

These release notes are covering changes in LIMES 2000 since Version 16.0303.756

Installation procedure

- With introduction of CQS in LIMES 2000 Revision 787, a new class of evaluation tools is implemented which requires installation of the LMT Automation Objects (LMTAO) library.

Version 1.2 with build number 20 or higher is required and can be downloaded from the LMT homepage. If the LMTAO library is not installed or has wrong version Limes and LimesControl will not start but will display an error message that LMTAO is not installed or LMTAO has wrong build number.

Stabilization procedure

- Stabilization with photometric parameters and/or electrical power has been implemented. Up to now the stability check was based on photometric values only.

The new feature is necessary to satisfy IES LM 79 and CIE S025 requirements, i.e. light output and electrical power shall be stable before starting a measurement (rf. for instance to clause 4.4 in CIE S025).

Stabilization data are displayed and will be saved for all configurations (photometry and/or electrical power).

Note 1: Stabilization using electrical power is currently only implemented using the Yokogawa type power measurement devices. Stabilization based on current and/or voltage measurement via reading of DC power supplies or individual Keithley multimeter is not yet available.

Note 2: At the moment stabilization using power is only implemented for General Lighting purposes based on turning devices or mirror goniophotometers. Automotive applications may follow if needed.

- The stabilization algorithm was changed such that instead of looking forward in time now the routine looks back in time. Based on the last measurement value the relative deviations are calculated for the past tolerance time interval. Additionally, the setup of the tolerance box is not anymore symmetric, i.e. divided into a plus or minus part, but comparing the difference of max and min to the full tolerance interval (see stabilization window in Figure 1 below).
- Graphical representation of the stabilization process has been improved. Size and position of most labels have been changed to ensure that text and data are displayed in the same format and without truncation. A bug has been fixed in order to display time correctly within the stabilization diagram with regards to seconds, minutes and hours.
- Messaging regarding lamp stabilization within the desired time interval was modified in order to include both photometry and power.

- The Flux/time table has been reviewed and given a more compact setup leaving out data which are not needed. In addition, the flux/time diagram was changed in a similar way to visualize as well electrical data.
- GO-V measurement with stabilization for each C-plane was updated. Now information is saved about the kind of stabilization (photometrical and/or electrical power) which was chosen including the given tolerances.
- The time/flux table has been updated with regard to the print routine. If no time and date was taken during the measurements, the row will not be displayed in the print out. The number of decimals is now identical with the entry in the data table option.

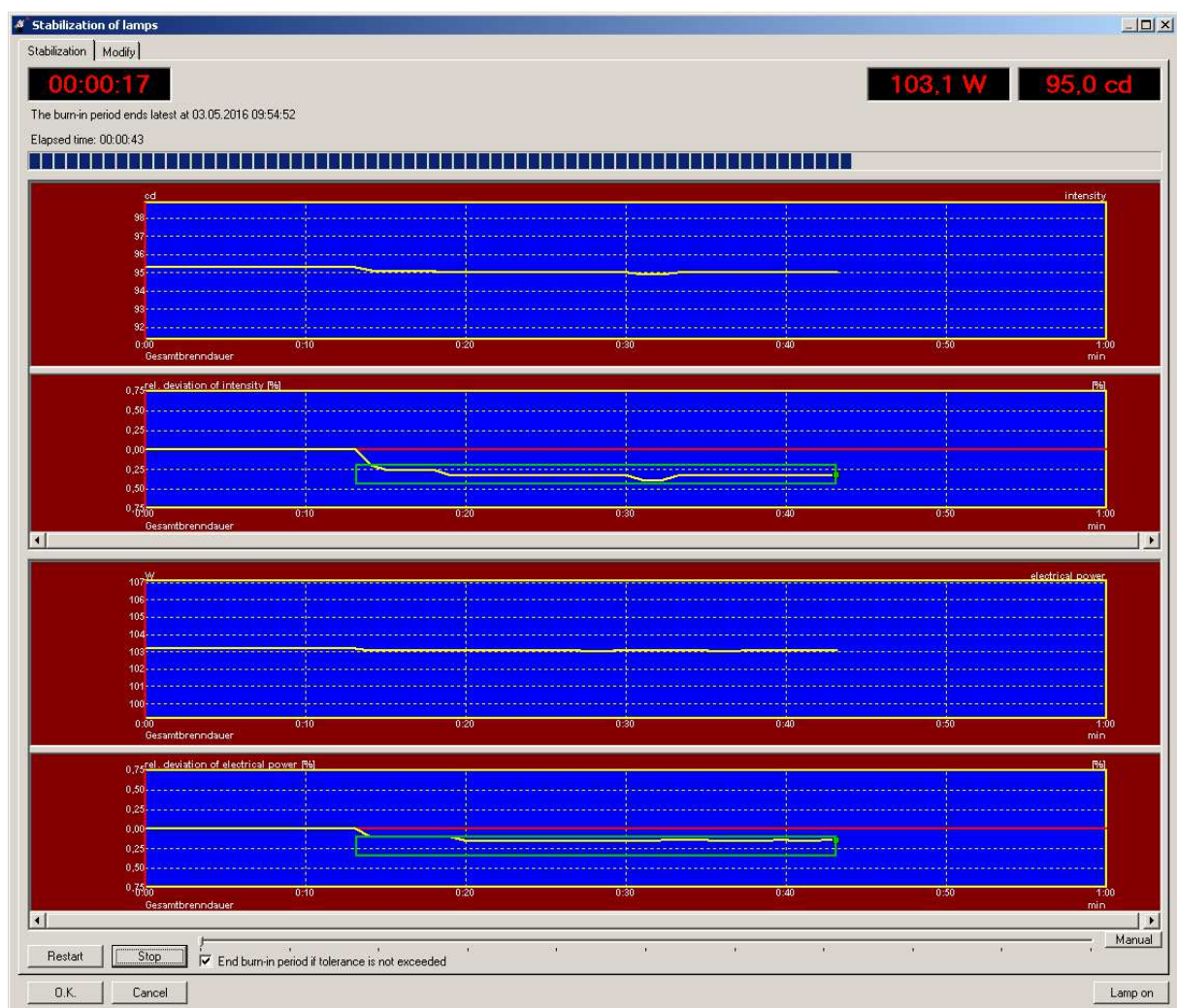


Figure 1 Stabilization window with both photometry and electrical power in absolute and relative units

Spectroradiometric evaluation

- The spectrometer software has been upgraded with the feature of Color Quality Scale (CQS) thus offering an alternative colour rendering algorithm. This feature is available with *Spectrometer Service* revision $\geq 1.2.4$.
If available, LIMES 2000 is reading CQS values from the spectrometer service and offers evaluations similar to the ones available for CRI. This feature needs unlocking via the user database file (*.udb)
- The calibration process within the spectrometer display client has been expanded in order to distinguish between *spectral* and *absolute* scale calibration. The latter is either based on a lamp calibration file (usually used in sphere applications) or based on the intensity reading delivered by the photometer. For detailed information, please refer to the spectrometer software manual.
- After absolute calibration the physical unit of the spectrometer readings will change from relative to absolute values:
 - Flux will be available in the sphere application either in lm or in W/nm
 - Intensity will be displayed for goniometer applications either in cd or W/sr, respectively, in lux or W/m².
In order to correctly convert cd into lux (or W/sr into W/m²) and vice versa, LimesControl transfers the measurement distance, in which the spectrometer is located to the spectrometer service. This is done during the initial setup of the TCP connection between LimesControl and the service. Thus, the laboratory layout is only stored once within the LIMES configuration files assuring, that independently of the individual Limes application in charge always the correct configuration data are used.
 - The distance is stored via LIMES 2000 in the hardware options menu, however, only for goniometer applications while the sphere application does not need a distance.
- The absorption correction factors determined with the photometer in the LIMES 2000 sphere application window can now be stored within the spectrometer software.
Once an absorption factor has been determined, it is transferred by double-click into the clipboard. Opening the calibration dialogue in the spectrometer software allows generating dedicated table entries for different lamp holders or absorption geometries and saving the absorption factor from the clipboard for an individual entry. For detailed information, please refer to the spectrometer software manual.
- The algorithm within the LM79 evaluation was revised in order to meet as well the CIE S025 requirements. The average spectrum is not anymore summed up according to the approximate approach using x, y and Y proposed in LM79, but more stringently calculated based on the tri-stimulus values X, Y Z.
Integration and weighting of luminaire contributions from different solid angles is calculated based on the well-known CIE formula for zonal flux (rf. CIE 84, The Measurement of Luminous Flux).
In addition, the algorithm now follows the LM79 recommendation to neglect values below 10% of peak intensity. In turn, this means that the “average” or integrated spectrum

does not carry any more the complete luminous flux of the light source, but only that part in which spectral data could be safely determined.

- “Average” CRI and CQS Values are calculated based on the average spectrum which disregards intensities below 10% of peak intensity (see remarks on the algorithm above).
- The diagrams containing radiometric data now display the unit at the left top position of the axis. The title of the measurement including both angles C , γ is plotted at the right top corner. Once the average spectrum is displayed this is indicated as well.
- In case of spectral diagram evaluation being selected for the printout, now the average spectrum is plotted.

GO-H automotive application

- Limes 2000 sometimes terminated with a runtime error during generation of an aiming template. The root cause was a wrong variable indexing the different vertical cut-off cross sections for horizontal aiming. Now the correct index is used and the aiming template can be edited without any problem.
- A run-time error occurring in situations using the multiplexer in combination with an external power supply was eliminated.
- The stabilization routine was changed as outlined above with regard to criteria (non-symmetrical, sliding time window, etc.), however, based on light output only (see *Note 2* above).

Flash measurements

- The evaluation algorithm which was chosen during measurements with the flash meter SF 105 is now saved within the test data structure in order to reliably identify the algorithm for effective intensity at all times, for instance when opening the data set at a later point in time.
Since old data do not have this information explicitly saved in the database, alternatively, the method which was stored within the test program is used.
- When displaying the results of all scan measurements, the effective intensity data will be read directly out of the raw data (FlashSys file with extension *.daq) containing the effective intensity based on all algorithms currently used by FlashSys.
- During the re-structuring of flash data a bug was fixed which caused the program always using the Schmidt-Clausen formula even if they had chosen a different algorithm. Now Blondel-Rey, Allard etc. can be displayed as well (see Figure 2 below).
- In the table on top of the iso-candela plot one can choose the algorithm for effective intensity by a right mouse click within the table and the values will be displayed for the

selected algorithm.

If another distribution is selected via the drop down menu initially the values corresponding to the algorithm selected during measurement are shown. If the user wants to see different algorithm results he can choose another one again.

The flash time diagram always display the point with highest effective intensity. Data of other angles are shown if the corresponding data point is actively chosen by highlighting the table entry, i.e. once clicking in the table on a data point its flash/time data will be plotted in the diagram.

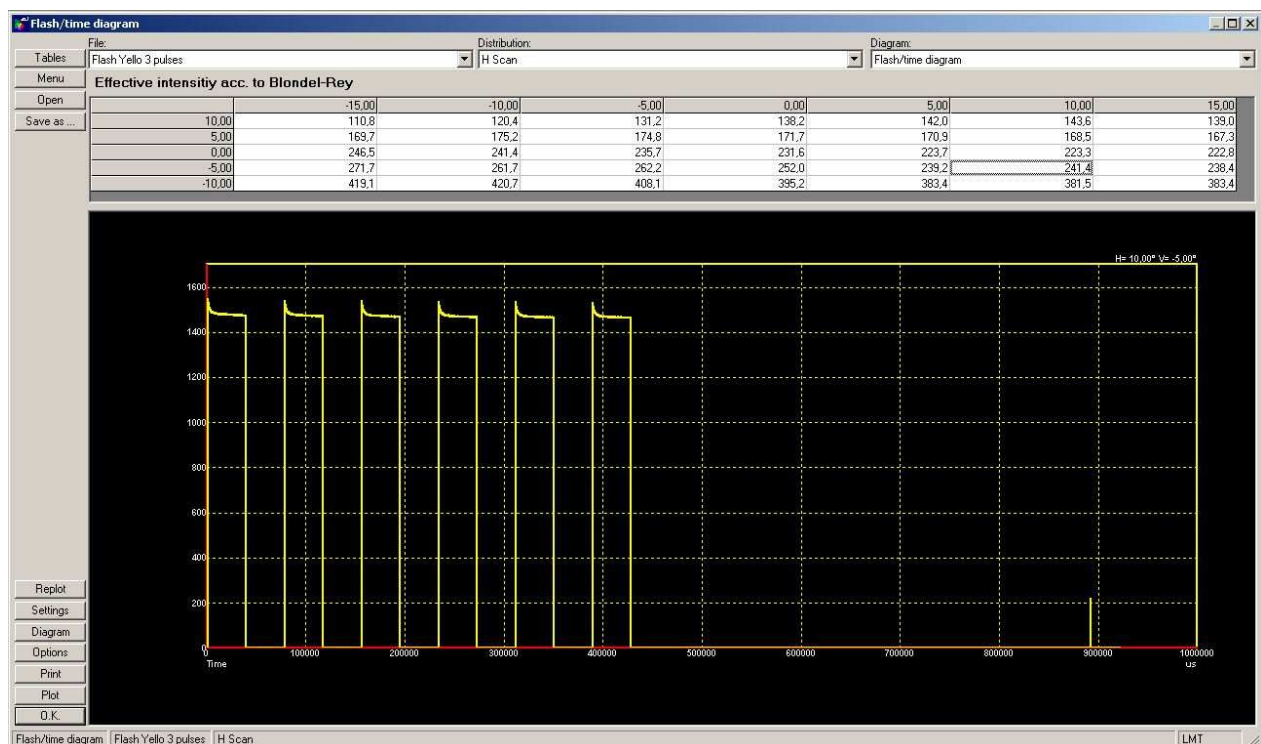


Figure 2 Flash/time diagram in LIMES 2000 with effective intensity tabled on top of the diagram.

- Diagrams of flash time data which were recorded without averaging could not be displayed. This bug was fixed.
- When loading a flash meter testprogram at program start sometimes the specific effective intensity was not shown. The user had to load the file again to get the specific table entry. The bug was fixed.
- Overall, the generation of flash diagrams was accelerated via code improvement.
- The dropdown menu for changing the distribution sometimes did not react properly. The behaviour was corrected.

General topics

- Occurrence of choosing wrong speed with GO-V for negative values has been fixed.
- C-plane measurements with GO-DS sometimes did not use a ramp-up leading to delayed readings at the pole. This bug has been fixed.
- Distances of checkboxes have been increased within the sphere application to take care of long texts (depending on language) thus avoiding truncation.
- Applying electric lamp stabilization in sphere applications caused problems since lamp data is stored differently in the sphere application.
Usually, the light source is part of the structure *test data* which also contains the program to be performed by the goniometer. Since the sphere measurement does not have angular variation, the lamp data are stored directly. Therefore, in sphere applications the lamp data structure was improved to always determine correctly which power supply and measurement devices are connected to the lamp during the sphere measurement.
- Shutting down Limes Control before LIMES 2000 sometimes led to long waiting times of up to 90 seconds. Now LIMES 2000 checks whether LimesControl is running and in case it is not, LIMES 2000 will quit without sending LimesControl the Quit or Disconnect command.
In a similar manner LIMES 2000 now checks if LimesControl is running before sending a command.