



PROGRAMME OF  
THE EUROPEAN UNION



## SPECIFICATIONS

### Sentinel-1 Product Unit Definition and Metadata ICD

**Prepared by**  
**Reference**  
**Issue/Revision**  
**Date of Issue**  
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# APPROVAL

<b>Title</b> Sentinel-1 Product Unit Definition and Metadata ICD	
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# CHANGE LOG

Reason for change	Issue Nr.	Revision Number	Date
Introduction of RTC products and GS Element Applicability	1	1	Jan. 2020
Addition of format for AUX products; Separation of Attributes mapping between Auxiliary products in .SAFE and .EOF formats; Updates to the “Sentinel-1 Product Attributes Mapping” document	1	2	Apr. 2020
Addition of FOS Auxiliary files and update to Reference Documents	1	3	Jun. 2020
Update in line with EOP GMQ review	1	4	Sep. 2020
Clarification on products to be archived in the LTAs and Addition of OLQC files	1	5	Nov. 2020
Update following “Checkpoint 2020”	1	6	Apr. 2021
“Checkpoint 2022” update	1	7	Sept. 2022
Entry into service of new S1 ETAD product types	1	8	Apr. 2023
Update of Sentinel-1 Product Attributes Mapping Excel file and alignment for Checkpoint 2024	1	9	Mar. 2024
Addition of AIS products mapping	2	0	Oct. 2024

# CHANGE RECORD

Issue Number 1	Revision Number 1		
Reason for change	Date	Pages	Paragraph(s)
Added RTC Products	Dec. 2019	9	Table 2-1
Introduced GS Element Applicability	Jan. 2020	Multiple	Table 2-1
Minor updates to Tables 3-1 and 4-1	Jan. 2020	Multiple	Table 3-1, Table 4-1

Issue Number 1	Revision Number 2		
Reason for change	Date	Pages	Paragraph(s)
Addition of format column for Auxiliary products	Apr. 2020	9	Table 2-2
Separation of Attributes mapping between Auxiliary products in .SAFE and .EOF formats	Apr. 2020	"Sentinel-1 Product Attributes Mapping.xls"	S1 AUX spreadsheets
Updates to the "Sentinel-1 Product Attributes Mapping" to align with the clarifications provided as part of the LTA ITT	Apr. 2020	"Sentinel-1 Product Attributes Mapping.xls"	All spreadsheets

Issue Number 1	Revision Number 3		
Reason for change	Date	Pages	Paragraph(s)
Update to Reference Documents	Jun. 2020	7	1.3
Addition of FOS Auxiliary products: ORBPRES, ORBRES, TLEPRE	Jun. 2020	9	Table 2-2

Issue Number 1	Revision Number 4		
Reason for change	Date	Pages	Paragraph(s)
Update to Reference Documents	Sep. 2020	7	1.3
Addition of Auxiliary Data definition	Sep. 2020	8	1.5
Addition of PSCalibration as well as Orbit and Burst Synchronisation product types	Sep. 2020	9	Table 2-1
Addition of Data Provider column to Sentinel-1 Auxiliary Data list	Sep. 2020	9	Table 2-2
Removal of GS Element Applicability columns	Sep. 2020	9	Table 2-1

Issue Number 1	Revision Number 5		
Reason for change	Date	Pages	Paragraph(s)
Clarification for PSCalibration and OBS_SS___ products long term archiving	Nov. 2020	9	Table 2-1

Addition of OLQC files	Nov. 2020	9, 13	2.4, Table 4-1
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Issue Number 1	Revision Number 6		
Reason for change	Date	Pages	Paragraph(s)
Update to the Reference Documents versions and issue dates	Apr. 2021	7	1.3
Addition of AUX_OBMEMC and MPL_ORBSCT	Apr. 2021	9	Table 2-2
Removal of GS Applicability from Table 3-1	Apr. 2021	10	Table 3-1
Addition of ADG applicability for OData attributes mapping related to AUX products	Apr. 2021	13	Table 4-1

Issue Number 1	Revision Number 7		
Reason for change	Date	Pages	Paragraph(s)
Addition of [AD-1] applicable document	Sept. 2022	7	1.2
Removal of Table 2-1 and Table 2-2, and reference to [AD-1]	Sept. 2022	9	2.1, 2.3
Addition of GeoFootprint property	Sept. 2022	11	Table 3-1
Removal of “coordinates” OData attribute in favour of the usage of Footprint and GeoFootprint properties	Sept. 2022	13	Table 4-1
Update to OLQC attributes	Sept. 2022	13	Table 4-1
Addition of ___OBS___SS attributes	Sept. 2022	13	Table 4-1
Addition of POD and MPC applicability	Sept. 2022	13	Table 4-1
Replacement of Data Distribution (DD) with Data Access (DA)	Sept. 2022	8, 13	1.4, Table 4-1

Issue Number 1	Revision Number 8		
Reason for change	Date	Pages	Paragraph(s)
Addition of ETAD and OBS products properties mapping	Apr. 2023	11	Table 3-1
Addition of ETAD products attribute mapping and alignment of DA applicability for Ascending Node times	Apr. 2023	13	Table 4-1

Issue Number 1	Revision Number 9		
Reason for change	Date	Pages	Paragraph(s)
Update of Sentinel-1 Product Attributes Mapping Excel file for Auxiliary Data Files	Mar. 2024	n/a	Sentinel-1 Product Attributes Mapping_v1.9.xlsx



Issue Number 2		Revision Number 0	
Reason for change	Date	Pages	Paragraph(s)
Update of Sentinel-1 Product Attributes Mapping Excel file for AIS Lo and AIS AUX files	Oct. 2024	n/a	Sentinel-1 Product Attributes Mapping_v2.0.xlsx
Introduction of AIS products mapping	Oct. 2024	11, 13	Table 3-1, Table 4-1



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## 1 INTRODUCTION

### 1.1 Purpose and Scope

The scope of this document is to be used as an annex for the CSC Common Entity Definition Document [RD-4] in order to describe the Product Entity Properties, the Product Attributes and the corresponding metadata elements that shall be catalogued and queryable for Sentinel products. This document provides the mapping and packaging format for the Sentinel-1 products.

### 1.2 Applicable Documents

ID	Document Reference	Document Title
[AD-1]	ESA-EOPG-EOPGC-TN-58	Copernicus Ground Segment Sentinels Data Flow Configuration

**Table 1-1 – Applicable Documents**

### 1.3 Reference Documents

ID	Document Reference	Document Title
[RD-1]	S1PD.SP.00110.ASTR	Sentinel-1 Level-0 Product Format Specifications
[RD-2]	S1-RS-MDA-52-7441	Sentinel-1 Product Specification
[RD-3]	S1-RS-MDA-52-7443	Sentinel-1 IPF Auxiliary Product Specification
[RD-4]	ESA-EOPG-EOPGC-IF-5	Copernicus Space Component Ground Segment - Common Entity Definition Document
[RD-5]	OGC 17-003r2	OGC EO Dataset Metadata GeoJSON(-LD) Encoding Standard
[RD-6]	OGC 10-157r4	OGC Earth Observation Metadata profile of Observations & Measurements
[RD-7]	ESA-EOPG-EOPGC-SP-5	Sentinels POD Files Definition and Metadata ICD

**Table 1-2 – Reference Documents**

## 1.4 Acronyms, Definitions and Abbreviations

Acronym	Description
ADG	Auxiliary Data Gathering
AIS	Automatic Identification System
AUX	Auxiliary
CSC	Copernicus Space Component
DA	Data Access
FOS	Flight Operations Service
GS	Ground Segment
ICD	Interface Control Document
JSON	JavaScript Object Notation
LTA	Long Term Archiving
MPC	Mission Performance Cluster
ODP	On-Demand Processing
OLQC	On Line Quality Control
PDGS	Payload Data Ground Segment
PR	Systematic Production
SAFE	Standard Archive Format for Europe

**Table 1-3 – Acronyms and Abbreviations**

## 1.5 Definitions

**Auxiliary Data** – Data which enhance processing and utilization of remote sensing instrument data. The auxiliary data are not necessarily captured by the same data collection process as the instrument data. Auxiliary data include data collected by any other platform or process (e.g. meteorological data from ECWMF or NCEP), data providing processing configuration information typically for data calibration and or instrument characterisation (e.g. processing auxiliary files), and data providing information on satellite position and velocity (orbit auxiliary files). Auxiliary data help in data processing, but are also data sets in their own right and may be relevant for end-users in specific *User Level Data* exploitation scenarios.



## **2 SENTINEL-1 PRODUCTS AND AUXILIARY DATA**

### **2.1 Sentinel-1 Product List**

[AD-1] describes the list of Sentinel-1 products which are required to be circulated within the Copernicus Space Component (CSC) Ground Segment (GS) elements (e.g. from Systematic Production to Long Term Archiving or Data Access systems).

### **2.2 Sentinel-1 Product Packaging**

All Sentinel-1 products follow the corresponding Product Format Specifications and are packaged as **compressed** 'zip' files.

### **2.3 Sentinel-1 Auxiliary (AUX) Data List**

[AD-1] presents the list of Sentinel-1 Auxiliary Data which are required to be circulated between the CSC GS elements.

### **2.4 Sentinel-1 OLQC Reports**

The On-Line Quality Control (OLQC) performs essential quality checks on each product generated by the processing chain. The results of the quality checks are presented as XML reports.

OLQC reports are provided by the Production Service on the Production Interface delivery Point (PRIP).



### 3 SENTINEL-1 PRODUCT ENTITY PROPERTIES MAPPING

[RD-4] defines the Generic CSC Common Entity Properties.

Table 3-1, below, provides the mapping between these Generic Product Entity Properties and the Sentinel-1 product metadata. Most of the properties defined in [RD-4] are generated by the CSC services. The following table describes the properties that map directly to the Sentinel-1 product metadata.

OData Product Entity Properties	Type	Description	Cardinality	Corresponding Sentinel-1 Metadata							Example
				L0 Std, Ann, Cal, Noise	L0 GPS L0 HKTM	AIS L0 AIS AUX	L1 & L2	ETAD	AUX	___OBS___S	
<b>Name</b>	String	Data file name (according to the Sentinel file naming conventions) plus the file extension	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	S1A_IW_SLC__1SDV_20160117T103451_20160117T103518_009533_00DD94_D46A.zip
<b>ContentDate</b>	TimeRange	The sensing range period. Compound property with start and end times in UTC in the format YYYY-MM-DDThh:mm:ss.sssZ	1	acquisitionPeriod/ <b>startTime</b>  acquisitionPeriod/ <b>stopTime</b>	acquisitionPeriod/ <b>startTime</b>  acquisitionPeriod/ <b>stopTime</b>	acquisitionPeriod/ <b>startTime</b>  acquisitionPeriod/ <b>stopTime</b>	safe:acquisitionPeriod/ <b>safe:startTime</b>  safe:acquisitionPeriod/ <b>safe:stopTime</b>	safe:acquisitionPeriod/ <b>safe:startTime</b>  safe:acquisitionPeriod/ <b>safe:stopTime</b>	s1auxsar:standAloneProductInformation / <b>s1auxsar:validity</b>	obsProduct/processingInformation/ <b>referenceANXTime</b>	"ContentDate": { "Start": "2016-01-17T10:34:51.922Z", "End": "2016-01-17T10:35:18.872Z" }
<b>Footprint</b>	Geography	Footprint of the product expressed as Edm.GeographyPolygon	0..1	frameSet/ frame/ footPrint/ <b>coordinates</b>	n/a	frameSet/ frame/ footPrint/ <b>coordinates</b>	safe:frameSet/ safe:frame/ safe:footPrint/ <b>gml:coordinates</b>	safe:frameSet/ safe:frame/ safe:footPrint/ <b>gml:coordinates</b>	n/a	n/a	geography'SRID=4326; Polygon((-41.15749 66.766701,-31.740927 67.629135,-31.479883 66.860405,-40.616844 66.011871,-41.15749 66.766701))'

OData Product Entity Properties	Type	Description	Cardinality	Corresponding Sentinel-1 Metadata							Example
				L0 Std, Ann, Cal, Noise	L0 GPS L0 HKTM	AIS L0 AIS AUX	L1 & L2	ETAD	AUX	___OBS___S	
GeoFootprint	Geography	Footprint of the product following the GeoJSON format	0..1	frameSet/ frame/ footPrint/ coordinates	n/a	frameSet/ frame/ footPrint/ coordinates	safe:frameSet/ safe:frame/ safe:footPrint/ gml:coordinates	safe:frameSet/ safe:frame/ safe:footPrint/ gml:coordinates	n/a	n/a	"GeoFootprint":{ "type": "Polygon", "coordinates": [ [ [-59.3169, 2.6367], [-63.105, -14.0539], [-60.8506, -14.4245], [-57.1309, 2.3269], [-59.3169, 2.6367] ] ] }

**Table 3-1 – Sentinel-1 Product Entity Properties mapping to Sentinel-1 metadata**

\*n/a = not available

## 4 SENTINEL-1 PRODUCT ATTRIBUTES MAPPING

All relevant metadata elements of the Sentinel-1 products shall be indexed in the Product Attributes, additional metadata elements may also be identified if appropriate. In order to provide a harmonised model across the Sentinel missions the JSON property naming from [RD-5] is preferred for the Attributes Ids. In case an attribute is not defined in [RD-5] the SAFE naming is preferred. The Product Attributes mapping for all Sentinel-1 products is described in the Excel file “Sentinel-1 Product Attributes Mapping”, which is packaged together with this document. A summary of the Sentinel-1 Product Attributes mapping across all Sentinel-1 products is presented in Table 4-1. It should be highlighted that, in order to harmonise the metadata model across the Sentinels, in some cases an “alias” for the value defined in the Sentinel-1 metadata is mapped to a standardised value to be used by the CSC GS elements, in other cases a standard value is defined where it is otherwise unavailable from the product.

OData Attribute Name	Sentinel-1 Product Attributes Mapping													Applicability					
	L0 Std / L0 Ann	L0 Cal	L0 Noise	L0 GPS	L0 HKTm	L1	L2	ETAD	AUX	OLQC Report	___OBS___SS	AIS L0	AIS AUX	PR	ADG	MPC	POD	LTA	DA
beginningDateTime	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
endingDateTime	x	x	x	x	x	x	x	x	x <sup>1</sup>	x	x	x	x	x	x	x	x	x	x
startTimeFromAscendingNode	x	x	x	x		x	x	x				x		x				x	x
completionTimeFromAscendingNode	x	x	x	x		x	x	x				x		x				x	x
platformShortName	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
platformSerialIdentifier	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
instrumentShortName	x	x	x	x		x	x	x	x <sup>2</sup>			x	x	x	x	x		x	x
operationalMode	x	x	x			x	x	x						x				x	x
swathIdentifier	x	x	x			x	x	x						x				x	x
productClass	x	x	x			x	x	x						x				x	x
productConsolidation	x	x	x											x				x	
productComposition						x	x	x						x				x	
productType	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
productGeneration									x <sup>2</sup>					x	x	x		x	x
timeliness						x	x	x						x				x	x
instrumentConfigurationID	x	x	x			x	x	x	x <sup>2</sup>					x	x	x		x	
dataTakeID	x	x	x			x	x	x						x				x	
sliceProductFlag	x	x	x			x	x	x						x				x	
segmentStartTime						x	x	x						x				x	
sliceNumber	x	x	x			x	x	x						x				x	x
totalSlices	x	x	x			x	x	x						x				x	
polarisationChannels <sup>3</sup>	x	x	x			x	x	x						x				x	x

<sup>1</sup> Only applicable to Sentinel-1 Auxiliary products in EOF format

<sup>2</sup> Only applicable to Sentinel-1 Auxiliary products in SAFE format

<sup>3</sup> In case of double polarisation, both channels shall be valued as a single string, separated by a comma

OData Attribute Name	Sentinel-1 Product Attributes Mapping													Applicability					
	L0 Std / L0 Ann	L0 Cal	L0 Noise	L0 GPS	L0 HKTm	L1	L2	ETAD	AUX	OLQC Report	OBS SS	AIS L0	AIS AUX	PR	ADG	MPC	POD	LTA	DA
orbitNumber	x	x	x	x	x	x	x	x			x	x		x				x	x
relativeOrbitNumber	x	x	x	x	x	x	x	x			x	x		x				x	x
cycleNumber	x	x	x	x	x	x	x	x				x		x				x	x
orbitDirection	x	x	x	x		x	x	x				x		x				x	x
processingDate	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
processingCenter	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x
processorName	x	x	x	x	x	x	x	x	x <sup>2</sup>			x	x	x	x	x		x	x
processorVersion	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x
checklistResult										x				x					
inspectedProduct										x				x					
inspectedProductType										x				x					

**Table 4-1 – Sentinel-1 Product Metadata Mapping Summary**