

ECGN Standards

for the Levelling Connection of the ECGN Station

General Requirements

The levelling height of the ECGN marker has to be determined in relation to the European Vertical Reference System (EVRS). The current realization of the EVRS is the EVRF2000 which is realized by the geopotential numbers and normal heights of nodal points of the United European Levelling Network 95/98 (UELN 95/98) extended for Estonia, Latvia, Lithuania and Romania .

The connection has to be determined between the ECGN levelling marker and the

- a) UELN 95/98 for all countries which are members of the UELN (see <http://evrs.leipzig.ifag.de/>)
- b) National height system for islands whose levelling network is not connected to the European continent and for all countries which are not members of UELN.

In case you are unsure about the position of the UELN points in your country you can get the information at martina.sacher@bkg.bund.de.

Measurements

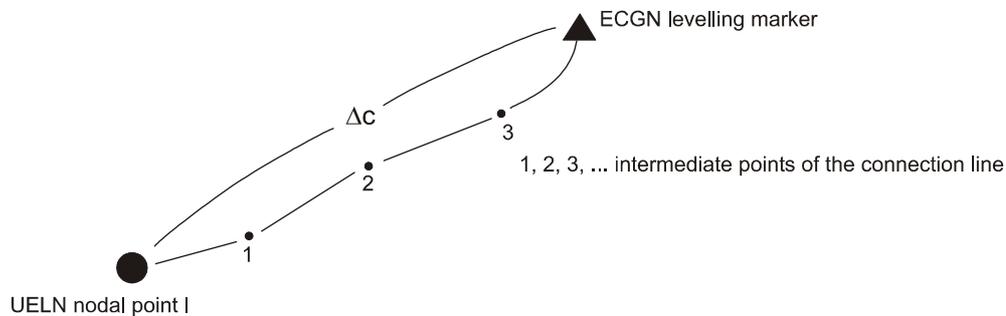
The connection between the ECGN levelling marker and the UELN marker should be given in geopotential number differences. The levelling accuracy should be equal to the requirements of a first order levelling (better than 1 mm per km). The geopotential number difference ΔC_P of a line has to be calculate by

$$\Delta C_P = \sum_1^n \frac{g_i + g_k}{2} \Delta h_{ik} \quad [m^2 \cdot s^{-2}]$$

Δh_{ik} are the levelled height differences between the intermediate points i, k in a distance of about 1 km along the levelling lines. g_i , g_k are the gravity values in IGSN71 of the intermediate points i and k along the levelling line. In dependence of the variation of the gravity and the topography along the levelling lines the gravity values are to be derived in distances between 0.5 and 3.0 km with an accuracy between 1 to 3 mgal. For connection levellings shorter than 0.5 km the gravity value is only necessary in one of the considered points: ECGN levelling marker or UELN point.

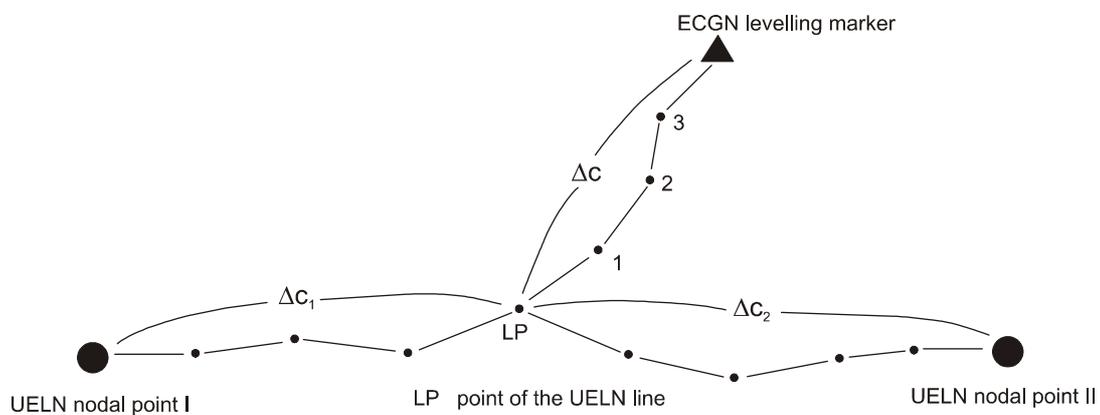
The connections ΔC_P between the ECGN levelling marker and the levelling network can be carried out principally in three ways :

a) With a levelling line or a levelling loop respectively to a nodal point (sketch 1)



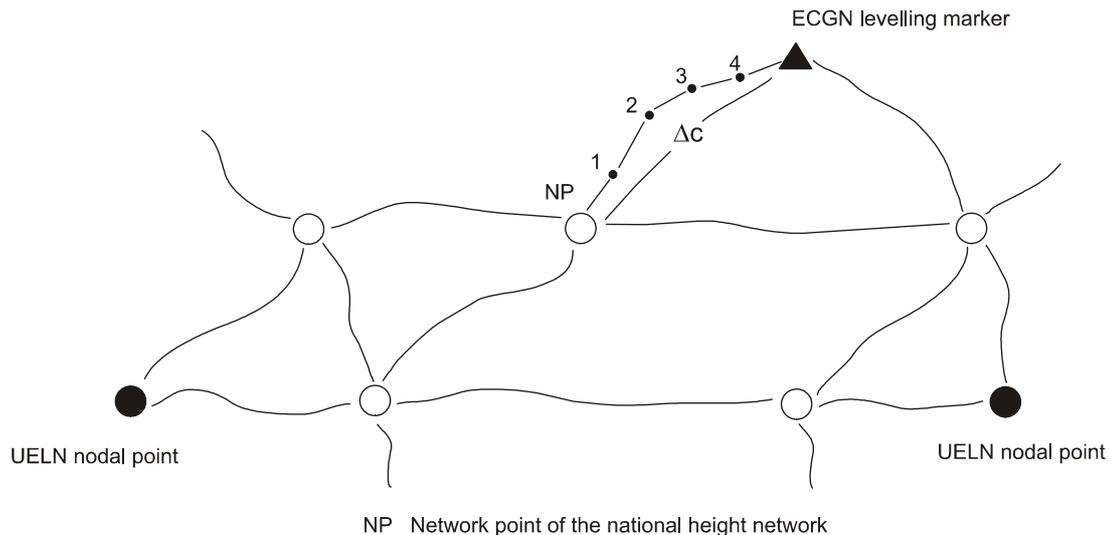
Sketch 1

b) With a connection levelling to a line point LP between two nodal points. In addition to ΔC the geopotential number differences ΔC_1 and ΔC_2 between the nodal points and the line point LP have to be given (sketch 2) and will be included in the next UELN adjustment.



Sketch 2

c) With a local height network (the national height network can be used) which is connected at least to 2 UELN nodal points (sketch 3). In this case it would be preferable to hand over the whole local network in order to include it into the UELN. (contact: martina.sacher@bkg.bund.de)



Sketch 3

Meta Data

Within the frame of ECGN meta data about the levelling connection, UELN marker ID, distance to the ECGN station etc. will be collected. Please use the corresponding forms and fill in all necessary information carefully.

Data exchange

Please use the *ECGN Levelling Form* to handing over your levelling data (in cases a and b).

The first part of the form contains general information.

In the second part you have to fill in information about the connection points to the UELN or national height network respectively. If your ECGN station is connected to only one nodal point of the height network (*case a*) you have to fill in only the column “nodal point NP I”. For *case b* you have to fill in all 3 columns (nodal point NP I, nodal point NP II, line point LP). Most of the countries taking part in the ECGN project are members of UELN - please fill in your information in the line “UELN”. If your ECGN station is connected only to your national height system please fill in the information in the line “other networks”. In the last line of the second part you shall fill in the coordinates of the connection point(s).

The third part shall contain the measured height differences between the ECGN levelling marker LM and the nodal point NP I (*case a*) or between two nodal points NP I and NP II to a line point LP and between the ECGN levelling marker LM to the line point LP (*case b*).