

5 Coordinate Reference Systems (CRS)

To define the location of features using the S-100 Framework, one first needs to define a Coordinate Reference System (CRS). A Coordinate Reference System in two dimensions uses a coordinate pair, either X and Y for a Cartesian system or latitude and longitude for a geodetic/geographic system to define the location of a feature on a 2-D grid. However, if one wants to plot features in a 3-dimensional Coordinate Reference System, where we now want to include depths on a nautical chart or elevations on a map, one needs to assign the depth or elevation as the third component. For Cartesian systems, one would use X, Y, Z as the triplet or for geodetic/geographic systems, one would use latitude, longitude and height. The height can be the ellipsoid height or any of the other vertical references (see Vertical Reference System below). Geodetic/geographic coordinates are more intuitive for positioning and navigation applications on or near the Earth's surface while Cartesian coordinates are more appropriate if vectors are needed to accurately illustrate a graphical relationship between two or more points. ~~If geodetic/geographic coordinates are specified, then the IHO recommends using the latest realisation of the World Geodetic System of 1984 (WGS 84).~~

5.1 Horizontal reference system

~~For products based on the S-100 Framework, including this Standard for S-104 products, the geodetic/geographic Coordinate Reference System must be of the form EPSG:xxxx (with WGS 84 as base datum). The generic form/code for the WGS 84 frame is EPSG:4326 while the latest and most widely adopted realisation of the WGS 84 reference frame as of 2022 was EPSG:9057. The full reference to EPSG can be found at <https://epsg.org> and other EPSG references for recent WGS 84 realisations are given below:~~

| | | |
|---------------------------------------------|-----------------------|-------------------------------|
| WGS 84 (generic) | ESPG:4326 | |
| WGS 84(G2296) | EPSG:10606 | |
| WGS 84(G2139) | EPSG:9755 | Valid epoch 2016:0 |
| WGS 84(G1762) | EPSG:9057 | Valid epoch 2005:0 |
| WGS 84(G1674) | EPSG:9056 | Valid epoch 2005:0 |
| WGS 84(G1150) | EPSG:9055 | Valid epoch 2001:0 |
| WGS 84 / UTM Zone 1N to Zone 60N | EPSG:32601 | EPSG:32660 |
| WGS 84 / UTM Zone 1S to Zone 60S | EPSG:32701 | EPSG:32760 |
| WGS 84 / UPS North (E,N) | EPSG:5041 | |
| WGS 84 / UPS South (E,N) | EPSG:5042 | |

~~Allowed coordinate reference systems are listed below.~~

| | |
|----------------------------------------------|------------------------------------------------------------------------|
| Coordinate Reference System: | EPSG:9057 (WGS 84) or another reference system listed above |
| | EPSG:4326 (WGS 84) |
| | WGS 84 / UTM Zone 1N to Zone 60N EPSG:32601 - EPSG:32660 |
| | WGS 84 / UTM Zone 1S to Zone 60S EPSG:32701 - EPSG:32760 |
| | WGS 84 / UPS North (E,N) EPSG:5041 |
| | WGS 84 / UPS South (E,N) EPSG:5042 |
| Datum: | WGS 84 defined by NGA |
| Projection: | None / UTM / UPS |
| Horizontal Units: | Decimal degrees / Easting and northing |
| Coordinate Reference System Registry: | EPSG Geodetic Parameter Registry |
| Date type (according to ISO 19115-1): | 002 - publication |
| Responsible party: | International Association of Oil and Gas Producers (IOGP) |

~~Producers of S-104 data must use the same CRS/projection as the underlying S-101 or S-102 dataset and should endeavour to use the same realisation. (Reference system information encoded in datasets must be~~

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such that application software can automatically match reference system information encoded in different data products, especially S-101/S-102/S-104.)