HIDEX

Date: 8.9.2023

TECHNICAL SPECIFICATIONS
Hidex 300 SL Academic model
Automatic TDCR Liquid Scintillation Counter

Code #	Description
425-204	**300SL TDCR liquid scintillation Counter** 100-240V AC and 12 V DC. **Features Model (425-204)** The Academic model of Hidex 300SL automatic TDCR liquid scintillation counter, ideal for scintillation counting research applications, including direct DPM counting without External radioactive standard source. The counter is equipped with unique 3- PMT technology to support TDCR counting, and modern MS Windows software for user-friendly operation. The design with small footprint and low weight allows integration into small laboratories and makes the system truly transportable. The instrument has min. 70 mm internal Pb shielding for background reduction. Results can be obtained automatically as DPM using TDCR quench correction method without radioactive standard source. The TDCR method reduces the need for preparation and maintenance of quench curves almost completely. Transportation and movement of standard instrument does not require licenses for handling radioactivity and decommissioning is easy and low cost. Academic model does not support connection to any optional features. The Hidex 300 SL liquid scintillation counter is intended for professional laboratory research use by trained personnel, who understand the nature of liquid scintillation analysis. **Isotopes** Detection of beta and alpha radiation by Liquid Scintillation Counting (LSC) ▪ beta-emitters on LSC mode up to 2,000 keV. ▪ alpha-emitters on LSC mode up to 10,000 keV ▪ Preset protocols: H-3 (unquenched, high water load and low water load), C-14, S-35, P-33, P-32, Fe-55, I-125, Ni-63, Sr-/Y-90 and Free. Other nuclides and Cerenkov counting can be easily defined. ▪ Up to 4 energy regions (ROI) can be defined in same measurement ▪ Ready-made measurement template library for detection of various most common isotopes as well as for double and triple label counting. **Analysis of data** ▪ Multi-Channel Analysis ▪ 2 x logarithmic MCA with 1024 channels each ▪ Beta spectrum analysis using MikroWin user interface software or Excel based Report Render spectrum analysis tool ▪ Quench curve analysis on MikroWin 300SL academic user interface software ▪ Quench correction by TDCR method, TDCR core function method and TDCR-quench curve method. **Counting modes** ▪ Beta (all coincidences) and beta triple (triple coincidences). ▪ Direct measurement of beta efficiency by triple to double coincidence ratio - applicable for all beta and alpha isotopes with continuous spectra, for monoenergetic isotopes and for detection of Cerenkov radiation. ▪ Triple counting mode for true luminescence free counting (Luminescence free mode) and for low level counting of C-14 and higher energy isotopes. **Physical Dimensions** ▪ 300 SL: 520 mm (Width) x 630 mm (Depth) x 680 mm (Height). ▪ Total weight 115 kg **Operating conditions** ▪ +10°C – +40°C; maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C. Note! Sample to cocktail suspensions may require measurements at 15C - 25C. ▪ Indoor use only ▪ Dust during operation: The system shall function in normal laboratory environment. ▪ Light during operation: The system shall function normally in normal ambient laboratory illumination **Storage and transport conditions** ▪ Transportation conditions -40°C to +70°C, humidity 5 – 90 %, packed in transport packaging ▪ Storage conditions -25°C to +50°C, humidity 5 – 90 %, packed in transport packaging

Electrical Connections

- Voltage: 100 ~ 240 VAC
- Frequency: 50 – 60 Hz
- Normal Power Consumption: <100W
- Silent operation.

Samples

- Vials: 5 mL, 7 mL and 20 mL (minivials such as Eppendorf tubes with adapters available as option)
- Vials require cap with flat surface to enable pneumatic gripping.
- Minimum dimensions of the vials: height 55 mm / Ø 14 mm.
- Vial compatibility must be confirmed with Hidex.
- Vials are placed in a tray with 40 x 20 mL vials, 96 x 7ml vials and 96 x 5 ml vials (option)

Counting time

- 1 second – 168 h (7 d) /sample.
- Max number of repeats in one measurement protocol is 1024 (either by vial or by range of vials)
- Counting can be terminated 1) by the counting time set 2) by max counts number or 3) by counting uncertainty thresholds, facilitating different counting times for samples with different activities in a run.

Vial transport

- Robotic loading arm with pneumatic mechanism removes the need for a complex elevator mechanism.

Static electricity

- By deionizer prior the movement of the vial to detector.
- Deionization time can be defined by user at 1 second intervals

Quench correction by

The instrument has automatic color, chemical and luminescence (quenching) detection and correction. Quench correction can be done using:

1. TDCR method
   - Allows automatic direct DPM counting of single beta emitters without the use of External standard source or quench curves
   - Allows automatic direct DPM counting of samples labeled with dual beta emitters, and with constant quench, without the use of external radioactive standard source or quench curve method
   - Deviation from true DPM is +/- 15 % depending on the isotope and the degree of quenching
   - Accuracy of TDCR method can be increase down to below +/- 5 % by fitting TDCR to TDCR-quench curve or mathematically using Core Functions
2. Instant DPM
   - by TDCR method

Luminescence correction

- ChemiCPM value that can be used for automatic luminescence correction is measured for each sample
- Luminescence free counting mode (triple coincidences)
- Adjustable "protocol start time delay" and adjustable "measurement chamber delay" to stabilize the samples before starting the measurement.

Measurement modes

- Low
  - for normal beta measurements
  - CPM data printed out with decimals
- Standard
  - for high activity samples - above 200 000 CPM
  - faster singnal processing/shorter DeadTime than in Low mode
  - CPM data printed without decimals
- Beta/BetaTriple
  - prints out all betas or beta triples only
  - data from up to 4 adjustable ROIs can be printed out

Spectra and Replay function

- User can choose to store and print out beta, beta triple
- Allows viewing the spectra and Replaying the data in new ROIs after completing the measurement.
- Live spectra during the measurement

Instrument operation and software

Counter can be operated using:

- MS Windows based MikroWin 300SL Academic user interface software
- Hidex Commfiler 2020 (for service use only)

3-color LED indicator for counter status

Data reduction by:

- MikroWin 300 SL or by Excel based tool Report Render spectral analysis software.
- User definable export format (txt, xls, csv, etc.) to any other data reduction software or data base.

MikroWin 300SL parameter-files for measurement for most typical isotopes and applications are available at parameter library included in all instrument deliveries.
The parameter files include predefined settings for running the assay and calculation formulas for printing out and export desired data. MikroWin 300SL software includes capabilities for biological assays, immunoassays, screening type assays, data validation and control history.
Random access counting:

- Possibility to add vials while instrumnet is counting
- Editing the protocols and analysis of previous data during the measurements

Analysis of data includes features such as automatic calculation of activity, normalization of results, background subtraction, precision, error of measurement, analysis of dual- and triple label data, half-life correction, etc. Also sample identification with sample number, position in the rack and with user definable ID is facilitated.

MikroWin enables also recalculatuion of the data with new PLI and ROIs after the measurement. Recalculation function enables sample specific calibration of the data in new energy regions (ROI) after the measurement.

Measured data can be printed out or exported in various formats e.g. to Excel.
Excel based tools: Report Render spectral analysis software enables easy-to-use tools for optimizing FOM, analysis of spectra and background spectral subtraction in familiar Excel environment.
MikroWin 300SL software is compatible with Windows 7, 8 and 10 – Win 10 suggested to confirm functionality of all features.
Results data-file is saved automatically in the PC after completing the run
A security copy of data is stored after measurement of each sample.

Communication connections

- USB port allows communication with PC.

Detectors

Three low background PMTs provide optimum measurement geometry and facilitate TDCR counting

- 3 x Single Photon Counting Photo Multiplier Tube (PMT)
- Spectral range from 300 nm to 630 nm
- PMTs 120 degrees apart from each other

Detector shielding

- Optimal Pb shield design with a 4-pi 70 mm shielding of PMTs in all directions provides low background and minimizes instrument weight.
- Lead shutter provides optimum shielding from cosmic radiation
- Copper shielding around the measurement chamber eliminates x-rays from Pb shield.
- Measurement chamber with high reflective opaque paint maximizes light collection.

Performance Specifications**

All the measurements are performed at temperature of 22°C ± 2°C and at normal humidity conditions of Hidex laboratory, Turku, Finland (relative humidity not measured). Background may vary locally depending on natural environmental radiation.
Counting efficiency:

- Counting efficiency typical > 65 % for H-3 and typical > 95 % for C-14 with unquenched samples.
- > 30 % for H-3 quenched (8 mL water sample + 12 mL AquaLight cocktail)
- Cerenkov: typical > 50 % in open Y-90 Cerenkov ROI

Typical background:

- < 15 CPM with 8 mL water + 12 mL AquaLight Low Level cocktail.

*Background value measured using window with 25 % counting efficiency.

- Cerenkov: < 30 CPM in open Y-90 Cerenkov ROI

FOM (E^2/B):

- H-3 in water, optimized window > 40

Count Rate

- up to 3 000 000 CPM, with MCA

Resolution: 0.02 keV - 12.5 keV, unquenched conditions.

- H-3 ROI (18,6 keV) covered with 300 channels, equal to 0.06 keV/channel in average
- C-14 ROI (156 keV) covered with 600 channels, equal to 0,26 keV/channel in average

Performance Assessment

- Using standard samples
- OQ parameter file with history log
- Standards with OQ history log can be included in all measurements

Data recovery

The data of every sample is stored automatically in computer hard disk after completing the run. Security backup data-file is stored after measurement of each sample.

Vial recovery

Automatic return of sample vials after power failure.

Power up diagnostics

- Automatic power up diagnostics of instrument settings.

Safety Standards

- CE marked
- External power UL/CSA approved

Warranty

- 12 months

Maintenance

- No recommended spared during the warranty period
- Extended warranty and maintenance & service program available on request.
- Hidex is suggesting annual preventive maintenance plan to maintain the counter in good working condition.

**Performance data measured at Hidex factory in Turku, Finland. Background may vary locally depending on natural environmental radiation.

Equipment included in the delivery

- 425-204 Automatic Liquid Scintillation Counter
- 410-001 Owner's Handbook (pdf-version)
- 431-320 rack for 40 x 20 ml vials
- 431-208 Power supply 100-240V/24V
- 529-017 USB communication cable, 2 m
- QA Report

Software

- 426-142 MikroWin 300 SL Academic User Interface software

Includes TDCR-Quench curves for H-3 and C-14 as well as Measurement template library (par-file templates).

- 431-103 CommFiler 2020 service software
- MS Excel analysis tools: 450-010 Report Render

Options for 425-204 Hidex 300SL Academic

Code #	Description
426-004	PC Includes: MS Windows, Office pack English version, MikroWin 300 SL installation, parameter library, CommFiler service software and Excel spectrum analysis tools. Connection w/Hidex 300 SL configured. Delivery with the instrument only. Do not include printer - must be obtained locally
Code #	**Software**
426-142	MikroWin 300 SL Academic Included in new Hidex 300 SL deliveries
431-103	CommFiler 2020 service software Included in new Hidex 300 SL deliveries
450-010	Report render Spectrum Analysis software Included in new deliveries