SLOVENSKI STANDARD
SIST ENV 12762:1999

01-april-1999

Geografske informacije - Napotki - Položaj

Geographic information - Referencing - Direct position

Geoinformation - Bezug - Position

Information géographique - Systeme de référence - Position directe

Ta slovenski standard je istoveten z: **ENV 12762:1998**

ICS:

07.040	Astronomija. Geodezija. Geografija	Astronomy. Geodesy. Geography
35.240.70	Uporabniške rešitve IT v znanosti	IT applications in science

SIST ENV 12762:1999 **en**

EUROPEAN PRESTANDARD
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Descriptors: data processing, information interchange, geographic information, position (location), geographic coordinates, definitions, specifications

English version

Geographic information - Referencing - Direct position

Information géographique - Système de référence - Position directe

Geoinformation - Bezug - Position

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 287 "Geographic Information", the secretariat of which is held by AFNOR.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

In the context of this European Prestandard, a direct positioning system identifies location of points in relation to the Earth by coordinates. The most widely-used systems are geodetic reference systems. Others exist, mainly for local use.

This European Prestandard :

- defines the basic concepts related to coordinate position information ;
- gives the guidance necessary to use the geodetic reference systems for geographic information.

The choice of any particular position system is outside the scope of this European Prestandard.

NOTE This European Prestandard is intended to be used for giving direct positions for geometric primitives according to prENV 12160 as part of geographic data or metadata.

2 Normative references

This European Prestandard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ENV 12009 :1997, *Geographic information - Reference Model.*

ENV 12160 : 1997, *Geographic information – Data description - Spatial schema.*

ENV 12657 : 1998, *Geographic information – Data description - Metadata.*

ENV 12661 : 1998, *Geographic information – Referencing – Geographic identifiers.*

ISO 1000 :1992, *SI units and recommendations for use of their multiples and of certain other units.*

ISO 10303-11 :1994, *Industrial automation systems and integration - Product data representation and exchange - Part 11: Description methods: The EXPRESS language reference manual.*

ISO 10303-41 : 1994, *Industrial automation systems and integration - Product data representation and exchange - Part 41: Integrated generic resources: Fundamentals of product description and support.*

3 Definitions

For the purpose of this European Prestandard, the following definitions apply :

3.1
astronomical coordinates ((Φ,Λ,*H*) or (Φ,Λ))
astronomical latitude and astronomical longitude of a given point, with or without height

3.2
astronomical latitude (Φ)
angle from the equatorial plane to the direction of gravity through the given point, northwards treated as positive

3.3
astronomical longitude (Λ)
angle from the zero meridian plane to the celestial meridian plane of the given point, eastwards treated as positive

NOTE The celestial meridian plane differs from the meridian plane defined in this standard ; the celestial meridian plane is the plane which contains the direction of the polar axis and the direction of gravity through the given point.

3.4
bidimensional datum (2-dimensional datum, horizontal datum)
datum which serves as a reference for defining 2-dimensional coordinates on a surface

NOTE 1 The surface can be a projected plane or a reference ellipsoid or any surface that can be considered as level.

NOTE 2 At present, regional geodetic datums like ED50 are treated as bidimensional.

3.5
cartesian coordinates
numbers given to locate a point in relation to mutually-perpendicular axes

3.6
coordinate system
rule for designating each point in space by an ordered set of numbers

NOTE The position can be in relation to space, to a surface, to a plane or to a line.

EXAMPLES (X,Y,Z), (Φ,λ,h), (Φ,λ), (E,N), in each case with numerical values.

3.7
datum
set of fundamental parameters which collectively serve as a reference for defining other parameters

NOTE Supertype of geodetic datum and vertical datum.

3.8
deflection of the vertical
angle between the perpendicular to a point on the geodetic ellipsoid and the direction of gravity through that point

NOTE When this is zero, astronomical latitude and longitude are the same as geodetic latitude and longitude.

3.9
direct position
position described by an ordered set of numbers in a positional reference system

3.10
easting (E)
eastward coordinate on a map projection plane

NOTE The eastward direction on a map projection plane is only an approximation to the true east direction.

3.11
ellipsoidal height (h)
distance of a point from the geodetic ellipsoid measured along the perpendicular to the geodetic ellipsoid at that point, with height of points outside the ellipsoid being treated as positive

NOTE Also known as geodetic height.

3.12
flattening
parameter for the deviation of the shape of an ellipsoid from a sphere expressed mathematically by the equation $f = \frac{a-b}{a}$, where a and b are the ellipsoid's semi-major and semi-minor axes

3.13
fundamental point
starting point of the bidimensional terrestrial network to which the datum definition is related

NOTE Only used in two dimensions.

3.14
geodetic coordinates ((Φ,λ,h) or (Φ,λ,H) or (Φ,λ))
geodetic latitude and geodetic longitude with or without height

3.15
geodetic datum
datum which describes the relation of the origin and the orientation of the axes of a coordinate system related to the Earth

NOTE See also bidimensional datum, tridimensional datum, unidimensional datum.

3.16
geodetic ellipsoid
flattened ellipsoid of rotation, usually chosen to fit the geoid as closely as possible, either locally or globally

NOTE Also called "reference ellipsoid" or "normal ellipsoid".

3.17
geodetic latitude (Φ)
angle from the equatorial plane to the direction of the perpendicular to the ellipsoid through the given point, northwards treated as positive

3.18
geodetic longitude (λ)
angle from the zero meridian plane to the meridian plane of the given point, eastward treated as positive

3.19
geodetic reference system
complete reference system for positioning a point on the Earth, including datum, coordinate description, coordinate system and possibly a projection

3.20
geographic coordinates
geographic latitude and geographic longitude, with or without height

3.21
geographic latitude
generic term for geodetic latitude or astronomical latitude

NOTE More often geodetic.

3.22
geographic longitude
generic term for geodetic or astronomical longitude

NOTE More often geodetic.

3.23
geoid
equipotential surface of the Earth's gravity field which most closely approximates mean sea level globally or locally

NOTE An equipotential surface is a surface which is "level" with respect to the stated gravity field.

3.24
geoid height
distance between geoid and the geodetic ellipsoid, outside the ellipsoid treated as positive

3.25
geoid model
mathematical function defining a surface to represent the geoid either locally or globally

EXAMPLE OSU91A.

3.26
gravity (*g*)
downward force on a unit mass, created by Earth's gravitation and the centrifugal effect due to the Earth's rotation

NOTE Gravity is sometimes used to mean the magnitude of the force.

3.27
Greenwich meridian plane
meridian plane passing through Greenwich, England, widely used as the zero meridian plane

NOTE This is actually only a half-plane, on the European side of the polar axis.

3.28
height
distance of a point from a chosen reference surface along a line perpendicular to that surface, with heights of points outside the surface treated as positive

NOTE See also ellipsoidal height, normal height, orthometric height.

3.29
hybrid tridimensional geodetic datum
tridimensional geodetic datum consisting of a horizontal datum and a vertical datum which are defined by two different surfaces

3.30
indirect position
position information based on geographic identifiers rather than coordinates

EXAMPLE Postal address.

3.31
latitude
see astronomical latitude, geodetic latitude, geographic latitude

3.32
local cartesian coordinates (*u,v,w* or *u,v*)
cartesian coordinates related to axes whose origin is a point on the Earth's surface

3.33
local datum
datum which serves as a reference for defining local cartesian coordinates

3.34
local reference system
positional reference system based on a horizontal surface through a starting point

NOTE 1 The horizontal surface is in contrast to a plane generated by a map projection.

NOTE 2 The system can be bidimensional or tridimensional (including heights).

3.35
longitude
Angle from the zero meridian plane to the meridian plane of the given point, eastward treated as positive (see astronomical longitude, geodetic longitude and geographic longitude)

3.36
map projection
mathematical mapping of a geodetic ellipsoid or part of a geodetic ellipsoid to a plane

NOTE Some projections use a sphere which approximates the ellipsoid in some way.

3.37
mean sea level (MSL)
average level of the surface of the sea without the effect of periodic variations

NOTE Mean sea level in a local context normally means sea level for the region as measured by tide gauge measurements over a considerable length of time.

3.38
meridian plane of a point
plane containing the polar axis and the point

NOTE Celestial meridian plane is slightly different (see the note in 3.3).

3.39
normal gravity (γ)
absolute value of a theoretical gravity force, defined by the equipotential ellipsoid of revolution, at a point

3.40
normal gravity formula
mathematical description of the reference surface for normal gravity values

3.41
normal height (H_n)
height above the quasigeoid, with heights outside it treated as positive

NOTE 1 The quasigeoid is an approximation to mean sea level very close to the geoid (usually within 0.1 metres, but about 2 metres above the geoid in mountainous regions). Normal height is equally close to orthometric height.

NOTE 2 A more rigorous definition, including the reasons for the word "normal", can be found in informative Annex C.

3.42
northing (N)
northward coordinate on a map projection plane

NOTE The northward direction on a map projection plane is only an approximation to the true north direction.

3.43
orthometric height (H_o)

distance of a point from the geoid measured along the direction of gravity at that point, with heights outside the geoid being treated as positive

NOTE A more rigorous definition, using additional geodetic terms, can be found in Annex C.

3.44
plane coordinate
map coordinate

3.45
positional reference system
system for assigning numerical coordinates to a location on the Earth

NOTE The system can be either a geodetic reference system or a local reference system.

3.46
reference surface
curved surface on which the coordinate system is based

3.47
semi-major axis
distance between the centre of the ellipsoid and any point on the equator

NOTE Also called equatorial radius.

3.48
semi-minor axis
distance between the centre of the ellipsoid and the North (or South) pole

3.49
tridimensional datum (3-dimensional datum)
datum which serves as a reference for defining 3-dimensional coordinates

NOTE At present, geocentric geodetic datums like WGS84 are treated as tridimensional.

3.50
unidimensional datum (1-dimensional datum, vertical datum)
datum which serves as a reference for defining heights

NOTE Often in relation to the mean sea surface.

3.51
vertical offset
height difference between a control point and the reference level (zero-level) -

3.52
zero meridian plane; zero meridian
chosen meridian plane from which longitude is measured

NOTE 1 The zero meridian plane is actually only a half-plane, on one side of the polar axis.

NOTE 2 Often abbreviated to zero meridian although strictly speaking a meridian is a line of intersection of the plane along a reference surface, for example an ellipsoid.

4 Definition of position information

There are two methods of positioning points relative to the surface of the Earth :

- direct position, which is position based on coordinates. This is the type of position covered in this European Prestandard ;
- indirect position, which means information related to position without using coordinates (example : postal address). This is the type of information covered by ENV 12661.

Complete references are formally described in the EXPRESS schema in Annex A.

4.1 Direct position

Direct position is a set of coordinates usually based on a geodetic reference system which includes a geodetic datum (which defines the position of the origin, orientation of the axes and the ellipsoid and geoid to be used) and a coordinate system. However, it can also be a set of coordinates based on a local reference system, using a horizontal surface through a starting point (see 4.7).

The information shown in figure 1 is mandatory to identify the direct position.
Information on how to transform coordinates from the reference system to another (figures 2 to 8) is optional.

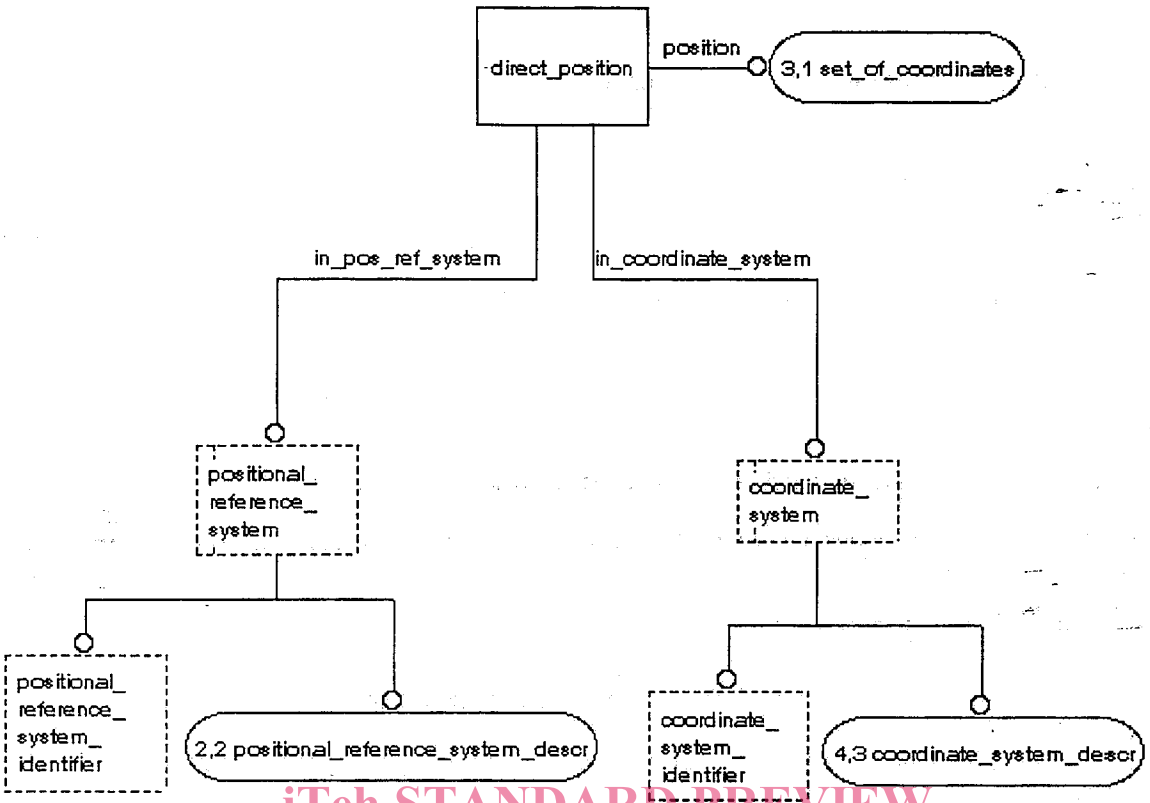


Figure 1 - EXPRESS-G diagram of direct position

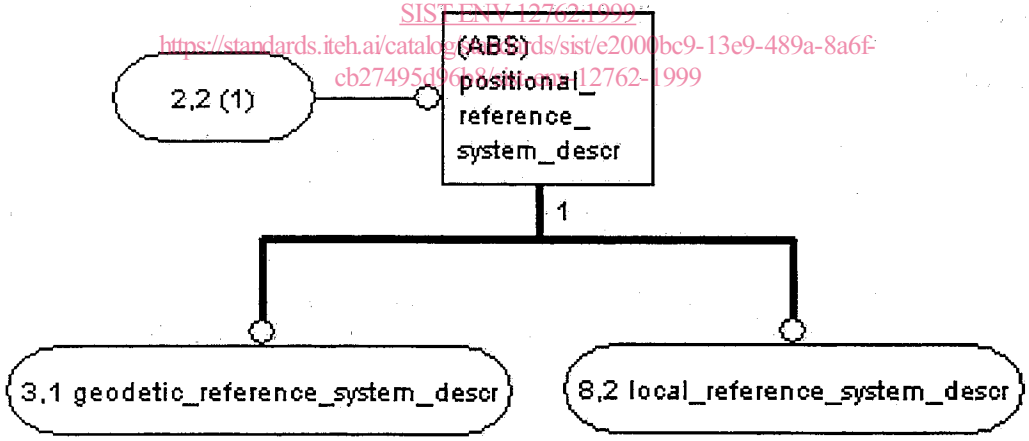
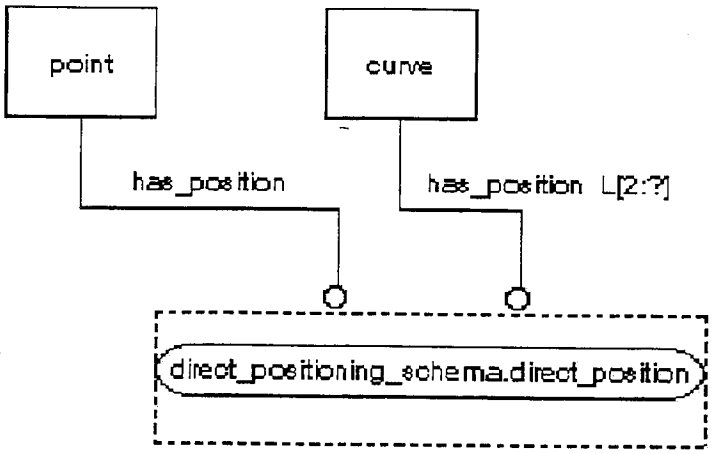


Figure 2 - EXPRESS-G diagram of positional reference system

NOTE The methods of using the positioning definitions in this schema are given in the ENV 12160 and the ENV 12657.

The main idea is illustrated in the two following examples :

EXAMPLE 1 In principle, spatial schema is referencing the direct positioning schema in the way illustrated below. The exact definition of spatial schemas are given in ENV 12160.



Formal EXPRESS specification of the example 1 :

```
SCHEMA spatialGx;

REFERENCE FROM direct_positioning_schema
      (direct_position);
ENTITY curve;
      has_position : LIST [2:?] OF direct_position;
END_ENTITY;

ENTITY point;
      has_position : direct_position;
END_ENTITY;

END_SCHEMA;
```