

# *GUM Workbench*

The Tool for Expression of Uncertainty in Measurement

*Manual*

for version 1.2  
English edition

Metrodata  
GmbH



TEKNOLOGISK  
INSTITUT

**Introduction • GUM  
Workbench**

GUM Workbench is software used to analyze the uncertainty of any measurement, test or analysis, including calibrations, physical testing and chemical analyses. The statistical and mathematical analysis and computations follow the rules of the 'ISO guide to the expression of uncertainty in measurement' and the requirement document EA 4/02 of the European cooperation for Accreditation. (The document was previously called EAL-R2).

The computation examples of the EA 4/02 can be analyzed with the help of the program. They are included in the software package as examples. The program supports a systematic procedure for building uncertainty analyses as recommended in the EA document. Starting with the mathematical equation which models the physical relationship between quantities in the respective measurement, the user is being prompted for the data needed for the analysis, such as the standard uncertainty or the distribution of values.

The analysis process is controlled by a standardized classification of the input quantities according to the information available.

The result of the analysis is a clear table of the uncertainty budget. This table holds all used measurands with their quantity names and values, the assigned standard uncertainty and effective degrees of freedom, the sensitivity coefficient automatically derived from the model

equation and the contribution to the standard uncertainty of the result of the measurement.

Finally the complete result of the examination is presented as a value with associated expanded uncertainty and automatically or manually selected coverage factor. All values are rounded to the correct number of decimal places.

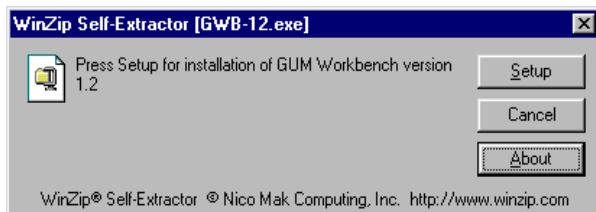
For documentation purposes, the result of the uncertainty analysis together with all input data can be printed as a report. All entered texts are included in the printout and used for a clear and structured documentation. Before the actual printing process is initiated, the user can check the result in a preview window.

Each analysis together with all the input (the model equation, the values and all the texts) can be saved in a file. That way the analysis is available for later modification or checking.

Each saved analysis can be used as a starting point for new uncertainty analyses utilizing the same model but using new or changed data.

The program is suited especially for the examination of the influence of the various values and their accompanying uncertainties on the result.

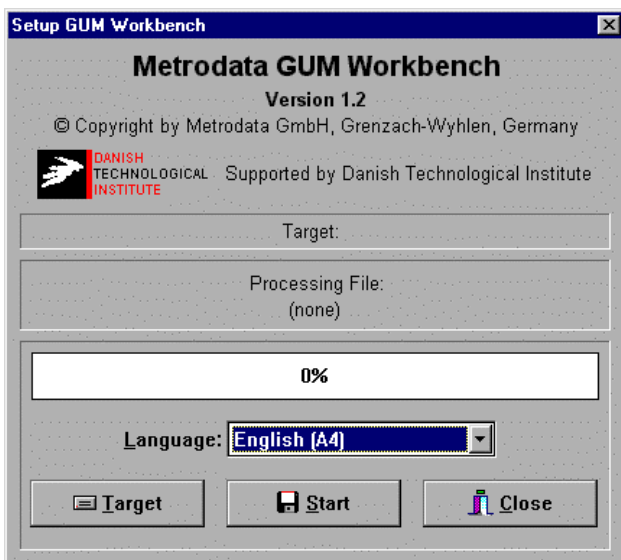
## Installation



### Installation of the program

GUM Workbench software is shipped in a self-extracting archive. The full version of the program is in the archive GWB-12.EXE and the demo version in the archive GWB-12D.EXE.

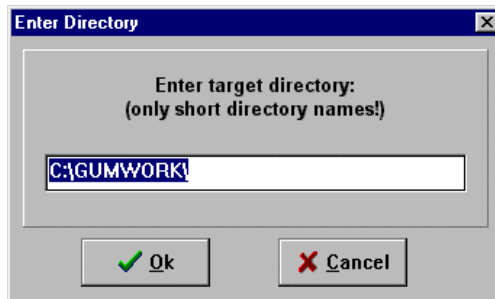
1. Double-click on the self-extracting file and press 'Setup' to start the installation.



2. Select a Target directory first. The default is GUMWORK for the full version of the program and GUMDEMO for the demo version of the program.

## Installation

## Installation



3.

Select the language for initial installation. (This selection is just to give the software a proper setting to start up with. The language and paper format may be switched any time after installation)

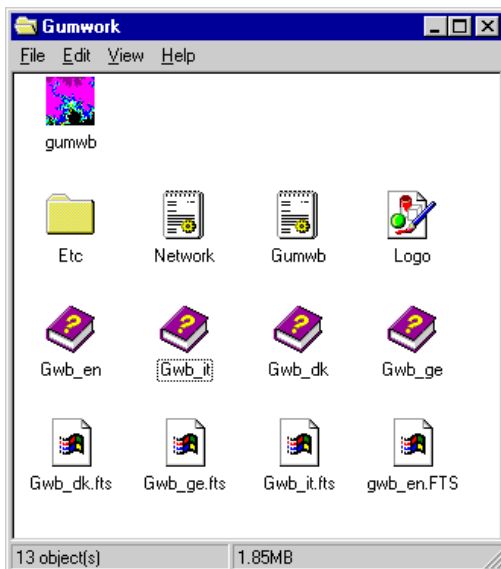
4.

Click 'Start' to install the program on the hard disk.



## Overview of installation

### GUM Workbench installation:



The file setup shown above is a typical installation of GUM Workbench (shown in the Windows™ 95 operating environment). Here, four languages are installed.

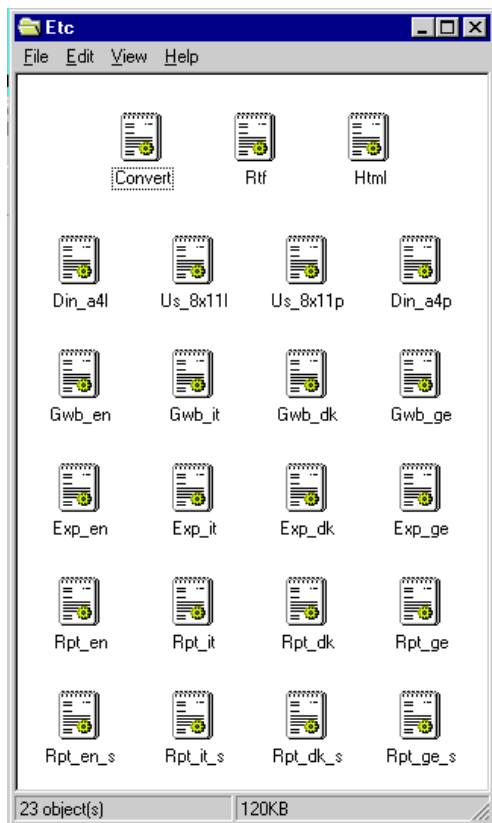
The file 'Gumwb' with Metrodata icon is the GUM Workbench application while the files 'Network' and 'Gumwb' with generic icon contains set-up parameters for the software. These files must neither be renamed, edited or moved, since this would compromise the correct operation of the software.

The folder 'Etc' contains additional resource files for the system.

The file 'Logo' is optional. GUM Workbench will run well without it. The purpose of this file is to place a logo (e.g. that of the user-organization) in the upper right hand corner of printed uncertainty reports. If a logo-file is absent, reports will just be printed with an empty field in the corner.

The files with book-icon shown to the left contain the on-line help in a number of languages. One book-icon should appear for each installed language.

Overview of installation  
Data files



Contents of the Etc-folder

The files 'Gwb\_en', 'Rpt\_en', 'Rpt\_en\_s' and 'Exp\_en' contain English-language texts for the user-interface, the report module and the export module respectively. The corresponding files with names ending in \_ge, \_it or \_dk are for German, Italian and Danish-language operation of the software.

The files 'Convert', 'Rtf' and 'Html' contain language independent settings and structure.

The files 'Din-A4p', 'Din\_A4l', 'US\_8x11p' and 'US\_8x11l' contain settings for paper sizes and orientations.

These files must neither be renamed, edited or moved, since this would compromise the correct operation of the software.

If GUM Workbench is only required to run in one language, this will not be hindered by removing the language dependent files for other languages.

.SMU files

Next, let us take a look at how data files appear. In the screenshot below, "Ampmeter" is the proper uncertainty file. Its full name is Ampmeter.smu. The file Ampmeter.bak has been created as a data-safety and integrity feature during the last save operation of Ampmeter.smu. To return to an uncertainty analysis, always double-click on the .SMU file. Uncertainty files may be placed freely in the file hierarchy. Some people prefer to keep uncertainty files in the same folder as the GUM Workbench application, while others place files according to project status or place them on network-drives for convenient sharing with other users. (This option requires GUM Workbench multi-user license).

