

# ***EPS-SG IASI-NG Level 1D Product Format Specification***

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## Document Change Record

<b>Issue / Revision</b>	<b>Date</b>	<b>DCN No.</b>	<b>Description</b>
v1 draft	16/10/2014	—	Initial version in view of the Processing Specification Version 0
v1	19/12/2014	—	First version in view of the V0 as per EPS-SG Development Logic Plan, for internal review in view of the System PDR.
v1A draft	23/01/2015	—	Including comments from internal review
v1B,v1.C	05/03/2015	—	Intermediate version, editorial
v1D	05/03/2015	—	V0 in EPS-SG Development Logic
v2 draft	10/09/2015	—	Changes in view of the V1 for the GS PDAP ITT. It implements comments from GS PDR. Removed the open issues raised for internal tracking. Updated Product ID as per GPFS
v2A draft	15/12/2015	—	Includes changes after review. Included section 4.2.1 with Table 3. Updated Tables 4, 7, 10, 13, 16, 23, 25, 26.
v2B	13/01/2016	—	Made read-only
v2C	13/01/2016	—	Updated all Word-fields (internal cross-reference). Updated Table 26.
v2E	17/10/2016	—	Updates in view of specifications v2 for PDAP KO. Updated products content and size estimation. Removed residuals and outliers from the product, to be kept in auxiliary files (AUX_OUTL), for diagnostic.
v2F	05/12/2016	EPSSG_DCR_500	Updates of the xml file. Editorials update of the document to follow the GPFS guidelines. Detailed content of the IASI-NG L1D product are presented following the sequence presented in the GPFS document. Open issues and assumptions are moved to annex.
v2G	29/05/2017	EPSSG_DCR_644	The compression_flag is split into flg_compression and flg_outlier.
v3	29/09/2017	—	The BUFR Specification of the IASI-NG L1D product is added with an estimate of its size. The data group is changed to follow the L1C: everything (except radiances) is copied as is from L1C to L1D. The size of IAS-1D-PCS is increased.
v3A	07/03/2018	EPSSG_DCR_834	The data group is changed to follow the L1C PFS v3.2. The size of IAS-1D-PCS is increased (from 1111 MB/orbit to 1728 MB/orbit). The EPS-SG IASI-NG Level 1C Product Format Specification is added as applicable document. The BUFR format of IAS-1D-PCS is modified to follow the L1C one. The estimate of the size of the BUFR format is increased (from 115 to 2081 MB/orbit). The TBC/TBD list is updated. Changes of the Product Format Version Control Number. Addition of the n_band dimension in the data \measurement_data group.

<b>Issue / Revision</b>	<b>Date</b>	<b>DCN No.</b>	<b>Description</b>
v3B	27/09/2018	—	The data group is changed to follow the L1C PFS v4 [IAS-L1C-PFS]. The size of IAS-1D-PCS is decreased. New reviewer added. Attributes are added to the satellite variables.
v3C	21/02/2019	EPSSG_DCR_1133	The attributes not used are removed. The BUFR format is changed. The TBD-TBC table is updated. The data group is changed to follow the L1C PFS v5 [IAS-L1C-PFS]. The size of IAS-1D-PCS is decreased.

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## 1 INTRODUCTION

### 1.1 Purpose and Scope

This document is the Format Specification for EPS-SG IASI-NG Level 1D products generated centrally by the EPS-SG Ground Segment at the EUMETSAT Headquarters. It specifies the detailed format of the IASI-NG Level 1D products in agreement with the format and naming conventions set out in the Generic Product Format Specification [GPFS] applicable to all EPS-SG products. The instrument specific Product Format Specification contains all the instrument specific NetCDF details, including specific metadata. The common groups and metadata are defined in the [GPFS].

This document addresses the native format of the products generated in the EPS-SG Ground Segment, which is netCDF-4 as specified in [GPFS]. Other user formats will be specified elsewhere.

### 1.2 Relation to other documents

The EPS-SG IASI-NG Level 1D Product Format Specification [IAS-L1D-PFS] is a System document in the System Specification Tree. It is called up in [SRD], [OGSRD], IASI-NG L1D Product Generation Specification [IAS-L1D-PGS] and EPS-SG System and Ground Segment documents including ICDs/IRDs wishing to convey information about the IASI-NG L1D products format and content.

This document is derived from and compliant to [GPFS] for generic product format and naming conventions applicable to all EPS-SG products.

### 1.3 Applicable Documents

ID	Title	Reference and version
[GPFS]	EPS-SG Generic Product Format Specification (GPFS)	EUM/LEO-EPSSG/SPE/13/702108
[MCSD]	EPS-SG Mission Conventions and Standards Document	EUM/LEO-EPSSG/STD/14/745221
[DEV]	Development Logic for EPS-SG L0-L1-L2 Processing Specifications	EUM/LEO-EPSSG/TEN/14/763159
[HQBAS]	"EPS-SG Data and Products Generation, Archiving and Dissemination Baseline at EUMETSAT HQ"	EUM/LEO-EPSSG/SPE/15/819557
[IAS-L1C-PFS]	EPS-SG IASI-NG Level 1C Product Format Specification	IASING-SP-4200-0272-CNES

## 1.4 Reference Documents

<b>ID</b>	<b>Title</b>	<b>Reference and version</b>
[SRD]	EPS-SG System Requirements Document	EUM/LEO-EPSSG/SPE/13/735903
[OGSRD]	EPS-SG Overall Ground Segment Requirements Document	EUM/LEO-EPSSG/REQ/13/725156
[IAS-L1D-PGS]	EPS-SG IASI-NG L1D Product Generation Specification	EUM/LEO-EPSSG/SPE/14/776813
[IAS-L1D-ADS]	EPS-SG IASI-NG L1D Auxiliary Data Specification	EUM/LEO-EPSSG/SPE/14/776811

## 1.5 Acronyms

The definition of conventions, terms and abbreviations applicable to the EPS-SG programme can be found in [MCSD].



## 1.6 Convention and Terminology

### 1.6.1 Meaning of Table Heading

Filename	The name of the product (following naming convention described in [GPFS])
Product ID	The product identifier of the product (global attribute: Product identifier as described in the [GPFS])
Product Description	A summary as defined in the relevant product format specification (global attribute: product_description described in the [GPFS])
Format	Native format of the product (i.e. netCDF-4)
Size	Estimated size of the product (Mbyte/Orbit)
Duration	Duration of product disseminated to the user (To be defined by PDAP Contractor).
Group Name	The name of the NetCDF group
Variable Name	The name of the NetCDF variable
Attribute Name	The name of the NetCDF attribute (see also <a href="http://www.unidata.ucar.edu/software/netcdf/docs/netcdf/Attribute-Conventions.html">http://www.unidata.ucar.edu/software/netcdf/docs/netcdf/Attribute-Conventions.html</a> ). Attributes may be global or related to a group instead of a variable; in this case they must appear before dimensions
Dimension Name	The name of NetCDF dimension
Description	"Description of the element; for a variable the description must coincide with its ""long_name"" attribute."
Usage	Usage of the product: Internal: Product/Data is for use within the EPS-SG system. It is not made available to the end-users. User: the product is disseminated to the end-users.

## 1.7 Document Structure

Section Number	Title	Content
1	Introduction	The Scope and Purpose of the PFS document is described in this section along with Applicable and Reference documents.
2	Overview of the instrument	A description of the main features and characteristics of the IASI-NG is provided in this section along with its acquisition modes generating data to be processed in the Ground Segment.
3	EPS-SG IASI-NG Level 1D Products Overview	A high-level overview on the IASI-NG Level 1D Product structure is presented in this section. The Product Tree and the Product Naming convention are also specified here.
4	EPS-SG IASI-NG Level 1D Product Detailed Format	The format of each IASI-NG Level 1D Product (detailed description of the NetCDF Data Files of each product) is described in this section.
5	Product Format Version Control	This section is aimed to describe the product format version control number for each product described in this document.
APP A	Size of EPS-SG IASI-NG Level 1D products	In this section the size of each IASI-NG Level 1D Products is provided.
APP B	XML Description of EPS-SG IASI-NG Level 1D Products Format	The .xml schemas for the IASI-NG Level 1D Products are provided in this section.
APP C	BUFR Format description of EPS-SG IASI-NG Level 1D Products	The BUFR format for the IASI-NG Level 1D Products are provided in this section.

## **2 OVERVIEW OF THE INSTRUMENT: IASI-NG**

An overview of the IASI-NG instrument: acquisition principle and scanning geometry is given in [IAS-L2-PGS].

A scan line is made of 14 fields of regard (FOR) consisting of 16 instantaneous and individual fields of view (FOV). An individual measurement is an infrared spectrum, originally containing 16921 channels in the L1C represented by a smaller number of principal components in the L1D products.

### 3 EPS-SG IASI-NG LEVEL 1D PRODUCT OVERVIEW

#### 3.1 Product List

Product ID	Product Description	Usage	Spatial Resolution
IAS-1D-PCS	IASI-NG Principal Component Scores	Global/Regional	pixel

#### 3.2 Naming convention

The naming convention of EPS-SG products complies with the naming convention specified in [GPFS] for all EPS-SG Ground Segment products generated in native format.

The product name of the IASI-NG L2 products is according to the following convention:

**(pflag)'\_'(productidentifier)'\_'(oflag)'\_'(originator)'\_'(YYYYMMDDhhmmss)'\_'(freeformat)**

Where freeformat contains a number of product name fields separated by the underscore symbol ”\_” as explained in the [GPFS].

An example product name using NetCDF formatting is provided (for illustrative purpose only):

**W\_xx-eumetsat-darmstadt,SAT,SGA1-IAS-1D-PCS\_C\_EUMT\_20220101121212\_G\_O\_20220101103000\_20220101104000\_O\_N\_\_nc**

This is a global Level 1D (1D) PCS product, generated in the context of the EPS-SG Global mission, for the IASI-NG instrument (IAS mission) embarked on the Metop-SG/A1 satellite (SGA1). The product was created on the 01 January 2022 at 12:12:12 hours, with a sensing start date of 01 January 2022 at 10:30:00 hours and a sensing end date of 01 January 2022 at 10:40:00 hours. The file was generated in the Ground Segment operational (O) environment. The disposition mode indicates that it was produced during routine operations (O), in NRT processing (N)

## **4 EPS-SG IASI-NG LEVEL 1D PRODUCT DETAILED FORMAT**

### **4.1 Overall Structure of EPS-SG**

All EPS-SG product types generated by the EPS-SG Ground Segment are NetCDF-4 files complying with the generic structure and data model set out in the [GPFS]. Their high-level structure is presented in the [GPFS] and consists of a root group, holding global attributes defined in the [GPFS] and the following sub-groups: status, data and quality. In the following sections, the physical composition of each product type is specified for the IASI-NG instrument.

## 4.2 IAS-1D-PCS

This section describes the detailed content of the NetCDF file, including groups, attributes, variables and dimensions applicable to the IAS-1D-PCS product.

### 4.2.1 Product Summary Sheet

The table provides a summary for the IASI-NG Level 1D PCS product.

<b>Filename</b>	W_xx-eumetsat-darmstadt,SAT,SGA[1-3]-IAS-1D-PCS_C_EUMT_YYYYMMDDhhmmss_[G R L]_[O V I D E]_YYYYMMDDhhmmss_YYYYMMDDhhmmss_[T C O V]_[N R]_.nc
<b>Product ID</b>	IAS-1D-PCS
<b>Product Description</b>	IASI-NG Principal Component Scores
<b>Format</b>	netCDF-4
<b>Size (MBytes/orbit)</b>	see Appendix A
<b>Duration</b>	TBD

*Table 4.1:* IAS-1D-PCS Product Summary Sheet

### 4.2.2 Overall Group Structure

The overall structure of the IASI-NG Level 1D PCS product is in accordance with [GPFS] and is shown in the figure 4.1.

Group dimensions, variables and attributes complement each subgroups in accordance with the NetCDF 4 model described in [GPFS].

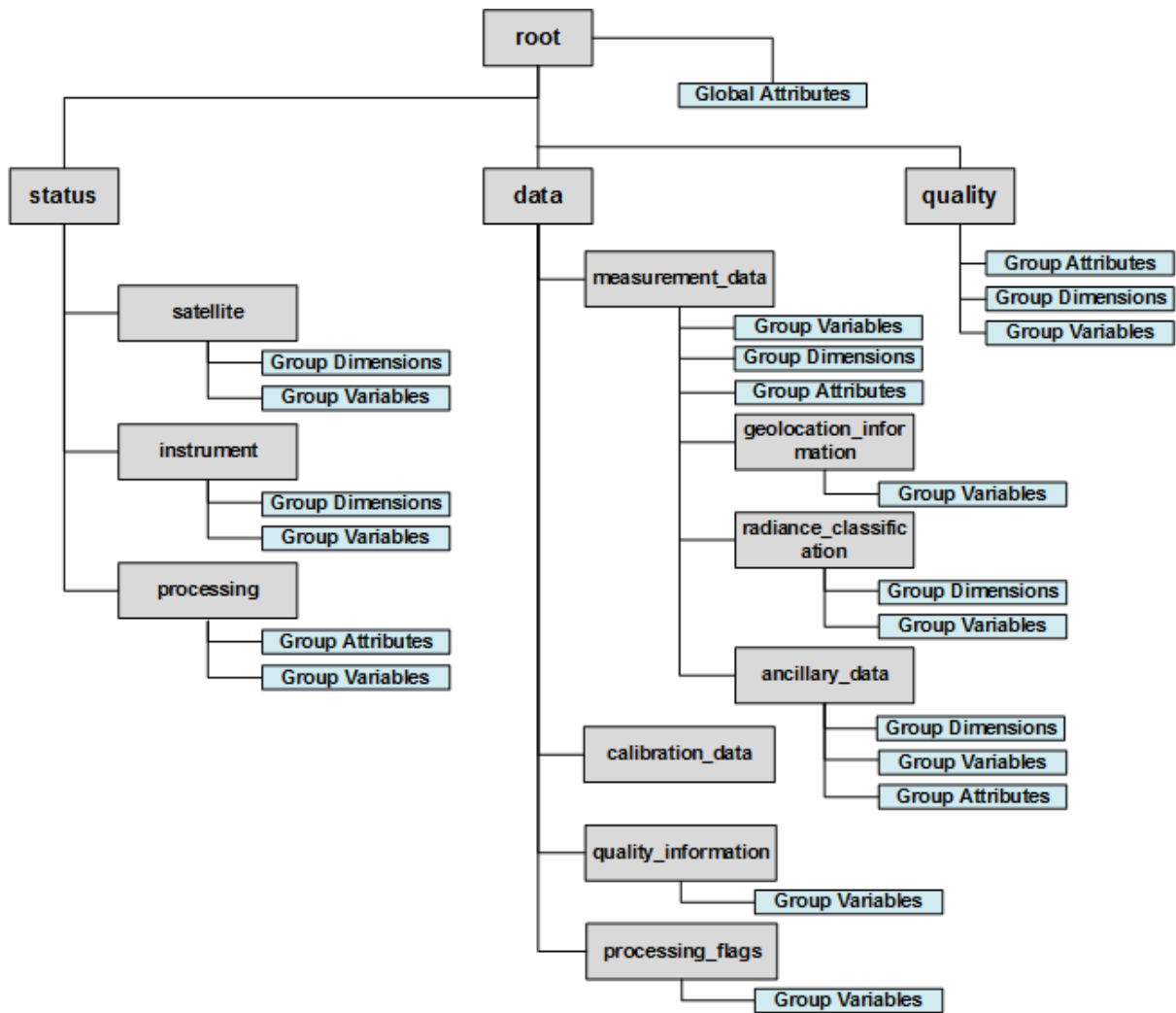


Figure 4.1: Overview of the groups in the IAS-1D-PCS product

**4.2.3 root**

**4.2.3.0.1 Attributes (global)**

Attribute Name	Data Type	Meaning and/or Value
Conventions	string	latest version of The Climate and Forecast (CF) Metadata Conventions; e.g. CF-1.6
metadata_conventions	string	Applicable version of UDDC. e.g. Unidata Dataset Discovery v1.0
product_name	string	<b>W_xx-eumetsat-darmstadt,SAT,SGA[1-3]-IAS-1D-PCS_C_EUMT_YYYYMMDDhhmmss_[G I R L]_[O I V I D E]_YYYYMMDDhhmmss_YYYYMMDDhhmmss_[T C O V]_[N I R]__.nc</b>
title	string	IAS Level 1D PCS
summary	string	Principal component scores of IASI-NG Level 1C radiance spectra
doi	string	Digital Object identifier

Attribute Name	Data Type	Meaning and/or Value
keywords	string	IASI-NG; EPS-SG; Level 1D; Infrared; Principal Components
history	string	(original generated product aggregated products sub-setted product)
institution	string	EUMETSAT
spacecraft	string	SGA(1 2 3)
instrument	string	IAS
product_level	string	1D
type	string	PCS
mission_type	string	Global Regional Local
disposition_mode	string	Test Commissioning Operational Validation
sensing_start_time_utc	string	YYYYMMDDhhmmss.ddd
sensing_end_time_utc	string	YYYYMMDDhhmmss.ddd
environment	string	Operational Validation Integration & Verification Development Engineering
references	string	www.eumetsat.int
orbit_start	uint	Absolute orbit number at sensing_start_time_utc
orbit_end	uint	Absolute orbit number at sensing_end_time_utc

**Table 4.2:** Global Dimensions for IAS-1D-PCS Product

#### 4.2.3.0.2 Dimensions (global)

No common Global Dimensions are currently envisaged.

#### 4.2.3.0.3 Variables (global)

No common Global Variables are currently envisaged.

### 4.2.4 status Group

#### 4.2.4.1 satellite Group

##### 4.2.4.1.1 satellite Attributes

No Attributes are currently envisaged.

##### 4.2.4.1.2 satellite Dimensions

Dimension Name	Comment	Dimension length
manoeuvre_items	number of manoeuvres occurring between product start and end.	$0 \leq N$

**Table 4.3:** satellite: Dimensions for IAS-1D-PCS Product

##### 4.2.4.1.3 satellite Variables

Variables Name	Description	Type	Range or Value	Dimension
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<b>Variables Name</b>	<b>Description</b>	<b>Type</b>	<b>Range or Value</b>	<b>Dimension</b>
<b>epoch_time_utc</b>	Epoch time in UTC of the orbital elements	double	valid_min to valid_max	1
long_name	Description of the variables	string	Epoch time in UTC of the orbital elements	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
valid_min	Minimum value	double	-1000000000	–
valid_max	Maximum value	double	1000000000	–
missing_value	Missing value	double	-900000000	–
<b>semi_major_axis</b>	Semi major axis of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Semi major axis of the orbit at epoch time [TOD]	–
units	Physical Units	string	m	–
valid_min	Minimum value	double	7190000	–
valid_max	Maximum value	double	7200000	–
missing_value	Missing value	double	-9000000	–
<b>eccentricity</b>	Eccentricity of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Eccentricity of the orbit at epoch time [TOD]	–
valid_min	Minimum value	double	0.00116	–
valid_max	Maximum value	double	0.00117	–
missing_value	Missing value	double	-900	–
<b>inclination</b>	Inclination of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Inclination of the orbit at epoch time [TOD]	–
units	Physical Units	string	degrees	–
valid_min	Minimum value	double	98.65	–
valid_max	Maximum value	double	98.75	–
missing_value	Missing value	double	-99	–
<b>perigee_argument</b>	Argument of perigee of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Argument of perigee of the orbit at epoch time [TOD]	–
units	Physical Units	string	degrees	–
valid_min	Minimum value	double	0	–
valid_max	Maximum value	double	360	–

Variables Name	Description	Type	Range or Value	Dimension
missing_value	Missing value	double	-999	—
<b>right_ascension</b>	Right ascension of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Right ascension of the orbit at epoch time [TOD]	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>mean_anomaly</b>	Mean anomaly of the orbit at epoch time [TOD]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Mean anomaly of the orbit at epoch time [TOD]	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>earth_sun_distance_ratio</b>	Ratio of current Earth-Sun distance to Mean Earth-Sun distance	double	valid_min to valid_max	1
long_name	Description of the variables	string	Ratio of current Earth-Sun distance to Mean Earth-Sun distance	—
valid_min	Minimum value	double	0.983	—
valid_max	Maximum value	double	1.017	—
missing_value	Missing value	double	-9999	—
<b>subsat_latitude_start</b>	Latitude of subsatellite point at start of the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Latitude of subsatellite point at start of the product	—
units	Physical Units	string	degrees_north	—
valid_min	Minimum value	double	-90	—
valid_max	Maximum value	double	90	—
missing_value	Missing value	double	-99	—
<b>subsat_longitude_start</b>	Longitude of subsatellite point at start of the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Longitude of subsatellite point at start of the product	—
units	Physical Units	string	degrees_east	—

Variables Name	Description	Type	Range or Value	Dimension
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>subsat_latitude_end</b>	Latitude of sub-satellite point at end of the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Latitude of sub-satellite point at end of the product	—
units	Physical Units	string	degrees_north	—
valid_min	Minimum value	double	-90	—
valid_max	Maximum value	double	90	—
missing_value	Missing value	double	-99	—
<b>subsat_longitude_end</b>	Longitude of sub-satellite point at end of the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Longitude of sub-satellite point at end of the product	—
units	Physical Units	string	degrees_east	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>state_vector_time_utc</b>	Time of the state vector and attitude items	double	valid_min to valid_max	1
long_name	Description of the variables	string	Time of the state vector and attitude items	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	—
valid_min	Minimum value	double	-1000000000	—
valid_max	Maximum value	double	1000000000	—
missing_value	Missing value	double	-9000000000	—
<b>x_position</b>	X position of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	X position of the orbital state vector [EARTH+FIXED]	—
units	Physical Units	string	m	—
valid_min	Minimum value	double	-7200000	—
valid_max	Maximum value	double	7200000	—
missing_value	Missing value	double	-9000000	—
<b>y_position</b>	Y position of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Y position of the orbital state vector [EARTH+FIXED]	—

Variables Name	Description	Type	Range or Value	Dimension
units	Physical Units	string	m	–
valid_min	Minimum value	double	-7200000	–
valid_max	Maximum value	double	7200000	–
missing_value	Missing value	double	-9000000	–
<b>z_position</b>	Z position of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Z position of the orbital state vector [EARTH+FIXED]	–
units	Physical Units	string	m	–
valid_min	Minimum value	double	-7200000	–
valid_max	Maximum value	double	7200000	–
missing_value	Missing value	double	-9000000	–
<b>x_velocity</b>	X velocity of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	X velocity of the orbital state vector [EARTH+FIXED]	–
units	Physical Units	string	m/s	–
valid_min	Minimum value	double	-8000	–
valid_max	Maximum value	double	8000	–
missing_value	Missing value	double	-9000	–
<b>y_velocity</b>	Y velocity of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Y velocity of the orbital state vector [EARTH+FIXED]	–
units	Physical Units	string	m/s	–
valid_min	Minimum value	double	-8000	–
valid_max	Maximum value	double	8000	–
missing_value	Missing value	double	-9000	–
<b>z_velocity</b>	Z velocity of the orbital state vector [EARTH+FIXED]	double	valid_min to valid_max	1
long_name	Description of the variables	string	Z velocity of the orbital state vector [EARTH+FIXED]	–
units	Physical Units	string	m/s	–
valid_min	Minimum value	double	-8000	–
valid_max	Maximum value	double	8000	–
missing_value	Missing value	double	-9000	–
<b>yaw_error</b>	Yaw attitude error	double	valid_min to valid_max	1
long_name	Description of the variables	string	Yaw attitude error	–

Variables Name	Description	Type	Range or Value	Dimension
units	Physical Units	string	degrees	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>roll_error</b>	Roll attitude error	double	valid_min to valid_max	1
long_name	Description of the variables	string	Roll attitude error	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>pitch_error</b>	Pitch attitude error	double	valid_min to valid_max	1
long_name	Description of the variables	string	Pitch attitude error	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	double	0	—
valid_max	Maximum value	double	360	—
missing_value	Missing value	double	-999	—
<b>leap_second_time_utc</b>	UTC time of occurrence of a leap second in this product	double	valid_min to valid_max	1
long_name	Description of the variables	string	UTC time of occurrence of a leap second in this product	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00	—
valid_min	Minimum value	double	-1000000000	—
valid_max	Maximum value	double	1000000000	—
missing_value	Missing value	double	-9000000000	—
<b>leap_second_value</b>	Value of leap second in product (1 0 or -1)	double	valid_min to valid_max	1
long_name	Description of the variables	string	Value of leap second in product (1 0 or -1)	—
units	Physical Units	string	s	—
valid_min	Minimum value	double	-1	—
valid_max	Maximum value	double	1	—
missing_value	Missing value	double	-32768	—
	<b>only in case of manoeuvre</b>			
<b>manoeuvre_occurrence</b>	Occurrence of manoeuvres between start and end times of the product (1 or 2) 1 for in-plane manoeuvre and 2 for out-of-plane manoeuvre	double	valid_min to valid_max	manoeuvre_items

Variables Name	Description	Type	Range or Value	Dimension
long_name	Description of the variables	string	Occurrence of manoeuvres between start and end times of the product (1 or 2) 1 for in-plane manoeuvre and 2 for out-of-plane manoeuvre	–
valid_min	Minimum value	double	0	–
valid_max	Maximum value	double	1	–
missing_value	Missing value	double	-9	–
<b>manoeuvre_start_time_utc</b>	UTC time of start of manoeuvre	double	valid_min to valid_max	manoeuvre_items
long_name	Description of the variables	string	UTC time of start of manoeuvre	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
valid_min	Minimum value	double	-1000000000	–
valid_max	Maximum value	double	1000000000	–
missing_value	Missing value	double	-9000000000	–
<b>manoeuvre_end_time_utc</b>	UTC time of end of manoeuvre	double	valid_min to valid_max	manoeuvre_items
long_name	Description of the variables	string	UTC time of end of manoeuvre	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
valid_min	Minimum value	double	-1000000000	–
valid_max	Maximum value	double	1000000000	–
missing_value	Missing value	double	-9000000000	–

**Table 4.4:** satellite: Variables for IAS-1D-PCS Product

#### 4.2.4.2 instrument Group

##### 4.2.4.2.1 instrument Attributes

No Attributes are currently envisaged.

##### 4.2.4.2.2 instrument Dimensions

Dimension Name	Comment	Dimension length
mode_items	number of modes the instrument assumed during product duration	$1 \leq N$

**Table 4.5:** instrument: Dimensions for IAS-1D-PCS Product

##### 4.2.4.2.3 instrument Variables

Variables Name	Description	Type	Type or Value	Dimension
<b>Instrument Modes shape = mode_items</b>				
<b>mode_start_time_utc</b>	Start time of the mode	double	valid_min to valid_max	mode_items
long_name	Description of the variables	string	Start time of the mode	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
valid_min	Minimum value	double	-1.e9	–
valid_max	Maximum value	double	1.e9	–
missing_value	Missing value	double	-9.e9	–
<b>mode_end_time_utc</b>	End time of the mode	double	valid_min to valid_max	mode_items
long_name	Description of the variables	string	End time of the mode	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	–
valid_min	Minimum value	double	-1.e9	–
valid_max	Maximum value	double	1.e9	–
missing_value	Missing value	double	-9.e9	–
<b>instrument_mode</b>	Name of the instrument mode assumed during period	string	valid_min to valid_max	mode_items
long_name	Description of the variables	string	Name of the instrument mode assumed during period	–
missing_value	Missing value	string		–

**Table 4.6:** instrument: Variables for IAS-1D-PCS Product

#### 4.2.4.3 processing Group

##### 4.2.4.3.1 processing Attributes

Attribute Name	Data Type	Meaning and/or Value
processor_name	string	IAS_L1D
processor_version	string	
processing_mode	string	(NRT Reprocessing)
format_version	string	3.2
pgs_reference_and_version	string	EUM/LEO-EPSSG/SPE/14/776813 v3C
pfs_reference_and_version	string	EUM/LEO-EPSSG/SPE/14/776809 v3C
atbd_reference_and_version	string	EUM/LEO-EPSSG/SPE/13/737517 v3C
baseline	string	
source	string	(AUXILIARY_DATA_NAME)*(INPUT_PRODUCT_NAME)* where the asterisks indicate zero or more instances

**Table 4.7:** processing: Attributes for IAS-1D-PCS Product

#### 4.2.4.3.2 processing Dimensions

No Dimensions are currently envisaged.

#### 4.2.4.3.3 processing Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>creation_time_utc</b>	UTC time of the start of the product creation	double	valid_min to valid_max	1
long_name	Description of the variables	string	UTC time of the start of the product creation	–
units	Physical Units	string	seconds since 2020-01-01 00:00:00	–
valid_min	Minimum value	double	-1.e9	–
valid_max	Maximum value	double	1.e9	–
missing_value	Missing value	double	-9.e9	–

*Table 4.8:* processing: Variables for IAS-1D-PCS Product

### 4.2.5 data Group

#### 4.2.5.0.1 data Attributes

No data attributes are envisaged

#### 4.2.5.0.2 data Dimensions

Dimension Name	Comment	Dimension length
<b>n_lines</b>	number of considered lines in the orbit	383
<b>n_for</b>	number of considered acquisition in the BRC	14
<b>n_fov</b>	number of field of view in the field of regard	16

*Table 4.9:* data: Dimensions for IAS-1D-PCS Product

#### 4.2.5.1 measurement\_data Group

##### 4.2.5.1.1 measurement\_data Dimensions

Dimension Name	Comment	Dimension length
<b>n_pc1</b>	number of PC scores band 1	≤ 100
<b>n_pc2</b>	number of PC scores band 2	≤ 100
<b>n_pc3</b>	number of PC scores band 3	≤ 80
<b>n_pc4</b>	number of PC scores band 4	≤ 60
<b>n_wn</b>	number of wavenumber in the band	16921
<b>n_band</b>	number of bands	4



Dimension Name	Comment	Dimension length
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*Table 4.10:* data/measurement\_data: Dimensions for IAS-1D-PCS Product

#### 4.2.5.1.2 measurement\_data Attributes

Attribute Name	Data Type	Meaning and/or Value
spectrum_sampling_ratio [cm <sup>-1</sup> ]	float	0.125
spectrum_band_limit_min [cm <sup>-1</sup> ]	int	645
spectrum_band_limit_max [cm <sup>-1</sup> ]	int	2760

*Table 4.11:* Global Dimensions for IAS-1D-PCS Product

#### 4.2.5.1.3 measurement\_data Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>for_index</b>	Step index of FOR into BRC	ubyte	valid_min to valid_max	n_for
long_name	Description of the variables	string	Step index of FOR into BRC	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	14	—
missing_value	Missing value	ubyte	15	—
<b>fov_index</b>	Pixel index in the FOR according to space segment specification	ubyte	valid_min to valid_max	n_fov
long_name	Description of the variables	string	Pixel index in the FOR according to space segment specification	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	16	—
missing_value	Missing value	ubyte	31	—
<b>pcscores_b1</b>	Band 1 PC scores	int	valid_min to valid_max	n_lines n_for n_fov n_pc1
long_name	Description of the variables	string	Band 1 PC scores	—
missing_value	Missing value	int	2147483647	—

Variables Name	Description	Type	Range or Value	Dimension
<b>pcscores_b2</b>	Band 2 PC scores	int	valid_min to valid_max	n_lines n_for n_fov n_pc2
long_name	Description of the variables	string	Band 2 PC scores	–
missing_value	Missing value	int	2147483647	–
<b>pcscores_b3</b>	Band 3 PC scores	int	valid_min to valid_max	n_lines n_for n_fov n_pc3
long_name	Description of the variables	string	Band 3 PC scores	–
missing_value	Missing value	int	2147483647	–
<b>pcscores_b4</b>	Band 4 PC scores	int	valid_min to valid_max	n_lines n_for n_fov n_pc4
long_name	Description of the variables	string	Band 4 PC scores	–
missing_value	Missing value	int	2147483647	–
<b>radiance_sum</b>	Sum of radiances in each band	float	valid_min to valid_max	n_lines n_for n_fov n_band
long_name	Description of the variables	string	Sum of radiances in each band	–
units	Physical Units	string	$W \cdot m^{-2} \cdot sr^{-1} \cdot m^{-1}$	–
missing_value	Missing value	float	3.4e+38	–
<b>residual_rms</b>	Residual RMS per band	float	valid_min to valid_max	n_lines n_for n_fov n_band
long_name	Description of the variables	string	Residual RMS per band	–
units	Physical Units	string	1	–
missing_value	Missing value	float	3.4e+38	–
<b>flag_compression</b>	0 = ok bit1-bit4:score too high	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	0 = ok bit1-bit4:score too high	–
missing_value	Missing value	ubyte	255	–
<b>flag_outlier</b>	Indication of bands where residuals RMS exceeds threshold	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Indication of bands where residuals RMS exceeds threshold	–
missing_value	Missing value	ubyte	255	–
<b>wn</b>	Wavenumber base	ushort	valid_min to valid_max	n_wn

Variables Name	Description	Type	Range or Value	Dimension
long_name	Description of the variables	string	Wavenumber base	—
units	Physical Units	string	cm-1	—
valid_min	Minimum value	ushort	0	—
valid_max	Maximum value	ushort	65534	—
scale_factor	Scale factor	float	0.032273324	—
add_offset	Offset	float	645.	—
missing_value	Missing value	ushort	65535	—

**Table 4.12:** measurement\_data: Variables for IAS-1D-PCS Product

#### 4.2.5.1.4 geolocation\_information Group

##### 4.2.5.1.4.1 geolocation\_information Dimensions

No dimensions currently identified

##### 4.2.5.1.4.2 geolocation\_information Attributes

No attributes currently identified

##### 4.2.5.1.4.3 geolocation\_information Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>alpha_scan_angle</b>	Scan angle values	int	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Scan angle values	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	int	-2147483647	—
valid_max	Maximum value	int	2147483647	—
scale_factor	Scale factor	float	7.66012817977934e-08	—
add_offset	Offset	float	114.5	—
missing_value	Missing value	int	-2147483648	—
<b>earth_satellite_distance</b>	Distance of satellite from Earth centre	uint	valid_min to valid_max	1
long_name	Description of the variables	string	Distance of satellite from Earth centre	—
units	Physical Units	string	m	—
valid_min	Minimum value	uint	0	—
valid_max	Maximum value	uint	200000	—
scale_factor	Scale factor	float	10	—
add_offset	Offset	float	6000000	—
missing_value	Missing value	uint	262143	—
<b>onboard_utc</b>	On-board time in UTC	double	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	On-board time in UTC	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	—
valid_min	Minimum value	double	-1000000000.	—

Variables Name	Description	Type	Range or Value	Dimension
valid_max	Maximum value	double	1000000000.	—
missing_value	Missing value	double	-9000000000.	—
<b>sounder_pixel_vii _pixel</b>	Position of sounder pixel centre in VII product (VII pixel)	ushort	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Position of sounder pixel centre in VII product (VII pixel)	—
units	Physical Units	string	VII pixel index	—
valid_min	Minimum value	ushort	0	—
valid_max	Maximum value	ushort	3144	—
missing_value	Missing value	ushort	4095	—
<b>sounder_pixel_vii_time</b>	Position of sounder pixel centre in VII product (VII time in UTC)	double	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Position of sounder pixel centre in VII product (VII time in UTC)	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	—
valid_min	Minimum value	double	-1000000000.	—
valid_max	Maximum value	double	1000000000.	—
missing_value	Missing value	double	-9000000000.	—
<b>sounder_pixel_azimuth</b>	Measurement azimuth angle at sounder pixel centre	int	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Measurement azimuth angle at sounder pixel centre	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	int	-2147483647	—
valid_max	Maximum value	int	2147483647	—
scale_factor	Scale factor	float	8.38190317544243e-08	—
add_offset	Offset	float	0.	—
missing_value	Missing value	int	-2147483648	—
<b>sounder_pixel_latitude</b>	Latitude at sounder pixel centre	short	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Latitude at sounder pixel centre	—
units	Physical Units	string	degrees_north	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	0.00274666585283975	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—
<b>sounder_pixel_longitude</b>	Longitude at sounder pixel centre	short	valid_min to valid_max	n_lines n_for n_fov

<b>Variables Name</b>	<b>Description</b>	<b>Type</b>	<b>Range or Value</b>	<b>Dimension</b>
long_name	Description of the variables	string	Longitude at sounder pixel centre	—
units	Physical Units	string	degrees_east	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	0.005493332	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—
<b>sounder_pixel_sun_azimuth</b>	Solar azimuth angle at sounder pixel centre	int	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Solar azimuth angle at sounder pixel centre	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	int	-2147483647	—
valid_max	Maximum value	int	2147483647	—
scale_factor	Scale factor	float	8.38190317544243e-08	—
add_offset	Offset	float	0.	—
missing_value	Missing value	int	-2147483648	—
<b>sounder_pixel_sun_zenith</b>	Solar zenith angle at sounder pixel centre	uint	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Solar zenith angle at sounder pixel centre	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	uint	0	—
valid_max	Maximum value	uint	4294967294	—
scale_factor	Scale factor	float	2.09547579386061e-08	—
add_offset	Offset	float	0.	—
missing_value	Missing value	uint	4294967295	—
<b>sounder_pixel_zenith</b>	Measurement zenith angle at sounder pixel centre	uint	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Measurement zenith angle at sounder pixel centre	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	uint	0	—
valid_max	Maximum value	uint	4294967294	—
scale_factor	Scale factor	float	2.09547579386061e-08	—
add_offset	Offset	float	0.	—
missing_value	Missing value	uint	4294967295	—

**Table 4.13:** geolocation\_information: Variables for IAS-1D-PCS Product

#### 4.2.5.1.5 radiances\_classification Group

##### 4.2.5.1.5.1 radiances\_classification Dimensions

Dimension Name	Comment	Dimension length
<b>n_class_channels</b>	identification of the VII channels or pseudo channels used for radiance analysis	7
<b>n_class</b>	number of classes identified	7
<b>class_image_nl</b>	number of lines in the classes image	150 (if IASI image is used for classification) or 115 if VII product is used for classification
<b>class_image_nc</b>	number of column in the classes image	150 (if IASI image is used for classification) or 115 if VII product is used for classification

*Table 4.14:* data/measurement\_data/radiances\_classification: Dimensions for IAS-1D-PCS Product

#### 4.2.5.1.5.2 radiances\_classification Attributes

No attributes currently identified

#### 4.2.5.1.5.3 radiances\_classification Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>homogeneity_flag</b>	Scene homogeneity flag: 0=homogeneous; 1=non-homogeneous	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Scene homogeneity flag: 0=homogeneous; 1=non-homogeneous	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	1	—
missing_value	Missing value	ubyte	3	—
<b>meti_clear_fraction</b>	Fraction in IASI-NG FOV of clear MET-Image pixels	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Fraction in IASI-NG FOV of clear MET-Image pixels	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—

<b>Variables Name</b>	<b>Description</b>	<b>Type</b>	<b>Range or Value</b>	<b>Dimension</b>
<b>meti_prob_clear_fraction</b>	Fraction in IASI-NG FOV of probably clear MET-Image pixels	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Fraction in IASI-NG FOV of probably clear MET-Image pixels	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—
<b>meti_prob_cloudy_fraction</b>	Fraction in IASI-NG FOV of probably cloudy MET-Image pixels	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Fraction in IASI-NG FOV of probably cloudy MET-Image pixels	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—
<b>meti_cloudy_fraction</b>	Fraction in IASI-NG FOV of cloudy MET-Image pixels	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Fraction in IASI-NG FOV of cloudy MET-Image pixels	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—
<b>meti_ash_fraction</b>	Fraction in IASI-NG FOV of MET-Image pixels covered by ash	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Fraction in IASI-NG FOV of MET-Image pixels covered by ash	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—
<b>class_channels_id</b>	Channels used for pixel classification	ubyte	valid_min to valid_max	n_lines n_class_channels
long_name	Description of the variables	string	Channels used for pixel classification	—
units	Physical Units	string	-	—

<b>Variables Name</b>	<b>Description</b>	<b>Type</b>	<b>Range or Value</b>	<b>Dimension</b>
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	7	—
missing_value	Missing value	ubyte	15	—
<b>class_channels_mean</b>	Channels radiances averages in pixel classes	short (TBC)	valid_min to valid_max	n_lines n_for n_fov n_class n_class_channels
long_name	Description of the variables	string	Channels radiances averages in pixel classes	—
units	Physical Units	string	TBD	—
valid_min	Minimum value	short (TBC)	TBD	—
valid_max	Maximum value	short (TBC)	TBD	—
scale_factor	Scale factor	float	TBD	—
add_offset	Offset	float	TBD	—
missing_value	Missing value	short (TBC)	16383	—
<b>class_channels_std</b>	Standard deviation of channels radiances in pixel classes	short (TBC)	valid_min to valid_max	n_lines n_for n_fov n_class n_class_channels
long_name	Description of the variables	string	Standard deviation of channels radiances in pixel classes	—
units	Physical Units	string	TBD	—
valid_min	Minimum value	short (TBC)	TBD	—
valid_max	Maximum value	short (TBC)	TBD	—
scale_factor	Scale factor	float	TBD	—
add_offset	Offset	float	TBD	—
missing_value	Missing value	short (TBC)		—
<b>class_first_useful_col</b>	Index of the first useful column in classes image	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Index of the first useful column in classes image	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	115	—
missing_value	Missing value	ubyte	255	—
<b>class_first_useful_line</b>	Index of the first useful line in classes image	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Index of the first useful line in classes image	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	115	—



Variables Name	Description	Type	Range or Value	Dimension
missing_value	Missing value	ubyte	255	—
<b>class_fraction</b>	Class percentage in the sounder pixel	ubyte	valid_min to valid_max	n_lines n_for n_fov n_class
long_name	Description of the variables	string	Class percentage in the sounder pixel	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—
<b>class_gravity_centre_y</b>	Y angular position of gravity centre	short	valid_min to valid_max	n_lines n_for n_fov n_class
long_name	Description of the variables	string	Y angular position of gravity centre	—
units	Physical Units	string	rad	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	2.44148075807978e-07	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—
<b>class_gravity_centre_z</b>	Z angular position of gravity centre	short	valid_min to valid_max	n_lines n_for n_fov n_class
long_name	Description of the variables	string	Z angular position of gravity centre	—
units	Physical Units	string	degrees	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	2.44148075807978e-07	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—
<b>class_image</b>	Classes images	ubyte	valid_min to valid_max	n_lines n_for class_image_nl class_image_nc
long_name	Description of the variables	string	Classes images	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	7	—
missing_value	Missing value	ubyte	31	—
<b>class_image_useful_col_nb</b>	Nb of useful columns in classes image	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Nb of useful columns in classes image	—

Variables Name	Description	Type	Range or Value	Dimension
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	115	—
missing_value	Missing value	ubyte	255	—
<b>class_image_useful_line_nb</b>	Nb of useful lines in classes image	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Nb of useful lines in classes image	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	115	—
missing_value	Missing value	ubyte	255	—
<b>class_number</b>	Number of classes identified in the sounder pixel	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Number of classes identified in the sounder pixel	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	1	—
valid_max	Maximum value	ubyte	7	—
missing_value	Missing value	ubyte	31	—
<b>extreme_classes_flag</b>	1=classes of extreme type; 0=no classes of extreme type	ubyte	valid_min to valid_max	n_lines n_for n_fov n_class
long_name	Description of the variables	string	1=classes of extreme type; 0=no classes of extreme type	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	1	—
missing_value	Missing value	ubyte	3	—
<b>land_fraction</b>	Land fraction in sounder pixel (nominally from VII L2 Cloud)	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Land fraction in sounder pixel (nominally from VII L2 Cloud)	—
units	Physical Units	string	%	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	100	—
missing_value	Missing value	ubyte	127	—

**Table 4.15:** radiances\_classification: Variables for IAS-1D-PCS Product

#### 4.2.5.1.6 ancillary\_data Group

#### 4.2.5.1.6.1 ancillary\_data Dimensions

Dimension Name	Comment	Dimension length
<b>psf_subg_y</b>	Y size of PSF grid for each pixel (TBC)	41 (TBC)
<b>psf_subg_z</b>	Z size of PSF grid for each pixel (TBC)	41 (TBC)
<b>sounder_apod_grid</b>	Number of values of sounder gaussian apodization function	131072

*Table 4.16:* data/measurement\_data/ancillary\_data: Dimensions for IAS-1D-PCS Product

#### 4.2.5.1.6.2 ancillary\_data Attributes

Attribute Name	Data Type	Meaning and/or Value
sounder_apod_sampling_ratio	float	TBD[cm <sup>-1</sup> ]
sounder_apod_first	int	TBD[cm <sup>-1</sup> ]
sounder_apod_last	int	TBD[cm <sup>-1</sup> ]

*Table 4.17:* Global Dimensions for IAS-1D-PCS Product

#### 4.2.5.1.6.3 ancillary\_data Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>sounder_apodization_function</b>	Sounder Gaussian apodization function	double	valid_min to valid_max	sounder_apod_grid
long_name	Description of the variables	string	Sounder Gaussian apodization function	—
units	Physical Units	string	-	—
valid_min	Minimum value	double	-1.	—
valid_max	Maximum value	double	1.	—
missing_value	Missing value	double	-9000000000.	—
<b>sounder_psf</b>	Sounder product spread function (PSF)	ushort	valid_min to valid_max	n_fov_psf_subg_y psf_subg_z
long_name	Description of the variables	string	Sounder product spread function (PSF)	—
valid_min	Minimum value	ushort	0	—
valid_max	Maximum value	ushort	65534	—
scale_factor	Scale factor	float	1.52592547379986e-05	—
add_offset	Offset	float	0.	—
missing_value	Missing value	ushort	65535	—
<b>sounder_psf_col_nb</b>	Number of columns for sounder PSF	ubyte	valid_min to valid_max	n_fov

Variables Name	Description	Type	Range or Value	Dimension
long_name	Description of the variables	string	Number of columns for sounder PSF	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	101	—
missing_value	Missing value	ubyte	127	—
<b>sounder_psf_line_nb</b>	Number of lines for sounder PSF	ubyte	valid_min to valid_max	n_fov
long_name	Description of the variables	string	Number of lines for sounder PSF	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	101	—
missing_value	Missing value	ubyte	127	—
<b>sounder_psf_position_y</b>	Y angular position of sounder PSF	short	valid_min to valid_max	n_fov_psf_subg_y
long_name	Description of the variables	string	Y angular position of sounder PSF	—
units	Physical Units	string	rad	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	2.44148075807978e-07	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—
<b>sounder_psf_position_z</b>	Z angular position of sounder PSF	short	valid_min to valid_max	n_fov_psf_subg_z
long_name	Description of the variables	string	Z angular position of sounder PSF	—
units	Physical Units	string	rad	—
valid_min	Minimum value	short	-32767	—
valid_max	Maximum value	short	32767	—
scale_factor	Scale factor	float	2.44148075807978e-07	—
add_offset	Offset	float	0.	—
missing_value	Missing value	short	-32768	—

**Table 4.18:** ancillary\_data: Variables for IAS-1D-PCS Product

#### 4.2.5.2 quality\_information Group

##### 4.2.5.2.1 quality\_information Dimensions

No dimensions currently identified

##### 4.2.5.2.2 quality\_information Attributes

No attributes currently identified

##### 4.2.5.2.3 quality\_information Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>general_quality_flags</b>	Product quality flags per bit: bit1: general quality; bit2: presence of mathematical errors; bit3: imager; bit4: imager geometric; bit5: imager radiometric; 0=ok; 1=nok	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Product quality flags per bit: bit1: general quality; bit2: presence of mathematical errors; bit3: imager; bit4: imager geometric; bit5: imager radiometric; 0=ok; 1=nok	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	31	—
missing_value	Missing value	ubyte	63	—
<b>sounder_quality_flags</b>	Sounder product quality flags per bit: bit1: sounder; bit2: geometric; bit3: radiometric; bit4: spectral; 0= ok; 1=nok	ubyte	valid_min to valid_max	n_lines n_for n_fov
long_name	Description of the variables	string	Sounder product quality flags per bit: bit1: sounder; bit2: geometric; bit3: radiometric; bit4: spectral; 0= ok; 1=nok	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	15	—
missing_value	Missing value	ubyte	31	—

**Table 4.19:** quality\_information: Variables for IAS-1D-PCS Product

### 4.2.5.3 processing\_flags Group

#### 4.2.5.3.1 processing\_flags Dimensions

No dimensions currently identified

#### 4.2.5.3.2 processing\_flags Attributes

No attributes currently identified

### 4.2.5.3.3 processing\_flags Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>imager_processing_modes</b>	Bit1-2: Geolocation mode: 0=IASI image coregistration with METImage; 1=geolocation with NAVATT; 2=geolocation with AUX_POFD; Bit3: Classification mode: 0=METImage; 1=IASI-NG Imager; Bit4 : Classification mode: 0=METImage; 1=static Land Sea Mask	ubyte	valid_min to valid_max	n_lines n_for
long_name	Description of the variables	string	Bit1-2: Geolocation mode: 0=IASI image coregistration with METImage; 1=geolocation with NAVATT; 2=geolocation with AUX_POFD; Bit3: Classification mode: 0=METImage; 1=IASI-NG Imager; Bit4 : Classification mode: 0=METImage; 1=static Land Sea Mask	—
units	Physical Units	string	-	—
valid_min	Minimum value	ubyte	0	—
valid_max	Maximum value	ubyte	15	—
missing_value	Missing value	ubyte	31	—

**Table 4.20:** processing\_flags: Variables for IAS-1D-PCS Product

## 4.2.6 quality Group

### 4.2.6.0.1 quality Attributes

Attribute Name	Data Type	Meaning and/or Value
overall_quality_flag	ushort	0 if overall quality is OK. Bit 0: Missing input product(s). Bit 1: Data gap(s). Bit 2: Corrupted input product(s). Bit 3: Instrument anomaly. Bit 4: missing or degraded auxiliary data. Bit 5 to 15: not used.

**Table 4.21:** quality: Attributes for IAS-1D-PCS Product

#### 4.2.6.0.2 quality Dimensions

Dimension Name	Comment	Dimension length
gap_items	Number of gaps indentified during product duration	$1 \leq N$

*Table 4.22:* quality: Dimensions for IAS-1D-PCS Product

#### 4.2.6.0.3 quality Variables

Variables Name	Description	Type	Range or Value	Dimension
<b>duration_of_product</b>	Entire duration of the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Entire duration of the product	—
units	Physical Units	string	s	—
valid_min	Minimum value	double	0	—
missing_value	Missing value	double		—
<b>duration_of_data_present</b>	Amount of data present in the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Amount of data present in the product	—
units	Physical Units	string	s	—
valid_min	Minimum value	double	0	—
missing_value	Missing value	double		—
<b>duration_of_data_missing</b>	Amount of data missing in the product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Amount of data missing in the product	—
units	Physical Units	string	s	—
valid_min	Minimum value	double	0	—
missing_value	Missing value	double		—
<b>duration_of_data_degraded</b>	Amount of data degraded in product	double	valid_min to valid_max	1
long_name	Description of the variables	string	Amount of data degraded in product	—
units	Physical Units	string	s	—
valid_min	Minimum value	double	0	—
missing_value	Missing value	double		—
<b>gap_start_time_utc</b>	Gap start time in UTC	double	valid_min to valid_max	gap_items
long_name	Description of the variables	string	Gap start time in UTC	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	—
valid_min	Minimum value	double	-1.e9	—
valid_max	Maximum value	double	1.e9	—

<b>Variables Name</b>	<b>Description</b>	<b>Type</b>	<b>Range or Value</b>	<b>Dimension</b>
missing_value	Missing value	double	-9.e9	—
<b>gap_end_time_utc</b>	Gap end time in UTC	double	valid_min to valid_max	gap_items
long_name	Description of the variables	string	Gap end time in UTC	—
units	Physical Units	string	seconds since 2020-01-01 00:00:00.000	—
valid_min	Minimum value	double	-1.e9	—
valid_max	Maximum value	double	1.e9	—
missing_value	Missing value	double	-9.e9	—

**Table 4.23:** Quality: Variables for IAS-1D-PCS Product



## 5 PRODUCT FORMAT VERSION CONTROL

This section provides Product Format Version Control Numbers for IAS-1D-PCS product defined within this document. This version is reflected in the following global attribute present in each EPS-SG mission product centrally generated as described in the [GPFS].

### 5.1 IAS-1D-PCS Format Version Control

<b>Product ID</b>	<b>Product Format Version Control Number (format_version)</b>	<b>Product Format Specification Issue (pfs_reference_and_version)</b>	<b>Generic Product Format Specification Issue (gpfs_reference_and_version)</b>
IAS-1D-PCS	0.0	1C	1E
IAS-1D-PCS	1.0	2C	1H
IAS-1D-PCS	2.0	2G	2A
IAS-1D-PCS	3.0	3A	3B
IAS-1D-PCS	3.1	3B	3B
IAS-1D-PCS	4.0	3C	3C

## A SIZE OF EPS-SG IASI-NG LEVEL 1D PRODUCTS

The Level 1D products contains the same fields as the L1C products, except that the radiances will be encoded as PC scores.

In the following table, the evaluation of the size for the measurement\_data group is reported:

Dimension name	Length
<b>n_pc1</b>	100
<b>n_pc2</b>	100
<b>n_pc3</b>	80
<b>n_pc4</b>	60
<b>n_wn</b>	16921

Variable name	Description [Units]	Shape	Type	Size(KB)
<b>fov_index</b>	Pixel index according to space segment specification	(n_fov)	ubyte	0
<b>for_index</b>	Step index into BRC	(n_for)	ubyte	0
<b>wn</b>	Wavenumber base [ $cm^{-1}$ ]	(n_wn)	ushort	33
<b>pcscores_b1</b>	Band 1 PC scores	(n_lines, n_for, n_fov, n_pc1)	int	33512
<b>pcscores_b2</b>	Band 2 PC scores	(n_lines, n_for, n_fov, n_pc2)	int	33512
<b>pcscores_b3</b>	Band 3 PC scores	(n_lines, n_for, n_fov, n_pc3)	int	26810
<b>pcscores_b4</b>	Band 4 PC scores	(n_lines, n_for, n_fov, n_pc4)	int	20107
<b>radiance_sum</b>	Sum of radiances in each band [ $W/m^2/sr/m^{-1}$ ]	(n_lines, n_for, n_fov, n_band)	float	1340
<b>residual_rms</b>	Residual RMS per band	(n_lines, n_for, n_fov, n_band)	float	1340
<b>flg_compression</b>	0 = ok bit1-bit4: score too high	(n_lines, n_for, n_fov)	byte	83
<b>flg_outlier</b>	Indication of bands where residuals RMS exceeds threshold	(n_lines, n_for, n_fov)	byte	83
<b>Total</b>				116820

But since the dynamic range of the lower ranking PC scores is small, the NetCDF internal compression scheme is able to gain estimated a factor four in size, such that about 29 MB/orbit will be needed.

Product ID	Product Description	size(MB/Orbit)
IAS-1D-PCS	IASI-NG Principal Component Scores	253
IAS-1D-PCS	IASI-NG Principal Component Scores (after internal compression)	168

**B XML DESCRIPTION OF EPS-SG IASI-NG LEVEL 1D PRODUCTS**

The XML format is in the following files:



## C BUFR FORMAT DESCRIPTION OF EPS-SG IASI-NG LEVEL 1D PRODUCTS

This section will include the BUFR specification of the IASI-NG L1D product.

References	Element	Notes (WMO)	Variable(s) from NetCDF
<b>IASI sequence combining PC scores, channel selection and enhanced data</b>			
<b>Satellite processing information</b>			
<b>0 01 007</b>	Satellite identifier		/spacecraft
<b>0 01 031</b>	Identification of originating/generating centre		/institution
<b>0 02 019</b>	Satellite instruments		/instrument
<b>0 02 020</b>	Satellite classification		e.g. 383 EPS-SG
<b>0 04 001</b>	Year		e.g. /data/measurement_data /geolocation/onboard_utc
<b>0 04 002</b>	Month		
<b>0 04 003</b>	Day		
<b>0 04 004</b>	Hour		
<b>0 04 005</b>	Minute		
<b>2 02 131</b>	Change scale	Add 3 to scale	
<b>2 01 138</b>	Change data width	Add 10 to width	
<b>0 04 006</b>	Second		
<b>2 01 000</b>	Change data width	Cancel	
<b>2 02 000</b>	Change scale	Cancel	
<b>Location information</b>			
<b>0 05 001</b>	Latitude (high accuracy)		/data/measurement_data /geolocation/sounder_pixel- _latitude
<b>0 06 001</b>	Longitude (high accuracy)		/data/measurement_data /geolocation/sounder_pixel- _longitude
<b>0 07 024</b>	Satellite zenith angle		/data/measurement_data /geolocation/sounder_pixel- _zenith
<b>0 05 021</b>	Bearing or azimuth		/data/measurement_data /geolocation/sounder_pixel- _azimuth
<b>0 07 025</b>	Solar zenith angle		/data/measurement_data /geolocation/sounder_pixel- _sun_zenith
<b>0 05 022</b>	Solar azimuth		/data/measurement_data /geolocation/sounder_pixel- _sun_azimuth
<b>0 05 043</b>	Field of view number		/data/measurement_data /geolocation/fov_index
<b>0 05 040</b>	Orbit number		/orbit_start
<b>2 01 133</b>	Change data width	Add 5 to width	
<b>0 05 041</b>	Scan line number		Index of /data/measurement- _data/n_lines
<b>2 01 000</b>	Change data width	Cancel	
<b>2 02 126</b>	Change scale	Subtract 2 from scale	
<b>0 07 001</b>	Height of station		/status/z_position or obtain from NAV

<b>2 02 000</b>	Change scale Cancel		
<b>Quality information</b>			
<b>1 03 003</b>	Replicate descriptors 3 times	3	
<b>0 25 140</b>	Start channel		
<b>0 25 141</b>	End channel		
<b>0 33 060</b>	GqisFlagQual ? individual IASI-System quality flag		/data/quality_information /overall_quality_flag
<b>Instrument band definition and PCS</b>			
<b>1 07 004</b>	Replicate descriptors 4 times	7	
<b>0 25 140</b>	Start channel		Start channel of band
<b>0 25 141</b>	End channel		End channel of band
<b>0 40 026</b>	Score quantization factor		Static 0.5 in our current products
<b>0 40 016</b>	Residual RMS in band		/data/measurement_data /residual_rms
<b>1 01 000</b>	Delayed replication of 1 descriptor		
<b>0 31 002</b>	Extended delayed descriptor replication factor		
<b>0 40 017</b>	Non-normalized principal component score		pcscores_bn
<b>Imager scene analysis: as in IAS-1C-RAD</b>			

An estimate of the size of the BUFR format of IAS-1D-PCS is 180.92 MB/orbit.

**TBD/TBC**
**TBD**

<b>ID</b>	<b>Section</b>	<b>Title</b>	<b>Text</b>
TBD-01	4.2.1	Duration of IAS-1D-PCS	This TBD is to be defined by the PDAP Contractor.
TBD-06	4.2.5.1.6	sounder_apod_sampling_ratio	Value of the attribute sounder_apod_sampling_ratio. This TBD is copied from L1C PFS
TBD-07	4.2.5.1.6	sounder_apod_first	Value of the attribute sounder_apod_first. This TBD is copied from L1C PFS
TBD-08	4.2.5.1.6	sounder_apod_last	Value of the attribute sounder_apod_last. This TBD is copied from L1C PFS
TBD-09	4.2.5.1.5	class_channel_mean	Units, Min_value, Max_value, Scale_factor, Offset and Missing_value are TBD. This TBD is copied from L1C PFS.
TBD-10	4.2.5.1.5	class_channel_std	Units, Min_value, Max_value, Scale_factor, Offset and Missing_value are TBD. This TBD is copied from L1C PFS.

**TBC**

<b>ID</b>	<b>Section</b>	<b>Title</b>	<b>Text</b>
TBC-08	4.2.5.1.6	Y size of PSF grid for each pixel	This TBC is copied from L1C PFS
TBC-09	4.2.5.1.6	Z size of PSF grid for each pixel	This TBC is copied from L1C PFS
TBC-10	4.2.5.1.5	class_channel_mean	Type is TBC. This TBC is copied from L1C PFS.
TBC-11	4.2.5.1.5	class_channel_std	Type is TBC. This TBC is copied from L1C PFS.