Transformation with 3-DIM

For GNSS (GPS/GLONASS/GALLILEO), CAD and GIS applications

3-DIM is available for the follwing kinds of transformations:

- GNSS heights into physical sea-level based standard heights (DFHRS) (Digital Finite Element Height Reference Surface). URL: www.dfhbf.de)
- GNSS positions into classical national plan position systems (DFPRS) (Digital Finite Element Plan Position Reference Surface)
- Classical national plan position systems according to ETRS89 (COPAG) (Continuously PAtched Georeferencing)

3-DIM allows an online transformation of ETRS89 based GNSS positions into the plan position and height datum of classical national systems without identical points. Additionally, 3-DIM provides the conversion of classical national plan position systems according to ETRS89.

Depending on the mesh size of the FEM grid and the density of identical points used for the computation of the data base parameters, the accuracy of 3-DIM database products are divided into different classes. These are 1 cm, (1-3) cm, (3-5) and (5-10) databases for the transformation of plan positions as well as for the transformation of GNSS heights into physical heights H.

Advantages of 3-DIM at one glance:

➔Flexibility

- Nation wide GNSS based online and post-processing plan position and height determination
- Broad support by the use external software
- Transformation of old classical positions and respective databases (e.g. DHDN in Germany) to the modern GNSS-consistent ITRF datum (e.g. ETRS89 in Europe).

➔Saving of costs

- Purchase, field-search (see picture above) and local non-continuous own transformation computations can be dropped.
- Amortization after a few days

➔Quality increase

- Reliability and constancy of the results
- Quality control is realised once when building up the database. The field calibration and interpretation of the transformation results in the field can be omitted.

The positions resulting from GNSS services (e.g. via **SA***POS*© or **as**cos©) relate to the ETRS89 datum. The parameters which are available through the 3-DIM databases realise the direct transformation of these GNSS positions into the corresponding datum of the national systems concerning plan position and height.

Within the scope of the general change of GIS data georeferencing into ETRS89, the COPAG databases support the transformation of existing data (e.g. with DHDN georeferencing in Germany) into the GNSS consistent ETRS89 datum.

3- DIM – the flexible tool

3-DIM databases can be used with the operating systems 9X, NT, 2000, XP and CE. The Engineering Office Seiler or the 3-DIM partners sell the 3-DIM databases. For quotations and orders please contact the below stated address. Furthermore, the Engineering Office Seiler prepares customer databases for special areas or higher accuracy requirements as a service.

The following software and hardware products support 3-DIM databases:

- Leica (Controller and SkiPro/LGO)
- Trimble (TGO, ACU and MAP500)
- TOPCON
- AutoCAD- Application
- Gart-2000
- DCTools
- Vestra
- GEOsamos
- GISmobil
- PageWin
- OLGA_PRO
- Use3DIM
- Microstation
- KomGIS

Plan position

DFCRS/CoPaG databases provide the so called DFCRS/CoPaG transformation parameters nation-wide. In the function of the ETRS 89 based GPS position (B, L, h), the coordinate is transfered into the classical national position grids with the help of these parameters.

For the DFCRS/CoPaG based approach plan position and height are separated:

$B_2 = B_1 + dB_1$ (u, v, w, $\varepsilon_x, \varepsilon_y, \varepsilon_z$, dm, da, df,$B_1$,$L_1$,$h_1$)
$L_2 = L_1 + dL_1$ (u, v, w, $\varepsilon_x, \varepsilon_y, \varepsilon_z$, dm, da, df, B_1,L_1,h_1)

whereas :

B_2	=	latitude in target system
L_2	=	longitude in target system
B_1	=	latitude in source system
L_1	=	longitude in source system
u, v, w, $\varepsilon_x, \varepsilon_y, \varepsilon_z$, dm	=	transformation parameter

Altitude

The heights resulting from GPS are purely geometrical (WGS84 ellipsoid).The DFHRS correction from the databases realise the direct transformation from GPS heights h into the physically defined heights (“sea level”) within the national height system. The DFHRS database provides the nationwide correction within the ETRS89 datum in funciton of the GPS position (B, L, h).

The DFHRS based approach looks as follows:
H = h - DFHBF(p|B,L,h)
whereas:

H	=	national height as an output
h	=	GPS height in the ETRS89 datum
B,L	=	GPS position in the ETRS89 datum
p	=	FEM and measurement parameter as components of DFHBF_DB
DFHRS(p|B,L,h)	=	DFHRSFcorrection (consisting of geoid- und measurement share)

The scientific concept is held by the following persons

DFLBF/CoPaG (www.geozilla.de)
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For further information please check our home page.

3-DIM customer

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