING STOCK	event ID	EPCIS event type	action	business step	disposition	MD / ext
<b>Modifications during initial delivery</b>						
Inspection for damage/quality check of function	V11	ObjectEvent	OBSERVE	inspecting	<b>rail:non_conformant<sup>4</sup></b> <b>rail:available<sup>5</sup></b> (1)	IR
Repair/Upgrade succeeded	V12	ObjectEvent	OBSERVE	repairing	<b>rail:available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail:non_conformant</b>	IR
<b>Maintenance and repair</b>						
Inspection for damage/quality check of function	V11	ObjectEvent	OBSERVE	inspecting	<b>rail:non_conformant</b> <b>rail:available</b>	IR
Repair/Upgrade succeeded	V12	ObjectEvent	OBSERVE	repairing <sup>6</sup>	<b>rail:available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail:non_conformant</b>	IR
Removal of component(s) from assembly	V14, V15	AggregationEvent	DELETE	disassembling	inactive	
Returned because the wrong part was delivered	V6 <sup>7</sup>	ObjectEvent	OBSERVE	shipping	in_transit	
Scrapped	V18	ObjectEvent	DELETE	destroying	destroyed	
Replace part with another of same type: <b>return logistics<sup>8</sup> (i.e., from customer /operator back to supplier) of part to be replaced</b>	V15, V16 followed by V3 through V10	ObjectEvent	OBSERVE	shipping	in_transit	
Replace part with another part of a different class: <b>class design change, new production and forward logistics of replacement part, iterative as required</b>	<b>md1..n</b> <b>and</b> <b>V2-V10</b>	(see V1-V9, as applicable)	(see V1-V9, as applicable)	(see V1-V9, as applicable)	(see V1-V9, as applicable)	CMD ILMD UCD CRP LP
<b>Operation</b>						
Collection of operational data	V17	ObjectEvent	OBSERVE		in_progress	RCD

<sup>4</sup> For example, "based on the CIT/COTIF/UIC General Contract of Use for Wagons (GCU) - Appendix 9"

<sup>5</sup> For example, "Based on ECM 445/2011, release to service"

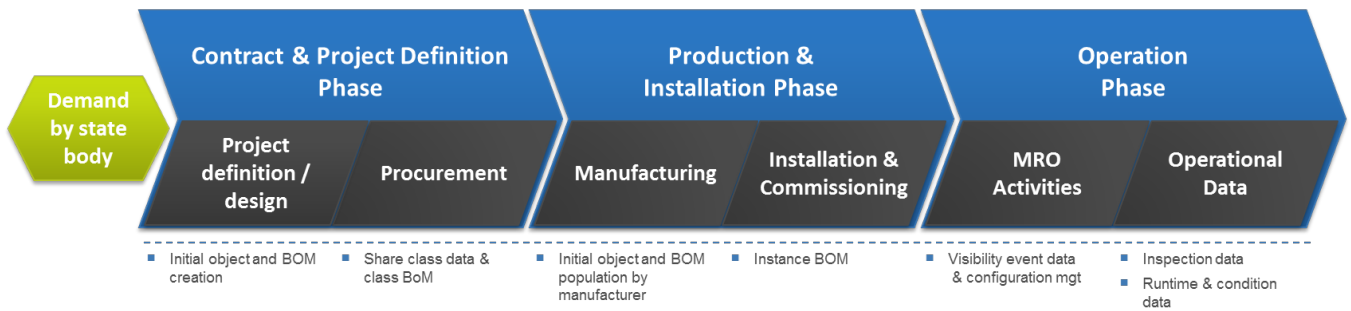
<sup>6</sup> "Repairing" does not necessarily imply that the object was previously damaged and has now been repaired. For example, an NCR has been opened, but no malfunction can be determined, and the repairing event can be simply used to set the object status back to available without physical repair. The circumstances should be noted in the IR reportDescription.

<sup>7</sup> Note that V5 (initially shipping DOWNSTREAM from supplier to customer/operator) is reiterated- leveraging the modular character of these visibility event building blocks - at this juncture to illustrate a RETURN LOGISTICS process of shipping back UPSTREAM from customer/operator back to the supplier.

<sup>8</sup> RMA (return merchandise authorization) can optionally be referenced by means of a business transaction reference, with corresponding BTT type "rma".

### 5.3 Infrastructure visibility events

**Figure 5-2** Data exchanges during infrastructure projects



**Table 5-2** Infrastructure visibility events

INFRASTRUCTURE	event ID	event type	action	business step	disposition	MD / ext
<b>New infrastructure creation</b>						
<b>Project definition</b>	MD	EPCIS Master Data Document				
Production	V1	ObjectEvent	ADD	commissioning	Active	ILM D
Assembly/composition	V3 – V4 <i>iterative as required</i>	AggregationEvent	ADD	assembling	Active	LP CRP
<i>Packing/staging of shipment</i>	V5	AggregationEvent	ADD	staging_outbound OR packing	in_progress	
Delivery	V6	ObjectEvent	OBSERVE	shipping	in_transit	
<i>Transport</i>	V7	ObjectEvent	OBSERVE	transporting	in_transit	
Receiving	V8	ObjectEvent	OBSERVE	receiving	in_progress	
Installation of infrastructure	V16	AggregationEvent OR ObjectEvent	ADD  OBSERVE	assembling	active	LP CRP UCD
<b>Planned large-scale maintenance of installed infrastructure</b>						
Repair/Upgrade succeeded	V13	ObjectEvent	OBSERVE	repairing	<b>rail: available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail: non_conformant</b>	IR
Scrapped	V18	ObjectEvent	DELETE	destroying	destroyed	
<b>Planned small-scale maintenance of installed infrastructure</b>						

INFRASTRUCTURE	event ID	event type	action	business step	disposition	MD / ext
Repair/Upgrade succeeded	V13	ObjectEvent	OBSERVE	repairing	<b>rail: available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail: non_conformant</b>	IR
Scrapped	V18	ObjectEvent	DELETE	destroying	destroyed	
<b>Ad hoc corrective breakdown maintenance</b>						
Inspection for damage/quality check of function	V11	ObjectEvent	OBSERVE	inspecting	<b>rail: non_conformant</b>	IR
Repair/Upgrade succeeded	V13	ObjectEvent	OBSERVE	repairing	<b>rail: available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail: non_conformant</b>	IR
<b>Infrastructure MRO object repair and refurbishment</b>						
Repair/Upgrade succeeded	V13	ObjectEvent	OBSERVE	repairing	<b>rail: available</b>	UCD
Repair failed	V13	ObjectEvent	OBSERVE	repairing	<b>rail: non_conformant</b>	IR
<b>Infrastructure inspection/ operation</b>						
Inspection for damage/quality check of function	V11	ObjectEvent	OBSERVE	inspecting	<b>rail: non_conformant</b>	IR
Earmarking of components that are up for replacement	V23, V24	ObjectEvent	OBSERVE	<b>rail: replacement_planning</b>	(none)	PR

## 6 Master data

### 6.1 Namespace

The name of every master data attribute **defined in the CBV** consists of the following namespace identifier:

`urn:epcglobal:cbv:mda`

The name of every master data attribute **defined in this Rail MRO application standard** consists of the following namespace identifier:

`https://gs1.org/cbv/rail`

### 6.2 Trade item master data

This section specifies master data attributes that may be used to describe a trade item identifier that appears in the “what” dimension of an EPCIS event.

In the context of this application standard, the term “trade item” refers to all MRO objects, including items from manufacturers.

**Table 6-1** What kind of master data are allowed where in an EPCIS Document?

for master data at...	...specify master data in an <b>EPCIS Master Data Document</b> or the header of an <b>EPCIS Document</b>	...specify production-time master data in <b>ILMD</b> (Instance/Lot Master Data) section of an <b>EPCIS Event</b>	...specify updated master data in <b>UCD</b> (Updated Configuration Data) section of an <b>EPCIS Event</b>
<b>Class-level</b> e.g., GTIN <i>...for BoM and catalogue alignment of classes/types of items assigned and orderable by a common part number</i>	✓		
<b>Lot-level</b> e.g., GTIN + Lot (LGTIN) <i>...for traceability of groupings of items assigned a common lot number at production</i>		✓	✓
<b>Instance-level</b> e.g., GTIN + Serial Number (SGTIN) <i>...for traceability of an individual instance of an item assigned a unique serial number at production</i>		✓	✓

#### 6.2.1 Class-level master data

Class-level master data is specified in the header of an EPCIS Document or in an EPCIS Master Data Document (see section [4.3](#)).

The GTIN is specified using the EPC Pure Identity Pattern URI. In this application standard for class-level master data always the `urn:epc:idpat:sgtin` pattern starting with SHALL be used, also for non-serialised trade items. For example, EPC Pure Identity Pattern URI `urn:epc:idpat:sgtin:1234567.012345.*` matches any SGTIN URI that begins with that pattern, e.g., SGTIN URI `urn:epc:idpat:sgtin:1234567.012345.400`.

A class-level master data (**CMD**) attribute is specified as a **name/value pair**.

The name of every trade item master data attribute consists of **the following three concatenated segments**:



1. the namespace identifier
2. a hash sign (#)
3. a local name

#### Example 6-1 EPCIS Master Data in EPCIS Document header

Here is how the attribute **tradeItemDescription** would appear in the **EPCIS Document header** for class-level master data for all objects of type GTIN 01234567123455:

```
<EPCISHeader>
. . .
<extension>
<EPCISMasterData>
<VocabularyList>
  <Vocabulary type="urn:epcglobal:epcis:vtype:EPCClass">
    <VocabularyElementList>
      <VocabularyElement id="urn:epc:idpat:sgtin:1234567.012345.*">
        <attribute id="https://gs1.org/cbv/rail#tradeItemDescription">
          <description language="EN">Brake disc</description>
        </attribute>
      </VocabularyElement>
    </VocabularyElementList>
  </Vocabulary>
</VocabularyList>
</EPCISMasterData>
</extension>
</EPCISHeader>
```

#### Notes:

- The GTIN pattern is included as `id` attribute of the `VocabularyElement`.
- The master data attributes are included as `<attribute>` elements within the `VocabularyElement`.



#### Rail-specific enhancement for class-level master data

Class-level master data related to a GTIN may undergo changes over time. This can lead to multiple sets of class-level master data for the same GTIN. In order to distinguish these sets, the functional status and revision status SHALL be expressed as attributes of the `VocabularyElement`.

The following `attributeNames` shall be used for this purpose:

- `rail:functionalStatus`
- `rail:revisionStatus`

#### Example 6-2 Representation of functional status and revision status as EPCIS Master Data.

```
<EPCISHeader>
. . .
<extension>
<EPCISMasterData>
  <VocabularyList>
    <Vocabulary type="urn:epcglobal:epcis:vtype:EPCClass">
      <VocabularyElementList>
        <VocabularyElement id="urn:epc:idpat:sgtin:1234567.012345.*"
rail:functionalStatus="1" rail:revisionStatus="1">
          <attribute
id="https://gs1.org/cbv/rail#tradeItemDescription"><description
language="en">original bogie</description></attribute>
        </VocabularyElement>
        <VocabularyElement id="urn:epc:idpat:sgtin:1234567.012345.*"
rail:functionalStatus="1" rail:revisionStatus="3">
          <attribute id="https://gs1.org/cbv/rail#tradeItemDescription"><description
language="en">newer bogie</description></attribute>
```

```

    </VocabularyElement>
  </VocabularyElementList>
</Vocabulary>
</VocabularyList>
</EPCISMasterData>
</extension>
</EPCISHeader>

```

### 6.2.2 Instance/lot level master data

Instance/lot level master data is specified in the ILMD section of an EPCIS event. An instance/lot master data attribute is specified as an XML element.

The element name is an XML QName whose namespace is the same namespace identifier specified above and whose local name is the local name as specified in table 6-2.

#### Example 6-3 ILMD

Here is how the attribute `revisionStatus` (here with applicability to lot L123), would appear in the ILMD section of an event:

```

<epcis:EPCISDocument
xmlns:cbvmda="urn:epcglobal:cbv:mda"
xmlns:rail="https://gs1.org/cbv/rail" ...>
  ...
  <ObjectEvent>
    ...
    <QuantityElement>
      <epcClass>urn:epc:class:lgTin:1234567.012345.L123</epcClass>
    </QuantityElement>
    ...
    <ilmd>
      <cbvmda:netWeight measurementUnitCode="KGM">3.5</cbvmda:netWeight>
      <rail:revisionStatus>1</rail:revisionStatus>
    </ilmd>
    ...
  </ObjectEvent>
  ...
</epcis:EPCISDocument>

```

### 6.2.3 Trade item master data attributes

Master data appearing in EPCIS documents has been indicated in the "level" column as follows:

- **CMD** = **class-level** (GTIN) master data
- **ILMD** = **instance/lot** master data (LGTIN, SGTIN or GIAI)

The following rules apply to the attributes listed in table 6-1:

- Class-level master data (**CMD**) attributes SHALL be specified in the header of an **EPCIS Document** or in an **EPCIS Master Data Document**.
- Multiple versions of class-level master data (**CMD**) MAY be specified for the same GTIN. In that case the function status and/or revision status SHALL be included (see section [6.2.1](#)).
- Instance/lot-level (ILMD) master data attributes SHALL be specified in the ILMD section of an EPCIS event.
- Attributes marked as CMD and ILMD MAY be used in the header an **EPCIS Document header** and in an **EPCIS Master Data Document** as well as in the ILMD section of an EPCIS event.
- All listed attributes may be updated (e.g., following refurbishment). In that case the updated values SHALL be included in a Rail-specific extension for **updated configuration data (UCD)**, see section [7.2](#).

**Table 6-2** Trade item master data attributes

Local name	Name space	Type	Description	Level
additionalTradeItemID		Additional TradeItemID	A trade item identifier that is in addition to the GTIN. Example: 12345111111 (BUYER_ASSIGNED) See section <a href="#">8.1.2</a> for a detailed description of the structure of this element.	CMD ILMD
functionalStatus	rail	string (1–20 chars)	The functional status of the trade item may need to be included by the manufacturer to meet regulatory or commercial requirements. For example requirements related to the type approval, allowing the trade item to be sold in a particular country. Example: 2	CMD (see 6.2.1) ILMD
revisionStatus	rail	string (1–20 chars)	The revision status of the trade item may need to be included by the manufacturer to meet regulatory or commercial requirements. For example, requirements related to the type approval, allowing the trade item to be sold in a particular country. Example: 2017-2	CMD (see 6.2.1) ILMD
manufacturer	rail	PartyInformation	Extended information about the manufacturer of the item. Example: Manufacturer X, UK See section <a href="#">8.2.4</a> for a detailed description of the structure of this element.	CMD ILMD
supplier	rail	PartyInformation	Extended information about the supplier of the item. Example: Supplier Y, NL See section <a href="#">8.2.4</a> for a detailed description of the structure of this element.	CMD ILMD
endOfLifeDate	rail	date	Date on which production will be discontinued. Example: 2020-12-31	CMD
endOfServiceForRepairDate	rail	date	Date on which support/repair service will be discontinued. Example: 2025-12-31	CMD
countryOfOriginList	rail	CountryOfOriginList	The country where an item comes from according to the applicable rules of origin. See section <a href="#">8.2.2</a> for a detailed description of the structure of this element. Example: NL rules: FR UK rules: BE	CMD ILMD
documentList	rail	DocumentList	Document related to the design or production of the item. E.g., test protocols, quality certificates, ... Example: ID: 2017-MM-01234 Title: Maintenance manual Keywords: wheelset URL: www.example.com/manual.pdf See section <a href="#">8.2.3</a> for a detailed description of the structure of this element.	CMD ILMD

Local name	Name space	Type	Description	Level
childItemList	rail	ChildItemList	<p>A list of the direct children of the item. Can be used to express or exchange the generic product structure.</p> <p>Example: gtin: 1234567890124 quantity: 3</p> <p>See section <a href="#">8.2.1</a> for a detailed description of the structure of this element.</p>	CMD
tradeItemName	rail	Description (1..40 chars)	<p>A free form short length description of the item that can be used to identify the item when ordering.</p> <p>Example: Acme Red Wheelset</p> <p>See section <a href="#">8.1.3</a> for a detailed description of the structure of this element.</p>	CMD
tradeItemDescription	cbv <i>(update to next cbv revision in 2018, tbd)</i>	Description (1..200 chars)	<p>An understandable and useable description of a trade item using brand and other descriptors. This attribute is filled with as little abbreviation as possible while keeping to a reasonable length.</p> <p>This should be a meaningful description of the trade item with full spelling to facilitate message processing. Retailers can use this description as the base to fully understand the <b>characteristics</b> of the specific GTIN in order to accurately create a product description as needed for their internal systems.</p> <p>Example: Acme Red Wheelset, model A123, year 2015</p> <p>See section <a href="#">8.1.3</a> for a detailed description of the structure of this element.</p>	CMD
objectShortestSide	rail	Measurement	<p>Measurement of the shortest side of the item excluding packaging.</p> <p>Example: 45 CMT</p> <p>See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.</p>	CMD ILMD
objectLongestSide	rail	Measurement	<p>Measurement of the longest side of the item excluding packaging.</p> <p>Example: 250 CMT</p> <p>See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.</p>	CMD ILMD
objectSecondLongestSide	rail	Measurement	<p>Measurement of the second longest side of the item excluding packaging.</p> <p>Example: 100 CMT</p> <p>See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.</p>	CMD ILMD
primaryPackagingWidth	rail	Measurement	<p>The width of the trade item, as measured according to the GDSN Package Measurement Rules for non-consumer trade items.</p> <p>Example: 280 CMT</p> <p>See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.</p>	CMD ILMD

Local name	Name space	Type	Description	Level
primaryPackaging Depth	rail	Measurement	The depth of the trade item, as measured according to the GDSN Package Measurement Rules for non-consumer trade items. Example: 120 CMT See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
primaryPackaging Height	rail	Measurement	The height of the trade item, as measured according to the GDSN Package Measurement Rules for non-consumer trade items. Example: 50 CMT See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
netWeight	cbv:mda	Measurement	Used to identify the net weight of the item. Net weight excludes any packaging materials. Must be qualified by a valid UOM. Example: 200 KGM See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
grossWeight	cbv:mda	Measurement	Used to identify the gross weight of the item. The gross weight includes all packaging materials of the item. Must be qualified by a valid UOM. Example: 210 KGM See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
itemExpirationDate	cbv:mda	date	The date after which the product should not be used. Its meaning is determined based on the trade item context (e.g., in the rail sector, the date will indicate the possibility of a malfunction resulting from the ineffectiveness of the product after the date, for example for rubber pads or dangerous goods). It is often referred to as "use by date" or "maximum durability date." Example: 2017-03-15	ILMD
bestBeforeDate	cbv:mda	date	The date before which the product is best used to ensure the effectiveness of the product. Example: 2017-03-15	ILMD
meanTimeToFailure	rail	Measurement	per EN 50126 Applicable to <u>non-repairable</u> parts. Indicates duration of operation (in hours or years) until failure is expected to appear. Example: 5 ANN See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
meanTimeBetween Failure	rail	Measurement	per EN 50126 Applicable to <u>repairable</u> parts. Indicates duration of operation (in hours or years) until failure is expected to appear. Example: 2 ANN See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD

Local name	Name space	Type	Description	Level
itemNextReconditioningDate	rail	date	Recommended reconditioning actions should be initialized before this date to ensure full functionality until the bestBeforeDate. E.g., a discharge-charge cycle for batteries or providing power to electronic devices. Example: 2017-03-15	ILMD
lifespanExtensionAfterReconditioning	rail	Measurement	Time span by which the itemNextReconditioningDate will be extended, if recommended reconditioning actions are undertaken. Example: 200 DAY See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	ILMD
warrantyDuration	rail	Measurement	Duration of the warranty as agreed between supplier and customer at the time of delivery. Since the start of the warranty period can vary for different contracts, a measurement is used rather than an end date. Example: 3 ANN See section <a href="#">8.1.4</a> for a detailed description of the structure of this element.	CMD ILMD
productClassificationCode	rail	External StandardValue	Code specifying the product category of the item according to a standard classification system. Example: 10005961 (GPC) See appendix B.1 for a code list with all supported classification standards. See section <a href="#">8.3.2</a> for a detailed description of the structure of this element.	CMD ILMD
weldingClass	rail	External StandardValue	Value that specifies the welding class according to an externally maintained standard. Example: D (EN287-1) See section <a href="#">8.3.2</a> for a detailed description of the structure of this element.	CMD ILMD
manufacturerDefinedMaintenanceCode	rail	Code	Code that specifies the recommended maintenance strategy as defined by the manufacturer. Allowed values: <ul style="list-style-type: none"> <li>▪ REPAIRABLE: A type of MRO-object that can be re-fabricated and does not follow a usage based maintenance strategy and does not need to have an individual track record. )</li> <li>▪ CONSUMABLE: A type of MRO-object that is not re-fabricated and that is discarded after replacement.</li> <li>▪ ROTABLE: A type of MRO-object that can be re-fabricated, follows a usage based maintenance strategy and needs to have an individual track record.</li> </ul> Example: ROTABLE	CMD ILMD

Local name	Name space	Type	Description	Level
operatorDefinedMaintenanceCode	rail	Code	Code that specifies the actually applied maintenance strategy as defined by the operator, it can differ from the manufacturer assigned code (but uses the same codelist). For allowed values, see manufacturerDefinedMaintenanceCode Example: ROTABLE	CMD ILMD
refurbishmentLot	rail	String (1–20 chars)	Together with the GTIN of the trade item and the GLN of the production or service location, the refurbishment lot ID identifies a batch of items that were remanufactured to the original specifications using a combination of reused, repaired and new parts. It is an alphanumeric, variable length string of up to 20 characters. Example: rf-21394-aa	ILMD
rawMaterialCode	rail	externalStandard Value	Code that specifies the type of raw material used in the item. Example: Inox 1.4539 See section 8.3.2 for a detailed description of the structure of this element.	ILMD
softwareChecksum	rail	externalStandard Value	Checksum is used to verify downloaded software. Example: 098f6bcd4621d373cade4e832627b4f6 (MD5) Note: Software is treated as separate MRO-object.	ILMD



**Note:** This list of trade item master data attributes should not be considered exhaustive or static, and may grow over time. A GSMP work request (WR) should be submitted to request the addition of attributes specified neither in this table nor in externally maintained standards.

### 6.3 Location and party master data

This section specifies master data attributes that may be used to describe a location identifier. The following general rules apply:

- Location master data attributes may be used to describe a location identifier; this identifier SHOULD be a Global Location Number (GLN), expressed in EPC URI format as an SGLN, whether the location identifier is used as a EPCIS Read Point, Business Location, Source, or Destination.
- A Rail Component/Part EPCIS document MAY include any of the master data attributes specified in this section **within the master data section of the EPCIS Document header**, subject to the constraints specified elsewhere in this section.
- The master attributes specified in this section may also be used in an EPCIS Master Data Document or in the response to an EPCIS Master Data Query.
- A Rail Component/Part EPCIS document SHALL NOT include any of the master data attributes specified in this section in the ILMD section of an EPCIS event.

#### 6.3.1 Location and party master data attributes

Party location master data is specified in the header of an EPCIS Document or in an EPCIS Master Data Document (see section 4.3).

The name of every location/party master data attribute defined in this section consists of the master data **namespace identifier** specified above, followed by a **hash sign (#)** character, followed by a **local name** as specified in table 6-3.

If a master data attribute indicates “**location**” in the usage column of the table, the Rail Component/Part EPCIS document MAY use that attribute to describe an identifier that appears in any of the following fields in an EPCIS event:

- Read point
- Business location

**Table 6-3** Location and party master data attributes

Local Name	namespace	Type	Description	Usage
name	cbv:mda	string	The name of the location or party expressed in text. Example: GS1	Location or Party
streetAddressOne	cbv:mda	string	The first free form line of an address. This first part is printed on paper as the first line below the name. For example, the name of the street and the number in the street or the name of a building. Example: Blue Tower, Avenue Louise 326, bte 10	Location or Party
streetAddressTwo	cbv:mda	string	The second free form line of an address. This second part is printed on paper as the second line below the name. The second free form line complements the first free form line to locate the party or location. Example: BE 1050, Brussels	Location or Party
streetAddressThree	cbv:mda	string	The third free form line of an address. This third part is printed on paper as the third line below the name. The third free form line complements the first and second free form lines where necessary. Example: Belgium	Location or Party
city	cbv:mda	string	Text specifying the name of the city. Example: BRUSSELS	Location or Party
postalCode	cbv:mda	string	Text specifying the postal code for an address. Example: BE 1050	Location or Party
countryCode	cbv:mda	string	The ISO 3166-1 alpha-2 code specifying the country for the address. Example: BE	Location or Party
latitude	cbv:mda	decimal	Latitude of the location, in degrees. Positive numbers are northern latitude; negative numbers are southern latitude. Example: 25.774	Location
longitude	cbv:mda	decimal	Longitude of the location, in degrees. Positive numbers are eastern longitude; negative numbers are western longitude. Example: 80.190	Location
radius	rail	decimal	Uncertainty radius, in metres. Example: 30	Location



### 6.3.2 Geofence polygons (GFP extension)

Instead of the CBV-specified geo URI and optional radius, Rail MRO applications MAY include geofence polygons in the context of location master data in the EPCIS Header.

Such polygons SHALL consist of three or more geocoordinates, each formatted as a geoURI, in an ordered list, such that the perimeter of the specified geofence begins with the first coordinate and passes through each of the subsequent coordinates, in order.

The naming convention for the attributes corresponding to the coordinates is as follows:

```
<attribute id="https://gs1.org/cbv/rail#geofencePolygon">
  <polygonPoint seq="1">geo:latitude,longitude</polygonPoint>
  <polygonPoint seq="2">geo:latitude,longitude</polygonPoint>
  <polygonPoint seq="3">geo:latitude,longitude</polygonPoint>
</attribute>
```

...where each successive coordinate shall be indicated by successive, ordinal numbers.

#### Example 6-4 Geofence polygon encoding (corresponding to the Bermuda Triangle)

```
<VocabularyElement id="urn:epc:id:sgln:6666666666.666.0">
  <attribute id="urn:epcglobal:cbv:mda#name">Six Six Six Sigma Offshore Ltd
  </attribute>
  <attribute id="https://gs1.org/cbv/rail#geofencePolygon">
    <polygonPoint seq="1">geo:25.774,-80.190</polygonPoint>
    <polygonPoint seq="2">geo:18.466,-66.118</polygonPoint>
    <polygonPoint seq="3">geo:32.321,-64.757</polygonPoint>
  </attribute>
</VocabularyElement>
```

#### Example 6-5 Geofence polygon (Bermuda Triangle) rendering in Google Maps



## 6.4 Standardised external (non-GS1) master data

If an external standard is xml-based and the issuing organisation has a valid namespace, that standard can be used as-is in EPCIS, referencing the valid namespace(s) and using the external xml structure.

If an external standard is NOT xml-based, the required elements may be supported in this application standard as master data attributes of the type "ExternalStandardValue". Requests for new additions will always need to be approved through the GS1 Global Standards Management Process (GSMP).

For more details, see section [8.2.5](#).

## 7 Rail-specific EPCIS event extensions

### 7.1 Introduction

Rail-specific EPCIS event extensions are specified using the user/vendor extension mechanism of the EPCIS standard.

An extension data element can contain any well-formed XML content, including sub-elements and attributes.

Each Rail-specific extension is assigned the following namespace identifier:

**`https://gs1.org/cbv/rail`**

The use of this Rail-specific XML namespace not only distinguishes Rail-specific extensions from standard EPCIS data elements, but also ensures that Rail-specific extensions will not be confused with extensions of other sectors and organisations that may use the same element names.

The namespace should be declared, along with the EPCIS standard namespace(s), in the beginning of the EPCIS header, as follows:

```
<epcis:EPCISDocument
  xmlns:epcis="urn:epcglobal:epcis:xsd:1"
  xmlns:rail="https://gs1.org/cbv/rail">

  <EPCISBody>
    <EventList>
      . . .
    </EventList>
  </EPCISBody>
</epcis:EPCISDocument>
```

The following general rules should be observed in using EPCIS event extensions:

- While an extension data element can contain any well-formed XML content, the EPCIS SimpleEventQuery is only capable of querying extension elements whose values are numbers or strings.
- The XML element `<extension>` defined in the EPCIS XML schema should never be used to carry user or vendor extensions. The `<extension>` element is reserved for use by the EPCIS standard itself, to introduce new data elements in later versions of the EPCIS standard.

For more details on EPCIS user/vendor extension elements, please see section 5.8 (“User/Vendor Extension elements”) of GS1’s *EPCIS and CBV Implementation Guideline*, which is published at [https://www.gs1.org/docs/epc/EPCIS\\_Guideline.pdf](https://www.gs1.org/docs/epc/EPCIS_Guideline.pdf).

### 7.2 Updated Configuration Data (UCD)

Master data, as described above, is applied to an object in a Commissioning event at the time of production (“delivery” ILMD), and/or in pre-production planned configuration data (BOM CMD), and remains valid for its entire life cycle.

By contrast, updates to configuration that are generated for instance/lot (LGTIN, SGTIN or GIAI) following **repair/refurbishment** of an assembly/vehicle/infrastructure – potentially superseding original CMD & ILMD values – are not considered master data, but instead SHALL be reflected in a Rail-specific extension for Updated Configuration Data (UCD).

All trade item master data attributes listed in section 6.2.3 can be used as elements in the UCD extension. The attributes SHALL be placed within an XML element `rail:UpdatedConfigurationData`.

### Example 7-1 Updated Configuration Data (UCD)

Here is how an assembly's updated `revisionStatus` , would be reflected in an `ObjectEvent` to depict the assembly's repair:

```
<epcis:EPCISDocument xmlns:rail="https://gs1.org/cbv/rail" ...>
  ...
  <ObjectEvent>
    ...
    <epcList>
      <epc>urn:epc:id:giai:1234567.7911bg</epc>
    </epcList>
    <action>OBSERVE</action>
    <bizStep>urn:epcglobal:cbv:bizstep:repairing</bizStep>
    <disposition>https://gs1.org/cbv/rail/disp/available</disposition>
    ...
    <rail:updatedConfigurationData>
      <rail:revisionStatus>07</rail:revisionStatus>
      <rail:tradeItemDescription language="en">balise 2.1</rail:tradeItemDescription>
    </rail:updatedConfigurationData>
    ...
  </ObjectEvent>
  ...
</epcis:EPCISDocument>
```

## 7.3 Runtime Condition Data (RCD)

Sensor/runtime data may be obtained in two major ways:

- By sensors directly affixed to the object in question, which mainly measure relevant properties for the object itself (e.g., internal activation cycles of an instance),
- By inheritance from parent objects in an aggregated assembly. An example of inherited (or "global") sensor/runtime data is the mileage recorded on rail vehicle level, which could be used to update the mileage of relevant components and parts, taking the time of installation into account.

### Rules for "direct sensor data"

Each attached sensor SHOULD be identified uniquely with a GIAI or SGTIN, and the sensor data SHOULD be specified in the RCD extension of the `ObjectEvent` related to the sensor in question.

Sensor installation should be captured by means of Aggregation events (action: ADD/business step: installing/disposition: active) including the sensor as child and the object to which the sensor is affixed as parent.

### Rules for "inherited sensor data"

Handling of sensor/runtime data inheritance is at the discretion of the operators that integrate these parts and subcomponents. The values will be specified in the RCD extension of an `ObjectEvent` related to the object in question.

When disaggregating, repairing or refurbishing, inherited sensor values SHOULD be updated to reflect current values of the parent and impacted children.

*For example, if a given part is aggregated to a wagon when the wagon has already travelled 50,000 km since being put into service, and removed from the wagon when the wagon has travelled 120,000 km since being put into service, then the subordinate part should have its mileage value incremented by 70,000 km upon the aforementioned disaggregation.*

For more precise values (e.g., temperatures at specific parts of the assembly, or differentiation between total elapsed time (including standby time) and real operational time, individual sensors are recommended instead of using inherited sensor/runtime data.

A party responsible for capturing visibility events relevant to impacted parts and assemblies is at the same time responsible for implementing a suitable mechanism for the calculation of parent component delta values, in order to be able to capture correct and accurate events.

**Table 7-1** Runtime Condition Data attributes

Local Name	name space	Type	Description
mileage	rail	Measurement	Total distance covered by object since its commissioning.
temperature	rail	Measurement	Current temperature at the point of measurement.
operatingTime	rail	Measurement	Cumulative elapsed operation time of an object over its lifetime.
sensorValueList	rail	SensorValueList	Additional sensor values, qualified by a sensor value type code. Example: 12454 (USER_AVG_AFBT)

The attributes SHALL be placed within an XML element `rail:runtimeConditionData`.

**Example 7-2** Runtime Condition Data (RCD)

```

Here is how an assembly's runtime condition data would be reflected in a nested extension to an ObjectEvent:
<epcis:EPCISDocument xmlns:rail="https://gs1.org/cbv/rail" ...>
  ...
  <ObjectEvent>
    ...
    <epcList>
      <epc>urn:epc:id:giai:1234567.7911bg</epc>
    </epcList>
    <action>OBSERVE</action>
    <bizStep>urn:epcglobal:cbv:bizstep:repairing</bizStep>
    <disposition>https://gs1.org/cbv/rail/disp/available</disposition>
    ...
    <rail:runtimeConditionData>
      <rail:mileage measurementUnitCode="KTM">40522</rail:mileage>
      <rail:temperature measurementUnitCode="CEL">58</rail:temperature>
      <rail:operatingTime measurementUnitCode="HUR">721</rail:operatingTime>
      <rail:sensorValueList>
        <sensorValue>
          <sensorValueType>USER_AVG_AFBT</sensorValueType>
          <sensorValueInteger>12454</sensorValueInteger>
        </sensorValue>
      </rail:sensorValueList>
    </rail:runtimeConditionData>
    ...
  </ObjectEvent>
  ...
</epcis:EPCISDocument>

```

**7.4 Relative Position of Child (CRP)**

Where it is necessary to express relative position of assembled and/or installed components within their parent assembly, as per externally maintained standards, including but not limited to:

- EN 15380-2: logical description in train (*similar to e-class*)
- EN 15380-3: position installation description (e.g., left/right)

...each such component must be expressed as an "only child" without siblings when aggregated to its parent in an EPCIS **Aggregation Event**.

Relative position MAY be specified with respect to multiple standards. However, each given standard SHALL NOT be assigned more than one value.

**Table 7-2** Relative Position of Child attributes

Local name	namespace	Type	Description
relativePosition	rail	ExternalStandardValue	The relative position of the MRO-object, specified according to the coding system of an external standard. Example: -BD (EN15380-2:2006)

**Example 7-3** Relative Position of Child (CRP)

Here is how the relative position of an individual child within an assembly, per EN 15380-2 and EN 15380-3, would be reflected in an extension to an AggregationEvent:

```
<epcis:EPCISDocument
  xmlns:epcis="urn:epcglobal:epcis:xsd:1"
  xmlns:rail="https://gs1.org/cbv/rail">
<EPCISBody>
  <EventList>
    <AggregationEvent>
      <eventTime>2017-04-12T00:00:00.000+02:00</eventTime>
      <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
      <parentID>urn:epc:id:giai:1234567.A3333333</parentID>
      <childEPCs>
        <epc>urn:epc:id:sgtin:1234567.011111.mw133</epc>
      </childEPCs>
      <action>ADD</action>
      <bizStep>urn:epcglobal:cbv:bizstep:assembling</bizStep>
      <disposition>urn:epcglobal:cbv:disp:active</disposition>
      <readPoint>
        <id>urn:epc:id:sgln:1234567.12345.rp</id>
      </readPoint>
      <bizLocation>
        <id>urn:epc:id:sgln:1234567.12345.id</id>
      </bizLocation>
      <rail:relativePosition standard="EN15380-2:2006">-BD</rail:relativePosition>
      <rail:relativePosition standard="EN15380-3:2006">+01</rail:relativePosition>
    </AggregationEvent>
  </EventList>
</EPCISBody>
</epcis:EPCISDocument>
```

## 7.5 Leading Part (LP)

When it comes to the identification of assemblies, two main scenarios can occur in practice:

1. The ID of the leading part is different from the ID of the assembly.
2. The ID of the leading part is used as the ID of the assembly (when the part is in assembled state).

Since each party is free to apply either one of the scenarios, and a given party's approach may not be known in advance, it is important to include sufficient information to eliminate ambiguity. **The party SHALL always transmit the leading part ID.**

For this reason, leading parts need to be specifically noted in EPCIS events by means of an extension attribute. The extension SHALL be applied in all cases of leading parts.

**Example 7-4** Aggregation event following scenario 1 (leading part ID different from assembly ID)

```
<AggregationEvent>
  <eventTime>2017-08-28T22:22:00.000+02:00</eventTime>
  <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
  <parentID>urn:epc:id:giai:1234567.A3333333</parentID>
  <childEPCs>
```

```

    <epc>urn:epc:id:sgtin:1234567.011111.mw133</epc>
    <epc>urn:epc:id:sgtin:1234567.054321.102</epc>
  </childEPCs>
  <action>ADD</action>
  <bizStep>urn:epcglobal:cbv:bizstep:assembling</bizStep>
  <disposition>urn:epcglobal:cbv:disp:in_progress</disposition>
  <readPoint>
    <id>urn:epc:id:sgln:1234567.12345.rp</id>
  </readPoint>
  <bizLocation>
    <id>urn:epc:id:sgln:1234567.12345.id</id>
  </bizLocation>
  <rail:leadingPart>urn:epc:id:sgtin:1234567.011111.mw133</rail:leadingPart>
</AggregationEvent>

```

**Example 7-5** Aggregation event following scenario 2  
(leading part ID is used as assembly ID)

```

<AggregationEvent>
  <eventTime>2017-08-28T22:22:00.000+02:00</eventTime>
  <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
  <parentID>urn:epc:id:sgtin:1234567.011111.mw133</parentID>
  <childEPCs>
    <epc>urn:epc:id:sgtin:1234567.054321.102</epc>
  </childEPCs>
  <action>ADD</action>
  <bizStep>urn:epcglobal:cbv:bizstep:assembling</bizStep>
  <disposition>urn:epcglobal:cbv:disp:in_progress</disposition>
  <readPoint>
    <id>urn:epc:id:sgln:1234567.12345.rp</id>
  </readPoint>
  <bizLocation>
    <id>urn:epc:id:sgln:1234567.12345.id</id>
  </bizLocation>
  <rail:leadingPart>urn:epc:id:sgtin:1234567.011111.mw133</rail:leadingPart>
</AggregationEvent>

```

**Example 7-6** Object event following scenario 1  
(leading part ID different from as assembly)

```

<ObjectEvent>
  <eventTime>2017-09-25T10:22:00.000+02:00</eventTime>
  <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
  <epcList>
    <epc>urn:epc:id:giai:1234567.A3333333</epc>
  </epcList>
  <action>OBSERVE</action>
  <bizStep>urn:epcglobal:cbv:bizstep:storing</bizStep>
  <disposition>https://gsl.org/cbv/rail/disp/available</disposition>
  <readPoint>
    <id>urn:epc:id:sgln:1234567.54321.N</id>
  </readPoint>
  <bizLocation>
    <id>urn:epc:id:sgln:1234567.54810.HO</id>
  </bizLocation>
  <rail:leadingPart>urn:epc:id:sgtin:1234567.011111.mw133</rail:leadingPart>
</ObjectEvent>

```

**Example 7-7** Object event following scenario 2  
(leading part ID same as assembly ID)

```

<ObjectEvent>
  <eventTime>2017-09-25T10:22:00.000+02:00</eventTime>
  <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
  <epcList>
    <epc>urn:epc:id:sgtin:1234567.011111.mw133</epc>
  </epcList>
  <action>OBSERVE</action>
  <bizStep>urn:epcglobal:cbv:bizstep:storing</bizStep>
  <disposition>https://gs1.org/cbv/rail/disp/available</disposition>
  <readPoint>
    <id>urn:epc:id:sgln:1234567.54321.N</id>
  </readPoint>
  <bizLocation>
    <id>urn:epc:id:sgln:1234567.54810.HO</id>
  </bizLocation>
  <rail:leadingPart>urn:epc:id:sgtin:1234567.011111.mw133</rail:leadingPart>
</ObjectEvent>

```

## 7.6 Inspection Report (IR)

Inspection report details, such as non-conformance report can be required. These details can be included using the Inspection Report (IR) extension.

The IR extension may be used in the following cases:

**1.** OBSERVE event, business step *inspecting*

This will help operators to provide a list of performed inspections, even if there is no standardized code list yet.

Outcome 1: disposition = *available*, no further action, IR extension is used to document the inspection.

Outcome 2: disposition = *non\_conformant*, IR extension is used to provide the details<sup>9</sup> of the inspection itself, as well as the resultant non-conformance report.

Note: If disposition is *non\_conformant*, follow up actions will indirectly show final disposition. Either it is not usable, so it will be stored in a separate area of the warehouse or if already in a train and not function critical just continue running until next repair cycle OR a disassembly event will follow.

**2.** OBSERVE event, business step *repairing*

Outcome 1: Repair is unsuccessful, disposition = *non\_conformant*. IR extension is included to document the non-conformance report details. E.g., if it was before an internal NCR due to an inspection, then the operator workshop tries to repair but it fails. NCR to an external company is opened.

Outcome 2: Repair is successful, disposition = *available*, no need for IR extension.

Each value of type *inspectionReportList* consist of one or more elements named *inspectionReport*, which contains the following sub-elements:

<sup>9</sup> For example, "based on the CIT/COTIF/UIC General Contract of Use for Wagons (GCU) - Appendix 9".



**Table 7-3** Inspection Report attributes

Local name	namespace	Type	Description
reportType	rail	Code	Code that defines the type of inspection report. Allowed values: INS: Inspection report (without incidence of non-conformance) NCR: Non-conformance report  Example: NCR
reportDescription	rail	Description	Text that provides a short summary of the report.  Examples: Issues with ... Available but with restriction due to...
reportID	rail	string	Identifier of the report. Example: 17-124
reportURL	rail	url	URL of the location where the report can be accessed. Example: www.example.com/NCR17-124.pdf

**Example 7-7** Inspection report

```

<rail:inspectionReportList>
  <rail:inspectionReport>
    <rail:reportType>INS</rail:reportType>
    <rail:reportDescription language="en">inspection performed
    </rail:reportDescription>
    <rail:reportID>INS24</rail:reportID>
    <rail:reportURL>http://www.example.com/example_url</rail:reportURL>
  </rail:inspectionReport>
  <rail:inspectionReport>
    <rail:reportType>NCR</rail:reportType>
    <rail:reportDescription language="en">non-conformance caused by ..
    </rail:reportDescription>
    <rail:reportID>NCR11</rail:reportID>
    <rail:reportURL>http://www.example.com/example_url</rail:reportURL>
  </rail:inspectionReport>
</rail:inspectionReportList>

```

*In the example above, the first report is the recording of an inspection which has been performed, while the second report opens/generates an NCR as a result of the inspection.*

## 7.7 Planned Replacement (PR)

To satisfy Infrastructure planning requirements, planned replacement parts and planned replacement dates MAY be specified at the time of commissioning/original installation of the planned replacement's predecessor (i.e., of the currently installed part) by means of a Rail-specific extension to an Object Event or an Aggregation Event, as indicated below.

A lone part MAY be designated for replacement by multiple parts; in this case there SHALL be a list of GTINs designated as replacement parts.

**Table 7-4** Planned Replacement attributes

Local name	namespace	Type	Description
Gtin	rail	urn	GTIN of the MRO-object that will replace the current MRO-object instance. Example: urn:epc:idpat:sgtin:0614141.112345.*
plannedReplacementDate	rail	date	The date that the MRO-object is expected to be replaced. Example: 2019-09-07

The attributes SHALL be placed within an XML element `rail:plannedReplacement`

**Example 7-6** Planned Replacement expressed in Object Event

```

<epcis:EPCISDocument xmlns:rail="https://gs1.org/cbv/rail" ...>
...
  <ObjectEvent>
    <eventTime>2017-10-03T07:07:00.000+02:00</eventTime>
    <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
    <epcList>
      <epc>urn:epc:id:giai:1234567.481cd14225</epc>
    </epcList>
    <action>OBSERVE</action>
    <bizStep>https://gs1.org/cbv/rail/disp/planning_replacement</bizStep>
    <readPoint>
      <id>geo:52.554433,13.398299</id>
    </readPoint>
    <bizLocation>
      <id>geo:52.554433,13.398299</id>
    </bizLocation>
    <rail:plannedReplacement>
      <rail:replacementPartList>
        <rail:gtin>urn:epc:idpat:sgtin:0614141.112345.*</rail:gtin>
        <rail:gtin>urn:epc:idpat:sgtin:0614141.112972.*</rail:gtin>
      </rail:replacementPartList>
      <rail:plannedReplacementDate>2019-11-09</rail:plannedReplacementDate>
    </rail:plannedReplacement>
  </ObjectEvent>
...
</epcis:EPCISDocument>

```

*Note: for infrastructure, top level is not always represented by GTIN or GIAI, in which case it is recommended to use an operator-assigned identifier, in http:// format (as described by the CBV).*

**Example 7-7** Planned Replacement expressed in Aggregation Event

```

<epcis:EPCISDocument xmlns:rail="https://gs1.org/cbv/rail" ...>
...
  <AggregationEvent>
    <eventTime>2017-10-03T07:07:00.000+02:00</eventTime>
    <eventTimeZoneOffset>+02:00</eventTimeZoneOffset>
    <parentID>urn:epc:id:sgtin:1234567.011111.mw133</parentID>
    <childEPCs>
      <epc>urn:epc:id:sgtin:0614141.112345.4711184</epc>
    </childEPCs>
    <action>OBSERVE</action>
    <bizStep>https://gs1.org/cbv/rail/disp/planning_replacement</bizStep>
    <readPoint>
      <id>geo:52.554433,13.398299</id>
    </readPoint>
  </AggregationEvent>
...
</epcis:EPCISDocument>

```

```
<bizLocation>
  <id>geo:52.554433,13.398299</id>
</bizLocation>
<rail:plannedReplacement>
  <rail:replacementPartList>
    <rail:gtin>urn:epc:idpat:sgtin:0614141.112345.*</rail:gtin>
    <rail:gtin>urn:epc:idpat:sgtin:0614141.112972.*</rail:gtin>
  </rail:replacementPartList>
  <rail:plannedReplacementDate>2019-11-09</rail:plannedReplacementDate>
</rail:plannedReplacement>      </AggregationEvent>
...
</epcis:EPCISDocument>
```

## 8 Common data types

### 8.1 Complex types with simple content

#### 8.1.1 AdditionalPartyID

Each value of type `AdditionalPartyID` consists of the following sub-elements:

Field	Type	Description
<code>additionalPartyID</code>	string	Value of the additional party identifier. Example: 123456789
<code>partyIDTypeCode</code>	Code	Code that defines the type of additional party identifier. The code list for this attribute is defined in GDSN; see <a href="http://apps.gs1.org/GDD/Pages/clDetails.aspx?semanticURN=urn:gs1:gdd:cl:AdditionalPartyIdentificationTypeCode&amp;release=1">http://apps.gs1.org/GDD/Pages/clDetails.aspx?semanticURN=urn:gs1:gdd:cl:AdditionalPartyIdentificationTypeCode&amp;release=1</a> Example: DUNS

When a value of type `AdditionalPartyID` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gs1.org/cbv/rail#additionalPartyID">
  <additionalPartyID partyIDTypeCode="DUNS">123456789</additionalPartyID>
</attribute>
```

When a value of type `AdditionalPartyID` appears in an EPCIS event extension, it takes the form illustrated below.

```
<ilmd>
  <rail:additionalPartyID partyIDTypeCode="DUNS">123456789</additionalPartyID>
</ilmd>
```

#### 8.1.2 AdditionalTradeItemID

Each value of type `AdditionalTradeItemID` consists the following sub-elements:

Field	Type	Description
<code>additionalTradeItemID</code>	string	Value of the additional trade item identifier.
<code>tradeItemIDTypeCode</code>	Code	Code that defines the type of additional trade item identifier. The code list for this attribute is defined in GDSN; see <a href="http://apps.gs1.org/GDD/Pages/clDetails.aspx?semanticURN=urn:gs1:gdd:cl:AdditionalTradeItemIdentificationTypeCode&amp;release=1">http://apps.gs1.org/GDD/Pages/clDetails.aspx?semanticURN=urn:gs1:gdd:cl:AdditionalTradeItemIdentificationTypeCode&amp;release=1</a> Example: BUYER_ASSIGNED

When a value of type `AdditionalTradeItemID` appears as attribute of a `VocabularyElement`, it takes the repeatable form illustrated below.

```
<attribute id="https://gs1.org/cbv/rail#additionalTradeItemID">
  <additionalTradeItemID tradeItemIDTypeCode="BUYER_ASSIGNED">IMP-125
</additionalTtradeItemID>
  <additionalTradeItemID tradeItemIDTypeCode="SUPPLIER_ASSIGNED">ASD-987
</additionalTtradeItemID>
</attribute>
```

When a value of type `AdditionalTradeItemID` appears in an EPCIS event extension, it takes the form illustrated below.

```
<ilmd>
  <rail:additionalTradeItemID tradeItemIDTypeCode="BUYER_ASSIGNED">IMP-125
</additionalTradeItemID>
  <additionalTradeItemID tradeItemIDTypeCode="SUPPLIER_ASSIGNED">ASD-987
```

```
</additionalTtradeItemID>
</ilmd>
```

### 8.1.3 Description

Each value of type `Description` consists of the following sub-elements:

Field	Type	Description
<code>description</code>	string	The description as a string
<code>languageCode</code>	Code	Two-letter language code per ISO 639-1

When a value of type `Description` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gsl.org/cbv/rail#tradeItemDescription">
  <description languageCode="DE">Bremsscheibe</description>
</attribute>
```

When a value of type `Description` appears in an EPCIS event extension, it takes the form illustrated below.

```
<ilmd>
  <rail:tradeItemDescription languageCode="DE">Bremsscheibe
  </rail:tradeItemDescription>
</ilmd>
```

**!** In the interest of interoperability, it is **STRONGLY RECOMMENDED** that `Description` data types and any other data types which support multiple language codes include a value in English.

### 8.1.4 Measurement

Each value of type `measurement` is a structure having the following sub-elements:

Field	Type	Description
<code>measurement</code>	Decimal	The numerical value of the measurement
<code>measurementUnitCode</code>	Code	The unit of measure for the measurement. The code list for this attribute is UN/ECE Recommendation 20; see <a href="http://www.unece.org/cefact/recommendations/rec_index.html">http://www.unece.org/cefact/recommendations/rec_index.html</a>

When a value of type `Measurement` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gsl.org/cbv/rail#objectSecondLongestSide">
  <measurement measurementUnitCode="MMT">400</measurement>
</attribute>
```

When a value of type `Measurement` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:objectSecondLongestSide measurementUnitCode="MMT">400
</rail:object2ndLongestSide>
```

## 8.2 Complex types with element sequence

### 8.2.1 ChildItemList

Each value of type `childItemList` consists of one or more elements named `childItem`, which contains the following sub-elements:

Field	Type	Description
<code>gtin</code>	<code>urn</code>	The GTIN that identifies the class of the child item.
<code>quantity</code>	<code>integer</code>	The number of instances of the child item that are present in the parent item.

When a value of type `childItemList` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gs1.org/cbv/rail#childItemList">
  <childItem>
    <gtin>urn:epc:idpat:sgtin:1234567.012345.*"</gtin>
    <quantity>3</quantity>
  </childItem>
</attribute>
```

When a value of type `childItemList` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:childItemList>
  <childItem>
    <gtin>urn:epc:idpat:sgtin:1234567.012345.*"</gtin>
    <quantity>3</quantity>
  <childItem>
</rail:childItemList>
```

### 8.2.2 CountryOfOriginList

Each value of type `countryOfOriginList` consist of one or more elements named `countryOfOrigin`, which contains the following sub-elements:

Field	Type	Description
<code>governingCountry</code>	<code>Code</code>	Country of which the rules were applied in determining the country of origin. The code list for this attribute is the ISO 3166-1 Alpha-2 list of 2-letter country codes; see <a href="http://www.iso.org/iso/country_codes">http://www.iso.org/iso/country_codes</a> Example: UK
<code>applicableCountry</code>	<code>Code</code>	Country of origin according to the applied rules of origin. The code list for this attribute is the ISO 3166-1 Alpha-2 list of 2-letter country codes; see <a href="http://www.iso.org/iso/country_codes">http://www.iso.org/iso/country_codes</a> Example: UK

When a value of type `countryOfOriginList` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gs1.org/cbv/rail#countryOfOriginList">
  <countryOfOrigin>
    <governingCountry>UK</governingCountry>
    <applicableCountry>NL</applicableCountry>
  </countryOfOrigin>
</attribute>
```

When a value of type `countryOfOriginList` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:countryOfOriginList>
  <countryOfOrigin>
    <governingCountry>UK</governingCountry>
    <applicableCountry>NL</applicableCountry>
  </countryOfOrigin>
</rail:countryOfOriginList>
```

### 8.2.3 DocumentList

Each value of type `documentList` consist of one or more elements named `document`, which contains the following sub-elements:

Field	Type	Description
documentID	string	The identifier of the document. This can for example be an internal ID or a GS1 Global Document Type Identifier (GDTI).
documentTitle	Description	The title of the document.
documentKeywords	Description	One or more keywords that can be used to retrieve the document.
documentURL	url	The location where the document can be downloaded.

When a value of type `DocumentList` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gsl.org/cbv/rail#documentList">
  <document>
    <documentID>4657</documentID>
    <documentTitle language="en">MRO Reference Guide 2017</documentTitle>
    <documentKeywords language="en">shunt</documentKeywords>
    <documentURL>http://epcismro.example.com/library</documentURL>
  </document>
</attribute>
```

When a value of type `DocumentList` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:documentList>
  <document>
    <documentID>4657</documentID>
    <documentTitle language="en">MRO Reference Guide 2017</documentTitle>
    <documentKeywords language="en">shunt</documentKeywords>
    <documentURL>http://epcismro.example.com/library</documentURL>
  </document>
</rail:documentList>
```

### 8.2.4 PartyInformation

Each value of type `partyInformation` consists of the following sub-elements:

Field	Type	Description
gln	urn	Global Location Number of the party.
additionalPartyID	additionalPartyID	A party identifier that is in addition to the GLN. Example: 123451111 (DUNS)
name	string	Name of the party.
country	Code	ISO 3166-1 alpha-2 code

When a value of type `partyInformation` appears as attribute of a `VocabularyElement`, it takes the form illustrated below.

```
<attribute id="https://gsl.org/cbv/rail#manufacturer">
  <gln>"urn:epc:id:sgln:1234567.000007.0"</gln>
  <additionalPartyID partyIDType="AcmeRegistry">14225</additionalPartyID>
  <additionalPartyID partyIDType="DUNS">123451111</additionalPartyID>
  <name>wheelsAreUs</name>
  <country>DE</country>
</attribute>
```

When a value of type `partyInformation` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:manufacturer>
  <gln>"urn:epc:id:sgln:1234567.000007.0"</gln>
  <additionalPartyID partyIDType="AcmeRegistry">14225</additionalPartyID>
  <additionalPartyID partyIDType="DUNS">123451111</additionalPartyID>
  <name>wheelsAreUs</name>
  <country>DE</country>
</rail:manufacturer>
```

### 8.2.5 SensorValueList

Each value of type `SensorValueList` consist of one or more elements named `sensorValue`, which contains the following sub-elements:

Field	Type	Description
<code>sensorValueType</code>	Code	A mandatory code that specifies the type of sensor value. Non-standardised values SHALL start with the string "USER_", for example USER_AVG_ABFT.
<code>sensorValueInteger</code>	Integer	The value of the sensor read, expressed as integer. Example: 356
<code>sensorValueMeasurement</code>	Measurement	The value of the sensor read, expressed as measurement. Example: 4000 KGM
<code>sensorValueDouble</code>	Float	The value of the sensor read, expressed as a floating-point number. Example: 123.456
<code>sensorValueDateTime</code>	dateTime	The value of the sensor read, expressed as date time Example: 2017-12-23T12:00:00Z
<code>sensorValueBoolean</code>	boolean	The value of the sensor read, expressed as true or false value. Example: true

For each `sensorValue` the `sensorValueType` SHALL be included and exactly one of the `sensorValue` elements.

When a value of type `SensorValueList` appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:sensorValueList>
  <sensorValue>
    <sensorValueType>USER_AVG_ABFT</sensorValueType>
    <sensorValueInteger>1245</sensorValueInteger>
    <sensorValueMeasurement measurementUnitCode="JOU">12
  </sensorValueMeasurement>
  <sensorValueDouble>1.21
</sensorValueDouble>
  <sensorValueDateTime>2017-12-23T12:00:00Z
  </sensorValueDateTime>
  <sensorValueBoolean>true</sensorValueBoolean>
  </sensorValue>
</rail:sensorValueList>
```



## 8.3 Integrating external vocabularies

### 8.3.1 External (non-GS1) vocabularies with XML syntax expression

If the external standard has a formal XML-based syntax expression, the namespace of the standard should be declared in the EPCIS Document Header, for example:

```
xmlns:welders="http://weldersguild.org/welding-classes/"
```

...and used where the external standards are cited in master data attributes.

When the attribute of the external vocabulary appears in a VocabularyElement, it takes the form illustrated below for a (fictitious) "Welder's Guild" namespace:


```
<attribute id="http://weldersguild.org/welding-classes#weldingClass_101">AA92c</attribute>
```

When a value of type ExternalStandardValue appears in an EPCIS event extension (for example ILM D), it takes the form illustrated below.

```
<ilmd>
  <welders:weldingClass>AA92c</weldingClass>
</ilmd>
```

### 8.3.2 External (non-GS1) vocabularies without XML syntax expression

If the issuing organisation of the external standard does NOT have its own namespace, required attributes may be supported using the GS1 rail namespace, <https://gs1.org/cbv/rail>, in conjunction with the GS1 Rail ExternalStandardValue data type.

 **Note:** Request for new attributes need to be submitted as work requests into the GS1 Global Standards Management Process (GSMP).

Each value of type ExternalStandardValue consists of the following subelements:

Field	Type	Description
externalStandardValue	string	Attribute value according to the specified standard.
standard	string	Name of the standard.
version	string	Version of referenced standard

When a value of type ExternalStandardValue appears in as attribute of a VocabularyElement, it takes the form illustrated below.

```
<attribute id="https://gs1.org/cbv/rail#weldingClass">
  <externalStandardValue standard="WeldingClass-101" version="4.1">AA92c
  </externalStandardValue>
</attribute>
```

When a value of type ExternalStandardValue appears in an EPCIS event extension, it takes the form illustrated below.

```
<rail:weldingClass standard="WeldingClass-101">AA92c</rail:weldingClass>
```

## 9 EPCIS document examples

Please see accompanying xml files:

- Rail event examples
- Rail master data document example

## 10 Visibility Data Event matrix

Please see accompanying pdf screenshots.

Alternatively, please load the aforementioned Rail event example xml file directly into the Visibility Data Workbench, using your own workbench account.

## 11 EPCIS Query examples

### 11.1 Find all Aggregation events containing a particular SGTIN . . .

...in descending chronological order of EventTime

...for SGTIN urn:epc:id:sgtin:1234567.011111.mw133

```
<epcisq:EPCISQueryDocument xmlns:epcisq="urn:epcglobal:epcis-query:xsd:1"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" schemaVersion="1"
creationDate="2017-10-03T10:26:32.982Z">
  <EPCISBody>
    <epcisq:Poll>
      <queryName>SimpleEventQuery</queryName>
      <params>
        <param>
          <name>eventType</name>
          <value xsi:type="epcisq:ArrayOfString">
            <string>AggregationEvent</string>
          </value>
        </param>
        <param>
          <name>MATCH_anyEPC</name>
          <value xsi:type="epcisq:ArrayOfString">
            <string>urn:epc:id:sgtin:1234567.011111.mw133</string>
          </value>
        </param>
        <param>
          <name>orderBy</name>
          <value xsi:type="xs:string">eventTime</value>
        </param>
        <param>
          <name>orderDirection</name>
          <value xsi:type="xs:string">DESC</value>
        </param>
      </params>
    </epcisq:Poll>
  </EPCISBody>
</epcisq:EPCISQueryDocument>
```



## **A Determining the GS1 Company Prefix (GCP) length**

### **A.1 General guidelines**

Please refer to GS1's RFID/Bar Code Interoperability guideline at:

[https://www.gs1.org/docs/gcp\\_length/rfid-barcode-interop-guideline.pdf](https://www.gs1.org/docs/gcp_length/rfid-barcode-interop-guideline.pdf) .

### **A.2 GS1 Company Prefix (GCP) length table**

The GS1 Company Prefix (GCP) Length Table is an xml file that can be used by software to look up the length of the GCP when converting barcoded or EDI-communicated GS1 identifiers into EPC encodings, in order to determine the correct "Partition" value for the EPC binary encoding on a Gen2 tag, or to determine correct placement of the "dot" in an EPC URI used to encode GS1 identifiers in EPCIS events.

This table can be accessed at:

[https://www.gs1.org/sites/default/files/docs/gcp\\_length/gcpprefixformatlist.xml](https://www.gs1.org/sites/default/files/docs/gcp_length/gcpprefixformatlist.xml)

## B Code Lists

### B.1 Product classification type codes

Code	Name	Description
GPC	GPC	GS1 Global Product Classification
19	Federal Agency on Technical Regulating and Metrology of the Russia Federation	A Russian government agency that serves as a national standardization body of the Russian Federation.
22	CPV	Common Procurement Vocabulary (CPV) was introduced in 1996 as a means of raising the level of transparency and efficiency in the field of public acquisition. The use of the standard names of the CPV facilitates the marking of the procurement contracts they are interested in. In addition, CPV facilitates the swift and exact translation of contract information for publication in the official EU Bulletin as well as the preparation of procurement statistics. The CPV code consists of eight characters as well as a control character. It is managed by the Office for Official Publications of the European Communities (OPOCE).
31	eCI@ss	Standardized Material and Service Classification and Dictionary
41	NAPCS	North American Classification System (NAPCS)
5	UNSPSC	United Nations Standard Products and Services Code
59	ETIM	ETIM - (Europees Technisch Informatie Model or European Technical Information Model in English) is an international organisation which develops, manages and publishes one European classification for technical products. More information: <a href="http://www.etim-international.com/">http://www.etim-international.com/</a> .
73	OKPD2 Russian Classification of Product by Economic Activities.	OKPD2 Russian Classification of Product by Economic Activities.
8	Supplier Assigned	A manufacturer's own codification system